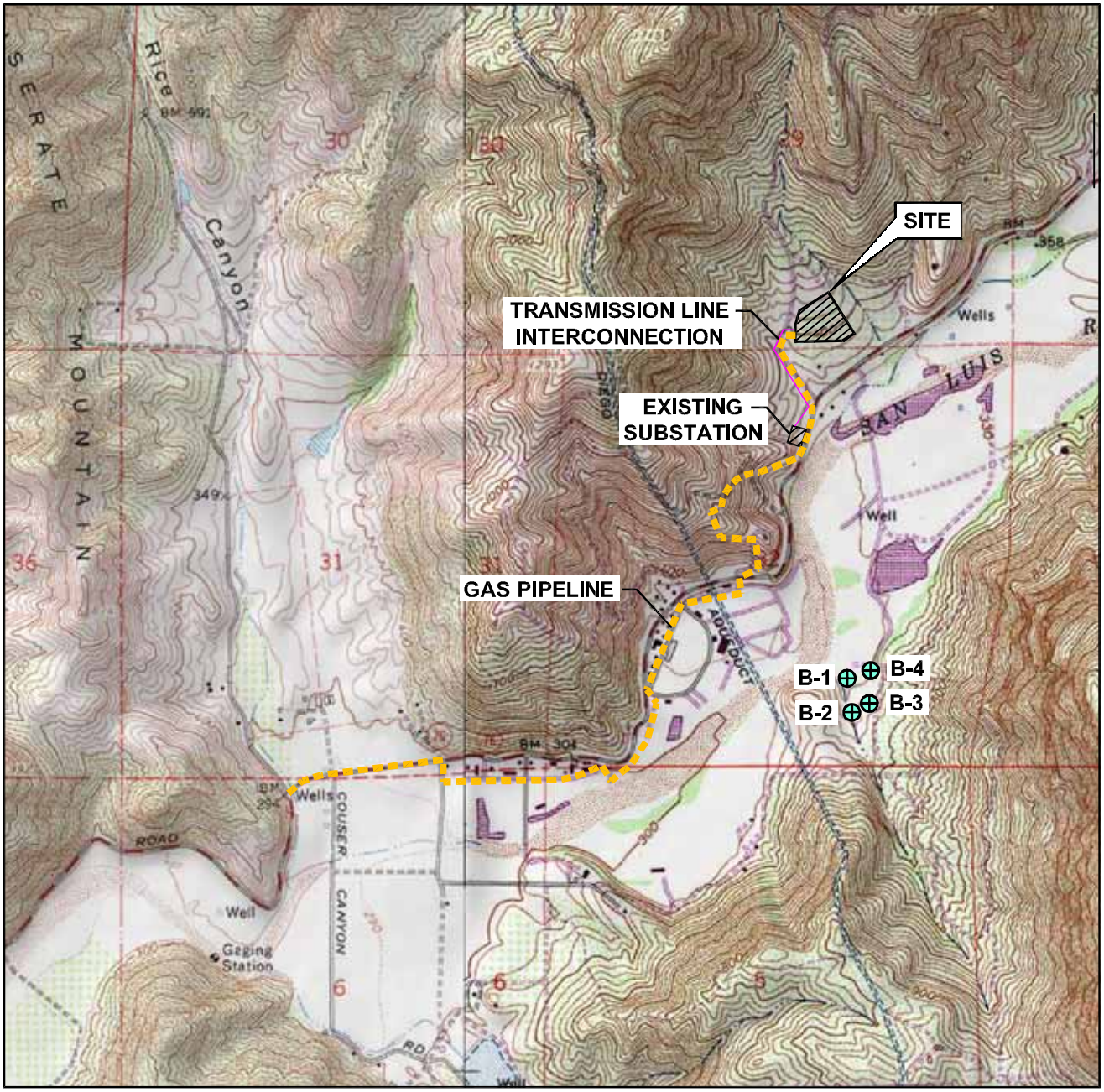
APPENDIX 6.3-D – LIQUEFACTION ANALYSIS FROM GREGORY CANYON LANDFILL EIR

APPENDIX 6.3-D1 – LOCATION OF BORINGS TESTED



N

0 1/4 1/2 3/4 1 MILE

SCALE 1:24,000

SOURCE:

United States Geological Survey
7.5 Minute Topographic Map, 2000:
Pala and Bonsall Quadrangles

TRC

PROJECT: 125158

FACILITY:

ORANGE GROVE PROJECT
SAN DIEGO COUNTY, CALIFORNIA

LOCATION OF BORINGS TESTED

FIGURE 6.3-D.1

PS=1:1 L:□Graphics□ProjectsByNumber□29-xxxx□29-0319□290319-Loc of Borings.dwg Jun 02, 2008 - 3:02pm aakers

APPENDIX 6.3-D2 – GREGORY CANYON LANDFILL FINAL EIR EXCERPTS

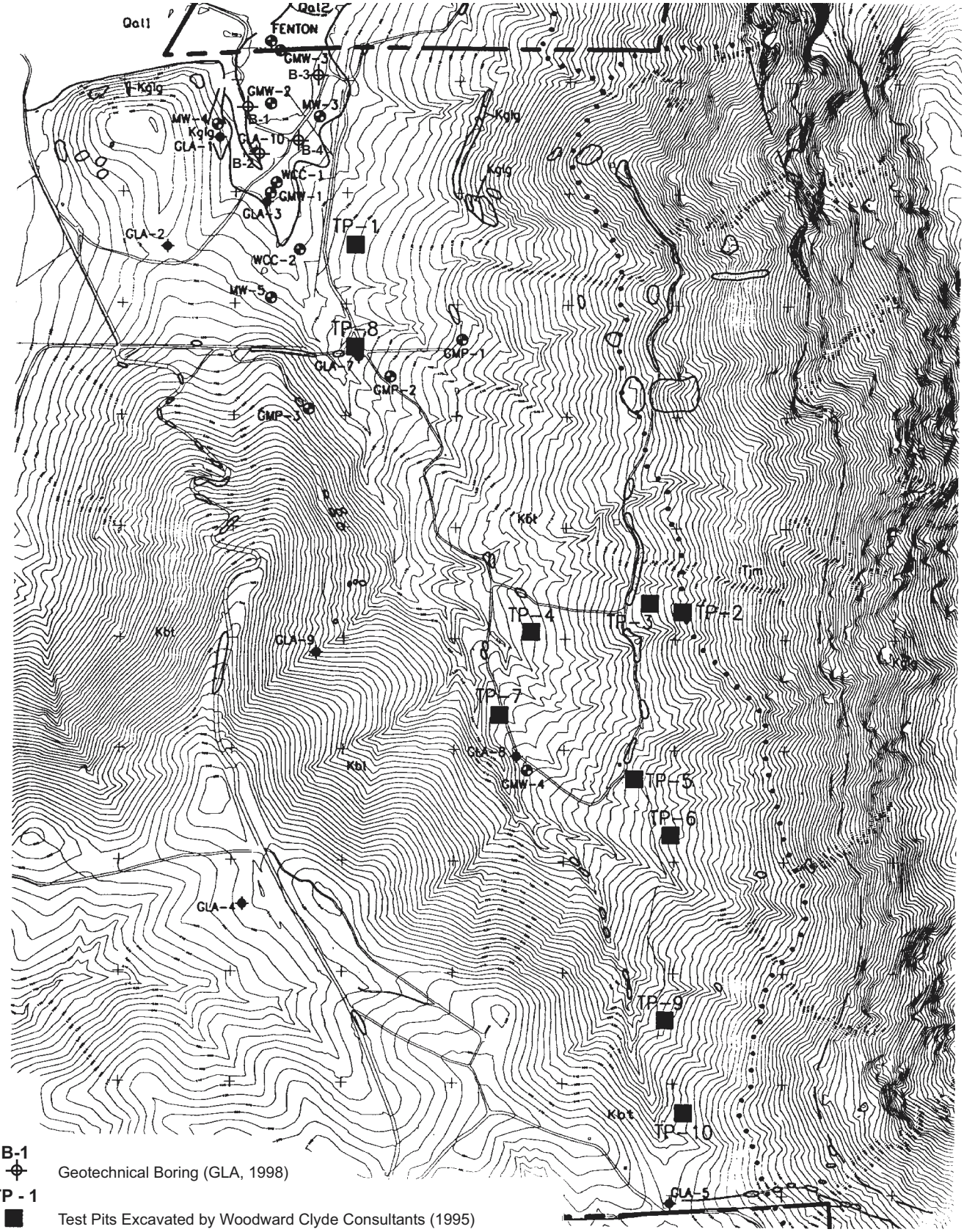
Soil Liquefaction

Seismic shaking can induce soil liquefaction of cohesionless soils that are saturated with water. Since grading operations at the project site will remove all loose soils from the footprint of the landfill, liquefaction will not occur within the landfill footprint. The ancillary facilities at the mouth of the canyon will be constructed over the alluvial wedge, however, and therefore soil liquefaction potential would exist in the event of strong seismic shaking.

Liquefaction typically occurs at depths less than 50 feet below ground surface (bgs), with the most susceptible conditions occurring in sandy soils with less than 15 percent silt and clay at depths shallower than 30 ft bgs. Deposits in which the zone of saturation is deeper than 50 ft bgs are generally stable regardless of their grain-size distribution.

GLA (1998) drilled and sampled the alluvial wedge at four different locations to a depth of 50 feet, and concluded that the soils are mostly silty sands and clayey sands with 14 to 45 percent silt and clay content. Depth to the zone of saturation varied between 19 and 26 feet bgs. The liquefaction susceptibility of these alluvial soils was then evaluated using the analytical procedure described by Seed and Idriss (1982). The procedure relies on the calculation of two parameters (cyclic-stress ratios, C_d and C_l) that determine liquefaction susceptibility. The first one represents the theoretical susceptibility to liquefaction of sediments with the same characteristics as those encountered, while the second represents actual resistance to liquefaction. Dividing the second ratio by the first one, the factor of safety against liquefaction is calculated. Table 4.2-8 summarizes the cyclic-stress ratios calculated for each location, and the calculated factors of safety. Factors of safety above 1.3 are considered conservatively adequate for engineering design.

As shown, the lowest calculated factor of safety is 1.39, and most other values are considerably higher. As a result, GLA (1998) concluded that the liquefaction susceptibility of the alluvial wedge at Gregory Canyon is low, and therefore, no significant impacts related to soil liquefaction are anticipated.



PCR

N

0 500 FEET

Exhibit 4.2-2
Location of Test Pits

Sources: GeoLogic Associates, 1998; David Evans and Associates, Inc., 1999;
PCR Services Corporation, 1999

TABLE 4.2-8
RESULTS OF LIQUEFACTION SUSCEPTIBILITY ANALYSIS

DEPTH IN FEET	MATERIAL	PERCENT FINES	DEPTH TO WATER TABLE (FT)	C_D FIRST CYCLIC-STRESS RATIO	C_L SECOND CYCLIC-STRESS RATIO	FACTOR OF SAFETY
Boring 1						
20	SM	17%	19	0.200	0.320	1.60
30	SM		19	0.234	0.700	2.99
40	SM		19	0.240	0.686	2.86
Boring 2						
30	SP/SM	14%	25	0.207	0.288	1.39
40	SM		25	0.218	0.679	3.12
Boring 3						
25	SM-SC	45%	24	0.195	0.500	2.56
35	SM-SC		24	0.219	0.700	3.20
45	SM		24	0.218	0.443	2.03
55	SM		24	0.203	0.660	3.26
Boring 4						
35	SM-SC	20%	26	0.211	0.302	1.43
45	SM-SC		26	0.212	0.672	3.17

Source: GeoLogic Associates, 1998