ROUTING AND TRANSMITTAL SLIP		ACTION
1 TO Dr. Richard O. Gilbert Battelle Pacific Northwest Laboratory Box 999	INITIALS DATE	CIRCULATE COORDINATION
2 Math Building, Room 1201 Richland, Washington 99352	INITIALS DATE	FILE INFORMATION
3	INITIALS DATE	NOTE AND RETURN PER CONVERSATION
4	INITIALS DATE	SEE ME SIGNATURE

REMARKS

409803

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FROM	DATE
FCDNA/FCLS	23 Nov 76
	PHONE 264-6487

OPTIONAL FORM 41
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FOLDER Enewetak Atk 1976

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Reviewed by [signature] Date 3/29/82

FCLS-H 23 November 1976

MEMORANDUM FOR RECORD

SUBJECT: Determination of Pu in Enewetak Soil by Alpha Particle Counting

REFERRENCE: Memorandum for Record, 27 Oct 76, Same Subject

1. Ref 1 reported interim results of a study to compare alpha particle count rates of Enewetak soil samples with their total specific alpha particle activity as determined by radiochemistry and reported in NVO-140. A reasonably good correlation was determined for 11 of 13 samples investigated. Since alpha particle count rates for the two "outliers" was reproducible, and their Pu content appeared too large, both samples were reanalyzed for Pu at USAF/MCL by radiochemistry. Results are as follows:

SAMPLE NUMBER	NVO-140 Pu CONC (pCi/g)	REVISED Pu CONC (pCi/g)	NVO-140 Am CONC (pCi/g)	TOTAL SPECIFIC α ACTIVITY
5116	399	278	19.00	297.0
5196	532	65	9.65	74.7

2. Enclosure 1 tabulates the net alpha particle count rates and total specific activities for all 13 samples. The average count rate per unit specific activity was determined both as the ratio of the means, β_1, and the mean of the ratios, β_2:

$$\beta_1 \pm SE = 0.0196 \pm 0.0019 \quad \text{Relative SE} = 9.8\%$$

$$\beta_2 \pm SE = 0.0302 \pm 0.0075 \quad \text{Relative SE} = 24.8\%$$

A linear regression yielded the relationship:

$$Y(c/min) = 0.433 + 0.0169\ X(pCi/g)$$

with a coefficient of determination, $r^2 = 0.9525$. This curve is plotted in enclosure 2 as a broken line. All data points are shown in enclosure 2 within circles, and the solid line is a plot of $Y = \beta_1 X$.

3. Alpha particle counting (without chemistry) continues to look suitable as a rapid method for estimating the concentration of transuranics in Enewetak soil at concentration levels of interest to Cleanup. A possible explanation for the high Pu concentrations reported in NVO-140 for samples 5116 and 5196 is that (≈10g) aliquots contained "hot particles" and the

aliquots were not representative of the entire (≈1000g) ball-milled sample. This explanation suggests that alpha particle counting (without chemistry) might also be used as a simple independent check of radiochemical analyses whenever small aliquots of large environmental samples are analyzed for transuranics.

E. T. Bramlitt

2 Encl
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E. T. BRAMLITT
Health Physicist

Alpha Particle Counting of Enewetak Soil Samples

SAMPLE NUMBER	Y NET α COUNT RATE (C/MIN)	X TOTAL α SPECIFIC ACTIVITY (pCi/g)	Y/X cpm/(pCi/g)
3892	1.0	46.3	.022
3746	0.8	27.9	.029
3777	1.0	44.7	.022
3894	0.0	12.2	.000
3896	2.2	91.2	.024
3754	1.0	18.8	.053
5200	0.3	2.59	.116
5115	5.8	313.0	.019
5114	7.0	338.0	.021
5113	7.5	384.0	.020
5116	4.2	297.0	.014
5119	7.7	462.0	.017
5196	2.8	74.7	.037

FIG. 1. Net alpha particle count rate versus total alpha particle specific activity.