IV.E. GEOLOGY AND SOILS

The following section is a summary of the Preliminary Soils and Engineering Investigation (MTC Engineering, Inc., April 2004) prepared for the project site and other available geologic data. The evaluation included soil samples at four locations, laboratory tests of the earth samples, and engineering analyses and evaluations.

ENVIRONMENTAL SETTING

Site Conditions

The proposed project site is currently occupied by a vacant single-family structure in a state of disrepair, several sheds and Los Angeles Cultural-Historic Monument No. 184; "Tower of Wooden Pallets". No surface drainage exists on the property and the site is relatively flat.

Soil Type and Characteristics

The earth materials found below the subsurface of the project site consist of fill and native soils. The fill soils were encountered from the surface to approximately 2 to 3.5 feet below ground surface and consist of dark brown silty clay, in very moist to moist and slightly firm condition. The native soils were found approximately 2 to 3.5 feet to the depths explored and consist of dark brown silty clay, in moist and moderately firm to firm condition; light yellow brown clayey silty, in moist to moderately firm condition; light yellow silty sand, in moderately moist and dense condition; and light olive brown clay, in moist and stiff condition.

Geologic Hazards

The macro-geology of southern California is composed of several large plates moving relative to each other. The primary line of contact between these plates is the San Andreas Fault zone. The geologic formations in the Los Angeles Basin belong to two geomorphic provinces: the Transverse Ranges and the Peninsular Ranges. The Peninsular Ranges comprise the coastal mountains that run from Los Angeles to Baja California. The Santa Monica Mountains form the central portion of the Transverse Ranges, running about 275 miles eastward from Point Arguello (just north of Santa Barbara) into Mojave Desert. Consisting of several large areas of uplifted basement rocks, these mountains are seismically active and are transected by a north-west-trending branch of the Santa Monica Fault and numerous small faults.

Faults

Based on criteria established by the California Division of Mines and Geology (CDMG), faults may be categorized as active, potentially active, or inactive. Active faults are defined as faults that have had surface displacement within Holocene times (about the last 11,000 years). A potentially active fault is a fault that has demonstrated surface displacement of Quaternary age deposits (within the last 1.6 million years). Faults showing no evidence of displacement within the last 1.6 million years are considered inactive for most purposes.

Geologic studies have found that the Los Angeles Basin is a geologically complex area with over one hundred active faults. Studies completed since the Northridge Earthquake of 1994 indicate that the six major fault systems in the Los Angeles area are capable of generating large earthquakes, and many of the faults traversing the southern California area have the potential of generating strong ground motions in the Los Angeles Basin.[1].

There are no known (active or potentially active) faults on the proposed project site, nor is the site located within an Alquist-Priolo Earthquake Fault Zone.[2] The closest mapped fault, the Santa Monica-Hollywood fault, lies approximately 6.3 miles to the south of the project site.

The Santa Monica fault is the western segment of the Santa Monica-Hollywood fault zone which trends east-west from the Santa Monica coastline on the west to the Hollywood area on the east. In the Santa Monica area, the Santa Monica fault splays into two segments, the North Branch and the South Branch. Several investigators have indicated that the fault is active, based on geomorphic evidence and fault trenching studies. The Santa Monica fault has not been zoned as active under the Alquist-Priolo Earthquake Fault Zoning Act because of the absence of well-defined fault traces. Figure IV.E-1 shows the approximate location of the project site in relation to these major fault systems.

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1 *California Department of Conservation, Division of Mines and Geology Open File Report 96-08 and U.S. Department of the Interior, U.S. Geological Survey Open File report 96-706. Probablistic Seismic Hazard Assessment for the State of California. Mark D. Petersen, William A. Bryant, Chris H. Cramer, Tianqing Cao, and Michael Reichle, California Department of Conservation, Division of Mines and Geology. Arthur D. Franke, U.S. Geological Survey, Denver, Colorado. James J. Lienkaemper, Patricia A. McCrory, and David P. Schwartz, U.S. Geological Survey, Menlo Park, California, 1996.*

2 *Earthquake Fault Zones are regulatory zones around active faults, The Alquist-Priolo Earthquake Fault Zoning Act (California Public Resources Code Section 2621) was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. The Alquist-Priolo Earthquake Fault Zoning Act's main purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults.*

Insert Figure IV.E-1

Regional Fault Map

Seismicity

Since 1933 there have been four moderate-size earthquakes which have caused numerous deaths and substantial property damage in the metropolitan Los Angeles area. These four temblors are known by their location as the Long Beach (March 11, 1933; magnitude 6.3), San Fernando (February 9, 1971; magnitude 6.4), Whittier Narrows (October 1, 1987; magnitude 5.9) and Northridge (January 17, 1994; magnitude 6.7)) earthquakes. The Long Beach earthquake, which was located about 45 miles southeast of the site, ranks as one of the major disasters in the history of southern California. The majority of the damage was suffered by structures that are now considered substandard in construction and/or were located on filled or saturated ground. The San Fernando earthquake, located in the San Fernando Valley, caused sufficient enough damage to lead to adoption of stringent building codes. The damage caused by the Whittier Narrows earthquake occurred in buildings constructed prior to the adoption of these more stringent building codes.

The Northridge earthquake, the most recent of these seismic episodes, January 17, 1994, occurred with a magnitude of 6.7 which produced strong ground motions over an extensive area. The earthquake occurred on a previously unrecognized blind thrust fault, and no surface rupture that can be unequivocally associated with the main shock has been identified. Analysis by the United States Geologic Survey (USGS) and Caltech indicates that the earthquake rupture initiated about 11 miles below the San Fernando Valley, and it is presumed that the rupture stopped about 3 miles below the surface.

Liquefaction

Liquefaction is defined as a phenomenon where the structure of saturated soil collapses during strong ground shaking of considerable duration, causing water pressure in the soil to rise sufficiently to make the soil behave like a fluid for a short period. The effects of liquefaction include the loss of the soil’s ability to support footings and foundations which may cause buildings and foundations to buckle. The preliminary soils and engineering evaluation prepared by MTC Engineering, Inc., April 2004, identified that the site is located in a Liquefaction Hazards Zone designated by the State of California.

Tsunamis, Innudation and Seiches

Since the site is not in a coastal area, the risk of damage from tsunamis (earthquake-induced sea waves) need not be considered.

According to the County of Los Angeles Seismic Safety Element, the site is not located downslope of any large bodies of water that would adversely affect the site in the event of an earthquake-induced failure or seiches (wave oscillations in a body of water due to earthquake shaking).

ENVIRONMENTAL IMPACTS

Thresholds of significance

Soil Erosion and Sedimentation

Based upon criteria established in the City of Los Angeles CEQA Thresholds Guide, the Project would have significant sedimentation or erosion impacts if it:

- Constitutes a geologic hazard to other properties by causing or accelerating instability from erosion; or
- Accelerates natural processes of wind and water erosion and sedimentation, resulting in sediment runoff or deposition which could not be contained or controlled on-site.

Geologic/Seismic Hazards

Based upon criteria established in the City of Los Angeles CEQA Thresholds Guide (1998), the Project would result in a significant impact to geology if the Project would cause or accelerate geologic hazards that would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

Project impacts

Soil Erosion and Sedimentation

The proposed project would not constitute a geologic hazard to other properties by causing or accelerating instability from erosion. The proposed project would not accelerate natural processes of wind and water erosion and sedimentation, resulting in sediment runoff or deposition which could not be contained or controlled on site. Erosion can occur as a result of, and can be accelerated by, site preparation activities associated with development. Vegetation removal in landscaped (pervious) areas could reduce soil cohesion, as well as the buffer provided by vegetation from wind, water, and surface disturbance, which could render the exposed soils more susceptible to erosive forces. Additionally, excavation or grading for the proposed building may also result in erosion during construction activities, irrespective of whether hardscape previously existed at the construction site, as bare soils would be exposed and could be eroded by wind or water.

Earth-disturbing activities associated with construction of the proposed project would include removal of vegetation and grading to accommodate the project building pad. No excavation of earth materials are planned for this project.[3] The proposed project would be required to comply with Chapters 29 and 70 of the California Building Code (CBC) to ensure that uncovered or uncompacted soils are managed to prevent movement, which would prevent erosional effects. Potential for soil erosion would be further controlled by implementation of dust control measures consistent with SCAQMD Rule 403, which would stabilize soils and prevent erosion. In addition, Best Management Practices implemented to minimize air quality impacts, such as watering for dust control, would further control erosion.[4] These measures would ensure that neither substantial soil erosion, nor a loss of topsoil would occur and that construction of the proposed project would result in a less than significant impact.

Geologic/Seismic Hazards

Movement along known active and/or potentially active faults in proximity to the proposed project site could periodically cause moderate to severe intensity ground shaking that is likely to occur during the design life of the proposed project. Several effects could result from earthquakes on faults in the Los Angeles Basin. The primary effect would be ground shaking. Under the current understanding of regional seismo-tectonics, the largest maximum credible event to impact the site may be generated by the Santa Monica-Hollywood Fault, Newport-Inglewood or Whittier Faults, or any other known fault within the Los Angeles Basin. Implementation of the proposed project would increase the density of development and the human occupancy at the site, increasing the potential for damage or injury during a major earthquake. State mandatory mitigation of ground-shaking effects is provided through enforcement of structural and nonstructural seismic design provisions defined in the Uniform Building Code (UBC). These codes are updated every three years and through this update process would incorporate new design provisions as needed. Application of these design provisions to the proposed project will mitigate potential effects of ground shaking to a level considered less than significant.

The proposed building would be designed to resist seismic lateral loads, and to comply with all applicable City codes and regulations (Municipal Code and Building and Safety requirements). In addition, ground shaking is not expected to be any more intense than that expected at other nearby developments. Impacts relating to ground shaking would be considered less than significant.

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[3] *The level of the site will be raised around the at-grade parking garage, no excavation will be required.*

[4] *Source: Development Best Management Practices Handbook, Part A: Construction Activities, Second Edition. City of Los Angeles Department of Public Works and City of Los Angeles Watershed Protection. May 31, 2002. PDF document on City of Los Angeles website: http://www.ci.la.ca.us/SAN/wpd/downloads/PDFs/part_a_2nd_ed1.pdf*

CUMULATIVE IMPACTS

Development of the proposed project in conjunction with the related projects would result in further development of the Sherman Oaks area in the City of Los Angeles. Geologic and soil conditions are site-specific and there is little, if any, cumulative relationship between development of the proposed project and the related projects. Cumulative development in the area would increase the overall population for exposure to seismic hazards by increasing the number of people potentially exposed. However, with adherence to applicable City, State and Federal regulations, building codes and sound engineering practices, cumulative geologic hazards could be reduced to less than significant levels.

MITIGATION MEASURES

The following mitigation measures are required to reduce geology and soils impacts to less than significant levels:

Code Required Measures

Soil Erosion and Sedimentation

1. The proposed project shall comply with Chapters 29 and 70 of the California Building Code (CBC) to ensure that uncovered or uncompacted soils are managed to prevent movement.

2. The proposed project shall comply with SCAQMD Rule 403 – Fugitive Dust during the construction phases of new project development. (See Section IV.C.Air Quality for measures implementing SCAQMD Rule 403).

Geologic/Seismic Hazards

3. The design and construction of the project shall conform to the Uniform Building Code seismic standards as approved by the Los Angeles Department of Building and Safety.

4. The proposed project shall conform to the City of Los Angeles' Seismic Safety plan.

Recommended Measures

The following recommendations have been provided by Preliminary Geotechnical Engineering Investigation for the proposed project:

Site Preparation

5. Remove all fill, loose soils, vegetation and other deleterious materials that conflict with the proposed development.

6. To minimize the amount of settlement, a minimum of 3 feet of compacted fill soils under the proposed footings shall be overexcavated and recompacted. The proposed development can be supported by conventional spread/continuous footings connected with grade beams and embedded into compacted fill soils.

7. For the proposed driveway and parking lot, the soil below the proposed subgrade shall be overexcavated 2 feet and extended 2 feet laterally, if applicable, and recompacted to the requirement. The top one-foot of subgrade and aggregate base shall be compacted to a minimum of 95 percent of maximum dry density as the current standard of ASTM D-1557.

8. Any loose spots, if founded, including the existing basement, shall be overexcavated and recompacted to a minimum of 90 percent of maximum dry density.

9. All structural fill shall be compacted to a minimum of 90 percent of the maximum dry density in accordance with ASTM Standard D-1557-00

10. Compacted fill shall be placed in controlled layers, not exceed 8 inches in thickness.

11. Field density tests shall be performed in accordance with ASTM Standard D-1556-00. Field density tests shall be taken at not more than 2-foot intervals of the fill placed.

12. All fill placements shall be performed in accordance with the current grading ordinances of the City of Los Angeles and the recommendations of the Preliminary Geotechnical Investigation (April 2004).

13. All fill placements shall be observed and tested by the representatives of the Geotechnical firm (MTC Engineering, Inc.) prior to placing any fill, steel or concrete.

Foundation System

14. The proposed development can be supported by conventional spread/continuous footings embedded into compacted fill soils. Footings may be dimensioned using an allowable net bearing pressure of 2,000 pounds per square foot (psf) for a minimum of 21 inches in width and 24 inches into compacted fill soils. To provide extra resistance, the footings shall be connected with grade beams.

Foundations designed and installed in accordance with the recommendations outlined in the Preliminary Geotechnical Investigation (April 2004) are anticipated to undergo a total settlement of less than one inch. Differential settlement between adjacent columns will be les than ½ inch. Some of the settlement will occur during construction.

The bearing capacity can be increased by one third when considered short duration wind or seismic loads.

A friction coefficient of 0.45 and a lateral bearing of 300 pounds per square foot (psf) per foot of depth, to a maximum of 3000 psf per foot of depth, can be used to resist lateral loads. When combining passive earth pressure and frictional resistance, the passive earth pressure can be combined without deduction.

All footings shall be reinforced with a minimum of two No. 4 rebars near the top and two No. 4 rebars near the bottom.

Prior to the placement of concrete or steel in the footing excavations, an inspection shall be made by representatives of the Geotechnical firm (MTC Engineering, Inc.) to ensure that the footing excavations are free of loose and disturbed soils.

Slab on Grade

15. Conventional concrete slab can be used, a minimum thickness of 4 inches and reinforced with No. 4 rebar at spacing of 16 inches, placed at mid-height is required. Heavily loaded floors shall be engineered separately. Slabs shall be underlain by a minimum of 6 mil. Polyethylene moisture barrier at moisture sensitive areas, the moisture barrier shall be sandwiched by two 2-inch coarse sand layers to protect the barrier from punctures. Due to the medium expansive soil encountered, it is suggested that the subsurface soils to 18 inches shall be moisture treated to 4 to 5 percent above optimum moisture content.

Corrosivity Test

16. Based on the chemical laboratory test results, sulfate test result is 42 parts per million (ppm), Type I or II cement can be used. Chloride value is 99 ppm, pH value is 7.2, and the resistivity value is 1100 ohm-cm (saturated condition). A potential corrosion problem from on-site soil is severe, all the underground pipes and devices shall have corrosion protection.

Drainage

17. Final grading shall provide a positive drainage to divert surface water away from the foundation areas in compliance with the City's grading requirements. All pad drainage shall be collected

and diverted away from the proposed buildings in nonerosive devices. Roof gutter shall be provided to collect runoff water and divert to down spouts leading down to the ground surface and discharge off-site. Planters adjacent to buildings or slope shall be designed with concrete bottom and subdrains leading away from the building or slope area. Proper subsurface drainage shall be provided to divert runoff water away from foundation areas. All underground plumbing fixtures shall be absolutely leak free. Proper drainage shall also be provided to divert surface water away from the building pad area during construction. This is especially important when construction takes place during the rainy season.

LEVEL OF SIGNIFICANCE AFTER MITIGATION

Project impacts related to soil erosion and sedimentation and geologic/seismic hazards would be less than significant.