

ANNUAL TECHNICAL REPORT
**LIQUEFACTION SUSCEPTIBILITY MAPPING AT 1:24,000-SCALE,
SAN FRANCISCO BAY AREA**

by
Robert C. Witter, Janet M. Sowers, Keith L. Knudsen⁽¹⁾,
Richard D. Koehler, and Carolyn E. Randolph
William Lettis & Associates, Inc.
1777 Botelho Drive, Suite 262
Walnut Creek, CA 94596
Email: witter@lettis.com
(925) 256-6070

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Recipient: William Lettis & Associates, Inc.

Principal Investigators: Robert C. Witter and Janet M. Sowers

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⁽¹⁾Present Address: California Division of Mines and Geology, 185 Berry Street, Suite 210, San Francisco, CA 94107

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ABSTRACT

Earthquake-induced liquefaction has caused loss of life and damage to property and infrastructure historically. Liquefaction has occurred in areas underlain by saturated, loose, cohesionless sand and silt. These areas can be delineated on the basis of geologic, geomorphic, and hydrologic mapping and map analysis. In this study we developed maps that delineate deposits susceptible to liquefaction-related ground failure within sixty-eight 7.5-minute quadrangles for the nine-county San Francisco Bay area. The study area includes portions of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.

The Quaternary geologic units are mapped on the basis of age and environment of deposition, properties that have a strong correlation to liquefaction susceptibility. For example, active stream channels and young terraces commonly contain liquefiable deposits. The Quaternary geologic map delineates a total of forty geologic units. We base the mapping on the interpretation of topographic maps, aerial photography, and soil surveys, as well as the compilation of published and unpublished geologic maps. The maps we present are a combination of our original mapping and previous mapping modified to fit our stratigraphy, nomenclature, and mapping style. The scale of the mapping for all quadrangles in the final digital database will be 1:24,000.

Development of the liquefaction susceptibility maps applies a criteria matrix that matches Quaternary geologic unit and groundwater levels to yield relative liquefaction susceptibility. Five categories of liquefaction susceptibility are identified - Very High, High, Moderate, Low, and Very Low. Liquefaction units reflect the probability that saturated, loose, unconsolidated granular materials are present within 40 feet of the surface. Calibration of the criteria matrix relies on published and unpublished borehole data and analysis, historical liquefaction occurrences, and previous studies.

Both the Quaternary geologic and liquefaction susceptibility maps will be published as digital databases, produced from original 1:24,000 scale mapping. The U. S. Geological Survey will make the database available in early 2002. These regional maps will show general conditions for planning purposes, and are not meant to substitute for site-specific studies. The maps will provide baseline data from which the CDMG can develop liquefaction zone maps.

Deposits most susceptible to liquefaction in the study area are non-engineered artificial fill emplaced over estuarine sediment and latest Holocene stream and stream terrace deposits. Other susceptible deposits include latest Holocene alluvial fan and fan levee deposits, Holocene estuarine deposits, artificial levees, Holocene stream terrace deposits, Holocene beach and dune deposits, and Holocene basin deposits. Communities within or adjacent to areas having moderate to very high liquefaction susceptibility include nearly every city in the map area.