299-W18-178 (A7660)
Log Data Report

Borehole Information:

Borehole:	299-W18-178 (A7660)		Site:	216-Z-11 Crib	
Coordinates (WA St Plane)		GWL[1] (ft):	None	GWL Date:	09/06/06
North (m)	East (m)	Drill Date	TOC Elevation	Total Depth (ft)	Type
135204.425	566644.756	03/80	675.31	77.0	Cable

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel	3.75	6 5/8	6	5/16	3.75	77

Borehole Notes:

This borehole, originally logged with the Spectral Gamma Logging System (SGLS) and the Neutron Moisture Logging System (NMLS) in September 2006, was re-logged with the Passive Neutron Logging System (PNLS) on April 3, 2007. This Log Data Report is revised to include these new data.

The logging engineer measured the casing diameter using a caliper and steel tape. Well completion reports indicate a grout plug is emplaced at the bottom of the borehole from 76 to 77 ft. Grout exists around the 6-in. casing from 0 to 18 ft. At the time of logging (9/6/06), water was found inside the casing at 75.4 ft. In April 2007 the water level had risen to 74.6 ft. Logging data acquisition is referenced to the TOC.

Logging Equipment Information:

Logging System:	Gamma 1E		Type:	SGLS (70%) SN: 45-TP40587A
Effective Calibration Date:	05/02/06	Calibration Reference:	DOE-EM/GJ1200-2006	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Logging System:	Gamma 2M		Type:	NMLS SN: H340207279
Effective Calibration Date:	08/02/06	Calibration Reference:	DOE-EM/GJ1283-2006	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Logging System:	Gamma 4H		Type:	PNLS SN: H310700352
Effective Calibration Date:	11/22/06	Calibration Reference:	DOE-EM/GJ1283-2006	
		Logging Procedure:	HGLP-CC-002	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	3	4 Repeat			
Date	09/12/06	09/12/06			
Logging Engineer	McClellan	McClellan			
Start Depth (ft)	4.0	27.0			
Finish Depth (ft)	75.0	20.0			
Count Time (sec)	100	100			
Live/Real	R	R			
Shield (Y/N)	N	N			

Log Run	3	4 Repeat			
MSA Interval (ft)	1.0	1.0			
ft/min	N/A[2]	N/A			
Pre-Verification	AE189CAB	AE189CAB			
Start File	AE189000	AE189072			
Finish File	AE189071	AE189079			
Post-Verification	AE189CAA	AE189CAA			
Depth Return Error (in.)	N/A	- 0.5			
Comments	No fine-gain adjustment.	No fine-gain adjustment.			

Neutron Moisture Logging System (NMLS) Log Run Information:

Log Run	1	2 Repeat			
Date	09/06/06	09/06/06			
Logging Engineer	Spatz	Spatz			
Start Depth (ft)	4.0	20.0			
Finish Depth (ft)	75.25	30.0			
Count Time (sec)	15	15			
Live/Real	R	R			
Shield (Y/N)	N	N			
Sample Interval (ft)	0.25	0.25			
ft/min	1.0	1.0			
Pre-Verification	BM007CAB	BM007CAB			
Start File	BM007000	BM007286			
Finish File	BM007285	BM007326			
Post-Verification	BM007CAA	BM007CAA			
Depth Return Error (in.)	N/A	0			
Comments	None	None			

Passive Neutron Logging System (PNLS) Log Run Information:

Log Run	5	6 Repeat			
Date	04/03/07	04/03/07			
Logging Engineer	Spatz	Spatz			
Start Depth (ft)	74.0	49.0			
Finish Depth (ft)	4.0	38.0			
Count Time (sec)	60	60			
Live/Real	R	R			
Shield (Y/N)	N	N			
Sample Interval (ft)	1.0	1.0			
ft/min	N/A	N/A			
Pre-Verification	DH472CAB	DH472CAB			
Start File	DH472000	DH472071			
Finish File	DH472070	DH472082			
Post-Verification	DH472CAA	DH472CAA			
Depth Return Error (in.)	0	0			
Comments	None	None			

Logging Operation Notes:

Logging was conducted with a centralizer on each sonde and measurements are referenced to top of casing.

Analysis Notes:

Analyst:	Henwood	Date:	04/09/07	Reference:	GJO-HGLP 1.6.3, Rev. 0

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

A casing correction for a 5/16-in. thick casing was applied to the SGLS data. NMLS data were corrected for a 6-in. borehole. PNLS data are used qualitatively only and no corrections are applied.

SGLS spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with an EXCEL worksheet template identified as G1EMay06.xls using an efficiency function and corrections for casing and dead time as determined from annual calibrations. The NMLS count rate data were converted to percent volumetric moisture. PNLS data are reported in counts per second

Results and Interpretations:

No manmade radionuclides were detected above minimum detection limits (MDLs) in the borehole. A plot indicating MDLs for three radionuclides commonly observed in the 216-Z cribs is included.

Moisture data indicate some variability. Particularly unusual is a saturated (i.e., 33% volumetric moisture) interval at approximately 24 ft that also exhibits a very low ^{40}K concentration. It is possible the casing has been breeched at this location and allows water to enter the casing and accumulate at the bottom of the plugged borehole. The TOC is 3.75 ft above ground surface and it is unlikely water entered the borehole casing from that location.

The PNLS data indicate no count rates that would indicate a significant neutron flux potentially caused by transuranic waste that could generate neutrons from alpha, neutron (α,n) reactions, or from spontaneous fission. A count rate of 0.3 cps, indicated in the repeat data at 47 ft, is considered to be a statistical fluctuation.

The following excerpt is from WIDS. "The 216-Z-11 Ditch was installed to replace the 216-Z-1D ditch. The 216-Z-11 ditch received liquid waste from Plutonium Finishing Plant process sewer, 291-Z and 231-Z until it was deactivated in 1971. The 216-Z-11 was replaced by the 216-Z-19 Ditch. During the 1960's, a special Space Nuclear Auxiliary Power program was operating in Z-Plant. The program isolated plutonium-238 and released an unknown amount of plutonium 239/240 to the 216-Z-11 ditch as waste." It is unlikely significant $^{239/240}Pu$ waste would result from ^{238}Pu production. ^{238}Pu most likely was produced from irradiating ^{237}Np targets with short reactor burn times so that only minimal amounts of other plutonium isotopes would be created.

The SGLS, NMLS, and PNLS repeat logs show good repeatability.

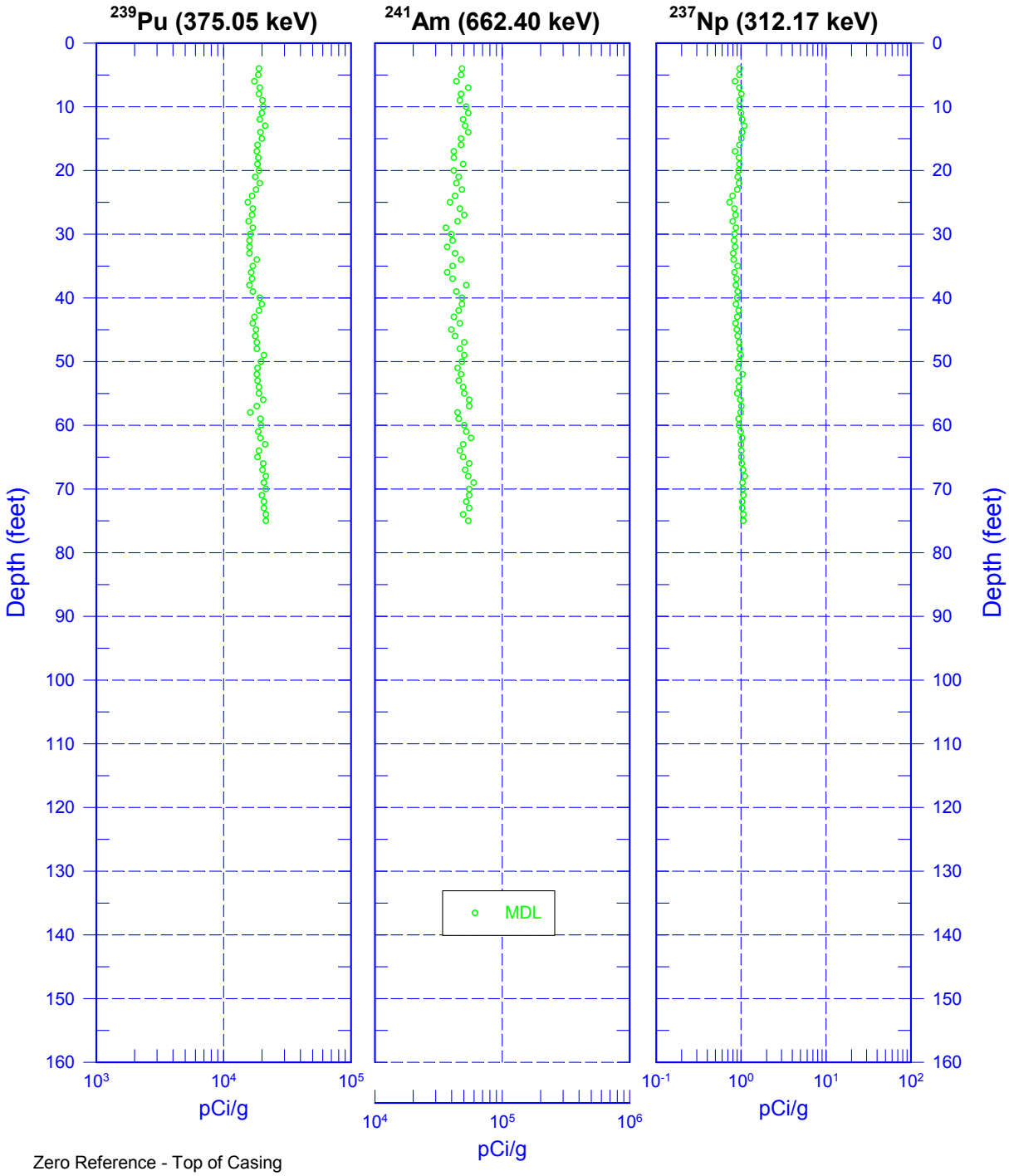
List of Log Plots:

Depth Reference is top of casing
Depth Scale - 20 ft/inch except for repeat logs

Manmade Radionuclides
Natural Gamma Logs
Combination Plot
Total Gamma, Moisture, & Dead Time
Repeat Section of Natural Gamma Logs
Repeat of Total Gamma, Dead Time, & Moisture
Total Gamma, Passive Neutron, & Moisture
Repeat of Passive Neutron

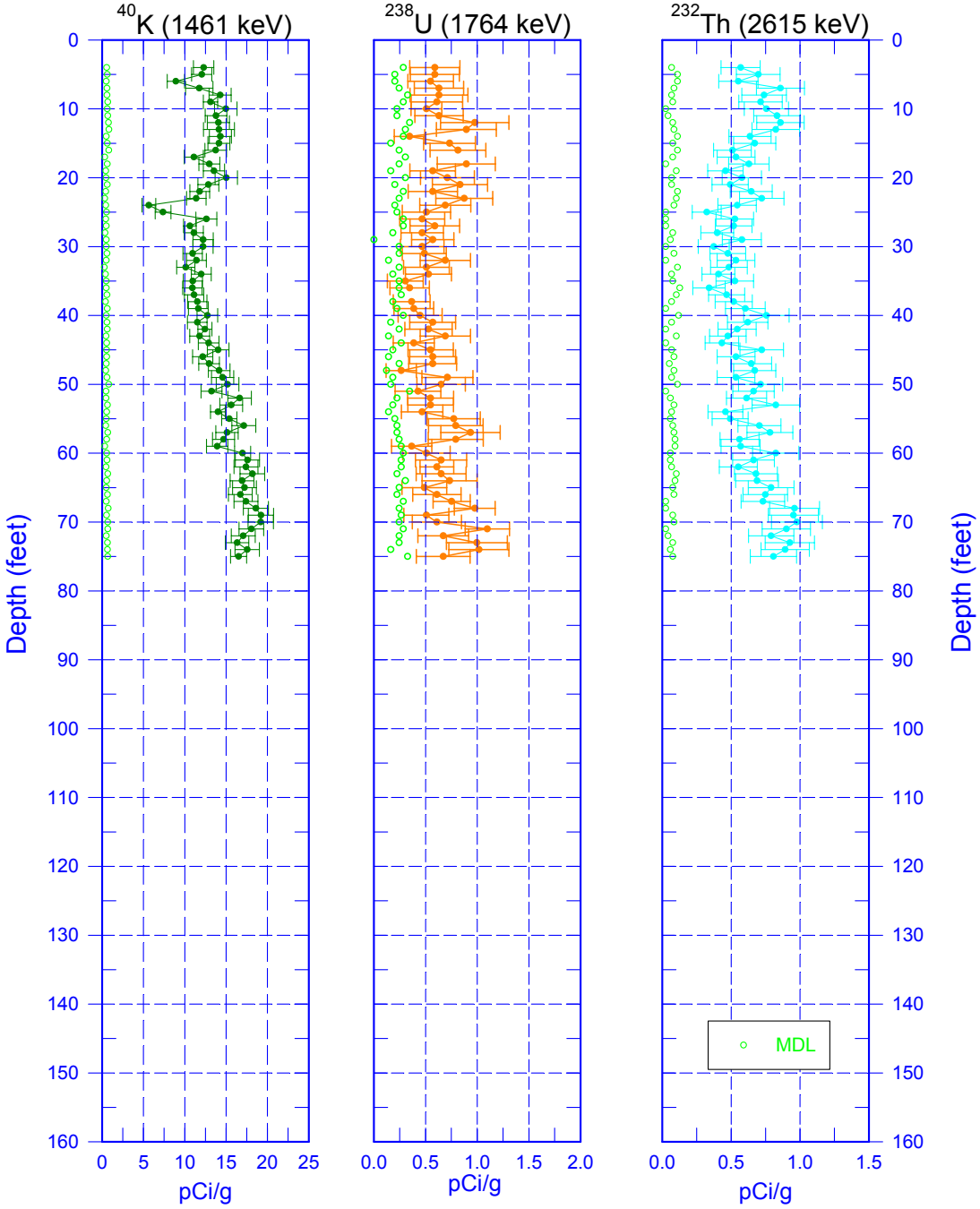
[1] GWL – groundwater level

299-W18-178 (A7660)
Manmade Radionuclides

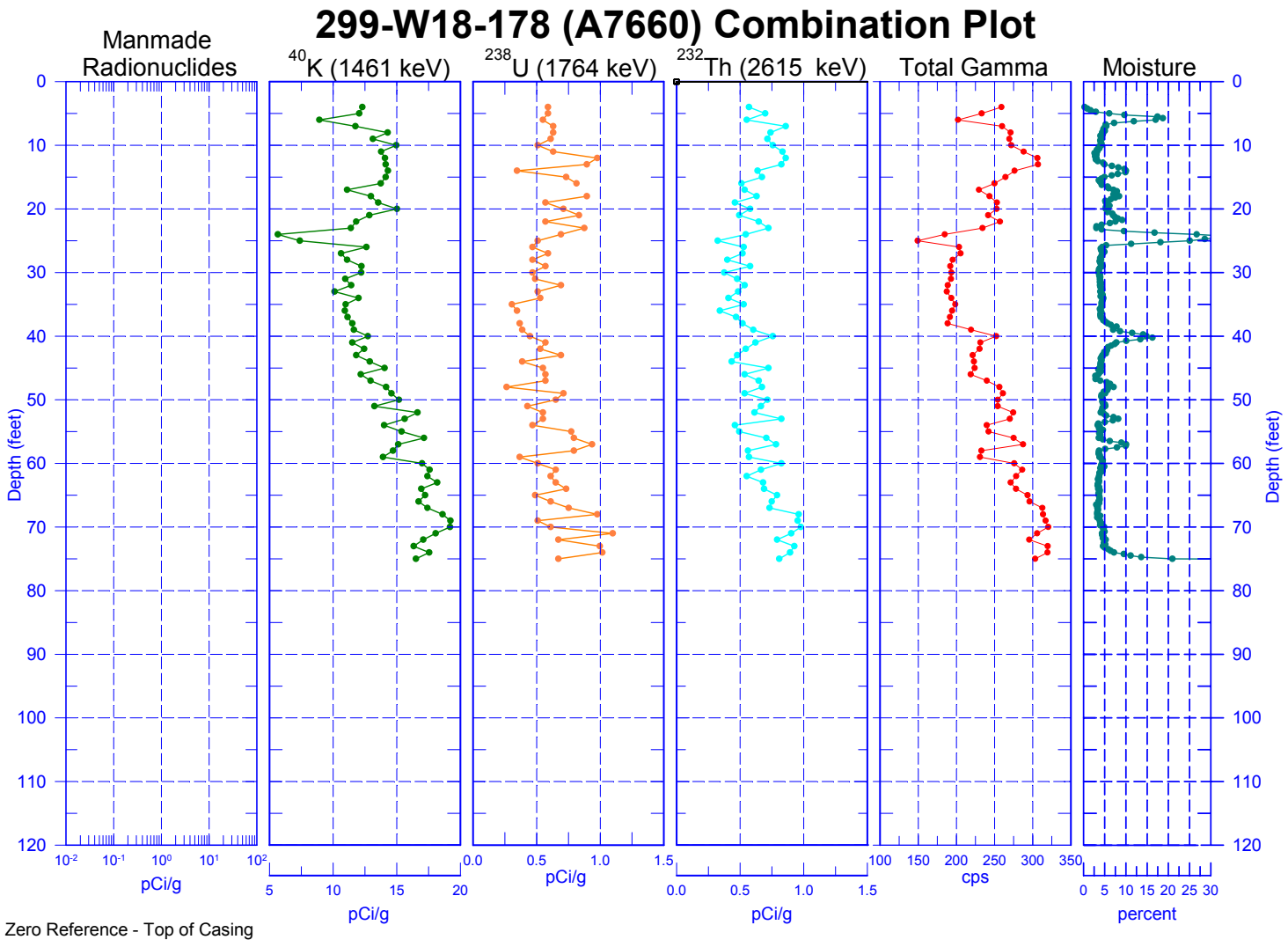


Zero Reference - Top of Casing

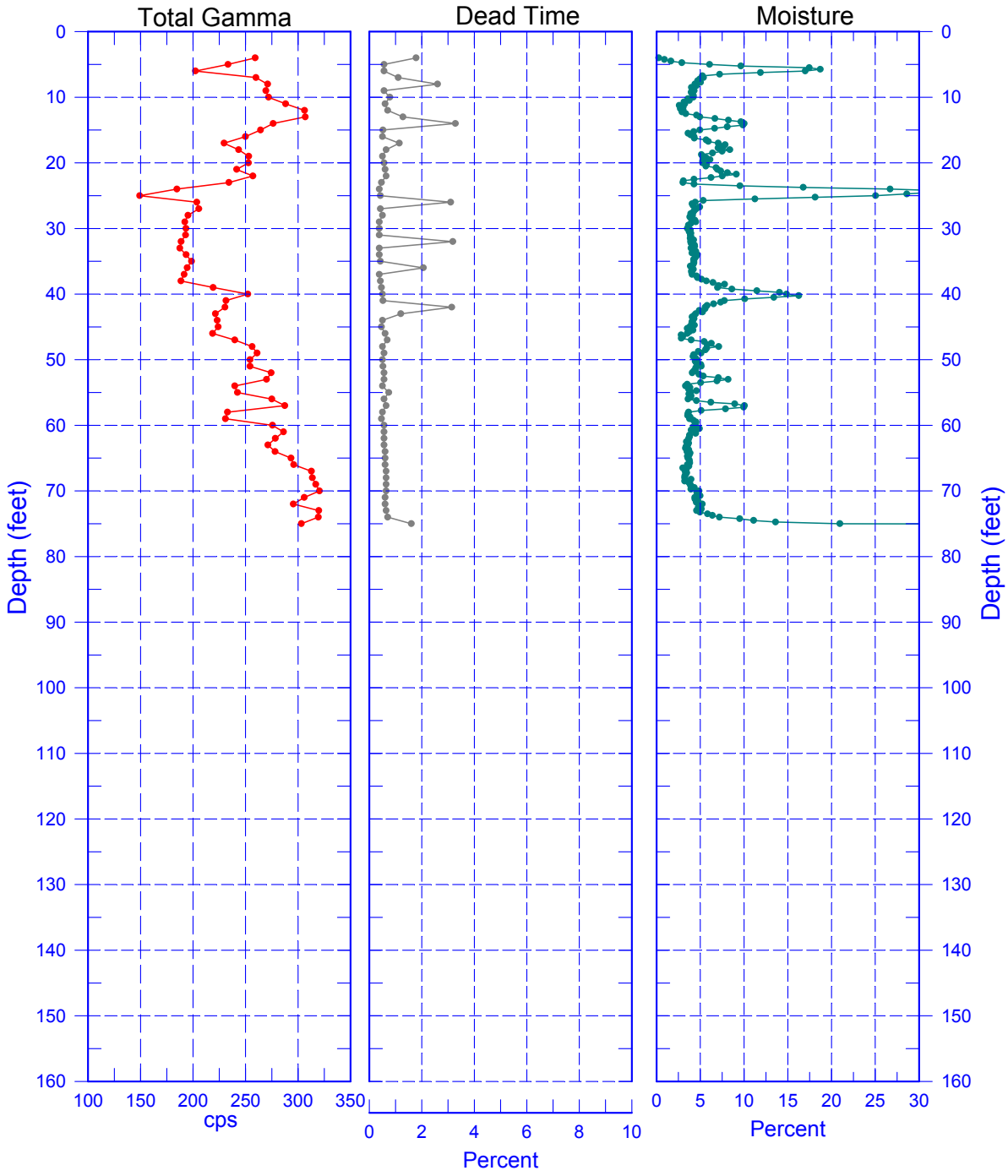
299-W18-178 (A7660)
Natural Gamma Logs



Zero Reference = Top of Casing

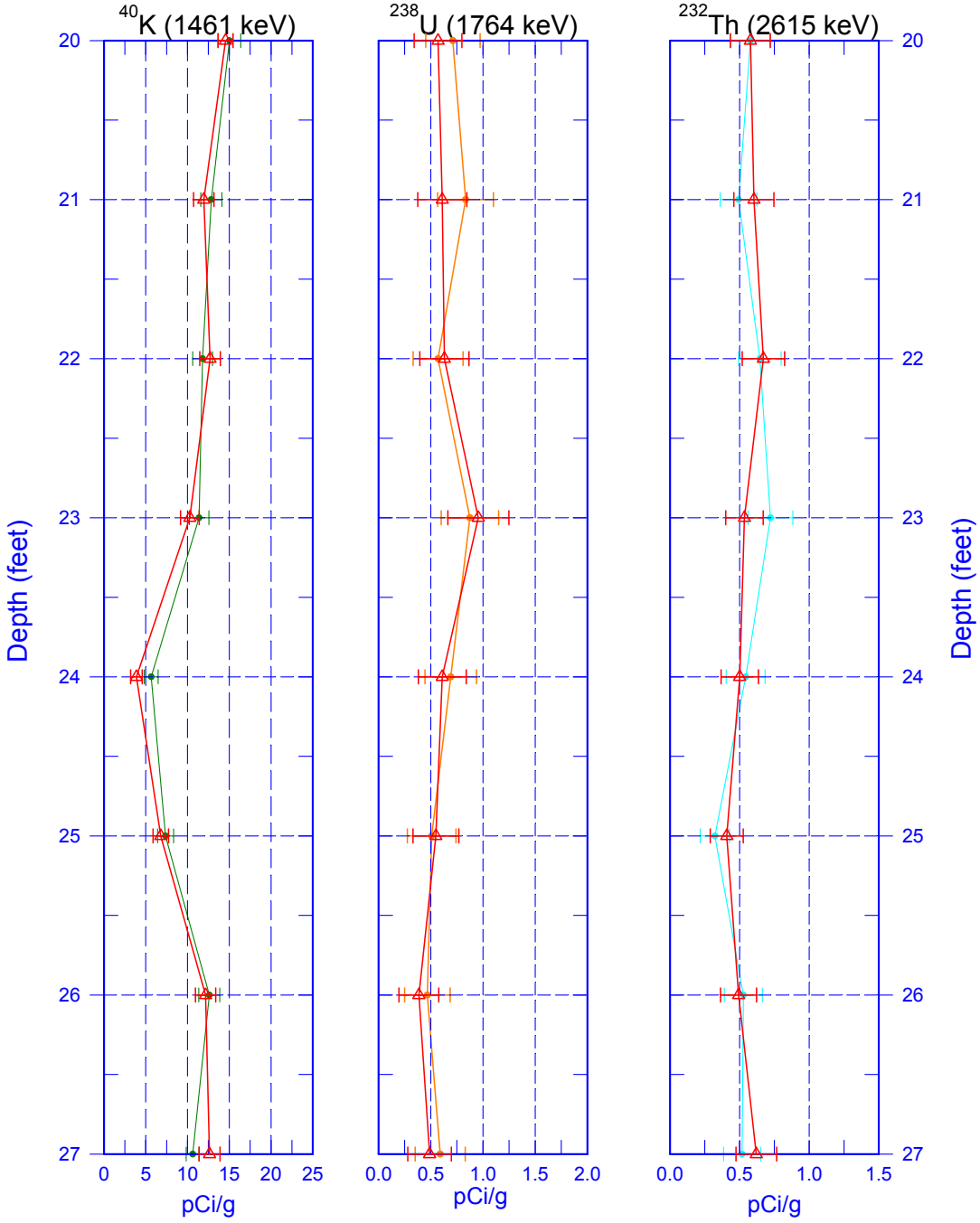

299-W18-178 (A7660) Combination Plot
Manmade Radionuclides
40K (1461 keV)
238U (1764 keV)
232Th (2615 keV)
Total Gamma
Moisture
Depth (feet)
pCi/g
pCi/g
pCi/g
pCi/g
cps
percent
Zero Reference - Top of Casing

299-W18-178 (A7660)
Total Gamma, Dead Time & Moisture



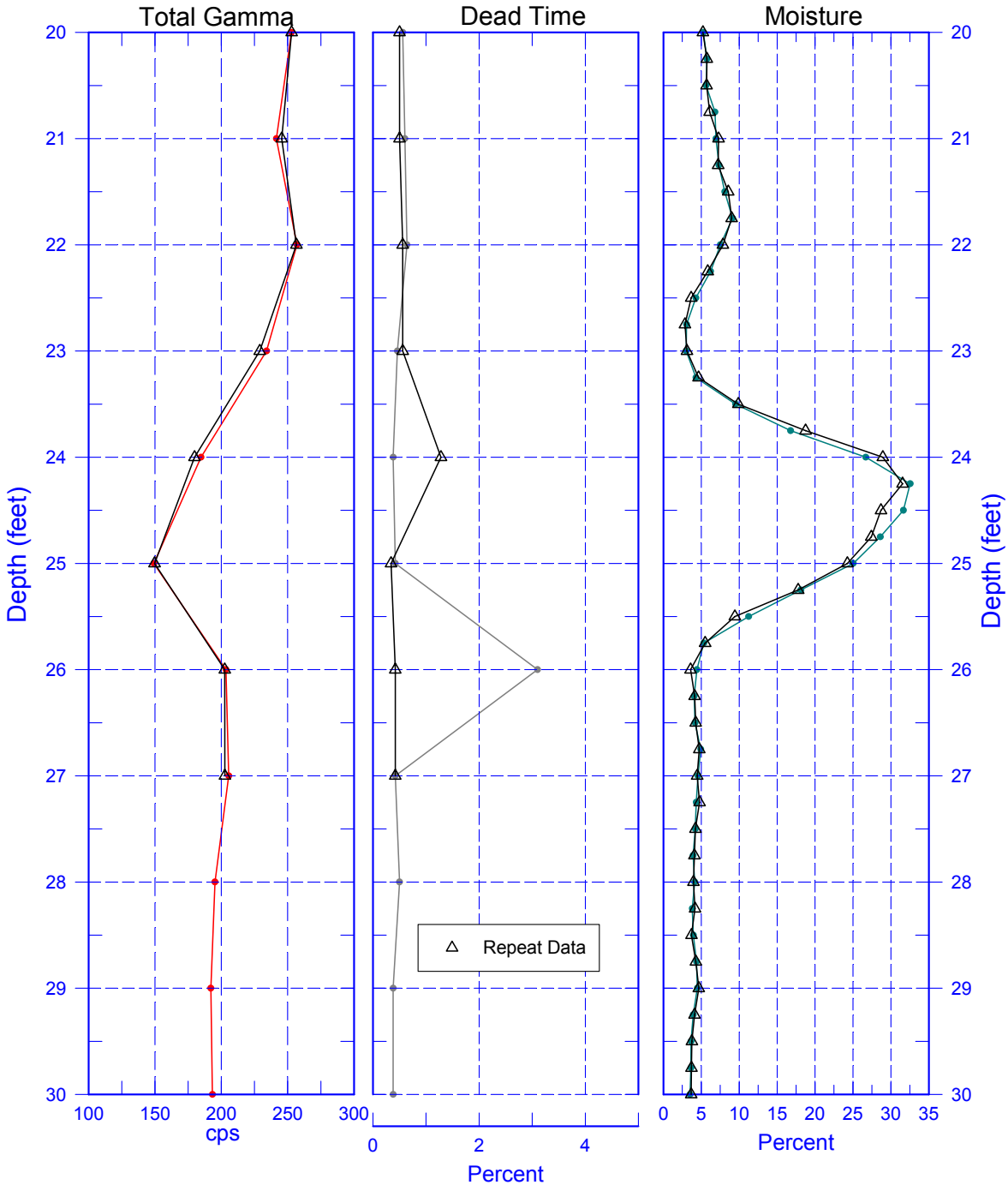
Reference - Top of Casing

299-W18-178 (A7660)
Repeat Section of Natural Gamma Logs



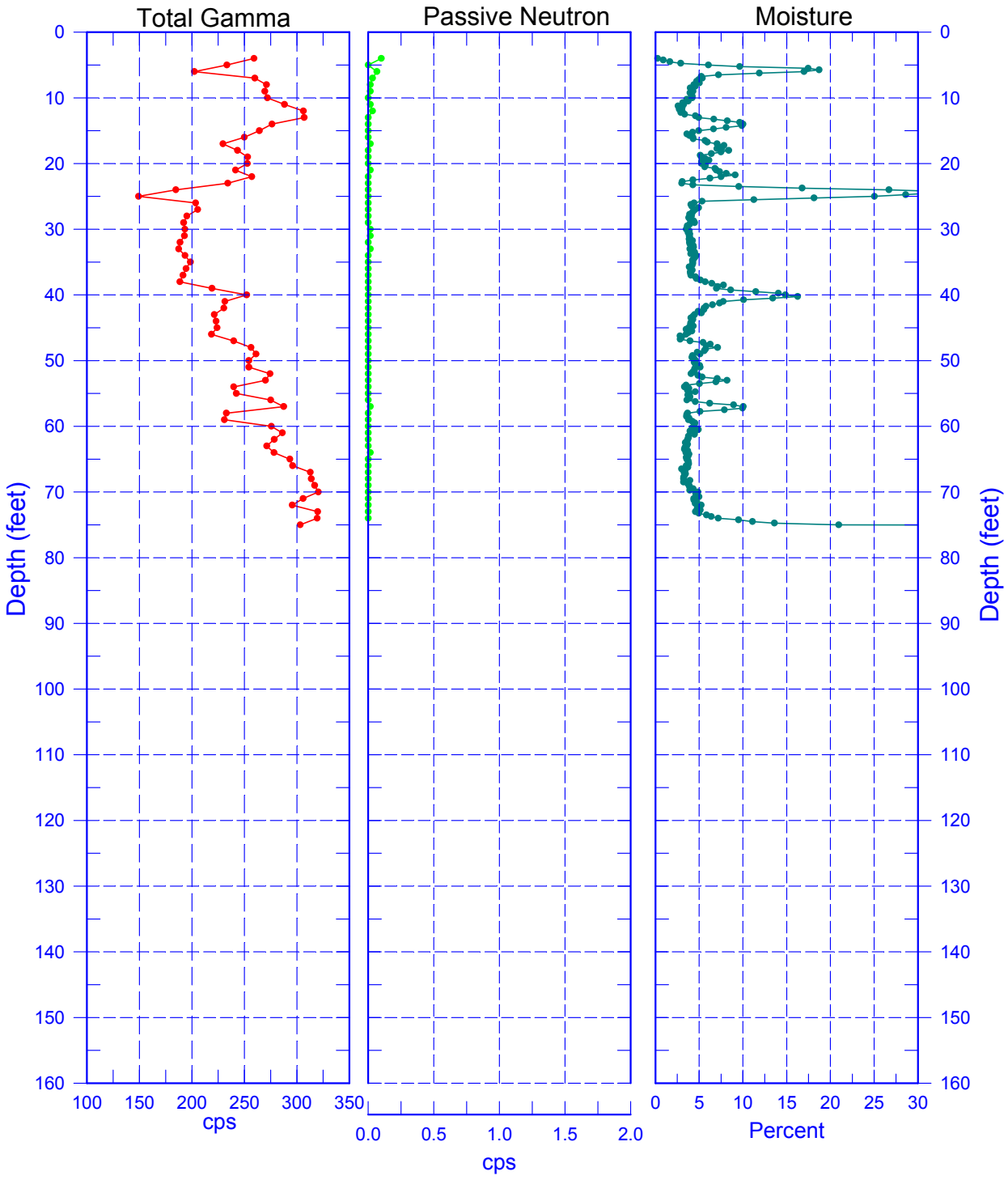
Zero Reference = Top of Casing

299-W18-178 (A7660)
Repeat of Total Gamma, Dead Time & Moisture



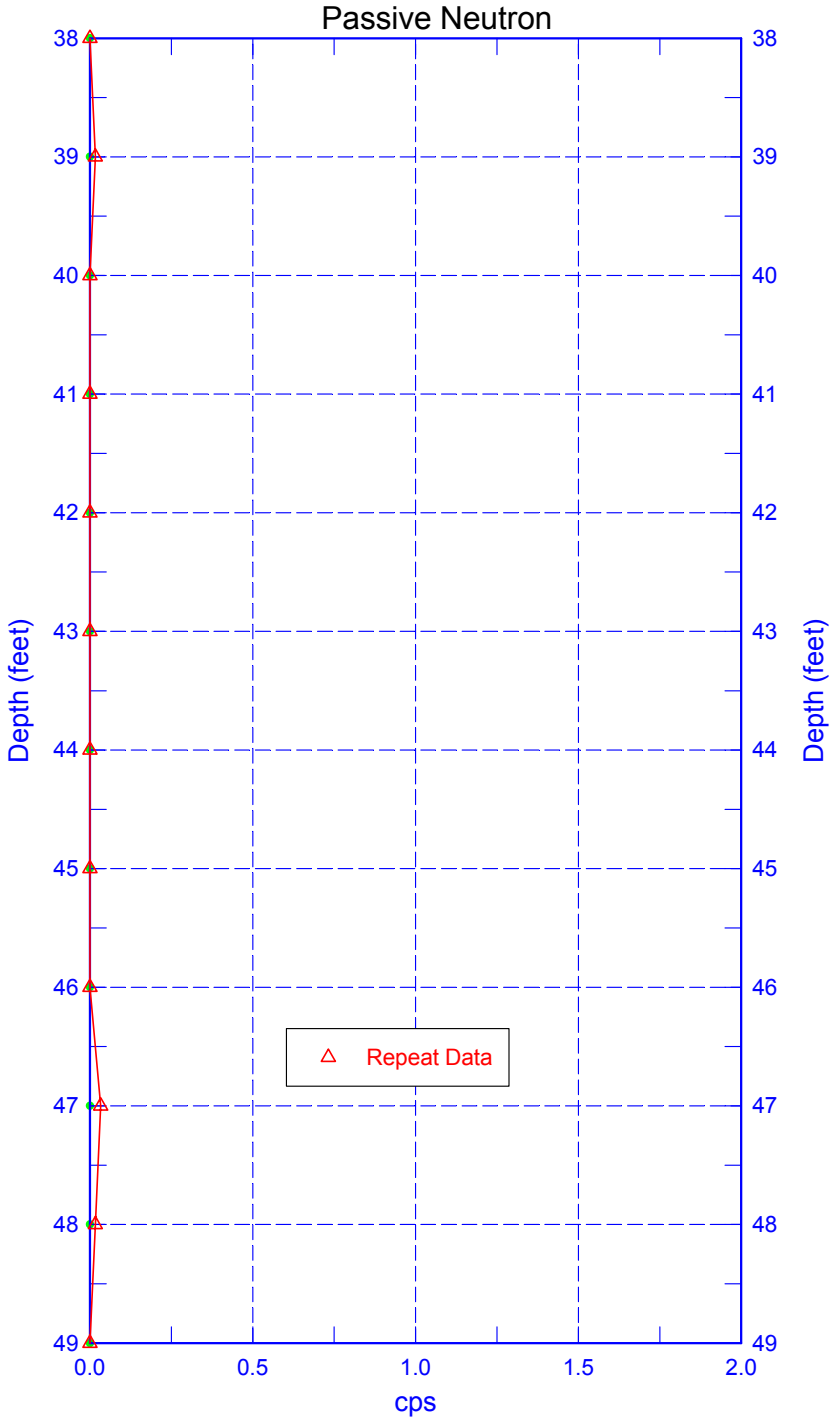
Reference - Top of Casing

299-W18-178 (A7660)
Total Gamma, Passive Neutron & Moisture



Reference - Top of Casing

299-W18-178 (A7660)
Repeat of Passive Neutron



Reference - Top of Casing