AR TARGET SHEET

The following document was too large to scan as one unit, therefore, it has been broken down into section.

DOCUMENT #: (none)

EDMC#: 0022940

SECTION: 5 of 5

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1100-EM-1 GROUNDWATER CHARACTERIZATION
PHASE I

DATA PACKAGE/REPORT No. 1

Revision 0

APPENDIX E

TOTAL BETA ANALYSIS

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See Appendix B: Radiochemistry Standards and Controls for additional supporting documentation.

Battelle
Pacific Northwest Laboratories

Project Number 19432

Internal Distribution

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Date March 31, 1992

To Bruce Prentice

From Sandy Fadeff

Subject Gross Beta Analysis Results

Samples submitted from the 1100-EM-1 project were analyzed for gross beta activity. The procedures used for this analysis were PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis, PNL-ALO-462, Source Preparation for Gross Beta Analysis, and PNL-ALO-463, Beta Counting Procedure. The analysis was performed in late January through February 1992, in the 329 Building, 300 Area.

The samples resulted in a significant solids loading on the beta dish (about 20 to 110 mg). An efficiency curve was prepared for a previous program for solids loading from soil matrices. This was utilized for the matrix of salts in these groundwater samples. The recoveries of ^{90}Sr-Y on the matrix spike samples were excellent ranging from 98% to 111% and averaging 104%. Therefore, the utilization of this efficiency curve for the groundwater matrix was determined to be accurate with relation to the higher energy beta emissions.

The beta detectors are calibrated relative to ^{90}Sr-Y, and, therefore, their efficiency is based on their response to high energy beta emissions of the ^{90}Sr-Y. As the data will show, this efficiency does not correlate well with the low energy beta of ^{99}Tc. In order to determine the recovery of the ^{99}Tc blank spikes and matrix spikes, a separate efficiency calibration was determined.

An efficiency curve was prepared utilizing sample B01574 (92-02726) to provide a typical salt matrix. Various volumes of this sample were spiked with a constant amount of ^{99}Tc standard in sufficient quantity to overwhelm the sample beta activity contribution. The resulting efficiency versus milligram loading on the beta plate curve was calculated using a curve fitting program and is defined as:

$$\text{efficiency (d/c)} = 2.486 + 0.0566(X) - 0.000123(X)^2$$

where X equals the milligram loading on the dish. This efficiency calculation is used to determine the blank and matrix spike recoveries of the ^{99}Tc.

The analysis was run in four batches. The first batch included half of the samples plus the QC samples. The second batch included the second half of the samples plus the QC samples. The second batch, however, had several problems. The technetium matrix spike duplicate showed a poor recovery (16%) and four samples did not correlate well with the ICP-MS results. To evaluate this problem, these four samples were re-run in a third batch along with the

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QC samples. This third batch run correlated well with the ICP-MS results and all QC sample results were within the expected ranges. It was concluded that several samples were mistakenly switched during the plate loading step. Steps shall be discussed within the radiochemistry group to prevent this problem from recurring. All results from the second analytical run were disregarded and the samples (not already run in batch 3) were re-analyzed (batch 4).

Limits of precision, accuracy, and detection for beta analysis were quoted in the technical proposal with relation to the ^{90}Sr/Y calibration. This is the same calibration radionuclide as specified in EPA Method 900.0. All QC criteria were met with this calibration within all four analytical batches. Excluding the second analytical batch (see above), the average spike recovery of the ^{90}Sr/Y is 102%. The method detection limit is calculated to be 2 pCi/L for the ^{90}Sr/Y calibration. This is conservative and based on a 100 minute count time. Near the detection limit, precision is about 30% relative. At such low levels (4.5 pCi/L), this lower precision is expected. At a level of 45 pCi/L, precision is about +/-6 % relative.

Based on the ^{99}Tc efficiency or calibration curve the blank and matrix spike recoveries ranged from 84% to 149%. (The second analytical batch is excluded.) It is unknown why one ^{99}Tc matrix spike recovery was so high (first batch). It is considered to be suspect data. The average spike recovery (not including the 149%) is 92% (including the 149% recovery, the average is 98%). The method detection limit for this calibration is calculated to be 3 pCi/L. Precision is about +/- 29% near the detection limit and +/- 2% at 108 pCi/L.

In order to compare the beta analysis results with the ^{99}Tc determined by ICP-MS, it is best to look at sample values calculated based on the ^{99}Tc efficiency calculation. If the sample activity is due entirely to ^{99}Tc, then the total beta results using the ^{99}Tc efficiency curve should compare well. If the sample activity is due to an additional or another radionuclide, then no real comparison between the methods can be made.

Sample B015W3 contains less than the detection limit in total beta activity, however the actual beta value obtained is reported for the sample. It is based on the actual sample count rate. The activity is reported to aid in any statistical treatments for which the data are subjected. The value should be considered as less than 2 pCi/L (^{90}Sr calibration) and less than 3 pCi/L (^{99}Tc calibration). At this level the associated error in the measurement becomes large relative to the sample value.

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1100-EM-1

OVERALL SUMMARY OF TOTAL BETA ANALYSIS

Beta results are presented in two ways: calibration based on Sr-Y-90 and calibration based on Tc-99

Sample ID	ALO #	Based on Sr-Y-90 Calibration pCi/L	+/-	Based on Tc-99 Calibration pCi/L	+/-
B01572	92-02724	5.03	0.49	10.8	1.3
B01573	92-02725	3.24	0.37	5.72	0.70
B01574	92-02726	5.23	0.33	11.4	0.9
B01575	92-02727	39.51	0.93	85.2	5.9
B015S9	92-02728	36.16	0.95	90.1	8.7
B015T1	92-02729	47.3	1.2	123	13
B015T3	92-02730	42.0	1.1	107	11
B015T5	92-02731	31.46	0.83	75.3	6.6
B015T7	92-02732	37.1	1.0	100	13
B015T9	92-02733	31.62	0.82	78.2	7.4
B015V1	92-02734	38.3	1.1	105	15
B015V3	92-02735	66.9	1.3	153	12
B015V5	92-02736	2.09	0.35	4.00	0.69
B015V7	92-02737	5.60	0.44	11.7	1.2
B015V8	92-02738	56.2	1.2	139	13
B015V9	92-02739	4.92	0.39	9.74	0.93
B015W0	92-02740	5.3	1.2	10.2	2.4
B015W1	92-02741	4.44	0.69	8.7	1.4
B015W2	92-02742	8.0	1.4	17.8	3.3
B015W3	92-02743	0.2 *	0.9	0.3 *	1.2
B01BV6	92-02744	44.3	2.0	108	8
B01BV9	92-02745	46.0	2.9	115	13
B01BW2	92-02746	50.8	2.1	138	14
B01BW5	92-02747	41.8	2.5	102	11
B01BW8	92-02748	50.9	2.7	128	14
B01BX1	92-02749	32.3	2.2	76.1	7.9
B01C38	92-02750	45.6	2.8	122	16
B01C11	92-02751	6.4	1.5	14.1	3.4
B01C28	92-02752	14.9	1.6	33.9	4.5

Errors listed are based on the propogated error of the individual measurements. Overall, the error is expected to be +/- 15% for the Sr/Y calibration, and +/- 20% for the Tc-99 calibration. The method detection limit is about 2 pCi/L (Sr/Y-90) and about 3 pCi/L (Tc-99).
*These values are below the detection limit, please refer to the narrative discussion, last paragraph, for the meaning of these results.

J. H. K. 4/8/92

J. H. Kinge 4/8/92

S. K. Fadeff 3/18/92

E01-005

1100-EM-1
Summary and Comparison of Total Beta Results and ICP-MS Results

Beta results are presented in two ways: calibration based on Sr-Y-90 and calibration based on Tc-99

Sample ID	ALO #	Based on Sr-Y-90 Calibration pCi/L	+/-	% Spike Recovery	Based on Tc-99 Calibration pCi/L	+/-	% Spike Recovery	ICP-MS pCi/L
First Batch Total Beta Analysis								
B01572	92-02724	5.03	0.49		10.8	1.3		17
B01573	92-02725	3.24	0.37		5.72	0.70		15
B01574	92-02726	5.67	0.46		11.9	1.2		24
B01574	DUP-02726	4.79	0.47		10.9	1.3		NA
B01575	92-02727	39.51	0.93		85.2	5.9		121
B015S9	92-02728	36.16	0.95		90.1	8.7		125
B015T1	92-02729	47.3	1.2		123	13		128
B015T3	92-02730	42.0	1.1		107	11		149
B015T5	92-02731	31.46	0.83		75.3	6.6		118
B015T7	92-02732	37.1	1.0		100	13		139
B015T9	92-02733	31.62	0.82		78.2	7.4		84
B015V1	92-02734	38.3	1.1		105	15		115
B015V3	92-02735	66.9	1.3		153	12		141
B015V5	92-02736	2.09	0.35		4.00	0.69		<10
B015V7	92-02737	5.60	0.44		11.7	1.2		<10
B015V8	92-02738	56.2	1.2		139	13		172, 139
	BL-02724	-1.27	0.31		-1.69	0.41		
	BS-02724Sr	1003	13	104	NA	NA		
	BS-02724Tc	62.0	1.1	64	81.7	3.6	84	
	MS-2724Sr	927	16	107	NA	NA		
	MS-2724Tc	72.0	3.1	69	156	13	149	
	MSD-2724Tc	248.4	3.7	40	544	37	87	

Errors listed are based on the propogated error of the individual measurements.
Overall, the error is expected to be +/- 15% for the Sr/Y calibration, and +/- 20% for the Tc-99 calibration.
The method detection limit is about 2 pCi/L (Sr/Y-90) and about 3 pCi/L (Tc-99).
Standards used: Tc-99 #54124-64-17 (all batches); Sr-Y-90 #52733-117-1 batches 1, 2, and 4, #52733-117-2 batch 3.

1100-EM-1
Summary and Comparison of Total Beta Results and ICP-MS Results

Beta results are presented in two ways: calibration based on Sr-Y-90 and calibration based on Tc-99

Sample ID	ALO #	Based on Sr-Y-90 Calibration pCi/L	+/-	% Spike Recovery	Based on Tc-99 Calibration pCi/L	+/-	% Spike Recovery	ICP-MS pCi/L
Second Batch Total Beta Analysis								
B015V9	92-02739	145.1	2.9		328	25		<10
B015W0	92-02740	3.58	0.38		6.72	0.78		<10
B015W0	DUP-02740	3.10	0.41		5.50	0.76		NA
B015W1	92-02741	47.0	1.1		120	13		<10
B015W2	92-02742	6.46	0.34		13.4	1.1		<10
B015W3	92-02743	-0.87	0.23		-1.17	0.31		<10
B01BV6	92-02744	38.9	1.3		102	12		150, 120
B01BV9	92-02745	38.6	1.2		104	13		140
B01BW2	92-02746	3.87	0.65		8.5	1.5		121
B01BW5	92-02747	37.45	0.91		93.2	8.9		104
B01BW8	92-02748	43.9	1.1		115	13		99
B01BX1	92-02749	30.6	1.2		73.6	6.8		86
B01C38	92-02750	41.6	1.4		108	12		86
B01C11	92-02751	5.21	0.42		10.6	1.1		17
B01C28	92-02752	122.2	1.9		250	15		20
	BL-02740	0.71	0.99		0.9	1.3		
	BS-02740Sr	992	15	103	NA	NA		
	BS-02740Tc	318.6	6.5	66	446	19	92	
	MS-2740Sr	813	13	101	NA	NA		
	MSD-2740Sr	955	15	111	NA	NA		
	MS-2740Tc	223.1	5.3	49	438	26	96	
	MSD-2740Tc	50.6	1.5	11	74.4	3.5	16	

Errors listed are based on the propogated error of the individual measurements.
Overall, the error is expected to be +/- 15% for the Sr/Y calibration, and +/- 20% for the Tc-99 calibration.
The method detection limit is about 2 pCi/L (Sr/Y-90) and about 3 pCi/L (Tc-99).
Standards used: Tc-99 #54124-64-17 (all batches); Sr-Y-90 #52733-117-1 batches 1, 2, and 4, #52733-117-2 batch 3.

1100-EM-1
Summary and Comparison of Total Beta Results and ICP-MS Results

Beta results are presented in two ways: calibration based on Sr-Y-90 and calibration based on Tc-99

Sample ID	ALO #	Based on Sr-Y-90 Calibration pCi/L	+/-	% Spike Recovery	Based on Tc-99 Calibration pCi/L	+/-	% Spike Recovery	ICP-MS pCi/L
Third Batch Total Beta Analysis								
B015V9	92-02739	4.92	0.39		9.74	0.93		<10
B015W1	92-02741	3.71	0.41		7.4	0.9		<10
B015W1	DUP-02741	5.2	1.3		9.9	2.6		NA
B01BW2	92-02746	50.9	2.9		138	19		121
B01C28	92-02752	14.9	1.6		33.9	4.5		20
	BL-02739	-0.43	0.29		-0.57	0.39		
	BS-02739Sr	1007	16	104	NA	NA		
	BS-02739Tc	590	10		878	36	90	
	MS-02741Sr	981	16	101	NA	NA		
	MSD-2741Sr	952	16	98	NA	NA		
	MS-02741Tc	427	9		892	57	90	
	MSD-2741Tc	465	9		947	57	96	

Errors listed are based on the propogated error of the individual measurements.
Overall, the error is expected to be +/- 15% for the Sr/Y calibration, and +/- 20% for the Tc-99 calibration.
The method detection limit is about 2 pCi/L (Sr/Y-90) and about 3 pCi/L (Tc-99).
Standards used: Tc-99 #54124-64-17 (all batches); Sr-Y-90 #52733-117-1 batches 1, 2, and 4, #52733-117-2 batch 3.

1100-EM-1
Summary and Comparison of Total Beta Results and ICP-MS Results

Beta results are presented in two ways: calibration based on Sr-Y-90 and calibration based on Tc-99

Sample ID	ALO #	Based on Sr-Y-90 Calibration pCi/L	+/-	% Spike Recovery	Based on Tc-99 Calibration pCi/L	+/-	% Spike Recovery	ICP-MS pCi/L
Fourth Batch Total Beta Analysis								
B015W0	92-02740	5.3	1.2		10.2	2.4		<10
B015W2	92-02742	8.0	1.4		17.8	3.3		<10
B015W3	92-02743	0.2	0.9		0.3	1.2		<10
B01BV6	92-02744	42.9	2.5		109	12		150
B01BV6	DUP-2744	45.6	3.2		107	11		120
B01BV9	92-02745	46.0	2.9		115	13		140
B01BW2	92-02746	50.7	2.9		138	20		121
B01BW5	92-02747	41.8	2.5		102	11		104
B01BW8	92-02748	50.9	2.7		128	14		99
B01BX1	92-02749	32.3	2.2		76.1	7.9		86
B01C38	92-02750	45.6	2.8		122	16		86
B01C11	92-02751	6.4	1.5		14.1	3.4		17
	BL-02744	-1.3	0.9		-1.7	1.3		
	BS-02744Sr	929	14	96	NA	NA		
	BS-02744Tc	NA	NA		502	21	103	
	MS-2744Sr	1028	17	102	NA	NA		
	MS-2744Tc	NA	NA		584	70	98	
	MSD-2744Tc	NA	NA		523	49	85	

Errors listed are based on the propogated error of the individual measurements.
Overall, the error is expected to be +/- 15% for the Sr/Y calibration, and +/- 20% for the Tc-99 calibration.
The method detection limit is about 2 pCi/L (Sr/Y-90) and about 3 pCi/L (Tc-99).
Standards used: Tc-99 #54124-64-17 (all batches); Sr-Y-90 #52733-117-1 batches 1, 2, and 4, #52733-117-2 batch 3.

rec'd 3/5/92

QUALITY CONTROL DATA REVIEW

Project/Work Package: 19432/M82776

Project/WP Title: 1100-EM-1 Groundwater Characterization

Requested Analysis: Total Beta

ALO Sample Numbers: 92-02724 - 92-02752

I have reviewed the data specified above for completeness and compliance with project requirements.

J. Leland Daniel
Data Quality Officer
Analytical Chemistry Laboratory

3/23/92
Date

E02-001

BATCH 1

TOTAL BETA ANALYSIS

Test Instruction for
1100-EM-1 Total Beta Analysis

Note: Samples need to be locked at all times.

This is impact level 1 work; date and sign all crossouts.

Analysis should be done in a low level lab such as 10A.

Take the specified aliquot and perform analysis per procedures PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis, PNL-ALO-462, Source Preparation for Gross Beta Analysis, and PNL-ALO-463, Beta Counting Procedure. Use the low beta detectors if the sample plates meet the criteria for their use (i.e. less than 25 dpm).

~~Dilute Tc-99~~ #1892-42-1000-2 100ul to 100ml in water. Label this #1892-42-1000-2-1000. Use calibrat~~ed pipet and volumetric flask.~~ NA SKJ 2/11/92

BL-02724	100 ml H2O		
BS-02724	100 ml H2O	200 ul Sr-Y-90 #52733-117-1	
BS-02724Tc	100 ml H2O	200 ul Tc-99 #1892-42-1000-2-1000	
92-02724	100 ml		
92-02725	100 ml		
92-02726	100 ml		
Dup-02726	100 ml		
92-02727	100 ml		
92-02728	100 ml		
92-02729	100 ml		
92-02730	100 ml		
92-02731	100 ml		
92-02732	100 ml		
92-02733	100 ml		
92-02734	100 ml		
92-02735	100 ml		
92-02736	100 ml		
92-02737	100 ml		
92-02738	100 ml		
MS-02726	100 ml	200 ul Sr-Y-90 #52733-117-1	
MSTc-02726	100 ml	200 ul Tc-99 ~~#1892-42-1000-2-1000~~	54124-64-17
MSDTc-02726	100 ml	1ml + 200 ul Tc-99 ~~#1892-42-1000-2-1000~~	54124-64-17

1-23-92

J. K. Jaeger 1/15/92

Leaching Data Sheet

Procedure PNL-ALO-106 Rev.0, leach: Check if used ✓

Date Sample Leach Started 1-20-92 Date Completed 1-21-92

Tracer or Spike Volumes

Isotope ^{90}Sr-Y Sample Added to: BS 02724
Pipette No. 10A-18 Volume 178.91 +/- 0.91 Date Pipetted 1-17-92
Spike ID 52733-117-1 Spike Activity 1.47x10^3 dpm/ml

Isotope ^{99}Tc Sample Added to: BS02724 TC
Pipette No. 10A-18 Volume 178.91 +/- 0.91 Date Pipetted 1-20-92
Spike ID ~~53960-28-1 53243-32~~ 54124-64-17 Spike Activity ~~107.4~~ 108.5 dpm/ml SLF 2/11/92

Sample ID, Aliquot Size, and Leachate Volume

Balance Number 510-06-01-006 Temperature (if weighing water samples) 22°

	Sample ID	Beaker Wt.	Bker + Smpl	Sample Wt or Vol	~~Dilu.~~ Volume factor	~~Dilu Vol Uncertainty~~ 2-11-92 SB	
	BL-02724			100 ml			
	BS-02724	NA		100 ml			
	BS-02724TC			100 ml			
B01572	92-02724	110.08 g	200.10 g	90.02 g	90.32 ml		
B01573	92-02725 2 2E3 1/8/92	103.88 g	199.71 g	95.83 g	96.04 ml		
B01574	92-02726	107.08 g	202.01 g	94.93 g	95.14 ml		
B01574	92-02726 2	107.79 g	201.46 g	93.67 g	93.88 ml		
B01575	92-02727	106.46 g	193.93 g	87.84 g	88.03 ml		
B01559	92-02728	106.09 g	204.85 g	98.76 g	98.98 ml		
B01571	92-02729	106.32 g	204.48 g	98.16 g	98.38 ml		

Sample Volumes (if a pipet was used for small aqueous samples)

Pipette No. NA Volume NA +/- NA Date Pipetted NA

Susan G Bradley 1-23-92 — Analyst, Date
J. L. Jacobs 2/11/92 — Reviewer, Date

LECHDATA.LOG

Leaching Data Sheet

Procedure PNL-ALO-106 Rev.0, leach: Check if used ✓

Date Sample Leach Started 1-20-92 Date Completed 1-21-92

Tracer or Spike Volumes

Isotope NA Sample Added to: _____
Pipette No. _____ Volume _____ +/- _____ Date Pipetted _____
Spike ID _____ Spike Activity _____

Isotope NA Sample Added to: _____
Pipette No. _____ Volume _____ +/- _____ Date Pipetted _____
Spike ID _____ Spike Activity _____

Sample ID, Aliquot Size, and Leachate Volume

Balance Number 510-06-01-006 Temperature (if weighing water samples) 22° Vol. factor 1.00221

	Sample ID	Beaker Wt.	Bker + Smpl	Sample Wt or Vol	~~Dilution~~ Volume ~~factor~~	Diln Vol. Uncertainty	
B015T3	92-02730	105.62	203.15	97.53 g	97.75 ml		
B015T5	92-02731	107.99	206.37	98.38 g	98.60 ml		
B015T7	92-02732	107.48	211.89	104.4 g	104.63 ml		
B015T9	92-02733	105.70	218.48	112.8 g	113.05 ml		
B015V1	92-02734	111.18	213.73	102.6 g	102.83 ml		
B015V3	92-02735	106.03	203.05	97.02 g	97.23 ml	NA	
B015V5	92-02736	106.09	215.64	109.6 g	109.84 ml		
B015V7	92-02737	108.07	206.91	98.84 g	99.06 ml		
B015V8	92-02738	103.08	204.30	101.2 g	101.42 ml		

Sample Volumes (if a pipet was used for small aqueous samples)

Pipette No. NA Volume NA +/- NA Date Pipetted NA

Gerson G Bradczynski 1-23-92 J. K. Indigo 2/11/92
Analyst Date Reviewer Date

LECHDATA.LOG

47393

Leaching Data Sheet

Procedure PNL-ALO-106 Rev.0, leach: Check if used ✓

Date Sample Leach Started 1-20-92 Date Completed 1-21-92

Tracer or Spike Volumes

Isotope ^{90}Sr-Y Sample Added to: MS-02726

Pipette No. 10A-18 Volume 198.9 λ +/- 0.9 λ Date Pipetted 1-20-92

Spike ID 52733-117-1 Spike Activity 1.47x10^3 dpm/ml

Isotope ^{99}TC Sample Added to: MSTC 02726 + MSD TC 02726

Pipette No. 10A-18 Volume 199.9 λ +/- 0.9 λ Date Pipetted 1-20-92

SK 3/4/92 Spike ID ~~53960-28-1~~ 53293-32 Spike Activity ~~107.4~~ 108.5 dpm/ml SKF 2/11/92

54124-64-17

NJ 3-4-92 to MSD TC 02726 added additional 999.1 ± 4.0 λ ^{99}TC 108.5 ~~107.4~~ dpm/ml per S.K. Fadeff 1-21-92 pipet 10A-22

Sample ID, Aliquot Size, and Leachate Volume

Balance Number 310-06-01-006 Temperature (if weighing water samples) 22° 1.00221-vol factor

Sample ID	Beaker Wt.	Bker + Smpl	Sample Wt or Vol	~~Diln~~ Volume factor	Diln Vol. Uncertainty	
MS-02726	107.57	218.25	110.7 g	110.9 ml		
MSTC 02726	111.21	215.37	104.1 g	104.3 ml		
MSDTC 02726	104.30	202.13	97.8 g	96.0 ml		
~~1 ml 99 TC dwt~~						
2						
3 1-22-92						

Sample Volumes (if a pipet was used for small aqueous samples)

Pipette No. NA Volume NA +/- NA Date Pipetted NA

Analyst 1-23-92 Date Reviewer 2/11/92 Date

LECHDATA.LOG

Gross Alpha and Beta Dish Weight
Data Sheet

Date Sample Prep Started 1-21-92
Date Completed 1-22-92

Sample ID and Dish Weights

Balance Number 509-06-03-003

Sample ID	Tare Wt. of Alpha Dish	Gross Wt. of Alpha Dish	Net Wt. of Alpha Ppt.	Tare Wt. of Beta Dish	Gross Wt. of Beta Dish	Net Wt. of Beta Ppt.
BL-02724				0.7520 g	0.7528 g	0.5 mg
BS-02724				0.7474	0.7474	0 mg
BS-02724TC				0.7407	0.7407	.1 mg
92-02724				0.7572	0.8007	43.5 mg
92-02725				0.7472	0.7677	20.5 mg
92-02726				0.7440	0.7833	39.3 mg
92-02726D				0.7349	0.7879	53.0 mg
92-02727				0.7496	0.7923	43.7 mg
92-02728				0.7409	0.8122	71.3 mg
92-02729	~~0.7440~~ 1-22-92			0.7440	0.8264	82.6 mg
92-02730				0.7440	0.8208	76.8 mg
92-02731				0.7430	0.8052	62.2 mg
92-02732				0.7506	0.8477	97.1 mg
92-02733				0.7508	0.8204	69.6 mg
92-02734				0.7408	0.8458	105 mg

Gerald G Bradley 1-23-92 S. K. Fadeff 2/11/92
Analyst Date Reviewer Date

ABDATA3.LOG

Gross Alpha and Beta Dish Weight
Data Sheet

Date Sample Prep Started 1-21-92
Date Completed 1-22-92

Sample ID and Dish Weights

Balance Number 509-02-03-003

	Sample ID	Tare Wt. of Alpha Dish	Gross Wt. of Alpha Dish	Net Wt. of Alpha Ppt.	Tare Wt. of Beta Dish	Gross Wt. of Beta Dish	Net Wt. of Beta Ppt.
	92-02735				0.7559g	0.8098g	53.9mg
	92-02736				0.7474	0.7759	28.5mg
	92-02737				0.7416	0.7803	38.7mg
	92-02738				0.7456	0.8153	69.7mg
	MS 02726				0.7426	0.7934	50.8mg
200λ 54124-64-1	MS TC 02726				0.7406	0.7920	51.4mg
200λ + 1mL 54124-67-1	MSD TC 02726				0.7389	0.7850	46.1mg
54124-64-1	Time 99 recd quiet 1				0.7472	0.7495	23mg
	2				0.7384	0.7410	2.6mg
	3				0.7465	0.7487	2.2mg

Susan G Bradsayn 1-23-92 — Analyst, Date

S. K. Fadeff 2/11/92 — Reviewer, Date

ABDATA3.LOG

9 2 1 2 , 9 1 1 3 5

Battelle
Pacific Northwest Laboratories

BETA COUNTING DATA

pg 2 of 3

REQUESTED BY

DATE ANALYZED: 1-22-92

SAMPLE TYPE: Total Beta

CHARGE CODE

REMARKS

HCCEM

DESIGNATION	SAMPLE	SAMPLED DATE - TIME	CANNIKIN (ML)	PROCESS	WT.-VOL. ANALYZED	WT.-RESIDUE	ANALYST	SET NUMBER	SHELF	COUNTED DATE - TIME	COUNTS	MINUTES	BKG. C/M	BKG. CORR. C/M	TECHNICIAN	CALCULATIONS	RESULTS
						53.0mg	2-11-92			1-23-92							
92-2726 D						93.6g ~~43.7mg~~			3	13:30	1152	1000	.709	0.44			
92-2728						98.76g	71.3		1	1-24-92 1400	4094	1000	.738	3.36			
92-2729						98.16g	82.6		2		4813		.570	4.24			
92-2730						97.52g	76.8		3		4503		.709	3.79			
incl 99Tc det										1-26-92							
BS-D2726						1-28-92 ~~45.5~~ 45.4g			1	1100	2308	1000	.738	22.34			
92-02731						98.35g	62.2		2		3550	1000	.570	2.98			
92-2732						104.4g	97.1		3		3889	1000	.472	3.42			
92-02733						112.8g	69.6		1	1-26-92 12:35	4405		.738	3.37			
Recount																	
MS 2726							51.4		1	1-28-92 0855	716	1000	.738	6.42			
92-02734							105.0		1	1-29-92 1355	4103	1000	[illegible]	3.40		702 BO 2-11-92	
92-02735							53.9		2		6960		.565	6.39			
lost some salt.							28.5		3								
92-02736											927		.683	0.24			
										~~1-30-92~~						1-30-92 LB 3-4-92	
92-02737							38.7		1	1315	1273	1000	.702	0.57			
92-02738							69.7		2		5937		.565	5.37			

Gloria G. Bradbury-Pish 2-11-92

Reviewed S. K. Fadley 2/11/92

No 1264

E02-003

9 2 1 2 5 9 1 1 3 7

Battelle
Pacific Northwest Laboratories

BETA COUNTING DATA

Pg 1 of 3

REQUESTED BY

DATE ANALYZED: 1-22-92

SAMPLE TYPE: Total Beta

CHARGE CODE

REMARKS: 1100 EM-1

DESIGNATION	SAMPLE	DATE - TIME SAMPLED	CARRIER (ML)	PROCESS	WT. - VOL. ANALYZED	WT. RESIDUE	ANALYST	SET NUMBER	SHELF	DATE - TIME COUNTED	COUNTS	MINUTES	BKG. C/M	BKG. CORR. C/M	TECHNICIAN
direct plates 1 mL 99 Tc std 107.4 dpm/mL	1			dc	1 mL	2.3 mg		66	1	1-22-92 11:15	606	10	15.6	45.0	
	2					2.6		67	1		613		17.8	43.5	
	3					2.2		68	1		584		14.8	43.6	
	1			dc		2.3		66B	1	1-22-92 11:30	4380	100	.738	43.1	
	2					2.6			2		4285		.570	42.3	
	3					2.2			3		4612		.709	45.4	
200 µl std MSR 2726					104.6 g	51.4			1	1-22-92 15:15	817	100	.738	7.43	
MSSr 2726					110.7 g	50.8			3		10,271		.709	102.0	
92-02724					90.0 g	43.5			1	1-22-92 17:00	1148	1000	.738	0.46	
92-02725					95.8 g	20.5			2		909		.570	0.34	
92-02726					94.9 g	39.3			3		1263		.709	0.55	
200 µl Tc std BS 02724					~~1-23-92~~	0.1			1	1-23-92 10:00	8016	100	.738	7.28	
200 µl Sr BS 02724						0			2		24,494	207	.570	117.8	
92-02727					87.84 g	43.7 ~~53.6~~			2	1-23-92 13:30	4093	100	.570	3.52	

CALCULATIONS: (C/M) (COUNT FACTOR) = DPM

RESULTS: UNITS OF pCi

from Cert. Cal.
107.4 dpm = 2.46 dc
436 C/m

from Cert. Cal.
108.5 dpm = 2.99 dc
43.6

Reviewed A.K. [illegible] 2/11/92

No. 1263

EQ2-040

9212 91153

Battelle
Pacific Northwest Laboratories

BETA COUNTING DATA

Pg 3 of 3

REQUESTED BY	DATE ANALYZED	SAMPLE TYPE	CHARGE CODE

REMARKS

DESIGNATION	SAMPLE	DATE - TIME SAMPLED	CARRIER (M L)	PROCESS	WT. - VOL. ANALYZED	WT. - RESIDUE	ANALYST	SLT NUMBER	SHELF	DATE - TIME COUNTED	COUNTS	MINUTES	BKG. C M	BKG. CORR. C M	TECHNICIAN	CALCULATIONS (C M) (VOLUME FACTOR)	RESULTS UNITS OF µC
MSDTC 02726						46.1 gr		2		15:15 2-11-92	24536	100	1536				
BL 02724						0.5 gr		3		↓	567	↓	716				

Given to Kathleen 2-13-92
Received L. K. Edge 2/12/92

EO2-011

ED-1705-045 (12-71)

№ 1273

Battelle
Pacific Northwest Laboratories

BETA COUNTING DATA

REQUESTED BY

DATE ANALYZED | SAMPLE TYPE | CHARGE CODE

REMARKS Recount

SAMPLE DESIGNATION	SAMPLED DATE - TIME	CARRIER (M L)	PROCESS WT.-VOL. ANALYZED	WT.-RESIDUE	ANALYST	SET NUMBER	SHELF	DATE - TIME COUNTED	COUNTS	MINUTES	BKG. C/M	BKG. CORR. C M	TECHNICIAN	CALCULATIONS (C/M) (VOLUME FACTOR) (DILUTION) (DECAY FACTOR)	RESULTS UNITS OF pCi
recount															
M9 TC0226				51.4			1	2-13-92 1400	729	60	0.76	6.52			
recount							3	10:40 2-14-92	2647	360	0.79	7.77			

used longest CT

G. Brodie 2-18-92

L. K. Fadeff 2/18/92

BD-1700-(4) (11-71)

№ 1278

EOC-016

Battelle
Pacific Northwest Laboratories

Page ____ of ____

ENGINEERING WORKSHEET

Prepared By:	Date:	Project:

Title/Subject:

To: Gwen B.

From: Sandy Fadeyy.

Subject: 1100 EM1

Samples exceed 50pCi/L (111 dpm/L).

A 100ml sample may contain 11.1 dpm or greater.

Samples were spiked with about 22 dpm ^{99}Tc.

Let us spike the second ^{99}Tc matrix spike with an additional 1ml spike solution (107 dpm) for a total of about 130 dpm ^{99}Tc. (Spike ID 54124-64-17)

J. K. [illegible] 1/21/92

E02-015

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	12-Feb-92	
Enter Radiochem Sample Number (XXXX)	BL-02724	
Enter Log-In Number (90-XXXX)	BL-02724	
Enter Client Sample ID		
Enter File Name	BL2724	
Initial amount of sample used	100 +\-	0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0201
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	567	
Enter count time in minutes	1000	
Enter background (cpm)	0.716	
Calculated net cpm	-0.1490 +\-	0.0358
Weight of residue on dish (NOT IN GRAMS) - in MG	0.5 +\-	0.1
d/c for detector based on mg loading	1.8940 +\-	0.0219

Signature _____ 2-12-92
(Entered by) (Date)

Total Beta Activity	-1.271 pCi/L =	-0.001271 pCi/ml
Error in activity units*	-0.306 pCi/L =	-0.000306 pCi/ml
Percent Error	24.07 %	
Minimum detectable activity	0.685 pCi/L =	0.000685 pCi/ml

Signature _____ 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA [illegible]

Date calculated	[illegible]	
Enter Radiochem Sample Number (X)[illegible]	[illegible]	
Enter Log-In Number (YRQ-XXXX)	[illegible]	
Enter Client Sample ID		
Enter File Name	[illegible]	
Initial amount of sample used	[illegible]	+ - 0.0010
Which units, ml, g or sample?	[illegible]	
If leached, enter final leach solution vol.	[illegible]	+ - 0.0001
If leached, enter ml of leach solution aliquot	[illegible]	+ - 0.0001
Enter total counts observed	[illegible]	
Enter count time in minutes	[illegible]	
Enter background (cpm)	[illegible]	
Calculated net cpm	[illegible]	+ - 0.0936
Weight of residue on dish (NOT IN GRAMS) - in mg	[illegible]	0.1
d/c for detector based on mg loading	[illegible]	0.0219

Signature G.G. Brodaczynski 2-11-92
(Entered by) Date

Total Beta Activity	[illegible] pCi/L =	[illegible] pCi/ml
Error in activity units*	[illegible] pCi/L =	[illegible] pCi/ml
Percent Error	[illegible] %	
Minimum detectable activity	[illegible]	

Signature S.K. Fadeff 2/11/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml reached)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 8.28.91
TOTBETA

E02-015

SPREADSHEET FOR CALCULATION OF TOTAL BETA [illegible]

Date calculated	[illegible]	
Enter Radcom sample number (XXX)	[illegible]	
Enter Log-In number (YY-XXXX)	[illegible]	
Enter Client Sample ID		
Enter File Name	[illegible]	
Initial amount of sample used	[illegible]	0.0200
Which units, ml, g or sample?	[illegible]	
If leached, enter final leach soln volume (ml)	[illegible]	0.0001
If leached, enter ml of leach soln aliquoted	[illegible]	0.0001
Enter total counts observed	[illegible]	
Enter count time in minutes	[illegible]	
Enter background (cpm)	[illegible]	
Calculated net cpm	[illegible]	0.7579
Weight of residue on dish (NOT IN [illegible])	[illegible]	0.1
d/c for detector based on mg loading	[illegible]	0.2519

Signature [illegible] 2-11-92
(Entered By) (Date)

Total Beta Activity	1202.751 pCi/L =	[illegible] pCi/g
Error in activity units*	15.274 pCi/L =	[illegible] pCi/g
Percent Error	[illegible] %	
Minimum detectable activity	NA	

Signature [illegible] 2/11/92
(Reviewed By) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leached)

(initial sample amount)(ml aliquoted)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading of the plate.

Total Beta Spreadsheet Revision 3, 6/23/91
TOTBETA

E02-016

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02724
Enter Log-In Number (92-XXXX)	92-02724
Enter Client Sample ID	b21572
Enter File Name	2724TB

Initial amount of sample used	90.22	+\- 0.2000
Which units, ml, g or sample?	mL	
If leached, enter final leach soln volume (ml)	1	+\- 0.0001
If leached, enter ml of leach soln analyzed	1	+\- 0.0001
Enter total counts observed	1190	
Enter count time in minutes	1000	
Enter background (cpm)	0.738	
Calculated net cpm	0.4600	+\- 0.2440
Weight of residue on dish (NOT IN GRAMS) - in MG	43.5	+\- 0.1
d/c for detector based on mg loading	2.1901	+\- 0.0268

Signature G G Bradczynski 2-11-92
(Entered by) (Date)

Total Beta Activity	5.030 pCi/L =	0.005030 pCi/ml
Error in activity units*	0.486 pCi/L =	0.000486 pCi/ml
Percent Error	9.66 %	
Minimum detectable activity	NA	

Signature A. K. Fadey 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-017

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY:

Date calculated	11-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02725	
Enter Log-In Number ('90-XXXX)	92-02725	
Enter Client Sample ID	a01573	
Enter File Name	2725TB	
Initial amount of sample used	96.04 +\-	0.2500
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	909	
Enter count time in minutes	1000	
Enter background (cpm)	0.57	
Calculated net cpm	0.3390 +\-	0.0385
Weight of residue on dish (NOT IN GRAMS) - in MG	28.5 +\-	0.1
d/c for detector based on mg loading	2.0350 +\-	0.0236

Signature J.G. Bradacyzyn 2-11-92
(Entered by) (Date)

Total Beta Activity	3.236 pCi/L =	0.003236 pCi/ml
Error in activity units*	0.369 pCi/L =	0.000369 pCi/ml
Percent Error	11.41 %	
Minimum detectable activity	NA	

Signature S. K. Fadyk 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02726
Enter Log-In Number ('90-XXXX)	92-02726
Enter Client Sample ID	031574
Enter File Name	2726TB
Initial amount of sample used	95.14 +\- 0.2000
which units, ml, g or sample?	ML
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	1263
Enter count time in minutes	1000
Enter background (cpm)	0.709
Calculated net cpm	0.5543 +\- 0.0444
Weight of residue on dish (NOT IN GRAMS) - in MG	39.3 +\- 0.1
d/c for detector based on mg loading	2.1624 +\- 0.0276

Signature G.G. Brakczynski 2-11-92
(Entered by) (Date)

Total Beta Activity	5.672 pCi/L =	0.005672 uCi/ml
Error in activity units*	0.461 pCi/L =	0.000461 uCi/ml
Percent Error	0.12 %	
Minimum detectable activity	NA	

Signature S. K. Fadeff 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-013

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92
Enter Radiochem Sample Number (XXXX)	DUP-2726
Enter Log-In Number ('90-XXXX)	DUP-2726
Enter Client Sample ID	DUP-2726
Enter File Name	DUP2726

Initial amount of sample used	93.98 +\- 0.2000
Which units, ml, g or sample?	ML
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	1152
Enter count time in minutes	1000
Enter background (cpm)	0.709
Calculated net cpm	0.4430 +\- 0.0431
Weight of residue on dish (NOT IN GRAMS) - in MG	53 +\- 0.1
d/c for detector based on mg loading	2.2519 +\- 0.0316

Signature G G Brodziejewski 2-11-92
(Entered by) (Date)

Total Beta Activity	4.787 pCi/L =	0.004787 pCi/ml
Error in activity units*	0.471 pCi/L =	0.000471 pCi/ml
Percent Error	9.84 %	
Minimum detectable activity	NA	

Signature S.K. Fadeff 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92
Enter Radiochem Sample Number (XXXX)	92-2727
Enter Log-In Number ('90-XXXX)	92-2727
Enter Client Sample ID	581575
Enter File Name	2727T6

Initial amount of sample used	88.03 +\-	0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	4093	
Enter count time in minutes	1000	
Enter background (cpm)	0.57	
Calculated net cpm	3.5230 +\-	0.0583
Weight of residue on dish (NOT IN GRAMS) - in mG	43.7 +\-	0.1
d/c for detector based on mg loading	2.1914 +\-	0.0288

Signature G G Bedzyczyn 2-11-92
(Entered by) (Date)

Total Beta Activity	39.505 pCi/L =	0.039505 pCi/ml
Error in activity units*	0.930 pCi/L =	0.000930 pCi/ml
Percent Error	2.35 %	
Minimum detectable activity	NA	

Signature J. K. Fadeff 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92
Enter Radiochem Sample Number (XXXX)	92-2728
Enter Log-In Number ('90-XXXX)	92-2728
Enter Client Sample ID	581559
Enter File Name	272878

Initial amount of sample used	99.96 +\- 0.2200
Which units, ml, g or sample?	ML
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	4894
Enter count time in minutes	1800
Enter background (cpm)	0.738
Calculated net cpm	3.3560 +\- 0.0695
Weight of residue on dish (NOT IN GRAMS) - in mg	71.3 +\- 0.1
d/c for detector based on mg loading	2.3674 +\- 0.0378

Signature G.G. Bradzynski 2-11-92
(Entered by) (Date)

Total Beta Activity	36.157 pCi/L =	0.036157 pCi/ml
Error in activity units*	0.949 pCi/L =	0.000949 pCi/ml
Percent Error	2.62 %	
Minimum detectable activity	NA	

Signature S. L. Fadyg 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/26/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92		
Enter Radiochem Sample Number (XXXX)	92-2729		
Enter Log-In Number ('90-XXXX)	92-2729		
Enter Client Sample ID	6015T1		
Enter File Name	272918		
Initial amount of sample used	98.38	+\-	0.2000
Which units, ml, g or sample?	ML		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	4813		
Enter count time in minutes	1000		
Enter background (cpm)	0.57		
Calculated net cpm	4.2430	+\-	0.0734
Weight of residue on dish (NOT IN GRAMS) - in MG	82.6	+\-	0.1
d/c for detector based on mg loading	2.4363	+\-	0.0421

Signature [illegible] 2-11-92
(Entered by) (Date)

Total Beta Activity	47.331 pCi/L =	0.047331 pCi/ml
Error in activity units+	1.161 pCi/L =	0.001161 pCi/ml
Percent Error	2.45 %.	
Minimum detectable activity	NA	

Signature J. L. Fadeff 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

+Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-2730	
Enter Log-In Number ('90-XXXX)	92-2730	
Enter Client Sample ID	BD15T3	
Enter File Name	2730T5	
Initial amount of sample used	97.75 +\-	0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	4523	
Enter count time in minutes	1000	
Enter background (cpm)	0.709	
Calculated net cpm	3.7940 +\-	0.0722
Weight of residue on dish (NOT IN GRAMS) - in MG	76.8 +\-	0.1
d/c for detector based on mg loading	2.4012 +\-	0.0399

Signature G.G. Bradley-Jones 2.11.92
(Entered by) (Date)

Total Beta Activity	41.981 pCi/L =	0.041981 pCi/ml
Error in activity units*	1.064 pCi/L =	0.001064 pCi/ml
Percent Error	2.53 %	
Minimum detectable activity	NA	

Signature A. K. Tadey 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

EOC-024

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-2731	
Enter Log-In Number ('90-XXXX)	92-2731	
Enter Client Sample ID	6015T5	
Enter File Name	2731TB	
Initial amount of sample used	98.6 +\-	0.2828
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	3550	
Enter count time in minutes	1000	
Enter background (cpm)	0.57	
Calculated net cpm	2.9800 +\-	0.0542
Weight of residue on dish (NOT IN GRAMS) - in MG	62.2 +\-	0.1
d/c for detector based on mg loading	2.3106 +\-	0.0346

Signature G.G. Bradzynski 2/11/92
(Entered by) (Date)

Total Beta Activity	31.457 pCi/L =	0.031457 pCi/ml
Error in activity units*	0.828 pCi/L =	0.000828 pCi/ml
Percent Error	2.63 %	
Minimum detectable activity	NA	

Signature S. K. Sadasivan 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91

E02-025

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92
Enter Radiochem Sample Number (XXXX)	92-2732
Enter Log-In Number ('90-XXXX)	92-2732
Enter Client Sample ID	8015T7
Enter File Name	2732T8

Initial amount of sample used	104.83 +\- 0.2088
Which units, ml, g or sample?	ML
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	7889
Enter count time in minutes	1200
Enter background (cpm)	0.472
Calculated net cpm	3.4178 +\- 0.0552
Weight of residue on dish (NOT IN GRAMS) - in MG	97.1 +\- 0.1
d/c for detector based on mg loading	2.5220 +\- 0.0478

Signature G.G. Bradzynski 2-11-92
(Entered by) (Date)

Total Beta Activity 37.101 pCi/L = 0.037101 pCi/ml

Error in activity units* 1.007 pCi/L = 0.001007 pCi/ml

Percent Error 2.71 %

Minimum detectable activity NA

Signature A.K. Indigo 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-026

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-2733	
Enter Log-In Number ('90-XXXX)	92-2733	
Enter Client Sample ID	B015T9	
Enter File Name	2733TB	
Initial amount of sample used	113.85 +\-	0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	4105	
Enter count time in minutes	1000	
Enter background (cpm)	0.738	
Calculated net cpm	3.3670 +\-	0.0096
Weight of residue on dish (NOT IN GRAMS) - in MG	69.6 +\-	0.1
d/c for detector based on mg loading	2.3569 +\-	0.0372

Signature G G Brodzinski 2-11-92
(Entered by) (Date)

Total Beta Activity	31.620 pCi/L =	0.031620 pCi/ml
Error in activity units*	0.824 pCi/L =	0.000824 pCi/ml
Percent Error	2.61 %	
Minimum detectable activity	NA	

Signature J. K. Fadeff 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-027

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02734
Enter Log-In Number ('90-XXXX)	92-02734
Enter Client Sample ID	B01591
Enter File Name	2734Tb
Initial amount of sample used	102.83 +\- 0.2000
Which units, ml, g or sample?	ML
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	4103
Enter count time in minutes	1000
Enter background (cpm)	0.702
Calculated net cpm	3.4010 +\- 0.2693
Weight of residue on dish (NOT IN GRAMS) - in MG	105 +\- 0.1
d/c for detector based on mg loading	2.5675 +\- 0.0511

Signature G.G. Bradzezynski 2-11-92
(Entered by) (Date)

Total Beta Activity	38.251 pCi/L =	0.038251 pCi/ml
Error in activity units*	1.092 pCi/L =	0.001092 pCi/ml
Percent Error	2.86 %	
Minimum detectable activity	NA	

Signature S.K. Fadeff 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02735	
Enter Log-In Number ('90-XXXX)	92-02735	
Enter Client Sample ID	581593	
Enter File Name	2735TB	
Initial amount of sample used	97.23 +\-	0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	6960	
Enter count time in minutes	1000	
Enter background (cpm)	0.565	
Calculated net cpm	6.3950 +\-	0.0657
Weight of residue on dish (NOT IN GRAMS) - in MG	53.9 +\-	0.1
d/c for detector based on mg loading	2.2577 +\-	0.0319

Signature G.G. Brodzeyunski 2-11-92
(Entered by) (Date)

Total Beta Activity	66.890 pCi/L =	0.066890 pCi/ml
Error in activity units*	1.317 pCi/L =	0.001317 pCi/ml
Percent Error	1.97 %	
Minimum detectable activity	NA	

Signature J. K. Tadeff 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-029

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92
Enter Radiochem Sample Number (XXXX)	92-0273o
Enter Log-In Number ('90-XXXX)	92-0273o
Enter Client Sample ID	0015VS
Enter File Name	2736TB
Initial amount of sample used	109.84 +\- 0.2000
Which units, ml, g or sample?	ML
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	927
Enter count time in minutes	1000
Enter background (cpm)	0.683
Calculated net cpm	0.2440 +\- 0.0401
Weight of residue on dish (NOT IN GRAMS) - in MG	28.5 +\- 0.1
d/c for detector based on mg loading	2.0896 +\- 0.0250

Signature G.G. Budzeczynski 2-11-92
(Entered by) (Date)

Total Beta Activity	2.091 pCi/L =	0.002291 uCi/ml
Error in activity units*	0.345 pCi/L =	0.000345 uCi/ml
Percent Error	16.49 %	
Minimum detectable activity	NA	

Signature J. K. Fadeff 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-030

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02737
Enter Log-In Number ('90-XXXX)	92-02737
Enter Client Sample ID	8015V7
Enter File Name	2737TB
Initial amount of sample used	99.00 +\- 0.2000
Which units, ml, g or sample?	ML
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	1273
Enter count time in minutes	1000
Enter background (cpm)	0.702
Calculated net cpm	0.5710 +\- 0.0444
Weight of residue on dish (NOT IN GRAMS) - in MG	38.7 +\- 0.1
d/c for detector based on mg loading	2.1584 +\- 0.0274

Signature G.G. Bradzynski 2-11-92
(Entered by) (Date)

Total Beta Activity	5.604 pCi/L =	0.005604 pCi/ml
Error in activity units*	0.442 pCi/L =	0.000442 pCi/ml
Percent Error	7.89 %	
Minimum detectable activity	NA	

Signature S.K. Fodoff 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	11-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02738	
Enter Log-In Number ('90-XXXX)	92-02738	
Enter Client Sample ID	801598	
Enter File Name	2738T8	
Initial amount of sample used	101.42 +\-	0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	5937	
Enter count time in minutes	1000	
Enter background (cpm)	0.565	
Calculated net cpm	5.3720 +\-	0.0066
Weight of residue on dish (NOT IN GRAMS) - in mG	69.7 +\-	0.1
d/c for detector based on mg loading	2.3575 +\-	0.0373

Signature G.G. Brodacynski 2.11.92
(Entered by) (Date)

Total Beta Activity	56.249 pCi/L =	0.056249 pCi/ml
Error in activity units*	1.231 pCi/L =	0.001231 pCi/ml
Percent Error	2.19 %	
Minimum detectable activity	NA	

Signature S. K. Fadeff 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

EO2-032

SPREADSHEET FOR CALCULATION OF TOTAL BETA [illegible]

Date calculated	[illegible]	
Enter Radiochem Sample Number (XXXX)	[illegible]	
Enter Log-In Number (90-XXXX)	[illegible]	
Enter Client Sample ID		
Enter File Name	[illegible]	
Initial amount of sample used	[illegible]	0.2000
Which units, ml, g or sample?	[illegible]	
If leached, enter final leach soln volume (ml)	[illegible]	0.0001
If leached, enter ml of leach soln aliquot	[illegible]	0.0001
Enter total counts observed	[illegible]	
Enter count time in minutes	[illegible]	
Enter background (cpm)	[illegible]	
Calculated net cpm	[illegible]	1.0173
Weight of residue on dish (NOT IN GRAMS - [illegible])	[illegible]	0.1
d/c for detector based on Ag loading	[illegible]	0.0307

Signature G.G. Brodacz 2-11-92
(entered by) (date)

Total Beta Activity	927.187 pCi/L =	[illegible]
Error in activity units*	15.888 pCi/L =	[illegible]
Percent Error	1.71 %	
Minimum detectable activity	NA	

Signature J. K. Fadyg 2/11/92
(reviewed by) (date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error calculated [illegible] the d/c calculation based on the Ag loading of the [illegible].

Total Beta Spreadsheet Revision 3, 8/28 [illegible]
TOTBETA

E02-030

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated [illegible]
Enter Radiochem Sample Number (XXXX) [illegible]
Enter Log-in Number (92-XXXX) [illegible]
Enter Client Sample ID
Enter File Name [illegible]

Initial amount of sample used [illegible] 0.2000
Which units, mg or sample? [illegible]
If leached, enter final leach soln volume [illegible] 0.0281
If leached, enter al of leach soln analyzed [illegible] 0.0281
Enter total counts observed [illegible]
Enter count time in minutes [illegible]
Enter background (cpm) [illegible]
Calculated net cpm [illegible] 0.2565
Weight of residue on disk (NOT IN [illegible] 0.1
d/c for detector based on mg loading [illegible] 0.2511

Signature G.G. Beaudoin 2-11-92
(Entered by) (Date)

Total Beta activity [illegible]

Error in activity units* [illegible]

Percent Error [illegible]

Minimum detectable activity NA

Signature S.K. Fedyk 2/11/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(al leached)

(initial sample amount)(al subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading of the disk.

Total Beta Spreadsheet Revision 1, [illegible]
TOTBETA

E02-034

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	12-Feb-92
Enter Radiochem Sample Number (XXXX)	MATRIX SPIKE
Enter Log-In Number ('90-XXXX)	DUP 99TC
Enter Client Sample ID	MSDTC2726
Enter File Name	MSD726T
Initial amount of sample used	96.87 +\- 0.2000
Which units, ml, g or sample?	ML
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	24536
Enter count time in minutes	1000
Enter background (cpm)	0.536
Calculated net cpm	24.0000 +\- 0.1553
Weight of residue on dish (NOT IN GRAMS) - in MG	46.1 +\- 0.1
d/c for detector based on mg loading	2.2872 +\- 0.0295

Signature [signature] 2-12-92
(Entered by) (Date)

Total Beta Activity	248.373 pCi/L =	0.248373 pCi/ml
Error in activity units*	3.738 pCi/L =	0.003738 pCi/ml
Percent Error	1.50 %	
Minimum detectable activity	NA	

Signature [signature] 2/12/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	18-Feb-92
Enter Radiochem Sample Number (XXXX)	5L-02724
Enter Log-In Number ('90-XXXX)	5LNW-02724
Enter Client Sample ID	5LNW-02724
Enter File Name	5L2724T
Initial amount of sample used	182 +\/- 0.0200
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\/- 0.0001
If leached, enter ml of leach soln analyzed	1 +\/- 0.0001
Enter total counts observed	567
Enter count time in minutes	1000
Enter background (cpm)	3.716
Calculated net cpm	-0.1493 +\/- 0.0358
Weight of residue on dish (NOT IN GRAMS) - in MG	4.5 +\/- 0.1
d/c for detector based on mg loading	2.5142 +\/- 0.1847

Signature G.G. Bodacyzynski 2-18-92
(Entered by) (Date)

Total Beta Activity	-1.687 pCi/L =	-0.001687 pCi/ml
Error in activity units*	-0.412 pCi/L =	-0.000412 pCi/ml
Percent Error	24.40 %	
Minimum detectable activity	0.989 pCi/L =	0.000989 pCi/ml

Signature S. K. Fadyff 2/10/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	14-Feb-92	
Enter Radiochem Sample Number (XXXX)	89-2724	
Enter Log-In Number ('90-XXXX)	89-2724	
Enter Client Sample ID	89-2724	
Enter File Name	892724T	
Initial amount of sample used	100	+\/- 0.2000
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1	+\/- 0.0001
If leached, enter ml of leach soln analyzed	1	+\/- 0.0001
Enter total counts observed	6816	
Enter count time in minutes	1000	
Enter background (cpm)	0.730	
Calculated net cpm	7.2780	+\/- 0.0730
Weight of residue on dish (NOT IN GRAMS) - in MG	0.1	+\/- 0.1
d/c for detector based on mg loading	2.4916	+\/- 0.1047

Signature S.G. Brodzeynski 2-18-92
(Entered by) (Date)

Total Beta Activity	81.663 pCi/L =	0.081663 uCi/ml
Error in activity units*	3.593 pCi/L =	0.003593 uCi/ml
Percent Error	4.40 %	
Minimum detectable activity	NA	

Signature S. K. Tadey 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-037

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	14-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02724
Enter Log-In Number ('90-XXXX)	92-02724
Enter Client Sample ID	581572
Enter File Name	2724TC6
Initial amount of sample used	90.22 +\- 0.0200
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	1198
Enter count time in minutes	1000
Enter background (cpm)	0.738
Calculated net cpm	0.4600 +\- 0.0440
Weight of residue on dish (NOT IN GRAMS) - in MG	43.5 +\- 0.1
d/c for detector based on mg loading	4.7153 +\- 0.3125

Signature G.E. Brodzczynski 2-18-92
(Entered by) (Date)

Total Beta Activity	10.831 pCi/L =	0.010831 pCi/ml
Error in activity units*	1.258 pCi/L =	0.001258 pCi/ml
Percent Error	11.61 %	
Minimum detectable activity	NA	

Signature J. K. Fraley 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91

E02-038

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	14-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02725
Enter Log-In Number ('90-XXXX)	92-02725
Enter Client Sample ID	501572
Enter File Name	2725TCb
Initial amount of sample used	96.84 +\- 0.0288
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	989
Enter count time in minutes	1000
Enter background (cpm)	0.57
Calculated net cpm	0.3398 +\- 0.0365
Weight of residue on dish (NOT IN GRAMS) - in mg	28.5 +\- 0.1
d/c for detector based on mg loading	3.5958 +\- 0.1054

Signature G.G. Bradzynski 2-18-92
(Entered by) (Date)

Total Beta Activity	5.716 pCi/L =	0.005716 uCi/ml
Error in activity units*	0.700 pCi/L =	0.000700 uCi/ml
Percent Error	12.24 %	
Minimum detectable activity	NA	

Signature S.K. Fadeff 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	14-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02726
Enter Log-In Number ('90-XXXX)	92-02726
Enter Client Sample ID	601574
Enter File Name	2726TC5

Initial amount of sample used	95.14 +\/- 0.0200
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\/- 0.0001
If leached, enter ml of leach soln analyzed	1 +\/- 0.0001
Enter total counts observed	1263
Enter count time in minutes	1000
Enter background (cpm)	0.709
Calculated net cpm	0.5543 +\/- 0.0444
Weight of residue on dish (NOT IN GRAMS) - in MG	39.3 +\/- 0.1
d/c for detector based on mg loading	4.5289 +\/- 0.2301

Signature G.G. Brodzinski 2-18-92
(Entered by) (Date)

Total Beta Activity	11.858 pCi/L =	0.011858 pCi/ml
Error in activity units*	1.201 pCi/L =	0.001201 pCi/ml
Percent Error	10.13 %	
Minimum detectable activity	NA	

Signature S. K. Fadeff 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

EO2-040

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	18-Feb-92
Enter Radiochem Sample Number (XXXX)	duplicate 92-0272b
Enter Log-In Number (90-XXXX)	DUP-2726
Enter Client Sample ID	DUP-2726
Enter File Name	2726DTC
Initial amount of sample used	93.83 +/- 0.0200
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +/- 0.0001
If leached, enter ml of leach soln analyzed	1 +/- 0.0001
Enter total counts observed	1152
Enter count time in minutes	1000
Enter background (cpm)	0.789
Calculated net cpm	0.4438 +/- 0.0431
Weight of residue on dish (NOT IN GRAMS) - in MG	53 +/- 0.1
d/c for detector based on mg loading	5.1428 +/- 0.5053

Signature [signature] 2-18-92
(Entered by) (Date)

Total Beta Activity	10.927 pCi/L =	0.010927 pCi/ml
Error in activity units*	1.343 pCi/L =	0.001343 pCi/ml
Percent Error	12.29 %	
Minimum detectable activity	NA	

Signature S.K. Jackson 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	14-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02727	
Enter Log-In Number ('90-XXXX)	92-02727	
Enter Client Sample ID	681575	
Enter File Name	2727TCB	
Initial amount of sample used	88.03	+/- 0.0280
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1	+/- 0.0001
If leached, enter ml of leach soln analyzed	1	+/- 0.0001
Enter total counts observed	4093	
Enter count time in minutes	1000	
Enter background (cpm)	0.57	
Calculated net cpm	3.5292	+/- 0.0683
Weight of residue on dish (NOT IN GRAMS) - in MG	43.7	+/- 0.1
d/c for detector based on mg loading	4.7250	+/- 0.3119

Signature G.G. Bradaynah 2-18-92
(Entered by) (Date)

Total Beta Activity	35.178 pCi/L =	0.035178 pCi/ml
Error in activity units*	5.861 pCi/L =	0.005861 pCi/ml
Percent Error	6.88 %	
Minimum detectable activity	NA	

Signature S. K. Fadyy 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-042

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO REDMEDIUM

Date calculated	18-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02726
Enter Log-In Number ('90-XXXX)	92-02726
Enter Client Sample ID	BJ1559
Enter File Name	272BTCB
Initial amount of sample used	98.98 +\- 0.0200
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	4094
Enter count time in minutes	1000
Enter background (cpm)	0.735
Calculated net cpm	3.3560 +\- 0.0695
Weight of residue on dish (NOT IN GRAMS) - in MG	71.3 +\- 0.1
d/c for detector based on mg loading	5.8961 +\- 0.5549

Signature G.G. Brodzaynski 2/18-92
(Entered by) (Date)

Total Beta Activity	90.851 pCi/L =	0.090851 uCi/ml
Error in activity units*	8.675 pCi/L =	0.008675 uCi/ml
Percent Error	9.54 %	
Minimum detectable activity	NA	

Signature S.K. Tadyg 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

50c-040

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	18-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02729
Enter Log-In Number (90-XXXX)	92-02729
Enter Client Sample ID	6015T1
Enter File Name	2729TCb
Initial amount of sample used	96.38 +\/- 0.0200
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\/- 0.0001
If leached, enter ml of leach soln analyzed	1 +\/- 0.0001
Enter total counts observed	4813
Enter count time in minutes	1000
Enter background (cpm)	0.57
Calculated net cpm	4.2430 +\/- 0.0734
Weight of residue on dish (NOT IN GRAMS) - in mg	82.0 +\/- 0.1
d/c for detector based on mg loading	6.3210 +\/- 0.0774

Signature [signature] 2-18-92
(Entered by) (Date)

Total Beta Activity	122.886 pCi/L =	0.122886 pCi/ml
Error in activity units*	13.330 pCi/L =	0.013330 pCi/ml
Percent Error	10.85 %	
Minimum detectable activity	NA	

Signature [signature] 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-044

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	18-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02738
Enter Log-In Number ('90-XXXX)	92-02738
Enter Client Sample ID	321517
Enter File Name	2738TCB
Initial amount of sample used	97.75 +\/- 0.0008
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\/- 0.0001
If leached, enter ml of leach soln analyzed	1 +\/- 0.0001
Enter total counts observed	4503
Enter count time in minutes	1000
Enter background (cpm)	0.789
Calculated net cpm	3.7940 +\/- 0.0722
Weight of residue on dish (NOT IN GRAMS) - in MG	76.8 +\/- 0.1
d/c for detector based on mg loading	6.1070 +\/- 0.5126

Signature G.G. Bazynski 2-18-92
(Entered by) (Date)

Total Beta Activity	106.772 pCi/L =	0.106772 uCi/ml
Error in activity units*	10.904 pCi/L =	0.010904 uCi/ml
Percent Error	10.21 %	
Minimum detectable activity	NA	

Signature S. K. Fadeff 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	16-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02731	
Enter Log-In Number ('90-XXXX)	92-02731	
Enter Client Sample ID	8815T5	
Enter File Name	2731TC6	
Initial amount of sample used	98.5	+\- 0.0200
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1	+\- 0.0001
If leached, enter ml of leach soln analyzed	1	+\- 0.0001
Enter total counts observed	3558	
Enter count time in minutes	1000	
Enter background (cpm)	0.57	
Calculated net cpm	2.9800	+\- 0.0542
Weight of residue on dish (NOT IN GRAMS) - in MG	62.2	+\- 0.1
d/c for detector based on mg loading	5.5307	+\- 0.4003

Signature G.G. Bradzynski 2-18-92
(Entered by) (Date)

Total Beta Activity	75.296 pCi/L =	0.075296 pCi/ml
Error in activity units*	6.552 pCi/L =	0.006552 pCi/ml
Percent Error	8.70 %	
Minimum detectable activity	NA	

Signature S. K. Fadeff 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	15-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02732
Enter Log-In Number ('9B-XXXX)	92-02732
Enter Client Sample ID	B015T7
Enter File Name	2732TC6
Initial amount of sample used	134.63 +\- 0.2000
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	3889
Enter count time in minutes	1000
Enter background (cpm)	0.472
Calculated net cpm	3.4170 +\- 0.0668
Weight of residue on dish (NOT IN GRAMS) - in MG	97.1 +\- 0.1
d/c for detector based on mg loading	0.8237 +\- 0.0556

Signature G.G. Brodzczynski 2-18-92
(Entered by) (Date)

Total Beta Activity	100.338 pCi/L =	0.100338 pCi/ml
Error in activity units*	12.737 pCi/L =	0.012737 pCi/ml
Percent Error	12.69 %	
Minimum detectable activity	NA	

Signature A. K. Fadeff
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	18-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02733
Enter Log-In Number (92-XXXX)	92-02733
Enter Client Sample ID	681579
Enter File Name	2733TCB
Initial amount of sample used	113.85 +\/- 0.2288
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\/- 0.2001
If leached, enter ml of leach soln analyzed	1 +\/- 0.0001
Enter total counts observed	4125
Enter count time in minutes	1000
Enter background (cpm)	0.738
Calculated net cpm	3.3678 +\/- 0.0696
Weight of residue on dish (NOT IN GRAMS) - in MG	69.6 +\/- 0.1
d/c for detector based on mg loading	5.6294 +\/- 0.5377

Signature G.G. Bodzeyuk 2-18-92
(Entered by) (Date)

Total Beta Activity	78.207 pCi/L =	0.078207 pCi/ml
Error in activity units*	7.394 pCi/L =	0.007394 pCi/ml
Percent Error	9.45 %	
Minimum detectable activity	NA	

Signature J. K. Fadeff 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

E02-048

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	18-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02734
Enter Log-In Number (90-XXXX)	92-02734
Enter Client Sample ID	3a15W1
Enter File Name	2734TC5

Initial amount of sample used	102.63 +\- 0.2000
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	4103
Enter count time in minutes	1000
Enter background (cpm)	0.702
Calculated net cpm	3.4010 +\- 0.0593
Weight of residue on dish (NOT IN GRAMS) - in mG	105 +\- 0.1
d/c for detector based on mg loading	7.0710 +\- 0.9630

Signature Sandra K. Fadoff 2/18/92
(Entered by) (Date)
Reviewed SKF 2/18/92

Total Beta Activity	105.345 pCi/L =	0.105345 pCi/ml
Error in activity units*	14.509 pCi/L =	0.014509 pCi/ml
Percent Error	13.77 %	
Minimum detectable activity	NA	

Signature G G Bandarczyk 2-18-92
(Reviewed by) (Date)
Entered SKF 2/18/92

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-049

SPREADSHEET [illegible] CALCULATION OF TOTAL [illegible]

Date calculated [illegible]
Enter Radiation Sample Number (xxxx) [illegible]
Enter Log-In Number (YYMD-xlxx) [illegible]
Enter Client Sample ID [illegible]
Enter File [illegible]

Initial amount of sample used [illegible] +/- 0.0208
Which units, mg, g or sample? [illegible]
If leached enter final leach soln [illegible] +/- 0.0001
If leached, enter al of leach soln [illegible] +/- 0.0001
Enter total counts observed [illegible]
Enter count time in minutes [illegible]
Enter background (cpm) [illegible]
Calculated net cpm [illegible] +/- 0.0647
Weight of residue on disk (NOT IN [illegible] 0.1
d/c for detector based on mg loading [illegible] +/- 0.3429

Signature J. K. [illegible] 2/19/92
(Entered by) (Date)

Total Beta activity [illegible] pCi/g = [illegible] pCi/g

Error in activity units* [illegible] pCi/g = [illegible] pCi/g

Percent Error [illegible]

Minimum detectable activity NA

Signature _____
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(al reached)

(initial sample amount)(al subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading in the disk.

Total Beta Spreadsheet Revision 3, [illegible]
TOTBETA

E02-050

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	18-Feb-92
Enter Radiochem Sample Number (XXXX)	92-u2736
Enter Log-In Number ('92-XXXX)	92-u2736
Enter Client Sample ID	b81575
Enter File Name	2736TCB
Initial amount of sample used	129.84 +\- 0.2000
which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	927
Enter count time in minutes	1800
Enter background (cpm)	0.283
Calculated net cpm	0.2448 +\- 0.0481
Weight of residue on dish (NOT IN GRAMS) - in MG	28.5 +\- 0.1
d/c for detector based on mg loading	3.9996 +\- 0.2097

Signature G.G. Bodaczynski 2-18-92
(Entered by) (Date)

Total Beta Activity	4.002 pCi/L =	0.004002 pCi/ml
Error in activity units*	0.691 pCi/L =	0.000691 pCi/ml
Percent Error	17.26 %	
Minimum detectable activity	NA	

Signature S.K. Fadoff 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	18-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02737
Enter Log-In Number ('92-XXXX)	92-02737
Enter Client Sample ID	2015W7
Enter File Name	2737T09

Initial amount of sample used	99.06 +\- 0.0200
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	1273
Enter count time in minutes	1200
Enter background (cpm)	0.782
Calculated net cpm	0.5710 +\- 0.0444
Weight of residue on dish (NOT IN GRAMS) - in mG	38.7 +\- 0.1
d/c for detector based on mg loading	4.4927 +\- 0.2759

Signature G.G. Bodzypowski 2-18-92
(Entered by) (Date)

Total Beta Activity	11.665 pCi/L =	0.011665 pCi/ml
Error in activity units*	1.156 pCi/L =	0.001156 pCi/ml
Percent Error	9.91 %	
Minimum detectable activity	NA	

Signature S. K. Tadyff 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

EO2-052

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	18-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02736
Enter Log-In Number ('90-XXXX)	92-02736
Enter Client Sample ID	881596
Enter File Name	2738TCB
Initial amount of sample used	101.4~~1~~2 +\- 0.2000 SKJ 2/18/92
which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	5937
Enter count time in minutes	1200
Enter background (cpm)	0.565
Calculated net cpm	5.3720 +\- 0.0066
Weight of residue on disk (NOT IN GRAMS) - in MG	69.7 +\- 0.1
d/c for detector based on mg loading	5.8333 +\- 0.5367

Signature G.G. Bendayna 2.18.92
(Entered by) (Date)

Total Beta Activity	139.1~~14~~80 pCi/L =	0.139111 dCi/ml SKJ 2/18/92
Error in activity units*	13.818 pCi/L =	0.013818 dCi/ml
Percent Error	9.36 %	
Minimum detectable activity	NA	

Signature S. K. Jadey 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-060

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	18-Feb-92
Enter Radiochem Sample Number (XXXX)	MSDTC-272b
Enter Log-In Number ('90-XXXX)	MSDTC-272b
Enter Client Sample ID	MATRIX SPIKE DUP ID
Enter File Name	MSDTC2b

Initial amount of sample used	96.07 +\/- 0.0200
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\/- 0.0001
If leached, enter ml of leach soln analyzed	1 +\/- 0.0001
Enter total counts observed	24536
Enter count time in minutes	1000
Enter background (cpm)	0.536
Calculated net cpm	24.0000 +\/- 0.1583
Weight of residue on dish (NOT IN GRAMS) - in MG	48.1 +\/- 2.1
d/c for detector based on mg loading	4.8343 +\/- 0.3301

Signature G.G. Bradzynski 2-18-92
(Entered by) (Date)

Total Beta Activity	544.002 pCi/L =	0.544002 pCi/ml
Error in activity units*	37.318 pCi/L =	0.037318 pCi/ml
Percent Error	6.86 %	
Minimum detectable activity	NA	

Signature S. K. Fedyk 2/10/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-061

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO RECOUNTING

Date calculated	18-Feb-92
Enter Radiochem Sample Number (XXXX)	MS-2726TC
Enter Log-In Number ('90-XXXX)	RECOUNT
Enter Client Sample ID	MS-2726TC
Enter File Name	MSTCR26
Initial amount of sample used	184.3 +\/- 0.2000
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\/- 0.0001
If leached, enter ml of leach soln analyzed	1 +\/- 0.0001
Enter total counts observed	2647
Enter count time in minutes	360
Enter background (cpm)	0.579
Calculated net cpm	0.7738 +\/- 0.1464
Weight of residue on dish (NOT IN GRAMS) - in MG	51.4 +\/- 0.1
d/c for detector based on mg loading	5.0706 +\/- 0.2721

Signature S. K. Fadyy 2/18/92
(Entered by) (Date)
Reviewed SKF 2/18/92

Total Beta Activity 148.338 pCi/L = 0.148338 pCi/ml

Error in activity units* 11.364 pCi/L = 0.011364 pCi/ml

Percent Error 7.66 %

Minimum detectable activity NA

Signature G G Bradley 2-18-92
(Reviewed by) (Date)
Entered SK F 2/18/92

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-062

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	18-Feb-92	
Enter Radiochem Sample Number (XXXX)	MS-2726TC	
Enter Log-In Number ('90-XXXX)	MS-2726TC	
Enter Client Sample ID	MS-2726TC	
Enter File Name	MS2726T	
Initial amount of sample used	~~110.9~~ +\- 0.2000	104.3 DKJ 2/19/92
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1 +\- 0.0001	
If leached, enter ml of leach soln analyzed	1 +\- 0.0001	
Enter total counts observed	817	
Enter count time in minutes	100	
Enter background (cpm)	0.738	
Calculated net cpm	7.4320 +\- 0.2985	
Weight of residue on dish (NOT IN GRAMS) - in mG	51.4 +\- 0.1	
d/c for detector based on mg loading	5.0705 +\- 0.3721	

Signature G G Bradaczynski 2/18/92
(Entered by) (Date)

Total Beta Activity	~~153.067~~ pCi/L =	0.153067 pCi/ml	162.75 pCi/L
Error in activity units*	~~12.800~~ pCi/L =	0.012800 pCi/ml	13.6 pCi/L

DKJ 2/19/92

Percent Error 8.37 %

Minimum detectable activity NA

Signature J. K. Tadych 2/18/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E02-063

1100 EM1 Total Beta analysis Batch 1

Spike Recoveries

Sr calibration curve

Blank Spike Sr on 1/22/92 activity of Sr-90 = 1077 +/- 53 dpm/ml

$$\frac{(0.1989 \pm 0.0009\ ml)(1077 \pm 53\ dpm/ml)}{(0.1\ L)\ (2.22\ dpm/pCi)} = 964.9 \pm 47.7\ pCi/L$$

$$\frac{1002.8 \pm 13.3}{964.9 \pm 47.7} \times 100 = \underline{104 \pm 5\ \%\ \text{recovered}}$$

Matrix Spike Sr

$$\frac{(0.1989 \pm 0.0009\ ml)(1077 \pm 53\ dpm/ml)}{(0.1109 \pm 0.0002\ L)(2.22\ dpm/pCi)} = 870.1 \pm 430\ pCi/L$$

$$\frac{927.1 \pm 15.9}{870.1 \pm 43.0} \times 100 = \underline{107 \pm 6\ \%}\ \text{recovered}$$

Blank Spike Tc activity of ^{99}Tc spike std # 54124-64-0

$$3.759 \times 10^{4} \pm 609\ \frac{\gamma}{g}\ \left(\frac{0.9989}{ml}\right)\left(\frac{60\ sec}{min} \pm 2\right)\left(\frac{0.207\ ml}{250\ ml}\right) = 1,864 \pm 30\ dpm/ml$$

54124-64-17: $\left(1,864 \pm 30\ dpm/ml\right)\left(\frac{1.4553 \pm 0.0034\ ml}{25\ ml}\right) = 108.5$ dpm on 11/15/82

$$\frac{(0.1989 \pm 0.0009\ ml)(108.5 \pm 2\ dpm/ml)}{(0.1\ L)\ (2.22\ dpm/pCi)} = 97.2 \pm 2\ pCi/L$$

S.K. Fadeff 2/11/92

G.G. Bodzaczynski 2-12-92

E02-064

Blank Spike Recovery: Tc-99 (Sr calibration curve)

$$\frac{620 \pm 11}{97.2 \pm 2} \times 100 = \underline{64 \pm 2\ \%\ \text{recovered}}$$

Matrix Spike

$$\frac{(72 \pm 3) - (5.23 \pm 0.33)}{97.2 \pm 2} \times 100 = \underline{69 \pm 4\ \%\ \text{recovered}}$$

S. K. Fadeff 2/11/92

Matrix Spike Duplicate

$$\frac{[(0.1989 \pm 0.0009\ ml) + (0.9991 \pm 0.0040\ ml)]\,(108.5 \pm 2\ dpm/ml)}{(0.09607 \pm 0.00002\ L)(2.22\ dpm/pCi)} = 609.5 \pm 11.4\ pCi/L$$

$$\frac{(248 \pm 4) - (5.23 \pm 0.3)}{610 \pm 11} \times 100 = \underline{40 \pm 1\ \%\ \text{recovered}}$$

Precision:

92-02726: $[(5.672 \pm 0.46) + (4.787 \pm 0.471)]\ \frac{1}{2} = 5.23 \pm 0.33$

$$\frac{(5.672 \pm 0.46) - (4.787 \pm 0.471)}{5.23 \pm 0.33} \times 100 = 17 \pm 13\ \%$$

S. K. Fadeff 2/12/92

N. Wynbell 3-4-92

E02-065

^{99}Tc recovery based on ^{99}Tc calibration curve

97.2 pCi/L added to blank spike

$$\frac{81.7 \pm 3.6}{97.2 \pm 2} \times 100 = \underline{84 \pm 4\ \%} \text{ recovered}$$

Average of 92-02726

$$\frac{(11.86 \pm 1.20) + (10.93 \pm 1.34)}{2} = 11.4 \pm 0.9 \text{ pCi/L}$$

$$\frac{(11.86 - 10.93)}{11.4} \times 100 = \underline{8\%} \quad \text{RPD}$$

Matrix Spike Recovery of 92-02726

2 counts taken

$$(163^{\pm 19} \text{ pCi/L} + 148^{\pm 11} \text{ pCi/L}) \tfrac{1}{2} = 156 \text{ pCi/L} \pm 9 \text{ pCi/L}$$

$$(156 \pm 9) - (11.4 \pm 0.9) = 145 \pm 9 \text{ pCi/L}$$

$$\frac{145 \pm 9}{97.2 \pm 2} \times 100 = 149\ \% \text{ recovered}$$

Matrix Spike Duplicate

$$\frac{(544 \pm 37) - (11.4 \pm 0.9)}{609.5 \pm 11.4} \times 100 = \underline{87 \pm 6\ \%} \text{ recovered.}$$

S. L. Fadoff 2/18/92
M J Wyatt 3-4-92

E02-066

BATCH 2

TOTAL BETA ANALYSIS

E03-001

Test Instruction for
1100-EM-1 Total Beta Analysis Set #2

Note: Samples need to be locked at all times.

This is impact level 1 work; date and sign all crossouts.

Analysis should be done in a low level lab such as 10A.

Take the specified aliquot and perform analysis per procedures PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis, PNL-ALO-462, Source Preparation for Gross Beta Analysis, and PNL-ALO-463, Beta Counting Procedure. Use the low beta detectors.

BL-02740	100 ml H2O	
BS-02740	100 ml H2O	200 ul Sr-Y-90 #52733-117-1
BS-02740Tc	100 ml H2O	100 dpm Tc-99
92-02739	100 ml	
92-02740	100 ml	
DUP-02740	100 ml	
92-02741	100 ml	
92-02742	100 ml	
92-02743	100 ml	
92-02744	100 ml	
92-02745	100 ml	
92-02746	100 ml	
92-02747	100 ml	
92-02748	100 ml	
92-02749	100 ml	
92-02750	100 ml	
92-02751	100 ml	
92-02752	100 ml	
MS-02740	100 ml	200 ul Sr-Y-90 #52733-117-1
MSD-02740	100 ml	200 ul Sr-Y-90 #52733-117-1
MSTc-02740	100 ml	100 dpm Tc-99
MSDTc-02740	100 ml	100 dpm Tc-99

TBETA2EM.TI

Leaching Data Sheet

Procedure PNL-ALO-106 Rev.0, leach: Check if used ✓

Date Sample Leach Started 2-6-92 Date Completed 2-7-92

Tracer or Spike Volumes 197.9 λ 2.11.92 ± 1.3 λ

Isotope ^{90}Sr Sample Added to: BS-02740, MS02740 MSD02740
Pipette No. 10A.18 Volume ~~198.0~~ λ +/- ~~1.3~~ λ Date Pipetted 2-6-92
Spike ID 52733-117.1 Spike Activity 1.47 x 10^3 dpm/ml 3-14-80

Isotope ^{99}Tc Sample Added to: BS-02740TC MSTC02740 MSDTC02740
Pipette No. 10A.22 Volume 994.6 λ +/- 2.7 λ Date Pipetted 2-6-92
Spike ID 54124-64-17 Spike Activity ~~10.79~~ dpm/ml
108.5 DKT 2/18/92

Sample ID, Aliquot Size, and Leachate Volume

Balance Number 510-06-01-006 Temperature (if weighing water samples) 22° 1.00221 ml/g

Sample ID	Beaker Wt.	Bker + Smpl	Sample Wt or Vol	~~Diln~~ x Volume factor	Diln Vol. Uncertainty	
BL-02740	NA	NA	100 ml	NA		
BS-02740	NA	NA	100 ml	NA		
BS-02740TC	NA	NA	100 ml	NA		
92-02739	106.10 g	237.6 g	131.50 g	131.79 ml		
92-02740	104.88	212.28	107.40 g	107.64 ml		
DUP-02740	108.07	205.79	97.72	97.94		
92-02741	111.17	213.70	102.53	102.76		
92-02742	107.80	237.28	129.48	129.77		
92-02743	98.91	231.72	132.81	133.10		
92-02744	104.52	217.33	112.81	113.06		

Sample Volumes (if a pipet was used for small aqueous samples)

Pipette No. NA Volume NA +/- NA Date Pipetted NA

[signature] 2-18-92 Analyst Date J. K. Tadey 2/18/92 Reviewer Date

LECHDATA.LOG

E03-003

1100 EMI pg 293

Leaching Data Sheet

Procedure PNL-ALO-106 Rev.0, leach: Check if used ✓

Date Sample Leach Started 2-6-92 Date Completed 2-7-92

Tracer or Spike Volumes see pg. 1 for tracer information
Isotope NA Sample Added to: NA
Pipette No. _____ Volume _____ +/- _____ Date Pipetted _____
Spike ID _____ Spike Activity _____

Isotope NA Sample Added to: NA
Pipette No. _____ Volume _____ +/- _____ Date Pipetted _____
Spike ID _____ Spike Activity _____

Sample ID, Aliquot Size, and Leachate Volume

Balance Number see pg 1 Temperature (if weighing water samples) _____

Sample ID	Beaker Wt.	Bker + Smpl	Sample Wt or Vol	~~Drtr~~ ~~Volume~~ factor	Diln Vol Uncertainty	
92-02745	110.10	240.91	130.81 g	131.10 ml		
92-02746	106.44	204.95	98.51	98.73		
92-02747	98.19	207.93	109.74	109.98		
92-02748	107.06	217.04	109.98	110.22		
92-02749	103.83	211.57	107.74	107.98		
92-02750	105.70	214.00	108.30	108.54		
92-02751	107.46	213.33	105.87	106.10		
92-02752	106.14	200.31	94.17	94.38		
MB 02740	106.17	225.23	119.06	119.32		
MBD-02740	108.05	219.27	111.22	111.47		

Sample Volumes (if a pipet was used for small aqueous samples)

Pipette No. NA Volume NA +/- NA Date Pipetted NA

[signature] 2-18-92 Analyst Date

[signature] 2/18/92 Reviewer Date

LECHDATA.LOG

E03-004

1100 EM 1 pg 393

Leaching Data Sheet

Procedure PNL-ALO-106 Rev.0, leach: Check if used ✓

Date Sample Leach Started 2-6-92 Date Completed 2-7-92

Tracer or Spike Volumes see pg 1 for spike information
Isotope ~~90Sr~~ NA Sample Added to: ~~BS-02~~ NA
Pipette No. 9L-2-3-92 Volume _____ +/- 9L-2-3-92 Date Pipetted _____
Spike ID _____ Spike Activity _____

Isotope NA Sample Added to: NA
Pipette No. _____ Volume _____ +/- _____ Date Pipetted _____
Spike ID _____ Spike Activity _____

Sample ID, Aliquot Size, and Leachate Volume

Balance Number _____ Temperature (if weighing water samples) _____

Sample ID	Beaker Wt.	Bker + Smpl	Sample Wt or Vol	~~Diln~~ xVolume factor	Diln Vol. Uncertainty	
MSTC-02740	104.30	212.12	107.82	108.06		
MSDTC-02740	98.57	208.81	110.24	110.48		

Sample Volumes (if a pipet was used for small aqueous samples)

Pipette No. NA Volume NA +/- _____ Date Pipetted NA

Analyst [signature] Date 2-18-92 Reviewer [signature] Date 2/18/92

LECHDATA.LOG

E03-005

Gross Alpha and Beta Dish Weight
Data Sheet

Date Sample Prep Started 2-7-92
Date Completed 2-10-92

Sample ID and Dish Weights

Balance Number 509-06-03-003

Sample ID	Tare Wt. of Alpha Dish	Gross Wt. of Alpha Dish	Net Wt. of Alpha Ppt.	Tare Wt. of Beta Dish g	Gross Wt. of Beta Dish g	Net Wt. of Beta Ppt. g
MS 02740				.7520	.7799	0.0279
MSD 02740				.7424	.7846	0.0422
MSTC 02740				.7453	.7766	0.0313
MSDTC 02740				.7444	.7509	0.0065
92-02739				.7408	.7923	0.0515
92-02740				.7446	.7710	0.0264
92-02741				.7512	.8302	0.0790
92-02742				.7504	.7883	0.0379
92-02743				.7435	.7449	0.0014
92-02744				.7440	.8292	0.0852
92-02745				.7503	.8467	0.0964
92-02746				.7444	.7907	0.0463
92-02747				.7502	.8213	0.0711
92-02748				.7494	.8359	0.0865
92-02749				.7477	.8110	0.0633

G. G. Bradzynski 2-18-92 S. L. Talley 2/18/92
Analyst Date Reviewer Date

ABDATA3.LOG

pg 2 of 2

Gross Alpha and Beta Dish Weight
Data Sheet

Date Sample Prep Started 2-7-92
Date Completed 2-10-92

Sample ID and Dish Weights

Balance Number 509-06-03-003

Sample ID	Tare Wt. of Alpha Dish	Gross Wt. of Alpha Dish	Net Wt. of Alpha Ppt.	Tare Wt. of Beta Dish	Gross Wt. of Beta Dish	Net Wt. of Beta Ppt.
92-02750				.7570	.8384	81.4mg
92-02751				.7448	.7810	36.2 mg
92-02752				.7445	.7807	36.2 mg
BS 02740				7441	.7445	0.4 mg
BS 02740 TC				.7530	.7565	3.5mg
BL 02740				.7446	.7446	0 mg
Dup 2740				.7406	.7615	20.9 mg

G.G. Bradczynski 2-18-92
Analyst Date

S.K. Tackett 3/4/92
Reviewer Date

ABDATA3.LOG

E03-007

Battelle
Pacific Northwest Laboratories

BETA COUNTING DATA

REQUESTED BY

REMARKS

DATE ANALYZED: 2-6-92

SAMPLE TYPE: 1100 EM! total Beta

CHARGE CODE

SAMPLE DESIGNATION	DATE - TIME SAMPLED	CARRIER (ML)	PROCESS WT.-VOL. ANALYZED	WT. RESIDUE	ANALYST	SET NUMBER	SHELF	DATE - TIME COUNTED	COUNTS	MINUTES	BKG. C/M	BKG. CORR. C/M	CALCULATIONS (SAMPLE VOLUME FACTOR)	RESULTS UNITS OF µC
92.02744				85.2 gh		1		0845 2-12-92	2061		442	.680		
92-02745				96.4		2			2211			.536		
92-02746				46.3		3			486			.716		
DUP 2740				20.9		1		1630 2-17-92	077		1000	.766		
92.2747				71.1		2			4443			.579		
92-2748				86.5		3			4942			.579		
92-2749				63.3		1		10:40 2-14-92	1415		360	.766		
92-2750				gh ~~81.5~~ 81.4 3-3-92		2			1695			.579		
92-2751				36.2				1700 2-14-92	1339		1000	.766		
92-2752				36.2		2			12,537			.579		
recount MSD2726				46.1		1		1245 2-18-92	3913		~~448~~ 448 gh 3-3-92	.766		

G G Brodzynski 3-3-92
Reviewed S. K. Fadeff 2/19/92

E03-008

№ 1275

BD-1700-049 (12-71)

Battelle

BETA COUNTING DATA

REQUESTED BY

REMARKS

DATE ANALYZED: 2-6-92

SAMPLE TYPE: 1100EM1 Total Beta

CHARGE CODE

SAMPLE DESIGNATION	DATE - TIME SAMPLED	CARRIER / %	PROCESS WT. - VOL. ANALYZED	WT. RESIDUE	ANALYST	SET NUMBER	SHELF	DATE - TIME COUNTED	COUNTS	MINUTES	BKG. C/M	BKG. CORR. C/M	TECHNICIAN	CALCULATIONS (CONVERSION FACTOR)	RESULTS UNITS OF µC
BS-02740		TB	100	0.4			1	2-7-92 1000	11703	100		0.65			
BS-02740TC			100	3.5			2		3748			.58			
BL 02740			100	0			3		72			.63			
MS-02740				27.9			1	2-6-92 1000	10,393	100		.680			
MSD-02740				42.2			2		10,885	100		.58			
MS TC 02740				31.3			3		2609	100		.711			
MSD TC 02740				46.5			1	2-10-92 1245	1843			.680			
92-02739				51.5			2		5062			.536			
92-2740				24.4			3	2-10-92 1200	1128 ~~5118~~			.711			
92-2741				79.0			1	2-10-92 1200	5118			.680			
92-2742				37.9			2		1400			.536			
92-02743				1.4			1	2-11-92 10:30	545	100		.680			
~~92-02744~~				~~85.2~~			~~2~~					~~.58~~			
~~92-02745~~				~~96.4~~			~~3~~					~~.711~~			

gh 2-12-92 ct interrupted

L.L. Brodacznski 3-3-92

Reviewed S.K. 2/19/92

BD-1700-049 (12-71)

E03-009

№ 1271

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	~~11-Feb-91~~ 2/19/92	JK3 2/19/92
Enter Radiochem Sample Number (YY		
Enter Log-In Number ('90-XXXX'	BS-02740	
Enter Client Sample ID		
Enter File Name	BS2740	
Initial amount of sample used	100 +\- 0.0001	
Which units, ml, g or sample?	ml	
If leached, enter final leach soln vol used (ml)	1 +\- 0.0001	
If leached, enter ml of leach soln analyzed	1 +\- 0.0001	
Enter total counts observed	11703	
Enter count time in minutes	100	
Enter background (cpm)	0.765	
Calculated net cpm	116.2650 +\- 1.0853	
Weight of residue on dish (NOT IN GRAMS) in MG	0.4 +\- 0.1	
d/c for detector based on mg loading	1.2933 +\- 0.0219	

Signature S. K. Jadeff 2/19/92
(Entered by)

Total Beta Activity = 0.001541 pCi/ml

Error in activity units* = 0.014724 pCi/ml

Percent Error 1.48 %

Minimum detectable activity NA

Signature G.G. Brodzczynski 3-3-92
(Reviewed by)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(d/c)(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml sampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E03-010

SPREADSHEET FOR [illegible] OF TOTAL BETA ACTIVITY

Date calculated	~~11-Feb-91~~ 2/19/92 3/2/19/92
Enter Radiochem Sample Number (XXX)	
Enter Log-In Number ('90-XXXX)	BL-02740
Enter Client Sample ID	
Enter File Name	BL2740

Initial amount of sample used	100 +\- 0.0001
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln [illegible]	1 +\- 0.0001
Enter total counts observed	72
Enter count time in minutes	100
Enter background (cpm)	0.637
Calculated net cpm	0.0830 +\- 0.1165
Weight of residue on dish (NOT IN [illegible] - in MG	0 +\- 0.1
d/c for detector based on mg loading	1.6904 +\- 0.0219

Signature S. K. Fadeff 2/19/92
(Entered by) (Date)

Total Beta Activity	0.707 pCi/L =	0.000707 pCi/ml
Error in activity units*	0.992 pCi/L =	0.000992 pCi/ml
Percent Error	140.35 %	
Minimum detectable activity	2.039 pCi/L =	0.002039 pCi/ml

Signature G.G. Bradaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/29 91
TOTBETA

E03-011

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	~~11-Feb-92~~ 2/19/92 SKJ 2/19/92
Enter Radiochem Sample Number (Y/N)	
Enter Log-In Number ('90-XXX)	89-02740TC
Enter Client Sample ID	
Enter File Name	652740TC

Initial amount of sample used	100	+\- 0.0001
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1	+\- 0.0001
If leached, enter ml of leach soln analyzed	1	+\- 0.0001
Enter total counts observed	3748	
Enter count time in minutes	100	
Enter background (cpm)	0.55	
Calculated net cpm	36.9300	+\- 0.6167
Weight of residue on dish (NOT IN GRAMS) in MG	3.5	+\- 0.1
d/c for detector based on mg loading	1.9155	+\- 0.0219

Signature S. K. Jadhav 2/19/92
(Entered by) (Date)

Total Beta Activity [illegible] 0.218649 pCi/ml

Error in activity units* [illegible] = 0.036450 pCi/ml

Percent Error 2.81 %

Minimum detectable activity [illegible]

Signature G. G. Bradaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22 [illegible]

(initial sample amount)(ml [illegible]

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 7, 5/26/91
TOTBETA

E03-012

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	~~11-Feb-91~~ 2/19/92 JKJ 2/19/92
Enter Radiochem Sample Number (XXXX)	
Enter Log-In Number ('90-XXXX)	92-02739
Enter Client Sample ID	
Enter File Name	2739B
Initial amount of sample used	131.79 +\- 0.0001
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln used, 2nd	1 +\- 0.0001
Enter total counts observed	5062
Enter count time in minutes	260
Enter background (cpm)	0.536
Calculated net cpm	18.9332 +\- 0.2774
Weight of residue on dish (NOT IN GRAMS) in MG	51.5 +\- 0.1
d/c for detector based on mg loading	2.2423 +\- 0.0311

Signature J. K. Jadoff 2/19/92
(Entered by) (Date)

Total Beta Activity	145.103 pCi/L =	0.145103 pCi/ml
Error in activity units*	2.939 pCi/L =	0.002939 pCi/ml
Percent Error	[illegible]	
Minimum detectable activity	[illegible]	

Signature G. G. Bradaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml sample)

*Note: The propagated error [illegible] associated with the d/c calculation based on [illegible] loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E03-013

SPREADSHEET FOR CALC[illegible] OF TOTAL BETA ACTIVITY

Date calculated	19-Feb-92 JKF 2/19/92
Enter Radiochem Sample Number (Y:	
Enter Log-In Number ('90-YYY:	92-02740
Enter client sample ID	
Enter file name	2740a
Initial amount of sample used	127.64 +\- 0.[illegible]
Which units, ml, g or sample'	ml
If leached, enter final leach [illegible]	1 +\- 0.0001
If leached, enter ml of leach [illegible]	1 +\- 0.0001
Enter total counts observed	1120
Enter count time in minutes	1000
Enter background (cpm)	0.716
Calculated net cpm	0.4120 +\- 0.0429
Weight of residue on dish (NOT IN [illegible] in MG	26.4 +\- 0.1
d/c for detector based on mg loading	2.0755 +\- 0.0246

Signature J. K. Fadoyo 2/19/92
(Entered by) (Date)

Total Beta Activity	[illegible] =	0.003578 pCi/ml
Error in activity units*	[illegible] pCi/L =	0.000375 pCi/ml
Percent Error	10.49 %	
Minimum detectable activity		

Signature G G Bradacyna 3-5-92.
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22cpm)(ml leachate)

(initial sample amount)(ml subsamples)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3.6 [illegible]
TOTBETA

E03-014

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	~~11-Feb-91~~ 2/19/92 DKF 2/19/92
Enter Radiochem Sample Number (XXXX)	
Enter Log-In Number ('90-XXXX)	DUP-02740
Enter Client Sample ID	
Enter File Name	2740DUPB
Initial amount of sample used	97.94 +\- 0.0001
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	1097
Enter count time in minutes	1000
Enter background (cpm)	0.766
Calculated net cpm	0.3310 +\- 0.0432
Weight of residue on dish (NOT IN [illegible]) - in MG	20.9 +\- 0.1
d/c for detector based on mg load[illegible]	2.0378 +\- 0.0236

Signature J. K. Fadoff 2/19/92
(Entered by) (Date)

Total Beta Activity	3.102 pCi/L =	0.003102 pCi/ml
Error in activity units*	3.406 pCi/L =	0.000406 pCi/ml
Percent Error	13.09 %	
Minimum detectable activity	NA	

Signature G G Bedzeyprak 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml sample)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E03-015

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	~~1-Feb-91~~ 2/19/92 SKJ 2/19/92
Enter Radiochem Sample Number (XXXX)	
Enter Log-In Number ('90-XXXX)	92-02741
Enter Client Sample ID	
Enter File Name	27418
Initial amount of sample used	102.76 +\- 0.0001
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln [illegible]	1 +\- 0.0001
Enter total counts observed	5118
Enter count time in minutes	1200
Enter background (cpm)	0.68
Calculated net cpm	[illegible]
Weight of residue on disk (mg) [illegible]	[illegible]
d/c for detector based on mg loading	[illegible]

Signature S. K. Jadhav 2/19/92
(Entered by) (Date)

Total Beta Activity	[illegible] pCi/L =	0.046973 pCi/ml
Error in activity units*	1.173 pCi/L =	0.001130 pCi/ml
Percent Error	[illegible] %	
Minimum detectable activity	NA	

Signature G. G. Bodaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22x10^6 dpm)(vol. leached)

(initial sample amount)(ml [illegible])

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/23/91
TOTBETA

E03-016

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	19-Feb-92
Enter Routcher's Sample Number	
Enter Log In Number (90-XXXX)	9[illegible]-2742
Enter Client Sample ID	
Enter File Name	27426

Initial amount of sample used	129.77 +\- 0.0001
Which units, ml, g or sample?	ml
If leached, enter final leach soln [illegible]	[illegible] +\- [illegible]
If leached, enter ml of leach soln [illegible]	[illegible] +\- [illegible]
Enter total counts observed	1[illegible]00
Enter count time in minutes	1200
Enter background (cpm)	0.536
Calculated net cpm	0.8640 +\- 0.0440
Weight of residue on dish (NOT IN GRAMS) - in MG	37.9 +\- 0.1
d/c for detector based on mg loading	2.1530 +\- 0.0272

Signature S. K. Fadeff 2/19/92
(Entered by) (Date)

Total Beta Activity	[illegible] pCi/L =	0.006457 pCi/ml
Error in activity units*	0.[illegible] pCi/L =	0.000339 pCi/ml
Percent Error	5.25 %	
Minimum detectable activity	NA	

Signature G. G. Baczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22[illegible])(1000)

(initial sample amount)(ml subsample)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/26/5.
TOTBETA

E03-017

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	19-Feb-92	
Enter Radiochem Sample Number (XX)		
Enter Log-In Number ('90-XXXX)	[illegible]	
Enter Client Sample ID		
Enter File Name	[illegible]	
Initial amount of sample used	[illegible] +\- 0.0001	
Which units, ml, g or sample?	[illegible]	
If leached, enter final leach [illegible]	1 +\- 0.0001	
If leached, enter ml of leach [illegible]	1 +\- 0.0001	
Enter total counts observed	545	
Enter count time in minutes	1000	
Enter background (cpm)	0.06	
Calculated net cpm	0.1350 +\- 0.0350	
Weight of residue on dish (NO) [illegible] in MG	1.4 +\- 0.1	
d/c for detector based on mg load [illegible]	1.9005 +\- 0.0219	

Signature *S. L. Fadeff* 2/19/92
(Entered by) Date

Total Beta Activity [illegible] = 0.000868 pCi/ml

Error in activity units* [illegible] = 2.000.05 pCi/ml

Percent Error [illegible]

Minimum detectable activity [illegible] = 0.000503 pCi/ml

Signature *G. G. Bradley* 3-3-92
(Reviewed by) Date

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)*(d/c)(pCi/2.22[illegible])

(initial sample amount) [illegible]

*Note: The propagated error [illegible] the error associated with the d/c calculation based [illegible] loading [illegible] the plate.

Total Beta Spreadsheet Revision [illegible]
BETA

E03-018

SPREADSHEET FOR CALCULATING TOTAL BETA ACTIVITY

Date calculated	19-Feb-92	
Enter Radiochem Sample Number (XXX)		
Enter Log-In Number (1993-XXXX)	92-2744	
Enter Client Sample ID		
Enter File Name	27443	
Initial amount of sample used	1[illegible].06 +\-	0.0001
Which units, ml, g or sample?	ml	
If leached, enter final leach [illegible]	1 +\-	0.0001
If leached, enter ml of leach [illegible]	1 +\-	0.0001
Enter total counts observed	7061	
Enter count time in minutes	442	
Enter background (cpm)	3.68	
Calculated net cpm	3.9829 +\-	0.1099
Weight of residue on disk (NOT IN [illegible] MG	6[illegible].2 +\-	0.1
d/c for detector based on mg loading	2.4319 +\-	0.0431

Signature S. K. Fadyg 2/19/92
(Entered by) (Date)

Total Beta Activity	38.903 pCi/L =	0.038908 pCi/ml
Error in activity units*	1.773 pCi/L =	0.001773 pCi/ml
Percent Error	[illegible]	
Minimum detectable activity		

Signature G. G. Brobaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leached)

(initial sample amount)(ml [illegible])

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, [illegible]
TOTBETA

E03-019

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	19-Feb-92
Enter Radiochem Sample Number (X.XX)	
Enter Log-In Number ('90-XXXX)	92-2746
Enter Client Sample ID	
Enter File Name	2746B

Initial amount of sample used	98.73 +\- 0.0001
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	486
Enter count time in minutes	442
Enter background (cpm)	0.716
Calculated net cpm	0.1835 +\- 0.0641
Weight of residue on dish (NOT IN GRAMS) in MG	46.3 +\- 0.1
d/c for detector based on mg loading	2.2085 +\- 0.0296

Signature J. K. Fadoff 2/19/92
(Entered by) Date

Total Beta Activity	pCi/L =	0.037865 pCi/ml
Error in activity units*	pCi/L =	0.000648 pCi/ml
Percent Error	16.75 %	
Minimum detectable activity	NA	

Signature G. G. Bradacynski 3-3-92
(Reviewed by) Date

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6 13.51
TOTBETA

E03-020

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	19-Feb-92	
Enter Radiochem Sample Number (XXXX)		
Enter Log-In Number ('90-XXXX)	92-2747	
Enter Client Sample ID		
Enter File Name	2747B	
Initial amount of sample used	49.98 +\-	0.0001
Which units, ml, g or sample?	g	
If leached, enter final leach volume [illegible]	1 +\-	0.0001
If leached, enter ml of leach solution subtracted	1 +\-	0.0001
Enter total counts observed	4443	
Enter count time in minutes	1000	
Enter background (cpm)	0.579	
Calculated net cpm	3.8640 +\-	0.0709
Weight of residue on dish (NOT IN GRAMS) - in MG	71.1 +\-	0.1
d/c for detector based on mg loading	2.3662 +\-	0.0278

Signature J. K. Fadeff 2/19/92
(Entered by) (Date)

Total Beta Activity [illegible] pCi/g = 0.027447 pCi/ml

Error in activity units* 0.910 pCi/g = 0.000910 pCi/ml

Percent Error 2.[illegible] %

Minimum detectable activity NA

Signature G G Bodaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml in sample)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E03-021

SPREADSHEET FOR [illegible] TOTAL BETA ACTIVITY

Date calculated	[illegible]
Enter Radiochem Sample Number	
Enter Log-In Number (YSJ-[illegible])	[illegible]
Enter Client Sample ID	
Enter File Name	[illegible]

Initial amount of sample used	118.22 +\-	0.0001
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	4942	
Enter count time in minutes	1000	
Enter background (cpm)	0.579	
Calculated net cpm	4.3630 +\-	0.0743
Weight of residue on dish (NOT IN GRAMS) - in MG	86.5 +\-	0.1
d/c for detector based on mg loading	2.4597 +\-	0.0436

Signature S. K. Fadeff 2/19/92
(Entered by) (Date)

Total Beta Activity	42.[illegible]9 pCi/L =	0.047658 pCi/ml
Error in activity units*	1.3[illegible] pCi/L =	0.001078 pCi/ml
Percent Error	2.4[illegible] %	
Minimum detectable activity	[illegible]	

Signature G. G. Bradaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachable})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/22/91
TOTBETA

E03-022

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	19-Feb-92	
Enter Radiochem Sample Number (XX)		
Enter Log-In Number ('90-XXX)	90-274[illegible]	
Enter Client Sample ID		
Enter File Name	27490	
Initial amount of sample used	107.96 +\-	0.0001
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	1415	
Enter count time in minutes	360	
Enter background (cpm)	0.766	
Calculated net cpm	3.1646 +\-	0.1142
Weight of residue on dish (NOT IN GRAMS) - in mG	63.3 +\-	0.1
d/c for detector based on mg loading	2.3175 +\-	0.0350

Signature S. K. Fadeff 2/19/92
(Entered by) (Date)

Total Beta Activity	2.554 pCi/L =	0.070594 pCi/ml
Error in activity units*	1.[illegible] pCi/L =	0.001197 pCi/ml
Percent Error	.91 %	
Minimum detectable activity	NA	

Signature G. G. Bandazyonak 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml sub sample)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/29/91
TOTBETA

E03-023

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	19-Feb-92	
Enter Radiochem Sample Number (XXXX)		
Enter Log-In Number (90-XXXX)	92-[illegible]	
Enter Client Sample ID		
Enter File Name	27532	
Initial amount of sample used	108.54 +\-	0.0001
Which units, ml, g or sample?	ml	
If leached, enter final leach sol[illegible] volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	1695	
Enter count time in minutes	360	
Enter background (cpm)	0.579	
Calculated net cpm	4.1293 +\-	0.1212
Weight of residue on dish (NOT IN GRAMS) - in MG	81.4 +\-	0.1
d/c for detector based on mg loading	2.4291 +\-	0.0416

Signature S. K. Fadoff 2/19/92
(Entered by) (Date)

Total Beta Activity	41.627 pCi/L =	0.041627 pCi/ml
Error in activity units*	1.415 pCi/L =	0.001415 pCi/ml
Percent Error	3.40 %	
Minimum detectable activity	NA	

Signature G. G. Bradzymek 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E03-024

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	19-Feb-92
Enter Radiochem Sample Number (YXXX)	
Enter Log-In Number ('90-XXXX)	92-2751
Enter Client Sample ID	
Enter File Name	2751B
Initial amount of sample used	185.1 +\- 0.0200
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	1339
Enter count time in minutes	1000
Enter background (cpm)	0.766
Calculated net cpm	0.5730 +\- 0.0459
Weight of residue on dish (NOT IN GRAMS) - in MG	36.2 +\- 0.1
d/c for detector based on mg loading	2.1417 +\- 0.0268

Signature S. K. Fadyy 2/19/92
(Entered by) (Date)

Total Beta Activity [illegible] pCi/ml = 0.085210 pCi/ml

Error in activity units* [illegible] = 0.008492 pCi/ml

Percent Error [illegible]

Minimum detectable activity [illegible]

Signature J.J. Brodaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E03-025

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	19-Feb-92	
Enter Radiochem Sample Number (XXXX)		
Enter Log-In Number ('90-XXXX)	92-2752	
Enter Client Sample ID		
Enter File Name	27520	
Initial amount of sample used	94.38 +\-	0.0200
Which units, ml, g or sample?	ml	
If leached, enter final leach solu[illegible] volume (ml)	1 +\-	0.0001
If leached, enter ml of leach solu[illegible]	1 +\-	0.0001
Enter total counts observed	12537	
Enter count time in minutes	1000	
Enter background (cpm)	[illegible]	
Calculated net cpm	[illegible] +\-	[illegible]
Weight of residue on dish (NO[illegible]	[illegible] +\-	[illegible]
d/c for detector based on mg load[illegible]	2.1417 +\-	0.0260

Signature S. K. Fadeff 2/19/92
(Entered by) (Date)

Total Beta Activity	122.232 pCi/L =	0.122232 pCi/ml	
Error in activity units*	1.927 pCi/L =	0.001927 pCi/ml	
Percent Error	1.58 %		
Minimum detectable activity	NA		

Signature G. G. Brodaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml L water)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 7, 4/29/91
TOTBETA

E03-026

SPREADSHEET FOR [illegible] OF TOTAL BETA ACTIVITY

Date calculated	19-Feb 92	
Enter Radiochem Sample Number (#)		
Enter Log-In Number (90-XXXX)	95-2748	
Enter Client Sample ID		
Enter File Name	MS27400	
Initial amount of sample used	119.32 +\-	0.0200
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	10393	
Enter count time in minutes	100	
Enter background (cpm)	0.68	
Calculated net cpm	103.3300 +\-	1.0228
Weight of residue on dish (NOT IN GRAMS) in MG	37.9 +\-	0.1
d/c for detector based on mg loading	2.0858 +\-	0.0249

Signature D. K. Fadyff 2/19/92
(Entered by) (Date)

Total Beta Activity	812.992 pCi/L =	0.812992 pCi/ml
Error in activity units*	12.716 pCi/L =	0.012616 pCi/ml
Percent Error	1.55 %	
Minimum detectable activity	MA	

Signature G. G. Bradsaymak 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3 6-25-91
TOTBETA

E03-027

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	19-Feb-92	
Enter Radiochem Sample Number (xxxx)		
Enter Log-In Number (92-xxxx)	55-2740	
Enter Client Sample ID		
Enter File Name	MS027400	
Initial amount of sample used	111.47 +\-	0.0200
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	10885	
Enter count time in minutes	100	
Enter background (cpm)	0.536	
Calculated net cpm	108.3140 +\-	1.0459
Weight of residue on dish (NOT IN GRAMS) - in MG	42.2 +\-	0.1
d/c for detector based on mg loading	2.1815 +\-	0.0284

Signature S. K. Tadeff 2/19/92
(Entered by) Date

Total Beta Activity	954.856 pCi/L =	0.954856 pCi/ml
Error in activity units*	15.474 pCi/L =	0.015474 pCi/ml
Percent Error	1.62 %	
Minimum detectable activity	NA	

Signature G. G. Bradzynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml 1. chate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/29/91
TOTBETA

E03-028

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	19-Feb-92
Enter Radinchem Sample Number (XXX)	
Enter Log-In Number (90-XXXX)	MSDT2-2740
Enter Client Sample ID	
Enter File Name	MSDT2740

Initial amount of sample used	110.48 +\- 0.0200
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	1943
Enter count time in minutes	300
Enter background (cpm)	0.68
Calculated net cpm	6.4085 +\- 0.1729
Weight of residue on dish (NOT IN GRAMS) - in MG	6.5 +\- 0.1
d/c for detector based on mg loading	1.9369 +\- 0.0220

Signature J. L. Jadoff 2/19/92
(Entered by) (Date)

Total Beta Activity [illegible] = 0.050689 pCi/ml

Error in activity units* [illegible] 0.001462 pCi/ml

Percent Error [illegible]

Minimum detectable activity NA

Signature G. G. Bradaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml [illegible])

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/29/[illegible]
TOTBETA

E03-029

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	19-Feb-92	
Enter Radiochem Sample Number (XX)		
Enter Log-In Number ('90-XXXX)	MSTc-2740	
Enter Client Sample ID		
Enter File Name	MSTc2740	
Initial amount of sample used	188.06	+\- 0.3200
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1	+\- 0.0001
If leached, enter ml of leach soln analyzed	1	+\- 0.0001
Enter total counts observed	2609	
Enter count time in minutes	100	
Enter background (cpm)	0.716	
Calculated net cpm	25.3740	+\- 0.5177
Weight of residue on dish (NOT IN GRAMS) [illegible] MG	21.3	+\- 0.1
d/c for detector based on mg loading	2.1083	+\- 0.0256

Signature S. K. Fadyff 2/19/92
(Entered by) (Date)

Total Beta Activity [illegible]051 pCi/L = 0.223051 pCi/ml

Error in activity units* [illegible] = 0.005298 pCi/ml

Percent Error [illegible]

Minimum detectable activity [illegible]

Signature G G Bradaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsample)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 2, [illegible]
TOTBETA

E03-030

SPREADSHEET FOR CALCULATION OF TOTAL [illegible]

Date calculated [illegible]
Enter Particular Sample Number (XXX) [illegible]
Enter Log-in Number (92-XXXX) [illegible]
Enter Client Sample ID [illegible]
Enter File Name [illegible]

Initial amount of sample used [illegible] = 0.0231
Which units, ml, g or sample? [illegible]
If leached, enter final leach soln volume (ml) [illegible] = 0.0231
If leached, enter ml of leach soln analyzed [illegible] = 0.0231
Enter total counts observed [illegible]
Enter count time in minutes [illegible]
Enter background (cpm) [illegible]
Calculated net cpm [illegible] = 0.1165
Weight of residue on dish (NOT IN [illegible]) - [illegible] [illegible] = 0.1
d/c for detector based on mg loading, [illegible] = 0.1047

Signature S. K. Fadeff 2/18/92
(Entered by) (Date)

Total Beta Activity [illegible] pCi/L = [illegible] pCi/ml

Error in activity units* [illegible] pCi/L = [illegible] pCi/ml

Percent Error [illegible]

Minimum detectable activity [illegible] pCi/L = [illegible] pCi/ml

Signature G G Brodaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leached)

(initial sample amount)(ml aliquot used)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the disk.

Total Beta Spreadsheet Revision 3, [illegible] 91
TOTBETA

E03-031

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	[illegible]	
Enter Radiochem Sample Number (YY)		
Enter Log-In Number (YY-XXXX)	[illegible]	
Enter Client Sample ID		
Enter File Name	[illegible]	
Initial amount of sample used	[illegible]	0.2001
Which units, ml, g or sample?	[illegible]	
If leached, enter final leach soln volume	[illegible]	0.2001
If leached, enter ml of leach soln aliquoted	[illegible]	0.2001
Enter total counts observed	[illegible]	
Enter count time in minutes	[illegible]	
Enter background (cpm)	[illegible]	
Calculated net cpm	[illegible]	0.6167
Weight of residue on dish (NOT IN [illegible])	[illegible]	0.1
d/c for detector based on mg loading	[illegible]	0.1269

Signature S. L. Fadyss 2/18/92
(entered by) (date)

Total Beta Activity	445.[illegible] pCi/L =	0.44[illegible] pCi/ml
Error in activity units*	15.[illegible] pCi/L =	0.0[illegible] pCi/ml
Percent Error	[illegible] %	
Minimum detectable activity	[illegible]	

Signature G G Brodzinski 3-3-92
(reviewed by) (date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(d/c)(pCi/2.22dpm)(\text{ml leached})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the filter.

Total Beta Spreadsheet Revision 2, 8/28/91
TOTBETA

E03-032

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY USE [illegible]

Date calculated	[illegible]	
Enter Radiochem Sample Number (XXXX)		
Enter Log-In Number (92-XXXX)	[illegible]	
Enter Client Sample ID		
Enter File Name	[illegible]	
Initial amount of sample used	[illegible]	0.0031
Which units, ml, g or sample?	[illegible]	
If leached, enter final leach soln volume (ml)	[illegible]	0.2201
If leached, enter ml of leach soln analyzed	[illegible]	0.2001
Enter total counts observed	[illegible]	
Enter count time in minutes	[illegible]	
Enter background (cpm)	[illegible]	
Calculated net cpm	[illegible]	0.2774
Weight of residue on dish (NOT IN g [illegible]) = [illegible]	[illegible]	0.1
d/c for detector based on mg loading	[illegible]	0.2729

Signature S. K. Fedyk 2/19/92
(Entered by) (Date)

Total Beta Activity	326,417 pCi/L =	[illegible] pCi/ml
Error in activity units*	24,268 pCi/L =	[illegible] pCi/ml
Percent Error	[illegible] %	
Minimum detectable activity	NA	

Signature G.E. Bradczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision [illegible]
TOTBETA

E03-033

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY [illegible]

Date calculated	[illegible]	
Enter Radiochem Sample number (XXXX)		
Enter Log-In number (1990-XXXX)	[illegible]	
Enter Client Sample ID		
Enter File Name	[illegible]	
Initial amount of sample used	[illegible] +/-	0.0001
Which units, ml, g or sample?	[illegible]	
If leached, enter final leach soln volume	[illegible] +/-	0.0001
If leached, enter ml of leach soln aliquot	[illegible] +/-	0.0001
Enter total counts observed	[illegible]	
Enter count time in minutes	[illegible]	
Enter background (cpm)	[illegible]	
Calculated net cpm	[illegible] +/-	0.0429
Weight of residue on disk (NOT IN [illegible] - [illegible] MG	[illegible] +/-	0.1
d/c for detector based on Aq loading	[illegible] +/-	0.1974

Signature [illegible] 2/19/92
(Entered by) (Date)

Total Beta Activity	[illegible] pCi/L =	[illegible] Ci/ml
Error in activity units*	[illegible] pCi/L =	[illegible] Ci/ml
Percent Error	[illegible] %	
Minimum detectable activity	NA	

Signature [illegible] 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the Aq loadi[illegible] g [illegible]

Total Beta Spreadsheet Revision 3, [illegible]
TOTBETA

E03-034

SPREADSHEET FOR CALCULATION OF TOTAL BETA [illegible]

Date calculated	[illegible]	
Enter Radiochem Sample Number (xxxx)		
Enter Log-In Number (92-xxxx)	[illegible]	
Enter Client Sample ID		
Enter File [illegible]	[illegible]	
Initial amount of sample used	[illegible]	0.0081
Which units, ml, g or sample?	[illegible]	
If leached, enter final leach soln volume [illegible]	[illegible]	0.0081
If leached, enter ml of leach soln [illegible]	[illegible]	0.0081
Enter total counts observed	[illegible]	
Enter count time in minutes	[illegible]	
Enter background (cpm)	[illegible]	
Calculated net cpm	[illegible]	0.0422
Weight of residue on dish (NET IN [illegible]	[illegible]	0.1
d/c for detector based on mg loading	[illegible]	0.1674

Signature J. L. Jodys 2/19/92
(Entered By) (Date)

Total Beta Activity	5.584 pCi/ml =	[illegible] pCi/ml
Error in activity units*	0.752 pCi/ml =	[illegible] ml
Percent Error	13.24 %	
Minimum detectable activity	NA	

Signature G.G. Bradaczynski 3-3-92
(Reviewed By) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the filter.

Total Beta Spreadsheet Revision 3, [illegible]
TOTBETA

E03-035

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY USE [illegible] TOTBETA

Date calculated	[illegible]	
Enter Radioactive Sample Number (XXXX)		
Enter Log-In Number ('92-XXXX)	[illegible]	
Enter Client Sample ID		
Enter File Name	[illegible]	
Initial amount of sample used	[illegible] +/-	0.3288
Which units, ml, g or sample?	[illegible]	
If leached, enter final leach soln volume (ml)	[illegible] +/-	0.0001
If leached, enter ml of leach soln analyzed	[illegible] +/-	0.0001
Enter total counts observed	[illegible]	
Enter count time in minutes	[illegible]	
Enter background (cpm)	[illegible]	
Calculated net cpm	[illegible] +/-	0.0761
Weight of residue on dish (NOT IN GRAMS) = [illegible]	[illegible] +/-	0.1
d/c for detector based on mg loading,	[illegible] +/-	0.0369

Signature [illegible] 2/19/92
(Entered by) (Date)

Total Beta Activity	[illegible] pCi/L =	[illegible] pCi/ml
Error in activity units*	[illegible] pCi/L =	[illegible] pCi/ml
Percent Error	[illegible] %	
Minimum detectable activity	NA	

Signature [illegible] 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E03-036

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY [illegible]

Date calculated [illegible]
Enter Radiochem Sample Number (XXXX) [illegible]
Enter Log-In Number (1990-XXXX) [illegible]
Enter Client Sample ID [illegible]
Enter File Name [illegible]

Initial amount of sample used [illegible] = 0.0200
Which units, ml, g or sample? [illegible]
If leached, enter final leach soln volume [illegible] = 0.0221
If leached, enter ml of leach soln [illegible] = 0.0001
Enter total counts observed [illegible]
Enter count time in minutes [illegible]
Enter background (cpm) [illegible]
Calculated net cpm [illegible] = 0.0440
Weight of residue on disk (NOT IN [illegible]) - in [illegible] [illegible] = 0.1
d/c for detector based on mg loading [illegible] = 0.2787

Signature S. K. Fadoff 2/19/92
(Entered by) Date

Total Beta Activity [illegible] pCi/g = [illegible] pCi/ml

Error in activity units* [illegible] = [illegible] pCi/ml

Percent Error [illegible] %

Minimum detectable activity [illegible]

Signature G. G. Bradczynski 3-3-92
(Reviewed By) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml [illegible])

(initial sample amount)(ml [illegible])

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading [illegible]

Total Beta Spreadsheet Revision 2, [illegible]
TOTBETA

E03-037

SPREADSHEET FOR CALCULATION OF TOTAL [illegible]

Date calculated [illegible]
Enter Radiation Sample Number (XXX)
Enter Log-In Number (92-XXXX) [illegible]
Enter Client Sample ID
Enter File Name [illegible]

Initial amount of sample used [illegible] = 0.2200
Which units, ml, g or sample? [illegible]
If leached, enter final leach soln volume [illegible] = 0.0281
If leached, enter ml of leach soln [illegible] = 0.0281
Enter total counts observed [illegible]
Enter count time in minutes [illegible]
Enter background (cpm) [illegible]
Calculated net cpm [illegible] = 0.2750
Weight of residue on disk (NOT IN [illegible]) [illegible] = 0.1
d/c for detector based on mg loading [illegible] = 0.1050

Signature J. K. Fadeff 2/19/92
(Entered By) (Date)

Total Beta Activity [illegible]

Error in activity units* [illegible]

Percent Error [illegible] %

Minimum detectable activity [illegible]

Signature G G Bradaczynski 3-3-92
(Reviewed By) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(60)/2.22dpm/pCi (leached)

(initial sample amount)(ml leach soln)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the disk.

Total Beta Spreadsheet Revision [illegible]
TOTBETA

E03-038

SPREADSHEET FOR CALCULATION OF TOTAL BETA [illegible]

Date calculated [illegible]
Enter Radiochem Sample Number (XXXX) [illegible]
Enter Log-In Number (YY-XXXX) [illegible]
Enter Client Sample ID [illegible]
Enter File Name [illegible]

Initial amount of sample used	[illegible]	+- 0.2000
Which units, ml, g or sample?	[illegible]	
If leached, enter final leach soln volume (ml)	[illegible]	+- 0.0001
If leached, enter ml of leach soln analyzed	[illegible]	+- 0.0001
Enter total counts observed	[illegible]	
Enter count time in minutes	[illegible]	
Enter background (cpm)	[illegible]	
Calculated net cpm	[illegible]	+- 0.1399
Weight of residue on dish (NOT IN GRAMS - [illegible] MG	[illegible]	+- 0.1
d/c for detector based on eg [illegible]	[illegible]	+- 0.7076

Signature S.K. Fadyff 2/19/92
(Entered by) (Date)

Total Beta Activity	101.[illegible] pCi/L +	[illegible] pCi/ml
Error in activity units*	11.[illegible] pCi/L +	[illegible] pCi/ml
Percent Error	11.[illegible] %	
Minimum detectable activity	NA	

Signature G.G. Bodaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm/(d/c))(pCi/2.22dpm)(ml leached)

(initial sample amount)(ml substituted)

*Note: The propagated error includes the error calculated with the d/c calculation based on the eg [illegible] on the [illegible].

Total Beta Spreadsheet Revision 3, [illegible]
TOTBETA

E03-039

SPREADSHEET FOR CALCULATION OF TOTAL [illegible]

Date calculated [illegible]
Enter Radiochem Sample Number (XXXX) [illegible]
Enter Log-In Number (YY-XXXX) [illegible]
Enter Client Sample ID [illegible]
Enter File Name [illegible]

Initial amount of sample used	[illegible]	0.0220
which units, ml, g or sample?	[illegible]	
If leached, enter final leach soln volume	[illegible]	0.0001
If leached, enter ml of leach soln analyzed	[illegible]	0.0201
Enter total counts observed	[illegible]	
Enter count time in minutes	[illegible]	
Enter background (cpm)	[illegible]	
Calculated net cpm	[illegible]	0.1119
Weight of residue on disk (NOT IN [illegible]	[illegible]	0.1
d/c for detector based on mg loading	[illegible]	0.8465

Signature J. L. Fadeff 2/19/92
(Entered by) (Date)

Total Beta Activity	184.516 pCi/L =	[illegible] pCi/g
Error in activity units*	17.250 pCi/L =	[illegible] pCi/g
Percent Error	[illegible]	
Minimum detectable activity	[illegible]	

Signature G. G. Bradzyowski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm) [illegible]

(initial sample amount)(ml aliquoted)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the disk.

Total Beta Spreadsheet Revision [illegible]
TOTBETA

E03-040

SPREADSHEET [illegible] CALCULATION OF TOTAL BETA [illegible]

Date calculated:	[illegible]	
Enter Radium or Sample Number (XXXX)		
Enter Log-In Number (YS0-XXXX)	[illegible]	
Enter Client Sample ID		
Enter File [illegible]	[illegible]	
Initial [illegible] of sample used	[illegible]	1.2200
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	[illegible]	0.2001
If leached, enter ml of leach soln analyzed	[illegible]	0.0001
Enter total counts observed	[illegible]	
Enter count time in minutes	[illegible]	
Enter background (cpm)	[illegible]	
Calculated net cpm	[illegible]	0.2641
Weight of residue on dish (NOT IN GRAMS) [illegible]	[illegible]	0.1
d/c for detector based on Ag losing	[illegible]	0.7216

Signature [illegible] 2/19/92
(Entered By) Date

Total Beta Activity	[illegible] pCi/[illegible]	[illegible]
Error in activity units*	[illegible] pCi/[illegible]	[illegible]
Percent Error	[illegible] %	
Minimum detectable activity	[illegible]	

Signature [illegible] 3-2-92
(Reviewed By) Date

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml initial)

(initial sample amount)(ml subsample)

*Note: The propagated error includes the error associated with the d/c calculation based on the Ag losing [illegible]

Total Beta Spreadsheet Revision 3, 6/26/91
TOTBETA

E03-042

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY [illegible]

Date calculated [illegible]
Enter Radiochem Sample Number (XXXX) [illegible]
Enter Log-In Number (92-XXXX) [illegible]
Enter Client Sample ID [illegible]
Enter File Name [illegible]

Initial amount of sample used [illegible] = 0.0220
Which units, ml, g or sample? ml
If leached, enter final leach soln volume (l) [illegible] = 0.0201
If leached, enter ml of leach soln a aliquot [illegible] = 0.0031
Enter total counts observed [illegible]
Enter count time in minutes [illegible]
Enter background (cpm) [illegible]
Calculated net cpm [illegible] = 0.0709
Weight of residue on dish (MUST IN [illegible] = 0.1
d/c for detector based on mg loading [illegible] = 0.5527

Signature J. K. Fadyp 2/19/92
(Entered by) (Date)

Total Beta Activity [illegible] = [illegible] pCi/ml

Error in activity units* 0.015 [illegible] = [illegible] pCi/ml

Percent Error [illegible]

Minimum detectable activity [illegible]

Signature G E Brodacynski 2-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leached)

(initial sample amount)(ml aliquoted)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the filter.

Total Beta Spreadsheet Revision 3, 6/20/91
TOTBETA

E03-045

SPREADSHEET [illegible]

Date calculated [illegible]
Enter Residue Sample number [illegible]
Enter [illegible] (g/ml-min) [illegible]
Enter Disk Sample ID [illegible]
Enter File Name [illegible]

Initial [illegible] of sample used [illegible] 0.2[illegible]
which units, [illegible] or sample? [illegible]
If leached, enter final leach soln volume [illegible] 0.2[illegible]
If leached, enter ml of leach soln [illegible] 0.0[illegible]
Enter total counts observed [illegible]
Enter count time in minutes [illegible]
Enter background (cpm [illegible]
Calculated net cpm [illegible] 0.0747
weight of residue on disk (NOT IN [illegible] 3.1
d/c for detector based on mg loading [illegible] 0.7[illegible]

Signature J. K. Fadoff 2/19/92
(Entered by) Date

Total Beta activity [illegible]

Error in activity, units* [illegible]

Percent Error [illegible]

Minimum detectable activity [illegible]

Signature G. G. Bodnaczyn 3-3-92
(Reviewed by) Date

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm) ml leach [illegible]

(initial sample amount) (ml used [illegible])

*Note: The propagated error includes the error associated with the d/c calculation based on [illegible]

Total Beta Spreadsheet Revision [illegible]
TOTBETA

E03-044

SPREADSHEET FOR CALCULATION OF TOTAL BETA [illegible]

Date calculated [illegible]
Enter Sample Number [illegible]
Enter Log-In Number (92-XXXX) [illegible]
Enter Client Sample ID
Enter File Name [illegible]

Initial weight of sample used	[illegible] +/-	0.0202
which units, ml, g or sample?		
If leached, enter final leach solution [illegible]	[illegible] +/-	0.0001
If leached, enter ml of leach solution aliquot	[illegible] +/-	0.0001
Enter total counts observed	[illegible]	
Enter count time in minutes	[illegible]	
Enter background (cpm)	[illegible]	
Calculated net cpm	[illegible] +/-	0.1142
weight of residue on dish (NOT IN [illegible]	[illegible] +/-	0.1
d/c for detector based on Mg loading	[illegible] +/-	0.4765

Signature J. K. Fadeff 2/19/92
(Entered By) (Date)

Total Beta Activity [illegible] pCi/[illegible] = [illegible]

Error in activity units* [illegible] = [illegible]

Percent Error [illegible]

Minimum Detectable Activity [illegible]

Signature G. G. Bradaczynski 3-3-92
(Reviewed By) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm/d/c)(pCi/2.22dpm/[illegible] leached)

(initial sample aliquot/ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the Mg loading in the [illegible].

Total Beta Spreadsheet Revision [illegible]
TOTBETA

E03-045

SPREADSHEET [illegible] CALCULATION OF TOT [illegible] [illegible]

Date calculated [illegible]
Enter Facility Sample Number (XXX) [illegible]
Enter Log-in Number (YY92-XXXX) [illegible]
Enter Client Sample ID [illegible]
Enter File Name [illegible]

Initial amount of sample used [illegible] - 0.0200
Which units, mg/g or sample? [illegible]
If leached, enter final leach soln volume [illegible] - 0.0201
If leached, enter vol of leach soln [illegible] 0.0201
Enter total counts observed [illegible]
Enter count time in minutes [illegible]
Enter background cpm [illegible]
Calculated net cpm [illegible] - 0.1210
Weight of residue on disk (NOT IN [illegible]) [illegible] - 0.1
d/c for detector based on mg loading [illegible] - 0.0577

Signature J. K. Fedy 2/19/92
(Entered by) Date

Total Beta activity [illegible]

Error in activity units* [illegible]

Percent Error [illegible]

Minimum Detectable activity [illegible]

Signature G G Brodzczynski 3-3-92
(Reviewed by) Date

CALCULATION OF SAMPLE ACTIVITY:

[illegible] cpm/(a/c)(pE)/2.22dpm/pCi results

(initial sample amount)(1 subsample)

*Note: The propagated error includes the error associated in the d/c calculation based on the mg loading [illegible]

Total Beta Spreadsheet Revision 7, [illegible]
TOTBETA

E03-046

SPREADSHEET FOR CALCULATION OF [illegible]

Date calc[illegible]
Enter [illegible] sample number [illegible]
Enter [illegible] number [illegible]
Enter [illegible] double II
Enter [illegible]

Initial [illegible] of sample used [illegible] 0.0220
Which units, [illegible] or sample? [illegible]
If leached, enter final leach [illegible] [illegible] 0.0001
If leached, enter [illegible] of leach [illegible] 0.0101
Enter total counts observed [illegible]
Enter count time in minutes [illegible]
Enter background cpm [illegible]
Calculated net cpm [illegible] 0.0457
Weight of residue on disk (NOT in [illegible]) [illegible] 0.1
d/c for detector based on [illegible] loading [illegible] 0.0027

Signature J.K. Fadyff 2/19/92
Entered by Date

Total Beta Activity [illegible]

Error in activity units* [illegible]

Percent Error [illegible]

Minimum Detectable Activity [illegible]

Signature G.G. Brodacynski 3-3-92
Reviewed by Date

CALCULATION OF SAMPLE ACTIVITY:

(net [illegible]/c)(pCi/2.22dpm) [illegible]

(initial sample amount) [illegible]

*Note: The propagated error includes the error [illegible] the d/c calculation based on the [illegible]

Total Beta Spreadsheet Revision [illegible]
TOTBETA

E03-047

APPENDIXXII [illegible]

Date calculated [illegible]
Enter Radio[illegible] Sample Number [illegible]
Enter Log-[illegible] Number (YYMM-[illegible]) [illegible]
Enter Client Sample ID
Enter File [illegible] [illegible]

Initial amount of sample used [illegible] 2.2722
Which units, dry or sample? [illegible]
If leached, enter final leach [illegible] [illegible] 0.0001
If leached, enter % of leach solution [illegible] 0.0001
Enter total counts observed [illegible]
Enter count [illegible] minutes [illegible]
Enter background (cpm) [illegible]
Calculated net cpm [illegible] 0.1145
Weight of residue on dish (NOT [illegible]) [illegible] 0.1
D/C for detector based on Kg loading [illegible] 2.2587

Signature S. K. Tadey 2/19/92
(Entered By) Date

Total Beta Activity [illegible] = [illegible]

Error in activity units* [illegible] = [illegible]

Percent Error [illegible]

Minimum Detectable Activity [illegible]

Signature G G Bradczynski 3-3-92
(Reviewed By) Date

CALCULATION OF SAMPLE ACTIVITY:

(net cpm x d/c)(pCi/2.22dpm) reduction

(initial sample amount) (leach [illegible])

*Note: The propagated error included the error associated with the d/c calculation based on the [illegible] loading of the [illegible]

Total Beta Worksheet Revision [illegible]
TOTBETA

E03-048

SPREADSHEET FOR CALCULATION OF TOTAL [illegible]

Date calculated [illegible]
Enter Radio of sample number [illegible]
Enter Log-In number (SD-xxxx) [illegible]
Enter Client sample ID [illegible]
Enter File name [illegible]

Initial aliquot of sample used [illegible] 0.0200
Which units, mg or g of sample? [illegible]
If leached, enter final leach solution [illegible] 0.0001
If leached, enter wt of leach solution [illegible] 0.0001
Enter total counts observed [illegible]
Enter count time in minutes [illegible]
Enter background cpm [illegible]
Calculated net cpm [illegible] 0.0177
Weight of residue on disk (MUST IN [illegible] 0.1
d/c for detector based on mg loading [illegible] 0.0069

Signature S. K. Jadoff 2/19/92
(Entered by) Date

Total Beta activity [illegible]

Error in activity units* [illegible]

Percent Error [illegible]

Minimum detectable activity [illegible]

Signature G. G. Bradaczynski 3-3-92
(Reviewed by) Date

CALCULATION OF SAMPLE ACTIVITY:

(net cpm/min)(pCi/2.22dpm) x detector

(initial sample amount)(mg aliquot)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading of the [illegible]

Total Beta Spreadsheet Revision 0, [illegible]
TOTBETA

E03-049

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SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY [illegible]

Date calculated [illegible]
Enter Residue or Sample Number [illegible]
Enter Logbook Number (198-xxx) [illegible]
Enter Client Sample ID [illegible]
Enter File Name [illegible]

Initial Solid or Sample used [illegible] = 0.0200
Enter units: mg, g or sample? [illegible]
If leached: enter final leach soln vol [illegible] = 0.1000
If leached, enter vol of leach soln analyzed [illegible] = 0.0200
Enter total counts observed [illegible]
Enter count time in minutes [illegible]
Enter background (cpm) [illegible]
Calculated net cpm [illegible] = 0.1729
Weight of residue on disk (NOT in DF) [illegible] = 0.1
d/c for detector based on cg loading [illegible] = 0.1120

Signature A. K. Jadoff 2/19/92
Entered by Date

Total Beta Activity [illegible] = [illegible]

Error in activity units* [illegible] = [illegible]

Percent Error [illegible]

Minimum detectable activity [illegible]

Signature G. G. Bundzynski 3-3-92
Reviewed by Date

CALCULATION OF SAMPLE ACTIVITY:

(net cpm - bkd)(pCi/2.22dpm)(1/d/c) Decinuclide

(initial sample amount)(ml aliquot)

*Note: The propagated error includes the error associated with the d/c calculation based on the cg loading, in the [illegible].

Total Beta Spreadsheet Revision [illegible]
TOTBETA

E03-050

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1100 EM1 total beta batch 2

Relative Percent Difference of duplicates.
92-2740, Dup-2740

$$\frac{(3.58 \pm 0.38\ pCi/L) + (3.10 \pm 0.41\ pCi/L)}{2} = 3.34 \pm 0.28\ pCi/L$$

$$\frac{(3.58 \pm 0.38) - (3.10 \pm 0.41)}{3.34 \pm 0.28} \times 100 = \underline{14 \pm 16\ \%\ RPD}$$

Spike Recoveries

Strontium spike

At count time, $^{90}Sr \cdot Y$ activity = 1076 +/- 53 dpm/ml

$$\frac{(0.1979 \pm 0.0013\ ml)(1076 \pm 53\ dpm/ml)}{(0.1\ L)\ (2.22\ dpm/pCi)} = 959 \pm 48\ pCi/L$$

Blank spike

$$\frac{992 \pm 15}{959 \pm 48} \times 100 = \underline{103 \pm 5\ \%\ recovered}$$

Matrix spike

found: $(813 \pm 13) - (3.3 \pm 0.3) = 810 \pm 13\ pCi/L$

added: $(0.1979 \pm 0.0013\ ml)(1076 \pm 53\ dpm/ml)(pCi/2.22\ dpm)(0.11932\ L)^{-1} = 804 \pm 40\ pCi/L$

$$\frac{810 \pm 13}{804 \pm 40} \times 100 = \underline{101 \pm 5\ \%\ recovery}$$

Matrix Spike Duplicate

$(955 \pm 15) - (3.3 \pm 0.3) = 952 \pm 15$ found

added: $(0.1979 \pm 0.0013\ ml)(1076 \pm 53\ dpm/ml)(pCi/2.22\ dpm)(0.11147\ L)^{-1} = 860 \pm 43\ pCi/L$

$$\frac{952 \pm 15}{860 \pm 43} \times 100 = \underline{111 \pm 5\ \%\ recovered}$$

S. K. Fadeff 2/19/92

[illegible] 3-3-92

E03-051

1100 EMI Total Beta Batch 2

^{90}Sr-Y

matrix spike

$(310\ pCi/L)(0.11932\ L) = 96.6\ pCi$

matrix Spike Duplicate

$(952\ pCi/L)(0.11147\ L) = 106.1\ pCi$

$$RPD = \frac{(106.1 - 96.6)\ pCi}{(106.1 + 96.6)\ \frac{1}{2}\ pCi} \times 100 = 9\%$$

J. L. Fadoff 2/24/92
G. G. Bulaczynski 3-3-92

E03-052

1100 EM1 total beta batch 2

Spike recoveries of ^{99}Tc based on ^{90}Sr-Y calibration

Blank Spike

$$\frac{(0.9946 \pm 0.0027\ ml)(108.5 \pm 2\ dpm/ml)}{0.1\ L\ (2.22\ dpm/pCi)} = 486 \pm 9\ pCi/L$$

$$\frac{318.6 \pm 6.6}{486 \pm 9} \times 100 = \underline{66 \pm 2\ \%\ \text{recovered}}$$

Matrix Spike

$$\frac{(0.9946 \pm 0.0027\ ml)(108.5 \pm 2\ dpm/ml)}{(0.10806\ L)(2.22\ dpm/pCi)} = 450 \pm 8\ pCi/L$$

$$(223 \pm 5) - (3.3 \pm 0.3) = 220 \pm 5$$

$$\frac{220 \pm 5}{450 \pm 8} \times 100 = \underline{49 \pm 1\ \%}\ \text{recovered}$$

Matrix Spike Duplicate

$$\frac{(0.9946 \pm 0.0027\ ml)(108.5 \pm 2\ dpm/ml)}{(0.11043\ L)(2.22\ dpm/pCi)} = 440 \pm 8\ pCi/L$$

$$(50.6 \pm 1.5) - (3.3 \pm 0.3) = 47.3 \pm 1.5$$

$$\frac{47.3 \pm 1.5}{440 \pm 8} \times 100 = \underline{11\ \%}\ \text{recovered}$$

S. K. Fadeff 2/19/92

G. G. Bradzynski 3-3-92

E03-055

1100 EMI total beta batch 2

Spike recoveries of ^{99}Tc based on ^{99}Tc calibration curve

blank spike

$$\frac{446 \pm 19}{486 \pm 9} \times 100 = \underline{92 \pm 4 \ \% \ \text{Recovered}}$$

matrix spike

$(437 \pm 26) - (6.11 \pm 0.54) = 431 \pm 26$

$$\frac{431 \pm 26}{450 \pm 8} \times 100 = 96 \pm 6 \ \% \ \text{Recovered}$$

matrix Spike Duplicate

$74.4 - 6.11 = 68.3$

$$\frac{68.3 \pm 3.5}{440 \pm 8} \times 100 = 16 \ \% \ \text{Recovered}$$

RPD of 92-02740

$[(6.715 \pm 0.778) + (5.504 \pm 0.762)] \frac{1}{2} = 6.11 \pm 0.54$ pCi/L

$$\frac{|6.715 - 5.504|}{6.11} \times 100 = \underline{20\% \ \text{RPD}}$$

J.K. Fackler 2/19/92
G.E. Brodzeyski 3-3-92

E03-054

Batch 2 total beta 1100EM1

Matrix Spike Duplicate

Anomaly: poor precipitate weight on plate.

92-02740	107.64 ml	26.4 mg
Dup 2740	97.94 ml	20.9 mg
MS 2740 (Sr)	119.32	27.9 mg
MSD 2740 Sr	111.47	42.2
MS Tc 2740	108.06	31.3
MSD Tc 2740	110.48	6.5 → should be about 30 mg

$6.5/30 = 0.22$

This correlates to about 22% recovery of precipitate

Estimated recovery based on a 22% yield:

$$\frac{74.4\ pCi/L}{0.22} = 338\ pCi/L$$

$$\frac{338 - 6.1}{440} \times 100 = 75\ \%$$

S. K. Fadeff 2/19/92
B. B. Budlaczynski 3-3-92

E03-055

BATCH 3

TOTAL BETA ANALYSIS

E04-001

Gross Alpha and Beta Analysis Data Sheet

		Check if used
Procedure PNL-ALO-106	Rev.0, leach:	✓
Procedure PNL-ALO-460	Rev.0, α prep:	NA
Procedure PNL-ALO-461	Rev.0, α count:	NA
Procedure PNL-ALO-462	Rev.0, β prep:	✓
Procedure PNL-ALO-463	Rev.0, β count:	✓

Date Sample Prep Started 2-20-92
Date Completed 2-21-92

Added Spike Volume
Alpha
Pipette No. NA Volume _____ +/- _____ Date Pipetted _____
Spike ID _____ Spike Activity _____

Beta
Pipette No. 104-18 Volume 0.1994 ml +/- 0.0014 ml Date Pipetted 2-20-92
Spike ID 52733-117-2 ^{90}Sr-Y Spike Activity 1110 ± 55 dpm/ml on 10/24/90
10A-22 0.9994 ± 0.0047 (2σ) 54124-64-7 ^{99}Tc
Sample ID, Aliquot Size, and Leachate Volume See LRS 54372 p.12.

Balance Number NA Temperature (if weighing liquid samples) _____

Sample ID	Beaker Wt.	Bker + Sapl	Sample Wt or Vol	Final Leachate Vol.	Volume for alpha anal.	Volume for beta anal.
BL-02739			100 ml			all
BS-2739 Sr			100 ml			
BS-2739 Tc			100 ml			
92-2739			100 ml			
92-2741			100 ml			
92-2741 Dup			100 ml			
92-2746			100 ml			
92-2752			100 ml			
MB-2741			100 ml			
MSB-2741			100 ml			
MSTc-2741			100 ml			
MSDTc-2741			100 ml			

Sample Volumes (if a pipet was used for small aqueous samples or leach aliquots)

Aliquot of original sample or alpha or beta aliquot? all
Pipette No. NA Volume _____ +/- _____ Date Pipetted _____

Aliquot of original sample or alpha or beta aliquot? _____
Pipette No. NA Volume _____ +/- _____ Date Pipetted _____

Diane L. McMullen 2-21-92
Analyst Date

J. L. Fadeff 2/21/92
Reviewer Date

ABDATA2.LOG

E04-002

Gross Alpha and Beta Dish Weight
Data Sheet

Date Sample Prep Started 2-20-92
Date Completed 2-20-92

Sample ID and Dish Weights

Balance Number 509-06-03-003

Sample ID	Tare Wt. of Alpha Dish	Gross Wt. of Alpha Dish	Net Wt. of Alpha Ppt.	Tare Wt. of Beta Dish	Gross Wt. of Beta Dish	Net Wt. of Beta Ppt.
BL-2739				0.7519	0.7524	0.0005
BS-2739Sr				0.7446	0.7460	0.0014
BS-2739Tc				0.7390	0.7463	0.0073
92-2739				0.7414	0.7738	0.0324
92-2741				0.7469	0.7797	0.0328
92-2741Dup				0.7409	0.7693	0.0284
92-2746				0.7400	0.8396	0.0996
92-2752				0.7464	0.7990	0.0526
MS-2741				0.7423	0.7686	0.0263
MSD-2741				0.7427	0.7706	0.0279
MSTc-2741				0.7392	0.7783	0.0391
MSDTc-2741				0.7450	0.7809	0.0359

Diana L. McMullin 2-20-92
Analyst Date

S. K. Fadeff 2/21/92
Reviewer Date

ABDATA3.LOG

Battelle
Pacific Northwest Laboratories

BETA COUNTING DATA

REQUESTED BY: 1100EM1

REMARKS: Batch 3

DATE ANALYZED: 2/20 - 2/21 /92

SAMPLE TYPE: Groundwater

CHARGE CODE:

DESIGNATION	SAMPLE	DATE - TIME SAMPLED	CARRIER (M L)	PROCESS	WT.-VOL. ANALYZED	WT. RESIDUE	ANALYST	SET NUMBER	SHELF	DATE - TIME COUNTED	COUNTS	MINUTES	BKG. C/M	BKG. CORR. C/M	TECHNICIAN	CALCULATIONS (CONVERSION FACTOR)	RESULTS UNITS OF (PICO CURIES PER LITER) µCi/
BL 2739									1	2-20-92 10:25	5560	100		1.606			
92-2739									2		1068			.552			
92-2741									3		1050			.641			
92-2746									1	2-21-92 9:35	500	100		0.606			
92-2752									2		200			0.552			
92-2741 Dup									3		124			0.641			
MSTc-2741									1	2-21-92 11:33	4451	100		0.606			
BS-2739Tc									2		6797			0.552			
BS-2739Sr									3		11836			0.641			
MSDTc-2741									1	2-21-92 13:18	4885	100		0.606			
MS-2741									2		10552			0.552			
MSD-2741									3		10207			0.641			

[illegible] 2-21-92

Reviewed S. K. [illegible] 2/21/92

№ 1282

BD-1703-(4) (12-71)

E04-004

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	21-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	BL-02739		
Enter Client Sample ID			
Enter File Name	BL2739		
Initial amount of sample used	100	+\-	0.5000
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	556		
Enter count time in minutes	1000		
Enter background (cpm)	0.606		
Calculated net cpm	-0.0500	+\-	0.0341
Weight of residue on dish (NOT IN GRAMS) - in MG	0.5	+\-	0.1
d/c for detector based on mg loading	1.8940	+\-	0.0219

Signature S. K. Fadyy 2/21/92
(Entered by) (Date)

Total Beta Activity	-0.427	pCi/L =	-0.000427	pCi/ml
Error in activity units*	-0.291	pCi/L =	-0.000291	pCi/ml
Percent Error	68.19	%		
Minimum detectable activity =	0.630	pCi/L =	0.000630	pCi/ml

Signature G. E. Bradzynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	21-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	92-02739		
Enter Client Sample ID	B015V9		
Enter File Name	BS739		
Initial amount of sample used	100	+\-	0.5000
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	1068		
Enter count time in minutes	1000		
Enter background (cpm)	0.552		
Calculated net cpm	0.5160	+\-	0.0402
Weight of residue on dish (NOT IN GRAMS) - in MG	32.4	+\-	0.1
d/c for detector based on mg loading	2.1162	+\-	0.0259

Signature J. K. [illegible] 2/21/92
(Entered by) (Date)

Total Beta Activity	4.919	pCi/L =	0.004919	pCi/ml
Error in activity units*	0.389	pCi/L =	0.000389	pCi/ml
Percent Error	7.91	%		

Minimum detectable activity = NA

Signature [illegible] 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	21-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	92-02741		
Enter Client Sample ID	B015W1		
Enter File Name	B2741		
Initial amount of sample used	100	+\-	0.5000
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	1080		
Enter count time in minutes	1000		
Enter background (cpm)	0.691		
Calculated net cpm	0.3890	+\-	0.0421
Weight of residue on dish (NOT IN GRAMS) - in MG	32.8	+\-	0.1
d/c for detector based on mg loading	2.1189	+\-	0.0260

Signature J. K. Tadey 2/21/92
(Entered by) (Date)

Total Beta Activity	3.713	pCi/L =	0.003713	pCi/ml
Error in activity units*	0.405	pCi/L =	0.000405	pCi/ml
Percent Error	10.90	%		

Minimum detectable activity = NA

Signature G G Bradley 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date c ulated	21-Feb-92		
Enter adiochem Sample Number (XXXX)			
Ent og-In Number ('90-XXXX)	92-02741DUPLICATE		
Er Client Sample ID	B015W1		
r r File Name	B2741D		
ial amount of sample used	100	+\-	0.5000
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	124		
Enter count time in minutes	100		
Enter background (cpm)	0.691		
Calculated net cpm	0.5490	+\-	0.1390
Weight of residue on dish (NOT IN GRAMS) - in MG	28.4	+\-	0.1
d/c for detector based on mg loading	2.0892	+\-	0.0250

Signature S. K. Jadeja 2/21/92
(Entered by) (Date)

Total Beta Activity	5.166	pCi/L =	0.005166	pCi/ml
Error in activity units*	1.309	pCi/L =	0.001309	pCi/ml
Percent Error	25.34	%		

Minimum detectable activity = NA

Signature [illegible] 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	21-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	92-02746		
Enter Client Sample ID	B01BW5		
Enter File Name	B2746		
Initial amount of sample used	100	+\-	0.5000
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	506		
Enter count time in minutes	100		
Enter background (cpm)	0.606		
Calculated net cpm	4.4540	+\-	0.2380
Weight of residue on dish (NOT IN GRAMS) - in MG	99.6	+\-	0.1
d/c for detector based on mg loading	2.5365	+\-	0.0489

Signature S. K. Fady 2/21/92
(Entered by) (Date)

Total Beta Activity	50.890	pCi/L =	0.050890	pCi/ml
Error in activity units*	2.902	pCi/L =	0.002902	pCi/ml
Percent Error	5.70	%		

Minimum detectable activity = NA

Signature G G Bradaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E04-009

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	21-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	92-02752		
Enter Client Sample ID	B01C28		
Enter File Name	B2752		
Initial amount of sample used	100	+\-	0.5000
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	200		
Enter count time in minutes	100		
Enter background (cpm)	0.532		
Calculated net cpm	1.4680	+\-	0.1591
Weight of residue on dish (NOT IN GRAMS) - in MG	52.6	+\-	0.1
d/c for detector based on mg loading	2.2494	+\-	0.0315

Signature S. K. Fedy 2/21/92
(Entered by) (Date)

Total Beta Activity	14.874	pCi/L =	0.014874	pCi/ml
Error in activity units*	1.627	pCi/L =	0.001627	pCi/ml
Percent Error	10.94	%		

Minimum detectable activity = NA

Signature G. G. Bradzynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	21-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	MS-02741		
Enter Client Sample ID			
Enter File Name	B2741MSSr		
Initial amount of sample used	100	+\-	0.5000
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	10552		
Enter count time in minutes	100		
Enter background (cpm)	0.552		
Calculated net cpm	104.9680	+\-	1.0299
Weight of residue on dish (NOT IN GRAMS) - in MG	26.3	+\-	0.1
d/c for detector based on mg loading	2.0749	+\-	0.0246

Signature S. K. Fadzy 2/21/92
(Entered by) (Date)

Total Beta Activity	981.049	pCi/L =	0.981049	pCi/ml
Error in activity units*	15.871	pCi/L =	0.015871	pCi/ml
Percent Error	1.62	%		

Minimum detectable activity = NA

Signature [illegible] 3.3.92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	21-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	MS-2741Tc		
Enter Client Sample ID			
Enter File Name	B2741MSTc		
Initial amount of sample used	100	+\-	0.5000
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	4451		
Enter count time in minutes	100		
Enter background (cpm)	0.606		
Calculated net cpm	43.9040	+\-	0.6717
Weight of residue on dish (NOT IN GRAMS) - in MG	39.1	+\-	0.1
d/c for detector based on mg loading	2.1610	+\-	0.0276

Signature S. K. Fadeff 2/21/92
(Entered by) (Date)

Total Beta Activity	427.377	pCi/L =	0.427377	pCi/ml
Error in activity units*	8.776	pCi/L =	0.008776	pCi/ml
Percent Error	2.05	%		

Minimum detectable activity = NA

Signature [illegible] 3 [illegible] 92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	21-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	BS-2739Tc		
Enter Client Sample ID			
Enter File Name	B2739BSTC		
Initial amount of sample used	100	+\-	0.5000
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	6797		
Enter count time in minutes	100		
Enter background (cpm)	0.552		
Calculated net cpm	67.4180	+\-	0.8278
Weight of residue on dish (NOT IN GRAMS) - in MG	7.3	+\-	0.1
d/c for detector based on mg loading	1.9426	+\-	0.0221

Signature J. K. Fadeff 2/21/92
(Entered by) (Date)

Total Beta Activity	589.936	pCi/L =	0.589936	pCi/ml
Error in activity units*	10.303	pCi/L =	0.010303	pCi/ml
Percent Error	1.75	%		

Minimum detectable activity = NA

Signature G. G. Bradaczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	21-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	MSDTc-02741		
Enter Client Sample ID			
Enter File Name	B741MSDT		
Initial amount of sample used	100	+\-	0.5000
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	4885		
Enter count time in minutes	100		
Enter background (cpm)	0.606		
Calculated net cpm	48.2440	+\-	0.7032
Weight of residue on dish (NOT IN GRAMS) - in MG	35.9	+\-	0.1
d/c for detector based on mg loading	2.1397	+\-	0.0267

Signature J. R. Fadeff 2/21/92
(Entered by) (Date)

Total Beta Activity	464.991	pCi/L =	0.464991	pCi/ml
Error in activity units*	9.225	pCi/L =	0.009225	pCi/ml
Percent Error	1.98	%		

Minimum detectable activity = NA

Signature [illegible] 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	21-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	MSD-2741		
Enter Client Sample ID			
Enter File Name	B2741MSDSr		
Initial amount of sample used	100	+\-	0.5000
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	10207		
Enter count time in minutes	100		
Enter background (cpm)	0.691		
Calculated net cpm	101.3790	+\-	1.0137
Weight of residue on dish (NOT IN GRAMS) - in MG	27.9	+\-	0.1
d/c for detector based on mg loading	2.0858	+\-	0.0249

Signature S. K. Tedy 2/21/92
(Entered by) (Date)

Total Beta Activity	952.484	pCi/L =	0.952484	pCi/ml
Error in activity units*	15.582	pCi/L =	0.015582	pCi/ml
Percent Error	1.64	%		

Minimum detectable activity = NA

Signature [illegible] 3.92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E04-015

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	24-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	BS-2739Sr		
Enter Client Sample ID			
Enter File Name	BS2739SR		
Initial amount of sample used	100	+\-	0.5000
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	11836		
Enter count time in minutes	100		
Enter background (cpm)	0.691		
Calculated net cpm	117.6690	+\-	1.0911
Weight of residue on dish (NOT IN GRAMS) - in MG	1.4	+\-	0.1
d/c for detector based on mg loading	1.9005	+\-	0.0219

Signature J. K. Fedey 2/24/92
(Entered by) (Date)

Total Beta Activity	1007.326	pCi/L =	1.007326	pCi/ml
Error in activity units*	15.717	pCi/L =	0.015717	pCi/ml
Percent Error	1.56	%		

Minimum detectable activity = NA

Signature [illegible] 3.3.92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	24-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	92-02739Tc		
Enter Client Sample ID	B015V9		
Enter File Name	2739TC2		
Initial amount of sample used	100	+\-	0.0200
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	1068		
Enter count time in minutes	1000		
Enter background (cpm)	0.552		
Calculated net cpm	0.5160	+\-	0.0402
Weight of residue on dish (NOT IN GRAMS) - in MG	32.4	+\-	0.1
d/c for detector based on mg loading	4.1912	+\-	0.2338

Signature J. K. Fedyk 2/24/92
(Entered by) (Date)

Total Beta Activity	9.742	pCi/L =	0.009742	pCi/ml
Error in activity units*	0.934	pCi/L =	0.000934	pCi/ml
Percent Error	9.59	%		

Minimum detectable activity = NA

Signature G. G. Bradzynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi/2.22dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	24-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	BL-02739TC		
Enter Client Sample ID			
Enter File Name	BL2739TC		
Initial amount of sample used	100	+\-	0.0200
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	556		
Enter count time in minutes	1000		
Enter background (cpm)	0.606		
Calculated net cpm	-0.0500	+\-	0.0341
Weight of residue on dish (NOT IN GRAMS) - in MG	0.5	+\-	0.1
d/c for detector based on mg loading	2.5142	+\-	0.1047

Signature S. K. Fadyll 2/24/92
(Entered by) (Date)

Total Beta Activity	-0.566	pCi/L =	-0.000566	pCi/ml
Error in activity units*	-0.387	pCi/L =	-0.000387	pCi/ml
Percent Error	68.30	%		
Minimum detectable activity =	0.836	pCi/L =	0.000836	pCi/ml

Signature [illegible] 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	24-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	92-02741		
Enter Client Sample ID	B015W1		
Enter File Name	2741TC2		
Initial amount of sample used	100	+\-	0.0200
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	1080		
Enter count time in minutes	1000		
Enter background (cpm)	0.691		
Calculated net cpm	0.3890	+\-	0.0421
Weight of residue on dish (NOT IN GRAMS) - in MG	32.8	+\-	0.1
d/c for detector based on mg loading	4.2106	+\-	0.2364

Signature J. K. Fadyg 2/24/92
(Entered by) (Date)

Total Beta Activity	7.378	pCi/L =	0.007378	pCi/ml
Error in activity units*	0.899	pCi/L =	0.000899	pCi/ml
Percent Error	12.19	%		

Minimum detectable activity = NA

Signature [illegible] 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E04-019

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	24-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	92-02741 DUPLICATE		
Enter Client Sample ID	B015W1		
Enter File Name	DUP2741T		
Initial amount of sample used	100	+\-	0.0200
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	124		
Enter count time in minutes	100		
Enter background (cpm)	0.691		
Calculated net cpm	0.5490	+\-	0.1390
Weight of residue on dish (NOT IN GRAMS) - in MG	28.4	+\-	0.1
d/c for detector based on mg loading	3.9947	+\-	0.2091

Signature S. L. Tidy 2/24/92
(Entered by) (Date)

Total Beta Activity	9.879	pCi/L =	0.009879	pCi/ml
Error in activity units*	2.553	pCi/L =	0.002553	pCi/ml
Percent Error	25.85	%		

Minimum detectable activity = NA

Signature G. L. Brodzynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E04-020

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	24-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	92-02746		
Enter Client Sample ID	B01BW5		
Enter File Name	2746Tc		
Initial amount of sample used	100	+\-	0.0200
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	506		
Enter count time in minutes	100		
Enter background (cpm)	0.606		
Calculated net cpm	4.4540	+\-	0.2380
Weight of residue on dish (NOT IN GRAMS) - in MG	99.6	+\-	0.1
d/c for detector based on mg loading	6.9016	+\-	0.8888

Signature S. L. Fady 2/24/92 SKF 2/24/92
(Entered by) (Date)

Total Beta Activity	138.467	pCi/L =	0.138467	pCi/ml
Error in activity units*	19.307	pCi/L =	0.019307	pCi/ml
Percent Error	13.94	%		

Minimum detectable activity = NA

Signature G. G. Bondarczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{\text{(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)}}{\text{(initial sample amount)(ml subsampled)}}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E04-021

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	24-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	92-02752		
Enter Client Sample ID	B01C28		
Enter File Name	2752TC2		
Initial amount of sample used	100	+\-	0.0200
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	200		
Enter count time in minutes	100		
Enter background (cpm)	0.532		
Calculated net cpm	1.4680	+\-	0.1591
Weight of residue on dish (NOT IN GRAMS) - in MG	52.6	+\-	0.1
d/c for detector based on mg loading	5.1232	+\-	0.3820

Signature S. K. Fadeff 2/24/92 S.L.F. 2/24/92
(Entered by) (Date)

Total Beta Activity	33.877	pCi/L =	0.033877	pCi/ml
Error in activity units*	4.457	pCi/L =	0.004457	pCi/ml
Percent Error	13.16	%		

Minimum detectable activity = NA

Signature G G Bradayrem 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E04-022

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	24-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	BS-2739TC		
Enter Client Sample ID			
Enter File Name	BS2739TC		
Initial amount of sample used	'100	+\-	0.0200
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	6797		
Enter count time in minutes	100		
Enter background (cpm)	0.552		
Calculated net cpm	67.4180	+\-	0.8278
Weight of residue on dish (NOT IN GRAMS) - in MG	7.3	+\-	0.1
d/c for detector based on mg loading	2.8927	+\-	0.1138

Signature J. L. Jacobs 2/24/92
(Entered by) (Date)

Total Beta Activity	878.481	pCi/L =	0.878481	pCi/ml
Error in activity units*	36.215	pCi/L =	0.036215	pCi/ml
Percent Error	4.12	%		

Minimum detectable activity = NA

Signature [illegible] 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	24-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	MS-02741TC		
Enter Client Sample ID			
Enter File Name	MS2741TC		
Initial amount of sample used	100	+\-	0.0200
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	4451		
Enter count time in minutes	100		
Enter background (cpm)	0.606		
Calculated net cpm	43.9040	+\-	0.6717
Weight of residue on dish (NOT IN GRAMS) - in MG	39.1	+\-	0.1
d/c for detector based on mg loading	4.5115	+\-	0.2787

Signature N. K. Tadeff 2/24/92
(Entered by) (Date)

Total Beta Activity	892.215	pCi/L =	0.892215	pCi/ml
Error in activity units*	56.779	pCi/L =	0.056779	pCi/ml
Percent Error	6.36	%		

Minimum detectable activity = NA

Signature G. G. Bradczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E04-024

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	24-Feb-92		
Enter Radiochem Sample Number (XXXX)			
Enter Log-In Number ('90-XXXX)	MSDTC-02741		
Enter Client Sample ID			
Enter File Name	MSD2741T		
Initial amount of sample used	100	+\-	0.0200
Which units, ml, g or sample?	ml		
If leached, enter final leach soln volume (ml)	1	+\-	0.0001
If leached, enter ml of leach soln analyzed	1	+\-	0.0001
Enter total counts observed	4885		
Enter count time in minutes	100		
Enter background (cpm)	0.606		
Calculated net cpm	48.2440	+\-	0.7032
Weight of residue on dish (NOT IN GRAMS) - in MG	35.9	+\-	0.1
d/c for detector based on mg loading	4.3599	+\-	0.2567

Signature J. K. Fedy 2/24/92
(Entered by) (Date)

Total Beta Activity	947.469	pCi/L =	0.947469	pCi/ml
Error in activity units*	57.474	pCi/L =	0.057474	pCi/ml
Percent Error	6.07	%		

Minimum detectable activity = NA

Signature G. G. Bandoczynski 3-3-92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{\text{(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)}}{\text{(initial sample amount)(ml subsampled)}}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E04-025

1100 EM 1 Batch 3 total beta analysis

^{90}Strontium calibration

Precision by RPD of duplicates.
92-02741.

average: $[(3.71 \pm 0.41) + (5.17 \pm 1.31)]\frac{1}{2} = 4.44 \pm 0.69$ pCi/L

$$\frac{(5.17 \pm 1.31) - (3.71 \pm 0.41)}{(4.44 \pm 0.69)} \times 100 = \underline{33 \pm 32\ \%\ \text{RPD}}$$

matrix spike Sr

$$\frac{(0.1994 \pm 0.0014\ \text{ml})(1075 \pm 53\ \text{dpm/ml}\ ^{90}\text{Sr:Y})}{(0.1\ \text{L})\ (2.22\ \text{dpm/pCi})} = 965.6 \pm 48\ \text{pCi/L}$$

$$\frac{(981 \pm 16) - (4.44 \pm 0.69)}{965.6 \pm 48} \times 100 = \underline{101\ \%\ \text{recovery}}$$

matrix Spike Duplicate

$$\frac{(952 \pm 16) - (4.44 \pm 0.69)}{965.6 \pm 48} \times 100 = \underline{98\ \%\ \text{recovery}}$$

Blank spike

$$\frac{1007 \pm 16}{965.6 \pm 48} \times 100 = \underline{104\ \%\ \text{recovered}}$$

S. L. Tadoff 4/24/92
G G Bradczynski 3 3-92

E04-026

1100 EMI Batch 3 Total Beta Analysis.

^{99}Tc calibration

Precision. 92-02741

average: $[(7.38 \pm 0.90) + (9.88 \pm 2.55)]\ \frac{1}{2} = \underline{8.63 \pm 1.35\ pCi/L}$

$$\frac{(9.88 \pm 2.55) - (7.38 \pm 0.90)}{(8.63 \pm 1.35)} \times 100 = \underline{29 \pm 32\ \%\ RPD}$$

Recovery of spikes

added $\frac{2(0.9994 \pm 0.0047\ ml)(108.5^{\pm 2}\ dpm\ ^{99}Tc/ml)}{(0.1\ L)(2.22\ dpm/pCi)} = 977 \pm 51\ pCi/L$

Blank spike

$$\frac{878 \pm 36}{977 \pm 51} \times 100 = \underline{90\ \%\ \text{recovered}}$$

matrix spike

$$\frac{(892 \pm 57) - (8.63 \pm 1.35)}{977 \pm 51} \times 100 = \underline{90\ \%\ \text{recovered}}$$

matrix Spike Duplicate

$$\frac{(947 \pm 57) - (8.6 \pm 1.4)}{977 \pm 51} \times 100 = \underline{96\ \%\ \text{recovered}}$$

S. K. Fadyl 2/24/92
G. G. Brodzynski 3.3.92

E04-027

1100 EM1 Batch 3 Total beta analysis

RPD of matrix spikes ^{99}Tc calibration
^{99}Tc matrix spikes

$$\frac{947 - 892}{(947 + 892)/2} \times 100 = \underline{6\ \%}$$

$^{90}Sr \cdot Y$ matrix spikes $^{90}Sr \cdot Y$ calibration

$$\frac{981 - 952}{(981 + 952)/2} \times 100 = \underline{3\%}$$

S.K. Fadyy 2/27/92
G.G. Bhalerao 3.3.92

BATCH 4

TOTAL BETA ANALYSIS

E05-001

Test Instruction for
1100-EM-1 Total Beta Analysis Set #4

Note: This is impact level 1 work; date and sign all crossouts.

Analysis should be done in a low level lab such as 10A.

Take the specified aliquot and perform analysis per procedures PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis, PNL-ALO-462, Source Preparation for Gross Beta Analysis, and PNL-ALO-463, Beta Counting Procedure. Use the low beta detectors.

BL-02744	100 ml H2O	
BS-02744	100 ml H2O	200 ul Sr-Y-90 #52733-117-1
BS-02744Tc	100 ml H2O	1 ml #54124-64-17 Tc-99
92-02740	100 ml	
92-02742	100 ml	
92-02743	100 ml	
92-02744	100 ml	
DUP-2744	100 ml	
92-02745	100 ml	
92-02746	100 ml	
92-02747	100 ml	
92-02748	100 ml	
92-02749	100 ml	
92-02750	100 ml	
92-02751	100 ml	
MS-02744	100 ml	200 ul Sr-Y-90 #52733-117-1
MSTc-02744	100 ml	1 ml #54124-64-17 Tc-99
MSDTc-02744	100 ml	1 ml #54124-64-17 Tc-99

TBETA4EM.TI

Gross Alpha and Beta Analysis Data Sheet

		Check if used	
Procedure PNL-ALO-106	Rev.0, leach:	✓	Date Sample
Procedure PNL-ALO-460	Rev.0, α prep:	NA	Prep Started 2-24-92
Procedure PNL-ALO-461	Rev.0, α count:	NA	Date Completed 2-25-92
Procedure PNL-ALO-462	Rev.0, β prep:	✓	
Procedure PNL-ALO-463	Rev.0, β count:	✓	

Pipet Calibrations in LAB-54372 Pg 12

Added Spike Volume

~~Alpha~~ Beta

Pipette No. 10A-22 Volume 999.4 λ +/- 4.7 λ Date Pipetted 2-24-92

Spike ID 99Tc 54124-64-17 Spike Activity 108.5 dpm/ml

Beta

Pipette No. 10A-18 Volume 199.4 λ +/- 1.4 λ Date Pipetted 2-24-92

Spike ID 52733-117-1 Spike Activity 1.47×10^3 dpm/ml 3-14-80

Sample ID, Aliquot Size, and Leachate Volume

Balance Number NA Temperature (if weighing liquid samples) _____

Sample ID	Beaker Wt.	Bker + Smpl	Sample Wt or Vol	Final Leachate Vol.	Volume for alpha anal.	Volume for beta anal.
BL 02744			100ml			100ml
BS 02744						
BS 02744TC						
92-02740						
92-02742	NA					
92-02743					NA	
92-02744						
DUP-2744						
92-02745						
92-02746						
92-02747						
92-02748						
92-02749						
92-02750						
92-02751						

Sample Volumes (if a pipet was used for small aqueous samples or leach aliquots)

Aliquot of original sample or alpha or beta aliquot? _____

Pipette No. NA Volume _____ +/- _____ Date Pipetted _____

Aliquot of original sample or alpha or beta aliquot? _____

Pipette No. NA Volume _____ +/- _____ Date Pipetted _____

Gwen G Brodzinski 2-27-92 S. K. Tedeff 2/28/92

Analyst Date Reviewer Date

ABDATA2.LOG

E05-003

Gross Alpha and Beta Analysis Data Sheet

		Check if used
Procedure PNL-ALO-106	Rev.0, leach:	✓
Procedure PNL-ALO-460	Rev.0, α prep:	NA
Procedure PNL-ALO-461	Rev.0, α count:	NA
Procedure PNL-ALO-462	Rev.0, β prep:	✓
Procedure PNL-ALO-463	Rev.0, β count:	✓

Date Sample
Prep Started 2-24-92
Date Completed 2-25-92

Added Spike Volume

Alpha
Pipette No. NA Volume _____ +/- _____ Date Pipetted _____
Spike ID _____ Spike Activity _____

Beta
Pipette No. See pg 1 Volume _____ +/- _____ Date Pipetted _____
Spike ID _____ Spike Activity _____

Sample ID, Aliquot Size, and Leachate Volume

Balance Number _____ Temperature (if weighing liquid samples) _____

Sample ID	Beaker Wt.	Bker + Smpl	Sample Wt or Vol	Final Leachate Vol.	Volume for alpha anal.	Volume for beta anal.
MS02744	NA		100ml	NA		100ml
MS02744Tc			↓			↓
MSD02744Tc						
		NA				

Sample Volumes (if a pipet was used for small aqueous samples or leach aliquots)

Aliquot of original sample or alpha or beta aliquot? _____
Pipette No. _____ Volume _____ +/- _____ Date Pipetted _____

Aliquot of original sample or alpha or beta aliquot? _____
Pipette No. _____ Volume _____ +/- _____ Date Pipetted _____

Susan G Brodzinski 2-27-92 — Analyst, Date
J. L. Tadeff 2/28/92 — Reviewer, Date

ABDATA2.LOG

Pg 1 of 2 1
gc
2-25-92

Gross Alpha and Beta Dish Weight
Data Sheet

Date Sample Prep Started 2-24-92
Date Completed 2-25-92

Sample ID and Dish Weights

Balance Nuaber 509-06-03-003

Sample ID	Tare Wt. of Alpha Dish	Gross Wt. of Alpha Dish	Net Wt. of Alpha Ppt.	Tare Wt. of Beta Dish	Gross Wt. of Beta Dish	Net Wt. of Beta Ppt.
92-2740				.7455	.7746	29.1 mg
92-2742				.7413	.7896	48.3
92-2743				.7435	.7440	0.5
92-2744				.7449	.8207	75.8
92-2745				.7453	.8186	73.3
92-2746				.7485	.8500	101.5
92-2747				.7513	.8187	67.4
92-2748				.7496	.8226	73.0
92 2749			gc 2-25-92	~~.7469~~ .7469	~~.8055~~ .8055	~~58.6~~ 58.6
92-2750				.7423	.8347	92.4
92-2751				.7427	.7890	46.3
BL 2744				.7375	.7380	0.5
MS 2744Tc				.7409	.8316	90.7
BS 2744Sr				.7536	.7546	1.0
BS 2744Tc				.7397	.7443	4.6
MS 2744Sr				.7476	.8199	72.3
MSD 2744Tc				.7513	.8203	68.0
DUP 2744				.7458	.8041	58.3

G G Bradzynski 2-25-92 — S.K. [illegible] 2/28/92
Analyst — Date — Reviewer — Date

ABDATA3.LOG

E05-005

Battelle

BETA COUNTING DATA

Pg 172

REQUESTED BY

REMARKS

DATE ANALYZED

SAMPLE TYPE: Total Beta 1100EM1

CHARGE CODE

DESIGNATION	SAMPLE	SAMPLED DATE - TIME	CARRIER (ML)	PROCESS	WT.-VOL. ANALYZED	WT.-RESIDUE	ANALYST	SHELF	DATE - TIME COUNTED	COUNTS	MINUTES	BKG. C/M	BKG. C/M	BKG. CORR.	TECHNICIAN	CALCULATIONS (CONVERSION FACTOR)	RESULTS UNITS OF pCi/
92-02742			NA	Beta Anal	100ml	48.3	gfs	1	16:30 NA 2-24-92	137	100	.568		Na			
92-02744						75.8		2		454		.561					
92-02746						101.5		3		511		.694					
BS-02744						1.0		1	08:55 2-25-92	10,930	100	.568					
BS-02744Tc						4.6		2		4117		.561					
MS-02744Tc						90.7		3		2032		.694					
92-02740						29.1		1	11:20 2-25-92	113	100	.568					
92-02743						0.5		2		59		.561					
92-02747						67.4		3		465		.694					
92-02748						73.0		1	13:15 2-25-92	532	100	.568					
92-02749						58.6		2		370		.561					
92-02750						92.4		3		475		.694					
92-02751						46.3		1	14:57 2-25-92	97	80	.568					
92-02745						73.3		2		388		.561					

Metc # 98 2-25-92

Steven G. Bradzynski
2-28-92

Reviewed S.K. Fahy 2/28/92

No. 1304

E05-006

Battelle

BETA COUNTING DATA

REQUESTED BY

DATE ANALYZED

SAMPLE TYPE

CHARGE CODE

Pg 2 of 2

REMARKS

DESIGNATION	SAMPLE	DATE - TIME SAMPLED	CARRIER (ml)	PROCESS	WT. - VOL. ANALYZED	WT. - RESIDUE	ANALYST	SHELF	DATE - TIME COUNTED	COUNTS	MINUTES	BKG. C/M	C/M CORR.	TECHNICIAN	CALCULATIONS (Corrected for background, efficiency, etc.)	RESULTS UNITS OF pCi/
MS02744	NA		Beta Amp 100ml		72.3 g		67	1	2-25-92 16:20	114146	1000		18			
MSD TC 2744						69.0		1		2056	100		.568			
BL02744						0.5		3		54	100		.694			
Dup-2744						58.3		1	2-26-92 11:45	300	60		.568			

Gwen Bradzozynski 2-25-92

Reviewed S. L. Tadey 4/28/92

№ 1303

E05-007

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92		
Enter Radiochem Sample Number (XXXX)	MS-27445R		
Enter Log-In Number ('90-XXXX)	MS-27445R		
Enter Client Sample ID	MATRIX SPIKE SR		
Enter File Name	2744MSS		
Initial amount of sample used	100 +\/-	0.2000	
Which units, ml, g or sample?	ML		
If leached, enter final leach soln volume (ml)	1 +\/-	0.0001	
If leached, enter ml of leach soln analyzed	1 +\/-	0.0001	
Enter total counts observed	114146		(114,146 cts/1000 min) - 18 cpm = 96.146
Enter count time in minutes	1000		
Enter background (cpm)	18		
Calculated net cpm	96.1460 +\/-	0.3035	
Weight of residue on dish (NOT IN GRAMS) - in MG	72.3 +\/-	0.1	
d/c for detector based on mg loading	2.3736 +\/-	0.0082	d/c = 1.8904 + 0.007202(72.3) − 0.00000718(72.3)² = 2.3736

Signature G.G. Bradacymski 2-26-92
(Entered by) (Date)

Total Beta Activity	1027.976 pCi/L =	1.027978 pCi/ml	$\frac{(96.146)(d/c)(2.3736\ d/c)(1)}{(0.1\ L)(1)\ 2.22\ dpm/pCi}$ = 1,027.97 pCi/L
Error in activity units*	17.119 pCi/L =	0.017119 pCi/ml	
Percent Error	1.67 %		
Minimum detectable activity	NA		

S.K. Sadoff 2/28/92

Signature S.K. Sadoff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-008

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	85-02744	
Enter Log-In Number ('90-XXXX)	85-02744	
Enter Client Sample ID	BLANK SPIKE SR	
Enter File Name	8527445	
Initial amount of sample used	100 +\-	0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	18930	
Enter count time in minutes	100	
Enter background (cpm)	0.508	
Calculated net cpm	188.7320 +\-	1.0+02
Weight of residue on dish (NOT IN GRAMS) - in MG	1 +\-	0.1
d/c for detector based on mg loading	1.8975 +\-	0.0215

Signature G G Bradzaynski 2-26-92
(Entered by) (Date)

Total Beta Activity	929.411 pCi/L =	0.929411 pCi/ml
Error in activity units*	14.087 pCi/L =	0.014087 pCi/ml
Percent Error	1.52 %	
Minimum detectable activity	NA	

Signature J. L. Lindsey 2/26/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-009

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	BL-2744	
Enter Log-In Number (90-XXXX)	BL-2744	
Enter Client Sample ID:	BLANK	
Enter File Name	BL2744B	
Initial amount of sample used	100 +\-	0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	54	
Enter count time in minutes	100	
Enter background (cpm)	0.694	
Calculated net cpm	-0.1540 +\-	0.1111
Weight of residue on disk (NOT IN GRAMS) - in MG	0.5 +\-	0.1
d/c for detector based on mg loading	1.8940 +\-	0.0219

Signature G.G. Bradaczynski 2-26-92
(Entered by) (Date)

Total Beta Activity	-1.314 pCi/L =	-0.001314 pCi/ml
Error in activity units*	-0.946 pCi/L =	-0.000946 pCi/ml
Percent Error	72.14 %	
Minimum detectable activity	2.132 pCi/L =	0.002132 pCi/ml

$$\frac{\left(\frac{3\sqrt{0.694 \times 100}}{100}\,cpm\right)\left(\frac{1\ pCi/L}{cpm}\right)}{(2.22\,dpm/pCi)(0.1\ L)} = 2.132\ pCi/L$$

Signature D.K. Todd 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/26/91
TOTBETA

E05-010

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02740	
Enter Log-In Number (90-XXXX)	92-02740	
Enter Client Sample ID	6015W8	
Enter File Name	2740TBS	
Initial amount of sample used	100 +\-	0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	113	
Enter count time in minutes	100	
Enter background (cpm)	0.568	
Calculated net cpm	0.5620 +\-	0.1303
Weight of residue on dish (NOT IN GRAMS) - in MG	29.1 +\-	0.1
d/c for detector based on mg loading	2.0939 +\-	0.0252

Signature G.G. Bradaczynski 2-26-92
(Entered by) (Date)

Total Beta Activity	5.301 pCi/L =	0.005301 pCi/ml
Error in activity units*	1.231 pCi/L =	0.001231 pCi/ml
Percent Error	23.22 %	
Minimum detectable activity	NA	

Signature S. K. Fadeff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-011

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02742	
Enter Log-In Number (90-XXXX)	92-02742	
Enter Client Sample ID	B015W2	
Enter File Name	2742TBS	
Initial amount of sample used	100 +/-	0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +/-	0.0001
If leached, enter ml of leach soln analyzed	1 +/-	0.0001
Enter total counts observed	137	
Enter count time in minutes	100	
Enter background (cpm)	0.508	
Calculated net cpm	0.8220 +/-	0.1392
Weight of residue on dish (NOT IN GRAMS) - in MG	48.3 +/-	0.1
d/c for detector based on mg loading	2.2215 +/-	0.0781

Signature G.G. Bradzeynski 2-26-92
(Entered by) (Date)

Total Beta Activity	0.825 pCi/L =	0.000825 pCi/ml
Error in activity units*	1.397 pCi/L =	0.001397 pCi/ml
Percent Error	17.41 %	
Minimum detectable activity	NA	

Signature S. L. Fadoff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-012

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02743
Enter Log-In Number (92-XXXX)	92-02743
Enter Client Sample ID	001BV6
Enter File Name	274356

Initial amount of sample used	100	+\- 0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1	+\- 0.0001
If leached, enter ml of leach soln analyzed	1	+\- 0.0001
Enter total counts observed	59	
Enter count time in minutes	100	
Enter background (cpm)	0.561	
Calculated net cpm	0.0290	+\- 2.1373
Weight of residue on dish (NOT IN GRAMS) - in MG	0.5	+\- 0.1
d/c for detector based on mg loading	1.8946	+\- 0.0219

Signature G.G. Bandarenyaki 2-26-92
(Entered by) (Date)

Total Beta Activity	0.247 pCi/L =	0.000247 pCi/ml
Error in activity units*	0.915 pCi/L =	0.000915 pCi/ml
Percent Error	369.95 %	
Minimum detectable activity	1.917 pCi/L =	0.001917 pCi/ml

Signature S. K. Fadeff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-013

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02744
Enter Log-In Number (92-XXXX)	92-02744
Enter Client Sample ID	881899
Enter File Name	2744TBS

Initial amount of sample used	100 +\- 0.2000
Which units, ml, g or sample?	ML
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	454
Enter count time in minutes	100
Enter background (cpm)	0.501
Calculated net cpm	3.9790 +\- 0.2259
Weight of residue on dish (NOT IN GRAMS) - in MG	75.0 +\- 0.1
d/c for detector based on mg loading	2.3951 +\- 0.0395

Signature G.G. Bodayyondi 2-26-92
(Entered by) (Date)

Total Beta Activity	42.928 pCi/L =	0.042928 pCi/ml
Error in activity units*	2.539 pCi/L =	0.002539 pCi/ml
Percent Error	5.91 %	
Minimum detectable activity	NA	

Signature D. K. Fadeff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(d/c)(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-014

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	27-Feb-92	
Enter Radiochem Sample Number (XXXX)	DUP-2744	
Enter Log-In Number ('90-XXXX)	DUP-2744	
Enter Client Sample ID	DUPLICATE 2744	
Enter File Name	2744DB5	
Initial amount of sample used	100 +\-	0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	300	
Enter count time in minutes	60	
Enter background (cpm)	0.500	
Calculated net cpm	4.4320 +\-	0.3040
Weight of residue on dish (NOT IN GRAMS) - in MG	58.3 +\-	0.1
d/c for detector based on mg loading	2.2859 +\-	0.0333

Signature G.G. Bradaczynski 2-27-92
(Entered by) (Date)

Total Beta Activity	45.635 pCi/L =	0.045635 pCi/ml
Error in activity units*	3.200 pCi/L =	0.003200 pCi/ml
Percent Error	7.00 %	
Minimum detectable activity	NA	

Signature A.L. Tedeff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-015

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02745
Enter Log-In Number (90-XXXX)	92-02745
Enter Client Sample ID	601BW2
Enter File Name	2745TB5

Initial amount of sample used	100 +\/-	0.2000
which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\/-	0.0001
If leached, enter ml of leach soln analyzed	1 +\/-	0.0001
Enter total counts observed	383	
Enter count time in minutes	60	
Enter background (cpm)	0.561	
Calculated net cpm	4.2698 +\/-	0.2601
Weight of residue on dish (NOT IN GRAMS) - in MG	73.3 +\/-	0.1
d/c for detector based on mg loading	2.3797 +\/-	0.0366

Signature G.G. Bradczynski 2-26-92
(Entered by) (Date)

Total Beta Activity	45.976 pCi/L =	0.045976 pCi/ml
Error in activity units*	2.887 pCi/L =	0.002887 pCi/ml
Percent Error	6.28 %	
Minimum detectable activity	NA	

Signature S. K. Fadeyi 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-016

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02746	
Enter Log-In Number (90-XXXX)	92-02746	
Enter Client Sample ID	6016W5	
Enter File Name	2746T65	
Initial amount of sample used	100 +\-	0.2000
Which units, ml, g or sample?	mL	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	511	
Enter count time in minutes	100	
Enter background (cpm)	0.694	
Calculated net cpm	4.4160 +\-	0.2409
Weight of residue on disn (NOT IN GRAMS) - in MG	101.5 +\-	0.1
d/c for detector based on mg loading	2.5475 +\-	0.0497

Signature G.G. Bodaczynski 2-26-92
(Entered by) (Date)

Total Beta Activity	50.674 pCi/L =	0.050674 pCi/ml
Error in activity units*	2.937 pCi/L =	0.002937 pCi/ml
Percent Error	5.80 %	
Minimum detectable activity	NA	

Signature S.K. Sadoff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-017

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02747	
Enter Log-In Number ('90-XXXX)	92-02747	
Enter Client Sample ID	8016W8	
Enter File Name	2747T65	
Initial amount of sample used	100 +\-	0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	465	
Enter count time in minutes	100	
Enter background (cpm)	0.094	
Calculated net cpm	3.9568 +\-	0.2312
Weight of residue on dish (NOT IN GRAMS) - in MG	67.4 +\-	0.1
d/c for detector based on mg loading	2.3432 +\-	0.0364

Signature G.G. Rudaczynski 2-26-92
(Entered by) (Date)

Total Beta Activity	41.756 pCi/L =	0.041756 pCi/ml
Error in activity units*	2.526 pCi/L =	0.002526 pCi/ml
Percent Error	6.05 %	
Minimum detectable activity	NA	

Signature S. K. Tadyy 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/26/91
TOTBETA

E05-018

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02748
Enter Log-In Number (`90-XXXX)	92-02748
Enter Client Sample ID	501BX1
Enter File Name	2748TBS

Initial amount of sample used	100	+\/- 0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1	+\/- 0.0001
If leached, enter ml of leach soln analyzed	1	+\/- 0.0001
Enter total counts observed	532	
Enter count time in minutes	100	
Enter background (cpm)	0.568	
Calculated net cpm	4.7520	+\/- 0.3427
Weight of residue on dish (NOT IN GRAMS) - in MG	73	+\/- 0.1
d/c for detector based on mg loading	2.3779	+\/- 0.0335

Signature G.G. Bradczynski 2-26-92
(Entered by) (Date)

Total Beta Activity	58.900 pCi/L =	0.058900 pCi/ml
Error in activity units*	2.726 pCi/L =	0.002726 pCi/ml
Percent Error	5.36 %	
Minimum detectable activity	NA	

Signature S. K. Fadyy 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{cpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/26/91
TOTBETA

E05-019

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02749	
Enter Log-In Number (`92-XXXX)	92-02749	
Enter Client Sample ID	001C38	
Enter File Name	2749T65	
Initial amount of sample used	100 +\-	0.2000
which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	370	
Enter count time in minutes	100	
Enter background (cpm)	0.561	
Calculated net cpm	3.1390 +\-	0.2064
Weight of residue on dish (NOT IN GRAMS) - in MG	58.6 +\-	0.1
d/c for detector based on mg loading	2.2878 +\-	0.0334

Signature G. G. Bradbaymski 2-26-92
(Entered by) (Date)

Total Beta Activity	32.349 pCi/L =	0.032349 pCi/ml
Error in activity units*	2.180 pCi/L =	0.002180 pCi/ml
Percent Error	6.74 %	
Minimum detectable activity	NA	

Signature J. K. Fadoff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-020

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92
Enter Radiochem Sample Number (XXXX)	92-02750
Enter Log-In Number ('90-XXXX)	92-02750
Enter Client Sample ID	B01C30
Enter File Name	2750T85

Initial amount of sample used	100 +\-	0.2000
Which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	475	
Enter count time in minutes	100	
Enter background (cpm)	0.694	
Calculated net cpm	4.0560 +\-	0.2333
Weight of residue on dish (NOT IN GRAMS) - in MG	92.4 +\-	0.1
d/c for detector based on mg loading	2.4946 +\-	0.0459

Signature G.G. Bradacz-ynski 2-26-92
(Entered by) (Date)

Total Beta Activity	45.577 pCi/L =	0.045577 pCi/ml
Error in activity units*	2.754 pCi/L =	0.002754 pCi/ml
Percent Error	6.04 %	
Minimum detectable activity	NA	

Signature S. K. Fadeff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-021

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02751	
Enter Log-In Number (90-XXXX)	92-02751	
Enter Client Sample ID	801C11	
Enter File Name	2751TB5	
Initial amount of sample used	100 +\-	0.2000
which units, ml, g or sample?	ML	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	97	
Enter count time in minutes	60	
Enter background (cpm)	0.500	
Calculated net cpm	0.6445 +\-	0.1492
Weight of residue on disk (NOT IN GRAMS) - in MG	40.3 +\-	0.1
d/c for detector based on mg loading	2.2085 +\-	0.0296

Signature G.G. Bonlawynski 2-26-92
(Entered by) (Date)

Total Beta Activity	0.412 pCi/L =	0.000412 pCi/ml
Error in activity units*	1.487 pCi/L =	0.001487 pCi/ml
Percent Error	23.19 %	
Minimum detectable activity	NA	

Signature A.K. Fadeyi 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-022

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	B5-02744	
Enter Log-In Number (90-XXXX)	B5-02744	
Enter Client Sample ID	BLANK SPIKE TL	
Enter File Name	B52744T	
Initial amount of sample used	100 +\-	0.2000
Which units, ml, g or sample?	mL	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	4117	
Enter count time in minutes	100	
Enter background (cpm)	0.561	
Calculated net cpm	40.6090 +\-	0.4060
Weight of residue on dish (NOT IN GRAMS) - in MG	4.6 +\-	0.1
d/c for detector based on mg loading	1.9234 +\-	0.0219

Signature G.G. Brodacynski 2-26-92
(Entered by) (Date)

Total Beta Activity	351.031 pCi/L =	0.351031 pCi/ml
Error in activity units*	0.924 pCi/L =	0.000924 pCi/ml
Percent Error	1.97 %	
Minimum detectable activity	NA	

Signature S. K. Tadeff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-023

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY

Date calculated	26-Feb-92
Enter Radiochem Sample Number (XXXX)	MS-02744TC
Enter Log-In Number ('90-XXXX)	MS-02744TC
Enter Client Sample ID	MATRIX SPIKE TC
Enter File Name	MS2744T
Initial amount of sample used	100 +\- 0.2000
Which units, ml, g or sample?	ML
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	2032
Enter count time in minutes	100
Enter background (cpm)	0.694
Calculated net cpm	19.6260 +\- 0.4584
Weight of residue on dish (NOT IN GRAMS) - in MG	98.7 +\- 0.1
d/c for detector based on mg loading	2.4846 +\- 0.0453

Signature 2-26-92
(Entered by) (Date)

Total Beta Activity	219.650 pCi/L =	0.219650 pCi/ml
Error in activity units*	6.521 pCi/L =	0.006521 pCi/ml
Percent Error	2.97 %	
Minimum detectable activity	NA	

Signature 2/23/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-024

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92
Enter Radiochem Sample Number (XXXX)	MS-2744TC
Enter Log-In Number ('90-XXXX)	MS-2744TC
Enter Client Sample ID	MATRIX SPIKE TC
Enter File Name	MS2744T
Initial amount of sample used	100 +\/- 0.2000
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\/- 0.0001
If leached, enter ml of leach soln analyzed	1 +\/- 0.0001
Enter total counts observed	2032
Enter count time in minutes	100
Enter background (cpm)	0.094
Calculated net cpm	19.6280 +\/- 0.4584
Weight of residue on dish (MUST IN GRAMS) - in MG	90.7 +\/- 0.1
d/c for detector based on mg loading	0.0007 +\/- 0.7740

Signature G.G. Bradczynski 2-26-92
(Entered by) (Date)

Total Beta Activity	584.069 pCi/L =	0.584069 pCi/ml
Error in activity units*	69.782 pCi/L =	0.069782 pCi/ml
Percent Error	11.95 %	
Minimum detectable activity	NA	

Signature S.K. Fadoff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-025

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92
Enter Radiochem Sample Number (XXXX)	MSD-2744TC
Enter Log-In Number ('90-XXXX)	MSD-2744TC
Enter Client Sample ID	MATRIX SPIKE DUP TC
Enter File Name	MSD744T
Initial amount of sample used	100 +\- 0.2000
which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	2056
Enter count time in minutes	100
Enter background (cpm)	0.566
Calculated net cpm	19.9920 +\- 0.4597
Weight of residue on dish (NOT IN GRAMS) - in MG	69 +\- 0.1
d/c for detector based on mg loading	5.0057 +\- 0.5317

Signature G. J. Bradaczynski 2-26-92
(Entered by) (Date)

Total Beta Activity	522.826 pCi/L =	0.522826 pCi/ml
Error in activity units*	49.378 pCi/L =	0.049378 pCi/ml
Percent Error	9.44 %	
Minimum detectable activity	NA	

Signature P. K. Fadoff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/26/91
TOTBETA

E05-026

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92
Enter Radiochem Sample Number (XXXX)	BL-2744
Enter Log-in Number ('90-XXXX)	BL-2744
Enter Client Sample ID	BLANK
Enter File Name	BL2744T

Initial amount of sample used	100	+\/- 0.2000
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1	+\/- 0.0001
If leached, enter ml of leach soln analyzed	1	+\/- 0.0001
Enter total counts observed	54	
Enter count time in minutes	100	
Enter background (cpm)	0.674	
Calculated net cpm	-0.1540	+\/- 0.1111
Weight of residue on dish (NOT IN GRAMS) - in MG	0.5	+\/- 0.1
d/c for detector based on mg loading	2.5142	+\/- 0.1047

Signature [signature] 2-26-92
(Entered by) (Date)

Total Beta Activity	-1.744 pCi/L =	-0.001744 pCi/ml
Error in activity units*	-1.260 pCi/L =	-0.001260 pCi/ml
Percent Error	72.25 %	
Minimum detectable activity	2.830 pCi/L =	0.002830 pCi/ml

Signature [signature] 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsample)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-027

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	BS-2744TC	
Enter Log-In Number ('90-XXXX)	BS-2744TC	
Enter Client Sample ID	BLANK SPIKE TC	
Enter File Name	BS2744T	
Initial amount of sample used	100	+\- 0.2000
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1	+\- 0.0001
If leached, enter ml of leach soln analyzed	1	+\- 0.0001
Enter total counts observed	4117	
Enter count time in minutes	100	
Enter background (cpm)	0.561	
Calculated net cpm	40.6090	+\- 0.6400
Weight of residue on dish (NOT IN GRAMS) - in MG	4.6	+\- 0.1
d/c for detector based on mg loading	2.7438	+\- 0.1084

Signature G.E. Bundacynski 2-26-92
(Entered by) (Date)

Total Beta Activity	501.905 pCi/L =	0.501905 pCi/ml
Error in activity units*	21.400 pCi/L =	0.021400 pCi/ml
Percent Error	4.26 %	
Minimum detectable activity	NA	

Signature J.K. Fadeff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-028

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM.

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-2748	
Enter Log-In Number (F90-XXXX)	92-2748	
Enter Client Sample ID	8015W8	
Enter File Name	2748TCB	
Initial amount of sample used	100	+\- 0.2000
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1	+\- 0.0001
If leached, enter ml of leach soln analyzed	1	+\- 0.0001
Enter total counts observed	113	
Enter count time in minutes	100	
Enter background (cpm)	0.566	
Calculated net cpm	0.5620	+\- 0.1300
Weight of residue on disk (NOT IN GRAMS) - in mg	29.1	+\- 0.1
d/c for detector based on mg loading	4.0294	+\- 0.2130

Signature G.G. Brodzinski 2-26-92
(Entered by) (Date)

Total Beta Activity	10.200 pCi/L =	0.010200 pCi/ml
Error in activity units*	2.426 pCi/L =	0.002426 pCi/ml
Percent Error	23.78 %	
Minimum detectable activity	NA	

Signature J. L. Todoff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-029

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02742	
Enter Log-In Number (90-XXXX)	92-02742	
Enter Client Sample ID	6015W2	
Enter File Name	2742TC6	
Initial amount or sample used	100 +\-	0.2000
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	137	
Enter count time in minutes	100	
Enter background (cpm)	4.566	
Calculated net cpm	0.8820 +\-	0.1372
Weight of residue on disk (NOT IN GRAMS) - in MG	48.3 +\-	0.1
d/c for detector based on mg loading	4.9332 +\-	0.3472

Signature G.G. Bradaczynski 2-26-92
(Entered by) (Date)

Total Beta Activity	17.822 pCi/L =	0.017822 pCi/ml
Error in activity units*	3.338 pCi/L =	0.003338 pCi/ml
Percent Error	18.73 %	
Minimum detectable activity	NA	

Signature S.K. Fadeff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-030

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92
Enter Radiochem Sample Number (XXXX)	92-2743
Enter Log-In Number (YY-XXXX)	92-2743
Enter Client Sample ID	SB16Vo
Enter File Name	2743TCB

Initial amount of sample used	100 +\- 0.2000
which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	59
Enter count time in minutes	100
Enter background (cpm)	0.561
Calculated net cpm	0.0290 +\- 0.1073
Weight of residue on dish (NOT IN GRAMS) - in mG	0.5 +\- 0.1
d/c for detector based on mg loading	2.5142 +\- 0.1047

Signature G G Bridgmohan 2-26-92
(Entered by) (Date)

Total Beta Activity	0.328 pCi/L =	0.000328 pCi/ml
Error in activity units*	1.215 pCi/L =	0.001215 pCi/ml
Percent Error	369.97 %	
Minimum detectable activity	2.545 pCi/L =	0.002545 pCi/ml

Signature S. K. Fedyg 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-031

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02744	
Enter Log-In Number (92-XXXX)	92-02744	
Enter Client Sample ID	6016V9	
Enter File Name	2744TCB	
Initial amount of sample used	100 +\-	0.2000
which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	454	
Enter count time in minutes	100	
Enter background (cpm)	0.501	
Calculated net cpm	3.9790 +\-	0.2259
Weight of residue on dish (NOT IN GRAMS) - in MG	75.6 +\-	0.1
d/c for detector based on mg loading	0.0692 +\-	0.0020

Signature G.G. Brodacznski 2-26-92
(Entered by) (Date)

Total Beta Activity	108.761 pCi/L =	0.108761 pCi/ml
Error in activity units*	12.434 pCi/L =	0.012434 pCi/ml
Percent Error	11.43 %	
Minimum detectable activity	NA	

Signature S. K. Tadey 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-032

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	27-Feb-92	
Enter Radiochem Sample Number (XXXX)	DUP-2744	
Enter Log-In Number (90-XXXX)	DUP-2744	
Enter Client Sample ID	DUPLICATE 2744 TC	
Enter File Name	2744DBT	
Initial amount of sample used	100 +\-	0.1000
which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	300	
Enter count time in minutes	60	
Enter background (cpm)	0.500	
Calculated net cpm	4.4320 +\-	0.3240
Weight of residue on dish (NOT IN GRAMS) - in MG	58.2 +\-	0.1
d/c for detector based on mg loading	5.3637 +\-	0.4300

Signature G.G. Brodzynski 2-27-92
(Entered by) (Date)

Total Beta Activity	107.080 pCi/L =	0.107080 pCi/ml
Error in activity units*	11.310 pCi/L =	0.011310 pCi/ml
Percent Error	10.56 %	
Minimum detectable activity	NA	

Signature J. L. Fadeff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-035

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02745	
Enter Log-In Number ('90-XXXX)	92-02745	
Enter Client Sample ID	B01BW2	
Enter File Name	2745TC6	
Initial amount of sample used	100 +\-	0.2000
which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	368	
Enter count time in minutes	80	
Enter background (cpm)	0.561	
Calculated net cpm	4.2898 +\-	0.2801
Weight of residue on dish (NOT IN GRAMS) - in MG	73.3 +\-	0.1
d/c for detector based on mg loading	5.9737 +\-	0.5756

Signature G.G. Bradaczynski 2-26-92 2-26-92
(Entered by) (Date)

Total Beta Activity	115.418 pCi/L =	0.115418 pCi/ml
Error in activity units*	13.141 pCi/L =	0.013141 pCi/ml
Percent Error	11.39 %	
Minimum detectable activity	NA	

Signature A. K. Tadoff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-034

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-02746	
Enter Log-In Number (92-XXXX)	92-02746	
Enter Client Sample ID	B01Bw5	
Enter File Name	2746TCB	
Initial amount of sample used	100 +\/-	0.2000
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1 +\/-	0.0001
If leached, enter ml of leach soln analyzed	1 +\/-	0.0001
Enter total counts observed	511	
Enter count time in minutes	100	
Enter background (cpm)	0.094	
Calculated net cpm	4.4160 +\/-	0.2409
Weight of residue on dish (NOT IN GRAMS) - in MG	101.5 +\/-	0.1
d/c for detector based on mg loading	6.9620 +\/-	0.9140

Signature G.G. Brodzinski 2-26-92
(Entered by) (Date)

Total Beta Activity	138.488 pCi/L =	0.138488 pCi/ml
Error in activity units*	19.701 pCi/L =	0.019701 pCi/ml
Percent Error	14.23 %	
Minimum detectable activity	NA	

Signature S. K. Fady 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-035

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-2747	
Enter Log-In Number ('90-XXXX)	92-2747	
Enter Client Sample ID	801BW8	
Enter File Name	2747TCE	
Initial amount of sample used	100 +\-	0.2000
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	465	
Enter count time in minutes	100	
Enter background (cpm)	0.694	
Calculated net cpm	3.9500 +\-	0.2312
Weight of residue on dish (NOT IN GRAMS) - in MG	07.4 +\-	0.1
d/c for detector based on mg loading	5.7420 +\-	0.5159

Signature R.G.Bradazymski 2-26-92
(Entered by) (Date)

Total Beta Activity	102.322 pCi/L =	0.102322 pCi/ml
Error in activity units*	10.968 pCi/L =	0.010968 pCi/ml
Percent Error	10.72 %	
Minimum detectable activity	NA	

Signature S. K. Tadoff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-036

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92
Enter Radiochem Sample Number (XXXX)	92-2746
Enter Log-In Number ('90-XXXX)	92-2746
Enter Client Sample ID	6816X1
Enter File Name	2746TCB

Initial amount of sample used	100 +\- 0.2000
Which units, ml, g or sample?	ml
If leached, enter final leach soln volume (ml)	1 +\- 0.0001
If leached, enter ml of leach soln analyzed	1 +\- 0.0001
Enter total counts observed	532
Enter count time in minutes	100
Enter background (cpm)	0.566
Calculated net cpm	4.7520 +\- 0.2427
Weight of residue on dish (NOT IN GRAMS) - in mG	73 +\- 0.1
d/c for detector based on mg loading	5.9621 +\- 0.5725

Signature G.G. Bradczynski 2-26-92
(Entered by) (Date)

Total Beta Activity	127.621 pCi/L =	0.127621 pCi/ml
Error in activity units*	13.881 pCi/L =	0.013881 pCi/ml
Percent Error	10.88 %	
Minimum detectable activity	NA	

Signature A. K. Fadiff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-037

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-2749	
Enter Log-In Number ('90-XXXX)	92-2749	
Enter Client Sample ID	601C3B	
Enter File Name	2749TCB	
Initial amount of sample used	100 +\-	0.2000
which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	378	
Enter count time in minutes	100	
Enter background (cpm)	0.561	
Calculated net cpm	3.1390 +\-	0.2804
Weight of residue on dish (NOT IN GRAMS) - in MG	58.6 +\-	0.1
d/c for detector based on mg loading	5.3806 +\-	0.4336

Signature G.G. Bradzeynski 2-26-92
(Entered by) (Date)

Total Beta Activity	76.079 pCi/L =	0.076079 pCi/ml
Error in activity units*	7.915 pCi/L =	0.007915 pCi/ml
Percent Error	10.40 %	
Minimum detectable activity	NA	

Signature J. K. Tadeff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

E05-038

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-2758	
Enter Log-In Number (90-XXXX)	92-2758	
Enter Client Sample ID	601035	
Enter File Name	2758TC6	
Initial amount of sample used	100 +\-	0.2000
Which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1 +\-	0.0001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	475	
Enter count time in minutes	100	
Enter background (cpm)	0.694	
Calculated net cpm	4.0568 +\-	0.2033
Weight of residue on dish (NOT IN GRAMS) - in mG	92.4 +\-	0.1
d/c for detector based on mg loading	0.6645 +\-	0.7952

Signature G.G. Brodaczynski 2-26-92
(Entered by) (Date)

Total Beta Activity	121.763 pCi/L =	0.121763 pCi/ml
Error in activity units*	16.131 pCi/L =	0.016131 pCi/ml
Percent Error	13.25 %	
Minimum detectable activity	NA	

Signature A. K. Fadeff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

$$\frac{(\text{net cpm})(\text{d/c})(\text{pCi}/2.22\text{dpm})(\text{ml leachate})}{(\text{initial sample amount})(\text{ml subsampled})}$$

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/28/91
TOTBETA

E05-039

SPREADSHEET FOR CALCULATION OF TOTAL BETA ACTIVITY DUE TO TECHNETIUM

Date calculated	26-Feb-92	
Enter Radiochem Sample Number (XXXX)	92-2751	
Enter Log-In Number (92-XXXX)	92-2751	
Enter Client Sample ID	661C11	
Enter File Name	2751TE6	
Initial amount of sample used	100 +\-	0.2000
which units, ml, g or sample?	ml	
If leached, enter final leach soln volume (ml)	1 +\-	0.2001
If leached, enter ml of leach soln analyzed	1 +\-	0.0001
Enter total counts observed	97	
Enter count time in minutes	80	
Enter background (cpm)	0.566	
Calculated net cpm	0.6445 +\-	0.1492
Weight of residue on dish (NOT IN GRAMS) - in MG	46.3 +\-	0.1
d/c for detector based on mg loading	4.6433 +\-	0.3316

Signature G.G. Bondarczyuk 2-26-92
(Entered by) (Date)

Total Beta Activity	14.801 pCi/L =	0.014801 pCi/ml
Error in activity units*	3.394 pCi/L =	0.003394 pCi/ml
Percent Error	24.14 %	
Minimum detectable activity	NA	

Signature S. K. Fadeff 2/28/92
(Reviewed by) (Date)

CALCULATION OF SAMPLE ACTIVITY:

(net cpm)(d/c)(pCi/2.22dpm)(ml leachate)

(initial sample amount)(ml subsampled)

*Note: The propagated error includes the error associated with the d/c calculation based on the mg loading on the plate.

Total Beta Spreadsheet Revision 3, 6/26/91
TOTBETA

E05-040

Total Beta Batch 4 1100 EMI
$^{90}Sr/Y$ Calibration

Precision, RPD
92-02744

average
$[(42.928 \pm 2.539) + (45.635 \pm 3.208)]/2 = 44.28 \pm 2.0$

RPD
$$\frac{|42.928 - 45.635|}{44.28} \times 100 = 6.11\%$$

Spike Recoveries
Blank spike ^{90}Sr
on 2/25/92 $^{90}Sr/Y$ activity = 1074 ± 53 dpm/ml

$$\frac{(0.1994 \pm 0.0014\ ml)(1074 \pm 53\ dpm/ml)}{(0.1\ L)(2.22\ dpm/pCi)} = 964.7 \pm 48\ pCi/L$$

$$\frac{929.4 \pm 14.1}{964.7 \pm 48} \times 100 = \underline{96.3\%\ \text{recovered}}$$

Matrix spike

$(1028 \pm 17\ pCi/L) - (44.3 \pm 2.0\ pCi/L) = 984 \pm 17\ pCi/L$

$$\frac{984 \pm 17}{965 \pm 48} \times 100 = \underline{102\%\ \text{recovered}}$$

J.K. Fadeff 2/28/92
[illegible] 3-4-92

E05-041

Total Beta Batch 4 1100 EMI
^{99}Tc calibration

precision

average 92-02744

$[(107 +/- 11) + (109 +/- 12)]\ 1/2 = 108 +/- 8$

$\left| \frac{107 - 109}{108} \right| \times 100 = \underline{2\% \quad RPD}$

MS ^{99}Tc

$[(584 +/- 70) + (523 +/- 49)]\ 1/2 = 553.5 +/- 43$

$\left| \frac{584 - 523}{553.5} \right| \times 100 = \underline{11\% \quad RPD}$

Spike Recoveries

Blank spike

$\frac{(0.9994 +/- 0.0047\ ml)(101.5 +/- 2\ dpm/ml)}{(0.1\ L)\ (2.22\ dpm/pCi)} = 488 +/- 9\ pCi/L$

$\frac{502 +/- 21}{488 +/- 9} \times 100 = \underline{103\% \text{ recovered}}$

matrix Spike Duplicate

$(523 +/- 49) - (108 +/- 8) = 415 +/- 50$

$\frac{415 +/- 50}{488 +/- 9} \times 100 = \underline{85\% \text{ recovered}}$

matrix spike

$(584 +/- 70) - (108 +/- 8) = 476 +/- 70$

$\frac{476 +/- 70}{488 +/- 9} \times 100 = \underline{98\% \text{ recovered}}$

S.K. [illegible] 2/20/92
[illegible] 3-4-92

E05-046

1100-EM-1 GROUNDWATER CHARACTERIZATION
PHASE I

DATA PACKAGE/REPORT No. 1

Revision 0

APPENDIX F

STRONTIUM-90 ANALYSIS

Table of Contents

F01 - Summary Results
F02 - Raw Data

See Appendix B: Radiochemistry Standards and Controls for additional supporting documentation.

Battelle
Pacific Northwest Laboratories

Project Number 19432

Internal Distribution

329 file
File/LB

Date March 31, 1992

To Bruce Prentice

From Sandy Fadeff

Subject 1100-EM-1 Strontium-90 Analysis Results

Summary

The six samples analyzed contained no detectable (< 8pCi/L) ^{90}Sr.

Six samples, B015T1, B015T3, B015V1, B015V3, B015V8, and B01C28, were analyzed for ^{90}Sr in February 1992. A nominal 100 ml sub-sample was taken from each sample for analysis and analyzed, along with the corresponding QC samples, per procedures PNL-ALO-465, Strontium Analysis, and PNL-ALO-463, Beta Counting Procedure. All analyses were conducted in building 329 of the 300 area.

The analysis for strontium-90 proceeded smoothly. One procedural deficiency, however, is documented (deficiency report (DR) number 92-011). The analyst did not run a background and control count on the regular beta detectors just prior to analysis as defined in the strontium analysis procedure. It was concluded, however, that the deviation had no impact on the quality of data. Background counts were taken one week apart, bracketing the sample analysis date with virtually no change. Also the control counts taken within one week, bracketing sample analysis, indicate the system was in control for the period. Samples counted on these regular background detectors were the yield spike, matrix spike and blank spike. Strontium-90 recovery on these samples was excellent, within expected ranges.

The yield spike consisted of de-ionized (DI) water and was used to determine the batch yield (99.7%). For most matrices, this factor is close to 100%. A yield of less than 90% indicates potential problems. The blank spike consisted of 100 ml DI water spiked with $^{90}Sr/Y$ and resulted in 102% recovery. The matrix spike consisted of 100 ml of sample B015T1 spiked with $^{90}Sr/Y$ and resulted in 105% recovery. This indicates an average method bias of +3.5%. The precision, estimated by the relative percent deviation of the duplicates, could not be calculated; the sample analyzed in duplicate was below the detection limit. A precision for this batch can be estimated from the blank spike and matrix spike if they are treated as duplicate matrix spikes. This results in ± 3% relative precision, which is consistent with previous experience with the method. Precision is estimated to be about 10% overall based on results from previous analytical runs. Strontium-90 in the blank was not detectable.

The detection limit for the method is 8 pCi/L. Obtained values are reported for each sample even though they are below the detection limit. They are bracketed as a reminder that no quantitative information should be

construed from them. They are provided as a courtesy in case the values are to be used in any statistical analysis.

1100-EM-1
Sr-90 Analysis (Oxalate-Nitric Acid Method)
Results Summary

ID	ALO #	Sr-90 pCi/L*	+/- 1 sigma**	Spike pCi/L	% Recovered	Normalized % Yield***
B015T1	92-02729	[-1]	3			
B015T1	92-02729	[3]	3			
B015T3	92-02730	[-1]	4			
B015V1	92-02734	[0.8]	3			
B015V3	92-02735	[0.7]	3			
B015V8	92-02738	[0.1]	4			
B01C28	92-02752	[-3]	3			
	MS-02729	502	43	479	105	
	BL-02729	[-0.1]	4			
	BS-02729	487	42	479	102	
	YS-02729	Used to determine batch yield				99.7

*The method detection limit is calculated to be 8 pCi/L. All sample and blank results are to be considered non-detects, < 8 pCi/L. The obtained values, provided in brackets are presented for statistical purposes only. The error associated with them is very large relative to the obtained value.

**One sigma uncertainties are based on propagation of mass, volume, and counting uncertainties.

***All Sr-90 analyses are calculated on the basis of their ratio to the matrix spike recovery which has been normalized to 100% chemical recovery.

V. K. Fadiff 3/31/92
Entered by date

S. M. Hayes 3/31/92
Reviewed by date

F01-003

Rec'd 3/5/92

QUALITY CONTROL DATA REVIEW

Project/Work Package: 19432/M82776

Project/WP Title: 1100-EM-1 Groundwater Characterization

Requested Analysis: Sr-90

ALO Sample Numbers: 92-02729, 92-02730, 92-02734, 92-02735, 92-02738, and 92-02752

I have reviewed the data specified above for completeness and compliance with project requirements.

J. L. Daniel
J. Leland Daniel
Data Quality Officer
Analytical Chemistry Laboratory

4/1/92
Date

F02-001

Test Instruction for
1100-EM-1 Strontium Analysis

Note: Samples need to be locked at all times.

This is impact level 1 work; date and sign all crossouts.

Analysis should be done in a low level lab such as 10A, 4A also should be adequate.

Take the specified aliquot and perform analysis per procedures PNL-ALO-465, Strontium-90 Analysis (Oxalate-Nitric Acid Method), and PNL-ALO-463, Beta Counting Procedure. Use the low beta detectors if the sample plates meet the criteria for their use (i.e. less than 25 dpm).

BL-02729		100 ml H2O	
BS-02729		100 ml H2O	200 ul Sr-Y-90 #52733-117-1
YS-02729		100 ML H2O	2 ml Sr-Y-90 #52733-117-1
92-02729	B015T1	100 ml	
Dup-02729	B015T1	100 ml	
92-02730	B015T3	100 ml	
92-02734	B015V1	100 ml	
92-02735	B015V3	100 ml	
92-02738	B015V8	100 ml	
92-02752	B01C28	100 ml	
MS-02729	B015T1	100 ml	200 ul Sr-Y-90 #52733-117-1

SRem1.ti

Sr-90 Analysis Data Sheet

	Check if used
Procedure PNL-ALO-465 Rev.0, Sr-90:	✓
Procedure PNL-ALO-463 Rev.0, β count:	✓

Date Sr Prep Started 2-13-92 Date Completed 2-20-92

^{90}Sr-^{90}Y Spike Volume
Blanl Spike
Pipette No. 10A18 Volume 197.9 l +/- 0.3 l Date Pipetted 2-13-92
Spike ID 52733-117-1 Spike Activity 1.47X10³ dpm/ml 3-14-90

Sr Carrier - nominal volume = 2ml VS.02729 2x = 1.9968 .0088ml

Pipette No. 10A-22 Volume 998.4 l +/- 6.2 l Date Pipetted 2-13-92
Concentration of Sr carrier 20.15 mg/ml

Sample ID, Aliquot Size, and $SrCO_3$ Weights

Balance Number 510-06-01-006 Temperature (if weighing water samples) 21°

Sample ID	Diln Aliquot	2-24 ~~Diln Vol ml~~ Wt. in grams	Volume Analyzed	Tare Wt. of Dish	Gross Wt. of Dish	Net Wt. of Ppt.
92-02729		95.34	95.53 ml	.7474g	.8056g	58.2mg
Dup 02729		103.04	103.2	.7433g	.8005g	57.2mg
92-02730		100.92	101.1	.7476g	.7937g	46.1mg
92-02734		98.66	98.9	.7464g	.8104g	64.0mg
92-02735		102.66	102.9	.7341g	.7930g	58.9mg
92-02752		99.26	99.5	.7526g	.8150g	62.4mg
MS 02729		100.75	100.9	.7449g	.8023	58.2mg
BL 02729			100ml	.7511g	.7945	43.4mg
VS 02729		2-24-92	100ml	.7420g	.7959	53.9mg
BS 02729			100ml	.7474g	.7989	51.5mg

Sample Volumes (if a pipet was used for small aqueous samples)
92-02738 91.69 91.9ml .7505g .8000g 49.5mg

Used For N/A
Pipette No. _____ Volume _____ +/- _____ Date Pipetted _____

Used For N/A
Pipette No. _____ Volume _____ +/- _____ Date Pipetted _____

Sr Separation Date & Time 2-20-92 10:15

G G Bodayynski 2-24-92 J. K. Jadyn 2/25/92
Analyst Date Reviewer Date

SRDATA3.LOG

F02-003

Sr-90 Analysis Data Sheet

	Check if used
Procedure PNL-ALO-465 Rev.0, Sr-90:	✓
Procedure PNL-ALO-463 Rev.0, β count:	✓

Date Sr Prep Started 2-13-92 Date Completed 2-20-92

^{90}Sr-^{90}Y Spike Volume

Blank Spike

Pipette No. 10A18 Volume 197.9 λ +/- 0.3 λ Date Pipetted 2-13-92

Spike ID 52733-117-1 Spike Activity 1.47 x 10^3 dpm/ml 3-14-80

Sr Carrier - YS-02729 nominal volume = 2ml 998.4 λ x 2 = 1.995 ± .0092 ml

Pipette No. 10A22 Volume ~~997.5 λ +/- 6.5 λ~~ Date Pipetted 2-13-92

Concentration of Sr carrier 20.15 mg/ml

Sample ID, Aliquot Size, and $SrCO_3$ Weights

Balance Number 510-06-01-006 Temperature (if weighing water samples) 21°

Sample ID	Diln Aliquot	~~Diln Vol~~ ~~Uncertainty~~	Volume Analyzed	Tare Wt. of Dish	Gross Wt. of Dish	Net Wt. of Ppt.
92-02729		95.34	95.53 ml	.7474 g	.8056 g	58.2 mg
Dup-02729		103.04	103.2	.7433	.8005	57.2 mg
92-02730		100.92	101.1	.7476	.7937	46.1 mg
92-02734		98.66	98.9	.7464	.8104	64.0 mg
92-02735		102.66	102.9	.7341	.7930	58.9 mg
92-02752		99.26	99.5	.7526	.8150	62.4 mg
MS 02729		100.75	100.9	.7441	.8023	58.2 mg
BL 02729			100 ml	.7541	.7945	48.4 mg
YS 02729			100 ml	.7420	.7959	53.9 mg
RS 02729			100 ml	.7474	.7989	51.5 mg
92-02738		91.69	91.9 ml	~~.8000~~ .7505	.8000	49.5 mg

Sample Volumes (if a pipet was used for small aqueous samples)

Used For N/A

Pipette No. _____ Volume _____ +/- _____ Date Pipetted _____

Used For NA

Pipette No. _____ Volume _____ +/- _____ Date Pipetted _____

Sr Separation Date & Time 2-20-92 10:15

G G Brodersen 2-21-92
Analyst Date

Reviewer Date
Re-copied for better clarity. S.K. Jadhav 2/25/92

SRDATA3.LOG

F02-004

Spreadsheet for Calculating the Sr-90 Beta Activity
Yield Determination SRYIELDC 12/13/90

Calculation Date		24-Feb-92
Internal Sample ID		YS-2729
HCL Log-in Number		YS-2729
Data File Name	(SR------)	YS2729S

Spike Yield Calculation			Errors +/-	(error/measurement)^2
Volume of Sr-Y-90 spike solution	(ul)	1997 *	2.8	0.000019
Concentration of Sr-Y-90 spike at T=10/24/90 dpm/ml		1110	55	0.002455
Count date of Sr-Y-90 spike	@date(yr,mo,day)	20-Feb-92 *		
Total dpm Sr-90 added to sample		1073	53	0.049745
Sr carrier volume added to spike sample	(ul)	1995	9.2	0.000021
Concentration of Sr carrier	(mg/ml)	20.15	0.04	0.000003
Theoretical yield of SrCO3 (100%) in mg	(1)	67.73	0.34	0.005020
Actual yield of SrCO3 (precip. weight)	(mg)	53.9 *	0.2	0.000013
Time of final Sr separation	(@time(hr,min,sec))	10:15 *		
Time spiked sample count began	(@time(hr,min,sec))	15:30 *		
Total count time	(@time(hr,min,sec))	00:30 *		
Sep. time to midpoint of count time		05:30		
Total counts of spiked sample		10262 *		
Counter used for Beta count		67 *		
Background cpm for the counter		16.2 *		
Calculated net cpm: spiked sample - background cpm		323.87	3.47	
d/c of the counter (corrected for SrCO3 weight)	(2)	2.791	0.106	0.0013
Fractional yield of Sr-90 spiked sample	(3)	0.9973	0.0625	
Percent error		6.26		

G.G. Bradczynski 2-25-92
Entered by Date

A.K. Jadoff 2/25/92
Reviewed by Date

(1) Theoretical yield of SrCO3:

(ml added carrier)(conc. added carrier)(1mg/87.62mmoles Sr)(147.62mg SrCO3/mmole)

(2) d/c calculation for SrCO3 loading on counting plate

d/c = 0.01585 (mg SrCO3) + 1.9802

(3) Yield of Strontium-90 spike (YS)

$$YS = \frac{(\text{net cpm spike} - \text{net cpm spike}(1-e(-0.693 * \text{delta t}/\text{Y-90 half-life}))) * TSC * d/c}{WP * \text{dpm Sr-90}}$$

lambda Y Decay constant for Y-90 = 2.67 days or 64.08 hours

WP = Weight of SrCO3 ppt. on the dish
TSC = Theoretical SrCO3 ppt. weight for 100% yield
delta t = Interval of time between the Sr separation and the mid-point of the sample count

F02-005

1100 EM1 Strontium Analysis Spreadsheet verification

Yield

$C = C_0 e^{-\ln 2 \frac{\Delta t}{t_{1/2}}}$

$C = (1110 \pm 55 \text{ dpm/ml } ^{90}Sr\text{-}Y)\, e^{-\ln 2 \left(\frac{1.3 \text{ yr}}{28.5 \text{ yr}}\right)} \left(\frac{1\ Sr}{2\ Sr\text{-}Y}\right)$

$C = 537.7 \pm 26.6 \text{ dpm/ml } ^{90}Sr$

$(1.997 \text{ ml})(537.7 \pm 26.6 \text{ dpm/ml}) = 1073.8 \pm 53 \text{ dpm } ^{90}Sr$ total dpm ^{90}Sr

$SrCO_3$ mol. wt: $(16)3 + 12 + 87.6 = 147.6$ mg/mmole

$(20.15 \text{ mg/ml})(1.995 \text{ ml}) = 40.2 \text{ mg Sr}$

$(40.2 \text{ mg Sr})(87.6 \text{ mg/mmole})^{-1} = 0.459 \text{ mmole Sr}$

$(0.459 \text{ mmole Sr})(147.6 \text{ mg/mmole}) = 67.73 \text{ mg } SrCO_3$ theoretical 100% yield.

time: $(15:30 + :15) - (10:15) = 5:30$ Sep. time to midpoint count time

net cpm $\frac{10262c}{30 \text{ min}} - 18.2 \text{ c/m} = 323.87 \text{ c/m}$

$d/c = (1.98) + (0.0151)(53.9)$
$= 2.79$

$$\text{yield} = \frac{\left[323.87 - 323.87\left(1 - e^{(-0.693 * 5.5\%/64 \text{ hr})}\right)\right] 67.73 * 2.791}{(53.9)(1073)} = 0.997$$

S.K. Tadey 2/27/92
Reviewed J. H. Kaye 2/27/92

F02-006

Spreadsheet for Calculating the Sr-90 Beta Activity
Sample Activity Determination

Calculation Date		24-Feb-92		
Internal Sample ID		92-02729		
ACL Log-in Number		92-02729		
Data File Name	(SR------)	272958		
			Errors +/-	
Strontium yield (from spiked sample calculation)		0.9973 *	0.0625	
Sample Yield Calculation				
Sr carrier volume added to sample (ul)		1997 *	0.8	0.000019
Concentration of Sr carrier (mg/ml)		20.15	0.04	0.000003
Theoretical yield of SrCO3 (100%) in mg (1)		67.79	0.33	0.004833
Actual yield of SrCO3 (precip. weight) (mg)		56.2 *	0.2	0.000011
Time of final sample separation (@time(hr,min,sec))		10:15 *		
Time sample count began (@time(hr,min,sec))		14:45 *		
Total count time (@time(hr,min,sec))		00:30 *		
Sep. time to midpoint of count time		04:45		
Total counts of sample		16 *		
Counter used for Beta count		1 *		
Background cpm for the counter		0.606 *		
Calculated net cpm: sample - background cpm		-0.07	0.19	
d/c of the counter (2)		2.856	0.105	0.0013
Sample volume if liquid or weight if solid (ml or g		100 *	0.1	
Enter g if sample is solid, ml if liquid	ML	*		
Sr-90 activity in the sample** pCi/L or pCi/g (3)		-1.037	-2.933 pCi/L	
Percent error		282.77		
Minimum detectable activity		6.407 pCi/L		

** not corrected for Sr-89 activity

G.G. Bodaczynski 2-25-92
Entered by Date

S. L. Fadoff 2/25/92
Reviewed by Date

(1) Theoretical yield of SrCO3:

(ml added carrier)(conc. added carrier)(0.0114129mmoles Sr/mg)(147.62mg SrCO3/mmole)

(2) d/c based on SrCO3 loading on plate

d/c = 0.01505(mg SrCO3) + 1.9802

(3) Activity of Sr-90 in the sample

$$A = \frac{[\text{net cpm sample} - \text{net cpm sample}(1-e^{(-\ln 2/(\text{Y-90 half-life}) * \text{delta t})})] * \text{TSC} * d/c * \text{pCi}}{\text{WP} * \text{YS} * 2.22\text{dpm} * \text{sample weight or volume}}$$

Decay constant for Y-90 = 2.67 days or 64.08 hours
WP = Weight of SrCO3 ppt. on the dish
TSC = Theoretical SrCO3 ppt. weight for 100% yield
delta t = Interval of time between the Sr separation and the mid-point of the sample count

SRCALC 12/13/90

F02-007

1100 EM1 Strontium Analysis <u>Spreadsheet Verification</u>
<u>Activity</u>

theoretical yield:

$(1.997\ ml)(20.15\ mg/ml) = 40.24\ mg\ Sr$

$(40.24\ mg\ Sr)\left(\frac{147.6\ mg\ SrCO_3}{87.6\ mg/mole}\right) = 67.80\ mg\ SrCO_3$ ✓

time:

$(14:45 + (:30)\ 1/2) - 10:15 = 4:45$ hrs:min.

net cnts = $(^{169}/_{30m}) - 0.606/_{hr} = -0.07$ cpm

$d/t = (1.98) + (0.01505)(58.2) = 2.856$

$$\text{activity} = \frac{\left[(-0.07\ cpm - (-0.07)(1 - e^{-\ln 2\,(4.75\,hrs/64.08\,hrs)})\right] 67.79 * 2.856}{(58.2)(0.9973)(2.22\ dpm/pCi)(0.1\ L)}$$

$= -1.0\ pCi/L$

minimum detectable activity $= \frac{3\sqrt{(0.606)30}}{30} = 0.426\ c/m$

method detection limit:

$$= \frac{\left[0.426 - (0.426)(1 - e^{-\ln 2\,(4.75/64.08)})\right] 67.79 * 2.856}{(58.2)(0.9973)(2.22)(0.1)}$$

$= 61\ pCi/L$

small variations in values are due to rounding errors.

S.K. Jackoff 2/27/92
Reviewed J. H. Kaye 2/27/92

F02-008

Spreadsheet for Calculating the Sr-90 Beta Activity
Sample Activity Determination

Calculation Date		24-Feb-92			
Internal Sample ID		DUP-02729			
HCL Log-in Number		DUPLICATE			
Data File Name	(SR------)	2729DSR			
				Errors +/-	
Strontium yield (from spiked sample calculation)		0.9973	+	0.0625	
Sample Yield Calculation					
Sr carrier volume added to sample (ul)		1997	+	6.8	0.000019
Concentration of Sr carrier (mg/ml)		20.15		0.04	0.000003
Theoretical yield of SrCO3 (100%) in mg (1)		67.79		0.33	0.004833
Actual yield of SrCO3 (precip. weight) (mg)		57.2	+	0.2	0.000012
Time of final sample separation (etime(hr,min,sec))		10:15	+		
Time sample count began (etime(hr,min,sec))		14:45	+		
Total count time (etime(hr,min,sec))		00:30	+		
Sep. time to midpoint of count time		04:45			
Total counts of sample		22	+		
Counter used for Beta count		2	+		
Background cpm for the counter		0.552	+		
Calculated net cpm: sample - background cpm		0.16		0.21	
d/c of the counter	(2)	2.841		0.104	0.0013
Sample volume if liquid or weight if solid (ml or g		100	+	0.1	
Enter g if sample is solid, ml if liquid	ML		+		
Sr-90 activity in the sample** pCi/L or pCi/g (3)		2.620		3.158 pCi/L	
Percent error		120.54			
Minimum detectable activity		6.169 pCi/L			

** not corrected for Sr-89 activity

G.G. Bobczynski 2-25-92
Entered by Date

S. K. Tadey 2/25/92
Reviewed by Date

(1) Theoretical yield of SrCO3:

(ml added carrier)(conc. added carrier)(0.0114129mmoles Sr/mg)(147.62mg SrCO3/mmole)

(2) d/c based on SrCO3 loading on plate

d/c = 0.01505(mg SrCO3) + 1.9802

(3) Activity of Sr-90 in the sample

$$A = \frac{[\text{net cpm sample} - \text{net cpm sample}(1-e^{(-\ln 2/(\text{Y-90 half-life}) * \text{delta t})})] * \text{TSC} * \text{d/c} * \text{pCi}}{\text{WP} * \text{YS} * 2.22\text{dpm} * \text{sample weight or volume}}$$

Decay constant for Y-90 = 2.67 days or 64.06 hours
WP = Weight of SrCO3 ppt. on the dish
TSC = Theoretical SrCO3 ppt. weight for 100% yield
delta t = Interval of time between the Sr separation and the mid-point of the sample count

SRCALC 12/13/90

F02-009

Spreadsheet for Calculating the Sr-90 Beta Activity
Sample Activity Determination

Calculation Date		24-Feb-92		
Internal Sample ID		92-02730		
ACL Log-in Number		92-02730		
Data File Name	(SR------)	2730SR		
			Errors +/-	
Strontium yield (from spiked sample calculation)		0.9973 *	0.0025	
Sample Yield Calculation				
Sr carrier volume added to sample (ul)		1997 *	0.6	0.000019
Concentration of Sr carrier (mg/ml)		20.15	0.04	0.000003
Theoretical yield of SrCO3 (100%) in mg (1)		67.79	0.33	0.004833
Actual yield of SrCO3 (precip. weight)	(mg)	46.1 *	0.2	0.000016
Time of final sample separation (ddtime(hr,min,sec))		10:15 *		
Time sample count began	(ddtime(hr,min,sec))	14:45 *		
Total count time	(ddtime(hr,min,sec))	00:30 *		
Sep. time to midpoint of count time		04:45		
Total counts of sample		19 *		
Counter used for Beta count		3 *		
Background cpm for the counter		0.691 *		
Calculated net cpm: sample - background cpm		-0.06	0.21	
d/c of the counter	(2)	2.074	0.091	0.0012
Sample volume if liquid or weight if solid (ml or g		100 *	0.1	
Enter g if sample is solid, ml if liquid	ML	*		
Sr-90 activity in the sample** pCi/L or pCi/g (3)		-0.973	-3.737 pCi/L	
Percent error		384.10		
Minimum detectable activity		0.007 pCi/L		

** not corrected for Sr-89 activity

G.G. Bodzaynski 2-25-92
Entered by Date

S.K. Fadeff 2/25/92
Reviewed by Date

(1) Theoretical yield of SrCO3:

(ml added carrier)(conc. added carrier)(0.0114129mmoles Sr/mg)(147.63mg SrCO3/mmole)

(2) d/c based on SrCO3 loading on plate

d/c = 0.01505(mg SrCO3) + 1.9802

(3) Activity of Sr-90 in the sample

$$A = \frac{[\text{net cpm sample} - \text{net cpm sample}(1-e^{(-\ln 2/(Y\text{-}90\ \text{half-life}) * \text{delta t})})] * TSC * d/c * pCi}{WP * YS * 2.22dpm * \text{sample weight or volume}}$$

Decay constant for Y-90 = 2.67 days or 64.00 hours
WP = Weight of SrCO3 ppt. on the dish
TSC = Theoretical SrCO3 ppt. weight for 100% yield
delta t = Interval of time between the Sr separation and the mid-point of the sample count

SRCALC 12/13/90

F02-010

Spreadsheet for Calculating the Sr-90 Beta Activity
Sample Activity Determination

Calculation Date		24-Feb-92		
Internal Sample ID		92-02734		
HCL Log-in Number		92-02734		
Data File Name	(SR------)	27345R		
			Errors +/-	
Strontium yield (from spiked sample calculation)		0.9973 *	0.0625	
Sample Yield Calculation				
Sr carrier volume added to sample (ul)		1997 *	5.0	0.000019
Concentration of Sr carrier (mg/ml)		20.15	0.04	0.000003
Theoretical yield of SrCO3 (100%) in mg (1)		67.79	0.33	0.004833
Actual yield of SrCO3 (precip. weight)	(mg)	64.0 *	0.2	0.000009
Time of final sample separation (etime(hr,min,sec))		10:15 *		
Time sample count began	(etime(hr,min,sec))	15:16 *		
Total count time	(etime(hr,min,sec))	00:30 *		
Sep. time to midpoint of count time		05:16		
Total counts of sample		20 *		
Counter used for Beta count		1 *		
Background cpm for the counter		0.606 *		
Calculated net cpm: sample - background cpm		0.06	0.21	
d/c of the counter	(2)	2.943	0.112	0.0014
Sample volume if liquid or weight if solid (ml or g		100 *	0.1	
Enter g if sample is solid, ml if liquid	ML	*		
Sr-90 activity in the sample** pCi/L or pCi/g (3)		0.007	2.906 pCi/L	
Percent error		350.03		
Minimum detectable activity		6.005 pCi/L		

** not corrected for Sr-89 activity

G.G. Bradzynski 2-25-92
Entered by Date

S.K. Fadey 2/25/92
Reviewed by Date

(1) Theoretical yield of SrCO3:

(ml added carrier)(conc. added carrier)(0.0114129mmoles Sr/mg)(147.62mg SrCO3/mmole)

(2) d/c based on SrCO3 loading on plate

d/c = 0.01505(mg SrCO3) + 1.9802

(3) Activity of Sr-90 in the sample

$$A = \frac{(\text{net cpm sample} - \text{net cpm sample}(1-e^{(-\ln 2/(\text{Y-90 half-life}) * \text{delta t})})) * TSC * d/c * pCi}{WP * YS * 2.22dpm * \text{sample weight or volume}}$$

Decay constant for Y-90 = 2.67 days or 64.08 hours
WP = Weight of SrCO3 ppt. on the dish
TSC = Theoretical SrCO3 ppt. weight for 100% yield
delta t = Interval of time between the Sr separation and the mid-point of the sample count

SRCALC 12/13/90

F02-011

Spreadsheet for Calculating the Sr-90 Beta Activity
Sample Activity Determination

Calculation Date		24-Feb-92		
Internal Sample ID		92-02735		
HCL Log-in Number		92-02735		
Data File Name	(SR------)	273556		
			Errors +/-	
Strontium yield (from spiked sample calculation)		0.9973 *	0.0625	
Sample Yield Calculation				
Sr carrier volume added to sample (ul)		1997 *	0.8	0.000019
Concentration of Sr carrier (mg/ml)		20.15	0.04	0.000003
Theoretical yield of SrCO3 (100%) in mg (1)		67.79	0.33	0.004833
Actual yield of SrCO3 (precip. weight)	(mg)	58.9 *	0.2	0.000011
Time of final sample separation (ëtime(hr,min,sec))		10:15 *		
Time sample count began	(ëtime(hr,min,sec))	15:16 *		
Total count time	(ëtime(hr,min,sec))	00:30 *		
Sep. time to midpoint of count time		05:16		
Total counts of sample		18 *		
Counter used for Beta count		2 *		
Background cpm for the counter		0.552 *		
Calculated net cpm: sample - background cpm		0.85	0.20	
d/c of the counter	(2)	2.667	0.106	0.0014
Sample volume if liquid or weight if solid (ml or g		100 *	0.1	
Enter g if sample is solid, ml if liquid	ML	*		
Sr-90 activity in the sample** pCi/L or pCi/g (3)		0.676	2.925 pCi/L	
Percent error		432.90		
Minimum detectable activity		6.065 pCi/L		

** not corrected for Sr-89 activity

G.G. Bradayyoshi 2-25-92
Entered by Date

S.K. Fadyff 2/25/92
Reviewed by Date

(1) Theoretical yield of SrCO3:

(ml added carrier)(conc. added carrier)(0.0114129moles Sr/mg)(147.62mg SrCO3/mmole)

(2) d/c based on SrCO3 loading on plate

d/c = 0.01505(mg SrCO3) + 1.9882

(3) Activity of Sr-90 in the sample

$$A = \frac{[\text{net cpm sample} - \text{net cpm sample}(1-e^{(-\ln 2/(Y\text{-}90\ \text{half-life})} * \text{delta t}))] * TSC * d/c * pCi}{WP * tS * 2.22dpm * \text{sample weight or volume}}$$

Decay constant for Y-90 = 2.67 days or 64.08 hours
WP = Weight of SrCO3 ppt. on the dish
TSC = Theoretical SrCO3 ppt. weight for 100% yield
delta t = Interval of time between the Sr separation and the mid-point of the sample count

SRCALC 12/13/90

F02-012

Spreadsheet for Calculating the Sr-90 Beta Activity
Sample Activity Determination

Calculation Date		24-Feb-92		
Internal Sample ID		92-02738		
ACL Log-in Number		92-02738		
Data File Name	(SR------)	27385R		
			Errors +/-	
Strontium yield (from spiked sample calculation)		0.9973 +	0.0025	
Sample Yield Calculation				
Sr carrier volume added to sample (ul)		1997 +	6.0	0.000019
Concentration of Sr carrier (mg/ml)		20.15	0.24	0.000003
Theoretical yield of SrCO3 (100%) in mg (1)		67.79	0.33	0.004833
Actual yield of SrCO3 (precip. weight)	(mg)	49.5 +	0.2	0.000016
Time of final sample separation (etime(hr,min,sec))		10:15 +		
Time sample count began	(etime(hr,min,sec))	15:16 +		
Total count time	(etime(hr,min,sec))	00:30 +		
Sep. time to midpoint of count time		05:16		
Total counts of sample		21 +		
Counter used for Beta count		3 +		
Background cpm for the counter		0.691 +		
Calculated net cpm: sample - background cpm		0.01	0.22	
d/c of the counter	(2)	2.725	0.095	0.0012
Sample volume if liquid or weight if solid (ml or g		100 +	0.1	
Enter g if sample is solid, ml if liquid	ML	+		
Sr-90 activity in the sample** pCi/L or pCi/g (3)		0.143	3.636 pCi/L	
Percent error		2536.70		
Minimum detectable activity		7.675 pCi/L		

** not corrected for Sr-89 activity

G G Bodaczynski 2-28-92
Entered by Date

S. L. Tadey 2/25/92
Reviewed by Date

(1) Theoretical yield of SrCO3:

(ml added carrier)(conc. added carrier)(0.0114129mmoles Sr/mg)(147.62mg SrCO3/mmole)

(2) d/c based on SrCO3 loading on plate

d/c = 0.01505(mg SrCO3) + 1.9802

(3) Activity of Sr-90 in the sample

$$A = \frac{[\text{net cpm sample} - \text{net cpm sample}(1-e^{\wedge}(-\ln 2/(\text{Y-90 half-life}) * \text{delta t}))] * \text{TSC} * \text{d/c} * \text{pCi}}{\text{WP} * \text{YS} * 2.22\text{dpm} * \text{sample weight or volume}}$$

Decay constant for Y-90 = 2.67 days or 64.08 hours
WP = Weight of SrCO3 ppt. on the dish
TSC = Theoretical SrCO3 ppt. weight for 100% yield
delta t = Interval of time between the Sr separation and the mid-point of the sample count

SRCALC 12/13/90

F02-015

Spreadsheet for Calculating the Sr-90 Beta Activity
Sample Activity Determination

Calculation Date		24-Feb-92		
Internal Sample ID		92-02752		
ACL Log-in Number		92-02752		
Data File Name	(SR------)	2752SR		
			Errors +/-	
Strontium yield (from spiked sample calculation)		0.9973 *	0.0025	
Sample Yield Calculation				
Sr carrier volume added to sample (ul)		1997 *	8.8	0.000019
Concentration of Sr carrier (mg/ml)		20.15	0.04	0.000003
Theoretical yield of SrCO3 (100%) in mg (1)		67.79	0.33	0.004833
Actual yield of SrCO3 (precip. weight)	(mg)	62.4 *	0.2	0.000010
Time of final sample separation	(@time(hr,min,sec))	10:15 *		
Time sample count began	(@time(hr,min,sec))	15:50 *		
Total count time	(@time(hr,min,sec))	00:30 *		
Sep. time to midpoint of count time		05:50		
Total counts of sample		11 *		
Counter used for Beta count		2 *		
Background cpm for the counter		0.552 *		
Calculated net cpm: sample - background cpm		-0.19	0.17	
d/c of the counter	(2)	2.919	0.110	0.0014
Sample volume if liquid or weight if solid (ml or g		100 *	0.1	
Enter g if sample is solid, ml if liquid	ML	*		
Sr-90 activity in the sample** pCi/L or pCi/g (3)		-2.493	-2.518 pCi/L	
Percent error		101.02		
Minimum detectable activity		5.830 pCi/L		

** not corrected for Sr-89 activity

G G Bradaczynski 2-25-92
Entered by Date

S. K. Fadeff 2/25/92
Reviewed by Date

(1) Theoretical yield of SrCO3:

(ml added carrier)(conc. added carrier)(0.0114129mmoles Sr/mg)(147.62mg SrCO3/mmole)

(2) d/c based on SrCO3 loading on plate

d/c = 0.01505(mg SrCO3) + 1.9002

(3) Activity of Sr-90 in the sample

$$A = \frac{[\text{net cpm sample} - \text{net cpm sample}(1-e^{(-\ln 2/(\text{Y-90 half-life}) * \text{delta t})})] * TSC * d/c * pCi}{WP * YS * 2.22dpm * \text{sample weight or volume}}$$

Decay constant for Y-90 = 2.67 days or 64.06 hours
WP = Weight of SrCO3 ppt. on the dish
TSC = Theoretical SrCO3 ppt. weight for 100% yield
delta t = Interval of time between the Sr separation and the mid-point of the sample count

SRCALC 12/13/90

F02-014

Spreadsheet for Calculating the Sr-90 Beta Activity
Sample Activity Determination

Calculation Date		24-Feb-92		
Internal Sample ID		BL-02729		
ACL Log-in Number		BLANK		
Data File Name	(SR------)	BL27295		
			Errors +/-	
Strontium yield (from spiked sample calculation)		0.9973 +	0.2625	
Sample Yield Calculation				
Sr carrier volume added to sample (ul)		1997 +	0.0	0.000019
Concentration of Sr carrier (mg/ml)		20.15	0.04	0.000003
Theoretical yield of SrCO3 (100%) in mg (1)		67.79	0.33	0.004833
Actual yield of SrCO3 (precip. weight) (mg)		43.4 +	0.2	0.000021
Time of final sample separation	(@time(hr,min,sec))	10:15 +		
Time sample count began	(@time(hr,min,sec))	15:50 +		
Total count time	(@time(hr,min,sec))	00:30 +		
Sep. time to midpoint of count time		05:50		
Total counts of sample		18 +		
Counter used for Beta count		1 +		
Background cpm for the counter		0.006 +		
Calculated net cpm: sample - background cpm		-0.01	0.20	
d/c of the counter	(2)	2.033	0.008	0.0011
Sample volume if liquid or weight if solid (ml or g		100 +	0.1	
Enter g if sample is solid, ml if liquid	ML	+		
Sr-90 activity in the sample** pCi/L or pCi/g (3)		-0.105	-3.732 pCi/L	
Percent error		3565.96		
Minimum detectable activity		7.922 pCi/L		

** not corrected for Sr-89 activity

G.G. Brodzinski 2-25-92
Entered by Date

S. K. Fadeff 2/25/92
Reviewed by Date

(1) Theoretical yield of SrCO3:

(ml added carrier)(conc. added carrier)(0.0114129moles Sr/mg)(147.62mg SrCO3/mmole)

(2) d/c based on SrCO3 loading on plate

d/c = 0.01505(mg SrCO3) + 1.9802

(3) Activity of Sr-90 in the sample

$$A = \frac{[\text{net cpm sample} - \text{net cpm sample}(1-e^{(-\ln 2/(Y\text{-}90\ \text{half-life}) * \text{delta t})})] * TSC * d/c * pCi}{WP * YS * 2.22dpm * \text{sample weight or volume}}$$

Decay constant for Y-90 = 2.67 days or 64.08 hours
WP = Weight of SrCO3 ppt. on the dish
TSC = Theoretical SrCO3 ppt. weight for 100% yield
delta t = Interval of time between the Sr separation and the mid-point of the sample count

SRCALC 12/13/90

F02-015

Spreadsheet for Calculating the Sr-90 Beta Activity
Sample Activity Determination

Calculation Date		24-Feb-92	
Internal Sample ID		BS-2729	
ACL Log-in Number		BLANK SPIKE	
Data File Name	(SR------)	BS27298	
			Errors +/-
Strontium yield (from spiked sample calculation)		0.9973 *	0.0625
Sample Yield Calculation			
Sr carrier volume added to sample (ul)		1997 *	6.6 0.000019
Concentration of Sr carrier (mg/ml)		20.15	0.04 0.000003
Theoretical yield of SrCO3 (100%) in mg (1)		67.79	0.33 0.004833
Actual yield of SrCO3 (precip. weight)	(mg)	51.5 *	0.2 0.000015
Time of final sample separation	(@time(hr,min,sec))	10:15 *	
Time sample count began	(@time(hr,min,sec))	15:30 *	
Total count time	(@time(hr,min,sec))	00:30 *	
Sep. time to midpoint of count time		05:30	
Total counts of sample		1424 *	
Counter used for beta count		66 *	
Background cpm for the counter		15.900 *	
Calculated net cpm: sample - background cpm		31.57	1.45
d/c of the counter	(2)	2.755	0.397 0.0012
Sample volume if liquid or weight if solid (ml or g		100 *	0.1
Enter g if sample is solid, ml if liquid	ML	*	
Sr-90 activity in the sample** pCi/L or pCi/g (3)		487.265	42.485 pCi/L
Percent error		8.72	
Minimum detectable activity		NA	pCi/L

** not corrected for Sr-89 activity

G.G. Bodayapati 2-25-92
Entered by Date

S.K. Fadyas 2/25/92
Reviewed by Date

(1) Theoretical yield of SrCO3:

(ml added carrier)(conc. added carrier)(0.0114129mmoles Sr/mg)(147.62mg SrCO3/mmole)

(2) d/c based on SrCO3 loading on plate

d/c = 0.01505(mg SrCO3) + 1.9802

(3) Activity of Sr-90 in the sample

$$A = \frac{[\text{net cpm sample} - \text{net cpm sample}(1-e^{(-\ln 2/(Y\text{-}90\ \text{half-life})} * \text{delta t}))] * TSC * d/c * pCi}{WP * YS * 2.22dpm * \text{sample weight or volume}}$$

Decay constant for Y-90 = 2.67 days or 64.08 hours
WP = Weight of SrCO3 ppt. on the dish
TSC = Theoretical SrCO3 ppt. weight for 100% yield
delta t = Interval of time between the Sr separation and the mid-point of the sample count

SRCALC 12/13/90

F02-016

1100 EM 1 Strontium Analysis

Duplicate / Precision could not be calculated because samples were non-detects.

Blank spike
on 2/20/92, ^{90}Sr-Y conc. = 1075 +/- 53 dpm/ml

$$\frac{(0.1979 \pm 0.0003\ ml)(1075 \pm 53\ dpm/ml)(\frac{1}{2}\ Sr/Sr\text{-}Y)}{(0.1\ L)(2.22\ dpm/pCi)} = 479^{+/-24}\ pCi/L\ ^{90}Sr$$

$$\frac{487 \pm 9}{479 \pm 24} \times 100 = \underline{102\ \%\ \text{recovered}}$$

Matrix spike (same volume used)

$$\frac{502 \pm 9}{479 \pm 24} \times 100 = \underline{105\ \%\ \text{recovered}}$$

S. K. Fadeff 2/25/92

Estimate of precision
Treat matrix and blank spikes as duplicate matrix spikes.

$$\frac{502 - 487}{(502 + 487)\frac{1}{2}} \times 100 = 3\ \%$$

S. K. Fadeff 2/26/92

Reviewed J. H. Kaye 2/27/92

F02-017

Spreadsheet for Calculating the Sr-90 Beta Activity
Sample Activity Determination

Calculation Date		24-Feb-92		
Internal Sample ID		MS-2729		
ACL Log-in Number		MATRIX SPIKE		
Data File Name	(SR------)	MS27295		
			Errors +/-	
Strontium yield (from spiked sample calculation)		0.7973 *	0.0025	
Sample Yield Calculation				
Sr carrier volume added to sample (ul)		1997 *	6.8	0.000019
Concentration of Sr carrier (mg/ml)		20.15	0.04	0.000003
Theoretical yield of SrCO3 (100%) in mg (1)		67.79	0.33	0.004833
Actual yield of SrCO3 (precip. weight)	(mg)	58.2 *	0.2	0.000011
Time of final sample separation	(etime(hr,min,sec))	10:15 *		
Time sample count began	(etime(hr,min,sec))	15:30 *		
Total count time	(etime(hr,min,sec))	00:30 *		
Sep. time to midpoint of count time		05:30		
Total counts of sample		1526 *		
Counter used for Beta count		68 *		
Background cpm for the counter		15.400 *		
Calculated net cpm: sample - background cpm		35.47	1.49	
d/c of the counter	(2)	2.856	0.105	0.0013
Sample volume if liquid or weight if solid (ml or g		100 *	0.1	
Enter g if sample is solid, ml if liquid	ML	*		
Sr-90 activity in the sample** pCi/L or pCi/g (3)		502.170	42.896 pCi/L	
Percent error		8.54		
Minimum detectable activity		NA pCi/L		

** not corrected for Sr-89 activity

B.G. Bradzynski 2-25-92
Entered by Date

A.L. Fadyg 2/25/92
Reviewed by Date

(1) Theoretical yield of SrCO3:

(ml added carrier)(conc. added carrier)(0.0114129mmoles Sr/mg)(147.62mg SrCO3/mmole)

(2) d/c based on SrCO3 loading on plate

d/c = 0.01505(mg SrCO3) + 1.9802

(3) Activity of Sr-90 in the sample

$$A = \frac{[\text{net cpm sample} - \text{net cpm sample}(1-e^{(-\ln 2/(\text{Y-90 half-life}) * \text{delta t})})] * TSC * d/c * pCi}{WP * YS * 2.22dpm * \text{sample weight or volume}}$$

Decay constant for Y-90 = 2.67 days or 64.08 hours
WP = Weight of SrCO3 ppt. on the dish
TSC = Theoretical SrCO3 ppt. weight for 100% yield
delta t = Interval of time between the Sr separation and the mid-point of the sample count

SRCALC 12/13/90

F02-018

Battelle
Pacific Northwest Laboratories

BETA COUNTING DATA

REQUESTED BY

REMARKS

DATE ANALYZED: 2-20-92

SAMPLE TYPE: 90 Sr

CHARGE CODE

1100 BPI sep time 10:15

MITE # 1-3 refer to lo beta 1-3 detectors.

DESIGNATION	SAMPLE	SAMPLED DATE - TIME	CARRIER (M L)	PROCESS	WT.-VOL. ANALYZED	WT. RESIDUE	ANALYST	MITE #	SHELF	DATE - TIME COUNTED	COUNTS	MINUTES	BKG. C/M	BKG. CORR. C M	TECHNICIAN	CALCULATIONS (C/M) (VOLUME FACTOR)	RESULTS UNITS OF µC/
92-02729				Sr			58.2 gr		1	2-20-92 1445	14	30	.606				
Dup 02729							57.2		2		22		.552				
92-02730							46.1		3		19		.681				
92-02734			N/A				64.0		1	2-20-92 15:16	20	30	.606				
92-02735						N/A	57.9		2		18		.552				
92-02738							49.5		3		21		.691				
BL 02729							43.4		1	2-20-92 1550	18	30	.606				
92-2752							62.4		2		11		.552				
NA																	
NA																	
BS 2729				Sr			51.5 gr	66	1	2-20-92 15:30	1424	30	15.9	15.9 gr			
YS 2729							53.9	67	1		10262		18.2				
MS 2729							58.2	68	1		1526		5.4				

2-21-92 G G Brodzczynski 2-21-92

Reviewed S. K. Fadeff 2/25/92

BD-1700-049 (12-71)

No. 1281

F02-019

1100-EM-1 GROUNDWATER CHARACTERIZATION
PHASE I

DATA PACKAGE/REPORT No. 1

Revision 0

APPENDIX G

TRITIUM ANALYSIS

Table of Contents

G01 - Summary Results
G02 - Raw Data

See Appendix B: Radiochemistry Standards and Controls for additional supporting documentation.

Battelle
Pacific Northwest Laboratories

Project Number 19432

Internal Distribution

File/LB

Date March 31, 1992

To Bruce Prentice

From J. H. Kaye J. H. Kaye

Subject TRITIUM RESULTS FOR 1100-EM-1 WATER SAMPLES

Eighteen groundwater samples and their corresponding QC samples were prepared and analyzed according to procedures PNL-ALO-441, Radionuclide Separation and Analysis Procedure for Tritium, and PNL-ALO-443, Liquid Scintillation Counting Procedure for Tritium. The sample preparation, distillation and counting were performed in building 329 in the 300 Area.

A nominal 50-ml volume of each groundwater sample was analyzed. A raw water sample spiked with tritium was not analyzed for determination of the batch recovery factor, F_w. The procedure does not require it be run. This factor, F_w should be 100% based on the principle of the technique. In the calculation phase, the recovery correction factor, F_w is assumed to be 100%. The recovery of the spike added to the blank was 89 percent, and that of the matrix spike was 74 percent. The latter is 1 percent lower than the target accuracy of ±25 percent. It is unknown why the matrix spike recovery was so low. Effort is currently underway to improve our application of this procedure for this and other matrix types, and thus improve our matrix spike recoveries.

Because the duplicate sample activity was below the method detection limit, the precision could not be calculated for this batch. However, a precision estimate can be obtained from the results for the matrix spike and the blank spike, which yields a relative percent difference of 18 percent. This is within the target value of ±25 percent. The method detection limit calculation is based on the blank count rate. For this method two blank count rates were taken, one in the first LSC tritium run and again in the re-count. From this data, two detection limits were calculated: 440 pCi/L and 450 pCi/L. For this analysis run and for simplicity, the method detection limit is considered to be 450 pCi/L.

Procedure PNL-ALO-441 calls for counting duplicate aliquots of each sample after distillation. The second aliquot of samples B01BW8 and B015V1 gave what appears to be erroneously high count rates. This is probably due to improper positioning of the scintillation vial in the counting chamber by the automatic sample changer. (This situation has occurred previously.) Therefore, these samples and their duplicate aliquots as well as the blank spike, matrix spike, and water standard samples were recounted. The recounts of the two samples and their corresponding duplicates showed good agreement.

Sample B01BW5 showed a positive result. This sample was re-counted (with the set described above) to confirm the positive value. The average activity based on the two count rates is 4950 ± 120 pCi/L. Sample B01BX1 also gave a

E54-1900-001 (10/89)

positive value (1160±140 pCi/L). At the time of the analysis the counting rate was only slightly above the detector background and was not immediately recognizable as being a positive result; therefore, this sample was not automatically recounted. The tritium levels in the remaining samples are at or below the MDA.

The detection limit for the method is estimated to be 450 pCi/L. Obtained values are reported for each sample even though they are below this detection limit. They are bracketed as a reminder that no quantitative information should be construed from them. They are provided as a courtesy in case the values are to be used in any statistical treatments.

File - T1100EM1.NAR

TRITIUM ANALYSIS RESULTS FOR 1100-EM-1 WATER SAMPLES

ENTERED BY [illegible] DATE 3/31/92

REVIEWER J H Kaye DATE 3/31/92

Client Sample No.	ALO Sample No.	Tritium (pCi/L)	+/- 1 sigma*	Rel. Pct. Difference	Pct. Spike Recovery
B015S9	92-2728	[100]	130		
B015T1	92-2729	[120]	130		
B015T3	92-2730	[190]	130		
B015T5	92-2731	[-40]	130		
B015T7	92-2732	[-90]	130		
B015T9	92-2733	[-10]	130		
B015V1	92-2734	[90]	130		
B015V3	92-2735	[120]	130		
B015V8	92-2738	[130]	130		
B01BV6	92-2744	[-50]	130		
B01BV9	92-2745	[170]	130		
B01BV9	92-2745-D	[310]	130		
B01BV9	92-2745-MS	32720	420		74
B01BV9	92-2745-MS rc	32680	420		
	Blank spike**	39290	480	18	89
	Blank spike** rc	39390	480		
	Blank**	[300]	130		
B01BW2	92-2746	[240]	130		
B01BW5	92-2747	5100	170		
B01BW5	92-2747 rc	4800	170		
B01BW8	92-2748	[100]	130		
B01BX1	92-2749	1160	140		
B01C38	92-2750	450	130		
B01C11	92-2751	[380]	130		
B01C28	92-2752	[350]	130		

D = duplicate
MS = matrix spike
rc = recount
The method detection limit is estimated to be 450 pCi/L. The obtained values below the detection limit, provided in brackets, are presented for statistical purposes only. The error associated with them is very large relative to the obtained value.

* One sigma uncertainties are based on propagation of mass, volume, and counting uncertainties.
** Blank and Blank Spike - used Milli-Q water

QUALITY CONTROL DATA REVIEW

Project/Work Package: 19432/M82776

Project/WP Title: 1100-EM-1 Groundwater Characterization

Requested Analysis: Tritium

ALO Sample Numbers: 92-02728 - 92-02735, 92-02738, 92-02744 - 92-02752

I have reviewed the data specified above for completeness and compliance with project requirements.

J L Daniel
J. Leland Daniel
Data Quality Officer
Analytical Chemistry Laboratory

4/1/92
Date

Battelle
Pacific Northwest Laboratories

Project Number 19432

Internal Distribution

B. Prentice
1100-EM-1 File
File/LB

Date February 4, 1992

To Nancy Wynhoff

From Sandy Fadeff

Subject Tritium Analysis on 1100-EM-1 Samples

The tritium analysis procedure, PNL-ALO-441, Radionuclide Separation and Analysis Procedure for Tritium, may be confusing with regard to section 4.4.1 and F_w, the recovery correction factor (section 6.2). This memo is intended to clarify any confusion.

Neither the proposal nor the ARF requires the need of a recovery correction factor. In the past this factor has been determined to be about 95%. It is believed this factor will add another measure of uncertianty to the final results. The recovery (or accuracy) of the method will be determined based on the results of the matrix spikes and blank spikes. For purposes of calculations (section 6.4), the F_w factor will be considered 100%.

E54-1900-001 (10/89)

G02-002

Prepare the following samples, duplicate, blank spike, matrix spike and blank according to the procedure PNL-ALO-441, Rev.0. Be sure to measure the aliquot of water for BS-2745 and MS-2745, since this is needed to calculate recovery of the tritium spike.

Sample ID	Type	Volume	Spike Soln.	Spike Vol.
92-2728	water	50 ml	-	
92-2729	water	50 ml	-	
92-2730	water	50 ml	-	
92-2731	water	50 ml	-	
92-2732	water	50 ml	-	
92-2733	water	50 ml	-	
92-2734	water	50 ml	-	
92-2735	water	50 ml	-	
92-2738	water	50 ml	-	
92-2744	water	50 ml	-	
92-2745	water	50 ml	-	
92-2745D	water	50 ml	-	
MS-2745	water	50 ml	#52733-109-100	500ul
BS-2745	MilliQ H_2O	50 ml	#52733-109-100	500ul
BL-2745	MilliQ H_2O	50 ml	-	
92-2746	water	50 ml	-	
92-2747	water	50 ml	-	
92-2748	water	50 ml	-	
92-2749	water	50 ml	-	
92-2750	water	50 ml	-	
92-2751	water	50 ml	-	
92-2752	water	50 ml	-	

Double-distill each sample.

Prepare duplicate aliquots of each distillate and count them per PNL-ALO-443, Rev.0.

Also prepare and count the following as required by PNL-ALO-441, Rev. 0:

Distilled Water Standards (for d/c) and Blanks (for bkgd): These are pipetted only and not distilled. (See Exhibit 2, page 1 of PNL-ALO-441):

2 4ml blanks pipetted from stock of distilled deep well water
Distilled deep well water with 50ul of tritium spike #52733-109-1
Distilled deep well water with 100ul of tritium spike #52733-109-1

Since no raw water std has been requested to determine a recovery correction factor, F_w, calculate assuming F_w = 100%.

H31100EM.INS

TRITIUM ANALYSIS LOG SHEET

Pipet No.	Nominal Vol.	Calibrated Vol. + Error	Date Pipetted
4A-5	50 lambda	0.0493 ± 0.0003 ml	2-7-92
4A-6	100 lambda	0.0990 ± 0.0001 ml	2-7-92
4A-13	4 ml	3.9223 ± 0.0062 ml	2-7-92
4A-10	500 lambda	0.5002 ± 0.0028 ml	2-7-92

See LRB54370 p. 16,17 for calibrations and check wts.

COUNTING ALIQUOTS FOR ALL SAMPLES:

Sample No: 92-2728
Nominal Vol: 4ml

Sample No: 92-2729
Nominal Vol: 4ml

Sample No: 92-2730
Nominal Vol: 4ml

Sample No: 92-2731
Nominal Vol: 4ml

Sample No: 92-2732
Nominal Vol: 4ml

Sample No: 92-2733
Nominal Vol: 4ml

Sample No: 92-2734
Nominal Vol: 4ml

Sample No: 92-2735
Nominal Vol: 4ml

Sample No: 92-2738
Nominal Vol: 4ml

Sample No: 92-2744
Nominal Vol: 4ml

Sample No: 92-2745
Nominal Vol: 4ml

Sample No: 92-2745D
Nominal Vol: 4ml

Sample No: MS-2745
*Vol. to distill 48.1990 ± 0.0472 ml
Spike ID: 82733-109-100
Nominal Spike Vol: 500λ
Nominal Vol: 4ml

Sample No: BS-2745
*Vol. to distill 48.1990 ± 0.0472 ml
Spike ID: 82733-109-100
Nominal Spike Vol: 500λ
Nominal Vol: 4ml

Sample No: BL-2745
Nominal Vol: 4ml

Sample No: 92-2746
Nominal Vol: 4ml

* 4A-14 9.6398 ± 0.02112 ml (5X) for MS & BS vol. to distill.
2-6-92

Sample No: 92-2747
Nominal Vol: 4ml

Sample No: 92-2748
Nominal Vol: 4ml

Sample No: 92-2749
Nominal Vol: 4ml

Sample No: 92-2750
Nominal Vol: 4ml

Sample No: 92-2751
Nominal Vol: 4ml

Sample No: 92-2752
Nominal Vol: 4ml

Blanks (Bkgds): Nominal Volume, each 4ml

Distilled Water Stds: Spike i.d. 52733-109-1

Std #1 nominal vol. 50λ Std #2 nominal volume 100λ

Diana L. McMullin 2-7-92
Analyst's Signature Date

J. H. Kaya 2/29/92
Reviewer's Signature Date

H31100EM.LOG

1100 EM1 · 34

Battelle
Pacific Northwest Laboratories

3000 TRI CARB

(1)

MATRIX:
- [ ] 16-2 BIO
- [ ] 16-2 RAO
- [ ] 21-4 RAO
- [ ] OTHER _____

COUNTING DATE(S): 2-7-92 → 2-11-92

ISOTOPE(S): ^3H

TIME BASE SELECTOR SWITCH:
- [ ] .01 MIN.
- [ ] .1 SEC.

OPERATOR'S INITIALS: DRM

ON 15:00 OFF _____

CONTROL SETTINGS:

HV _____

GAIN:

RED _____ GREEN _____

WINDOW SETTINGS:

RED _____ GREEN _____

WINDOW WIDTH:

A _____ B _____

C _____ D _____

EXT. STD.:
- [ ] ON
- [ ] OFF

POS.	SAMPLE DESIGNATION	SAMPLE ALIQUOT	DATE-TIME SAMPLED	LOG. NO.	DATE-TIME RECEIVED	REMARKS
241	Beckman BD002811					
242	Beckman HD0608					
243	Blk 1					
244	Blk 2					
245	50λ Spk					
246	100λ spk					
247	92-2728 A					
248	" B					
249	92-2729 A					
250	" B					
251	92-2730 A					
252	" B					
253	92-2731 A					
254	" B					
255	92-2732 A					
256	" B					
257	92-2733 A					
258	" B					
259	92-2734 A					
260	" B					scu pect
261	92-2735 A					
262	" B					
263	92-2738 A					
264	" B					
265	92-2744 A					
266	" B					
267	92-2745 A					
268	" B					

BD-1700-124 (11-71)

Diana L. McMullin 2-18-92

Reviewed J H Page 2/20/92

G02-007

1100 EM 3H (cont.) 2-7-92 to 2-11-92

Battelle
Pacific Northwest Laboratories

3000 TRI CARB

(2)

MATRIX:
- [ ] 16-2 BIO
- [ ] 16-2 RAD
- [ ] 21-4 RAD
- [ ] OTHER _____

CONTROL SETTINGS:
HV _____
GAIN:
RED _____ GREEN _____
WINDOW SETTINGS:
RED _____ GREEN _____
WINDOW WIDTH:
A _____ B _____
C _____ D _____
EXT. STD.:
- [ ] ON
- [ ] OFF

COUNTING DATE(S)

ISOTOPE(S)

TIME BASE SELECTOR SWITCH:
- [ ] .01 MIN.
- [ ] .1 SEC.

OPERATOR'S INITIALS:
ON _____ OFF _____

POS.	SAMPLE DESIGNATION	SAMPLE ALIQUOT	DATE-TIME SAMPLED	LOG. NO.	DATE-TIME RECEIVED	REMARKS
269	92-2745 D A					
270	" B					
271	MS-2745 A					
272	" B					
273	BL-2745 A					
274	" B					
275	BS-2745 A					
276	" B					
277	92-2746 A					
278	" B					
279	92-2747 A					
280	1 B					
281	92-2748 A					
282	" B					suspect
283	92-2749 A					
284	" B					
285	92-2750 A					
286	" B					
287	92-2751 A					
288	" B					
289	92-2752 A					
290	" B					
291	Smear					

BD-1700-124 (11-71)

Disina L. McMullin 2-18-92
Reviewed J. H. Kaye 2/29/92

G02-008

1100 EM 1 Recount

Battelle
Pacific Northwest Laboratories

3000 TRI CARB

MATRIX:
- [ ] 16-2 BIO
- [ ] 16-2 RAO
- [ ] 21-4 RAO
- [ ] OTHER _____

COUNTING DATE(S): 2-12-92 to 2-13-92

ISOTOPE(S): ^3H

TIME BASE SELECTOR SWITCH:
- [ ] .01 MIN.
- [ ] .1 SEC.

OPERATOR'S INITIALS: BZM

ON 2:03 2-12-92 OFF _____

CONTROL SETTINGS:
HV _____

GAIN:
RED _____ GREEN _____

WINDOW SETTINGS:
RED _____ GREEN _____

WINDOW WIDTH:
A _____ B _____
C _____ D _____

EXT. STD.:
- [ ] ON
- [ ] OFF

POS.	SAMPLE DESIGNATION	SAMPLE ALIQUOT	DATE-TIME SAMPLED	LOG. NO.	DATE-TIME RECEIVED	REMARKS
292	BD02811					
293	HD00608					
294	BLK 1					
295	BLK 2					
296	92-2734 A					
297	⊥ B					
298	92-2748 A					
299	⊥ B					
1	92-2747 A					
2	⊥ B					
3	50 λ Spk					
4	100 λ Spk					
5	BS-2745 A					
6	⊥ B					
7	MS-2745 A					
8	⊥ B					

BD-1700-124 (11-71)

Dana L. McMullin 2-18-92
Reviewed J. H. Kaye 2/24/92

G02-009

2-10-92 - Suspect data (@ 82) 92-2748B did not
Diana L. McMullin lower into the chamber yet had a high
count rate of 502 cpm. 92-2748A had a
more count rate of 12 cpm (bkg).

Reviewed 2/29/92 J. H. Kaye

00278

PROG 1 USER 1

CNT CH 12 1 TIMES
CSS 1 TIMES
SCR =2/1
AQC =NO
RCM =NO
CALC= 1
PST = 100.00 MIN
QCF = 0 H#
CH 1 1.00 2 SIGMA %
.0 LSR
.0 BKG
.00 2 SIGMA B
0 LL
397 UL
CH 2 1.00 2 SIGMA %
.0 LSR
.0 BKG
.00 2 SIGMA B
180 LL
397 UL

Diana L. McMullin 2-7-92 15:00

SAMP	POS	CH	CPM	2S%	TIME	ELTIME	SCR	
1	241	1	14.75	5.20	100.00	101.09	.772	B D002811
		2	11.39	5.92				
2	242	1	57845.45	.94	.77	101.99	.907	H D000608
		2	52518.18	.99				
3	243	1	13.14	5.51	100.00	202.84	.891	Blk 1
		2	11.71	5.84				
4	244	1	-12.24	5.71	100.00	303.68	.892	BLK 2

		2	18.32	5.00				
5	245	1	13128.94	.85	4.18	308.04	.729	60λ Spk
		2	9577.51	.99				
6	246	1	26101.90	.85	2.10	310.30	.731	100λ Spk
		2	19100.95	.99				
7	247	1	12.94	5.55	100.00	411.15	.905	92-2728 A
		2	11.72	5.84				
8	248	1	12.94	5.55	100.00	512.00	.896	" B
		2	11.60	5.87				
9	249	1	13.34	5.47	100.00	612.85	.903	92-2729A
		2	12.05	5.76				
10	250	1	12.64	5.62	100.00	713.70	.899	" B
		2	11.37	5.93				

00279

SAMP	POS	CH	CPM	2S%	TIME	ELTIME	SCR	
11	251	1	13.21	5.50	100.00	814.62	.892	92-2730 A
		2	11.79	5.82				
12	252	1	13.11	5.52	100.00	915.44	.905	" B
		2	11.87	5.80				
13	253	1	12.36	5.68	100.00	1016.28	.902	92-2731A
		2	11.16	5.98				
14	254	1	12.85	5.57	100.00	1117.13	.916	" B
		2	11.78	5.82				
15	255	1	12.33	5.69	100.00	1217.97	.893	92-2732A
		2	11.02	6.02				
16	256	1	12.61	5.63	100.00	1318.82	.915	" B
		2	11.54	5.88				
17	257	1	12.71	5.60	100.00	1419.66	.904	92-2733A
		2	11.50	5.89				
18	258	1	12.64	5.62	100.00	1520.50	.895	" B
		2	11.32	5.94				
19	259	1	12.51	5.65	100.00	1621.34	.920	92-2734A
		2	11.52	5.89				
20	260	1	19.41	4.53	100.00	1722.18	.766	" B
		2	14.87	5.18				
21	261	1	13.14	5.51	100.00	1823.03	.890	92-2735A
		2	11.70	5.84				

-- ---

22	262	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	"	B
		2	11.66	5.85					
23	263	1	13.15	5.51	100.00	2024.71	.895	92-2738	A
		2	11.77	5.82					
24	264	1	12.87	5.57	100.00	2125.56	.903	"	B
		2	11.63	5.86					
25	265	1	12.11	5.74	100.00	2226.40	.913	92-2744	A
		2	11.06	6.01					
26	266	1	13.05	5.53	100.00	2327.25	.894	"	B
		2	11.67	5.85					
27	267	1	12.41	5.67	100.00	2428.10	.900	92-2745	A
		2	11.17	5.98					
28	268	1	13.78	5.38	100.00	2528.94	.908	"	B
		2	12.52	5.65					

00280

SAMP	POS	CH	CPM	2S%	TIME	ELTIME	SCR		
29	269	1	13.22	5.50	100.00	2629.87	.887	92-2745D	A
		2	11.73	5.83					
30	270	1	13.64	5.41	100.00	2730.68	.903	"	B
		2	12.33	5.65					
31	271	1	92.57	2.07	100.00	2831.77	.760	MS-2745	A
		2	70.41	2.38					
32	272	1	91.70	2.08	100.00	2932.86	.756	"	B
		2	69.33	2.40					
33	273	1	13.35	5.47	100.00	3033.71	.893	BL-2745	A
		2	11.93	5.79					
34	274	1	13.49	5.44	100.00	3134.56	.899	"	B
		2	12.14	5.73					
35	275	1	106.47	1.93	100.00	3235.68	.759	BS-2745	A
		2	80.84	2.22					
36	276	1	109.71	1.90	100.00	3336.79	.754	"	B
		2	82.80	2.19					
37	277	1	13.58	5.42	100.00	3437.64	.896	92-2746	A
		2	12.18	5.73					
38	278	1	12.96	5.55	100.00	3538.49	.904	"	B
		2	11.72	5.84					
39	279	1	24.49	4.04	100.00	3639.39	.832	92-2747	A
		2	20.40	4.42					
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		

40	280	1	[illegible]	[illegible]	100.00	3740.23	.888	"	B
		2	20.71	4.39					
41	281	1	12.86	5.62	100.00	3841.14	.897	92-2748 A	
		2	11.36	5.93					
42	282	1	501.06	.89	100.00	3942.09	.636	"	B
		2	318.78	1.11					
43	283	1	15.62	5.06	100.00	4042.92	.885	92-2749A	
		2	13.83	5.37					
44	284	1	15.37	5.10	100.00	4143.78	.882	1	B
		2	13.57	5.42					
45	285	1	13.91	5.36	100.00	4244.63	.896	92-2750 A	
		2	12.47	5.66					
46	286	1	13.63	5.41	100.00	4345.48	.904	"	B
		2	12.33	5.69					

00281

SAMP	POS	CH	CPM	2S%	TIME	ELTIME	SCR		
47	287	1	13.56	5.43	100.00	4446.41	.913	92-2751 A	
		2	12.39	5.68					
48	288	1	13.64	5.41	100.00	4547.22	.897	"	B
		2	12.24	5.71					
49	289	1	13.41	5.46	100.00	4648.07	.918	92-2752 A	
		2	12.32	5.69					
50	290	1	13.69	5.40	100.00	4748.92	.912	"	B
		2	12.49	5.65					
51	291	1	9.16	6.60	100.00	4849.75	.943	Smear.	
		2	8.64	6.80					

Diana L. McMullin
2-11-92

Reviewed J. H. Kuge
2/24/92

PROG 1 USER 1

CNT CH 12 1 TIMES
CSS 1 TIMES
SCR =2/1
AQC =NO
RCM =NO
CALC= 1
PST = 100.00 MIN
QCF = 0 H#
CH 1 1.00 2 SIGMA %
.0 LSR
.0 BKG
.00 2 SIGMA B
0 LL
397 UL
CH 2 1.00 2 SIGMA %
.0 LSR
.0 BKG
.00 2 SIGMA B
180 LL
397 UL

Diana L. McMullin
2-12-92
2:03

SAMP	POS	CH	CPM	2S%	TIME	ELTIME	SCR	
1	292	1	15.02	5.15	100.00	101.09	.791	BD02811
		2	11.89	5.79				
2	293	1	57418.18	.95	.77	102.00	.908	HD00608
		2	52148.05	.99				
3	294	1	13.27	5.48	100.00	202.85	.894	Blk 1
		2	11.87	5.80				
4	295	1	13.08	5.52	100.00	303.70	.905	Blk 2
		2	11.84	5.81				
5	296	1	13.39	5.46	100.00	404.55	.908	92-2734A
		2	12.16	5.73				
6	297	1	13.37	5.46	100.00	505.40	.890	⊥ B
		2	11.91	5.79				
7	298	1	13.71	5.40	100.00	606.25	.916	92-2748A
		2	12.56	5.64				
8	299	1	13.10	5.52	100.00	707.10	.922	⊥ B
		2	12.08	5.75				
9	1	1	24.63	4.03	100.00	808.02	.827	92-2747A
		2	20.38	4.42				
10	2	1	24.94	4.00	100.00	908.92	.822	⊥ B
		2	20.51	4.41				

00286

11	3	1	12925.17	.85	4.25	913.43	.729	50 λ spt
		2	9423.29	.99				
12	4	1	26293.26	.85	2.08	915.64	.732	100 λ spt
		2	19271.83	.99				
13	5	1	109.74	1.90	100.00	1016.76	.761	BS J.H.K 2/24/92 ~~BA~~ -2745A
		2	83.52	2.18				
14	6	1	107.24	1.93	100.00	1117.88	.756	⊥ B
		2	81.12	2.22				
15	7	1	91.99	2.08	100.00	1218.97	.762	MS-2745A
		2	70.12	2.38				
16	8	1	92.50	2.07	100.00	1320.06	.751	⊥ B
		2	69.50	2.39				

Reviewed J. H. Kaye 2/27/92 Diana L. McMullin 2-13-92

TRITIUM CALCULATIONS FOR LIQUID SAMPLES, page 1
FOR PNL-ALO-441 not using Recovery Factor, Fw

Spreadsheet file name: H3LIQGEN, Rev. 1 (1/8/91)
Data file name: EM13H2 Entered by: DLM
Date Counted 02/12/92 Date Calc'd 02/29/92
Sample Counting Time,min 100.00

Tritium Std No. 52733-109-1
Date Calibrated 10/23/90 Activity= 1.022E+06 dpm/ml
error= 1.748E+04 dpm/ml
Half-Life = 12.3 years

--I.D.--	aliquot ml	error ml	--cpm--	2S%	d/c	d/c error
Blank #1	3.9223	0.0062	13.27	5.48		
Blank #2	3.9223	0.0062	13.08	5.52		
Avg			13.18			
Std dev			0.13			
Propagated, 1sigma			0.26			
50ul Std	0.0493	0.0003	12925.17	0.85	3.622	0.068
100ul Std	0.0990	0.0001	26293.26	0.85	3.575	0.063
Avg d/c					3.598	
Std dev					0.033	
Propagated, 1 sigma					0.046	

-------SAMPLES---------

--I.D.--	aliquot ml	error ml	--cpm--	2S%	pCi/ml	error, pCi/ml
Sample I.D. =		92-2734				
dup 1	3.9223	0.0062	13.39	5.46	0.089	0.184
dup 2	3.9223	0.0062	13.37	5.46	0.081	0.184
avg					0.085	
std dev					0.006	
propagated, 1 sigma					0.130	
MDA (propagated)				<	0.450	
Sample I.D. =		92-2748				
dup 1	3.9223	0.0062	13.71	5.40	0.221	0.186
dup 2	3.9223	0.0062	13.10	5.52	-0.031	-0.183
avg					0.095	
std dev					0.178	
propagated, 1 sigma					0.131	
MDA (propagated)				<	0.450	

TRITIUM CALCULATIONS, page 2 Date Counted: 02/12/92
Filename: EM13H2

--I.D.--	aliquot ml	error ml	--cpm--	2S%	pCi/ml	error, pCi/ml
Sample I.D. =		92-2747				
dup 1	3.9223	0.0062	24.63	4.03	4.734	0.239
dup 2	3.9223	0.0062	24.94	4.00	4.862	0.240
avg					4.798	
std dev					0.091	
propagated, 1 sigma					0.169	
MDA (propagated)				NA		
Sample I.D. =		BS-2745				
dup 1	3.9223	0.0062	109.74	1.90	39.905	0.681
dup 2	3.9223	0.0062	107.24	1.93	38.872	0.669
avg					39.388	
std dev					0.731	
propagated, 1 sigma					0.477	
MDA (propagated)				NA		
Sample I.D. =		MS-2745				
dup 1	3.9223	0.0062	91.99	2.08	32.570	0.587
dup 2	3.9223	0.0062	92.50	2.07	32.780	0.590
avg					32.675	
std dev					0.149	
propagated, 1 sigma					0.416	
MDA (propagated)				NA		

J. H. B. 2/29/92

Diana L. McMullen 2-29-92
ENTERED BY/DATE

J. H. Kaye 3/3/92
REVIEWED BY/DATE

TRITIUM CALCULATIONS FOR LIQUID SAMPLES, page 1
FOR PNL-ALO-441 not using Recovery Factor, Fw

Spreadsheet file name: H3LIQGEN, Rev. 1 (1/8/91)
Data file name: 1100EM3H Entered by: DLM
Date Counted 02/07/92 Date Calc'd 02/29/92
Sample Counting Time,min 100.00

Tritium Std No. 52733-109-1
Date Calibrated 10/23/90 Activity= 1.022E+06 dpm/ml
error= 1.748E+04 dpm/ml
Half-Life = 12.3 years

--I.D.--	aliquot ml	error ml	--cpm--	2S%	d/c	d/c error
Blank #1	3.9223	0.0062	13.14	5.51		
Blank #2	3.9223	0.0062	12.24	5.71		
Avg			12.69			
Std dev			0.64			
Propagated, 1sigma			0.25			
50ul Std	0.0493	0.0003	13128.94	0.85	3.568	0.067
100ul Std	0.0990	0.0001	26101.90	0.85	3.604	0.064
Avg d/c					3.586	
Std dev					0.025	
Propagated, 1 sigma					0.046	

-------SAMPLES---------

--I.D.--	aliquot ml	error ml	--cpm--	2S%	pCi/ml	error, pCi/ml
Sample I.D. =		92-2728				
dup 1	3.9223	0.0062	12.94	5.55	0.103	0.181
dup 2	3.9223	0.0062	12.94	5.55	0.103	0.181
avg					0.103	
std dev					0.000	
propagated, 1 sigma					0.128	
MDA (propagated)				<	0.440	
Sample I.D. =		92-2729				
dup 1	3.9223	0.0062	13.34	5.47	0.268	0.183
dup 2	3.9223	0.0062	12.64	5.62	-0.021	-0.179
avg					0.124	
std dev					0.204	
propagated, 1 sigma					0.128	
MDA (propagated)				<	0.440	

TRITIUM CALCULATIONS, page 2 Date Counted: 02/07/92
Filename: 1100EM3H

--I.D.--	aliquot ml	error ml	--cpm--	2S%	pCi/ml	error, pCi/ml
Sample I.D. =		92-2730				
dup 1	3.9223	0.0062	13.21	5.50	0.214	0.182
dup 2	3.9223	0.0062	13.11	5.52	0.173	0.182
avg					0.194	
std dev					0.029	
propagated, 1 sigma					0.129	
MDA (propagated)				<	0.440	
Sample I.D. =		92-2731				
dup 1	3.9223	0.0062	12.36	5.68	-0.136	-0.178
dup 2	3.9223	0.0062	12.85	5.57	0.066	0.180
avg					-0.035	
std dev					0.143	
propagated, 1 sigma					0.127	
MDA (propagated)				<	0.440	

--I.D.--	aliquot ml	error ml	--cpm--	2S%	pCi/ml	error, pCi/ml
Sample I.D. =		92-2732				
dup 1	3.9223	0.0062	12.33	5.69	-0.148	-0.178
dup 2	3.9223	0.0062	12.61	5.63	-0.033	-0.179
avg					-0.091	
std dev					0.082	
propagated, 1 sigma					0.126	
MDA (propagated)				<	0.440	
Sample I.D. =		92-2733				
dup 1	3.9223	0.0062	12.71	5.60	0.008	0.179
dup 2	3.9223	0.0062	12.64	5.62	-0.021	-0.179
avg					-0.006	
std dev					0.020	
propagated, 1 sigma					0.127	
MDA (propagated)				<	0.440	

--I.D.--	aliquot ml	error ml	--cpm--	2S%	pCi/ml	error, pCi/ml
Sample I.D. =		92-2735				
dup 1	3.9223	0.0062	13.14	5.51	0.185	0.182
dup 2	3.9223	0.0062	12.83	5.58	0.058	0.180
avg					0.121	
std dev					0.090	
propagated, 1 sigma					0.128	
MDA (propagated)				<	0.440	

TRITIUM CALCULATIONS, page 3 Date Counted: 02/07/92
Filename: 1100EM3H

--I.D.--	aliquot ml	error ml	--cpm--	2S%	pCi/ml	error, pCi/ml
Sample I.D. =		92-2738				
dup 1	3.9223	0.0062	13.15	5.51	0.189	0.182
dup 2	3.9223	0.0062	12.87	5.57	0.074	0.180
avg					0.132	
std dev					0.082	
propagated, 1 sigma					0.128	
MDA (propagated)				<	0.440	
Sample I.D. =		92-2744				
dup 1	3.9223	0.0062	12.11	5.74	-0.239	-0.177
dup 2	3.9223	0.0062	13.05	5.53	0.148	0.181
avg					-0.045	
std dev					0.274	
propagated, 1 sigma					0.127	
MDA (propagated)				<	0.440	

--I.D.--	aliquot ml	error ml	--cpm--	2S%	pCi/ml	error, pCi/ml
Sample I.D. =		92-2745				
dup 1	3.9223	0.0062	12.41	5.67	-0.115	-0.178
dup 2	3.9223	0.0062	13.78	5.38	0.449	0.185
avg					0.167	
std dev					0.399	
propagated, 1 sigma					0.128	
MDA (propagated)				<	0.440	
Sample I.D. =		92-2745D				
dup 1	3.9223	0.0062	13.22	5.50	0.218	0.182
dup 2	3.9223	0.0062	13.64	5.41	0.391	0.184
avg					0.305	
std dev					0.122	
propagated, 1 sigma					0.129	
MDA (propagated)				NA		

--I.D.--	aliquot ml	error ml	--cpm--	2S%	pCi/ml	error, pCi/ml
Sample I.D. =		MS-2745				
dup 1	3.9223	0.0062	92.57	2.07	32.898	0.589
dup 2	3.9223	0.0062	91.70	2.08	32.539	0.585
avg					32.718	
std dev					0.253	
propagated, 1 sigma					0.415	
MDA (propagated)				NA		

TRITIUM CALCULATIONS, page 4 Date Counted: 02/07/92
Filename: 1100EM3H

--I.D.--	aliquot ml	error ml	--cpm--	2S%	pCi/ml	error, pCi/ml
Sample I.D. =		BL-2745				
dup 1	3.9223	0.0062	13.35	5.47	0.272	0.183
dup 2	3.9223	0.0062	13.49	5.44	0.329	0.183
avg					0.301	
std dev					0.041	
propagated, 1 sigma					0.129	
MDA (propagated)				NA		
Sample I.D. =		BS-2745				
dup 1	3.9223	0.0062	106.47	1.93	38.622	0.663
dup 2	3.9223	0.0062	109.71	1.90	39.956	0.680
avg					39.289	
std dev					0.944	
propagated, 1 sigma					0.475	
MDA (propagated)				NA		

--I.D.--	aliquot ml	error ml	--cpm--	2S%	pCi/ml	error, pCi/ml
Sample I.D. =		92-2746				
dup 1	3.9223	0.0062	13.58	5.42	0.367	0.184
dup 2	3.9223	0.0062	12.96	5.55	0.111	0.181
avg					0.239	
std dev					0.181	
propagated, 1 sigma					0.129	
MDA (propagated)				<	0.440	
Sample I.D. =		92-2747				
dup 1	3.9223	0.0062	24.49	4.04	4.860	0.237
dup 2	3.9223	0.0062	25.63	3.95	5.329	0.243
avg					5.094	
std dev					0.332	
propagated, 1 sigma					0.170	
MDA (propagated)				NA		
Sample I.D. =		92-2749				
dup 1	3.9223	0.0062	15.62	5.06	1.207	0.194
dup 2	3.9223	0.0062	15.37	5.10	1.104	0.192
avg					1.155	
std dev					0.073	
propagated, 1 sigma					0.136	
MDA (propagated)				NA		

TRITIUM CALCULATIONS, page 5 Date Counted: 02/07/92
Filename: 1100EM3H

--I.D.--	aliquot ml	error ml	--cpm--	2S%	pCi/ml	error, pCi/ml
Sample I.D. =		92-2750				
dup 1	3.9223	0.0062	13.91	5.36	0.502	0.185
dup 2	3.9223	0.0062	13.63	5.41	0.387	0.184
avg					0.445	
std dev					0.082	
propagated, 1 sigma					0.131	
MDA (propagated)				NA		
Sample I.D. =		92-2751				
dup 1	3.9223	0.0062	13.56	5.43	0.358	0.184
dup 2	3.9223	0.0062	13.64	5.41	0.391	0.184
avg					0.375	
std dev					0.023	
propagated, 1 sigma					0.130	
MDA (propagated)				NA		
Sample I.D. =		92-2752				
dup 1	3.9223	0.0062	13.41	5.46	0.297	0.183
dup 2	3.9223	0.0062	13.69	5.40	0.412	0.184
avg					0.354	
std dev					0.082	
propagated, 1 sigma					0.130	
MDA (propagated)				NA		

Diana T. McMullen 2-29-92
ENTERED BY/DATE

J. H. Kuo 3/3/92
REVIEWED BY/DATE

Battelle
Pacific Northwest Laboratories

ENGINEERING WORKSHEET

Prepared By: J. H. Kaye | Date: 3/6/92 | Project: 1100-EM-1

Title/Subject: Hand Calculation of Results for 92-2747

Activity of ^3H at time of count

$$A = A_0 e^{-\frac{\ln 2 \, \Delta t}{H}}$$

$A_0 = 1.022 \times 10^6$ dpm/ml $\pm 1.748 \times 10^4$

$H = 12.3$ years

Date of count = 2/7/92 = 33641 (Lotus day format)

Date calibrated = 10/23/90 = 33164

$\Delta t = 472 \, d = \frac{472}{365.25}$ years

$\Delta t = 1.292$ years

$$A = (1.022 \pm 0.01748) \times 10^6 \, e^{-\ln 2 \times 1.292/12.3}$$

$$A = (1.022 \pm 0.01748) \times 10^6 \, (0.929779)$$

$$A = (9.502339 \pm 0.1625) \times 10^5 \quad \frac{dpm}{ml} \; 2/7/92$$

50 λ std (0.0493 ± 0.0003) ml gives 13128.94 cpm ± 0.85 (20%)

100 λ std (0.0990 ± 0.0001) ml gives 26101.90 cpm ± 0.85 (20%)

Blanks give 13.14 ± 5.51 (20%)
12.24 ± 5.71 (20%)

Blank Avg = $12.69 \pm \left(\sqrt{\left(\frac{5.51}{2}\right)^2 + \left(\frac{5.71}{2}\right)^2}\right)/2$

$= 12.69 \pm (3.967\%)/2 = 12.69 \pm 0.2517$ ✓

Prepared By: H. Kaye | Date: 3/6/92 | Project: 1100-EM-1
Title/Subject:

50 λ std = 13128.94 ± 0.85(25%) = 13128.94 ± 55.80 cpm
100 λ std. = 26101.90 ± 0.85(25%) = 26101.90 ± 110.93 cpm

for 50 λ std
net = (13128.94 ± 55.80) − (12.69 ± 0.25) = 13116.25 ± 55.80 cpm

for 100 λ std
net = (26101.90 ± 110.93) − (12.69 ± 0.25) = 26089.21 ± 110.93 cpm

activity of 50 λ std

$A_{50} = (9.502 \pm 0.163) \times 10^5 \frac{dpm}{ml} \times (0.0493 \pm 0.0003)\, ml$

$A_{50} = (4.6847 \pm 0.085) \times 10^4\, dpm$

$d/c_{50} = \frac{(468.47 \pm 8.50) \times 10^2}{(13116.25 \pm 55.80)} = 3.572 \pm 0.067$

$A_{100} = (9.502 \pm 0.163) \times 10^5 \frac{dpm}{ml} \times (0.0990 \pm 0.0001)\, ml$

$d/c_{100} = \frac{(94069.8 \pm 1616.5)}{(26089.21 \pm 110.93)} = 3.606 \pm 0.064$

avg d/c = 3.589 ± 0.046

Program gives 3.586 ± 0.046 ✓

ENGINEERING WORKSHEET

Prepared By: J. Kaye | Date: 3/6/92 | Project: 1100-EM-1

Title/Subject:

Sample 92-2747

dup 1 - $24.49 \pm 4.04 (25\%)$ cpm

$$24.49 \pm \left(\frac{4.04}{2} \times \frac{24.49}{100}\right) \text{ cpm}$$

$$(24.49 \pm 0.4947) \text{ cpm}$$

$$\text{net} = (24.49 \pm 0.4947) - (12.69 \pm 0.2517)$$

$$= (11.80 \pm 0.555) \text{ cpm}$$

$$^3H\,\text{act} = \frac{(11.80 \pm 0.555) \text{ cpm} \times d/c}{\text{Vol} \times 2.22 \text{ dpm}/\mu Ci}$$

$$^3H = \frac{(11.80 \pm 0.555) \text{ cpm} \times (3.589 \pm 0.046)}{(3.9223 \pm 0.0062) \text{ ml} \times 2.22 \text{ dpm}/\mu Ci}$$

$$^3H = \frac{(42.3502 \pm 2.0645)}{(3.9223 \pm 0.0062) \text{ ml} \times 2.22 \text{ dpm}/\mu Ci}$$

$$^3H = (4.864 \pm 0.237) \ \mu Ci/\text{ml}$$

spreadsheet gives $(4.860 \pm 0.237) \ \mu Ci/\text{ml}$ ✓

Building 329 Radiochemistry
Sample Log-In Form

Requester 200 BP1 Date 3-31-92

Phone 6-5802 Mail Stop P7-27 Project No. _____

Wk Pkg No. _____ Date Required _____ Impact Level II

SOW No. _____ Specify QA requirements if other than GPS for III or 1 blank, 1 duplicate, and 1 blank spike per batch for I or II.

see TI

Sample Description Soil

Analyses Required Tα, Tβ, Pu, ^{90}Sr, ^{3}H

Radioactive Contaminants / Estimated Levels

B01567 ~ 2,500 cpm

B01569 21 mr/hr

Other Sample Hazards (e.g. toxic, acid, caustic, etc.) _____

Excess sample pickup and removal contact _____ ph. _____

Sample Identification Number:	329 ID:
B01567	1238
B01569	1239

login.FRM

1100 EM1 Tritium

MDA calculation:

$$\frac{3\sqrt{\frac{12.69 \times 100 \text{ counts}}{100 \text{ minutes}}}\left(3.586 \frac{dpm}{cpm}\right) 1000 \text{ ml}/L}{(2.22 \text{ dpm}/pCi)(3.9223 \text{ ml})} = 440 \text{ pCi}/L$$

S. L. Fadoff
3/5/92

Reviewed J. H. Kaye
3/6/92

Battelle
Pacific Northwest Laboratories

Page ____ of ____

ENGINEERING WORKSHEET

Prepared By: J. H. Kaye	Date: 3/3/92	Project: 1100-EM-1

Title/Subject:

RPD for MS & BS

$$RPD = \frac{|39.289 - 32.718| \times 100}{\frac{1}{2}(39.289 + 32.718)} = 18.25\%$$

Reviewed S. K. Fadeff 3/5/92

Battelle
Pacific Northwest Laboratories

Page ____ of ____

ENGINEERING WORKSHEET

Prepared By: J. Kayes | Date: 2/24/92 | Project: 1100-EM-1

Title/Subject:

Sample BS-2745 — J HK 3/5/92

Vol to distill = 48.1490 ± ~~0.1056~~ 0.0472
+ 0.5002 ± 0.0028
(48.6992 ± ~~0.1056~~ 0.0473) ml — J HK 3/5/92

Volume counted = (3.9223 ml ± 0.0062 ml)

Dilution factor = (48.6992 ± ~~0.1056~~ 0.0473) / (3.9223 ± 0.0062) — J HK 3/5/92

= (12.416 ± ~~0.033~~ 0.023) — J HK 3/5/92

Activity of 52733-109-100 is

$A_0 = (1.02_{40} \pm 0.017_{60}) \times 10^4 \frac{dpm}{ml}$ on 10-23-90

Decay Factor to time of count (2/12/92)

DATE (92, 2, 12) = 33646
DATE (90, 10, 23) = 33169

Δt = 477 days

$A = A_0 e^{-\frac{\ln 2 (\Delta t)}{H}}$

$A = (1.02_{40} \pm 0.017_{60}) \times 10^4 e^{-\frac{\ln 2 \times 477}{(12.3 \times 365.25)}}$

$A = (1.02_{40} \pm 0.017_{60}) \times 10^4 (0.9290)$

$A = (0.9513 \pm 0.0164) \times 10^4$ dpm/ml on 2/12/92

$x = \frac{(0.5002 \pm 0.0028)\,ml \times (0.9513 \pm 0.0164) \times 10^4}{2.22}$ pCi

$x = (2143 \pm 39)$ pCi added, decay cor. to 2/12/92

Reviewed S.K. Tadey 3/2/92

DOE-RL Richland, WA

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54-1007-114 (1/83)

G02-030

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Pacific Northwest Laboratories

Page ____ of ____

ENGINEERING WORKSHEET

Prepared by: J. Kaye | Date: 2/29/92 | Project: 1100-EM-1

Title/Subject:

MS - 2745

$^3H = (32.718 \pm 0.415)$ pCi/ml

$(32.718 \pm 0.415)\frac{pCi}{ml} \times 3.9223\ ml \times (12.416 \pm 0.033)$

$(1593.3429\ pCi \pm 20.6491\ pCi)$

$\% \text{ Recovery} = \frac{(1593 \pm 21) \times 100}{(2143 \pm 39)} = (74.35 \pm 0.02)\%$

$= 74\%$

BS- 2745

$^3H = (39.289 \pm 0.475)$ pCi/ml

$(39.289 \pm 0.475)\frac{pCi}{ml} \times 3.9223\ ml \times (12.416 \pm \cancel{0.033})$ 0.023 JHK 3/5/92

$(1913.3459 \pm \cancel{23.6846})$ 23.4028 JHK 3/5/92 pCi

$\% \text{ Recovery} = \frac{(1913 \pm \cancel{24})}{(2143 \pm 39)} \times 100 = (89.28 \pm 1.9\cancel{1}6)\%$ 23 JHK 3/5/92 JHK 3/5/92

$= 89\%$

Reviewed S.K. Fadeff 3/2/92

1100-EM-1 GROUNDWATER CHARACTERIZATION
PHASE I

DATA PACKAGE/REPORT No. 1

Revision 0

APPENDIX H

LIQUID SCINTILLATION COUNTING

Table of Contents

H01 - Summary Results
H02 - Raw Data

See Appendix B: Radiochemistry Standards and Controls for additional supporting documentation.

Battelle
Pacific Northwest Laboratories

Project Number 19432

Internal Distribution

File/LB

Date March 11, 1992

To Bruce Prentice

From Sandy Fadeff S.L. Fadeff

Subject Activity Analysis Using Liquid Scintillation Counting on 1100EM1 Samples

Liquid scintillation counting (LSC) was used for measurement of the beta spectra of six groundwater samples and the corresponding QC samples. A QA approved procedure has not been written to cover this activity. Therefore, all effort in performing this analysis is documented herein.

A 500 ml aliquot of each sample was concentrated by evaporation to 25 ml. From this a 10 ml portion of each sample was transferred to a 20 ml LSC vial and mixed with 10 ml Instagel liquid scintillation cocktail. This latter step was performed in duplicate for each sample. The samples were transferred to building 325 for counting on a low background 2260XL liquid scintillation counting system (serial number 103039). The LSC was operated per the manufacturer's instructions. The energy region analyzed ranged from 0 to 2000 keV. The low background mode of operation covers the range from 0 to 500 keV.

The LSC sample and standard spectra resulted in significant quenching. (This is noted by the "tSIE" factor where a number of 1000 signifies no quenching and the lower the number the more quenching occurs.) Quenching results in peak shifting to lower energy levels, peak broadening and lowering of intensity. Quenching may be caused from the varying amounts of salt in the samples or to the HNO_3 added to the samples as a preservative in the field, or perhaps a combination of the two. The blank and blank spike resulted in more quenching than all but one of the samples. The reason for this is unknown. It is suspected that too much HNO_3 was added in an attempt to imitate the sample matrix. More effort would be required to resolve this problem.

In order to compensate for the significant amount of quenching in the samples, further analyses were performed to create a quench curve. This entailed analyzing a constant amount of ^{99}Tc with various amounts of nitromethane (to cause the quenching) added to the Instagel scintillator. The resulting quench was not enough to bracket the sample quenching. Therefore, the blank spike from the sample analytical run was used to provide the low-end quench point (tSIE = 41). From the spectra obtained, the location (in keV units) corresponding to the maximum counting rate was determined visually. This peak location for each quenched ^{99}Tc standard was plotted as a function of the tSIE factor by hand, establishing what appears to be a linear fit. The sample tSIE factor was located relative to the line identified by the curve (hand drawn) so that the approximate region expected for the ^{99}Tc peak could be located. The theoretical peak location was then compared to the sample peak location(s).

Despite the severe quenching encountered, some general statements can be made to help interpret the results of these beta spectra. Because quenching causes the energy peak to shift to lower energies and it tends to broaden peaks, the results given should be considered as approximate rather than absolute. Good agreement with the theoretical ^{99}Tc locations and the sample peak locations is obtained for all samples except one, B015V1 (which had the most quenching). The shape of this sample spectrum does not conform with the other sample spectra shapes. It displays a broad leading shoulder on the peak located at about 7 keV (theoretical ^{99}Tc peak at 3keV). This may be due to the extreme quenching of this sample (tSIE equals 29), an instrumental or procedural limitation, or more likely, a combination of beta peaks. Sample number B015V3 displays two peaks, one in the expected ^{99}Tc region and the other at a higher energy. Sample number B01C28 was difficult to interpret in that the beta spectrum was very broad with no definitive peaks, and it was close to the background. Signal above the background was evident in the ^{99}Tc region. It appears that two very low level peaks may be present with energies greater than that of the ^{99}Tc. The activity of samples B015T1, B015T3, and B015V8 appears to be solely due to ^{99}Tc. A tabular summary of the results is attached.

In order to enhance this study a quench curve should be generated with more points close to the sample quench points (tSIE ranging from 29 to 144). In order to better define the energies of the other peaks, an analytical strategy will need to be developed. This was considered beyond the scope of the phase 1 part of this program.

Due to the high quenching of these samples as well as to the presence of higher energy peaks, it was not possible to determine endpoint energies. No alpha activities are represented in these LSC spectra. The low-background mode of instrument operation was used and it rejects alpha pulses.

lsc.rpt

1100EM1 LIQUID SCINTILLATION COUNTING RESULTS

Sample ID	ALO #	tSIE Factor	Fit keV*	Peaks found (keV) first	second	third
B015T1	92-02729	65	8-8.5	8-9		
B015T3	92-02730	63	8-8.5	8-9		
B015V1	92-02734	29	2.5-3	2.2-7 **		
B015V3	92-02735	81	10.5-11	9-10	30-32	
B015V8	92-02738	144	20-21	23		
B01C28	92-02752	71	9-9.5	7	23	60
B015C28	matrix spike	139	19-20	20		

*Tc-99 peak location based on curve fit
**Appears to be a mixture of peaks

H01-003

S.K. Fedoff 3/11/92
Reviewed by J. H. Kaye
3/11/92

QUALITY CONTROL DATA REVIEW

Project/Work Package: 19432/M82776

Project/WP Title: 1100-EM-1 Groundwater Characterization

Requested Analysis: Liquid Scintillation Counting

ALO Sample Numbers: 92-02729, 92-02730, 92-02734, 92-02735, 92-02738, 92-02752

I have reviewed the data specified above for completeness and compliance with project requirements.

J. Leland Daniel

J. Leland Daniel
Data Quality Officer
Analytical Chemistry Laboratory

3/30/92
Date

TEST INSTRUCTIONS FOR ANALYSIS OF 1100-EM-1
SAMPLES BY LIQUID SCINTILLATION COUNTING

1. Perform this work in lab 10A. Evaporate 500-ml aliquots of the following samples, blank, blank spike and matrix spike to a volume of 25 ml.

To prepare blank and blank spike, use 500 ml Milli-Q water and 1 ml c HNO3.

Sample Number	ALO Number		Spike
B01C28	92-2752		
B015T1	92-2729		
B015T3	92-2730		
B015V1	92-2734		
B015V3	92-2735		
B015V8	92-2738		
		Blank	
		Blank Spike	500 ul of Tc-99 spike*
B01C28	92-2752	Matrix Spike	500 ul of Tc-99 spike*

*To prepare Tc-99 spike:

a) Calibrate 10 ul pipet.

b) Remove 10 ul of Tc-99 52733-80-RS-4, accurately dilute to 10 ml using volumetric flask or by weighing. Record all data. N/O 10 ml vol flask Used 25 ml in ~.01M NH4OH 52733-80-1000

c) Use 500 ul of this spike for the blank spike and matrix spike.

2. Transfer two 10-ml portions of each sample into 20-ml glass LSC vials, then add 10 ml of Instagel liquid scintillation cocktail to each. Cap each vial and mix thoroughly. Gel will be milky white.

3. Transfer samples to 325 building for counting. Diana or Bob can do this.

4. Jim Kaye will count with 2260XL Liquid scintillation counting system in 325 building, using low background mode, 0-2000 keV.

G. Bradacypski 2-10-92
J. H. Kaye
2/10/92

Liquid Scintillation Counting ^{99}Tc

~~Leaching~~ Data Sheet
gh 3-10-92

Check if used

Procedure PNL-ALO-106 Rev.0, leach: NA

Date ~~Sample Leach~~ gh 3-10-92 Started 2-13-92 Date Completed 2-14-92

Tracer or Spike Volumes

Isotope ^{99}Tc Sample Added to: Blank Spike + MS 2752

Pipette No. 10A-26 Volume 491.7 l +/- 1.9 l Date Pipetted 2-12-92

Spike ID 52733-80-1000 Spike Activity 67.50 dpm ± 2.5 dpm

Isotope _____ Sample Added to: _____

Pipette No. _____ Volume _____ +/- _____ Date Pipetted _____

Spike ID _____ Spike Activity ~~67.50 dpm ± 2.5 dpm~~ gh 3/9-92

Sample ID, Aliquot Size, and Leachate Volume

Balance Number 510-06-01-006 Temperature (if weighing water samples) 22°

Sample ID	Beaker Wt.	Bker + Smpl	Sample Wt or Vol	~~Diln~~ Volume gh 3-9-92	Diln Vol. Uncertainty ±0.02 ml	
Blank	402.9	912	509.1	510.2		
Blk Spk	408.1	905.5	497.4	498.5		
92-2729	400.9	910.8	509.9	511.0		
MS 2752	401.0	901.5	500.5	501.6		
92-2735	399.5	929.6	530.1	531.3		
92-2734	400.1	930.3	530.2	531.3		
92-2751	396.6	894.1	497.5	498.6		
92-2730	403.1	897.6	494.2	495.3		
92-2738	tared balance		501			

Sample Volumes (if a pipet was used for small aqueous samples)

Pipette No. NA Volume _____ +/- _____ Date Pipetted _____

G Bukaczynski 2-14-92
Analyst Date

J. M. Kaye 3/10/92
Reviewer Date

LECHDATA.LOG

Note: Samples were put into incorrect glass vials and were transferred. First vials were scintillation vials of the same size but were not of the low K^{40} glass required for the 3250 liquid scintillation counter.

52733-80-RS.4 $1.4013 \times 10^5 \pm 574$

a dilution was made: 24.49 ± .09 l
(pipet 10A.25 2.12.92 LZB 5YBZZ) to 25ml in
a volumetric flask.

$$\frac{1.4013 \times 10^5 \pm 574 \text{ dpm} (.02449 \pm .0009 \text{ ml})}{25 \text{ ml}} = 137.27^{+5.08}_{-} \text{ dpm/ml}$$

D. Rodzynski

Reviewed S. K. Fackoff 3/11/92

Protocol #: 9 Name:JHK 14-Feb-92 16:31
Region A: LL-UL= 0.0-10.0 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Region B: LL-UL=10.0-150. Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Region C: LL-UL= 0.0-2000 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Time =300.00 QIP = tSIE ES Terminator = Count
Low Level Count Mode

S#	TIME	CPMA	CPMB	CPMC	tSIE	FLAG	ELTIME	
1	300.00	12.18	7.29	41.12	44.0	B	304	BLANK
2	300.00	12.88	0.00	12.22	40.3		607	BS-A
3	300.00	8.32	23.85	33.63	139.		910	MS 2752-A
4	300.00	13.23	34.25	48.00	144.		1213	92-2738A
5	300.00	2.40	7.71	10.76	70.9		1516	2752 A
6	300.00	19.62	10.97	31.04	65.3		1820	2729 A
7	300.00	27.46	12.56	40.15	62.6		2123	2730 A
8	300.00	37.82	0.00	36.59	29.3		2428	2734 A
9	300.00	26.41	38.13	64.19	85.1		2731	2735 A
10	300.00	0.00	0.10	0.00	46.4		3034	BLANK B
11	300.00	12.28	0.00	11.06	40.7		3337	BS-B
12	300.00	8.34	20.57	28.98	132.		3640	MS 2752 B
13	300.00	16.93	35.83	53.64	136.		3943	92-2738 B
14	300.00	2.78	7.70	10.87	67.6		4247	2752 B
15	300.00	20.69	10.49	31.29	62.2		4550	2729 B
16	300.00	27.84	12.57	40.14	62.3		4853	2730 B
17	300.00	33.73	0.00	30.36	28.5		5158	2734 B
18	300.00	29.05	37.57	66.34	80.7		5461	2735 B

J. H. Kage
2/18/92

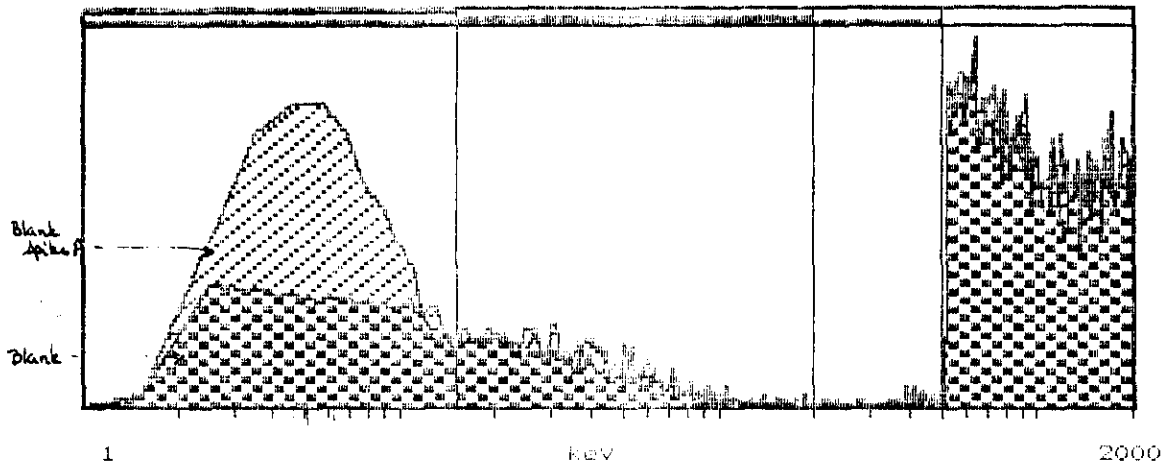
H02-005

SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 18-Feb-92 15:16

L o g V I E W

50.0 Y Transform Log max Endpoint 1959 keV

// Active File: SP9S2.1 \\ NonActive File: SP9S1.1



Regions of Interest

	LL	UL	CPM SP9S2.1	CPM SP9S1.1
A:	0.0	15.0	26.95	13.92
B:	15.0	200.	4.73	5.52
C:	0.0	500.	31.91	19.66
D:	0.0	2000	53.17	40.97
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

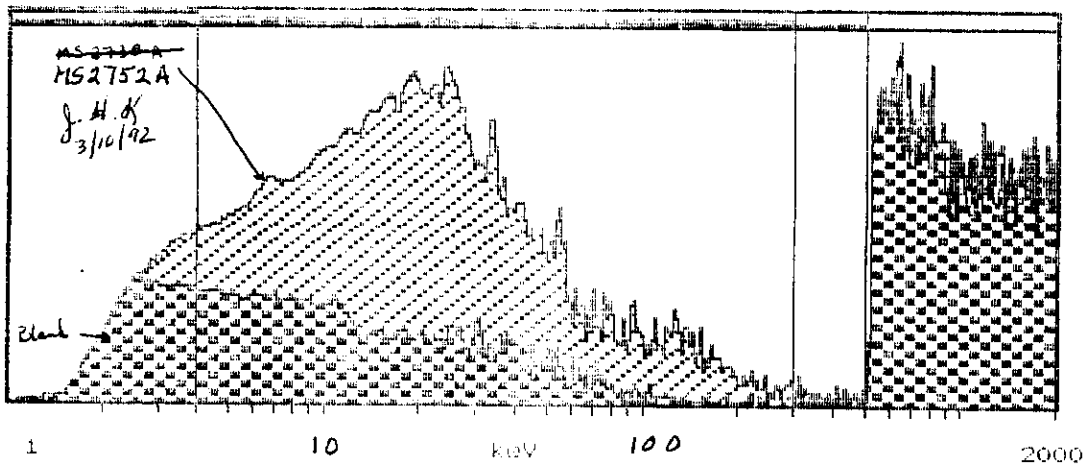
H02-006

SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 18-Feb-92 15:27

L o g V I E W

50.0 Y Transform Log max Endpoint 1946 keV

// Active File: SP9S3.1 \\ NonActive File: SP9S1.1



Regions of Interest

	LL	UL	CPM SP9S3.1	CPM SP9S1.1
A:	0.0	4.0	9.15	7.08
B:	4.0	300.	43.48	12.41
C:	0.0	500.	52.84	19.66
D:	0.0	2000	74.33	40.97
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

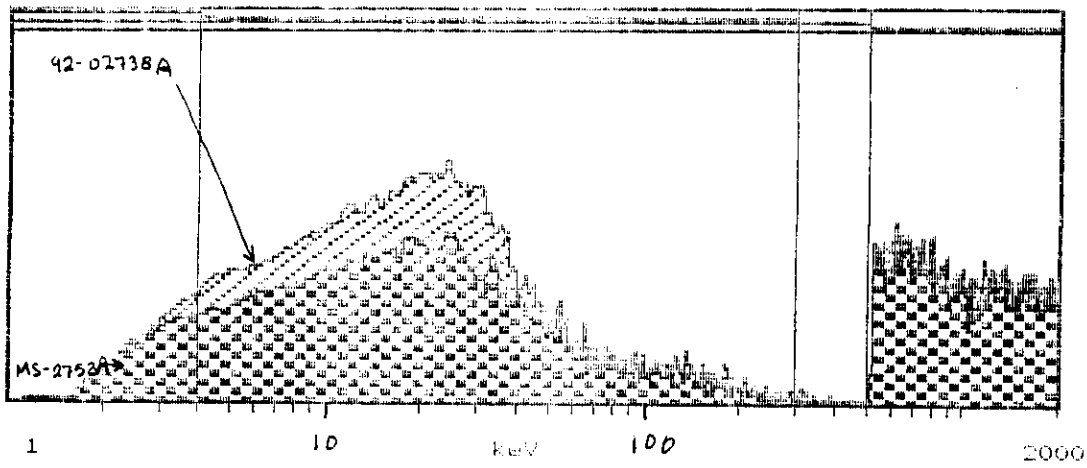
H02-007

SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 18-Feb-92 15:42

L o g V i E W

100.0 Y Transform Log max Endpoint 1929 keV

// Active File: SP9S4.1 \\ NonActive File: SP9S3.1



Regions of Interest

	LL	UL	CPM SP9S4.1	CPM SP9S3.1
A:	0.0	1.0	10.38	9.15
B:	4.0	300.	57.58	43.48
C:	0.0	500.	68.20	52.84
D:	500.	2000	20.45	21.49
E:	0.0	2000	88.65	74.33
F:	0.0	0.0	0.00	0.00

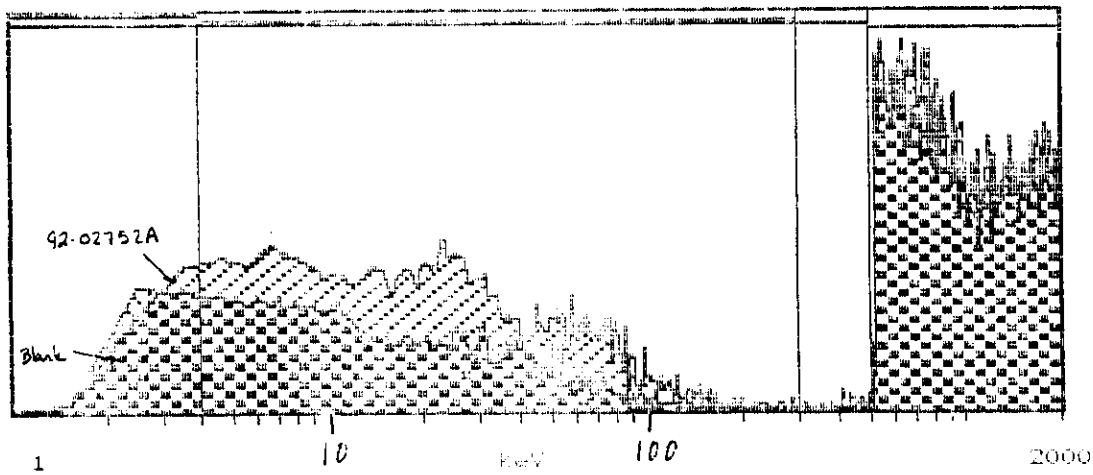
H02-008

SPECTRAGRAPH 3.2V (C) Copyright Packard Instrument Co. 1987 18-Feb-92 15:53

L o g V i e w

50.0 Y Transform Log max Endpoint 1963 keV

// Active File: SP9S5.1 \\ NonActive File: SP9S1.1



Regions of Interest

	LL	UL	CPM SP9S5.1	CPM SP9S1.1
A:	0.0	4.0	7.41	7.08
B:	4.0	300.	22.23	12.41
C:	0.0	500.	29.71	19.66
D:	500.	2000	21.95	21.31
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

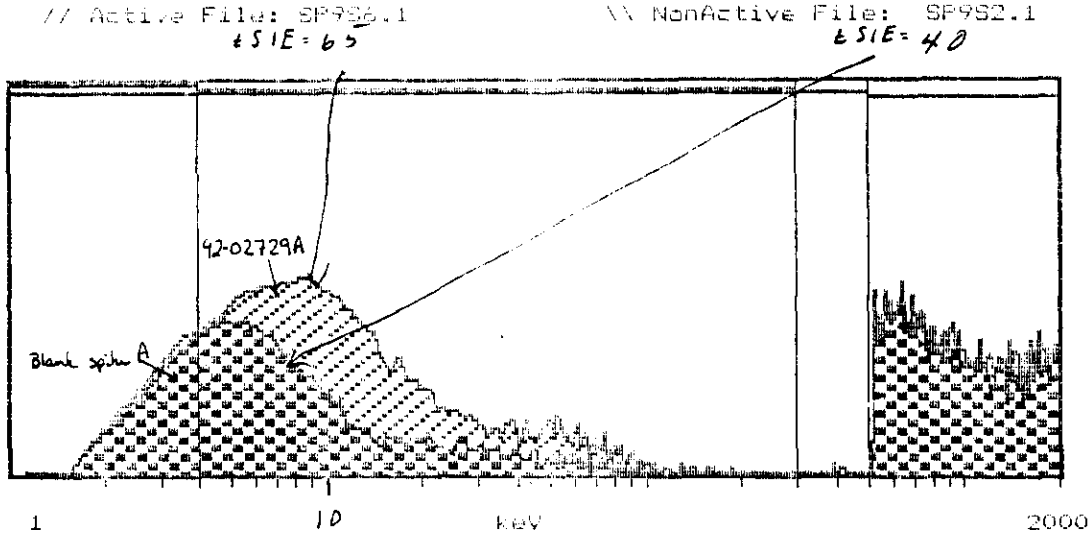
H02-009

SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 18-Feb-92 16:09

L o g V I E W

100.0 Y Transform Log max Endpoint 1947 keV

// Active File: SP9S6.1 \\ NonActive File: SP9S2.1



Regions of Interest

	LL	UL	CPM SP9S6.1	CPM SP9S2.1
A:	0.0	4.0	13.14	13.79
B:	4.0	300.	37.00	17.93
C:	0.0	500.	50.18	31.91
D:	500.	2000	21.81	21.26
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

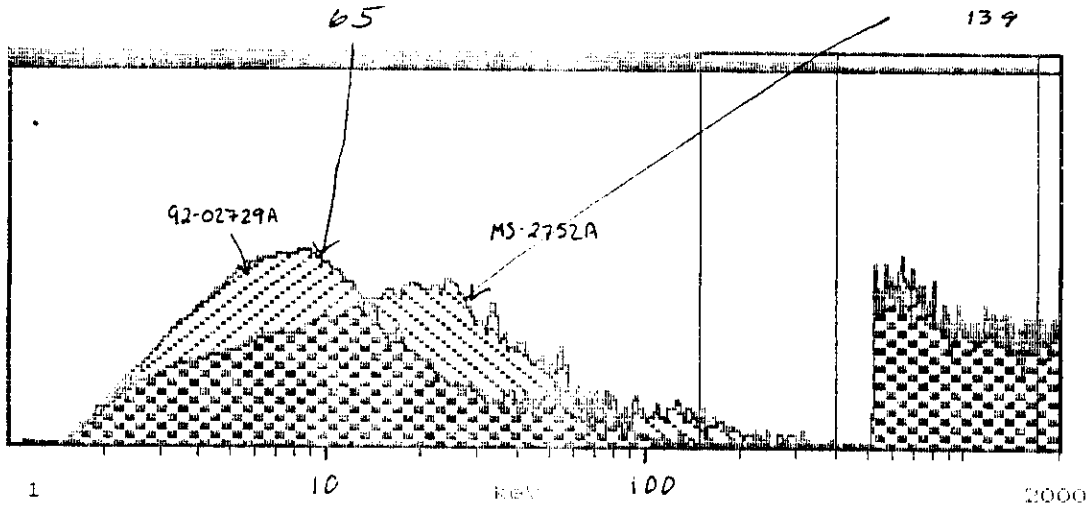
H02-010

SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 18-Feb-92 16:33

L o g V I E W

100.0 Y Transform Log max Endpoint 1947 keV

// Active File: SP9S6.1 \\ NonActive File: SP9S3.1



Regions of Interest

	LL	UL	CPM SP9S6.1	CPM SP9S3.1
A:	0.0	150.	49.94	51.45
B:	0.0	400.	50.17	52.80
C:	0.0	1700	69.65	72.08
D:	0.0	2000	71.98	74.33
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

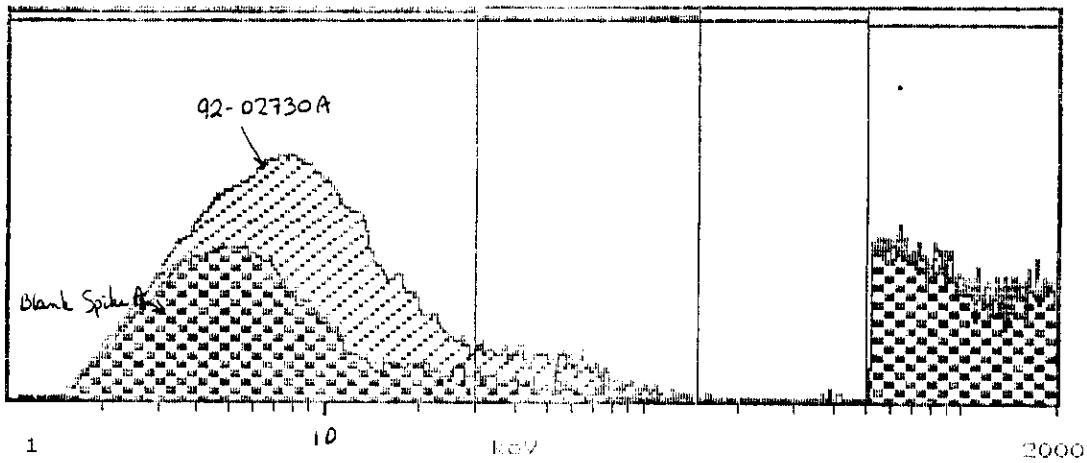
H02-011

SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 18-Feb-92 16:39

L o g V I E W

100.0 Y Transform Log max Endpoint 1945 keV

// Active File: SP9S7.1 \\ NonActive File: SP9S2.1



Regions of Interest

	LL	UL	CPM SP9S7.1	CPM SP9S2.1
A:	0.0	30.0	53.70	29.43
B:	30.0	150.	5.66	2.21
C:	0.0	500.	59.55	31.91
D:	500.	2000	21.53	21.26
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

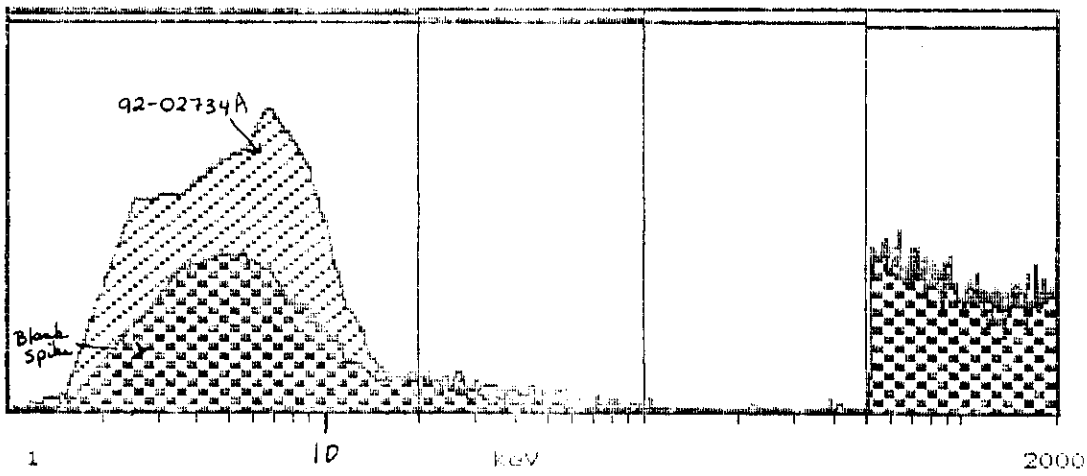
H02-01c

SPECTRAGRAPH 2.27 (C) Copyright Packard Instrument Co. 1987 18-Feb-92 16:45

L o g V i e w

100.0 Y Transform Log max Endpoint 1943 keV

// Active File: SP958.1 \\ NonActive File: SP952.1



Regions of Interest

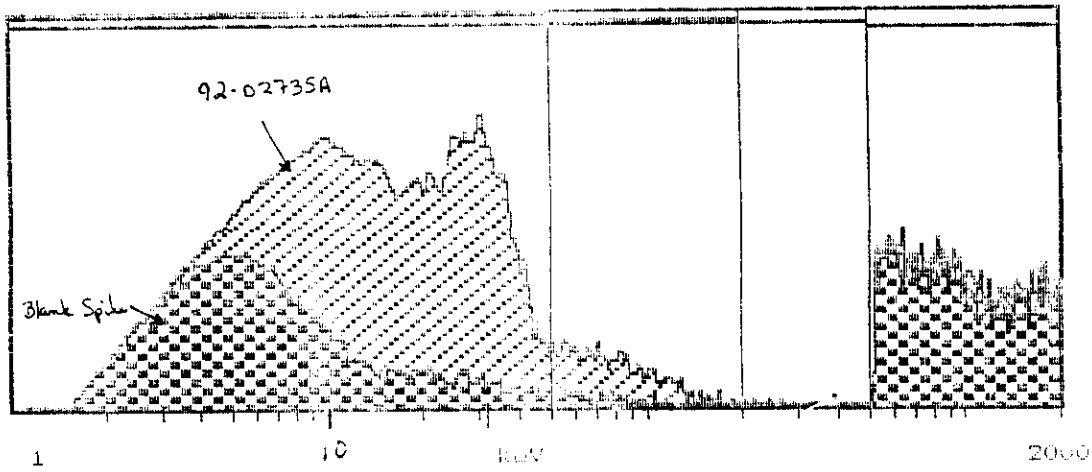
	LL	UL	CPM SP958.1	CPM SP952.1
A:	0.0	20.0	54.11	28.11
B:	20.0	100.	2.07	3.43
C:	0.0	500.	56.46	31.91
D:	500.	2000	21.04	21.26
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

H02-013

L o g I E W

100.0 Y Transform Lin, max Endpoint 1920 keV

// Active File: SP9S9.1 \\ NonActive File: SP9S2.1



Regions of Interest

	LL	UL	CPM SP9S9.1	CPM SP9S2.1
A:	0.0	50.0	78.60	30.69
B:	50.0	200.	5.43	0.98
C:	0.0	500.	84.27	31.91
D:	500.	2000	20.70	21.26
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

H02-014

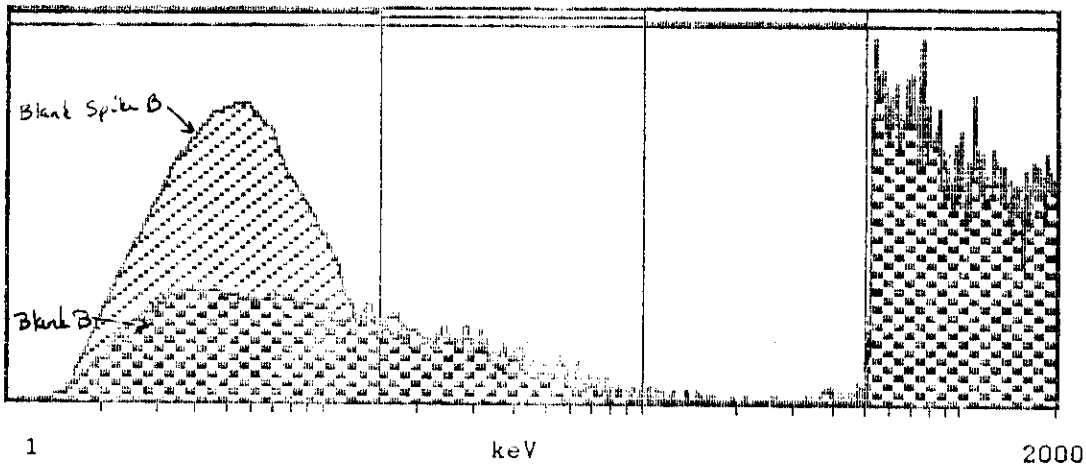
B duplicates, 1100-EM-1 samples for LSC counting

SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 25-Feb-92 15:53

L o g V I E W

50.0 Y Transform Log max Endpoint 1972 keV

// Active File: SP9S11.1 \\ NonActive File: SP9S10.1



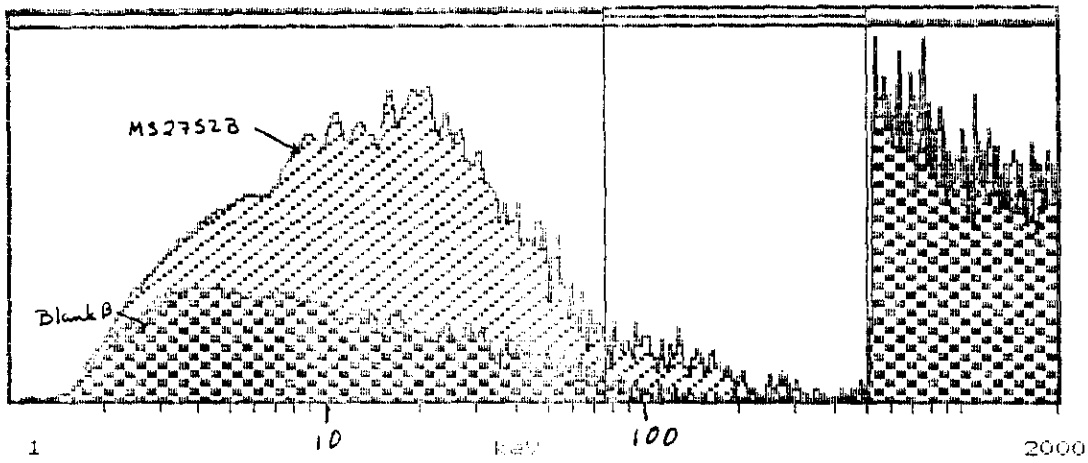
Regions of Interest

	LL	UL	CPM SP9S11.1	CPM SP9S10.1
A:	0.0	15.0	26.49	12.80
B:	15.0	100.	4.37	5.23
C:	100.	500.	0.42	0.40
D:	0.0	2000	52.01	39.60
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

H02-015

SPECTRAGRAPH 2.29 (C) Copyright Canberra Instrument Co. 1987 25-Feb-92 16:03

50.0 Y Transform Log max Endpoint 1949 keV
// Active File: SP9S12.1 \\ NonActive File: SP9S10.1



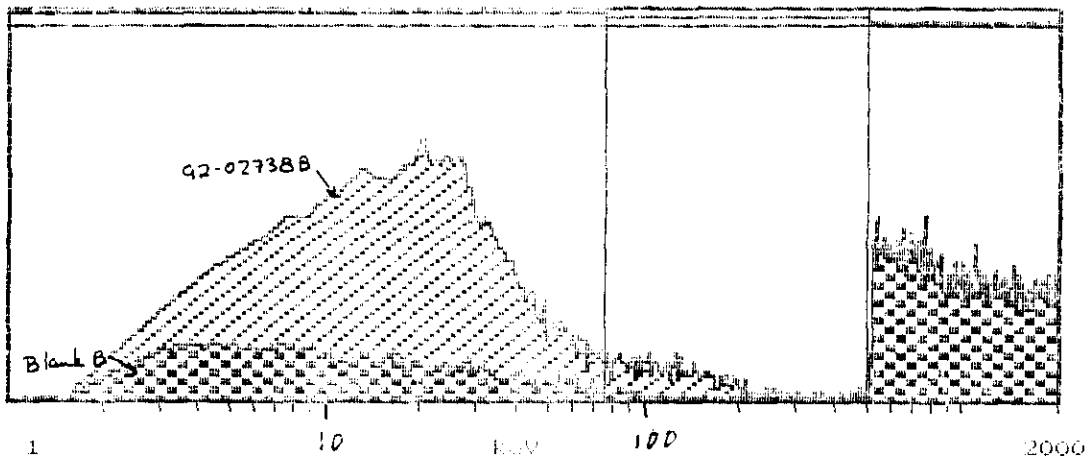
Regions of Interest

	LL	UL	CPM SP9S12.1	CPM SP9S10.1
A:	0.0	75.0	46.02	17.78
B:	75.0	500.	3.17	0.65
C:	500.	2000	20.49	21.17
D:	0.0	2000	69.68	39.60
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

L o g V i e w

100.0 γ Transition Log mode Endpoint 1927 keV

// Active File: SP9S13.1 \\ NonActive File: SP9S10.1



Regions of Interest

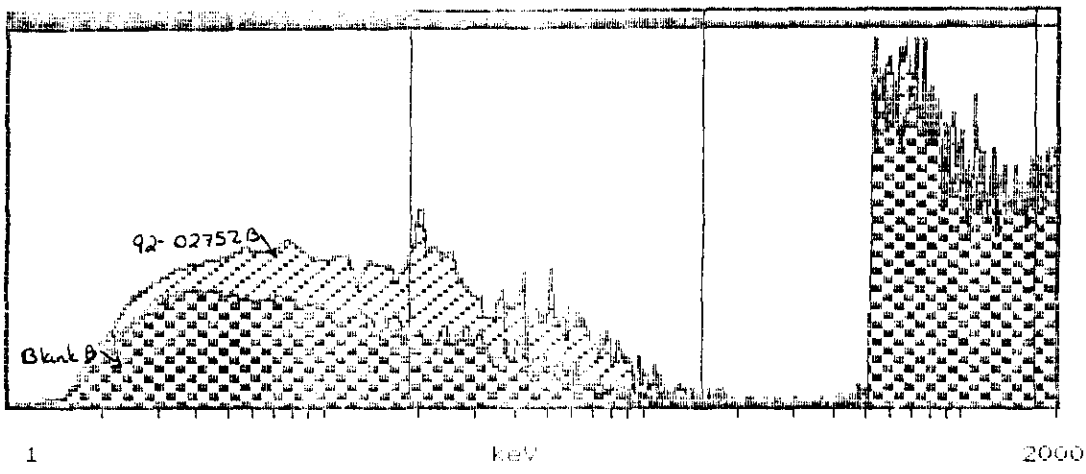
	LL	UL	CPM SP9S13.1	CPM SP9S10.1
A:	0.0	75.0	69.11	17.78
B:	75.0	500.	4.23	0.65
C:	500.	2000	20.99	21.17
D:	0.0	2000	94.34	39.60
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 25-Feb-92 16:12

L o g V i e w

50.0 Y Transform Log max Endpoint 1965 keV

// Active File: SP9S14.1 \\ NonActive File: SP9S10.1



Regions of Interest

	LL	UL	CPM SP9S14.1	CPM SP9S10.1
A:	0.0	18[illegible]	19.99	13.75
B:	0.0	15[illegible]	29.82	18.19
C:	0.0	1700	49.37	37.31
D:	0.0	2000	51.79	39.60
E:	0.0	[illegible]	0.00	0.00
F:	0.0	[illegible]	0.00	0.00

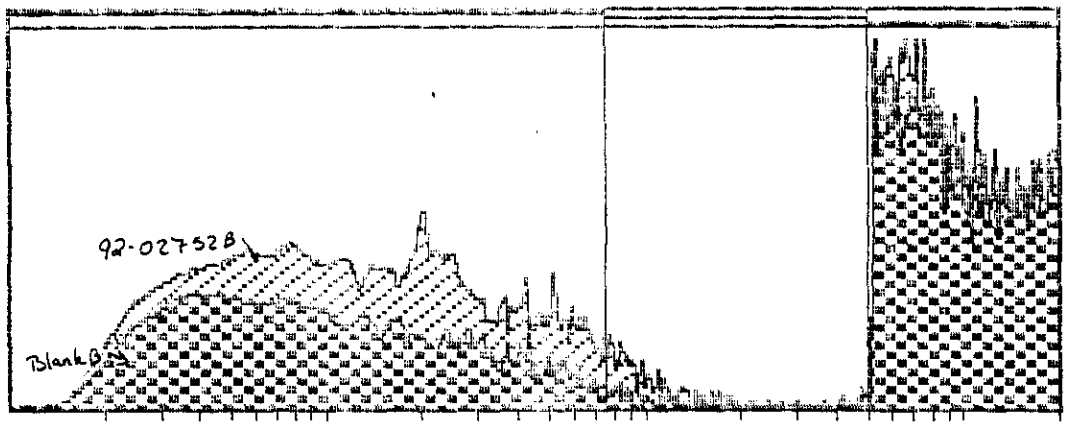
H02-018

SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 25-Feb-92 16:14

L o g V I E W

50.0 Y Transform Log max Endpoint 1965 keV

// Active File: SP9S14.1 \\ NonActive File: SP9S10.1



1 keV 2000

Regions of Interest

	LL	UL	CPM SP9S14.1	CPM SP9S10.1
A:	0.0	75.0	28.61	17.78
B:	75.0	500.	1.45	0.65
C:	500.	2000	21.73	21.17
D:	0.0	2000	51.79	39.60
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

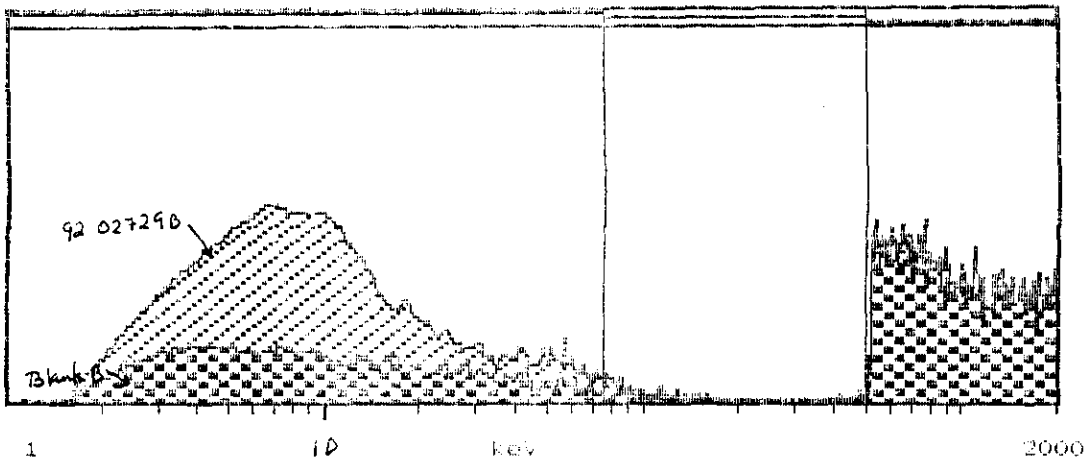
H02-019

SPECTRAGRAPH 2.29 (C) Copyright [illegible] Instrument Co. 1987 25-Feb-92 16:20

L o g V i e W

100.0 Y Transform Log max Endpoint 1950 keV

// Active File: SP9S15.1 \\ NonActive File: SP9S10.1



Regions of Interest

	LL	UL	CPM SP9S15.1	CPM SP9S10.1
A:	0.0	75.0	49.62	17.78
B:	75.0	500.	1.11	0.65
C:	500.	2000	21.47	21.17
D:	0.0	2000	72.20	39.60
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

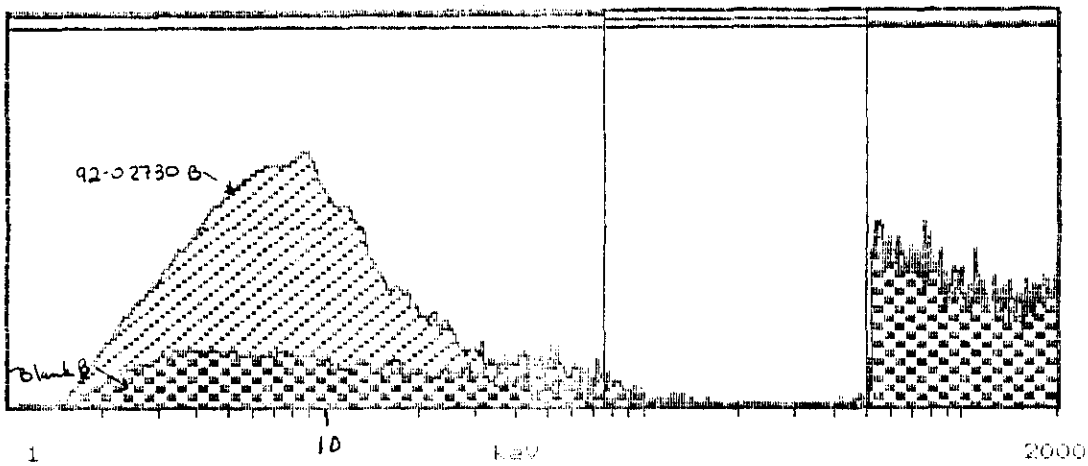
H02-020

SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 25-Feb-92 16:53

L o g V I E W

100.0 Y Transform Log max Endpoint 1948 keV

// Active File: SP9S16.1 \\ NonActive File: SP9S10.1



Regions of Interest

	LL	UL	CPM SP9S16.1	CPM SP9S10.1
A:	0.0	75.0	58.82	17.78
B:	75.0	500.	1.09	0.65
C:	500.	[illegible]	21.16	21.17
D:	0.0	[illegible]	81.07	39.60
E:	0.0	[illegible]	0.00	0.00
F:	0.0	[illegible]	0.00	0.00

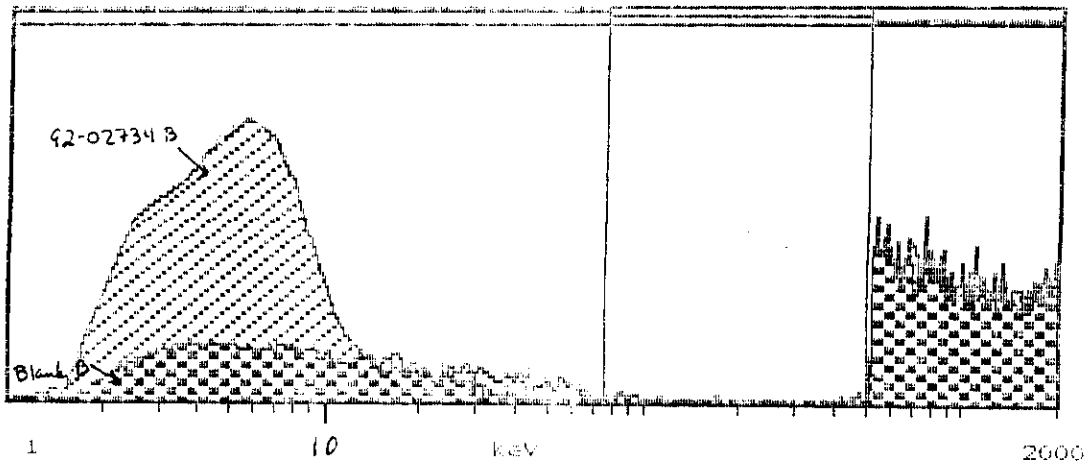
H02-021

SPECTRASCAN 2.29 (C) Copyright Packard Instrument Co. 1987 25-Feb-92 16:58

L o g V I E W

100.0 Y Transform Log MAX Endpoint 1948 keV

// Active File: SP9S17.1 \\ NonActive File: SP9S10.1



Regions of Interest

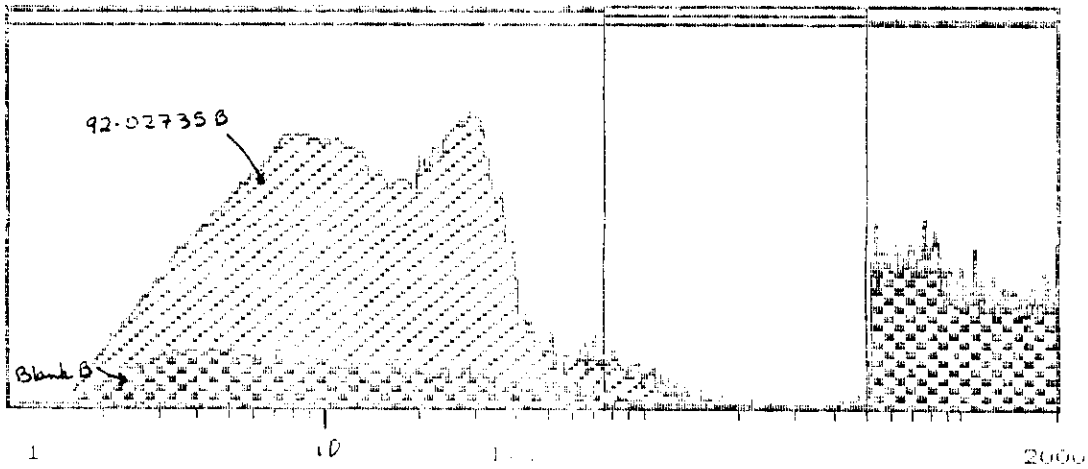
	LL	UL	CPM SP9S17.1	CPM SP9S10.1
A:	0.0	75.0	50.59	17.78
B:	75.0	500.	0.24	0.65
C:	500.	2000	20.47	21.17
D:	0.0	2000	71.30	39.60
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

H02-022

L o g V i e w

Endpoint 1915 keV

// Active File: SP9S18.1 \\ NonActive File: SP9S10.1



Regions of Interest

	LL	UL	CPM SP9S18.1	CPM SP9S10.1
A:	0.0	75.0	83.61	17.78
B:	75.0	500.	2.71	0.05
C:	500.	2000	20.83	21.17
D:	0.0	2000	107.16	39.70
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

1100EM1

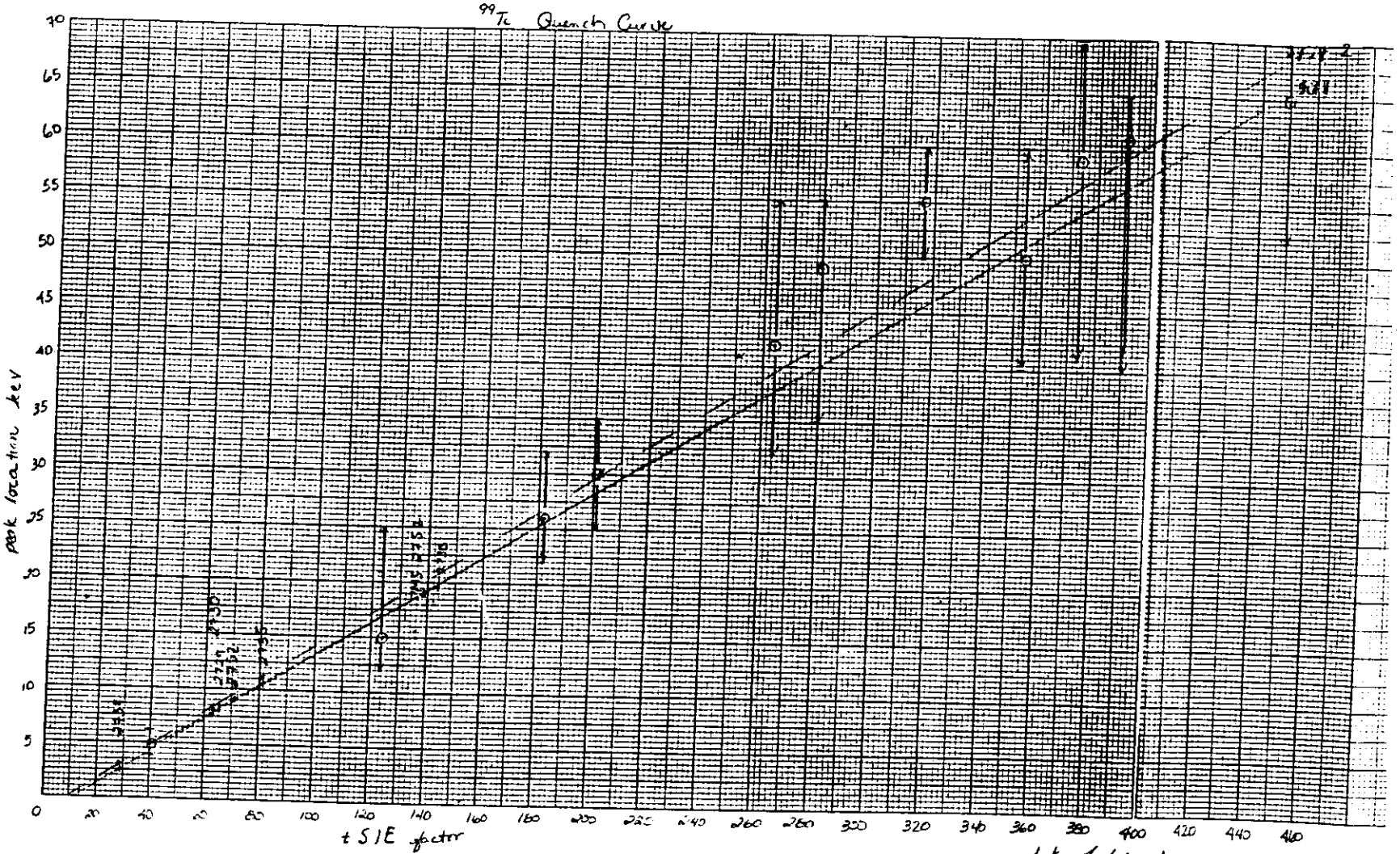
QUENCH CURVE GENERATION

tSIE factor	peak location	
449	65 (52-70)	
391	61 (40-65)	
374	59 (41-70)	
354	50 (43-60)	
317	55 (50-60)	
280	49 (35-55)	
264	42 (32-55)	
201	30 (25-35)	
181	26 (22-32)	
124	15 (12-25)	
41	5 (4-6.2)	From blank spike run 2/14/92.

J.K. Fadeff 3/11/92

K+E 10 X 10 TO 1/2 INCH 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

46 1320



S. K. Sadoff 3/11/92

H02-025

QUENCH CURVE SAMPLES FOR Tc-99 BY LSC

1. Prepare 5 vials, each containing 500 ul of Tc-99 sol'n 52733-80-1000 and 500 ul DI water.

Add the following:

VIAL		
1		19 ml Instagel
2	10 ul nitromethane	19 ml Instagel
3	20ul "	" "
4	50ul "	" "
5	100ul "	" "

First add the nitromethane, mix, then add the Instagel.

2. Prepare 5 vials, each containing 500 ul of Tc-99 sol'n 52733-80-1000 and 5 ml DI water.

Add the following:

VIAL		
6		15 ml Instagel
7	10 ul nitromethane	15 ml Instagel
8	20ul "	" "
9	50ul "	" "
10	100ul "	" "

Count with Packard 2260XL LSC system in 325 bldg.

Done 15:35

J. H. Kaye
2/26/92

H02-026

Fiber Calib

2/26/92 JK.

T = 21.3 °C

10A-26 500 λ

1	497.41
2	498.24
3	499.58
4	499.76
5	500.58

J.H.K. 2/26/92

1	~~498.~~ 499.03
2	501.49
3	500.15
4	502.17
5	499.48

T = 21 °C

in BNU 53647, p 76

James H. Kaye
2/26/92

Tc-99 Quench Curve Spectra

Protocol #: 9 Name:JHK 27-Feb-92 13:39
Region A: LL-UL= 0.0-10.0 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Region B: LL-UL=10.0-150. Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Region C: LL-UL= 0.0-2000 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Time =100.00 QIP = tSIE F5 Terminator = Count
Low Level Count Mode

S#	TIME	CPMA	CPMB	CPMC	tSIE	FLAG	ELTIME		
1	100.00	12.85	48.77	87.17	449.		102	0λ nitromethane	19ml Quicksafe 1ml water
2	100.00	14.97	57.19	97.66	391.		204	10λ	
3	100.00	15.70	57.45	97.89	334.		306	20λ	
4	100.00	20.22	57.02	100.50	264.		408	50λ	
5	100.00	26.56	49.86	99.52	161.		510	100λ	
6	100.00	14.81	52.49	90.99	374.		612	0λ	15ml Quicksafe, 5.5ml water
7	100.00	17.15	55.91	96.92	317.		714	10λ	
8	100.00	17.95	55.29	98.26	280.		816	20λ	
9	100.00	22.12	51.98	97.11	201.		918	50λ	
10	100.00	30.29	41.30	93.54	124.		1020	100λ	
11	100.00	11.97	6.59	39.27	30.9		1122	BLANK A	
12	100.00	24.21	5.54	50.38	22.5		1225	BLANK SPIKE "A"	

SYSTEM NORMALIZED
C14 IPA DATA PROCESSED
H3 IPA DATA PROCESSED

James H. Kaye
2/28/92

H02-028

Tc-99 Growth Curve Spectra

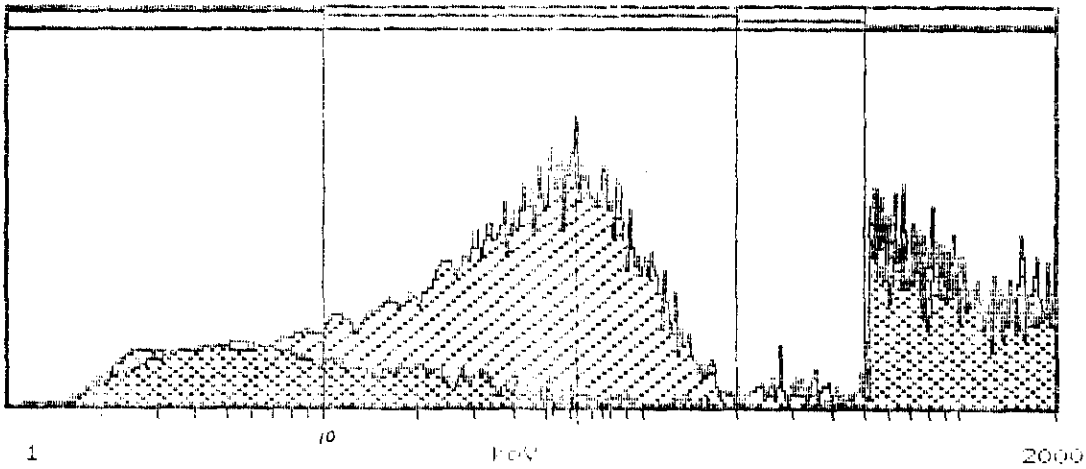
SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 28-Feb-92 16:03

L o g V I E W

100.0 Y Transform Log max Endpoint 1934 keV

// Active File: SP9S1.1 \\ NonActive File: SP9S11.1

t SIE= 449



Regions of Interest

	LL	UL	CPM SP9S1.1	CPM SP9S11.1
A:	0.0	10.0	12.85	11.97
B:	10.0	200.	48.84	6.37
C:	200.	500.	2.04	0.19
D:	500.	2000	22.10	20.39
E:	0.0	2000	85.83	38.92
F:	0.0	0.0	0.00	0.00

H02-029

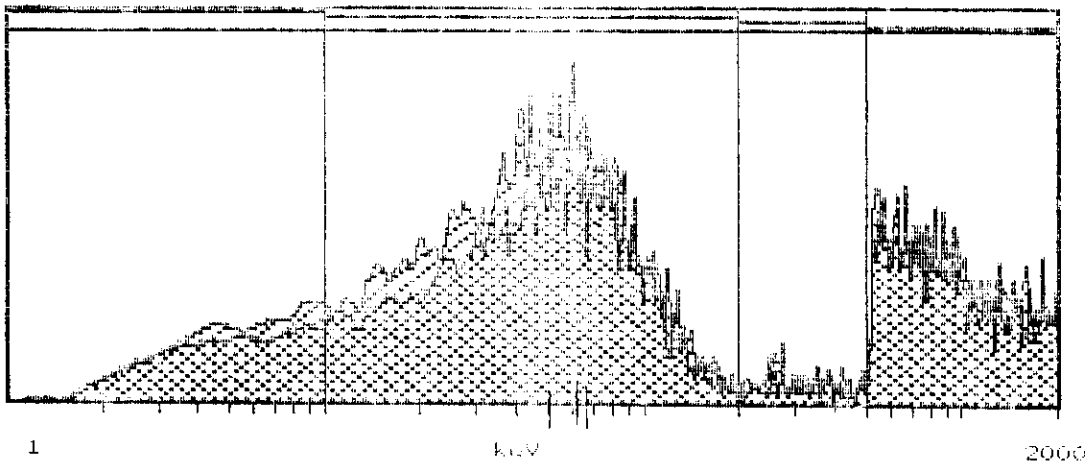
SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 28-Feb-92 16:18

L o g V i E W

100.0 Y Transform Log max Endpoint 1919 keV

// Active File: SP9S2.1 \\ NonActive File: SP9S1.1

t SIE = 391 t SIE = 449



Regions of Interest

	LL	UL	CPM SP9S2.1	CPM SP9S1.1
A:	0.0	10.0	14.97	12.85
B:	10.0	200.	57.46	48.84
C:	200.	500.	2.73	2.04
D:	500.	2000	21.45	22.10
E:	0.0	2000	96.61	85.83
F:	0.0	0.0	0.00	0.00

H02-030

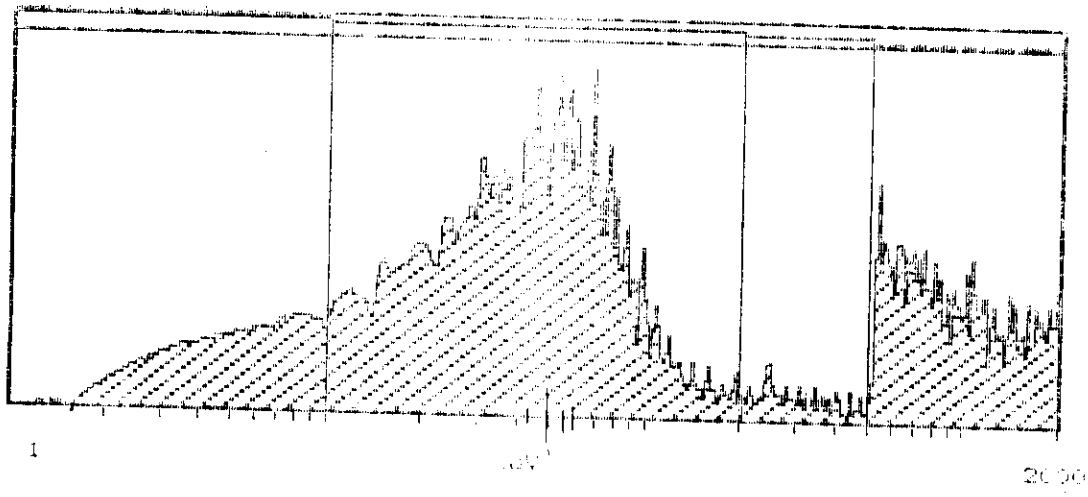
SPECTRAGRAPH 2.29 (C) Copyright Canberra Instrument Co. 1987 05-Mar-92 16:0

L o g V i e w

100.0 Y Trans Lin Log Man
// Active File: SF933.1

Endpoint 1983 keV
\\ NonActive File:

tSIE = 354



Regions of Interest

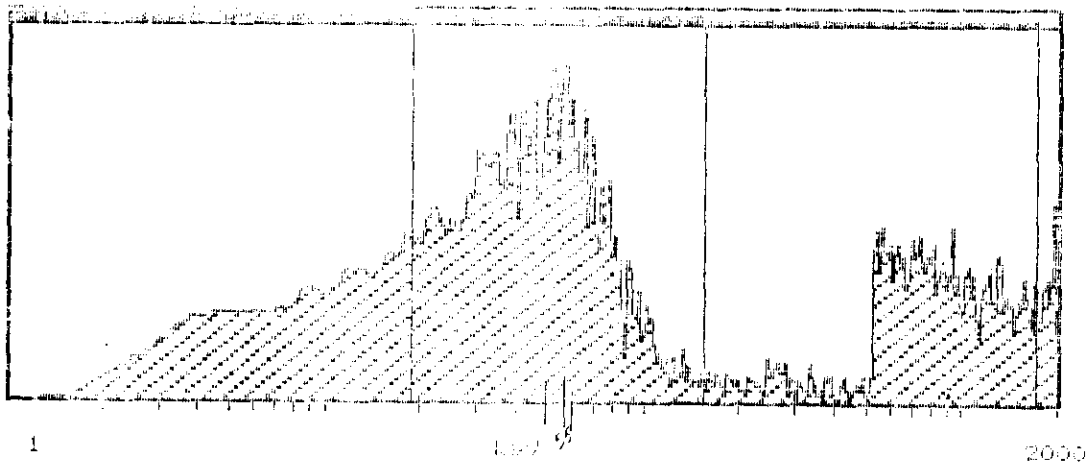
	LL	UL	CPM
A:	0.0	[illegible]	15.70
B:	10.0	200.	57.99
C:	200.	500.	2.48
D:	500.	[illegible]	20.81
E:	0.0	[illegible]	96.98
F:	0.0	[illegible]	0.00

H02-031

SPECTRAGRAPH 2.09 (C) Co[illegible] Instrument No. 1987 05 Mar-92 16:33

[illegible] Endpoint 1949 keV
[illegible] Nonactive File:

tSIE = 317



Region of Interest

	LL	UL	CPM
A:	0.0	18[illegible]	27.19
B:	0.0	1[illegible]	72.72
C:	0.0	1[illegible]	93.58
D:	0.0	2[illegible]	95.97
E:	0.0	[illegible]	0.00
F:	0.0	[illegible]	0.00

H02-032

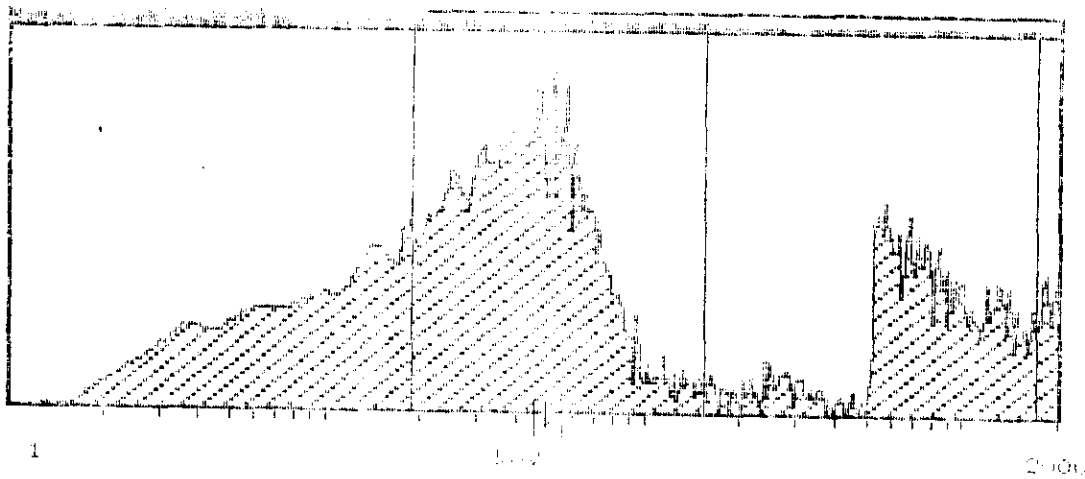
Log VIEW

Endpoint: 1951 keV

Active File: SP980 1

NonActive File:

t SIE = 280



Region	LL	UL	Counts CPM
1:	[illegible]	[illegible]	28.92
2:	[illegible]	[illegible]	72.92
3:	[illegible]	[illegible]	54.93
4:	[illegible]	[illegible]	97.40
5:	[illegible]	[illegible]	3.00
6:	[illegible]	[illegible]	0.00

SPECTRAGRAPH 2.2 (c) Canberra Packard Instrument Co. 1987 05-Mar-92 16:13

L o g - l i n

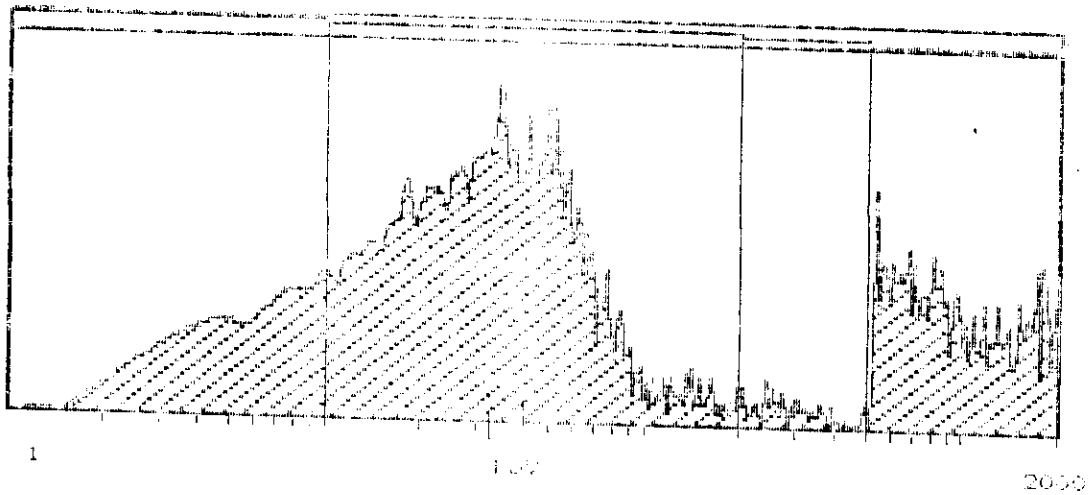
1.0:0 Y Transform Log max

Active File: S295.1

Endpoint 1932 keV

Nonactive File:

tSIE - 264



	Region of Interest		
	LL	UL	CPM
A:	0.0	[illegible]	20.22
B:	[illegible]	[illegible]	97.58
C:	[illegible]	[illegible]	1.05
D:	500.0	[illegible]	20.03
E:	[illegible]	[illegible]	99.88
F:	0.0	[illegible]	0.00

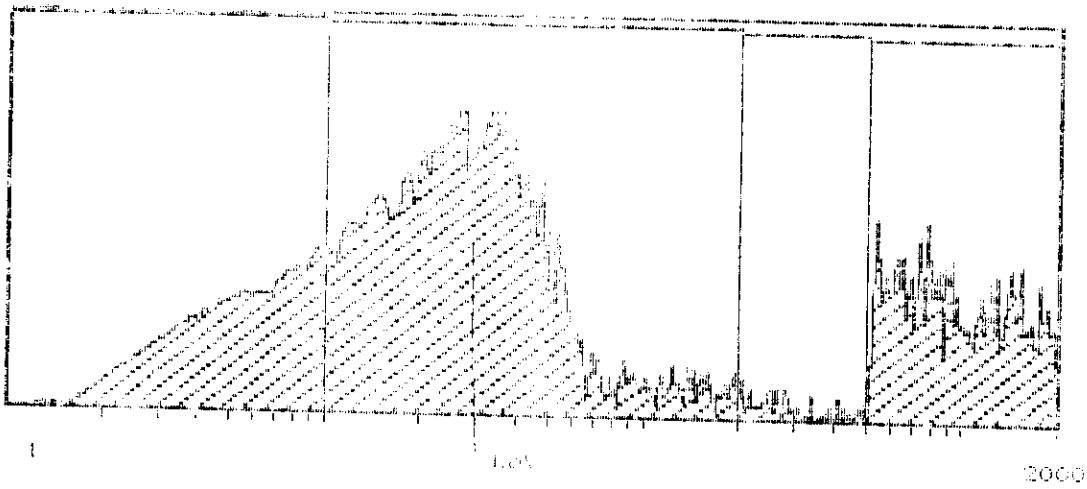
H02-034

SPECTRA[illegible] [illegible] Transmark Co. 1987 [illegible]

[illegible] / Transform Log [illegible]
/ Active Filter [illegible]

Endpoint 1902 keV
\ Non-Active Filter

tSIE = 201



Regions of Interest

	LL	UL	CPM
A1	0.0	10.	22.12
B1	10.0	20.	52.65
C1	20.	50.	1.72
D1	50.0	200.	20.29
E1	0.0	0.	0.00
F1	0.0	0.	0.00

H02-035

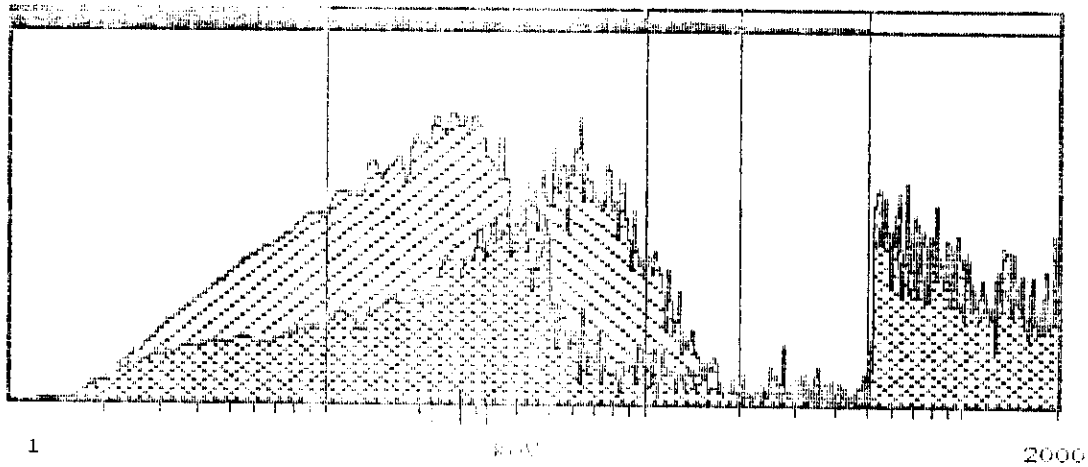
SPECTRAGAMMA 2.29 (C) Copyright Packard Instrument Co. 1987 28-Feb-92 16:26

L o g V i E W

10/1.0 Y Transform Log max Endpoint 1923 keV

// Active File: SP9S5.1 \\ NonActive File: SP9S1.1

tSIE 181 tSIE 449



Regions of Interest

	LL	UL	CPM SP9S5.1	CPM SP9S1.1
A:	0.0	100.0	26.56	12.85
B:	0.0	100.0	74.63	56.49
C:	0.0	200.0	76.75	61.69
D:	0.0	500.0	77.98	63.73
E:	0.0	2000	99.00	85.83
F:	0.0	0.0	0.00	0.00

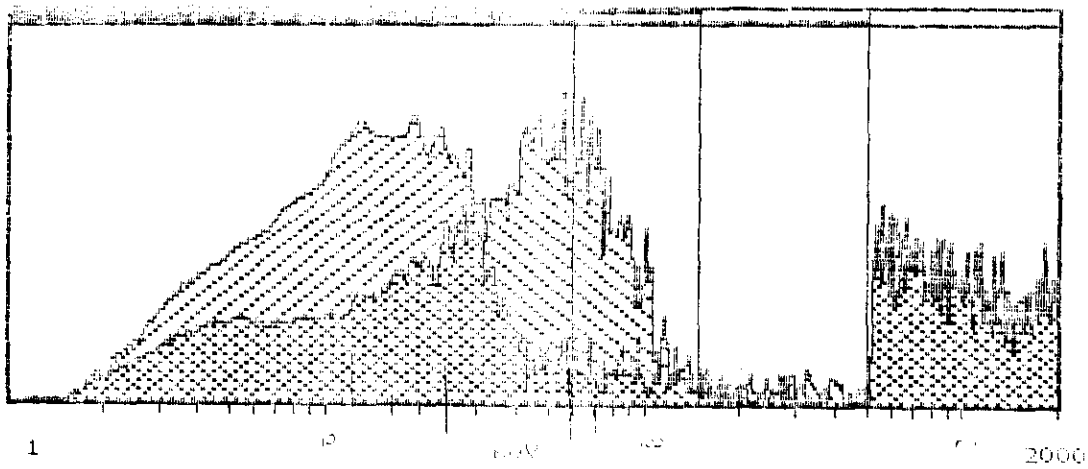
H02-036

Log View

100.0 Y Transform Log max Endpoint 1942 keV

// Active File: SP9S10.1 \\ NonActive File: SP9S6.1

t SIE=124 t SIE=374



Regions of Interest

	LL	UL	CPM SP9S10.1	CPM SP9S6.1
A:	0.0	150.	71.19	66.72
B:	0.0	80.0	68.05	52.03
C:	0.0	500.	72.25	69.36
D:	0.0	2000	93.00	89.89
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

H02-037

1100 EMI Quench Curve LSC

This includes a copy of the Data sheet, test instructions, Sample listing and LSC spectra of the blank spike and duplicate blank spike from the analytical run. The blank spike is included in the Quench Curve as the low-end point.

S. K. Fadeff 3/11/92

HO2-038

TEST INSTRUCTIONS FOR ANALYSIS OF 1100-EM-1
SAMPLES BY LIQUID SCINTILLATION COUNTING

1. Perform this work in lab 10A. Evaporate 500-ml aliquots of the following samples, blank, blank spike and matrix spike to a volume of 25 ml.

To prepare blank and blank spike, use 500 ml Milli-Q water and 1 ml c HNO3.

Sample Number	ALO Number		Spike
B01C28	92-2752		
B015T1	92-2729		
B015T3	92-2730		
B015V1	92-2734		
B015V3	92-2735		
B015V8	92-2738		
		Blank	
		Blank Spike	500 ul of Tc-99 spike*
B01C28	92-2752	Matrix Spike	500 ul of Tc-99 spike*

*To prepare Tc-99 spike:

a) Calibrate 10 ul pipet.

b) Remove 10 ul of Tc-99 52733-80-RS-4, accurately dilute to 10 ml using volumetric flask or by weighing. Record all data. MO 10 ml vol flask
Then 2.5 ml → 25 ml in ~ .01M NH4OH 52733-80-1000

c) Use 500 ul of this spike for the blank spike and matrix spike.

2. Transfer two 10-ml portions of each sample into 20-ml glass LSC vials, then add 10 ml of Instagel liquid scintillation cocktail to each. Cap each vial and mix thoroughly. Gel will be milky white.

3. Transfer samples to 325 building for counting. Diana or Bob can do this.

4. Jim Kaye will count with 2260XL Liquid scintillation counting system in 325 building, using low background mode, 0-2000 keV.

J. Bradczynski 2-10-92
J. H. Kaye
2/10/92

Liquid Scintillation Counting 117c

~~Leaching~~ Data Sheet
gh 3-10-92

Check if used

Procedure PNL-ALO-106 Rev.0, leach: NA

Date ~~Sample Leach~~ gh 3 10-92 Started 2-13-92 Date Completed 2-14-92

Tracer or Spike Volumes
Isotope ^{99}Tc Sample Added to: Blank Spike + MS 2752
Pipette No. 10A-26 Volume 491.7 l +/- 1.9 l Date Pipetted 2-12-92
Spike ID 52733-80-1000 Spike Activity 67.50 dpm ± 2.5 dpm

Isotope _____ Sample Added to: _____
Pipette No. _____ Volume _____ +/- _____ Date Pipetted _____
Spike ID _____ Spike Activity ~~67.50 dpm ± 2.5 dpm~~
gh 3/9-92

Sample ID, Aliquot Size, and Leachate Volume

Balance Number 510-06-01-006 Temperature (if weighing water samples) 22°

Sample ID	Beaker Wt	Bker + Smpl	Sample Wt or Vol	~~Diln~~ Volume gh 3-9-92	Diln Vol. Uncertainty 1.00221		
Blank	402.9	912	509.1	510.2			
Blk Spk	408.1	905.5	497.4	498.5			
92-2729	400.9	910.8	509.9	511.0			
MS 2752	401.0	901.5	500.5	501.6			
92-2735	399.5	929.6	530.1	531.3			
92-2734	400.1	930.3	530.2	531.3			
92-2752	396.6	894.1	497.5	498.6			
92-2730	403.1	897.6	494.2	495.3			
92-2738	tared Balance		501				

Sample Volumes (if a pipet was used for small aqueous samples)

Pipette No. NA Volume _____ +/- _____ Date Pipetted _____

G Bialczynski 2-14-92 Analyst Date

J. H. Kaye 3/10/92 Reviewer Date

LECHDATA.LOG

Note: Samples were put into incorrect glass vials and were transferred. First vials were scintillation vials of the same size but were not of the low K^{40} glass required for the 3255 liquid scintillation counter.

Protocol #: 9 Name:JHK 14-Feb-92 16:31
Region A: LL-UL= 0.0-10.0 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Region B: LL-UL=10.0-150. Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Region C: LL-UL= 0.0-2000 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Time =300.00 QIP = tSIE ES Terminator = Count
Low Level Count Mode

S#	TIME	CPMA	CPMB	CPMC	tSIE	FLAG	ELTIME	
1	300.00	12.18	7.29	41.12	44.0	B	304	BLANK
2	300.00	12.88	0.00	12.22	40.3		607	BS-A
3	300.00	8.32	23.85	33.63	139.		910	MS 2752-A
4	300.00	13.23	34.25	48.00	144.		1213	92-2738A
5	300.00	2.40	7.71	10.76	70.9		1516	2752 A
6	300.00	19.62	10.97	31.04	65.3		1820	2729 A
7	300.00	27.46	12.56	40.15	62.6		2123	2730 A
8	300.00	37.82	0.00	36.59	29.3		2428	2734 A
9	300.00	26.41	38.13	64.19	85.1		2731	2735 A
10	300.00	0.00	0.10	0.00	46.4		3034	BLANK B
11	300.00	12.28	0.00	11.06	40.7		3337	BS-B
12	300.00	8.34	20.57	28.98	132.		3640	MS 2752 B
13	300.00	16.93	35.83	53.64	136.		3943	92-2738 B
14	300.00	2.78	7.70	10.87	67.6		4247	2752 B
15	300.00	20.69	10.49	31.29	62.2		4550	2729 B
16	300.00	27.84	12.57	40.14	62.3		4853	2730 B
17	300.00	33.73	0.00	30.36	28.5		5158	2734 B
18	300.00	29.05	37.57	66.34	80.7		5461	2735 B

J. H. Kaye
2/18/92

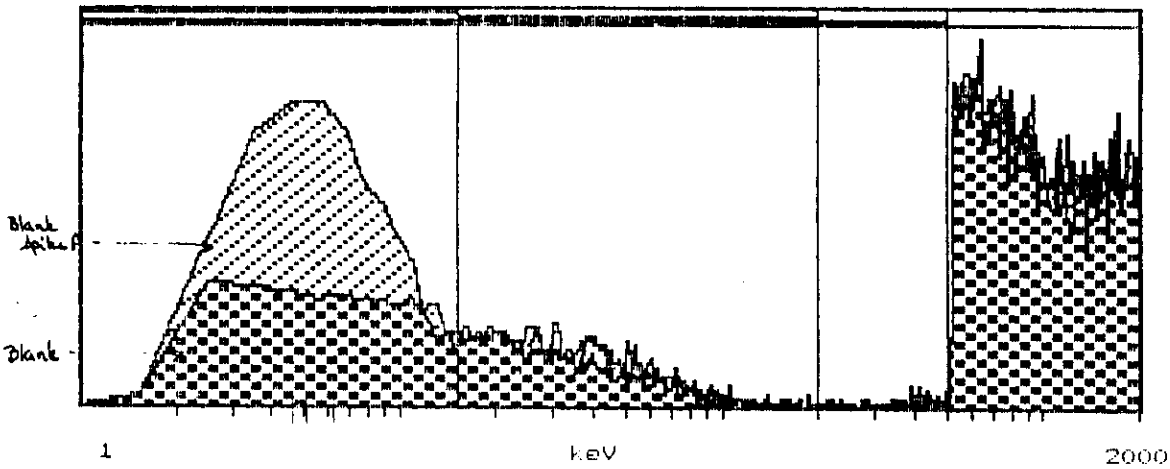
H02-041

SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 18-Feb-92 15:16

L o g V I E W

50.0 Y Transform Log max Endpoint 1959 keV

// Active File: SP9S2.1 \\ NonActive File: SP9S1.1



Regions of Interest

	LL	UL	CPM SP9S2.1	CPM SP9S1.1
A:	0.0	15.0	26.95	13.92
B:	15.0	200.	4.73	5.52
C:	0.0	500.	31.91	19.66
D:	0.0	2000	53.17	40.97
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

H02-04c

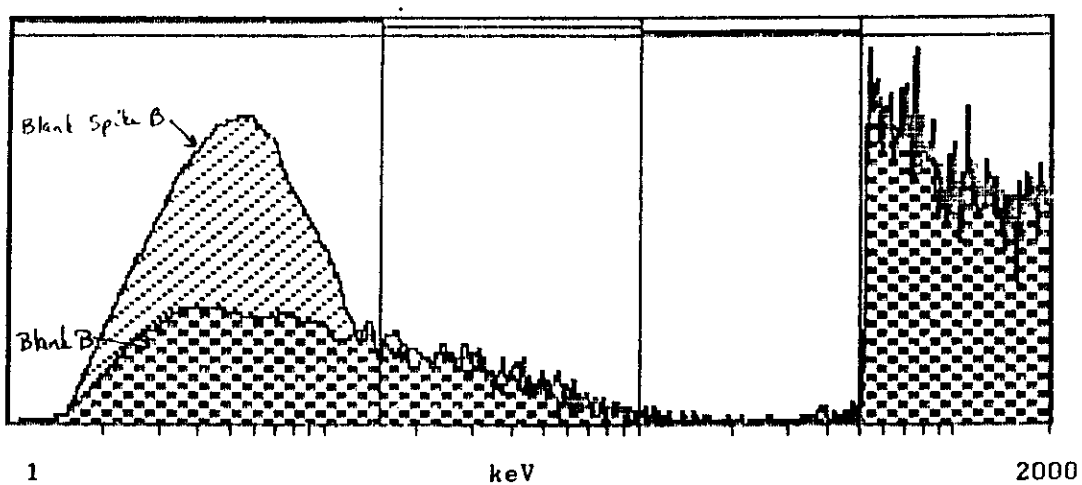
B duplicates, 1100-EH-1 samples for LSC counting

SPECTRAGRAPH 2.29 (C) Copyright Packard Instrument Co. 1987 25-Feb-92 15:53

L o g V I E W

50.0 Y Transform Log max Endpoint 1972 keV

// Active File: SP9S11.1 \\ NonActive File: SP9S10.1



Regions of Interest

	LL	UL	CPM SP9S11.1	CPM SP9S10.1
A:	0.0	15.0	26.49	12.80
B:	15.0	100.	4.37	5.23
C:	100.	500.	0.42	0.40
D:	0.0	2000	52.01	39.60
E:	0.0	0.0	0.00	0.00
F:	0.0	0.0	0.00	0.00

H02-043

1100-EM-1 GROUNDWATER CHARACTERIZATION
PHASE I

DATA PACKAGE/REPORT No. 1

Revision 0

APPENDIX J

RADIOCHEMICAL ANALYSIS FOR TC-99

Table of Contents

J01 - Summary Results

Battelle
Pacific Northwest Laboratories

Project Number 19432

Internal Distribution

LR Greenwood
File/LB

Date April 10, 1992

To Bruce Prentice

From Nancy Wynhoff S.K. Fadeff

Subject ^{99}Tc Analysis Results for 1100-EM-1

Six samples submitted from the 1100-EM-1 project were prepared for analysis according to procedure PNL-MA-597, 7-40.39, Determination of ^{99}Tc. A known activity ^{95m}Tc tracer standard was added to each sample to serve as a yield monitor and a technetium separation was performed. The Tc yield in each sample was determined by gamma spectroscopy, comparing the ^{95m}Tc in the prepared sample to a reference standard containing the original known activity. The prepared samples were counted by beta flow-through proportional counting according to PNL-ALO-463, Beta Counting Procedure. ^{99}Tc is determined by subtracting the ^{95m}Tc contribution from the sample's beta count rate.

The sample results, when corrected for the contribution of the ^{95m}Tc tracer to the total measured beta counts per minute, were negative. Since preliminary calculations had indicated that the method was expected to provide a detection limit of 35 pCi/L and ICP/MS analysis had found ^{99}Tc present at well above 35 pCi/L in all but one of these samples, we investigated the analysis for problems. Two problems were identified as the cause of these incorrect and unusable results. First of all an error was found in the addition of ^{95m}Tc tracer: ten times the planned amount had been added due to an error in a dilution calculation. Secondly, the ^{95m}Tc tracer used did not have the same beta absorption characteristics as the tracers used in the past. As a result, beta absorption could not be used to discriminate between ^{99}Tc and the tracer as called for in the procedure.

The first problem, the addition of too much ^{95m}Tc tracer to the samples, resulted in the situation where two large numbers were subtracted to produce a small net result. An exampleis given below using theoretical counting data and actual analytical conditions for one sample. (The ICP/MS result was 147 pCi/L ^{99}Tc.)

$$136 \text{ beta cpm} - 120 \pm 13\ ^{95m}\text{Tc cpm} = 16 \text{ net } ^{99}\text{Tc cpm}$$

where: beta cpm = gross cpm - instrument bkgd cpm,
^{95m}Tc cpm = the expected contribution of ^{95m}Tc to the beta cpm, calculated from the yield and the count rate of a ^{95m}Tc standard of known activity,
net ^{99}Tc cpm = expected cpm based on ICP/MS result for ^{99}Tc.

The uncertainties involved in the large correction term (^{95m}Tc cpm) are equal in magnitude to the expected net count rate.

J01-001

E54-1900-001 (10/89)

The second problem involved beta absorption characteristics. For the ^{95m}Tc tracers used in the past, the fraction through a 8.4 mg/cm^2 absorber (that is, the ratio of cpm through the absorber to the cpm with no absorber) was approximately 0.09. The ratio for a ^{99}Tc standard was about 0.43. Therefore, counting the samples through this absorber would discriminate against ^{95m}Tc. Counting data for the sample given above, if the planned activity of tracer had been added, would be approximately as follows:

$$8.0 \text{ beta cpm} - 1.0 \pm .12\ ^{95m}\text{Tc cpm} = 7.0\ ^{99}\text{Tc cpm}.$$

Under these conditions the ^{99}Tc could have been determined.

However, the ^{95m}Tc tracer recently purchased for this work was found to have a fraction through a 8.4 mg/cm^2 absorber of 0.77. In this case, ^{99}Tc is discriminated against in favor of the ^{95m}Tc. It appears from additional investigation of the ^{95m}Tc tracers (by gamma spectroscopy, liquid scintillation spectroscopy and beta absorption studies) that the new tracer is pure ^{95m}Tc and the old tracers contained a mixture of ^{97m}Tc and ^{95m}Tc. (The old and new tracers are from two different vendors.) It is the ^{97m}Tc that appears to allow discrimination of ^{99}Tc from the tracer by beta absorption.

If the client is interested, all but one of these samples could be reanalyzed using the appropriate amount of the $^{97m-95m}Tc$ tracer. (It is available to us from the Nuclear Chemistry Department.) One half to two liters remains of each sample except 92-02730 which was consumed. We would have to use an aliquot smaller than one liter for some samples.

TC1100EM.NAR