

Architectural
Structural
Geotechnical



Materials Testing
Forensic
Civil/Planning

SOIL AND GEOLOGY STUDY

**Gunners Ridge
El Paso County, Colorado**

PREPARED FOR:

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9630 Arroya Lane
Colorado Springs, CO 80908**

JOB NO. 192027

**February 17, 2023
Amended April 11, 2023**

Respectfully Submitted,

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1.0 GENERAL SITE AND PROJECT DESCRIPTION

1.1 Project Location

The project lies in the a portion of the northeast quarter of Section 14, Township 12 South, Range 65 west of the 6th Principle Meridian in El Paso County, Colorado, and is generally located northwest of the intersection of Rex Road and Goodson Road. The approximate location of the site is shown on the Site Vicinity Map, Figure 1.

1.2 Existing Land Use

The site consists of one parcel. It is approximately 38.83 acres and has not been developed. The parcel included is:

- Schedule No. 5214000014 – currently addressed as 12172 Goodson Road, is zoned "RR-5" – *Residential Rural*.

1.3 Project Description

The site consists of approximately 38.83 acres and is vacant. The proposed development is to consist of 4 lots, three of which are to be approximately 5 acres. The fourth lot will comprise the remaining acreage of approximately 23 acres. The Proposed Lot Layout is presented in Figure 2.

Each lot is to be serviced by an on-site wastewater treatment system (OWTS) and an individual water supply well. It is our understanding site grading activities are to be limited to the extent necessary to facilitate construction of individual homes, drainage, utilities and roadway construction. The lots are reportedly to be accessed from a shared driveway that extends west from Goodson Road, between Lot 1 (the approximately 23-acre lot) and the remaining lots. It is our understanding that this shared driveway is not to be owned or maintained by the County.

2.0 QUALIFICATIONS OF PREPARERS

This Soil and Geology Study was prepared by a professional geologist as defined by Colorado Revised Statutes 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 21 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, P.E. is a licensed professional engineer with over 21 years of experience in the construction engineering (residential) field. Mr. Munger holds a B.S. in Architectural Engineering from the University of Wyoming.

3.0 STUDY OVERVIEW

The purpose of this investigation is to characterize the general geotechnical, geologic site conditions, and onsite wastewater treatment system (OWTS) feasibility and present our opinions of the potential effect of these conditions on the proposed residential development within El Paso County, Colorado. 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 El Paso County Engineering Criteria Manual (ECM), specifically Appendix C last updated July 9, 2019.

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.

The objectives of our study are to:

- Identify geologic conditions present on the site
- Analyze potential negative impacts of these conditions on the proposed site development
- Analyze potential negative impacts to surrounding properties and/or public services resulting from the proposed site development as it relates to existing geologic conditions
- Provide our opinion of suitable techniques that may be utilized to mitigate any 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 several sources, including:

- Field reconnaissance
- Geologic and topographic maps
- Review of selected publicly available, pertinent engineering reports
- Available aerial photographs
- Subsurface exploration
- Laboratory testing of representative site soil and rock samples
- 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 nearby sites were available for our review and are listed below:

1. *Subsurface Soil Investigation, 12202 Goodson Road, El Paso County, Colorado, prepared by RMG – Rocky Mountain Group, Job No. 191132, dated November 14, 2022.*
2. *Soils and Geology Study, Treasured Acres, El Paso County, Colorado, prepared by RMG – Rocky Mountain Group, Job No. 177644, dated July 27, 2021.*
3. *Soils and Geology Study, Cornerstone Estates, Northwest of the Intersection of Goodson Rd and Rex Rd, prepared by RMG – Rocky Mountain Group, Job No. 184228, dated November 5, 2021.*

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 vacant. The property is generally located northwest of the intersection of Ayer Road and Goodson Road, in northeastern El Paso County, Colorado and comprises approximately 38.83 acres. The site is zoned RR-5, Residential Rural. Adjacent properties to the north and west are zoned RR-5, rural residential. The adjacent property to the south is zoned PUD RR-5, Planned Unit Development – Residential Rural.

4.2 Topography

Based on our site reconnaissance on January 17, 2023 and USGS 2013 topographic map of the Black Forest Quadrangle, the site generally slopes down from west to east with an elevation difference of approximately 57 feet across the entire site. No drainage features were observed at this site.

4.3 Vegetation

Site vegetation primarily consists of native grasses and other alpine-type vegetation. Coniferous trees are densely carpeted across the entire site.

4.4 Aerial photographs and remote-sensing imagery

Personnel of RMG reviewed aerial photos available through Google Earth Pro dating back to 1985, CGS surficial geologic mapping, and historical photos by historicaerials.com dating back to 1947. The utility easement paralleling the eastern property boundary was constructed prior to 1969. Historically, the site has remained vacant land since the 1940s.

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

The current subsurface conditions within the property were explored by drilling one (1) exploratory test boring to a depth of 20-feet below the existing ground surface on January 16 and two 8-foot deep test pits on January 17, 2023. The test pits were excavated for on-site wastewater treatment system (OWTS) purposes. RMG's previous investigation conducted in November of 2022, Job No. 191132, explored subsurface conditions on the property to the west by drilling two (2) exploratory test borings to depths of 20-feet below the existing ground surface. The total number of borings generally meets the minimum criteria as stipulated in the ECM, Section C.3.3.

The test boring was 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 Modified O.D. California sampler, respectively. Results of penetration tests are shown on the drilling logs. The test boring location is presented in the Test Boring and Test Pit Location Map, Figure 3. An Explanation of Test Boring Logs is presented in Figure 4, the Test Boring and Test Pit Logs are presented in Figures 5 and 6.

5.1 Laboratory Testing

Soil laboratory testing was performed as part of this investigation. Laboratory testing included moisture content, grain-size analysis and Atterberg Limits. A Summary of Laboratory Test Results is presented in Figure 7. Soil Classification Data is presented in Figure 8.

5.2 Groundwater

Groundwater was not encountered in the test boring during the field exploration for the current investigation. Indications of groundwater (redox) was not observed in the test pits.

Fluctuations in groundwater and subsurface moisture conditions may occur due to variations in precipitation, landscape irrigation, and modifications in land use in the area. Development of adjacent properties may also affect groundwater levels.

6.0 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY

The site is located within the western portion of the Great Plains Physiographic Province. A major structural feature known as the Rampart Range Fault is located approximately 17 miles west of the site.

Rampart Range Fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the southern edge of a large structural feature known as the Denver Basin. In general, the geology at the site consists of alluvium overlying the bedrock of the Upper part of the Dawson Formation. The alluvium generally consist of gravelly loamy sands to extremely gravelly loamy sands. The upper part of the Dawson Formation is generally comprised of the arkosic sandstone, claystone, mudstone, conglomerate, and localized coal beds.

6.1 Subsurface Soil Conditions

The subsurface materials encountered in the test boring were classified within the laboratory using the Unified Soil Classification System (USCS). The materials classify primarily as silty to clayey sandstone (SC-SM) bedrock with a seam of sandy claystone (CL) bedrock.

Additional descriptions and the interpreted distribution (approximate depths) of the subsurface materials are presented on the Test Boring Logs. The classifications shown on the log are based upon the engineer's description 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.

6.2 Bedrock Conditions

Bedrock was encountered in the test boring performed for this study. In general, the bedrock (as mapped by Colorado Geologic Survey - CGS) is considered part of the Dawson formation and consists of silty sandstone with interbedded layers of claystone. The Dawson formation is thick-bedded to massive, generally light colored arkose, pebbly, and pebble conglomerate. The sandstone is generally poorly sorted with various amounts of clay content. The sandstone is generally permeable, well drained, and has good foundation characteristics. The claystone is generally well sorted with high sand content. The claystone is less permeable than the sandstone and is generally not suitable for direct bearing of shallow foundations. Bedrock is anticipated in the excavations and utility trenches for the proposed development.

6.3 U.S. Soil Conservation Service

The U.S. Soil Conservation Service along with United States Department of Agriculture (USDA) identifies the site soils as:

- 40 – Kettle Gravelly Loamy Sand, 3 to 8 percent slopes. The Kettle Gravelly Loamy Sand was mapped by the USDA to encompass is very small portion of the northwest property corner. Properties of the loamy sand include somewhat excessively drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be low, frequency of flooding and ponding is none, and landforms include hills.

The USDA Soil Survey Map is presented in Figure 9.

6.4 General Geologic Conditions

Based on our field observations and review of relevant geologic maps, a geologic map was prepared which identifies the geologic conditions affecting the development. The identified geologic conditions affecting the development are presented in the Engineering and Geology Map, Figure 10.

The site generally consists of alluvial sandstone bedrock. One geologic unit was mapped at the site as:

- *TKda5 – Dawson formation, facies unit five* – white to light tan, thin to medium bedded, fine to medium-grained feldspathic sandstone or pebbly conglomerate. The Dawson is known to contain occasional interbedded sandy claystone. Estimated thickness is around 500 feet. The Dawson sandstone was encountered in the test boring near the surface and extended to the 20-foot termination depth of the boring. The sandstone bedrock is anticipated to be encountered at various depths across the site.

6.5 Engineering Geology

Charles Robinson and Associates (1977) have mapped one environmental engineering unit and one additional unit at the site as:

- *IA* – Stable alluvium, colluvium and bedrock on flat to gentle slopes (0-5%).
- *Ut* – Utility Easement – existing overhead utility easement, this area is to be a “No Build Zone” for the future single family residences and OWTS’s.

6.6 Structural Features

Structural features such as schistosity, 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.

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

6.9 Drainage of Surface Water and Groundwater

The overall topography of the site slopes down from the west to the east. It is anticipated the direction of surface water and groundwater is to flow in the same direction. Groundwater was not encountered in the test boring performed for this current study or in the soils investigation for the neighboring area to the west.

6.10 Floodplain

Based on our review of the Federal Emergency Management Agency (FEMA) Community Panel No. 08041C0320G and the online ArcGIS El Paso County Risk Map, the entire site lies outside the 100- and 500-year floodplains of both Black Squirrel Creek and Sand Creek. The site currently lies in the Zone X. Zone X is defined by FEMA as an area of minimal flood hazard that is determined to be outside the Special Flood Hazard Area and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood.

No natural drainage features were observed at this site. It is not anticipated that the area will be potentially seasonally wet.

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 Upland Deposits. The overburden upland deposits consist of sand and gravel with silt and clay deposited by older stream deposits on topographic highs or beach like features. Extraction of the sand and gravel more than likely would not be 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 southern part of the Denver Basin Coal Region. However, the area of the site has been mapped "Somewhat 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. No oil and gas wells are drilled on this tract, or within two miles of it. There are no historic coal mines in the vicinity. In this part of the Denver coal region, coal resources are locally present within the lower part of the Laramie Formation of Upper Cretaceous age.

The alluvium on this tract may contain sand or gravel. Due to the high clay content in the sandstone of the upper Dawson Formation and the interbedded claystone, the sand and gravel are often unusable.

8.0 IDENTIFICATION AND MITIGATION OF POTENTIAL GEOLOGIC CONDITIONS

The El Paso County Engineering Criteria Manual recognizes and delineates the difference between geologic 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 constraints were considered in the preparation of this report. They are not are not anticipated to pose a significant risk to the proposed development:

- Avalanches
- Compressible Soils
- Debris Flow-Fans/Mudslides
- Downhill/Downslope Creep
- Floodplains
- Ground Subsidence
- Landslides
- Rockfall
- Ponding water
- Steeply Dipping Bedrock
- Unstable or Potentially Unstable Slopes

- Scour, Erosion, accelerated erosion along creek banks and drainage ways
- Corrosive Minerals
- Undocumented Fill or History of Landfill

The following sections present geologic constraints 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 surrounding area), the sandy clay (if encountered) and claystone bedrock generally possess low to high swell potential. It is anticipated if expansive clay soils or claystone bedrock are encountered at the time of the site-specific subsurface soil investigation, additional mitigations will be provided at the time of the Open Excavation Observation. These materials are readily mitigated with typical construction practices common to this region of El Paso County, Colorado.

Mitigation

Sporadic areas of expansive soils and bedrock are anticipated. If expansive soils or bedrock are encountered beneath the foundations, mitigation will be required. “Mass” subexcavation during land development is currently not proposed, nor do we recommend it at this time. Overexcavation and replacement with non-expansive soils at a minimum of 95 percent of its maximum Modified Proctor Dry Density (ASTM D-1557) is a suitable mitigation. Floor slabs bearing directly on expansive material should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movement. Overexcavation is not anticipated for the majority of the lots. However, if clay or claystone seams are encountered, overexcavation depths of 3 to 4 feet are anticipated. Moisture conditioning and recompacting the on-site clays (if encountered) may also be considered for mitigation of expansive materials.

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 Seasonal Groundwater

Based on our site observations and review of the Black Forest Quadrangle and Google Earth images dating back to September 1999, springs do not appear to originate on the subject site. Groundwater was not encountered at the time of drilling for this investigation. Additionally, areas of shallow groundwater were not encountered in our previous investigation to the west. However, due to the potential for seasonal fluctuations in groundwater, 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. Groundwater information obtained for the current investigation performed prior to the land development phase may or may not be representative of the conditions present at the time of construction. Furthermore, the development processes (reshaping of the ground surface, installation of buried utilities, installation of an underdrain below the roadways, etc.) can significantly alter the depth and flow paths of the subsurface water. The construction of surrounding lots can also alter the amount and depth of subsurface groundwater below a given lot. The potential exists for high groundwater levels during high moisture periods and should structures encroach on these areas the following mitigations should be followed.

Mitigation:

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. A typical perimeter drain detail is presented in Figure 11.

If groundwater is encountered at the time of the site-specific subsurface soil investigations within 4 to 6 feet of the proposed basement slab elevation, an underslab drain would be considered in conjunction with the perimeter drain. It must be understood that subsurface drains are designed to intercept some types of subsurface moisture and not others. Therefore, the drain(s) could operate properly and not mitigate all moisture problems relating to foundation performance or moisture intrusion into the basement areas.

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 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 located near 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".

Northern El Paso County and the 80908 zip code in which the site is located, has an EPA assigned Radon Zone of 1. A radon Zone of 1 predicts an average indoor radon screening level greater than 0.4 pCi/L (picocuries per liter), which is above the recommended levels assigned by the EPA. *The EPA recommends corrective measures to reduce exposure to radon gas.*

All of the State of Colorado is considered EPA Zone 1 based on the information provided at https://county-radon.info/CO/El_Paso.html. Elevated hazardous levels of radon from naturally occurring sources are not anticipated 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. 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, Erosion Control, Cuts and Masses of Fill

A preliminary grading plan was not available for this site. It is our understanding that site grading is to be limited to the building, barn and OWTS locations and will alter the existing topography only to the extent necessary to accommodate the proposed development. Based on the test boring for this investigation, excavations are anticipated to encounter clayey sandstone with interbedded sandy claystone seams.

Mitigation

The on-site soils can be used as site grading fill, though the claystone should be avoided in areas where the proposed foundations are not anticipated to penetrate through the grading fill.

The on-site soils are mildly susceptible to wind and water erosion. Minor wind erosion and dust may be an issue for a short time during and immediately after construction. Should the problem be considered severe during construction, watering of the cut areas may be required. Once construction is complete, vegetation should be re-established.

Prior to placement of overlot fill or removal and recompaction of the existing materials, topsoil, low-density native soil, all uncontrolled or undocumented fill, and organic matter should be removed from the proposed fill area. The subgrade should be scarified, moisture conditioned to facilitate compaction (usually 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.

9.0 ON-SITE WASTEWATER TREATMENT SYSTEMS

It is our understanding that On-site Wastewater Treatment Systems (OWTS) are proposed for the site, The site was evaluated in general accordance with the El Paso Land Development Code, specifically sections 8.4.8. Two test pits to depths of 6 to 7 feet were performed across the site to obtain a general understanding of the soil and bedrock conditions. The Test Pit Logs are presented in Figures 5 and 6.

The United States Department of Agriculture (USDA) as discussed in section 6.3 consisted of sandy loam and loamy sand. Limiting layers were encountered in both test pits at depths of 6 feet and 7 feet. The long

term acceptance rates (LTAR) associated with the soils observed in the test pits range from 0.35 to 0.80 gallons per day per square foot (soil types 1 to 3A). Signs of seasonal groundwater was not observed in the test pits.

Contamination of surface and subsurface water resources should not occur provided the OWTS sites are evaluated and installed according to the El Paso County Board of Health Guidelines and property maintained.

Treatment areas at a minimum, must achieve the following:

- Treatment areas must be 4 feet above groundwater or bedrock as defined by the Definitions 8.3.4 of the Regulations of the El Paso County Board of Health, Chapter 8 OWTS Regulations, most recently amended May 23, 2018;
- Each lot (after purchase but prior to construction of an OWTS) will require an OWTS site evaluation report prepared per *the Regulations of the El Paso County Board of Health, Chapter 8 OWTS Regulations*. During the site reconnaissance, a minimum of two 8-foot deep test pits will need to be excavated in the vicinity of the proposed treatment area;
- Comply with any physical setback requirements of Table 7-1 of the El Paso County Department of Health and Environment (EPCHDE);
- Treatment areas are to be located a minimum 100 feet from any well (existing or proposed), including those located on adjacent properties per Table 7-2 per the EPCHDE;
- Each lot shall be designed to insure that a minimum of 2 sites are appropriate for a OWTS and do not fall within the restricted areas identified on the Engineering and Geology Map, Figure 10, (e.g. existing ponds, existing septic fields that may remain).

It is our opinion that if the EPCHDE physical setback requirements are met for each lot, there are no restrictions on the placement of the individual On-site Wastewater Treatment Systems.

Soil and groundwater conditions at the site are suitable for individual treatment systems. It should be noted, if LTAR values of less than 0.35 (or soil types 3A to 5) or greater than 0.80 (soil type 0) are encountered at the time of the site specific OWTS evaluation an, "engineered system" will be required.

Additionally, based on the depth of the limiting layer encountered at approximately 6 to 7 feet below the existing ground surface, the maximum depth of the OWTS components may be limited to 2 feet below the existing ground surface. The Wastewater Study is included in Appendix C.

10.0 BEARING OF GEOLOGIC CONDITIONS UPON PROPOSED DEVELOPMENT WITHOUT CONTROL

Geologic hazards (as described in Section 8.0 of this report) found to be present at this site include seismicity and radon. The most significant geologic constraints to development recognized at this site are expansive soils and the potential for seasonal groundwater. The geologic conditions encountered at this site are relatively common to the immediate area and mitigation can be accomplished by implementing common engineering and construction practices. None of these conditions are anticipated to preclude the proposed development.

11.0 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 of individual OWTS or foundations. ***A site-specific subsurface soil investigation will be required for all proposed structures including (but not limited to) residences and retaining walls (if needed).***

To develop recommendations for construction of the proposed roadways, a pavement design investigation should be performed. This investigation should consist of additional test borings, soil laboratory testing and specific recommendations for the design and construction of roadway pavement sections.

12.0 CONCLUSIONS

Based upon our evaluation of the geologic conditions, it is our opinion that the proposed development is feasible. The geologic conditions identified are considered typical 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 suitable construction practices.

In addition to the previously identified mitigation alternatives, surface and subsurface drainage systems should be considered. 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 and floor slabs of the structures should be designed using the recommendations provided in the site-specific Subsurface Soil Investigation performed for each lot. In addition, appropriate surface drainage should be established during construction and maintained by the homeowner.

The recommendations in this and the referenced 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.

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.

13.0 CLOSING

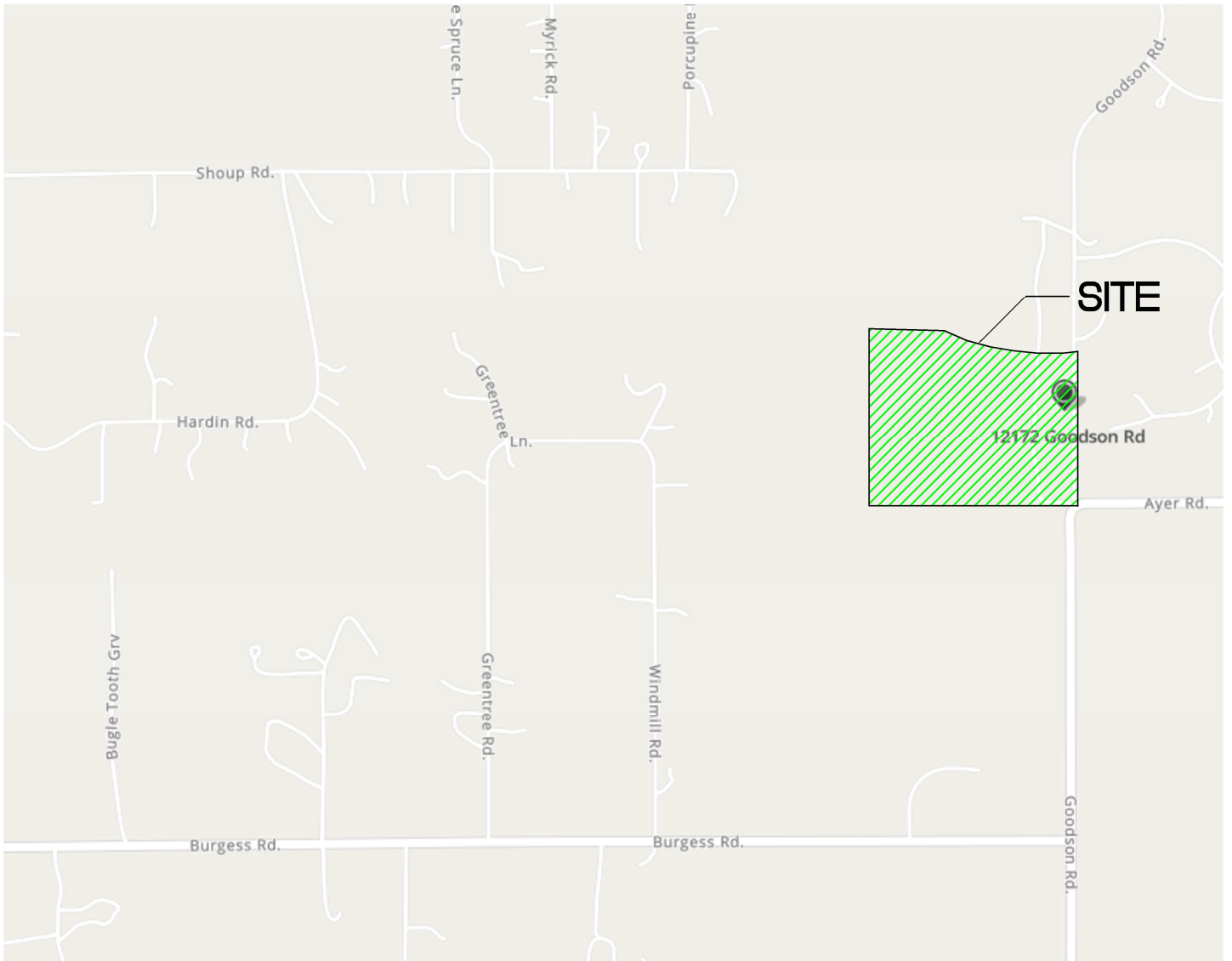
This report is for the exclusive purpose of providing geologic hazards information and preliminary geotechnical engineering recommendations. The scope of services did not include, either specifically or

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 **Drew Makings** 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.

FIGURES



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SITE VICINITY MAP

12172 GOODSON RD
EI PASO COUNTY, COLORADO
DREW MAKINGS

JOB No. 192027

FIG No. 1

DATE 2-17-2023

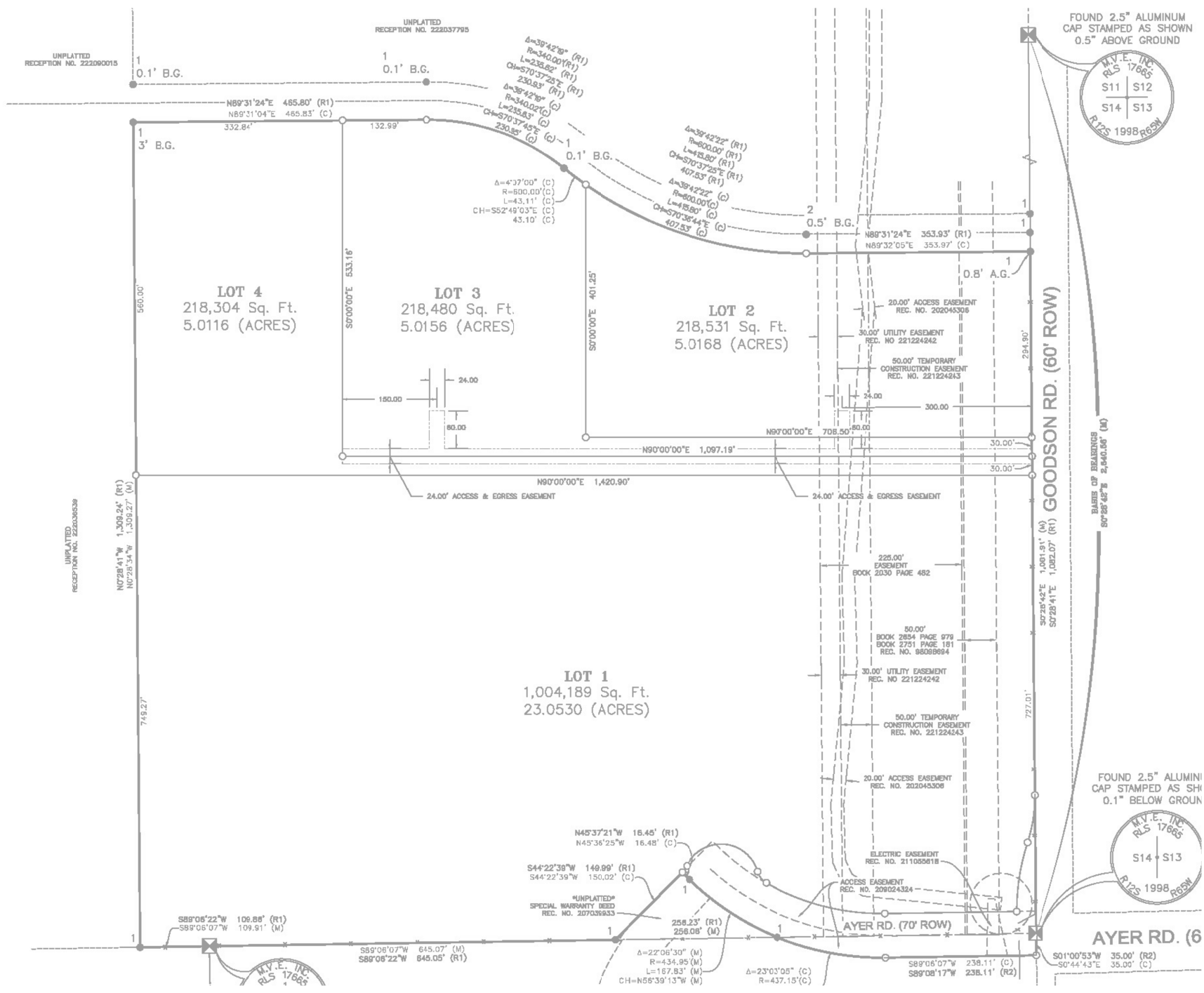
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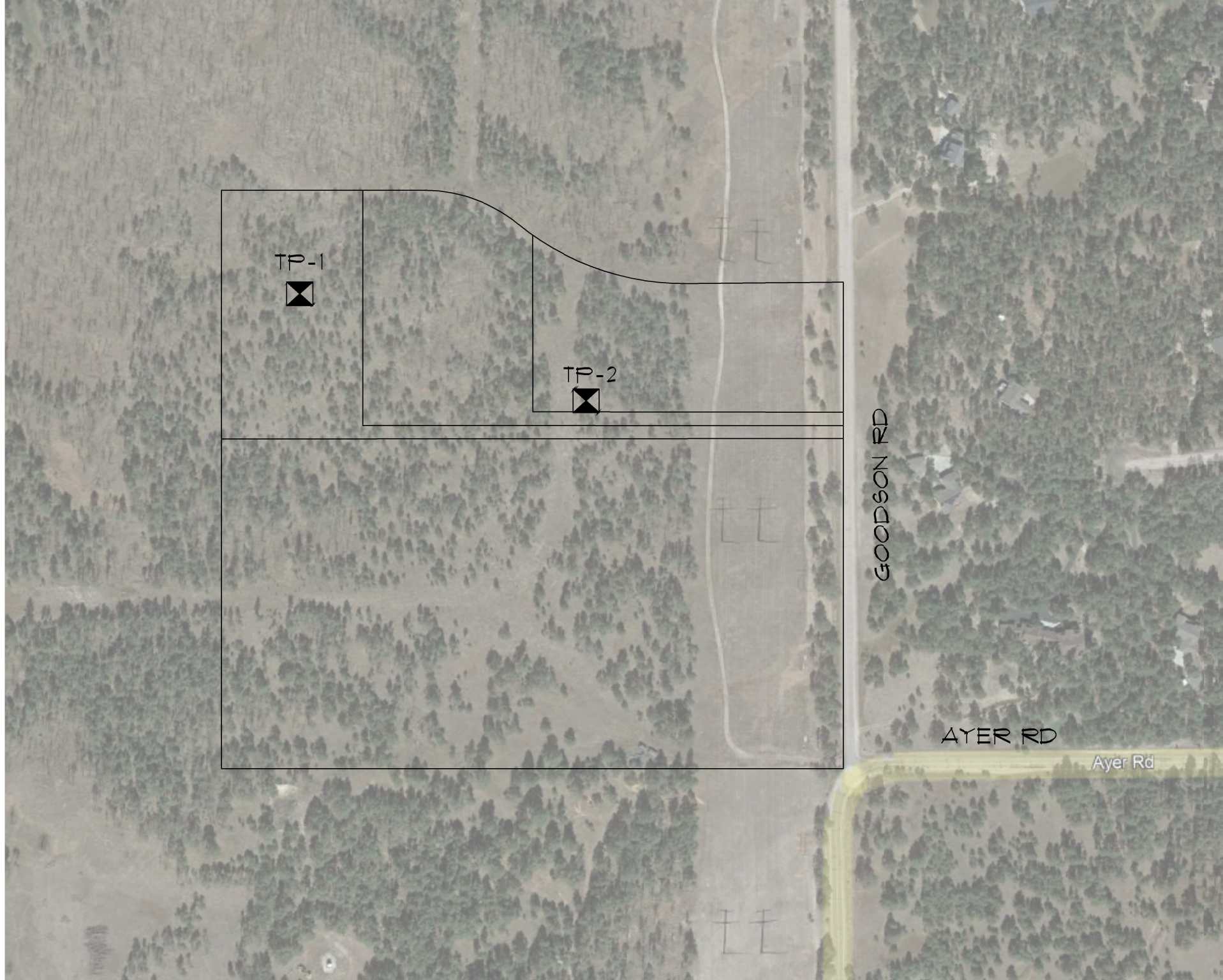

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BASE MAP PROVIDED BY GALLOWAY

12172 GOODSON RD
EL PASO COUNTY, COLORADO
DREW MAKINGS

ENGINEER:	TM
DRAWN BY:	NM
CHECKED BY:	TM
ISSUED:	2-17-2023
REVISION:	4/11/2023
Update Site Plan	192027

PROPOSED LOT
LAYOUT

SHEET No.
FIG-2



 DENOTES APPROXIMATE LOCATION OF TEST PITS PERFORMED FOR THIS INVESTIGATION


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Update Lot Layout	192027

TEST PIT LOCATION PLAN

SHEET No. FIG-3

SOILS DESCRIPTION



CLAYSTONE



SANDSTONE

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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





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Materials Testing
Civil, Planning

EXPLANATION OF TEST BORING LOGS

JOB No. 192027

FIGURE No. 4

DATE Feb/17/2023

TEST BORING: 1 DATE DRILLED: 1/16/23 NO GROUNDWATER ON 1/16/23	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	
SANDSTONE, CLAYEY, with gravel, tan to olive, hard to very hard, moist	5			50/7"	7.9	
CLAYSTONE, SANDY, with gravel, gray, firm, moist	10			50/9"	15.7	
SANDSTONE, CLAYEY, with gravel, tan to olive, very hard, moist	15			23	18.3	
	20			10/0"	13.6	

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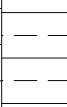
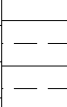
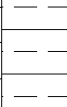
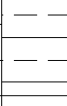
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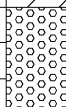
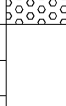
TEST BORING LOG

JOB No. 192027

FIGURE No. 5

DATE Feb/17/2023

TEST PIT TP-1			
DATE OBSERVED: 1/13/23			
SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 7.0 FT SAND (single-grain, structureless)	2ft		1
	4ft		
	6ft		
7.0 FT BEDROCK (limiting layer)	8ft		

TEST PIT TP-2			
DATE OBSERVED: 1/13/23			
SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 3.0 FT SAND (single-grain, structureless)	2ft		1
3.0 - 4.0 FT SANDY CLAY LOAM (granular, weak)	4ft		3A
4.0 - 6.0 FT SANDY CLAY LOAM (granular, moderate)	6ft		3
6.0 FT BEDROCK (limiting layer)	8ft		

SOIL DESCRIPTIONS



SAND, CLAY
LOAM



SAND



CLAY LOAM

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TEST PIT LOGS

GOODSON RD
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JOB No. 192027

FIG No. 6

DATE 2-17-2023

SHEET 1 of 1

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	7.9				14.5	10.1			
1	9.0	15.7		34	19	0.4	46.4			SC
1	14.0	18.3								
1	19.0	13.6								

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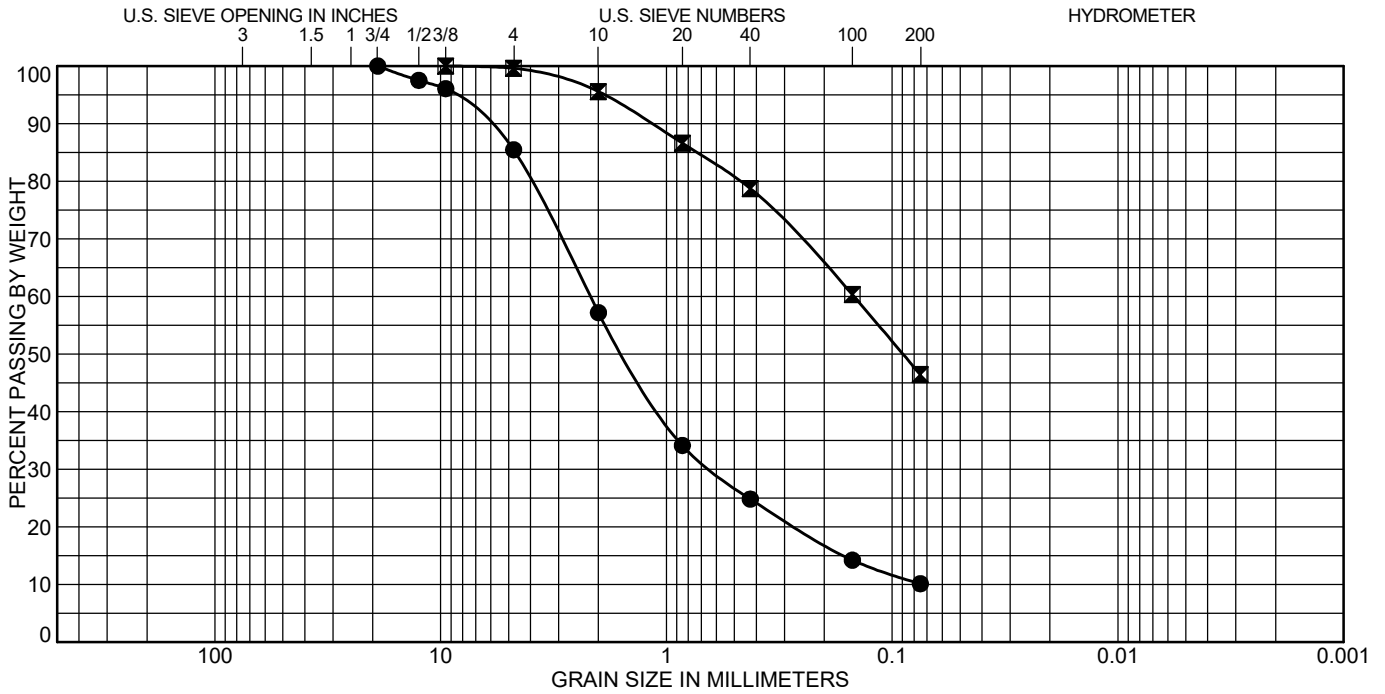
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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 192027
 FIGURE No. 7
 PAGE 1 OF 1
 DATE Feb/17/2023



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Test Boring	Depth (ft)	Classification	LL	PL	PI
● 1	4.0				
☒ 1	9.0	CLAYEY SAND(SC)	34	15	19

Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
● 1	4.0	14.5	75.3	10.1	
☒ 1	9.0	0.4	53.2	46.4	

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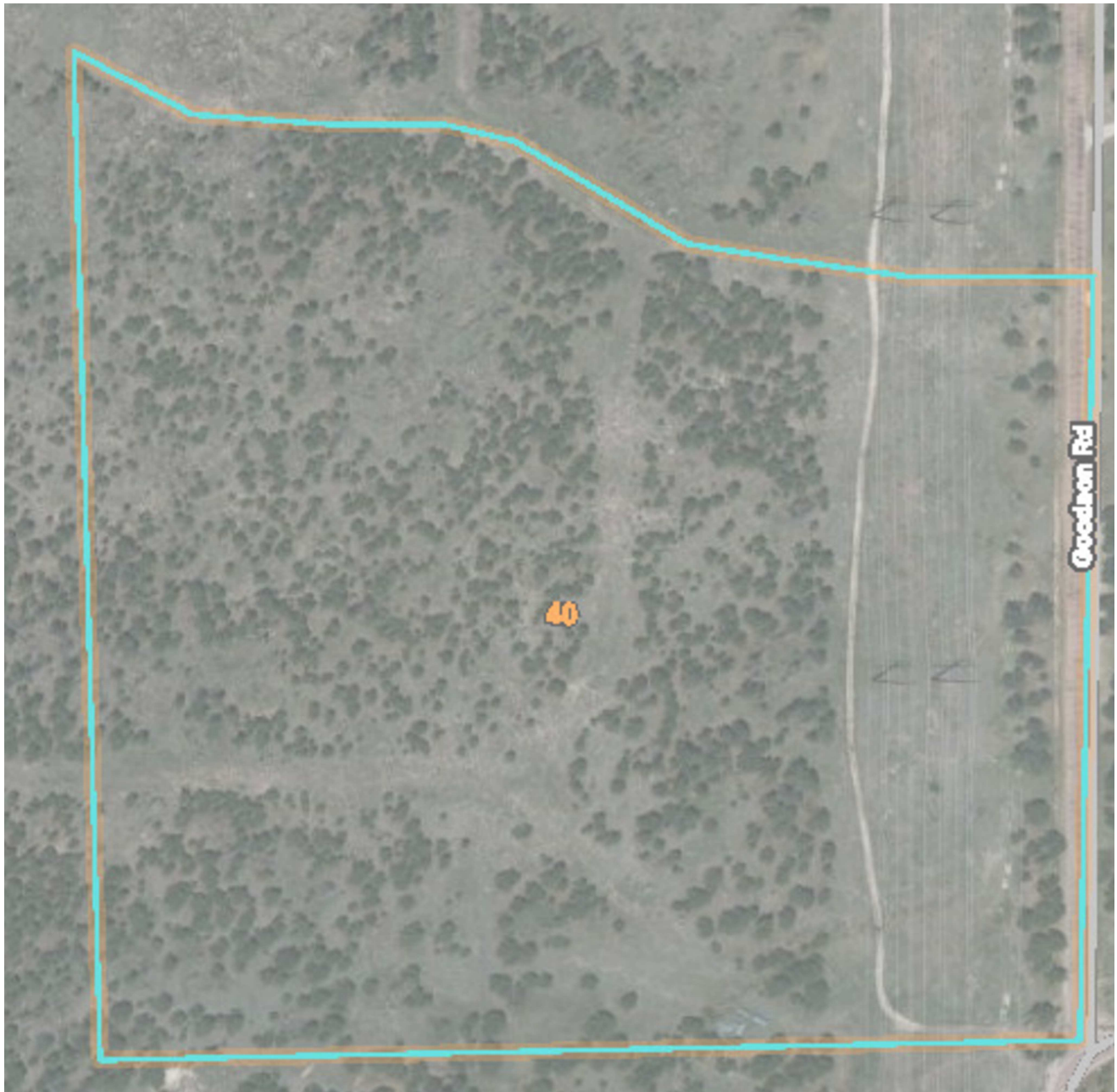
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SOIL CLASSIFICATION DATA

JOB No. 192027

FIGURE No. 8

DATE Feb/17/2023



40 - Kettle Gravelly Loamy Sand, 3 to 8 percent slopes



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USDA SOIL SURVEY MAP

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JOB No. 192027

FIG No. 9

DATE 2-17-2023



GEOLOGIC CONDITIONS

TKda₅ - DAWSON FORMATION, FACIES UNIT FIVE (EOCENE)

ENGINEERING GEOLOGY

1A - STABLE ALLUVIUM, COLLUVIUM, AND BEDROCK ON FLAT TO GENTLE SLOPES (0-5%)

ADDITIONAL UNIT

Ut - UTILITY EASEMENT - EXISTING OVERHEAD UTILITY EASEMENT. THIS AREA IS TO BE A "NO BUILD ZONE" FOR SINGLE FAMILY RESIDENCES, AND OWTS'S

12172 GOODSON RD
EL PASO COUNTY, COLORADO
DREW MAKINGS

ENGINEER:	TM
DRAWN BY:	NM
CHECKED BY:	TM
ISSUED:	2-17-2023
REVISION:	4/11/2023
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ENGINEERING AND GEOLOGY MAP

SHEET No. FIG-10



NOT TO SCALE

APPENDIX A

Additional Reference Documents

1. *Final Plat, Gunners Ridge*, prepared by Bombacini Land Surveying, dated April 5, 2023.
2. *Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Community Panel No. 08041C0320G*, Federal Emergency Management Agency (FEMA), effective December 7, 2018.
3. *Geologic Map of the Black Forest Quadrangle, El Paso County, Colorado*, Madole, R.F., 2003, Colorado Geological Survey Open-File Report OF03-08.
4. *Black Forest Quadrangle, Environmental and Engineering Geologic Map for Land Use*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
5. *Black Forest Quadrangle, Map of Potential Geologic Hazards and Surficial Deposits*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
6. *Pikes Peak Regional Building Department*: <https://www.pprbd.org/>.
[El Paso County - Colorado \(spatiallest.com\)](https://www.pprbd.org/El-Paso-County-Colorado-spatialest.com) Schedule No. 5214000014
7. *Colorado Geological Survey, USGS Geologic Map Viewer*:
<http://coloradogeologicalsurvey.org/geologic-mapping/6347-2/>.
8. *Historical Aerials*: <https://www.historicaerials.com/viewer>, Images dated 1947, 1952, 1955, 1960, 1969, 1983, 1999, 2005, 2009, 2011, 2013, 2015, and 2017.
9. *USGS Historical Topographic Map Explorer*: <http://historicalmaps.arcgis.com/usgs/> Colorado Springs, Black Forest Quadrangle dated 1898, 1909, 1948, 1969, 1981 and 1989.
10. *Google Earth Pro*, Imagery dated 1999, 2004, 2005, 2006, 2011, 2013, 2015, 2017, 2019 and 2020.

APPENDIX B
Site Photos

Site Photos – January 17, 2023



☀ 153°SE (T) ● 39°0'28"N, 104°37'37"W ±13ft ▲ 7402ft



☀ 1°N (T) ● 39°0'25"N, 104°37'45"W ±13ft ▲ 7423ft





☀ 181°S (T) ☉ 39°0'25"N, 104°37'46"W ±13ft ▲ 7425ft



☀ 87°E (T) ☉ 39°0'25"N, 104°37'46"W ±13ft ▲ 7425ft





☀ 342°N (T) ● 39°0'32"N, 104°37'49"W ±13ft ▲ 7413ft



☀ 269°W (T) ● 39°0'30"N, 104°37'41"W ±13ft ▲ 7404ft





☀ 266°W (T) ● 39°0'32"N, 104°37'49"W ±13ft ▲ 7413ft



☀ 360°N (T) ● 39°0'30"N, 104°37'41"W ±13ft ▲ 7405ft





☉ 182°S (T) ☉ 39°0'29"N, 104°37'41"W ±13ft ▲ 7402ft



APPENDIX C
Wastewater Study

Job No. 192027

February 17, 2023

Drew Makings
9630 Arroya Lane
Colorado Springs, CO 80908

Re: Wastewater Study
12172 Goodson Rd
El Paso County, Colorado

Ref: *Land Survey Plat, prepared by Galloway, Project No. SLV000012.10, last dated March 24, 2022*

Dear Mr. Makings:

As requested, personnel of RMG – Rocky Mountain Group has performed a preliminary investigation and site reconnaissance at the above referenced address. It is our understanding the parcel included in this study is:

- Schedule No. 5214000014 – currently addressed as 12172 Goodson Road, is zoned "RR-5" – *Residential Rural*.

The site consists of approximately 38.83 acres and is vacant. The proposed development is to consist of 4 lots, three of which range between 4.92 and 5.03 acres. The fourth lot will comprise the remaining acreage of approximately 23.87 acres. The Proposed Lot Layout Plan is presented in Figure 2.

This letter is to provide information for the on-site wastewater report per the On-Site Wastewater Treatment Systems (OWTS) Regulations of the El Paso County Board of Health pursuant to Chapter 8.

The following are also excluded from the scope of this report including (but not limited to) foundation recommendations, site grading/surface drainage recommendations, subsurface drainage recommendations, geologic, natural and environmental hazards such as landslides, unstable slopes, seismicity, snow avalanches, water flooding, corrosive soils, erosion, radon, wild fire protection, hazardous waste and natural resources.

Previous Studies and Field Investigation

Reports of previous geotechnical engineering/geologic investigations for this site was not available for our review. However, one geologic report was completed in conjunction with this study and is listed below:

1. *Soil and Geology Study, 12172 Goodson Road, El Paso County, Colorado, prepared by RMG – Rocky Mountain Group, Job No. 192027, dated February 17, 2023.*

The findings, conclusions and recommendations contained in this report was considered during the preparation of this report.

SITE CONDITIONS

Personnel of RMG performed a reconnaissance visit on January 13, 2023. The purpose of the reconnaissance visit was to evaluate the site surface characteristics including landscape position, topography, vegetation, natural and cultural features, and current and historic land uses. Two test pits were performed, one on each proposed northern lot, during our reconnaissance visit. A Test Pit Location Plan is presented in Figure 3.

The site surface characteristics were observed to consist of low lying grasses and weeds across the entire site. Deciduous trees were located across the property.

The following conditions were observed with regard to the 38.83-acre parcel:

- A well currently **does not** exist on the existing 38.83-acre site.
- No runoff or irrigation features anticipated to cause deleterious effects to treatment systems on the site were observed;
- **No** major waterways exist on the property. The entire site lies outside the designated floodway and floodplain;
- Slopes greater than 20 percent **do not** exist on the site; and
- Significant man-made cuts **do not** exist on the site.

Treatment Areas

Treatment areas at a minimum must achieve the following:

- The treatment areas must be 4 feet above groundwater or bedrock as defined by the Definitions 8.3.4 of the Regulations of the El Paso County Board of Health, Chapter 8, *OWTS Regulations*, effective July 7, 2018;
- Prior to construction of an OWTS, an OWTS design prepared per *the Regulations of the El Paso County Board of Health, Chapter 8, OWTS Regulations* will need to be completed. A scaled site plan and engineered design will also be required prior to obtaining a building permit;
- Comply with any physical setback requirements of Table 7-1 of the El Paso County Department of Health and Environment (EPCHDE);
- Treatment areas are to be located a minimum 100 feet from any well (existing or proposed), including those located on adjacent properties per Table 7-2 per the EPCHDE;
- Treatment areas must also be located a minimum 50 feet from any spring, lake, water course, irrigation ditch, stream or wetland, and 25 feet from dry gulches;
- Other setbacks include the treatment area to be located a minimum 10 feet from property lines, dry gulches, cut banks and fill areas (from the crest);
- The new lots shall be laid out to ensure that the proposed OWTS does not fall within any restricted areas, (e.g. utility easements, right of ways). Based on the test pit observations, the parcel has a minimum of two locations for the OWTS.

Contamination of surface and subsurface water resources should not occur if the treatment areas are evaluated and installed according to El Paso County Health Department and State Guidelines in conjunction with proper maintenance.

DOCUMENT REVIEW

RMG has reviewed the above referenced site plan, identified the soil conditions anticipated to be encountered during construction of the proposed OWTS for each lot. This review included the Natural Resource Conservation Service - NRCS data provided by websoilsurvey.nrcs.usda.gov. The Soil Survey Descriptions are presented below. A review of FEMA Map No. 08041C0320G, effective December 7, 2018 indicates that the proposed treatment areas are not located within an identified floodplain.

SOIL EVALUATION

Personnel of RMG performed a soil evaluation to include two test pits, on January 13, 2022 (Test Pit TP-1 and TP-2), utilizing the visual and tactile method for the evaluation of the site soils. The test pits were excavated in areas that appeared most likely to be used for residential construction. The Test Pit Logs are presented in Figure 4. A Septic Suitability map is presented in Figure 5.

The soil conditions as indicated by the NRCS data are anticipated to consist of:

- 40 – Kettle Gravelly Loamy Sand, 3 to 8 percent slopes. The Kettle Gravelly Loamy Sand was mapped by the USDA to encompass a very small portion of the northwest property corner. Properties of the loamy sand include somewhat excessively drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be low, frequency of flooding and ponding is none, and landforms include hills.

A USDA Soil Survey Map and USDA Full Map Unit Descriptions are attached in Figures 6 and 7.

Groundwater was not encountered in the test pits performed by RMG, but bedrock was encountered in both test pits.

An OWTS is proposed for each lot in this subdivision and should conform to the recommendations of a future OWTS site evaluation, performed in accordance with the applicable health department codes prior to construction. This report may require additional test pits in the vicinity of the proposed treatment field. A minimum separation of 4 feet shall be maintained from groundwater and bedrock to the infiltrative surface.

Redoximorphic features indicating the fluctuation of groundwater or higher ground water levels were not observed in the test pits.

CONCLUSIONS

In summary, it is our opinion the site is suitable for individual on-site wastewater treatment systems within the cited limitations. There are no foreseeable or stated construction related issues or land use changes proposed at this time.

Soil and groundwater conditions at the site are suitable for individual treatment systems. It should be noted that the LTAR values stated above are for the test pit locations performed for this report only. The LTAR values may change throughout the site. If an LTAR value of less than 0.35 (or soil types 3A to 5) are encountered at the time of the site specific OWTS evaluation an "engineered system" will be required.

Additionally, based on the depth of the limiting layer encountered at approximately 6 to 7 feet below the existing ground surface, the maximum depth of the OWTS components may be limited to 2 feet below the existing ground surface.

LIMITATIONS

The information provided in this report is based upon the subsurface conditions observed in the profile pit excavations and accepted engineering procedures. The subsurface conditions encountered in the excavation for the treatment area may vary from those encountered in the test pit excavations. Therefore, depth to limiting or restrictive conditions, bedrock, and groundwater may be different from the results reported in this letter.

An OWTS site evaluation will need to be performed in accordance with the applicable health department codes prior to construction.

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

Cordially,

Reviewed by,

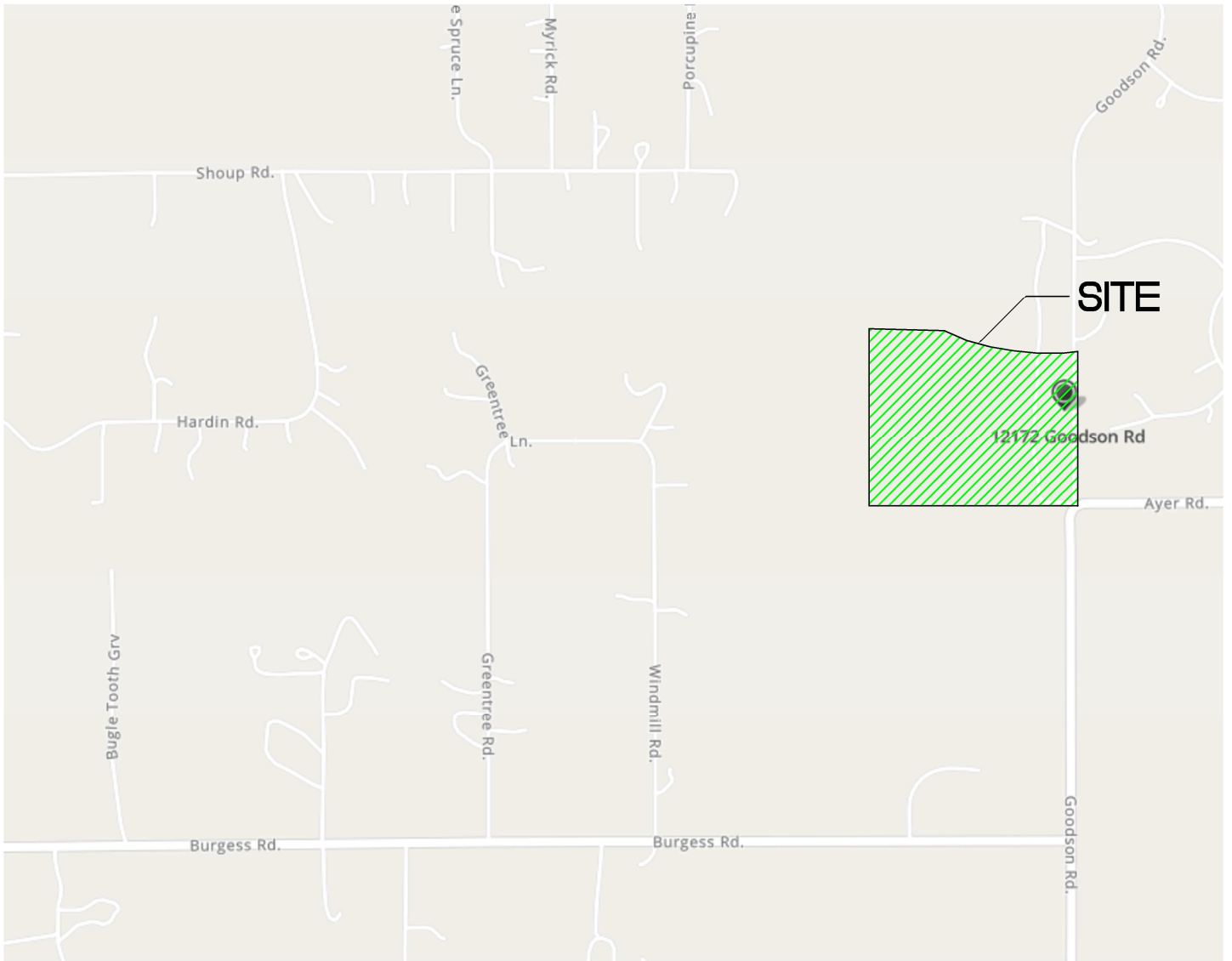
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Kelli Zigler
Project Geologist

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



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SITE VICINITY MAP

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FIG No. 1

DATE 2-17-2023

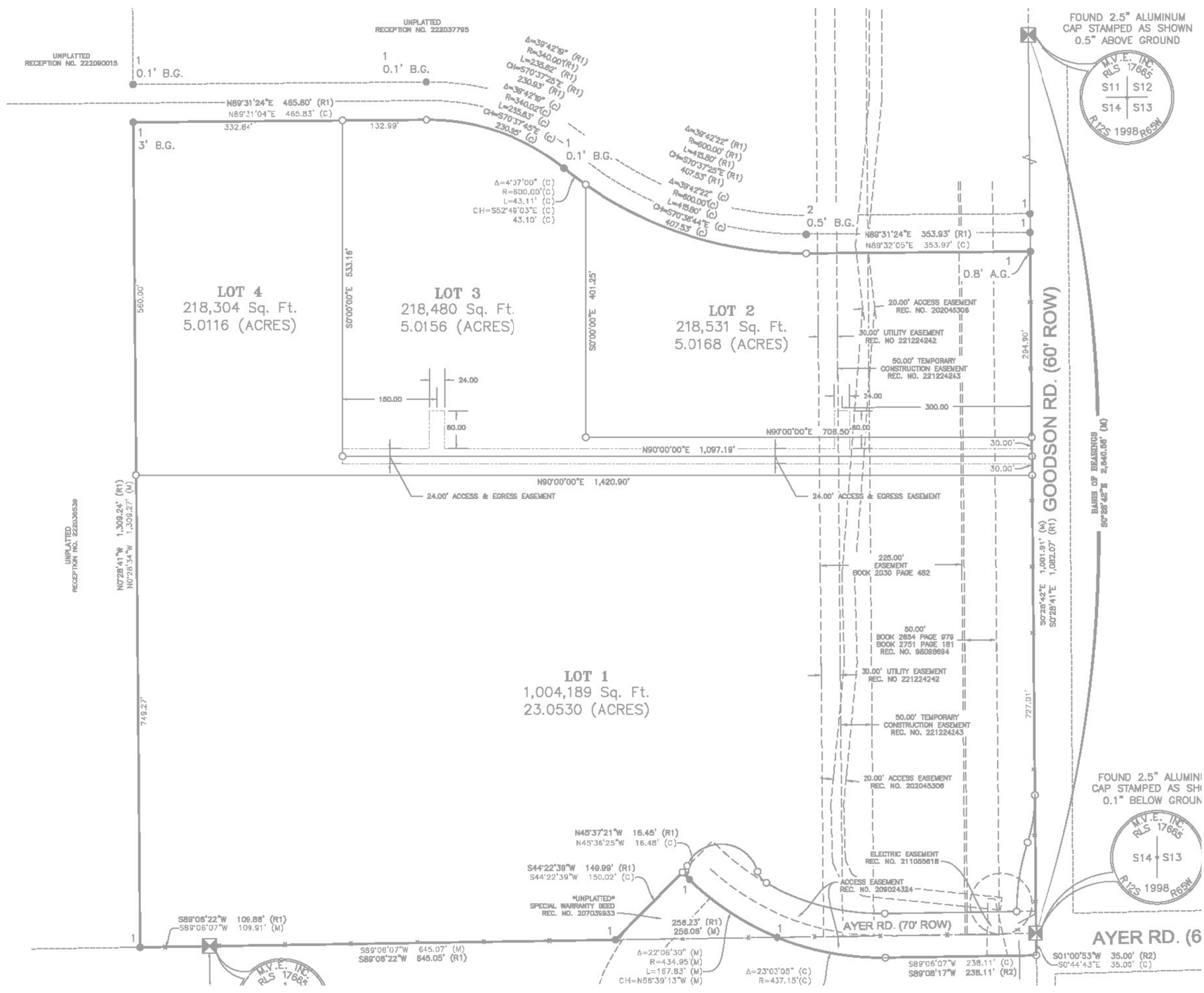
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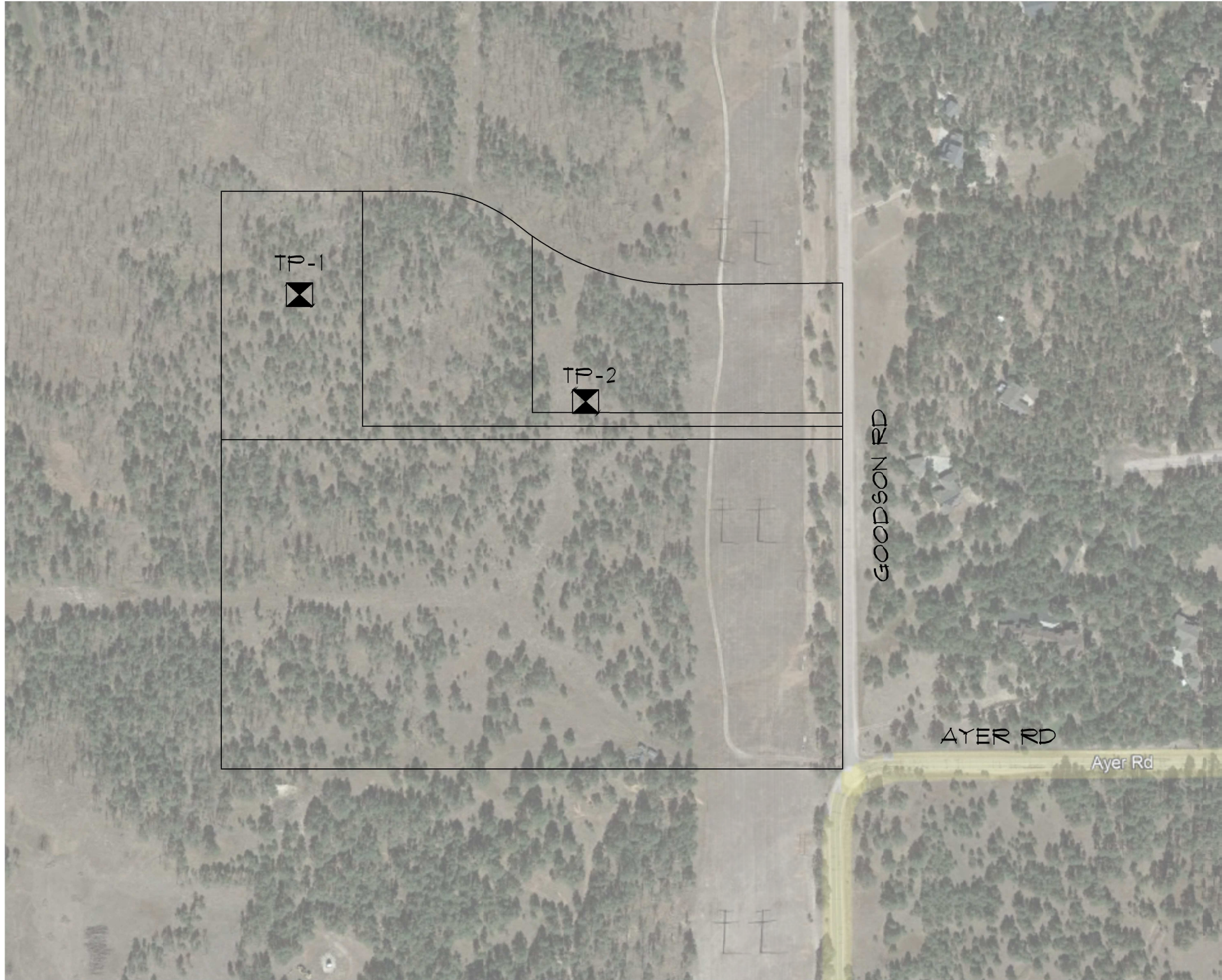

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BASE MAP PROVIDED BY GALLOWAY

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ENGINEER:	TM
DRAWN BY:	NM
CHECKED BY:	TM
ISSUED:	2-17-2023
REVISION:	4/11/2023
Update Site Plan	192027

PROPOSED LOT LAYOUT

SHEET No. FIG-2



 DENOTES APPROXIMATE
 LOCATION OF TEST PITS
 PERFORMED FOR THIS
 INVESTIGATION



NOT TO SCALE

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Materials Testing
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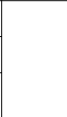
12172 GOODSON RD
 EL PASO COUNTY, COLORADO
 DREW MAKINGS



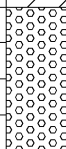
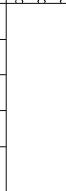
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TEST PIT LOCATION
PLAN

SHEET No.

FIG-3

TEST PIT TP-1			
DATE OBSERVED: 1/13/23			
SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 7.0 FT SAND (single-grain, structureless)	2ft 4ft 6ft		1
7.0 FT BEDROCK (limiting layer)	8ft		

TEST PIT TP-2			
DATE OBSERVED: 1/13/23			
SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 3.0 FT SAND (single-grain, structureless)	2ft		1
3.0 - 4.0 FT SANDY CLAY LOAM (granular, weak)	4ft		3A
4.0 - 6.0 FT SANDY CLAY LOAM (granular, moderate)	6ft		3
6.0 FT BEDROCK (limiting layer)	8ft		

SOIL DESCRIPTIONS



SAND, CLAY
LOAM



SAND



CLAY LOAM

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TEST PIT LOGS

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FIG No. 4

DATE 2-17-2023

SHEET 1 of 1

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NOTE: THE CHOSEN ON-SITE WASTEWATER TREATMENT SYSTEM (OWTS) LOCATIONS ARE FOR ILLUSTRATION ONLY. IF THE EL PASO COUNTY HEALTH DEPARTMENT PHYSICAL SETBACK REQUIREMENTS ARE MET FOR EACH LOT, THERE ARE NO RESTRICTIONS ON THE PLACEMENT OF THE INDIVIDUAL OWTS.

○ DENOTES POTENTIAL OWTS LOCATIONS



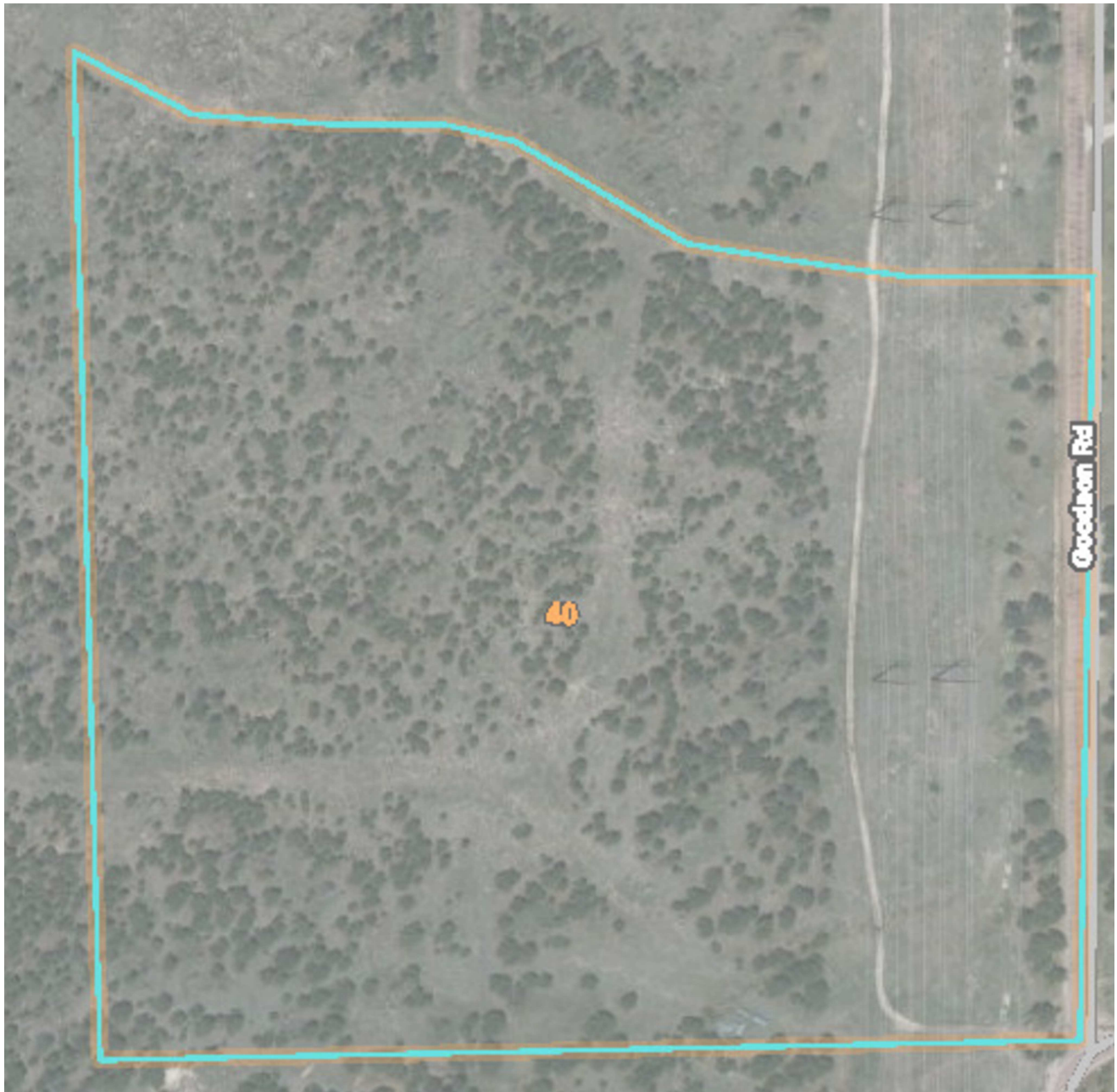
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SEPTIC SUITABILITY
MAP

SHEET No.
FIG-5



40 - Kettle Gravelly Loamy Sand, 3 to 8 percent slopes



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USDA SOIL SURVEY MAP

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FIG No. 6

DATE 2-17-2023

El Paso County Area, Colorado

40—Kettle gravelly loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 368g
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

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

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High
(2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No



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USDA FULL MAP UNIT DESCRIPTIONS

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FIG No. 7

DATE 2-17-2023