



Borehole **30-09-11**

Log Event A

**Borehole Information**

|                         |                                 |                                  |
|-------------------------|---------------------------------|----------------------------------|
| Farm : <u>C</u>         | Tank : <u>C-109</u>             | Site Number : <u>299-E27-100</u> |
| N-Coord : <u>43,045</u> | W-Coord : <u>48,349</u>         | TOC Elevation : <u>644.99</u>    |
| Water Level, ft :       | Date Drilled : <u>7/31/1974</u> |                                  |

**Casing Record**

|                            |                                |                    |
|----------------------------|--------------------------------|--------------------|
| Type : <u>Steel-welded</u> | Thickness : <u>0.280</u>       | ID, in. : <u>6</u> |
| Top Depth, ft. : <u>0</u>  | Bottom Depth, ft. : <u>100</u> |                    |

**Borehole Notes:**

This borehole was drilled in July 1974. A driller's log was not available for this borehole. According to Chamness and Merz (1993), the borehole was completed to a depth of 100 ft with 6-in. diameter casing. There was no mention of perforations or grouting; therefore, it is assumed that the casing is not perforated or grouted. The casing thickness is assumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. casing. The top of the casing is the zero reference for the log. The casing lip is approximately even with the ground surface.

**Equipment Information**

|                                   |   |  |
|-----------------------------------|---|--|
| Logging System : <u>1B</u>        | Detector Type : <u>HPGe</u>               | Detector Efficiency: <u>35.0 %</u>     |
| Calibration Date : <u>02/1997</u> | Calibration Reference : <u>GJO-HAN-13</u> | Logging Procedure : <u>P-GJPO-1783</u> |

**Log Run Information**

|                                 |                                  |                                       |
|---------------------------------|----------------------------------|---------------------------------------|
| Log Run Number : <u>1</u>       | Log Run Date : <u>03/25/1997</u> | Logging Engineer: <u>Alan Pearson</u> |
| Start Depth, ft.: <u>0.0</u>    | Counting Time, sec.: <u>100</u>  | L/R : <u>L</u> Shield : <u>N</u>      |
| Finish Depth, ft. : <u>10.0</u> | MSA Interval, ft. : <u>0.5</u>   | Log Speed, ft/min.: <u>n/a</u>        |
| Log Run Number : <u>2</u>       | Log Run Date : <u>03/26/1997</u> | Logging Engineer: <u>Alan Pearson</u> |
| Start Depth, ft.: <u>98.5</u>   | Counting Time, sec.: <u>100</u>  | L/R : <u>L</u> Shield : <u>N</u>      |
| Finish Depth, ft. : <u>14.0</u> | MSA Interval, ft. : <u>0.5</u>   | Log Speed, ft/min.: <u>n/a</u>        |
| Log Run Number : <u>3</u>       | Log Run Date : <u>03/27/1997</u> | Logging Engineer: <u>Alan Pearson</u> |
| Start Depth, ft.: <u>15.0</u>   | Counting Time, sec.: <u>100</u>  | L/R : <u>L</u> Shield : <u>N</u>      |
| Finish Depth, ft. : <u>9.0</u>  | MSA Interval, ft. : <u>0.5</u>   | Log Speed, ft/min.: <u>n/a</u>        |



Borehole **30-09-11**

Log Event A

---

### Analysis Information

---

Analyst : H.D. Mac Lean

Data Processing Reference : MAC-VZCP 1.7.9

Analysis Date : 09/23/1997

#### Analysis Notes :

The SGLS log of this borehole was completed in three logging runs using a centralizer. The pre-survey field verification spectra for all logging runs met the acceptance criteria established for peak shape and system efficiency, but the post-survey field verification spectra for logging run two failed to meet the acceptance criteria. The energy and peak-shape calibration from the pre-survey field verification spectra were used to establish the channel-to-energy parameters used in processing the spectra acquired during the logging runs. There was negligible gain drift during the logging runs and it was not necessary to adjust the established channel to energy parameters to maintain proper peak identification.

Casing correction factors for a 0.280-in.-thick casing were applied during the analysis.

Cs-137 was the only man-made radionuclide detected in this borehole log. Cs-137 contamination was detected continuously from the ground surface to a depth of 15.5 ft, intermittently from 16.5 to 41 ft, continuously from 44.5 to 47.5 ft, at 66.5 ft, and continuously from 93.5 to 98.5 ft. The measured concentration in the upper 12 ft of the logged interval ranged from 2 to 4 pCi/g. The measured Cs-137 concentrations below a depth of about 12 ft ranged from 0.2 pCi/g (just above the MDL) to about 3 pCi/g. Peaks in the measured concentrations occur at depths of 1, 9, 45.5, and 95 ft. The measured Cs-137 concentration at the ground surface was about 19 pCi/g.

An analysis of the shape factors associated with applicable segments of the spectra was performed. The shape factors provide insights into the distribution of the Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides.

The logs of the naturally occurring radionuclides show that the K-40 concentrations increase from a background of about 14 pCi/g from the ground surface to 41 ft, increase to about 16 pCi/g from 41 to 78 ft, and increase again to a background of 17 to 20 pCi/g below 78 ft. The K-40 concentration is variable between 41 and 78 ft, with 5-ft to 7-ft-thick intervals showing slightly higher or slightly lower concentrations.

Increased U-238 concentrations occur from 40.5 to 44.5 ft. The U-238 and Th-232 concentrations peak at 86.5 ft.

Details concerning the interpretation of data for this borehole are presented in the Tank Summary Data Reports for tanks C-109 and C-111.

#### 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.



Borehole **30-09-11**

Log Event A

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.

Plots of the spectrum shape factors are included. The plots are used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.