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Operation

ROLLER COASTER

PROJECT OFFICERS REPORT—PROJECT 5.2/5.3c

RADIOCHEMISTRY

Eric L. Geiger, Project Officer

Eberline Instrument Corporation
Santa Fe, New Mexico

Issuance Date: September 17, 1965

DEPARTMENT OF DEFENSE
Washington, D.C. 20301

ATOMIC ENERGY COMMISSION
Washington, D.C. 20545

ATOMIC WEAPONS RESEARCH ESTABLISHMENT
Aldermaston Berkshire, England

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ABSTRACT

Samples of air filters, impactor discs, cylindrical collector wire wipes, deposition collectors, and soil were analyzed for Pu^{239} as required to accomplish the objectives of Roller Coaster Projects 2.1, 2.2, 2.3, and 2.4. Samples of femur, kidney, liver, lungs, hylar lymph nodes, urine and feces from dogs, sheep, and burros were analyzed for Pu^{239} as required to accomplish objectives of Project 4.1. A total of 1687 physical and 427 biological samples were analyzed for Pu^{239}. Selected samples were also analyzed for uranium. A consistent ratio of U/Pu was not obtained.

The plutonium procedure consisted of complete sample dissolution, anion exchange separation of the plutonium, electrodeposition, and alpha spectrometry. Pu^{236} was used as a tracer in each sample to correct the results for plutonium recovery. Uranium purification was accomplished by anion exchange. The mass of uranium was determined by fluorimetry, and the isotopic ratio was determined by alpha spectrometry.

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TABLES

FIGURES

CHAPTER 1

INTRODUCTION

The objectives of Operation Roller Coaster were:

1. To obtain, by physical and biological measurements, necessary data on the plutonium airborne particulate to permit an assessment of the acute (inhalation) hazard.

2. To measure the distribution of plutonium on the ground to permit detailed accountability of the amount involved in the field of measurement.

3. To evaluate the total effectiveness of the structures including varying thickness of earth cover for reducing the radiological hazard from a real accident.

4. To obtain those data of special importance in forecasting the hazard arising from a real accident (cloud models).

Project 5.2/5.3c was one of four U.S. radiochemistry projects established to provide the analytical data necessary to accomplish the above objectives.

CHAPTER 2

PROCEDURE

2.1 CONTROL OF CROSS-CONTAMINATION

The possibility of cross-contamination of samples was recognized, and steps were taken to minimize this risk. Biological samples were analyzed in a laboratory reserved for low level samples. Physical samples were analyzed in a higher level laboratory. Shoe covers, laboratory coats, and gloves were required in the higher level laboratory. A step-off line was established at the door to this laboratory. Personnel were required to monitor for alpha contamination frequently during the course of the work and each time they left the laboratory.

New glassware was used with each sample. Platinum dishes, crucibles, and anodes were cleaned thoroughly with acid between samples. Disposable plating cells were used once then discarded (Figure 2.1). Tweezers used to handle the plated discs were wiped with Kleenex tissue after each sample.

Sample handling techniques were employed which would avoid cross contamination of samples. Samples were segregated and run in groups with similar levels of contamination. Samples were wet ashed in pre-

ference to dry ashing, and care was taken to avoid burning or splattering. Beakers were covered during the acid digestion when this was practical.

2.2 PLUTONIUM SEPARATION AND COUNTING

Samples were spiked with Pu^{236} tracer and wet ashed with nitric or sulfuric acid and hydrogen peroxide. Silica, if present, was destroyed with nitric and hydrofluoric acids. Intractable residue which could not be dissolved by acid digestion was fused with sodium carbonate and dissolved in 8N nitric acid. Details of the procedures are given in Appendixes A and B.

The plutonium was isolated by anion exchange using Bio Rad AG1X2 resin and 8N nitric acid. Am^{241}, uranium, and non-radioactive salts were removed by washing the anion exchange column with 8N nitric acid. The plutonium was removed from the column with a reducing agent and electroplated on a stainless steel disc from a hydrochloric acid-ammonium oxalate electrolyte. The disc was counted in an alpha spectrometer consisting of surface barrier detector in a vacuum chamber and a multichannel pulse height analyzer. Eleven detectors and four multichannel analyzers were used for counting samples (Figure 2.2).

The disintegration rate, dpm, of Pu^{239} in the sample was calculated by dividing the total number of counts from Pu^{239} by the total number of counts from Pu^{236} and multiplying this ratio by the total dpm of Pu^{236} added in the sample preparation step. This simple ratio calculation corrected the results for losses in the procedure, counting efficiency, and length of count.

2.3 URANIUM SEPARATION AND MEASUREMENT

The 8N nitric acid effluent from the plutonium anion exchange procedure was devoid of plutonium, but contained all of the uranium. The uranium was further purified by anion exchange as described in Reference 1.

In some cases, a combination of two ion-exchange steps and a solvent extraction step was required. An aliquot of the purified sample was evaporated in a platinum dish and fused with a mixture of sodium fluoride and lithium fluoride. The uranium content of the fused pellet was determined fluorometrically using a Turner Fluorometer.

Figure 2.1 Disposable plating cell.

Figure 2.2 Alpha spectrometry equipment.

CHAPTER 3
RESULTS

3.1 RECOVERY, PRECISION, AND SENSITIVITY

A high degree of precision in the percent recovery was not essential since each sample was spiked with Pu^{236} tracer and corrected for recovery based on the Pu^{236} counting rate. However, high recovery was desired since a low recovery directly affected sensitivity and increased the counting time required. The average plutonium recovery for various types of samples is summarized in Table 3.1.

The desired sensitivity in terms of dpm at 95% confidence is also given in Table 3.1. Recovery, aliquot size, counting efficiency, background counting rate, and length of count all influenced sensitivity. The counting efficiency of the solid-state detectors ranged from 12% to 30%. The background counting rate was less than 0.5 count/hr. Samples were counted for the time required to obtain the desired sensitivity, or up to a maximum of 800 minutes. Shorter counting times were used when the Pu^{236} and Pu^{239} peaks had reached a total of 1,000 counts in each peak. Smearing of the Pu^{236} into the Pu^{239} peak was not a problem except in a few instances. A typi-

cal alpha spectrum plotted with a Mosely X-Y plotter attached to the pulse height analyzer is shown in Figure 3.1. A typical energy calibration curve is shown in Figure 3.2.

Since an internal tracer was not used in the uranium determination, recovery was not determined for every sample. However, duplicate aliquots were taken of representative samples, and one aliquot was spiked with uranium. Recovery was calculated from the difference between the aliquot that was spiked and the one that was not spiked. This method would have indicated unknown quenching agents had they been present in the purified sample, but no significant interference was indicated. These results are summarized in Table 3.2.

3.2 INTERFERENCES

Alpha emitters that were potentially present in all samples included various isotopes of plutonium, americium, and uranium. The americium and uranium were not absorbed on the Bio Rad AG1X2 column from 8N nitric acid. Adequate washing of the column completely removed these alpha emitters.

Since the alpha energy of Pu^{240} is almost identical to that of Pu^{239}, these two can not be separated by alpha spectrometry. Consequently the dpm values reported as Pu^{239} include Pu^{240}.

No interferences remained in the purified uranium portion.

3.3 QUALITY CONTROL SAMPLES

The Roller Coaster Referee Team, consisting of Dr. Morris F. Milligan (LASL), Mr. Derek M.C. Thomas (UK, Aldermaston), Mr. Loyd A. Currie (NBS), Dr. John H. Harley (NASL), Dr. Jacob Sedlet (ANL), Dr. Julian M. Nielsen (HAPL), and Col. Irving J. Russell (USAF), established certain specifications and quality control provisions applicable to all Roller Coaster samples. This team prepared and distributed standardized samples during the analysis program, such samples being blanks, spikes, blind duplicates, and actual standards. Biological quality control samples, prepared by Professor Robert Wilson of the University of Rochester, were also submitted for analysis. The results for these samples are summarized in Table 3.3. In-house quality control samples were also run periodically, including spikes and blanks. The results are tabulated in Tables 3.4 and 3.5.

3.4 BIOLOGICAL SAMPLES

A total of 427 biological samples, representing the first 180 days of a three-year sacrifice schedule, were analyzed for plutonium. These results are summarized in Table 3.6. Selected samples were analyzed for uranium. These results are tabulated in Table 3.7.

3.5 PHYSICAL SAMPLES

A total of 1,687 physical samples was analyzed for plutonium. Selected samples were analyzed for uranium. The plutonium results are summarized in Tables 3.8 (DT), 3.9 (CS I), 3.10 (CS II), 3.11 (CS III). The uranium results are summarized in Tables 3.12 (DT), 3.13 (CS I), 3.14 (CS II), and 3.15 (CS III). The results for throw-out soil samples from Project 2.6a, analyzed by gamma spectrometry for Am^{241} from which Pu^{239} is inferred, are tabulated in Table 3.16. The error term is not shown in the table except for sample from BO-06, but in every other case the counting standard deviation is ± 1% or better. Unless otherwise indicated, the aliquot weight was 10.00 grams. A comparison of results obtained by gamma spectrometry with results obtained by radiochemistry for Pu^{239} is given in Table 3.17.

3.6 INTERLABORATORY DATA

Metal samples were dissolved and analyzed for plutonium in direct support of Project 2.1. Although these samples were not a part of the Project 5.2/5.3c allotment of samples, the results are given in Table 3.18 to indicate agreement of interlaboratory data. All of the samples were analyzed by Eberline Instrument Corporation (EIC) and Los Alamos Scientific Laboratory (LASL). Six of the samples were also analyzed by Dow Chemical Company, Rocky Flats Plant (DOW). For most samples the agreement is good, but in some cases the agreement is not as close as was expected.

TABLE 3.1 PLUTONIUM RECOVERY AND SENSITIVITY

Type of Sample	Number of Samples	Sensitivity (dpm)	Average % Recovery
Andersen Disc	360	1.0	35
Casella Disc	568	1.0	30
Air Sample Filter	377	1.0	42
Wire Wipe	17	2.0	73
Film Collector	353	2.0	61
Soil	12	10.0	88
Femur-Dog	10	1.0	56
Femur-Sheep	44	2.0	42
Femur-Burro	15	5.0	35
Kidney-Dog	10	1.0	55
Kidney-Sheep	43	2.0	55
Kidney-Burro	15	5.0	52
Liver-Dog	11	2.0	41
Liver-Sheep	44	5.0	31
Liver-Burro	15	10.0	43
Lung-Dog	13	0.5	71
Lung-Sheep	42	1.0	56
Lung-Burro	15	2.0	60
Hylar node-Dog	10	0.5	48
Hylar node-Sheep	44	0.5	58

Table 3.1 (Con't).

Type of Sample	Number of Samples	Sensitivity (dpm)	Average % Recovery
Hylar node-Burro	13	1.0	43
Urine-Sheep	67	5.0	52
Feces-Sheep	16	5.0	30

Total physical 1687

Total biological 427

Total 2114

TABLE 3.2 URANIUM RECOVERY AND PRECISION

Fluorometric

Type Sample	ug U/Pellet	% Recovery
Andersen	.025	80
Casella	.025	78
Water	.020	103
"	.020	102
"	.020	98
"	.020	102
"	.020	98
"	.020	100
"	.020	102
"	.020	97
"	.020	100
"	.020	104
"	.020	88
"	.016	92
"	.012	108
Casella	.010	121
"	.010	99
"	.010	108

Table 3.2 (Con't.)

Type Sample	ug U/Pellet	% Recovery
Andersen	.010	94
"	.005	98
"	.005	108
"	.005	54
"	.005	31
"	.005	94
Film Collector	.005	153
"	.005	155
"	.005	88
"	.005	118
"	.005	127
Mean ± S.D. (all samples)		100 ± 24
Mean ± S.D. (samples above .005 ug)		99 ± 10

Radiometric

ug U Added	dpm of Uranium Recovered U238	U234	Total	% Recovery
50	37.2 ± 1.4	35.3 ± 1.3	72.5 ± 2.7	96
50	40.0 ± 2.0	35.3 ± 1.2	75.3 ± 3.2	100
50	32.6 ± 1.3	37.2 ± 2.0	69.8 ± 3.3	93
50	42.8 ± 2.0	39.0 ± 1.5	81.8 ± 3.5	109

Mean 100%

TABLE 3.3 QUALITY CONTROL SAMPLES

Sample No.	Sample Type	Uranium ug/l	Plutonium dpm *	% Pu Recovery
F	Liquid		9.30 ± .40 (2)	100
G	"		9.50 ± .50 (1)	100
CA-24	"		1.00 ± .50	100
CB-11	"		5.10 ± .10 (2)	93
CB-12	"		4.98 ± .08 (2)	96
CC-41	"		9.30 ± .20 (1)	83
CC-83	"		8.60 ± .20 (1)	96
CD-83	"		5.04 ± .18 (3)	99
223	"	198	0.30 ± .10	90
548	"	430	1.60 ± .30	80
638	"	45	2.40 ± .60 (1)	11
AA-41	"	135		

*The plutonium results for liquid samples are reported as dpm/ml

Table 3.3 (Con't.)

Sample No.	Sample Type	Uranium ug/l	Plutonium dpm *	% Pu Recovery
AA-66	Liquid	110		
AB-21	"	550		
AB-51	"	590		
BA-6	Soil		1.44 ± .04 (5)	73
BB-4	"		5.67 ± .14 (4)	62
BD-5	"		2.36 ± .07 (4)	84
BD-7	"		2.13 ± .06 (4)	88
BG-1	"		9.70 ± .50 (2)	79
BH-7	"		2.43 ± .11 (2)	68
BI-10	"		4.94 ± .06 (4)	59
BK-6	"		8.10 ± .30 (3)	65
BK-9	"		8.60 ± .20 (3)	79
BL-9	"		1.29 ± .03 (4)	72

*The plutonium results for liquid samples are reported as dpm/ml

Table 3.3 (Con't.)

Sample No.	Sample Type	Uranium ug/l	Plutonium dpm *	% Pu Recovery
BM-1	Soil		9.20 ± .30 (2)	85
BN-10	"		3.73 ± .11 (3)	60
BP-2	"		2.08 ± .15 (2)	56
91	Soil		1.20 ± .10 (3)	32
92	"		2.32 ± .16 (3)	38
93	"		2.0 ± 1.0	40
94	"		1.54 ± .14 (3)	28
95	"		1.70 ± .07 (5)	70
96	"		2.40 ± .21 (3)	36
97	"		1.05 ± .04 (5)	96
98	"		3.0 ± 1.0	30
1E	Biological		1.15 ± .04 (3)	84
2E	"		Lost in process	

Table 3.3 (Con't.)

Sample No.	Sample Type	Uranium ug/l	Plutonium dpm *	% Pu Recovery
3E	Biological		7.15 ± .42 (2)	5
4E	"		2.28 ± .15 (3)	28
5E	"		1.48 ± .15 (3)	34
6E	"		3.38 ± .15 (3)**	70
7E	"		1.15 ± .03 (2)	56
8E	"		Lost in process	
9E	"		1.20 ± .28 (3)**	3
10E	"		1.55 ± .05 (3)	68
11E	"		6.00 ± .52 (2)	16
12E	"		2.64 ± .12 (2)	30
13E	"		8.40 ± .80 (2)	15
14E	"		6.70 ± .51 (2)	1

** Hole in sample bag- may have lost a portion of sample in shipment.

Table 3.3 (Con't.)

Sample No.	Sample Type	Uranium ug/l	Plutonium dpm *	% Pu Recovery
15E	Biological		2.45 ± .07 (3)	41
16E	"		Lost in process	
17E	"		1.42 ± .09 (2)	5
18E	"		7.50 ± .60 (2)	24

*The plutonium results for liquid samples are reported as dpm/ml

** Hole in sample bag - may have lost a portion of sample in shipment.

TABLE 3.4 SPIKED SAMPLES

TYPE SAMPLE SIMULATED	Pu^{239} ADDED	Pu^{239} by RADIOCHEMISTRY
Andersen Disc	65,000	67,000±2,000
"	130,000	137,000±3,000
Film Collector	65,000	66,000±2,000
"	65,000	51,000±2,000
"	65,000	67,000±2,000
"	130,000	129,000±3,000
"	130,000	135,000±3,000
"	130,000	132,000±3,000
Casella Disc	65,000	63,000±2,000
"	65,000	69,000±2,000
"	65,000	68,000±2,000
"	130,000	136,000±3,000
"	130,000	129,000±3,000
"	130,000	129,000±3,000

TABLE 3.5 QUALITY CONTROL BLANKS

IDENTIFICATION	MAXIMUM dpm of SAMPLES	dpm Pu^{239} in BLANK
B-452	10^2	0.10±0.05
B-506	10^2	0.00±0.10
B-507	10^2	0.09±0.07
B-508	10^2	0.17±0.06
B-509	10^2	0.35±0.08
B-601	10^2	0.10±0.10
B-602	10^2	0.06±0.04
B-605	10^2	0.03±0.03
B-606	10^2	0.11±0.06
B-607	10^2	0.09±0.04
B-608	10^2	0.50±0.10
B-609	10^2	0.00±0.10
B-610	10^2	0.03±0.03
B-611	10^2	0.20±0.10
B-612	10^2	0.08±0.05
B-613	10^2	0.40±0.10
B-687	10^2	0.13±0.03
B-688	10^2	1.20±0.10
B-689	10^2	0.51±0.08
B-690	10^2	0.27±0.04
B-691	10^2	0.23±0.03

Table 3.5 (Con't.)

IDENTIFICATION	MAXIMUM dpm of SAMPLES	dpm Pu^{239} in BLANK
B-692	10^2	0.13±0.03
B-693	10^2	0.08±0.03
B-708	10^2	0.32±0.05
B-710	10^2	0.26±0.04
B-711	10^2	0.70±0.11
B-712	10^2	0.39±0.06
B-714	10^2	0.14±0.03
P2Q	10^4	1.1±1.1
P3	10^4	2.2±0.6
P4	10^4	1.9±0.5
P1	10^5	3.4±0.7
P2	10^5	4.1±0.8
B1	10^5	49±16
C1	10^5	35±12
D1	10^5	9±3
B2	10^5	4.7±0.2
C2	10^5	24±5
P8	10^6	8.0±1.1
P6	10^6	2.2±0.5
P3	10^6	4.3±0.2
P10	10^7	24.0±1.9
P7	10^7	14.0±1.3
P5	10^7	9.8±1.2
P4Q	10^7	13.1±0.3

TABLE 3.6 BIOLOGICAL SAMPLES, PLUTONIUM

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
4-1001		Lung	93.3	0.9±0.3	19
1-1018		Bone	51.6	1.6±0.3	100
2-1018		Kidney	67.5	0.5±0.3	37
3-1018		Liver	350.5	0.8±0.3	35
4-1018		Lung	93.3	0.9±0.3	19
5-1018		H.Node	1.3	0.5±0.2	40
1-1045		Bone	37.0	1.0±0.2	61
4-1045		Lung	103.7	6.3±0.2	61
5-1045		H.Node	1.9	0.2±0.2	24
3-1046		Liver	297.0	0.5±0.2	39
4-1046		Lung	91.4	15.3±0.6	83
1-1056	D-180	Bone	41.1	0.4±0.3	34
2-1056	D-180	Kidney	47.0	0.2±0.2	63
3-1056	D-180	Liver	330.0	0.4±0.4	34
4-1056	D-180	Lung	105.7	1.1±0.2	99
5-1056	D-180	H.Node	1.4	0.9±0.3	43
1-1057	D-180	Bone	33.7	0.5±0.2	90
2-1057	D-180	Kidney	36.0	0.4±0.2	53
3-1057	D-180	Liver	370.2	2.4±0.8	24
4-1057	D-180	Lung	87.1	2.4±0.6	38

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
5-1057	D-180	H.Node	1.7	3.7±0.4	20
1-1068	D-180	Bone	42.3	1.3±0.2	43
2-1068	D-180	Kidney	66.4	0.5±0.2	75
3-1068	D-180	Liver	290.6	7.9±0.8	52
4-1068	D-180	Lung	89.8	5.4±0.3	80
5-1068	D-180	H.Node	1.2	0.5±0.1	60
1-1083	D-180	Bone	50.5	0.8±0.2	52
2-1083	D-180	Kidney	50.9	0.2±0.1	50
3-1083	D-180	Liver	332.0	1.4±0.5	55
4-1083	D-180	Lung	99.9	6.2±0.3	100
5-1083	D-180	H.Node	1.8	0.9±0.2	56
1-1102C	D-180	Bone	41.4	0.3±0.1	61
2-1102C	D-180	Kidney	51.1	0.2±0.2	63
3-1102C	D-180	Liver	201.5	2.4±0.3	19
4-1102C	D-180	Lung	86.4	0.8±0.1	74
5-1102C	D-180	H.Node	0.9	0.6±0.2	52
1-1119		Bone	50.5	0.2±0.1	45
2-1119		Kidney	52.4	0.14±0.08	48
3-1119		Liver	357.5	1.4±0.3	36
5-1119		H.Node	1.3	0.2±0.1	52
1-1124	D-180	Bone	43.1	1.7±0.2	83

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
2-1124	D-180	Kidney	47.1	0.6±0.3	63
3-1124	D-180	Liver	494.0	2.3±0.7	28
4-1124	D-180	Lung	105.1	3.9±0.2	66
5-1124	D-180	H. Node	2.1	0.3±0.2	55
1-1129	D-180	Bone	42.2	0.9±0.2	45
2-1129	D-180	Kidney	73.7	0.6±0.3	90
3-1129	D-180	Liver	393.5	0.6±0.3	21
4-1129	D-180	Lung	92.7	2.9±0.2	58
5-1129	D-180	H.Node	1.6	0.68±0.12	58
2-1134		Kidney	42.7	1.2±0.3	31
3-1134		Liver	380.5	7.5±0.5	85
4-1134		Lung	75.8	1.0±0.2	100
4-1654X		Lung	393.0	1.5±0.2	100
1-2021	D-30	Bone	200.0	6.9±0.5	35
2-2021	D-30	Kidney	113.8	2.6±1.3	19
3-2021	D-30	Liver	621.9	1.7±0.2	61
4-2021	D-30	Lung	553.8	1.1±0.4	100
5-2021	D-30	H. Node	8.9	0.00±0.06	46
1-2026	D-30	Bone	215.0	4.7±0.5	20
2-2026	D-30	Kidney	120.0	0.00±0.04	70
3-2026	D-30	Liver	692.3	3.7 ±0.2	75
4-2026	D-30	Lung	662.8	1.1±0.3	70
5-2026	D-30	H. Node	11.8	1.22±0.14	74

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
1-2028		Bone	185.8	1.6±0.3	74
2-2028		Kidney	107.4	0.5±0.2	51
3-2028		Liver	700.5	0.8±0.2	46
1-2029	D-3	Bone	188.2	5.5±1.1	6
2-2029	D-3	Kidney	100.0	0.00±0.08	51
3-2029	D-3	Liver	626.2	3.1±0.4	25
4-2029	D-3	Lung	623.1	10.7±0.6	91
5-2029	D-3	H. Node	2.35	0.00±0.06	75
1-2040	D-3	Bone	182.3	2.4±0.7	10
2-2040	D-3	Kidney	100.8	0.32±0.07	68
3-2040	D-3	Liver	559.2	0.17±0.04	18
4-2040	D-3	Lung	409.0	Lost in Process	
5-2040	D-3	H. Node	8.70	0.00±0.07	78
1-2041	D-30	Bone	179.8	3.3±0.5	67
2-2041	D-30	Kidney	117.3	1.3±0.5	26
3-2041	D-30	Liver	652.5	1.3±0.4	64
4-2041	D-30	Lung	422.0	2.3±0.5	34
5-2041	D-30	H. Node	7.7	0.09±0.05	54
1-2042	D-180	Bone	204.8	0.7±0.3	40
2-2042	D-180	Kidney	114.6	0.3±0.1	66
3-2042	D-180	Liver	762.4	Lost in Process	
4-2042	D-180	Lung	394.4	0.9±0.2	45

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
5-2042	D-180	H. Node	5.8	0.3±0.1	46
1-2044	D-14	Bone	199.0	0.0±0.0	12
2-2044	D-14	Kidney	144.7	0.00±0.07	53
3-2044	D-14	Liver	780.4	4.0±0.1	60
4-2044	D-14	Lung	466.6	5.5±0.4	74
5-2044	D-14	H. Node	0.45	0.00±0.04	85
1-2051	D-180	Bone	182.9	10.9±0.7	28
2-2051	D-180	Kidney	97.6	0.1±0.1	59
3-2051	D-180	Liver	536.3	0.0±0.0	60
4-2051	D-180	Lung	340.4	1.1±0.3	77
5-2051	D-180	H. Node	3.6	0.9±0.2	49
1-2062	D-180	Bone	157.4	0.0±0.1	96
2-2062	D-180	Kidney	106.5	0.6±0.2	51
3-2062	D-180	Liver	545.0	2.7±1.5	11
4-2062	D-180	Lung	388.3	1.4±0.3	60
5-2062	D-180	H. Node	8.2	0.1±0.1	32
1-2070		Bone	192.2	1.8±0.3	47
2-2070		Kidney	100.0	0.00±0.05	45
3-2070		Liver	653.1	0.0±0.2	10
4-2070		Lung	396.8	5.4±0.4	48
5-2070		H. Node	1.60	0.27±0.06	62
1-2076	D-3	Bone	207.2	9.2±0.5	40

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
2-2076	D-3	Kidney	121.3	0.00±0.08	45
3-2076	D-3	Liver	652.2	2.2±0.3	20
4-2076	D-3	Lung	471.4	3.5±0.3	59
5-2076	D-3	H. Node	6.35	0.00±0.08	78
1-2077	D-180	Bone	163.6	0.7±0.2	55
2-2077	D-180	Kidney	115.7	0.9±0.3	63
3-2077	D-180	Liver	632.1	1.3±0.6	50
4-2077	D-180	Lung	344.3	2.8±0.3	42
5-2077	D-180	H. Node	8.5	1.0±0.2	42
1-2081	D-30	Bone	180.0	1.8±0.2	43
2-2081	D-30	Kidney	113.3	0.06±0.09	53
3-2081	D-30	Liver	583.3	2.3±0.6	67
4-2081	D-30	Lung	393.6	57.3±4.1	6
5-2081	D-30	H.Node	9.5	0.0±0.1	39
1-2094	D-14	Bone	165.6	6.6±1.4	6
2-2094	D-14	Kidney	126.0	1.1±0.2	56
3-2094	D-14	Liver	798.8	0.6±0.3	25
4-2094	D-14	Lung	422.7	7.0±0.6	88
5-2094	D-14	H. Node	0.40	0.00±0.06	79
1-2096	D-180	Bone	185.5	1.9±0.4	34
2-2096	D-180	Kidney	86.5	0.8±0.4	42
3-2096	D-180	Liver	604.5	0.9±0.5	35

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
4-2096	D-180	Lung	477.8	3.6±0.2	62
5-2096	D-180	H. Node	9.7	6.0±0.5	43
1-2099	D-180	Bone	175.2	13.4±0.6	98
2-2099	D-180	Kidney	116.1	0.0±0.0	49
3-2099	D-180	Liver	653.2	0.0±0.0	8
4-2099	D-180	Lung	460.9	2.2±0.3	37
5-2099	D-180	H. Node	3.1	1.1±0.3	13
1-2105	D-14	Bone	178.7	0.5±0.3	19
2-2105	D-14	Kidney	102.0	0.00±0.08	48
3-2105	D-14	Liver	736.2	0.7±0.1	46
4-2105	D-14	Lung	398.5	4.1±0.4	24
5-2105	D-14	H. Node	0.70	0.00±0.04	78
1-2108C	D-180	Bone	157.4	0.0±0.1	91
2-2108C	D-180	Kidney	113.1	0.7±0.4	62
3-2108C	D-180	Liver	589.8	0.0±0.0	30
4-2108C	D-180	Lung	375.8	0.0±0.3	23
5-2108C	D-180	H. Node	8.3	0.11±0.06	56
1-2109		Bone	165.4	0.24±0.15	33
2-2109		Kidney	84.4	0.7±0.2	46
3-2109		Liver	527.3	1.3±0.5	20
4-2109		Lung	435.0	7.6±0.6	71
5-2109		H. Node	2.0	0.1±0.1	51
1-2117	D-7	Bone	239.0	0.6±0.2	42

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
2-2117	D-7	Kidney	115.0	0.00±0.08	64
3-2117	D-7	Liver	591.2	3.4±0.4	20
4-2117	D-7	Lung	416.6	120±6	62
5-2117	D-7	H. Node	3.85	0.00±0.05	77
1-2118	D-3	Bone	209.1	2.6±0.7	11
2-2118	D-3	Kidney	101.4	0.40±0.18	50
3-2118	D-3	Liver	512.4	1.2±0.5	20
4-2118	D-3	Lung	546.2	1.6±0.3	84
5-2118	D-3	H. Node	9.00	0.00±0.07	60
1-2135	D-3	Bone	201.6	5.5±0.3	71
2-2135	D-3	Kidney	115.3	0.00±0.09	60
3-2135	D-3	Liver	779.6	0.6±0.1	28
4-2135	D-3	Lung	458.5	19.5±0.9	14
5-2135	D-3	H. Node	14.45	0.00±0.04	55
1-2136	D-14	Bone	191.8	Lost in Process	
2-2136	D-14	Kidney	143.8	0.20±0.12	50
3-2136	D-14	Liver	907.6	5.2±0.5	14
4-2136	D-14	Lung	458.0	Lost in Process	
5-2136	D-14	H. Node	2.55	Lost in Process	
1-2141	D-3	Bone	174.4	7.4±0.8	50
2-2141	D-3	Kidney	108.3	0.00±0.09	66
3-2141	D-3	Liver	548.2	1.9±0.1	33
4-2141	D-3	Lung	393.8	1.4±0.3	20

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
5-2141	D-3	H. Node	4.2	0.00±0.03	81
1-2142	D-3	Bone	222.1	3.8±0.7	13
2-2142	D-3	Kidney	115.7	0.23±0.07	59
3-2142	D-3	Liver	640.7	1.0±0.3	79
4-2142	D-3	Lung	430.8	2.9±0.6	27
5-2142	D-3	H. Node	2.20	Lost in Process	
1-2144	D-3	Bone	193.6	0.7±0.4	9
2-2144	D-3	Kidney	101.0	0.00±0.10	45
3-2144	D-3	Liver	not weighed	1.5±0.3	15
4-2144	D-3	Lung	451.5	22.2±0.8	68
5-2144	D-3	H. Node	2.90	0.32±0.08	42
1-2146	D-3	Bone	185.7	47.3±3.7	9
2-2146	D-3	Kidney	87.0	0.2±0.1	67
3-2146	D-3	Liver	not weighed	2.3±0.6	37
4-2146	D-3	Lung	629.3	2.9±0.3	78
5-2146	D-3	H. Node	18.3	Lost in Process	
1-2150	D-3	Bone	242.2	27.8±1.3	78
2-2150	D-3	Kidney	109.0	0.04±0.11	49
3-2150	D-3	Liver	551.1	Lost in Process	
4-2150	D-3	Lung	not weighed	22.2±0.7	20
5-2150	D-3	H. Node	1.3	0.00±0.06	73
1-2151	D-180	Bone	183.5	2.5±0.5	32

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
2-2151	D-180	Kidney	126.4	0.3±0.2	66
3-2151	D-180	Liver	742.5	7.0±1.1	7
4-2151	D-180	Lung	343.8	0.8±0.2	78
5-2151	D-180	H.Node	7.2	0.3±0.1	38
1-2153	D-3	Bone	201.6	32.9±1.6	28
2-2153	D-3	Kidney	125.4	0.5±0.1	88
3-2153	D-3	Liver	798.0	2.6±1.0	1
4-2153	D-3	Lung	501.2	1.6±0.3	33
5-2153	D-3	H.Node	1.75	4.9±0.3	100
1-2154	D-30	Bone	163.1	1.9±0.3	40
2-2154	D-30	Kidney	102.2	1.6±0.5	43
3-2154	D-30	Liver	583.0	0.5±0.1	89
4-2154	D-30	Lung	398.8	1.6±0.3	51
5-2154	D-30	H.Node	10.4	0.58±0.11	100
1-2155		Bone	152.2	1.1±0.3	54
2-2155		Kidney	107.8	0.3±0.1	73
3-2155		Liver	581.8	3.2±0.9	10
4-2155		Lung	400.8	8.0±0.7	91
5-2155		H.Node	4.4	0.3±0.1	68
1-2156	D-180	Bone	167.8	0.5±0.2	64
2-2156	D-180	Kidney	96.4	0.3±0.2	54
3-2156	D-180	Liver	555.3	1.8±0.5	61

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
4-2156	D-180	Lung	327.2	7.7±0.5	60
5-2156	D-180	H. Node	7.6	0.2±0.1	67
1-2163	D-30	Bone	192.0	1.7±0.3	22
2-2163	D-30	Kidney	125.7	0.00±0.06	67
3-2163	D-30	Liver	761.8	3.4±0.5	29
4-2163	D-30	Lung	410.0	1.9±0.4	40
5-2163	D-30	H. Node	7.0	0.00±0.06	77
1-2167	D-180	Bone	168.1	3.3±0.3	67
2-2167	D-180	Kidney	108.1	0.9±0.3	54
3-2167	D-180	Liver	595.5	0.7±0.7	22
4-2167	D-180	Lung	327.7	3.5±0.5	52
5-2167	D-180	H. Node	7.6	0.18±0.07	63
5-2171		H. Node	2.1	0.5±0.2	21
1-2176	D-3	Bone	207.2	0.5±0.2	44
2-2176	D-3	Kidney	100.1	0.00±0.04	52
3-2176	D-3	Liver	543.3	9±3	3
4-2176	D-3	Lung	384.8	317±13	92
5-2176	D-3	H. Node	2.05	0.00±0.04	77
1-2178		Bone	207.2	0.5±0.2	44
2-2178		Kidney	107.6	0.5±0.2	47
3-2178		Liver	625.0	7.5±1.3	18
5-2178		H. Node	1.1	0.2±0.1	75

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
1-2181	D-3	Bone	168.3	6.4±0.5	67
2-2181	D-3	Kidney	86.0	1.0±0.3	17
3-2181	D-3	Liver	503.1	0.7±0.1	25
4-2181	D-3	Lung	391.6	1.3±0.2	39
5-2181	D-3	H. Node	15.1	0.00±0.02	82
1-2184	D-3	Bone	222.4	3.7±0.9	10
2-2184	D-3	Kidney	99.9	0.00±0.07	70
3-2184	D-3	Liver	580.0	3.7±0.4	27
4-2184	D-3	Lung	396.4	8.3±0.4	69
5-2184	D-3	H. Node	5.8	Lost in Process	
1-2187	D-180	Bone	203.3	7.1±0.6	21
2-2187	D-180	Kidney	105.3	0.2±0.2	57
3-2187	D-180	Liver	590.0	0.9±0.2	22
4-2187	D-180	Lung	407.8	1.0±0.3	59
5-2187	D-180	H. Node	2.2	0.3±0.3	14
1-2191	D-14	Bone	196.2	0.6±0.2	44
2-2191	D-14	Kidney	117.2	0.28±0.11	61
3-2191	D-14	Liver	666.4	2.9±0.6	14
4-2191	D-14	Lung	395.2	40.8±1.4	75
5-2191	D-14	H. Node	1.75	0.00±0.05	63
1-2199		Bone	221.5	1.1±0.2	64
3-2199		Liver	642.7	0.5±0.3	72

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
4-2199		Lung	593.2	6.1±0.4	100
5-2199		H. Node	1.8	0.0±0.0	12
1-2200C	D-180	Bone	209.3	7.0±0.5	45
2-2200C	D-180	Kidney	134.7	0.3±0.2	48
3-2200C	D-180	Liver	639.7	2.3±0.6	17
4-2200C	D-180	Lung	524.1	1.2±0.2	67
5-2200C	D-180	H. Node	1.4	0.5±0.2	37
1-3002	D-180	Bone	840.8	28.8±1.5	18
2-3002	D-180	Kidney	598.6	4.2±0.6	29
3-3002	D-180	Liver	1946.3	17.5±1.3	40
4-3002	D-180	Lung	1319.3	12.6±0.7	52
5-3002	D-180	H. Node	7.9	1.4±0.3	20
1-3021		Bone	890.6	9.8±0.9	32
2-3021		Kidney	618.4	1.3±0.3	53
3-3021		Liver	1933.0	35±5	9
4-3021		Lung	1328.9	5.5±0.5	84
5-3021		H. Node	16.3	0.2±0.1	31
1-3027		Bone	996.8	15±2	10
2-3027		Kidney	567.5	0.8±0.3	40
3-3027		Liver	1928.3	27.3±1.3	40
4-3027		Lung	1583.4	42±2	50
5-3027		H. Node	7.7	0.2±0.2	17

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	$dpmPu^{239}$	% RECOVERY
1-3028		Bone	829.3	2.4±1.2	63
2-3028		Kidney	911.3	0.6±0.2	100
3-3028		Liver	1900.0	109±4	48
4-3028		Lung	1401.4	120±5	46
5-3028		H.Node	28.3	7.5±0.9	32
1-3036		Bone	865.0	7.3±0.8	34
2-3036		Kidney	641.8	0.8±0.3	52
3-3036		Liver	2280.0	23±2	57
4-3036		Lung	1232.0	3.0±0.6	100
5-3036		H.Node	8.8	0.05±0.04	78
1-3059		Bone	1027.8	9.9±0.9	42
2-3059		Kidney	802.4	0.4±0.1	28
3-3059		Liver	3516.0	76±4	27
4-3059		Lung	1275.5	24.3±1.6	55
1-3060C		Bone	838.7	4.0±1.0	15
2-3060C		Kidney	490.0	8.0±0.5	100
3-3060C		Liver	1827.8	9.0±0.6*	80
4-3060C		Lung	1066.3	2.5±0.4	83
5-3060C		H.Node	7.6	0.10±0.06	60
1-3067		Bone	918.0	7.4±1.1	29
2-3067		Kidney	882.3	1.4±0.4	24

* Sample 3-3073 Exploded during wet ashing and may have contaminated sample 3-3060C

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
3-3067		Liver	3094.0	10.9±2.2	64
4-3067		Lung	770.0	10.6±0.9	50
5-3067		H.Node		0.64±0.42	5
1-3073		Bone	1120.8	5.8±1.0	20
2-3073		Kidney	669.7	1.1±0.5	12
3-3073		Liver	2681.0	8.7±0.9*	26
4-3073		Lung	1344.4	7.5±0.6	95
5-3073		H.Node	15.1	0.2±0.1	70
1-3107		Bone	929.0	15.8±1.1	61
2-3107		Kidney	845.0	2.3±0.6	39
3-3107		Liver	3048.0	16.7±0.8	63
4-3107		Lung	1812.0	31.9±1.1	29
5-3107		H.Node	9.0	0.00±0.06	76
1-3110		Bone	1043.5	6.2±0.4	73
2-3110		Kidney	836.3	0.7±0.2	48
3-3110		Liver	2905.0	66.3±5.8	6
4-3110		Lung	1090.0	626±28	40
5-3110		H.Node	10.5	0.0±0.0	7
1-3130		Bone	976.0	8.0±1.1	39
2-3130		Kidney	804.8	0.13±0.13	13
3-3130		Liver	2213.0	66±3	82

* Sample 3-3073 exploded during wet ashing and may have contaminated sample 3-3060C

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
4-3130		Lung	1362.0	21.6±0.6	44
5-3130		H. Node	7.6	0.35±0.07	48
1-3133		Bone	1177.7	6.3±0.8	46
2-3133		Kidney	670.5	0.9±0.2	60
3-3133		Liver	2655.0	0.0±0.0	57
4-3133		Lung	1497.0	13.1±0.7	35
5-3133		H. Node		0.17±0.09	44
1-3136		Bone	1201.0	36.9±2.6	30
2-3136		Kidney	727.2	7.7±0.7	95
3-3136		Liver	2459.0	16.9±1.6	9
4-3136		Lung	1342.0	36.6±2.0	61
5-3136		H. Node	21.0	0.04±0.05	67
1-3143	D-180	Bone	1028.6	9.0±1.3	18
2-3143	D-180	Kidney	879.5	1.0±0.2	80
3-3143	D-180	Liver	3655.5	144±4	39
4-3143	D-180	H. Node	1213.8	135±4	70
218C	30 day	Urine	9233.3	23.6±1.8**	29
238C	30 day	Urine	8128.1	3.1±0.3**	100
241C	90 day	Urine	5441.4	15.0±1.3**	38
247	90 day	Urine	3590.1	5.8±0.8***	37
247	30 day	Urine	838.7	2.2±0.3	64
247	12-2-63	Urine	2380.0	15.6±1.1	33

** Composite of 5 samples
*** Composite of 4 samples

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
2092	11-28-63	Urine	818.0	29.3±1.8	37
2092	11-29-63	"	820.0	3.3±0.5	51
2097	12-2-63	"	3542.0	3.3±0.4	57
2097	12-3-63	"	1314.0	15.6±1.0	6
2097	12-4-63	"	744.0	0.28±.04	67
2097	12-5-63	"	1390.0	3.8±0.5	52
2097	12-6-63	"	992.0	2.7±0.3	100
2111	11-25-63	"	3580.0	9.7±1.2	18
2111	11-26-63	"	1020.0	4.7±0.6	55
2111	11-27-63	"	940.0	5.7±0.5	65
2111	11-28-63	"	1280.0	4.0±0.6	48
2111	11-29-63	"		5.5±0.5	84
2128	11-28-63	"	908.0	6.7±0.9	14
2131	11-29-63	"		Lost in Process	
2133	11-25-63	"	1872.0	4.6±0.8	28
2133	11-26-63	"	2750.0	6.6±0.6	79
2133	11-27-63	"	2020.0	Lost in Process	
2133	11-28-63	"	2240.0	Lost in Process	
2133	11-29-63	"	1816	2.6±0.4	52
2134	11-25-63	"	1476.0	3.9±0.6	45
2134	11-26-63	"	880.0	Lost in Process	
2134	11-27-63	"	1280.0	5.5±0.7	45

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
247	12-3-63	Urine	1374.0	0.79±0.40	2
247	12-4-63	"	1140.0	3.8±0.6	29
247	12-5-63	"	1343.0	2.5±0.5	6
247	12-6-63	"	990.0	4.1±0.4	91
2031	11-25-63	"	2160.0	4.6±0.6	49
2031	11-26-63	"	1110.0	5.2±0.4	89
2031	11-27-63	"	970.0	5.1±0.7	30
2031	11-28-63	"	908.0	5.7±0.5	34
2031	11-29-63	"	790.0	1.5±0.3	50
2036	11-25-63	"	2326.0	6.2±0.8	35
2036	11-26-63	"	1310.0	4.1±0.5	63
2036	11-27-63	"	1984.0	4.4±0.4	82
2036	11-28-63	"	1816.0	2.9±0.4	74
2036	11-29-63	"	1474.0	6.5±0.7	43
2087	11-25-63	"	2562.0	12.0±0.6	23
2087	11-26-63	"	1880.0	2.5±0.3	100
2087	11-27-63	"	1500.0	2.5±0.3	91
2087	11-28-63	"	1272.0	4.0±0.4	80
2087	11-29-63	"	1726.0	2.8±0.5	40
2092	11-25-63	"	1642.0	3.0±0.3	87
2092	11-26-63	"	1160.0	4.2±0.4	76
2092	11-27-63	"	1220.0	4.5±0.7	41

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
2134	11-28-63	Urine	1244.0	2.8±0.4	54
2134	11-29-63	"	908.0	2.5±0.4	66
2157	11-25-63	"	2354.0	4.5±0.5	70
2157	11-26-63	"	1530.0	7.3±1.2	22
2157	11-27-63	"	2160.0	18.8±3.1	4
2157	11-28-63	"	1614.0	2.8±0.5	38
2157	11-29-63	"	1726.0	6.9±1.1	19
2172	11-25-63	"	1956.0	Lost in Process	
2172	11-26-63	"	990.0	30.7±4.3	6
2172	11-27-63	"	1280.0	12.3±1.0	23
2172	11-28-63	"	992.0	Lost in Process	
2172	11-29-63	"	964.0	56.1±3.3	44
B3078	11-25-63	"	3206.0	5.4±0.6	33
B3078	11-26-63	"	2240.0	5.2±0.5	54
B3078	11-27-63	"	1790.0	6.5±1.0	24
B3078	11-28-63	"	1328.0	4.8±0.5	64
B3078	11-29-63	"	1474.0	4.4±0.5	66
218	30 day	Feces	766.0	33.8±1.7	28
238	30 day	"	1391.0	69.8±5.1	17
241	90 day	"	1022.0	38.3±2.6	30
247	90 day	"	1135.0	115±6	25
247	11-25-63	"	1334.0	60±2	39

Table 3.6 (Con't.)

SAMPLE NO.	SACRIFICE DATE	TYPE	WEIGHT (g)	dpm Pu^{239}	% RECOVERY
2031	11-25-63	Feces	1565.0	140±12	4
2036	11-25-63	"	1082.0	96.9±3.4	14
2087	11-25-63	"	1246.0	60.5±3.6	10
2092	11-25-63	"	1391.0	61.7±2.7	31
2097	12-2-63	"	1391.0	55.6±4.0	16
2111	11-25-63	"	1334.0	268±25	13
2133	11-25-63	"	1053.0	24.9±4.5	3
2134	11-25-63	"	1192.0	55.8±1.9	46
2157	11-25-63	"	1198.0	43.6±3.0	14
2172	11-25-63	"	1256.0	51.2±2.5	16
B3078	11-25-63	"	1140.0	46.1±3.1	9

TABLE 3.7 BIOLOGICAL SAMPLES, URANIUM

Sample No.	Type	ug U
1-1119	Bone	0.220
1-1129	"	0.143
2-1056	Kidney	0.021
2-1119	"	0.130
2-2070	"	0.504
2-2077	"	0.053
2-2081	"	0.029
3-1083	Liver	0.073
3-2042	"	0.064
3-2163	"	0.314
3-2178	"	0.047
3-2184	"	0.002
4-1045	Lung	0.063
4-1068	"	0.648
4-2041	"	0.341
4-2070	"	0.047
4-2096	"	0.352
4-2184	"	0.395
5-2136	Hylar Node	0.0002
5-2187	"	0.0002
5-2199	Hylar Node	0.0002
5-3021	"	0.004
2031 (11-28-63)	Urine	5.76
2134 (11-29-63)	"	4.80

TABLE 3.8 PHYSICAL SAMPLES, PLUTONIUM, DOUBLE TRACKS

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	2095	B-038	1	3.81 ± .27 (1)	16
"	"	"	2	4.92 ± .21 (1)	59
"	"	"	3	9.10 ± .90	61
"	"	"	4	8.30 ± .50	30
"	"	"	5	9.90 ± .70	68
Casella	2106	L-20,P5	1	3.08 ± .15 (1)	51
"	"	"	2	1.65 ± .11 (1)	32
"	"	"	3	2.86 ± .21 (1)	42
"	"	"	4	Lost in process	
"	"	"	5	4.00 ±1.20	82
Casella	2108	L26,P5	1	3.48 ± .06 (2)	82
"	"	"	2	1.69 ± .06 (2)	100
"	"	"	3	1.03 ± .02 (2)	82
"	"	"	4	3.20 ± .09 (2)	56
"	"	"	5	2.10 ±0.10 (1)	47
Casella	2109	L30,P5	1	5.45 ± .21 (1)	49
"	"	"	2	3.70 ± .10 (2)	32
"	"	"	3	7.15 ± .25 (1)	77
"	"	"	4	4.97 ± .23 (1)	33
"	"	"	5	2.14 ± .09 (1)	52

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Casella	2110	L6,P13	1	1.06 ± .03 (5)	80
"	"	"	2	5.82 ± .10 (4)	54
"	"	"	3	9.02 ± .11 (3)	55
"	"	"	4	2.16 ± .06 (3)	28
"	"	"	5	5.40 ± .30 (3)	20
Casella	2111	L8,P13	1	2.22 ± .02 (4)*	42
"	"	"	2	6.43 ± .12 (4)	71
"	"	"	3	3.13 ± .05 (4)	80
"	"	"	4	8.45 ± .24 (2)	54
"	"	"	5	3.78 ± .07 (2)	98
Casella	2112	L12,P13	1	5.20 ± .40 (1)	13
"	"	"	2	1.16 ± .02 (2)	94
"	"	"	3	1.20 ± .03 (2)	82
"	"	"	4	1.72 ± .06 (2)	25
"	"	"	5	2.37 ± .07 (2)	56
Casella	2139	L21,P17	1	1.15 ± .03 (2)	58
"	"	"	2	1.00 ± .03 (2)	60
"	"	"	3	3.10 ± .10 (2)	27
"	"	"	4	4.82 ± .16 (2)	68
"	"	"	5	2.15 ± .18 (1)	44
Casella	2143	L23,P9	1	1.63 ± .11 (1)	55
"	"	"	2	2.42 ± .20 (1)	35

*Aliquot spiked

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Casella	2143	L23,P9	3	1.72 ± .20 (1)	24
"	"	"	4	8.60 ± .70	86
"	"	"	5	2.30 ± .20 (1)	48
Casella	2150	L6,P21	1	4.51 ± .10 (4)	64
"	"	"	2	4.24 ± .12 (4)	46
"	"	"	3	2.76 ± .06 (3)	73
"	"	"	4	Lost in process	
"	"	"	5	1.21 ± .02 (3)	94
Casella	2153	L14,P21	1	9.16 ± .03 (4)	43
"	"	"	2	1.74 ± .02 (4)	82
"	"	"	3	3.45 ± .05 (3)*	97
"	"	"	4	3.25 ± .11 (2)	23
"	"	"	5	4.50 ± .02 (2)*	70
Casella	2154	L18,P21	1	1.66 ± .02 (4)	61
"	"	"	2	3.88 ± .06 (3)	84
"	"	"	3	6.34 ± .12 (1)	73
"	"	"	4	3.48 ± .07 (2)	78
"	"	"	5	1.32 ± .03 (2)	49
Casella	2155	L20,P21	1	3.68 ± .06 (3)	46
"	"	"	2	2.31 ± .05 (3)	82
"	"	"	3	1.92 ± .06 (3)	50

*Aliquot spiked

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Casella	2155	L20,P21	4	6.88 ± .18 (2)	68
"	"	"	5	2.14 ± .07 (2)	43
Casella	2401	B-054	1	1.24 ± .08 (1)	58
"	"	"	2	2.43 ± .06 (1)	100
"	"	"	3	1.98 ± .08 (1)	43
"	"	"	4	2.49 ± .15 (1)	38
"	"	"	5	2.03 ± .12 (1)	41
Casella	2402	B-068	1	7.87 ± .11 (3)	79
"	"	"	2	1.08 ± .04 (4)	74
"	"	"	3	5.98 ± .08 (3)	39
"	"	"	4	2.09 ± .05 (3)	64
"	"	"	5	1.87 ± .04 (3)	87
Casella	2405	B-062	1	1.19 ± .01 (3)	83
"	"	"	2	1.10 ± .02 (4)	64
"	"	"	3	2.89 ± .12 (1)	24
"	"	"	4	7.70 ± .30 (1)	70
"	"	"	5	4.10 ± .13 (1)	46
Casella	2408	B-074	1	6.37 ± .08 (3)	96
"	"	"	2	1.07 ± .01 (4)	53
"	"	"	3	4.14 ± .02 (3)	92
"	"	"	4	6.86 ± .11 (2)	77
"	"	"	5	1.45 ± .02 (3)	77

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Casella	2416	B-080	1	8.50 ± .10 (2)	63
"	"	"	2	1.39 ± .05 (1)	100
"	"	"	3	1.45 ± .05 (1)	64
"	"	"	4	7.40 ± .40	84
"	"	"	5	8.57 ± .28 (1)	68
Casella	2435	L2, P5	1	9.29 ± .27 (1)	65
"	"	"	2	3.80 ± .40	72
"	"	"	3	1.87 ± .06 (1)	82
"	"	"	4	5.77 ± .17 (1)	100
"	"	"	5	3.16 ± .09 (1)	64
Casella	2437	L2, P21	1	7.15 ± .10 (3)	57
"	"	"	2	1.84 ± .05 (4)	28
"	"	"	3	3.23 ± .04 (3)	66
"	"	"	4	1.39 ± .04 (3)	62
"	"	"	5	1.17 ± .02 (3)	84
Casella	2459	L3, P1	1	1.22 ± .09 (1)	19
"	"	"	2	1.22 ± .06 (1)	53
"	"	"	3	1.62 ± .06 (1)	74
"	"	"	4	6.40 ± .20 (1)	75
"	"	"	5	9.90 ± .50	61
Casella	2461	L3, P17	1	2.25 ± .04 (4)*	95

*Aliquot spiked

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Casella	2461	L3, P17	2	2.80 ± .05 (4)	15
"	"	"	3	6.64 ± .15 (2)	70
"	"	"	4	1.41 ± .07 (1)	43
"	"	"	5	3.70 ± .09 (2)	50
Casella	2489	BI03	1	1.17 ± .08 (1)	49
"	"	"	2	3.90 ± .40	72
"	"	"	3	1.50 ± .10 (1)	62
"	"	"	4	1.83 ± .08 (1)	34
"	"	"	5	1.72 ± .05 (1)	65
Casella	2501	BI18	1	9.28 ± .32 (1)	28
"	"	"	2	1.32 ± .05 (1)	48
"	"	"	3	5.80 ± .04	85
"	"	"	4	1.12 ± .06 (1)	59
"	"	"	5	1.10 ± .05 (1)	54
Casella	2507	BM08	1	1.76 ± .06 (2)	32
"	"	"	2	6.48 ± .23 (1)	20
"	"	"	3	2.13 ± .16 (1)	58
"	"	"	4	2.15 ± .06 (1)	69
"	"	"	5	3.89 ± .10 (2)	34
Casella	2522	A-042	1	1.51 ± .07 (1)	59
"	"	"	2	6.00 ± .60	21

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Casella	2522	A-042	3	3.80 ± .40	57
"	"	"	4	0.90 ± .30	32
"	"	"	5	1.20 ± .30	80
Casella	2524	A-054	1	2.90 ± .09 (1)	43
"	"	"	2	1.00 ± .07 (1)	30
"	"	"	3	1.03 ± .08 (1)	29
"	"	"	4	3.80 ± .30	99
"	"	"	5	1.03 ± .07 (1)	64
Casella	2528	A-078	1	2.88 ± .02 (3)	44
"	"	"	2	4.23 ± .07 (3)	62
"	"	"	3	1.62 ± .05 (3)	48
"	"	"	4	2.50 ± .10 (2)	52
"	"	"	5	5.27 ± .14 (2)	65
Casella	2530	A-090	1	2.89 ± .10 (1)	39
"	"	"	2	4.90 ± .20 (1)	38
"	"	"	3	1.62 ± .14 (1)	15
"	"	"	4	1.34 ± .06 (1)	56
"	"	"	5	6.70 ± .40	67
Casella	2537	BM12	1	2.58 ± .09 (1)	63
"	"	"	2	7.90 ± .40 (1)	52
"	"	"	3	6.90 ± .60	70

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Casella	2537	BM12	4	1.60 ± .07 (1)	57
"	"	"	5	1.81 ± .08 (1)	67
Casella	2848	D-074	1	3.76 ± .17 (1)	22
"	"	"	2	3.44 ± .16 (1)	49
"	"	"	3	2.72 ± .21 (1)	12
"	"	"	4	8.30 ± .30 (1)	71
"	"	"	5	1.97 ± .08 (1)	48
Casella	2850	D-080	1	1.56 ± .14 (1)	14
"	"	"	2	5.20 ± .70 (1)	71
"	"	"	3	9.10 ± .90	48
"	"	"	4	4.15 ± .21 (1)	48
"	"	"	5	1.07 ± .06 (1)	65
Casella	2857	D-060	1	7.78 ± .18 (2)	75
"	"	"	2	1.25 ± .04 (2)	50
"	"	"	3	2.96 ± .15 (1)	74
"	"	"	4	3.89 ± .17 (1)	19
"	"	"	5	7.70 ± .30 (1)	41
Casella	2863	D-050	1	1.68 ± .05 (3)	59
"	"	"	2	5.30 ± .20 (1)	13
"	"	"	3	9.80 ± .50	59
"	"	"	4	2.41 ± .13 (1)	17
"	"	"	5	2.57 ± .09 (1)	28

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Casella	2867	D-044	1	7.20 ± .70	17
"	"	"	2	2.90 ± .30	77
"	"	"	3	5.00 ± .50	55
"	"	"	4	1.18 ± .07 (1)	46
"	"	"	5	8.70 ± .70	67
Casella	2878	L15, P17	1	1.85 ± .07 (1)	51
"	"	"	2	2.40 ± .30	51
"	"	"	3	3.52 ± .22 (1)	32
"	"	"	4	1.80 ± .20 (1)	12
"	"	"	5	4.90 ± .50	67
Casella	2880	L17, P1	1	3.00 ± .10 (1)	15
"	"	"	2	5.70 ± .50	64
"	"	"	3	8.90 ± .60	84
"	"	"	4	1.08 ± .05 (1)	87
"	"	"	5	3.70 ± .40	50
Casella	2909	L9, P1	1	5.20 ± .30	85
"	"	"	2	Lost in process	
"	"	"	3	1.29 ± .05 (1)	76
"	"	"	4	1.50 ± .20	17
"	"	"	5	1.31 ± .09 (1)	37
Casella	2910	L9, P9	1	1.00 ± .05 (1)	100

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Casella	2910	L9, P9	2	2.30 ± .10 (1)	100
"	"	"	3	4.00 ± .50	86
"	"	"	4	4.90 ± .40	71
"	"	"	5	2.19 ± .16 (1)	65
Casella	2911	L9, P17	1	1.28 ± .03 (4)*	96
"	"	"	2	3.10 ± .10 (3)	60
"	"	"	3	2.19 ± .04 (3)	51
"	"	"	4	4.71 ± .12 (2)	47
"	"	"	5	9.20 ± .30 (2)	60
Casella	2913	L11, P1	1	1.53 ± .09 (1)	55
"	"	"	2	3.30 ± .40	49
"	"	"	3	3.00 ± .50	42
"	"	"	4	Lost in process	
"	"	"	5	2.49 ± .13 (1)	52
Casella	2915	L11, P9	1	1.16 ± .07 (1)	37
"	"	"	2	1.40 ± .10 (1)	41
"	"	"	3	8.00 ± .70	31
"	"	"	4	1.36 ± .06 (1)	49
"	"	"	5	1.30 ± .10 (1)	44
Casella	2916	L11, P17	1	1.27 ± .02 (4)	85
"	"	"	2	2.94 ± .05 (3)	43

*Aliquot spiked

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Casella	2916	L11, P17	3	7.82 ± .02 (2)	47
"	"	"	4	1.60 ± .05 (2)	37
"	"	"	5	1.86 ± .05 (2)	86
Casella	2919	D-034	1	1.36 ± .03 (2)	22
"	"	"	2	4.40 ± .20 (1)	78
"	"	"	3	Lost in process	
"	"	"	4	5.45 ± .19 (1)	29
"	"	"	5	8.50 ± .60 (1)	55
Casella	2923	D-062	1	6.04 ± .24 (2)	58
"	"	"	2	2.97 ± .08 (3)	61
"	"	"	3	8.80 ± .30 (1)	100
"	"	"	4	5.10 ± .11 (3)	98
"	"	"	5	3.66 ± .15 (1)	49
Casella	2926	D-032	1	4.50 ± .40	65
"	"	"	2	7.70 ± .60	68
"	"	"	3	Lost in process	
"	"	"	4	9.70 ±1.10	16
"	"	"	5	3.70 ± .30 (1)	39
Casella	2982	L29, P1	1	3.10 ± .09 (1)	100
"	"	"	2	2.40 ± .10 (1)	62
"	"	"	3	5.00 ±1.00	67

*Aliquot spiked

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Casella	2982	L29, P1	4	9.00 ± .60	56
"	"	"	5	1.00 ± .15 (1)	52
TAS-D	2409	B-068		4.64 ± .08 (4)	86
TAS-D	2494	BI05		1.39 ± .04 (4)	40
TAS-D	2500	BI17		7.38 ± .34 (3)	14
"	2508	BM09		4.39 ± .07 (3)*	77
"	2523	A048		2.05 ± .04 (2)	75
"	2525	A060		2.45 ± .08 (2)	67
"	2529	A-084		1.40 ± .08 (3)	42
"	2531	A096		2.60 ± .13 (2)	82
"	2538	BM-13		1.09 ± .03 (3)	96
"	2543	BC07		1.42 ± .04 (2)	86
"	2547	BC11		1.77 ± .04 (2)	78
"	2855	D-048		2.14 ± .07 (2)	61
"	2864	D-074		1.76 ± .05 (2)	100
"	2980	B036		7.15 ± .21 (2)	30
"	2978	B042		2.02 ± .02 (2)	82
"	2975	B048		2.14 ± .10 (1)	45
"	2970	B-054		5.18 ± .17 (1)	80
"	2972	B-066		2.62 ± .04 (3)	100
"	2973	B-072		1.84 ± .06 (4)	23

*Aliquot spiked

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
TAS-D	2974	B-078		1.25 ± .03 (3)	72
TAS I	2128	L22, P5		1.96 ± .07 (2)	31
"	2129	L22, P13		1.96 ± .07 (2)	36
"	2130	L22, P21		3.79 ± .06 (2)	94
"	2432	L1, P17		1.38 ± .04 (3)	28
"	2439	L7, P1		3.50 ± .10 (2)	51
"	2440	L13, P1		5.40 ± .10 (2)	44
"	2441	L19, P1		6.00 ± .30 (2)	16
"	2444	L7, P17		1.15 ± .01 (5)	32
"	2446	L13, P9		3.75 ± .05 (2)	17
"	2449	L19, P9		Lost in process	
"	2450	L19, P17		6.30 ± .20 (2)	60
"	2452	L25, P9		2.85 ± .14 (1)	35
"	2453	L25, P17		7.40 ± .20 (2)	67
"	2457	L31, P17		7.10 ± .20 (2)	34
"	2466	L4, P5		4.34 ± .16 (2)	43
"	2467	L4, P13		1.02 ± .03 (5)	21
"	2468	L4, P21		2.65 ± .04 (5)	63
TAS II	2845	D060		1.53 ± .03 (3)	54
"	2849	D042		3.40 ± .10 (2)	88
"	2852	D054		9.40 ± .30 (2)	12

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
TAS II	2856	D-048		1.95 ± .04 (3)	59
"	2859	D-036		8.70 ± .20 (2)	46
"	2866	D-078		6.90 ± .20 (2)	54
"	2869	D-072		1.36 ± .02 (3)	75
"	2873	D-066		6.70 ± .10 (3)	75
"	2921	D-030		1.26 ± .03 (3)	53
"	2928	D-084		6.30 ± .20 (2)	43
"	2987	L10, P5		Lost in process	
"	2988	L10, P13		1.62 ± .04 (2)	44
"	2999	L28, P21		Lost in process	
Wire Swipe	2121	L12, P19		1.04 ± .05 (6)	61
"	2122	L14, P21		7.09 ± .04 (5)	62
"	2123	L18, P24		1.19 ± .06 (5)	64
"	2475	L3, P6		8.83 ± .17 (4)*	93
"	2475	L3, P7		5.58 ± .28 (5)	54
"	2475	L3, P8		1.06 ± .05 (6)	66
"	2475	L3, P9		1.90 ± .02 (6)*	55
"	2475	L3, P15		5.94 ± .32 (5)	56
"	2475	L3, P20		1.60 ± .06 (5)*	72
"	5320	L1, P1		3.21 ± .06 (4)*	99
"	5320	L1, P4		2.20 ± .10 (5)	73

*Aliquot spiked

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Wire Swipe	5320	L1, P5		1.15 ± .02 (6)*	85
"	5320	L1, P6		1.65 ± .11 (6)	62
"	5320	L1, P7		6.72 ± .14 (5)	86
"	5320	L1, P11		2.80 ± .05 (6)*	81
"	5320	L1, P16		3.98 ± .20 (5)	76
"	5320	L1, P18		3.82 ± .07 (4)*	100
Gel. Seq.	3991	F 056	1	2.20 ± .30	24
"	"	"	2	5.18 ± .15 (1)	56
"	"	"	3	3.40 ± .20 (2)	54
"	"	"	4	1.30 ± .10	53
"	"	"	5	1.00 ± .10	37
Gel. Seq.	"	"	6	4.90 ± .30	69
"	"	"	7	9.00 ± .50	52
"	"	"	8	8.89 ± .22 (1)	76
"	"	"	9	4.60 ± .30	69
"	"	"	10	2.90 ± .20	59
"	"	"	11	3.35 ± .11 (1)	44
Gel. Seq.	3993	F 064	1	2.59 ± .12 (1)	54
"	"	"	2	1.02 ± .03 (2)	71
"	"	"	3	1.57 ± .05 (2)	59
"	"	"	4	4.67 ± .08 (2)	72

* Aliquot spiked

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	^{239}Pu dpm	% RECOVERY
Gel. Seq	3993	F-064	5	2.29 ± .06 (2)	65
"	"	"	6	1.70 ± .06 (2)	70
"	"	"	7	4.86 ± .11 (2)	70
"	"	"	8	5.70 ± .10 (2)	68
"	"	"	9	1.85 ± .13 (2)	64
"	"	"	10	2.38 ± .07 (2)	55
"	"	"	11	1.25 ± .03 (2)	69
"	"	"	12	8.90 ± .20 (1)	100
Film Coll	8050	BO-09		5.53 ± .13 (6)*	74
"	"	BM-03		1.34 ± .03 (4)*	72
"	"	BM-08		3.00 ± .06 (4)*	78
"	"	BM-09		1.76 ± .05 (6)*	76
"	"	BM-10		Lost in process	
"	8051	CO-09.1		2.92 ± .05 (5)*	53
"	"	CO.09.3		1.89 ± .04 (5)*	83
"	"	CM-09.1		1.84 ± .01 (6)*	90
"	"	CM-09.2		2.64 ± .04 (5)*	87
"	8048	B-064A		8.40 ± .08 (5)*	77
"	"	B-064B		7.76 ± .03 (5)*	89
"	"	B-068		5.50 ± .03 (5)	64

*Aliquot spiked

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Film Coll	8048	B-072A		3.66 ± .18(5)	74
"	"	B-072B		3.79 ± .19 (5)	66
"	"	B-080		Lost in process	
"	"	B-084		1.10 ± .02 (4)	27
"	8046	D-052		7.50 ± .30 (3)*	81
"	"	D-054		7.50 ± .22 (5)*	74
"	"	D-056		7.28 ± .35 (5)	31
"	"	D-058		1.83 ± .05 (5)*	69
"	"	D-062		5.55 ± .20 (5)	38
"	"	D-064		4.73 ± .33 (5)	36
"	"	D-066		2.05 ± .05 (5)*	77
"	"	D-068		2.09 ± .05 (5)*	83
"	"	D-070		6.72 ± .03 (4)*	97
"	8041	F-040		5.17 ± .10 (6)*	79
"	"	F-042		2.90 ± .05 (5)*	84
"	"	F-044		2.13 ± .25 (5)	16
"	"	F-046A		9.00 ± .27 (5)	20
"	"	F-048		Lost in process	
"	"	F-050		1.30 ± .06 (6)	29
"	"	F-052		9.87 ± .27 (5)	9
"	"	F-056		4.84 ± .17 (5)	28

*Aliquot spiked

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Film Coll	8041	F-066		6.50 ± .03(4)	79
"	"	F-068		4.72 ± .02(4)	68
Al. Coll.	9805	D-070		8.25 ± .20(5)*	79
"	9806	C-050		2.11 ± .02(6)*	90
"	9807	B-050		Lost in process	
"	"	B-060		2.50 ± .05(6)*	87
"	9808	A-060		1.18 ± .01(6)*	90
"	"	A-080		2.10 ± .04(5)*	90
"	9809	BO-10		1.05 ± .02(6)*	90
"	9810	BM-08		1.30 ± .04(6)*	90
Film Coll.	010017	STK239		1.16 ± .04(2)	85
"	"	STK240		1.32 ± .03(2)	79
"	"	STK241		3.66 ± .09(2)	55
"	"	STK242		Lost in process	
"	"	STK243		1.08 ± .03(2)	100
"	"	STK244		6.10 ± .20(1)	60
"	"	STK245		1.70 ± .04(2)	36
"	"	STK246		3.26 ± .06(2)	50
"	"	STK247		2.73 ± .08(3)	65
"	"	STK248		2.70 ± .07(3)	77
"	"	STK249		2.73 ± .09(3)	74

*Aliquot spiked

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Film Coll	010019	STK219		4.62 ± .12(1)	77
"	"	STK220		2.09 ± .05(2)	78
"	"	STK221		4.55 ± .19(1)	81
"	"	STK222		2.47 ± .06(2)	85
"	"	STK223		3.62 ± .13(2)	16
"	"	STK224		2.32 ± .04(2)	95
"	"	STK225		1.88 ± .09(2)	24
"	"	STK226		4.40 ± .16(1)	100
"	"	STK227		3.80 ± .10(1)	88
"	"	STK228		3.60 ± .40(1)	60
"	"	STK229		3.86 ± .07(2)	77
"	"	STK230		1.56 ± .06(2)	45
"	"	STK231		1.27 ± .02(3)	64
"	"	STK232		2.33 ± .06(3)	75
"	"	STK233		3.80 ± .10(1)	90
"	"	STK234		1.39 ± .02(2)	100
"	"	STK235		2.80 ± .20(1)	53
"	"	STK236		6.00 ± .20(1)	76
"	"	STK237		1.27 ± .05(2)	28
"	"	STK238		1.46 ± .13(1)	5
"	010026	STK201		6.40 ± .20(2)	70

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Film Coil	010026	STK202		1.93 ± .08(2)	44
"	"	STK203		1.03 ± .04(2)	67
"	"	STK204		1.78 ± .12(1)	77
"	"	STK205		3.14 ± .12(1)	92
"	"	STK206		3.15 ± .12(1)	99
"	"	STK207		1.07 ± .04(2)	63
"	"	STK208		2.56 ± .08(1)	68
"	"	STK209		2.70 ± .10(1)	100
"	"	STK210		1.75 ± .08(1)	85
"	"	STK211		4.59 ± .20(1)	61
"	"	STK212		5.14 ± .21(1)	81
"	"	STK213		2.59 ± .13(1)	100
"	"	STK214		5.70 ± .40(2)	25
"	"	STK215		2.58 ± .05(2)	65
"	"	STK216		5.92 ± .17(2)	30
"	"	STK217		5.20 ± .20(1)	51
"	"	STK218		3.02 ± .07(2)	51
Andersen	2096	B-058	1	6.52 ± .17(2)	12
"	"	"	2	9.90 ± .30(2)	51
"	"	"	3	7.50 ± .30(2)	61
"	"	"	4	6.06 ± .18(2)	83

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Andersen	2096	B-058	6	5.80 ± .16	29
"	"	"	7	1.40 ± .05(3)	29
"	2413	B-064	1	2.87 ± .08(3)	74
"	"	"	2	2.03 ± .05(3)	64
"	"	"	3	6.66 ± .11(2)	100
"	"	"	4	1.20 ± .04(3)	80
"	"	"	6	3.95 ± .13(2)	15
"	"	"	7	1.84 ± .05(3)	72
"	2426	B-070	1	Lost in process	
"	"	"	2	4.58 ± .17(3)	63
"	"	"	3	1.47 ± .03(4)	36
"	"	"	4	1.81 ± .01(4)	86
"	"	"	6	4.40 ± .09(3)	34
"	"	"	7	3.01 ± .07(3)	96
"	2544	BC-08	1	1.25 ± .02(2)	37
"	"	"	2	4.02 ± .10(1)	62
"	"	"	3	5.40 ± .10(1)	60
"	"	"	4	1.40 ± .07(2)	7
"	"	"	6	Lost in process	
"	"	"	7	7.22 ± .23(1)	14
"	2548	BC-12	1	2.32 ± .18(1)	39

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	dpm ^{239}Pu	% RECOVERY
Andersen	2548	BC-12	2	1.29 ± .04(3)	75
"	"	"	3	8.16 ± .27(1)	34
"	"	"	4	1.10 ± .08(2)	10
"	"	"	6	1.55 ± .10(1)	44
"	"	"	7	6.70 ± .30(1)	55
"	2854	D-076	1	5.70 ± .20(1)	88
"	"	"	2	5.17 ± .49(1)	6
"	"	"	3	1.24 ± .10(1)	34
"	"	"	4	3.37 ± .14(1)	29
"	"	"	6	2.40 ± .10(1)	70
"	"	"	7	2.90 ± .10(2)	75
"	2865	D-040	1	1.32 ± .09(1)	80
"	"	"	2	3.70 ± .10(1)	58
"	"	"	3	4.00 ± .20(1)	49
"	"	"	4	1.59 ± .08(1)	60
"	"	"	6	1.00 ± .06(1)	93
"	"	"	7	6.15 ± .33(1)	17
"	2868	D-046	1	1.99 ± .14(1)	62
"	"	"	2	2.38 ± .15(1)	59
"	"	"	3	4.73 ± .15(2)	49
"	"	"	4	1.20 ± .11(1)	61

Table 3.8 (Con't.)

SAMPLE TYPE	TLAB NO.	DT LOCATION	STAGE NO.	239 dpm Pu	% RECOVERY
Andersen	2868	D-046	6	2.60 ± .15(1)	65
"	"	"	7	5.47 ± .22(1)	70
"	2871	D-034	1	2.43 ± .07(1)	69
"	"	"	2	1.98 ± .06(1)	66
"	"	"	3	7.59 ± .19(1)	37
"	"	"	4	5.60 ± .20(1)	75
"	"	"	6	7.96 ± .39(1)	61
"	"	"	7	4.34 ± .19(1)	10
"	2927	D-058	1	4.22 ± .12(2)	41
"	"	"	2	3.39 ± .10(1)	51
"	"	"	3	2.73 ± .16(1)	35
"	"	"	4	4.76 ± .12(1)	55
"	"	"	6	1.05 ± .07(1)	19
"	"	"	7	5.45 ± .15(2)	100
Film Coll	8051	CO-09.2		2.50 ± .05(6)*	94
"	8042	N-050		Lost in process	
"	8050	BM-04		7.42 ± .37(2)	14
"	8046	DO-48		1.50 ± .03(5)*	36
"	8045	DO-48		3.20 ± .08(4)	28

*Aliquot spiked

TABLE 3.9 PHYSICAL SAMPLES, PLUTONIUM, CLEAN SLATE I

SAMPLE TYPE	TLAB NO.	CS I LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	3436	L12,P21	1	1.54 ± .50 (4)	54
"	"	"	2	Lost in process	
"	"	"	3	6.04 ± .12 (2)	99
"	"	"	4	1.17 ± .05 (2)	12
"	"	"	5	8.26 ± .35 (1)	17
Casella	3437	L14,P13	1	3.60 ± .04 (1)	40
"	"	"	2	6.80 ± .06 (1)	26
"	"	"	3	.80 ± .40	49
"	"	"	4	6.00 ±1.00	26
"	"	"	5	7.50 ± .03 (1)	30
Casella	3438	L14,P21	1	1.00 ± .03 (4)	58
"	"	"	2	3.20 ± .27 (2)	55
"	"	"	3	2.26 ± .11 (2)	28
"	"	"	4	4.69 ± .22 (1)	28
"	"	"	5	8.61 ± .42 (1)	1
Casella	3444	L17,P1	1	2.80 ± .40	34
"	"	"	2	1.60 ± .30	89
"	"	"	3	Lost in process	
"	"	"	4	Lost in process	
"	"	"	5	Lost in process	

Table 3.9 (Con't.)

SAMPLE TYPE	TLAB NO.	CS I LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	3446	L18,P13	1	Lost in Process	
"	"	"	2	3.60 ± .80 (1)	48
"	"	"	3	Lost in Process	
"	"	"	4	Lost in Process	
"	"	"	5	Lost in Process	
Casella	3453	L23,P9	1	Lost in Process	
"	"	"	2	Lost in Process	
"	"	"	3	Lost in Process	
"	"	"	4	Lost in Process	
"	"	"	5	1.47 ± .05 (3)	51
Casella	3456	L24,P13	1	2.64 ± .11 (4)	32
"	"	"	2	6.46 ± .14 (3)	48
"	"	"	3	1.98 ± .03 (3)	100
"	"	"	4	4.71 ± .16 (3)	60
"	"	"	5	1.26 ± .03 (2)	34
Casella	3459	L26,P5	1	Lost in Process	
"	"	"	2	Lost in Process	
"	"	"	3	1.91 ± .06 (2)	46
"	"	"	4	9.10 ± .04 (1)	31
"	"	"	5	9.60 ± .20 (2)	10

Table 3.9 (Con't.)

SAMPLE TYPE	TLAB NO.	CS I LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	3464	L27,P9	1	8.70 ± .14 (4)	52
"	"	"	2	2.83 ± .06 (4)	89
"	"	"	3	1.11 ± .05 (1)	61
"	"	"	4	Lost in process	
"	"	"	5	1.20 ± .02 (3)	86
Casella	3422	L5P9	1	1.15 ± .04 (2)	55
"	"	"	2	3.42 ± .12 (1)	47
"	"	"	3	1.06 ± .09 (1)	72
"	"	"	4	1.21 ± .07 (1)	36
"	"	"	5	1.21 ± .10 (1)	41
Casella	3424	L8,P5	1	2.02 ± .07 (1)	45
"	"	"	2	5.03 ± .10 (1)	66
"	"	"	3	5.70 ± .40	81
"	"	"	4	1.10 ± .10 (1)	22
"	"	"	5	5.45 ± .15 (1)	100
Casella	3431	L8,P13	1	8.10 ± .50	28
"	"	"	2	Lost in process	
"	"	"	3	Lost in process	
"	"	"	4	Lost in process	
"	"	"	5	Lost in process	

Table 3.9 (Con't.)

SAMPLE TYPE	TLAB NO.	CS I LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	3457	L24,P21	1	3.70 ± .80 (1)	27 **
"	"	"	2	1.20 ± .40 (1)*	59 **
"	"	"	3	Lost in Process	
"	"	"	4	Lost in Process	
"	"	"	5	4.27 ± .24 (1)	23
Tas I	3025	L4,P13		1.30 ± .10 (3)	85
"	3031	L7,P9		2.88 ± .16 (1)	23
"	3030	L10,P13		1.21 ± .09 (2)	4
"	3037	L25,P1		7.10 ± .20 (1)	15
"	3023	L28,P13		6.20 ± .20 (1)	60
Andersen	2614	D-022	1	1.80 ± .05 (3)	27
"	"	"	2	3.26 ± .15	8
"	"	"	3	2.00 ± .20 (1)	17
"	"	"	4	2.54 ± .15 (1)	20
"	"	"	6	1.54 ± .04 (1)	59
"	"	"	7	1.49 ± .24 (1)	18
Andersen	2617	D-028	1	5.05 ± .16 (3)	45
"	"	"	2	3.00 ± .14 (2)	24
"	"	"	3	1.30 ± .10	82
"	"	"	4	4.90 ± .20 (1)	23

*Aliquot Spiked

**Disc lost - data based on original 40 minute count.

Table 3.9 (Con't.)

SAMPLE TYPE	TLAB NO.	CS I LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	2617	D-028	6	1.10 ± .10 (1)	21
"	"	"	7	2.62 ± .29 (1)	4
Andersen	2609	D-040	1	4.15 ± .12 (2)	60
"	"	"	2	2.02 ± .13 (1)	51
"	"	"	3	8.30 ± .30 (1)	27
"	"	"	4	2.50 ± .20 (1)	21
"	"	"	6	3.43 ± .40 (1)	10
"	"	"	7	1.05 ± .09 (1)	51
Casella	2629	D-018	1	3.70 ± .60 (1)	45 **
"	"	"	2	2.00 ± .70 (1)	22 **
"	"	"	3	1.90 ± .50	72
"	"	"	4	5.66 ± .19 (1)	27
"	"	"	5	4.50 ± .70	18
Casella	2621	D-024	1	Lost in Process	
"	"	"	2	Lost in Process	
"	"	"	3	6.50 ± .50	62
"	"	"	4	1.00 ± .08 (1)	31
"	"	"	5	1.50 ± .18 (1)	38
Casella	2619	D-034	1	2.00 ± .02 (2)	95
"	"	"	2	1.70 ± .20 (1)	53

**Disc lost - data based on original 40 minute count.

Table 3.9 (Con't.)

SAMPLE TYPE	TLAB NO.	CS I LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	2619	D-034	3	2.47 ± .17 (1)	25
"	"	"	4	1.28 ± .11 (1)	21
"	"	"	5	3.08 ± .18 (1)	25
Casella	2618	D-038	1	Lost in process	
"	"	"	2	Lost in process	
"	"	"	3	2.40 ± .40	80
"	"	"	4	2.86 ± .23 (1)	21
"	"	"	5	8.70 ± .50 (1)	79
Tas D	3592	D-020		6.09 ± .14 (2)	18
Tas II	3590	D-014		Lost in process	
"	3584	D-020		1.50 ± .06 (2)	27
Tas II	3585	D-026		2.80 ± .09 (3)	16
"	3580	D-030		Lost in process	
"	3582	D-036		5.20 ± .20 (1)	21
"	3581	D-042		Lost in process	
Andersen	2599	F-016	1	1.34 ± .11 (1)	43
"	"	"	2	3.60 ± .10 (1)	55
"	"	"	3	2.18 ± .12 (1)	48
"	"	"	4	Lost in process	
"	"	"	6	9.70 ±1.00	17

Table 3.9 (Con't.)

SAMPLE TYPE	TLAB NO.	CS I LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	2599	F-016	7	1.65 ± .12 (1)	32
Andersen	2600	F-028	1	1.70 ± .05 (3)	69
"	"	"	2	4.10 ± .20 (1)	27
"	"	"	3	5.40 ± .20 (1)	23
"	"	"	4	6.80 ± .30 (2)	14
"	"	"	6	3.40 ± .10 (1)	65
"	"	"	7	3.60 ± .17 (1)	29
Andersen	2596	F-034	1	4.14 ± .16 (1)	41
"	"	"	2	4.60 ± .20 (1)	13
"	"	"	3	8.40 ± .90	12
"	"	"	4	3.70 ± .40 (1)	7
"	"	"	6	4.17 ± .05 (2)	50
"	"	"	7	1.64 ± .15 (1)	25
Andersen	2595	F-040	1	2.58 ± .12 (1)	23
"	"	"	2	6.50 ± .19 (1)	40
"	"	"	3	2.06 ± .13 (2)	5
"	"	"	4	3.77 ± .19 (1)	18
"	"	"	6	4.25 ± .26 (1)	12
"	"	"	7	4.00 ± .20 (1)	54
Casella	2587	F-026	1	9.00 ±2.00	55

Table 3.9 (Con't.)

SAMPLE TYPE	TLAB NO.	CS I LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	2587	F-026	2	8.10 ± .60	44
"	"	"	3	7.06 ± .29 (1)	37
"	"	"	4	4.10 ± .50	33
"	"	"	5	6.30 ± .27 (1)	37
Casella	2578	F-032	1	9.30 ±1.00	44
"	"	"	2	1.83 ± .07 (1)	54
"	"	"	3	3.00 ± .20 (1)	36
"	"	"	4	2.20 ± .10 (1)	100
"	"	"	5	Lost in process	
Tas II	3540	F-020		6.00 ± .40 (1)	10
"	3545	F-030		Lost in process	
Tas D	3554	F-040		1.62 ± .05 (2)	16
Tas II	3544	F-042		Lost in process	
Tas D	3559	F-092		1.04 ± .07 (1)	46
Andersen	3483	FM-017	1	Lost in process	
"	"	"	2	2.78 ± .11 (1)	60
"	"	"	3	1.61 ± .09 (1)	22
"	"	"	4	7.90 ± .29 (1)	36
"	"	"	6	1.25 ± .12 (1)	29
"	"	"	7	1.38 ± .24 (1)	19

Table 3.9 (Con't.)

SAMPLE TYPE	TLAB NO.	CS I LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3482	FM-018	1	1.26 ± .13 (1)	16
"	"	"	2	1.61 ± .09 (1)	31
"	"	"	3	1.33 ± .06 (1)	86
"	"	"	4	3.00 ± .04 (2)	31
"	"	"	6	1.43 ± .09 (1)	19
"	"	"	7	1.08 ± .08 (1)	23
Casella	3478	FM-003	1	7.40 ± .40	49
"	"	"	2	9.20 ± .50	85
"	"	"	3	Lost in process	
"	"	"	4	Lost in process	
"	"	"	5	Lost in process	
Casella	3473	FM-007	1	1.92 ± .03 (2)	42
"	"	"	2	9.11 ± .17 (1)	50
"	"	"	3	Lost in process	
"	"	"	4	Lost in process	
"	"	"	5	Lost in process	
Andersen	3384	H-028	1	1.90 ± .02 (3)	30
"	"	"	2	2.07 ± .12 (1)	34
"	"	"	3	3.88 ± .15 (1)	45
"	"	"	4	4.82 ± .23 (1)	45
"	"	"	6	1.35 ± .09 (1)	59

Table 3.9 (Con't.)

SAMPLE TYPE	TLAB NO.	CS I LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3384	H-028	7	3.81 ± .26 (1)	20
Andersen	3387	H-040	1	3.71 ± .11 (1)	51
"	"	"	2	1.34 ± .02 (2)	66
"	"	"	3	1.50 ± .04 (2)	30
"	"	"	4	8.70 ± .20 (1)	51
"	"	"	6	5.19 ± .15 (1)	50
"	"	"	7	3.55 ± .14 (1)	36
Andersen	3386	H-040	1	2.12 ± .11 (1)	45
"	"	"	2	1.79 ± .10 (1)	61
"	"	"	3	6.40 ± .50 (1)	7
"	"	"	4	2.05 ± .22 (1)	17
"	"	"	6	1.41 ± .09 (1)	24
"	"	"	7	2.56 ± .18 (1)	20
Casella	3398	H-034	1	1.73 ± .06 (2)	9
"	"	"	2	9.10 ± .50	48
"	"	"	3	1.99 ± .26 (1)	39
"	"	"	4	3.48 ± .18 (1)	18
"	"	"	5	8.20 ± .40	95
Casella	3397	H-040	1	3.60 ± .10 (2)	51
"	"	"	2	5.70 ± .60	45

Table 3.9 (Con't.)

SAMPLE TYPE	TLAB NO.	CS I LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	3397	H-040	3	1.12 ± .08 (1)	16
"	"	"	4	1.36 ± .03 (2)	37
"	"	"	5	7.20 ± .50	66
Tas II	3531	H-026		Lost in process	
"	3529	H-048		Lost in process	
Tas D	3537	H-048		9.90 ± .40 (1)	8
Film Coll	8125	J-028		5.48 ± .07 (5)	97
"	"	J-030		2.65 ± .03 (5)	91
"	"	J-032		1.26 ± .05 (5)	67
"	"	J-036		2.70 ± .06 (3)	15
"	"	J-038		Lost in process	
"	"	L-026		2.85 ± .09 (5)	34
"	"	L-028		4.98 ± .11 (5)	98
"	"	L-030		3.88 ± .05 (5)	81
"	"	L-032		4.33 ± .74 (5)	24
"	"	L-034		7.12 ± .35 (4)	55
"	"	L-042		2.84 ± .11 (3)	41
"	8126	N-028		3.64 ± .47 (5)	41
"	"	N-030		7.14 ± .20 (5)*	59
"	"	N-032		2.53 ± .11 (5)*	26

*Aliquot Spiked

Table 3.9 (Con't.)

SAMPLE TYPE	TLAB NO.	CS I STAGE LOCATION NO.	dpm Pu^{239}	% RECOVERY
Film Coll	8126	N-034	1.35 ± .08 (5)	16
"	"	N-036	7.40 ± .10 (3)	61
"	"	N-038	1.89 ± .05 (4)	31
"	"	N-042	3.90 ± .30 (3)*	12
"	"	0-028	1.94 ± .04 (4)*	47
"	"	0-030	6.27 ± .09 (5)	71
"	"	0-032	3.43 ± .04 (5)	87
"	"	0-034	3.10 ± .06 (4)	100
"	"	0-036	6.98 ± .17 (4)*	64
"	"	0-038	4.66 ± .15 (4)*	63
"	"	0-040	6.75 ± .40 (3)*	92
"	"	0-044	8.85 ± .12 (3)*	44
"	8127	P-030	1.00 ± .03 (4)*	54
"	"	P-032	6.58 ± .18 (5)	42
"	"	P-034	2.50 ± .03 (5)*	44
"	"	P-036	7.20 ± .20 (4)	44
"	"	P-040	5.00 ± .12 (4)*	42
"	"	P-044	1.06 ± .21 (4)	4
"	"	L-030	1.37 ± .03 (5)	60
"	8124	F-028	1.85 ± .03 (5)	75

*Aliquot Spiked

Table 3.9 (Con't.)

SAMPLE TYPE	TLAB NO.	CS I LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Film Coll	8127	P-028		6.40 ± .50 (4)	40
"	8120	CO-05.1		Lost in process	
"	"	CO-07.4-A		4.30 ± .50 (4)	38
"	"	CO-07.4-B		2.26 ± .57 (4)	3
"	"	CO-09.0		Lost in process	
Al Coll	9829	H-030		2.64 ± .06 (5)*	88
"	"	AH-06		1.39 ± .03 (6)*	90
"	"	BO-06		Lost in process	
"	"	BL-07		1.53 ± .03(6) *	90
Film Coll	9923	STK821		1.55 ± .03 (4)*	64
"	"	STK822		1.26 ± .08 (3)*	79
"	"	STK823		1.10 ± .03 (4)*	54
"	"	STK824		3.70 ± .10 (3)	84
"	"	STK825		2.95 ± .04 (3)*	91
"	"	STK826		3.50 ± .04 (3)*	82
"	"	STK827		2.42 ± .01 (4)*	100
"	"	STK828		9.50 ± .35 (2)*	27
"	"	STK829		5.50 ± .18 (2)*	89
"	"	STK830		2.05 ± .05 (3)*	52

*Aliquot Spiked

TABLE 3.10 PHYSICAL SAMPLES, PLUTONIUM, CLEAN SLATE II

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3195	H-014	1	Lost in process	
"	"	"	2	3.10 ± .21 (1)	13
"	"	"	3	8.08 ± .93	18
"	"	"	4	2.86 ±3.71	4
"	"	"	6	1.58 ± .17 (1)	10
"	"	"	7	4.22 ± .30 (1)	22
Andersen	3194	H-020	1	1.07 ± .02 (3)	24
"	"	"	2	1.26 ± .15 (1)	11
"	"	"	3	1.44 ± .19 (1)	17
"	"	"	4	Lost in process	
"	"	"	6	3.00 ±1.00	50
"	"	"	7	3.89 ± .36 (1)	8
Andersen	3191	H-040	1	1.30 ± .03 (3)	21
"	"	"	2	2.68 ± .15 (1)	15
"	"	"	3	2.53 ± .44 (1)	5
"	"	"	4	6.60 ± .60	22
"	"	"	6	6.54 ± .69	44
"	"	"	7	4.62 ± .54	25

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3190	H-040	1	1.90 ± .08 (3)	46
"	"	"	2	5.34 ± .30 (1)	25
"	"	"	3	1.16 ± .04 (2)	18
"	"	"	4	1.29 ± .10 (1)	51
"	"	"	6	4.67 ± .30 (1)	24
"	"	"	7	7.70 ± .20 (2)	27
Andersen	3202	H-046	1	1.81 ± .04 (2)	23
"	"	"	2	2.63 ± .13 (1)	27
"	"	"	3	7.08 ± .70	24
"	"	"	4	4.01 ± .54	38
"	"	"	6	1.08 ± .11 (1)	25
"	"	"	7	6.24 ± .78	15
Andersen	3199	H-052	1	6.51 ± .48 (1)	20
"	"	"	2	9.90 ± .20 (1)	27
"	"	"	3	3.10 ± .21 (1)	28
"	"	"	4	2.16 ± .20 (1)	21
"	"	"	6	2.03 ± .15 (1)	18
"	"	"	7	3.71 ± .24 (1)	16

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3201	H-058	1	7.27 ± .18 (2)	31
"	"	"	2	3.40 ± .20 (1)	13
"	"	"	3	5.97 ± .39 (1)	13
"	"	"	4	3.47 ± .26 (1)	25
"	"	"	6	5.16 ± .27 (1)	8
"	"	"	7	6.10 ± .25 (1)	23
Andersen	3200	H-058	1	7.82 ± .21 (2)	54
"	"	"	2	6.10 ± .30 (1)	21
"	"	"	3	2.54 ± .11 (1)	28
"	"	"	4	3.31 ± .34 (1)	12
"	"	"	6	2.24 ± .23 (1)	10
"	"	"	7	3.02 ± .36 (1)	5
Andersen	3198	H-064	1	2.97 ± .15 (1)	53
"	"	"	2	2.45 ± .22 (1)	18
"	"	"	3	8.67 ± .95	38
"	"	"	4	1.16 ± .12 (1)	32
"	"	"	6	3.73 ± .72	28
"	"	"	7	1.89 ± .12 (1)	56

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3197	H-080	1	7.93 ± .27 (2)	39
"	"	"	2	9.00 ± .40 (1)	14
"	"	"	3	2.95 ± .13 (1)	55
"	"	"	4	2.48 ± .20 (1)	11
"	"	"	6	5.59 ± .13 (1)	75
"	"	"	7	1.44 ± .11 (1)	24
Casella	2254	H-006	1	4.70 ± .60	44
"	"	"	2	1.83 ± .15 (1)	14
"	"	"	3	2.60 ± .27 (1)	24
"	"	"	4	6.40 ± .30 (1)	7
"	"	"	5	2.73 ± .29 (1)	19
Casella	2249	H-010	1	2.93 ± .14 (1)	35
"	"	"	2	2.28 ± .10 (1)	49
"	"	"	3	4.22 ± .32 (1)	12
"	"	"	4	Lost in process	
"	"	"	5	1.76 ± .17 (1)	16
Casella	2247	H-016	1	9.11 ± .19 (1)	60
"	"	"	2	8.19 ± .17 (1)	75
"	"	"	3	Lost in process	
"	"	"	4	2.18 ± .06 (2)	21

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	2247	H-016	5	3.09 ± .10 (2)	18
Casella	2251	H-034	1	1.00 ± .03 (2)	37
"	"	"	2	7.55 ± .27 (1)	63
"	"	"	3	1.69 ± .07 (1)	48
"	"	"	4	5.60 ±1.00	28
"	"	"	5	7.10 ± .70	43
Casella	2246	H-038	1	5.50 ± .11 (2)	28
"	"	"	2	2.61 ± .04 (2)	35
"	"	"	3	1.30 ± .06 (1)	95
"	"	"	4	1.10 ± .06 (1)	60
"	"	"	5	1.96 ± .14 (1)	20
Casella	2253	H-040	1	1.43 ± .06 (2)	32
"	"	"	2	4.10 ± .14 (2)	44
"	"	"	3	2.88 ± .11 (1)	49
"	"	"	4	1.19 ± .07 (1)	57
"	"	"	5	Lost in Process	
Casella	2252	H-044	1	2.20 ± .07 (2)	23
"	"	"	2	5.70 ± .20 (1)	29
"	"	"	3	4.67 ± .28 (1)	25
"	"	"	4	4.90 ± .50	64

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	2252	H-044	5	2.24 ± .06 (2)	84
Casella	2245	H-050	1	2.72 ± .11 (2)	3
"	"	"	2	1.28 ± .21 (2)	51
"	"	"	3	1.36 ± .06 (1)	100
"	"	"	4	2.00 ± .06 (1)	44
"	"	"	5	3.51 ± .20 (1)	25
Casella	2242	H-056	1	3.40 ± .40 (2)	2
"	"	"	2	2.00 ± .03 (2)	62
"	"	"	3	Lost in process	
"	"	"	4	5.80 ± .90	46
"	"	"	5	Lost in process	
Casella	2243	H-058	1	5.25 ± .15 (2)	26
"	"	"	2	8.40 ± .20 (1)	30
"	"	"	3	8.10 ± .20 (1)	85
"	"	"	4	9.70 ± .50	100
"	"	"	5	2.82 ± .19 (1)	25
Casella	2250	H-062	1	6.68 ± .25 (2)	20
"	"	"	2	6.75 ± .20 (1)	32
"	"	"	3	2.00 ± .30 (1)	41
"	"	"	4	Lost in process	

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	2250	H-062	5	4.90 ± .50	90
Casella	2241	H-080	1	3.30 ± .04 (2)	52
"	"	"	2	1.08 ± .04 (2)	20
"	"	"	3	2.85 ± .28 (1)	12
"	"	"	4	6.80 ± .50	62
"	"	"	5	2.90 ± .40	50
Tas II	4063	H-006		1.19 ± .02 (3)	35
"	4062	H-012		2.60 ± .40	40
"	4061	H-018		9.80 ± .28 (2)	44
"	4054	H-036		Lost in process	
"	4055	H-042		Lost in process	
Tas D	4049	H-048		3.24 ± .10 (2)	10
Tas II	4057	H-054		Lost in process	
"	4058	H-060		Lost in process	
"	4059	H-066		Lost in process	
Tas D	4050	H-074		1.83 ± .05 (2)	45
"	4047	H-100		1.40 ± .02 (3)	61
"	4048	H-114		1.85 ± .04 (3)	27
Andersen	3157	J-008	1	1.11 ± .11 (1)	15
"	"	"	2	1.64 ± .12 (1)	28

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3157	J-008	3	1.83 ± .14 (1)	34
"	"	"	4	2.04 ± .13 (1)	37
"	"	"	6	1.81 ± .14 (1)	26
"	"	"	7	3.29 ± .19 (1)	21
"	3159	J-014	1	2.20 ± .12 (1)	55
"	"	"	2	5.52 ± .15 (1)	94
"	"	"	3	3.47 ± .17 (1)	48
"	"	"	4	6.78 ± .18 (1)	44
"	"	"	6	1.40 ± .11 (1)	23
"	"	"	7	2.51 ± .21 (1)	16
"	3162	J-020	1	2.30 ± .09 (2)	15
"	"	"	2	1.54 ± .16 (1)	21
"	"	"	3	1.01 ± .13 (1)	18
"	"	"	4	5.61 ± .39 (1)	6
"	"	"	6	1.39 ± .21 (1)	8
"	"	"	7	1.44 ± .10 (1)	31
"	3163	J-026	1	1.69 ± .04 (3)	18
"	"	"	2	5.76 ± .46 (1)	13
"	"	"	3	3.98 ± .29 (1)	21
"	"	"	4	2.47 ± .08 (2)	26

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3163	J-026	6	4.60±.15 (1)	29
"	"	"	7	2.23±.15 (1)	42
Andersen	3165	J-046	1	9.40±.37 (1)	28
"	"	"	2	1.05±.04 (2)	25
"	"	"	3	7.77±.39 (1)	26
"	"	"	4	5.18±.25 (1)	39
"	"	"	6	5.51±.28 (1)	15
"	"	"	7	Lost in Process	
Andersen	3167	J-052	1	2.22±.14 (1)	38
"	"	"	2	1.58±.13 (1)	30
"	"	"	3	1.26±.16 (1)	17
"	"	"	4	1.42±.16 (1)	8
"	"	"	6	4.52±.33 (1)	15
"	"	"	7	1.27±.09 (1)	27
Andersen	3166	J-058	1	8.0±.30 (1)	22
"	"	"	2	4.48±.28 (1)	10
"	"	"	3	1.22±.09 (1)	47
"	"	"	4	2.65±.16 (1)	27
"	"	"	6	1.01±.11 (1)	18
"	"	"	7	Lost in Process	
Andersen	3169	J-060	1	3.55±.12 (1)	37
"	"	"	2	5.43±.22 (1)	25

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3169	J-060	3	3 91±.21 (1)	39
"	"	"	4	Lost in Process	
"	"	"	6	1.53±.14 (1)	35
"	"	"	7	2.00±.80	93
Andersen	3164	J-064	1	3.63±.17 (2)	8
"	"	"	2	4.54±.25 (1)	33
"	"	"	3	3.97±.27 (1)	16
"	"	"	4	2.55±.21 (1)	13
"	"	"	6	1.64±.17 (1)	9
"	"	"	7	2.11±.25 (1)	13
Andersen	3168	J-078	1	5.75±.18 (2)	24
"	"	"	2	8.54±.29 (1)	31
"	"	"	3	3.34±.19 (1)	22
"	"	"	4	Lost in Process	
"	"	"	6	2.98±.26 (1)	11
"	"	"	7	2.43±.16 (1)	34
Andersen	3158	J-040	1	7.57±.42 (1)	19
"	"	"	2	2.45±.18 (1)	24
"	"	"	3	2.58±.22 (1)	17
"	"	"	4	8.71±1.10	24
"	"	"	6	4.89±.62	38
"	"	"	7	2.31±.28 (1)	19
Casella	2196	J-010	1	2.150±.08 (3)	43

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	2196	J-010	2	4.6±.10 (1)	32
"	"	"	3	7.20±1.4	13
"	"	"	4	Lost in Process	
"	"	"	5	Lost in Process	
Casella	2198	J-016	1	2.17±.04 (2)	33
"	"	"	2	2.46±.07 (1)	92
"	"	"	3	3.60±1.80	26
"	"	"	4	8.50±.30 (1)	48
"	"	"	5	1.20±.03 (2)	91
Casella	2197	J-022	1	1.59±.05 (2)	19
"	"	"	2	3.16±.15 (1)	34
"	"	"	3	9.50±.90	10
"	"	"	4	2.50±.30 (1)	5
"	"	"	5	5.52±.15 (2)	13
Casella	2200	J-026	1	1.41±.04 (3)	18
"	"	"	2	8.30±.20 (2)	50
"	"	"	3	Lost in Process	
"	"	"	4	4.25±.19 (1)	67
"	"	"	5	1.84±.31 (1)	7
Casella	2199	J-028	1	2.90±.10 (2)	13
"	"	"	2	2.00±.03 (2)	49
"	"	"	3	8.30±1.30	30

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	2199	J-028	4	3.35±.52 (1)	4
"	"	"	5	1.76±.06 (2)	51
Casella	2203	J-038	1	2.21±.06 (2)	30
"	"	"	2	2.17±.12 (1)	17
"	"	"	3	1.53±.19 (1)	13
"	"	"	4	3.18±.16 (1)	43
"	"	"	5	Lost in process	
Casella	2204	J-042	1	3.15±.12 (1)	38
"	"	"	2	6.07±.19 (1)	57
"	"	"	3	6.50±.30	96
"	"	"	4	5.80±.40 (1)	8
"	"	"	5	1.14±.06 (2)	5
Casella	2202	J-044	1	1.96±.05 (2)	46
"	"	"	2	8.19±.38 (1)	24
"	"	"	3	1.56±.09 (1)	57
"	"	"	4	Lost in process	
"	"	"	5	5.00±.40	40
Casella	2206	J-050	1	2.40±.10 (2)	13
"	"	"	2	1.92±.05 (1)	100
"	"	"	3	1.03±.14 (2)	3
"	"	"	4	3.80±.31 (1)	26
"	"	"	5	8.80±.20 (1)	65

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	2212	J-056	1	2.50±.10 (2)	13
"	"	"	2	1.72±.06 (2)	20
"	"	"	3	6.90±.30 (1)	44
"	"	"	4	Lost in Process	
"	"	"	5	3.96±.16 (1)	15
Casella	2207	J-062	1	3.00±.15 (2)	23
"	"	"	2	1.67±.06 (2)	24
"	"	"	3	2.11±.18 (1)	10
"	"	"	4	2.24±.06 (1)	83
"	"	"	5	4.53±.18 (2)	11
Casella	2210	J-080	1	6.74±.28 (2)	38
"	"	"	2	8.45±.66 (1)	5
"	"	"	3	4.16±.13 (1)	32
"	"	"	4	8.90±1.20	17
"	"	"	5	3.03±.32 (1)	7
Casella	2209	J-106	1	2.45±.08 (2)	14
"	"	"	2	8.65±.44 (2)	2
"	"	"	3	7.40±.20 (1)	100
"	"	"	4	5.24±.43 (1)	20
"	"	"	5	4.50±.20 (1)	37
Tas D	4123	J-000		1.54±.03 (2)	45
Tas II	4144	J-006		5.40±.60	43
Tas II	4143	J-012		1.54±.29 (1)	15

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Tas D	4124	J-014		9.80±.30 (1)	47
Tas II	4142	J-018		4.70±.90 (1)	2
Tas D	4125	J-040		1.32±.04 (2)	40
Tas II	4136	J-042		3.22±.09 (3)	14
Tas II	4137	J-048		3.60±.19 (1)	20
Tas I	4132	J-056		3.96±.13 (2)	66
Tas II	4139	J-060		1.40±.03 (2)	19
Tas I	4133	J-064		3.60±.06 (2)	47
Tas II	4140	J-066		Lost in Process	
Tas D	4126	J-068		2.62±.09 (2)	36
Tas D	4127	J-092		7.90±.20 (2)	25
Tas D	4128	J-120		9.53±.29 (2)	41
Andersen	3179	L-014	1	3.39±.60	30
"	"	"	2	1.40±.12 (1)	16
"	"	"	3	2.93±.21 (1)	23
"	"	"	4	1.60±.10 (1)	36
"	"	"	6	9.40±1.03	34
"	"	"	7	7.01± .50(1)	30
Andersen	3175	L-020	1	6.96±.41 (1)	19
"	"	"	2	1.37±.06 (2)	22
"	"	"	3	5.99±.25 (1)	41
"	"	"	4	1.60±.16 (1)	13

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3175	L-020	6	1.74±.27 (1)	5
"	"	"	7	Lost in Process	
Andersen	3176	L-026	1	3.04±.09 (2)	46
"	"	"	2	7.22±.26 (1)	40
"	"	"	3	3.04±.16 (1)	38
"	"	"	4	2.59±.24 (1)	14
"	"	"	6	1.41±.16 (1)	19
"	"	"	7	1.55±.40 (1)	2
Andersen	3178	L-034	1	1.13±.04 (3)	28
"	"	"	2	Lost in Process	
"	"	"	3	1.77±.06 (2)	29
"	"	"	4	1.07±.04 (2)	31
"	"	"	6	1.58±.14 (1)	38
"	"	"	7	7.57±1.04	16
Andersen	3173	L-052	1	3.26±.02 (2)	50
"	"	"	2	1.60±.04 (2)	58
"	"	"	3	1.14±.03 (2)	44
"	"	"	4	1.24±.03 (2)	48
"	"	"	6	5.33±.17 (1)	53
"	"	"	7	4.00±.24 (1)	40
Andersen	3172	L-064	1	1.84±.16 (1)	32
"	"	"	2	1.35±.09 (1)	46

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3172	L-064	3	1.35±.13 (1)	32
"	"	"	4	2.25±.15 (1)	26
"	"	"	6	1.78±.13 (1)	20
"	"	"	7	1.29±.09 (1)	47
Casella	2214	L-006	1	2.18±.25 (1)	10
"	"	"	2	1.10±0.30	27
"	"	"	3	8.20±1.10	11
"	"	"	4	1.40±0.26 (1)	79
"	"	"	5	1.89±.31 (1)	5
Casella	2213	L-010	1	5.80±.40	28
"	"	"	2	6.40±.60	15
"	"	"	3	8.60±.70	37
"	"	"	4	1.39±.14 (1)	19
"	"	"	5	5.68±.47 (1)	9
Casella	2225	L-016	1	1.00±.10 (1)	26
"	"	"	2	2.78±.19 (1)	12
"	"	"	3	6.40±.70	24
"	"	"	4	7.52±.42 (1)	24
"	"	"	5	1.58±.11 (1)	27
Casella	2221	L-028	1	2.80±.10 (2)	31
"	"	"	2	2.14±.09 (2)	15
"	"	"	3	1.63±.16 (1)	16

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	2221	L-028	4	2.94±.26 (1)	13
"	"	"	5	1.36±.13 (1)	25
Casella	2215	L-032	1	2.30±.03 (2)	49
"	"	"	2	1.15±.03 (2)	46
"	"	"	3	2.46±.20 (1)	20
"	"	"	4	1.09±.15 (1)	19
"	"	"	5	1.66±.12 (1)	35
Casella	2216	L-034	1	1.65±.05 (2)	22
"	"	"	2	1.37±.05 (2)	9
"	"	"	3	6.92±.24 (1)	43
"	"	"	4	9.23±.40 (1)	32
"	"	"	5	3.37±.12 (1)	34
Casella	2226	L-044	1	Lost in Process	
"	"	"	2	3.00±.06 (2)	61
"	"	"	3	1.97±.11 (2)	10
"	"	"	4	5.47±.31 (1)	20
"	"	"	5	3.62±.13 (1)	65
Casella	2223	L-056	1	3.22±.04 (2)	50
"	"	"	2	Lost in Process	
"	"	"	3	6.80±.30 (1)	18
"	"	"	4	1.03±.15 (1)	10
"	"	"	5	2.21±.18 (1)	19

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella 2219		L-088	1	6.08±.31 (1)	26
"	"	"	2	1.66±.16 (1)	37
"	"	"	3	8.80±1.60	12
"	"	"	4	6.60±.60	100
"	"	"	5	6.01±.21 (1)	34
Tas II	4073	L-006		1.70±.10 (1)	31
Tas II	4072	L-012		6.78±.30 (1)	10
Tas II	4071	L-018		1.82±.05 (2)	52
Tas D	4064	L-020		1.16±.05 (2)	39
Tas II	4070	L-024		3.55±.09 (2)	35
Tas II	4074	L-030		1.24±.03 (3)	19
Tas D	4068	L-048		1.95±.04 (3)	53
Tas II	4069	L-066		3.12±.10 (2)	62
Tas D	4067	L-074		7.18±.21 (2)	77
Tas D	4066	L-100		5.70±.16 (2)	46
Tas D	4065	L-114		5.30±.15 (2)	40
Film Collector	8119	F-062-2		7.75±.32 (3)	41
"	"	F-062-3		1.29±.03 (4)	45
"	"	F-062-4		1.04±.03 (4)	46
"	"	F-062-5		2.27±.14 (4)	22
"	"	F-066-3		4.10±.30 (3)	66
"	"	F-066-4		9.50±.15 (3)	31
"	"	F-050-1		1.34±.05 (4)	51

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Film Collector	8119	F-050-2		2.00±.01 (4)*	94
"	"	F-050-3		2.53±.07 (4)	41
"	"	F-050-4		5.50±.13 (4)	42
"	"	F-050-5		4.62±.08 (2)	25
"	"	F-054-2		1.09±.03 (4)*	90
"	"	F-054-3		2.17±.03 (4)*	76
"	"	F-054-4		2.49±.09 (4)	8
"	"	F-054-5		1.99±.04 (4)	76
"	"	F-058-2		1.90±.03 (4)	31
"	"	F-058-3		4.19±.02 (4)*	68
"	"	F-058-4		7.22±.13 (4)*	97
"	8115	G-032		1.28±.01 (5)*	91
"	"	G-034		1.85±.09 (5)	3
"	"	G-036		9.47±.04 (4)*	69
"	"	G-038		1.82±.03 (5)*	100
"	"	G-040		7.95±.03 (4)*	83
"	"	G-042		1.05±.03 (5)	14
"	"	G-044		9.50±.40 (4)*	33
"	"	G-046		3.86±.07 (4)*	96
"	"	G-048		2.42±.03 (4)*	48
"	"	G-050		3.22±.08 (4)	33

* Based on spiked aliquot

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Film Coll	8115	G-052		3.49±.49 (4)*	27
"	"	G-054		6.60±.50 (4)	21
"	"	G-056		2.85±.16 (4)*	8
"	"	G-058		3.18±.12 (4)	41
"	"	G-060		Lost in process	
"	"	G-062		5.00±.10 (4)	17
"	"	G-064		9.78±.26 (3)*	86
"	"	G-066		2.84±.14 (4)	29
"	"	G-068		3.30±.20 (4)	7
"	"	G-070		2.74±.07 (4)	30
"	"	G-074		2.27±.02 (4)	93
"	8114	F-042		4.27±.17 (4)	88
"	"	F-044		8.85±.15 (4)*	66
"	"	F-046		1.15±.03 (5)	32
"	"	F-048		1.29±.04 (5)	31
"	"	F-050		5.22±.05 (4)*	59
"	8116	H-016		1.42±.05 (4)	19
"	"	H-018		2.45±.03 (4)	7
"	"	H-020		Lost in process	
"	8117	J-022		1.35±.01 (5)*	73

* Based on spiked aliquot

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Film Coll	8117	J-026		9.25±.11 (5)	83
"	"	J-028		3.31±.04 (5)*	63
"	"	J-030		3.00±.04 (4)*	87
"	"	J-032		4.50±.05 (4)*	77
"	"	J-034		2.40±.04 (4)*	89
"	"	J-036A		1.01±.05 (5)*	64
"	"	J-036B		3.15±.05 (4)*	91
"	"	J-038		1.88±.03 (4)*	99
"	"	J-042		7.84±.23 (4)	18
"	"	J-044		1.38±.03 (4)*	89
"	"	J-046		2.93±.05 (4)	35
"	"	J-048		Lost in process	
"	"	J-052		2.95±.05 (4)	62
"	"	J-054		1.13±.02 (4)	100
"	"	J-056A		2.45±.05 (4)	18
"	"	J-056B		1.38±.02 (4)*	66
"	"	J-058		1.06±.02 (4)	72
"	"	J-062		2.07±.05 (4)	22
"	"	J-064		1.71±.07 (4)	42
"	"	J-066		1.71±.04 (4)	27
"	"	J-068		1.69±.09 (4)	34

* Based on spiked aliquot

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Film Collector	8117	J-070		8.74±.24 (3)	82
"	"	J-072		1.21±.03 (4)	53
"	"	J-074		1.07±.04 (4)	28
"	"	J-076		1.21±.01 (4)	38
"	"	J-078		1.66±.04 (4)	18
"	"	J-080		1.23±.04 (4)	54
"	"	J-082		6.12±.05 (2)	60
"	"	J-084		8.41±.66 (3)*	64
"	"	J-086		1.02±.03 (4)*	63
"	"	J-090		5.72±.15 (3)	37
"	"	J-092		2.01±.04 (3)	67
"	"	J-096		1.67±.06 (4)	40
"	"	J-098		4.54±.10 (3)*	51
"	"	J-100		3.06±.08 (4)	40
"	"	J-102		2.47±.04 (4)*	43
"	"	J-104		7.28±.16 (4)	51
"	"	J-110		4.27±.20 (3)	68
"	8118	L-022		2.05±.04 (4)	94
"	"	L-030		6.24±.12 (4)	99
"	"	L-032		7.22±.22 (4)	18
"	"	L-034		4.39±.13 (4)	24

* Based on spiked aliquot

Table 3.10 (Con't.)

SAMPLE TYPE	TLAB NO.	CS II LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Film Coll	8118	L-036		3.31±.08 (4)	63
"	"	L-038		2.83±.01 (4)*	74
"	"	L-040		9.86±.27 (4)	22
"	"	L-042		5.94±.12 (4)*	39
"	"	L-044		1.78±.04 (5)*	60
"	"	L-046		2.99±.07 (4)	35
"	"	L-048		4.29±.12 (4)	24
"	"	L-050		1.59±.06 (4)	25
"	"	L-052		1.23±.04 (4)*	93
"	"	L-054		1.55±.05 (4)	30
"	"	L-056		1.22±.04 (4)	50
"	"	L-058		1.34±.03 (3)	100
"	"	L-060		8.90±.30 (3)	84
"	"	L-062		5.00±.14 (3)*	66
"	"	L-064		1.50±.10 (2)	39
"	"	L-066		1.58±.05 (4)	53
"	"	L-068		7.07±.11 (3)*	84
"	"	L-070		6.75±.10 (3)	37

* Based on spiked aliquot

TABLE 3.11 PHYSICAL SAMPLES, PLUTONIUM, CLEAN SLATE III

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239} & RECOVERY
Andersen	3246	B-010	1	1.26±.06 (1) 51
"	"	"	2	7.10±.20 (1) 74
"	"	"	3	2.28±.09 (1) 30
"	"	"	4	1.23±.11 (1) 31
"	"	"	6	4.70±.07 27
"	"	"	7	4.10±.60 32
Andersen	3245	B-022	1	1.01±.01 (5) 92
"	"	"	2	1.64±.04 (4) 61
"	"	"	3	2.00±.06 (2) 68
"	"	"	4	3.69±.09 (1) 48
"	"	"	6	Lost in process
"	"	"	7	1.00±.20 53
Andersen	3243	B-026	1	2.61±.05 (4) 82
"	"	"	2	4.72±.13 (2) 77
"	"	"	3	7.30±.30 (1) 63
"	"	"	4	6.72±.19 (1) 26
"	"	"	6	2.07±.06 (2) 68
"	"	"	7	8.20±.50 49
Andersen	3242	B-042	1	1.84±.05 (3) 32
"	"	"	2	6.33±.08 (2) 65
"	"	"	3	1.20±.04 (2) 24

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3242	B-042	4	7.63±.35 (1)	23
"	"	"	6	2.64±.15 (1)	34
"	"	"	7	2.26±.09 (1)	28
Andersen	3244	B-046	1	3.69±.09 (2)	46
"	"	"	2	1.38±.05 (2)	16
"	"	"	3	1.16±.05 (2)	17
"	"	"	4	2.38±.13 (1)	21
"	"	"	6	2.68±.17 (1)	30
"	"	"	7	4.66±.21 (1)	78
Andersen	3236	B-054	1	6.88±.23 (2)	33
"	"	"	2	1.32±.04 (2)	41
"	"	"	3	1.15±.03 (2)	57
"	"	"	4	3.24±.14 (1)	30
"	"	"	6	5.56±.35 (1)	16
"	"	"	7	2.83±.10 (1)	44
Andersen	3235	B-058	1	1.30±.04 (2)	44
"	"	"	2	9.88±.23 (1)	37
"	"	"	3	9.80±.40 (1)	29
"	"	"	4	5.26±.14 (2)	19
"	"	"	6	5.29±.30 (1)	9
"	"	"	7	3.26±.18 (1)	35
Andersen	3232	B-060	1	2.15±.07 (3)	57

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3232	B-060	2	3.06±.08 (2)	66
"	"	"	3	1.00±.02 (2)	61
"	"	"	4	1.02±.03 (3)	29
"	"	"	6	8.39±.33 (1)	7
"	"	"	7	1.47±.09 (1)	20
Andersen	3234	B-070	1	1.40±.04 (2)	21
"	"	"	2	1.42±.12 (3)	6
"	"	"	3	2.21±.05 (2)	40
"	"	"	4	9.24±.24 (1)	30
"	"	"	6	7.26±.25 (1)	47
"	"	"	7	6.38±.28 (1)	15
Andersen	3233	B-078	1	1.49±.04 (3)	11
"	"	"	2	1.50±.06 (2)	38
"	"	"	3	1.53±.05 (2)	20
"	"	"	4	7.50±.30 (1)	32
"	"	"	6	7.40±.20 (1)	44
"	"	"	7	1.39±.06 (1)	68
Andersen	3231	B-080	1	9.00±.30 (1)	20
"	"	"	2	1.08±.06 (2)	20
"	"	"	3	6.50±.30 (1)	35
"	"	"	4	4.97±.25 (1)	56
"	"	"	6	6.95±.25 (1)	40

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3231	B-080	7	1.64±.08 (1)	79
Andersen	3241	B-094	1	8.70±.30 (1)	38
"	"	"	2	7.90±.70 (1)	10
"	"	"	3	1.05±.04 (2)	30
"	"	"	4	8.70±.40 (1)	30
"	"	"	6	8.86±.33 (1)	20
"	"	"	7	4.44±.25 (1)	17
Andersen	3238	B-106	1	1.71±.04 (2)	45
"	"	"	2	1.15±.04 (2)	37
"	"	"	3	1.00±.04 (2)	47
"	"	"	4	Lost in Process	
"	"	"	6	1.23±.04 (2)	37
"	"	"	7	2.79±.21 (1)	47
Andersen	3237	B-106	1	8.47±.53 (1)	7
"	"	"	2	1.96±.08 (2)	57
"	"	"	3	6.09±.29 (1)	13
"	"	"	4	8.30±.32 (1)	16
"	"	"	6	2.00±.07 (2)	86
"	"	"	7	3.34±.25 (1)	15
Andersen	3239	B-118	1	2.54±.18 (1)	15
"	"	"	2	2.82±.15 (1)	32
"	"	"	3	2.19±.14 (1)	38

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3239	B-118	4	1.99±.14 (1)	33
"	"	"	6	3.56±.31 (1)	13
"	"	"	7	1.22±.15 (1)	11
Casella	4823	B-002	1	1.30±.30	100
"	"	"	2	6.62±.15 (1)	56
"	"	"	3	6.60±.30	90
"	"	"	4	3.80±.70	42
"	"	"	5	2.31±.06 (2)	11
Casella	4830	B-014	1	1.13±.04 (2)	19
"	"	"	2	6.10±.80	23
"	"	"	3	6.12±.44 (1)	35
"	"	"	4	9.00±.20 (1)	31
"	"	"	5	1.20±.24 (1)	6
Casella	4822	B-026	1	3.81±.09 (3)	100
"	"	"	2	1.32±.03 (3)	100
"	"	"	3	3.28±.05 (2)	19
"	"	"	4	1.02±.02 (2)	77
"	"	"	5	3.14±.14 (1)	19
Casella	4820	B-026	1	1.53±.03 (4)	42
"	"	"	2	3.91±.14 (1)	39
"	"	"	3	1.00±.03 (2)	27
"	"	"	4	2.09±.07 (2)	25

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	4820	B-026	5	2.62±.09 (2)	19
Casella	4828	B-038	1	1.61±.05 (3)	24
"	"	"	2	1.03±.03 (2)	25
"	"	"	3	1.81±.06 (2)	34
"	"	"	4	1.58±.17 (1)	18
"	"	"	5	5.15±.35 (1)	14
"	4831	B-042	1	8.40±.30 (1)	71
"	"	"	2	2.66±.39 (1)	12
"	"	"	3	3.29±.41	59
"	"	"	4	8.10±1.00	15
"	"	"	5	1.90±.10 (1)	18
"	4832	B-050	1	2.00±.60 (2)	16
"	"	"	2	6.69±.19 (2)	6
"	"	"	3	5.95±.37 (1)	17
"	"	"	4	6.50±.30 (1)	21
"	"	"	5	9.40±.40 (1)	13
"	4835	B-054	1	2.83±.04 (3)	33
"	"	"	2	4.36±.05 (2)	59
"	"	"	3	3.00±.10 (1)	100
"	"	"	4	9.50±.40 (1)	34
"	"	"	5	2.30±.06 (2)	25

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	4829	B-060	1	2.15±.06 (3)	17
"	"	"	2	6.30±.20 (2)	14
"	"	"	3	2.00±.09 (2)	26
"	"	"	4	4.74±.25 (1)	20
"	"	"	5	4.64±.33 (1)	14
Casella	4836	B-062	1	3.40±.10 (3)	17
"	"	"	2	6.34±.16 (2)	21
"	"	"	3	6.40±.30 (1)	48
"	"	"	4	1.54±.05 (2)	18
"	"	"	5	1.21±.05 (2)	13
"	4826	B-074	1	2.09±.05 (3)	34
"	"	"	2	5.04±.12 (2)	33
"	"	"	3	3.00±.10 (2)	59
"	"	"	4	1.05±.05 (2)	19
"	"	"	5	2.92±.23 (1)	18
"	4824	B-080	1	1.70±.04 (2)	61
"	"	"	2	1.40±.40	22
"	"	"	3	5.40±1.60	19
"	"	"	4	1.40±.50	19
"	"	"	5	1.96±.29 (1)	14
Casella	4821	B-086	1	1.25±.05 (3)	3
"	"	"	2	2.34±.15 (2)	2

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	4821	B-086	3	6.70±.30 (1)	41
"	"	"	4	2.58±.22 (1)	17
"	"	"	5	2.97±.14 (1)	48
"	4825	B-098	1	6.68±.08 (2)	46
"	"	"	2	2.66±.05 (2)	29
"	"	"	3	1.20±.05 (2)	22
"	"	"	4	4.28±.35 (1)	10
"	"	"	5	2.66±.33 (1)	9
"	4833	B-106	1	1.25±.04 (2)	34
"	"	"	2	1.31±.03 (2)	16
"	"	"	3	Lost in Process	
"	"	"	4	3.68±.28 (1)	25
"	"	"	5	1.90±.09 (2)	21
Tas II	5123	B-006		Lost in Process	
Tas D	5136	B-014		8.83±.02 (3)	70
Tas I	5134	B-056		9.52±.12 (4)	67
Tas I	5135	B-064		Lost in Process	
Tas II	5128	B-066		6.68±.18 (2)	51
Tas D	5140	B-068		4.04±.07 (2)	23
Tas II	5125	B-060		Lost in Process	
Tas II	5130	B-078		4.21±.12 (2)	42
Tas II	5133	B-102		3.06±.17 (2)	34

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Tas II	5131	B-114		1.06±.04 (2)	28
Tas D	5137	B-120		1.73±.06 (2)	34
Andersen	3283	D-010	1	2.03±.16 (1)	16
"	"	"	2	6.54±.63	33
"	"	"	3	2.87±.18 (1)	32
"	"	"	4	1.92±.23 (1)	13
"	"	"	6	1.63±.18 (1)	18
"	"	"	7	1.40±.09 (1)	45
"	3284	D-022	1	4.08±.04 (3)	84
"	"	"	2	Lost in Process	
"	"	"	3	4.26±.34 (1)	23
"	"	"	4	Lost in Process	
"	"	"	6	Lost in Process	
"	"	"	7	8.78±1.03	32
"	3287	D-046	1	3.25±.15 (1)	48
"	"	"	2	1.52±.11 (1)	37
"	"	"	3	2.64±.13 (1)	21
"	"	"	4	9.97±.68	33
"	"	"	6	1.06±.03 (2)	56
"	"	"	7	2.86±.04 (2)	47
"	3282	D-070	1	1.12±.04 (2)	29
"	"	"	2	4.50±.20 (1)	23

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Andersen	3282	D-070	3	2.84±.14 (1)	24
"	"	"	4	2.83±.16 (1)	23
"	"	"	6	1.66±.15 (1)	16
"	"	"	7	1.10±.08 (1)	35
"	3281	D-094	1	1.10±.03 (2)	50
"	"	"	2	2.10±.06 (2)	4
"	"	"	3	5.00±.20 (1)	62
"	"	"	4	8.00±.40 (1)	37
"	"	"	6	9.28±.35 (1)	55
"	"	"	7	Lost in Process	
"	3280	D-106	1	5.38±.22 (1)	15
"	"	"	2	1.54±.07 (2)	9
"	"	"	3	8.00±.30 (1)	57
"	"	"	4	9.10±.40 (1)	15
"	"	"	6	4.74±.18 (1)	23
"	"	"	7	2.71±.27 (1)	6
"	3279	D-118	1	Lost in Process	
"	"	"	2	3.24±.21 (1)	24
"	"	"	3	5.51±.20 (1)	53
"	"	"	4	2.69±.13 (1)	60
"	"	"	6	5.05±.26 (1)	28
"	"	"	7	3.87±.27 (1)	10

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	4920	D-002	1	8.70±.50	35
"	"	"	2	7.40±.40	40
"	"	"	3	4.10±.10 (1)	93
"	"	"	4	1.02±.19 (1)	10
"	"	"	5	6.41±.24 (1)	21
"	4919	D-006	1	2.80±.30	66
"	"	"	2	2.40±.30	41
"	"	"	3	0.16±.04	21
"	"	"	4	3.20±.50	11
"	"	"	5	3.38±.16	26
"	4918	D-014	1	Lost in Process	
"	"	"	2	6.30±1.00	16
"	"	"	3	6.40±0.80	10
"	"	"	4	8.10±0.30	89
"	"	"	5	5.40±0.90	12
"	4921	D-026	1	1.98±.07 (3)	44
"	"	"	2	1.02±.05 (1)	44
"	"	"	3	2.70±.07 (2)	29
"	"	"	4	1.04±.12 (1)	38
"	"	"	5	8.80±1.40	28
"	4927	D-050	1	1.68±.10 (2)	13
"	"	"	2	8.40±.20 (1)	57

Table 3.11 (Con t.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	RECOVERY
Casella	4927	D-050	3	3.22±.19 (1)	48
"	"	"	4	3.60±.28 (1)	26
"	"	"	5	2.10±.13 (1)	40
"	4922	D-060	1	7.75±.17 (2)	29
"	"	"	2	4.35±.26 (1)	19
"	"	"	3	6.27±.28 (1)	16
"	"	"	4	1.04±.14 (1)	33
"	"	"	5	2.98±.29 (1)	11
"	4923	D-62	1	6.17±.14 (2)	28
"	"	"	2	2.17±.06 (2)	30
"	"	"	3	5.57±.94 (1)	3
"	"	"	4	7.40±1.30	27
"	"	"	5	1.08±.06 (1)	87
"	4925	D-074	1	9.42±.20 (2)	34
"	"	"	2	1.80±.07 (2)	18
"	"	"	3	2.37±.21 (1)	20
"	"	"	4	9.10±.70	19
"	"	"	5	1.60±.09 (1)	64
"	4928	D-086	1	1.00±.03 (3)	52
"	"	"	2	1.20±.04 (2)	43
"	"	"	3	5.31±.24 (1)	26
"	"	"	4	3.46±.32 (1)	18

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	4928	D-086	5	5.88±.41 (1)	26
"	4917	D-088	1	1.54±.06 (2)	20
"	"	"	2	4.17±.16 (2)	17
"	"	"	3	7.72±.29 (1)	21
"	"	"	4	Lost in Process	
"	"	"	5	1.76±.12 (1)	76
"	4915	D-110	1	1.48±.05 (2)	28
"	"	"	2	8.20±.30 (1)	25
"	"	"	3	6.28±.37 (1)	25
"	"	"	4	3.21±.18 (1)	27
"	"	"	5	1.41±.09 (2)	9
Tas II	5147	D-006		7.23±.16 (2)	10
Tas II	5150	D-018		6.41±.19 (2)	17
Tas D	5156	D-020		7.36±.63 (1)	12
Tas D	5155	D-048		7.10±.40	39
Tas II	5141	D-054		1.04±.03 (2)	52
Tas II	5142	D-060		4.20±.30 (2)	5
Tas II	5151	D-066		4.14±.15 (2)	22
Tas II	5145	D-078		Lost in process	
Tas II	5146	D-090		1.42±.03 (2)	51
Tas II	5148	D-102		2.93±.03 (2)	100
Tas II	5144	D-114		2.10±.06 (2)	23

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Tas D	5152	D-114		8.60±.30 (2)	24
Tas D	5122	B-000		3.66±.10 (1)	53
Andersen	5031	Im-13	1	1.95±.05 (2)	25
"	"	"	2	2.03±.11 (1)	37
"	"	"	3	2.03±.04 (1)	56
"	"	"	4	1.13±.09 (1)	46
"	"	"	6	2.30±.06 (2)	21
"	"	"	7	1.38±.14 (1)	13
Casella	5020	Im-01	1	1.38±.04 (2)	50
"	"	"	2	3.60±.20 (1)	23
"	"	"	3	4.28±.73 (1)	5
"	"	"	4	1.21±.17 (1)	10
"	"	"	5	2.02±.27 (1)	15
"	5019	Im-03	1	1.30±.30	32
"	"	"	2	3.41±.09 (1)	57
"	"	"	3	7.10±1.10	35
"	"	"	4	5.80±1.10	14
"	"	"	5	4.70±1.20	18
"	5018	Im-04	1	2.90±.40	40
"	"	"	2	2.50±.40	45
"	"	"	3	1.38±.25 (1)	5
"	"	"	4	5.80±.60	34

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	5018	Im-04	5	Lost in Process	
"	5016	Im-05	1	7.80±.70	31
"	"	"	2	2.34±.05 (1)	82
"	"	"	3	Lost in Process	
"	"	"	4	2.60±.09 (1)	30
"	"	"	5	Lost in Process	
"	5021	Im-06	1	4.90±.50	37
"	"	"	2	4.98±.14 (1)	44
"	"	"	3	Lost in Process	
"	"	"	4	Lost in Process	
"	"	"	5	Lost in Process	
"	5022	Im-07	1	5.07±.15 (1)	50
"	"	"	2	9.34±.18 (1)	69
"	"	"	3	Lost in Process	
"	"	"	4	Lost in Process	
"	"	"	5	Lost in Process	
"	5024	Im-12	1	2.50±.03 (2)	49
"	"	"	2	1.35±.03 (2)	39
"	"	"	3	Lost in Process	
"	"	"	4	Lost in Process	
"	"	"	5	Lost in Process	
Casella	4952	L-014	1	2.20±.40	35

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	4952	L-014	2	1.19±.06 (1)	70
"	"	"	3	8.70±.30 (1)	21
"	"	"	4	Lost in Process	
"	"	"	5	1.35±.04 (3)	3
"	4951	L-034	1	1.00±.03 (2)	28
"	"	"	2	9.70±.50	44
"	"	"	3	2.65±.26 (1)	10
"	"	"	4	Lost in Process	
"	"	"	5	Lost in Process	
"	4955	L-038	1	1.76±.08 (2)	12
"	"	"	2	9.70±.20 (1)	68
"	"	"	3	1.20±.05 (2)	10
"	"	"	4	4.93±.21 (1)	38
"	"	"	5	1.22±.13 (1)	11
"	4950	L-050	1	2.00±.04 (2)	55
"	"	"	2	2.81±.29 (1)	9
"	"	"	3	1.30±.02 (2)	64
"	"	"	4	6.50±.50	23
"	"	"	5	2.12±.47 (1)	4
"	4947	L-060	1	2.30±.08 (2)	21
"	"	"	2	7.03±.16 (1)	61
"	"	"	3	3.18±.09 (2)	17

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Casella	4947	L-060	4	3.82±.09 (1)	56
"	"	"	5	0.00±.00	29
Tas D	5198	CSI-N-042		Lost in Process	
"	5190	" " 048		4.80±.20 (1)	43
"	5192	" " 054		8.40±.20 (1)	39
"	5193	" " 060		4.82±.10 (2)	29
"	5194	" " 066		9.10±.30 (1)	39
"	5187	" " 072		5.64±.18 (1)	38
"	5188	" " 078		1.83±.01 (3)	77
"	5189	" " 084		1.64±.13 (2)	3
Film Collector	8154	B-016		2.43±.05 (6)*	90
"	"	B-024		9.32±.21 (6)*	85
"	"	B-028		Lost in Process	
"	"	B-036A		1.27±.02 (5)*	94
"	"	B-036B		1.69±.03 (5)*	50
"	"	B-040		Lost in Process	
"	"	B-044		2.76±.04 (4)*	79
"	"	B-048		5.42±.04 (3)*	69
"	"	B-052		8.65±.03 (4)*	75
"	"	B-056A		6.39±.17 (4)*	86
"	"	B-056B		7.31±.14 (4)*	84
"	"	B-060		6.75±.03 (4)*	67

*Based on spiked aliquot

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Film Collector	8154	B-064		Lost in Process	
"	"	B-068		4.76±.11 (4)*	100
"	"	B072		6.58±.12 (4)*	96
"	"	B-076		7.36±.11 (4)*	100
"	"	B-080		9.93±.38 (4)	36
"	"	B-084		1.80±.07 (4)*	17
"	8155	C-010		Lost in Process	
"	"	C-020		6.11±.07 (5)*	80
"	"	C-022		3.85±.08 (6)*	92
"	"	C-024		5.99±.13 (6)*	96
"	"	C026B		2.20±.01 (5)	49
"	"	C-028		4.97±.11 (6)*	89
"	"	C-030		2.78±.07 (6)•	72
"	"	C-032		1.68±.01 (6)*	55
"	"	C-034		9.15±.03 (4)*	91
"	"	C-036		1.25±.02 (5)*	70
"	"	C-038		5.79±.07 (4)•	83
"	"	C-040		5.83±.06 (4)*	100
"	"	C-042		6.15±.24 (4)	41
"	"	C-044		2.85±.03 (4)*	69
"	"	C-046A		8.26±.07 (2)*	90

• Based on spiked aliquot

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Film Collector	8155	C-046B		6.50±.30 (3)*	68
"	"	C-048		4.53±.14 (4)	59
"	"	C-050		3.34±.07 (4)*	40
"	"	C-052		1.01±.01 (4)*	69
"	"	C-054		1.10±.01 (4)*	74
"	"	C-056		4.92±.07 (4)*	49
"	"	C-058		Lost in Process	
"	"	C-060		2.87±.02 (4)*	87
"	"	C-062		4.25±.19 (3)*	42
"	"	C-064		Lost in Process	
"	"	C-066		2.69±.04 (4)*	45
"	"	C-068		2.61±.06 (4)*	42
"	"	C-070		1.92±.07 (4)*	43
"	"	C-072		8.90±.50 (3)*	57
"	"	C-074		2.58±.08 (3)*	73
"	"	C-076		2.62±.03 (4)*	29
"	"	C-078		3.55±.18 (4)	26
"	"	C-080		3.42±.01 (4)*	75
"	"	C-082		3.40±.20 (3)*	100
"	"	C-084		4.40±.30 (3)*	64
"	"	C-088		Lost in Process	

*Based on spiked aliquot

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Film Collector	8155	C-090		Lost in Process	
"	"	C-092		9.46±.12 (3)	47
"	"	C-094		1.40±.11 (3)*	60
"	"	C-096		3.20±.06 (3)*	76
"	"	C-098		3.70±.10 (2)•	79
"	"	C-100		6.33±.19 (3)*	53
"	"	C-102		Lost in Process	
"	8156	D-008		5.33±.18 (2)	31
"	"	D-010		Lost in Process	
"	"	D-020		2.43±.05 (3)*	74
"	"	D-022		5.85±.12 (5)*	79
"	"	D-024		5.49±.06 (5)*	91
"	"	D-026		2.06±.01 (6)*	88
"	"	D-032		2.71±.03 (6)*	78
"	"	D-034		1.48±.01 (6)*	92
"	"	D-036		9.32±.16 (5)*	96
"	"	D-038		5.26±.06 (5)*	77
"	"	D-040		4.55±.01 (5)•	85
"	"	D-044		1.88±.04 (5)*	44
"	"	D-046		8.60±.20 (4)*	82
"	"	D-048		5.72±.14 (3)*	55

• Based on spiked aliquot

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Film collector	8156	D-050		8.50±.30 (3)*	96
"	"	D-052		1.26±.01 (4)	44
"	"	D-054		7.00±.19 (3)*	87
"	"	D-056		1.31±.02 (4)*	72
"	"	D-062		2.98±.04 (3)*	55
"	"	D-064		7.50±.20 (3)*	88
"	"	D-066A		2.96±.08 (4)	20
"	"	D-066B		Lost in Process	
"	"	D-068		4.20±.24 (3)*	80
"	"	D-070		1.65±.06 (4)*	42
"	"	D-072		1.59±.03 (4)*	84
"	"	D-074		1.29±.03 (4)*	66
"	"	D-076A		1.44±.02 (4)*	68
"	"	D-076B		1.52±.02 (4)*	62
"	"	D-078		4.45±.19 (3)*	69
"	"	D-086		4.90±.14 (3)*	82
"	"	D-088		1.70±.10 (3)*	64
"	"	D-092		8.80±.79 (2)*	80
"	"	D-094		3.70±.30 (3)*	29
"	"	D-108		6.45±.30 (2)	61
"	"	D-114		5.60±.30 (2)*	15

*Based on spiked aliquot

Table 3.11 (Con't.)

SAMPLE TYPE	TLAB NO.	CS III LOCATION	STAGE NO.	dpm Pu^{239}	% RECOVERY
Film Collector	8157	E-024		1.71±.01 (5)*	32
"	"	E-026		6.19±.12 (5)*	85
"	"	E-028		5.78±.16 (5)*	88
"	"	E-030		5.55±.13 (6)*	88
"	"	E-034		7.73±.17 (6)*	95
"	"	E-036A		6.65±.14 (6)*	100
"	"	E-036B		2.49±.05 (6)*	94
"	"	E-038		7.23±.09 (5)*	79
"	"	E-040		1.89±.05 (5)*	61
"	"	E-042		2.60±.11 (4)*	75
"	"	E-044		9.61±.12 (4)*	71
"	"	E-046		1.40±.03 (4)*	82

* Based on spiked aliquot

TABLE 3.12 PHYSICAL SAMPLES, URANIUM, DOUBLE TRACKS

SAMPLE TYPE	TLAB NO.	LOCATION	STAGE NO.	ugU	dpm RATIO U234/U238	Wt. RATIO* U/Pu
Casella	2110	L6,P13	4	2.70		
"	"	"	5	0.46		
"	2112	L12,P13	2	0.40		
"	2143	L23,P9	4	0.22		
"	2153	L14,P21	3	0.29		
"	"	"	4	0.48		
"	"	"	5	0.55		
Casella	2401	B-054	1	Lost in Process		
"	"	"	2	0.248		
"	"	"	3	0.246		
"	"	"	4	Lost in Process		
"	"	"	5	0.188		
"	2435	L2,P5	1	0.184		
"	"	"	2	0.196		
"	"	"	3	0.152		
"	"	"	4	0.236		
"	"	"	5	0.180		
"	2459	L3,P1	1	0.752		
"	"	"	2	0.760		
"	"	"	3	0.300		
"	"	"	4	0.084		
"	"	"	5	0.616		

* Calculated only for samples with more than 100 dpm Pu.

Table 3.12 (Con't.)

SAMPLE TYPE	TLAB NO.	LOCATION	STAGE NO.	ugU	dpm RATIO U234/U238	Wt.RATIO* U/Pu
Casella	2522	A-042	1	0.09		
"	"	"	2	0.42		
"	"	"	3	0.46		
"	"	"	4	0.33		
Casella	2522	A-042	5	< 0.001		
"	2524	A-054	1	0.26		
"	"	"	2	0.328		
"	"	"	3	0.412		
"	"	"	4	0.360		
Tas	2523	A-048		0.012		8
"	2525	A-060		0.03		17
"	2531	A-096		0.034		19
"	2974	B-078		0.08		9
"	2980	B-036		0.112		12
"	2978	B-042		0.044	0.17	26
"	2975	B-048		0.052		
"	2130	L22,P21		0.026		9
"	2452	L25,P9		0.076		
Wire Swipe	2475	L3,P8		1.45		19
"	5320	L1,P4		1.40		8
Film Coll	8048	B-064A		0.838		14
"	"	B-072A		2.20		7

* Calculated only for samples with more than 100 dpm Pu.

Table 3.12 (Con't.)

SAMPLE TYPE	TLAB NO.	LOCATION	STAGE NO.	ugU	dpm RATIO U234/U238	Wt.RATIO* U/Pu
Film Coll	8048	B-072B		2.95		8
Andersen	2096	B-058	1	0.380		8
"	"	"	3	0.338		6
"	"	"	6	0.472		11
"	"	"	7	1.264		12

* Calculated only for samples with more than 100 dpm Pu.

TABLE 3.13 PHYSICAL SAMPLES, URANIUM, CLEAN SLATE I

SAMPLE TYPE	TLAB NO.	LOCATION	STAGE NO.	ugU	dpm RATIO U234/U238	Wt.RATIO* U/PU
Tas	3031	L7,P9		0.344		
"	3030	L10,P13		0.344		
"	3037	L25,P1		0.600		
"	3023	L28,P13		0.360		
Andersen	2599	F-016	1	0.420		
"	"	"	2	0.298		
"	"	"	3	0.330		
"	"	"	4	< 0.05		
"	"	"	6	0.342		
"	"	"	7	0.342		
Casella	2578	F-032	1	0.177		
"	"	"	2	0.300		
"	"	"	3	Lost in Process		
"	"	"	4	0.290		
"	"	"	5	Lost in Process		
Tas	3540	F-020		< 0.05		
Tas II	3545	F-030	SC-6	0.590		
Tas	3554	F-040		0.60		51
Tas	3556	F-092		0.134		
Aluminum Collector	9817	B-050		Lost in Process		

* Calculated only for samples with more than 100 dpm Pu.

TABLE 3.14 PHYSICAL SAMPLES, URANIUM, CLEAN SLATE II

SAMPLE TYPE	TLAB NO.	LOCATION	STAGE NO.	ugU	dpm RATIO U234/U238	Wt.RATIO* U/Pu
Andersen	3176	L-026	1	0.436		
"	"	"	2	0.400		
"	"	"	3	0.632		
"	"	"	4	0.680		
"	"	"	6	0.28		
"	"	"	7	0.46		
Casella	2216	L-034		0.037**		
Casella	2219	L-088	1	2.31		
"	"	"	2	0.32		
"	"	"	3	0.56		
"	"	"	4	0.18		
"	"	"	5	0.1		
Tas	4073	L-006		1.78		
"	4072	L-012		Lost in Process		
"	4071	L-018		0.86		660
"	4074	L-030		1.01		112
"	4067	L-074		0.68		130
"	4066	L-100		0.82		197

• Calculated only for samples with more than 100 dpm Pu.

** Composite of all stages.

Table 3.14 (Con't.)

SAMPLE TYPE	TLAB NO.	LOCATION	STAGE NO.	ugU	dpm RATIO U234/U238	Wt.RATIO* U/Pu
Tas	4065	L-114		1.16		300
Film Coll	8118	L-038		0.86		415
"	"	L-042		18.1	0.00	42
"	"	L-046		1.88	0.00	9
"	"	L-050		4.42		38
"	"	L-054		1.96		17
"	"	L-058		0.358		2
"	"	L-062		3.83		25
"	"	L-066		3.60		29
"	"	L-070		0.61		9
Aluminum Coll	9841	A-030		Lost in Process		
"	9841	A-040		Lost in Process		

* Calculated only for samples with more than 100 dpm Pu.

TABLE 3.15 PHYSICAL SAMPLES, URANIUM, CLEAN SLATE III

SAMPLE TYPE	TLAB NO.	LOCATION	STAGE NO.	ugU	dpm RATIO U234/U238	Wt. RATIO* U/Pu
Andersen	3245	B-022	1	1.84		2
"	"	"	2	2.740		23
"	"	"	3	0.149		102
"	"	"	4	0.440		
"	"	"	6	Lost in Process		
"	"	"	7	0.248		
"	3241	B-094	1	0.448		
"	"	"	2	0.180		
"	"	"	3	0.568		737
"	"	"	4	0.204		
"	"	"	6	0.428		
"	"	"	7	1.29		
Tas	5122	B-000		0.298		
"	5123	B-006	1	Lost in Process		
"	5136	B-014		1.07		16
"	5133	B-102		0.448		200
"	5131	B-114		0.28		362
"	5137	B-120		1.16		920

* Calculated only for samples with more than 100 dpm Pu.

Table 3.15 (Con't.)

SAMPLE TYPE	TLAB NO.	LOCATION	STAGE NO.	ugU	dpm RATIO U234/U238	Wt.RATIO* U/Pu
Tas D	5198	CSI-N-042		Lost in Process		
"	5190	CSI-N-048		0.029		
"	5192	CSI-N-054		0.63		
"	5193	CSI-N-060		2.88		
"	5194	CSI-N-066		0.47		
"	5187	CSI-N-072		Lost in Process		
"	5188	CSI-N-078		0.038		2
"	5189	CSI-N-084		1.33		1117
Film Coll	8154	B-028		Lost In Process		
"	"	B-036A		51.1		55
"	"	B-040		Lost in Process		
"	"	B-044		1.09		5
"	"	B-048		2.00		51
"	"	B-052		62.5	.004	99
"	"	B-056A		16.67	.009	34
"	"	B-060		5.17	.076	10
"	"	B-064		1.28		
Film Coll	8154	B-068		46.5	0.155	134
"	"	B-072		166.1	.038	346
"	"	B-076		49.0	.022	91
"	"	B-080		3.36		4
"	"	B-084		12.8		105

* Calculated only for samples with more than 100 dpm Pu.

TABLE 3.16 ASSAY OF SOIL ON ALUMINUM COLLECTORS

FROM – Project 2.6A Soil by Am^{241} Gamma Spectrometry

Test	Sample No.	Aliquot	uc Am^{241}	uc Pu^{239}*
CSI	BO-06-	(0.10g)	0.007	0.42 ± .02
"	AH-06	1	1.08	64.8
"	"	2	0.97	58.2
"	"	3	1.06	63.6
"	"	4 (7.27g)	0.70	42.0
"	"	5 (4.65g)	0.59	35.4
CSII	BL-10a	1	0.048	2.88
"	"	2	0.055	3.30
"	"	3	0.054	3.24
"	"	4	0.052	3.12
"	"	5	0.052	3.12
"	"	6	0.052	3.12
"	"	7	0.051	3.06
"	"	8	0.050	3.00
"	"	9	0.050	3.00
"	"	10	0.053	3.18
"	"	11	0.051	3.06
"	"	12	0.051	3.06
"	"	13	0.049	2.94
"	"	14	0.050	3.00

Table 3.16 (Con't.)

Test	Sample No.	Aliquot	uc Am^{241}	uc Pu^{239}*
CSII	BL-10a	15	0.053	3.18
"	"	16	0.052	3.12
"	"	17	0.055	3.30
"	"	18	0.053	3.18
"	"	19	0.054	3.24
"	"	20	0.052	3.12
"	"	21	0.051	3.06
"	"	22	0.054	3.24
"	"	23	0.051	3.06
"	"	24	0.054	3.24
"	"	25	0.051	3.06
"	"	26	0.053	3.18
"	"	27	0.053	3.18
"	"	28	0.051	3.06
"	"	29	0.050	3.00
"	"	30	0.051	3.06
"	"	31	0.051	3.06
"	"	32	0.053	3.18
"	"	33	0.049	2.94
"	"	34	0.049	2.94
"	"	35	0.055	3.30

Table 3.16 (Con't.)

Test	Sample No.	Aliquot	uc Am^{241}	uc Pu^{239}*
CSII	BL-10a	36	0.050	3.00
"	"	37	0.052	3.12
"	"	38	0.048	2.88
"	"	39	0.051	3.06
"	"	40	0.051	3.06
"	"	41	0.048	2.88
"	"	42	0.052	3.12
"	"	43	0.051	3.06
"	"	44	0.051	3.06
"	"	45	0.051	3.06
"	"	46 (7.00g)	0.043	2.58
CSII	BL-10b	1	0.069	4.14
"	"	2	0.071	4.26
"	"	3	0.064	3.84
"	"	4	0.062	3.72
"	"	5	0.065	3.90
"	"	6	0.069	4.14
"	"	7	0.064	3.84
"	"	8	0.067	4.02
"	"	9	0.067	4.02
"	"	10	0.074	4.44
CSII	BL-10b	11	0.066	3.96

*Based on a ratio of 60 uc Pu^{239}/uc Am^{241}.

TABLE 3.17 Au^{241} GAMMA COUNTING VERSUS RADIOCHEMISTRY FOR Pu^{239}

SAMPLE NO.	DESCRIPTION	ESTIMATE BASED ON GAMMA COUNT	RADIOCHEMISTRY RESULTS
159B	Metal, 3"x4"	18.9 mg	24.8 mg
160-7	" 1"x1"	0.18 mg	0.205 mg
160-9	" 1"x2"	0.75 mg	0.72 Mg
163C	" 3"x3"	10.1 mg	8.2 mg
163K	" 2"x1'	10.1 mg	8.9 mg
159D	" 4"x6"	100.8 mg	96.6 mg
BL10-1	Soil, 10.00g	67 ug	72 ug
BL10-2	"	69 ug	58 ug
BL10-5	"	63 ug	73 ug
BL10-7	"	62 ug	75 ug
BL10-9	"	65 ug	75 ug
BL10-10	"	52 ug	55 ug
BL10-20	"	51 ug	54 ug
BL10-30	"	50 ug	56 ug
BL10-40	"	50 ug	56 ug
BL10-42	"	51 ug	55 ug

TABLE 3.18 INTERLABORATORY COMPARISON OF Pu^{239} DATA METAL DEBRIS SOLUTIONS

	Sample	Laboratory Results (ug/ml)		
	No.	LASL	EIC	DOW
CS I A1 Stand Debris	160-7A	0.147	0.142	0.193
	160-7B	0.047	0.048	0.014
DT PLATE PLUG from NE Corner	161-1A	2.46	0.670	0.666
	161-1B	0.343	0.357	0.453
CS III A1 Stand Debris	163-KA	5.49	5.49	8.00
	163-KB	0.291	0.267	0.361
	159-BA	19.0	17.8	
	159-BB	2.49	2.47	
	159-BC	0.225	0.334	
	159-DA	50.8	52.8	
	159-DB	4.44	5.11	
	159-DC	2.49	3.28	
	159-DD	0.159	0.287	
	160-9A	0.529	0.751	
	160-9B	0.015	0.015	
	161-2A	0.414	0.698	
	161-2B	0.408	0.420	
	161-3A	0.324	0.412	

Table 3.18 (Con't.)

No.	LASL	EIC	DOW
161-3B	0.322	0.341	
161-4A	0.328	0.397	
161-4B	0.328	0.330	
161-4C	0.061	0.048	
161-5B	0.305	0.258	
163-CA	4.06	3.83	
163-CB	0.254	0.244	
103-3A	1.590	0.969	
103-3B	0.010	0.010	
104-4A	0.837	0.621	
105-5A	0.560	0.437	
150-5B	0.014	0.014	
106-6A	0.269	0.264	
106-6B	0.172	0.169	

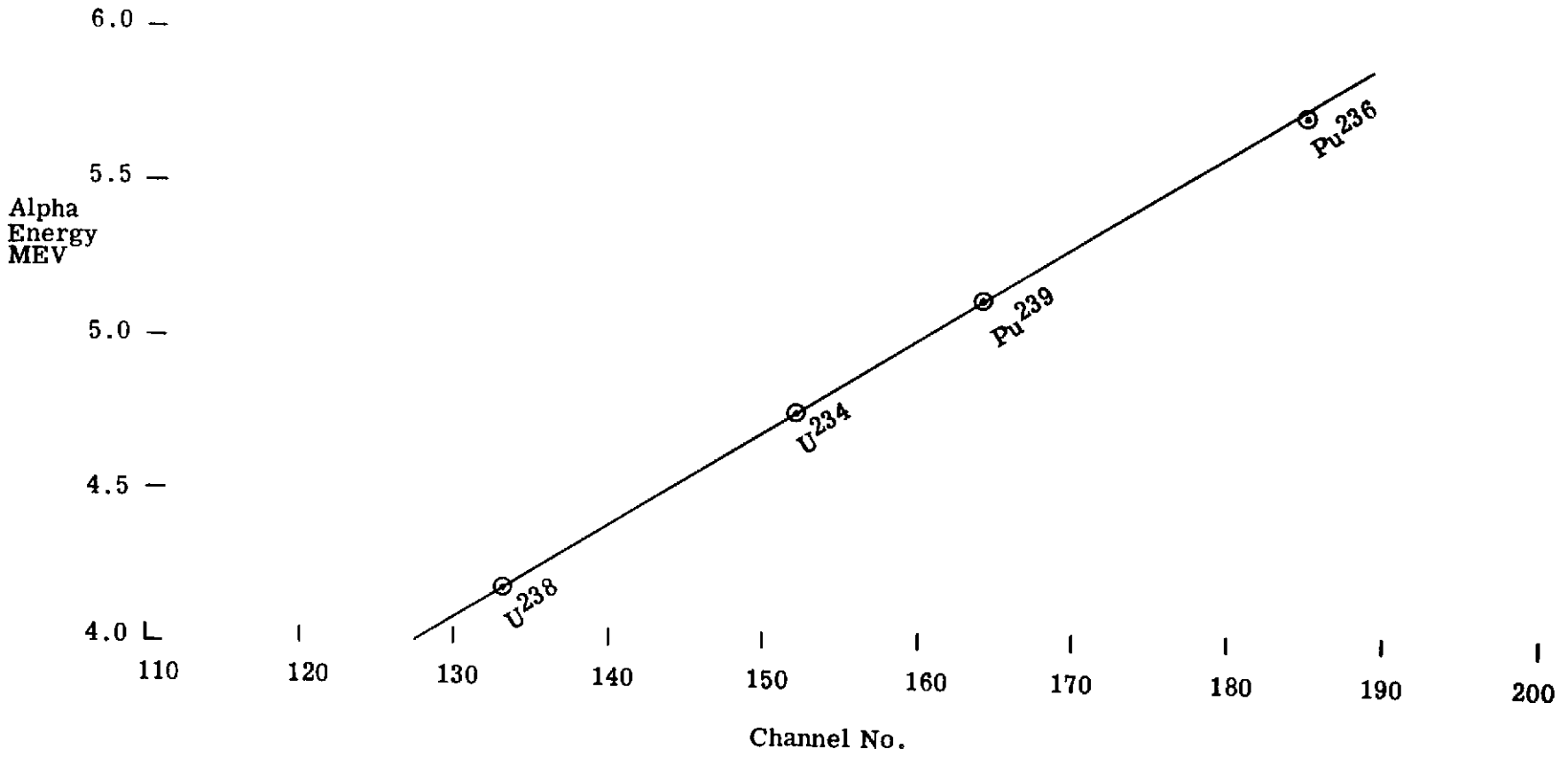

Figure 3.2 Energy calibration curve.

CHAPTER 4

CONCLUSIONS

The use of Pu^{236} tracer proved to be an invaluable aspect of the analytical program. It provided a built-in quality control feature not previously available. The correctness of the plutonium results, even when the recovery was low, is demonstrated by the data in Table 4.1.

The analysis of more than 2,000 samples, ranging from soil to the femur of a burro, was a large task. Many analytical problems were encountered but the presence of Pu^{236} tracer in each sample and the related specification of alpha spectrometry preserved the accuracy of the data and provided a means for identifying and correcting problems that were encountered. Thus, the use of Pu^{236} as a tracer provided analytical data of the highest integrity.

A suitable tracer for uranium was not available, but the relatively high and consistent uranium recovery made the use of an internal tracer less essential. A consistent ratio of U/Pu was not obtained.

TABLE 4.1 VALIDITY OF DATA FOR LOW RECOVERY SAMPLES

TYPE SAMPLE	% RECOVERY	dpm Pu^{239}
Film Collector	100	127 ± 11
	72	129 ± 11
"	63	7180 ± 90
	25	7600 ± 800
"	68	39800 ± 2400
	43	42500 ± 3800
"	57	315 ± 19
	55	347 ± 21
"	79	10100 ± 100
	4	7400 ± 400
"	62	29500 ± 500
	20	35000 ± 3000
Andersen Disc	61	27.4 ± 2.5
	58	24.3 ± 1.5
Casella	34	424 ± 20
	32	398 ± 20
"	61	16600 ± 200
	43	17200 ± 200
"	43	236 ± 15
	22	295 ± 20
Tas D	78	184 ± 13
	33	170 ± 13
Soil	60	3000 ± 90
	38	2960 ± 160
"	61	16600 ± 400
	62	17100 ± 700

Table 4.1 (Cont'd.)

TYPE SAMPLE	% RECOVERY	dpm Pu^{239}
Soil	54	20900 ± 1000
	44	19100 ± 400
"	63	2650 ± 110
	36	2720 ± 110
"	32	820 ± 60
	17	900 ± 70
"	72	5300 ± 100
	15	5600 ± 450
"	38	18900 ± 1000
	21	19100 ± 1300

APPENDIX A

ANALYTICAL PROCEDURES FOR PLUTONIUM

A.1 PLUTONIUM IN BONE AND URINE

1. Weigh the sample and place it in a new beaker of adequate size. Urine samples are weighed in the plastic bag and the total contents of the bag are transferred into the beaker using deionized water.
2. Add exactly 500 ml of Pu^{236} solution R(27 dpm). Add 4N nitric acid until the sample is half submerged. Cover with a watch glass and allow to stand overnight without heating.
3. Wet ash with nitric acid. Heat carefully at first, to avoid excessive foaming. A drop of n-octyl alcohol may be added if foaming is excessive. Best results are obtained for urine samples if concentrated nitric acid is used once the foaming has ceased. When the solution is clear use hydrogen peroxide, added carefully in small increments, to speed the digestion. The heat should be increased when all traces of fat are gone. The final residue should be white.
4. Dissolve the salt in 8N nitric acid. Larger quantities of salt will go into solution more readily if water is first added to the salt followed by enough

concentrated nitric acid to make 8N nitric acid. Cover the beaker with the watch glass and heat to aid dissolution of the salt. Remove from hotplate and allow to cool.

Note: If the sample is not completely dissolved at this point, filter out the insoluble fraction, ash at 600° C, and fuse in a platinum crucible at 900° C, using anhydrous sodium carbonate flux. Dissolve the melt in 8N nitric acid and combine with the filtrate.

5. Take an aliquot of the sample and transfer it into a beaker. Readjust the normality to 8N if necessary. (1/3 of the total was usually used). Dilute the aliquot with 8N nitric acid until the salt concentration in the aliquot is less than 30g/liter. Up to four liters of 8N nitric acid may be needed for large bone samples.

6. Prepare a Bio Rad AG 1-X2 anion exchange resin column.

   a. For large bone and feces samples:

      (1) Slurry the resin in 8N nitric acid. Allow the resin to settle and decant the acid. Repeat this step twice to remove chloride ions in the resin. Again slurry the resin with 8N nitric acid and pour the resin into a 3/4-inch

diameter by 24-inch-high chromatographic column. Enough resin should be added to make a resin bed about four inches high.

(2) Use 8N nitric acid to wash the walls of the column free of resin particles. Place a glass wool plug on top of the resin bed to prevent the resin from floating to the top of the column.

(3) Wash the resin with 100 ml of 8N nitric acid.

(4) When the 8N nitric acid has drained, the column is ready for addition of the sample aliquot.

b. For small bone, flesh, and urine samples:

(1) Pack the tip of a base exchange tube with a small glass wool plug.

(2) Slurry the resin in deionized water. Use a disposable dropper to add the slurry to the column until the resin bed is about 3 cm long. Use deionized water to wash the walls of the column free of resin particles.

(3) Wash the column with three 10-ml washes of 8N nitric acid.

(4) When the 8N nitric acid has drained, the column is ready for addition of sample.

Note: Four columns may be necessary for larger flesh and urine samples.

7. Add the sample to the column. After the sample has passed completely through the column, wash the column three times with 10 ml of 8N nitric acid. For large bone samples wash three times with 100 ml of 8N nitric acid.

8. When the 8N nitric acid has drained, wash the column twice with 2 ml of 4N nitric acid. (Caution: an excess of 4N nitric acid at this point will result in loss of plutonium. Do not wash large bone samples with 4N nitric acid.)

9. When the 4N nitric acid has drained thoroughly, (8N nitric acid for large bone samples) elute the plutonium into a new beaker with four 2ml portions of sulfurous acid. Use three 30-ml portions of sulfurous acid for large bone samples.

10. Evaporate the sulfurous acid eluate to dryness. Add 1ml of concentrated hydrochloric acid and evaporate again to dryness. Allow the sample to cool slightly and re-dissolve the sample in 4 drops of 4N hydrochloric acid solution. Add 3ml of 4% am-

monium oxalate solution. Transfer the sample quantitatively into a plating cell with deionized water. The anode should be in the cell with the power supply on so that the sample starts plating immediately when the electrolyte is added to the cell. Fill the cells to within 1/8 inch of the top. Plate the samples at 210 milliamperes (adjusted) for 2½ hours.

11. After 2½ hours make the cell basic with 1 or 2 drops of 1N ammonium hydroxide before breaking the current. Wash out the cell thoroughly with deionized water.
12. Dry the discs under the heat lamp and flame until the disc glows a dull red. Do not flame to cherry red.
13. Place the cooled discs into a labeled petri dish.
14. Count the sample with the alpha spectrometer. Calculate dpm of Pu^{239} per sample as follows:
    a. Add the net counts within the Pu^{239} (lower energy) channels to obtain total Pu^{239} counts.
    b. Add the net counts within the Pu^{236} (higher energy) channels to obtain total Pu^{236} counts.
    c. Divide total Pu^{239} counts by total Pu^{236} counts and multiply this ratio by the total dpm of Pu^{236} added in step 2. (Note: If an aliquot of the sample was spiked after the sample was dissolved, this must be considered in the calculation).

A.2 PLUTONIUM IN FLESH

1. Weigh the sample in its plastic bag and record weight. If the sample was packaged in more than one plastic bag (an inner and outer bag) weigh only the flesh and inner bag. In the case of lymph nodes or other small samples it might be advisable to remove the sample from the bag while still frozen and weigh independently on clean paper. While the flesh is still frozen, slash the bag with a new razor blade and transfer its contents into a beaker of adequate size for digestion.

   Note: If the sample is too large to place in one beaker, divide the sample into equal portions and treat each portion as a separate sample.

2. Add exactly 5.00 ml Pu^{236} solution R(27 dpm) to the beaker containing the sample. Add a sufficient quantity of 4N HNO_3 to cover the sample. Cover with a watch glass and allow to digest overnight without application of heat.

3. Place the sample on a hotplate and digest at low heat with nitric acid. When the solution is clear, add hydrogen peroxide cautiously in small quantities until oxidation has proceeded to the point

where more heat may be applied. Continue heating and evaporate to near dryness. Complete the wet ashing step by the continued addition of nitric acid and hydrogen peroxide. Evaporate the sample to dryness. The ash should be white.

4. Dissolve the residue in 8N nitric acid for the ion exchange step. If material insoluble in 8N nitric acid is present at this point, proceed with filtration, ashing, and fusion as directed in the procedure for bone.
5. Proceed with the ion exchange, electrodeposition, and counting as outlined in the procedure for small bone. If the sample has been divided, combine the results obtained for each portion.

A.3 PLUTONIUM IN SOIL

1. Weigh the sample and take a five-minute count with the low energy gamma spectrometer. Spread the soil in a thin uniform layer for counting.
2. Transfer the sample to a 100-ml platinum dish and add Pu^{236} tracer based on the gamma count at 17KEV.
3. Add concentrated nitric acid to the sample so that the soil is completely covered with the liquid.
4. Digest the samples on the hotplate on thin asbestos cloth. When the sample is hot, add 3 to 5 ml of hydrofluoric acid. Watch the samples so that the one on the hottest part of the hotplate does not begin to splatter. Continue adding hydrofluoric acid in small amounts as needed. When the samples have evaporated to a jelly-like consistency, add more concentrated nitric acid to make it more fluid again. Continue this treatment with nitric and hydrofluoric acid until very little reaction is observed upon the addition of hydrofluoric acid. Evaporate the samples to dryness.
5. Add 8N nitric acid until the sample is fluid, then begin adding 50% hydrogen peroxide dropwise until the sample is clear. Evaporate to dryness (white residue)

6. Add about 10 ml of concentrated nitric acid and evaporate to dryness again.
7. Dissolve the sample in about 75 ml of 8N nitric acid and transfer to a 600-ml beaker. Wash the platinum dish out with more 8N nitric acid.
8. Make a mark on the beaker at the solution level and add an equal amount of de-ionized water. Boil the sample on the hotplate and stir with a glass rod until the volume is reduced back to the mark on the beaker. Set the beaker off the hotplate and allow the insoluble material to settle.
9. Decant the solution into a smaller beaker, being careful not to transfer any of the insoluble material. Transfer the insoluble material to the platinum dish from which it was transferred in step 10 and treat again with nitric and hydrofluoric acid. Filter the solution with Whatman 42 paper and collect the soluble fraction in a 500-ml volumetric flask.
10. Repeat steps 3 to 9 until the sample is in complete solution.

    Note: If necessary, use carbonate fusion as described for bone.
11. Proceed with ion exchange, electrodeposition, and counting as outlined in Section A.1.

A.4 PLUTONIUM IN FECES

1. Transfer the contents of the plastic bag into a large drying pan. Dry the feces in an oven at 80° C for 24 hours. Obtain the dry weight of the feces by recording the weight of the pan and the feces and then subtracting the weight of the pan.
2. Weigh out 250 grams of the dry feces and place the aliquot into a large porcelain dish. Add exactly 5.00 ml of Pu^{236} solution R. Ash the contents of the dish in a furnace at 700° C for 24 hrs.
3. Transfer the ash into a 3,000-ml beaker, using water. When the entire sample is transferred, add enough concentrated nitric acid to make 8N nitric acid. Wet ash the sample with nitric acid and hydrogen peroxide until a white ash is obtained.

   Note: Halides will sometimes give the ash a purplish color. No further ashing is necessary.

4. Dissolve the dried ash in 8N nitric acid for the ion exchange step. If insoluble material is present at this point, proceed with filtering, ashing, and fusion as directed in the procedure for bone.
5. Proceed with the ion-exchange purification as described for large bone samples.

A.5 PLUTONIUM IN PHYSICAL SAMPLES (EXCLUDING SOIL)

1. Remove sample I. D. slip from brown envelope.
2. Make up work sheet and staple I. D. slip to the back and write Roller Coaster Log No. on sheet.
3. Transfer sample from brown envelope to a beaker of suitable size (250 ml for Casella up to 800 ml for film collector). Write Roller Coaster Log No. on beaker.
4. Spike with Pu^{236} solution, measured precisely, as follows:

   approximately 400 dpm Pu^{236} for sample activities up to 10^3 dpm.

   approximately 4,000 dpm Pu^{236} for sample activities between 10^3 and 10^4 dpm. No spike in samples above 10^4 dpm.

Note: Steps 5 to 9 apply only to film collectors.

5. Add concentrated H_2SO_4 and H_2O_2 dropwise to effect dissolution of paper. Continue to add with heating until all paper is charred. Do not add any more H_2SO_4 than is necessary, as it is very hard to evaporate.
6. Evaporate to complete dryness.
7. Add H_2O_2 dropwise and with care.
8. Continue to add dropwise to cause slow burning at surface of charred paper until all burning ceases.

9. Add concentrated HNO_3 to wash down sides of beaker.
10. Evaporate to dryness and add fuming HNO_3 and 50% H_2O_2 until white precipitate remains.
11. Add 100 cc concentrated HNO_3 and 5 to 10 drops of HF.
12. Allow to evaporate to dryness.

Note: Steps 13 to 16 apply only to glass discs.

13. Add 10 to 20 cc concentrated HNO_3 and decant liquid to 100-ml beaker. Keep glass disc in original container.
14. Treat glass disc again with HNO_3 and HF. Decant this solution into the 100-ml beaker.
15. Remove glass disc, wash thoroughly, and discard glass.
16. Allow to evaporate to dryness.

17. Add about 20 to 40 cc of 8N HNO_3 and mark the level on the side of the beaker with a wax pencil.
18. Dilute to approximately 4N and evaporate until liquid level reaches mark on the beaker.
19. Filter into clean, new plastic bottle through No. 42 Whatman filter paper.
20. If any residue is visible in the filter, place the filter back in its original beaker and go through entire digestion again.
21. Proceed with ion exchange purification as described for small bone samples.

APPENDIX B

ANALYTICAL PROCEDURES FOR URANIUM

B.1 PURPOSE

The aim of this procedure is to provide a method of uranium analysis sufficiently sensitive to measure 0.001 ug uranium. To meet this requirement both a suitable means of isolating uranium from interfering ions and compounds and a consistent way of fusing with flux are required (References 2, 3, 4 and 7). Also, a suitable means of avoiding contamination and a way of de-contaminating fusion materials and apparatus is required. These four requirements, along with others, are treated in this method. Some of the equipment is commercially available, while a few items have been constructed by Eberline Instrument Corporation. While following a general theme as described in the Project 5.2/5.3c Pretest Report and general instructions given by the G. K. Turner Company, makers of the fluorometer used here (Reference 6), a few changes have been made in adapting the fusion method to the conditions and equipment at hand. A completely new method of isolating uranium from extraneous salts has been included as part of the treatment (Reference 1), and a larger amount of flux has been incorporated to correct for distortion of flux pellets formed in the

platinum dishes, which, consequently, have given more consistent results from duplicate analysis.

B.2 PROCEDURES

B.2.1 Cleaning and Maintenance of Platinum Fusion Dishes.

The form and cleanliness of the platinum fusion dishes must be maintained in order to produce reproducible results; also any materials which attack platinum at the fusion temperatures must be avoided, such as SO_4, $HClO_4$, and NO_3 (Reference 3). Also all substances which cause quenching of fluorescence such as iron, manganese, chromium (Reference 4), or those which cause further excitation such as detergents, must be reduced to a minimum (Reference 3). While experimenting with several different cleaning solutions (Reference 3), a method using hot deionized water and 6N HCl was found to be the most satisfactory for our purposes.

The platinum dishes are allowed to soak in hot deionized water for at least 1 hour; then enough concentrated HCl is added to adjust to 6N. The dishes are allowed to soak in this solution for another hour before rinsing with deionized water and blotting dry with Kleenex tissue. This washing cycle is repeated every time a fusion is completed to insure removal

of all adhering materials on the dishes that could contain contamination. Occasionally, the dishes may need reshaping; this can be done by using the dish mold constructed for this purpose.

B.2.2 Preparation of Fusion Flux and Pellets.

The fusion flux is composed of 98% NaF, 2% LiF (References 3 and 7), which has been homogenized in a tumbling apparatus to insure proper mixing of components. The fusion pellets are prepared using a pellet former that produces pellets weighing 0.8 gram in cylinder form to accommodate the shape of the platinum dishes. The shaft of the pellet former is constructed of aluminum, while the plunger is made of steel; this partly eliminates contamination of the flux with iron; however, aluminum sometimes adheres to the flux. Aluminum does not appear to impart coloration to the fusions or to seriously affect the reproducibility of the system. The pellet former should not be washed with water, acids, or organic solvents before or after use, since this appears to increase the amount of contamination from the shaft and the plunger. A polyethylene pellet former would probably be more appropriate.

The pellets are formed by placing a suitable amount of flux in a large watch glass and compacting

it into the shaft with moderate pressure until the plunger does not have any noticeable clearance. A smooth surface is obtained by sliding or rotating the shaft against the watch glass, being careful not to abrade the surface of the shaft on it and consequently on the flux. Pellets weighing 0.798± .011 gram can be obtained in this manner.

B.2.3 Calibration of G. K. Turner Fluorometer.

Blank fusions are of two types: those which are processed simultaneously with the samples (B^r) and those which are prepared from fusing pure flux (B). In calibrating and operating the Turner Fluorometer another type of blank is also used: that of zero fluorescence (B°) which is produced by placing a piece of opaque electrical tape over the orifice through which U.V. light enters the fusion pellet (Reference 5). B and B° are used primarily for calibration purposes and general analysis of samples, whereas B^r is used for corrective purposes and recovery measurements (Reference 6).

A suitable primary uranium standard has been made to provide secondary standards at the required dilutions. A known quantity of these solutions is transferred to the platinum dishes (S_o), fused, and

the fluorescence recorded (Reference 5). B samples are run simultaneously to correct for the natural fluorescence of the fusion pellets. The difference, S_o-B equals S_c, is the corrected value of the standard fluorescence. The values of S_c were plotted versus ug U to obtain a standard calibration curve

B.2.4 Preparation of Samples for Analysis.

The 8N HNO_3 solution, samples from which the plutonium has been removed, is held for uranium analysis. The solution is taken to dryness and redissolved in 50 ml of acetic-nitric acid solution (90% glacial acetic acid, 10% 5N HNO_3acid, v/v) (Note 1). The ion exchange column is prepared by transferring in a slurry Dowex 1 by 8, which has been soaking in 8N HNO_3. Enough resin is added to completely fill the column. The column is further placed in the nitrate form with three 10 ml volumes of 8N HNO_3, after which three 10-ml volumes of acetic-nitric acid solution are allowed to soak through the columns. The sample solution is then passed through the columns followed by four 10-ml volumes of acetic-nitric acid solution to remove any non-adsorbed extraneous salts (Reference 1). The uranium is eluted, using three 10-ml volumes of 1N HNO_3 and the resulting

solution evaporated to dryness, then the salts converted to chloride form using HCl. The residue is then dissolved in the desired amount of 1N HCl for the fusion procedure. In some cases, the uranium is purified by extraction with diethyl ether. Details of this method are described in the published literature (Reference 8).

B.2.5 Fusion Method.

An aliquot of the above solution is transferred to the platinum dish, evaporated to dryness, and flamed. The fusion pellet is then added to each dish. Since fusions are performed in groups of four, at least four analyses should be made, and as many as twenty can be performed in five fusion cycles. The dishes with samples are centered and leveled in pairs on the fusion rack inside the fusion hood. The rack may also need levelling; for this purpose levelling screws have been inserted into the base of the rack. The air vents at the base of the burner are closed and the natural gas admitted into the burner for ignition. The air vents are opened and the fuel pressure is reduced by the needle valve at the base of the burner until a flame is reached where the sample melts in about two minutes. The fuel pressure is further reduced until the melts

spread up the sides of the fusion dishes and the bubbles formed at the bottom of the melts begin to effervesce (Note 2). At this point the burner is moved slowly to each side of the median, both laterally and horizontally, to remove all traces of bubbles. During this movement the melts should not be allowed to cool to their congealing temperature but kept in the molten state (Note 3). After all bubbles have been removed, the timer is set for one minute and the samples are allowed to remain at this temperature. At the end of one minute the timer is set for another minute interval and the air vents adjusted until the flame just forms a blue cone about three inches high, then opened until the cone just disappears. At the end of the minute interval the timer is again reset for one minute and the burner is moved briskly from one side of the median to the other, both laterally and horizontally, until the melts form into a dull red crystalline state (about 15 seconds). The air vents are then completely closed and the melts annealed by slower lateral and horizontal movements for the remaining part of the minute (about 45 seconds); the burner is then moved to the next group of samples for a new cycle. Depending on the constancy of the

natural gas and air pressures, the initial gas adjustment may be omitted from the next group of fusions and the needle valve may remain at the same adjustment throughout the whole fusion period. The latter can generally be inferred by visual observation.

B.2.6 Radiometric Determination.

The samples that contain higher levels of uranium are electroplated and counted with the alpha spectrometer to determine the activity ratio of the uranium isotopes. The electrodeposition procedure for uranium is exactly the same as for plutonium.

Note #1

Occasionally a sample will dissolve more readily if 5 ml of 5N HNO_3 are added first and then 45 ml of glacial acetic acid are added to make the acetic-nitric wash solution.

Note #2

This adjustment must be made with care because too low a fuel pressure will not allow the sample to remain molten or will cause flameout.

Note #3

If the sample solidifies it is best to remelt it before setting the timer. Samples which remain solid at this stage have a tendency to shrink and form dis-

torted pellets.

Note #4

Samples with a high salt content tend to give the pellet an opaque slaky appearance and cause deformation with this fusion method.

B.3 CALCULATIONS

B.3.1 Corrections.

To obtain the true reading, R_t, of a sample from the observed value, R_o, the pure flux blank, B, or the reagent blank, B^r, is subtracted. If the reagent blank is significantly different from the pure flux blank, then B^r is subtracted instead of B. The amount of uranium present in the fusion flux is then calculated from the standard calibration curve.

B.3.2 Dilution and Total Sample Values.

Since the amount of uranium present in the fusion is only a fraction of the total amount present in the sample, the dilution factor, D, must be included when calculating the total amount of uranium in a sample: $ugU_t = P_t \times C^m \times D$. The dilution factor is generally calculated from three aliquots: The initial aliquot taken from the total sample volume, the volume in which

the residue is dissolved after the second ion exchange stage, and the pipetted volume which is transferred to the platinum fusion dish.

B.3.3 Sources of Error.

There are three main sources of error: pipetting, ion-exchange loss, and the reproducibility of the fusion method itself. The last source of error can be approximated from the standard deviation of blank or standard fusions. The combined effect of the different errors can be approximated by analyzing samples which have been injected with an internal spike of known uranium concentration (Table 3.2). B^r fusions can be used to correct for any errors the reagents might produce.

B.4 DISCUSSION

The Turner Fluorometer is adjustable to four ranges of sensitivity simply by varying the amount of U.V. light impinging on the sample; however, these ranges cannot decrease the natural limitation of the instrument, which has been reported as ± 0.0005 ug U or ± 5%, whichever is greatest (Reference 6). The former value closely approximates ± 1 division. To have a minimum of ± 10% error, then at least 0.005 ugU must be present in the

fusion dish, or at least 0.01 ugU for a ± 5% error. The values above 0.01 ugU are limited to a 5% error, but the values below 0.001 ugU are always subject to an error in excess of 10%. This error does not include the total error of the procedure so that very small amounts of uranium have prohibitively large standard deviations, and at least 0.01 ugU should be present in the fusion dish to give reliable results when samples are analyzed. The problem of dilution becomes critical when the total amount of uranium in the sample is quite low (Note 4).

Samples containing relatively large amounts of uranium can be conveniently handled by sufficient dilution or by using the 1% filter attachment.

B.5 REAGENTS AND EQUIPMENT

B.5.1 Reagents and Solutions.

NaF	Baker	8N HNO_3
LiF	Baker	5N HNO_3
Dowex 1x8 50-100 mesh		1N HNO_3
Glacial acetic acid	Dupont	1N HCl
Concentrated HCl		Deionized water

B.5.2 Preparation of Uranium Standards.

The primary standard was prepared in water from uranyl nitrate: $UO_2(NO_3)_2.6H_2O$, f.w. 502.182, m.p. 60.2 deg. C., decomposes @ 100 deg. C., Baker analyzed.

The uranium salt was dried just below its melting point, reaching a maximum temperature of 58° C, for two hours. The sample was brought to room temperature in a vacuum dessicator and weighed. 0.4216 gram was dissolved in 1 liter of deionized water. The uranium factor: $U/UO_2(NO_3)_2.6H_2O = 238.07/502.182$ was used to calculate the amount of uranyl nitrate hydrate required to give a 1000-ppm solution in one liter. This is equal to 2.1094 grams. The primary standard then has a concentration of 0.4216/2.1094 x 1000 ppm of 199.87 ppm. All of the secondary standards were made from the primary solution.

B.5.3 Equipment and Materials.

Turner Fluorometer Model 110

Platinum fusion dishes

Pellet holder door

1% filter DT 72-20

Pellet former: to contain 0.8 gram flux, aluminum shaft, stainless steel plunger.

Platinum dish mold: compression type, stainless steel

Fusion rack

General dimensions:

Length: 63.5 cm

External width: 10 cm

Width between consecutive platinum wire supports: 1.5 cm

Width between alternate wire pairs: 2.5 cm

Internal width: 8.7 cm

Height from base to platinum wires: 4 cm

Height of burner from base: 20.5 c
(distance of burner from platinum wires: 3.5 cm)

Frame and base made of aluminum, adjusting bolts made of stainless steel.

Fusion Hood

General dimensions:

Length: 76.2 cm

Width: 41.7 cm

Height: 51.0 cm

Construction of Translucite, two open sides

Compressor, Brown; Hi-Pressure

Capacity: 11.5 gallons

Pressure range: 80 to 100 psi

W. R. Brown Corp., Chicago, Ill.

Pressure regulator, Norgen: Type 11-002

C. A. Norgen Co., 3400 S. Elati St., Englewood, Colo.

Filter, Manual Drain; Norgen, Type 12-002

Flowrator, Unknown brand

used to check on equilibrium air flow from compressor @ zero regulator pressure

Fischer burner; No. 18224, high temperature adjustable

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