



## 299-E28-57 (A6808)

### Log Data Report

#### Borehole Information:

<b>Borehole:</b> 299-E28-57 (A6808)		<b>Site:</b> 216-B-9 Crib			
<b>Coordinates (WA State Plane)</b>		<b>GWL (ft)<sup>1</sup>:</b> Not reached		<b>GWL Date:</b> N/A <sup>2</sup>	
<b>North</b>	<b>East</b>	<b>Drill Date</b>	<b>TOC<sup>3</sup> Elevation</b>	<b>Total Depth (ft)</b>	<b>Type</b>
136,851.4 m	573,843.1 m	July 1948	208.3 m	150	Cable Tool

#### Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel Welded	1.9	8.625	8.0	0.3125	0	152

#### Borehole Notes:

The logging engineer measured the stickup using a steel tape. Stickup was measured between an engraved "X" on top of the casing and the ground surface. Calipers were used to measure the casing wall thickness and the outside diameter. The inside diameter is calculated. Zero reference is the top of casing stickup. Top of casing stickup is cut squarely. HWIS<sup>4</sup> is the source of the TOC elevation and coordinates. Total depth (ground level reference) and casing bottom (TOC reference) are reported from information provided in Chamness and Merz (1993). On 03/12/02, the borehole was swabbed, and no contamination was detected.

#### Logging Equipment Information:

<b>Logging System:</b> Gamma 2B	<b>Type:</b> SGLS (35%)
<b>Calibration Date:</b> 11/01/01	<b>Calibration Reference:</b> GJO-2002-287-TAR
<b>Logging Procedure:</b> MAC-HGLP 1.6.5, Rev. 0	

<b>Logging System:</b> Gamma 1C	<b>Type:</b> High Rate Detector
<b>Calibration Date:</b> 02/07/02	<b>Calibration Reference:</b> GJO-2002-309-TAR
<b>Logging Procedure:</b> MAC-HGLP 1.6.5, Rev. 0	

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

Log Run	1	2	3	4	
Date	03/28/02	04/01/02	04/02/02	04/02/02	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	58.0	150.5	63.0	56.5	
Finish Depth (ft)	2.0	62.0	57.0	40.0	
Count Time (sec)	100	100	100	100	
Live/Real	R	R	R	R	
Shield (Y/N)	N/A	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	B0115CAB	BB116CAB	BB117CAB	BB117CAB	
Start File	B0115000	BB116000	BB117000	BB117013	

Log Run	1	2	3	4	
Finish File	B0115112	BB116177	BB117012	BB117046	
Post-Verification	B0115CAA	BB116CAA	BB117CAA	BB117CAA	
Depth Return Error (in.)	-1	0	N/A	+1.5	
Comments	No fine-gain adjustment.	Fine-gain adjustment notes below.	No fine-gain adjustment.	Repeat section. No fine-gain adjustment.	

**High Rate Logging System (HRLS) Log Run Information:**

Log Run	1	2			
Date	05/06/02	05/06/02			
Logging Engineer	Kos	Kos			
Start Depth (ft)	11.0	22.0			
Finish Depth (ft)	16.0	32.0			
Count Time (sec)	300	300			
Live/Real	L	L			
Shield (Y/N)	N/A	N/A			
MSA Interval (ft)	0.5	0.5			
ft/min	N/A	N/A			
Pre-Verification	AC013CAB	AC013CAB			
Start File	AC013000	AC013011			
Finish File	AC013010	AC013031			
Post-Verification	AC013CAA	AC013CAA			
Depth Return Error (in.)	N/A	-1.0			
Comments	No fine-gain adjustment.	No fine-gain adjustment.			

**Logging Operation Notes:**

Zero reference is the top of casing for both the SGLS and HRLS. Logging was performed with a centralizer installed on the both the SGLS and HRLS sondes. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT verifier with SN 082, and pre- and post-survey verification measurements were acquired for the HRLS in the <sup>137</sup>Cs verifier SN 1013.

During SGLS logging, fine-gain adjustments were made to maintain the 1460-keV (<sup>40</sup>K) photopeak at a pre-described channel. During logging run 2, 04/01/02, fine-gain adjustments were made after files BB116125 and BB116148.

The HRLS detector was in the unshielded housing during logging.

**Analysis Notes:**

<b>Analyst:</b>	Sobczyk	<b>Date:</b>	06/03/02	<b>Reference:</b>	MAC-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. The recorded peak counts per second (cps) 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 within 10 percent of one another at each spectrum's energy line. The recorded peak counts per second for these three photopeaks were consistently lower each day in the post-

run verification as compared to the pre-run verification. The post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC Supervisor.

HRLS pre-run and post-run verification spectra were collected at the beginning and end of each day. The spectra were within the acceptance criteria for the field verification of the Gamma 1C logging system (HRLS). The post-run verification spectra were used to determine the energy calibration for processing the data using APTEC Supervisor.

Log spectra for both the SGLS and HRLS were processed in batch mode using APTEC Supervisor to identify individual energy peaks and determine count rates. Concentrations were calculated in EXCEL (source file: G2BNov1.xls), using parameters determined from analysis of recent calibration data. Zero reference is the top of the casing. The casing configuration was assumed to be one string of 8-in. casing with a thickness of 0.322 in. to a log depth of 152 ft. A casing thickness of 0.322 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.

Using the SGLS, dead time greater than 40 percent was encountered in the intervals from 11.5 to 14.5 ft and 22.5 to 28.5 ft, and data from these regions were considered unreliable. At SGLS dead time greater than 40 percent, peak spreading and pulse pile-up effects may result in underestimation of activities. This effect is not entirely corrected by the dead time correction, and the extent of error increases with increasing dead time. SGLS dead time corrections were applied when dead time reached 10.5 percent. The HRLS was utilized to obtain data where the SGLS dead time exceeded 40 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. 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.

### **Results and Interpretations:**

$^{137}\text{Cs}$ ,  $^{235}\text{U}$ , and  $^{238}\text{U}$  (based on the 1001-keV photopeak) were the man-made radionuclides detected in this borehole.  $^{137}\text{Cs}$  was detected near the ground surface (3.5- through 4.5-ft log depth) at concentrations ranging from 0.5 to 1.3 pCi/g. In the intervals between 11.5 and 14.5 ft and 22.5 and 28.5 ft,  $^{137}\text{Cs}$  occurred with activities exceeding 1,000 pCi/g. The maximum detected  $^{137}\text{Cs}$  activity was 7,000 pCi/g at 12.0 ft.  $^{137}\text{Cs}$  was also detected at 103 and 130 ft with an activity of about 0.2 pCi/g. At about 18.5 and 19 ft,  $^{235}\text{U}$  was detected with an activity of about 2 pCi/g near its MDL of about 1.7 pCi/g, and  $^{238}\text{U}$  was detected with an activity of about 20 pCi/g near its MDL of about 15 pCi/g. In addition, man-made  $^{238}\text{U}$  and  $^{235}\text{U}$  were detected at 52 ft at activities near their MDL on the repeat log run and not on the original log run.

Recognizable changes in the KUT logs occurred in this borehole. Changes in apparent  $^{40}\text{K}$  activities of about 5 pCi/g occur in the zone of high dead time between 22 and 29 ft. This increase in  $^{40}\text{K}$  activities probably represents the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2.

The plots of the repeat logs demonstrate good repeatability of the SGLS data for both the man-made and naturally occurring radionuclides. Between 40 and 41 ft, the apparent differences between the original log run and the repeat log run are due to a slight depth error (1.5 in.) on the repeat run.

## **References:**

Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNNL-8800, UC-903, Pacific Northwest Laboratory, Richland, Washington.

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<sup>1</sup> GWL – groundwater level

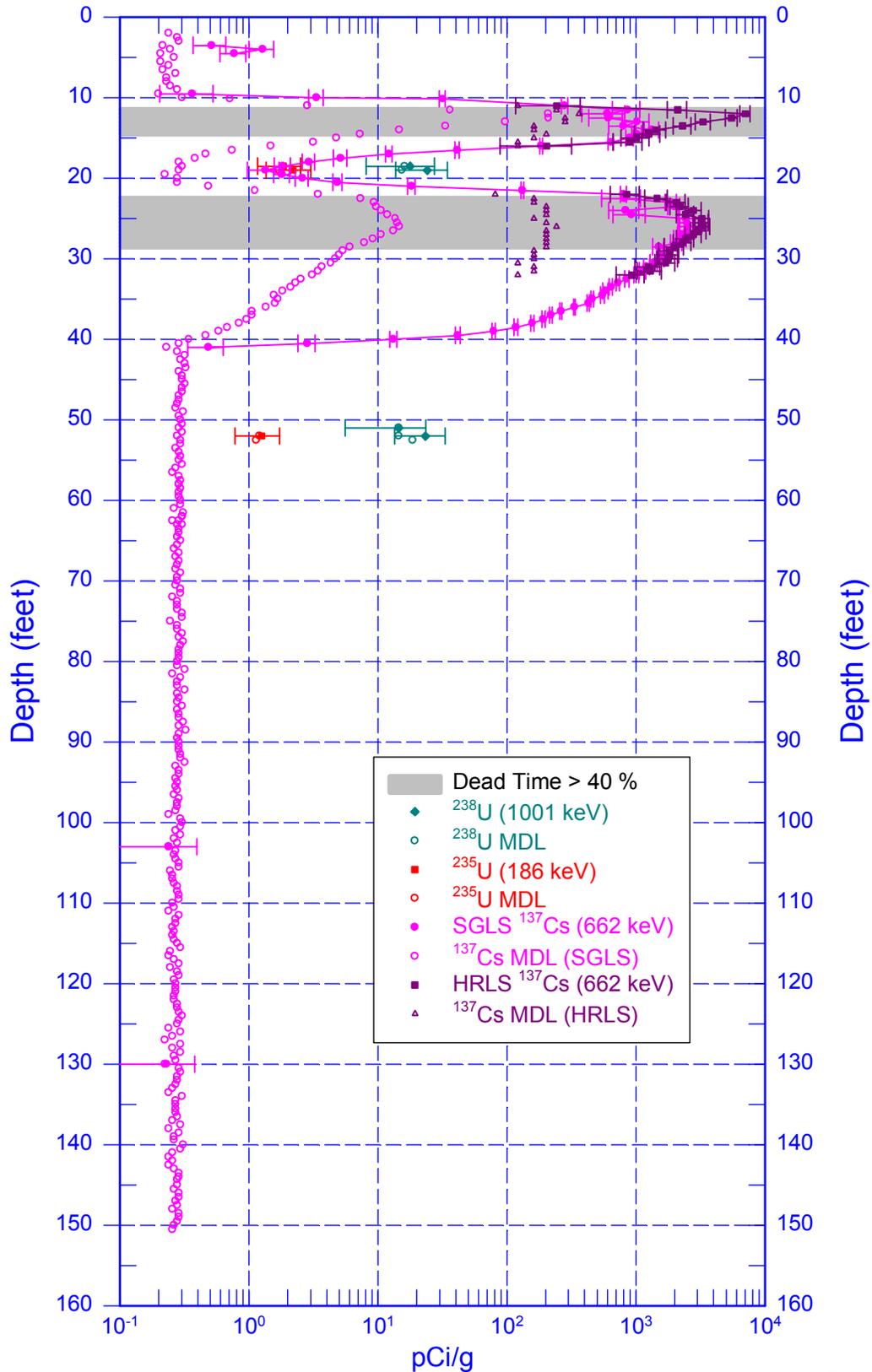
<sup>2</sup> N/A – not applicable

<sup>3</sup> TOC – top of casing

<sup>4</sup> HWIS – Hanford Well Information System

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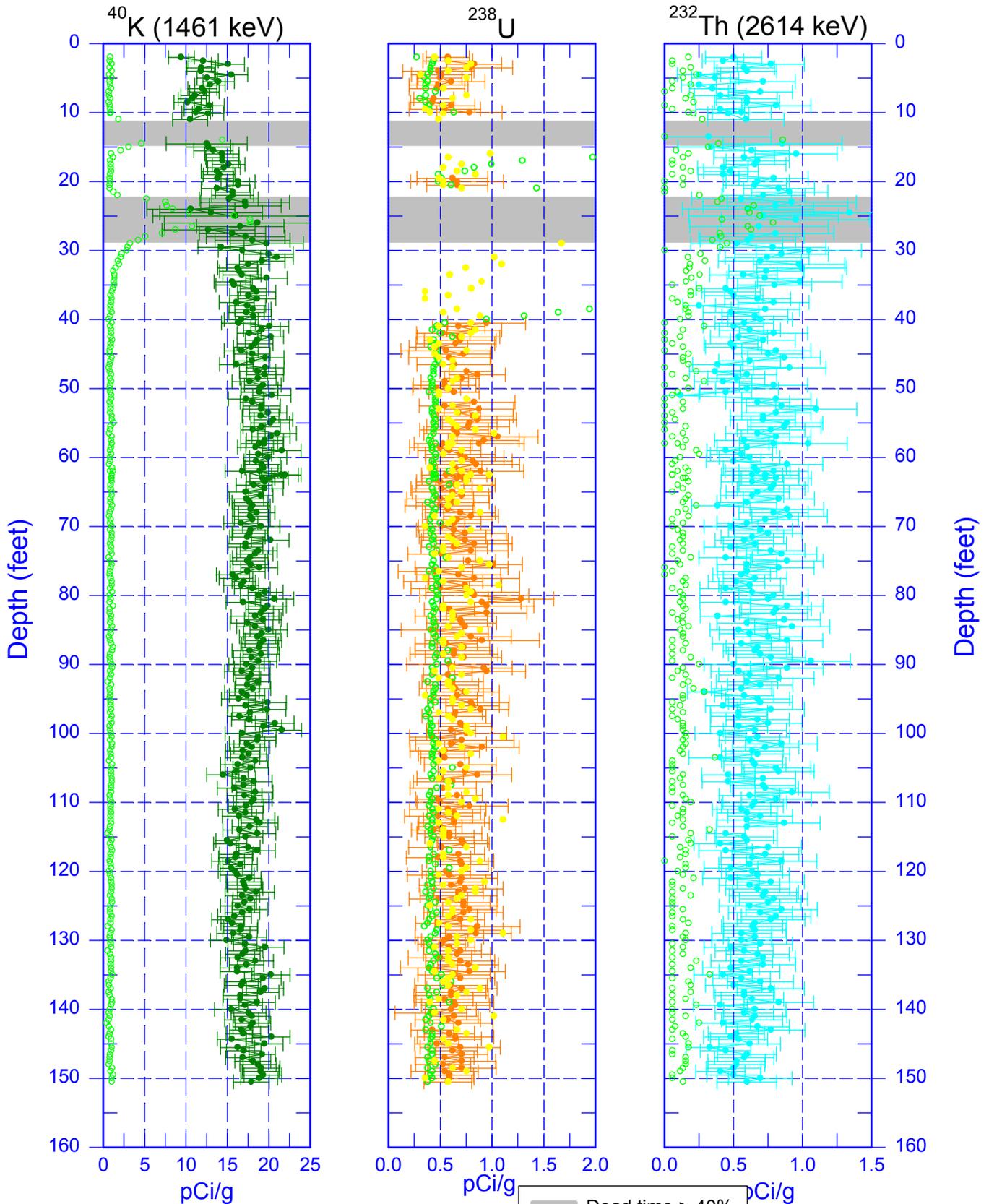
## Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run  
05/06/2002

# 299-E28-57 (A6808) Natural Gamma Logs



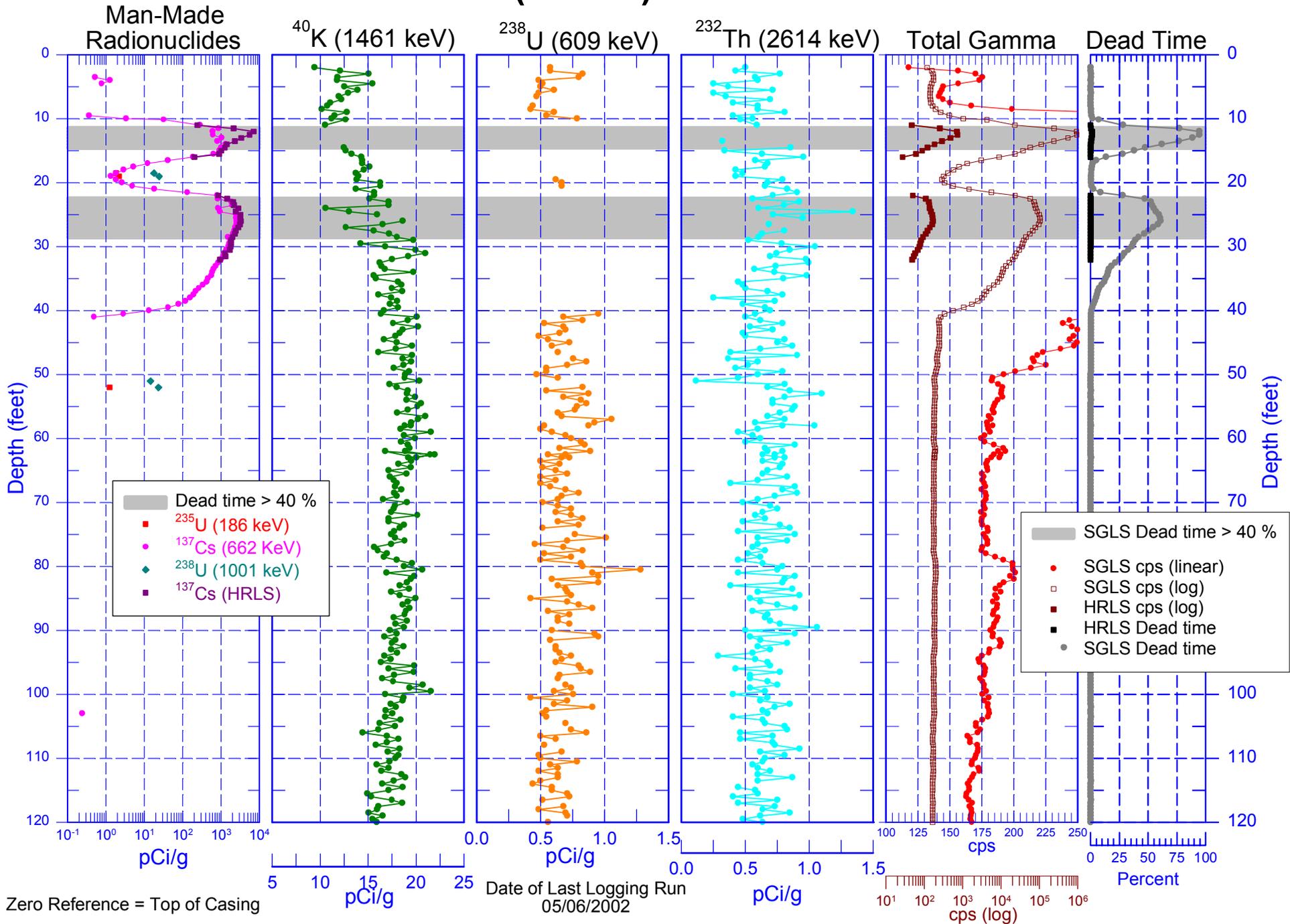
Zero Reference = Top of Casing

○ MDL

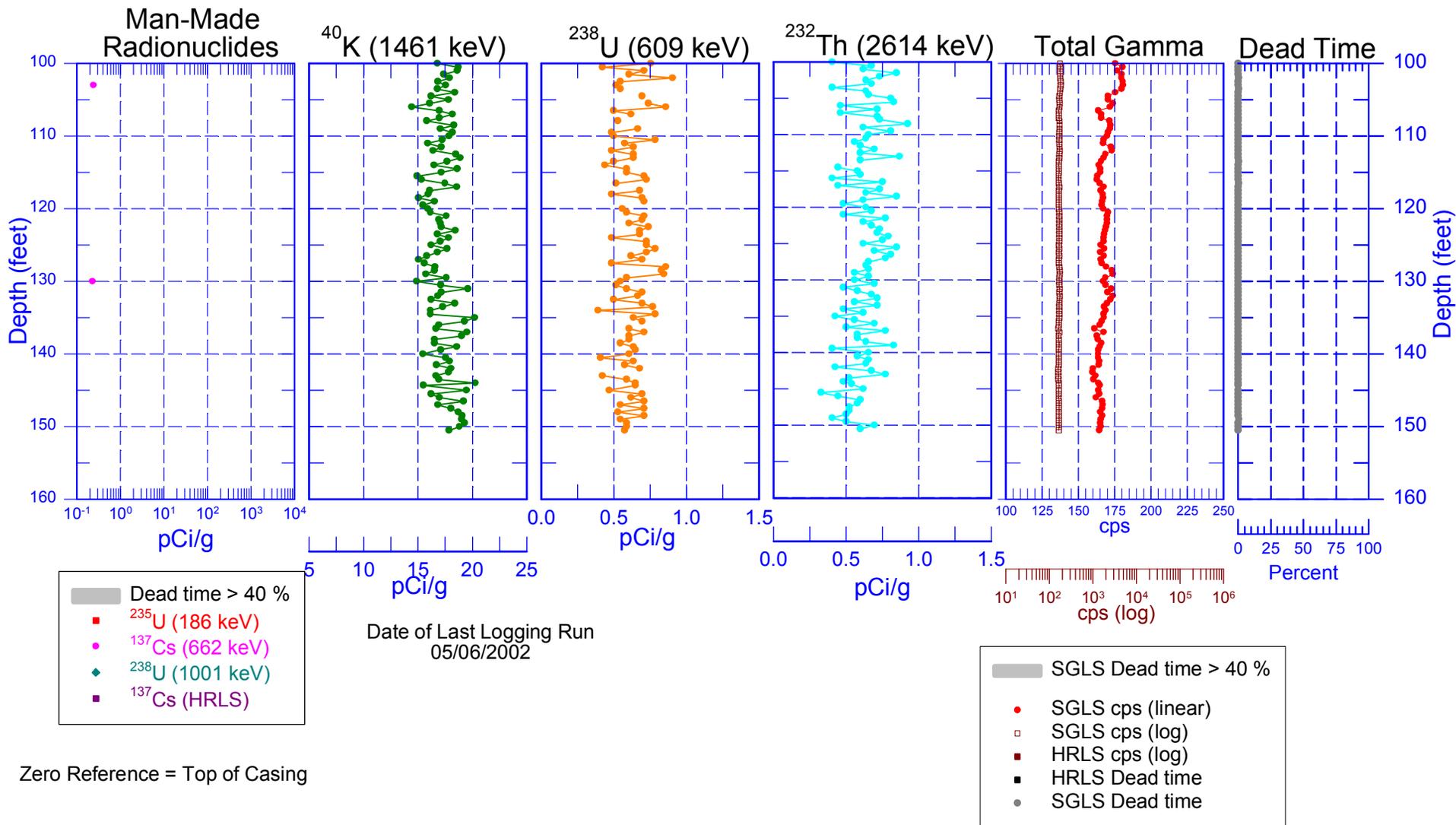
- Dead time > 40%
- 609 keV
- MDL (609 keV)
- 1764 keV

Date of Last Logging Run  
04/02/2002

# 299-E28-57 (A6808) Combination Plot

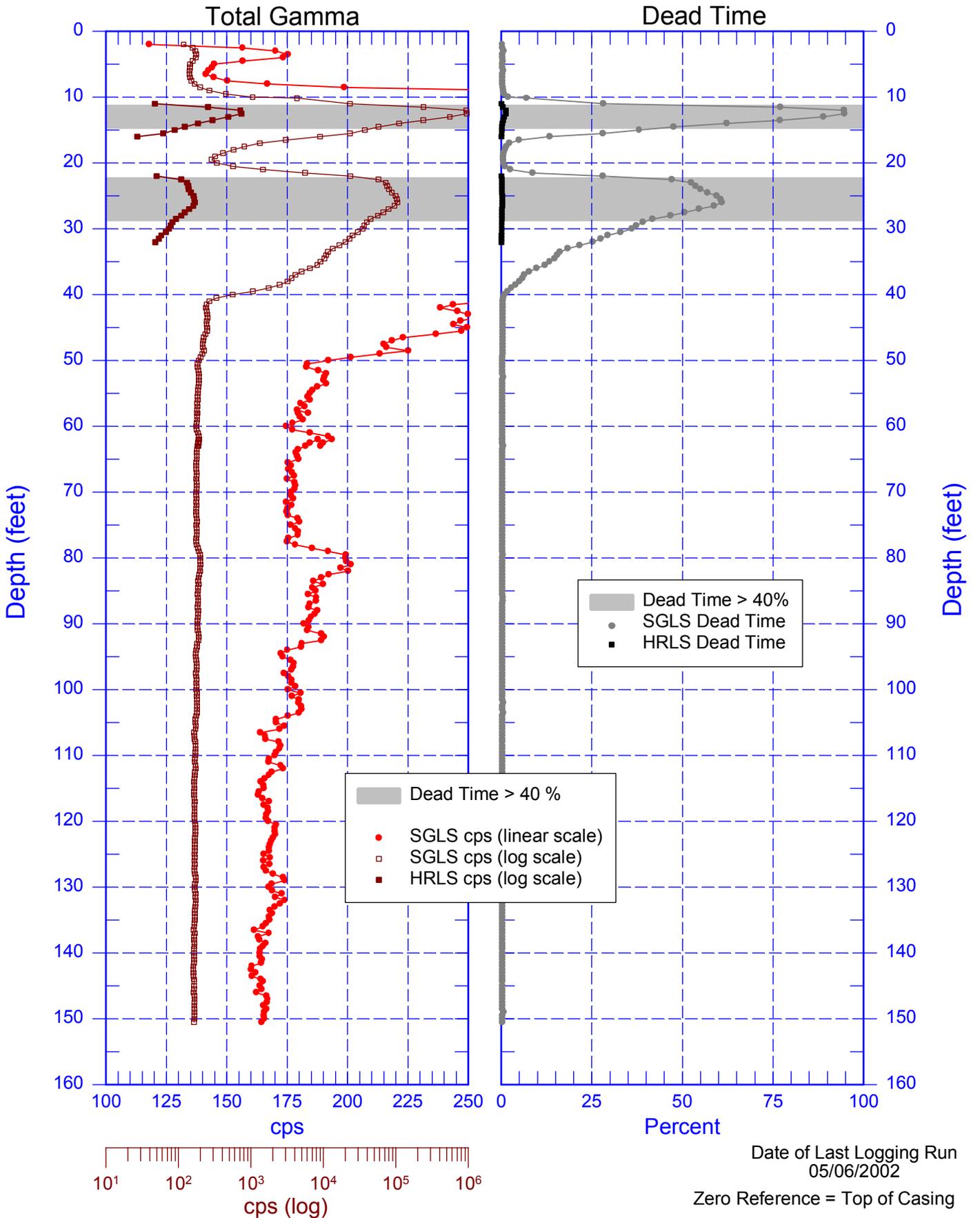


# 299-E28-57 (A6808) Combination Plot



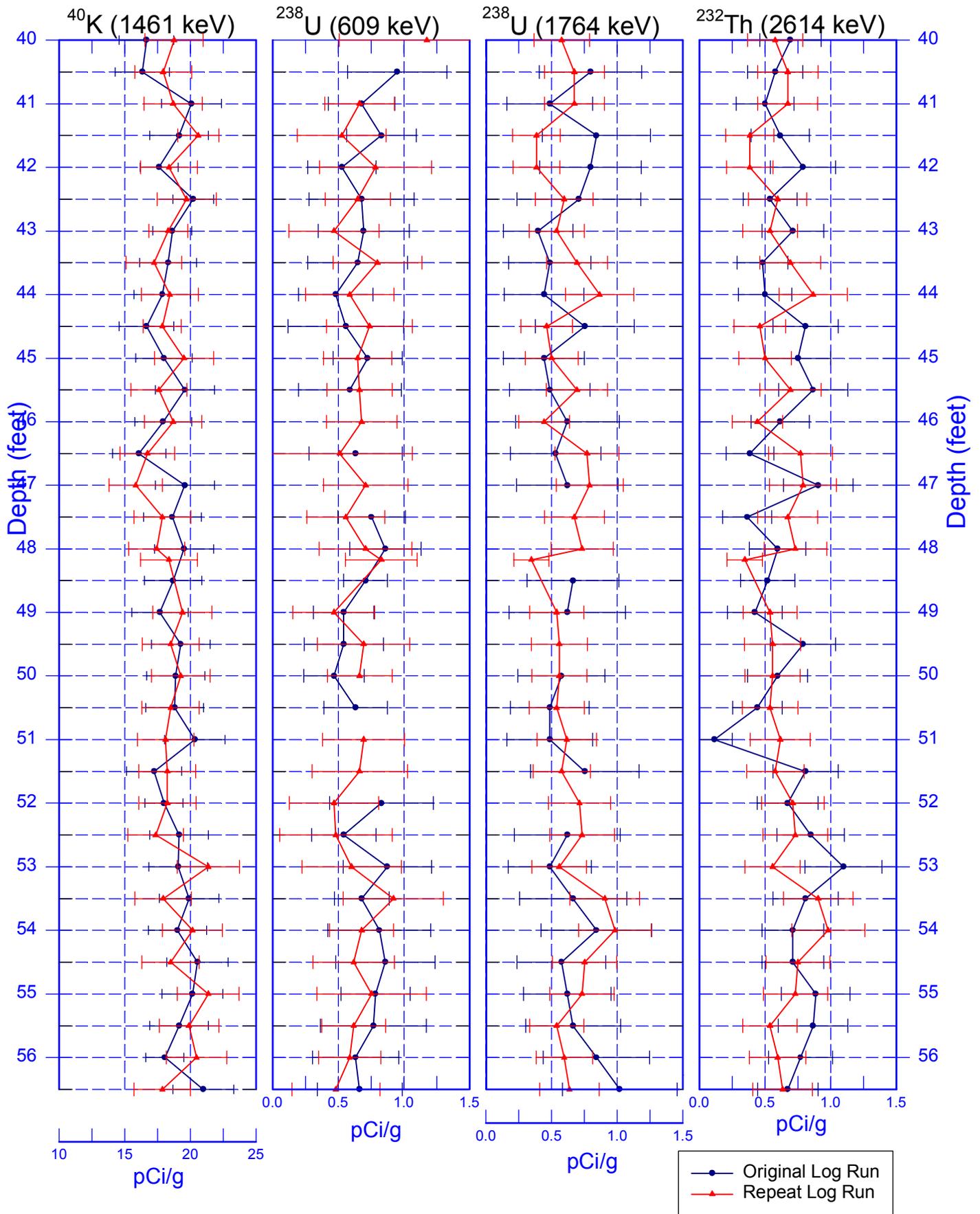
# 299-E28-57 (A6808)

## Total Gamma & Dead Time



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## Rerun of Natural Gamma Logs (40 to 56.5 ft)



# 299-E28-57 (A6808)

## Rerun of Man-Made Radionuclides (40 to 56.5 ft)

