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May 10, 2021
Project No. 056.011

City of Carpinteria
5775 Carpinteria Street
Carpinteria, California 93013

Attention: Mr. John Ilasin, Public Works Director/City Engineer

Subject: Geologic Third-Party Review, 5885 Carpinteria Avenue, Carpinteria, California

References:

- 1) Campbell Geo, Inc. (2018), Evaluation of Fault Location and Surface Rupture Hazard – Update, 5885 Carpinteria Avenue, Carpinteria, California, dated December 20; prepared for O. Rhyan Capital Management, LLC.
- 2) _____ (2021), Evaluation of Fault Location and Surface Rupture Hazard – Update, 5885 Carpinteria Avenue, Carpinteria, California, dated March 22; prepared for Mila Co. II, LLC, c/o Plus Development.
- 3) _____ (2021), Revised Geologic Map Plate 2, Plus-Development, dated April 30.
- 4) California Geological Survey (CGS, 2018) Special Publication 42, Earthquake Fault Zones, A Guide for Government Agencies, Property Owners / Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California.

Dear Mr. Ilasin:

Oakridge Geoscience, Inc. has performed a third-party geologic review of the faulting evaluation and surface rupture hazard report by Campbell Geo, Inc. (Campbell Geo) for the property located at 5885 Carpinteria Avenue in Carpinteria, California. Campbell Geo's reports and updated site map, References 1 through 3 above, summarize the work performed to evaluate the locations and recency of three mapped faults located within the subject property.

General

The geologic review of the Campbell Geo reports was performed in general accordance with the California Geological Survey (CGS) Special Publication 42 (CGS, 2018). SP42 has been developed to assist government agencies, property owners/developers, and geoscience practitioners for assessing fault rupture hazards in California. CGS SP42 describes the procedures and evaluations required to evaluate faulting and for review of fault reports.

The CGS indicates the primary purpose of a site-specific fault investigation is to determine the presence or absence of existing faults and evaluate the recency of their past activity. Determination of fault location and recency of activity can impact project development and require mitigations to avoid faulting.

The CGS provides the following definitions of three fault classifications based on the age of the most recent fault movement.

- Holocene-active faults. Faults that have moved within the past 11,700 years;
- Pre-Holocene faults. Faults that have not moved within the past 11,700 years; and
- Age-undetermined faults. Faults where the age of the most recent movement is not known or has not been determined due to data constraints, etc.

The Alquist Priolo Earthquake Fault Zoning Act (A-P Act, 1972) mandates that structures for human occupancy cannot be located on a Holocene-active fault. The typical mitigation is to set the structure back 50 feet from the fault location, although agencies may adopt lesser setbacks.

Project Site

The project site is located at 5885 Carpinteria Avenue, approximately 2,000 feet west of Bailard Avenue in the Carpinteria Bluffs area. The roughly rectangular-shaped parcel is located between Carpinteria Avenue to the north, the Union Pacific Railroad (UPRR) tracks to the south (long axis) and is bordered by existing commercial development to the west and undeveloped property to the east (narrow axis). According to Campbell Geo, the site is occupied by the Tee Time golf driving range in the area extending south approximately 750 feet from Carpinteria Avenue. The southern part of the parcel is occupied by a farmed field and an ornamental rock storage yard. The topography is reportedly flat to gently sloping with low to sparse vegetation. A trailer office is used by Tee Time, and various fences mark edges of the driving range.

Background

Hoover & Associates, Inc. (Hoover) performed a geologic evaluation of the Carpinteria Bluffs area in 1982. The Hoover study included advancing four trenches, eight borings, and a 1,400-foot long seismic line near the western property limits of the 5885 Carpinteria Avenue site. Hoover's trenching exposed two closely-spaced fault features on the subject site trending southeasterly from the western property limits. As mapped by Hoover, one fault extends about 300 feet into the property from the western property limits and one fault extends over 2,000 feet across the entire study area, including across the width of the subject property limits. Hoover referred to the fault features as the Carpinteria fault.

Evaluation

General. Review of the consultant's reports indicates Campbell Geo's study was focused on the evaluation of the locations and ages of the two faults previously exposed by Hoover in the western portion of the site. Their work scope consisted of review of existing geologic data, field exploration, laboratory age-dating testing, and reporting their findings and opinions.

Data Review. Campbell Geo reportedly performed a review of select aerial photographs and existing geologic data including published regional geologic mapping (Dibblee [1966 and 1987], Fredrickson [2016], Gurrola [2006], Jennings and Bryant [2010], Minor, et al. [2009 and 2015], and Jackson [1980]), geologic fault evaluation studies for relative proximal sites, and the site-specific fault evaluation by Hoover (1982). Based on their review, Campbell Geo provides a summary of the regional geologic conditions in the project area and for the project site. Campbell Geo concludes the site is located in a seismically active area and is traversed by three fault strands likely related to the Red Mountain fault. The lithology encountered in the various

boreholes, trenches, and test pits advanced onsite, from oldest to youngest, consist of the Monterey formation (Tm), the Santa Barbara formation (Qsb), the Marine Terrace (Qt), alluvium (Qa), and artificial fill (Qaf).

Field Exploration. Campbell Geo's field exploration consisted of excavating one 450-foot long trench (Trench CG-1) to expose the two faults previously exposed by Hoover and advancing one test pit in an attempt to locate an existing mapped utility. The trench was excavated to a depth of up to about 19 feet and was logged and photographed for documentation purposes. The trench, fault, and test pit locations were surveyed by a licensed surveyor and soil samples were collected for age-dating testing. Following completion of the logging and testing effort, the trench and test pit explorations were reportedly backfilled but not compacted. The consultant recommends the backfill be evaluated by the geotechnical consultant as part of project design if the excavated areas are within the proposed construction area.

Campbell Geo indicates the two fault features found at the 5885 Carpinteria Avenue site in Hoover's 1982 Trench 1 and Trench 15 were consistent with the dip and relative offset of faults exposed in their 2018 Trench CG-1. Campbell Geo refers to the fault features as "Fault 1" and "Fault 2" and indicates the two faults are not the main trace of the Carpinteria fault due to the small vertical offsets observed in their trench. However, Campbell Geo does interpret the Carpinteria fault to be located at depth near the northern portion of the site (about 135 feet south of Carpinteria Avenue) based on review of published data, the Hoover seismic data, and the lack of evidence of faulting observed within the terrace deposits overlying the bedrock materials.

Review of the consultant's trench log for Trench CG-1 depicts Fault 1 and Fault 2 as offsetting the Monterey formation bedrock and the lower marine terrace deposits and being truncated and overlain by unfaulted, laterally continuous younger terrace deposit materials (i.e. not extending to the ground surface). Additionally, the consultant indicates that none of the terrace deposits exposed in the vicinity of the inferred trace of the Carpinteria fault showed evidence of offset, suggesting the age of the fault exceeds that of the overlying terrace materials.

Laboratory Testing. Two samples were collected by the consultant from unfaulted marine terrace deposits lying above the fault offset locations encountered within Trench CG-1 for laboratory age-dating testing. The testing was performed by the University of Cincinnati Department of Geology using the Optically Stimulated Luminescence (OSL) method. As detailed in the laboratory report, the marine terrace sample from Trench CG-1 was age-dated at 36,600 years old (plus or minus 2,500 years). Campbell Geo concludes the age of the tested materials interpreted to be unfaulted marine terrace deposits are pre-Holocene and therefore the fault movement occurred more than 11,700 years ago.

Reporting. The Campbell Geo reports provide a summary of the purpose of the work conducted, requirements of CGS SP42, the work performed for the study, the interpreted regional geologic site conditions based on their data review and site-specific work, logs of their trench and test pit explorations, laboratory test data, and their opinions, conclusions, and recommendations for the proposed project.

Based on the work performed, the consultant concludes the results of the conditions observed in their trench and the results of the age-dating of the materials interpreted as unfaulted terrace deposits confirm the three investigated faults located on the project site as depicted on their revised site map (Reference 3) have not ruptured in the last 11,700 years. Therefore, they

further conclude that no setback is required from the faults since they are defined as Pre-Holocene faults based on the results of the study.

Comments

Based on our review of Campbell Geo, Inc's fault evaluation reports (References 1 and 2) summarizing the findings from the trenching and age-dating testing, it appears the work was performed in general accordance with CGS SP42 (Reference 3) and that the findings indicate the faults evaluated in their study are Pre-Holocene (greater than 11,700 years old). Thus, as concluded by the consultant and described in CGS SP42, there are no setback requirements or avoidance mitigations required for the studied faults.

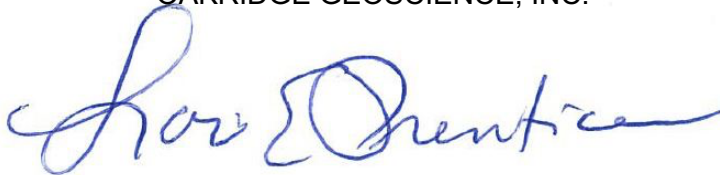
Campbell states their study was performed for the purpose of geologic evaluation of the presence and age of faulting onsite and that a geotechnical design study will be required prior to project development.

Closure

Thank you for the opportunity to provide geotechnical review services to the City of Carpinteria. Please contact us if you have any questions on the information presented herein.

Sincerely,

OAKRIDGE GEOSCIENCE, INC.



Lori Prentice, EG 2312
President

Copies Submitted: 1 pdf via email