

EP-22-0053 Cueller Residence (Crystal Park Site S-309)

S½ SW¼ SW¼ Section 8, T14S, R67W, 6<sup>th</sup> Meridian

38.8398, -104.9201

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The applicant proposes a single-family residence at 570 Dayspring View in the Crystal Park development. With this referral, we received the Site Plan (Tuscany Homes, October 26, 2020), Elevation Plans (Tuscany Homes, October 26, 2020), and Subsurface Soil Investigation (Entech Engineering, Inc., stamped December 2, 2021). The Entech soils report did not address the geologic hazards associated with the site. Per County code, a soil and geology report is required that identifies geologic hazards and provides appropriate mitigation measures.

CGS offers the following comments and recommendations during the planning and development of this site.

**Geologic Hazard Disclosure Statement.** CGS recommends that Entech or another qualified geotechnical engineer evaluate the geologic hazards and constraints required by county code and provide appropriate recommendations and mitigation measures. We suggest the geologic hazards and constraints be included in the preliminary/site plan.

**Site Geology.** The site is underlain at variable depths by relatively loose material (commonly known as “Grus” or “Colluvium”) weathered from the underlying Pikes Peak Granite. Pikes Peak Granite is typically not problematic from a geotechnical or foundation performance perspective. However, the rock is fractured and weathered, sometimes extensively. Both of these rock quality characteristics can impact slope stability and erosion potential. Additionally, Grus is weaker than the bedrock and can be highly variable in depth.

**Rockfall.** Directly upslope from the site is mapped as containing a rockfall hazard. The risk of rockfall was first recognized and mapped at this site in the geologic hazard mapping conducted for El Paso County in the 1970s according to House Bill 1041 concerning geologic hazards in Colorado. Even a low probability rockfall can have significant risk to permanent structures even after many decades without previous rockfall resulting in significant property damage and fatalities.

As previously stated, the bedrock at the site is the Pikes Peak Granite, forming outcrops directly upslope (to the west). The existing rocks and boulders are likely to be disturbed during construction activities and/or freeze/thaw, resulting in an increased potential for a rockfall hazard. It may be prudent to remove such rocks during construction. **CGS recommends the county require the risk for rockfall hazards to be evaluated prior to construction.** The appropriate mitigation measures should be noted on the project plans.

**Steep Slopes and Construction-Related Slope Instability.** Available LiDAR show slopes exceeding 30 percent upslope and downslope from the proposed residence. There are risks associated with construction on steep slopes, such as are present at this site. While mapped landslides are not present, there are risks associated with construction on these steep slopes where erosion is also a significant constraint. Presently stable slopes may become unstable as a result of reduced soil strengths if,

1) Modifications are made through the excavation of cuts, the addition of fills, and loading due to structures,

- 2) Significant moisture is added to the slope through residential irrigation (including infiltration from septic fields) and ample precipitation or snowmelt,
- 3) The existing drainage pattern is altered through grading, introducing water to previously drier areas.

To further reduce potential hazards associated with erosion, construction-related slope instability, shallow failures such as creep and slumping, and increased runoff, the following should be implemented in the design and construction:

- A qualified geotechnical professional should determine maximum allowable, unretained temporary, and permanent cut/fill heights and slope angles.
- All planned cuts exceeding four feet in height **should be evaluated for slope stability** using proposed slope geometry and considering all foundation and proposed cuts that will affect the slope.
- Driveway retaining walls, building foundations, and upslope walls that will function as retaining walls must be designed by a qualified geotechnical or civil engineer and must include adequate behind-wall drainage.
- The structure should be designed with as much rigidity as possible due to the potential of downslope creep. CGS agrees with Entech on page 2, *“Due to the moderate to steep slopes at this site, foundation stiffeners such as tie-beams, buttresses or additional reinforcement may be required.”*
- The existing vegetative cover should be left intact to the extent possible, and every effort should be made to restore native vegetation within disturbed areas as quickly as possible. Irrigation beyond the bare minimum required to reestablish native vegetation should not be permitted.

**Surface Drainage and Erosion.** The onsite soil and colluvium (“Grus”) are highly susceptible to erosion. Concentrated, developed flows can cause serious and damaging erosion and rapidly erode the surface material down to hard rock. Site drainage should be designed and constructed to prevent concentrated flows from being developed within the site. Proper maintenance and erosion protection of the slope face within the subject property is critical to the long-term structural integrity of the proposed structure.

In summary, CGS recommends that Entech or another qualified geotechnical engineer evaluate the geologic hazards and constraints as required by county code and provide appropriate recommendations and mitigation measures. At a minimum, we recommend:

1. The geologic hazards and constraints are evaluated as required by county code, and appropriate recommendations and mitigation measures are provided.
2. A geologic hazard disclosure statement is included in the preliminary/site plan.
3. The county requires the risk for a rockfall hazard to be evaluated prior to construction and a mitigation plan established to reduce the potential risk.
4. The geotechnical engineer provides maximum allowable, unretained temporary, and permanent cut/fill heights and slope angles.
5. All planned cuts exceeding four feet in height are evaluated for slope stability using proposed slope geometry and considering all foundation and proposed cuts that will affect the slope.

Submitted 1/18/2022 by Amy Crandall, Engineering Geologist, Colorado Geological Survey (303-384-2632 or acrandall@mines.edu)