C2EARTH, INC.
GEOLOGIC & GEOTECHNICAL ENGINEERING SERVICES

13 January 2020
Document Id. 19075C-01L1
Serial No. 19193

Mr. George Li
146 Lassen Drive
San Bruno, CA 94066

SUBJECT: RESPONSE TO PEER REVIEW COMMENTS
PROPOSED RESIDENTIAL DEVELOPMENT
LI PROPERTY
APN 080-072-210, EL NIDO ROAD
SAN MATEO COUNTY, CALIFORNIA

Dear Mr. Li:

As requested, we are responding to geotechnical engineering related peer review comments for the proposed residential development of your property, APN 080-72-210, on El Nido Road in the Los Trancos Woods community of unincorporated San Mateo County, California. We previously submitted our Geologic and Geotechnical Study report dated 27 November 2019 (Document Id. 19075C-01R1) which presented our findings and recommendations for the project.

Following the submittal of our report, the report was reviewed by the County's Geologic and Geotechnical Peer Review Consultant (Cotton Shires and Associates). We participated in a conference call to discuss review comments on 8 January 2019 with Mr. Craig Stewart of Cotton Shires and Associates and Ms. Sherry Liu of the San Mateo County Planning Department. On that same date, we received (by email) the following summary and two formal comments. Our responses to the comments follow each comment.

> *The Project Geotechnical and Geologic Consultant has evaluated site landslide and fault hazards. This evaluation included a slope stability analysis of proposed slope configurations. The Consultant* finds *the risk associated with these hazards to be low. We do not have geologic or geotechnical objections to the Consultants recommendations for project design; however, we recommend clarification or consideration of the following geotechnical items prior to geologic and geotechnical approval of subject planning permit applications.*
>
> *1) The PGC should consider completing displacement analysis consistent with the guidelines presented in SP117A to further evaluate the relative stability of the slope, given the pseudo-static factor of safety was determined to be below 1.1 (per County recommendation).*

Because the pseudo-static (seismically induced) slope stability analyses yielded Factor of Safety values of less than 1.1, we performed a displacement analysis using the Simplified Procedure for Estimating Earthquake Induced Deviatoric Slope Displacements developed by Bray and Travasarou (2007). Please note that as indicated by Bray (2007), seismic displacement estimates will always be approximate in nature due to the complexities of the dynamic response of the earth materials involved and the variability of the earthquake ground motion.

We calculated approximate slope displacement for the critical failure surface shown on Slope Stability Analysis No. 2. The calculated displacement was based upon: a maximum Earthquake Magnitude of 7.9; a yield coefficient of 0.35; an initial fundamental period of 0.064 seconds (based upon a landslide depth of 40 feet and a shear wave velocity of 2,500 feet per second). A degraded period (1.5 times the initial fundamental period) was calculated to be 0.10 seconds. A spectral acceleration of 1.10g computed using the degraded period and data from the USGS Seismic Design Maps tool with the 2016 ASCE 7 design code reference. The analysis calculated a 50% probability of exceedance displacement of 7.9 centimeters or about 3 inches.

> *2). The PGC should consider completing sensitivity analysis to determine the major contributing factors impacting slope stability. The PGC may discuss the engineering judgements* [SIC] *and laboratory testing associated with material strength of encountered bedrock to further clarify the results of the slope stability analysis. The Consultant may also further discuss the potential hydrogeologic conditions anticipated based on the results of their investigation and experience in the site vicinity.*

The shear strengths for the Santa Clara formation utilized in the analyses were based on the results of consolidated, undrained triaxial shear tests performed on samples retained from relatively shallow depths (about 10 to 15 feet). These results were modeled as the properties for the entire formation at depth. Santa Clara formation materials encountered in our borings at deeper depths (below about 25 feet) had much higher SPT blow counts (N-values).

We performed multiple iterations of our analyses using the laboratory shear strength values, strength values derived from N-value correlations, as well as published strength values presented in the Seismic Hazard Zone Report for the Mindego Hill 7½-Minute Quadrangle (California Geologic Survey, 2005). Compared with other correlated or published values, we determined that the laboratory strength values utilized were lower. The model and results presented in our report represent a conservative scenario with the lower, laboratory strength parameters for the entire modeled depth of the formation.

The thin layer of colluvial soil was modeled using the results of direct shear tests presented in the prior report for the site by Silicon Valley Soil Engineering. These results (phi of 22 and cohesion of 800 psf) are more conservative than published values for Holocene age colluvium (phi of 25 and mean cohesion of 748 psf).

For clarification, groundwater was measured in Boring 1 at a depth of about 38 feet. Boring 2, drilled at a higher elevation on-site, did not encounter groundwater. The level of groundwater modeled represents the depth noted in Boring 1 and an assumed "high" depth just below the bottom of Boring 2. It should be noted that observations of materials during drilling did not reveal evidence of historically higher values and it is likely that groundwater beneath Boring 2 and the upper portions of the site is actually lower, as the phreatic surface would tend to descend to the southwest to meet the level of surface water in the Los Trancos Water District's reservoir, on the southwest side of Coal Mine Ridge.

The model results revealed the surfaces with the lowest factors of safety were for predicted landslides with depths of about 40 feet below ground surface. Thus, because the material strengths within the Santa Clara formation at this depth are likely higher than the shallower

laboratory test strengths used, and because the thin layer of colluvial soil has no significant affect on the global stability, we judge that the results of our analyses are generally conservative, and additional revisions to the model are unwarranted.

We appreciate the opportunity to continue to assist you with your project. If you have any questions, please contact us.

Sincerely,
C2Earth, Inc.

Christopher R. Hundemer, Principal
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THIS DOCUMENT HAS BEEN DIGITALLY SIGNED

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