



299-E33-58 (A6866)

Log Data Report

Borehole Information:

Borehole: 299-E33-58 (A6866)		Site: 216-B-7A Crib			
Coordinates (WA State Plane)		GWL (ft)¹: Not reached		GWL Date: N/A ²	
North 137388	East 573797	Drill Date May 1947	TOC³ Elevation 642.82 ft	Total Depth (ft) 153	Type cable tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel Welded	1.25	8.640	7.92	0.360	0	153

Borehole Notes:

The casing depth information provided above is from *Hanford Wells* (Chamness and Merz 1993). The nominal 8-in. steel casing size was confirmed by the MACTEC-ERS logging engineer's tape and caliper measurements.

Logging measurements are referenced to the top of the 8-in. casing.

Logging Equipment Information:

Logging System: Gamma 1D	Type: SGLS (35%)
Calibration Date: 07/01	Calibration Reference: GJO-2001-243-TAR
Logging Procedure: MAC-HGLP 1.6.5	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4 Repeat	5	6
Date	12/03/01	12/04/01	12/05/01	12/05/01		
Logging Engineer	Musial	Musial	Musial	Musial		
Start Depth (ft)	1.5	31.0	146.0	32.0		
Finish Depth (ft)	32.0	120.0	119.0	47.0		
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	A0048CAB	A0050CAB	A0051CAB	A0051CAB		
Start File	A0049000	A0050000	A0051000	A0051055		
Finish File	A0049061	A0050178	A0051054	A0051085		
Post-Verification	A0049CAA	A0050CAA	A0052CAA	A0052CAA		

Logging Operation Notes:

Spectral gamma-ray logging was performed by MACTEC-ERS in early December 2001 on three separate days. A repeat section was collected between 32.0 and 47.0 ft to measure the logging system's performance. Fine-gain adjustments were not necessary during the log runs.

Analysis Notes:

Analyst:	Spatz	Date:	12/12/01	Reference:	MAC-VZCP 1.7.9 Rev. 2
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Pre-run and post-run verification spectra for the SGLS were evaluated. The acceptance criteria for field verification of the Gamma 1D logging system are in the process of being established. The photopeak counts per second for the 2614.5-keV, 1461-keV and 609-keV peaks were consistently slightly lower in the post-run verification spectra when compared to the pre-run verification spectra. However, examination of spectra indicates that the detector appears to have functioned normally during the log runs, and the log data are provisionally accepted, subject to further review and analysis.

A casing correction for 0.322-in.-thick casing is applied for the nominal 8-in. steel casing. This value is within the error of the field measurement collected to confirm casing size and represents the published thickness for ASTM schedule-40 steel pipe (Driscoll 1986), a common borehole casing at Hanford.

Individual spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with EXCEL using an efficiency function and corrections for casing and dead time as appropriate. In zones of high dead time (> 40%), maximum gross count rates and radionuclide concentrations are not considered reliable, and actual values may be higher than reported values. Where dead time is greater than about 40 percent, pulse pileup and peak spreading effects tend to result in underestimating the count rate of full energy peaks. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations rather than the ^{214}Bi peak at 609 keV. The higher energy 1764-keV energy peak exhibits slightly better count rates than the 609-keV peak because of less gamma-ray attenuation caused by the casing in the borehole.

Log Plot Notes:

Separate log plots are provided for the man-made radionuclide (^{137}Cs) detected in the borehole, naturally occurring radionuclides (^{40}K , ^{238}U , ^{232}Th [KUT]), a combination of man-made, KUT, total gamma and dead time, a plot of total gamma plotted with dead time, and a repeat section plot. 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.

Results and Interpretations:

^{137}Cs was the only man-made radionuclide detected in this borehole. An upper zone of ^{137}Cs contamination was detected just below the ground surface (log depth 2 ft) with maximum concentration of 19 pCi/g at the 8.5-ft depth. Continuous ^{137}Cs contamination was detected between the depths of 21 and 89.5 ft at concentrations ranging from just above 0.2 pCi/g to a maximum of 2,039 pCi/g at the 35-ft depth. System dead time exceeded 40 % between 32 and 55 ft, where the calculated concentrations are unreliable and probably slightly under estimated. Between 94.5 and 104.5 ft mostly continuous ^{137}Cs contamination exists at concentrations less than 3 pCi/g. At the 146-ft depth, a single detection of ^{137}Cs contamination occurs at about 0.3 pCi/g.

Below the 31.5-ft depth and extending to the bottom of the logged interval, the ⁴⁰K concentration increases from about 12 pCi/g above 31.5 ft to more than 20 pCi/g. This concentration change suggests a transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2.

A repeat log section was collected between the 32- and 47-ft depth. The log data show good repeatability for depth and ¹³⁷Cs concentration but only fair repeatability for KUT concentrations. The full energy peaks for KUT are being affected by the high gamma flux in this interval where higher background and dead time exist. System dead time exceeded 40 % over the entire interval, where the calculated concentrations may be slightly under estimated.

References:

Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, prepared by Pacific Northwest Laboratory for the U.S. Department of Energy.

Driscoll, F. G., 1986. *Groundwater and Wells*, 2nd Edition, Johnson Filtration Systems, Inc, St. Paul, MN.

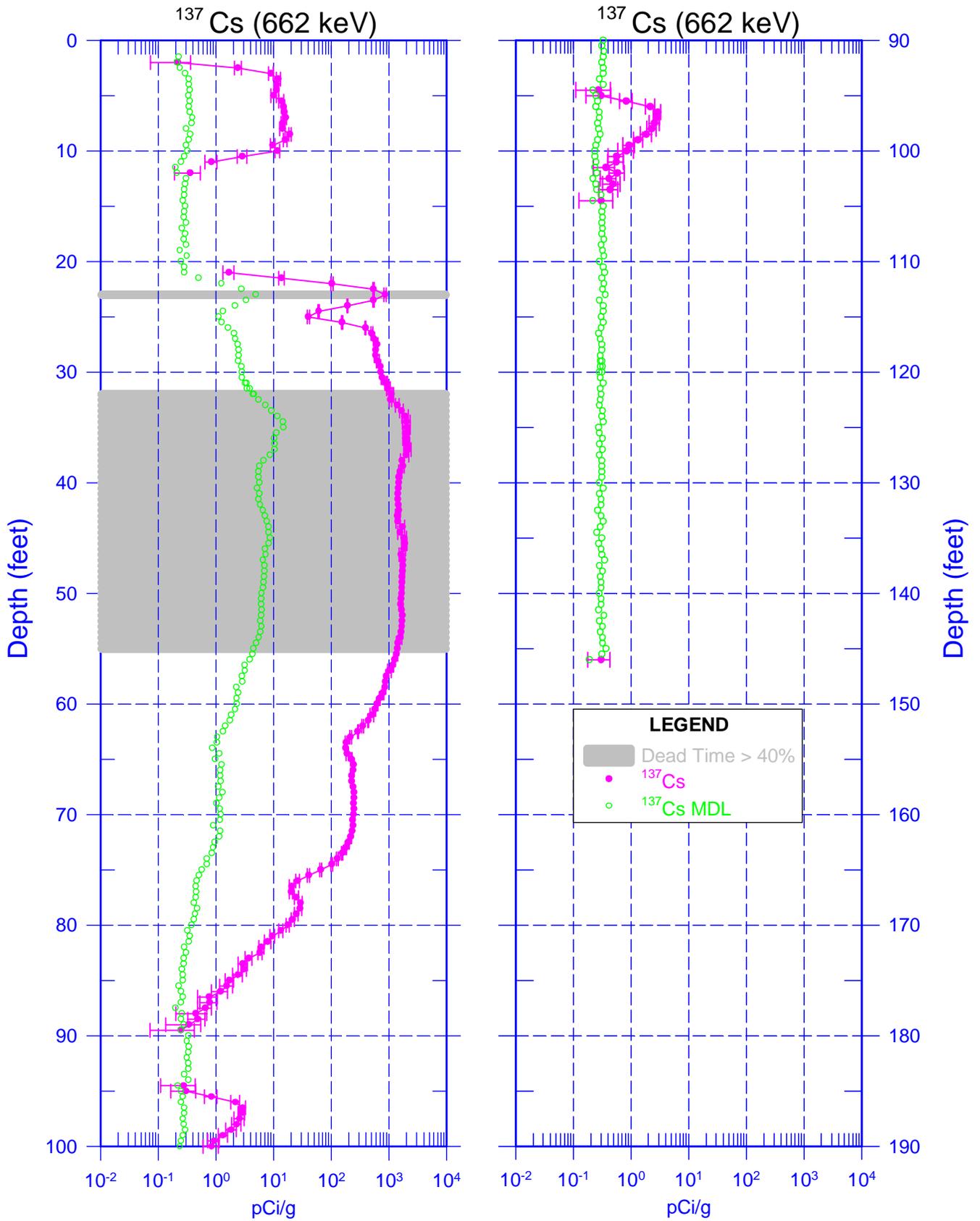
¹ GWL – groundwater level

² N/A – not applicable

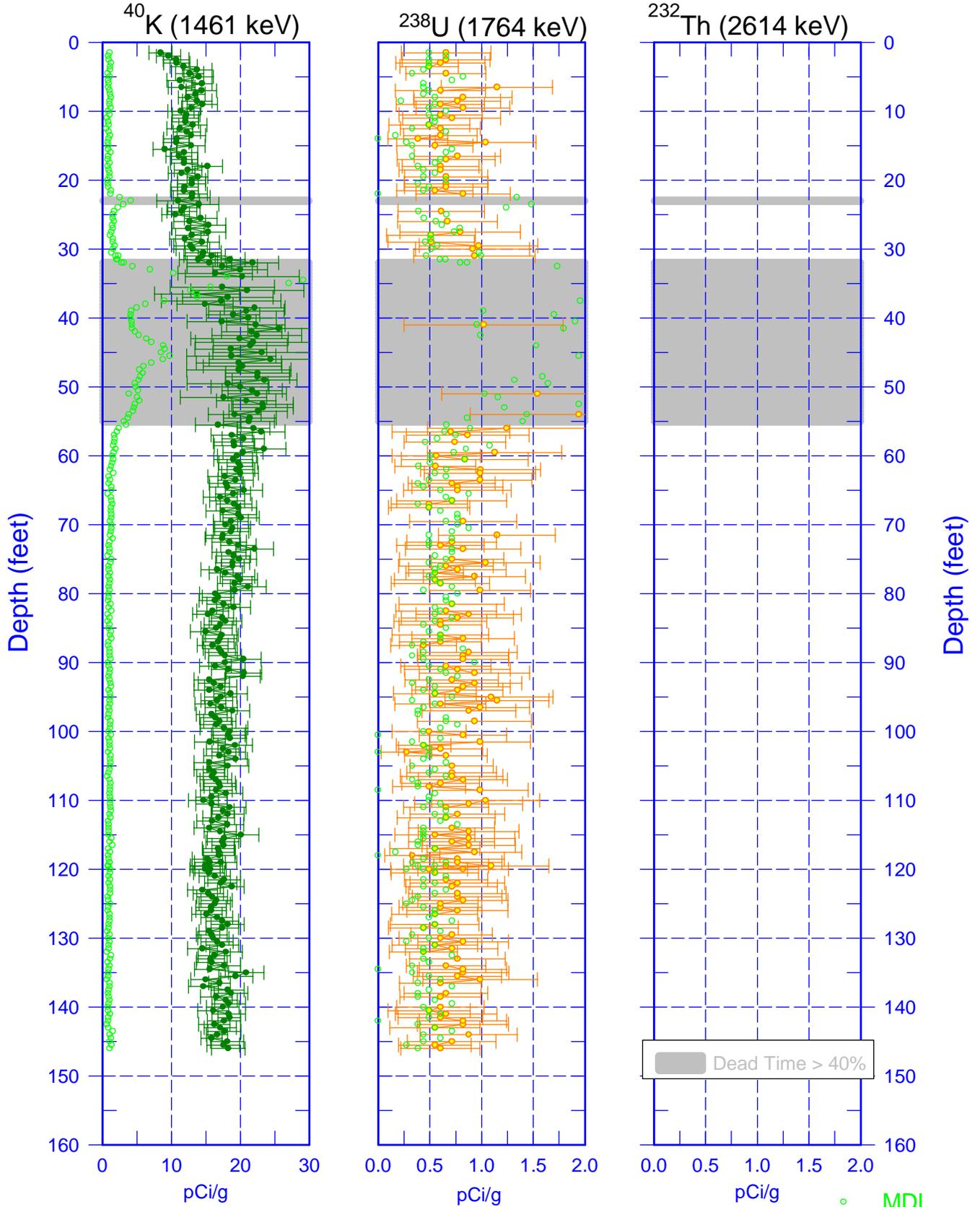
³ TOC – top of casing

299-E33-58 (A6866)

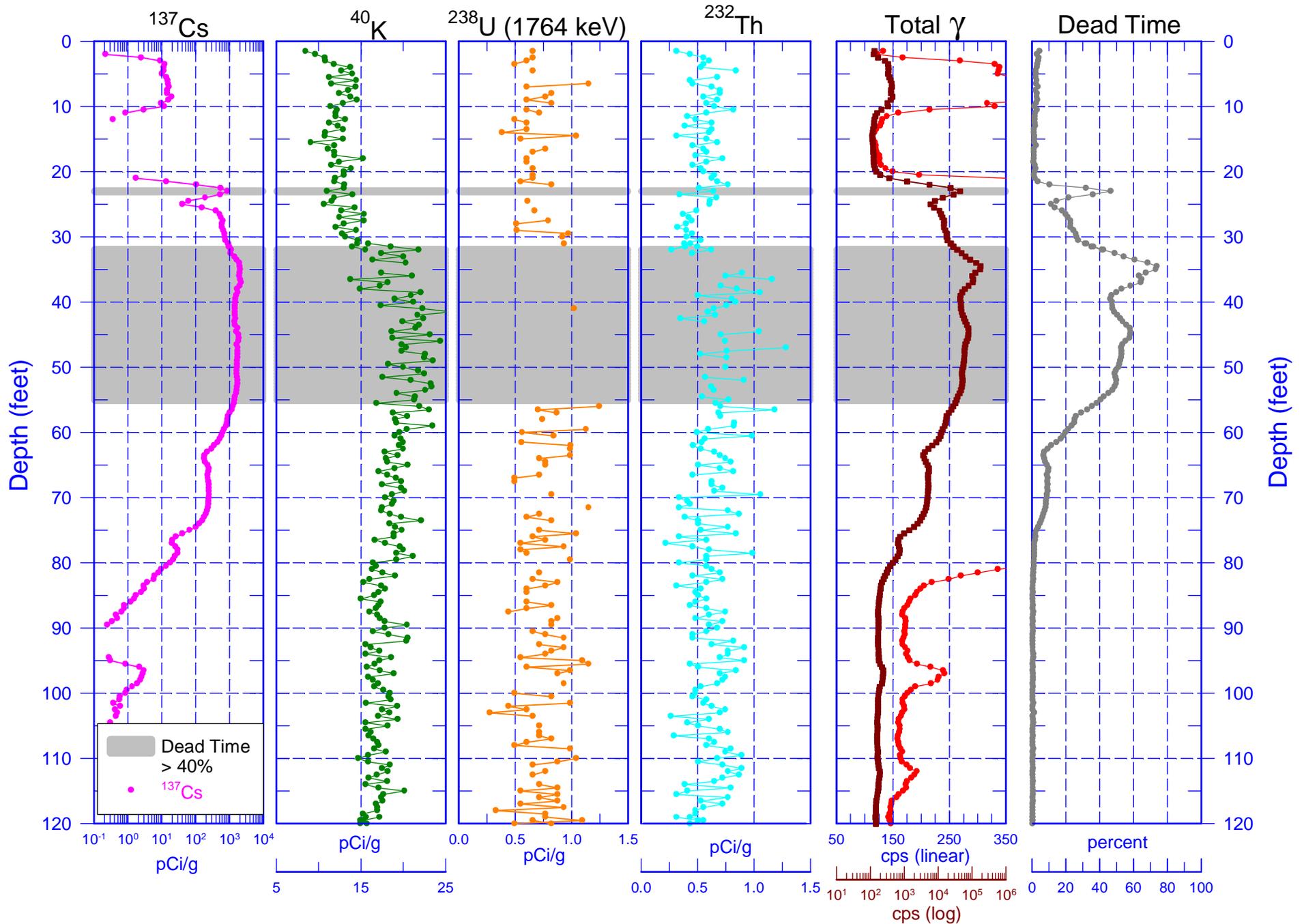
Man-Made Radionuclide Concentrations



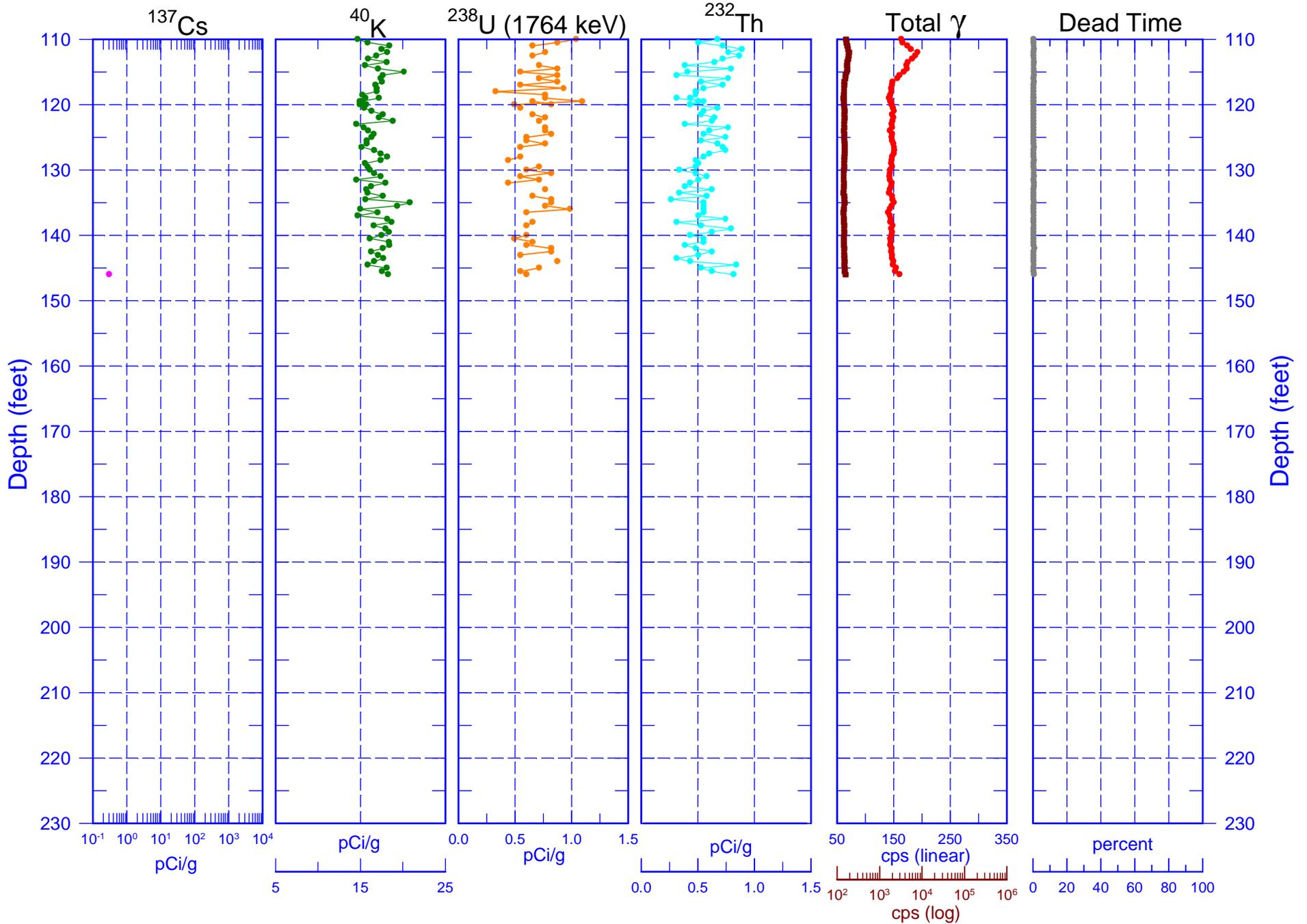
299-E33-58 (A6866) Natural Gamma Logs



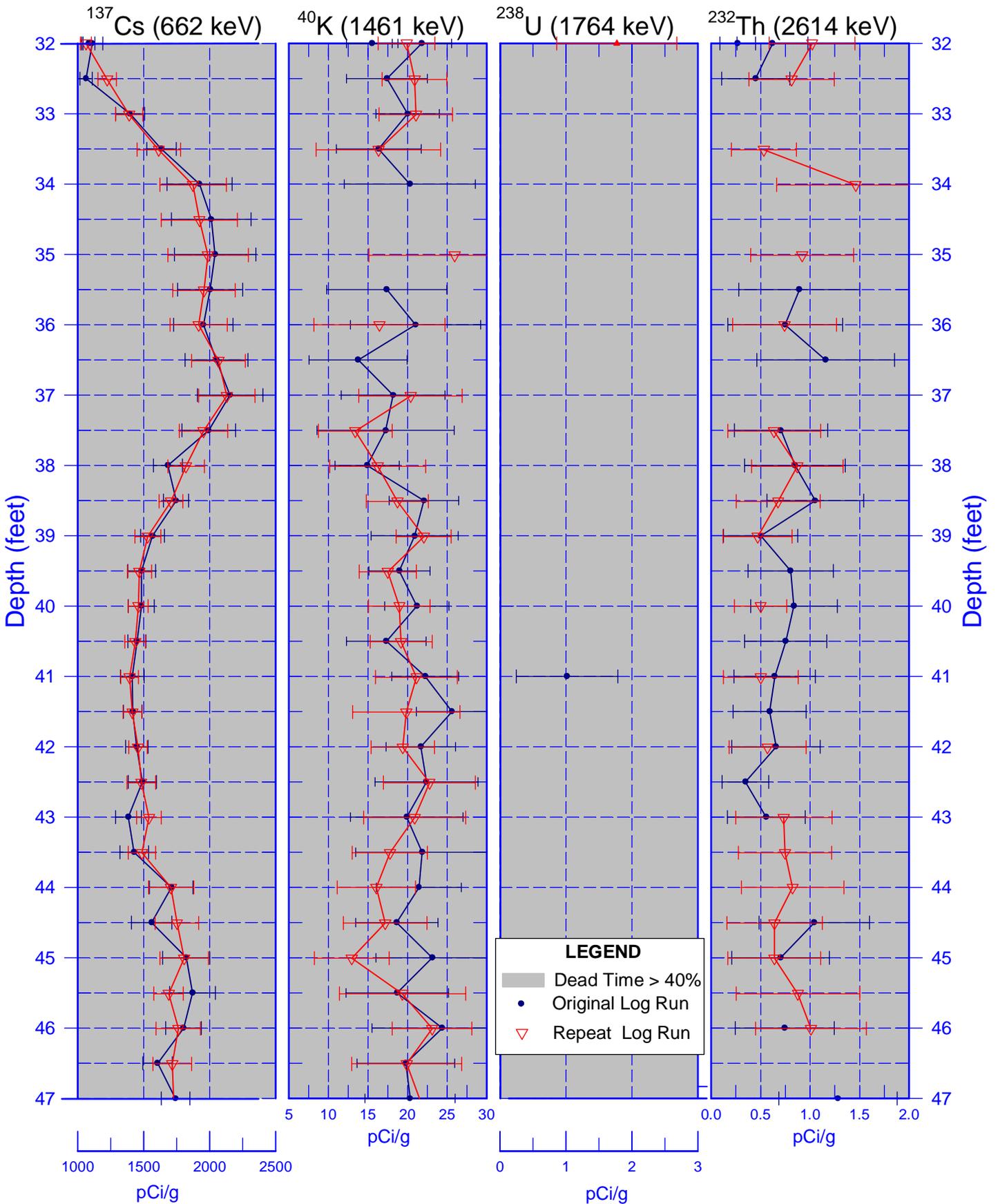
299-E33-58 (A6866) Combination Plot



299-E33-58 (A6866) Combination Plot



299-E33-58 (A6866) Repeat Logs



299-E33-58 (A6866)

Total Gamma & Dead Time

