

COLORADO GEOLOGICAL SURVEY

1801 19th Street
Golden, Colorado 80401



Karen Berry
State Geologist

May 19, 2016

Mr. Michael Turisk
Planning and Community Development
City of Colorado Springs
30 S. Nevada Ave, Suite 105
Colorado Springs, CO 80901

Location:
SW ¼ SE ¼ of Section 12,
T14S, R67W of the 6th PM
38.8398°, -104.8358°

Subject: 543 Robbin Place – CPC PFP 19-6-00054; CPC SWP 16-00057
City of Colorado Springs, El Paso County, CO; CGS Unique No. EP-16-0023

Dear Mr. Turisk:

Per your request, the Colorado Geological Survey has reviewed the referral for 543 Robbin Place. The applicant proposes 6 duplex residential infill lots on 0.5 acres located north of Bijou Street and west of I-25 on the east-facing slope of the southern part of The Mesa, directly below the turn in Skyline Drive. This site was reviewed by CGS in 2003 (CGS Unique Number EP-04-0009).

Included in the referral documents were: the review request, preliminary plat (Clark Surveying, 4/20/16), replat (Clark Surveying, 5/28/15), final drainage report (Terra Nova, May 2015), and geologic hazard study (Entech Engineering, 3/8/16).

A site inspection was conducted on May 16, 2016. The site is located on a moderate to steep slope (grades up to 55%) with a total elevation gain of about 50 feet. The hill is an erosional surface capped by granular alluvial soils over the Pierre Shale bedrock that dips to the east about 10-15 degrees in this area. Colluvium and sheet wash cover the shale. The surface has 3-4 benches, which appear to be from past grading activities. The top of the hill, just west of the site, is bounded by Skyline Drive. Water runoff is east down the slope to the alley, then south to Manitou Blvd. where it is collected by the storm sewer system. Six lots (3 duplex buildings) are proposed. The preliminary plat shows the structures to be located at the east side of the site, at the base of the slope. CGS generally concurs with the Entech report concerning the geologic hazards present at the site that may impact development, including slope stability, creeping soils, and expansive soils.

Slope Stability and Creep. The site has similar geology and topography as nearby areas which have had recent landslide activity and should be considered an area susceptible to future landslide activity. The adjacent properties show some surface evidence of shallow ground movement – broken asphalt, tipped retaining walls, etc. The bedrock slope dips to the east as does the site topography, so the natural bedding of the shale will not provide any resistance to shearing. The Entech report includes a slope stability analysis, which indicates that the existing slope in its current state is marginally stable (safety factor of 1.1 - 1.3).

The Entech report recommends two rows of drilled 24-inch diameter pier caissons to a minimum depth of 35 feet below ground surface on the slope above the building area to provide stabilization to the building locations. Entech recommends that structures be compact and rigid, with foundation wall designs appropriate for lateral slope movement. In addition, surface and subsurface drainage control measures should be strictly adhered to and maintained. Based on the recommendations made by Entech in the report, they evaluated the slope stability post-development at safety factors ranging from 1.3 – 1.5.

- The Entech stability analysis was based on water levels from borings drilled in September 2015. It

would be prudent to do a sensitivity analysis for groundwater levels to determine how sensitive the slope stability is to seasonally high groundwater, or infiltration following development.

- A representative from Entech should evaluate all grading plans, slope stabilization designs, and subsurface materials during grading and excavation to verify that slope stability will be adequately addressed and that the subsurface conditions do not appreciably differ from the assumed conditions in the stability analysis.
- Recommendations made by Entech should be followed, including restrictions on landscaping and yard grading.
- It should be noted that the Entech design and analysis only addresses slope stability at this specific site, and that larger-scale slope failures may occur, and have occurred in areas with similar geologic and topographic conditions.

Expansive Soils. The site is underlain by clayey soils and claystones of the Pierre Shale, which is widely known to be expansive when wet under a load and can cause damage to structures and utility lines from differential ground movement. The area has been mapped as having very high swelling potential. Entech recommends that structures be placed on spread footing foundations with structural floors on overexcavated fill soils, and that final foundation design recommendations be determined on a site-specific basis with further subsurface investigation. Subsurface foundation drainage should be included for the structures to reduce expansive soils and help preserve slope stability. CGS concurs with these recommendations.

Disclosure. There are no plat notes pertaining to geologic hazards on the plat documents reviewed by CGS.

- Adequate disclosure regarding the potential geologic hazards and development constraints should be made to potential property owners.

Thank you for the opportunity to review and comment on this project. If you have questions or require further review, please call me at 303-384-2655, or e-mail tcwait@mines.edu.

Sincerely,

TC Wait

TC Wait
Engineering Geologist

Cc: File

January 9, 2017

Tara Custom Homes
15770 Pineycone Court
Colorado Springs, Colorado 80921



ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
FAX (719) 531-5238

Attn: Paul Rising

Re: Geologic Hazard Investigation and Slope Stability Analysis
Response to Comments from Colorado Geological Survey Concerning the Geologic Hazard
Study: Robbin Place, Block B, Lots 1-3
Colorado Springs, Colorado

Dear Mr. Rising:


As requested, personnel from Entech Engineering, Inc. have reviewed the letter from the Colorado Geological Survey, dated May 19, 2016, in response to the Geologic Hazard Study by Entech Engineering, Inc., Entech Job No. 151664, dated March 8, 2016. Additional recommendations were provided by the Colorado Geological Survey and are addressed below:

- Groundwater was encountered in Test Borings 1 and 2 at depths of 27 and 19.5 feet, respectively. These groundwater depths are greater than 10 feet below the clay/claystone interface. Groundwater was not encountered in Test Borings 3 and 4, which were drilled to depths of 35 and 25 feet, respectively. Fluctuations in groundwater conditions may occur due to variations in rainfall or other factors not readily apparent at this time. A water sensitivity analysis, with groundwater within 3 feet of the claystone layer, shows a factor of safety of 1.5 with the proposed drilled shafts and shallow foundations (for the duplexes). The proposed foundation rests on a 6 foot layer of structural fill beneath the building foundation. It should be noted that this analysis utilizes an overexcavation drain as shown in Figure 9 in the initial report to lower the groundwater table to the base of the structural fill layer.
- The duplex foundations are currently being designed by Entech Engineering, Inc. Foundation walls will be designed to resist lateral pressures generated by the soils on this site. Soil properties provided in the initial Geologic Hazard Study will be used for the foundation design. Expansive clay soils are not recommended for backfill against the walls. The open excavation should be observed and evaluated to determine if the exposed soil conditions are consistent with those found in the original subsurface soil investigation by others and the above referenced geologic hazard investigation.

The Colorado Geological Survey response and water sensitivity analysis for slope section A-A are attached. Based on our previous analysis and the Slope Analysis presented with this letter, the combination of the drilled caissons and structural fill wedge is adequate to stabilize the slope for the proposed construction. We trust that this has provided you with the information you required. If you have any questions or need additional information, please do not hesitate to contact us.

Respectfully Submitted,

ENTECH ENGINEERING, INC


Austin M. Nossokoff, EI

AMN/amn

Entech Job No. 151664
151664 - Tara Custom Homes - Lots 1-3 Robbins PM151664 sg-ghz

Reviewed by:


Joseph C. Goode, Jr., P.E.
President

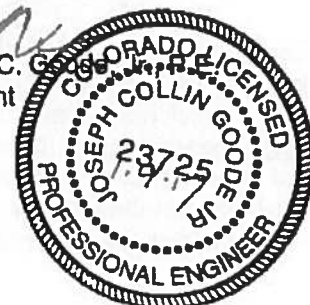


Figure 8 - Geological Hazard Investigation

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1801 19th Street
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Karen Berry
State Geologist

February 17, 2017

Mr. Michael Turisk
Planning and Community Development
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City of Colorado Springs, El Paso County, CO; CGS Unique No. EP-16-0023 2

Dear Michael:

The Colorado Geological Survey has reviewed the 543 Robbin Place resubmittal. Based on the preliminary plat, the applicant proposes 6 duplex residential infill lots on 0.5 acres located north of Bijou Street and west of I-25 on the east-facing slope of the southern part of The Mesa, directly below the turn in Skyline Drive. Included in the resubmittal documents were: a Response to Comments letter (Entech Engineering, January 9, 2017).

CGS's concerns about slope stability have been satisfactorily addressed by Entech. However, there is more risk for long-term stability problems at this location, even with engineered mitigation measures, than in other areas of Colorado Springs that do not have these particular geologic conditions. Long-term stability at this location critically depends on implementation of the geotechnical engineers recommendations.

CGS recommends conditional approval of the 543 Robbin Place provided that all geotechnical recommendations concerning slope stability, expansive soils, site drainage, grading cuts, erosion control, and irrigation are incorporated into the development plans and that the plat clearly states the potential for unstable slopes that occurs here. The drainage plan must indicate flow patterns and improvements that prevent ponding, especially behind the buildings.

Thank you for the opportunity to review and comment on this project. If you have questions or require further review, please call me at 303-384-2654, or e-mail jlovekin@mines.edu.

Sincerely,

A handwritten signature in blue ink that reads "Jonathan R. Lovekin".

Jonathan R. Lovekin, P.G.
Senior Engineering Geologist