RUST GEOTECH INC.

Spectral Gamma-Ray Borehole
Log Data Report

Borehole 51-00-09

Log Event A

Borehole Information

Farm : TX	**Tank :** TX	**Site Number :** 299-W15-74
N-Coord : 41,803	**W-Coord :** 76,126	**TOC Elevation :** 668.86
Water Level, ft : 132.50	**Date Drilled :** 3/31/1949	

Casing Record

Type : Steel-welded	Thickness, in. : 0.313	ID, in. : 8
Top Depth, ft. : 0	Bottom Depth, ft. : 150	

Borehole Notes:

This borehole was drilled in February and March 1949. A starter casing of unknown diameter was installed to a depth of 15 ft. The borehole was completed to a depth of 150.5 ft with 8-in. casing. The casing was perforated between 40 and 100 ft. Three-hundred perforations were made in this interval. There is no indication that the bottom of the borehole was cemented or if grout was placed in the annulus between the borehole wall and the permanent casing in the upper 15 ft of the borehole. Water was encountered at 132.5 ft.

The casing thickness is presumed to be 0.322 in., on the basis of published thickness for schedule-40, 8-in. steel tubing.

The top of the casing is the starting depth for the logs. The casing collar is about even with the ground surface.

Equipment Information

Logging System : 1	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 11/1995	**Calibration Reference :** GJPO-HAN-3	**Logging Procedure :** P-GJPO-1783

Log Run Information

Log Run Number :	1	**Log Run Date :**	2/13/1996	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	0.0	**Counting Time, sec.:**	100	**L/R :** L **Shield :**	N
Finish Depth, ft. :	19.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	2	**Log Run Date :**	2/14/1996	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	138.5	**Counting Time, sec.:**	100	**L/R :** L **Shield :**	N
Finish Depth, ft. :	50.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

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Log Run Number :	3	**Log Run Date :**	2/15/1996	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	51.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	18.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Analysis Information

Analyst : H.D. Mac Lean

Data Processing Reference : P-GJPO-1787 Analysis Date : 2/24/1997

Analysis Notes :

This borehole was logged by the SGLS in three runs. The pre-survey field verification spectra for the three logging runs failed to meet the acceptance criteria established for the peak shape and system efficiency. A nonconformance report issued in August 1996 (N-96-05) identified the cause of this failure as a power supply malfunction that resulted in a low detector bias voltage supplied to the detector. This malfunction occurred in the mornings because of inadequate system warm-up time. The nonconformance report also documents that radionuclide concentrations calculated from data collected in the first 2 hours of logging operation could be systematically underestimated by about 10 percent. Data collected between 0 and 19 ft (first log run) will be unaffected. Data collected from the bottom 30 ft of the borehole (second log run) and data collected between 51 and 19 ft (third log run) may show a repeatability problem if the borehole is relogged in the future.

The post-survey field verification spectra for all the logging runs passed the acceptance criteria for the peak shape and system efficiency, indicating that the logging system was operating within specifications after an initial warm-up period. The energy calibration and peak-shape calibration from the post-survey field verification spectra were used to establish the channel-to-energy parameters used in processing the spectra acquired during logging. Slight gain drift was experienced during brief intervals during the second log run. It was necessary to adjust the energy calibration to compensate for this drift while processing the data from some of the logging spectra in order to maintain proper peak identification.

A correction factor for a 0.322-in.-thick casing was not available; therefore, a casing correction factor for a 0.330-in.-thick steel casing was applied during analysis. Use of the correction factor for the thicker casing may result in calculated radionuclide concentrations that are slightly higher than the actual concentrations.

Depth overlaps, where data were collected by separate runs at the same depth, occurred in this borehole between 18 and 19 ft and between 50 and 51 ft. The concentrations of K-40 and Th-232 using the separate data sets at the overlapping depths were within the statistical uncertainty of the measurements, indicating very good repeatability of the measurements. The difference in the measured concentrations of U-238 using the separate data sets exceeded the uncertainty of the measurements. A possible explanation for this discrepancy appears below.

The only man-made radionuclide identified in this borehole was Cs-137. The Cs-137 concentrations were detected almost continuously between 75 and 110 ft in concentrations generally below 1 pCi/g. The maximum measured concentration was just below 2 pCi/g at 81.5 ft. Cs-137 concentrations were also encountered intermittently between 43 and 75 ft, at 1 ft, and at the ground surface. Measured concentrations at these points were about 0.2 pCi/g, barely above the MDL.

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A steplike increase in the measured K-40 concentration was detected from about 12 pCi/g above 38 ft to about 18 pCi/g below 38 ft. A lesser change in the Th-232 background was detected at 38 ft. A noticeable decrease in the measured K-40 and Th-232 concentration was detected between 105 and 120 ft and the background concentration of both K-40 and Th-232 decreases at 131 ft.

The observed change in the U-238 background concentration at about 18 ft coincides with the logging runs in this region of the borehole. The calculated U-238 concentration is derived from the measured Bi-214 concentration that must be in secular equilibrium with the U-238. Rn-222, an intermediate member of the U-238 decay chain, is a gas and the concentration does not necessarily remain constant between logging runs.

Additional information and interpretations of log data are included in the main body of the TSDRs for tanks TX-108 and TX-112.

Log Plot Notes:

Separate log plots show the man-made radionuclide (Cs-137) and the naturally occurring radionuclides (KUT). The concentrations of 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.

A combination plot shows the concentrations of the man-made and natural radionuclides, the total gamma-ray activity derived from the spectral data and the Tank Farm 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.