Stoller
Hanford Office

DOE-EM/GJ1097-2006

299-W15-213 (A7511)
Log Data Report

Borehole Information:

Borehole:	299-W15-213 (A7511)		Site:	216-Z-8 French Drain	
Coordinates (WA St Plane)		GWL[1] (ft) :	None	GWL Date:	11/21/05
North	East	Drill Date	Elevation (ft) (TOC)	Total Depth (ft)	Type
135652.245	566653.262	07/85	674.45	44	Cable

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	1.7	6 5/8	6 1/16	9/32	1.7	44
Welded Steel	0.2	8	unknown	5/16	0.2	13

Borehole Notes:

Casing diameter and stickup measurements were acquired using a caliper and steel tape. Logging data acquisition is referenced to the top of casing (TOC).

Spectral Gamma Logging System (SGLS) Equipment Information:

Logging System:	Gamma 4E		Type:	SGLS (70%) SN: 34TP40587A
Effective Calibration Date:	12/21/04	Calibration Reference:	DOE/EM-GJ854-2005	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Passive Neutron Logging System (PNLS) Equipment Information:

Logging System:	Gamma 4I		Type:	Passive Neutron U1754
Calibration Date:	None	Calibration Reference:	None	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2 Repeat	3 Repeat		
Date	11/21/05	11/21/05	11/21/05		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	43.5	24.5	18.5		
Finish Depth (ft)	2.5	15.5	18.5		
Count Time (sec)	100	200	1000		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		

Log Run	1	2 Repeat	3 Repeat		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A[2]	N/A	N/A		
Pre-Verification	DE991CAB	DE991CAB	DE991CAB		
Start File	DE991000	DE991042	DE991052		
Finish File	DE991041	DE991051	DE991052		
Post-Verification	DE991CAA	DE991CAA	DE991CAA		
Depth Return Error (in.)	0	0	0		
Comments	No fine-gain adjustment	No fine-gain adjustment	No fine-gain adjustment		

Passive Neutron Logging System (PNLS) Log Run Information:

Log Run	4	5 - Repeat			
Date	11/22/05	11/22/05			
Logging Engineer	Spatz	Spatz			
Start Depth (ft)	43.5	24.5			
Finish Depth (ft)	2.5	15.5			
Count Time (sec)	N/A	N/A			
Live/Real	R	R			
Shield (Y/N)	N	N			
Sample Interval (ft)	1.0	1.0			
ft/min	1.0	1.0			
Pre-Verification	DI252CAB	DI252CAB			
Start File	DI252000	DI252042			
Finish File	DI252041	DI252051			
Post-Verification	DI242CAA	DI252CAA			
Depth Return Error (in.)	0	0			
Comments	None	None			

Logging Operation Notes:

Logging was conducted with a centralizer on the spectral gamma sonde and without a centralizer on the PNLS sonde. Measurements are referenced to the top of casing. A 1,000-sec counting time was used to acquire a spectrum at 18.5 ft where the highest total count rate was observed. A repeat section was collected in this borehole at 200 sec to evaluate the logging system's performance.

Analysis Notes:

Analyst:	Henwood	**Date:**	12/27/05	**Reference:**	GJO-HGLP 1.6.3, Rev. 0

Pre-run and post-run verifications for the logging systems were performed before and after each day's data acquisition. Acceptance criteria were met.

SGLS spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated using the EXCEL worksheet template identified as G4EApr05.xls. A combined casing correction for 0.59375-in.-thick casing (0.28125 + 0.3125, for the 6- and 8-in. casings, respectively) was applied to the SGLS data from 0 to 13 ft. Below 13 ft, a correction for 0.3125-in. casing was applied. No corrections for dead time or water were required.

Results and Interpretations:

^{137}Cs, ^{239}Pu, and ^{241}Am were detected by the SGLS during logging of this borehole. The 662 keV energy peak can receive counts attributed to ^{137}Cs (661.62 keV) or ^{241}Am (662.40 keV) gamma rays and cannot be distinguished by the SGLS. Energy peaks were detected near 662 keV at 3.5 ft and 18.5 ft at 0.39 and 0.19 counts per second (cps), respectively; the spectrum at 18.5 ft was acquired for 1,000 sec versus 100 sec at 3.5 ft. Neither spectrum indicated a full energy peak at 722 keV, which can be a corroborating peak for ^{241}Am with slightly less yield than the 662.40 keV gamma ray. However, the energy peak at 18.5 ft coincides with a depth where ^{239}Pu is unambiguously identified. Experience in spectral gamma logging at Hanford suggests ^{241}Am is often associated with ^{239}Pu. Therefore, it is interpreted that ^{241}Am exists at 18.5 ft at a concentration of approximately 17,000 pCi/g. The MDL for the corroborating peak at 722 keV is approximately 21,000 pCi/g, which may explain its absence in the spectrum. The energy peak at 3.5 ft is attributed to ^{137}Cs at a concentration of approximately 0.2 pCi/g.

^{239}Pu was detected between 18 and 21 ft, ranging in concentrations from approximately 10,000 to 25,000 pCi/g; the maximum concentration was detected at 18.5 ft. The ^{239}Pu was indicated in spectra by the 129, 375.05, and 413.71 keV energy peaks. The 129 keV energy peak is below the range of the SGLS calibration (186 to 2615 keV). The 375.05 keV gamma ray has a slightly higher yield than the 413.71 keV gamma ray and was utilized for the assay of the ^{239}Pu.

Passive neutron logging was also conducted in this borehole. Slight elevation in count rate was centered at 18.5 ft. The increased count rate is attributed to the (α,n) reactions created by alpha emitters such as ^{239}Pu interacting with lighter elements.

The Westinghouse Hanford Company logged this borehole in 1995 with the Radionuclide Logging System (RLS). ^{239}Pu, using the 413.71 keV gamma ray energy peak, was detected at similar concentrations and depths as the current SGLS logging. The ^{137}Cs and ^{241}Am interpreted to exist by the current logging at 3.5 and 18.5 ft were not reported in 1995.

The repeat sections for the SGLS indicate good agreement for the naturally occurring and man-made radionuclides.

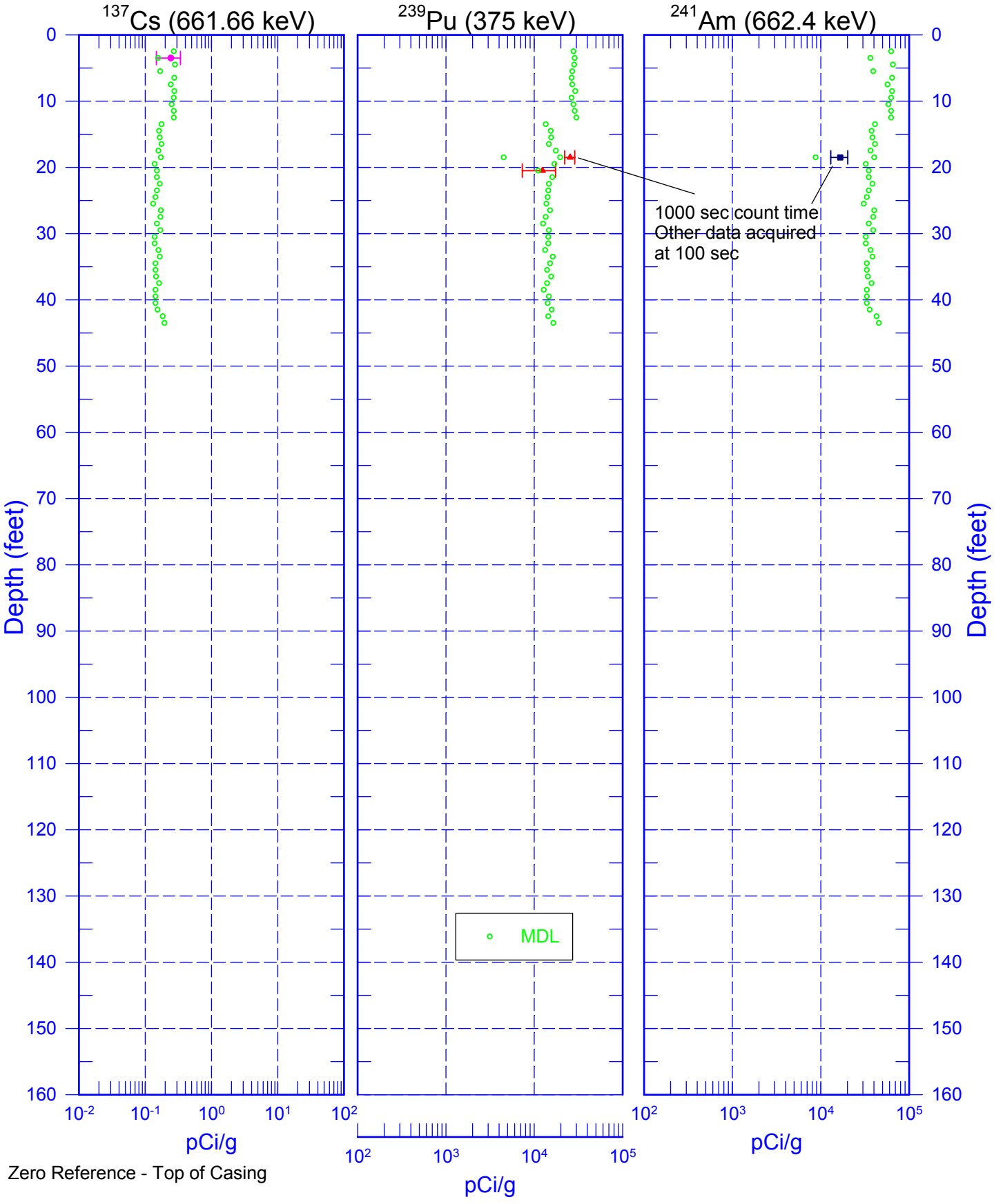
List of Plots:

Man-Made Radionuclides
Natural Gamma Logs
Combination Plot
Total Gamma and Dead Time
Total Gamma and Passive Neutron
Man-Made Radionuclides RLS/SGLS Comparison
Repeat Section of Man-Made Radionuclides
Repeat Section of Natural Gamma Logs

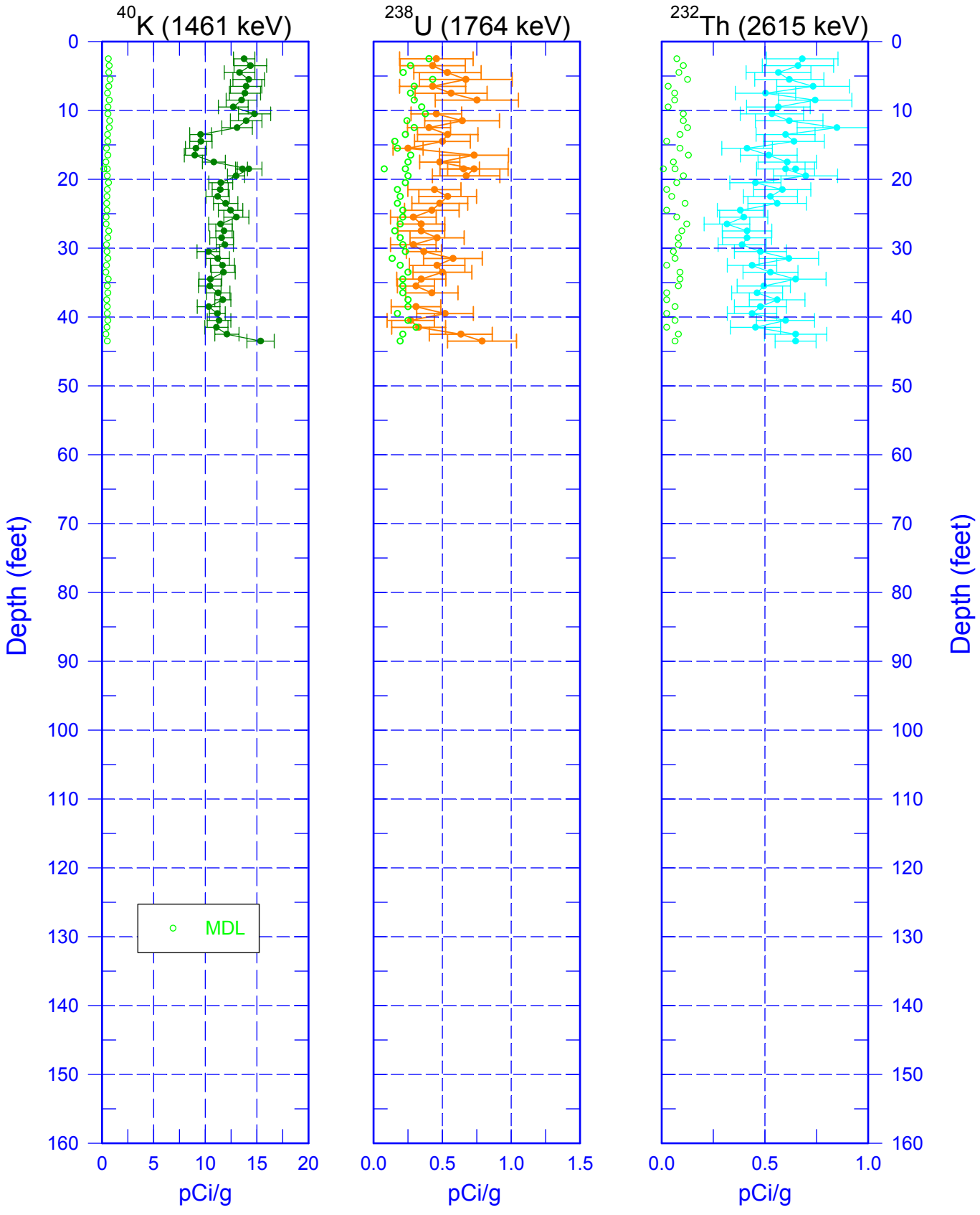
---

[1] GWL – groundwater level
[2] N/A – not applicable

299-W15-213 (A7511)
Man-Made Radionuclides

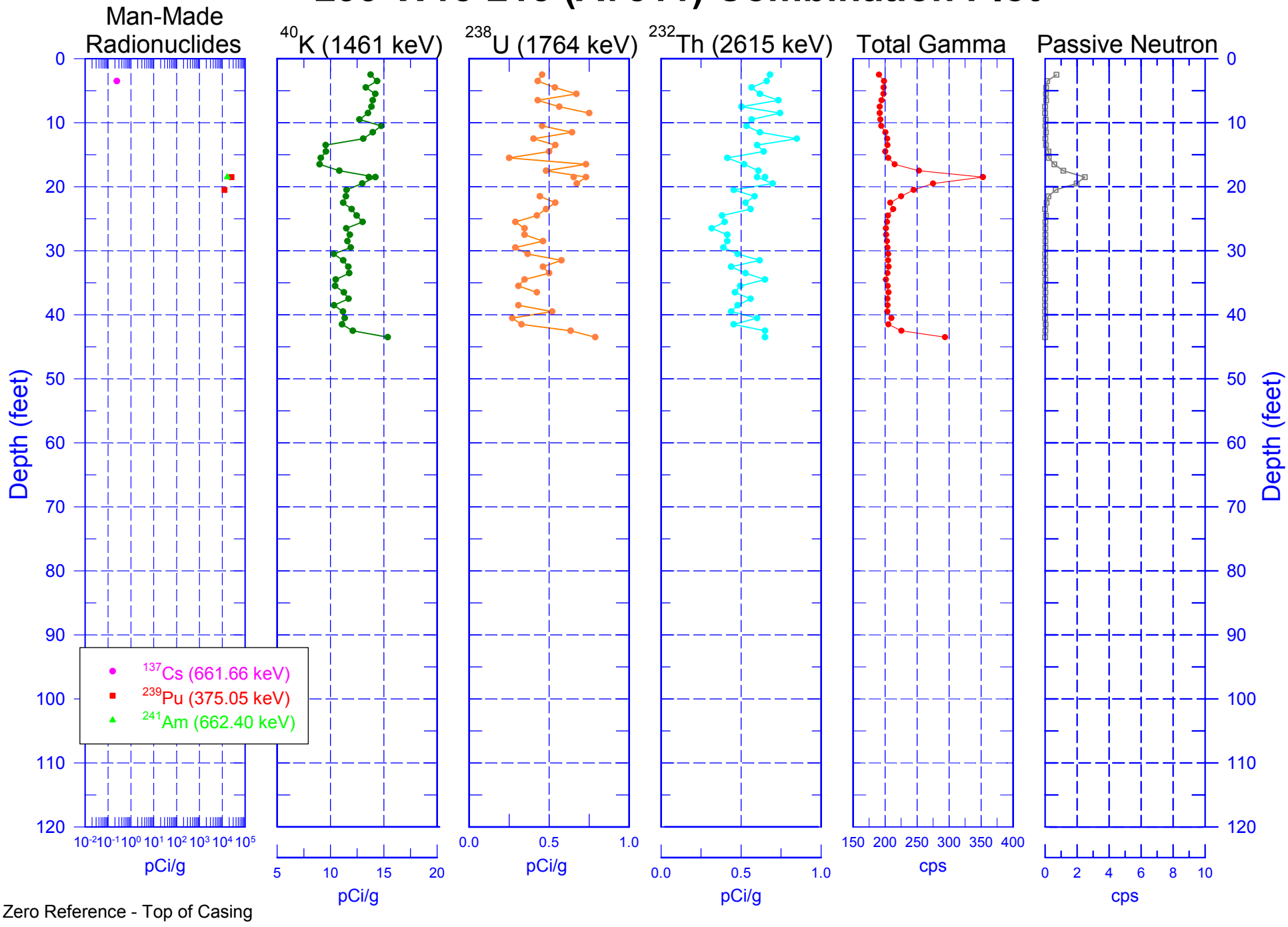


299-W15-213 (A7511)
Natural Gamma Logs



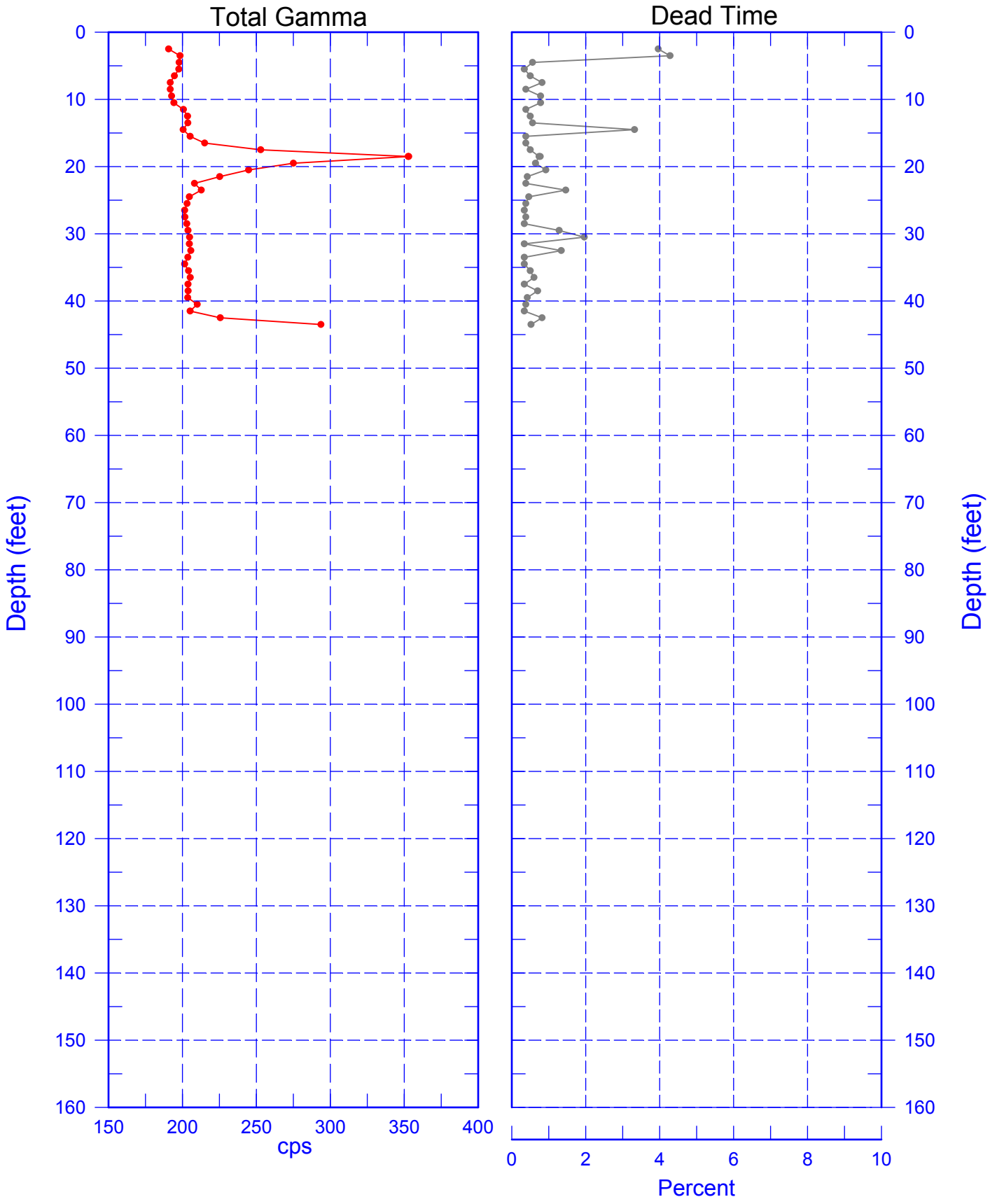
Zero Reference = Top of Casing

299-W15-213 (A7511) Combination Plot



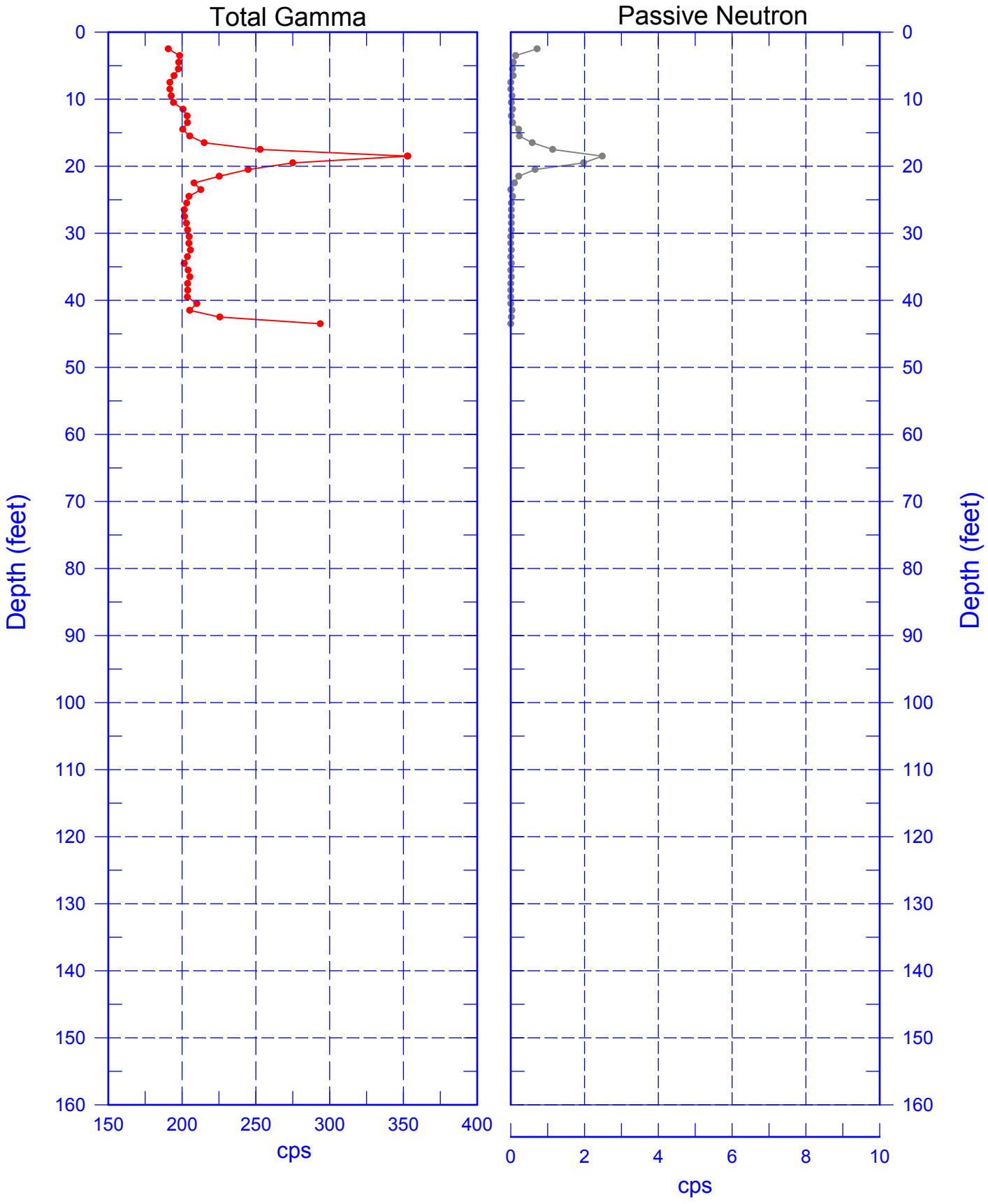
Zero Reference - Top of Casing

299-W15-213 (A7511)
Total Gamma & Dead Time



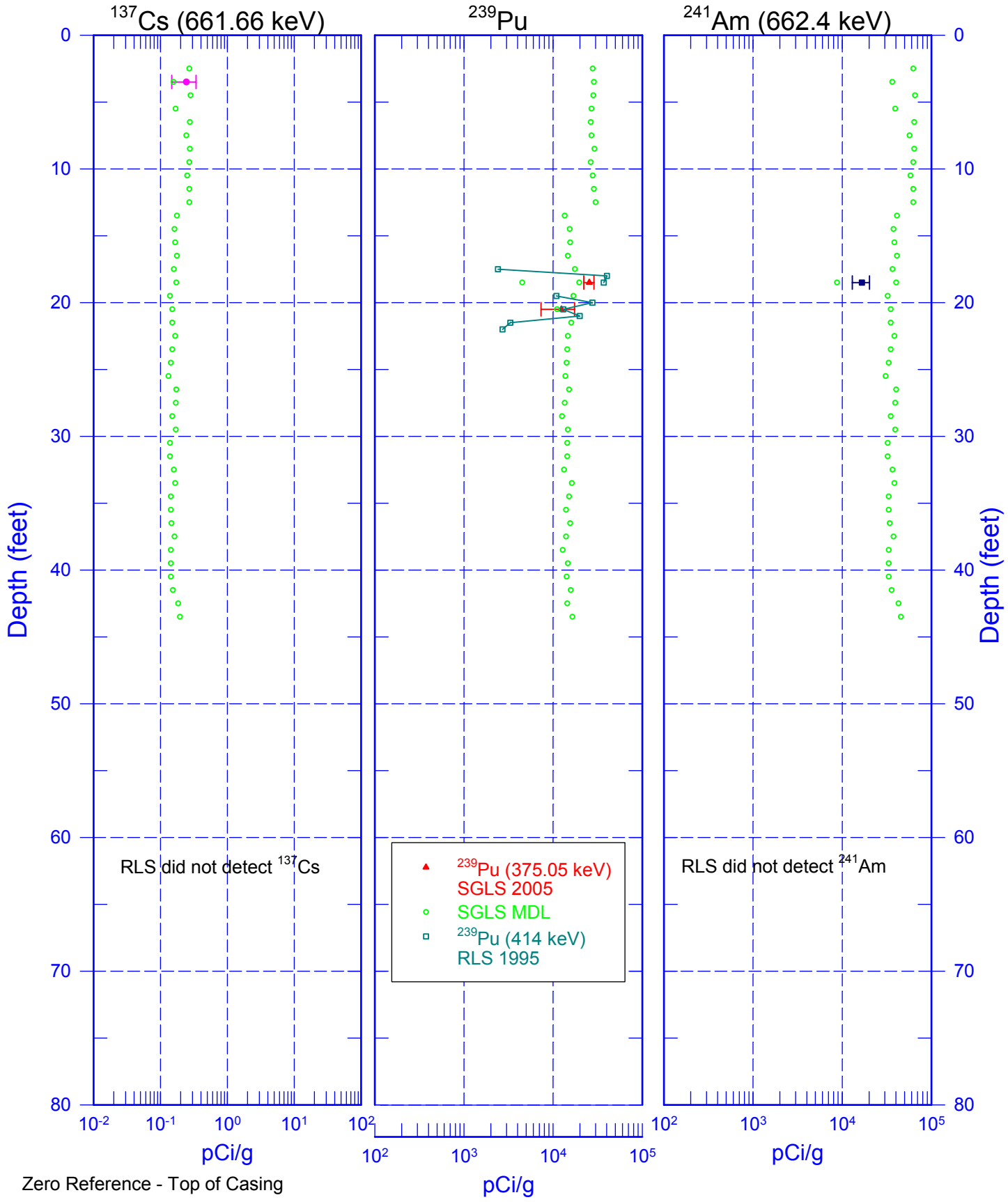
Reference - Top of Casing

299-W15-213 (A7511)
Total Gamma & Passive Neutron



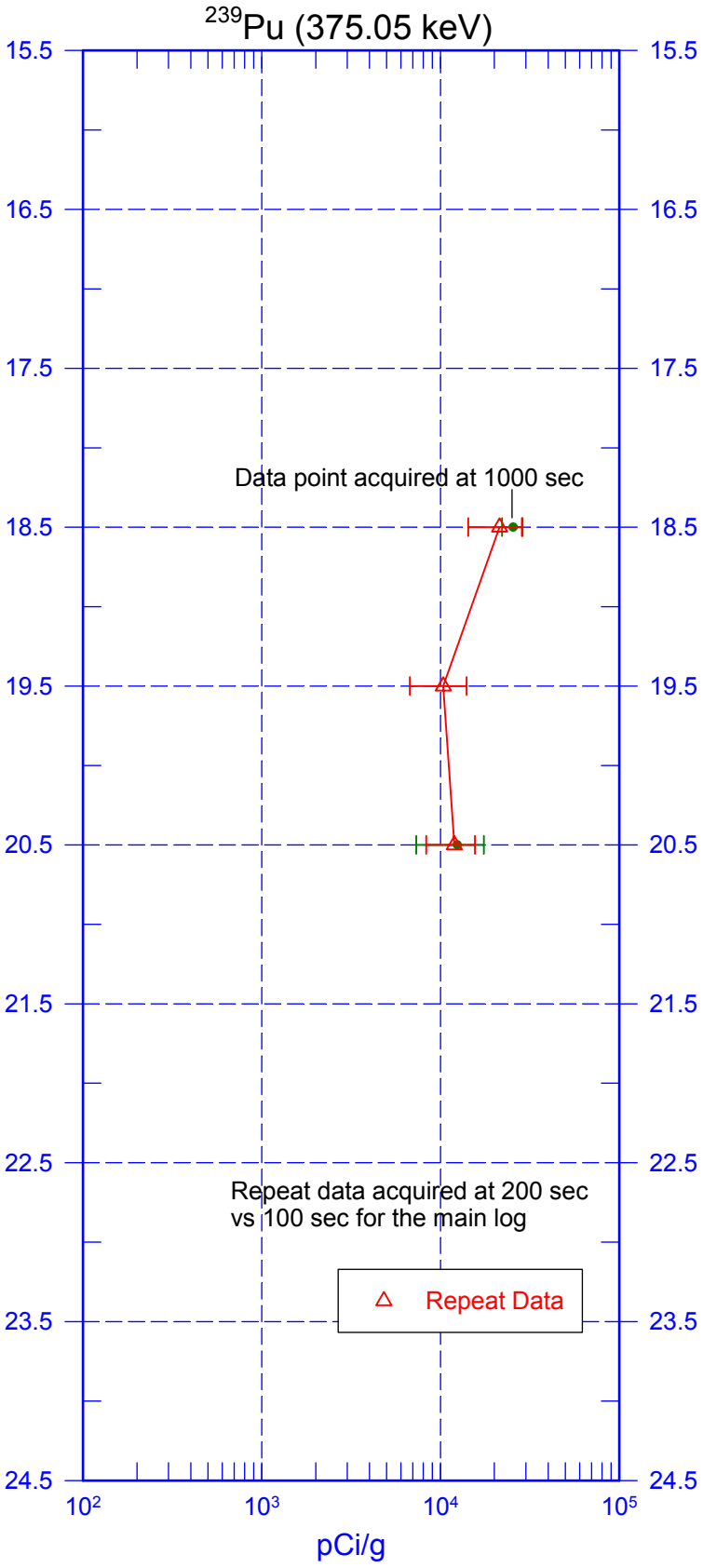
Reference - Top of Casing

299-W15-213 (A7511)
Man-Made Radionuclides RLS/SGLS Comparison



Zero Reference - Top of Casing

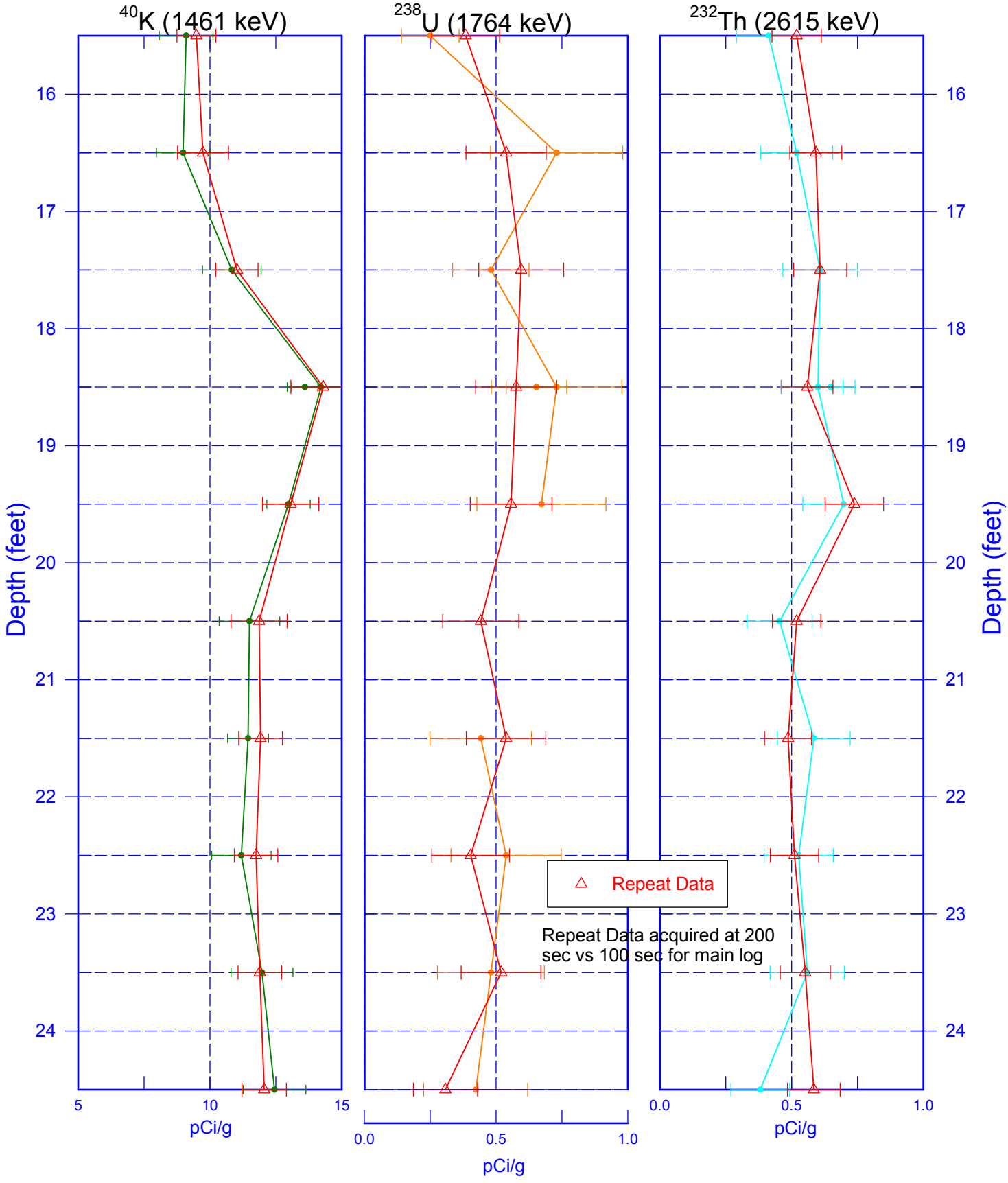
299-W15-213 (A7511)
Repeat Section of Man-Made Radionuclides



Zero Reference - Top of Casing

299-W15-213 (A7511)

Repeat Section of Natural Gamma Logs



Zero Reference - Top of Casing