

## 299-E33-25 (A6858) Log Data Report

### Borehole Information:

<b>Borehole:</b> 299-E33-25 (A6858)		<b>Site:</b> 216-B-61 Crib			
<b>Coordinates</b> (WA State Plane)		<b>GWL (ft)<sup>1</sup>:</b> 233.05		<b>GWL Date:</b> 9/16/2002	
<b>North</b>	<b>East</b>	<b>Drill Date</b>	<b>TOC<sup>2</sup> Elevation</b>	<b>Total Depth (ft)</b>	<b>Type</b>
137,681.63 m	573,365.23 m	Feb. 1969	193.336 m	240	Cable Tool

### Casing Information:

<b>Casing Type</b>	<b>Stickup (ft)</b>	<b>Outer Diameter (in.)</b>	<b>Inside Diameter (in.)</b>	<b>Thickness (in.)</b>	<b>Top (ft)</b>	<b>Bottom (ft)</b>
Welded steel	3.0	6 5/8	6	5/16	0	238
The logging engineer measured the casing stickup using a steel tape. A caliper was used to determine the outside casing diameter. The caliper was measured using a steel tape and rounded to the nearest 1/16 in. Inside casing diameter was measured using a steel tape and also rounded to the nearest 1/16 in. Casing thickness was calculated. Casing bottom is as reported from the well construction summary report.						

### Borehole Notes:

Borehole coordinates, elevation, and well construction information, as shown in the above tables, are from measurements by Stoller field personnel and Ledgerwood (1993). The depths have been adjusted to TOC. Zero reference is the top of the 6-in. casing. Top of casing stickup is for the most part evenly cut. A reference point survey "X" is located on top of the casing stickup. The casing is perforated from 202 to 236 ft (Ledgerwood 1993).

### Logging Equipment Information:

<b>Logging System:</b>	Gamma 1D	<b>Type:</b>	SGLS (35%)
<b>Calibration Date:</b>	07/01/01	<b>Calibration Reference:</b>	GJO-2002-243-TAR
		<b>Logging Procedure:</b>	MAC-HGLP 1.6.5, Rev. 0

### Spectral Gamma Logging System (SGLS) Log Run Information:

<b>Log Run</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	
Date	09/16/02	09/17/02	09/18/02	09/18/02	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	105.0	232.0	135.5	26.0	
Finish Depth (ft)	3.0	134.5	104.0	3.0	
Count Time (sec)	100	100	100	100	
Live/Real	R	R	R	R	
Shield (Y/N)	N/A <sup>3</sup>	N/A	N/A	N/A	
MSA Interval (ft)	0.5	0.5	0.5	0.5	
ft/min	N/A	N/A	N/A	N/A	
Pre-Verification	AD037CAB	AD038CAB	AD039CAB	AD039CAB	
Start File	AD037000	AD038000	AD039000	AD039064	

Log Run	1	2	3	4	
Finish File	AD037204	AD038195	AD039063	AD039110	
Post-Verification	AD037CAA	AD038CAA	AD039CAA	AD039CAA	
Depth Return Error (in.)	-1	-1	N/A	0	
Comments	No fine-gain adjustment.	No fine-gain adjustment.	No fine-gain adjustment.	Repeat section. No fine-gain adjustment.	

### **Logging Operation Notes:**

Zero reference was the top of casing. Logging was performed with a centralizer installed on the sonde. Logging began at 232 ft below TOC, which is 1 ft above groundwater level. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT ( $^{40}\text{K}$ ,  $^{238}\text{U}$ , and  $^{232}\text{Th}$ ) verifier with serial number 118. Post-run peak counts per second (cps) for U and K were not within the verification criteria for file AD038CAA. Post-run peak counts per second for KUT were not within the verification criteria for file AD039CAA. The cause of the failure of the post-run verification spectra to meet the verification criteria is unknown.

### **Analysis Notes:**

<b>Analyst:</b>	Sobczyk	<b>Date:</b>	09/30/02	<b>Reference:</b>	GJO-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. The verification spectra were all within the control limits. Two of the post-run verification spectra were within the upper and lower control limits but significantly lower than the pre-run values. The peak counts per second at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were generally lower and between 6 and 16 percent of one another. Examinations of spectra suggest that the detector appears to have functioned with reduced sensitivity during log runs 2, 3, and 4. The log data are provisionally accepted, subject to further review and analysis.

Log spectra for the SGLS were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G1DJul01.xls), using parameters determined from analysis of calibration data. Zero reference is the top of the casing. The casing configuration was assumed to be one string of 6-in. casing with a thickness of 0.280 in. to a depth of 238 ft. A casing thickness of 0.280 in. is the published value for ASTM schedule-40 steel pipe (a commonly used casing material at Hanford). This casing thickness is within the range of measurement error associated with the logging engineer's measurements. A water correction was not needed or applied to the SGLS data. Dead time corrections were not needed since dead time did not exceed 10.5 percent.

### **Log Plot Notes:**

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides ( $^{40}\text{K}$ ,  $^{238}\text{U}$ , and  $^{232}\text{Th}$ ), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The  $^{214}\text{Bi}$  peak at 609 keV was used to determine

the naturally occurring  $^{238}\text{U}$  concentrations on the combination plot rather than the  $^{214}\text{Bi}$  peak at 1764 keV because it exhibited slightly higher net counts per second.

### **Results and Interpretations:**

$^{137}\text{Cs}$  and  $^{60}\text{Co}$  were the man-made radionuclides detected in this borehole.  $^{137}\text{Cs}$  was detected in the borehole from the ground surface to 5.5 ft with a maximum concentration of 5.7 pCi/g at a log depth of 5.0 ft.  $^{137}\text{Cs}$  was also detected at 50, 208, 216.5, and 220 ft with concentrations between 0.2 pCi/g and 0.3 pCi/g.  $^{60}\text{Co}$  was detected in the interval from 224 ft through total depth (232 ft). The range of concentrations was from the MDL (0.1 pCi/g) to 0.7 pCi/g, which was detected at total depth. A 1408-keV photopeak was detected at 104 ft. Confirming photopeaks for  $^{152}\text{Eu}$  were not apparent in this spectrum, and this peak is probably a  $^{214}\text{Bi}$  peak (indicative of natural  $^{238}\text{U}$ ). As such, it was not included in the log plots.

Recognizable changes in the KUT logs occurred in this borehole. Changes of about 4 pCi/g in apparent  $^{40}\text{K}$  concentrations occur at approximately 24 and 135 ft. The increase in  $^{40}\text{K}$  concentrations at 24 ft corresponds with the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2. At 135 ft, the change in apparent  $^{40}\text{K}$  concentrations may be due to the difference in tool sensitivity at the beginning of log run 3 versus the end of log run 2.  $^{232}\text{Th}$  concentration increases by about 0.5 pCi/g from 54 through 55 ft.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for both the man-made and natural radionuclides (661, 609, 1461, 1764, and 2614 keV). In addition,  $^{137}\text{Cs}$  was detected at 6.0 and 9.5 ft at an activity near its MDL of about 0.25 pCi/g on the repeat log run and not on the original log run.

Gross gamma profiles from Additon et al. (1978) (attached) also detected gamma-ray-emitting contamination. Logs from 4/24/70 and 2/20/76 detected elevated gamma-ray activity above background in the interval between 226 and 236 ft (69 and 72 m). The SGLS detected  $^{60}\text{Co}$  in the interval from 228 to 232 ft with a maximum activity of 0.7 pCi/g.

### **References:**

Additon, M.K., K.R. Fecht, T.L. Jones, and G.V. Last, 1978. *Scintillation Probe Profiles From 200 East Area Crib Monitoring Wells*, RHO-LD-28, Rockwell Hanford Operations, Richland, Washington.

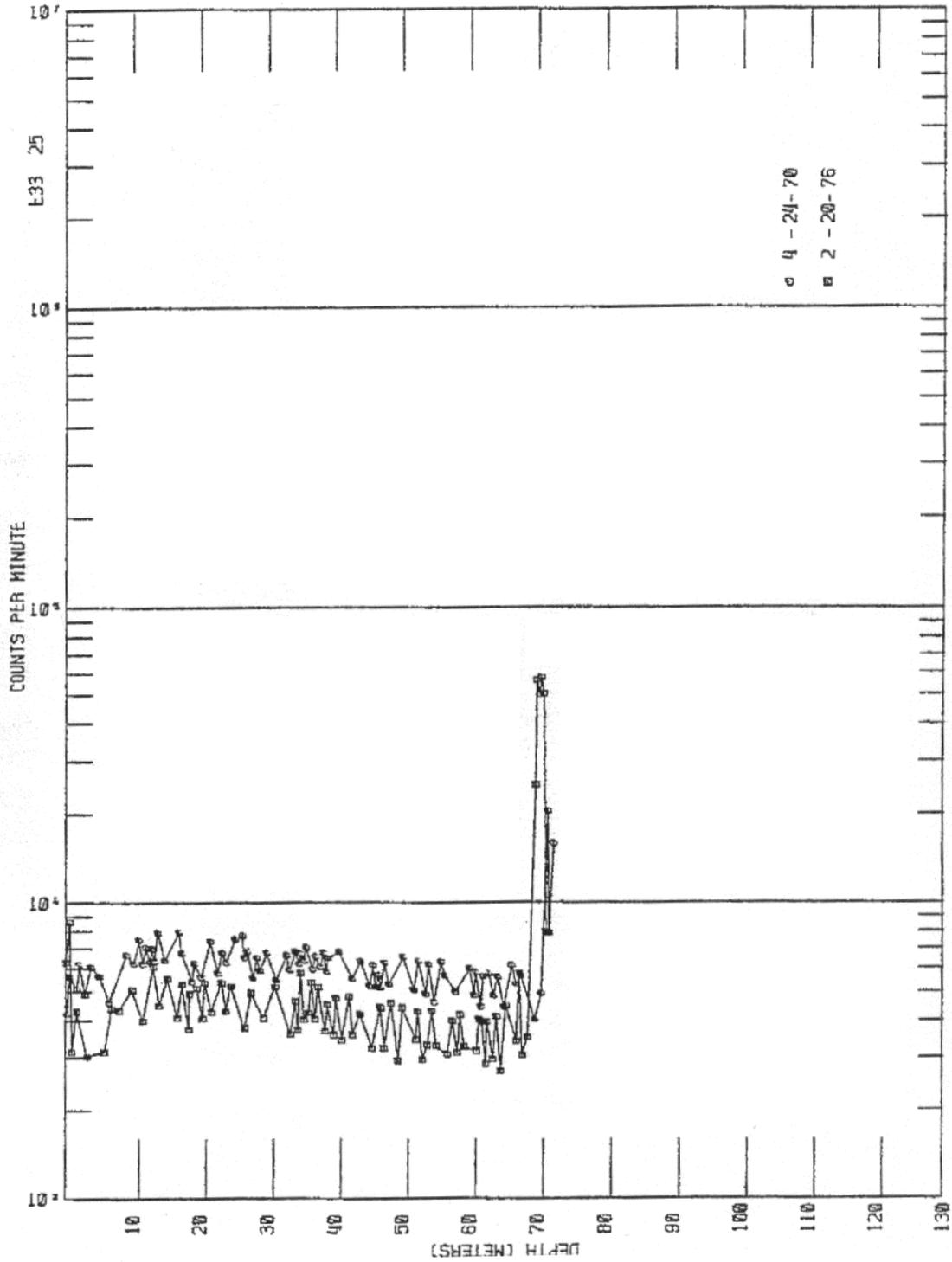
Ledgerwood, R.K., 1993. *Summaries of Well Construction Data and Field Observations for Existing 200-East Resource Protection Wells*, WHC-SD-ER-TI-007, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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<sup>1</sup> GWL – groundwater level

<sup>2</sup> TOC – top of casing

<sup>3</sup> N/A – not applicable

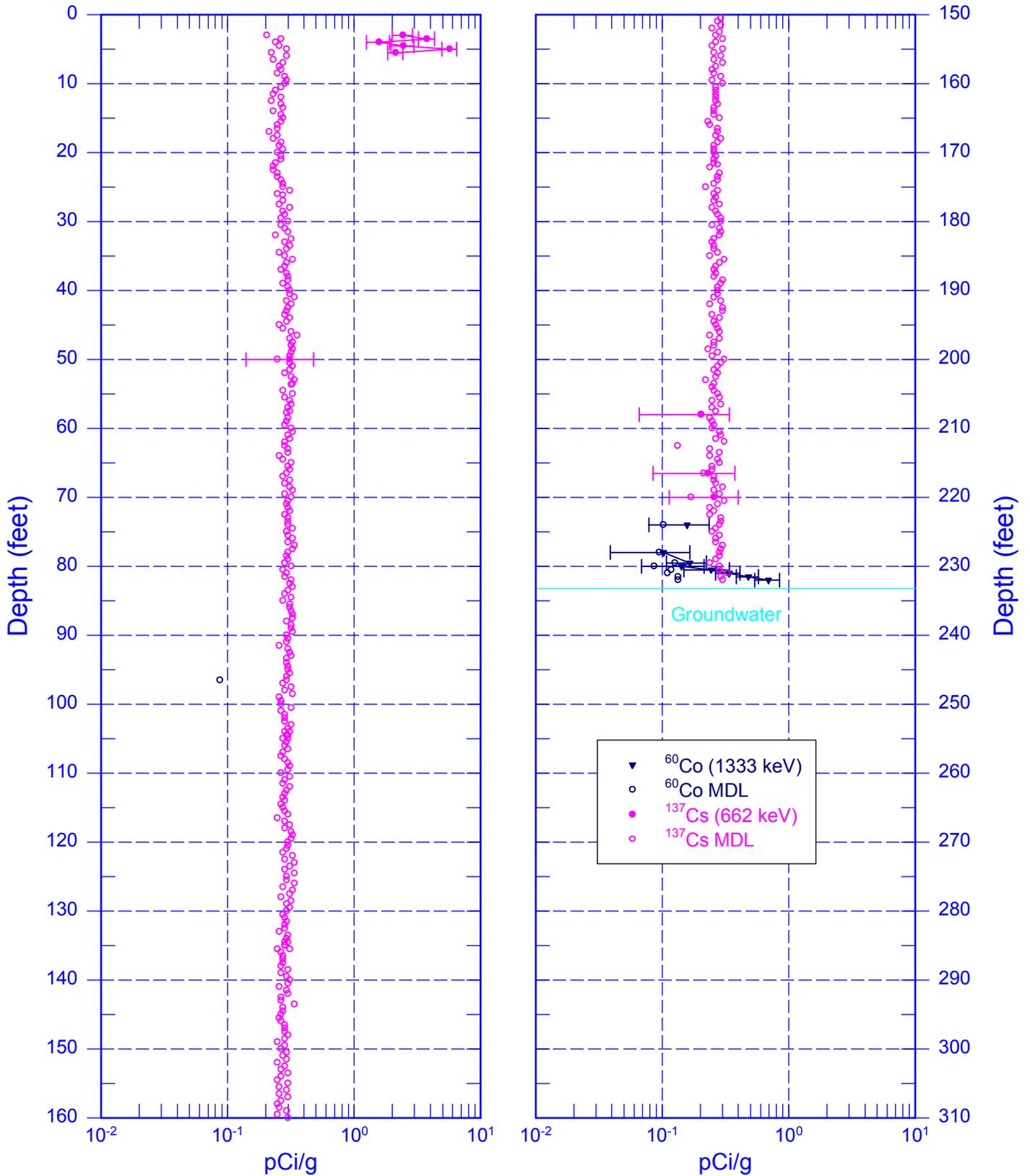


from Additon et al. (1978)

Scintillation Probe Profiles for Borehole 299-E33-25 (logged on 4/24/70 and 2/20/76)

# 299-E33-25 (A6858)

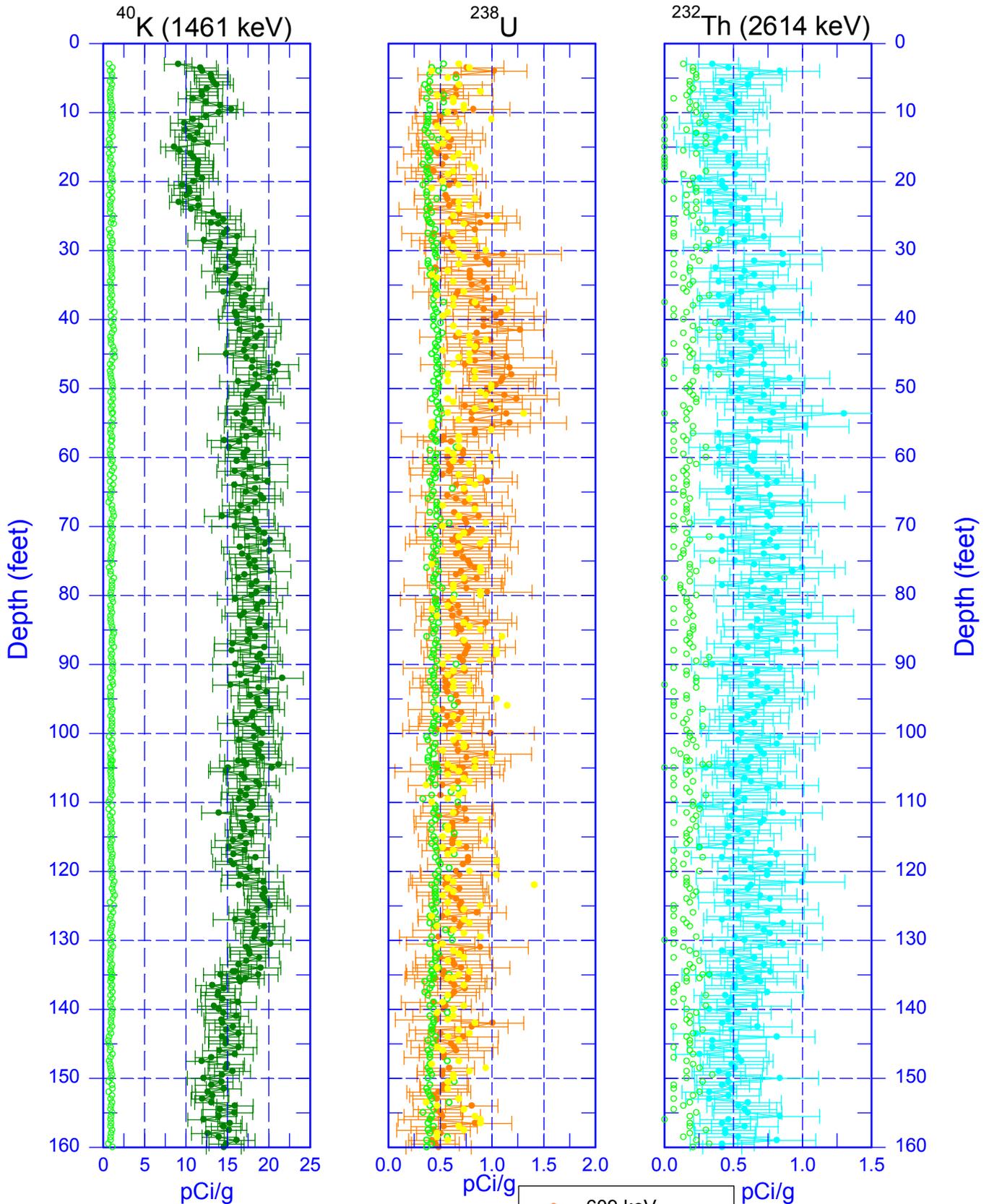
## Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run  
09/18/2002

# 299-E33-25 (A6858) Natural Gamma Logs



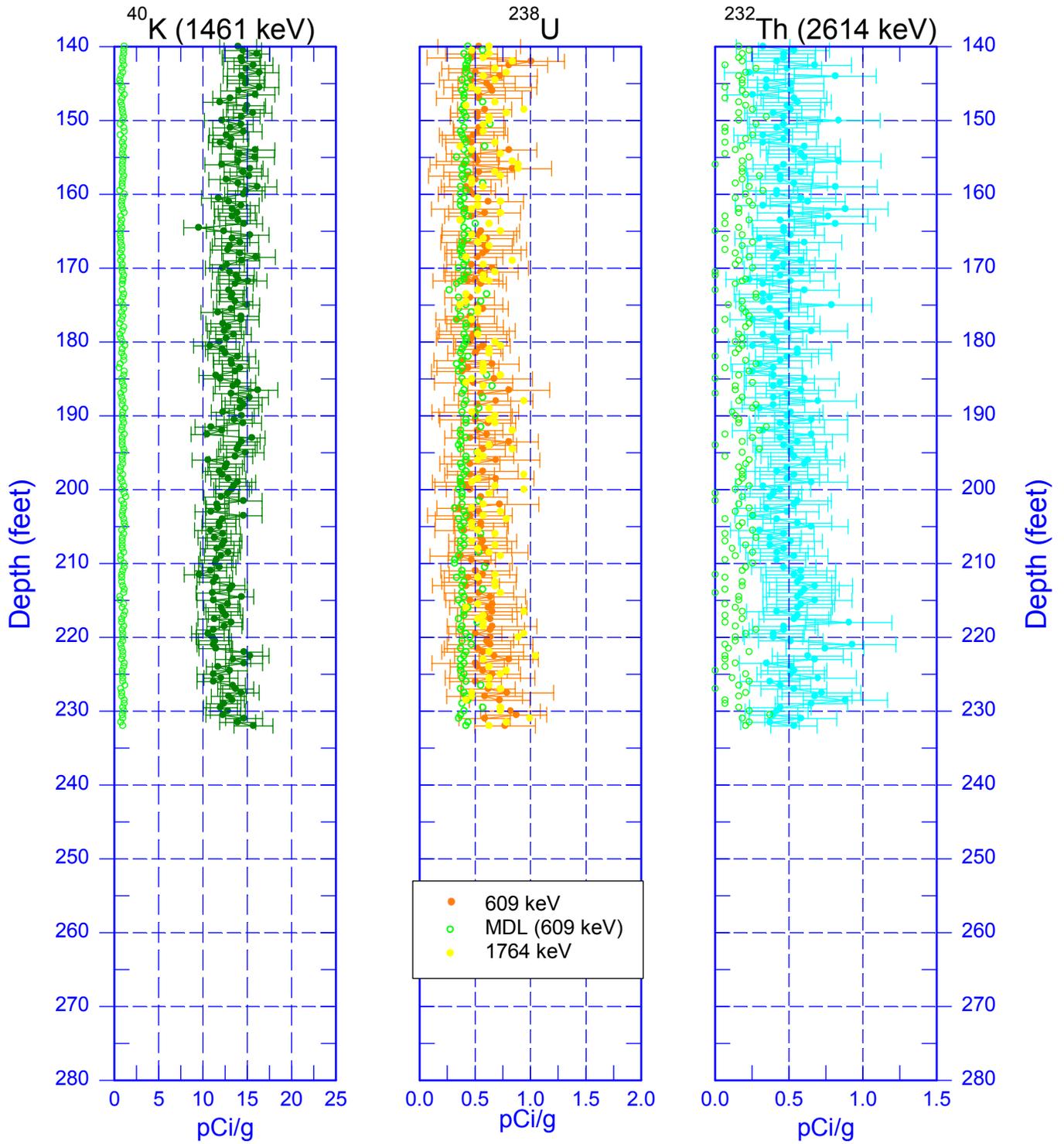
○ MDL

- 609 keV
- MDL (609 keV)
- 1764 keV

Zero Reference = Top of Casing

Date of Last Logging Run  
09/18/2002

# 299-E33-25 (A6858) Natural Gamma Logs



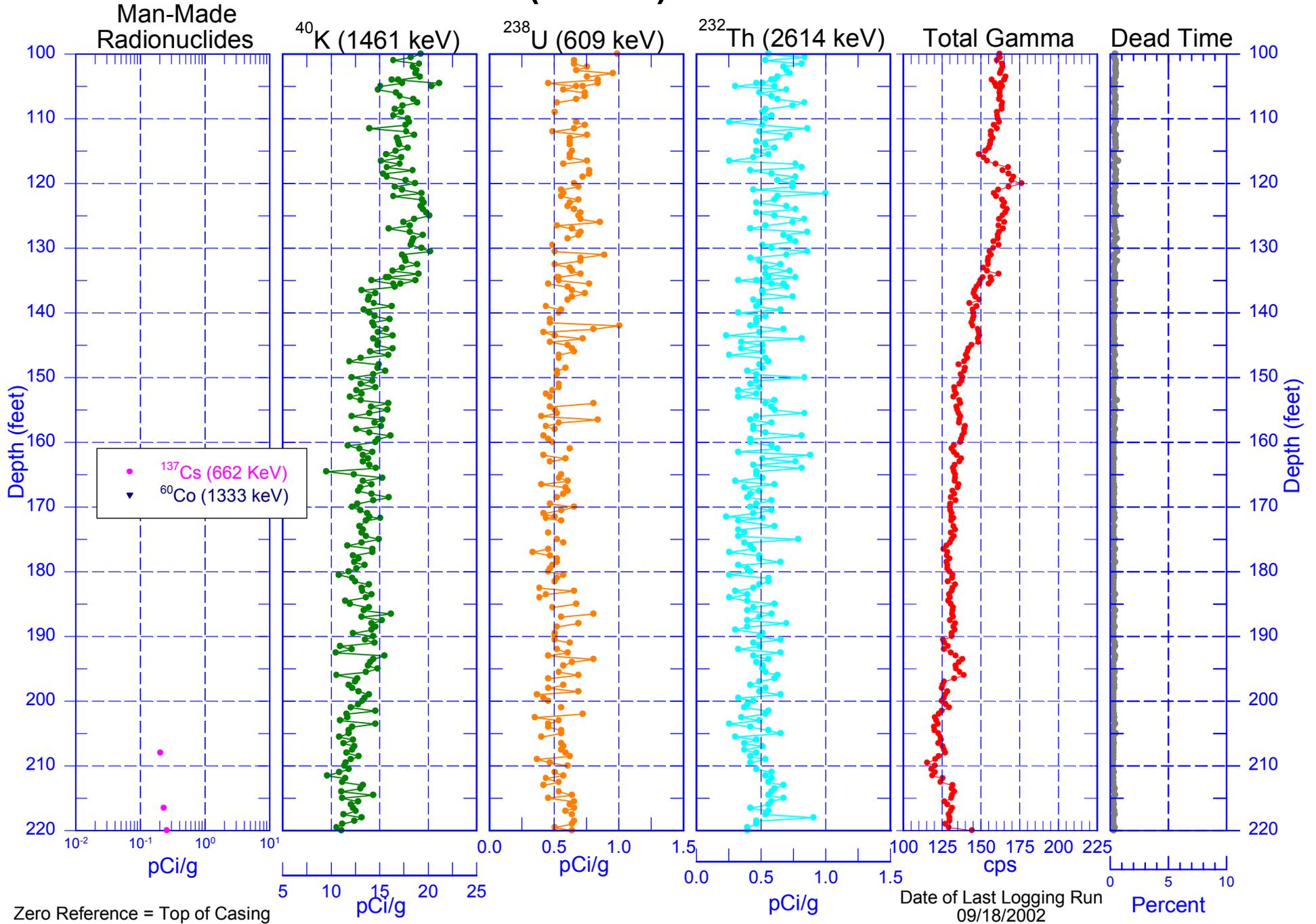
○ MDL

Zero Reference = Top of Casing

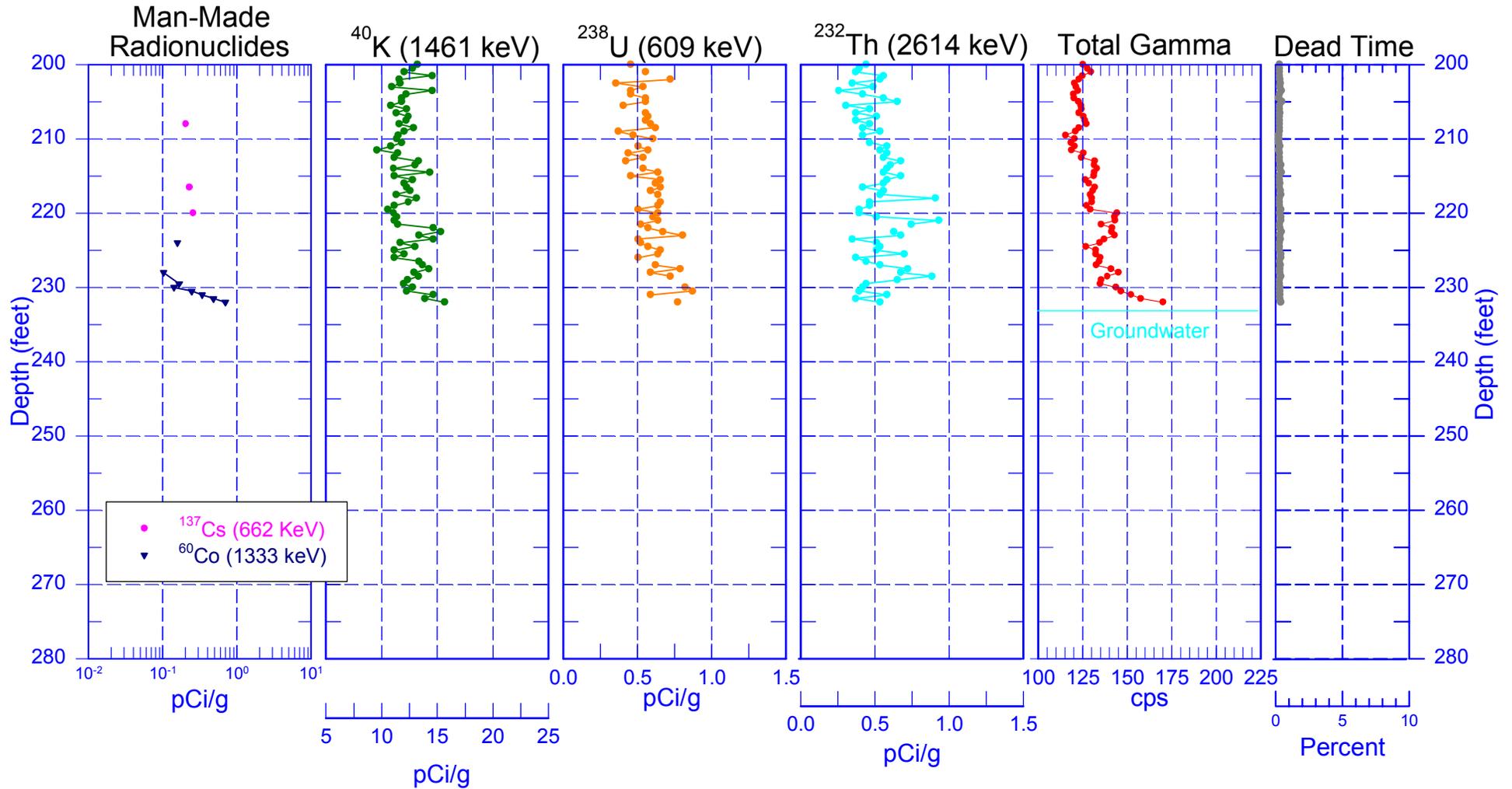
Date of Last Logging Run  
09/18/2002



# 299-E33-25 (A6858) Combination Plot



# 299-E33-25 (A6858) Combination Plot

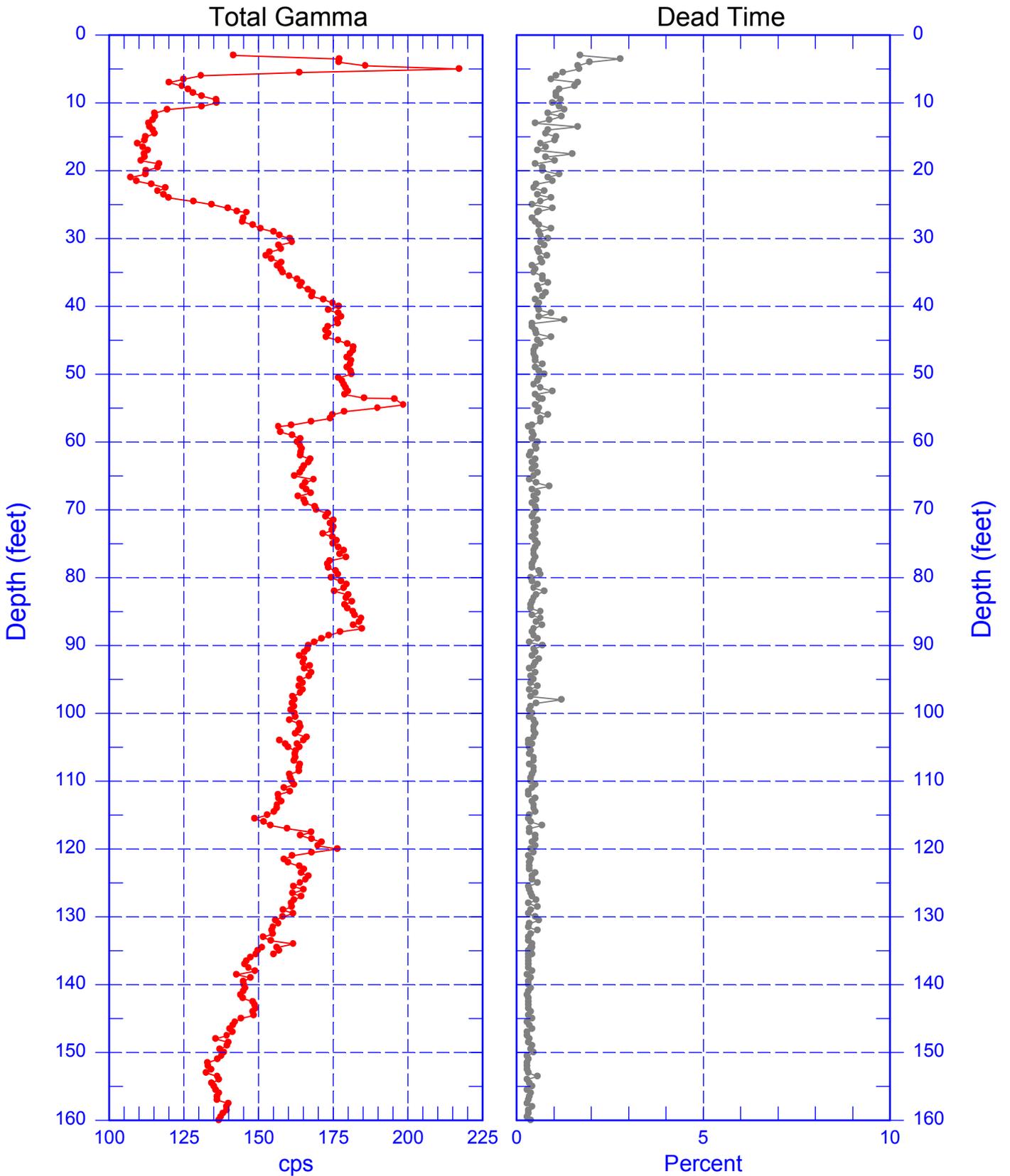


Zero Reference = Top of Casing

Date of Last Logging Run  
09/18/2002

# 299-E33-25 (A6858)

## Total Gamma & Dead Time

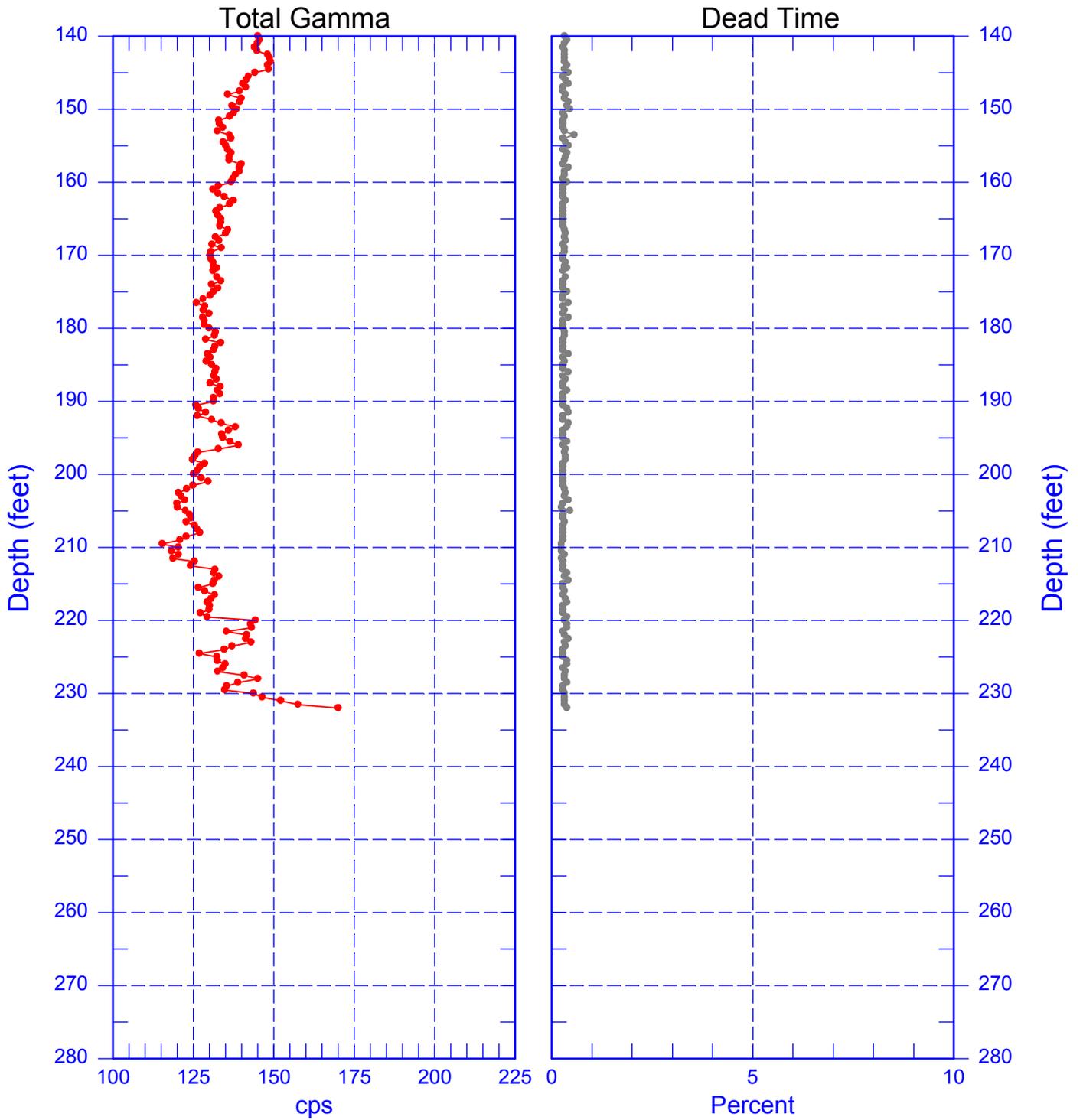


Date of Last Logging Run  
09/18/2002

Zero Reference = Top of Casing

# 299-E33-25 (A6858)

## Total Gamma & Dead Time

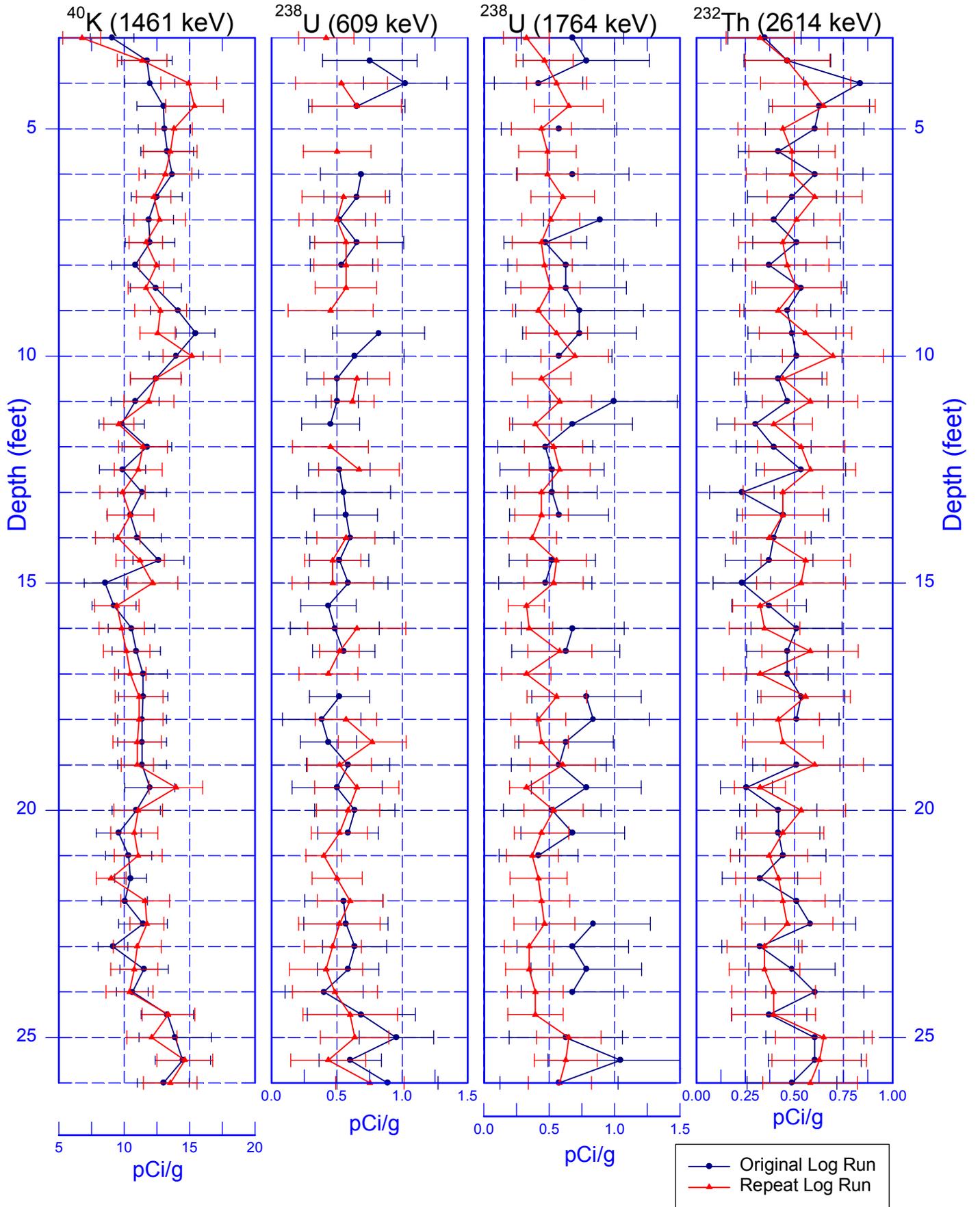


Date of Last Logging Run  
09/18/2002

Zero Reference = Top of Casing

# 299-E33-25 (A6858)

## Rerun of Natural Gamma Logs (26.0 to 3.0 ft)



# 299-E33-25 (A6858)

## Rerun of Man-Made Radionuclides (26.0 to 3.0 ft)

