Architectural
Structural
Geotechnical

RMG
Engineers / Architects

Materials Testing
Forensic
Civil/Planning

SOIL AND GEOLOGY STUDY

Crossroads Apartments
Crossroads Mixed Use, Filing No. 2
Parcel No. 5408305005
El Paso County, Colorado

PREPARED FOR:

Colorado Springs Equities LLC
90 South Cascade Avenue, 1500
Colorado Springs, CO 80903

JOB NO. 177025-2

March 22, 2023
PCD File No. SF2238

Respectfully Submitted,
RMG – Rocky Mountain Group

Kelli Zigler

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Project Geologist

Reviewed by,
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1.0 GENERAL SITE AND PROJECT DESCRIPTION

1.1 Project Location

The project lies in the South half (S ½) of Section 8, Township 14 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 one parcel. The total area of the proposed site is 12.02 acres as recorded on the El Paso County Assessors website. The parcel included is:

- Schedule No. 5408305005 - The current zoning is *"CR – RS-5000 CAD-O"* - *Commercial Regional – Residential Suburban – Commercial Airport District.* The parcel is currently not developed.

1.3 Project Description

Based on a final plat provided to us by our client, it is our understanding the proposed site development is to consist of two lots and two tracts. The development is to be named Crossroads Mixed Use, Filing No. 2. The lots range between 0.794 and 2.489 acres. The tracts range between 2.022 and 2.815 acres. The Final Plat is presented in Figure 2.

Access into the development is to be provided from the west and the north via two new private drives. Southern Rail Point is to extend south from Meadowbrook Parkway and parallel the western property boundary. Central Rail Point, is to extend east from Southern Rail Point and terminates near the middle of the site. Pacific Rail Way is located near the middle of the site, and extends between Central Rail Point and Meadowbrook Parkway. Curb and gutter has been installed along all interior roadways and the roadways are paved. Additional proposed land usage may include landscaped public easements and utility easements. Currently there are no public streets associated with the development. Interior driveways and parking areas will most likely be privately owned and maintained. If public streets are developed, they will require a site-specific pavement design investigation and report.

The development is to utilize public sewer and water services. Neither individual wells nor on-site wastewater treatment systems are proposed.

This 12-acre site was originally included in this study that originally encompassed a total of 29.04 acres. Since the issuance of the report, the lot/tract layout has been replatted. With the replat, the western 17.02 acres has been eliminated. The purpose of this report is to provide a revised Soil and Geology Study for approval of the replatted 12-acre Crossroads Mixed Use, Filing No. 2 development within El Paso County.

2.0 QUALIFICATIONS OF PREPARERS

This Soil 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 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 and geologic site conditions, and present our opinions of the potential effect of these conditions on the proposed commercial development within the referenced site.

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. Our services exclude evaluation of 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 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 by RMG
- Laboratory testing of representative site soil and rock samples by RMG
- Geologic research and analysis
- Site development plans prepared by others

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 investigations for the site to the west were available for our review and are listed below:

1. *Infiltration Testing (ASTM D3385) Summary, Crossroads Mixed Use, Meadowbrook Parkway, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 188737, dated May 18, 2022.
2. *Pavement Design Report, Meadowbrook Parkway, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 188737, last dated September 13, 2022.
3. *Addendum to Subsurface Soil Investigation – Underground Detention Area, Tract A, Crossroads Mixed Use, Meadowbrook Parkway, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 188737, dated March 3, 2023.
4. *Field Activity Reports, Crossroads Mixed Use,* prepared by Rocky Mountain Group, Job No. 188737 dates ranged from December 21, 2022 to March 29, 2022.
5. *Crossroads Commercial, Parcel No. 5408007005, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 17702, last dated August 20, 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 partially developed. Highway 24 borders the property to the south, Meadowbrook Parkway borders the property to the east and west, a single-family residential subdivision lies north of the property, and open land is adjacent to the west.

4.2 Topography

Based on our site reconnaissance on March 14, 2023, the site topography is generally level. The interior roadways have been installed and paved and the lots/tracts have been graded. The elevation varies approximately 10-feet across the entire site from the northeast to the southwest.

4.3 Vegetation

Vegetation and deciduous trees have been removed due to the recent overlot grading.

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. Historically, the site has remained undeveloped land. Prior to 1947, it appears from imagery, the banks of the East Fork Sand Creek (EFSC) "breached" and water found its way downslope from EFSC to the northwest portion of the site. A natural catch basin was created early 2018 to capture the overflow of soil and water deposited on the site. Water flowed freely to this catch basin until the drainageway was rerouted during the development of the softball and baseball field on the adjacent land to the west. The softball and baseball fields are no longer in use.

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

Four (4) test borings (TB-1, 2 4 and 5) from the above referenced Soils and Geology Study lie within the 12-acre site. The test borings were drilled to depths of 20-feet below the existing ground surface on June 30, 2020. RMG explored the site on November 21, 2019 for a previous client by drilling four (4) exploratory test borings, two of which are within or adjacent to this site (TB-7 and TB-8), to depths of 20 to 35-feet. A geotechnical report was not prepared for the prior exploration as the project was canceled. Additionally, a pavement design report was completed for Meadowbrook Parkway, along the northern portion of the site, in May of 2022. Four of the previous pavement borings (PB-1 through PB-4) are also included in this study.

Additional test borings were not considered necessary for this study. In reviewing our previous reports, test boring logs, and laboratory data, the soil across the site is fairly uniform. Furthermore, neither groundwater nor indications of elevated moisture conditions were encountered in any of the borings completed for the three previous studies. It is our opinion that additional test borings would not have provided any additional information that would have changed our recommendations presented in this updated study.

The Test Boring Logs, Summary of Laboratory Data and Soil Classifications from the previous studies are included in this current study. In order to maintain consistency across the investigations, the test borings completed from the previous studies were not renumbered for this study. The number of borings included in this study exceed the minimum criteria of 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 stipulated in 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. Results of penetration tests are shown on the drilling logs. The Test Boring Location Plan is presented in Figure 4. The Test Boring Logs from the previous three studies are included in Appendix B.

5.1 Laboratory Testing

Soil laboratory testing was performed as part of each previous investigation. Laboratory testing included moisture content, grain-size analysis, and Atterberg Limits. A Summary of Laboratory Test Results from each study is presented in Appendix B.

5.2 Groundwater

Groundwater was not encountered in the test boring during the field explorations. The soil on site appears to be well draining with low natural moisture contents. 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

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 that 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.

6.1 Subsurface Soil Conditions

The subsurface materials encountered in the test borings were classified within the laboratory using the Unified Soil Classification System (USCS). The materials classify primarily as native silty to clayey sand (SP-SM, SC) throughout the depths tested. Neither interbedded clay layers, or claystone bedrock were encountered in the test borings.

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 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 not encountered in the test borings performed for the previous studies. In general, bedrock (as mapped by Colorado Geologic Survey - CGS) is at depth beneath this site, and is considered part of the Dawson formation. Bedrock is not anticipated in the excavations or 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:

- 8 – Blakeland loamy sand, 1 to 9 percent slopes. The Blakeland loamy sand was mapped by the USDA to encompass the majority of the property. Properties of the loamy sand include, some-what excessively 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 ponding is none, and landforms include depressions.

- 10 – Blendon sandy loam, 0 to 3 percent slopes. The Blendon sandy loam was mapped by the USDA to encompass a narrow "strip" that runs parallel to the northern property line. 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 ponding is none, and landforms include depressions.

The USDA Soil Map is presented in Figure 5.

6.4 General Geologic Conditions

Based on our field observations, the USDA soil mapping, and the Geologic Map of the Elsmere Quadrangle, 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 4.

The site generally consists of eolian deposits overlying sandstone bedrock. Four geologic units were mapped at the site as:

- *Qes_1 – Younger eolian sand (middle and early Holocane and late? Pleistocene)* – very pale-brown, pale-brown, and light yellowish-brown sand. Unit is chiefly very coarse and coarse sand that appears to have been deposited as sand sheets. Unit thickness is estimated to be 3-20 feet deep. The eolian sand was encountered in the test borings to a depth of 20 feet.

- *$TKda_1$ – Dawson formation, facies unit one* – white to light-gray, cross-bedded or massive, very coarse arkosic sandstone or pebbly conglomerate. Occasional interbedded thin to very thinly bedded sandy claystone. Estimate thickness varies from 25 to 200 feet. The Dawson formation was not encountered in the test borings.

- *da – disturbed area* – area that has been disturbed from past activity on the site and/or from historical overflow of sediment and water from EFSC from the north.

- *ss – steep slopes* – Isolated steep slopes that may require a retaining wall, if not sloped back to a 3:1 (horizontal:vertical).

6.5 Engineering Geology

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

- *2D* – Eolian deposits generally on flat to gentle upland areas.
- *2E* – Low terraces and valleys of minor tributary streams.

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 conglomerates in the Dawson Formation up-valley along EFSC, or reworked from gravel-capped mesas from the Pleistocene period.

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 Water and Groundwater

The overall topography of the site slopes down from the southeast to the southwest. It is anticipated the direction of surface water and groundwater flows in the same direction, i.e., toward East Fork Sand Creek. Groundwater was not encountered in the test borings performed for this study. Groundwater water depths are greater than 35-feet in the area and are not anticipated to affect foundation construction.

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 *"Coal"*. The overburden above coal deposits is estimated to be up to 200 feet, with unknown seam thickness ranging up to 4 feet. Extraction of the coal 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 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 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 hazard and constraints were considered in the preparation of this report but were not identified on the property, and are not anticipated to pose a significant risk to the proposed development:

- Avalanches
- Debris Flow-Fans/Mudslides
- Expansive Soils and Bedrock
- Floodplains
- Ground Subsidence
- Landslides
- Rockfall
- Ponding water
- Expansive Soils and Bedrock
- Steeply Dipping Bedrock
- Unstable or Potentially Unstable Slopes
- Scour, Erosion, accelerated erosion along creek banks and drainage ways
- Springs and High Groundwater
- Corrosive Minerals
- Undocumented Fill or History of Landfill

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

8.1 Compressible Soils

Shallow foundations are anticipated for the development. Based on the test borings performed by RMG for the previous investigations, the silty to clayey sand generally possesses low compressibility potential.

Mitigation

Areas of loose soils are anticipated. If loose soils are encountered beneath the foundations, mitigation will be required.

If loose soils are encountered during the Open Excavation Observation, they may require additional compaction to achieve the allowable bearing pressure indicated in this report. Fluctuations in material density may occur. In some cases, removal and recompaction of up to 2 feet of soil may be required. The removal and recompaction shall extend a minimum of the same distance beyond the building perimeter, and at least that same distance beyond the perimeter of counterfort and "T" wall footings. The use of track-mounted excavation equipment, or other low ground pressure equipment, is recommended on loose soils to reduce the likelihood of loss of stability during excavation.

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 compressible soils is not considered to pose a risk to the proposed structures.

8.2 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

In accordance with the International Building Code, 2018, seismic design parameters have been determined for this site. The Seismic Site Class has been interpreted from the results of the soil test borings drilled within the project site. The Applied Technology Council seismic design tool has been used to determine the seismic response acceleration parameters using ASCE 7-16. The soil on this site is not considered susceptible to liquefaction. The following recommended Seismic Design Parameters are based upon Seismic Site Class D, and a 2 percent probability of exceedance in 50 years. The Seismic Design Category is “B”.

Period (sec)	Mapped MCE Spectral Response Acceleration (g)		Site Coefficients		Adjusted MCE Spectral Response Acceleration (g)		Design Spectral Response Acceleration (g)	
0.2	S_s	0.191	F_a	1.6	S_{ms}	0.306	S_{ds}	0.204
1.0	S_1	0.057	F_v	2.4	S_{m1}	0.136	S_{d1}	0.09

Notes: MCE = Maximum Considered Earthquake
g = acceleration due to gravity

8.3 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".*

Central El Paso County and the 80915 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.

8.4 Erosion

Due to the fine-grain nature of the soils on the site, the upper sands encountered at the site are susceptible to erosion by wind and flowing water.

Mitigation
Minor wind erosion and dust problems may arise during and immediately after construction. If the problem becomes severe during this time, watering of the cut areas may be required to control dust. Installation of erosion protection or vegetation after completion of the structures is anticipated to mitigate the majority of the erosion and dust problems.

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

Based on the test borings from the previous investigation, the excavations are anticipated to encounter silty to clayey sand. The on-site soils are suitable for use as site-grading fill.

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 competent personnel.

If unsuitable fill soils are encountered at the time of construction, 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).

We anticipate that the deepest excavation cuts for the proposed commercial construction utilizing a shallow spread footing foundation will be approximately 3 to 4-feet below the existing ground surface.

We believe the surficial soils will classify as Type C materials as defined by OSHA in 29CFR Part 1926, dated January 2, 1990. OSHA requires temporary slopes made in Type C materials be laid back at ratios no steeper than 1.5:1 (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).

9.0 BEARING OF GEOLOGIC CONDITIONS UPON PROPOSED DEVELOPMENT

Geologic hazards (as described in Section 8 of this report) were not found to be present at this site. Geologic constraints (as described in section 8 of this report) such as potentially compressible soils, seismicity, radon, and erosion were found on the site. 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 mostly of native silty to clayey sand. It is anticipated the sands will be encountered at loose to medium dense relative densities. Bedrock conditions are not anticipated within the utility trenches.

We believe the sand will classify as Type C materials and perhaps 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 the slope designed by a professional engineer.

11.0 PAVEMENTS

A Pavement Design Report was completed by RMG for Meadowbrook Parkway. The interior roadways were not included in that report. The interior roadways are classified as private and do not require a engineered design but should consider the criteria presented in the Engineering Criteria Manual.

For purposes of this report, we anticipate the subgrade soils will have American Association of State Highway and Transportation Officials (AASHTO) Soil Classifications primarily of A-1-b (0) and A-2-4(0), which are considered “excellent to good” for use as subgrade material.

The ECM notes that mitigation measures may be required for expansive soils, shallow ground water, subgrade instability, etc. Based on the AASHTO classification of the soils in the subdivision and laboratory swell testing, the subgrade soils are expected to encounter nil to low expansive potential. Therefore, special mitigation measures are not anticipated for subgrade preparation.

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 are anticipated to be suitable for proposed commercial structures. Typical foundation cuts are anticipated to be approximately 3 to 4 feet below the final ground surface. The following are general foundation recommendations. Structure specific investigations should be performed prior to structure design.

Loose sand soils are anticipated in the majority of the excavations at and/or near foundation or floor slab bearing levels. If loose sands are encountered, they may require additional compaction to achieve the suitable bearing pressure. In some cases, removal and recompaction may be required for loose soils.

The proposed apartments may be supported on shallow foundations bearing on a minimum of 24-inches of compacted native soil or imported compacted structural fill prepared in accordance with the following recommendations. Site preparation should include clearing and grubbing the site of all vegetation, topsoil, and any other deleterious material within the construction area and disposing this material appropriately. Following clearing and grubbing, the area within the foundation footprint and a 2-foot perimeter beyond should be overexcavated 18-inches below the bottom of footing elevation. An Open Excavation Observation should be made at this point to verify soil conditions are as reported in the soil boring logs herein.

Upon verification, 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 Modified Proctor test (ASTM D-1557).

After compaction of the in situ soil, the excavation should then be backfilled in compacted lifts to bottom of footing elevation with native soil or structural fill consisting of well-graded non-cohesive granular material. The material should not be excessively wet, should be free of organic matter and construction debris, and contain no rock fragments greater than 2-inches in any dimension. Structural fill material should be placed in 8-inch loose lifts with moisture content within 2 percent of optimum as determined by ASTM D-1557. Each loose lift should be compacted to a minimum of 95 percent of Modified Proctor maximum dry density as determined by ASTM D-1557. Each lift of soil should be density tested to verify compaction meets these requirements.

Structures may be supported on shallow foundations when the site is prepared in accordance with the recommendations above. When so prepared, a maximum allowable bearing pressure of 2,000 to 2,500 psf with no minimum dead load requirement may be used for design. The foundation design should be prepared by a qualified Colorado Registered Professional Engineer using the recommendations presented in this report. The foundation systems should be designed to span a minimum of 10 feet under the design loads. The bottoms of exterior foundations should be at least 30 inches below finished grade for frost protection. When prepared and properly compacted, total settlement of 1-inch or less with differential settlement of ½ inch or less is estimated. Settlement in granular material will occur relatively rapidly with construction loads. Long-term consolidation settlement should not be an issue in the site material if prepared as recommended above.

12.1 Structural Fill - General

Except as described above for foundations, areas to receive structural fill should have topsoil, organic material, and 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 Modified Proctor test (ASTM D-1557).

Structural fill should be placed in loose lifts not exceeding 8 to 10-inches 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 Modified Proctor test (ASTM D-1557).

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 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.

12.2 Surface Grading and Drainage

The ground surface should be sloped from structures with a minimum gradient of 2 percent to intercept the surface water and transport it away from the structure. Roof drains should extend across backfill zones and landscaped areas to a region that is graded to direct flow away from the structure. Water should be kept from ponding near the foundations.

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

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

12.3 Foundation Drains

A subsurface perimeter drain is recommended around portions of the structures that will have habitable or storage space located below the finished ground surface. This includes crawlspace areas if applicable.

Shallow groundwater conditions were not encountered in the test borings included in this study. Depending on the conditions encountered during site-specific subsurface soil investigations and the conditions observed at the time of the open excavation observations, additional subsurface drainage systems may be recommended.

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 DETENTION STORAGE CRITERIA

It is our understanding a proposed underground detention area is to be installed in Tract A located on the site to the west, near the southwestern corner of this site. The drainage from this site is to be routed to the underground detention area. An additional detention area is not proposed within this 12-acre site.

14.0 ADDITIONAL STUDIES

The findings, conclusions and recommendations presented in this report were provided to evaluate the suitability of the site for the proposed development. The test borings, laboratory test results, conclusions and recommendations presented in this report are for preliminary evaluations, and not intended for use for final design and construction. We recommend that a *lot-specific* subsurface soil investigation be performed for each proposed structures. The extent of any fill soils encountered during the lot-specific investigations 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 compressible soils, seismicity, radon, and erosion, but these conditions 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 systems for the proposed apartment structures and retaining walls greater than 4 feet should be designed and constructed based upon recommendations developed in a site-specific subsurface soil investigation.

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.

16.0 CLOSING

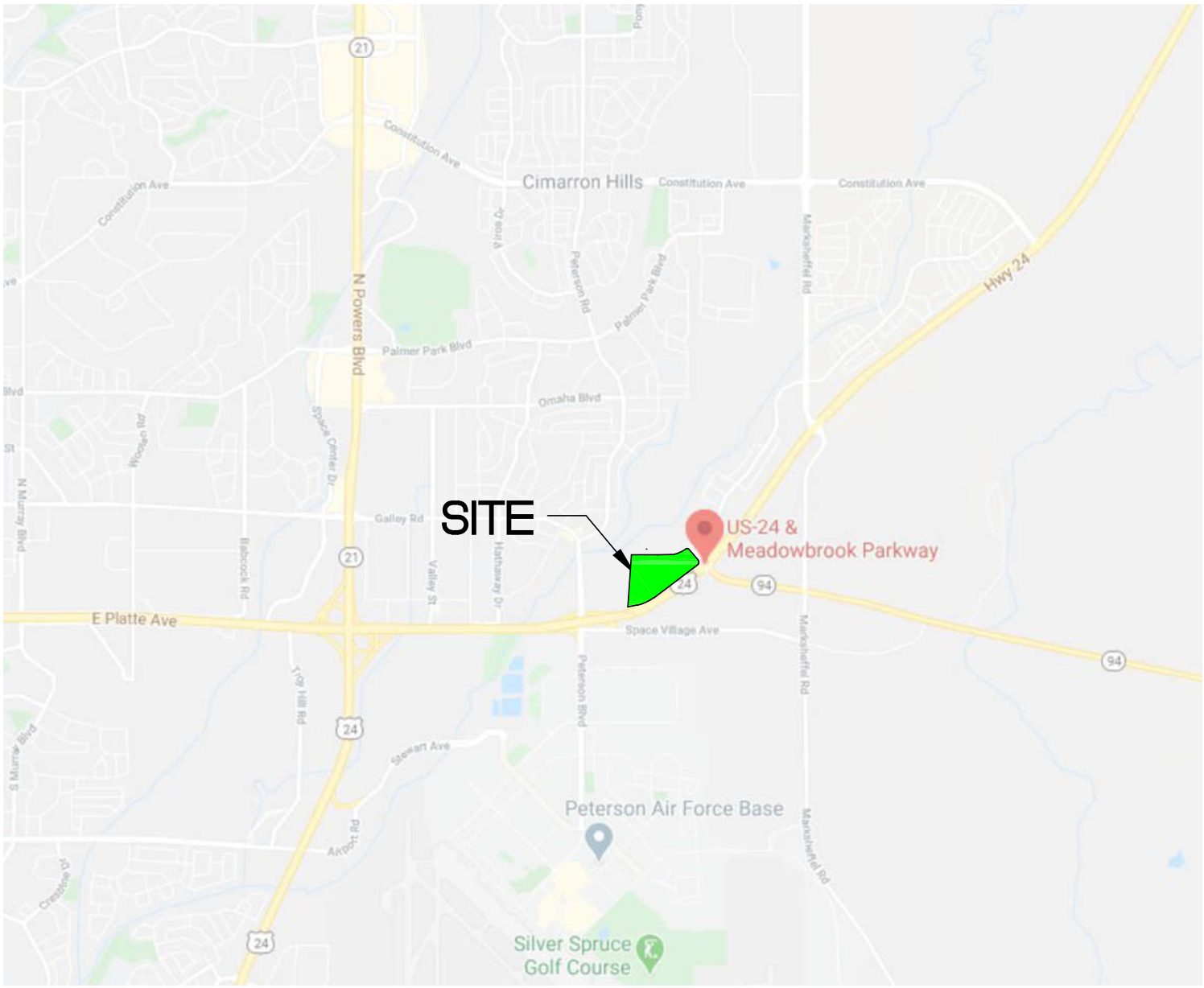
This report is for the exclusive purpose of providing geologic hazards information and preliminary geotechnical engineering recommendations. The scope of services did not include, either specifically or by implication, evaluation of wild fire hazards, environmental assessment of the site, or identification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



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SITE VICINITY MAP

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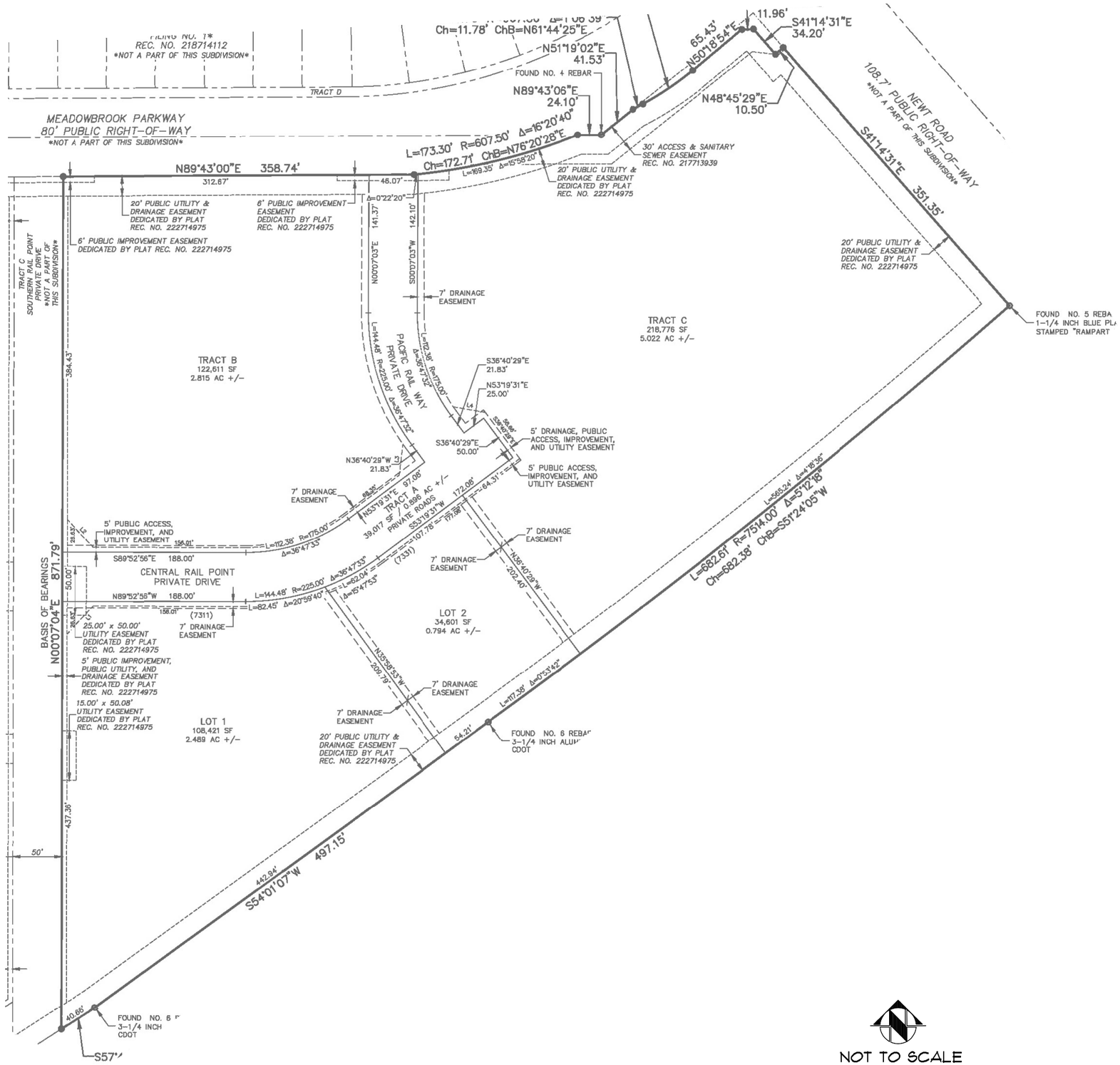
JOB No. 177025-2

FIG No. 1

DATE 3-22-2023



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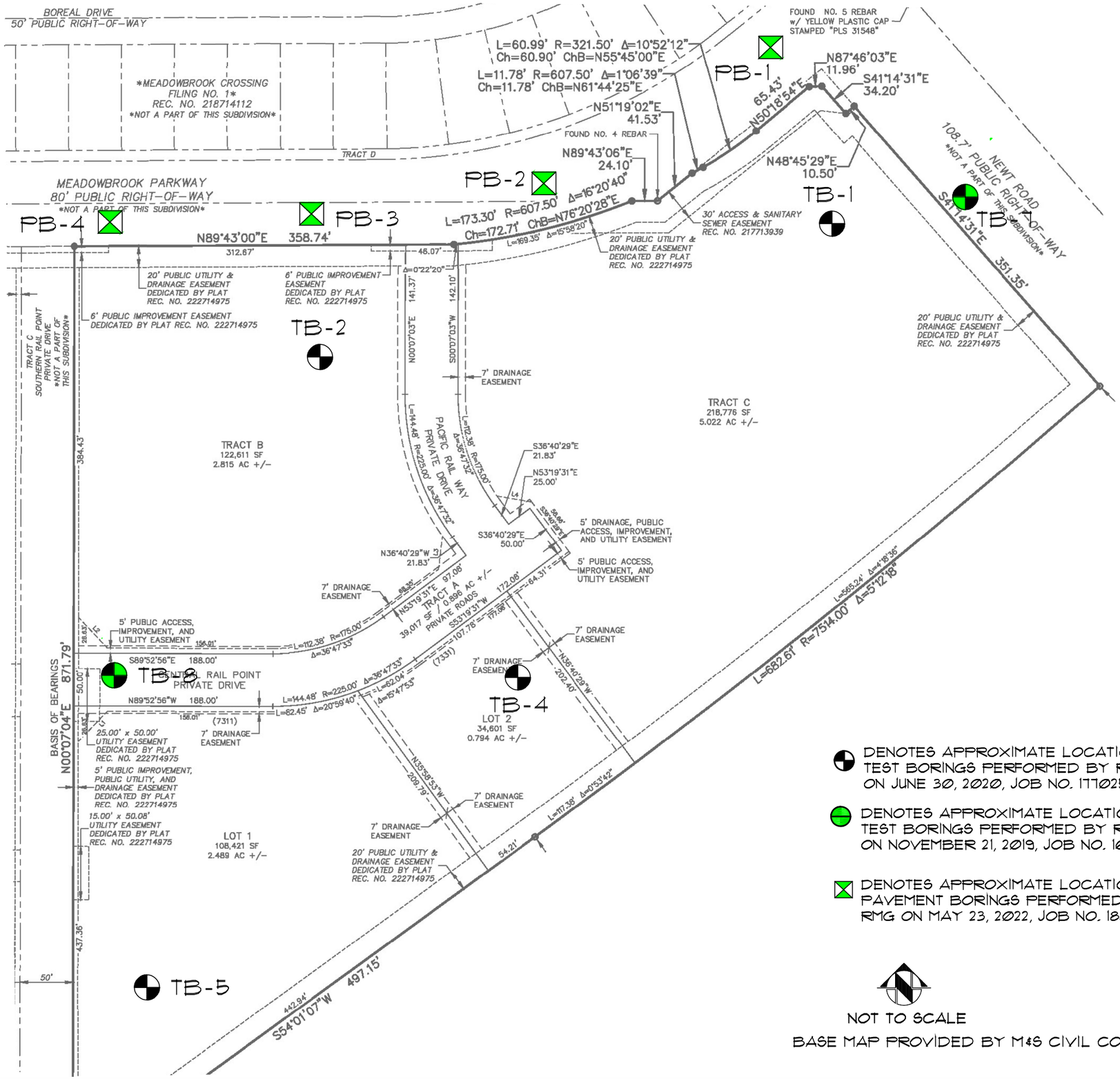
DRAWN BY:	KZ
CHECKED BY:	TM
ISSUED:	3-22-2023

FINAL PLAT

SHEET No.
FIG-2



DENOTES APPROXIMATE LOCATION OF TEST BORINGS PERFORMED BY RMG ON JUNE 30, 2020, JOB NO. 177025

DENOTES APPROXIMATE LOCATION OF TEST BORINGS PERFORMED BY RMG ON NOVEMBER 21, 2019, JOB NO. 167718

DENOTES APPROXIMATE LOCATION OF PAVEMENT BORINGS PERFORMED BY RMG ON MAY 23, 2022, JOB NO. 188737

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BASE MAP PROVIDED BY M&S CIVIL CONSULTANTS LLC

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CHECKED BY:	TM
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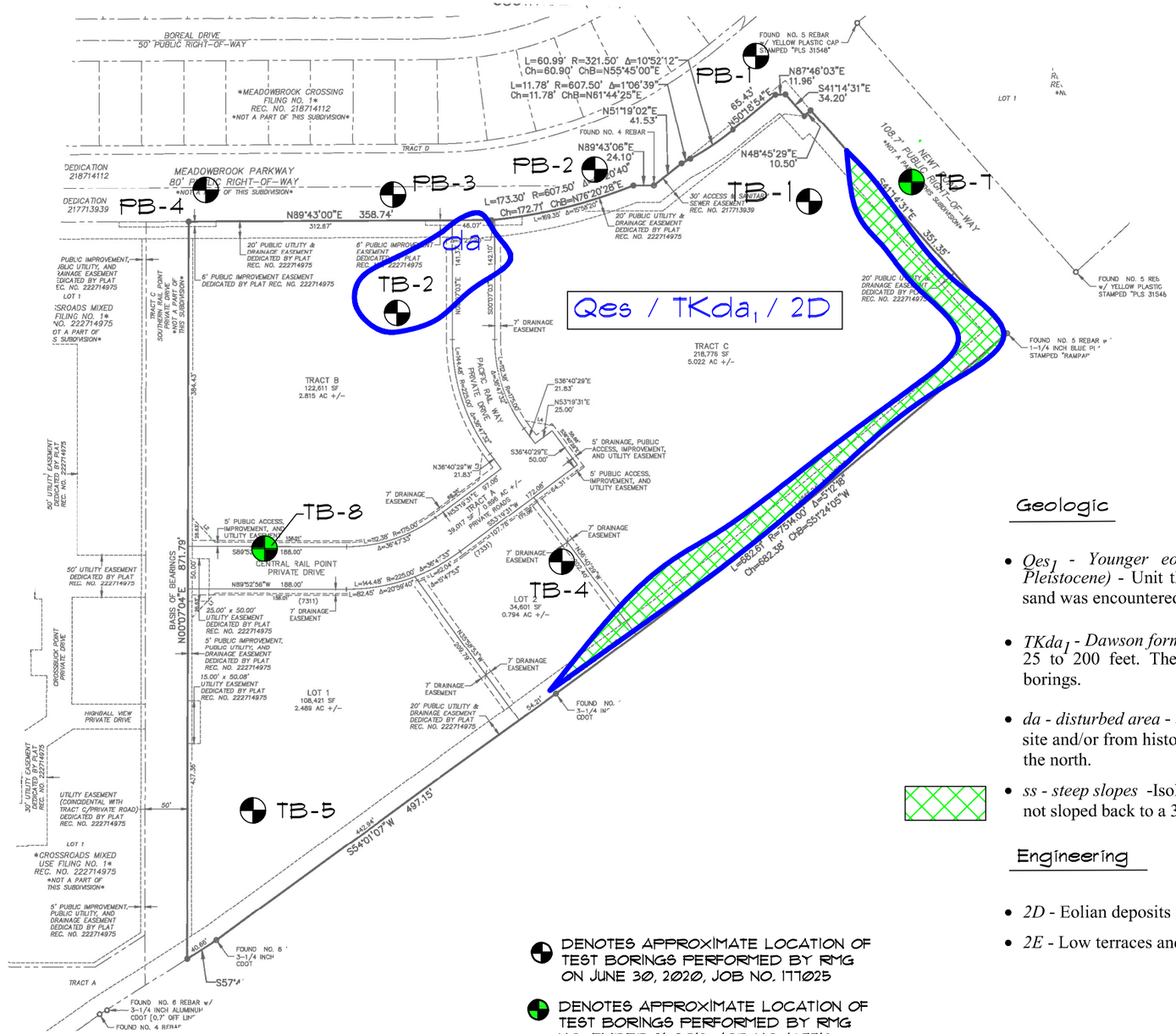
TEST BORING LOCATION PLAN

SHEET No.
FIG-3



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BASE MAP PROVIDED BY M&S CIVIL CONSULTANTS INC

● DENOTES APPROXIMATE LOCATION OF TEST BORINGS PERFORMED BY RMG ON JUNE 30, 2020, JOB NO. 177025

● DENOTES APPROXIMATE LOCATION OF TEST BORINGS PERFORMED BY RMG NOVEMBER 21, 2019, JOB NO. 167718

⊠ DENOTES APPROXIMATE LOCATION OF PAVEMENT BORINGS PERFORMED BY RMG ON MAY 23, 2022, JOB NO. 188137

Geologic

- *Qes_1 - Younger eolian sand (middle and early Holocane and late? Pleistocene)* - Unit thickness is estimated to be 3-20 feet deep. The eolian sand was encountered in sll the test borings to a depth of 20 feet.
- *$TKda_1$ - Dawson formation, facies unit one* - Estimated thickness varies from 25 to 200 feet. The Dawson formation was not encountered in the test borings.
- *da - disturbed area* - area that has been disturbed from past activity on the site and/or from historical overflow of sediment and water from EFSC from the north.
- *ss - steep slopes* -Isolated steep slopes that may require a retaining wall, if not sloped back to a 3:1 (horizontal:vertical).

Engineering

- *2D* - Eolian deposits generally on flat to gentle upland areas.
- *2E* - Low terraces and valleys of minor tributary streams.

JOB No. 177025-2

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ENGINEERING AND GEOLOGY MAP

SHEET No.
FIG-4

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	32.0	94.0%
10	Blendon sandy loam, 0 to 3 percent slopes	2.0	6.0%
Totals for Area of Interest		34.1	100.0%

REFERENCE
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USDA SOIL MAP

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FIG No. 5

DATE 3-22-2023

APPENDIX A
Additional Reference Documents

1. *Final Plat, Crossroad Mixed Use Filing No. 2, prepared by M&S Civil Consultants, Inc.,* Job No. 18-004, last dated November 22, 2022.
2. *Crossroads Mixed Use, Pre-Development Grading & Erosion Control Plans*, prepared by M&S Civil Consultants, Inc., Project No. 18-003, dated February 16, 2021.
3. *Preliminary Site Plan, Crossroads Apartments, El Paso County, Colorado*, prepared by Kimley Horn, via email, from Raimere Fitzpatrick, Wednesday, July 29, 2020.
4. *Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Community Panel No. 081041C0752G,* Federal Emergency Management Agency (FEMA), effective December 7, 2018.
5. *Geologic Map of the quadrangle, El Paso County, Colorado*, Jonathan L. White, Kassandra O. Lindsey, Matthew L. Morgan, and Shannon A. Mahan. Colorado Geological Survey Open-File Report OF-17-05.
6. *Elsmere, Quadrangle, Environmental and Engineering Geologic Map for Land Use*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
7. *Elsmere, Quadrangle, Map of Potential Geologic Hazards and Surficial Deposits*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
8. *Geologic map of the Pueblo 1 degree x 2 degrees quadrangle, south-central Colorado,* Scott, G.R., Taylor, R.B., Epis, R.C., and Wobus, R.A., 1976.
9. *Pikes Peak Regional Building Department:* https://www.pprbd.org/.
10. https://property.spatialest.com/co/elpaso/#/property/5522105006 Schedule No.: 5522105006.
11. *Colorado Geological Survey, USGS Geologic Map Viewer*: http://coloradogeologicalsurvey.org/geologic-mapping/6347-2/.
12. *Historical Aerials:* https://www.historicaerials.com/viewer, Images dated 1947, 1960, 1969, 1999, 2005, 2009, 2011, 2013, and 2015.
13. *USGS Historical Topographic Map Explorer:* http://historicalmaps.arcgis.com/usgs/ Colorado Springs Quadrangles dated 1950, 1951, 1958, 1963, 1969, 1970, 1975, 1978, 1981, 1994, 2013 and 2016.
14. *Google Earth Pro*, Imagery dated 1999, 2003, 2004, 2005, 2006, 2011, 2015, 2017, 2018, 2019, 2020, and 2022.

APPENDIX B

Test Boring Logs and Laboratory Data from the following previous studies:

1. *Soils and Geology Study, Crossroads Commercial, Parcel No. 5408007005, El Paso County,* prepared by RMG – Rocky Mountain Group, Job No. 177025, last dated March 3, 2021.

2. *Pavement Design Report, Meadowbrook Parkway, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 188737, last dated September 13, 2022.

TEST BORING: **1** ELEVATION (FT): DATE DRILLED: 6/30/20 NO GROUNDWATER ON 6/30/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, light brown to brown, medium dense, moist	5			11	8.6
	10			11	1.2
	15			13	3.0
	20				2.4

TEST BORING: **2** ELEVATION (FT): DATE DRILLED: 6/30/20 NO GROUNDWATER ON 6/30/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, light brown to brown, medium dense, moist	5			13	7.3
	10			14	2.0
	15			12	4.5
	20			16	3.4

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TEST BORING LOG

JOB No. 177025

FIGURE No. 5

DATE Aug/18/2020

TEST BORING: **3** ELEVATION (FT): DATE DRILLED: 6/30/20 NO GROUNDWATER ON 6/30/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, brown, medium dense, moist	5			14	4.7
SAND, SILTY, with gravel, light brown, medium dense, moist	10			19	6.9
	15			20	6.5
	20			19	6.6

TEST BORING: **4** ELEVATION (FT): DATE DRILLED: 6/30/20 NO GROUNDWATER ON 6/30/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, light brown, loose to medium dense, moist	5			6	4.4
	10			5	6.0
	15			10	5.2
	20			11	6.2

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TEST BORING LOG

JOB No. 177025

FIGURE No. 6

DATE Aug/18/2020

TEST BORING: **5** ELEVATION (FT): DATE DRILLED: 6/30/20 NO GROUNDWATER ON 6/30/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, light brown to brown, loose to medium dense, moist	5			9	2.2
	10			8	3.2
	15			11	3.4
	20			10	5.3

TEST BORING: **6** ELEVATION (FT): DATE DRILLED: 6/30/20 NO GROUNDWATER ON 6/30/20	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, brown, loose to medium dense, moist	5			6	2.2
	10			20	3.5
	15				2.5
	20			29	10.6

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TEST BORING LOG

JOB No. 177025

FIGURE No. 7

DATE Aug/18/2020

TEST BORING: **7** ELEVATION (FT): DATE DRILLED: 11/21/19 NO GROUNDWATER ON 11/21/19	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, dark brown to tan, loose to medium dense, moist	5			17	4.9
	10			8	3.8
	15			9	4.7
	20			10	4.0

TEST BORING: **8** ELEVATION (FT): DATE DRILLED: 11/21/19 NO GROUNDWATER ON 11/21/19	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, tan, very loose to dense, moist	5			1	2.3
	10			3	2.9
	15			7	3.9
	20			9	4.4
	25			16	5.0
	30				
	35			32	8.9

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TEST BORING LOG

JOB No. 177025

FIGURE No. 8

DATE Aug/18/2020

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	FHA Expansion Pressure (psf)	% Swell/ Collapse	USCS Classification
1	4.0	8.6		25	12	1.1	39.5			SC
1	9.0	1.2								
1	14.0	3.0								
1	19.0	2.4								
2	4.0	7.3								
2	9.0	2.0		NP	NP	3.2	3.4			SP
2	14.0	4.5								
2	19.0	3.4								
3	4.0	4.7		NP	NP	1.6	22.1			SM
3	9.0	6.9								
3	14.0	6.5								
3	19.0	6.6								
4	4.0	4.4								
4	9.0	6.0								
4	14.0	5.2		NP	NP	0.0	6.4			SP-SM
4	19.0	6.2								
5	4.0	2.2								
5	9.0	3.2		NP	NP	0.0	5.9			SP-SM
5	14.0	3.4								
5	19.0	5.3								
6	4.0	2.2		NP	NP	0.0	8.1			SP-SM
6	9.0	3.5								
6	14.0	2.5								
6	19.0	10.6								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 177025
FIGURE No. 10

DATE Aug/18/2020

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	FHA Expansion Pressure (psf)	% Swell/ Collapse	USCS Classification
7	4.0	4.9		24	10	1.3	26.4			SC
7	9.0	3.8								
7	14.0	4.7								
7	19.0	4.0								
8	4.0	2.3								
8	9.0	2.9		NP	NP	0.0	8.2			SP-SM
8	14.0	3.9								
8	19.0	4.4								
8	24.0	5.0								
8	34.0	8.9								
9	4.0	3.9		NP	NP	0.0	6.7			SP-SM
9	9.0	11.0								
9	14.0	5.4								
9	19.0	7.4								
10	4.0	12.5		NP	NP	5.4	7.1			SP-SM
10	9.0	11.7								
10	14.0	12.5								
10	19.0	10.2								

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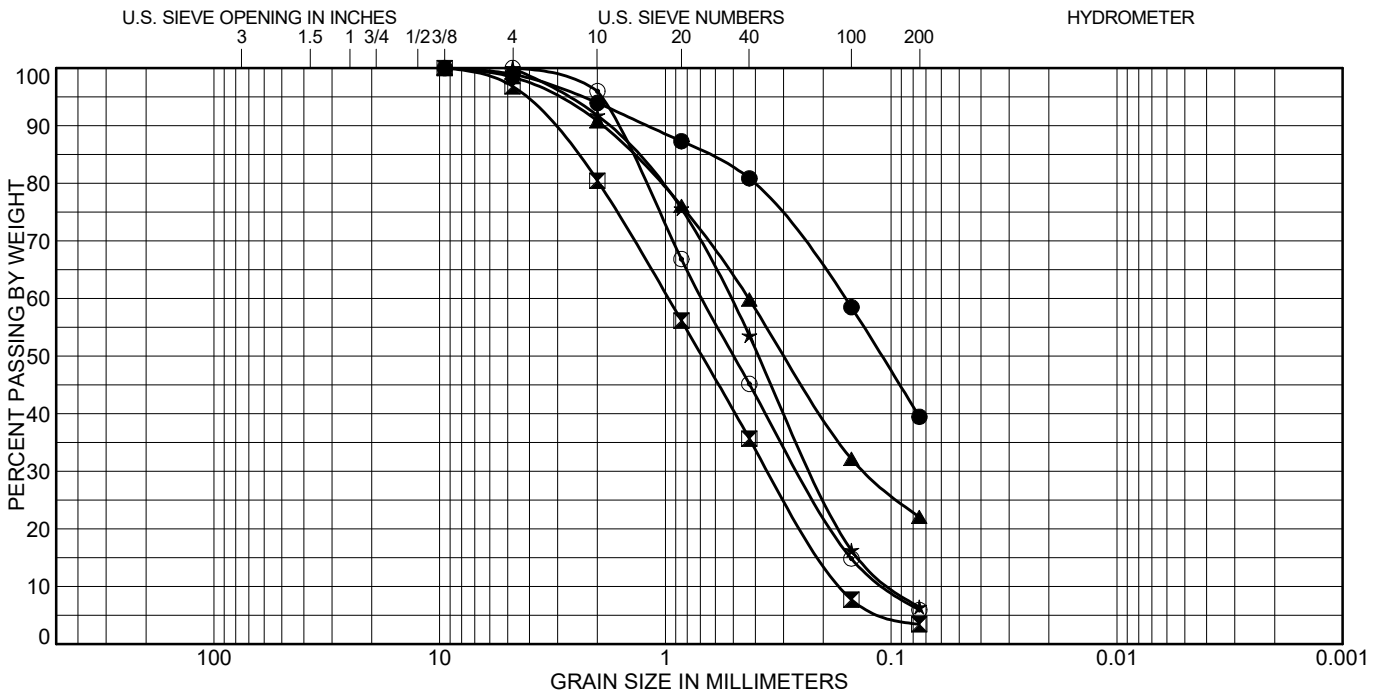
SUMMARY OF LABORATORY TEST RESULTS

JOB No. 177025
FIGURE No. 10
PAGE 2 OF 2
DATE Aug/18/2020



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	1	4.0	CLAYEY SAND(SC)	25	13	12
⧓	2	9.0	POORLY GRADED SAND(SP)	NP	NP	NP
▲	3	4.0	SILTY SAND(SM)	NP	NP	NP
★	4	14.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP
⊙	5	9.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	1	4.0	1.1	59.5	39.5	
⧓	2	9.0	3.2	93.4	3.4	
▲	3	4.0	1.6	76.3	22.1	
★	4	14.0	0.0	93.6	6.4	
⊙	5	9.0	0.0	94.1	5.9	

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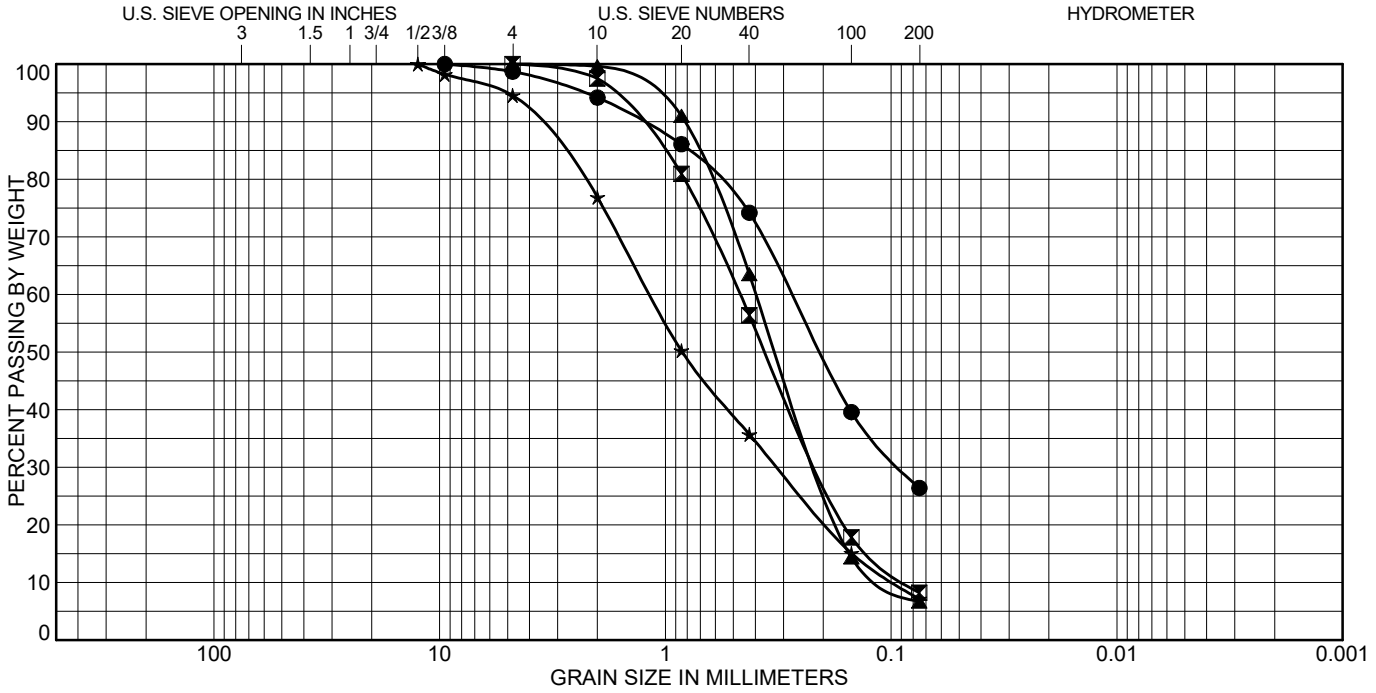
SOIL CLASSIFICATION DATA

JOB No. 177025

FIGURE No. 11

DATE Aug/18/2020



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	7	4.0	CLAYEY SAND(SC)	24	14	10
⧓	8	9.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP
▲	9	4.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP
★	10	4.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	7	4.0	1.3	72.3	26.4	
⧓	8	9.0	0.0	91.8	8.2	
▲	9	4.0	0.0	93.3	6.7	
★	10	4.0	5.4	87.4	7.1	

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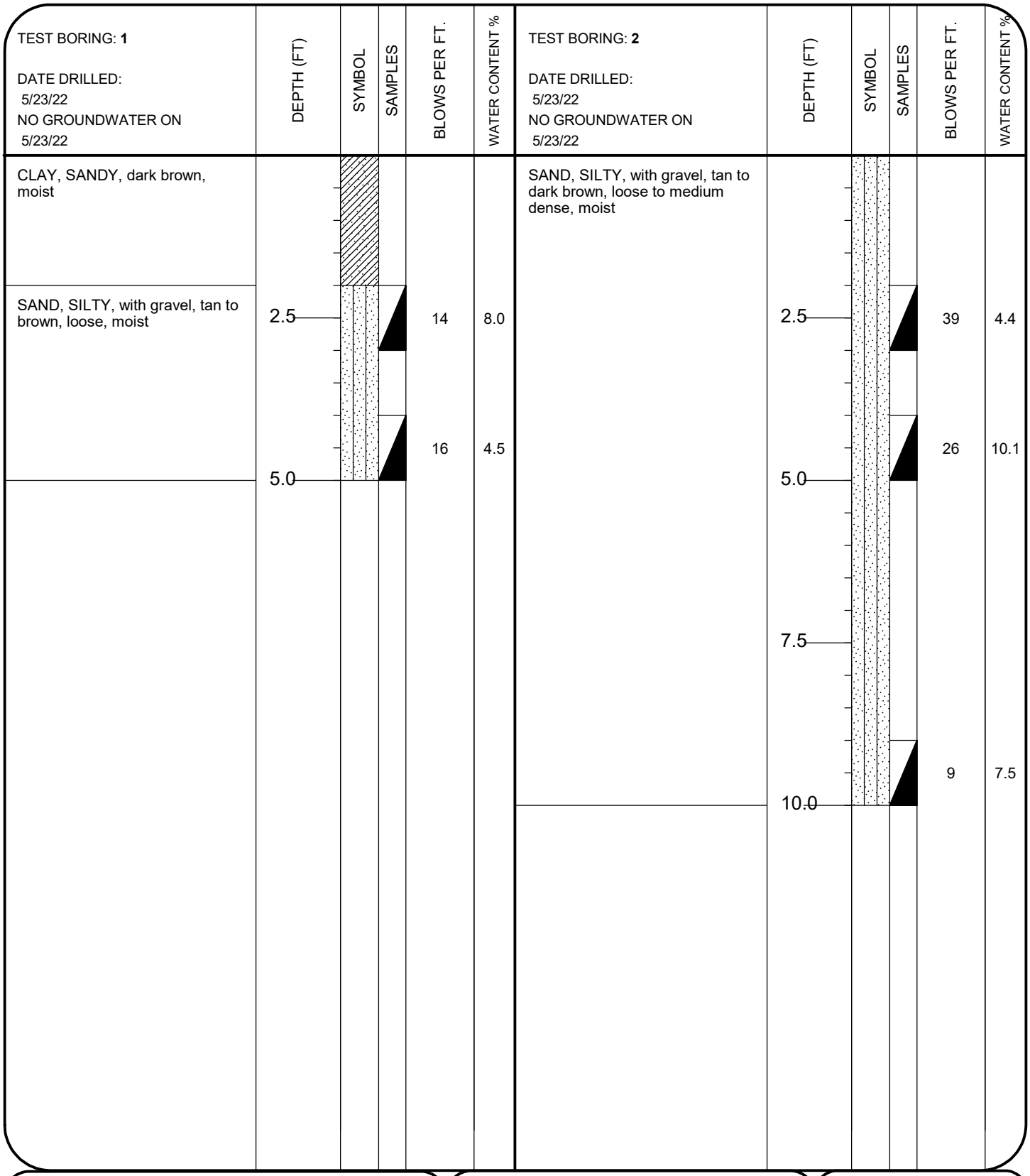
SOIL CLASSIFICATION DATA

JOB No. 177025

FIGURE No. 13

DATE Aug/18/2020



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TEST BORING LOG

JOB No. 188737

FIGURE No. 4

DATE Sep/13/2022

TEST BORING: **3** DATE DRILLED: 5/23/22 NO GROUNDWATER ON 5/23/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, with gravel, tan to brown, loose to medium dense, moist	2.5			19	6.1
				11	8.2
	5.0				

TEST BORING: **4** DATE DRILLED: 5/23/22 NO GROUNDWATER ON 5/23/22	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY, with gravel, tan to dark brown, medium dense, moist	2.5			45	8.6
				23	8.9
	5.0				

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TEST BORING LOG

JOB No. 188737

FIGURE No. 5

DATE Sep/13/2022

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.10 Sieve	% Retained No.40 Sieve	% Passing No. 200 Sieve	% Swell @ 100 psf	AASHTO Classification
1	2.0	8.0		NP	NP	30.2	64.0	14.2		A-1-b (0)
1	4.0	4.5								
2	2.0	4.4		NP	NP	1.6	45.6	8.6		A-3 (0)
2	4.0	10.1								
2	9.0	7.5								
3	2.0	6.1		NP	NP	2.3	42.7	11.1		A-2-4 (0)
3	4.0	8.2								
4	2.0	8.6		NP	NP	0.6	43.6	9.8		A-3 (0)
4	4.0	8.9								
5	2.0	7.6		NP	NP	0.6	45.1	7.5		A-3 (0)
5	4.0	6.0								
6	2.0	5.7		NP	NP	0.6	46.0	8.5		A-3 (0)
6	4.0	7.2								

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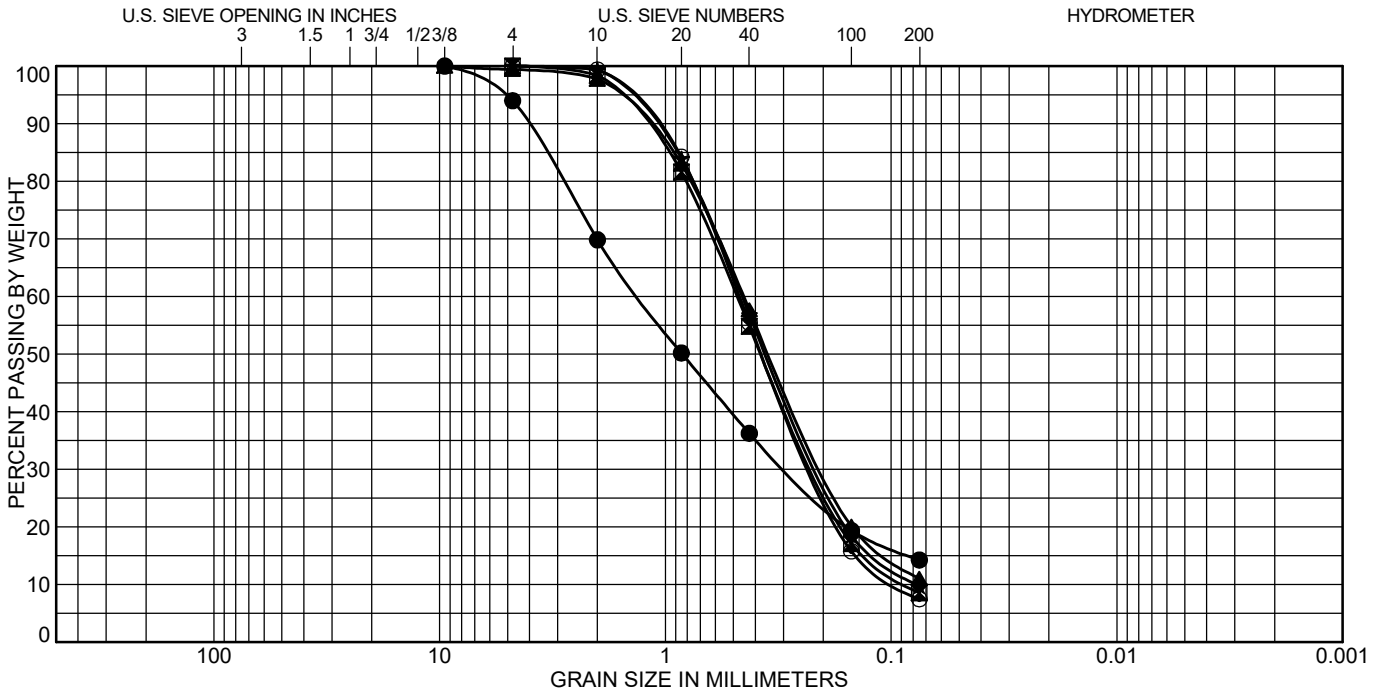
SUMMARY OF LABORATORY TEST RESULTS

JOB No. 188737
FIGURE No. 7
PAGE 1 OF 1
DATE Sep/13/2022



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	1	2.0	SILTY SAND(SM)	NP	NP	NP
⊠	2	2.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP
▲	3	2.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP
★	4	2.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP
⊙	5	2.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	1	2.0	6.0	79.7	14.2	
⊠	2	2.0	0.0	91.4	8.6	
▲	3	2.0	0.6	88.4	11.1	
★	4	2.0	0.0	90.2	9.8	
⊙	5	2.0	0.0	92.5	7.5	

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SOIL CLASSIFICATION DATA

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FIGURE No. 8

DATE Sep/13/2022