



## 299-E33-66 (A6874)

### Log Data Report

#### Borehole Information:

<b>Borehole:</b> 299-E33-66 (A6874)		<b>Site:</b> 216-B-8 Crib Tile Field			
<b>Coordinates</b> (WA State Plane)		<b>GWL<sup>1</sup> (ft):</b> See borehole notes below		<b>GWL Date:</b> n/a <sup>2</sup>	
<b>North (m)</b> ~ 137,465 m	<b>East (m)</b> ~ 573,795 m	<b>Drill Date</b> Nov. 1947	<b>TOC<sup>3</sup> Elevation (ft)</b> 635.89 ft	<b>Total Depth (ft)</b> 150	<b>Type</b> Unknown

#### Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel Welded	2.0	8.625	8.0	0.3125	0	142

#### Borehole Notes:

This borehole has not been positively identified. Identification, which is usually painted on the stickup portion of the casing, is missing from this borehole. The only identification on the casing is a yellow decal with the following information, "HWDS 44." By process of elimination of the boreholes in the 216-B-8 Crib area, this borehole is deduced to be 299-E33-66, and if so, it is not accurately located in the Hanford Site Atlas (BHI 1998). Based upon field measurements, 299-E33-79 is located 49.5 ft N12°E of this borehole, and 299-E33-16 is located 10.4 ft N64°E of this borehole. The coordinates stated above are estimates based on the field measurements and the surveyed coordinates for 299-E33-79 and 299-E33-16 as reported in HWIS<sup>4</sup>.

The logging engineer measured the pipe stickup at the borehole using a steel tape. Calipers were used to measure casing outside diameter and thickness. The casing inside diameter is calculated. Top of casing stickup is cut squarely. The TOC elevation, casing bottom, and total depth (TOC reference) are reported from information provided in Chamness and Merz (1993).

An e-tape measurement (taken 01/31/02) detected water in this borehole at a depth of 139.3 ft. It is probably water trapped inside the casing or perched water rather than groundwater. Groundwater wells nearby show that groundwater is located at approximately 230 ft.

#### Logging Equipment Information:

<b>Logging System:</b> Gamma 2B	<b>Type:</b> SGLS (35%)
<b>Calibration Date:</b> 11/01	<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> HRLS
<b>Calibration Date:</b> 02/02	<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:**

<b>Log Run</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>Repeat</b>	
Date	01/31/02	02/04/02	02/05/02	02/05/02	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	2.0	26.5	143.5	117.0	
Finish Depth (ft)	27.5	124.5	123.5	132.0	
Count Time (sec)	100	100	100	100	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	0.5	0.5	0.5	0.5	
ft/min	n/a	n/a	n/a	n/a	
Pre-Verification	B0073CAB	B0075CAB	B0076000	B0076CAB	
Start File	B0074000	B0075000	B0076CAB	B0076040	
Finish File	B0074051	B0075196	B0076039	B0076070	
Post-Verification	B0074CAA	B0075CAA	B0077CAA	B0077CAA	
Depth Return Error (in.)	0	+1.2	n/a	0	
Comments	No fine-gain adjustments.	Fine-gain adjustment notes below.	No fine-gain adjustments.	No fine-gain adjustments.	

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

<b>Log Run</b>	<b>1</b>				
Date	03/13/02				
Logging Engineer	Kos				
Start Depth (ft)	27.0				
Finish Depth (ft)	37.0				
Count Time (sec)	300				
Live/Real	R				
Shield (Y/N)	N				
MSA Interval (ft)	0.5				
ft/min	n/a				
Pre-Verification	D0025CAB				
Start File	D0026000				
Finish File	D0026020				
Post-Verification	D0026CAA				
Depth Return Error (in.)	-0.375				
Comments	No fine-gain adjustments.				

**Logging Operation Notes:**

SGLS and HRLS logging were performed in February and March 2002, respectively. The reference depth for logging measurements is the top of casing. A depth initialization error was introduced by the logging engineer at the beginning of logging with the HRLS. Although casing stickup is 2.0 ft, the logging engineer entered the detector location as 2.2 ft. The recorded sample depths in data files are 0.2 ft greater than actual. The depths were adjusted during processing to correct for the error.

Logging was performed with a centralizer installed on the sondes. During SGLS logging run 2, 02/04/02, a fine-gain adjustment was made after files B0075049, -057, -092, and -152. During logging run 3 and the repeat run, 02/05/02, a plastic bag enclosed the sonde.

A repeat section was performed for the SGLS to check system performance. The HRLS was used to perform logging in a high gamma flux where the SGLS dead times exceeded 40 percent.

## **Analysis Notes:**

<b>Analyst:</b>	SS/PH	<b>Date:</b>	03/20/02	<b>Reference:</b>	MAC-VZCP 1.7.9, Rev. 2
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Pre-run and post-run verification spectra were collected at the beginning and end of each day for each logging system. The recorded peak counts per second (cps) for the 609-keV peak, 1461-keV peak, and 2615-keV peak as measured with the SGLS were consistently lower each day in the post-run verification as compared to the pre-run verification. All of the verification spectra were within the control limits. The HRLS also passed acceptance criteria. The post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR.

Spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated in EXCEL (source files: G2BNov01.xls and G1Cfeb02.xls for the SGLS and HRLS, respectively), using parameters determined from analysis of calibration data. Based on the observations of the logging engineer and Chamness and Merz (1993), the casing configuration was assumed to be one string of 8-in. casing with a thickness of 0.3125 in. to total measured depth. A water correction was applied at and below 139 ft. This water correction appears to over-compensate for the gamma attenuation, causing slightly higher KUT values than expected.

Dead time corrections are applied to log data, including the total gamma data, where the dead time is in excess of 10.5 percent. In zones of high SGLS dead time (> 40%) gross count rates and radionuclide concentrations become increasingly less reliable, and may be significantly higher than the calculated values. The HRLS is used in zones of high SGLS dead time to quantify the  $^{137}\text{Cs}$  concentrations.

## **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. A combination plot is also included to facilitate correlation. The  $^{214}\text{Bi}$  peak at 1764 keV was used to determine the naturally occurring  $^{238}\text{U}$  concentrations on the combination plot rather than the  $^{214}\text{Bi}$  peak at 609 keV because it generally exhibited slightly higher net count rates especially in the regions with higher concentrations of  $^{137}\text{Cs}$ . The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for both the man-made and naturally occurring radionuclides.

## **Results and Interpretations:**

$^{137}\text{Cs}$ , which is a man-made radionuclide, was detected in significant amounts essentially throughout this borehole. The highest concentrations exist where the SGLS dead time exceeded 40 % between 28 and 36 ft. At these depths the HRLS data were substituted for the SGLS data. A maximum concentration of about 40,000 pCi/g was measured with the HRLS at 31 ft. A zone of  $^{137}\text{Cs}$  contamination was detected near the ground surface (log depth 0 through 7.0 ft) with activities ranging from 0.2 to 90 pCi/g.

Few recognizable changes in the KUT logs occurred in this borehole that can be readily attributed to stratigraphic variation. Above the zone of intense gamma-ray activity, apparent  $^{40}\text{K}$  activities are about 13 pCi/g. Below the zone (27 to 37 ft) of highest gamma-ray activity, apparent  $^{40}\text{K}$  activities are about 17 pCi/g. The relatively high concentrations of  $^{137}\text{Cs}$  below about 27 ft may correspond with the increase in  $^{40}\text{K}$  activities and the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2. At log depth 102 ft, there is an apparent spike of about 0.5 pCi/g in  $^{232}\text{Th}$

activities. The apparent changes in  $^{40}\text{K}$  and  $^{238}\text{U}$  below 139 ft are probably the result of an inappropriate water correction and are probably not indicative of a change in sediment composition.

**References:**

Bechtel Hanford Inc. (BHI), 1998. *Hanford Site Atlas*, BHI-01119, Rev. 1, Bechtel Hanford Inc., Richland, Washington.

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

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<sup>1</sup> GWL – groundwater level

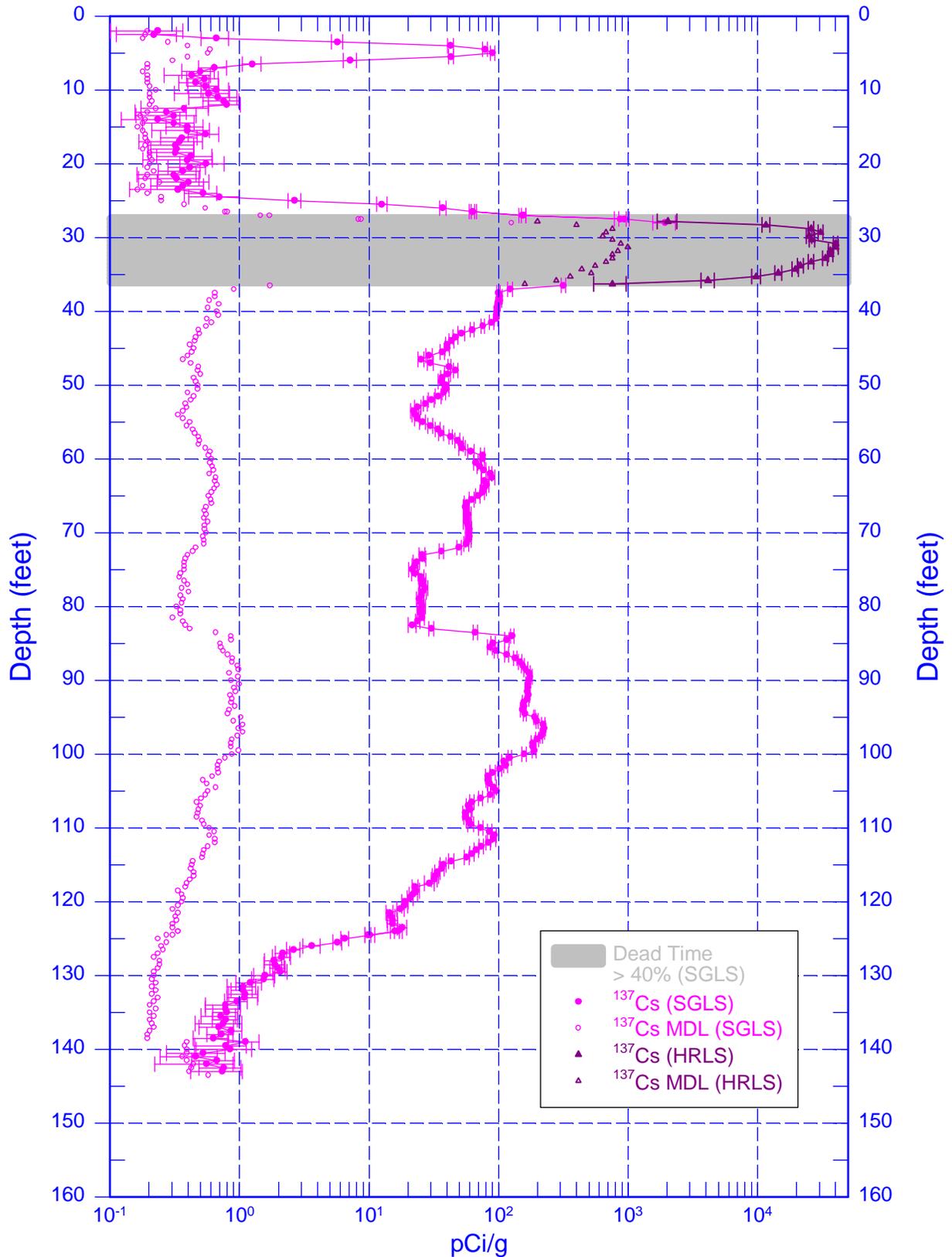
<sup>2</sup> n/a – not applicable

<sup>3</sup> TOC – top of casing

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

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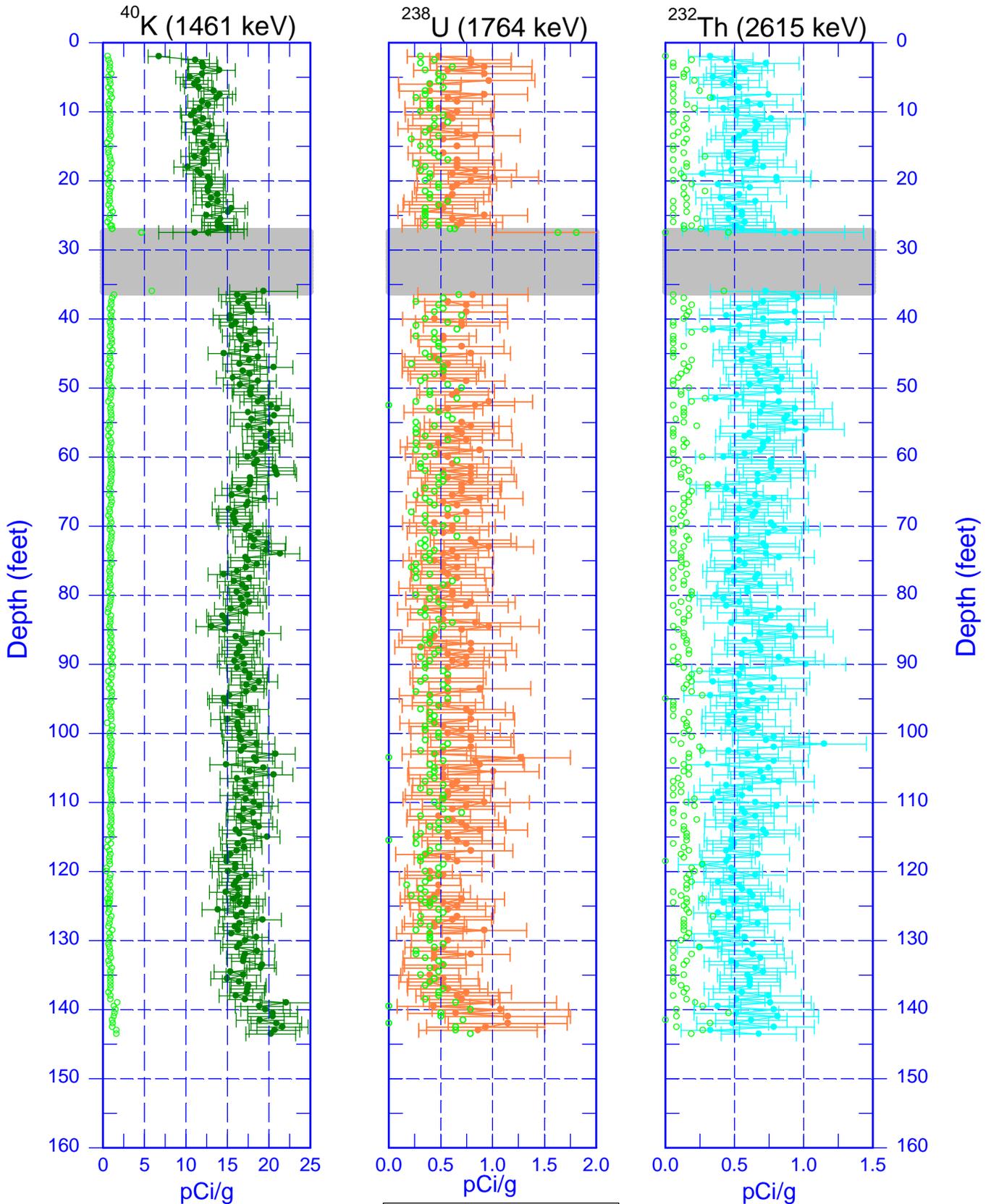
## Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run  
03/13/02

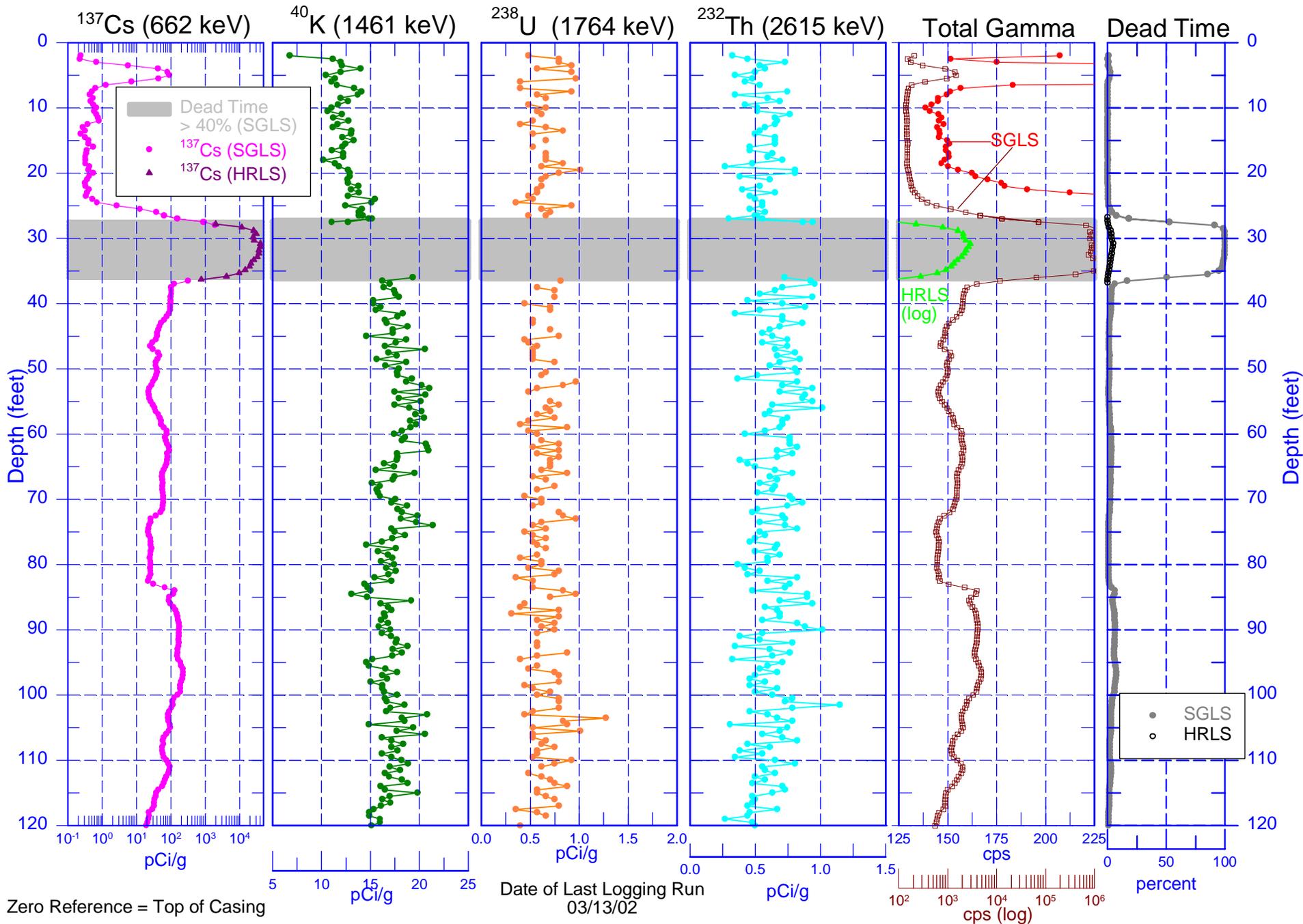
# 299-E33-66 (A6874) Natural Gamma Logs



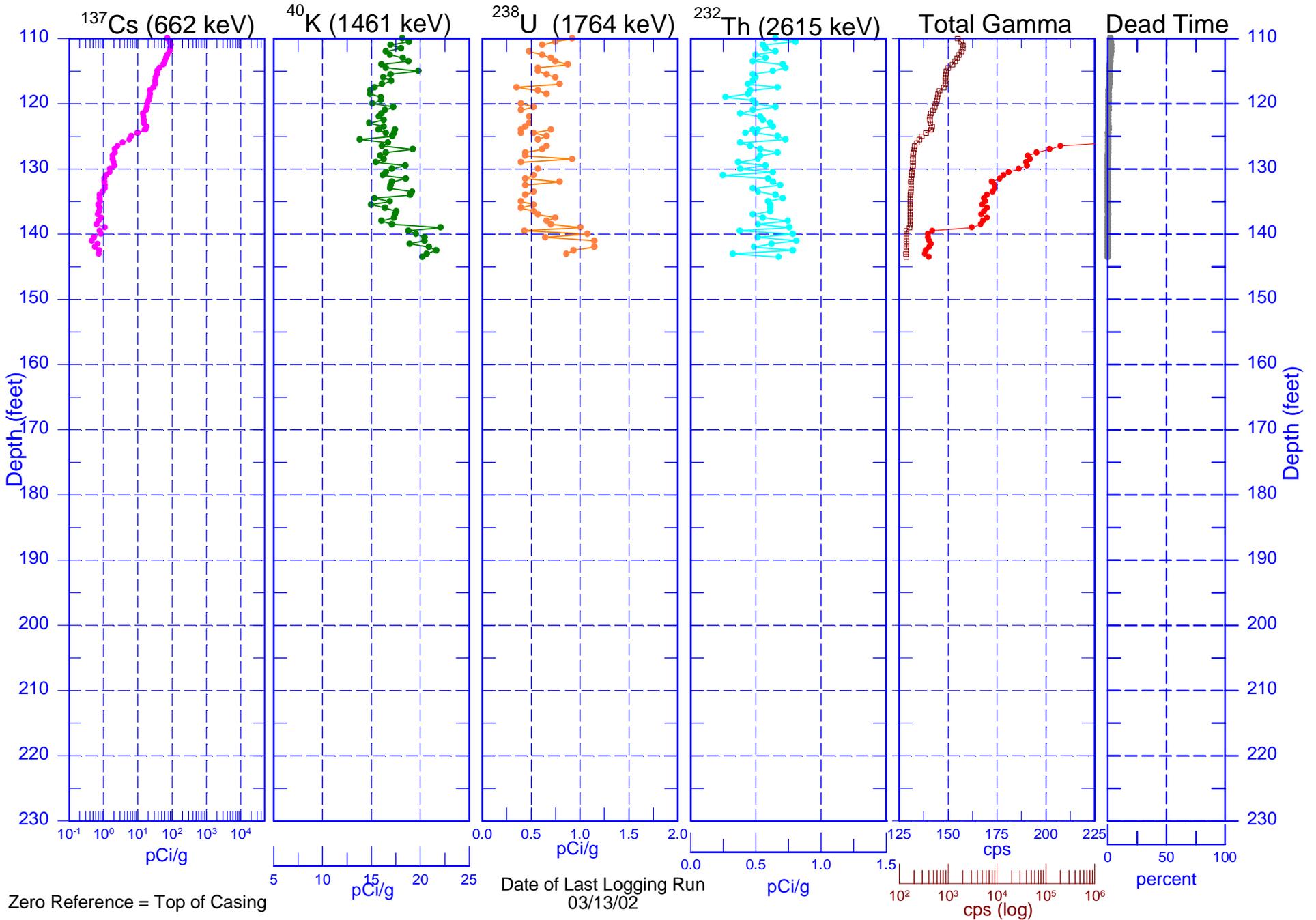
Zero Reference = Top of Casing

Date of Last Logging Run  
03/13/02

# 299-E33-66 (A6874) Combination Plot



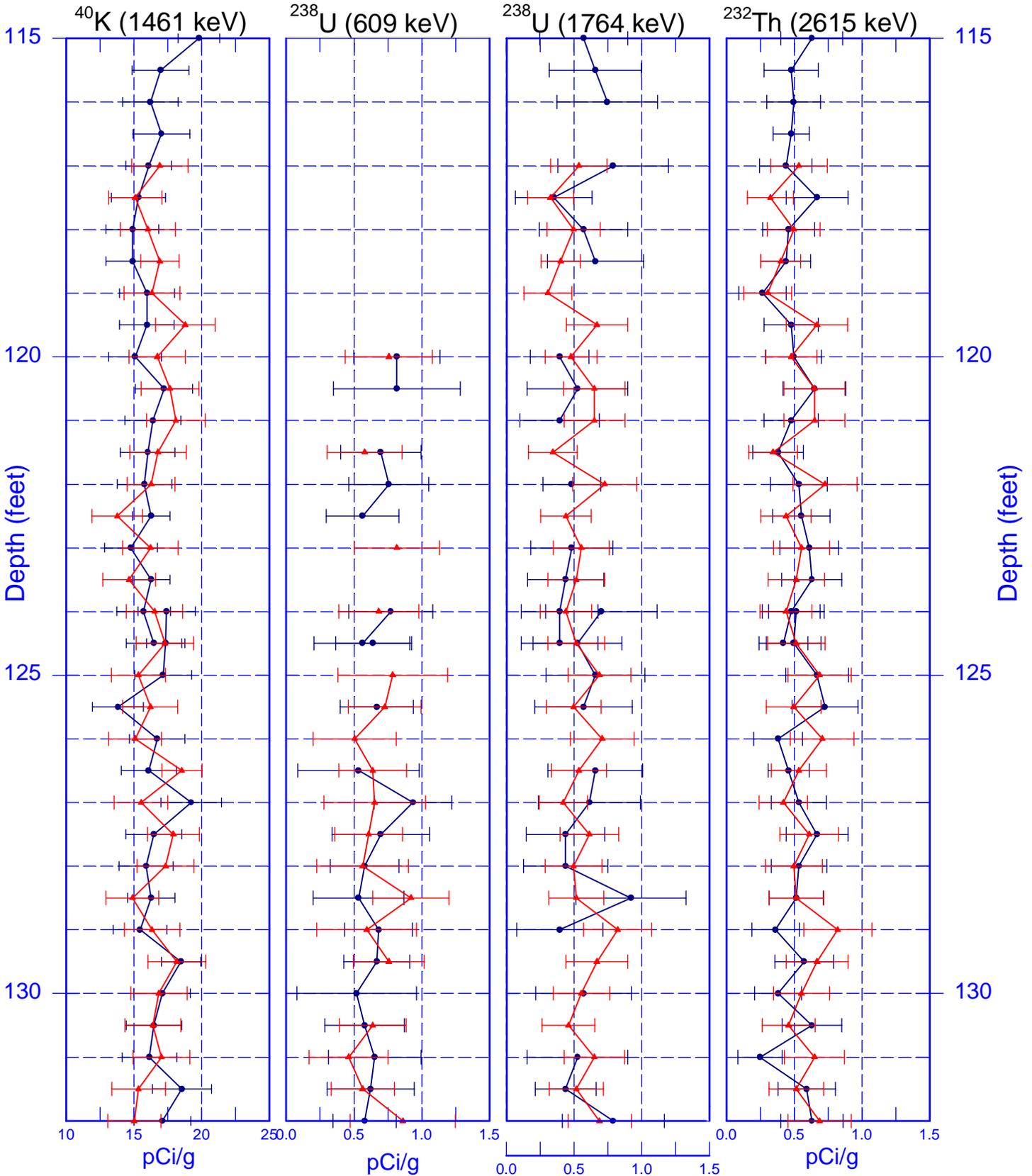
# 299-E33-66 (A6874) Combination Plot





# 299-E33-66 (A6874)

## Repeat Section of Natural Gamma Logs



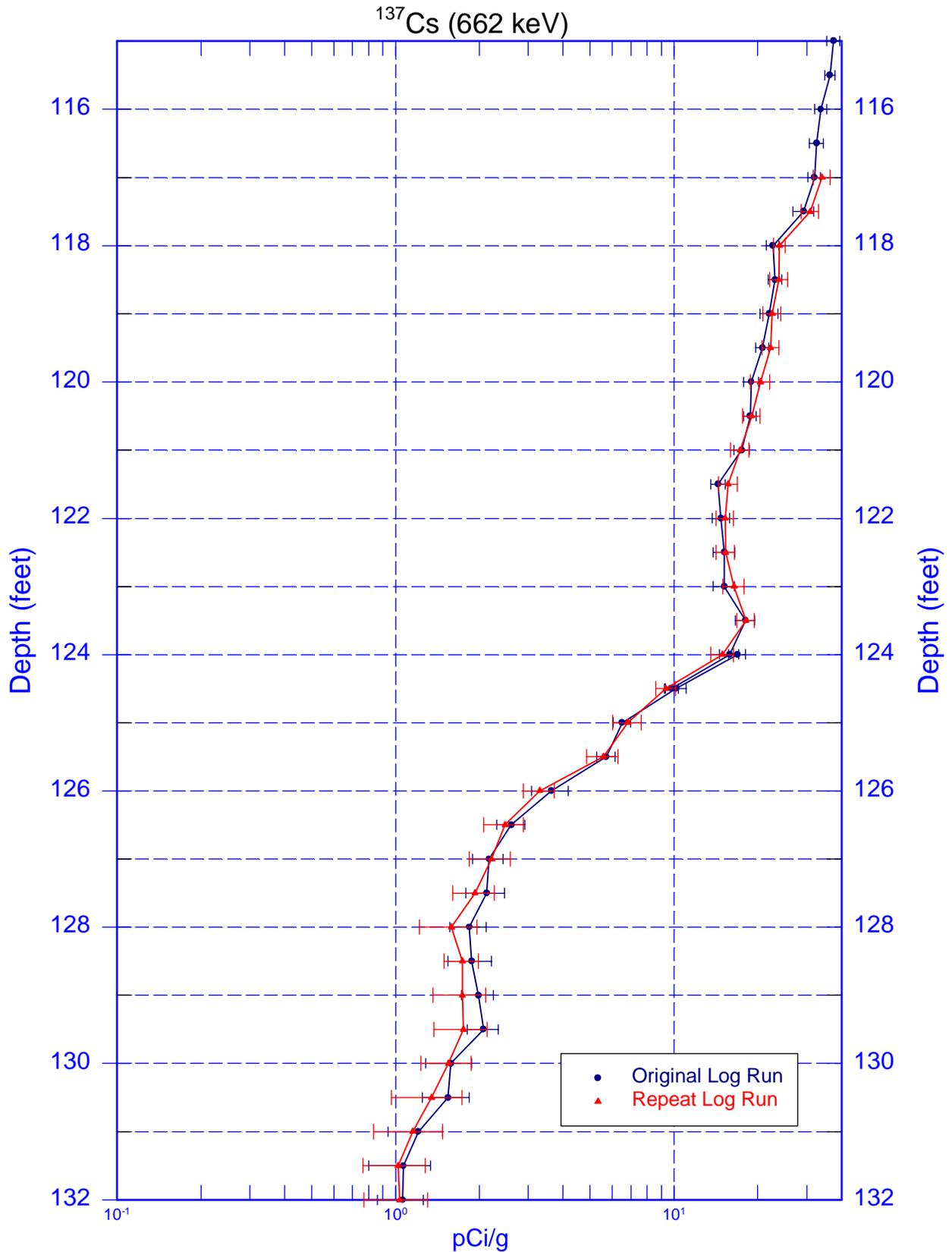
Zero Reference = Top of Casing



Date of Last Logging Run  
03/13/02

# 299-E33-66 (A6874)

## Repeat Section of Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run  
03/13/02