APPENDIX D

GEOTECHNICAL FEASIBILITY STUDY

 Prepared by:

CORNERSTONE EARTH GROUP

MARCH 21, 2014
Dear Mr. Cord:

This letter provides the results of our geotechnical feasibility study and preliminary recommendations for the project referenced above. The findings and recommendations provided herein are intended for project planning and CEQA purposes only and are not intended to be used for final project design or construction.

**PROJECT UNDERSTANDING**

Based on our understanding, the approximately ½ acre site at the northwest corner of Post Street and San Pedro Avenue in downtown San Jose is to be converted into a 19-story tower with approximately 156 residential units, and have 4,100 square feet of commercial space on the ground floor. In addition, there will also be parking at the ground level as well as three levels of below-grade.

We understand a feasibility geotechnical study is needed for the site at this time and a final design-level investigation will be completed once the development plans are finalized.

**SITE CONDITIONS**

**REGIONAL SEISMICITY (GENERAL)**

The San Francisco Bay area is one of the most seismically active areas in the Country. While seismologists cannot predict earthquake events, the U.S. Geological Survey’s Working Group on California Earthquake Probabilities 2007 estimates there is a 63 percent chance of at least one magnitude 6.7 or greater earthquake occurring in the Bay Area region between 2007 and 2036. As seen with damage in San Francisco and Oakland due to the 1989 Loma Prieta earthquake that was centered about 50 miles south of San Francisco, significant damage can occur at considerable distances. Higher levels of shaking and damage would be expected for earthquakes occurring at closer distances.

**EXISTING SITE CONDITIONS**

This site is located on the east side of Highway 87 and on the north side of Highway 280 in San Jose, California. It is bounded by San Pedro Avenue to the northeast, Post Street to the...
southeast, existing commercial buildings to the southwest, and a three-story parking garage to the northwest.

The site is currently paved with asphalt concrete, serving as a parking lot. The site grade is relatively flat and in good condition, with little to minor cracking.

**ANTICIPATED SUBSURFACE CONDITIONS**

The surficial geology at the site is mapped as Holocene flood plain deposits (USGS, 1999). Based on the mapped geological unit and our experience at other sites in the vicinity, we anticipate the site is underlain by sandy to silty clay with interbedded silt, sand, and fine gravel. The upper 20 to 60 feet may consist of soft to medium stiff silts and clays that are potentially compressible.

Based on our experience with similar sites with past site use, we recommend you anticipate encountering localized areas of undocumented fill and loose surficial soils. Undocumented fill and potential mitigation measures are discussed in the “Undocumented Fill and Construction Debris” Section below.

**GROUND WATER**

Maps published by the California Geological Survey estimate historical high ground water depth at approximately 10 to 15 feet below the ground surface. Fluctuations in the level of the ground water may occur due to variations in rainfall, underground drainage patterns, as well as numerous other factors.

**GEOLOGIC HAZARDS**

**FAULT RUPTURE**

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone, therefore, fault rupture through the site is not anticipated (CSG). Additionally, the site is not located in a Santa Clara County Fault Rupture Hazard Zone (Santa Clara County, 2002).

**GROUND SHAKING**

Moderate to severe (design-level) earthquakes can cause strong ground shaking, which is the case for most sites within the Bay Area. While a seismic hazard analysis has not been prepared for this feasibility study, strong ground shaking can be expected at the site during the life of the improvement.

Potential mitigation of strong ground shaking likely includes designing new structures to meet current building codes and applicable requirements.
LANDSLIDING

The site is not located within a California Seismic Hazard Zone for landsliding (CGS, 2011) or a Santa Clara County Landslide Hazard Zone (Santa Clara County, 2012). Due to the relatively flat topography, the potential for landsliding at the site may be considered low.

DIFFERENTIAL COMPACTION

Provided any near-surface undocumented fill and loose material is removed and replaced as engineered fill, in our opinion, the probability of differential compaction at the site is low.

LIQUEFACTION

The site is mapped within a California Seismic Hazard Zone for liquefaction (CGS, 2002) and the Santa Clara County Liquefaction Hazard Zone (Santa Clara County, 2002).

As previously discussed, historic high ground water in the area is mapped to be on the order of 10 to 15 feet below the ground surface. In addition, the site is underlain by alluvial deposits consisting of clayey, silty, and sandy soils. The granular materials, including sandy soils, are generally medium dense to dense in consistency. Therefore and for the above reasons, the potential for liquefaction impacting site development is considered high.

We recommend the potential for liquefaction is evaluated during the design-level geotechnical investigation once the project plans are finalized.

LATERAL SPREADING

Lateral spreading is horizontal/lateral ground movement of relatively flat-lying soil deposits towards a free face such as an excavation, channel, or open body of water; typically lateral spreading is associated with liquefaction of one or more subsurface layers near the bottom of the exposed slope. As failure tends to propagate as block failures, it is difficult to analyze and estimate where the first tension crack will form.

There are no open faces within an appropriate distance of the site where lateral spreading could occur; therefore, in our opinion, the potential for lateral spreading to affect the site is low.

FLOODING

Based on our internet search of the Federal Emergency Management Agency (FEMA) flood map public database, the site is located within Zone X (1% annual chance flood with average depths of less than 1 foot, or with drainage areas less than 1 square mile FEMA 2009). We recommend the project civil engineer be retained to confirm this information and verify the base flood elevation, if appropriate.

The Association of Bay Area Governments has compiled a database of Dam Failure Inundation Hazard Maps (ABAG, 1995). The generalized hazard maps were prepared by dam owners as
required by the State Office of Emergency Services; they are intended for planning purposes only. Based on our review of these maps, the site is located within a dam failure inundation area for the Anderson, Elsma, and Lexington Reservoirs.

**CONCLUSIONS AND RECOMMENDATIONS**

**GEOTECHNICAL DESIGN CONSIDERATIONS**

Based on available data and our engineering judgment, the planned project is feasible from a geotechnical standpoint. This feasibility report and recommendations are intended to assist you with the project planning and preparation of the CEQA documents. A final design-level geotechnical investigation should be performed once development plans are finalized.

Potential geotechnical concerns, design considerations, and preliminary recommendations are provided herein. A brief description of these concerns follows.

- Shallow ground water
- Potential for liquefaction-induced settlements
- Potential for high static settlements
- Undocumented fill
- Close proximity to adjacent streets and buildings

**Shallow Ground Water**

Historic high ground water is expected to be about 10 to 15 feet below the ground surface. Below-grade excavations or planned utilities extending near or below the ground water will most likely require dewatering and/or excavation bottoms be stabilized. Potential impacts typically consist of wet and unstable pavement subgrade, difficulty achieving compaction, and difficult underground utility installation. Dewatering and shoring of utility trenches should be planned for. In addition, waterproofing measures and design for hydrostatic pressure (uplift) also should be expected.

**Potential for Liquefaction-Induced Settlements**

The site is located within a State of California and County of Santa Clara liquefaction hazard zones. Liquefaction is a phenomenon where soils lose strength and stiffness during strong ground shaking. Liquefaction can result in ground failure (fissures, sand boils, etc.), foundation bearing failure, and settlement of the ground surface. Soils most susceptible to liquefaction are loose, non-cohesive soils that are saturated and bedded with poor drainage, such as sand and silt layers bedded with a cohesive cap. Depending on the liquefiable layer thickness and depth, liquefaction-induced settlements can range from less than an inch to several inches and
significantly larger, if surface rupture occurs. The potential for liquefaction should be evaluated further as part of the design-level geotechnical investigation.

**Potential for High Static Settlements**

Though the structural loads are not available at the time of this report, we estimate the loads to be relatively high. Based on the anticipated subsurface conditions and estimated structural loads, we anticipate the total and differential static settlements are above acceptable limits for conventional spread footings. If the total and/or differential settlement cannot be tolerated, alternative foundation systems or subsurface ground mitigation measures will be required. Additional comments for potential foundation alternatives are discussed below.

**Undocumented Fill**

Areas of undocumented fill and loose surficial materials should be anticipated and planned for. Based on our observations, undocumented fill may extend several feet below the ground surface. Undocumented fill within future improvement areas should be removed and replaced as engineered fill.

We recommend the presence and lateral extent of undocumented fill be evaluated further during the design-level geotechnical investigation.

**Close Proximity to Adjacent Streets and Buildings**

During excavation of the below-grade parking structure, a deep, stiff shoring system will most likely have to be implemented. A stiff shoring system will help to limit the lateral movements adjacent to the excavation, and prevent the nearby streets and buildings from being affected.

**FOUNDATIONS**

The new building will most likely consist of concrete construction for the below-grade parking structure and steel-frame construction for the tower. The exact building layouts are not known at this time; therefore, our initial recommendations provided below are intended for your project planning purposes only. They should not be used for project design.

In our opinion, it is likely that the tower structure will need to be supported on deep foundations or ground improvement. Depending on the final project plans, and if the tower can tolerate the total and differential static and seismic settlements due to structural loads and liquefaction, it potentially can be supported on reinforced mat foundations.

If the total and/or differential settlement cannot be tolerated, alternative foundation systems or subsurface ground mitigation measures will be required. Alternative foundation systems could potentially include deep pile foundations, such as pre-cast driven piles or auger-cast piles, or ground improvement such as Rammed Aggregate Piers.
Feasibility of the above foundations and recommendations should be evaluated further during the design-level geotechnical investigation.

**DESIGN-LEVEL GEOTECHNICAL INVESTIGATION**

The design considerations and feasibility recommendations contained in this report were based on limited site development information, geotechnical data in our files, and available published information. We recommend that Cornerstone Earth Group be retained to perform a design-level geotechnical investigation, once detailed site development plans are available. The recommendations provided in this letter should not be used for project design.

**CLOSURE**

This report has been prepared for the sole use of Cord Associates for the Post and San Pedro Mixed Use Development located in San Jose, California. Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices at this time and location. No warranties are expressed or implied.

If you have any questions or need any additional information from us, please call and we will be glad to discuss them with you.

Sincerely,

Cornerstone Earth Group, Inc.

Danh T. Tran, P.E.
Senior Principal Engineer

DTT:CBB

Copies: Addressee (by email)