



299-E33-59 (A6867)

Log Data Report

Borehole Information:

Borehole: 299-E33-59 (A6867)		Site: 216 B-7A&B Crib			
Coordinates (WA State Plane)		GWL¹ (ft): Not reached		GWL Date: N/A ²	
North 137388	East 573797	Drill Date 12/47	TOC³ Elevation 643.05	Total Depth (ft) 150.0	Type Cable tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel (welded)	1.1	8.625	7.981	0.322	0	153

Borehole Notes:

The casing depth information provided above is derived from *Hanford Wells* (Chamness and Merz 1993). Casing dimensions are based on published values for 8-in.-diameter schedule-40 pipe. 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		
Date	12/11/01	12/12/01	12/13/01		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth	1.5	130.5	116.0		
Finish Depth	66.0	115.0	65.0		
Count Time (sec)	100	100	100		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	0.5	0.5	0.5		
ft/min	N/A	N/A	N/A		
Pre-Verification	A0055CAB	A0057CAB	A0058CAB		
Start File	A0056000	A0057000	A0058000		
Finish File	A0056129	A0057031	A0058102		
Post-Verification	A0056CAA	A0057CAA	A0058CAA		

Logging Operation Notes:

Spectral gamma logging was performed in this borehole during December 2001 on three separate days. No repeat section was acquired.

Analysis Notes:

Analyst:	Henwood	Date:	01/10/02	Reference:	MAC-VZCP 1.7.9 Rev. 2
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Pre-run and post-run verifications of the logging system were performed for each day's log event. The efficiency (peak counts per second) of the logging system was consistently lower each day in the post-run verification as compared to the pre-run verification. Evaluation of the spectra indicates the detector is functioning normally 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 8-in. steel casing. This value is the published thickness for ASTM schedule-40 steel pipe, a common borehole casing at Hanford.

Each spectrum collected during a log run was processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with EXCEL worksheet template g1dcalc4.xls using an efficiency function and corrections for casing and dead time as appropriate. The ^{214}Bi peak at 609 keV was used to determine the naturally occurring ^{238}U concentrations rather than the ^{214}Bi peak at 1764 keV because the error in most spectra was slightly less.

Log Plot Notes:

Separate log plots are provided for the man-made radionuclides (^{137}Cs and processed uranium [^{235}U and ^{238}U]) 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, and a plot of total gamma plotted with dead time. 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, casing corrections, or water corrections.

Results and Interpretations:

The man-made radionuclides detected in this borehole were ^{137}Cs and processed uranium. A zone of ^{137}Cs is detected near the ground surface between about 3 and 8 ft with a maximum concentration of about 10 pCi/g. A second zone of ^{137}Cs contamination includes the depths from about 32 to 55 ft. The maximum concentration is about 1,000 pCi/g.

Processed uranium includes ^{238}U as inferred using the 1001-keV metastable protactinium-234 ($^{234\text{m}}\text{Pa}$) energy peak and ^{235}U as directly measured using the 185.7-keV energy peak. The maximum concentrations for ^{238}U and ^{235}U are about 25 and 3 pCi/g, respectively. The processed uranium exists between depths of about 41 and 53 ft.

^{40}K concentrations increase from about 12 to 16 pCi/g at 35 ft, suggesting a transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2. This depth coincides with the beginning of the contamination interval that extends to 55 ft. Naturally occurring ^{238}U measurements between the depths of about 32 to 52 ft are obscured by the elevated ^{137}Cs concentrations. Downscatter from the ^{137}Cs at 662 keV causes an elevated background at the 609-keV energy peak, which is used to measure naturally occurring ^{238}U .

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.

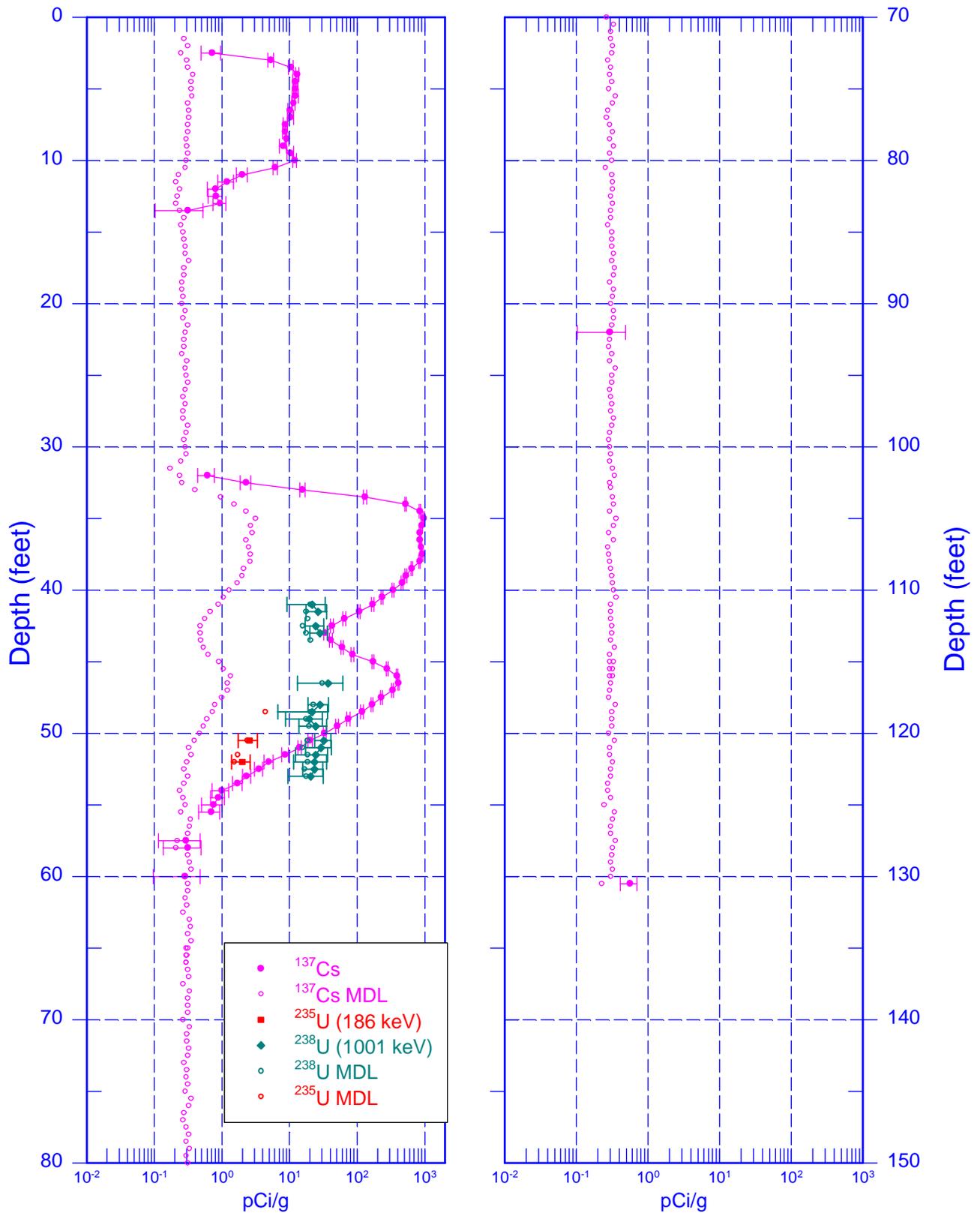
¹ GWL – groundwater level

² N/A – not applicable

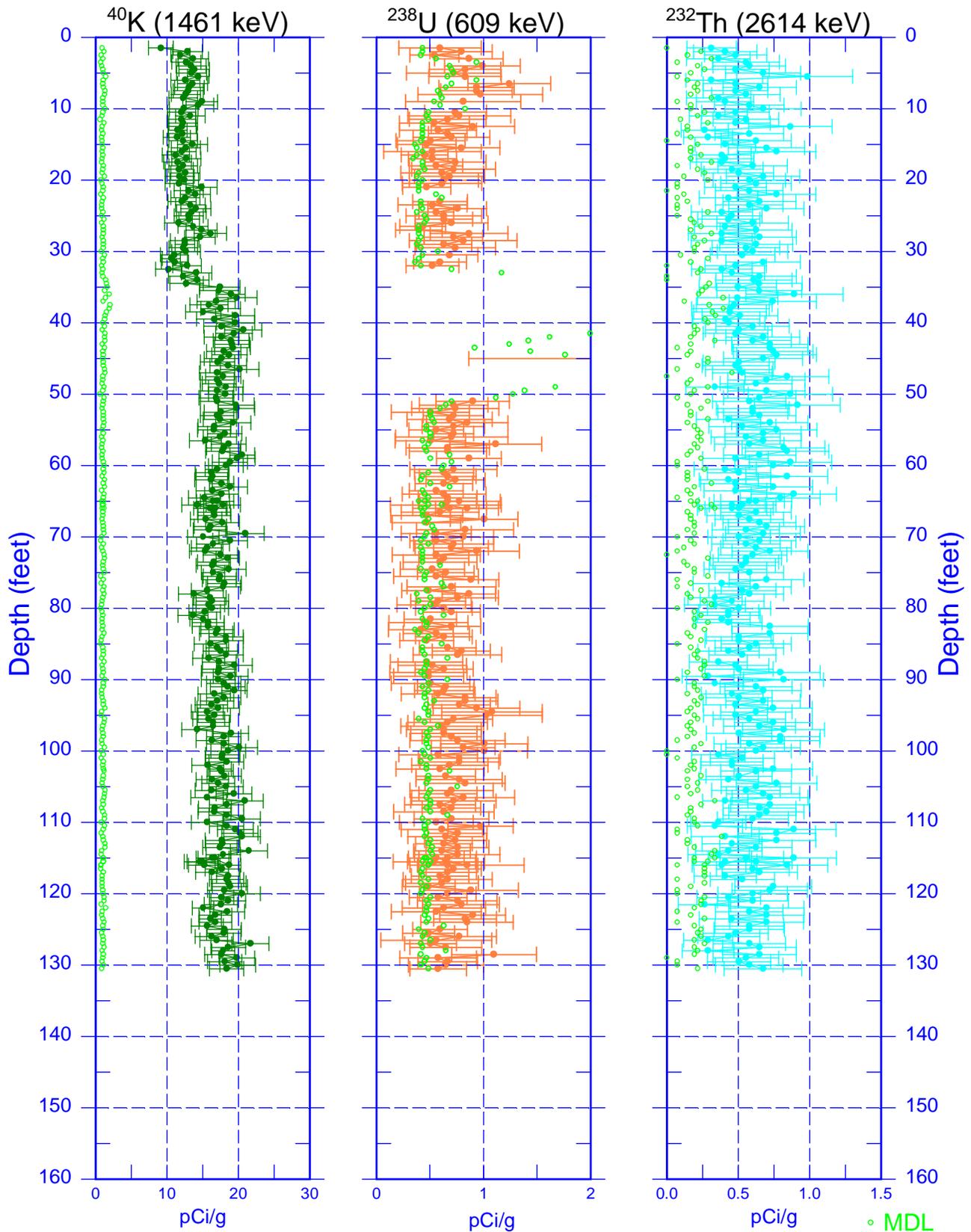
³ TOC – top of casing

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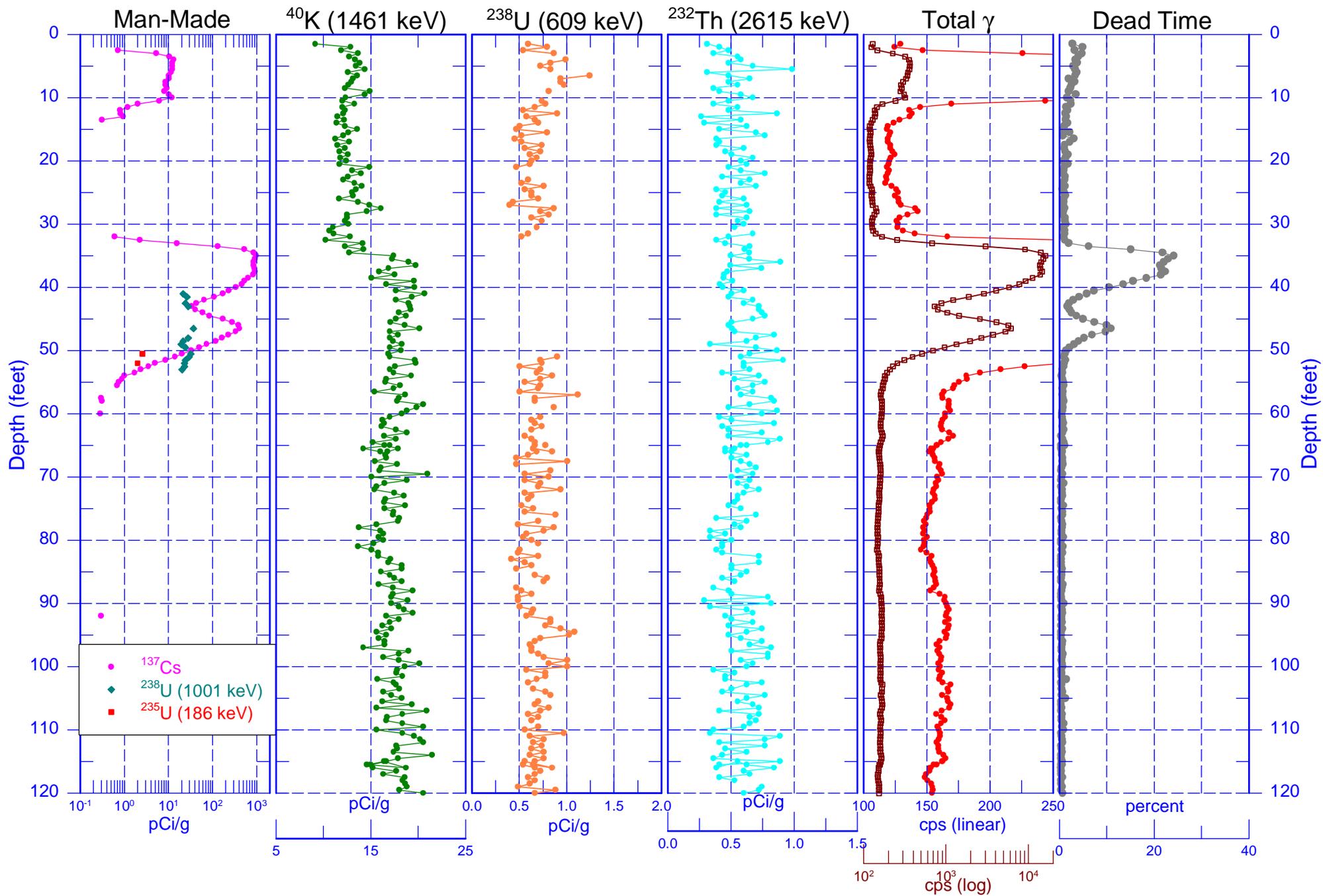
Man-Made Radionuclide Concentrations



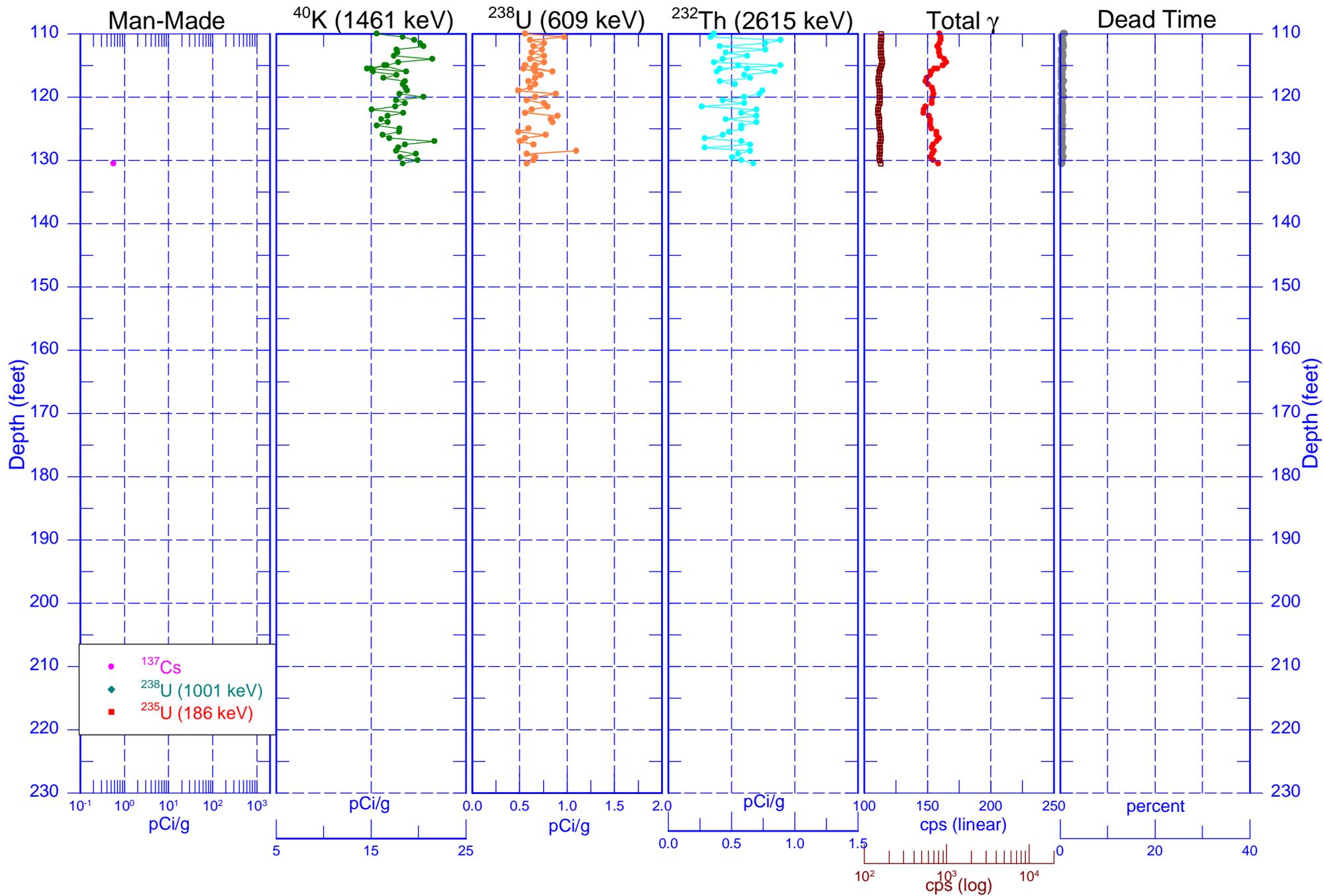
299-E33-59 (A6867) Natural Gamma Logs



299-E33-59 (A6867) Combination Plot



299-E33-59 (A6867) Combination Plot (continued)



299-E33-59 (A6867)

Total Gamma & Dead Time

