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CENTERSTONE COMMUNITIES
3500-B West Lake Center Drive
Santa Ana, California 92704

April 17, 2008
Work Order 700248

Attention: Mr. Hal Woods

Subject: **ESTIMATION OF PERCOLATION CHARACTERISTICS**
Tentative Tract 18583
Southwest of Intersection of Greenspot Road and
Boulder Avenue City of Highlands, California

References: See Appendix

Gentlemen:

Pacific Soils Engineering, Inc. (PSE) is pleased to submit this estimation of the percolation characteristics of the soils underlying Tentative Tract 18583, City of Highland, California. This estimation is based solely on readily available geological literature archived in PSE files. This firm has not carried out field investigations to verify information contained in the reports listed in the Appendix. In this document, PSE first gives a brief description of the site geological setting, sets forth estimations of soil permeability based on literature review, and then posits the suitability of those soils for individual sewage disposal systems. And finally, PSE provides conclusions and recommendations.

GEOLOGICAL SETTING

Tract 18583 occupies a part of the northeastern Santa Ana River basin, near its interface with the San Bernardino Mountains. Coalescing alluvial fans ranging in age from Pleistocene, to Holocene, to historic cover most of the northeastern floor of the basin. These fans and associated incised channels are composed of sediments debouched from San Bernardino Mountains. They generally decrease in age away from the mountains as existing fans were incised by channels that distributed younger sediments away from the mountain front. According to Morton and Miller (2003), three separate young (Holocene) deposits occur onsite. Those include "young" (late to middle Holocene) alluvial deposits composed of fine-to coarse-grained sand, pebbly sand, and

small cobble gravel in the north one-fifth of the site. "Interlayered" young alluvial valley deposits consisting of thin to thick-bedded very fine- to medium-grained sand to pebbly fine-grained sand underlie the southern three-fifths. These two deposits are separated by a young distributary channel that contains late Holocene sand and gravel that are common to active channels on alluvial fan surfaces. In sum, coarse-grained sediments predominate (Morton and Miller, 2003). Such is typical of outwash deposits along Southern California mountain fronts.

The United States Department of Agriculture, Natural Resource Conservation Services (NRSC) (http://websoilsurvey.nrcs.usda.gov) assigns the soil in the northern one-fifth of the site to the Tujunga Loamy Sand composed of loamy sand, coarse sand, and loamy coarse sand (SM, SP-SM), with 5 to 25 percent silt and clay. The remainder of the site, according to NRSC, is underlain by Soboba Stony Loamy Sand composed of very stony sand (SP-SM) with 0 to 10 percent silt and clay.

The site is within the Bunker Hill Ground Water Basin. Carson and Matti (1984) indicate that ground water levels (presumably the "water table") were on the order of 100 ft. below ground surface (bgs) between 1973 and 1979. The Western Municipal Water Company (2002) reported that the water levels in Well 1S/3N/03Q01 near the site varied from about 166 to 248 ft. bgs between 1993 and 2002. Dutcher and Garrett (1963) stated that the ground water surface was about 250 ft. bgs in 1936.

PERMEABILITY ESTIMATES

Based solely on literature review, PSE offers the following information. The NRCS (formerly the Soil Conservation Service) estimates that onsite soils (both the Tujunga Loamy Sand and the Soboba Stony Loamy Sand) have percolation rates of greater then 6 inches per hour at depths of 2 to 5 feet below the ground surface where they considered septic tank absorption fields. That is, the soils have high infiltration rates – on the order of 10 minutes per inch. These rates, with coefficients of permeability of 10^{-3} cm/sec at a minimum, are typical of the kinds of alluvial soils found onsite. For example, Cedergren (1968) gives coefficients of permeability that vary from about 10^{0} to 10^{-3} cm/sec for similar soils.

The generally high energy environment throughout Pleistocene and modern times near the base of the San Bernardino Mountains would have and does permit the deposition of generally very coarse to medium-grained sediments, while winnowing the fines for deposition in a less energetic environments farther downstream. Thus, it is likely that the sediments at depth are similar to those near the surface, and are likely to be permeable.

The anticipated soil percolation rates are, therefore, high and well above acceptable minimums for sewage disposal systems. For example, the San Bernardino County Department of Environmental Heath (1992) deems a percolation rate of 60 minutes per inch as the slowest acceptable rate. The soil percolation rates at the study site are likely an order of magnitude higher.

CONCLUSIONS AND RECOMMENDATIONS

Based on literature research, PSE offers the following:

1. The site is underlain by relatively coarse-grained alluvium.
2. Available records indicate that ground water is, historically, at least 100 ft. bgs.
3. Percolation rates pertinent to design of individual sewage disposal systems are generally high.
4. The information presented herein is preliminary. Field investigations of the site soils and of percolation rates will be necessary for the design of San Bernardino County-accepted systems.

PSE thanks you for the opportunity to be of service, if you have any questions about this and other geotechnical aspects of your project, please contact us at (951) 582-0170.

Respectfully submitted,
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Distribution: (2) Addressee
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APPENDIX

Cited References

1. Carson, S.E., and Matti, J.C., 1984, Contour map showing minimum depth to groundwater, upper Santa Ana River Valley, California: USGS Miscellaneous Field Map MF-1802.

2. Cedegren, H.R., 1968, Seepage, drainage and flow rates: John Wiley and Sons, Inc., New York.

3. County of San Bernardino Department of Environmental Health Services, 1992, On-site wastewater disposal system soil percolation (PERC) test report standards: August 1992.

4. Dutcher and Garrett, 1963, Geologic and hydrologic features of the San Bernardino area California: USGS Water-Supply Paper 1419.

5. Eastern Municipal Water District, 2002, Cooperative well measuring program: Tabulated data supplied by the Eastern Municipal Water District.

6. Morton, D.M., & Miller, F., 2003, Preliminary geologic map of the San Bernardino 30' X 60' quadrangle, California: U.S. Geol. Surv. Open-File Report 03-293.

7. United States Department of Agriculture, 2008, Web soil survey: Natural Resources Conservation Service, http//websoilsurvey.nrcs.gov.