

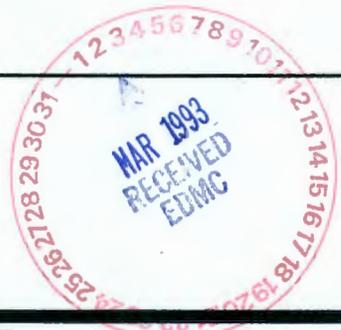
**START**

FEB 10 1993

ENGINEERING DATA TRANSMITTAL

1. EDT 160295

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) Geosciences	4. Related EDT No.: NA
5. Proj./Prog./Dept./Div.: ER	6. Cog. Engr.: R.K. Price	7. Purchase Order No.: NA
8. Originator Remarks: Release		9. Equip./Component No.: NA
		10. System/Bldg./Facility: NA
11. Receiver Remarks:		12. Major Assm. Dwg. No.: NA
		13. Permit/Permit Application No.: NA
		14. Required Response Date: 2-12-93



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15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Impact Level	Reason for Transmittal	Originator Disposition	Receiver Disposition
	WHC-SD-EN-TI-123		0	Spectral Gamma-Ray Log Report for 100 Area Borehole Surveys	4	1/2	1	

16. KEY		
Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 (see MRPS.43)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

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(G)	(H)	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
1	RI	Cog. Eng. R.K. Price	<i>R.K. Price</i>	2/8/93	H6-06						
1	RI	Cog. Mgr. K.R. Fecht	<i>K.R. Fecht</i>	2/8/93	H6-06						
		QA									
		Safety									
		Env.									
3		EDMC (2)			H6-08						
3		Central Files (2)			L8-04						

18. R.K. Price <i>Randall Price</i> 2/8/93 Signature of EDT Originator Date	19. _____ Authorized Representative Date for Receiving Organization	20. K.R. Fecht <i>K.R. Fecht</i> 2/8/93 Cog. Mgr./Project Engineer's Manager Date	21. DOE APPROVAL (if required) Ltr. No. <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments
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**SUPPORTING DOCUMENT**

1. Total Pages 133

2. Title

Spectral Gamma-Ray Log Report for 100 Area Borehole Surveys

3. Number

WHC-SD-EN-TI-123

4. Rev No.

0

5. Key Words

RLS  
Log header  
geophysics  
radioelement  
calibration

**APPROVED FOR  
PUBLIC RELEASE**

*2/9/93 N. Solie*

6. Author

Name: R.K. Price

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7. Abstract

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RLS Passive Spectral Gamma-Ray Borehole Survey Report  
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Report Date: September 21, 1992  
 Project: 100 Areas  
 Operable Units: 100-BC-1, 100-BC-5, 100-DR-1, 100-FR-3,  
 100-HR-1, 100-HR-3, and 100-NR-2  
 Boreholes: See Table 1, 2 and 3, below  
 Calibration Date: November 1991  
 Logging Engineers: R. V. Cram, S. E. Kos, R. K. Price  
 Analyst: R. K. Price, G. K. Jaeger, J. P. Kiesler

Introduction

Logging with the high resolution, high purity germanium (HPGe) passive spectral gamma-ray system has been completed for the selected boreholes. A summary of the boreholes included in this report are presented in three tables. Table 1 contains borehole surveys for Operable Units 100-BC-1, 100-BC-5, 100-FR-3 and 100-NR-2. Table 2 contains borehole surveys for Operable Units 100-DR-1 and 100-HR-1. Table 3 contains borehole surveys for Operable Unit 100-HR-3. Each table contains the borehole identification number, log survey date, maximum survey depth, man-made radionuclides identified, maximum radionuclide depth, and maximum radionuclide activity. The maximum radionuclide depth is not necessarily the depth of the maximum radionuclide decay activity. Likewise, the maximum radionuclide activity is not necessarily the maximum detection depth of the radionuclide.

Three types of boreholes were logged for inclusion in the report.

- o Newly constructed ground water monitoring wells,
- o Existing ground water monitoring wells, and
- o Vadose boreholes drilled in retention basins or disposal facilities.

The objective of the borehole surveys was to identify the presence of man-made gamma-ray emitting radionuclides. The graphs of the decay activities (concentrations) versus depth are presented for each survey. Decay activities are reported in picocuries per gram (pCi/g) of sample.

The contents of the report are limited to description of survey results for each borehole logged. Details of the following: equipment configuration, calibration, logging procedures, casing and water correction factors, spectra analysis software, and data management have been excluded. The details of the excluded topics are described in the papers cited at the end of this report.

Integrating the geology, hydrology and disposal site history with the spectral gamma-ray survey results is beyond the scope of this report.

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Table 1: Summary of 100 Area Borehole Log Surveys for 100-BC-1, 100-BC-5, 100-FR-3 and 100-NR-2

Borehole ID	Page num.	Final Log Date	Survey Depth	Cesium-137 Depth <sup>1</sup> pCi/g <sup>2</sup>	Cobalt-60 Depth <sup>1</sup> pCi/g <sup>2</sup>	Europium-152 Depth <sup>1</sup> pCi/g <sup>2</sup>	Europium-154 Depth <sup>1</sup> pCi/g <sup>2</sup>
<b>100-BC-1 Operable Unit</b>							
116-B-1	11	3/25/92	23'	23' <sup>3</sup> 50	19' 10	23' <sup>3</sup> 200	23' <sup>3</sup> 12
116-B-2	14	3/17/92	20.5'	18' 185	10' 1	16' 20	12' 2
116-B-3	17	4/08/92	17'	17' <sup>3</sup> 1000	-	-	-
116-B-5	20	4/23/92	21.5'	-	17' 2	15' 7	12' 1
<b>100-BC-5 Operable Unit</b>							
199-B2-13	23	3/09/92	37'	-	-	-	-
199-B3-1	26	6/30/92	51.8'	51' 1	-	45' 3	-
199-B3-47	29	3/05/92	56'	43' 1	-	-	-
199-B4-1	32	7/01/92	73'	-	-	-	-
199-B4-4	35	8/13/92	99'	-	-	-	-
199-B4-5	38	7/16/92	94'	-	-	-	-
199-B4-9	41	4/22/92	78'	78' <sup>3</sup> 60	26' 13	26' 67	27' 7
199-B9-1	44	7/07/92	112'	-	23' 5	23' 12	23' 2
<b>100-FR-3 Operable Unit</b>							
199-F5-45	47	9/08/92	49'	-	-	-	-
199-F5-48	50	9/08/92	51'	-	-	-	-
<b>100-NR-2 Operable Unit</b>							
199-N-75	53	5/01/92	86'	-	85' 1	-	-
199-N-80	56	8/12/92	120'	-	69' 1	-	-

<sup>1</sup>Maximum depth where radionuclide was identified; Not necessarily depth of maximum decay activity

<sup>2</sup>Maximum decay activity observed for radionuclide; Not necessarily at maximum depth of borehole

<sup>3</sup>Maximum depth of borehole survey

Table 2: Summary of 100 Areaa Borehole Log Surveys for 100-DR-1 and 100-HR-1

Borehole ID	Page num.	Final Log Date	Survey Depth	Cesium-137 Depth <sup>1</sup> pCi/g <sup>2</sup>	Cobalt-60 Depth <sup>1</sup> pCi/g <sup>2</sup>	Europium-152 Depth <sup>1</sup> pCi/g <sup>2</sup>	Europium-154 Depth <sup>1</sup> pCi/g <sup>2</sup>
<b>100-DR-1 Operable Unit</b>							
116-D-1A	59	11/27/91	45'	45' <sup>3</sup> 450	45' <sup>3</sup> 11	45' <sup>3</sup> 200	45' <sup>3</sup> 20
116-D-2A	62	2/20/92	19.5'	19.5' <sup>3</sup> 770	14' 1	19.5' <sup>3</sup> 30	14' 2
116-D-3	65	12/14/91	19'	-	-	-	-
116-D-5	68	1/28/92	23'	-	-	-	-
116-D-6	71	2/19/92	18'	-	-	12' 4	10' 1
116-DR-5	74	2/08/92	24'	-	-	-	-
132-D-3	77	2/20/92	34'	19' 2	19' 1	19' 2	18' 1
<b>100-HR-1 Operable Unit</b>							
116-H-1	80	3/11/92	21'	19' 100	17' 30	21' <sup>3</sup> 700	17' 60
116-H-2	83	4/07/92	14'	-	-	-	-
116-H-3	86	3/09/92	18'	-	18' <sup>3</sup> 1	18' <sup>3</sup> 5	16' 1
116-H-9	89	3/02/92	20'	-	-	-	-

<sup>1</sup>Maximum depth where radionuclide was identified; Not necessarily depth of maximum decay activity

<sup>2</sup>Maximum decay activity observed for radionuclide; Not necessarily at maximum depth of borehole

<sup>3</sup>Maximum depth of borehole survey

Table 3: - Summary of 100 Areaa Borehole Log Surveys for 100-HR-3

Borehole ID	Page num.	Final Log Date	Survey Depth	Cesium-137 Depth <sup>1</sup> pCi/g <sup>2</sup>	Cobalt-60 Depth <sup>1</sup> pCi/g <sup>2</sup>	Europium-152 Depth <sup>1</sup> pCi/g <sup>2</sup>	Europium-154 Depth <sup>1</sup> pCi/g <sup>2</sup>
<b>100-HR-3 Operable Unit</b>							
199-D5-2	92	6/19/92	86'	-	-	-	-
199-D5-12	95	6/18/92	87'	-	-	-	-
199-D8-2	98	3/22/92	40'	40' <sup>3</sup> 35	40' <sup>3</sup> 30	40' <sup>3</sup> 80	30' 12
199-D8-3	101	7/17/92	77'	8' 6	6' 1	6' 2	6' 1
199-D8-54B	104	11/01/91	73'	-	-	-	-
199-D8-55	107	1/13/92	68'	48' 2	-	-	-
199-H3-1	110	6/16/92	65'	-	-	-	-
199-H4-3	113	2/20/91	42'	-	-	-	-
199-H4-11	116	2/21/91	45'	-	-	-	-
199-H4-13	119	6/26/92	48'	-	-	-	-
199-H4-16	122	8/18/92	53'	-	-	-	-
199-H4-18	125	8/25/92	47'	-	-	-	-
199-H4-45	128	2/12/92	51'	-	-	-	-

<sup>1</sup>Maximum depth where radionuclide was identified; Not necessarily depth of maximum decay activity

<sup>2</sup>Maximum decay activity observed for radionuclide; Not necessarily at maximum depth of borehole

<sup>3</sup>Maximum depth of borehole survey

100 Area Borehole Geophysics Project Review

Observations of the RLS borehole surveys included in this report are summarized below. This review does not necessarily include all the information that can be gleaned from the spectral gamma-ray survey data.

**REPEATABILITY:** An extended interval of borehole 116-D-1A was surveyed twice. Concern about the system performance prompted the double survey. The repeatability between the two surveys of identical logging configuration is excellent. When reviewing the plot of 116-D-1A remember that passive spectral gamma is attempting to measure the absolute decay activity which occurs as purely random events.

Normally repeatability of the system response is accomplished by acquiring stationary measurements with extended count time at various depths. The count time of the stationary measurements is several times longer than the survey specifications and the uncertainty is significantly less. The shorter count time of the continuous survey agrees with the longer count stationary measurements within the computed uncertainty ranges.

**HIGH ACTIVITY BOREHOLES:** The boreholes having the highest decay activity of man-made radionuclides are listed below with the nuclide and maximum observed activity. Keep this information in perspective. The decay activities in the subsurface at these borehole locations while significant in the 100 Area are several times less than the maximum activity observed in other areas at Hanford.

Borehole ID	Nuclide	Activity	Nuclide	Activity
116-B-3	Cs-137	1000 pCi/g		
116-D-1A	Cs-137	450 pCi/g	Eu-152	200 pCi/g
116-D-2A	Cs-137	770 pCi/g		
116-H-1	Eu-152	700 pCi/g		

**MAXIMUM DEPTH OF ACTIVITY:** The maximum depth of the man-made radionuclides was not always established in recently drilled boreholes. Remember that the field screening instruments are limited to identifying decay activity that significantly exceeds the decay activity of the natural radionuclides. The activity of the man-made radionuclides at the bottom of the boreholes were within the variations common in the natural radionuclides.

This observation may be viewed as insignificant if the assumption could be proven as fact that the activity of man-made radionuclides decrease with depth. Unfortunately several recently drilled Hanford boreholes have demonstrated that man-made radionuclides do not necessarily decrease with depth.

Man-made radionuclides were identified at the maximum survey depth in eight of the nineteen boreholes containing man-made radionuclides. Two of these boreholes are 116-B-1 and 116-D-1A. The survey for 116-B-1 indicates that the activity of europium-152 is beginning to increase at the maximum survey depth

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**UNEXPECTED RADIONUCLIDES IN NEW WELLS:** Man-made radionuclides were identified in four boreholes being constructed for ground water monitoring wells. The decay activity of the man-made radionuclides was generally less than 10 pCi/g. This information will be included in mapping the extend of man-made radionuclides in the subsurface and verifying the movement patterns. The ground water monitoring wells in which nuclides were not identified by field screening instruments are:

199-B3-47,  
199-D8-55,  
199-N-75, and  
199-N-80.

**IDENTIFY LITHOLOGY:** Variations in the naturally occurring radionuclides, KUT (ie. potassium, uranium and thorium) may be used to identify lithologies, their thickness and interface depths. The borehole surveys acquired in the 100 Area were not intended to identify lithologies, however, some variations in the "Total Gamma" curve will probable raise questions when reviewing the individual survey reports and plots.

Borehole 199-B2-13 recorded a high "Total Gamma" activity from 4 feet to 9 feet. This increase is due to potassium activity exceeding 10 pCi/g.

Borehole 199-D5-12 recorded a high "Total Gamma" activity from 47 feet to 83 feet. This increase is due to an increase potassium activity.

Borehole 199-D8-54B recorded a high "Total Gamma" activity from 45 feet to 49 feet. This increase is due to an increase in uranium and thorium activity.

Borehole 199-H-9 recorded an decrease in "Total Gamma" activity from 7 to 18 feet. This decrease is due to potassium activity less than 7 pCi/g.

**COMPLETED WELLS:** Surveys were recorded in five completed monitoring wells with formation sealant materials between the stainless steel casing and the undisturbed formation. The sealing material contains natural radionuclides in higher concentrations than occurs in the sediments at Hanford. The "Total Gamma" activity in these wells are higher than wells with out the seals. The increase in activity is due to uranium and thorium at concentrations about three times greater than the native sediments. The wells with elevated "Total Gamma" activity from well seals are:

199-B4-5,  
199-H4-11,  
199-H4-13,  
199-H4-16, and  
199-H4-18.

Formation lithologies can not be determined in ground water monitoring wells with seals installed. Any lithology information must be acquired before the permanent casing and seal is added.

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Quantifying the decay activity of man-made radionuclides in the formation will be underestimated in wells with the sealing material. The varying thickness of the sealant creates a varying attenuation factor for the gamma-rays being measured.

**HIGH SURFACE RADIATION:** High surface radiation was recorded during setup of the equipment on both borehole at 100-N. This surface radiation is observed in the "Total Gamma" plot of the borehole survey from 0 feet to 1 feet. Attenuation properties of the soil once the detector reached 1 foot effectively eliminated detection of the surface radiation.

**NO TOTAL-GAMMA CORRECTION:** The Total-gamma plot, presented as the first curve on each survey plot, is the count rate (c/s) observed for all gamma-rays recorded in the spectra. No correction factors for steel casing or borehole fluid have been applied to the data. The gross-gamma plot is equivalent to the PNL Gross-Gamma survey.

**EQUIPMENT CALIBRATION:** The borehole surveys presented in this report have all been analysed using the calibration data acquired in November 1991. The accuracy of the two calibration data sets are identical within the reported uncertainties. However, the precision of the November 1991 calibration data is significantly better than the November 1990 data.

Calculation of calibration factors used in data reduction depended on the calibration data and on nuclear data (half lives, branching ratios, number of gammas per decay) for the particular nuclide. All of the nuclear data were taken from Erdtmann and Soyka, Die Gamma-Linien der Radionuklide (The Gamma Rays of the Radionuclides), Verlag Chemie GMBh Weinheim, Deutschland, 1979.

### Borehole Survey Report

The report for each borehole survey by the RLS contains three types of information. The contents of each information type are described below. The borehole survey reports are presented in the same order as they are listed in Tables 1 thru 3.

1. A single page log header form is first. The form is titled "RLS Spectral Gamma-Ray Borehole Survey Log Header" and summarizes the borehole and survey information.

The form contains the borehole name, coordinates, and elevation. Survey coordinates and elevation for several boreholes have not been established at the time of this report.

Borehole environment information is next and includes casing parameters and water depth (if present). These are the parameters used for data reduction.

RLS survey information is presented third and includes the logging engineers name, date, file names, logging mode, and survey depths.

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The survey data reduction information follows and includes calibration date and calibration report number, analyst names and analysis date. A single line is present for analysis notes and man-made radionuclides encountered.

2. Radionuclide activity responses versus depth, i.e., data plots, are plotted on one or more pages. A uniform depth scale of 20 feet/inch is used for all plots. Four plot tracks are presented for uniformity. The experimental uncertainties in the computed radionuclide activities are not presented on the data plots at this time.

The "Total Gamma" is the count rate for all gamma-rays detected by the RLS detector with no discrimination of gamma-ray energy. The "Total Gamma" is equivalent to the gross gamma log commonly used by some organizations at Hanford. The count rate data values are plotted on two linear scales. The scale of the narrow line is 0 to 1000 c/s. The scale of the wide line is 0 to 100,000 c/s.

The remaining plot tracks contain the results of the spectra gamma-ray analysis. The computed data values are generally plotted on two linear scales. The scale of the narrow line is given at the top of the plot and is 0 to 50 pCi/g. The scale of the wide line is given at the bottom of the plot and is 0 to 5000 pCi/g.

3. The analysis notes follow as the third type of information reported for each spectral gamma-ray survey. The notes contain descriptions of the borehole conditions and possible limitations of the plotted results. The depth ranges where each radionuclide was encountered and the maximum activities are reported.

#### Limitations to the Radioelement Analyses

Several limitations of the borehole survey equipment, calibration, and data acquisition objectives follow.

The logging cable supporting the borehole detector, supplying electrical power, receiving voltage signals for each detected gamma-ray, and permitting the liquid-nitrogen cooled detector to be submerged in water was specially fabricated for the RLS system. The recorded depth of the detector is estimated to be accurate to 98.5 percent, with a precision (repeatability) of 99 percent. Comparisons with drilling measurements, other logging equipment, and secondary measuring systems have verified the accuracy. Depth differences between log runs occasionally must be shifted about 1 foot when the detector depth is at 100 feet. An upgrade in the logging cable and measuring system is being investigated.

The standard logging configuration optimizes the counting system for detecting low decay activities of radioelements. The RLS has frequently detected man-

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made radioelement activities of 0.3 pCi/g for nuclides with gamma-rays having energies greater than 500 keV and number of gammas per decay at greater than 50 percent. The maximum decay activity the RLS has detected is about 10,000 pCi/g in this standard configuration.

The alternate logging configuration employs a lead shield and changes the counting system to maximize the count rate. Configuring the counting system to maximize the count rate compromises its ability to detect radioelements at low decay activities (concentrations). The RLS has frequently detected man-made radioelement activities exceeding 33,000 pCi/g in this shielded configuration. The alternate logging configuration was not employed for the surveys included in this report.

Borehole environment correction factors have been determined for steel casing and water in the borehole. Correction factors for other borehole configurations have not been investigated. Borehole configurations for which no correction is available include: (1) grout between multiple casing strings, (2) formation seals containing bentonite, sand, or grout behind the casing, and (3) drilling mud remaining inside the borehole during logging. The calculated decay activity for man-made radionuclides will be underestimated for boreholes with these configurations.

Energy dependent casing corrections have been established for steel casing thicknesses up to 0.40 inches. Corrections for casings of different materials and/or cumulative thicknesses greater than 0.40 inches have not been calculated and therefore cannot be used in the data reduction.

The calibration data were recorded with the detector centered in calibration zones that are uniform in density, water content, and gamma-ray source material. The dimensions of each zone are large enough that the detector always responded as though surrounded by a medium of infinite extent. Therefore, the use of the calibration results to calculate nuclide activity carries the assumption that the nuclides in the logged formation are also distributed in thick uniform layers.

Gamma-ray sources are not normally distributed in the earth in thick uniform layers. Source inhomogeneities are reflected to some degree by the fluctuations in the amplitudes of the log traces. A factor called the vertical spacial resolution quantifies the correlation between (1) the intensity of the log fluctuation and the depth interval over which it extends, and (2) the intensity of the corresponding gamma-ray source and the thickness of the zone in which the source is embedded. The vertical spatial resolution of the RLS HPGe logging system is scheduled for investigation.

Radionuclide decay activities are determined from the net area of the gamma-ray peaks. Radioelements such as strontium-90 which do not emit a gamma-ray when they decay will not be identified or quantified by the spectra analysis performed for this report. The decay of strontium-90 results in a high energy beta particle that can excite surrounding elements to emit photon radiation that can be identified by the HPGe detector. This type of radiation is called bremsstrahlung radiation. A method to obtain estimates of the concentrations of strontium-90 is under consideration.

Conclusion

The RLS has completed surveys for 40 boreholes in the 100 areas. Excellent repeatability of the system was demonstrated. Four boreholes with significant amounts of man-made radionuclides were identified. Nineteen borehole surveys identified the presence of man-made radionuclides.

The high purity germanium detector of the RLS borehole survey truck has identified the presence of small amounts of man-made radionuclides in the the subsurface. The field screening instruments may not have identified the potential for man-made radionuclides since the decay activity may be less than the decay activity of the natural occurring radionuclides of potassium, uranium and thorium that are present globally.

The decay activity for the natural radionuclides, KUT, have been computed by the data reduction program. The decay activity of KUT have not been presented in this report. Plots of the KUT activity levels can be prepared if necessary.

Cited Reports

Koizumi, C. J., J. R. Brodeur, W. H. Ulbricht, and R. K. Price, 1991, "Calibration of the RLS HPGe Spectral Gamma-Ray Logging System," WHC external publication WHC-EP-0464

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Koizumi, C. J., R. K. Price, and R. D. Wilson, 1992, "Calibration of the RLS System for 200 Aggregate Area Management Study Screening Measurements," WHC supporting document WHC-SD-EN-TRP-001

Koizumi, C. J., R. K. Price, and R. D. Wilson, 1992, "Gamma-Ray Logging results for the 200 Aggregate Area Management Study," WHC supporting document WHC-SD-EN-TI-021

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Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-BC-1

Borehole	<u>116-B-1</u>		
Coordinates	_____ N	_____ W	meters
Elevation	_____ feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.33	0.0	26.0

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top Base Incr
Mar 25, 92	H116B1\A158	MSA 80 sec LT Station 500 s	0 23 0.5 Depth: 23

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: <u>Nov 21, 1991</u>
Calibration Report: <u>WHC-SD-EN-TRP-001</u>
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>April 9, 1992</u>
Analysis Notes: <u>Eu-152 max 200 pCi/g at 15 ft</u>
Radionuclides identified: <u>Cs-137, Co-60, Eu-152, Eu-154</u>

93129051603

# RLS Spectral Gamma-Ray Borehole Survey

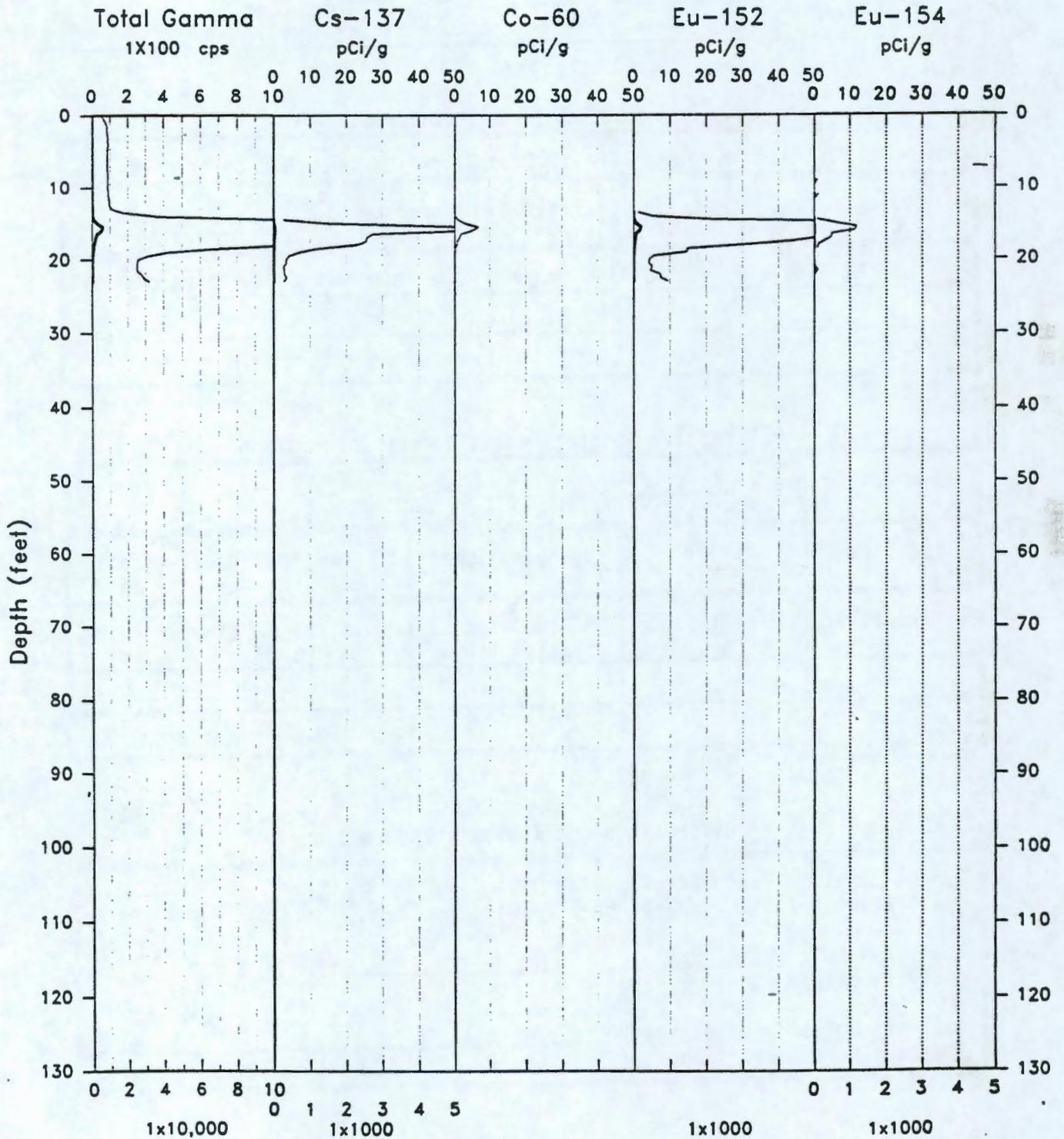
Project: 100-BC-1

Log Date: Mar 25, 92

Borehole: 116-B-1

Anal. Date: Apr 9, 92

93129051604



RLS Borehole Survey Report

116-B-1

Casing	Depth: 26'	Size: 8"	Thickness: 0.33"
Water	Depth: none		
Survey	Depth: 0 - 23'	Mode: MSA 80sec	Date: 3/25/92

**General Notes:**

Drilling was terminated before the maximum extent of man-made radionuclides was reached. The activity of Eu-152 is increasing at the maximum depth.

The long count spectra acquired at the bottom of the borehole confirmed the presence of Cs-137, Eu-152, and Eu-154.

**Man-made Radionuclides:**

Cesium (Cs-137) was encountered in the borehole from 14 feet to the maximum survey depth of 23 feet. The maximum cesium decay activity detected was 50 pCi/g at 16 feet.

Cobalt (Co-60) was observed from 13 feet to 19 feet with a detected decay activity of less than 10 pCi/g.

Europium-152 (Eu-152) was encountered in the borehole from 13 feet to the maximum survey depth of 23 feet. The maximum Eu-152 decay activity detected was 200 pCi/g at 16 feet.

Europium-154 (Eu-154) was encountered in the borehole from 14 feet to the maximum survey depth of 23 feet. The maximum Eu-154 decay activity detected was 12 pCi/g at 16 feet.

93129051605

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-BC-1

Borehole	<u>116-B-2</u>		
Coordinates	<u>                    </u> N <u>                    </u> W		Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.33	0.0	23.5

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top      Base      Incr
Mar 17, 92	H116B2\A159	MSA 80sec LT Station 1000 s	0.0      20.5      0.5 Depth: 20.5

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u> _____
Analysis Date: <u>Apr 9, 1992</u>
Analysis Notes: <u>No man-made nuclides found at maximum survey depth</u>
Radionuclides identified: <u>Cs-137, Co-60, Eu-152, Eu-154</u>

93129051606

# RLS Spectral Gamma-Ray Borehole Survey

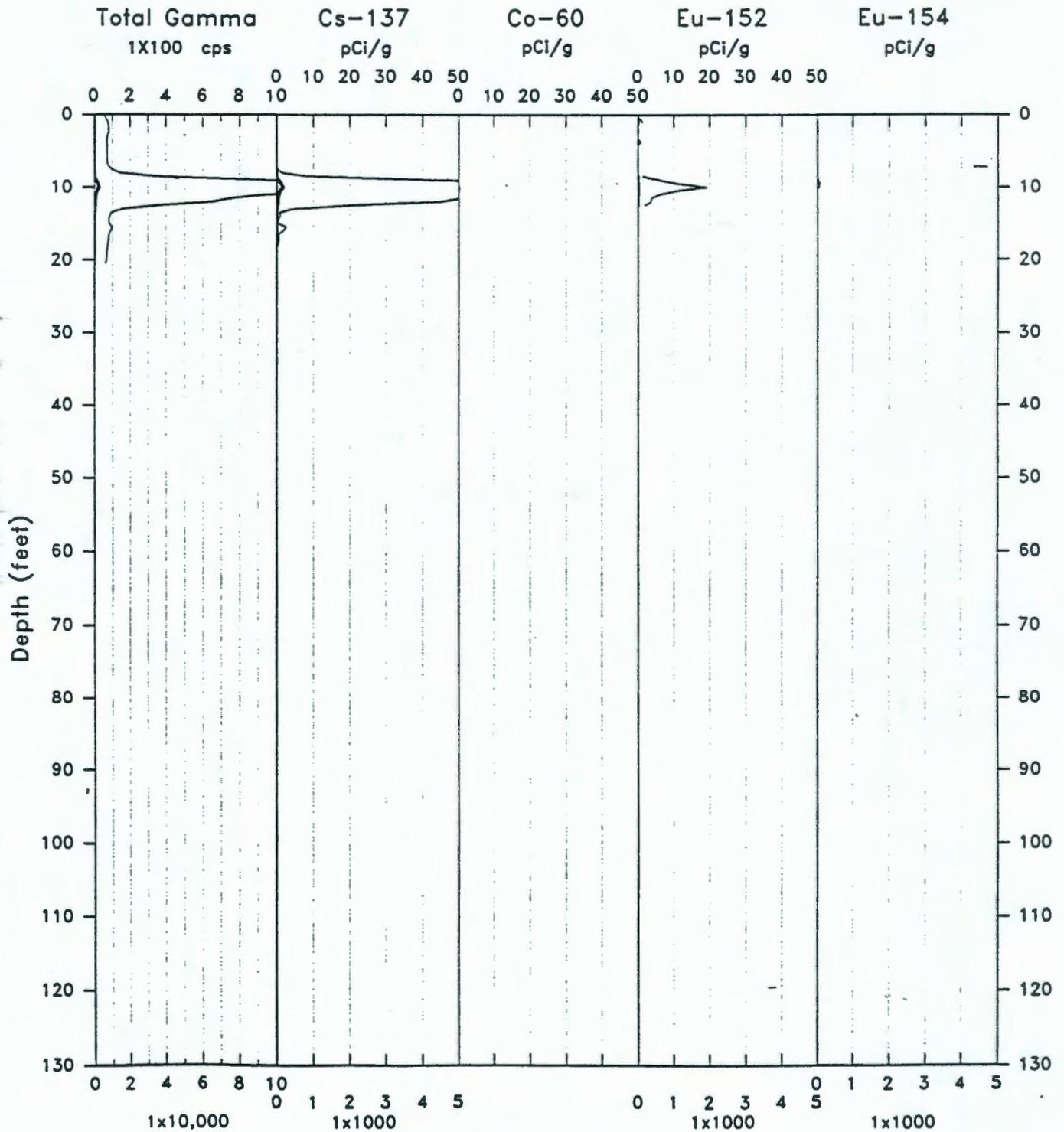
Project: 100-BC-1

Log Date: Mar 17, 92

Borehole: 116-B-2

Anal. Date: Apr 9, 92

93129051607



RLS Borehole Survey Report

116-B-2

Casing	Depth: 23.5'	Size: 8"	Thickness: 0.33"
Water	Depth: none		
Survey	Depth: 0 - 20'	Mode: MSA 80sec	Date: 3/17/92

**General Notes:**

A long count spectra was acquired at the bottom of the borehole. No man-made radionuclides were detected at the maximum survey depth of 20.5 feet.

**Man-made Radionuclides:**

Cesium (Cs-137) was encountered in the borehole from 7 feet to 18 feet. The maximum cesium decay activity detected was 185 pCi/g at 10 feet.

Cobalt (Co-60) was observed at 10 feet with a detected decay activity of less than 1 pCi/g.

Europium-152 (Eu-152) was encountered in the borehole from 8 feet to 16 feet. The maximum Eu-152 decay activity detected was 20 pCi/g at 10 feet.

Europium-154 (Eu-154) was encountered in the borehole from 9 feet to 12 feet. The maximum Eu-154 decay activity detected was less than 2 pCi/g.

93129051608

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-BC-1

Borehole	<u>116-B-3</u>		
Coordinates	<u>                    </u> N <u>                    </u> W		Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.31	0.0	23.5

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top      Base      Incr
Apr 8, 92	H116B03\A165	MSA 80 sec LT Station 500 s	0      17      0.5 Depth: 17.1

1 MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>G. K. Jaeger</u> <u>R. K. Price</u>
Analysis Date: <u>Apr 13, 1992</u>
Analysis Notes: <u>Cesium activity at maximum survey depth &lt; 1 pCi/g</u>
Radionuclides identified: <u>Cs-137</u>

93129051609

# RLS Spectral Gamma-Ray Borehole Survey

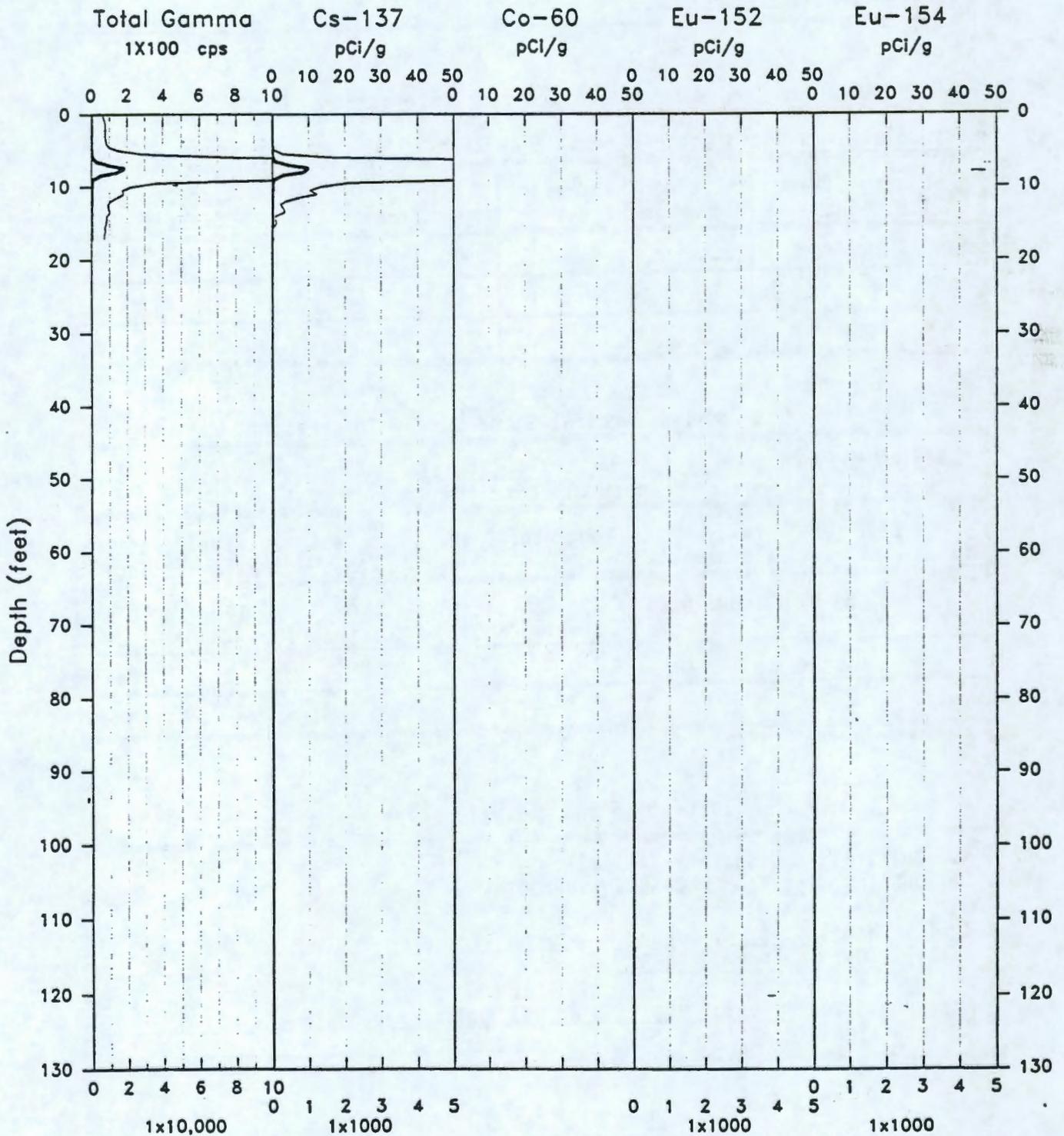
Project: 100-BC-1

Log Date: Apr 8, 92

Borehole: 116-B-3

Anal. Date: Aug 13, 92

93129051610



RLS Borehole Survey Report

116-B-3

Casing	Depth: 20'	Size: 8"	Thickness: 0.31"
Water	Depth: none		
Survey	Depth: 0 - 17'	Mode: MSA 80sec	Date: 4/08/92

**General Notes:**

A long count spectra was acquired at the bottom of the borehole. The cesium activity detected at the maximum survey depth of 17.1 feet was less than 1 pCi/g.

**Man-made Radionuclides:**

Cesium (Cs-137) was encountered in the borehole from 4 feet to the maximum survey depth of 17 feet. The cesium decay activity exceeded 200 pCi/g from 7 feet to 9 feet.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051611

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-BC-1

Borehole	<u>116-B-5</u>		
Coordinates	<u>                    </u> N <u>                    </u> W	Meters	
Elevation	<u>                    </u> feet	Brass Cap	

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing-Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.31	0	23.6

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top      Base      Incr
Apr 23, 92	H116B05\A171	MSA 80 sec LT Station: 500 s	0      21.5      0.5 Depths: 21.5'

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>G. K. Jaeger</u> <u>J. P. Kiesler</u>
Analysis Date: <u>Sept 14, 1992</u>
Analysis Notes: <u>Detection of Eu-154 is discontinuous.</u>
Radionuclides identified: <u>Co-60, Eu-152, Eu-154</u>

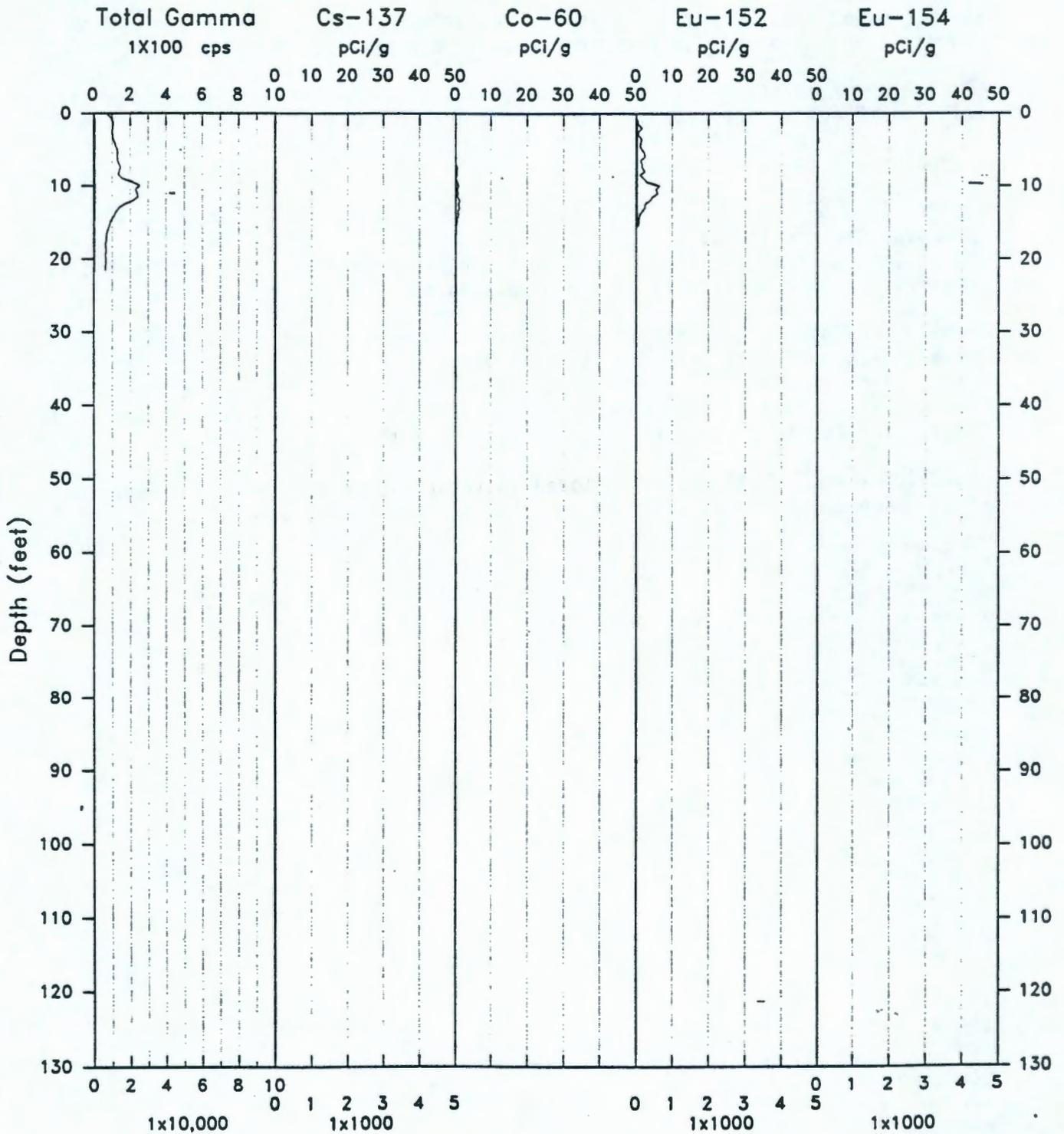
93129051612

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-BC-1  
Borehole: 116-B-5

Log Date: Apr 23, 92  
Anal. Date: Sep 14, 92

93129051613



RLS Borehole Survey Report

116-B-5

Casing	Depth: 23.6'	Size: 8"	Thickness: 0.31"
Water	Depth: none		
Survey	Depth: 0 - 21.5'	Mode: MSA 80sec	Date: 4/23/92

**General Notes:**

A long count spectra was acquired at the maximum depth of the borehole survey. No man-made radionuclides were confirmed in the stationary measurement.

Detection of Europium-154 was not continuous through the identified interval of 3 to 12 feet. The activity level is probable below the detection limit for the logging configuration specified for the survey. The activity level of Europium-154 is less than 1 pCi/g.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

Cobalt (Co-60) was encountered in the borehole from 5 feet to 17 feet. The cobalt decay activity detected is less than 1.5 pCi/g.

Europium-152 (Eu-152) was encountered in the borehole survey from 3 feet to 15 feet. The Eu-152 decay activity detected is less than 7 pCi/g.

Europium-154 (Eu-154) was encountered in the borehole survey from 3 feet to 12 feet. The Eu-154 decay activity detected is less than 1 pCi/g.

93129051614

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-BC-5

Borehole	<u>199-B2-13</u>		
Coordinates	<u>                    </u> N	<u>                    </u> W	Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>20.6</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
10	0.38	0.0	22.1
8	0.33	0.0	38.0

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>					
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>					
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet)		
			Top	Base	Incr
Mar 09, 92	H1B0213\A151	MSA 80sec LT	0	34	0.5

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>Apr 6, 1992</u>
Analysis Notes: <u>No water correction applied</u>
Radionuclides identified: <u>No man-made nuclides detected</u>

93129051615

# RLS Spectral Gamma-Ray Borehole Survey

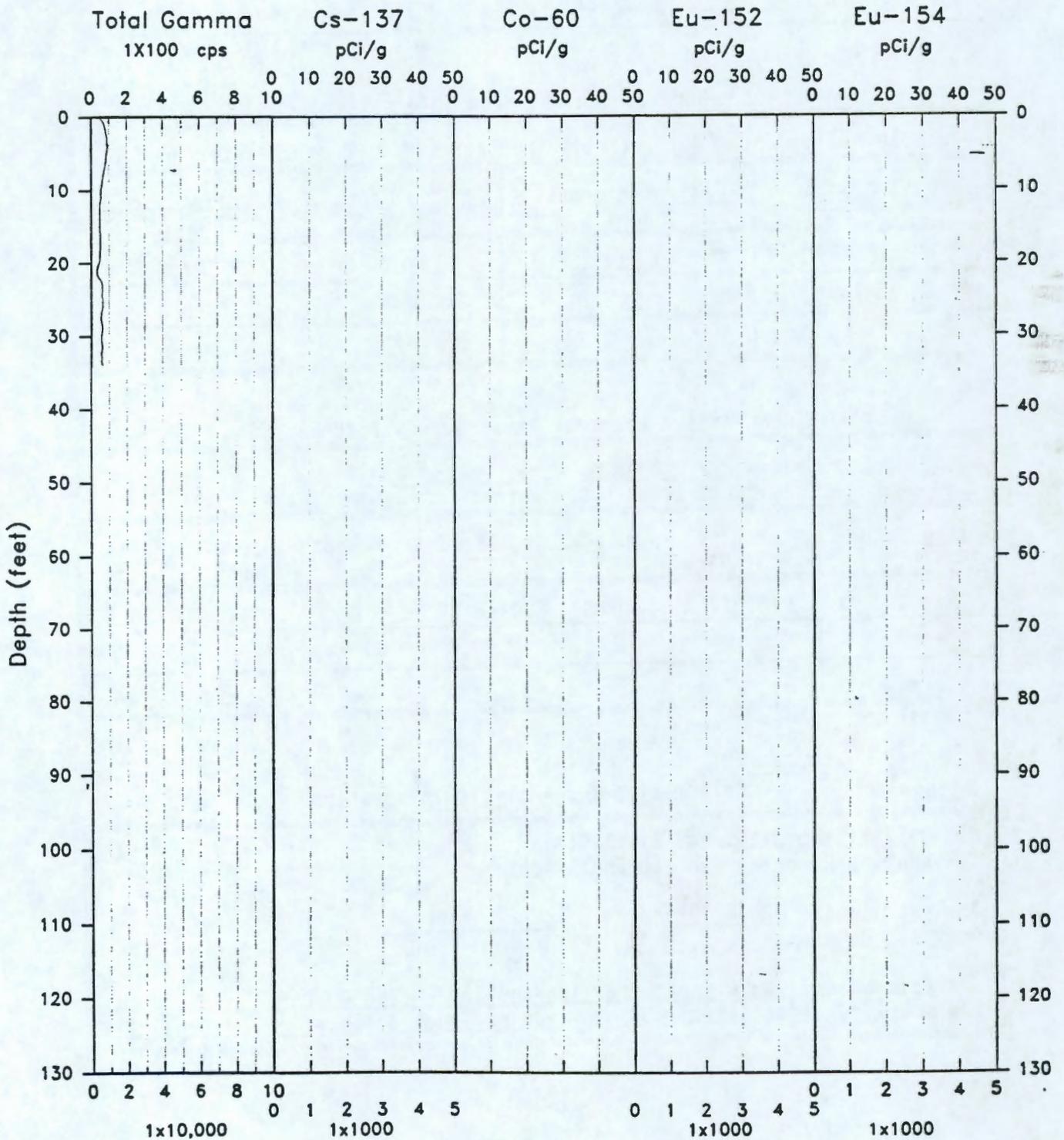
Project: 100-BC-5

Log Date: Mar 9, 92

Borehole: 199-B2-13

Anal. Date: Apr 6, 92

93129051616



RLS Borehole Survey Report

199-B2-13

Casing	Depth: 22'	Size: 10"	Thickness: 0.38"
	Depth: 38'	Size: 8"	Thickness: 0.33"
Water	Depth: 20.6'		
Survey	Depth: 0 - 34'	Mode: MSA 80sec	Date: 4/09/92

**General Notes:**

No man-made radionuclides were identified in the borehole survey.

No water correction was applied to the analyzed spectra.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051617

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-BC-5

Borehole	<u>199-B3-1</u>		
Coordinates	<u>                    </u> N <u>                    </u> W		Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>42.5</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.29	0.0	54.8

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top          Base          Incr
June 30, 92	H1B0301\A199	MSA 80sec LT Station: 500 s	0.0          51.8          0.5 Depths: 30, 51.8'

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>J. P. Kiesler</u> _____
Analysis Date: <u>Sept 10, 1992</u>
Analysis Notes: <u>Cs-137 less than 1 pCi/g, Eu-152 less than 3 pCi/g</u>
Radionuclides identified: <u>Cs-137, Eu-152</u>

93129051618

# RLS Spectral Gamma-Ray Borehole Survey

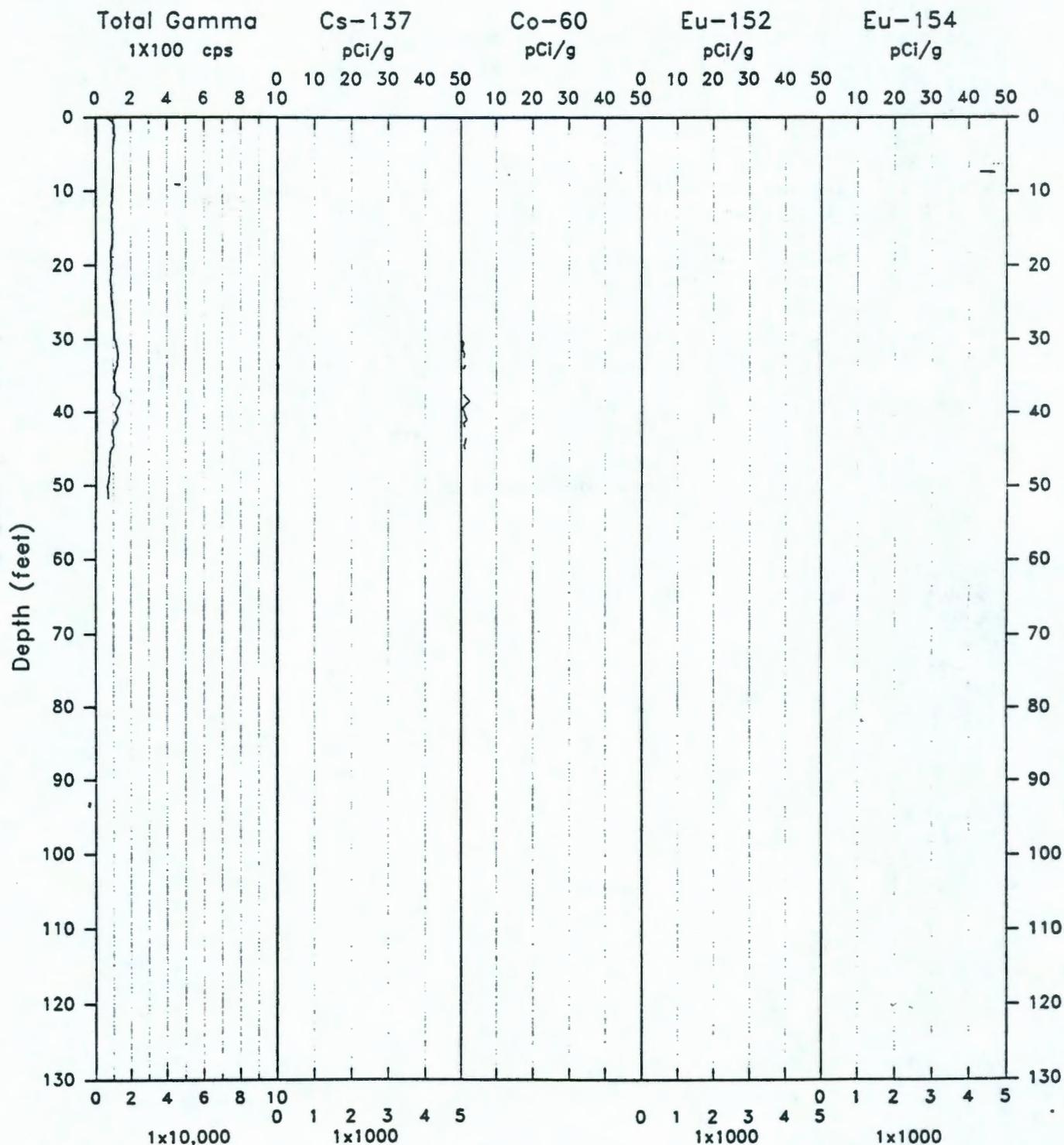
Project: 100-BC-5

Log Date: Jun 30, 92

Borehole: 199-B3-1

Anal. Date: Sep 10, 92

93129051619



RLS Borehole Survey Report

199-B3-1

Casing	Depth: 54.8'	Size: 8"	Thickness: 0.29"
Water	Depth: 42.5'		
Survey	Depth: 0 - 51'	Mode: MSA 80sec	Date: 6/30/92

**General Notes:**

A long count spectra was acquired at 30 feet and at the bottom of the borehole. Only cesium-137 was detected at the maximum survey depth of 51.8 feet with less than 1 pCi/g.

**Man-made Radionuclides:**

Cesium (Cs-137) was encountered in the borehole from 27 feet to 51 feet. The cesium decay activity detected was less than 1 pCi/g.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

Europium-152 (Eu-152) was encountered in the borehole from 32 feet to 45 feet. The Eu-152 decay activity detected was less than 3 pCi/g.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051620

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-BC-5

Borehole	<u>199-B3-47</u>		
Coordinates	<u>                    </u> N <u>                    </u> W	Meters	
Elevation	<u>                    </u> feet	Brass Cap	

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
10	0.38	0.0	19.0
8	0.33	0.0	59.1

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top            Base            Incr
Mar 5, 92	H1B0347\A148	MSA 80sec LT Station: 500 s	0            56            0.5 Depths: 7,34'

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>Apr 06, 1992</u>
Analysis Notes: <u>Cesium decay activity &lt; 1 pCi/g</u>
Radionuclides identified: <u>Cs-137</u>

93129051621

# RLS Spectral Gamma-Ray Borehole Survey

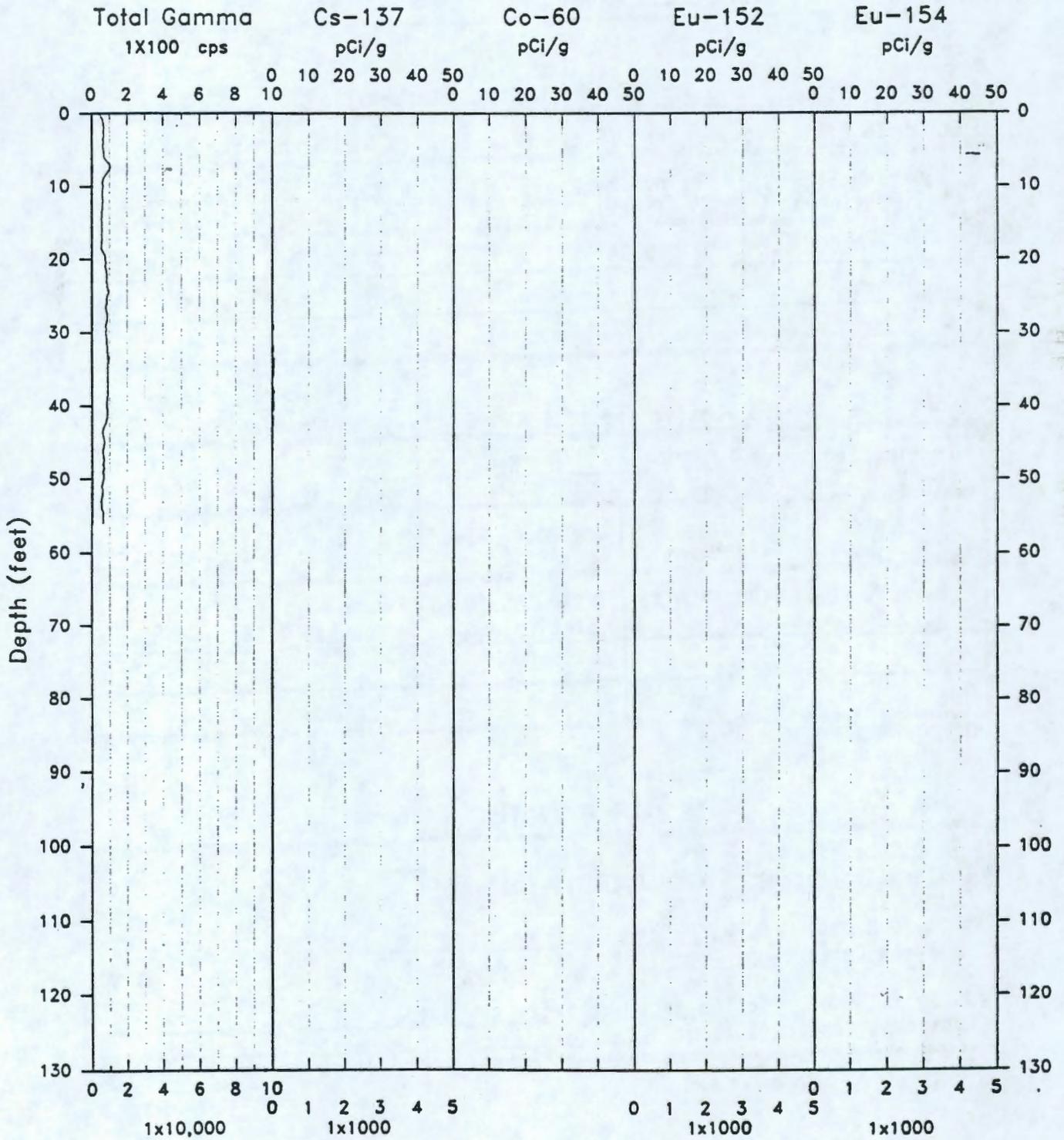
Project: 100-BC-5

Log Date: Mar 5, 92

Borehole: 199-B3-47

Anal. Date: Apr 6, 92

93129051622



RLS Borehole Survey Report

199-B3-47

Casing	Depth: 19'	Size: 10"	Thickness: 0.38"
	Depth: 59'	Size: 8"	Thickness: 0.33"
Water Survey	Depth: none	Mode: MSA 80sec	Date: 3/05/92
	Depth: 0 - 56'		

**General Notes:**

A long count spectra was acquired at 7 feet and 34 feet. No man-made radionuclides were detected at 7 feet. The long count spectra detected only cesium at 34 feet with a decay activity of less than 1 pCi/g.

The high gamma-ray activity observed at 7 feet was due to natural thorium and uranium at concentrations levels near 1 pCi/g.

**Man-made Radionuclides:**

Cesium (Cs-137) was encountered in the borehole from 29 feet to 43 feet. The cesium decay activity detected was less than 1 pCi/g.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051623

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 199-BC-5

Borehole	<u>199-B4-1</u>		
Coordinates	<u>                    </u> N	<u>                    </u> W	Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>61.5</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.33	0.0	76.1

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top      Base      Incr
July 01, 92	H1B0401\A200	MSA 80sec LT Station: 500 s	0      73      0.5 Depth: 73.1

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>J. P. Kiesler</u> _____
Analysis Date: <u>Sept 10, 1992</u>
Analysis Notes: _____
Radionuclides identified: <u>No man-made nuclides detected</u>

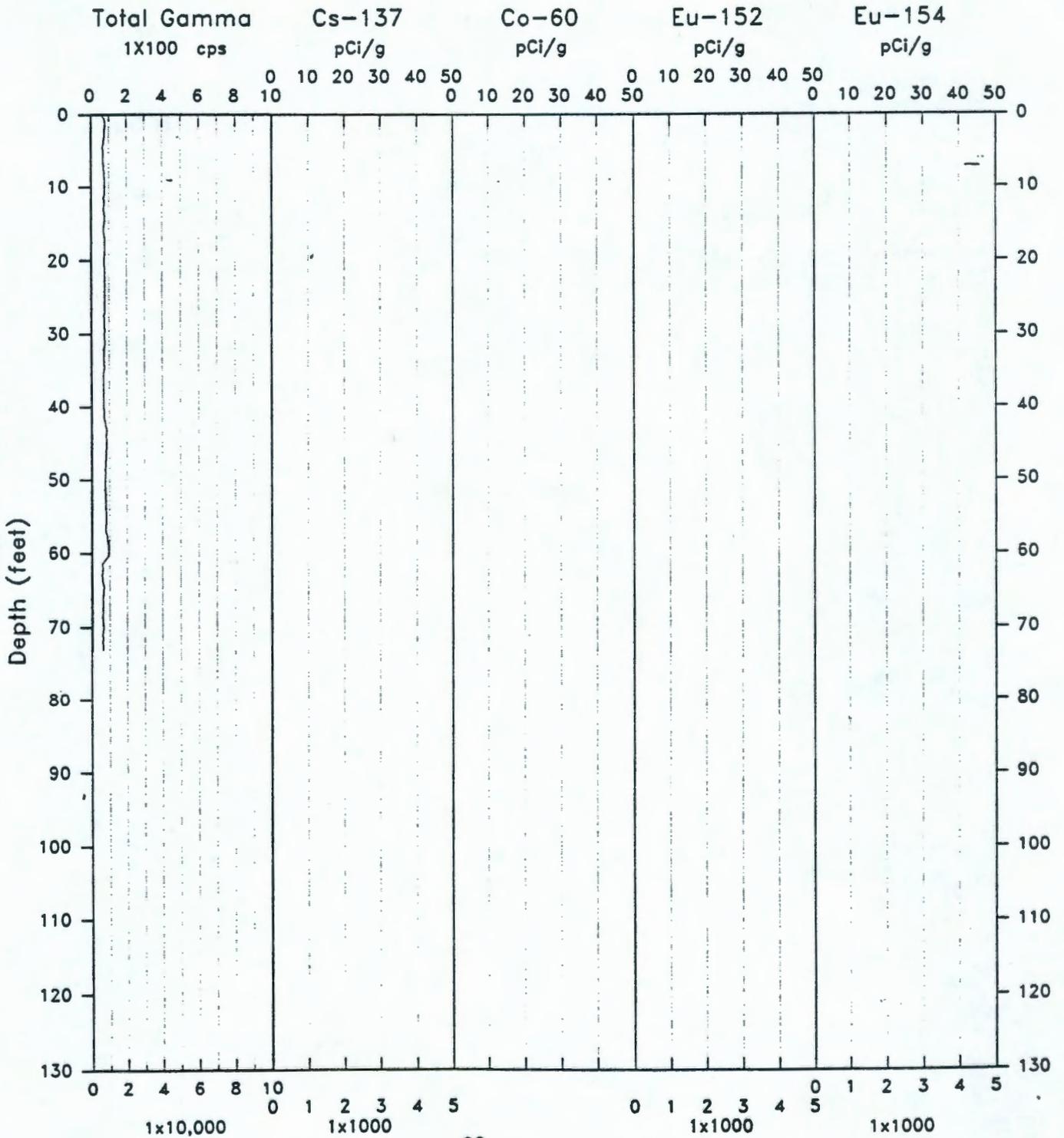
93129051624

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-BC-5  
Borehole: 199-B4-1

Log Date: July 1, 92  
Anal. Date: Sep 10, 92

93129051625



RLS Borehole Survey Report

199-B4-1

Casing	Depth: 76'	Size: 8"	Thickness: 0.33"
Water	Depth: 61.5'		
Survey	Depth: 0 - 73'	Mode: MSA 80sec	Date: 7/01/92

**General Notes:**

No man-made radionuclides were identified in the borehole survey.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051626

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-BC-5

Borehole	<u>199-B4-4</u>		
Coordinates	<u>                    </u> N <u>                    </u> W	Meters	
Elevation	<u>                    </u> feet	Brass Cap	

Borehole Environment Information

Borehole Fluid Depth <u>72.5</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.28	0.0	101.7

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>					
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>					
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet)		
			Top	Base	Incr
July 08, 92	H1B0404\A202	MSA 80 sec LT	0	53	0.5
July 09, 92	H1B0404\A203	MSA 80 sec LT Station: 500 s	50 Depth: 99'	99	0.5

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>G. K. Jaeger</u> _____
Analysis Date: <u>Aug 13, 1992</u>
Analysis Notes: _____
Radionuclides identified: <u>No man-made nuclides detected</u>

93129051627

# RLS Spectral Gamma-Ray Borehole Survey

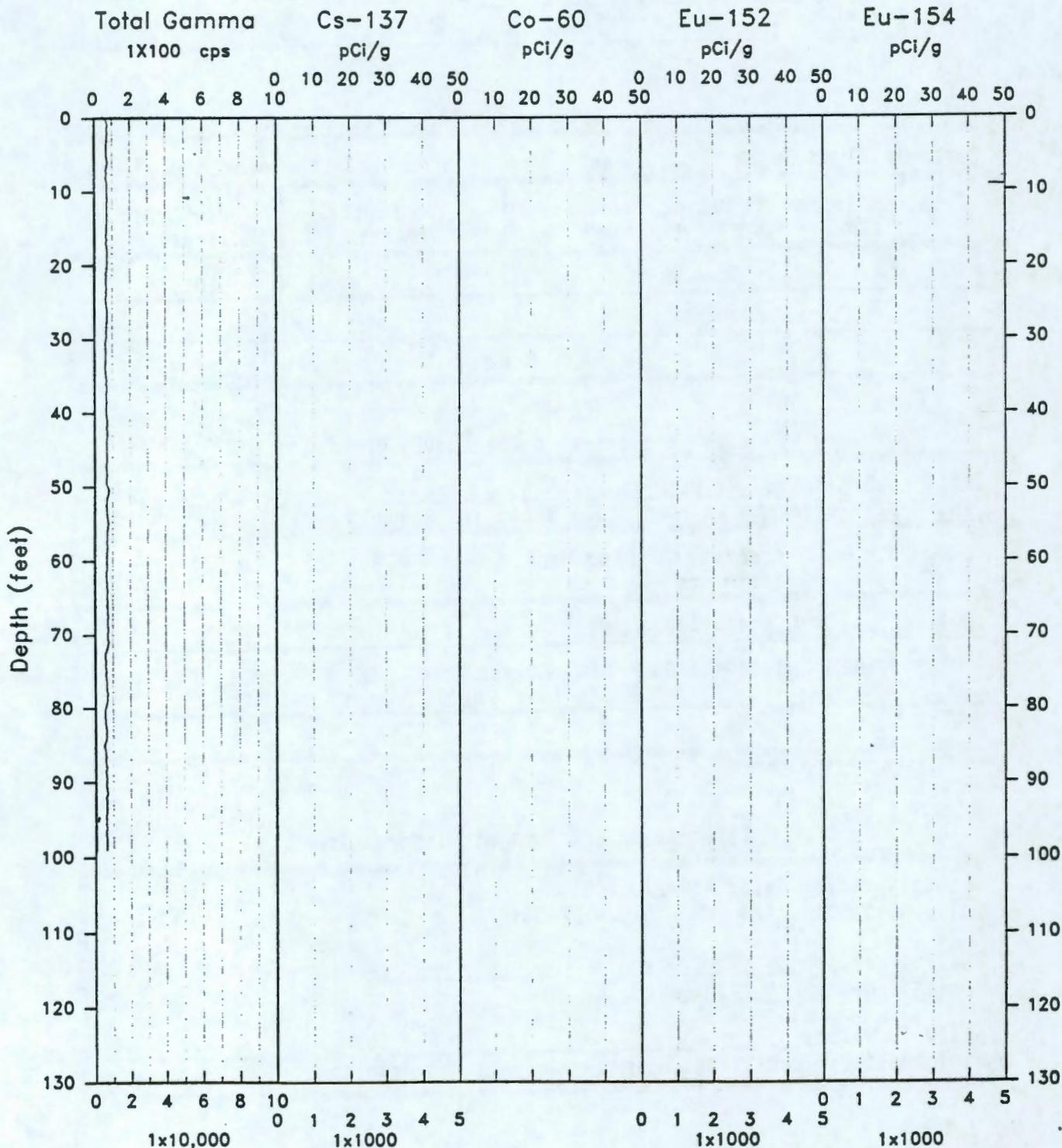
Project: 100-BC-5

Log Date: July 9, 92

Borehole: 199-B4-4

Anal. Date: Aug 13, 92

93129051628



RLS Borehole Survey Report

199-B4-4

Casing	Depth: 101'	Size: 8"	Thickness: 0.28"
Water	Depth: 72.5'		
Survey	Depth: 0 - 53'	Mode: MSA 80sec	Date: 7/08/92
	Depth: 50 - 99'	Mode: MSA 80sec	Date: 7/09/92

**General Notes:**

No man-made radionuclides were identified in the borehole survey.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051629

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 199-BC-5

Borehole	<u>199-B4-5</u>		
Coordinates	<u>                    </u> N <u>                    </u> W		Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>80</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
4	0.19	0.0	96.9

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top            Base            Incr
July 16, 92	H1B0405\A207	MSA 80 sec LT Station: 300 s	0            93            0.5 Depth: 39, 93.9'

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>G. K. Jaeger</u> _____
Analysis Date: <u>Aug 18, 1992</u>
Analysis Notes: <u>Gross-gamma increase (19-73') due to completion material</u> <u>Radionuclides identified: No man-made nuclides detected</u>

93129051630

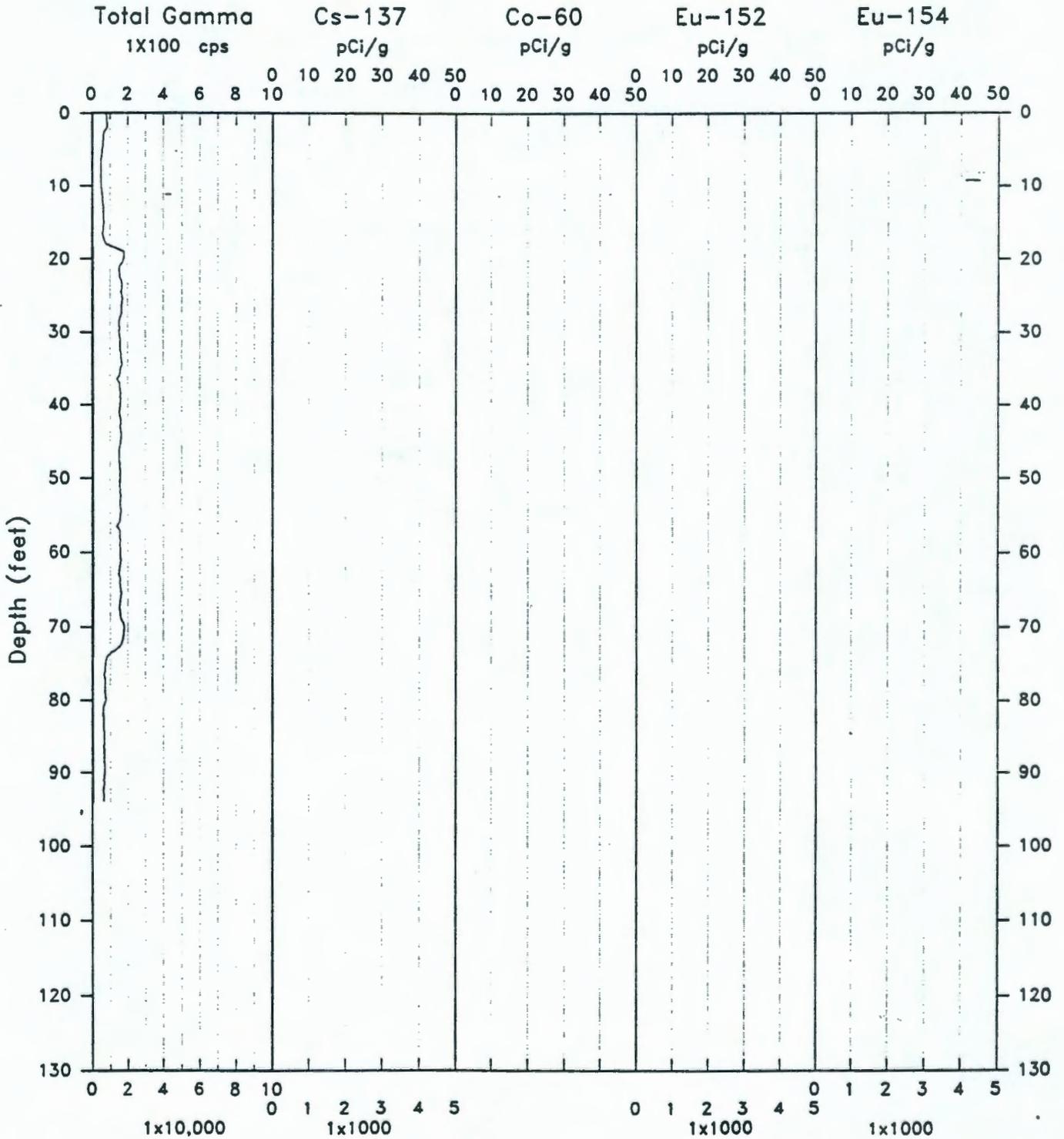
# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-BC-5

Log Date: Jul 16, 92

Borehole: 199-B4-5

Anal. Date: Aug 18, 92



93129051631

RLS Borehole Survey Report

199-B4-5

Casing	Depth: 97'	Size: 4"	Thickness: 0.19"
Water	Depth: 80'		
Survey	Depth: 0 - 94'	Mode: MSA 80sec	Date: 7/16/92

**General Notes:**

No man-made radionuclides were encountered in the borehole survey.

Borehole casing is stainless steel. Increase gross-gamma activity from 19 feet to 73 feet is due to natural radionuclides present in well seal materials. Uranium and thorium concentrations exceed 2 pCi/g.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051632

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 199-BC-5

Borehole	<u>199-B4-9</u>		
Coordinates	<u>                    </u> N	<u>                    </u> W	Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>71.3</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing-Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
10	0.38	0	30
8	0.31	0	87

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>					
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>					
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet)		
			Top	Base	Incr
Apr 13, 92	H1B0409\A167	MSA 80 sec LT Station: 500 s	0	28	0.5
Apr 22, 92	H1B0409\A170	MSA 80 sec LT Station: 500 s	25	78	0.5

MSA: Move-Stop-Acquire LT: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>G. K. Jaeger</u>
Analysis Date: <u>Jul 28, 1992</u>
Analysis Notes: <u>Decrease Cs-137 on 4/22/92 due to max casing corr 0.40"</u>
Radionuclides identified: <u>Cs-137, Co-60, Eu-152, Eu-154</u>

93129051633

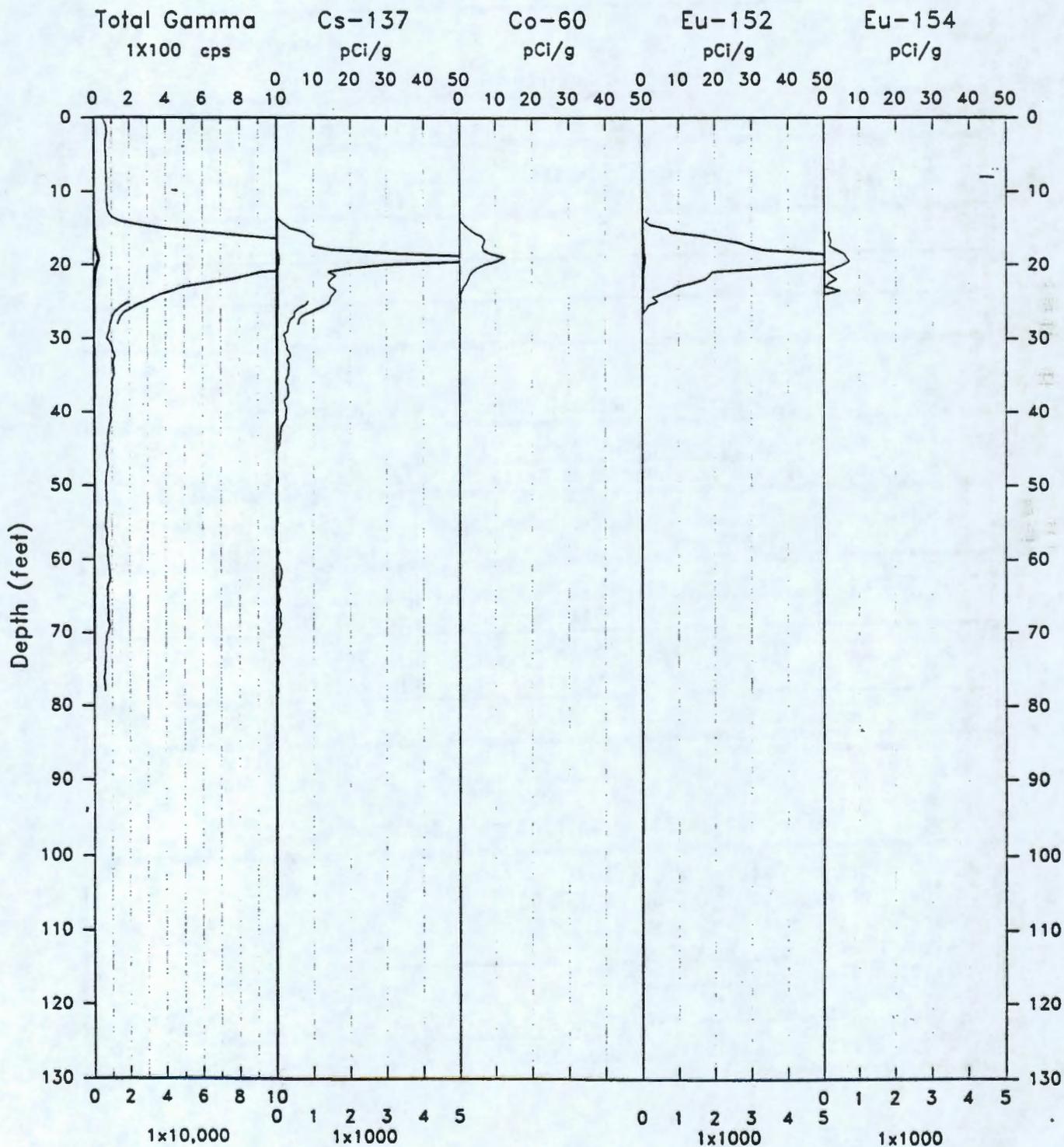
# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-BC-5

Log Date: Apr 22, 92

Borehole: 199-B4-9

Anal. Date: Jul 28, 92



93129051634

RLS Borehole Survey Report

199-B4-9

Casing	Depth: 30'	Size: 10"	Thickness: 0.38"
	Depth: 87'	Size: 8"	Thickness: 0.31"
Water Survey	Depth: 71.3'		
	Depth: 0 - 28'	Mode: MSA 80sec	Date: 4/13/92
	Depth: 25 - 78'	Mode: MSA 80sec	Date: 4/22/92

**General Notes:**

Total depth of well was not reached during the borehole survey due to hole sloughing.

The cesium decay activity for the second log survey, 4/22/92, is less than the previous survey at the overlap interval from 25 to 28 feet. The overlap was recorded through two casing thicknesses with a total thickness of 0.69 inches. The maximum casing correction, 0.40 inches, applied to the data shows that the computed activity through multiple casings is underestimated.

A long count spectra was acquired at the bottom of the borehole and at 28 feet. No man-made radionuclides were detected at the maximum survey depth of 78 feet. Only cesium-137 was detected in the long count spectra at 28 feet.

The variation in the observed depth of Eu-152 and Eu-154 is possibly due to the subsurface activity being at or below the detection limits for the logging survey configuration.

**Man-made Radionuclides:**

Cesium (Cs-137) was encountered in the borehole from 13 feet to the maximum survey depth of 78 feet. The maximum cesium decay activity detected was 60 pCi/g at 19 feet.

Cobalt (Co-60) was encountered in the borehole survey from 13 feet to 26 feet. The maximum decay activity detected was 13 pCi/g at 19 feet.

Europium-152 (Eu-152) was encountered in the borehole from 14 feet to 26 feet. The maximum Eu-152 decay activity detected was 67 pCi/g at 19 feet.

Europium-154 (Eu-154) was encountered in the borehole from 15 feet to 27 feet. The Eu-154 decay activity detected was less than 7 pCi/g.

93129051635

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-BC-5

Borehole	<u>199-B9-1</u>		
Coordinates	<u>                    </u> N <u>                    </u> W		Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>85.4</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.35	0	115

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top            Base            Incr
July 7, 92	H1B0901\A201	MSA 80sec LT Station: 300 s	0            112            0.5 Depths: 22, 112'

MSA: Move-Stop-Acquire LT: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>G. K. Jaeger</u>
Analysis Date: <u>Aug 13, 1992</u>
Analysis Notes: <u>Cs-137 not encountered in the borehole survey</u>
Radionuclides identified: <u>Co-60, Eu-152, Eu-154</u>

93129051636

# RLS Spectral Gamma-Ray Borehole Survey

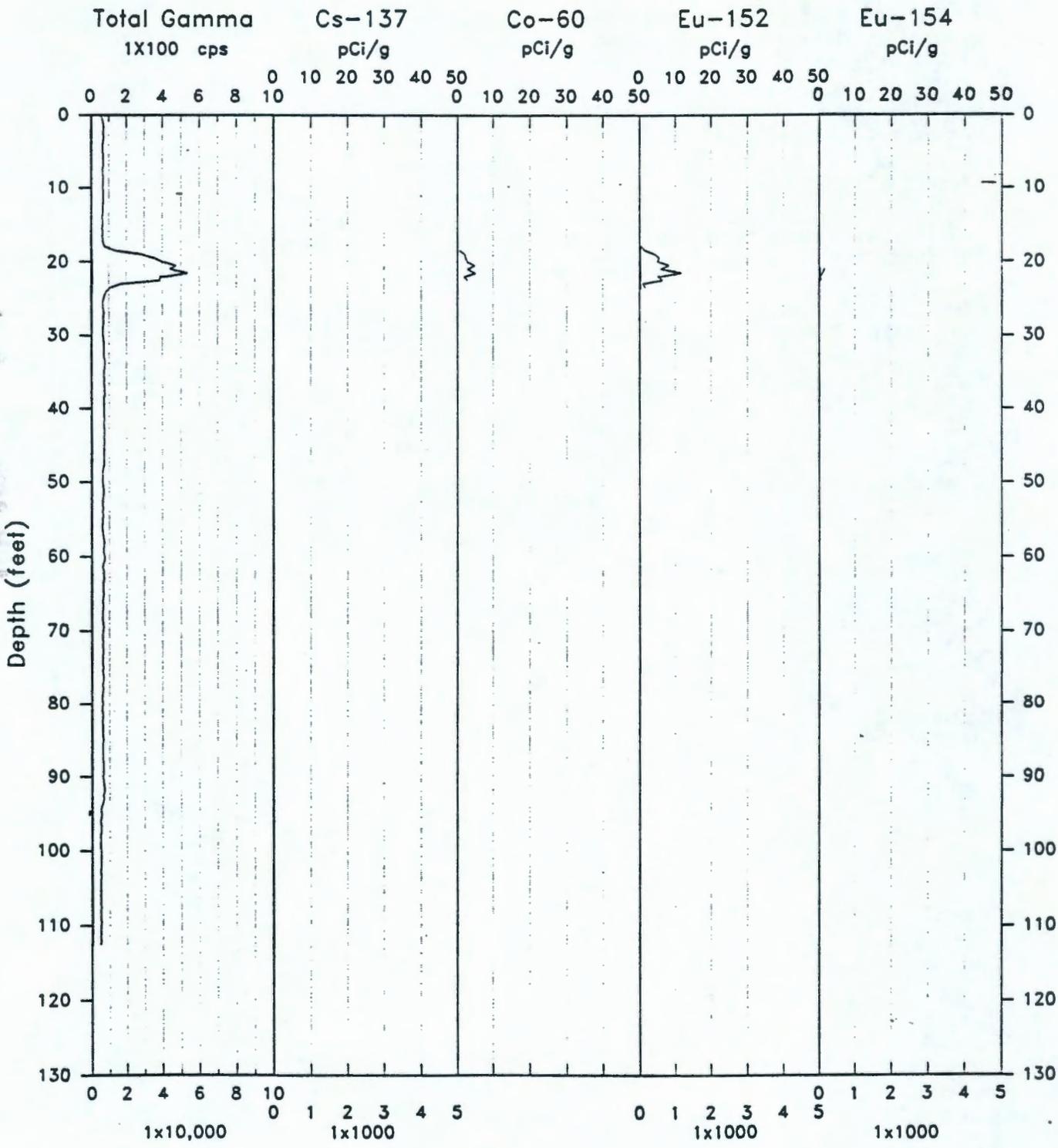
Project: 100-BC-5

Log Date: July 7, 92

Borehole: 199-B9-1

Anal. Date: Aug 13, 92

93129051637



RLS Borehole Survey Report

199-B9-1

Casing	Depth: 115'	Size: 8"	Thickness: 0.35"
Water	Depth: 85.4'		
Survey	Depth: 0 - 112'	Mode: MSA 80sec	Date: 7/07/92

**General Notes:**

A long count spectra was acquired at 22 feet and at the bottom of the borehole. No man-made radionuclides were detected at the maximum survey depth of 112 feet.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

Cobalt (Co-60) was encountered in the borehole survey from 18 feet to 23 feet. The decay activity detected was less than 5 pCi/g.

Europium-152 (Eu-152) was encountered in the borehole from 18 feet to 23 feet. The maximum Eu-152 decay activity detected was 12 pCi/g at 21 feet.

Europium-154 (Eu-154) was encountered in the borehole survey from 21 feet to 22.5 feet. The Eu-154 decay activity detected was less than 2 pCi/g.

93129051638

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-FR-3

Borehole	<u>199-F5-45</u>		
Coordinates	<u>                    </u> N <u>                    </u> W		Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>41.5</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
10	0.38	0.0	21.3
8	0.33	0.0	51.8

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top            Base            Incr
Sept 08, 92	H1F0545\A237	MSA 80sec RT Station: 300 s	0.0            49.            0.5 Depth: 28.5'

MSA: Move-Stop-Acquire Rt: Real Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>J. P. Kiesler</u> _____
Analysis Date: <u>Sept 10, 1992</u>
Analysis Notes: <u>Total-gamma increase at 22' due to end of 10" casing</u>
Radionuclides identified: <u>No man-made nuclides detected</u>

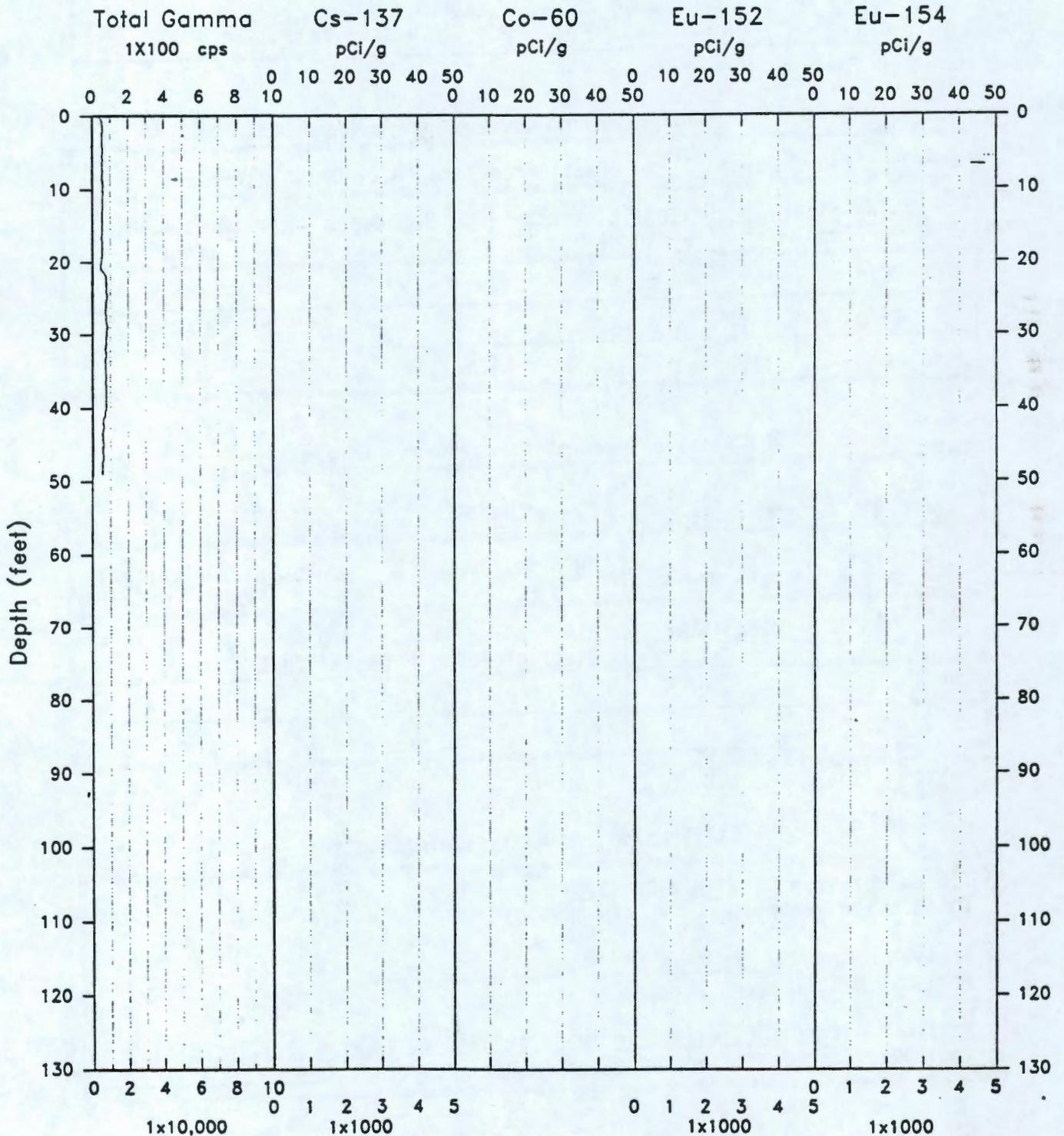
93129051639

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-FR-3  
Borehole: 199-F5-45

Log Date: Sep 8, 92  
Anal. Date: Sep 10, 92

93129051640



RLS Borehole Survey Report

199-F5-45

Casing	Depth: 21.3'	Size: 10"	Thickness: 0.38"
	Depth: 51.8'	Size: 8"	Thickness: 0.33"
Water	Depth: 41.5'		
Survey	Depth: 0 - 49'	Mode: MSA 80sec LT	Date: 9/08/92

**General Notes:**

The maximum calibrated casing correction of 0.40 inches was applied to the survey data. The computed activity for data recorded through multiple casing strings will be underestimated. The decreased Total-gamma activity above 22 feet is due to the double casing present in the borehole.

No man-made radionuclides were identified in the borehole survey.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051641

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-FR-3

Borehole	<u>199-F5-48</u>		
Coordinates	<u>                    </u> N <u>                    </u> W		Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>46.5</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
10	0.38	0	21.8
8	0.33	0	54.5

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>					
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>					
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet)		
			Top	Base	Incr
Sept 08, 92	H1F0548\A238	MSA 80sec LT	0.0	51.5	0.5

MSA: Move-Stop-Acquire LT: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>J. P. Kiesler</u>
Analysis Date: <u>Sept 10, 1992</u>
Analysis Notes: <u>Total-gamma increase at 22' due to end of 10" casing</u>
Radionuclides identified: <u>No man-made nuclides detected</u>

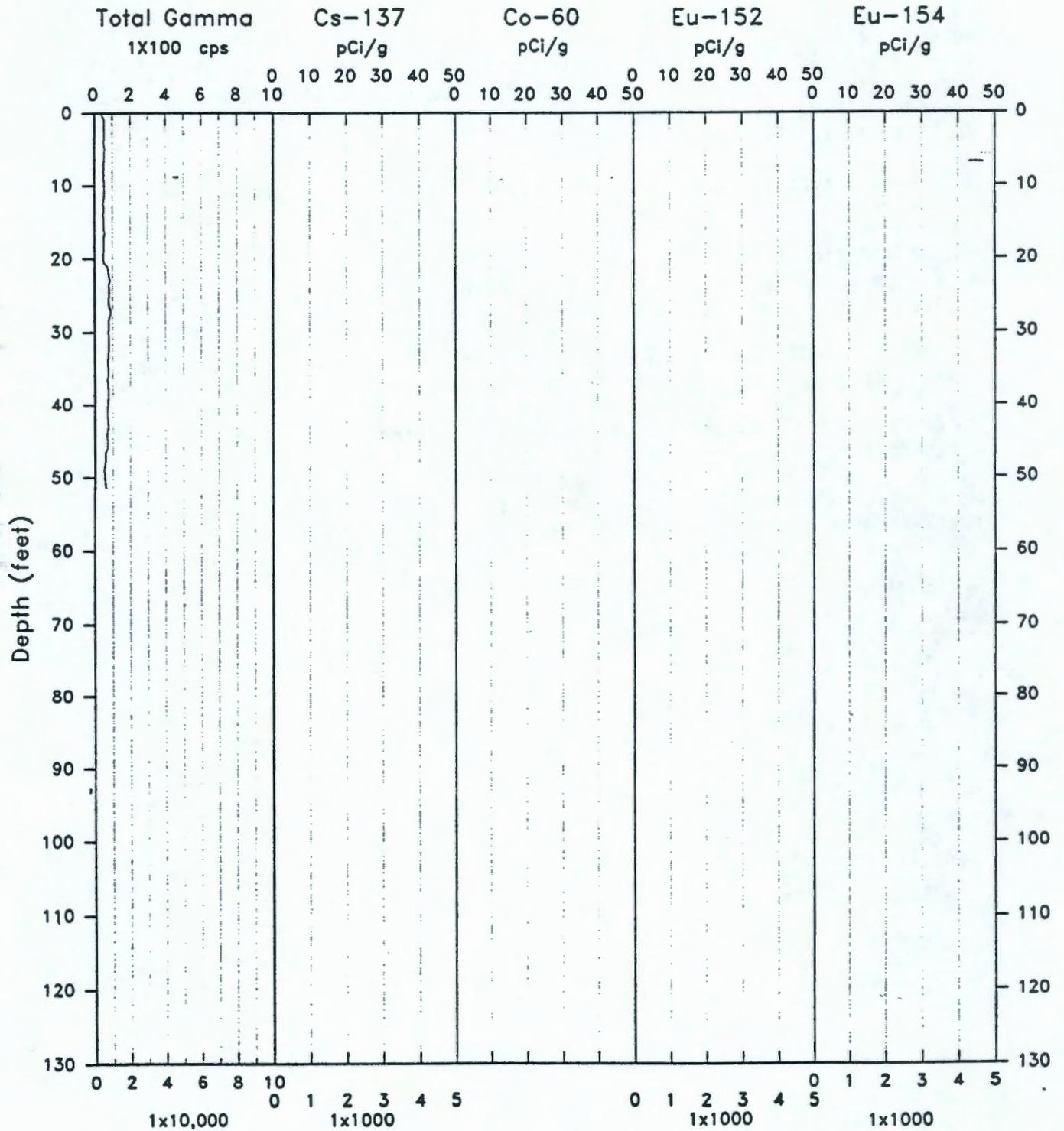
93129051642

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-FR-3  
Borehole: 199-F5-48

Log Date: Sep 8, 92  
Anal. Date: Sep 10, 92

93129051643



RLS Borehole Survey Report

199-F5-48

Casing	Depth: 21.8'	Size: 10"	Thickness: 0.38"
	Depth: 54.5'	Size: 8"	Thickness: 0.33"
Water	Depth: 46.5'		
Survey	Depth: 0 - 51'	Mode: MSA 80sec LT	Date: 9/08/92

**General Notes:**

The maximum calibrated casing correction of 0.40 inches was applied to the survey data. The computed activity for data recorded through multiple casing strings will be underestimated. The decreased Total-gamma activity above 22 feet is due to the double casing present in the borehole.

No man-made radionuclides were identified in the borehole survey.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051644

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-NR-2

Borehole	<u>199-N-75</u>		
Coordinates	<u>                    </u> N <u>                    </u> E	Meters	
Elevation	<u>                    </u> feet	Brass Cap	

Borehole Environment Information

Borehole Fluid Depth <u>68.7</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
12	0.40	0	20
10	0.38	0	89.2

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top      Base      Incr
May 1, 92	H1N75\A175	MSA 80sec LT Station: 500 s	0      86      0.5 Depth: 68, 70'

MSA: Move-Stop-Acquire LT: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>G. K. Jaeger</u> <u>R. K. Price</u>
Analysis Date: <u>Aug 18, 1992</u>
Analysis Notes: <u>Very high background activity at surface to 1 foot</u>
Radionuclides identified: <u>Co-60</u>

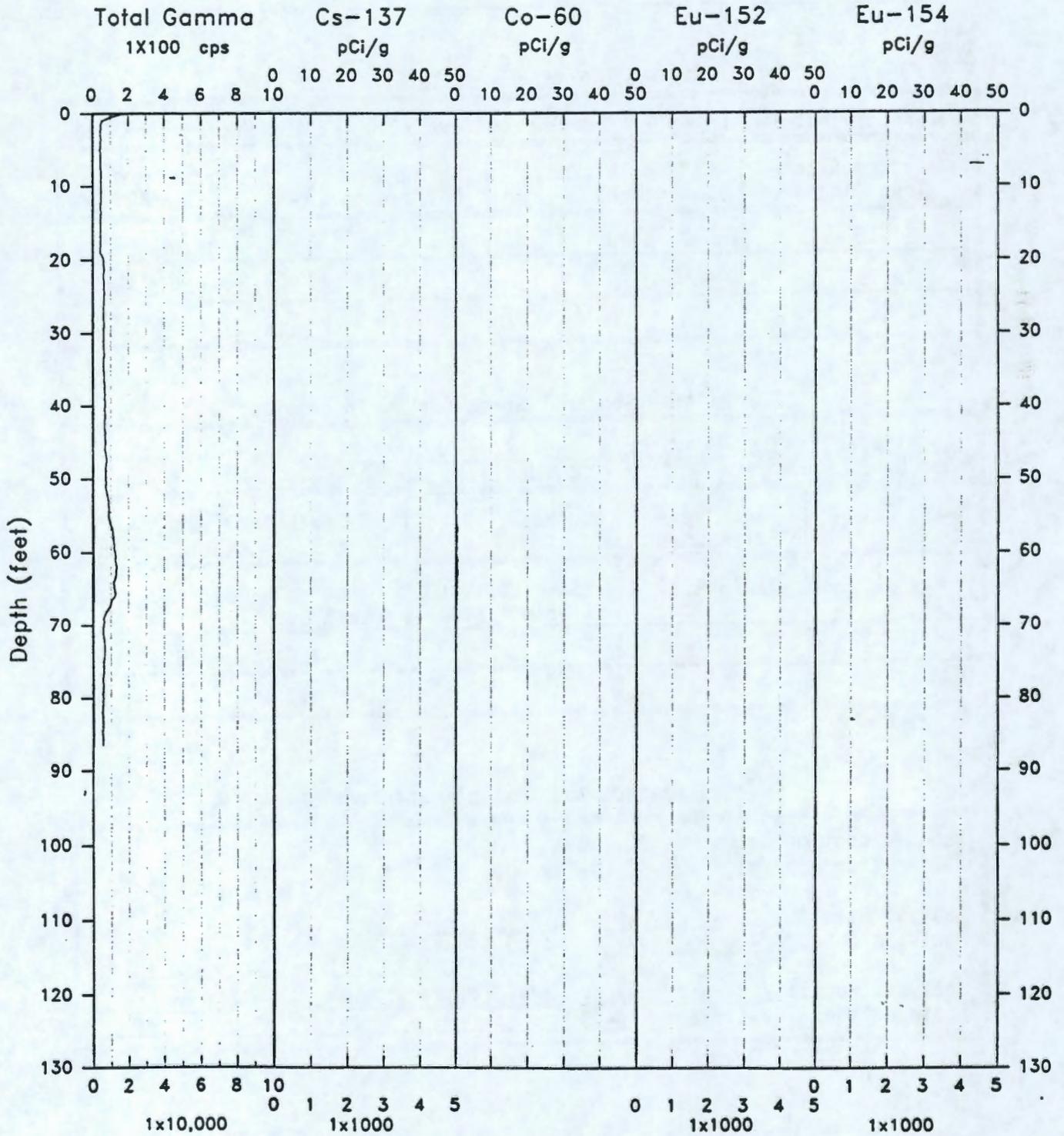
93129051645

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-NR-2  
Borehole: 199-N-75

Log Date: May 1, 92  
Anal. Date: Aug 18, 92

93129051646



RLS Borehole Survey Report

199-N-75

Casing	Depth: 20'	Size: 12"	Thickness: 0.40"
	Depth: 89'	Size: 10"	Thickness: 0.38"
Water	Depth: 68.7'		
Survey	Depth: 0 - 86'	Mode: MSA 80sec LT	Date: 5/01/92

**General Notes:**

Very high total gamma activity observed on the surface is identified in the borehole survey from 0 feet to 1 feet.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

Cobalt (Co-60) was encountered in the borehole from 52 feet to 85 feet. The cobalt decay activity detected is less than 1 pCi/g.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051647

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-NR-2

Borehole	<u>199-N-80</u>		
Coordinates	<u>                    </u> N <u>                    </u> W	Meters	
Elevation	<u>                    </u> feet	Brass Cap	

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
12	0.40	0	18.9
10	0.38	0	99.5
8	0.33	0	125.5

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top      Base      Incr
Aug 3, 92	H1N80\A220	MSA 80 sec LT Station: 500 s	0      95      0.5 Depths: 66, 95'
Aug 12, 92	H1N80\A225	MSA 80 sec LT Station: 500 s	90      120      0.5 Depths: 111.5, 120'

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>G. K. Jaeger</u> <u>J. P. Kiesler</u>
Analysis Date: <u>Sept 16, 1992</u>
Analysis Notes: <u>No water in borehole for Spectral survey.</u>
Radionuclides identified: <u>Co-60</u>

93129051648

# RLS Spectral Gamma-Ray Borehole Survey

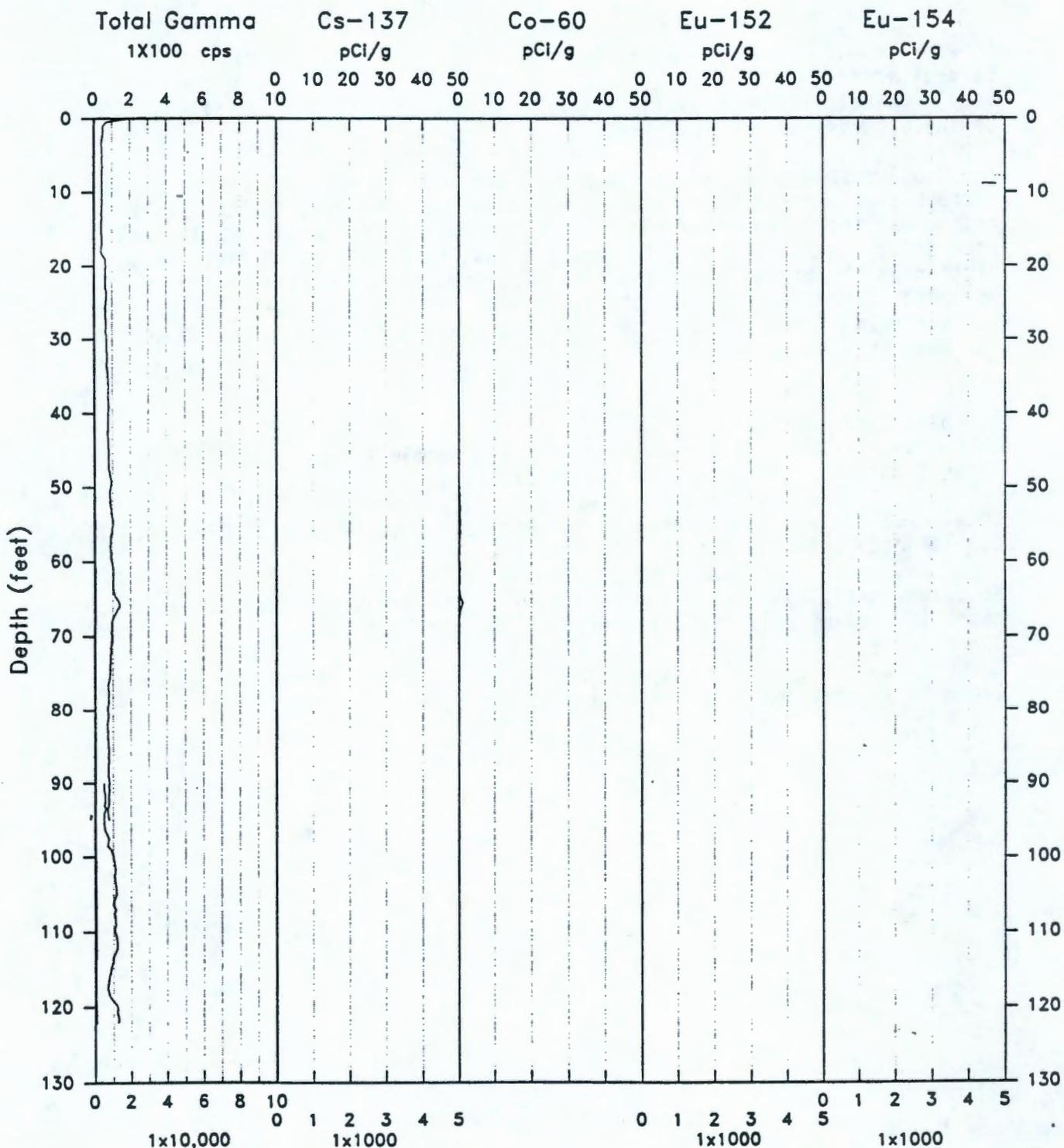
Project: 100-NR-2

Log Date: Aug 12, 92

Borehole: 199-N-80

Anal. Date: Sep 16, 92

93129051649



RLS Borehole Survey Report

199-N-80

Casing	Depth: 18.9'	Size: 12"	Thickness: 0.40"
	Depth: 99.5'	Size: 10"	Thickness: 0.38"
	Depth: 125.5'	Size: 8"	Thickness: 0.33"
Water Survey	Depth: none		
	Depth: 0 - 95'	Mode: MSA 80sec	Date: 8/03/92
	Depth: 90 - 120'	Mode: MSA 80sec	Date: 8/12/92

**General Notes:**

Very high total gamma activity observed in the surface is identified in the borehole survey from 0 to 1 feet.

The RLS spectral gamma-ray surveys were acquired during well construction through single casings. No survey was acquired after the 12-inch starter casing was installed. The first survey on 8/3/92 from 0 feet to 90 feet recorded the gamma activity through two casings from 0 to 19 feet. A short section at the beginning of the second survey through double casing is recorded. The computed activity level will be underestimated when the survey was conducted through double casing. The maximum casing correction applied to the data is 0.40 inches.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

Cobalt (Co-60) was encountered in the borehole from 49 feet to 69 feet. The cobalt decay activity detected is less than 1 pCi/g.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051650

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-DR-1

Borehole	<u>116-D-1A</u>		
Coordinates	<u>115,586.76 N 573,847.09 W</u>	Meters	(Lambert NAD'83)
Elevation	<u>467.74</u> feet	Brass Cap	(NGVD'29)

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
10	0.38	0	11.6
8	0.33	0	48.3

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. K. Price</u>					
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>					
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet)		
			Top	Base	Incr
Nov 27, 91	H1D01A\A097	FIXED 0.6 fpm	0	45.5	0.5
Nov 27, 91	H1D01A\A098	FIXED 0.6 fpm Station: 500 s	9	44.6	0.5
			Depths: 9'		

FIXED: Fixed cable speed velocity fpm: Feet per minute

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>Apr 7, 1992</u>
Analysis Notes: <u>Suspected truck instrument problems, survey run twice.</u>
Radionuclides identified: <u>Cs-137, Co-60, Eu-152, Eu-154</u>

93129051651

# RLS Spectral Gamma-Ray Borehole Survey

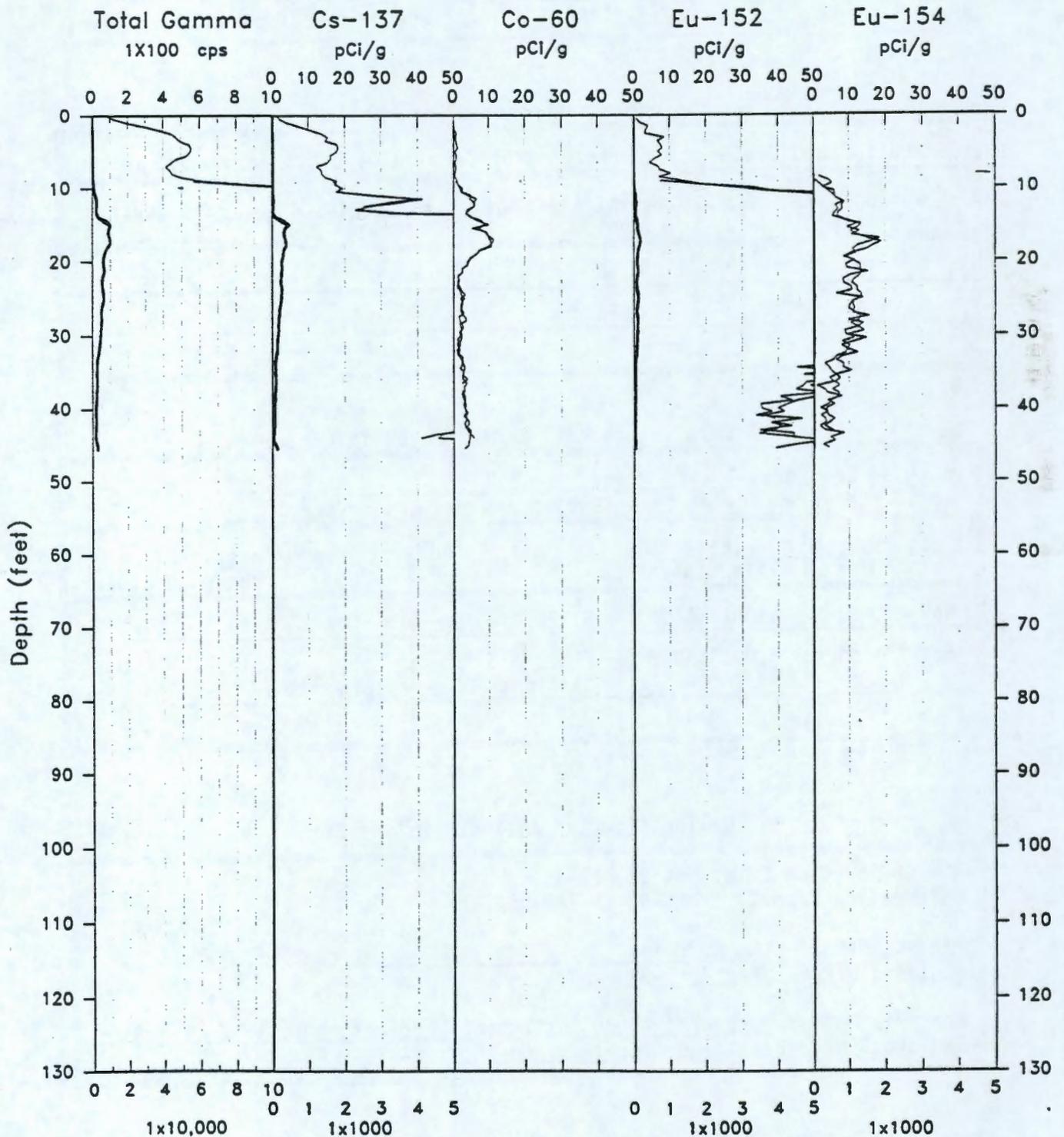
Project: 100-DR-1

Log Date: Nov 27, 91

Borehole: 116-D-1A

Anal. Date: Apr 07, 92

93129051652



## RLS Borehole Survey Report

116-D-1A

Casing	Depth: 11.6'	Size: 10"	Thickness: 0.38"
	Depth: 48.3'	Size: 8"	Thickness: 0.33"
Water Survey	Depth: none		
	Depth: 0 - 45'	Mode: FIXED 0.6 fpm	Date: 11/27/91
	Depth: 9 - 44'	Mode: FIXED 0.6 fpm	Date: 11/27/91

**General Notes:**

The RLS spectral gamma-ray surveys were acquired through two casings from 0 feet to 11.6 feet. The the maximum casing correction applied is 0.40 inches. The computed decay activity will be underestimated in the survey interval recorded through multiple casings.

Instrumentation problems were observed at the end of the November 1991 calibration trip. The problem was intermittent and noticable immediately at instrumentation power-up. If the system was powered up without the occurrence of the problem it generally would not occur during equipment operation. Test conducted when the problem was noticed indicated that if the problem was not present during data acquisition then the recorded results were valid. The problem had not been resolved at the time this survey was taken. The problem was not observed while acquiring the borehole survey data.

The survey was acquired twice through the zone of interest. The computed decay activity of the natural radionuclides (K,U,Th) agree with the range encountered at Hanford.

**Man-made Radionuclides:**

Cesium (Cs-137) was encountered in the borehole survey from the surface to the maximum survey depth of 45.5 feet. The cesium decay activity exceeded 200 pCi/g from 14 feet to 28 feet.

Cobalt (Co-60) was encountered in the borehole from the surface to the maximum survey depth of 45.5 feet. The maximum cobalt decay activity detected was 11 pCi/g at 18 feet.

Europium-152 (Eu-152) was encountered in the borehole survey from the surface to the maximum survey depth of 45.5 feet. The maximum Eu-152 decay activity detected was 200 pCi/g at 17 feet.

Europium-154 (Eu-154) was encountered in the borehole survey from 8 feet to the maximum survey depth of 45.5 feet. The maximum Eu-154 decay activity detected was 20 pCi/g at 17 feet. Europium-154 was detected when the decay activity of Eu-152 reached 10 pCi/g.

93129051653

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-DR-1

Borehole	<u>116-D-2A</u>		
Coordinates	<u>                    </u> N <u>                    </u> W		Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.33	0	22.5

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>A. Pearson</u>					
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>					
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet)		
			Top	Base	Incr
Feb 20, 92	H116D02A\A138	MSA 80 sec LT	0	19.5	0.5

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u> _____
Analysis Date: <u>Apr 6, 1992</u>
Analysis Notes: <u>Maximum depth of man-made radionuclides not reached.</u>
Radionuclides identified: <u>Cs-137, CO-60, Eu-152, Eu-154</u>

93129051654

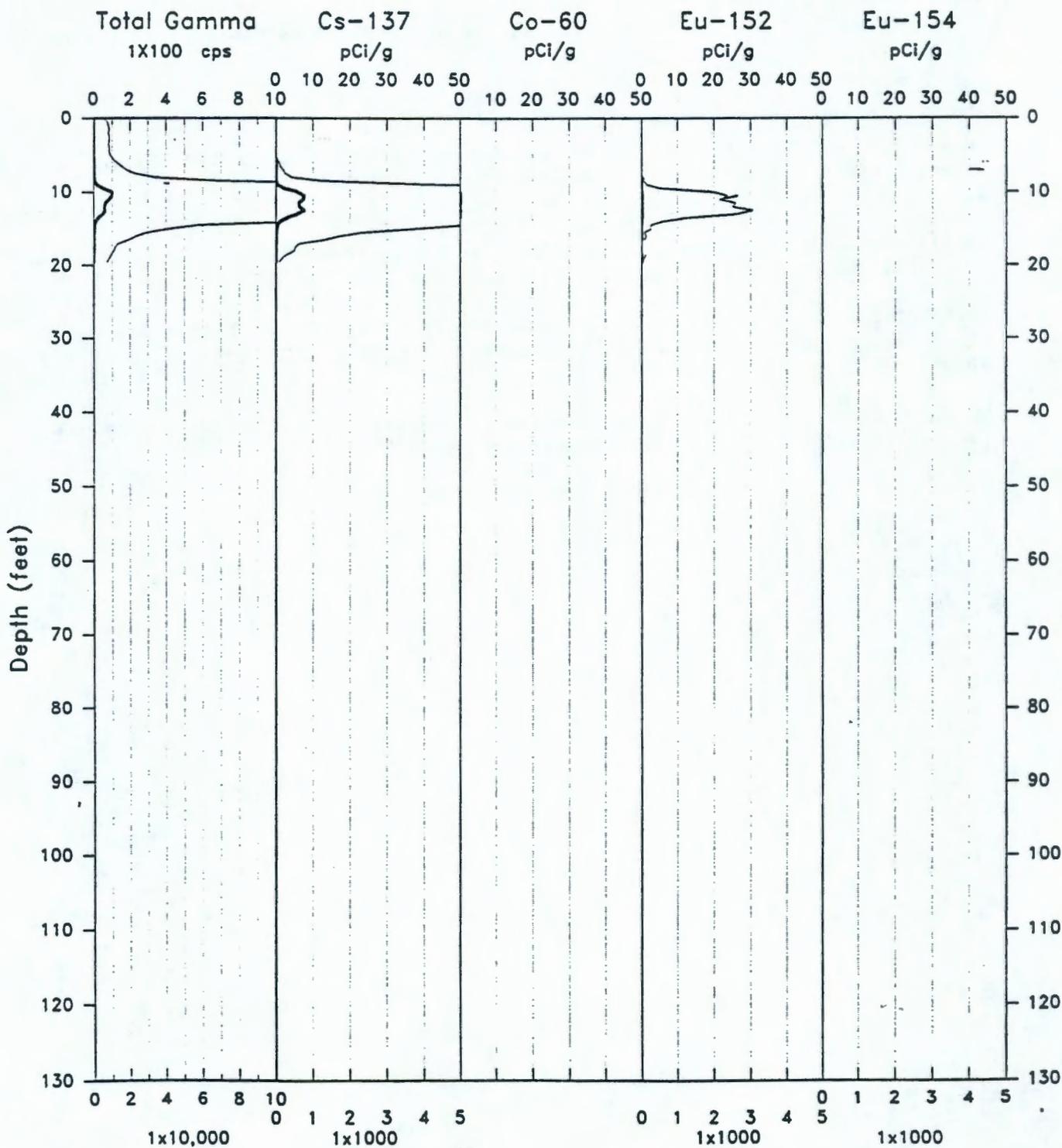
# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-DR-1

Log Date: Feb 20, 92

Borehole: 116-D-2A

Anal. Date: Apr 06, 92



93129051655

RLS Borehole Survey Report

166-D-2A

Casing	Depth: 22.5'	Size: 8"	Thickness: 0.33"
Water	Depth: none		
Survey	Depth: 0 - 19'	Mode: MSA 80sec	Date: 2/20/92

**General Notes:**

Man-made radionuclides were detected at the maximum survey depth of 19.5 feet.

**Man-made Radionuclides:**

Cesium (Cs-137) was encountered in the borehole from 5 feet to the maximum survey depth of 19.5 feet. The cesium decay activity exceeded 200 pCi/g from 9 feet to 14 feet.

Cobalt (Co-60) was observed in the borehole survey from 10 feet to 13.5 feet. The cobalt decay activity detected was less than 1 pCi/g.

Europium-152 (Eu-152) was encountered in the borehole from 8 feet to the maximum survey depth of 19.5 feet. The maximum Eu-152 decay activity detected was 30 pCi/g at 12 feet.

Europium-154 (Eu-154) was encountered in the borehole from 10 feet to 14 feet. The Eu-154 decay activity detected was less than 2 pCi/g.

93129051656

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-DR-1

Borehole	<u>116-D-3</u>		
Coordinates	<u>151,756.58 N 573,768.38 E</u>	Meters	(Lambert NAD'83)
Elevation	<u>468.19</u> feet	Brass Cap	(NGVD'29)

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.33	0	7.5
6	0.31	0	19.5

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>					
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>					
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet)		
			Top	Base	Incr
Dec 14, 91	H116D03\A106	FIXED 0.4 fpm	0	19	0.5

FIXED: Fixed velocity of cable speed fpm: Feet per minute

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>Apr 6, 1992</u>
Analysis Notes: <u>Total-gamma increase at 7.5' due to end of 8" casing</u>
Radionuclides identified: <u>No man-made nuclides detected</u>

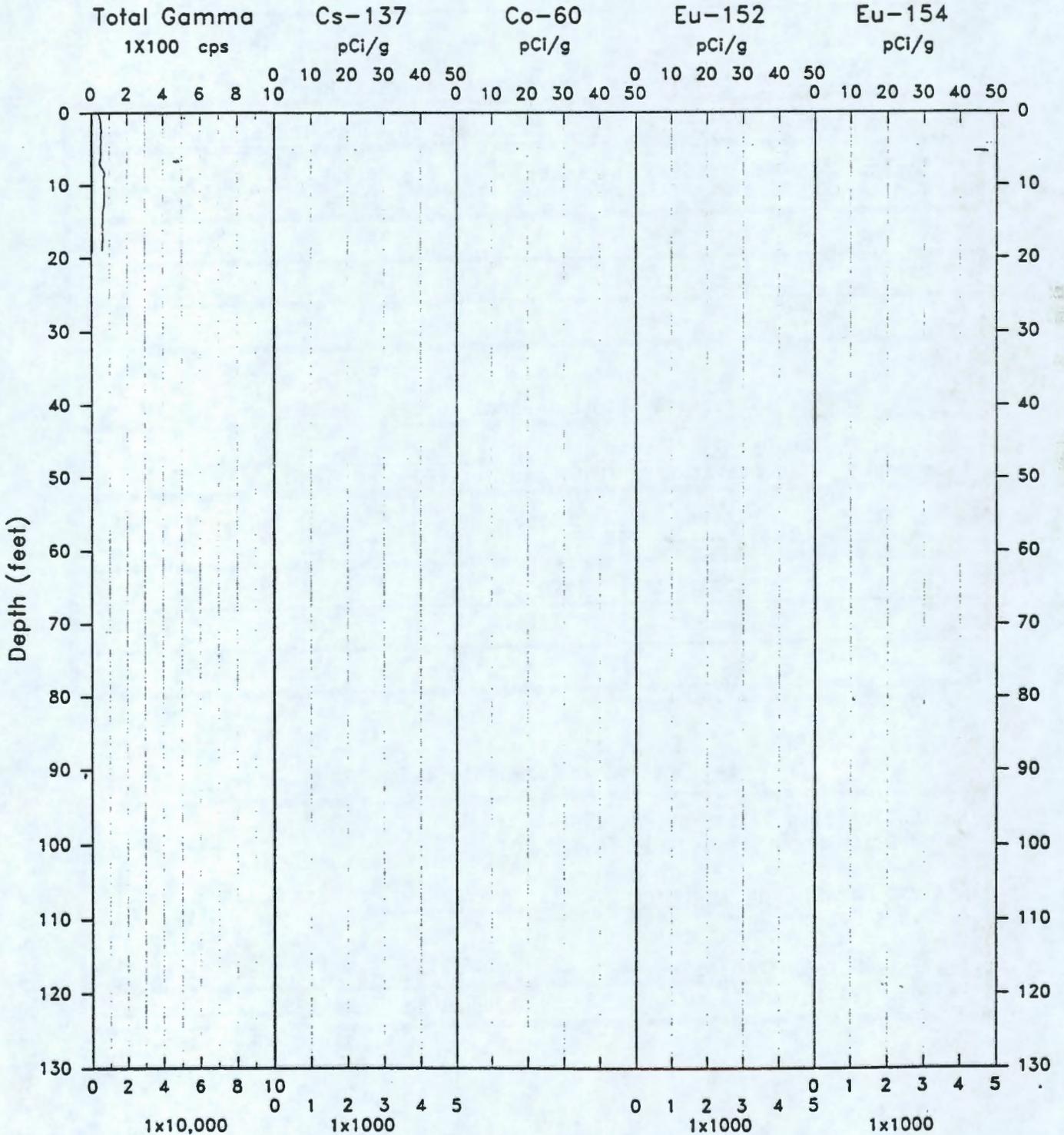
93129051657

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-DR-1  
Borehole: 116-D-3

Log Date: Dec 04, 91  
Anal. Date: Apr 06, 92

93129051658



RLS Borehole Survey Report

116-D-3

Casing	Depth: 7.5'	Size: 8"	Thickness: 0.33"
	Depth: 19'	Size: 6"	Thickness: 0.31"
Water	Depth: none		
Survey	Depth: 0 - 19'	Mode: FIXED 0.4 fpm	Date: 12/14/91

**General Notes:**

No man-made radionuclides were identified in the borehole survey.

The increase in Total-gamma activity at 7.5 feet occurs at the end of the 8 inch casing.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051659

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-DR-1

Borehole	<u>116-D-5</u>		
Coordinates	<u>152,340.14 N</u>	<u>573,517.33 E</u>	Meters (Lambert NAD'83)
Elevation	<u>431.3</u>	feet	Brass Cap (NGVD'29)

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.33	0	27

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top Base Incr
Jan 28, 92	H116D05\A125	FIXED 0.4 fpm Station: 600s	0 23 0.5 Depth: 23.2

FIXED: Fixed velocity of cable speed fpm: Feet per minute

Calibration and Analysis Information

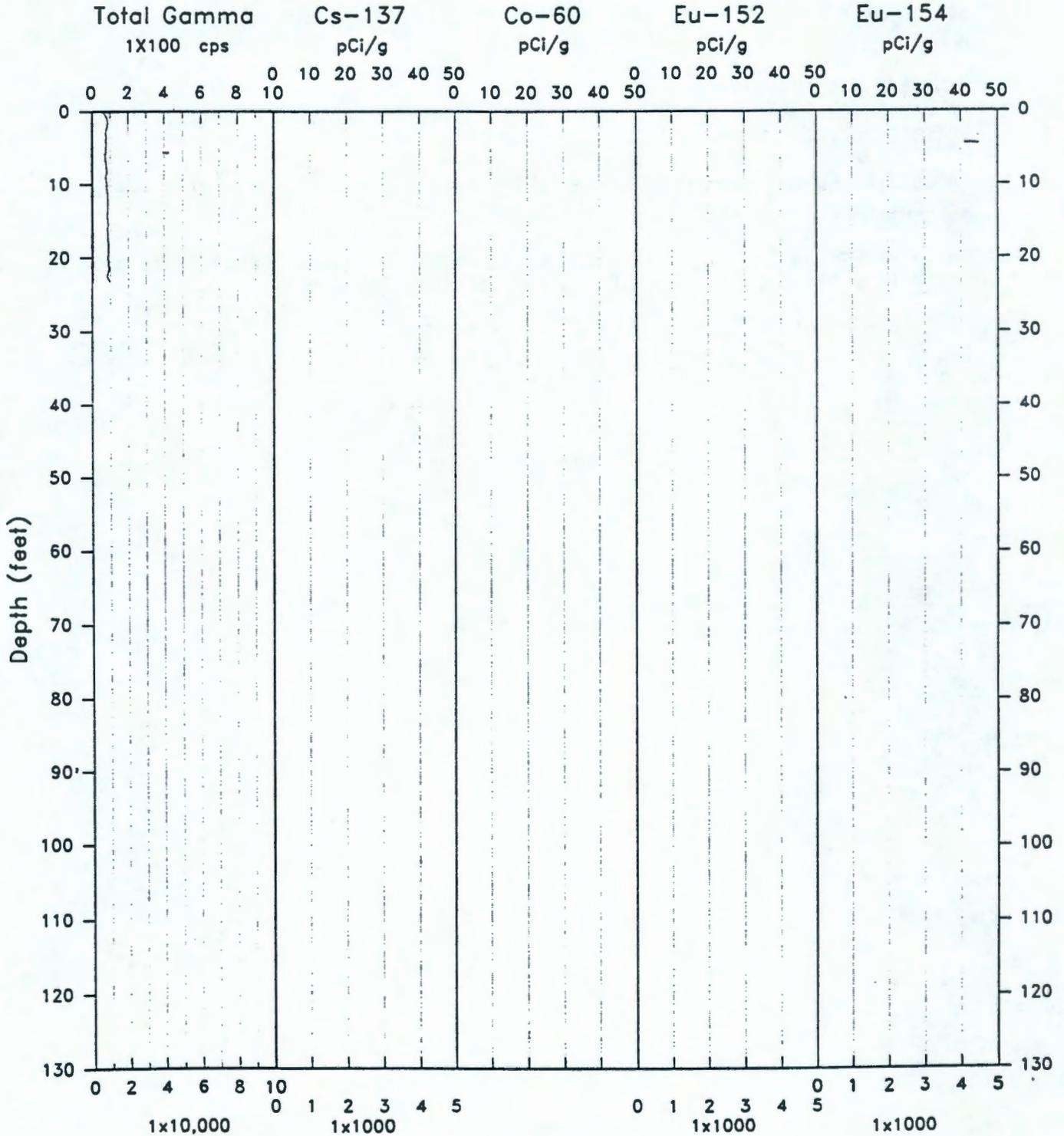
RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>Apr 7, 1992</u>
Analysis Notes: <u>Long count spectra at 23.2' indicated only natural KUT Radionuclides identified: No man-made nuclides detected</u>

93129051660

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-DR-1  
Borehole: 116-D-5

Log Date: Jan 28, 92  
Anal. Date: Apr 7, 92



93129051661

RLS Borehole Survey Report

116-D-5

Casing	Depth: 27'	Size: 8"	Thickness: 0.33"
Water	Depth: none		
Survey	Depth: 0 - 23'	Mode: FIXED 0.4 fpm	Date: 1/28/92

**General Notes:**

No man-made radionuclides were identified in the borehole survey.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051662

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-DR-1

Borehole	<u>116-D-6</u>		
Coordinates	<u>151,612.41 N 573,789.64 E</u>	Meters	(Lambert NAD'83)
Elevation	<u>467.43</u> feet	Brass Cap	(NGVD'29)

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.33	0	18.4

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>A. Pearson</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top Base Incr
Feb 19, 92	H116D06\A137	MSA 80sec LT Station: 180 s	0 18.5 0.5 Depths: 9.5,18.5

MSA: Move-Stop-Acquire LT: Live Time

Calibration and Analysis Information

RLS Calibration Date: <u>Nov 21, 1991</u>
Calibration Report: <u>WHC-SD-EN-TRP-001</u>
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>Apr 6, 1992</u>
Analysis Notes: <u>No Cs-137 or Co-60 detected in borehole survey.</u>
Radionuclides identified: <u>Eu-152, Eu-154</u>

93129051663

# RLS Spectral Gamma-Ray Borehole Survey

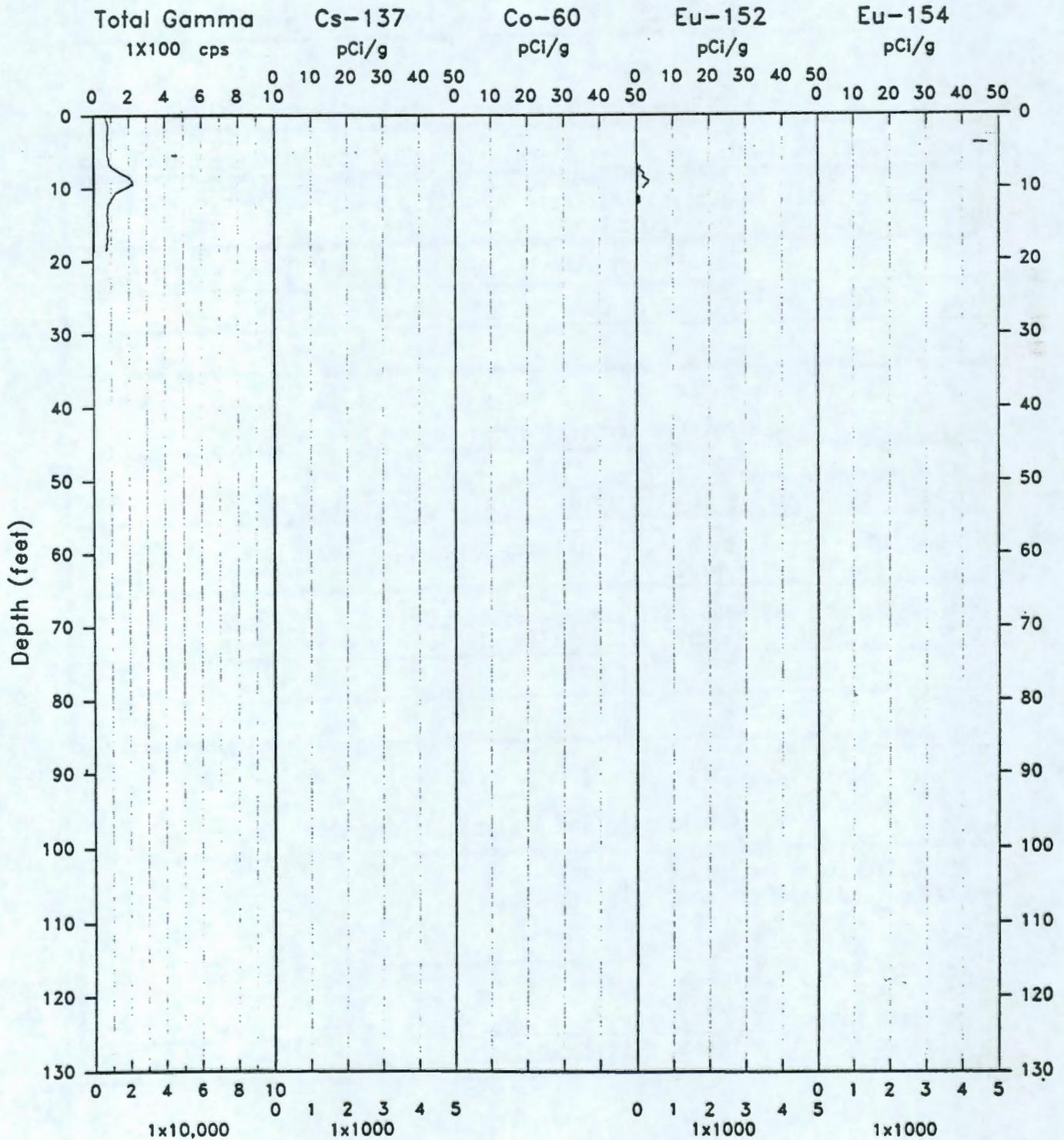
Project: 100-DR-1

Log Date: Feb 19, 92

Borehole: 116-D-6

Anal. Date: Apr 6, 92

93129051664



RLS Borehole Survey Report

116-D-6

Casing	Depth: 18.4'	Size: 8"	Thickness: 0.33"
Water	Depth: none		
Survey	Depth: 0 - 18'	Mode: MSA 80sec	Date: 7/07/92

**General Notes:**

A long count spectra was acquired at 9.5 feet and at the bottom of the borehole. No man-made radionuclides were detected at the maximum survey depth of 18.5 feet. Trace amounts of Eu-152 and Eu-154 were detected at 9.5 feet.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

Europium-152 (Eu-152) was encountered in the borehole survey from 6 feet to 12 feet. The Eu-152 decay activity detected was less than 4 pCi/g.

Europium-154 (Eu-154) was encountered in the borehole survey from 9 feet to 10 feet. The Eu-154 decay activity detected was less than 1 pCi/g.

93129051665

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-DR-1

Borehole	<u>116-DR-5</u>		
Coordinates	<u>152,418.83 N</u>	<u>573,629.81 E</u>	Meters (Lambert NAD'83)
Elevation	<u>433.0</u>	feet	Brass Cap (NGVD'29)

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.33	0	27

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top Base Incr
Feb 08, 92	H116DR05\A131	FIXED 0.4 fpm Station: 500 s	0 24 0.5 Depths: 19, 24

FIXED: Fixed cable velocity; fpm: Feet per minute MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>Apr 6, 1992</u>
Analysis Notes: <u>Long counts at 19 &amp; 24' detected only natural nuclides</u> <u>Radionuclides identified: No man-made nuclides detected</u>

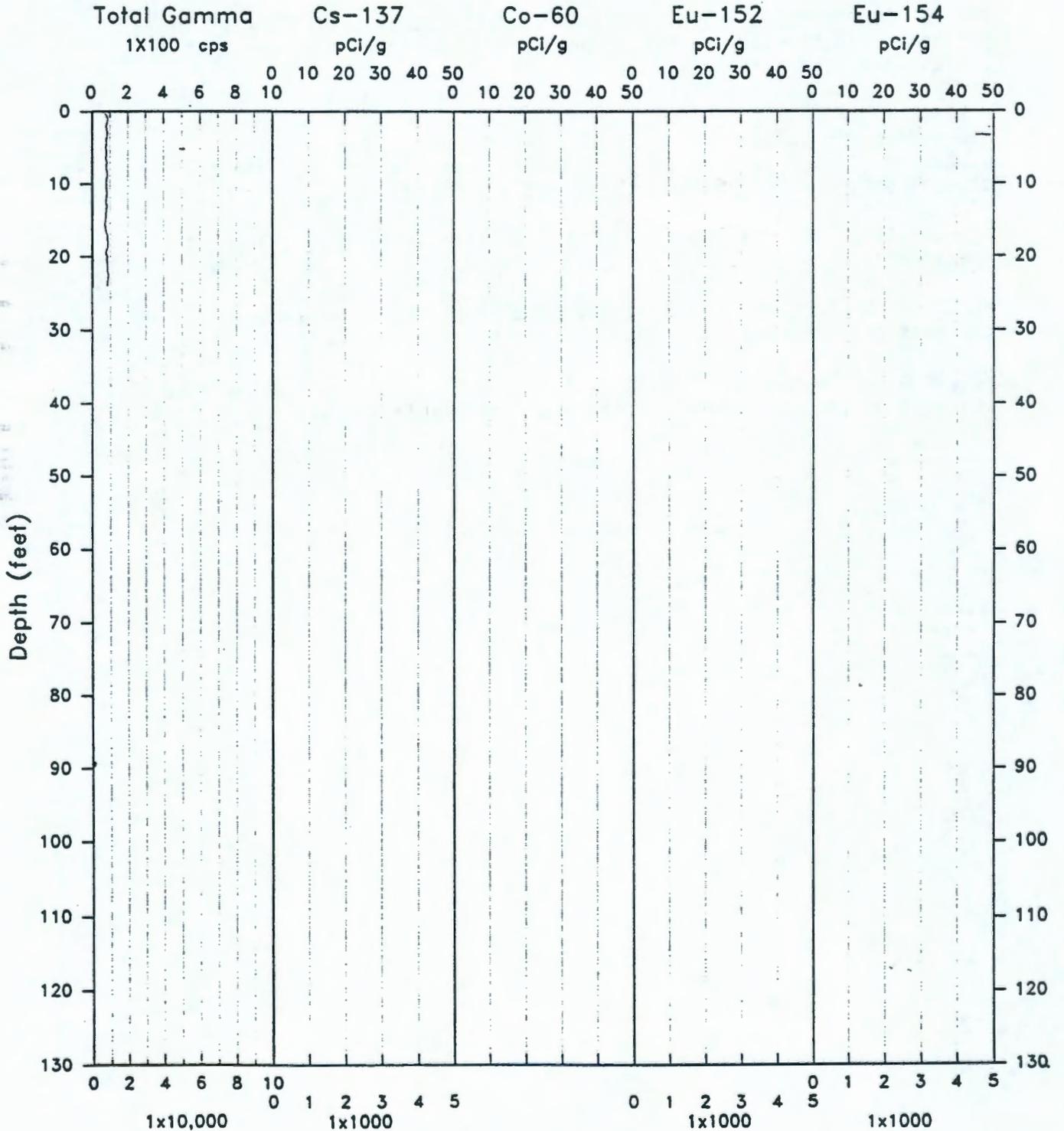
93129051666

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-DR-1  
Borehole: 116-DR-5

Log Date: Feb 8, 92  
Anal. Date: Apr 6, 92

93129051667



RLS Borehole Survey Report

116-DR-5

Casing	Depth: 27'	Size: 8"	Thickness: 0.33"
Water	Depth: none		
Survey	Depth: 0 - 24'	Mode: FIXED 0.4 fpm	Date: 2/08/92

**General Notes:**

A long count spectra was acquired at 19 feet and at the bottom of the borehole. No man-made radionuclides were detected at 19 feet or at the maximum survey depth of 24 feet.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051668

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-DR-1

Borehole	<u>132-D-3</u>		
Coordinates	<u>151,552.63 N</u>	<u>573,766.96 E</u>	Meters (Lambert NAD'83)
Elevation	<u>467.20</u>	feet	Brass Cap (NGVD'29)

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.38	0	35

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top Base Incr
Feb 20, 92	H132D03\A139	MSA 80sec LT Station: 500 s	0 34 0.5 Depth: 18

MSA: Move-Stop-Acquire LT: Live Time

Calibration and Analysis Information

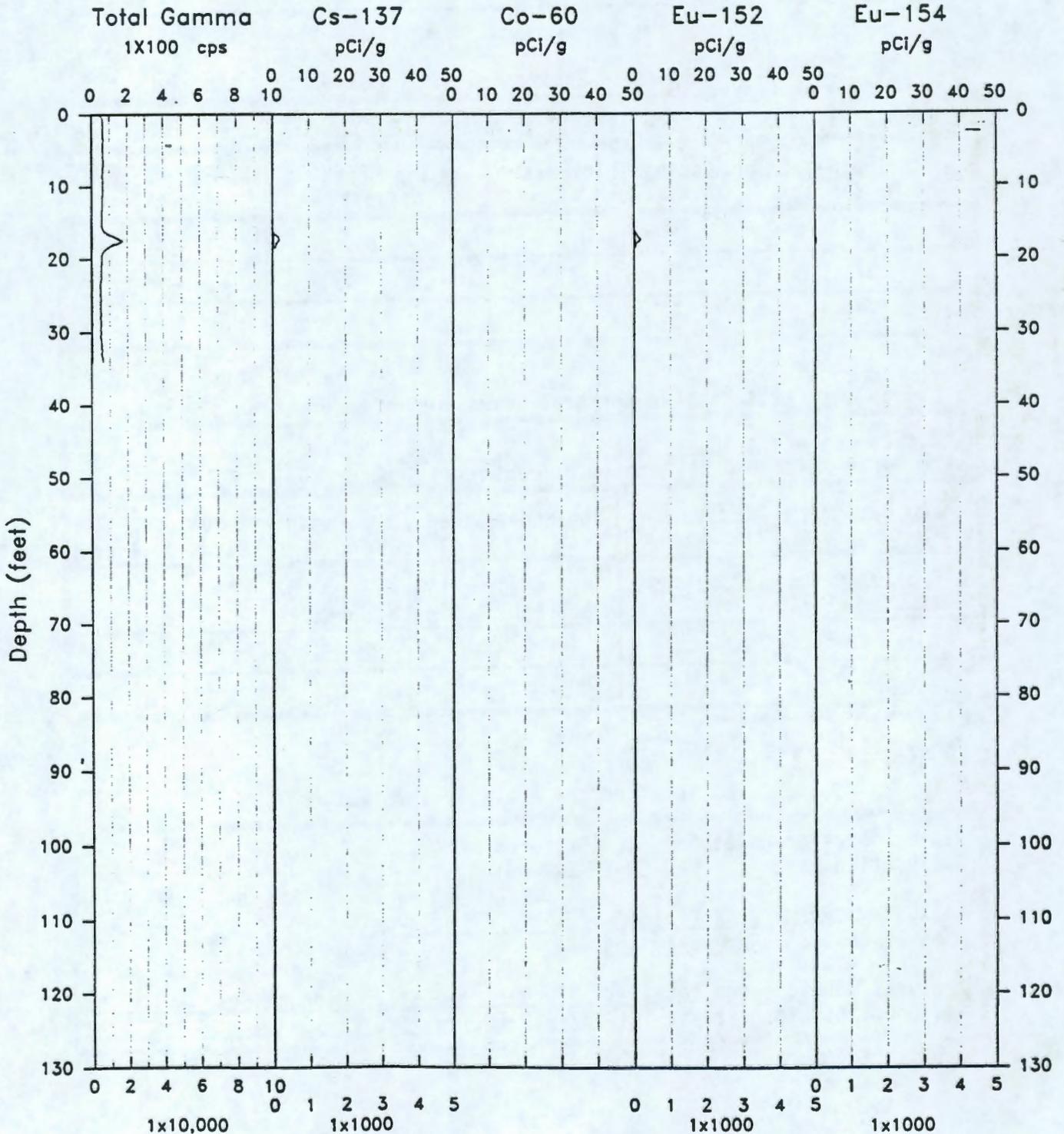
RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>Apr 6, 1992</u>
Analysis Notes: <u>Long count at 18' confirmed all radionuclides</u>
Radionuclides identified: <u>Cs-137, CO-60, Eu-152, Eu-154</u>

93129051669

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-DR-1  
Borehole: 132-D-3

Log Date: Feb 20, 92  
Anal. Date: Apr 6, 92



93129051670

RLS Borehole Survey Report

132-D-3

Casing	Depth: 35'	Size: 8"	Thickness: 0.38"
Water	Depth: none		
Survey	Depth: 0 - 34'	Mode: MSA 80sec	Date: 2/20/92

**General Notes:**

A long count spectra was acquired at 18 feet confirmed the presence of all four man-made radionuclides.

**Man-made Radionuclides:**

Cesium (Cs-137) was encountered in the borehole from 16 feet to 19 feet. The cesium decay activity detected was less than 2 pCi/g.

Cobalt (Co-60) was encountered in the borehole survey from 17 feet to 19 feet. The cobalt decay activity detected was less than 1 pCi/g.

Europium-152 (Eu-152) was encountered in the borehole from 16 feet to 19 feet. The Eu-152 decay activity detected was less than 2 pCi/g.

Europium-154 (Eu-154) was encountered in the borehole from 17 feet to 18 feet. The Eu-154 decay activity detected was less than 1 pCi/g.

93129051671

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-1

Borehole	<u>116-H-1</u>		
Coordinates	<u>152,452.90 N</u>	<u>578,085.14 E</u>	Meters (Lambert NAD'83)
Elevation	<u>416.7</u>	feet	Brass Cap (NGVD'29)

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.38	0	24

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top Base Incr
Mar 11, 92	H116H01\A153	MSA 80sec LT Station: 400 s	0.0 21.0 0.5 Depth: 21'

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>Apr 7, 1992</u>
Analysis Notes: <u>Eu-152 identified in long count at maximum survey depth</u>
Radionuclides identified: <u>Cs-137, CO-60, Eu-152, Eu-154</u>

93129051672

# RLS Spectral Gamma-Ray Borehole Survey

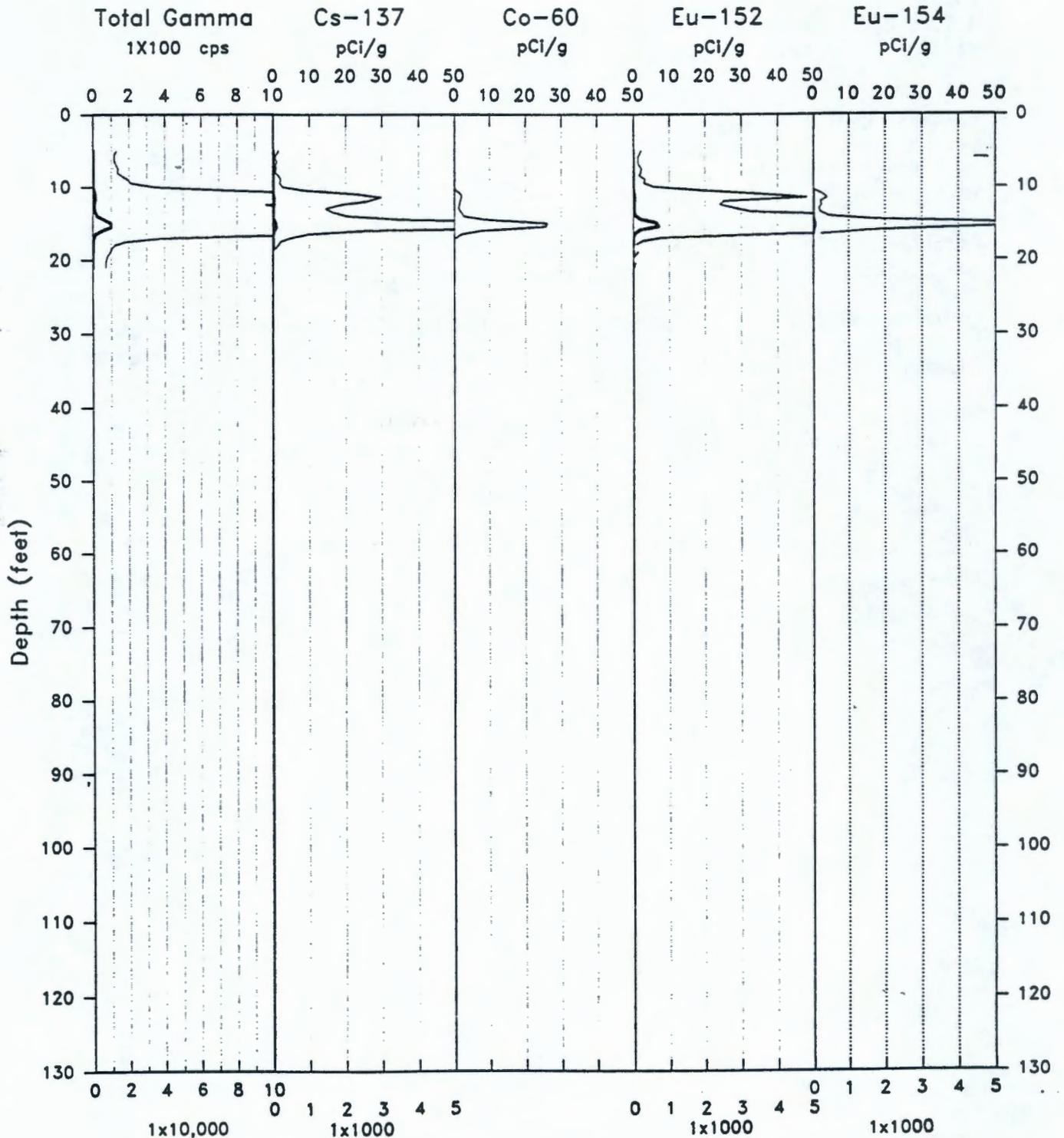
Project: 100-HR-1

Log Date: Mar 11, 92

Borehole: 116-H-1

Anal. Date: Apr 7, 92

93129051673



RLS Borehole Survey Report

116-H-1

Casing	Depth: 24'	Size: 8"	Thickness: 0.38"
Water	Depth: none		
Survey	Depth: 0 - 21'	Mode: MSA 80 sec	Date: 3/11/92

**General Notes:**

A long count spectra was acquired at the maximum survey depth. Man-made radionuclides were encountered at 21 feet.

**Man-made Radionuclides:**

Cesium (Cs-137) was encountered in the borehole survey from the surface to 18.5 feet. The maximum cesium decay activity detected was 100 pCi/g at 15 feet.

Cobalt (Co-60) was encountered in the borehole survey from 9 feet to 17 feet. The maximum cobalt decay activity detected was 30 pCi/g at 15 feet.

Europium-152 (Eu-152) was encountered in the borehole survey from the surface to the maximum survey depth of 21 feet. The Eu-152 decay activity exceeded 200 pCi/g from 14 feet to 16 feet.

Europium-154 (Eu-154) was encountered in the borehole survey from 10 feet to 17 feet. The maximum Eu-154 decay activity detected was 60 pCi/g at 15 feet.

93129051674

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-1

Borehole	<u>116-H-2</u>		
Coordinates	<u>152,399.52 N 577,748.33 E</u>	Meters	(Lambert NAD'83)
Elevation	<u>419.3</u> feet	Brass Cap	(NGVD'29)

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.45	0	15.8

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top      Base      Incr
Mar 16, 92	H116H02\A155	MSA 80sec LT Station: 500 s	0      14      0.5 Depth: 14.4'

MSA: Move-Stop-Acquire LT: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u> _____
Analysis Date: <u>Apr 7, 1992</u>
Analysis Notes: <u>Long count at 14.4' identified only natural nuclides</u>
Radionuclides identified: <u>No man-made nuclides detected</u>

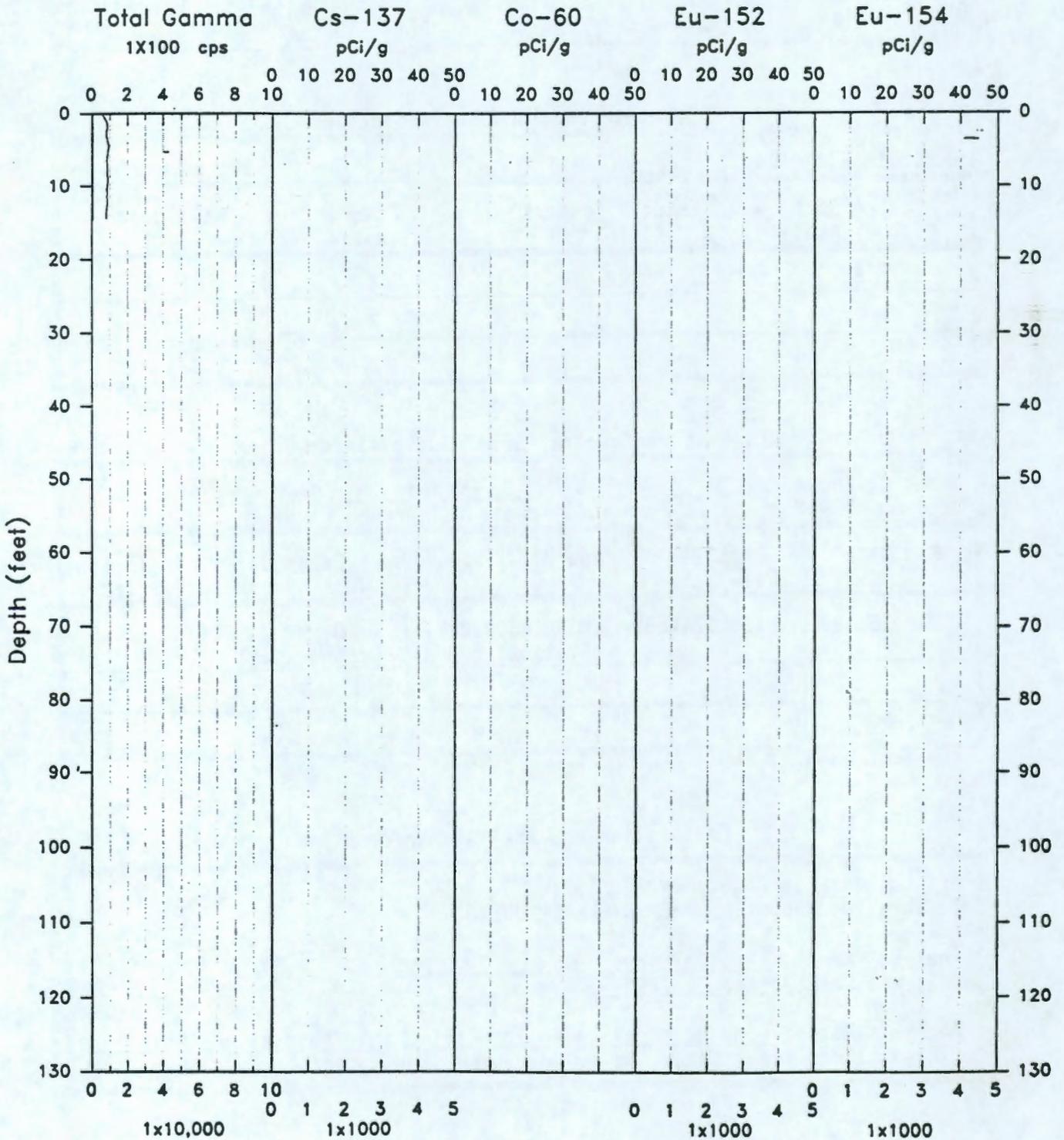
93129051675

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-1  
 Borehole: 116-H-2

Log Date: Mar 16, 92  
 Anal. Date: Apr 7, 92

93129051676



RLS Borehole Survey Report

116-H-2

Casing	Depth: 15'	Size: 8"	Thickness: 0.45"
Water	Depth: none		
Survey	Depth: 0 - 14'	Mode: MSA 80sec	Date: 3/16/92

**General Notes:**

A long count spectra was acquired at the bottom of the borehole identified only natural radionuclides.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051677

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-1

Borehole	<u>116-H-3</u>		
Coordinates	<u>152,479.85 N</u>	<u>577,852.34 E</u>	Meters (Lambert NAD'83)
Elevation	<u>421.7</u>	feet	Brass Cap (NGVD'29)

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.33	0.0	19.3

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top Base Incr
Mar 09, 92	H116H03\A150	MSA 80sec LT Station: 500 s	0 18 0.5 Depths: 12, 18'

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>Apr 6, 1992</u>
Analysis Notes: <u>Cesium not identified in either long count spectra</u>
Radionuclides identified: <u>Cs-137, Eu-152, Eu-154</u>

93129051678

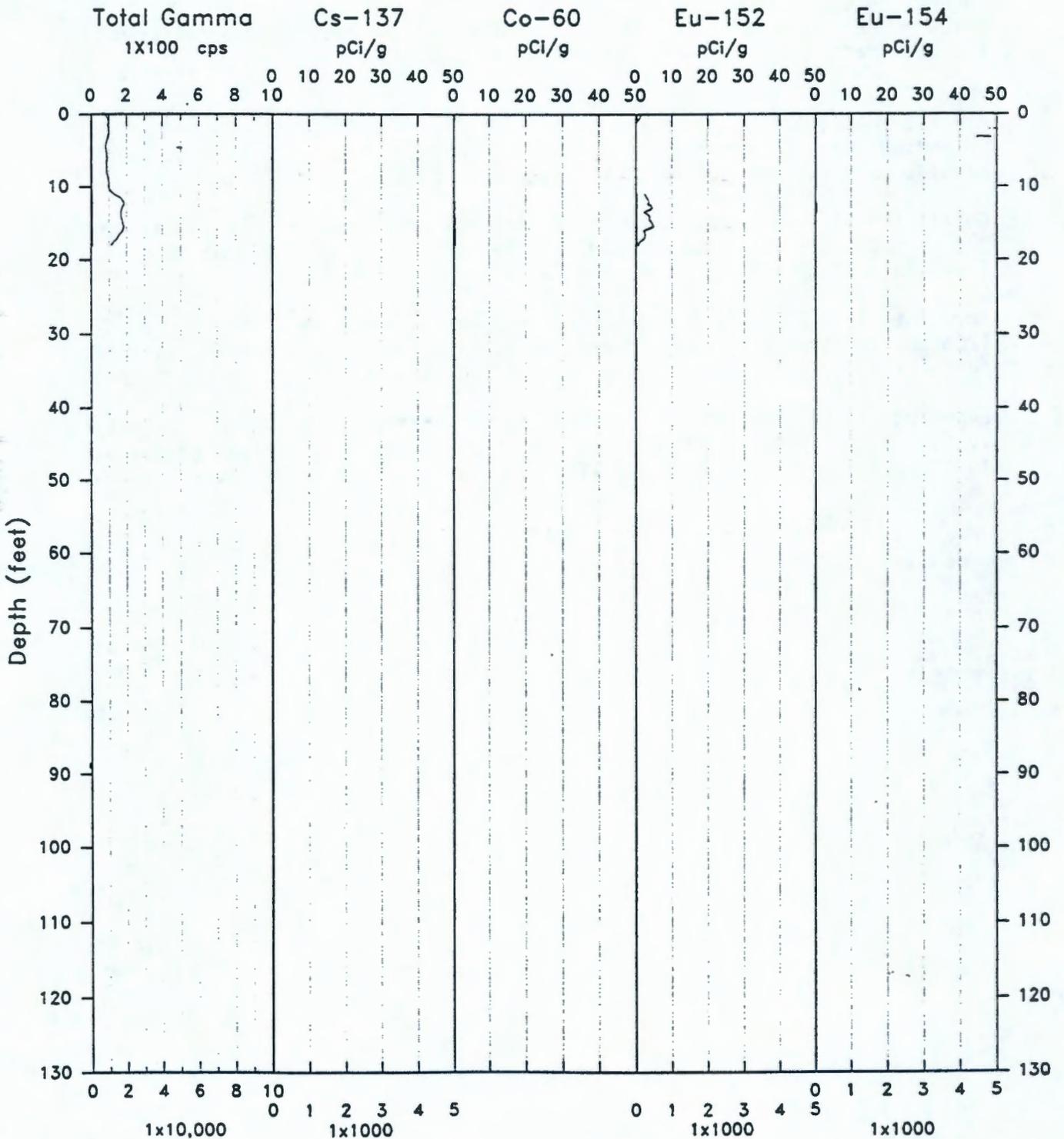
# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-1

Log Date: Mar 9, 92

Borehole: 116-H-3

Anal. Date: Apr 6, 92



93129051679

RLS Borehole Survey Report

116-H-3

Casing	Depth: 19'	Size: 8"	Thickness: 0.33"
Water	Depth: none		
Survey	Depth: 0 - 18'	Mode: MSA 80 sec	Date: 3/09/92

**General Notes:**

A long count spectra was acquired at 12 feet and at the maximum survey depth. Man-made radionuclides were encountered in both spectra.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

Cobalt (Co-60) was encountered in two intervals in the borehole survey from the surface to 1 foot and from 12 feet to maximum survey depth of 18 feet. The cobalt decay activity detected was less than 1 pCi/g.

Europium-152 (Eu-152) was encountered in two intervals in the borehole survey from the surface to 1 foot and from 11 feet to the maximum survey depth of 18 feet. The Eu-152 decay activity detected was less than 5 pCi/g.

Europium-154 (Eu-154) was encountered in the borehole survey from 12 feet to 16 feet. The identification of Eu-154 is not continuous between this interval. The Eu-154 decay activity detected was less than 1 pCi/g.

93129051680

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-1

Borehole	<u>116-H-9</u>		
Coordinates	<u>152,456.87 N</u>	<u>577,628.43 E</u>	Meters (Lambert NAD'83)
Elevation	<u>419.1</u>	feet	Brass Cap (NGVD'29)

Borehole Environment Information

Borehole Fluid Depth <u>24.1</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.33	0.0	22.3

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top Base Incr
Mar 02, 92	H1H09\A145	MSA 80sec LT	0 20 0.5

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

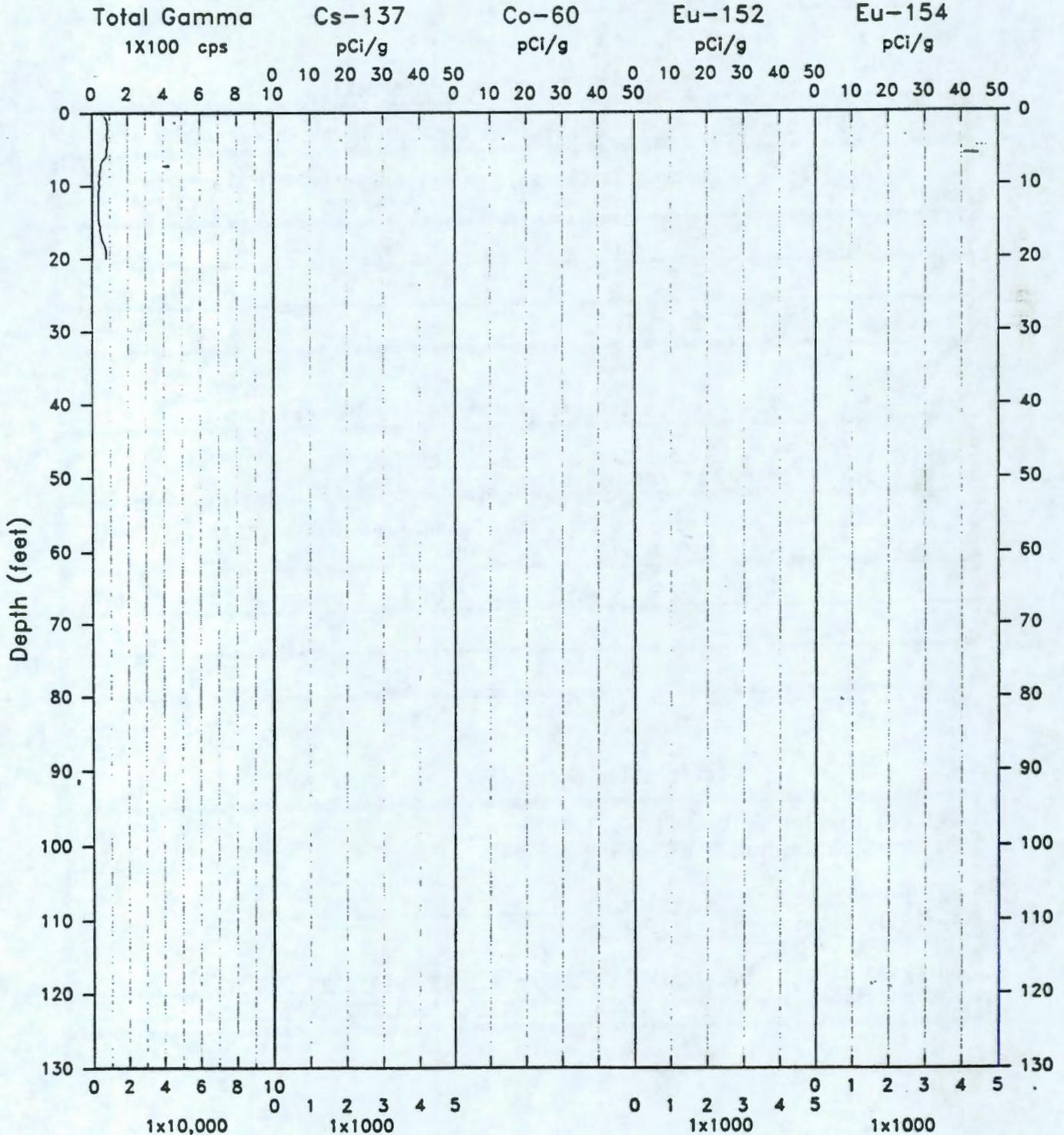
RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>Mar 2, 1992</u>
Analysis Notes: <u>Low activity zone 7-18' has potassium &lt; 10 pCi/g</u>
Radionuclides identified: <u>No man-made nuclides detected</u>

93129051681

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-1  
 Borehole: 116-H-9

Log Date: Mar 2, 92  
 Anal. Date: Apr 6, 92



93129051682

RLS Borehole Survey Report

116-H-9

Casing	Depth: 22'	Size: 8"	Thickness: 0.33"
Water	Depth: none		
Survey	Depth: 0 - 20'	Mode: MSA 80sec	Date: 3/02/92

**General Notes:**

The low Total-gamma activity interval from 7 feet to 18 feet identified a lower than normal potassium activity, less than 10 pCi/g, while the uranium and thorium activity appears to be normal.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051683

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-BC-5

Borehole	<u>199-D2-5</u>		
Coordinates	<u>                    </u> N <u>                    </u> W	Meters	
Elevation	<u>                    </u> feet	Brass Cap	

Borehole Environment Information

Borehole Fluid Depth <u>71.8</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.28	0	89.4

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top      Base      Incr
June 19, 92	H1D0205\A195	MSA 80 sec LT Station: 500 s	0      86      0.5 Depth: 86.4'

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>G. K. Jaeger</u> <u>R. K. Price</u>
Analysis Date: <u>Aug 13, 1992</u>
Analysis Notes: <u>Long count spectra at 86.4' confirmed only natural KUT Radionuclides identified: No man-made nuclides detected</u>

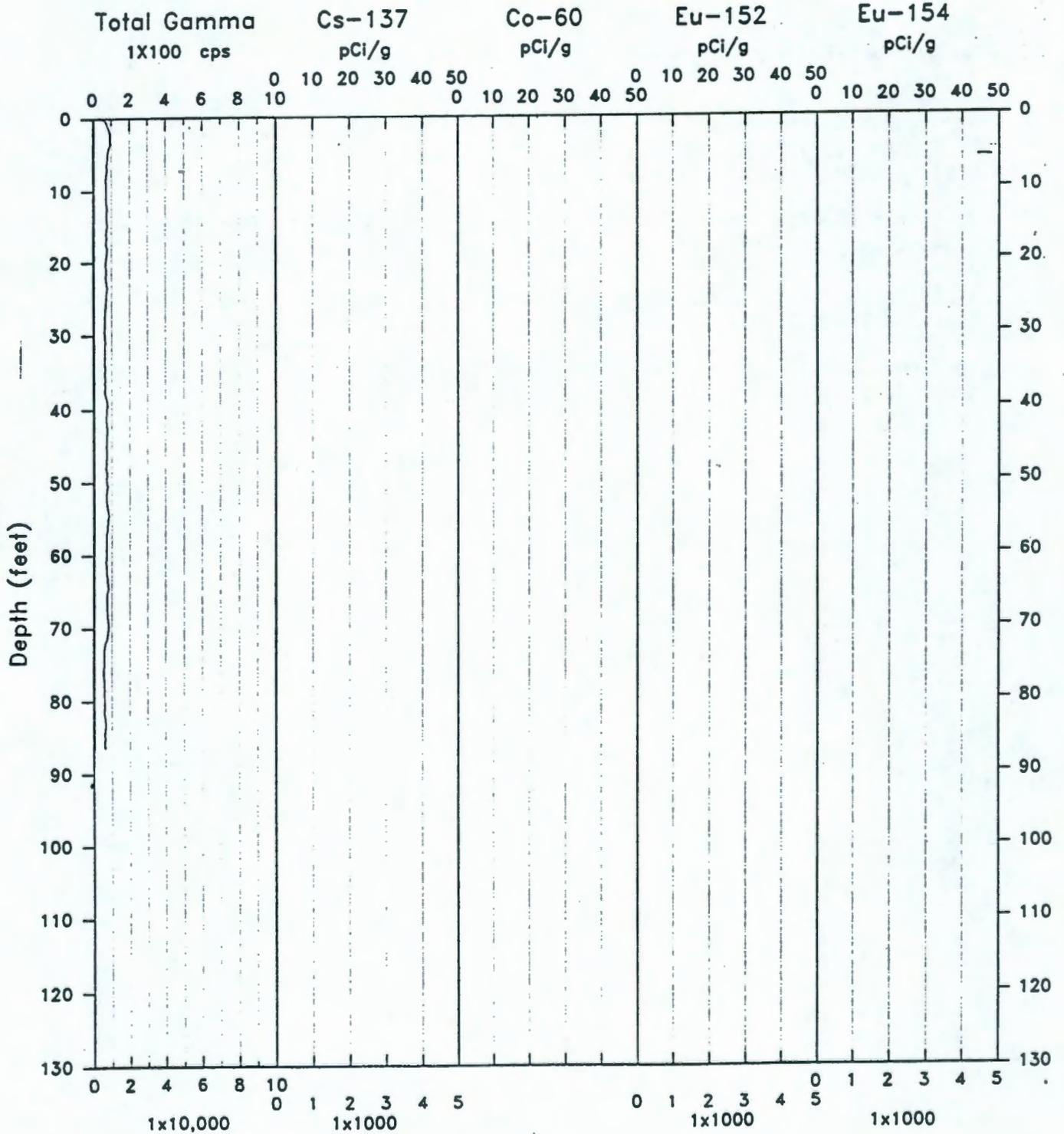
93129051684

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-3  
Borehole: 199-D2-5

Log Date: Jun 19, 92  
Anal. Date: Aug 13, 92

93129051685



RLS Borehole Survey Report

199-D2-5

Casing	Depth: 89'	Size: 8"	Thickness: 0.28"
Water	Depth: 71.8'		
Survey	Depth: 0 - 86'	Mode: MSA 80sec	Date: 6/19/92

**General Notes:**

No man-made radionuclides were identified in the borehole survey.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051686

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-3

Borehole	<u>199-D5-12</u>		
Coordinates	<u>                    </u> N <u>                    </u> W		Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>unknown</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.28	0	90.5

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top      Base      Incr
Jun 18, 92	H1D0512\A194	MSA 80 sec LT Station: 500 s	0      87      0.5 Depths: 87.5'

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>G. K. Jaeger</u> <u>R. K. Price</u>
Analysis Date: <u>Jul 28, 1992</u>
Analysis Notes: <u>No water correction applied to logging data.</u>
Radionuclides identified: <u>No man-made nuclides detected</u>

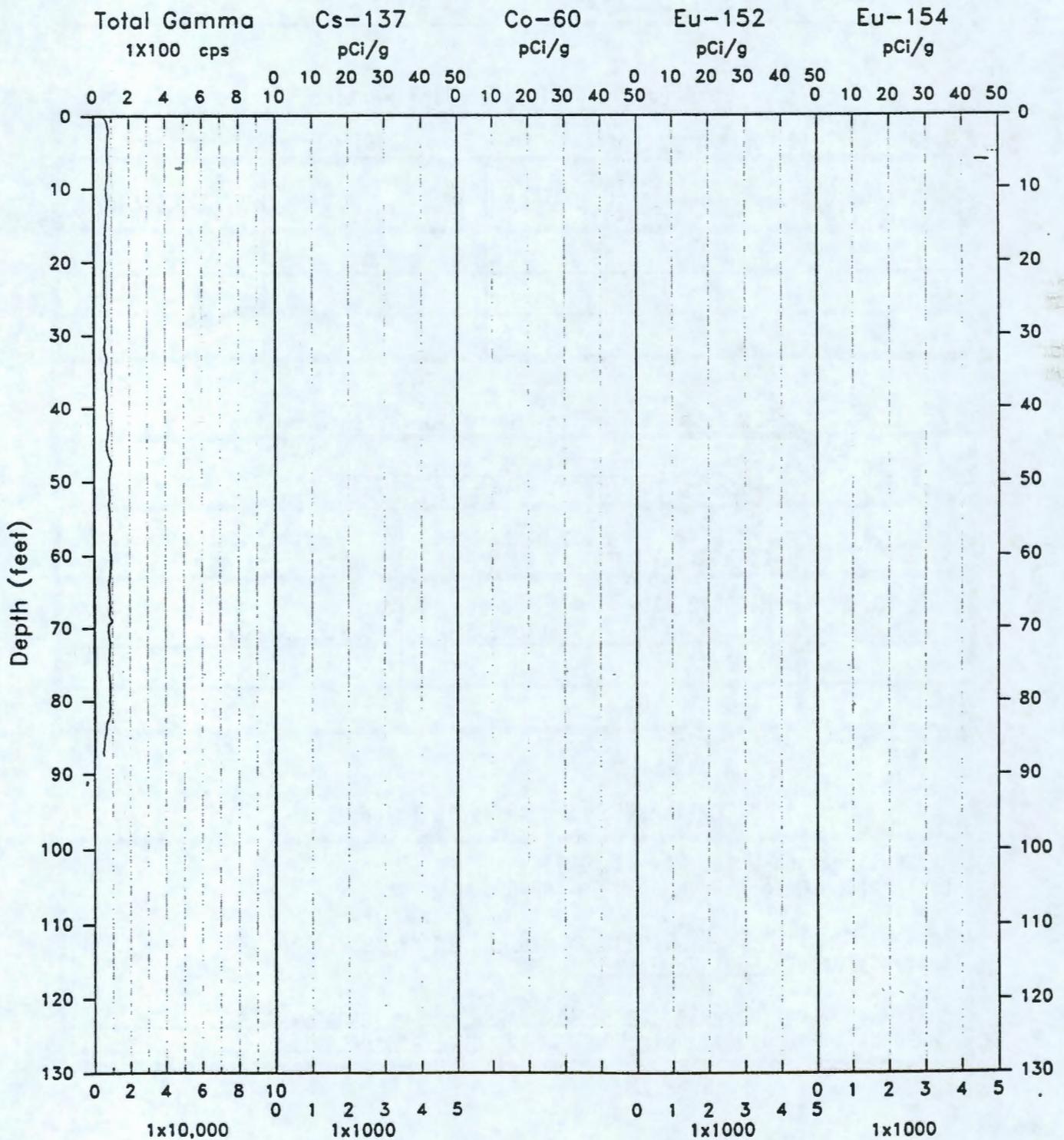
93129051687

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-3  
Borehole: 199-D5-12

Log Date: Jun 18, 92  
Anal. Date: Jul 28, 92

93129051688



RLS Borehole Survey Report

199-D5-12

Casing	Depth: 90.5'	Size: 8"	Thickness: 0.28"
Water	Depth: unknown		
Survey	Depth: 0 - 87'	Mode: MSA 80sec	Date: 6/18/92

**General Notes:**

No man-made radionuclides were identified in the borehole survey.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051689

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-3

Borehole	<u>199-D8-2</u>		
Coordinates	<u>                    </u> N <u>                    </u> W		Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>none</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
6	0.31	0	45

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>R. K. Price</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top      Base      Incr
Mar 22, 91	H1D0802\A030	FIXED 0.4 fpm Station: 300 s	0      40      0.5 Depths: 11

FIXED: Fixed velocity of Cable Speed fpm: Feet per minute

Calibration and Analysis Information

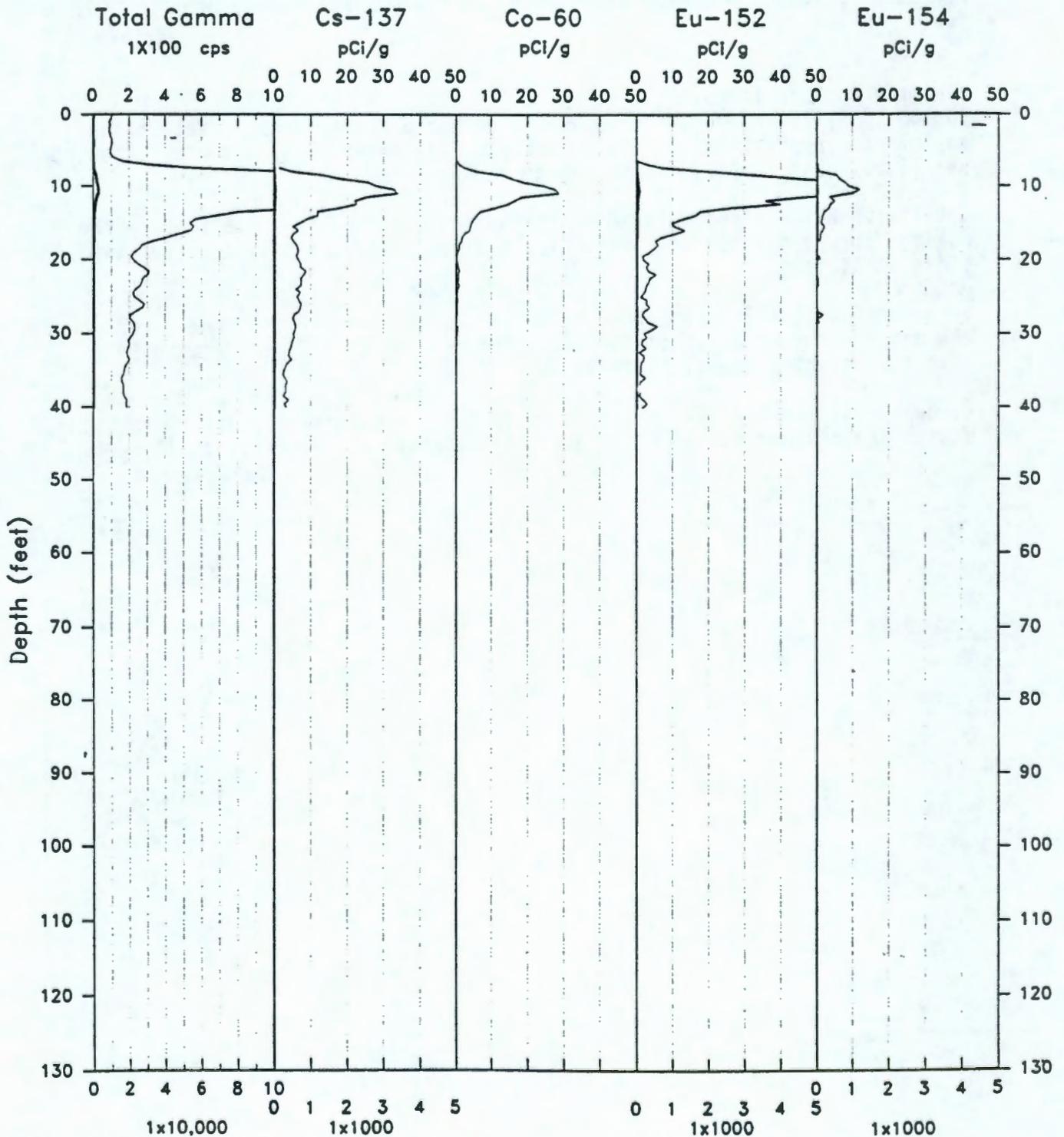
RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u> _____
Analysis Date: <u>Apr 9, 1992</u>
Analysis Notes: <u>Man-made radionuclides were detected at maximum depth</u>
Radionuclides identified: <u>Cs-137, Co-60, Eu-152, Eu-154</u>

93129051690

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-3  
Borehole: 199-D8-2

Log Date: Mar 22, 92  
Anal. Date: Apr 9, 92



93129051691

RLS Borehole Survey Report

199-D8-2

Casing	Depth: 45'	Size: 6"	Thickness: 0.31"
Water	Depth: none		
Survey	Depth: 0 - 40'	Mode: FIXED 0.4 fpm	Date: 3/22/91

**General Notes:**

Man-made radionuclides were encountered at the maximum survey depth of 40 feet.

**Man-made Radionuclides:**

Cesium (Cs-137) was encountered in the borehole survey from 7 feet to the maximum survey depth of 40 feet. The maximum cesium decay activity detected was 35 pCi/g at 11 feet.

Cobalt (Co-60) was encountered in the borehole survey from 6.5 feet to the maximum survey depth of 40 feet. The maximum decay activity detected was 30 pCi/g at 11 feet.

Europium-152 (Eu-152) was encountered in the borehole survey from 7 feet to the maximum survey depth of 40 feet. The maximum Eu-152 decay activity detected was 80 pCi/g at 11 feet.

Europium-154 (Eu-154) was encountered in the borehole survey from 7 feet to 30 feet. The maximum Eu-154 decay activity detected was 12 pCi/g at 11 feet.

93129051692

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-3

Borehole	<u>199-D8-3</u>		
Coordinates	<u>                    </u> N <u>                    </u> W	Meters	
Elevation	<u>                    </u> feet	Brass Cap	

Borehole Environment Information

Borehole Fluid Depth <u>64.4</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
6	0.28	0	80

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top            Base            Incr
Jun 17, 92	H1D0803\A193	MSA 80sec LT Station: 500 s	0            77            0.5 Depths: 77.4

MSA: Move-Stop-Acquire    LT: Live time

Calibration and Analysis Information

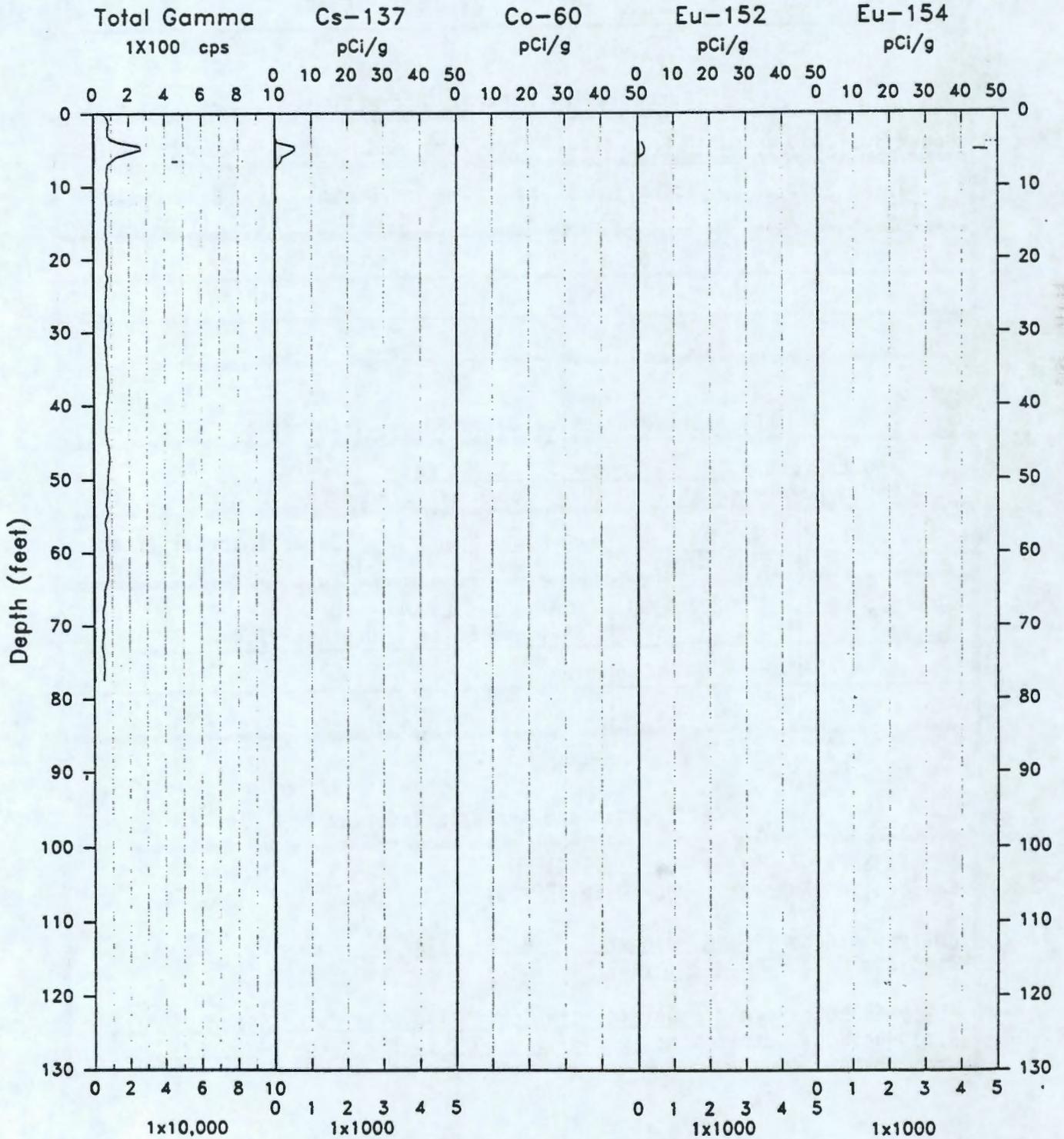
RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>G. K. Jaeger</u> <u>R. K. Price</u>
Analysis Date: <u>Jul 28, 1992</u>
Analysis Notes: <u>Long count spectra identified only natural radionuclides</u>
Radionuclides identified: <u>Cs-137, Co-60, Eu-152, Eu-154</u>

93129051693

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-3  
Borehole: 199-D8-3

Log Date: Jul 17, 92  
Anal. Date: Jul 28, 92



93129051694

RLS Borehole Survey Report

199-D8-3

Casing	Depth: 80'	Size: 6"	Thickness: 0.28"
Water	Depth: 64.6'		
Survey	Depth: 0 - 77'	Mode: MSA 80 sec	Date: 6/17/92

**General Notes:**

No man-made radionuclides were identified in long count spectra at maximum survey depth of 77.4 feet.

**Man-made Radionuclides:**

Cesium (Cs-137) was encountered in the borehole survey from 3 feet to 8 feet. The cesium decay activity detected was less than 6 pCi/g.

Cobalt (Co-60) was encountered in the borehole survey from 4 feet to 6 feet. The cobalt decay activity detected was less than 1 pCi/g.

Europium-152 (Eu-152) was encountered in the borehole survey from 4 feet to 6 feet. The Eu-152 decay activity detected was less than 2 pCi/g.

Europium-154 (Eu-154) was encountered in the borehole survey from 4 feet to 6 feet. The Eu-154 decay activity detected was less than 1 pCi/g.

93129051695

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-3

Borehole	<u>199-D8-54B</u>		
Coordinates	<u>152,398.65 N 573,768.24 E</u>	Meters	(Lambert NAD'83)
Elevation	<u>439.17</u> feet	Brass Cap	(NGVD'29)

Borehole Environment Information

Borehole Fluid Depth <u>73.8</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
12	0.40	0.0	19.0
10	0.38	0.0	76.5

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top Base Incr
Nov 01, 91	H1D0854B\A001	FIXED 0.4 fpm Station: 500s	0.0 73.0 0.5 Depth: 70'

FIXED: Fixed velocity of Cable speed fpm: Feet per minute

Calibration and Analysis Information

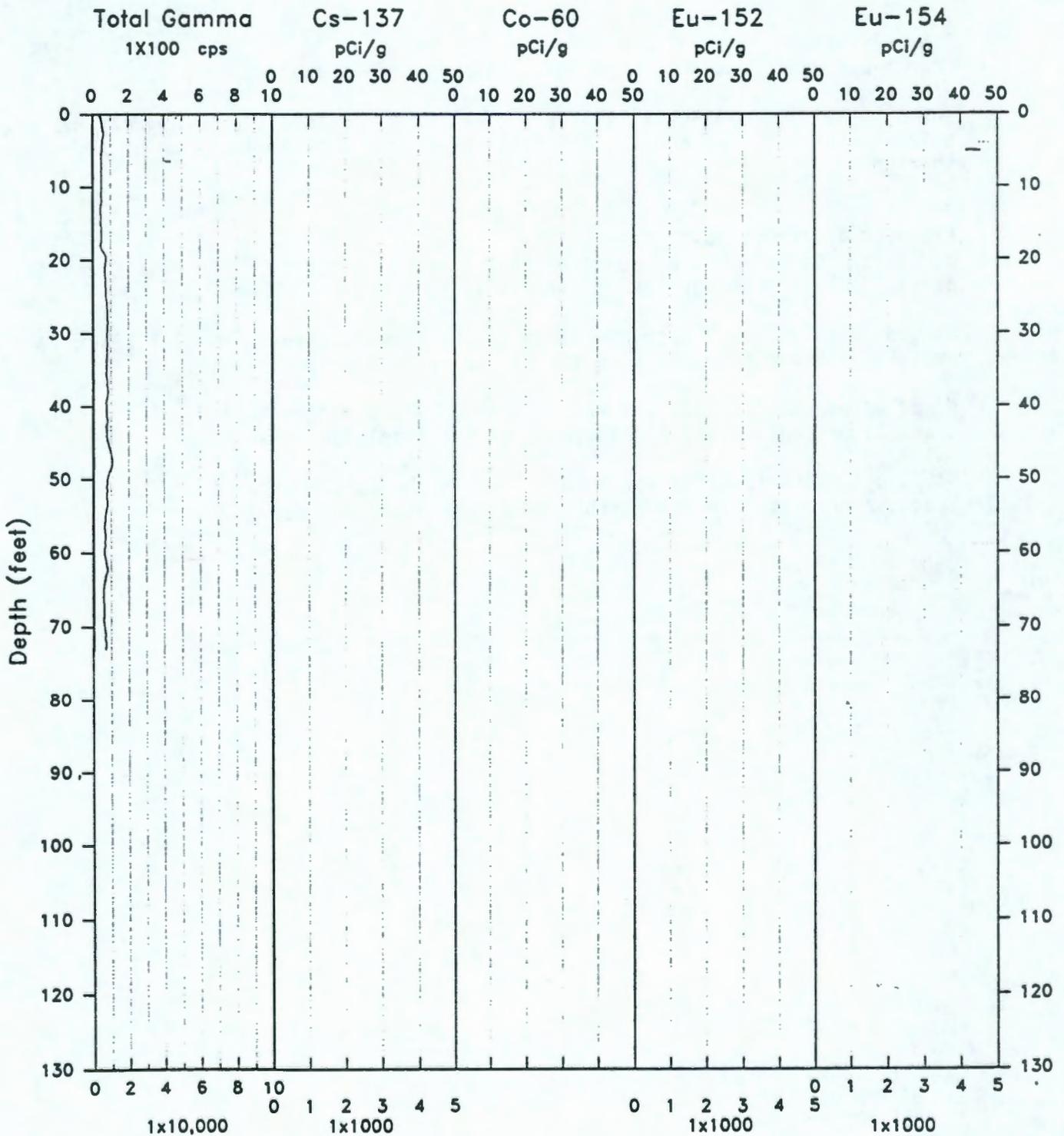
RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>Apr 7, 1992</u>
Analysis Notes: <u>High gamma 45-49' caused by natural U &amp; Th near 1 pCi/g</u> <u>Radionuclides identified: No man-made nuclides detected</u>

93129051696

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-3  
Borehole: 199-B8-54B

Log Date: Nov 1, 91  
Anal. Date: Apr 7, 92



93129051697

RLS Borehole Survey Report

199-D8-54B

Casing	Depth: 19'	Size: 12"	Thickness: 0.40"
	Depth: 76.5'	Size: 10"	Thickness: 0.38"
Water	Depth: 73.8'		
Survey	Depth: 0 - 73'	Mode: Fixed 0.4 fpm	Date: 11/01/91

**General Notes:**

No man-made radionuclides were identified in the borehole survey.

The high total gamma activity from 45 feet to 49 feet is due to increased natural radionuclides concentrations greater than 1 pCi/g for uranium and thorium.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051698

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-3

Borehole	<u>199-D8-55</u>		
Coordinates	<u>152,364.56 N 573,621.11 E</u>	Meters	(Lambert NAD'83)
Elevation	<u>435.66</u> feet	Brass Cap	(NGVD'29)

Borehole Environment Information

Borehole Fluid Depth <u>71.3</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
10	0.38	0	19.4
8	0.33	0	74

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top Base Incr
Jan 13, 92	H1D0855\A114	FIXED 0.4 fpm Station: 300 s	0 68 0.5 Depths: 36, 68.9'

FIXED: Fixed velocity of Cable Speed fpm: Feet per minute

Calibration and Analysis Information

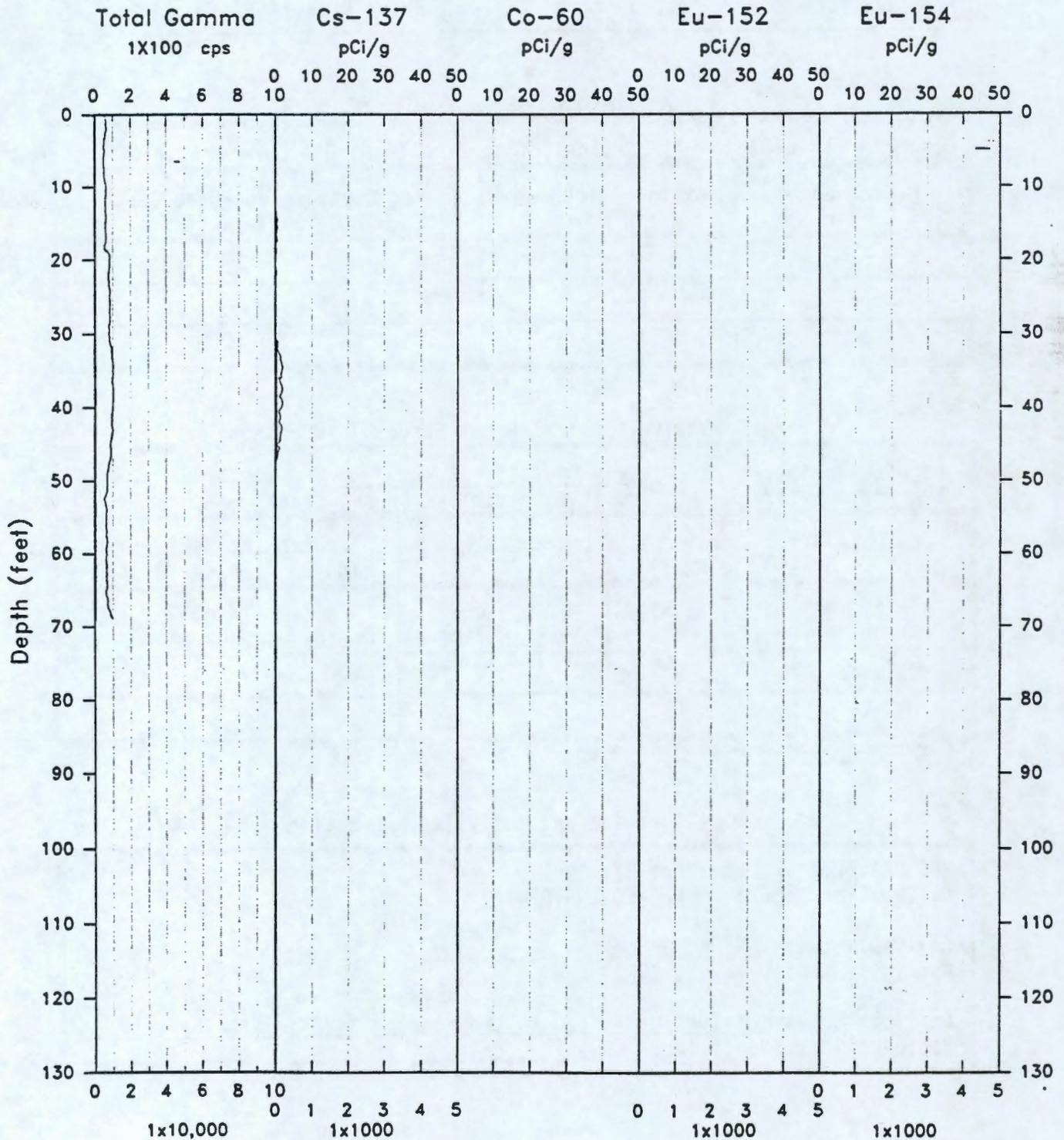
RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u> _____
Analysis Date: <u>Apr 7, 1992</u>
Analysis Notes: <u>Cesium identified in two zones: 13-22 and 30-48 feet.</u>
Radionuclides identified: <u>Cs-137</u>

93129051699

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-3  
Borehole: 199-D8-55

Log Date: Jan 13, 92  
Anal. Date: Apr 7, 92



93129051700

RLS Borehole Survey Report

199-D8-55

Casing	Depth: 19.4'	Size: 10"	Thickness: 0.38"
	Depth: 74'	Size: 8"	Thickness: 0.33"
Water	Depth: 71.3'		
Survey	Depth: 0 - 68'	Mode: FIXED 0.4 fpm	Date: 1/13/92

**General Notes:**

No man-made radionuclides were identified in long count spectra at maximum survey depth of 68.9 feet.

**Man-made Radionuclides:**

Cesium (Cs-137) was encountered in the borehole survey from 13 to 22 feet and from 30 to 48 feet. The cesium decay activity detected was less than 2 pCi/g.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051701

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-3

Borehole	<u>199-H3-1</u>		
Coordinates	<u>                    </u> N <u>                    </u> E		Meters
Elevation	<u>                    </u> feet		Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>43.1</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.28	0	68.8

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top            Base            Incr
Jun 16, 92	H1H0301\A192	MSA 80sec LT Station: 500 s	0            65            0.5 Depth: 65.8'

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: <u>Nov 21, 1991</u>
Calibration Report: <u>WHC-SD-EN-TRP-001</u>
Analyst Names: <u>G. K. Jaeger</u> <u>R. K. Price</u>
Analysis Date: <u>Aug 13, 1992</u>
Analysis Notes: _____
Radionuclides identified: <u>No man-made nuclides detected</u>

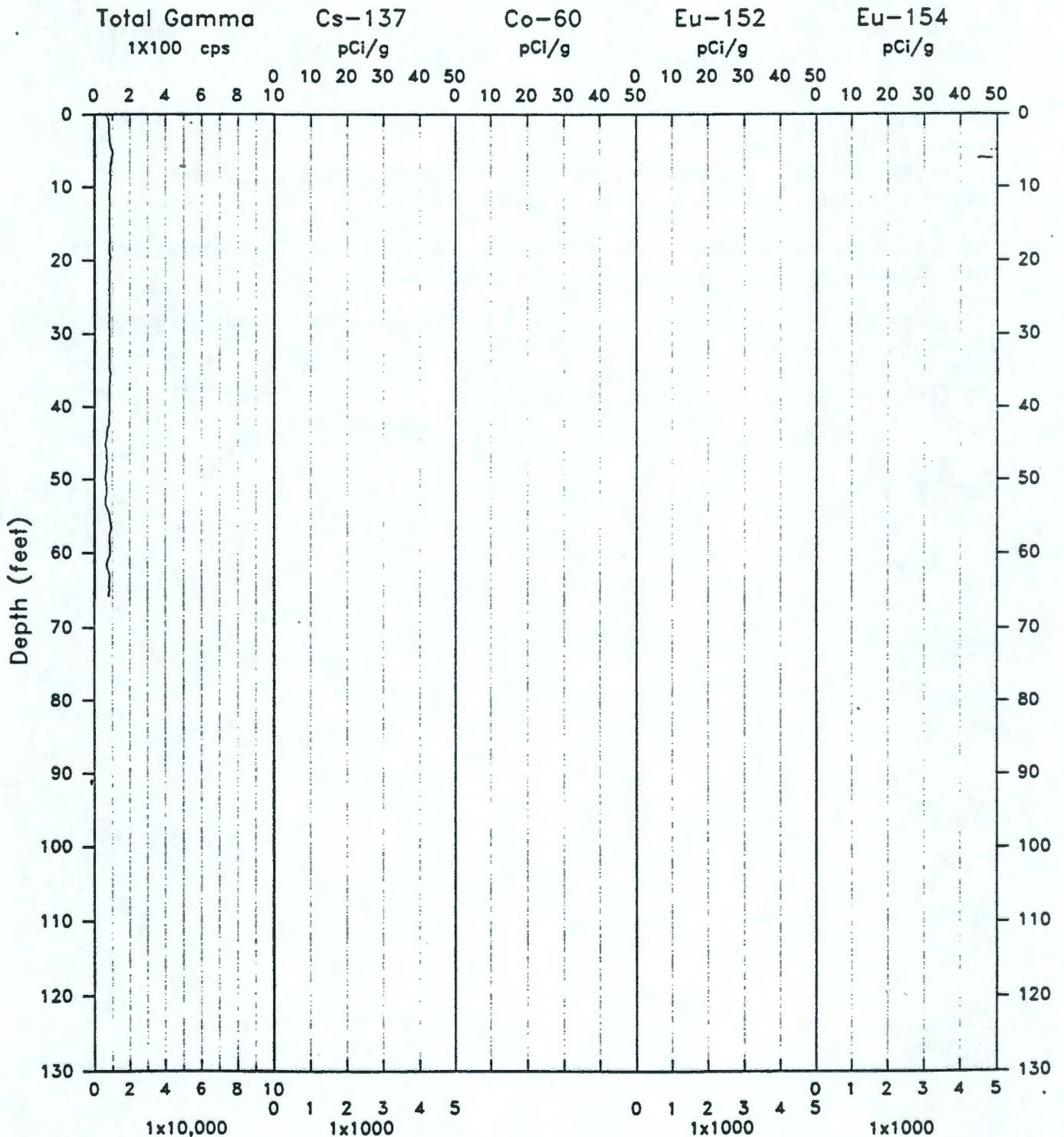
93129051702

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-3  
 Borehole: 199-H3-1

Log Date: Jun 16, 92  
 Anal. Date: Aug 13, 92

93129051703



RLS Borehole Survey Report

199-H3-1

Casing	Depth: 68.8'	Size: 8"	Thickness: 0.28"
Water	Depth: 43.1'		
Survey	Depth: 0 - 65'	Mode: MSA 80sec	Date: 6/16/92

**General Notes:**

No man-made radionuclides were identified by the borehole survey. The long count spectra acquired at the maximum survey depth of 65.8 feet identified only natural nuclides.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051704

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-3

Borehole	<u>199-H4-3</u>		
Coordinates	<u>96,372.3</u> N	<u>39,079.7</u> E	Feet (100 Area Coord sys)
Elevation	_____	feet	Top of casing

Borehole Environment Information

Borehole Fluid Depth <u>41</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
6	0.33	0	50

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>R. K. Price</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top      Base      Incr
Feb 20, 91	H1H0403\A026	FIXED 0.4 fpm Station: 1000s	0      42      0.5 Depth: 20, 35.3'

FIXED: Fixed cable speed velocity    fpm: Feet per minute

Calibration and Analysis Information

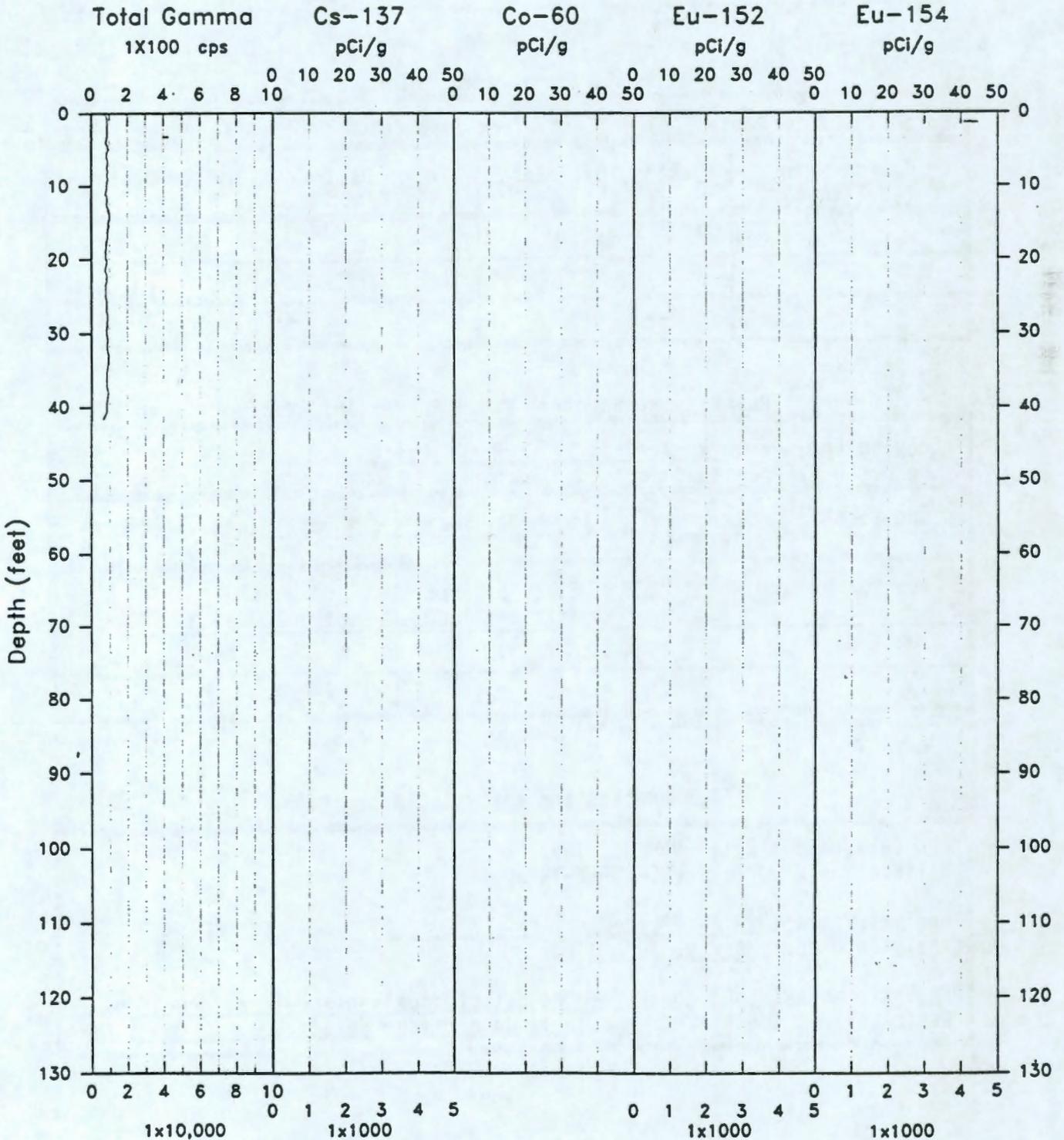
RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u> _____
Analysis Date: <u>Apr 9, 1992</u>
Analysis Notes: <u>Long count spectra detected only natural radionuclides.</u>
Radionuclides identified: <u>No man-made nuclides detected</u>

93129051705

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-3  
Borehole: 199-H4-3

Log Date: Feb 20, 91  
Anal. Date: Apr 9, 92



93129051706

RLS Borehole Survey Report

199-H4-3

Casing	Depth: 50'	Size: 6"	Thickness: 0.33"
Water	Depth: 41'		
Survey	Depth: 0 - 42'	Mode: FIXED 0.4 fpm	Date: 2/20/91

**General Notes:**

No man-made radionuclides were identified by the borehole survey. The long count spectra acquired at 20 and 35.3 feet identified only natural nuclides.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051707

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-3

Borehole	<u>199-H4-11</u>		
Coordinates	<u>95,944 N</u>	<u>38,420 E</u>	Feet (100 Area Coord sys)
Elevation	<u>          </u> feet	Top of casing	

Borehole Environment Information

Borehole Fluid Depth <u>44</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
6 Stainless	0.12	0	50

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>R. K. Price</u>					
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>					
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet)		
			Top	Base	Incr
Feb 21, 91	H1H0411\A027	FIXED 0.4 fpm Station: 600 s	0	45	0.5

FIXED: Fixed cable speed velocity fpm: Feet per minute

Calibration and Analysis Information

RLS Calibration Date: <u>Nov 21, 1991</u>
Calibration Report: <u>WHC-SD-EN-TRP-001</u>
Analyst Names: <u>R. K. Price</u>
Analysis Date: <u>Apr 9, 1992</u>
Analysis Notes: <u>Long count spectra detected only natural radionuclides.</u>
Radionuclides identified: <u>No man-made nuclides detected</u>

93129051708

# RLS Spectral Gamma-Ray Borehole Survey

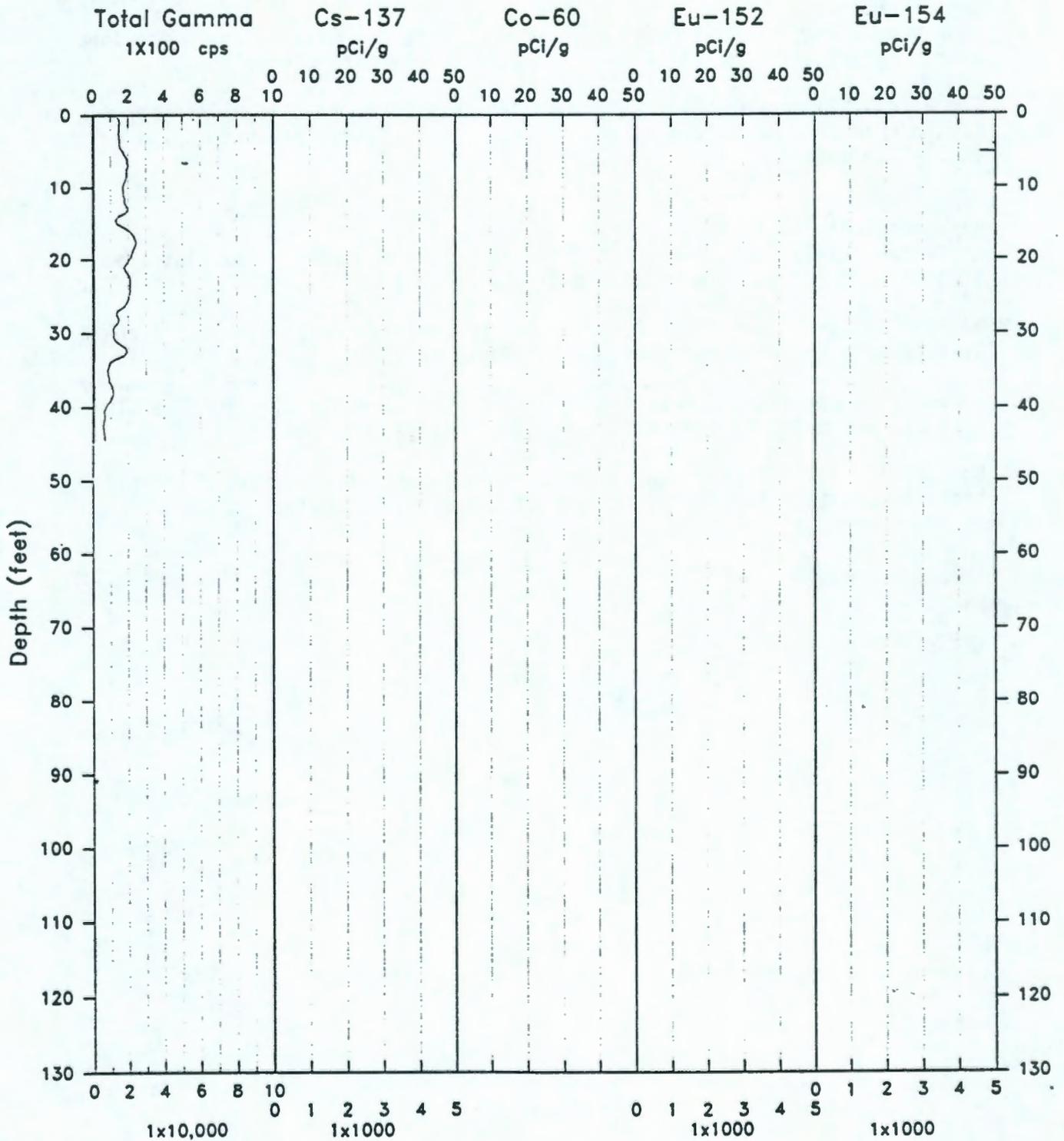
Project: 100-HR-3

Log Date: Feb 21, 92

Borehole: 199-H4-11

Anal. Date: Apr 9, 92

93129051709



RLS Borehole Survey Report

199-H4-11

Casing	Depth: 50'	Size: 6" Stainless	Thickness: 0.12"
Water	Depth: 44'		
Survey	Depth: 0 - 45'	Mode: FIXED 0.4 fpm	Date: 2/21/91

**General Notes:**

No man-made radionuclides were identified by the borehole survey. The long count spectra acquired at 18 feet identified only natural nuclides.

The high Total-gamma activity from the surface to 34 feet is due to the higher than normal concentrations of the natural radionuclides present in the well completion material.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051710

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-3

Borehole	<u>199-H4-13</u>		
Coordinates	<u>                    </u> N <u>                    </u> E	Meters	
Elevation	<u>                    </u> feet	Brass Cap	

Borehole Environment Information

Borehole Fluid Depth <u>38</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
6 Stainless	0.12	0	51

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>					
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>					
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet)		
			Top	Base	Incr
Jun 26, 92	H1H0413\A198	MSA 80 sec LT Station: 500 s	0	48	0.5
			Depths: 9, 20, 48.2'		

MSA: Move-Stop-Acquire LT: Live time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>G. K. Jaeger</u> <u>R. K. Price</u>
Analysis Date: <u>Aug 18, 1992</u>
Analysis Notes: <u>Long count spectra detected only natural radionuclides.</u>
Radionuclides identified: <u>No man-made nuclides detected</u>

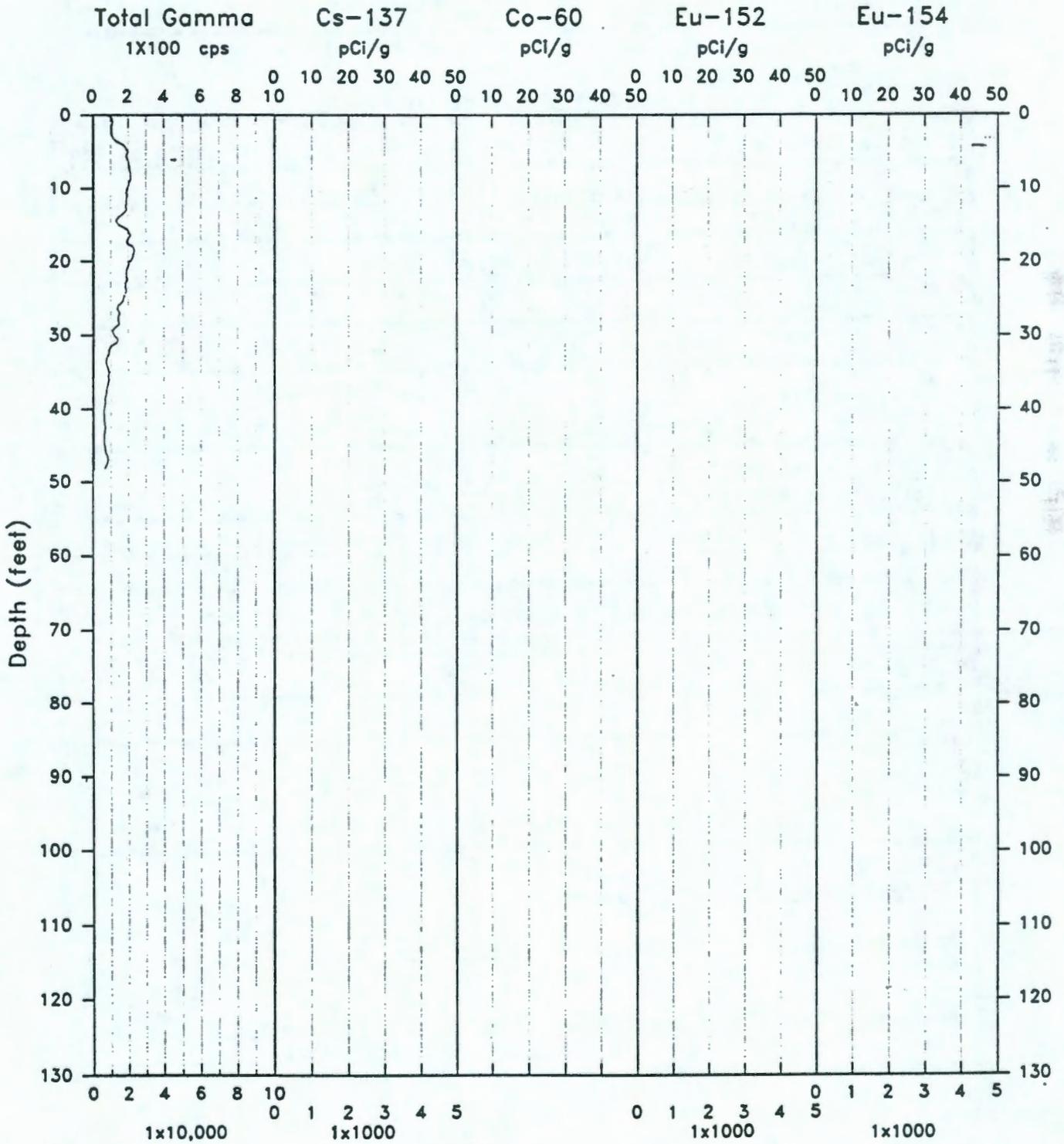
93129051711

# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-3  
Borehole: 199-H4-13

Log Date: Jun 26, 92  
Anal. Date: Aug 18, 92

93129051712



RLS Borehole Survey Report

199-H4-13

Casing	Depth: 51'	Size: 6" Stainless	Thickness: 0.12"
Water	Depth: 38'		
Survey	Depth: 0 - 48'	Mode: MSA 80sec LT	Date: 6/26/92

**General Notes:**

No man-made radionuclides were identified by the borehole survey. The long count spectra acquired at 9, 20, and 48.2 feet identified only natural nuclides.

The high Total-gamma activity from the 4 feet to 29 feet is due to the higher than normal concentrations of the natural radionuclides present in the well completion material.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

93129051713

Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-3

Borehole	<u>199-H4-16</u>		
Coordinates	<u>                    </u> N	<u>                    </u> E	Meters
Elevation	<u>                    </u>	feet	Brass Cap

Borehole Environment Information

Borehole Fluid Depth <u>45.9</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
6 Stainless	0.12	0	57

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top          Base          Incr
Jun 15, 92	H1H0416\A191	MSA 80sec LT Station: 500 s	0          53          0.5 Depth: 53.9'

MSA: Move-Stop-Acquire LT: Live time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>G. K. Jaeger</u> <u>R. K. Price</u>
Analysis Date: <u>Aug 18, 1992</u>
Analysis Notes: <u>Long count spectra detected only natural radionuclides.</u>
Radionuclides identified: <u>No man-made nuclides detected</u>

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# RLS Spectral Gamma-Ray Borehole Survey

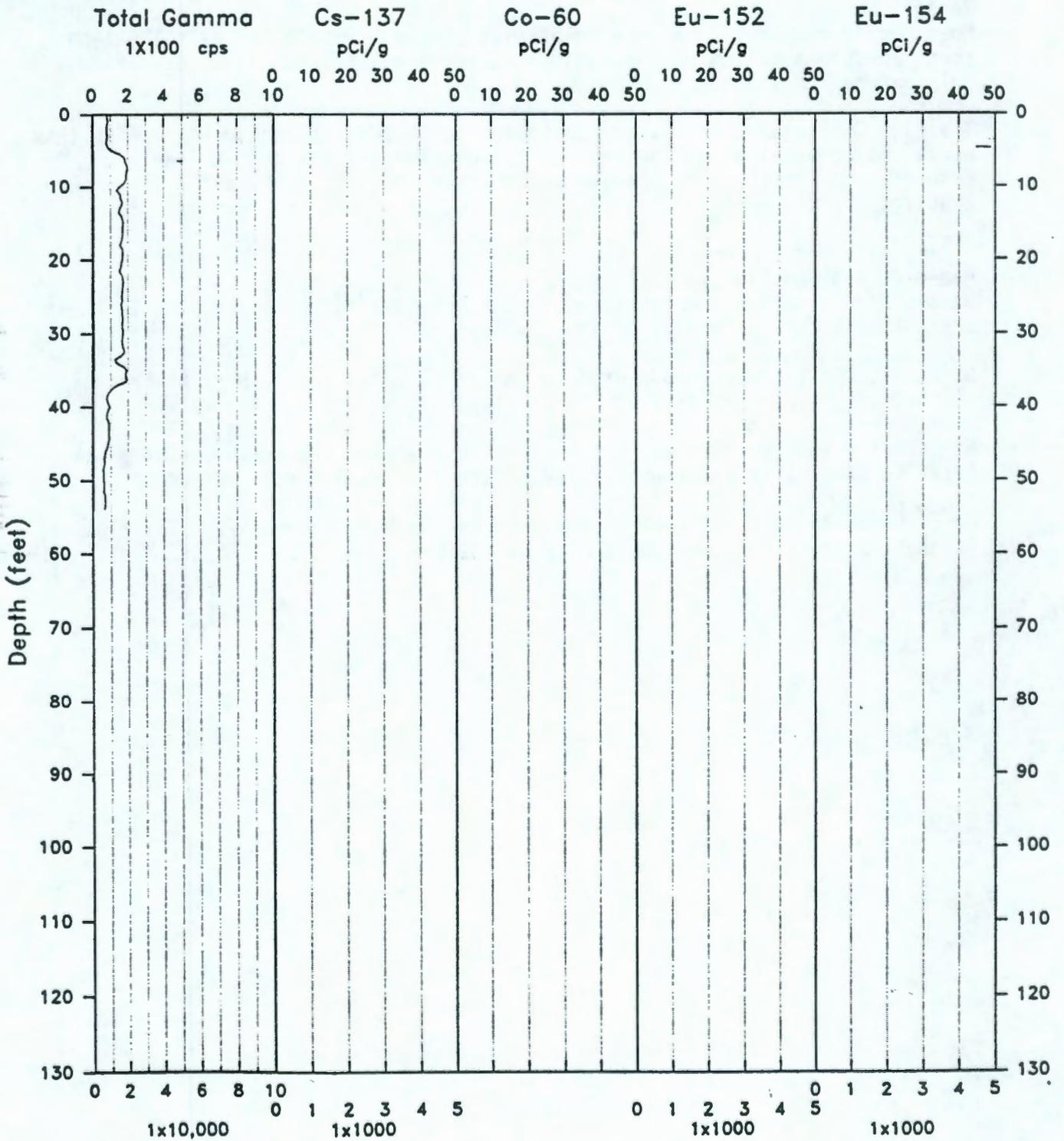
Project: 100-HR-3

Log Date: Jun 15, 92

Borehole: 199-H4-16

Anal. Date: Aug 18, 92

93129051715



RLS Borehole Survey Report

199-H4-16

Casing	Depth: 57'	Size: 6" Stainless	Thickness: 0.12"
Water	Depth: 45.9'		
Survey	Depth: 0 - 53'	Mode: MSA 80sec LT	Date: 6/15/92

**General Notes:**

No man-made radionuclides were identified by the borehole survey. The long count spectra acquired at the maximum survey depth of 53.9 feet identified only natural nuclides.

The high Total-gamma activity from 5 feet to 37 feet is due to the higher than normal concentrations of the natural radionuclides present in the well completion material. The uranium and thorium content of the material is about 2 pCi/g.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

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Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-3

Borehole	<u>199-H4-18</u>		
Coordinates	<u>                    </u> N <u>                    </u> E	Meters	
Elevation	<u>                    </u> feet	Brass Cap	

Borehole Environment Information

Borehole Fluid Depth <u>42.7</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
6 Stainless	0.12	0	50

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>S. E. Kos</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top      Base      Incr
Aug 25, 92	H1H0418\A197	MSA 80sec LT Station: 500 s	0      47      0.5 Depths: 30, 47'

MSA: Move-Stop-Acquire LT: Live time

Calibration and Analysis Information

RLS Calibration Date: <u>Nov 21, 1991</u>
Calibration Report: <u>WHC-SD-EN-TRP-001</u>
Analyst Names: <u>G. K. Jaeger</u> <u>R. K. Price</u>
Analysis Date: <u>Aug 25, 1992</u>
Analysis Notes: <u>Long count spectra detected only natural radionuclides.</u>
Radionuclides identified: <u>No man-made nuclides detected</u>

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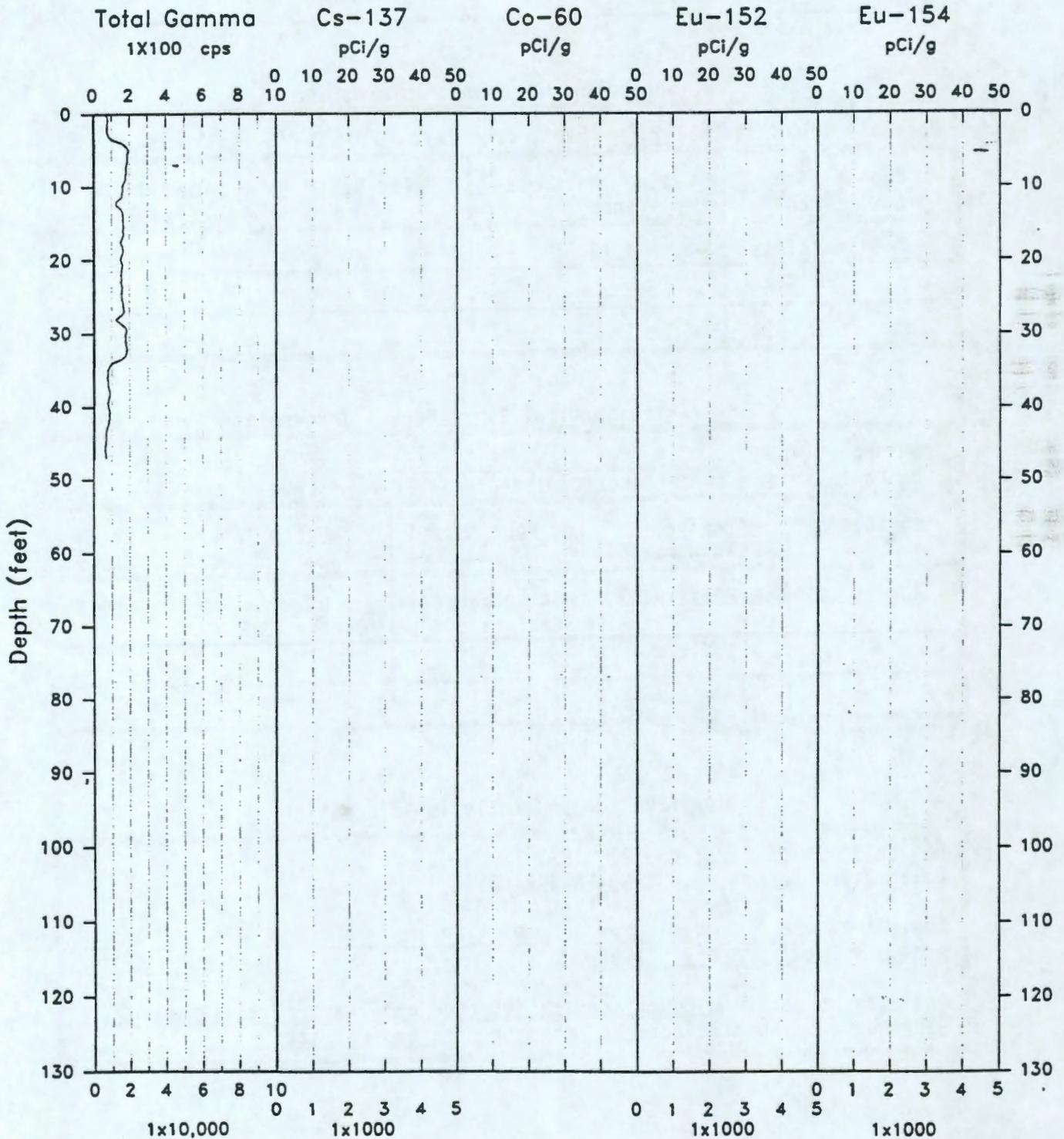
# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-3

Log Date: Jun 25, 92

Borehole: 199-H4-18

Anal. Date: Aug 25, 92



93129051718

RLS Borehole Survey Report

199-H4-18

Casing	Depth: 50'	Size: 6" Stainless	Thickness: 0.12"
Water	Depth: 42.7'		
Survey	Depth: 0 - 47'	Mode: MSA 80sec LT	Date: 8/25/92

**General Notes:**

No man-made radionuclides were identified by the borehole survey. The long count spectra acquired at 30 feet and the maximum survey depth of 47 feet identified only natural nuclides.

The high Total-gamma activity from 4 feet to 34 feet is due to the higher than normal concentrations of the natural radionuclides present in the well completion material. The uranium and thorium content of the material is about 2 pCi/g.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

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Westinghouse Hanford Company  
 RLS Spectral Gamma-Ray Borehole Survey Log Header

Project: 100-HR-3

Borehole	<u>199-H4-45</u>		
Coordinates	<u>152,433.60 N 578,156.56 E</u>	Meters	(Lambert NAD'83)
Elevation	<u>413.74</u> feet	Brass Cap	(NGVD'29)

Borehole Environment Information

Borehole Fluid Depth <u>38.7</u> (Feet) from Zero (0.0) Depth Reference of Log			
Casing Size I.D. (inch)	Casing Thickness (inch)	Top Depth (feet)	Base Depth (feet)
8	0.33	0.0	54.5

RLS Passive Spectral Gamma Survey Information

Logging Engineers <u>R. V. Cram</u> <u>T.H. Richards</u>			
Log Depth Reference at Zero (0.0) depth is <u>Ground Level</u>			
Log Date	Archive File Names	Log Mode, Speed	Depth Interval (feet) Top      Base      Incr
Feb 12, 92	H1H0445\A133	MSA 80sec LT Station: 500 s	0      51      0.5 Depth: 51.5'

MSA: Move-Stop-Acquire Lt: Live Time

Calibration and Analysis Information

RLS Calibration Date: Nov 21, 1991
Calibration Report: WHC-SD-EN-TRP-001
Analyst Names: <u>R. K. Price</u> _____
Analysis Date: <u>Apr 7, 1992</u>
Analysis Notes: <u>Long count spectra at 51.5' detected only natural KUT</u>
Radionuclides identified: <u>No man-made nuclides detected</u>

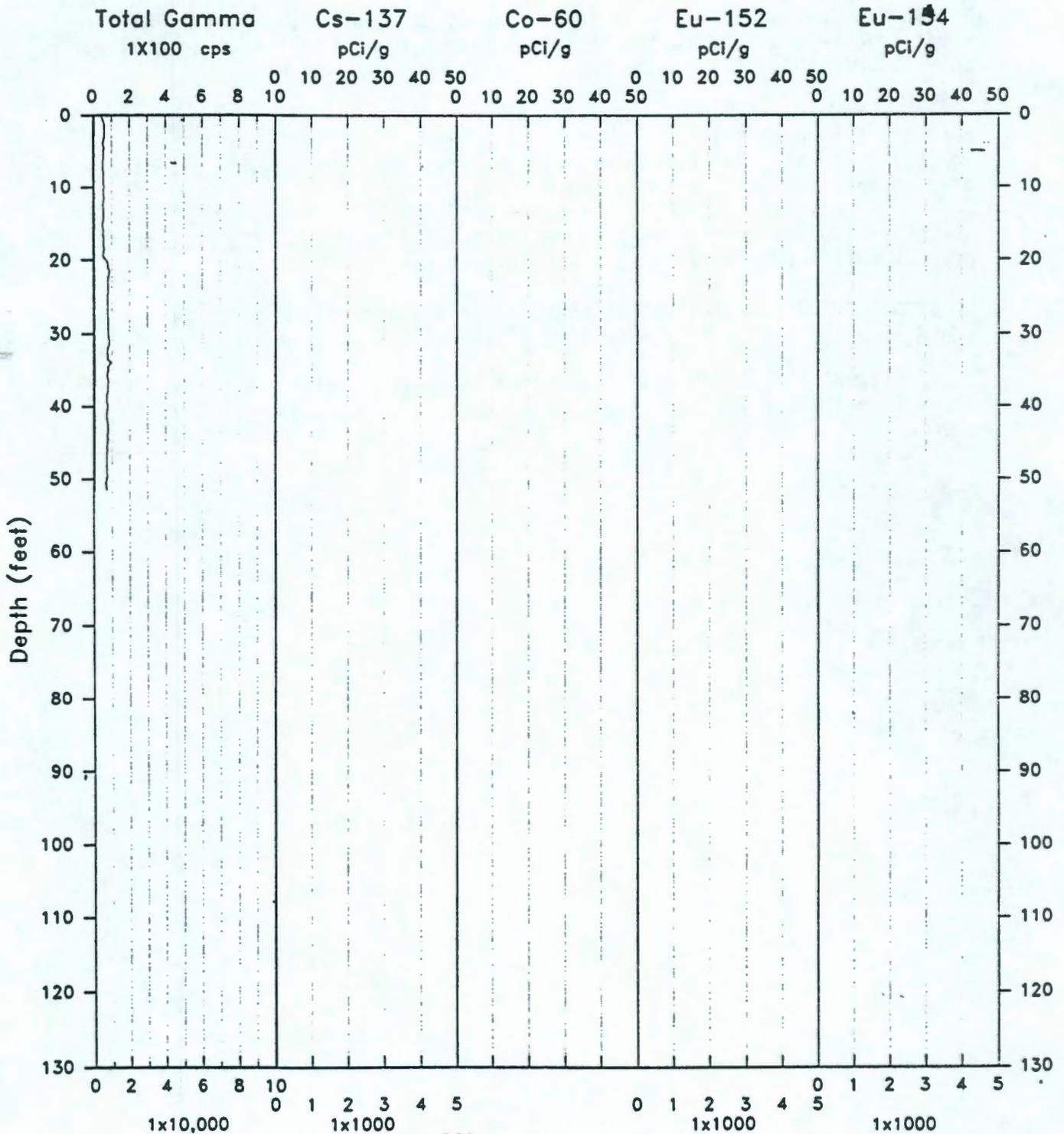
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# RLS Spectral Gamma-Ray Borehole Survey

Project: 100-HR-3  
Borehole: 199-H4-45

Log Date: Feb 12, 92  
Anal. Date: Apr 7, 92

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RLS Borehole Survey Report

199-H4-45

Casing	Depth: 54.5'	Size: 8"	Thickness: 0.33"
Water	Depth: 38.7'		
Survey	Depth: 0 - 51'	Mode: MSA 80sec LT	Date: 2/12/92

**General Notes:**

No man-made radionuclides were identified by the borehole survey. The long count spectra acquired at the maximum survey depth of 51.5 feet identified only natural nuclides.

**Man-made Radionuclides:**

No Cesium (Cs-137) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Cobalt (Co-60) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-152 (Eu-152) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

No Europium-154 (Eu-154) was encountered in the borehole survey. The plot track is present only for uniformity of the displayed data.

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Date Received: <u>1/28/93</u>		<b>INFORMATION RELEASE REQUEST</b>		Reference: WHC-CM-3-4
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