August 1, 2014 Project No. 10106-01

Mr. Larry Netherton
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Subject: ***Discussion of Potential Implications of Subsurface Geological Features in the Southern Portion of Cielo Vista, Tentative Tract Map No. 17341, County of Orange, California***

Introduction

LGC Geotechnical, Inc. ("LGC") has prepared this letter to discuss its findings relating to the potential effect of various subsurface geological features on the proposed southern portion of the Cielo Vista development, Tentative Tract Map No. 17341, County of Orange, California. In a separate letter, LGC Geotechnical (LGC, 2014) concluded that the location of the Whittier Fault was well defined as a narrow fault zone along the east-west drainage in the central portion of the Cielo Vista site.

Method of Investigation

In the Fall of 2012, LGC Geotechnical excavated, detail-logged, backfilled and compacted four fault trenches (FT-1 through FT-4) within the southern portion of the Fault Rupture Hazard Zone depicted on Figure 4.5-1 of the Draft EIR and the Whittier Fault Setback Map, Sheet 1 attached to this letter. Each of the fault trenches was excavated to a depth of approximately ten feet below the existing ground surface. The trenches ranged in lengths from approximately 105 feet to 320 feet. The locations and lateral extents of Fault Trenches FT-1 through FT-4 are presented on the Whittier Fault Setback Map, Sheet 1. The trenches were excavated within the footprint of the proposed Cielo Vista development in the Southern Fault Rupture Hazard Zone Area. The trenches were oriented approximately perpendicular to the Whittier Fault's primary trace. The trench walls of the trenches were scraped clean and detail logging of the lithology, geologic structure and stratigraphy exposed within the trench walls was performed.

LGC Geotechnical also observed the trenching on the adjacent Esperanza Hills property, and reviewed the fault studies for the properties immediately adjacent to the east (Esperanza Hills) and west of the Cielo Vista site.

Conclusion

Our review of fault trenching performed east and west of the southern Fault Rupture Hazard Zone on the site has indicated the absence of active faulting projecting towards and within the southern portion of the Fault Rupture Hazard Zone. Although we have identified subsurface geological features in Fault Trenches FT-1

and FT-4, these faults are well south of and subparallel to the primary trace of the Whittier Fault and are not considered to be the active trace, nor active branches of the Whittier Fault. Rather, the features in Fault Trenches FT-1 and FT-4 are likely older faults related to "ridge shatter" as the ridgeline in the central portion of the site was uplifted and the geology folded.

To build residential structures within the Southern Fault Rupture Hazard Zone Area, it needs to be demonstrated that the area of proposed development is not underlain by an active fault (CDMG, 2007). A fault that has ruptured the ground surface within the Holocene Age (approximately the last 11,000 years) is considered active. The data examined and exposed by LGC Geotechnical's excavations does not definitively conclude that the area of proposed development is underlain by inactive or ancient faults, as datable materials were not identified which could constrain the age of the faults encountered. Therefore, it cannot be ruled out that an active fault may extend between the unfaulted materials exposed in Fault Trenches FT-2 and FT-3, which could also project south of the unfaulted southern portion of American Geotechnical's Fault Trench T-1 and connect to the primary trace of the Whittier Fault (Sheet 1). As a result, LGC Geotechnical recommends the following measures:

Recommendations

Cielo Vista Planning Area 1:

Additional off-site fault trenching is recommended to determine the presence or absence of active faulting projecting towards the proposed development area within the Fault Rupture Hazard Zone shown on Sheet 1. If the proposed additional fault trenching finds unfaulted bedrock and/or faulted bedrock capped by old alluvial material, then it would show that the faulting encountered within Fault Trenches FT-1 and FT-4 is not active.

In the event the faults in FT-1 and FT-4 are not active, then a 75-foot fault setback zone would be recommended along the south side of the active Whittier Fault. This setback zone would be expected to have little effect on the development of the southern portion of the site (Planning Area 1). A 10-foot overexcavation and recompaction below pad grade for the proposed structures in the ridge area of the site closest to the Whittier Fault would be recommended in order to reduce the potential effect of the differential expansion of the steeply dipping bedding in this area. Post-tensioned (PT) foundations would also be recommended. The 10-foot overexcavation and use of PT foundations would also mitigate any potential impacts associated with minor movement along the old faults due to a major event on the Whittier Fault.

Should the faults be found to be active, it is recommended that the lots within the southern portion of the Fault Rupture Hazard Zone Area shown on Sheet 1 not receive residential building permits until studies are performed and the County determines which lots are suitable for residential construction (e.g., because additional study concludes that certain areas of proposed development are not underlain by an active fault.)

All lots located outside of the southern portion of the Fault Rupture Hazard Zone Area can be developed without mitigation for faulting, as no faulting was encountered within Fault Trench FT-3 and the active trace of the Whittier Fault has been well constrained by the fault evaluation discussed in the separate letter based upon our additional analysis of the fault trenches and evaluation by American Geotechnical and Earth Research Associates north, east and west of the Southern Fault Rupture Hazard Zone Area.

Cielo Vista Planning Area 2:

Immediately west of the site, previous fault studies have recommended a 100-foot-wide setback zone: 50 feet on either side of the primary trace of the fault and residential structures were accordingly set back from the active trace of the fault. North of the Whittier Fault, we recommend a setback zone in accordance with that recommended by American Geotechnical (AGI, 2012), ranging from 50 feet on the west side of the site to approximately 120 feet on the east side. The proposed development area north of the Whittier Fault (Planning Area 2) would be sufficiently located away from the fault so that the fault setback zone would not impact this portion of the proposed development.

Should you have any questions regarding this letter-report, please do not hesitate to contact our office. We appreciate this opportunity to be of service.

Sincerely,

LGC Geotechnical, Inc.

Tim Lawson
Geotechnical Engineer

TJL/kmb

Attachments: References
Sheet 1 – Whittier Fault Setback Map

Distribution: County of Orange

References

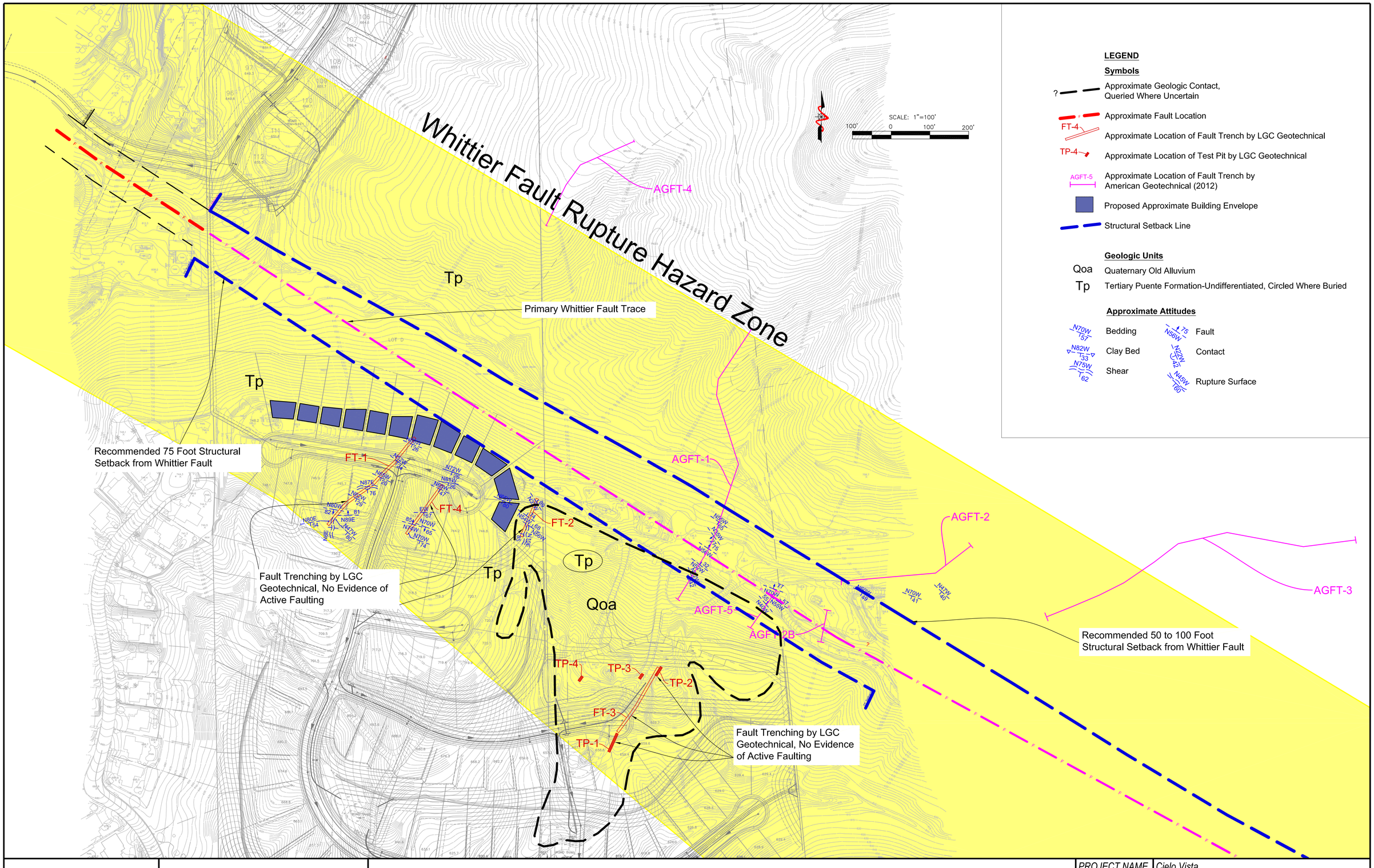
American Geotechnical, Inc., 2012, Fault Hazard Assessment Report "Whittier Fault Zone: Addressing a Portion of the Proposed Esperanza Hills Residential Development Project in the Southeastern Puente Hills Unincorporated Orange County, Southern California, Project No. 33366-01, dated November 2012.

California Department of Conservation, Division of Mines and Geology (CDMG), 1980, State of California Special Studies Zones, Yorba Linda Quadrangle, Official Map Effective: January 1, 1980.

_____, 2007, Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps, Special Publication 42, Interim Revision 2007.

Earth Research Associates, Inc., 1985, Preliminary Soils Engineering and Engineering Geologic Investigation, Tentative Tract No. 9813, City of Yorba Linda, California, Job No. 233-84, dated March 27, 1985.

LGC Geotechnical, Inc., 2014, Location of Whittier Fault, Cielo Vista, Tentative Tract Map No. 17341, County of Orange, California, Project No. 10106-01, dated July 31, 2014.



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Whittier Fault Setback Map

PROJECT NAME	Cielo Vista
PROJECT NO.	10106-01
ENG. / GEOL.	TJL/KBC
SCALE	Not to Scale
DATE	August 2014

SHEET 1 of 1