

299-W22-61 (A7868)
Log Data Report

Borehole Information:

Borehole: 299-W22-61 (A7868)		Site: 216-S-20 Crib			
Coordinates (WA State Plane)		GWL (ft)¹: Dry		GWL Date: 05/03/2004	
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
133,916.247 m	567,546.203 m	Dec. 1950	208.652 m	151.8	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	+1.0	8 5/8	8	5/16	0	150
The logging engineer used a caliper to determine the outside 8-in. casing diameter. The caliper and casing stickup were both measured using a steel tape. Inside casing diameter was measured with a steel tape. All measurements were rounded to the nearest 1/16 in. Depth to bottom was measured with an e-tape.						

Borehole Notes:

Borehole coordinates, elevation, and well construction information, as shown in the above tables, are from measurements by Stoller field personnel, Chamness and Merz (1993), and HWIS³. Zero reference is the top of the 8-in. casing. The top of the casing was capped with a flange. This borehole is located at the west end of the crib. There appears to be approximately 1.5 ft of gravel covering the top of the crib.

Logging Equipment Information:

Logging System: Gamma 2A	Type: SGLS (35%) 34TP20893A
Calibration Date: 03/2004	Calibration Reference: DOE-EM/GJ642-2004
Logging Procedure: MAC-HGLP 1.6.5, Rev. 0	

Logging System: Gamma 1C	Type: High Rate Detector
Calibration Date: 04/2003	Calibration Reference: GJO-2003-429-TAC
Logging Procedure: MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3t	4	5 / Repeat
Date	05/04/04	05/04/04	05/04/04	05/05/04	05/05/04
Logging Engineer	Pearson	Pearson	Pearson	Pearson	Pearson
Start Depth (ft)	1.0	21.0	36.0	151.0	52.0
Finish Depth (ft)	22.0	37.0	100.0	99.0	37.0
Count Time (sec)	200	20	200	200	200
Live/Real	R	R	R	R	R

Log Run	1	2	3t	4	5 / Repeat
Shield (Y/N)	N	N	N	N	N
MSA Interval (ft)	1.0	1.0	1.0	1.0	1.0
ft/min	N/A ⁴	N/A	N/A	N/A	N/A
Pre-Verification	BA327CAB	BA327CAB	BA327CAB	BA329CAB	BA329CAB
Start File	BA328000	BA328022	BA328039	BA329000	BA329053
Finish File	BA328021	BA328038	BA328103	BA329052	BA329068
Post-Verification	BA328CAA	BA328CAA	BA328CAA	BA329CAA	BA329CAA
Depth Return Error (in.)	N/A	N/A	½ low	N/A	0.0
Comments	No gain adjustments.	High rate section.	No gain adjustments.	No gain adjustments.	Adjusted gain after file BA329056.

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2	3	4 / Repeat	
Date	05/12/04	05/12/04	05/12/04	05/12/04	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	37.0	34.0	26.0	32.0	
Finish Depth (ft)	34.0	27.0	20.0	28.0	
Count Time (sec)	300	100	300	100	
Live/Real	R	R	R	R	
Shield (Y/N)	None	None	None	None	
MSA Interval (ft)	1.0	1.0	1.0	1.0	
ft/min	N/A	N/A	N/A	N/A	
Pre-Verification	AC099CAB	AC099CAB	AC099CAB	AC099CAB	
Start File	AC100000	AC100003	AC100011	AC100018	
Finish File	AC100002	AC100010	AC100017	AC100022	
Post-Verification	AC100CAA	AC100CAA	AC100CAA	AC100CAA	
Depth Return Error (in.)	N/A	N/A	N/A	0	
Comments	No fine-gain adjustment.	None	Fine-gain adjustment after file 016.	Repeat section.	

Logging Operation Notes:

Zero reference was top of the 8-in. casing. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (⁴⁰K, ²³⁸U, and ²³²Th) verifier.

Analysis Notes:

Analyst:	Sobczyk	Date:	5/17/04	Reference:	GJO-HGLP 1.6.3, Rev. 0
-----------------	---------	--------------	---------	-------------------	------------------------

SGLS pre-run and post-run verification spectra were collected at the beginning and end of the day. All of the verification spectra were within the acceptance criteria. The 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 between 3.7 percent lower and 3.6 percent higher at the end of the day. Examinations of spectra indicate that the detector appears to have functioned normally during logging, and the spectra are accepted.

HRLS pre-run and post-run verification spectra were collected at the beginning and end of the day. The spectra were within the acceptance criteria for the field verification of the Gamma 1C logging system (HRLS).

Log spectra 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 files: G2AMar04.xls [SGLS] and G1CApr03.xls [HRLS]). Zero reference was the top of the 8-in. casing. Based on Chamness and Merz (1993) and the field measurements, the casing configuration was assumed to be a string of 8-in. casing with a thickness of 5/16 in. to total logging depth (151 ft). A water correction was not required.

Using the SGLS, dead time greater than 40 percent was encountered in the interval from 21 to 36 ft. Data from this region are 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. The HRLS was utilized to obtain data where the SGLS dead time exceeded 40 percent. SGLS and HRLS dead time corrections were applied when dead time surpassed 10.5 percent.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}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}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs , ^{60}Co , and processed uranium (^{238}U and ^{235}U) were the man-made radionuclides detected in this borehole. ^{137}Cs was detected in the intervals between 4 to 7 ft and 18 to 42 ft at concentrations ranging from the MDL (0.2) to 153,000 pCi/g. The maximum concentration was measured at 30 ft. ^{60}Co , based on the 1333-keV photopeak, was detected in the intervals between 20 to 22 ft and 36 to 42 ft at concentrations ranging from the 0.3 to 5.4 pCi/g. The maximum concentration was measured at 22 ft. ^{60}Co was also detected at 136, 142, and 144 ft at concentrations near the MDL (0.1 pCi/g). $^{235/238}\text{U}$ was detected in the interval between 37 and 42 ft, and the maximum concentrations were measured at 38 ft. The range of concentrations of ^{238}U , as inferred from the $^{234\text{m}}\text{Pa}$ 1001-keV energy peak, was between 35 and 410 pCi/g. ^{235}U , which is measured directly by the 186-keV photopeak, was detected at concentrations between 1.6 and 24 pCi/g. The MDLs for ^{60}Co , ^{238}U , and ^{235}U in the high ^{137}Cs interval between 21 and 36 ft are elevated because of high background counts. Thus, processed uranium and ^{60}Co probably exist in the high activity zone even though they were not detected.

The plots of the repeat logs demonstrate reasonable repeatability of the HRLS and SGLS data. ^{137}Cs (662 keV) concentrations are comparable between the repeat and original HRLS log runs. The natural radionuclides at energy levels of 609, 1461, 1764, and 2614 keV are comparable between the repeat and original SGLS log runs. The man-made radionuclides at energy levels of 186 (^{235}U), 662 (^{137}Cs), 1001 (^{238}U), and 1333 (^{60}Co) keV are comparable between the repeat and original SGLS log runs.

References:

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

¹ GWL – groundwater level

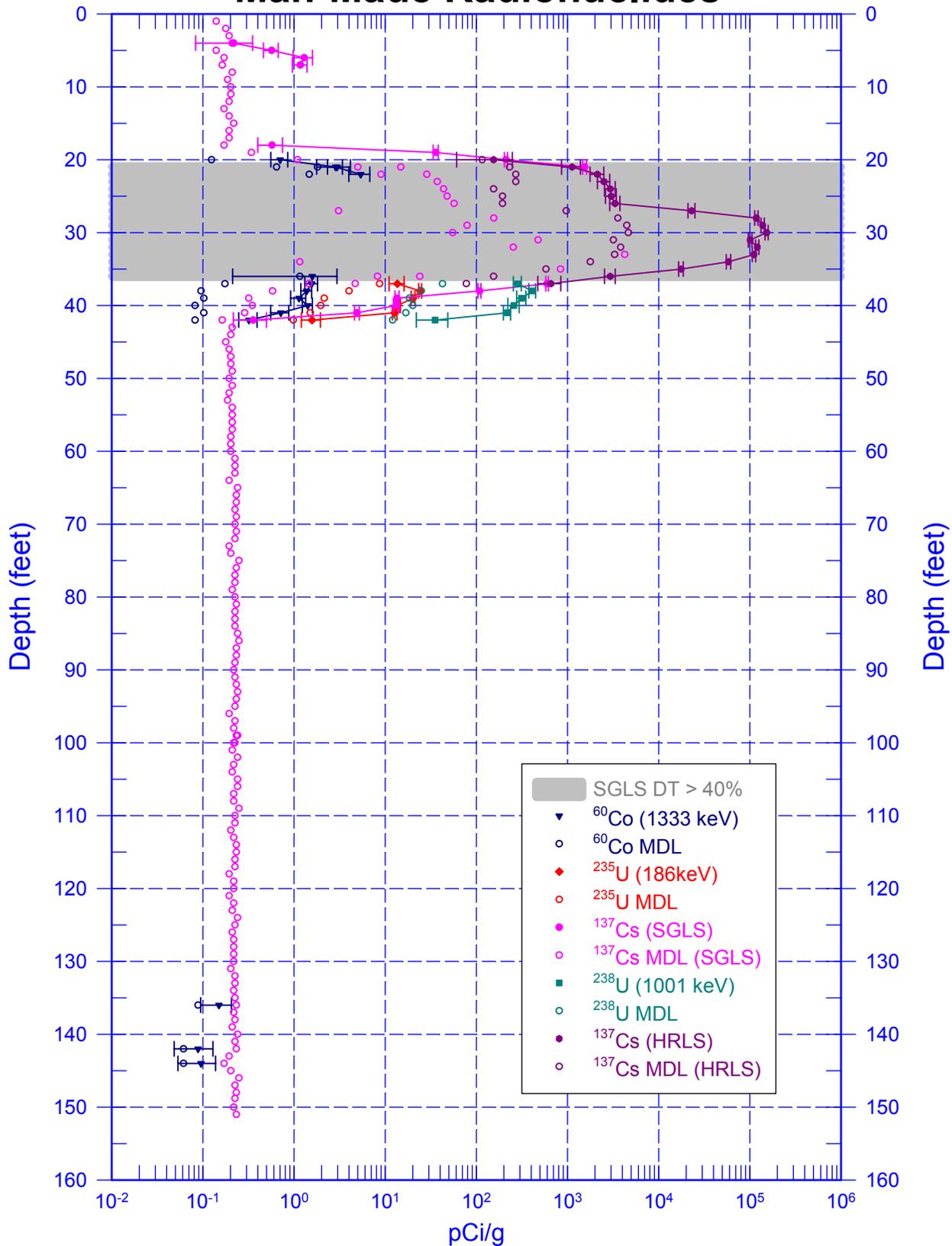
² TOC – top of casing

³ HWIS – Hanford Well Information System

⁴ N/A – not applicable

299-W22-61 (A7868)

Man-Made Radionuclides

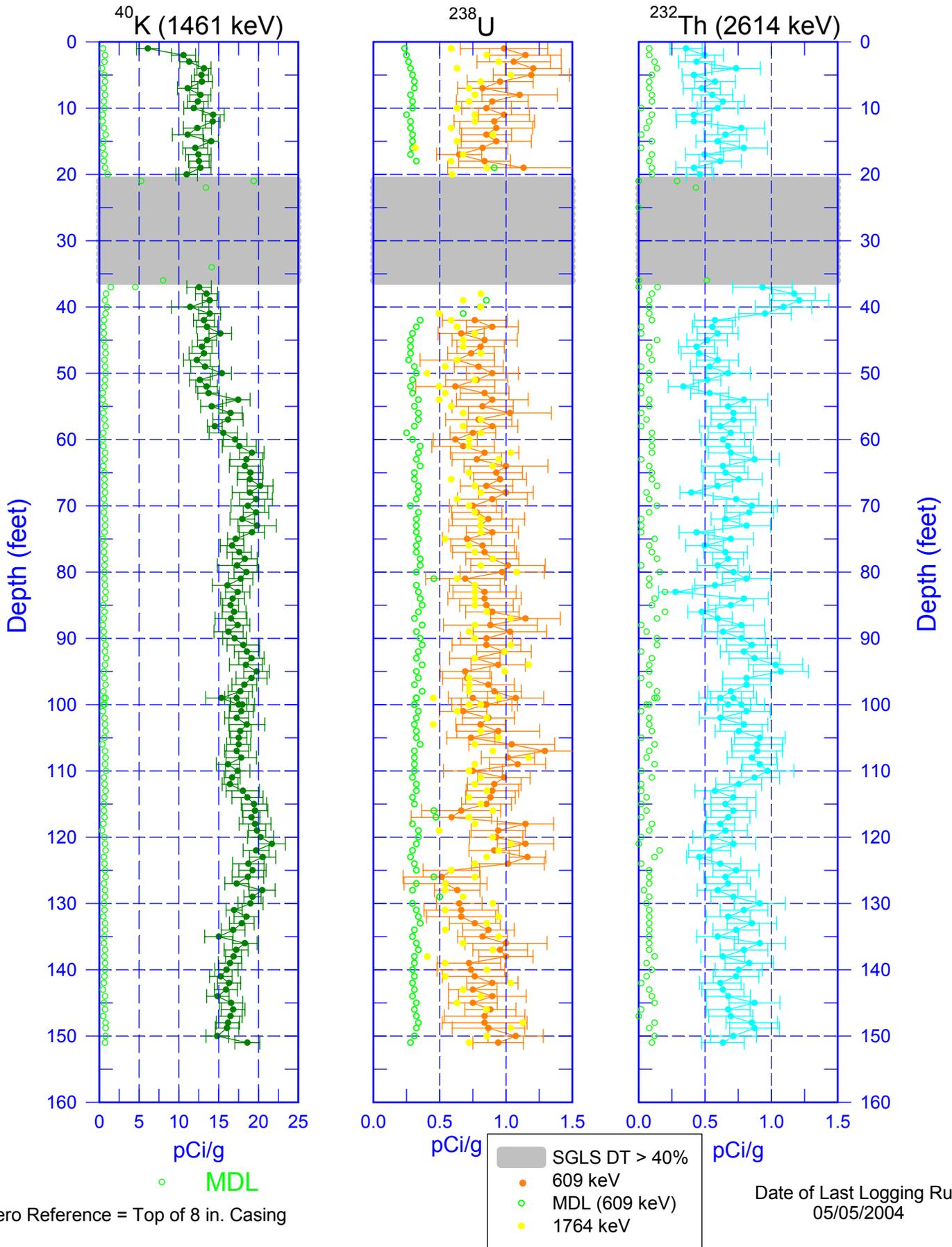


Zero Reference = Top of 8 in. Casing

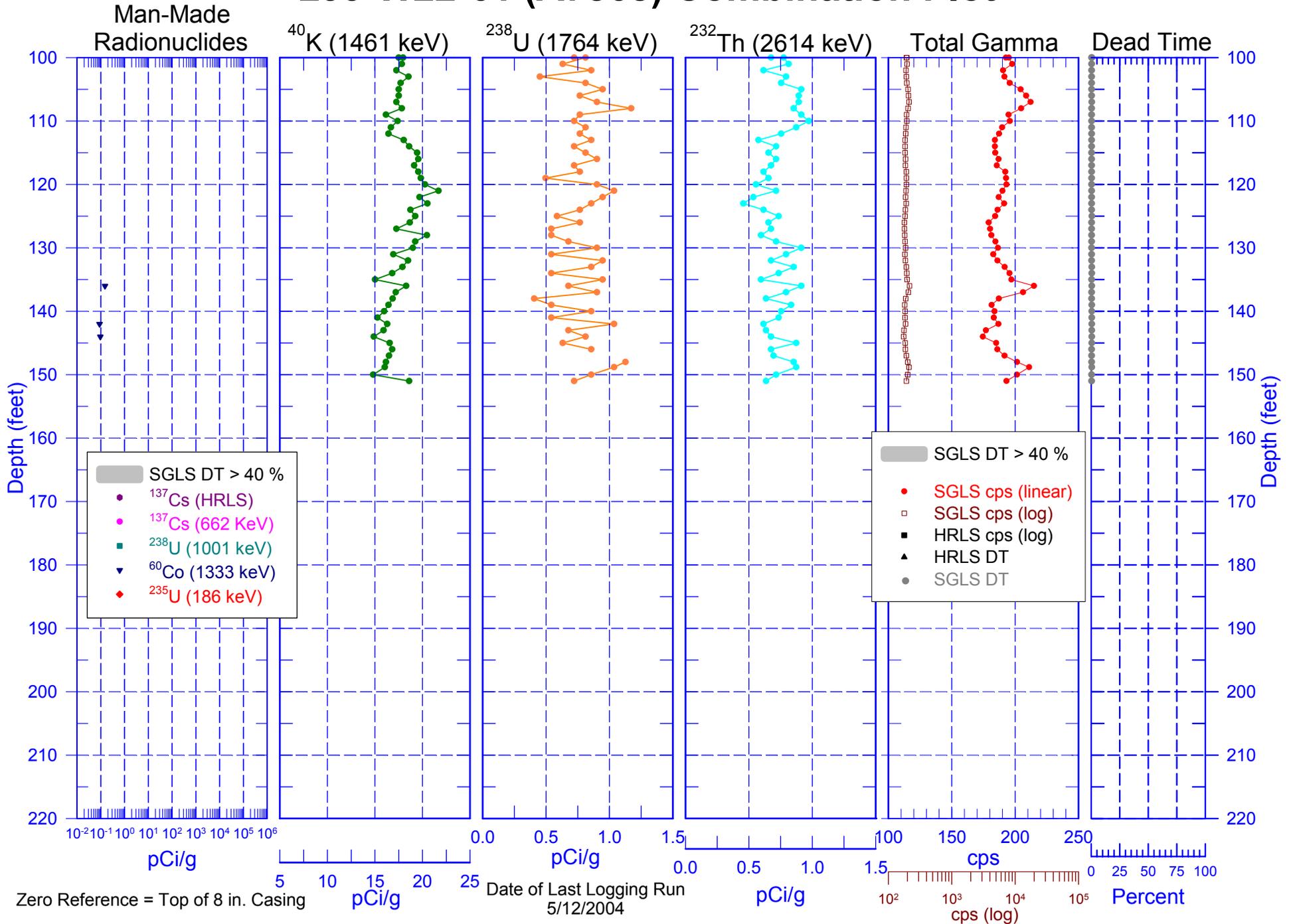
Date of Last Logging Run
5/12/2004

299-W22-61 (A7868)

Natural Gamma Logs

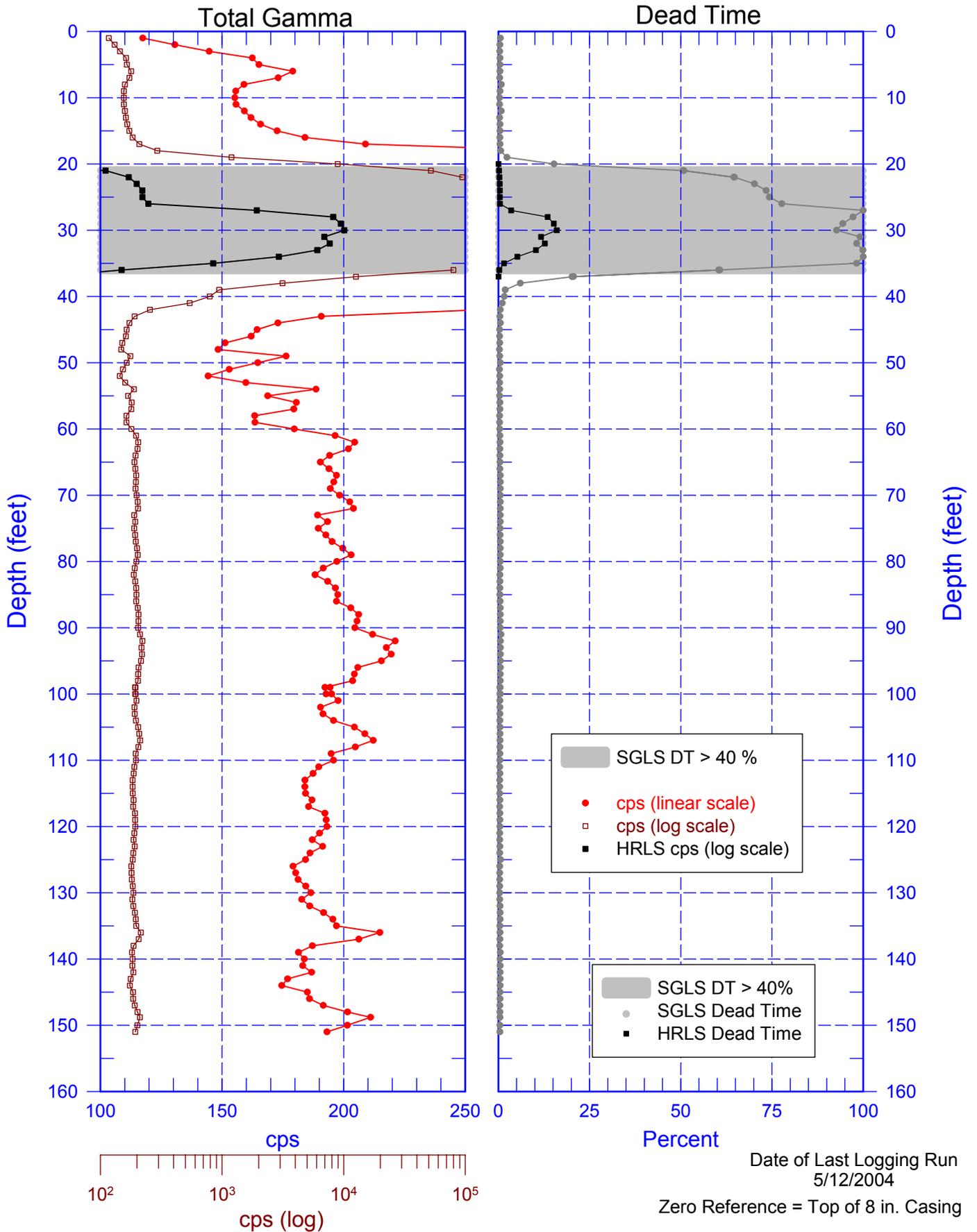


299-W22-61 (A7868) Combination Plot



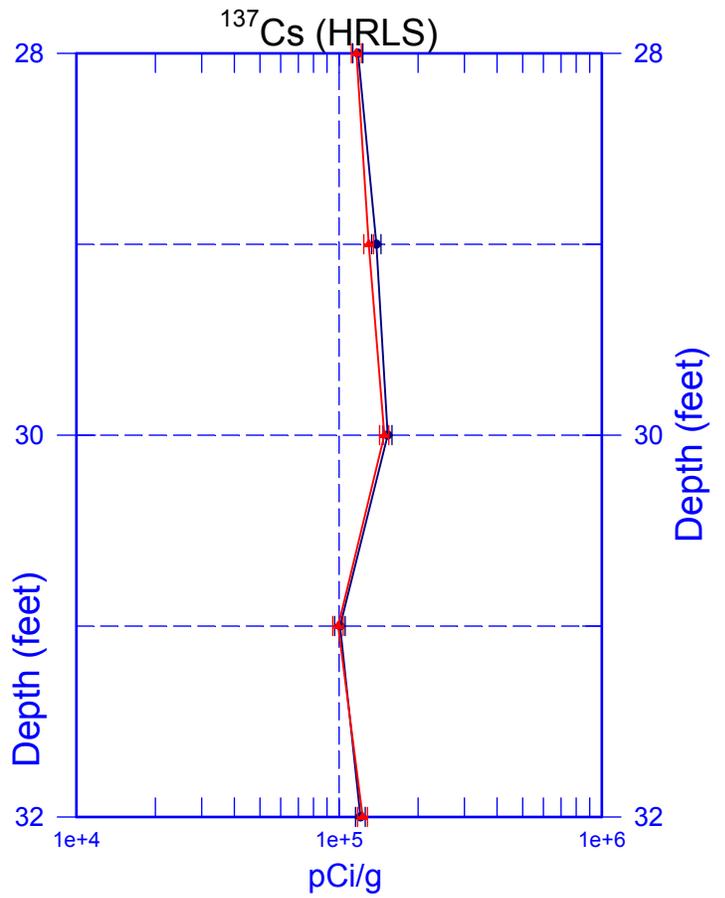
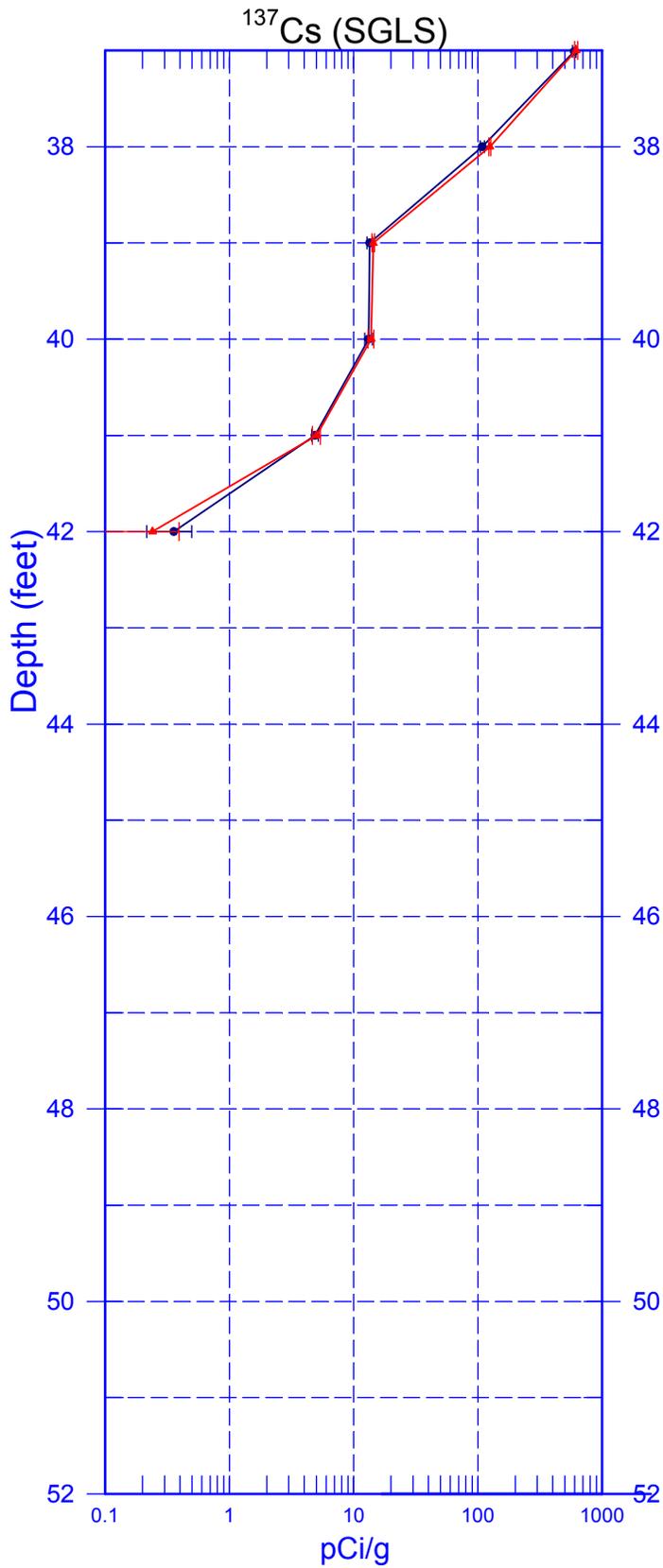
299-W22-61 (A7868)

Total Gamma & Dead Time



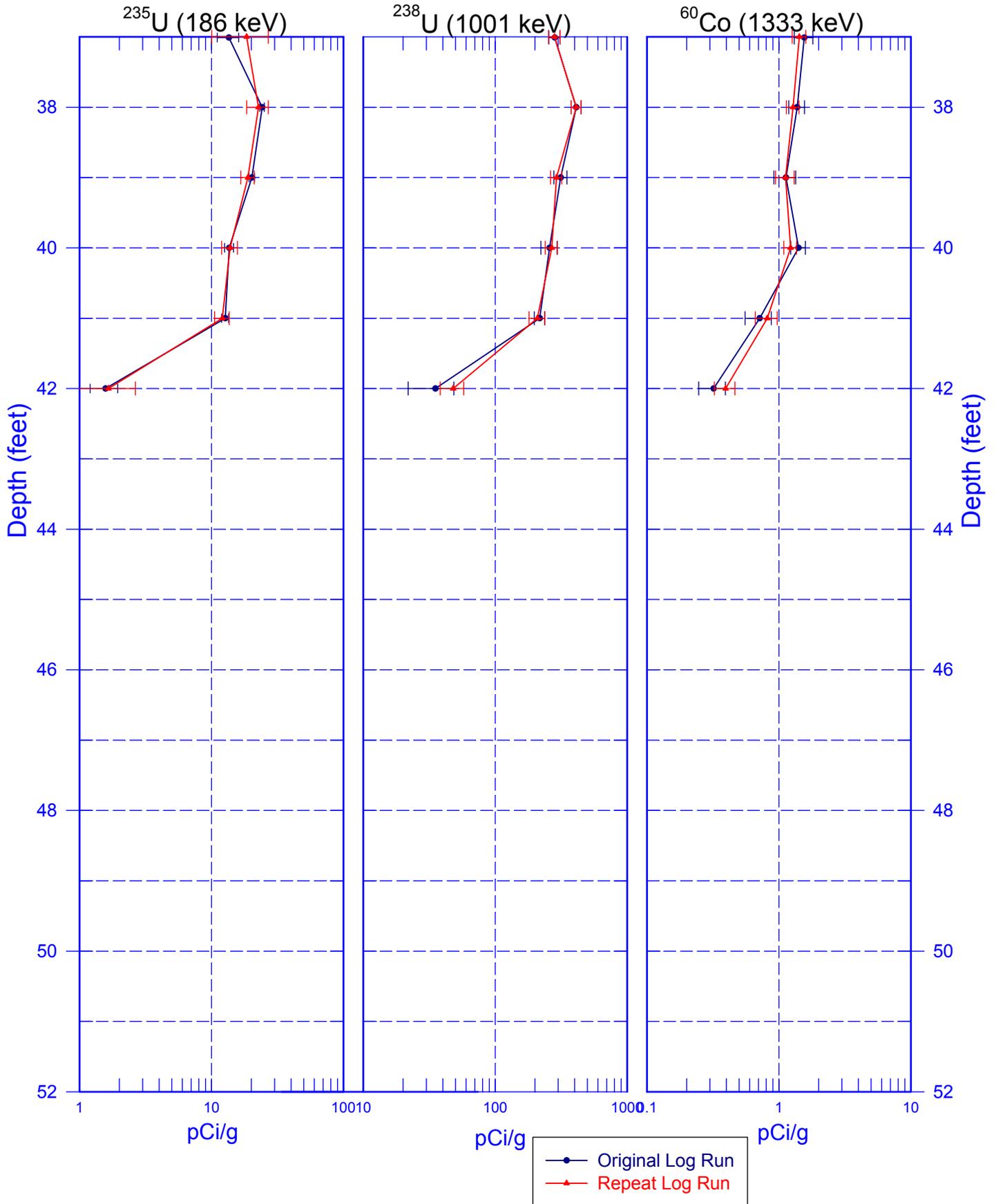
299-W22-61 (A7868)

Rerun of ^{137}Cs (SGLS & HRLS)



299-W22-61 (A7868)

Rerun of Man-Made Radionuclides (52.0 to 37.0 ft)



299-W22-61 (A7868)

Rerun of Natural Gamma Logs (52.0 to 37.0 ft)

