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GEOLOGIC HAZARD STUDY

**550 Sunrise Peak Rd
S-74 Site Addition to Crystal Park, Sub. No. 2
El Paso County, Colorado**

PREPARED FOR:

**Rob Estes
1675 Little Bear Creek Pt. Unit 303
Colorado Springs, CO 80904**

JOB NO. 173916

February 25, 2020

Respectfully Submitted,
RMG – Rocky Mountain Group

Reviewed by,
RMG – Rocky Mountain Group

A handwritten signature in blue ink that reads "Kelli Zigler".

**Kelli Zigler
Project Geologist**



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

This report presents the findings of an evaluation of the above-referenced site in El Paso County, Colorado performed by RMG – Rocky Mountain Group. The purpose of our report is to evaluate the site conditions and present our opinions of the observed conditions on the proposed development with respect to the intended usage.

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) and/or upon receipt of review comments from El Paso County and/or any third-party reviewing agencies.

Qualifications of Preparers

This Geologic Hazard 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 with over 19 years of experience in the geological and geotechnical engineering field. Ms. Zigler holds a Bachelor of Science in Geology from the University of Tulsa. Ms. Zigler has supervised and performed numerous geological and geotechnical field investigations in Colorado. Tony Munger is a licensed professional engineer with over 19 years of experience in the construction engineering (residential) field. Mr. Munger and holds a Bachelor of Science in Architectural Engineering from the University of Wyoming.

Existing and Proposed Land Use

The site is to consist of an approximately 23,200 square foot parcel zoned as “PUD” Planned Unit Development per El Paso County zoning. The proposed land use is to create an approximately 0.52 acre single-family parcel known as Site S-74 within the Crystal Park subdivision.

Project Description

The proposed development of this site is to consist of the construction of a single-family residence with an on-site wastewater treatment system and well. This geologic hazard study was performed to evaluate geologic conditions that may impact the proposed development and provide associated recommendations for mitigation and design for residential construction.

Site Evaluation Techniques

The information included in this report has been compiled from

1. Field reconnaissance,
2. Geologic and topographic maps,
3. Review of previous reports performed by RMG in the same subdivision,
4. Available aerial photographs,

5. Geologic research and analysis, and
6. Site development plans prepared by others.

Geophysical investigations were not considered necessary for characterization of the site geology.

Previous Studies and Field Investigations

Reports of previous geotechnical engineering/geologic investigations specifically addressed to this site or to a nearby lot were available for our review and are listed below:

1. *Subsurface Soil Investigation, 550 Sunrise Peak Road, S-74 Addition to Crystal Park, Sub. No. 2, Manitou Springs, Colorado*, prepared by RMG – Rocky Mountain Group., Job 173916, last dated February 25, 2020.
2. *Geologic Hazard Study, 565 Sunrise Peak Rd, S-93, Crystal Park, El Paso County, Colorado*, prepared by RMG – Rocky Mountain Group, last dated October 5, 2018.
3. *Subsurface Soil Investigation, 550 Sunrise Peak Road, Lot 74, Crystal Park Subdivision*, prepared by RMG Engineers, Job No. 31905, last dated October 18, 1996.

Site Conditions

We performed a site visit for field reconnaissance on January 24, 2020. At the time of the field reconnaissance, the site consisted of vacant land generally located 0.5 miles from Crystal Park entrance in El Paso County, Colorado. The ground surface within the proposed building area was covered with vegetation consisting of scrub oak, and weeds. The driveway area was cleared. The remainder of the site contained a moderate growth of coniferous trees, aspens, and boulders scattered throughout the property. Topographically, the slopes within (and immediately below) the footprint of the proposed residence ranged up to approximately 30 percent, slopes across the remainder of the site were less than 30 percent. The site has generally good drainage in the form of surface sheet flow directed to the south, southeast. Minor slope creep was observed in the vicinity of the site as visible along the roadway cut for the driveway parallel to Oak Ridge Road.

General Geology

Based upon mapping presented by the Colorado Geological Survey (CGS) (¹Keller et al, 2003), the bedrock underlying the subject site is comprised The Pikes Peak Granite. The Pikes Peak Granite is comprised of light-gray to pink and reddish brown, coarse grained, porphyritic granite. The Pikes Peak Granite often produces grus (disaggregated loose mass of constituent minerals) when weathered. Resistant outcrops typically are round and bouldery. The principal minerals composing the Pikes Peak Granite are perthitic microcline, quartz, biotite and plagioclase (oligoclase).

The surficial deposits as observed during our site visit consist of residuum and colluvium generally composed of sands and gravels with varying amounts of silt and clay. Evidence of natural rockfall or debris flow deposits was not observed in the vicinity of the building site.

¹ Keller, John W., Siddoway, Christine, Morgan, Matthew L., Route, Erik E., Grizzell, Matthew T., Sacerdoti, Raffaello, and Stevenson, Adair, 2003 **Geologic Map of the Manitou Springs Quadrangle, El Paso and Teller Counties, Colorado**, Colorado Geological Survey, Open File Map 03-19.

The site is located in the vicinity of the Ute Pass Fault zone (to the west), and an unnamed fault is mapped approximately 1/2 mile to the east of the site. The Ute Pass Fault is located approximately 0.75 miles to the west of the site. According to information presented by the CGS (²Kirkham et al, 2004-2007), several earthquakes have occurred in the vicinity of the Ute Pass Fault near Colorado Springs and Woodland Park. The earthquakes, with magnitudes in the range of 3.0 to 3.9, occurred approximately from 1962 to 2007.

Subsurface Materials

Based on review of the Subsurface Soil Investigation completed in conjunction with this study (RMG Job No. 173916, referenced above), two test borings were performed on January 24, 2020. The test borings encountered approximately 19-feet of formational granite. Groundwater was not encountered at the time of drilling.

BEARING OF GEOLOGIC FACTORS UPON PROPOSED DEVELOPMENT

General Geologic Considerations

Based upon our evaluation of the geologic conditions, it is our opinion that the proposed development is feasible. The geologic hazards identified are not considered unusual for mountainous regions of Colorado. Mitigation of geologic hazards is most effectively accomplished by avoidance. However, where avoidance is not a practical or acceptable alternative, geologic hazards should be mitigated by implementing appropriate planning, engineering, and local construction practices.

Potentially Unstable Slopes

Downslope creep, which is the slow downslope movement of superficial soil and rock materials, is common to the area. However, the potential for relatively rapid downslope movement at the site is considered to be low. Nevertheless, the structural design of the residence should consider its placement on the hillside and the additional pressures that could be generated by downslope creep and by retaining upslope materials. Proper surface grading and positive drainage away from the structure will reduce (but not eliminate) the potential for downslope creep to impact the proposed residence. Any landscaping should utilize xeriscape techniques in order to minimize the amount of irrigation necessary to maintain landscaping. Further, stormwater and snowmelt runoff from parking areas should be directed towards drainage channels and away from potentially unstable slopes, both during construction activities and upon completion of site development.

Rockfall

The subject site is located at the top of Sugarloaf Mountain and does not have steep slopes above the lot to generate rockfall. The subject property is not considered to be prone to rockfall.

² Kirkham, R. M., Rogers, W. P., Powell, L., Morgan, M. L., Matthews, V., and Pattyn, G. R., 2004-2007, *Colorado Earthquake Map Server*. Colorado Geological Survey Bulletin 52b.

<http://geosurvey.state.co.us/Default.aspx?tabid=270>

Debris Flows and Debris Fans

Terrain features consistent in the formation of debris flows and debris fans are not present in the vicinity of the property.

Seismicity

The Pikes Peak Regional Building Code, 2017 Edition, indicates maximum considered earthquake spectral response accelerations of 0.193g for a short period (S_s) and 0.063g for a 1-second period (S_1). Specific recommendations should be provided by the Geotechnical Engineer of Record during the design phase of the project.

Surface Drainage and Erosion

The permeability of the formation granite at the site is generally considered to be moderate to high. Surface runoff could also be rapid and the potential for rapid erosion of unvegetated slopes could be high. Long-term slopes should not be steeper than 3:1 (horizontal:vertical) in both cut and fill areas. Revegetation of any disturbed areas should be performed as soon as possible with revegetation/erosion mats placed as required. Excavation cuts and soil disturbance should be kept to a minimum. Proper surface drainage, as recommended in a geotechnical engineering report, should be provided and maintained by the Homeowner.

Radioactivity/Radon Gas

Based upon a Map of Radon Zones by the Colorado Department of Public Health and Environment (CDPHE) (Ref. 11), two zones of radon potential are indicated in Colorado, Zone 1 - High Radon Potential (probable indoor radon average >4 pCi/L) and Zone 2 -Moderate Radon Potential (probable indoor radon average 2-4 pCi/L). El Paso County is located within Zone 1.

Potential 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.

CLOSING

This report has been prepared for the exclusive purpose of providing geologic hazards information and recommendations for development described in this report. RMG should be retained to review the final construction documents prior to construction to verify our findings, conclusions and recommendations have been appropriately implemented.

This report has been prepared for the exclusive use by **Rob Estes** for application as an aid in the design and construction of the proposed development in accordance with generally accepted geotechnical and geological engineering practices. The analyses and recommendations in this report are based in part upon data obtained from site observations and the information presented in referenced reports. The nature and extent of variations may not become evident until construction. If variations then become

evident, RMG should be retained to review the recommendations presented in this report considering the varied condition, and either verify or modify them in writing.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers 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.

The scope of services for this project does not include, either specifically or by implication, 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 Client desires investigation into the potential for such contamination or conditions, other studies should be undertaken.

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.