CORNERSTONE EARTH GROUP

Date:	December 14, 2020
Project No.:	352-2-3
Prepared For:	Dr. Shawn Robinson **CLAYTON COMMUNITY CHURCH** 6055 Main Street Clayton, California 94517
Re:	Geotechnical Response to Review Comments Clayton Community Church 1027 Pine Hollow Court Clayton, California

Dear Dr. Robinson:

As requested by EPIC, we present responses to geotechnical peer review comments for the above-referenced project. As you know, we previously performed a geotechnical investigation for the project and presented our findings in our report titled, "Geotechnical Investigation, Clayton Community Church, 1027 Pine Hollow Court, Clayton, California," dated February 27, 2019.

The documents reviewed include the following:

- Updated civil plan titled, "Grading and Drainage Plan, Clayton Community Church, 1027 Pine Hollow Court, Clayton, California, Sheet C-3," dated November 30, 2020.

- A peer review letter prepared by Geocon Consultants on behalf of the Town of Clayton dated November 23, 2020.

Based on our review of the above documents, we are providing responses to geotechnical peer review comments and supplemental geotechnical recommendations, as needed. Each comment is reiterated for clarity following by our response.

Comment No. 1:

The project proposes to situate the new church building near the top of a 3:1 slope that is mantled by moderately to highly plastic clayey soils. Clayey soils in slopes may be susceptible to slope creep – a natural geologic process where relatively loose/soft weathered materials migrate downslope over time. Slope creep in clayey soils is often exacerbated by seasonal shrink and swell cycles that result in desiccation cracking in dry periods followed by the ready infiltration of runoff and saturation of the slope face during winter rains. The potential for slope creep should be evaluated by the geotechnical engineer and updated recommendations for foundation type, deepened foundations and/or remedial grading should be presented if necessary

Response to Comment No. 1:

Based on our review of the updated building plans, the eastern edge of the church will be located at or slightly beyond the crest of the existing 3:1 (horizontal:vertical) slope that is mantled by a few to several feet of clay overlying weathered bedrock. The new finished floor is planned at Elevation 457 feet and current site grades along the crest of slope range from approximately Elevation 447 to 450 feet. As a result, the east foundation edge could retain up to 10 feet of building pad fill. We concur that the potential for gradual slope creep is moderate to high and should be mitigated by modifying the foundation recommendations along the eastern edge of the building. Updated foundation recommendations for the eastern edge of the building are presented below. In addition, we also evaluated the potential for seismic earth pressures acting on the eastern foundation wall. Further discussion and recommendations are presented below.

Comment No. 2:

Test Pit Nos. TP-2, TP-3 and TP-6 performed for the referenced geotechnical feasibility study (Reference No. 1) extended to depths of 4 to 4 ½ feet below grade in the south-east facing slope area. These test pits did not encounter bedrock and moderately to highly plastic clays were noted to the maximum depth explored. These soils conditions should be reviewed relative to the anticipated deck and balcony foundations. Updated opinions and/or recommendations regarding foundation type and/or remedial grading should be presented.

Response to Comment No. 2:

We understand that a new above-ground deck will be constructed on the east side of the church that will extend out over the existing 3:1 (horizontal:vertical) slope. The slope is mantled by native clays; therefore, we concur that the shallow footing recommendations presented in our 2019 report would not be suitable due to potential long-term soil creep. We recommend that the deck be supported on drilled, cast-in-place friction piers that extend below the potential soil creep zone. Drilled pier recommendations for the deck are presented below.

Recommendations

UPDATED SHALLOW FOOTING CRITERIA – EASTERN FOUNDATION WALL

Shallow footings supporting the eastern building wall should bear on natural, undisturbed soil, be at least 24 inches wide, and extend at least 36 inches below the lowest adjacent grade. Lowest adjacent grade is defined as the deeper of the following: 1) bottom of the adjacent interior slab-on-grade, or 2) finished exterior grade, excluding landscaping topsoil. For the existing 3:1 slope, this would place the outside edge of the footing approximately 9 feet from the face of slope. The allowable bearing capacity values presented in our 2019 report are still suitable.

Lateral Loading

Lateral loads may be resisted by friction between the bottom of footing and the supporting subgrade, and also by passive pressures generated against footing sidewalls. An ultimate frictional resistance of 0.45 applied to the footing dead load, and an ultimate passive pressure based on an equivalent fluid pressure of 450 pcf may be used in design. The structural

engineer should apply an appropriate factor of safety (such as 1.5) to the ultimate values above. Because the eastern footing will be at the top of the existing 3:1 slope, the upper 24 inches of soil should be neglected when determining passive pressure capacity.

SEISMIC LATERAL EARTH PRESSURES

As discussed in Section 10.1 of our 2019 report, walls less than 6 feet higher were determined not to require an additional seismic earth pressure increment above the static values presented in Table 6. Because the eastern wall may be greater than 6 feet in height, and peak ground accelerations are greater than 0.40g, we checked the result of the total seismic increment when added to the recommended active earth pressure against the recommended fixed (restrained) wall earth pressures. Because the eastern wall will act as a restrained wall and will be designed for 45 pcf (equivalent fluid pressure) plus a uniform earth pressure of 8H psf, based on current recommendations for seismic earth pressures, it appears that active earth pressures plus a seismic increment do not exceed the fixed wall earth pressures. Therefore, an additional seismic increment above the design earth pressures is not required as long as the walls are designed for the restrained wall earth pressures recommended above in accordance with the 2019 CBC.

CAST-IN-DRILLED HOLE (CIDH) PIERS

As discussed, the proposed deck extending out over the existing slope should be supported on cast-in-drilled hole (CIDH) friction piers. The piers should have a minimum diameter of 12 inches and extend to a depth of at least 8 feet below lowest adjacent slope grade or at least 2 feet into underlying bedrock, whichever is shallower, unless structural loads require a deeper depth. The vertical capacity of the piers may be designed based on an allowable skin friction of 500 psf for combined dead plus live loads based on a factor of safety of 2.0; dead loads should not exceed two-thirds of the allowable capacities. The allowable skin friction may be increased by one-third for wind and seismic loads. Frictional resistance to uplift loads may be developed along the pier shafts based on an allowable frictional resistance of 400 psf. The upper 24 inches of soil should be neglected when determining vertical pier capacity.

Total settlement of individual piers should not exceed ¼ inch to mobilize static capacities and post-construction differential settlement between each pier should not exceed ¼ inch due to static loads.

Lateral Capacity

Lateral loads exerted on the deck piers may be resisted by a passive resistance based on an *ultimate* equivalent fluid pressure of 400 pcf acting against twice the projected area of piers up to a maximum uniform pressure of 2,500 psf at depth. The upper 24 inches of soil should be neglected when determining lateral capacity. The structural engineer should apply an appropriate factor of safety (such as 1.5) to the ultimate passive pressure.

Construction Considerations

The excavation of all drilled shafts should be observed by a Cornerstone representative to confirm the soil profile, verify that the piers extend the minimum depth into suitable materials and that the piers are constructed in accordance with our recommendations and project requirements.

The drilled shafts should be straight, dry, and relatively free of loose material before reinforcing steel is installed and concrete is placed. If perched ground water is encountered in the pier excavations and cannot be removed prior to concrete placement, the concrete should be placed using a tremie pipe, keeping the tremie pipe below the surface of the concrete to avoid entrapment of water or drilling slurry in the concrete.

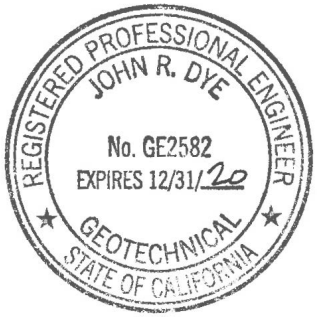
Closure

This response to peer review comments has been prepared for the sole use of Clayton Community Church in accordance with generally accepted geotechnical engineering principles and practices in the San Francisco Bay Area at this time. No warranties are either expressed or implied.

Should you have any questions, or if we may be of further service, please contact us at your convenience.

Sincerely,

Cornerstone Earth Group, Inc.



John R. Dye, P.E., G.E.
Principal Engineer

Copies: Addressee, EPIC (PDF by email)