CASE STUDY #RV

Client: Vistoso Partnership

Location: Rancho Vistoso Golf Course, Tucson, Arizona, U.S.A.

Physical Site: Several sites consisting of above ground fuel tanks and power generators.

Problem: Surface and sub-surface diesel contamination from re-fueling operations (depth to 9 feet).

Previous Treatment: None

Site Characterization: Surface contaminated soil was excavated and placed in Bio-cells (5 cells consisting of a total of 300 cu. yds). Due to limited access at 4 locations (180 cu. yds.), in-situ clean-up methods were initiated by means of microbial/nutrient infiltration through perforated PVC piping. Pipes were installed vertically to a depth of 8 feet and horizontally connected at a depth of 6 feet.

Biological Treatment: January 1996 – Analytical tests showed TPH = 20,000 – 43,000 ppm. March 19, 1996 – PHase III, Inc. Nutrient was applied at ½ lb. per cubic yard. March 22, 1996, PHase III, Inc. PDM-7 H.C. Microbial Cultures and PDM-7 Nutrients were applied at a rate of ½ gallon per cu. yd. April 6, 1996, Phase III, Inc. PDM-7 H.C. Microbial Cultures and PDM-7 Nutrients were applied at a rate of ½ gallon per cu. yd. Bio-cells were rototilled every week and watered daily. Moisture levels were kept at 25%. In-situ sites were watered every 2 weeks (up to saturation point).

Biological Treatment Results Samples were taken April 19, 2002 and tested for TPH. are as follows:

BIOC-01 (Bio-Cell #1 40'L x 15'W x 18"D)	948 ppm
BIOC-02 (Bio-Cell #2 40'L x 15'W x 18"D)	1980 ppm
BIOC-03 (Bio-Cell #3 75'L x 20'W x 18"D)	1230 ppm
BIOC-04 (Bio-Cell #4 75'L x 20'W x 18"D)	1080 ppm
BIOC-05 (Bio-Cell #5 80'L x 20'W x 18"D)	438 ppm
In-Situ #1 (Area VLIS-07)	6340 ppm
In-Situ #1 (Area VPH-08)	452 ppm
In-Situ #1 (Area VPH-09)	26 ppm

In-Situ #2 (Area VLIS-06) 1850 ppm

Arizona TPH maximum limits for above sites are 7000 ppm. All sites meet criteria for clean up. In-situ #1 (Area VLIS-07) received an additional application of Oil Sponge H.C. and Oil Sponge Nutrient on April 23, 1996 to further reduce TPH levels. Sample from In-situ #1 (Area VLIS-07) was tested May 7, 1996 (results 870 ppm).

Conclusion: Degradation rates varied from a low of 90% to a high of 98.9% between 30-45 days. Attending consultant signed off and closed sites May 9, 1996.