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17 July 2003
Project 3717.01

Mr. Tom Conner
Evergreen Northwest, LLC
1399 Franklin Blvd., 3rd Floor
Eugene, OR 97403

Subject: Geotechnical Review
Residential Project Adjacent to the DeAnza Hotel
San Jose, California

Dear Mr. Conner:

This letter presents the results of our geotechnical review of the site adjacent to the DeAnza Hotel in San Jose. The site is bound by the DeAnza Hotel to the west, West Santa Clara Street to the south and North Almaden Avenue to the east. It is currently a paved parking lot. It is our understanding that plans are to construct a 21-story concrete building with 200 condominium units on the site. There will be four levels of parking of which either one or two levels may be underground. Along the perimeter of the building there will be two levels of retail space.

Treadwell & Rollo, Inc. performed geotechnical investigations at 200 Park Avenue, 303 Almaden Boulevard, 495 South Almaden Boulevard and the Fairmont Hotel Annex at the corner of North First Street and Market Street. We also provided geotechnical consultation for a 14-story high rise office building at the corner of West Santa Clara Street and Almaden Avenue.

Our scope of services for this consultation included a site reconnaissance and review of geotechnical reports for our other projects in the vicinity. The documents we reviewed are listed in the attached reference list. The purpose of our study was to evaluate subsurface conditions at the site and present preliminary geotechnical conclusions and recommendations regarding the geotechnical aspects of the proposed project.

SUBSURFACE CONDITIONS

Borings from previous investigations performed in the site vicinity encountered up to about 18 feet of fill. The fill in the area is underlain by interbedded layers of clay, sand and gravel. The clays and sand generally become stiffer and denser, respectively, with depth. However, the native clay in the upper 20 to 30 feet is generally soft and compressible.

Borings from the east side of the DeAnza hotel indicate there are several lenses of loose to medium dense layer of silty sand and sandy silt at depths ranging from about 20 to 35 feet. These lenses are typically 5 to 10 feet thick. A medium dense to dense gravel layer was

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encounter at depths of about 45 to 55 feet. Groundwater was encountered at depths of about 20 feet below existing ground surface.

SEISMICITY AND SEISMIC HAZARDS

The major active faults in the area are the San Andreas, San Gregorio, Hayward, and Calaveras Faults. These and other active faults of the region are shown on Figure 2. For the nearest active faults, their distance from the site and estimated maximum Moment magnitude[1] (Working Group on California Earthquake Probabilities (WGCEP) 1999 and California Division of Mines and Geology (CDMG) 1996) are summarized in Table 1. The Silver Creek fault is about 2.5 kilometers northeast of the site; however, there is no evidence of activity within Holocene time (last 11,000 years).

TABLE 1
Regional Faults and Seismicity

Fault Segment	Approximate Distance from Site (km)	Direction from Site	Maximum Magnitude
Hayward – South East Extension	9.3	Northeast	6.4
Monte Vista	11.6	Southwest	6.8
Central Calaveras	13.7	Northeast	6.6
Hayward – Total	14.5	Northeast	7.1
Northern Calaveras	14.5	Northeast	7.0
Southern Hayward	14.5	Northeast	6.9
San Andreas – 1906 Rupture	19.0	Southwest	7.9
San Andreas – Peninsula	19.0	Southwest	7.2
San Andreas – Santa Cruz Mnts.	20.1	Southwest	7.2
Sargent	22.2	South	6.8
Zayante-Vergeles	28.2	South	6.8
Southern Greenville	35.6	East	6.9
San Gregorio North	42.5	Southwest	7.3
Central Greenville	43.9	Northeast	6.7
Great Valley – 7	44.8	Northeast	6.7
Mount Diablo Thrust	44.9	North	6.7
Great Valley – 6	44.9	Northeast	6.7
Monterey Bay – Tularcitos	50.2	Southwest	7.1

[1] Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude is directly related to average slip and fault rupture area.

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Since 1800, four major earthquakes have been recorded on the San Andreas Fault. In 1836 an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) scale, (Figure 3) occurred east of Monterey Bay on the San Andreas Fault (Toppozada and Borchardt 1998). The estimated Moment magnitude, M_w, for this earthquake is about 6.25. In 1838, an earthquake occurred with an estimated intensity of about VIII-IX (MM), corresponding to a M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas Fault from Shelter Cove to San Juan Bautista approximately 470 kilometers in length. It had a maximum intensity of XI (MM), a M_w of about 7.9, and was felt 560 kilometers away in Oregon, Nevada, and Los Angeles. The most recent earthquake to affect the Bay Area was the Loma Prieta Earthquake of 17 October 1989, in the Santa Cruz Mountains with a M_w of 6.9, approximately 33 km from the site.

In 1868 an earthquake with an estimated maximum intensity of X on the MM scale occurred on the southern segment (between San Leandro and Fremont) of the Hayward Fault. The estimated M_w for the earthquake is 7.0. In 1861, an earthquake of unknown magnitude (probably a M_w of about 6.5) was reported on the Calaveras Fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill earthquake ($M_w = 6.2$).

In 1999, the WGCEP at the U.S. Geologic Survey (USGS) predicted a 70 percent probability of a magnitude 6.7 or greater earthquake occurring in the San Francisco Bay Area by the year 2030. More specific estimates of the probabilities for different faults in the Bay Area are presented in Table 2.

TABLE 2
WGCEP (1999) Estimates of 30-Year Probability (2000 to 2030) of a Magnitude 6.7 or Greater Earthquake

Fault	Probability (percent)
Hayward-Rodgers Creek	32
San Andreas	21
Calaveras	18
San Gregorio	10
Concord-Green Valley	6
Greenville	6
Mount Diablo	4

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Seismic Hazards

Strong ground shaking should be anticipated at the site during a moderate to large earthquake on any of the nearby major faults, particularly the San Andreas and Hayward Faults.

Strong shaking during an earthquake can result in ground failure such as that associated with soil liquefaction[2] and differential compaction[3]. The site is in an area designated by the California Geologic Survey (formerly California Division of Mines and Geology) as a zone of potential liquefaction (CDMG 2001). Specifically, the map defines the site as being in an area "where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693 (c) would be required." Based on the data from the adjacent property, we conclude the saturated sand lenses encountered at depths of 20 to 35 feet are loose and could potentially liquefy.

There are layers of loose to medium dense sandy fill in the upper 10 to 15 feet. These unsaturated sandy fill layers may densify during a major earthquake. Settlement on the order of a few inches may occur beneath the adjacent sidewalks and utilities during a major earthquake. This condition should be investigated further during a detailed geotechnical study of the site. Future utility connections entering the building may need to be designed to accommodate this potential differential settlement.

If the building is designed in accordance with the 2001 California Building Code (CBC), the requirements for Zone 4 should be used as a minimum. The closest distance to a known active fault, the south east segment of the Hayward Fault (a B-type fault), is about 9.3 kilometers. The anticipated soil conditions at the site indicate the soil profile type could be either an S_D or S_F, depending on the amount of liquefaction expected during a major earthquake. If the site is classified as an S_D soil profile type then new source factors of 1.00 and 1.03, respectively should be used. If the soil profile type is classified as S_F, then a site-specific response spectrum will be required.

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2 Liquefaction is a transformation of soil from a solid to a liquefied state during which saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure, especially during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits.

3 Differential compaction is a phenomenon in which non-saturated, cohesionless soil is densified by earthquake vibrations, causing differential settlement.

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DISCUSSIONS AND CONCLUSIONS

From our review of the available subsurface data, we conclude the proposed project is feasible from a geotechnical standpoint. The primary geotechnical concern for this site is the presence of potentially liquefiable soil and selection of an appropriate foundation system for the building and the support of adjacent structures during construction of the basement level(s). These issues are discussed in the remaining sections of this report.

Foundations

We anticipate construction may include an excavation of approximately 25 feet of soil depending on the number of basement levels. The bottom of the excavation will be at or above the potentially liquefiable sand, which could lose its strength and bearing capacity during a major earthquake. We have preliminarily evaluated a shallow foundation system for the building and judge it could settle excessively and erratically during a major earthquake. Therefore, we conclude the building will likely need to be supported on driven piles. If liquefiable soil does not exist below the planned foundation level, a mat may be feasible. However, this cannot be ascertained without site specific subsurface data. Consequently, for current planning, piles should be anticipated.

Based on our experience with similar projects, we judge that 14- and 16-inch square, precast, prestressed concrete piles may be the most appropriate piles for this project. The piles should extend through the potentially liquefiable sand and medium stiff to stiff clay and gain support through end-bearing in the gravel layers at a depth of about 50 to 65 feet below ground surface. Our preliminary conclusion is that 14- and 16-inch square piles may be designed for allowable dead plus live loads of 240 and 300 kips per pile with a one-third increase for total design loads (including seismic). If the gravel layer is not present at these depths or is not sufficiently thick, then end-bearing may not be counted on for support and longer piles may be necessary to carry the load in friction.

Construction Considerations

Because the subgrade for the excavation for two basement levels will be near or below the water table and the soil consists of medium stiff clay, it may rut and become unstable under heavy equipment such as a pile-driving rig. For the two basement level scheme, we recommend the piles be driven from at least three feet above final grade. A follower should be used to drive the piles to the design cut-off elevations. If the piles are driven from the basement subgrade, timber mats or other means of support may be required to distribute the loads and support the rig while it is driving piles or moving around the site. Depending on the depth for the one basement level, it may be possible to drive the piles from the bottom of the excavation.

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The excavation for two basement levels will require dewatering. The site should be dewatered to at least 3 feet below the bottom of the excavation to reduce the potential of blowing out the bottom of the excavation. Furthermore to prevent a "boiling" condition (where sand begins to flow from the seepage forces) from developing, special precautions, such as additional wells and interior and exterior dewatering, may be required.

The sides of the proposed excavation should be supported by temporary shoring. Our past experience indicates a shoring system consisting of soldier piles, and timber lagging, is the most economical system for the conditions at the site. If the proposed excavation extends beneath the foundations of adjacent buildings, underpinning may be required. The type and depth of the foundation system supporting the adjacent structures should be determined prior to design of the shoring and underpinning. If underpinning is required, hand excavated underpinning piers or drilled piers are typically used.

We trust this letter contains the information you require. Should you have any questions, please contact us.

Sincerely yours,
TREADWELL & ROLLO, INC.

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REFERENCES

California Division of Mines and Geology (1996). "Probabilistic seismic hazard assessment for the State of California." DMG Open-File Report 96-08.

California Division of Mines and Geology (2000). "State of California Seismic Hazard Zones, Zones of Potential for Liquefaction", City and County of San Francisco."

Treadwell & Rollo, Inc. (2002). Feasibility Geotechnical Study, 355-375 Fremont Street, San Francisco, California.

Treadwell & Rollo, Inc. (2000). Geotechnical Investigation, 301 First Street, San Francisco, California.

Treadwell & Rollo, Inc. (2000). Geotechnical Investigation, 325 Fremont Street, San Francisco, California.

Treadwell & Rollo, Inc. (1997). Geotechnical Investigation, City Plaza Towers, San Francisco, California. (388 Beale Street – Avalon Towers).

Working Group on California Earthquake Probabilities (WGCEP) (1999). "Earthquake probabilities in the San Francisco Bay region: 2000 to 2030 – A summary of findings." Open File Report 99-517.