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MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole
Log Data Report

Log Event A

Borehole # 50-09-09

Borehole Information

Farm :	T	**Tank :**	T-109	**Site Number :**	299-W10-120
N-Coord :	43,447	**W-Coord :**	75,882	**TOC Elevation :**	671.37
Water Level, ft :	116	**Date Drilled :**	8/31/1973		

Casing Record

Type :	Steel-welded	Thickness, in. :	0.280	ID, in. :	6
Top Depth, ft. :	0	Bottom Depth, ft. :	121		
Type :	Steel-welded	Thickness, in. :	0.250	ID, in. :	4
Top Depth, ft. :	0	Bottom Depth, ft. :	121		

Cement Bottom, ft. : 92 **Cement Top, ft. :** 0

Borehole Notes:

Borehole 50-09-09 was originally drilled in August 1973 to a depth of 92 ft with 6-in. casing. In April 1977, the borehole was deepened to 121 ft. The driller's log indicates that during borehole deepening activities, the core-barrel became stuck at a depth of 102 ft and the borehole had to be abandoned. However, deepening activities apparently resumed about 3 weeks later. There is nothing to indicate what activities took place during those 3 weeks or how the borehole was completed. On the basis of information presented in the driller's log, Chamness and Merz (1993), and observations made in the field, it appears the 6-in. casing was perforated, a 4-in. casing was placed inside the 6-in. casing, and the space between the two casings was grouted.

The tops of both casings, which are the zero reference for the SGLS, are approximately even with the ground surface.

Equipment Information

Logging System :	2B	**Detector Type :**	HPGe	**Detector Efficiency:**	35.0 %
Calibration Date :	10/1997	**Calibration Reference :**	GJO-HAN-14	**Logging Procedure :**	MAC-VZCP 1.7.10-1

Logging Information

Log Run Number :	1	**Log Run Date :**	12/23/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	0.0	**Counting Time, sec.:**	200	**L/R :** L **Shield :**	N
Finish Depth, ft. :	12.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

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Log Run Number :	2	**Log Run Date :**	12/24/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	12.0	**Counting Time, sec.:**	200	**L/R :** L **Shield :**	N
Finish Depth, ft. :	38.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a
Log Run Number :	3	**Log Run Date :**	12/29/1997	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	37.0	**Counting Time, sec.:**	200	**L/R :** L **Shield :**	N
Finish Depth, ft. :	78.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a
Log Run Number :	4	**Log Run Date :**	12/30/1997	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	118.0	**Counting Time, sec.:**	200	**L/R :** L **Shield :**	N
Finish Depth, ft. :	77.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Logging Operation Notes:

Borehole 50-09-09 was logged in four runs. The total logging depth achieved by the SGLS was 118 ft. Spectra were collected at intervals of 0.5 ft using a 200-s counting time.

At the time of logging, there was water in the borehole at a depth of 116 ft.

Analysis Information

Analyst : D.L. Parker

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 05/11/1998

Analysis Notes :

The pre-survey and post-survey field verification for each logging run met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from the field verification spectrum that most closely matched the field data were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra.

A casing correction factor for a 0.50-in.-thick steel casing was applied to the concentration data during the analysis process. Although this correction factor does not match actual field conditions, it is probably the closest to the field conditions. Use of this casing correction factor will cause radionuclide concentrations to be undercalculated.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

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A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A time-sequence plot of the historical gross gamma log data from 1975 to 1982 is presented with the SGLS log plots.

A time-sequence of the peak activities measured between 55 and 60 ft between January 1975 and May 1994 is also presented.

Results/Interpretations:

The only man-made radionuclide detected in this borehole was Cs-137. The Cs-137 contamination was detected almost continuously in the upper 3 ft of the borehole at apparent concentrations of about 0.2 pCi/g.

Apparent K-40 concentrations range from about 8 to 9 pCi/g between 1 and 37 ft and then increase slightly to about 12 to 13 pCi/g below about 38 ft. This concentration increase is probably caused by a change from backfill material above this depth to the undisturbed Hanford formation sediments below this depth. K-40 concentrations decrease sharply below about 50 ft. This concentration decrease is probably caused by an increase in coarser grained material below this depth.

KUT concentrations increase gradually from about 67 to 83 ft. This concentration increase may be from a fining downward sequence within the Hanford formation sediments.

The Th-232 concentrations increase below about 83 ft. This concentration increase may represent the upper contact of the Plio-Pleistocene unit. KUT concentrations decrease sharply at about 93 ft, probably indicating the caliche interval occurs at this depth.