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LUCAS HEIGHTS RESEARCH LABORATORIES

A REPORT TO

CSIRO
Corporate property Branch

on

THE LEVELS OF RADIOACTIVITY IN THE WASTE FROM THE FISHERMANS BEND SITE

by

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EXECUTIVE SUMMARY

In December 1989 the CSIRO commissioned the Australian Nuclear Science and Technology Organisation (Ansto) to remove radioactively contaminated materials from the CSIRO's Fishermans Bend site in Melbourne. During the removal operation, a portable radiation meter was used to determine whether material was contaminated. The contaminated material, defined as material having an activity greater than twice background, was excavated and packed into 205 L drums and moved into temporary storage at Ansto's Lucas Heights Research Laboratories.

The waste is stored in approximately 10,000 drums located in compound 62 at Lucas Heights. Drums are stored four to a pallet, with pallets stacked three tiers high in fourteen stacks. The stacks are covered with tarpaulins. The contaminated material was described in the Ansto report of the clean-up operations as consisting mainly of; soil (ranging from sandy to gravelly consistency), concrete paving and piping and asbestos lagging (confined to a few drums that were labelled).

It is known that during the period from 1941 to 1965, pilot plant and laboratory-scale projects involving the extraction of cerium, uranium and thorium from ores were carried out by the CSIRO at the Fishermans Bend property. However, the radionuclide content in the drums was not measured when the dean-up process was carried out. Subsequently, the Uranium and Nuclear Policy Branch of the Department of Primary Industries and Energy requested Ansto, with the permission of CSIRO, to carry out a determination of the radioactivity contained in the waste. The estimate of radioactivity contained in these drums was required within a relatively short period of time. Sampling from each drum would have been a lengthy and expensive operation so an alternative strategy was proposed to and accepted by the Uranium and Nuclear Policy Branch of the Department of Primary Industries and Energy. The following methodology was used;

1. A survey of accessible drums was undertaken using a portable dose meter.
2. Approximately 100 drums (1% of total) were selected from the accessible drums and weighed and counted externally by y-spectrometry. The purpose of this operation was to obtain a correlation between radionuclide activity and field measurements of surface dose.
3. Six drums spanning a range of activities were selected for internalsampling. Gamma-spectrometry was carried out on the samples from these drums to determine the activity of speafic radionuclides.
4. These results were analysed to estimate the activity in all 10,000 drums on a specific radionuclide basis.

The results obtained from these measurements were used to estimate the levels of radioactivity in the wastes from the measured external surface dose. Overall, the levels of radioactivity ccntained in the Fishermans Bend waste were found to below, reflecting the conservative criteria that was used in the clean-up of the site and the dilution of contaminated material by non-contaminated soil. The great majority of the drums contain soil which would be classified as non-radioactive under international transport regulations. In more detail the major findings of the

investigation may be summarised as follows;

- The material in the drums appears to arise from the same source, because the U:Th ratio is fairly constant, with variations between activities in the drums being caused by varying levels of dilution by inert materials.
- The average calculated total specific activity for the Fishermans Bend waste is 12 Bq gl and the average measured external dose was I pSv h-1.
- About 78% of the drums had external surface doses less than 1 **pSv** h-1, i.e. within a factor of 2.8 of the average background measured at the compound gate.
- About 94% of the drums had external dose measurements that were less than 10 times the average background measured at the impoundment gate (i.e. **c** 3.6 pSv h-1).
- About 98% of the drums contain levels of radioactivity that would allow them to be transported *as* non-radioactive material.

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1. INTRODUCTION

In December 1989 the CSIRO commissioned the Australian Nuclear Science and Technology Organisation (Ansto) to remove radioactively contaminated materials from the CSIRO's Fishermans Bend site in Melbourne. During the removal operation, a portable radiation meter was used to determine whether material was contaminated. The contaminated material, defined as material having an activity greater than twice background, was excavated'and packed into 205 L drums and moved into temporary storage at Ansto's Lucas Heights Research Laboratories.

The radionudide content in the drums was not measured when the dean-up process was carried out although a previous survey of the site had shown that the wastes were from the processing of uranium and thorium ores[1]. Subsequently, the Uranium and Nuclear Policy Branch of the Department of Primary Industries and Energy requested that Ansto, with the permission of CSIRO, carry out a determination of the radioactivity contained in the waste. This report details the measurements made by Ansto on the wasfe contained in the drums and the interpretation of the levels of radioactivity:

2. METHODOLOGY

The waste is stored in approximately 10,000 drums iocated in compound 62 at Lucas Heights. Drums are stored four to a pallet, with pallets stacked three tiers high in fourteen stacks. The stacks are covered with tarpaulins (see Appendix **A** for site map and plan). The contaminated material mainly consists of; soil (ranging from sandy to gravelly consistency), concrete paving and piping and asbestos lagging (confined to a few drums that were labelled and were not sampled).

An estimate of the radioactivity contained in these drums was required within a relatively short period of time. Sampling from each drum would have been a lengthy and expensive operation so an alternative strategy was proposed to and accepted by the Uranium and Nuclear Policy Branch of the Department of Primary Industries and Energy. The following methodology was used;

1. A survey of accessible drums was undertaken using a portable dose meter
2. Approximately 100 drums (1% of total) were selected from the accessible drums and weighed and counted externally by γ-spectrometry. The purpose of this operation was to obtain a correlation between radionuclide activity and field measurerftents of surface dose.
3. Six drums spanning a range of activities were selected for internal sampling. Gamma-spectrometry was carried out on the samples from these drums to determine the activity of speafic radionuclides.
4. These results were analysed to estimate the activity in all 10,000 drums on a specific radionuclide basis and determine the confidence limits for this estimate.

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[1] Ansto Project Report (1990)— Removal of Radioactive Contaminated Materials - CSIRO's Fishermans Bend Site, Melbourne.

[2] according to Ansto's May 1990 Project Report

3. EXPERIMENTAL METHODS

The study was generally carried out in agreement with the strategy outlined above. Listed below are details of the techniques used to carry out the measurements.

3.1 Surface Dose Survey

The stack configuration (see Appendix A) allowed only drums on the perimeter of each stack to be accessed. A total of 2893 drums was surveyed and the contact dose on each drum was measured using a FAG FH40F2 portable dose meter (serial number 006008). The γ-dose at contact (in units of $\mu Sv\ h^{-1}$) was measured by sliding the dose meter over the drum to locate the highest level of activity. The meter was held at that position until the reading stabilised, usually after 30 to 60 seconds. Where possible, drums located inside and around the drum being measured were checked to see if they contributed to the dose measured for the drum. In most cases where high readings were obtained, the surrounding drums were found to have a negligible effect on the reading.

Each day that measurements were made, a number of background radiation readings were taken at the compound gate. This location was chosen as it was far enough away from the drums to exclude their contribution to background but was dose enough to estimate the background in the compound. The background levels were found to vary not only from day to day but during each day, probably because of other activities being carried out close by, and so it was decided that these measurements could not be used to correct the drum dose to net dose, i.e. the dose above background arising from the drum. So in this report measured, not corrected, doses are quoted.

3.2 Survey of Selected Drums

A total of 94 drums was removed by forklift and transported to a laboratory (Building 21H-Pilot Plant). Drum selection was carried out in a manner to try and be as random as possible but two logistical factors affected the ability to do this; firstly, many drums were not able to be reached easily and secondly, some drums were found to be unstable because of deterioration of the pallets on which they were stored and hence were not selected.

In the laboratory each drum was weighed using a 500 kg scale (± 1 kg). (Details for each drum are given in Appendix B.) A NaI aystal, type 12a12 (serial # EH942(1)), and a Canberra Series 10 Plus rate meter (model 1104, serial # 989301) was used to externally count on each drum and collect a γ-spectrum.

The spectrum was calibrated using a uranium ore standard to relate channel number to peak energy. Regular background counts were also taken to correct the gross counts and peak counts collected for each drum. The background count and counting of the drums were performed under otherwise identical conditions. Each

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[3] The drums studied herein were identified by a sample number such as FBA123. In this example the FB referred to Fishermans Bend, the letter A referred to the stack that the drum was located in and 123 referred to the position in the stack (please refer to Appendix A-1 for a description of the stacks and the initial drum positions).

drum was counted using the NaI crystal placed on top of the drum in a standard configuration. A γ-spectrum was obtained over a known time, usually between 2500 and 3000 seconds. As well as the total integrated area of the spectrum, several spectral regions of interest were collected for each drum. Table 1 gives the regions of interest collected with details of the radionuclides detected in each energy region.

Table 1
Regions of Interest (ROI) Used with the γ-Spectrum Collected Using the NaI Detector

ROI	Energy range (keV)	Radionuclides detected	Decay chain
1	315 to 388	^{228}Ac, ^{214}Pb	Th/U
2	579 to 623	^{208}Tl, ^{214}Bi	Th/U
3	858 to 1005	^{228}Ac, ^{214}Bi	Th/U
4	1078 to 1181 .	^{214}Bi	U
5	1387 to 1519 .	^{214}Bi	U
6	1665 to 1886	^{214}Bi	U
7	2018 to 2253	^{214}Bi	U
8	2473 to 2708 .	^{208}Tl	Th

The data obtained from the NaI detector for the 94 drums was used to calculate, for each region of interest, and the total spectrum, collected between 300 and 2900 keV, the count rate, C, of each drum, expressed as counts sec^{-1} kg^{1}, using the following equation;

$$C = \frac{c}{t\,W}$$

where c . = corrected counts of either the region of interest or the total spectrum
t = counting time (s)
W = weight of material in the drum (kg)

3.3 Radionuclide Activity in Selected Drums

A detailed analysis of six drums, chosen to cover the range of doses found in the initial dose survey, was carried out. For each of these drums, multiple core samples were taken throughout the length of the drum using a 25 mm core sampler. The core samples were dried at 100°C, to allow the calculation of the total specific activity on a dry basis, and then riffled down to approximately 120 gram samples. About 94 grams of each sample were packed into "re-entrant" containers (commonly known as Marinelli beakers) and counted for about 60,000 seconds after the radionuclides in the sample were in equilibrium. The detector used for these measurements was a GAMMA-X detector manufactured by EG&G Ortec. When used in the Marinelli

beaker configuration, the detector has a detection efficiency of 4.9% for the 609.4 keV peak of ^{214}Bi. Table 2 lists the most useful γ-peaks used for this analysis.

Table 2
Gamma-peaks Used For Radionuclide Analysis

Peak (keV)	Radionuclide detected	Half-life	Monitors*
46.5	^{210}Pb	22.3 y	^{210}Pb
63.3	^{234}Th	24.1 d	^{238}U
67.8	^{230}Th	7.7×10^4 y	^{230}Th
186.0	^{226}Ra	1620 y	$^{226}Ra + ^{235}U$§
238.6	^{212}Pb	10.64 h	^{228}Th
338.6	^{228}Ac	6.13 h	^{228}Ra
351.9	^{214}Pb	26.8 m	^{226}Ra*
583.2	^{208}Tl	3.07 m	^{228}Th*
509.3	^{214}Bi	19.9 m	^{226}Ra

* For short-lived radionudides the long-lived parent is listed.

§ Relative contribution of these two isotopes requires measurement of additional peaks.

The activity of each radionuclide was calculated by comparing the corrected counts with those obtained for standard materials. Two standards supplied by the IAEA, S16 (specific activity 64.4 Bq g^{-1}) for the thorium decay chain and BL3 (specific activity 123.3 Bq g^{-1}) for the uranium decay chain, were used. The speafic activity, A, of each radionuclide was calculated from the γ-spectroscopy results using the following equation;

$$A = \frac{\frac{c_S}{t_S m_S}}{\frac{c_{std}}{t_{std} m_{std}}} A_{std}$$

where c = corrected counts
t = counting time (s)
m = mass (g)
A = speafic activity (Bq g^{-1})

and subscripts std and s refer to sample and standard, respectively.

Total radioactivity in each decay chain was calculated by adding the contribution of each daughter. Radionuclides that had not been measured were assumed to be in equilibrium with their closest, long-lived parent. Total specific activity was calculated by summing the total activity in the uranium and thorium decay chains.

Uranium levels in these six samples were also dete'rmined by Delayed Neutron Activation Analysis (DNAA).

4. RESULTS

Detailed results for the γ–spectrometry and surface dose measurements are given in Appendix B.

4.1 Surface Dpse

The average background measured at the impoundment gate was 0.36 ± 0.07 μSv h^{-1}. The distribution of doses measured on the external surfaces of the 2893 drums studied is shown in Figure 1. In summary the measurements show that;

- About 78% of the drums had external surface doses less than 1 μSv h^{-1}, i.e. within a factor of 2.8 of the average background measured at the compound gate, and
- About 94% of the drums had external dose measurements that were less than 10 times the average background measured at the impoundment gate.

4 2 External Gamma Measurements

External γ–spectra were measured on a 94 drum subsample of the 2893 drums that had been monitored for surface dose. Data collected for the total spectrum area and each of the regions of interest of the γ–spectrum are given in Appendix B. The data for regions of interest 7 and 8 are important because they give measurements of daughters from the uranium and thorium chains, respectively. Comparison of the data for each of these regions of interest (see Figure 2) showed that, where ccunt rates were significantly above background and surface doses were greater than about 4 μSv h^{-1}, the ratio of U:Th daughters was fairly constant with the activity arising from uranium daughters predominating.

Overall, the material in the drums appeared to arise from the same source with variations between activities in the drums being caused by varying levels of dilution by inert materials. The total counts in the external spectrum measured for each drum was the most sensitive measurement of γ-radioactivity in the drum and this value was used in further calculations of total specific activity for radionuclides.

4.3 γ-spectrometry

Gamma-spectrometry was carried out on samples from six of the drums. Table 3 summarises the total speafic activity measured in each of the samples. The uranium levels in these samples were also measured by DNAA. Table 4 compares the uranium levels measured by γ–spectrometry and DNAA. Generally the numbers are similar but the results obtained with γ–spectrometry tend to overestimate the levels of uranium in the samples.

The data obtained by γ-spectrometry support the general findings from the external γ–measurements on the drums in that the activity of radionuclides in the uranium decay chain is generally a factor of 10 higher than the activity of radionudides in the thorium decay chain regardless of the levels of radioactivity in the drum.

There is no available record of the material disposed in the Fishermans Bend site but sample FBM156 appears to be tailings arising from the processing of uranium ore containing 0.2%U. The levels of uranium and thorium in this sample suggest further that the tailings have arisen from the processing of a uranium ore similar to that of the Mary Kathleen deposit (MKU). (Certainly some of this ore was processed at Fishermans Bend, personal communication from CSIRO.)

The relativ levels of radionuclides in the samples give some indication of the processing that has been carried out on the ore. For example, the radionuclide levels in all of the samples, with the exception of FBN93, are typical of uranium ore that has been processed by sulphuric acid under conditions that are speafic for dissolution of uranium. This type of processing typically does not mobilise the other radionuclides and they are in apparent equilibrium[4]. FBN93 however, appears to have undergone more stringent processing because the uranium extractions are higher and radium and its daughters have also been preferentially removed.

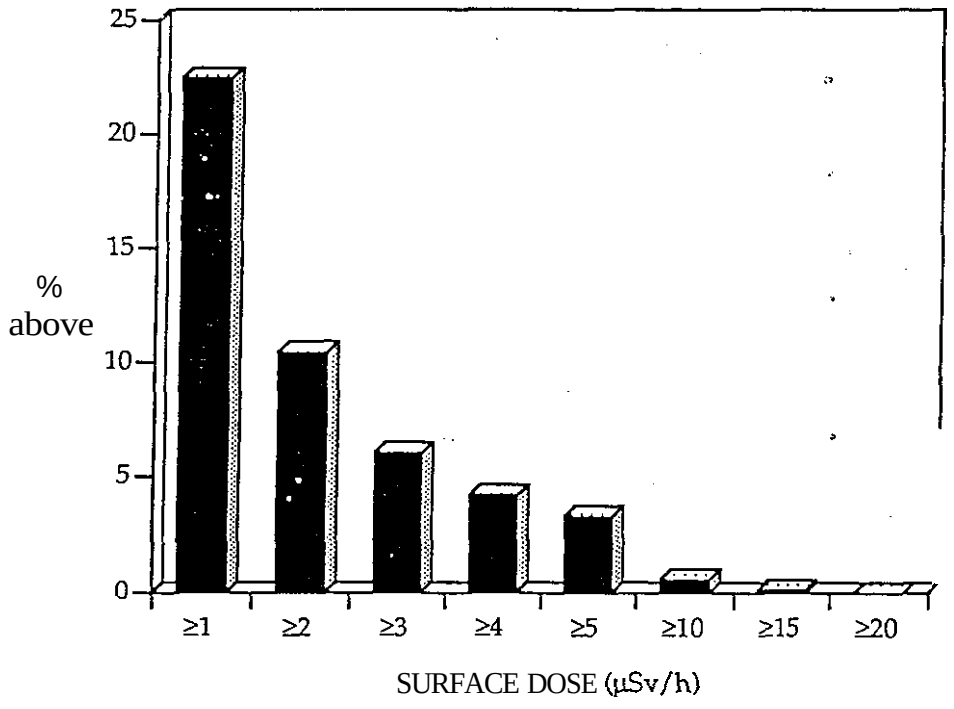

Figure 1 Distribution of Surface Doses Measured on the External Surface of the Drums

[4] Levins, D.M. *et al.* (1978) — Mobilisation of radionuclides and heavy metals in uranium mill and tailings dam circuits. Proc. Scientific Workshop on the Environmental Protection in the Alligator Rivers Region, sponsored by the Office of the Supervising Scientist, Jabiru, NT, Australia, May 17-20.

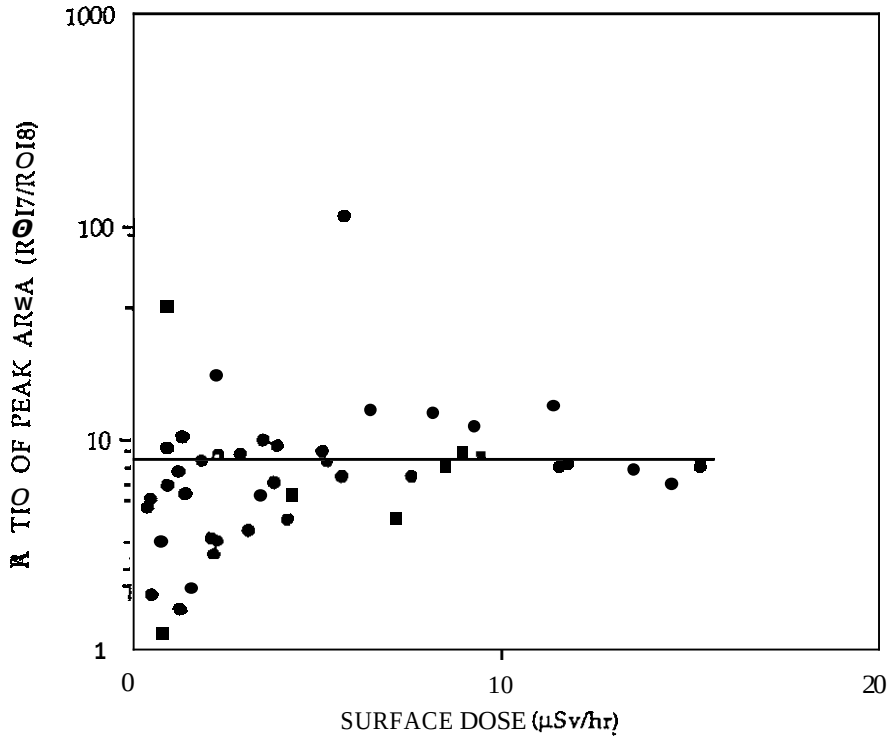

Figure 2 Variation of the Ratio of Activity of Uranium and Thorium Daughters with Surface Dose on the Drums.

Table 3
Specific Activity of Internal Samples

Radionuclide	Activity (Bq g^{-1})					
	FBM156	FBM153	FBN93	FBM150	FBK4	FBE99
Thorium-234	6.5	4.5	3.1	0.57	0.37	0.012
Thorium-230	25	11	12	1	0.5	0.03
Radium-226	22.7	10.3	8.2	0.7	0.3	0.02
Lead-210	20.4	10.4	12	0.9	0.5	0.03
Total Uranium Chain§	248	122	110	10	5	0.3
Radium-228	2.1	1.3	0.6	0.1	0.03	0.005
Thorium-228	1.6	0.9	0.5	0.1	0.02	0.005
Total Thorium Chain‡	17	10	5	1	0.2	0.05
TOTAL ACTIVITY	265	132	115	11	5	0.4

§ Total radioactivity in the uranium decay chain is calculated for processed samples from the following; Total uranium chain = $4x^{234}Th + {}^{230}Th + 6x^{226}Ra + 3x^{210}Pb$

‡ Total radioactivity in the thorium decay chain is calculated for processed samples from the following; Total thorium chain = $8x^{228}Th + 2x^{228}Ac$

Table 4
Comparison of Uranium Levels Measured by DNAA and Calculated from γ-Spectrometry Activities

Sample	Uranium (ppm)	
	γ-spectrometry§	DNAA
FBM156	530	520.7
FBM153	365	309.1
FBN93	252	238.1
FBM150	46	36.3
FBK4	30	31.7
FBE99	1	1.8

§ **Measured *using* the 633 keV peak of ^{234}Th**

4.4 Determination of Total Specific Activity

The total specific activity measured for the six samples (see Table 3) was used to obtain a relationship between the external γ-measurements and the total specific activity. The relationship developed was constrained to give the expected result of an intercept of 0 Bq g^{-1} total speafic activity for a zero.net measurement of external γ-activity. The total specific activity for all of the drums was then calculated as follows;

1 The total integrated spectrum area was used to calculate total specific activity, using the relationship obtained for the six drums, for the 94 drums measured in the laboratory,
2 From the calculated total specific activity and the surface dose measured for the 94 drums a linear relationship between surface dose and total specific activity was calculated,
3 This relationship, between the surface dose and total specific activity, was used to calculate the total specific activity in the 2893 drums from their measured external surface dose.

The calculated total specific activity for all 2893 drums is shown in Figure 3.

5. DISCUSSION

The average calculated total specific activity for the Fishermans Bend waste is 12 Bq g^{-1} and the average measured external dose was 1 μSv h^{-1}.

Uranium and thorium are ubiquitous in the earth's crust and all materials contain some levels of these elements. For disposal of wastes, such as those from Fishermans Bend, the most appropriate Commonwealth Code is that for the "Disposal of

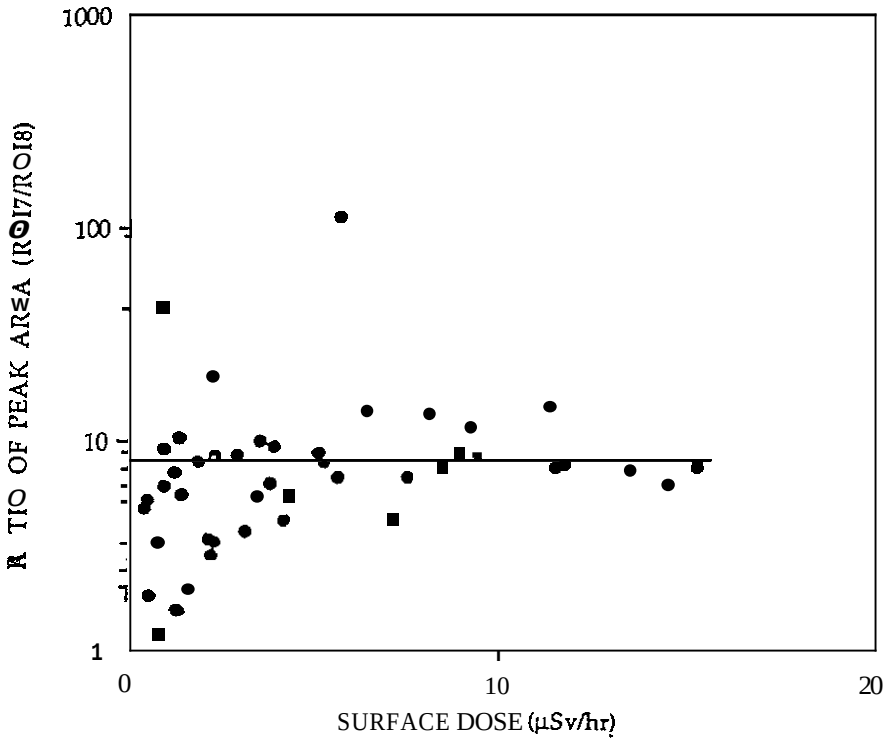

Figure 2 Variation of the Ratio of Activity of Uranium and Thorium Daughters with Surface Dose on the Drums.

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Total Uranium Chain§	248	122	110	10	5	0.3
Radium-228	2.1	1.3	0.6	0.1	0.03	0.005
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Total Thorium Chain‡	17	10	5	1	0.2	0.05
TOTAL ACTIVITY	265	132	115	11	5	0.4

§ Total radioactivity in the uranium decay chain is calculated for processed samples from the following; Total uranium chain = $4x^{234}Th + {}^{230}Th + 6x^{226}Ra + 3x^{210}Pb$

‡ Total radioactivity in the thorium decay chain is calculated for processed samples from the following; Total thorium chain = $8x^{228}Th + 2x^{228}Ac$

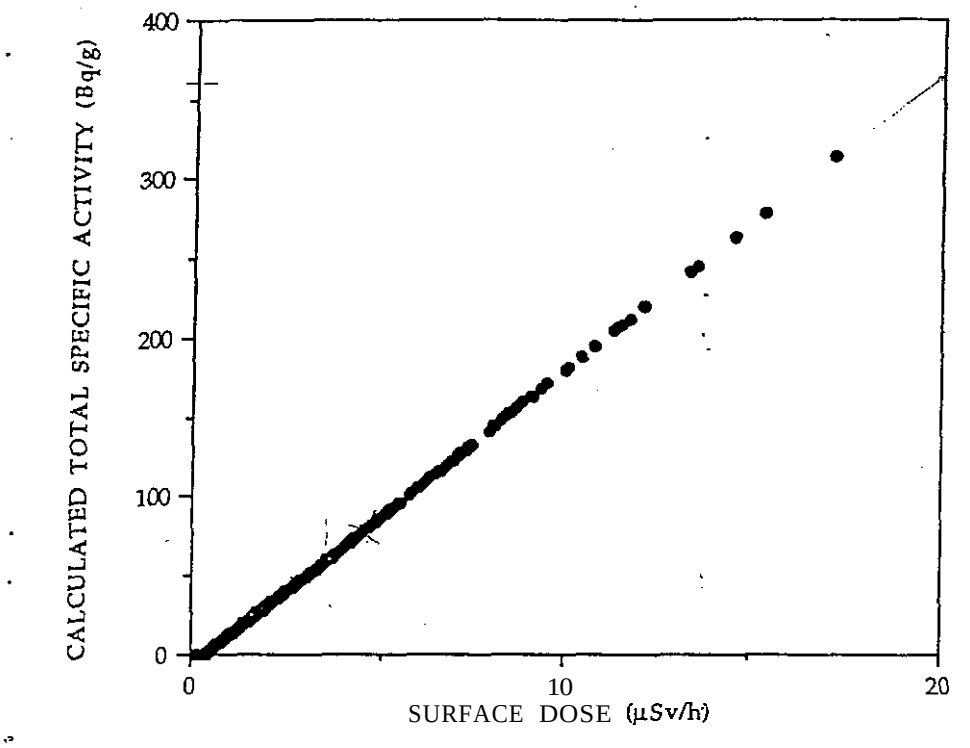


Figure **3** Calculated Total Specific Activity for All Drums Monitored for External Surface Dose

6. CONCLUSIONS

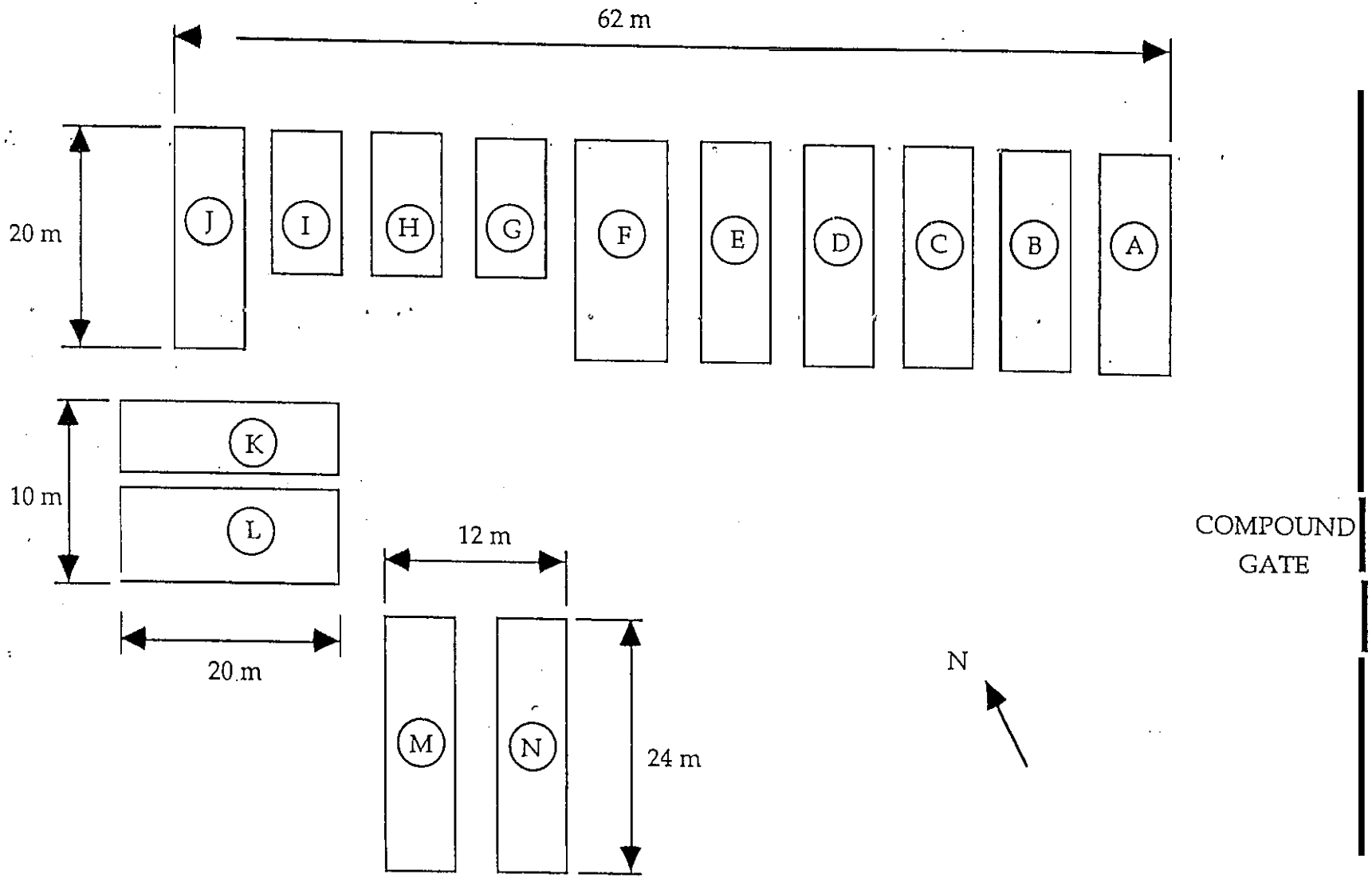
This study has been carried out to determine, within a short period of time, the average and distribution of radioactivity levels contained in the wastes arising from the Fishermans Bend site. Overall, the estimated levels of radioactivity contained in the Fishermans Bend Waste were found to be low, reflecting the conservative criteria that was used in the clean-up of the site and the dilution of contaminated material by non-contaminated soil. The great majority of the drums contain soil which would be classified as non-radioactive under international transport regulations. The main findings arising from this study may be summarised as follows;

- Overall, the material in the drums appears to arise from the same source, because the U:Th ratio is fairly constant, with variations between activities in the drums being caused by varying levels of dilution by inert materials.
- About 78% of the drums had external surface doses less than 1 $\mu Sv\ h^{-1}$, i.e. within a factor of 2.8 of the average background measured at the compound gate.
- About 94% of the drums had external dose measurements that were less than 10 times the average background measured at the impoundment gate (i.e. $< 3.6\ \mu Sv\ h^{-1}$).

- Ninety-six percent of the drums have external doses less than 5 $\mu Sv\ h^{-1}$.
- About 98% of the drums contain total specific activities of less than 70 $Bq\ g^{-1}$ and about 95% contain less than 35 $Bq\ g^{-1}$.
- The average calculated total specific activity for the Fishermans Bend waste is 12 $Bq\ g^{-1}$ and the average measured external dose was 1 $\mu Sv\ h^{-1}$. Individually, *6 3* % of the drums satisfy both of the conditions of the Commonwealth Code on Disposal of Wastes by the User.
- The estimation of the levels of radioactivity in the drums has been undertaken so that any effect arising from the non-uniform distribution of radioactivity in the drums or from the influence of other nearby drums on the surface dose will be conservative, i.e. that these effects will lead to an overestimation of the total specific activity of material contained in the drum.

Appendix A
Site Plan

FIGURE A1 : Site Plan of Fishermans Bend Waste Storage Area



Appendix B
Detailed Experimental Results

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBA 1	0.3
FBA 2	0.26
FBA 3	0.26
FBA 4	0.39
FBA 5	0.34
FBA 6	0.34
FBA 7	0.36
FBA 8	0.36
FBA 9	0.4
FBA 10	0.36
FBA 11	0.27
FBA 12	0.39
FBA 13	0.43
FBA 14	0.38
FBA 15	0.3
FBA 16	0.29
FBA 17	0.39
FBA 18	0.35
FBA 19	0.42
FBA 20	0.28
FBA 21	0.4
FBA 22	0.38
FBA 23	0.4
FBA 24	0.36
FBA 25	0.38
FBA 26	0.4
FBA 27	0.55
FBA 28	0.39
FBA 29	0.5
FBA 30	0.7
FBA 31	0.4
FBA 32	0.4
FBA 33	0.4
FBA 34	0.38
FBA 35	0.45
FBA 36	0.45
FBA 37	0.39
FBA 38	0.41
FBA 39	0.45
FBA 40	0.43
FBA 41	0.42
FBA 42	0.55
FBA 43	0.33
FBA 44	0.51
FBA 45	0.42

Drum	Dose
FBA 46	0.38
FBA 47	0.41
FBA 48	0.45
FBA 49	0.31
FBA 50	0.33
FBA 51	0.33
FBA 52	0.4
FBA 53	0.41
FBA 54	0.44
FBA 55	0.35
FBA 56	0.4
FBA 57	0.41
FBA 58	0.44
FBA 59	0.35
FBA 60	0.4
FBA 61	0.37
FBA 62	0.38
FBA 63	0.43
FBA 64	0.3
FBA 65	0.33
FBA 66	0.34
FBA 67	0.42
FBA 68	0.4
FBA 69	0.44
FBA 70	0.42
FBA 71	0.42
FBA 72	0.4
FBA 73	0.3
FBA 74	0.3
FBA 75	0.31
FBA 76	0.38
FBA 77	0.38
FBA 78	0.3
FBA 79	0.45
FBA 80	0.41
FBA 81	0.4
FBA 82	0.45
FBA 83	0.36
FBA 84	0.31
FBA 85	0.36
FBA 86	0.42
FBA 87	0.36
FBA 88	0.39
FBA 89	0.27
FBA 90	0.3

Drum	Dose
FBA 91	0.26
FBA 92	0.22
FBA 93	0.16
FBA 94	0.4
FBA 95	0.35
FBA 96	0.29
FBA 97	0.27
FBA 98	0.31
FBA 99	0.32
FBA 100	0.25
FBA 101	0.26
FBA 102	0.34
FBA 103	0.28
FBA 104	0.36
FBA 105	0.32
FBA 106	0.27
FBA 107	0.27
FBA 108	0.38
FBA 109	0.25
FBA 110	0.27
FBA 111	0.3
FBA 112	0.32
FBA 113	0.28
FBA 114	0.27
FBA 115	0.28
FBA 116	0.29
FBA 117	0.48
FBA 118	0.35
FBA 119	0.27
FBA 120	0.41
FBA 121	0.32
FBA 122	0.22
FBA 123	0.3
FBA 124	0.23
FBA 125	0.26
FBA 126	0.23
FBA 127	0.2
FBA 128	0.23
FBA 129	0.21
FBA 130	0.23
FBA 131	0.38
FBA 132	0.21
FBA 133	0.35
FBA 134	0.28
FBA 135	0.34

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBA 136	0.3
FBA 137	0.3
FBA 138	0.26
FBA 139	0.28
FBA 140	0.3
FBA 141	0.37
FBA 142	0.3
FBA 143	0.42
FBA 144	0.44
FBA 145	0.32
FBA 146	0.3
FBA 147	0.31
FBA 148	0.35
FBA 149	0.4
FBA 150	0.3
FBA 151	0.22
FBA 152	0.35
FBA 153	0.31
FBA 154	0.34
FBA 155	0.36
FBA 156	0.48
FBA 157	0.29
FBA 158	0.27
FBA 159	0.33
FBA 160	0.23
FBA 161	0.25
FBA 162	0.4
FBA 163	0.31
FBA 164	0.29
FBA 165	0.3
FBA 166	0.24
FBA 167	0.28
FBA 168	0.38
FBA 169	0.34
FBA 170	0.36
FBA 171	0.3
FBA 172	0.31
FBA 173	0.37
FBA 174	0.34
FBA 175	0.24
FBA 176	0.28
FBA 177	0.3
FBA 178	0.29
FBA 179	0.3
FBA 180	0.35

Drum	Dose
FBA 181	0.32
FBA 182	0.28
FBA 183	0.2
FBA 184	0.26
FBA 185	0.29
FBA 186	0.3
FBA 187	0.28
FBA 188	0.22
FBA 189	0.31
FBA 190	0.37
FBA 191	0.28
FBA 192	0.22
FBA 193	0.24
FBA 194	0.32
FBA 195	0.22
FBA 196	0.26
FBA 197	0.39
FBA 198	0.34
FBA 199	0.38
FBA 200	0.34
FBA 201	0.31
FBA 2021	0.43
FBA 203	0.36
FBA 204	0.41
FBA 205	0.47
FBA 206	0.38
FBA 207	0.44
FBA 208	0.4
FBA 209	0.36
FBA 210	0.34
FBA 211	0.41
FBA 212	0.43
FBA 213	0.52
FBA 214	0.43
FBA 215	0.38
FBA 216	0.47
FBB 1	0.43
FBB 2	0.46
FBB 3	0.49
FBB 4	0.28
FBB 5	0.4
FBB 6	0.41

Drum	Dose
FBB 7	0.3
FBB 8	0.4
FBB 9	0.47
FBB 10	0.3
FBB 11	0.28
FBB 12	0.53
FBB 13	0.36
FBB 14	0.31
FBB 15	0.34
FBB 16	0.27
FBB 17	0.31
FBB 18	0.28
FBB 19	0.33
FBB 20	0.32
FBB 21	0.26
FBB 22	0.3
FBB 23	0.36
FBB 24	0.3
FBB 25	0.25
FBB 26	0.39
FBB 27	0.34
FBB 28	0.29
FBB 29	0.35
FBB 30	0.31
FBB 31	0.31
FBB 32	0.33
FBB 33	0.3
FBB 34	0.3
FBB 35	0.31
FBB 36	0.36
FBB 37	0.31
FBB 38	0.28
FBB 39	0.41
FBB 40	0.31
FBB 41	0.36
FBB 42	0.42
FBB 43	0.31
FBB 44	0.34
FBB 45	0.37
FBB 46	0.46
FBB 47	0.37
FBB 48	0.39
FBB 49	0.31
FBB 50	0.36
FBB 51	0.3

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBB 52	0.32
FBB 53	0.38
FBB 54	0.36
FBB 55	0.4
FBB 56	0.36
FBB 57	0.26
FBB 58	0.24
FBB 59	0.4
FBB 60	0.32
FBB 61	0.32
FBB 62	0.34
FBB 63	0.39
FBB 64	0.3
FBB 65	0.26
FBB 66	0.33
FBB 67	0.31
FBB 68	0.29
FBB 69	0.24
FBB 70	0.38
FBB 71	0.4
FBB 72	0.34
FBB 73	0.28
FBB 74	0.28
FBB 75	0.35
FBB 76	0.38
FBB 77	0.28
FBB 78	0.33
FBB 79	0.35
FBB 80	0.25
FBB 81	0.26
FBB 82	0.25
FBB 83	0.28
FBB 84	0.33
FBB 85	0.46
FBB 86	0.36
FBB 87	0.44
FBB 88	0.44
FBB 89	0.36
FBB 90	0.32
FBB 91	0.41
FBB 92	0.44
FBB 93	0.54
FBB 94	0.33
FBB 95	0.3
FBB 96	0.27

Drum	Dose
FBB 97	0.25
FBB 98	0.31
FBB 99	0.35
FBB 100	0.34
FBB 101	0.35
FBB 102	0.34
FBB 103	0.34
FBB 104	0.3
FBB 105	0.29
FBB 106	0.33
FBB 107	0.32
FBB 108	0.42
FBB 109	0.32
FBB 110	0.47
FBB 111	0.41
FBB 112	0.27
FBB 113	0.45
FBB 114	0.4
FBB 115	0.33
FBB 116	0.52
FBB 117	0.42
FBB 118	0.36
FBB 119	0.35
FBB 120	0.35
FBB 121	0.32
FBB 122	0.34
FBB 123	0.33
FBB 124	0.32
FBB 125	0.4
FBB 126	0.35
FBB 127	0.44
FBB 128	0.4
FBB 129	0.4
FBB 130	0.36
FBB 131	0.38
FBB 132	0.41
FBB 133	0.31
FBB 134	0.34
FBB 135	0.38
FBB 136	0.36
FBB 137	0.46
FBB 138	0.46
FBB 139	0.31
FBB 140	0.53
FBB 141	0.38

Drum	Dose
FBB 142	0.34
FBB 143	0.54
FBB 144	[illegible]
FBB 145	
FBB 146	0.32
FBB 147	0.37
FBB 148	0.33
FBB 149	0.35
FBB 150	0.36
FBB 151	0.3
FBB 152	0.38
FBB 153	0.31
FBB 154	
FBB 155	
[illegible]	[illegible]
FBB 157	0.27
FBB 158	0.28
FBB 159	0.25
FBB 160	0.25
FBB 161	0.31
FBB 162	0.4
FBB 163	0.38
FBB 164	0.35
FBB 165	0.47
FBB 166	0.35
FBB 167	0.44
FBB 168	0.45
FBB 169	0.39
FBB 170	0.36
FBB 171	0.24
FBB 172	0.36
FBB 173	0.31
FBB 174	0.3
FBB 175	0.64
FBB 176	0.39
FBB 177	0.39
FBB 178	0.5
FBB 179	0.33
FBB 180	0.26
FBB 181	0.32
FBB 182	0.32
FBB 183	0.3
FBB 184	0.2
FBB 185	0.3
FBB 186	0.41

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBB 187	0.35
FBB 188	0.27
FBB 189	0.3
FBB 190	0.35
FBB 191	0.37
FBB 192	0.42
FBB 193	0.35
FBB 194	0.42
FBB 195	0.79
FBB 196	0.91
FBB 197	0.41
FBB 198	0.72
FBB 199	0.43
FBB 200	0.44
FBB 201	0.47
FBB 202	0.41
FBB 203	0.5
FBB 204	0.4
FBB 205	0.37
FBB 206	0.38
FBB 207	0.36
FBB 208	0.44
FBB 209	0.5
FBB 210	0.46
FBB 211	0.41
FBB 212	0.55
FBB 213	0.46
FBB 214	0.44
FBB 215	0.57
FBB 216	0.5
FBC 1	0.28
FBC 2	0.36
FBC 3	0.45
FBC 4	0.46
FBC 5	0.45
FBC 6	0.38
FBC 7	0.3
FBC 8	0.34
FBC 9	0.41
FBC 10	0.38
FBC 11	0.3
FBC 12	0.31

Drum	Dose
FBC 13	0.29
FBC 14	0.42
FBC 15	0.41
FBC 16	0.36
FBC 17	0.44
FBC 18	0.31
FBC 19	0.36
FBC 20	0.26
FBC 21	0.4
FBC 22	0.26
FBC 23	0.34
FBC 24	0.44
FBC 25	0.37
FBC 26	0.38
FBC 27	0.28
FBC 28	0.32
FBC 29	0.35
FBC 30	0.37
FBC 31	0.32
FBC 32	0.37
FBC 33	0.43
FBC 34	0.27
FBC 35	0.32
FBC 36	0.34
FBC 37	0.41
FBC 38	0.42
FBC 39	0.34
FBC 40	0.42
FBC 41	0.37
FBC 42	0.33
FBC 43	0.34
FBC 44	0.24
FBC 45	0.42
FBC 46	0.36
FBC 47	0.35
FBC 48	0.39
FBC 49	0.31
FBC 50	0.35
FBC 51	0.3
FBC 52	0.27
FBC 53	0.25
FBC 54	0.41
FBC 55	0.45
FBC 56	0.53
FBC 57	0.42

Drum	Dose
FBC 58	0.37
FBC 59	0.56
FBC 60	0.46
FBC 61	0.37
FBC 62	1.16
FBC 63	0.35
FBC 64	0.43
FBC 65	0.91
FBC 66	0.54
FBC 67	0.46
FBC 68	0.36
FBC 69	1.03
FBC 70	0.46
FBC 71	0.34
FBC 72	0.64
FBC 73	0.51
FBC 74	0.43
FBC 75	0.41
FBC 76	0.3
FBC 77	0.33
FBC 78	0.26
FBC 79	0.28
FBC 80	0.22
FBC 81	0.29
FBC 82	0.27
FBC 83	0.28
FBC 84	0.32
FBC 85	0.28
FBC 86	0.32
FBC 87	0.36
FBC 88	0.28
FBC 89	0.3
FBC 90	0.34
FBC 91	0.29
FBC 92	0.32
FBC 93	0.49
FBC 94	0.34
FBC 95	0.32
FBC 96	0.3
FBC 97	0.39
FBC 98	0.44
FBC 99	0.32
FBC 100	0.64
FBC 101	0.54
FBC 102	0.4

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBC 103	0.41
FBC 104	0.36
FBC 105	0.34
FBC 106	0.39
FBC 107	0.36
FBC 108	0.44
FBC 109	0.32
FBC 110	0.33
FBC 111	0.41
FBC 112	0.65
FBC 113	0.6
FBC 114	0.7
FBC 115	0.92
FBC 116	0.68
FBC 117	0.48
FBC 118	1.26
FBC 119	0.59
FBC 120	0.46
FBC 121	0.5
FBC 122	0.42
FBC 123	0.45
FBC 124	0.8
FBC 125	0.92
FBC 126	0.93
FBC 127	0.68
FBC 128	0.87
FBC 129	2.47
FBC 130	1.03
FBC 131	10.1
FBC 132	1.24
FBC 133	0.76
FBC 134	1.1
FBC 135	1.3
FBC 136	0.46
FBC 137	0.65
FBC 138	0.48
FBC 139	0.6
FBC 140	0.57
FBC 141	0.41
FBC 142	0.53
FBC 143	0.47
FBC 144	0.42
FBC 145	0.39
FBC 146	0.44
FBC 147	0.45

Drum	Dose
FBC 148	0.38
FBC 149	0.41
FBC 150	0.55
FBC 151	0.41
FBC 152	0.41
FBC 153	0.36
FBC 154	0.42
FBC 155	0.44
FBC 156	0.4
FBC 157	0.43
FBC 158	0.3
FBC 159	0.24
FBC 160	0.32
FBC 161	0.34
FBC 162	0.41
FBC 163	0.35
FBC 164	0.41
FBC 165	0.31
FBC 166	0.3
FBC 167	0.34
FBC 168	0.33
FBC 169	0.26
FBC 170	0.34
FBC 171	0.39
FBC 172	0.34
FBC 173	0.33
FBC 174	0.38
FBC 175	0.28
FBC 176	0.3
FBC 177	0.47
FBC 178	0.3
FBC 179	0.29
FBC 180	0.57
FBC 181	0.26
FBC 182	0.33
FBC 183	0.32
FBC 184	0.24
FBC 185	0.31
FBC 186	0.27
FBC 187	0.26
FBC 188	0.28
FBC 189	0.34
FBC 190	0.29
FBC 191	0.28
FBC 192	0.24

Drum	Dose
FBC 193	0.27
FBC 194	0.3
FEC 195	
FBC 196	
FBC 197	0.32
FBC 198	0.28
FBC 199	0.43
FBC 200	0.39
FBC 201	0.35
FBC 202	0.31
FBC 203	0.41
FBC 204	0.43
FBC 205	0.44
FBC 206	0.56
FBC 207	0.35
FBC 208	0.34
FBC 209	0.43
FBC 210	0.47
FBC 211	0.35
FBC 212	0.3
FBC 213	0.33
FBC 214	0.38
FBC 215	0.38
FBC 216	0.36
FBD 1	0.31
FBD 2	0.33
FBD 3	0.4
FBD 4	0.32
FBD 5	0.31
FBD 6	0.38
FBD 7	0.36
FBD 8	0.32
FBD 9	0.27
FBD 10	0.3
FBD 11	0.26
FBD 12	0.23
FBD 13	0.3
FBD 14	0.34
FBD 15	0.46
FBD 16	0.41
FBD 17	0.32

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBD 18	0.68
FED 19	
FBD 20	0.41
FBD 21	0.81
FBD 22	0.42
FBD 23	0.45
FBD 24	0.43
FBD 25	0.34
FBD 26	0.44
FBD 27	0.38
FBD 28	0.51
FBD 29	0.5
FBD 30	0.4
FBD 31	0.4
FBD 32	0.79
FBD 33	0.44
FBD 34	0.35
FBD 35	0.42
FBD 36	0.31
FBD 37	0.47
FBD 38	0.45
FBD 39	0.38
FBD 40	0.38
FBD 41	0.52
FBD 42	0.41
FBD 43	0.68
FBD 44	0.42
FBD 45	0.35
FBD 46	0.4
FBD 47	0.4
FBD 48	0.32
FBD 49	0.39
FBD 50	0.3
FBD 51	0.45
FBD 52	0.42
FBD 53	0.47
FBD 54	0.45
FBD 55	0.79
FBD 56	0.71
FBD 57	1.47
FBD 58	0.61
FBD 59	0.53
FBD 60	1.15
FBD 61	0.6
FBD 62	0.42

Drum	Dose
FBD 63	0.53
FBD 64	0.71
FBD 65	1.56
FBD 66	2
FBD 67	0.96
FBD 68	3.31
FBD 69	5.19
FBD 70	1.23
FBD 71	5.99
FBD 72	6.48
FBD 73	0.72
FBD 74	0.68
FBD 75	1.24
FBD 76	0.66
FBD 77	0.93
FBD 78	0.7
FBD 79	0.6
FBD 80	0.8
FBD 81	0.48
FBD 82	0.52
FBD 83	0.48
FBD 84	0.45
FBD 85	0.45
FBD 86	0.42
FBD 87	0.38
FBD 88	0.48
FBD 89	0.43
FBD 90	0.42
FBD 91	0.41
FBD 92	0.34
FBD 93	0.41
FBD 94	0.22
FBD 95	0.25
FBD 96	0.93
FBD 97	0.32
FBD 98	0.28
FBD 99	0.43
FBD 100	0.27
FBD 101	0.3
FBD 102	0.48
FBD 103	0.46
FBD 104	0.38
FBD 105	0.53
FBD 106	0.45
FBD 107	0.41

Drum	Dose
FBD 108	0.4
FBD 109	0.56
FBD 110	0.87
FBD 111	0.9
FBD 112	0.9
FBD 113	1.15
FBD 114	0.91
FBD 115	1.1
FBD 116	0.86
FBD 117	1.92
FBD 118	0.77
FBD 119	0.73
FBD 120	1.22
FBD 121	0.61
FBD 122	1.54
FBD 123	0.93
FBD 124	0.74
FBD 125	0.93
FBD 126	1.27
FBD 127	0.77
FBD 128	0.62
FBD 129	1.05
FBD 130	0.7
FBD 131	0.86
FBD 132	0.7
FBD 133	0.64
FBD 134	0.83
FBD 135	0.95
FBD 136	0.68
FBD 137	0.73
FBD 138	0.96
FBD 139	0.7
FBD 140	1.24
FBD 141	1.51
FBD 142	1.04
FBD 143	1.54
FBD 144	1.1
FBD 145	1.12
FBD 146	1.18
FBD 147	1.34
FBD 148	1.86
FBD 149	2.04
FBD 150	1.2
FBD 151	2.75
FBD 152	1.86

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBD 153	1.13
FBD 154	3.45
FBD 155	2.98
FBD 156	2.05
FBD 157	3.18
FBD 158	2.16
FBD 159	2.82
FBD 160	3.28
FBD 161	2.36
FBD 162	2.17
FBD 163	5.16
FBD 164	2.9
FBD 165	1.67
FBD 166	17.2
FBD 167	2.96
FBD 168	2.01
FBD 169	4.12
FBD 170	2.91
FBD 171	3.17
FBD 172	3.6
FBD 173	3.25
FBD 174	2.02
FBD 175	4.06
FBD 176	2.04
FBD 177	2.08
FBD 178	2.24
FBD 179	2.98
FBD 180	3.09
FBD 181	1.52
FBD 182	2.84
FBD 183	4.32
FBD 184	1.76
FBD 185	2.84
FBD 186	5.48
FBD 187	1.88
FBD 188	5.25
FBD 189	2.03
FBD 190	1.67
FBD 191	3.36
FBD 192	1.53
FBD 193	1.81
FBD 194	1.42
FBD 195	2.28
FBD 196	1.77
FBD 197	1.32

Drum	Dose
FBD 198	1.72
FBD 199	0.52
FBD 200	0.44
FBD 201	2.18
FBD 202	0.64
FBD 203	0.4
FBD 204	0.44
FBD 205	0.47
FBD 206	0.36
FBD 207	0.43
FBD 208	0.31
FBD 209	0.32
FBD 210	0.52
FBD 211	0.41
FBD 212	0.42
FBD 213	0.44
FBD 214	0.28
FBD 215	0.34
FBD 216	0.3
WE 1	3.68
FBE 2	8.43
FBE 3	2.21
WE4	6.78
FBE 5	**8.72**
WE6	3.01
FBE 7	1.47
FBE 8	1.11
FBE 9	1.53
FBE 10	1.18
FBE 11	1.37
FBE 12	1.6
FBE 13	1.05
FBE 14	1.03
FBE 15	1.85
FBE 16	1.35
FBE 17	1.68
FBE 18	1.89
FBE 19	2.16
FBE 20	1.79
FBE 21	2.26
FBE 22	2.54

Drum	Dose
FBE 23	1.39
FBE 24	2.28
FBE 25	6.9
FBE 26	5.73
FBE 27	3.29
FBE 28	6.34
FBE 29	8.5
FBE 30	6.73
FBE 31	7.46
FBE 32	4.72
FBE 33	5.12
FBE 34	10.1
FBE 35	4.47
FBE 36	7.24
FBE 37	1.62
FBE 38	1.77
FBE 39	1.4
FBE 40	3.11
FBE 41	1.29
FBE 42	2.34
FBE 43	7.26
FBE 44	11.3
FBE 45	2.76
FBE 46	6.59
FBE 47	9.06
FBE 48	2.22
FBE 49	0.83
FBE 50	0.86
FBE 51	1.26
FBE 52	0.68
FBE 53	0.58
FBE 54	0.63
FBE 55	0.65
FBE 56	0.76
FBE 57	0.72
FBE 58	0.5
FBE 59	0.68
FBE 60	0.62
FBE 61	0.58
FBE 62	0.53
FBE 63	0.61
FBE 64	0.44
FBE 65	0.44
FBE 66	0.43
FBE 67	0.42

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBE 68	0.41
FBE 69	0.37
FBE 70	0.61
FBE 71	1.21
FBE 72	1.83
FBE 73	0.84
FBE 74	2.59
FBE 75	7.31
FBE 76	0.21
FBE 77	1.25
FBE 78	9.52
FBE 79	0.23
FBE 80	0.34
FBE 81	1.13
FBE 82	1.35
FBE 83	2.61
FBE 84	1.33
FBE 85	1.39
FBE 86	6.2
FBE 87	2.22
FBE 88	1.35
FBE 89	4.94
FBE 90	2.06
FBE 91	1.18
FBE 92	5.14
FBE 93	2.3
FBE 94	1.61
FBE 95	6.25
FBE 96	1.27
FBE 97	1.36
FBE 98	9.32
FBE 99	1.26
FBE 100	0.86
FBE 101	0.79
FBE 102	0.95
FBE 103	0.44
FBE 104	0.48
FBE 105	0.75
FBE 106	0.44
FBE 107	0.38
FBE 108	0.47
FBE 109	0.37
FBE 110	0.31
FBE 111	0.56
FBE 112	2.86

Drum	Dose
FBE 113	1.6
FBE 114	0.85
FBE 115	6.78
FBE 116	0.52
FBE 117	0.53
FBE 118	6.82
FBE 119	0.32
FBE 120	0.45
FBE 121	6.58
FBE 122	0.4
FBE 123	0.52
FBE 124	3.56
FBE 125	1.38
FBE 126	1.08
FBE 127	0.91
FBE 128	0.71
FBE 129	0.73
FBE 130	0.48
FBE 131	0.34
FBE 132	1.05
FBE 133	0.45
FBE 134	0.43
FBE 135	0.46
FBE 136	0.51
FBE 137	0.41
FBE 138	0.49
FBE 139	0.46
FBE 140	0.38
FBE 141	0.6
FBE 142	0.45
FBE 143	0.44
FBE 144	0.5
FBE 145	0.62
FBE 146	0.67
FBE 147	0.61
FBE 148	1.14
FBE 149	1.71
FBE 150	1.01
FBE 151	5.43
FBE 152	1.03
FBE 153	0.8
FBE 154	2.97
FBE 155	4.34
FBE 156	2.03
FBE 157	2.11

Drum	Dose
FBE 158	13.3
FBE 159	5.17
FBE 160	2.12
FBE 161	5.19
FBE 162	7.33
FBE 163	0.57
FBE 164	0.82
FBE 165	1.54
FBE 166	1.8
FBE 167	1.12
FBE 168	1.14
FBE 169	7.13
FBE 170	0.82
FBE 171	2.07
FBE 172	5.01
FBE 173	4.47
FBE 174	7.06
FBE 175	2.37
FBE 176	10.4
FBE 177	6.16
FBE 178	1.5
FBE 179	8.25
FBE 180	7.28
FBE 181	2.6
FBE 182	10.8
FBE 183	3.59
FBE 184	1.04
FBE 185	1.24
FBE 186	1.76
FBE 187	0.93
FBE 188	1.95
FBE 189	0.98
FBE 190	0.74
FBE 191	1.47
FBE 192	1.1
FBE 193	0.56
FBE 194	0.86
FBE 195	0.61
FBE 196	0.55
FBE 197	0.52
FBE 198	0.46
FBE 199	0.59
FBE 200	0.64
FBE 201	0.82
FBE 202	0.43

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBE 203	0.41
FBE 204	0.46
FBE 205	0.55
FBE 206	0.74
FBE 207	0.71
FBE 208	0.7
FBE 209	1.01
FBE 210	1.02
FBE 211	2.08
FBE 212	4.48
FBE 213	1.71
FBE 214	5.38
FBE 215	8.11
FBE 216	2.22
FBF 1	0.64
FBF 2	0.84
FBF 3	0.73
FBF 4	0.72
FBF 5	0.76
FBF 6	0.83
FBF 7	1.08
FBF 8	0.53
FBF 9	0.86
FBF 10	1.5
FBF 11	1.3
FBF 12	1.23
FBF 13	1.3
FBF 14	1.25
FBF 15	0.91
FBF 16	1.27
FBF 17	1.2
FBF 18	1.45
FBF 19	1.95
FBF 20	1.73
FBF 21	1.22
FBF 22	2.06
FBF 23	1.6
FBF 24	1.31
FBF 25	1.79
FBF 26	1.32
FBF 27	1.52

Drum	Dose
FBF 28	1.78
FBF 29	1.35
FBF 30	1.29
FBF 31	1.72
FBF 32	1.59
FBF 33	1.14
FBF 34	1.52
FBF 35	1.47
FBF 36	1.34
FBF 37	1.03
FBF 38	1.3
FBF 39	0.82
FBF 40	1.12
FBF 41	0.98
FBF 42	1.06
FBF 43	1.85
FBF 44	1.42
FBF 45	1.07
FBF 46	1.14
FBF 47	1.08
FBF 48	1.27
FBF 49	0.71
FBF 50	0.93
FBF 51	0.9
FBF 52	0.71
FBF 53	1.1
FBF 54	0.81
FBF 55	0.64
FBF 56	0.62
FBF 57	0.85
FBF 58	0.67
FBF 59	0.48
FBF 60	0.51
FBF 61	0.53
FBF 62	0.47
FBF 63	0.51
FBF 64	0.5
FBF 65	0.49
FBF 66	0.52
FBF 67	0.74
FBF 68	0.62
FBF 69	0.84
FBF 70	1.26
FBF 71	1.45
FBF 72	1.32

Drum	Dose
FBF 73	1.39
FBF 74	4.18
FBF 75	1.46
FBF 76	1.47
FBF 77	2.52
FBF 78	1.81
FBF 79	1.18
FBF 80	1.03
FBF 81	1.13
FBF 82	1.26
FBF 83	0.83
FBF 84	1.07
FBF 85	0.97
FBF 86	0.59
FBF 87	0.95
FBF 88	0.7
FBF 89	0.53
FBF 90	1.13
FBF 91	0.51
FBF 92	0.43
FBF 93	0.53
FBF 94	0.36
FBF 95	0.41
FBF 96	0.34
FBF 97	0.48
FBF 98	0.47
FBF 99	0.67
FBF 100	0.79
FBF 101	0.65
FBF 102	0.92
FBF 103	1.01
FBF 104	0.71
FBF 105	0.69
FBF 106	3
FBF 107	1.1
FBF 108	0.54
FBF 109	2.54
FBF 110	0.63
FBF 111	0.68
FBF 112	0.42
FBF 113	0.55
FBF 114	0.61
FBF 115	0.41
FBF 116	0.42
FBF 117	0.44

,Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBF 118	0.46
FBF 119	1.68
FBF 120	1.81
FBF 121	0.69
FBF 122	3.08
FBF 123	7.15
FBF 124	1.27
FBF 125	4.13
FBF 126	5.37
FBF 127	5.38
FBF 128	0.75
FBF 129	1.18
FBF 130	3.72
FBF 131	0.84
FBF 132	0.63
FBF 133	0.28
FBF 134	0.44
FBF 135	0.42
FBF 136	0.46
FBF 137	0.61
FBF 138	1.91
FBF 139	0.58
FBF 140	0.53
FBF 141	5.44
FBF 142	0.62
FBF 143	0.49
FBF 144	4.25
FBF 145	0.72
FBF 146	0.54
FBF 147	1.83
FBF 148	0.45
FBF 149	0.36
FBF 150	0.54
FBF 151	0.32
FBF 152	0.33
FBF 153	0.4
FBF 154	0.31
FBF 155	0.3
FBF 156	0.36
FBF 157	0.35
FBF 158	0.37
FBF 159	0.51
FBF 160	0.42
FBF 161	0.37
FBF 162	0.44

Drum	Dose
FBF 163	0.4
FBF 164	0.51
FBF 165	0.59
FBF 166	0.51
FBF 167	0.46
FBF 168	0.41
FBF 169	0.52
FBF 170	0.61
FBF 171	0.5
FBF 172	0.34
FBF 173	0.33
FBF 174	0.34
FBF 175	0.39
FBF 176	0.41
FBF 177	0.35
FBF 178	0.39
FBF 179	0.39
FBF 180	0.43
FBF 181	0.41
FBF 182	0.36
FBF 183	0.37
FBF 184	0.39
FBF 185	0.43
FBF 186	0.47
FBF 187	0.44
FBF 188	0.42
FBF 189	0.56
FBF 190	0.39
FBF 191	0.34
FBF 192	0.31
FBF 193	0.31
FBF 194	0.47
FBF 195	0.47
FBF 196	0.36
FBF 197	0.39
FBF 198	0.44
FBF 199	0.38
FBF 200	0.26
FBF 201	0.32
FBF 202	0.3
FBF 203	0.33
FBF 204	0.32
FBF 205	0.35
FBF 206	0.37
FBF 207	0.62

Drum	Dose
FBF 208	0.53
FBF 209	0.37
FBF 210	0.74
FBF 211	0.55
FBF 212	0.52
FBF 213	0.98
FBF 214	0.62
FBF 215	0.54
FBF 216	0.41
FBF 217	0.45
FBF 218	0.43
FBF 219	0.46
FBF 220	0.4
FBF 221	0.31
FBF 222	0.38
FBF 223	0.33
FBF 224	0.37
FBF 225	0.41
FBF 226	0.48
FBF 227	0.42
FBF 228	0.53
FBG 1	0.32
FBG 2	0.41
FBG 3	0.34
FBG 4	0.45
FBG 5	0.39
FBG 6	0.41
FBG 7	0.34
FBG 8	0.43
FBG 9	0.3
FBG 10	0.28
FBG 11	0.26
FBG 12	0.22
FBG 13	0.32
FBG 14	0.3
FBG 15	0.31
FBG 16	0.29
FBG 17	0.27
FBG 18	0.31
FBG 19	0.31
FBG 20	0.3

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBG 21	0.35
FBG 22	0.32
FBG 23	0.34
FBG 24	0.29
FBG 25	0.35
FBG 26	0.35
FBG 27	0.38
FBG 28	0.27
FBG 29	0.35
FBG 30	0.46
FBG 31	0.35
FBG 32	0.51
FBG 33	0.55
FBG 34	0.48
FBG 35	0.57
FBG 36	0.63
FBG 37	0.76
FBG 38	0.62
FBG 39	0.61
FBG 40	0.66
FBG 41	0.57
FBG 42	0.52
FBG 43	0.69
FBG 44	0.76
FBG 45	0.54
FBG 46	0.67
FBG 47	- - -
FBG 48	0.66
FBG 49	0.83
FBG 50	0.87
FBG 51	0.72
FBG 52	0.7
FBG 53	0.68
FBG 54	0.52
FBG 55	0.53
FBG 56	0.54
FBG 57	0.51
FBG 58	0.5
FBG 59	0.42
FBG 60	0.36
FBG 61	0.31
FBG 62	0.23
FBG 63	0.24
FBG 64	0.27
FBG 65	0.29

Drum	Dose
FBG 66	0.31
FBG 67	0.32
FBG 68	0.29
FBG 69	0.28
FBG 70	0.33
FBG 71	0.36
FBG 72	0.4
FBG 73	0.33
FBG 74	0.25
FBG 75	0.19
FBG 76	0.21
FBG 77	0.24
FBG 78	0.22
FBG 79	0.26
FBG 80	0.28
FBG 81	0.27
FBG 82	0.28
FBG 83	0.26
FBG 84	0.27
FBG 85	0.32
FBG 86	0.3
FBG 87	0.3
FBG 88	0.24
FBG 89	0.29
FBG 90	0.23
FBG 91	0.21
FBG 92	0.27
FBG 93	0.17
FBG 94	0.28
FBG 95	0.27
FBG 96	0.35
FBG 97	0.3
FBG 98	0.23
FBG 99	0.28
FBG 100	0.31
FBG 101	0.3
FBG 102	0.28
FBG 103	0.26
FBG 104	0.32
FBG 105	0.35
FBG 106	0.34
FBG 107	0.38
FBG 108	0.32
FBG 109	0.26
FBG 110	0.32

Drum	Dose
FBG 111	0.28
FBG 112	0.23
FBG 113	0.25
FBG 114	0.22
FBG 115	0.27
FBG 116	0.5
FBG 117	0.42
FBG 118	0.34
FBG 119	0.44
FBG 120	0.31
FBG 121	0.29
FBG 122	0.24
FBG 123	0.27
FBG 124	0.33
FBG 125	0.3
FBG 126	0.31
FBG 127	0.31
FBG 128	0.37
FBG 129	0.28
FBG 130	0.32
FBG 131	0.36
FBG 132	0.34
FBG 133	0.33
FBG 134	0.31
FBG 135	0.43
FBG 136	0.4
FBG 137	0.54
FBG 138	0.34
FBG 139	0.39
FBG 140	0.65
FBG 141	0.67
FBG 142	0.6
FBG 143	0.96
FBG 144	0.49
FBG 145	0.41
FBG 146	0.46
FBG 147	0.44
FBG 148	0.68
FBG 149	0.62
FBH 1	0.31
FBH 2	0.33

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBH 3	0.34
FBH 4	0.3
FBH 5	0.32
FBH 6	0.3
FBH 7	0.29
FBH 8	0.3
FBH 9	0.28
FBH 10	0.25
FBH 11	0.3
FBH 12	0.24
FBH 13	0.31
FBH 14	0.22
FBH 15	0.27
FBH 16	0.21
FBH 17	0.27
FBH 18	0.33
FBH 19	0.25
FBH 20	0.22
FBH 21	0.23
FBH 22	0.34
FBH 23	0.32
FBH 24	0.28
FBH 25	0.28
FBH 26	0.31
FBH 27	0.28
FBH 28	0.32
FBH 29	0.27
FBH 30	0.34
FBH 31	0.29
FBH 32	0.13
FBH 33	0.2
FBH 34	0.2
FBH 35	0.21
FBH 36	0.14
FBH 37	0.2
FBH 38	0.25
FBH 39	0.22
FBH 40	0.21
FBH 41	0.18
FBH 42	0.17
FBH 43	0.29
FBH 44	0.18
FBH 45	0.22
FBH 46	0.18
FBH 47	0.24

Drum	Dose
FBH 48	0.22
FBH 49	0.27
FBH 50	0.28
FBH 51	0.21
FBH 52	0.25
FBH 53	0.19
FBH 54	0.2
FBH 55	0.22
FBH 56	0.24
FBH 57	0.17
FBH 58	0.23
FBH 59	0.21
FBH 60	0.24
FBH 61	0.28
FBH 62	0.17
FBH 63	0.24
FBH 64	0.2
FBH 65	0.14
FBH 66	0.24
FBH 67	0.17
FBH 68	0.15
FBH 69	0.23
FBH 70	0.18
FBH 71	0.21
FBH 72	0.16
FBH 73	0.24
FBH 74	0.24
FBH 75	0.29
FBH 76	0.26
FBH 77	0.32
FBH 78	0.34
FBH 79	0.3
FBH 80	0.25
FBH 81	0.22
FBH 82	0.26
FBH 83	0.26
FBH 84	0.23
FBH 85	0.24
FBH 86	0.25
FBH 87	0.29
FBH 88	0.22
FBH 89	0.27
FBH 90	0.21
FBH 91	0.36
FBH 92	0.3

Drum	Dose
FBH 93	0.34
FBH 94	0.24
FBH 95	0.4
FBH 96	0.38
FBH 97	0.33
FBH 98	0.41
FBH 99	0.43
FBH 100	0.36
FBH 101	0.41
FBH 102	0.38
FBH 103	0.4
FBH 104	0.32
FBH 105	0.33
FBH 106	0.28
FBH 107	0.27
FBH 108	0.34
FBH 109	0.29
FBH 110	0.33
FBH 111	0.3
FBH 112	0.31
FBH 113	0.28
FBH 114	0.33
FBH 115	0.43
FBH 116	0.41
FBH 117	0.36
FBH 118	0.39
FBH 119	0.31
FBH 120	0.31
FBH 121	0.3
FBH 122	0.27
FBH 123	0.27
FBH 124	0.24
FBH 125	0.29
FBH 126	0.22
FBH 127	0.26
FBH 128	0.32
FBH 129	0.32
FBH 130	0.38
FBH 131	0.33
FBH 132	0.3
FBH 133	0.22
FBH 134	0.25
FBH 135	0.26
FBH 136	0.27
FBH 137	0.28

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBH 138	0.3
FBH 139	0.29
FBH 140	0.25
FBH 141	0.23
FBH 142	0.31
FBH 143	0.29
FBH 144	0.21
FBH 145	0.34
FBH 146	0.3
FBI 1	0.26
FBI 2	0.23
FBI 3	0.25
FBI 4	0.27
FBI 5	0.28
FBI 6	0.23
FBI 7	0.3
FBI 8	0.27
FBI 9	0.31
FBI 10	0.26
FBI 11	0.33
FBI 12	0.27
FBI 13	0.24
FBI 14	0.25
FBI 15	0.23
FBI 16	0.22
FBI 17	0.19
FBI 18	0.18
FBI 19	0.27
FBI 20	0.29
FBI 21	0.25
FBI 22	0.28
FBI 23	0.23
FBI 24	0.24
FBI 25	0.23
FBI 26	0.28
FBI 27	0.22
FBI 28	0.32
FBI 29	0.29
FBI 30	0.55
FBI 31	0.43
FBI 32	0.51

Drum	Dose
FBI 33	0.69
FBI 34	0.39
FBI 35	0.64
FBI 36	0.86
FBI 37	0.42
FBI 38	0.6
FBI 39	0.38
FBI 40	0.34
FBI 41	0.51
FBI 42	0.31
FBI 43	0.34
FBI 44	0.37
FBI 45	0.55
FBI 46	0.27
FBI 47	0.33
FBI 48	0.33
FBI 49	0.29
FBI 50	0.26
FBI 51	0.23
FBI 52	0.18
FBI 53	0.18
FBI 54	0.19
FBI 55	0.23
FBI 56	0.22
FBI 57	0.2
FBI 58	0.17
FBI 59	0.18
FBI 60	0.24
FBI 61	0.22
FBI 62	0.18
FBI 63	0.2
FBI 64	0.24
FBI 65	0.23
FBI 66	0.22
FBI 67	0.28
FBI 68	0.28
FBI 69	0.31
FBI 70	0.21
FBI 71	0.25
FBI 72	0.26
FBI 73	0.26
FBI 74	0.32
FBI 75	0.35
FBI 76	0.28
FBI 77	0.42

Drum	Dose
FBI 78	0.31
FBI 79	0.2
FBI 80	0.29
FBI 81	0.38
FBI 82	0.26
FBI 83	0.3
FBI 84	0.28
FBI 85	0.23
FBI 86	0.27
FBI 87	0.25
FBI 88	0.26
FBI 89	0.29
FBI 90	0.26
FBI 91	0.28
FBI 92	0.32
FBI 93	0.26
FBI 94	0.28
FBI 95	0.27
FBI 96	0.39
FBI 97	0.28
FBI 98	0.31
FBI 99	0.4
FBI 100	0.33
FBI 101	0.29
FBI 102	0.34
FBI 103	0.21
FBI 104	0.41
FBI 105	0.27
FBI 106	0.28
FBI 107	0.3
FBI 108	0.25
FBI 109	0.26
FBI 110	0.32
FBI 111	0.33
FBI 112	0.25
FBI 113	0.3
FBI 114	0.24
FBI 115	0.26
FBI 116	0.31
FBI 117	0.4
FBI 118	0.3
FBI 119	0.35
FBI 120	0.35
FBI 121	0.58
FBI 122	0.42

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBI 123	0.56
FBI 124	0.7
FBI 125	0.68
FBI 126	0.47
FBI 127	0.21
FBI 128	0.31
FBI 129	0.18
FBI 130	0.2
FBI 131	0.18
FBI 132	0.26
FBI 133	0.27
FBI 134	0.28
FBI 135	0.34
FBI 136	0.33
FBI 137	0.32
FBI 138	0.26
FBI 139	0.34
FBI 140	0.24
FBI 141	0.4
FBI 142	0.39
FBI 143	0.36
FBI 144	0.36
FBI 145	0.29
FBI 146	0.41
FBI 147	0.28
FBI 148	0.24
FBI 149	0.27
FBI 150	0.2
FBI 151	0.51
FBI 152	0.41
FBI 153	0.38
FBI 154	0.3
FBI 155	0.25
FBI 156	0.29
FBJ 1	0.28
FBJ 2	0.3
FBJ 3	0.38
FBJ 4	0.4
FBJ 5	0.43
FBJ 6	0.32
FBJ 7	0.29

Drum	Dose
FBJ 8	0.32
FBJ 9	0.22
FBJ 10	0.25
FBJ 11	0.24
FBJ 12	0.26
FBJ 13	0.34
FBJ 14	0.28
FBJ 15	0.35
FBJ 16	0.35
FBJ 17	0.4
FBJ 18	0.31
FBJ 19	0.32
FBJ 20	0.32
FBJ 21	0.28
FBJ 22	0.22
FBJ 23	0.2
FBJ 24	0.24
FBJ 25	0.35
FBJ 26	0.3
FBJ 27	0.33
FBJ 28	0.32
FBJ 29	0.25
FBJ 30	0.31
FBJ 31	0.3
FBJ 32	0.33
FBJ 33	0.35
FBJ 34	0.28
FBJ 35	0.34
FBJ 36	0.25
FBJ 37	0.29
FBJ 38	0.34
FBJ 39	0.26
FBJ 40	0.31
FBJ 41	0.3
FBJ 42	0.36
FBJ 43	0.3
FBJ 44	0.32
FBJ 45	0.39
FBJ 46	0.26
FBJ 47	0.34
FBJ 48	0.27
FBJ 49	0.31
FBJ 50	0.36
FBJ 51	0.32
FBJ 52	0.38

Drum	Dose
FBJ 53	0.42
FBJ 54	0.43
FBJ 55	0.3
FBJ 56	0.32
FBJ 57	0.37
FBJ 58	0.39
FBJ 59	0.34
FBJ 60	0.28
FBJ 61	0.31
FBJ 62	0.31
FBJ 63	0.3
FBJ 64	0.34
FBJ 65	0.4
FBJ 66	0.31
FBJ 67	0.23
FBJ 68	0.33
FBJ 69	0.26
FBJ 70	0.27
FBJ 71	0.3
FBJ 72	0.29
FBJ 73	0.38
FBJ 74	0.37
FBJ 75	0.42
FBJ 76	0.32
FBJ 77	0.38
FBJ 78	0.31
FBJ 79	0.22
FBJ 80	0.27
FBJ 81	0.23
FBJ 82	0.28
FBJ 83	0.19
FBJ 84	0.27
FBJ 85	0.29
FBJ 86	0.32
FBJ 87	0.29
FBJ 88	0.28
FBJ 89	0.28
FBJ 90	0.25
FBJ 91	0.24
FBJ 92	0.29
FBJ 93	0.31
FBJ 94	0.24
FBJ 95	illegible
FBJ 96	0.25
FBJ 97	0.32

Table B-1 Surface Doses Measured on the **2893** Drums in the Compound

Drum	Dose
FBJ 98	0.28
FBJ 99	0.31
FBJ 100	0.31
FBJ 101	0.3
FBJ 102	0.3
FBJ 103	0.25
FBJ 104	0.34
FBJ 105	0.29
FBJ 106	0.26
FBJ 107	0.3
FBJ 108	1.24
FBJ 109	0.26
FBJ 110	0.43
FBJ 111	0.53
FBJ 112	0.3
FBJ 113	0.43
FBJ 114	0.46
FBJ 115	0.23
FBJ 116	0.36
FBJ 117	0.26
FBJ 118	0.31
FBJ 119	0.3
FBJ 120	0.32
FBJ 121	0.25
FBJ 122	0.29
FBJ 123	0.28
FBJ 124	0.27
FBJ 125	0.26
FBJ 126	0.23
FBJ 127	0.28
FBJ 128	0.27
FBJ 129	0.3
FBJ 130	0.24
FBJ 131	0.29
FBJ 132	0.31
FBJ 133	0.33
FBJ 134	0.3
FBJ 135	0.47
FBJ 136	0.35
FBJ 137	0.52
FBJ 138	0.43
FBJ 139	0.3
FBJ 140	0.44
FBJ 141	0.45
FBJ 142	0.31

Drum	Dose
FBJ 143	0.34
FBJ 144	0.35
FBJ 145	0.3
FBJ 146	0.28
FBJ 147	0.25
FBJ 148	0.3
FBJ 149	0.34
FBJ 150	0.28
FBJ 151	0.36
FBJ 152	0.43
FBJ 153	0.41
FBJ 154	0.27
FBJ 155	0.36
FBJ 156	0.33
FBJ 157	0.28
FBJ 158	0.34
FBJ 159	0.27
FBJ 160	0.27
FBJ 161	0.29
FBJ 162	0.24
FBJ 163	0.22
FBJ 164	0.23
FBJ 165	0.28
FBJ 166	0.19
FBJ 167	0.23
FBJ 168	0.2
FBJ 169	0.25
FBJ 170	0.32
FBJ 171	0.24
FBJ 172	0.22
FBJ 173	0.18
FBJ 174	0.24
FBJ 175	0.21
FBJ 176	0.18
FBJ 177	0.2
FBJ 178	0.23
FBJ 179	0.22
FBJ 180	0.2
FBJ 181	0.24
FBJ 182	0.2
FBJ 183	0.18
FBJ 184	0.19
FBJ 185	0.18
FBJ 186	0.18
FBJ 187	0.24

Drum	Dose
FBJ 188	0.23
FBJ 189	0.22
FBJ 190	0.23
FBJ 191	0.21
FBJ 192	0.26
FBJ 193	0.21
FBJ 194	0.21
FBJ 195	0.31
FBJ 196	0.33
FBJ 197	0.36
FBJ 198	0.35
FBJ 199	0.3
FBJ 200	0.28
FBJ 201	0.31
FBJ 202	0.4
FBJ 203	0.38
FBJ 204	0.42
FBJ 205	0.42
FBJ 206	0.43
FBJ 207	0.39
FBJ 208	0.43
FBJ 209	0.52
FBJ 210	0.38
FBJ 211	0.56
FBJ 212	0.58
FBJ 213	0.63
FBJ 214	0.48
FBJ 215	0.44
FBJ 216	0.42
FBK 1	0.48
FBK 2	0.54
FBK 3	4.32
FBK 4	0.43
FBK 5	3.78
FBK 6	9.11
FBK 7	0.42
FBK 8	1.37
FBK 9	1.45
FBK 10	0.49
FBK 11	0.77
FBK 12	0.58
FBK 13	0.4

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBK 14	0.51
FBK 15	0.4
FBK 16	0.39
FBK 17	0.43
FBK 18	0.5
FBK 19	0.54
FBK 20	0.76
FBK 21	1.29
FBK 22	1.31
FBK 23	2.17
FBK 24	1.81
FBK 25	3.5
FBK 26	2.64
FBK 27	1.75
FBK 28	3.41
FBK 29	3.16
FBK 30	1.58
FBK 31	1.41
FBK 32	2.25
FBK 33	1.84
FBK 34	2.31
FBK 35	4.46
FBK 36	3.11
FBK 37	3
FBK 38	5.3
FBK 39	7.38
FBK 40	1.54
FBK 41	4.65
FBK 42	3.67
FBK 43	1.4
FBK 44	1.64
FBK 45	1.77
FBK 46	1.68
FBK 47	1.29
FBK 48	1.42
FBK 49	0.63
FBK 50	0.89
FBK 51	0.95
FBK 52	0.42
FBK 53	0.61
FBK 54	0.74
FBK 55	0.42
FBK 56	0.48
FBK 57	0.42
FBK 58	0.39

Drum	Dose
FBK 59	0.38
FBK 60	0.42
FBK 61	0.22
FBK 62	0.3
FBK 63	0.26
FBK 64	0.4
FBK 65	0.43
FBK 66	0.48
FBK 67	2.48
FBK 68	0.44
FBK 69	0.71
FBK 70	0.45
FBK 71	0.29
FBK 72	0.56
FBK 73	0.59
FBK 74	0.46
FBK 75	0.45
FBK 76	0.47
FBK 77	0.49
FBK 78	0.73
FBK 79	0.47
FBK 80	0.56
FBK 81	0.43
FBK 82	0.47
FBK 83	0.72
FBK 84	0.54
FBK 85	0.42
FBK 86	0.58
FBK 87	0.39
FBK 88	0.37
FBK 89	0.41
FBK 90	0.32
FBK 91	0.49
FBK 92	0.44
FBK 93	0.44
FBK 94	0.7
FBK 95	0.77
FBK 96	0.68
FBK 97	0.66
FBK 98	1.11
FBK 99	0.71
FBK 100	0.55
FBK 101	0.9
FBK 102	0.46
FBK 103	0.57

Drum	dose
FBK 104	0.79
FBK 105	0.65
FBK 106	0.48
FBK 107	0.67
FBK 108	0.47
FBK 109	0.79
FBK 110	0.48
FBK 111	0.58
FBK 112	0.55
FBK 113	0.45
FBK 114	[illegible]
FBK 115	[illegible]
FBK 116	0.44
FBK 117	0.45
FBK 118	0.95
FBK 119	0.46
FBK 120	0.48
FBK 121	0.73
FBK 122	0.41
FBK 123	0.65
FBK 124	0.49
FBK 125	0.51
FBK 126	0.43
FBK 127	0.34
FBK 128	0.42
FBK 129	0.35
FBK 130	0.64
FBK 131	0.44
FBK 132	0.51
FBK 133	0.55
FBK 134	0.4
FBK 135	0.56
FBK 136	1.57
FBK 137	0.42
FBK 138	1.03
FBK 139	5.28
FBK 140	8.05
FBK 141	2.83
FBK 142	2.19
FBK 143	5.81
FBK 144	3.4
FBK 145	4.36
FBK 146	2.78
FBK 147	3.89
FBK 148	4.92

Table B-1 **Surface** Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBK 149	8.63
FBK 150	3.22
FBK 151	5.43
FBK 152	6.54
FBK 153	3.33
FBK 154	5.26
FBK 155	8.61
FBK 156	4.39
FBK 157	3.68
FBK 158	7.15
FBK 159	2.57
FBK 160	4.14
FBK 161	10.8
FBK 162	2.38
FBK 163	2.11
FBK 164	3.64
FBK 165	2.52
FBK 166	3.19
FBK 167	3.09
FBK 168	2.97
FBK 169	3.95
FBK 170	1.57
FBK 171	1.23
FBK 172	2.93
FBK 173	1.27
FBK 174	1.31
FBK 175	1.82
FBK 176	1.07
FBK 177	1.51
FBK 178	2.3
FBK 179	2.97
FBK 180	2.44
FBK 181	2.09
FBK 182	10
FBK 183	2.68
FBK 184	1.97
FBK 185	12.1
FBK 186	3.87
FBK 187	1.02
FBK 188	1.31
FBK 189	2.14
FBK 190	0.8
FBK 191	1.01
FBK 192	0.87
FBK 193	0.56

Drum	Dose
FBK 194	1.53
FBK 195	2.05
FBK 196	0.75
FBK 197	1.79
FBK 198	2.68
FBK 199	0.86
FBK 200	2.06
FBK 201	2.57
FBK 202	0.71
FBK 203	4.2
FBK 204	13.5
FBL 1	0.47
FBL 2	0.51
FBL 3	0.66
FBL 4	1.41
FBL 5	0.94
FBL 6	0.85
FBL 7	5.51
FBL 8	0.79
FBL 9	1.16
FBL 10	2.52
FBL 11	1.22
FBL 12	1.1
FBL 13	1.15
FBL 14	1.43
FBL 15	1.29
FBL 16	1.49
FBL 17	2.27
FBL 18	1.68
FBL 19	4.68
FBL 20	5.3
FBL 21	2.83
FBL 22	8.64
FBL 23	6.21
FBL 24	3.66
FBL 25	2.08
FBL 26	1.19
FBL 27	1.79
FBL 28	2.01
FBL 29	1.75
FBL 30	2.03

Drum	Dose
FBL 31	1.8
FBL 32	1.56
FBL 33	1.16
FBL 34	1.67
FBL 35	1.38
FBL 36	1.22
FBL 37	1.63
FBL 38	1.91
FBL 39	1.47
FBL 40	2.48
FBL 41	1.64
FBL 42	1.55
FBL 43	2.47
FBL 44	2.7
FBL 45	1.6
FBL 46	2.07
FBL 47	2.48
FBL 48	1.85
FBL 49	1.41
FBL 50	1.47
FBL 51	1.13
FBL 52	1.46
FBL 53	1.43
FBL 54	1.1
FBL 55	1.28
FBL 56	1.22
FBL 57	0.82
FBL 58	0.88
FBL 59	0.85
FBL 60	0.79
FBL 61	0.63
FBL 62	0.66
FBL 63	0.62
FBL 64	0.72
FBL 65	0.58
FBL 66	0.52
FBL 67	0.47
FBL 68	0.43
FBL 69	1.05
FBL 70	0.75
FBL 71	0.54
FBL 72	0.48
FBL 73	0.48
FBL 74	0.61
FBL 75	0.53

Table B-1 **Surface** Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBL 76	0.62
FBL 77	0.47
FBL 78	0.51
FBL 79	0.43
FBL 80	0.56
FBL 81	0.52
FBL 82	0.54
FBL 83	0.47
FBL 84	0.46
FBL 85	0.32
FBL 86	0.39
FBL 87	0.27
FBL 88	0.45
FBL 89	0.7
FBL 90	0.38
FBL 91	0.78
FBL 92	1.23
FBL 93	0.56
FBL 94	0.3
FBL 95	0.48
FBL 96	0.29
FBL 97	0.29
FBL 98	0.32
FBL 99	0.35
FBL 100	0.56
FBL 101	0.45
FBL 102	0.44
FBL 103	1.77
FBL 104	0.56
FBL 105	0.43
FBL 106	0.42
FBL 107	0.39
FBL 108	0.55
FBL 109	0.66
FBL 110	0.62
FBL 111	0.66
FBL 112	0.62
FBL 113	1.3
FBL 114	1.01
FBL 115	0.68
FBL 116	0.59
FBL 117	0.55
FBL 118	0.44
FBL 119	0.42
FBL 1201	0.39

Drum	Dose
FBL 121	0.33
FBL 122	0.3
FBL 123	0.31
FBL 124	0.45
FBL 125	0.34
FBL 126	0.36
FBL 127	0.43
FBL 128	0.37
FBL 129	0.58
FBL 130	0.56
FBL 131	0.44
FBL 132	0.73
FBL 133	0.46
FBL 134	0.35
FBL 135	0.44
FBL 136	0.47
FBL 137	0.48
FBL 138	0.77
FBL 139	0.51
FBL 140	0.63
FBL 141	0.56
FBL 142	0.69
FBL 143	0.62
FBL 144	0.6
FBL 145	2.03
FBL 146	1.12
FBL 147	1.09
FBL 148	2.76
FBL 149	1.14
FBL 150	1.02
FBL 151	0.47
FBL 152	0.55
FBL 153	1.72
FBL 154	0.74
FBL 155	0.85
FBL 156	1.7
FBL 157	0.75
FBL 158	0.68
FBL 159	1.19
FBL 160	0.93
FBL 161	0.68
FBL 162	1.49
FBL 163	1.14
FBL 164	0.53
FBL 165	1.19

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FBL 166	[illegible]
FBL 167	[illegible]
FBL 168	0.94
FBL 169	1.01
FBL 170	0.82
FBL 171	0.56
FBL 172	3.03
FBL 173	0.82
FBL 174	0.55
FBL 175	2.52
FBL 176	1.15
FBL 177	0.48
FBL 178	0.93
FBL 179	0.72
FBL 180	0.52
FBL 181	2.24
FBL 182	
FBL 183	
FBL 184	1.34
FBL 185	[illegible]
FBL 186	0.68
FBM 1	0.43
FBM 2	0.42
FBM 3	0.44
FBM 4	0.46
FBM 5	0.4
FBM 6	0.47
FBM 7	0.61
FBM 8	1.13
FBM 9	0.54
FBM 10	0.57
FBM 11	0.98
FBM 12	0.63
FBM 13	0.42
FBM 14	0.64
FBM 15	0.43
FBM 16	0.52
FBM 17	0.56
FBM 18	0.45
FBM 19	0.42
FBM 20	0.75

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBM 21	0.74
FEW 22	0.43
FEN 23	0.96
FBM 24	1.34
FBM 25	0.45
FBM 26	0.98
FBM 27	1.48
FBM 28	0.4
FBM 29	0.7
FBM 30	0.97
FBM 31	0.45
FBM 32	0.79
FBM 33	1.25
FBM 34	0.41
FBM 35	0.72
FBM 36	0.96
FBM 37	0.38
FEN 38	0.66
FBM 39	0.93
FBM 40	0.43
FBM 41	0.5
FBM 42	0.54
FBM 43	0.43
FBM 44	0.67
FBM 45	0.45
FBM 46	0.27
FBM 47	0.43
FBM 48	0.36
FBM 49	0.4
FBM 50	0.34
FBM 51	0.44
FBM 52	0.87
FBM 53	0.89
FBM 54	0.56
FBM 55	2.48
FBM 56	1.75
FBM 57	1.04
FBM 58	2.7
FBM 59	1.92
FBM 60	0.68
FBM 61	0.52
FBM 62	0.61
FBM 63	0.47
FBM 64	0.58
FBM 65	1.11

Drum	Dose
FBM 66	0.96
FBM 67	0.73
FBM 68	2.72
FBM 69	3.36
FBM 70	1.81
FEW 71	1.96
FBM 72	4.48
FBM 73	6.08
FBM 74	1.21
FBM 75	0.81
FBM 76	8.24
FBM 77	0.82
FBM 78	0.31
FBM 79	0.45
FBM 80	0.47
FBM 81	0.73
FBM 82	0.51
FBM 83	0.49
FBM 84	0.64
FBM 85	0.89
FBM 86	0.83
FBM 87	0.74
FBM 88	1.08
FBM 89	0.71
FBM 90	0.75
FBM 91	0.73
FBM 92	0.94
FBM 93	0.59
FBM 94	0.84
FBM 95	2.27
FBM 96	1.02
FBM 97	1.05
FBM 98	4.87
FBM 99	1.26
FBM 100	0.7
FBM 101	1.3
FBM 102	1.08
FBM 103	0.49
FBM 104	1.03
FBM 105	0.53
FBM 106	1.2
FBM 107	1.17
FBM 108	0.92
FBM 109	2.43
FBM 110	1.84

Drum	Dose
FBM 111	1.54
FBM 112	3.02
FBM 113	1.83
FBM 114	2.4
FBM 115	1.87
FBM 116	1.35
FBM 117	1.72
FBM 118	2.48
FBM 119	2.83
FBM 120	3.07
FBM 121	1.05
FBM 122	2.38
FBM 123	3.46
FBM 124	0.89
FBM 125	3.06
FBM 126	5.22
FBM 127	0.75
FBM 128	2.38
FBM 129	2.31
FBM 130	0.61
FBM 131	2.11
FBM 132	0.8
FBM 133	0.83
FBM 134	2.26
FBM 135	1.42
FBM 136	0.93
FBM 137	1.4
FBM 138	1.84
FBM 139	0.85
FBM 140	1.02
FBM 141	0.64
FBM 142	1.26
FBM 143	1.37
FBM 144	1.42
FEN 145	4.17
FBM 146	2.18
FBM 147	2.69
FBM 148	1.8
FBM 149	5.47
FEN 150	3.04
FEW 151	2.12
FBM 152	8.87
FBM 153	7.33
FBM 154	1.2
FBM 155	8.35

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBM 156	14.5
FBM 157	2.02
FBM 158	6.45
FBM 159	8.57
FBM 160	2.36
FBM 161	3.79
FBM 162	6.67
FBM 163	6.59
FBM 164	2.8
FBM 165	3.02
FBM 166	6.03
FBM 167	2.99
FBM 168	1.79
FBM 169	1.23
FBM 170	1.65
FBM 171	1.47
FBM 172	1.1
FBM 173	1.08
FBM 174	1
FBM 175	1.25
FBM 176	0.62
FBM 177	
FBM 178	
FBM 179	0.94
FBM 180	0.93
FBM 181	1.06
FBM 182	0.93
FBM 183	0.99
FBM 184	1.38
FBM 185	1.75
FBM 186	1.62
FBM 187	1.39
FBM 188	4.56
FBM 189	2.86
FBM 190	1.15
FBM 191	2.62
FBM 192	1.22
FBM 193	0.55
FBM 194	0.58
FBM 195	0.63
FBM 196	0.66
FBM 197	0.46
FBM 198	0.74
FBM 199	0.72
FBM 200	0.68

Drum	Dose
FBM 201	0.57
FBM 202	0.41
FBM 203	0.38
FBM 204	0.36
FBM 205	0.3
FBM 206	0.24
FBM 207	0.34
FBM 208	0.35
FBM 209	0.35
FBM 210	0.53
FBM 211	0.38
FBM 212	0.49
FBM 213	0.44
FBM 214	0.52
FBM 215	0.67
FBM 216	0.54
FBM 217	0.86
FBM 218	2.98
FBM 219	1.37
FBM 220	0.84
FBM 221	2.02
FBM 222	1.67
FBM 223	0.61
FBM 224	0.93
FBM 225	1.19
FBM 226	0.43
FBM 227	0.55
FBM 228	0.77
FBM 229	0.41
FBM 230	0.48
FBM 231	0.44
FBM 232	0.67
FBM 233	1.13
FBM 234	0.61
FBM 235	0.89
FBM 236	1.41
FBM 237	0.72
FBM 238	0.86
FBM 239	1.3
FBM 240	0.74
FBM 241	0.44
FBM 242	1.7
FBM 243	0.58
FBM 244	0.65
FBM 245	1.52

Drum	Dose
FBM 246	0.7
FBM 247	0.51
FBM 248	1.43
FBM 249	0.45
FBM 250	0.3
FBM 251	0.31
FBM 252	0.32
FBM 253	0.28
FBM 254	0.33
FBM 255	0.33
FBM 256	0.34
FBM 257	0.51
FBM 258	0.66
FBM 259	0.44
FBM 260	0.53
FBM 261	0.68
FBM 262	0.46
FBM 263	0.37
FBM 264	0.44
FBN 1	0.33
FBN 2	0.4
FBN 3	0.41
FBN 4	0.47
FBN 5	0.52
FBN 6	0.4
FBN 7	0.43
FBN 8	0.46
FBN 9	0.42
FBN 10	0.48
FBN 11	0.44
FBN 12	0.48
FBN 13	0.42
FBN 14	0.54
FBN 15	0.46
FBN 16	0.47
FBN 17	0.45
FBN 18	0.48
FBN 19	0.43
FBN 20	0.52
FBN 21	0.52
FBN 22	0.57

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBN 23	0.47
FBN 24	0.48
FBN 25	0.43
FBN 26	0.56
FBN 27	0.51
FBN 28	0.39
FBN 29	0.51
FBN 30	0.44
FBN 31	0.36
FBN 32	0.5
FBN 33	0.47
FBN 34	0.31
FBN 35	0.36
FBN 36	0.43
FBN 37	0.42
FBN 38	0.4
FBN 39	0.35
FBN 40	0.52
FBN 41	0.47
FBN 42	0.45
FBN 43	0.4
FBN 44	0.31
FBN 45	0.35
FBN 46	0.32
FBN 47	0.41
FBN 48	0.5
FBN 49	0.44
FBN 50	0.43
FBN 51	0.57
FBN 52	0.87
FBN 53	1.23
FBN 54	1.12
FBN 55	2
FBN 56	5.31
FBN 57	3.15
FBN 58	2.3
FBN 59	7.21
FBN 60	1.6
FBN 61	1.98
FBN 62	4.65
FBN 63	1.48
FBN 64	1.17
FBN 65	4.01
FBN 66	1.51
FBN 67	0.81

Drum	Dose
FBN 68	0.63
FBN 69	1.17
FBN 70	1.06
FBN 71	0.93
FBN 72	1.18
FBN 73	1.33
FBN 74	1.12
FBN 75	1.64
FBN 76	3.05
FBN 77	2.48
FBN 78	4.28
FBN 79	11.5
FBN 80	3.28
FBN 81	15.3
FBN 82	2.84
FBN 83	2.16
FBN 84	11.7
FBN 85	5.48
FBN 86	2.51
FBN 87	2.3
FBN 88	3.64
FBN 89	2.65
FBN 90	3.13
FBN 91	2.24
FBN 92	2.41
FBN 93	11.4
FBN 94	1.42
FBN 95	1.64
FBN 96	7.95
FBN 97	1.38
FBN 98	1.02
FBN 99	1.26
FBN 100	0.93
FBN 101	0.75
FBN 102	1.47
FBN 103	1.09
FBN 104	0.73
FBN 105	1.14
FBN 106	1.02
FBN 107	1.83
FBN 108	1.77
FBN 109	1.2
FBN 110	6.95
FBN 111	3.36
FBN 112	1.24

Drum	Dose
FBN 113	4.04
FBN 114	3.75
FBN 115	0.85
FBN 116	0.92
FBN 117	2.6
FBN 118	0.75
FBN 119	0.76
FBN 120	0.53
FBN 121	0.41
FBN 122	0.43
FBN 123	0.42
FBN 124	0.58
FBN 125	0.36
FBN 126	0.44
FBN 127	0.53
FBN 128	0.64
FBN 129	0.6
FBN 130	0.43
FBN 131	0.57
FBN 132	0.75
FBN 133	0.51
FBN 134	0.66
FBN 135	0.67
FBN 136	0.52
FBN 137	0.88
FBN 138	1.18
FBN 139	0.76
FBN 140	1.09
FBN 141	1.78
FBN 142	1.28
FBN 143	1.21
FBN 144	2.31
FBN 145	1.29
FBN 146	0.64
FBN 147	0.89
FBN 148	2.12
FBN 149	1.9
FBN 150	1.44
FBN 151	0.67
FBN 152	3.24
FBN 153	0.71
FBN 154	0.82
FBN 155	2.15
FBN 156	1.08
FBN 157	0.81

Table B-1 Surface Doses Measured on the 2893 Drums in the Compound

Drum	Dose
FBN 158	0.63
FBN 159	2.75
FBN 160	0.67
FBN 161	0.71
FBN 162	1.54
FBN 163	1.58
FBN 164	0.62
FBN 165	0.91
FBN 166	2.11
FBN 167	0.64
FBN 168	0.53
FBN 169	0.37
FBN 170	0.36
FBN 171	0.47
FBN 172	0.44
FBN 173	0.55
FBN 174	0.9
FBN 175	0.61
FBN 176	1.72
FBN 177	0.55
FBN 178	0.52
FBN 179	0.76
FBN 180	0.81
FBN 181	0.73
FBN 182	0.94
FBN 183	1.66
FBN 184	0.93
FBN 185	1.35
FBN 186	3.57
FBN 187	1.12
FBN 188	0.61
FBN 189	0.64
FBN 190	2.06
FBN 191	0.43
FBN 192	0.38
FBN 193	0.36
FBN 194	0.3
FBN 195	0.39
FBN 196	0.45
FBN 197	0.38
FBN 198	0.41
FBN 199	0.31
FBN 200	0.36
FBN 201	0.27
FBN 202	0.33
FBN 203	0.4
FBN 204	0.38
FBN 205	0.48
FBN 206	0.46
FBN 207	0.4
FBN 208	0.38
FBN 209	0.37
FBN 210	0.33
FBN 211	0.27
FBN 212	0.24
FBN 213	0.31
FBN 214	0.37
FBN 215	0.41
FBN 216	0.42
FBN 217	0.39
FBN 218	0.3
FBN 219	0.47
FBN 220	0.36
FBN 221	0.48
FBN 222	0.46
FBN 223	0.5
FBN 224	0.33
FBN 225	0.42
FBN 226	0.44
FBN 227	0.34
FBN 228	0.38
FBN 229	0.51
FBN 230	0.45
FBN 231	0.42
FBN 232	0.44
FBN 233	0.46
FBN 234	0.3
FBN 235	0.39
FBN 236	0.43
FBN 237	0.41
FBN 238	0.47
FBN 239	0.4
FBN 240	0.43
FBN 241	0.32
FBN 242	0.33
FBN 243	0.37
FBN 244	0.44
FBN 245	0.45
FBN 246	0.34
FBN 247	0.45
FBN 248	0.48
FBN 249	0.47
FBN 250	0.6
FBN 251	0.82
FBN 252	0.58
FBN 253	0.42
FBN 254	0.75
FBN 255	0.47
FBN 256	0.47
FBN 257	0.33
FBN 258	0.45
FBN 259	0.4
FBN 260	0.39
FBN 261	0.38
FBN 262	0.3
FBN 263	0.34
FBN 264	0.42

Table B-2 Data from the Externally Measured Gamma-spectrums on the 94 Drum Subsample

Drum	Net Weight					Counts/sec/kg					External dose
	(kg)	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	Total spectrum	(μSv/hr)
FBE085	304	0.3357	0.1359	0.0553	0.0570	0.0296	0.0416	0.0100	-0.0002	2.0992	1.39
FBE086	295	6.5900	2.8245	1.2124	1.0773	0.5447	0.7427	0.2205	-0.0103	48.2025	6.2
FBE087	255	0.2727	0.1156	0.0602	0.0442	0.0251	0.0330	0.0123	0.0037	1.7061	2.22
FBE089	296	6.8214	2.7685	1.2449	1.1172	0.5942	0.8200	0.2371	0.0263	47.9791	4.94
FBE090	269.5	0.2770	0.1081	0.0567	0.0383	0.0178	0.0190	0.0073	-0.0092	2.2930	2.06
FBE091	299	0.0687	0.0361	0.0212	0.0124	0.0062	0.0087	0.0041	-0.0014	0.4253	1.18
FBE092	250	8.9850	3.3952	1.5827	1.4773	0.8302	1.1341	0.3137	0.0397	58.6602	5.14
FBE093	274.5	0.3335	0.1444	0.0562	0.0507	0.0218	0.0291	0.0075	-0.0068	2.4687	2.3
FBE094	285	0.1033	0.0480	0.0314	0.0188	0.0119	0.0142	0.0064	0.0033	0.6134	1.61
FBE095	290	5.9062	2.3622	1.0374	0.9606	0.5096	0.7100	0.1955	0.0144	41.6129	6.25
FBE096	267.5	0.1050	0.0458	0.0338	0.0173	0.0104	0.0140	0.0071	0.0046	0.7365	1.27
FBE097	267.5	0.0593	0.0329	0.0101	0.0139	0.0065	0.0087	0.0008	-0.0030	0.1752	1.36
FBE098	246.5	14.7290	6.1592	2.9400	2.5892	1.4437	1.9564	0.5830	0.0751	142.0149	9.32
FBE099	271.5	-0.0309	-0.0028	-0.0024	0.0001	-0.0013	-0.0004	-0.0013	-0.0012	-0.5539	1.26
FBE100	308.5	0.1375	0.0575	0.0246	0.0271	0.0147	0.0188	0.0033	-0.0017	0.8676	0.86
FBE101	267	0.5066	0.2182	0.0789	0.0803	0.0363	0.0534	0.0127	-0.0044	3.5399	0.79
FBE102	254	0.3922	0.1696	0.0639	0.0600	0.0258	0.0340	0.0083	-0.0075	2.9474	0.95
FBE103	306	0.0641	0.0306	0.0154	0.0112	0.0048	0.0060	0.0014	-0.0064	0.4263	0.44
FBE104	281	0.5394	0.2126	0.0987	0.0818	0.0415	0.0591	0.0184	0.0035	4.1128	0.48
FBE105	269	0.4397	0.1880	0.0710	0.0723	0.0348	0.0496	0.0121	-0.0020	3.0889	0.75
FBK001	275	-0.0016	0.0094	0.0063	0.0030	0.0009	0.0022	0.0011	0.0002	-0.1943	0.48
FBK002	297	0.1083	0.1431	0.0287	0.0157	0.0064	0.0074	0.0027	-0.0091	0.9955	0.54
FBK003	214	3.5177	1.3386	0.6463	0.4845	0.2289	0.2349	0.0854	-0.0089	29.3976	4.32
FBK004	287.5	0.1509	0.0537	0.0280	0.0255	0.0148	0.0194	0.0052	0.0011	0.9810	0.43
FBK005	285.5	0.0454	0.0139	0.0078	0.0084	-0.0012	-0.0006	-0.0035	-0.0124	0.3747	3.78
FBK006	193.5	12.5294	2.2013	2.4464	2.2598	1.0106	1.4707	0.3555	0.0310	94.5154	9.11
FBK202	263.5	0.2167	0.0853	0.0399	0.0330	0.0155	0.0212	0.0062	-0.0019	1.8964	0.71
FBK203	299	0.1818	0.1855	0.0349	0.0367	0.0130	0.0191	0.0008	-0.0017	1.3371	2.18
FBK204	219.5	19.5560	7.9223	4.1969	3.3471	1.8357	2.3573	0.7670	0.1073	147.4691	13.5
FBM130	261	0.0331	0.0214	0.0225	0.0068	0.0066	0.0053	0.0051	0.0027	0.1750	0.61
FBM131	300	0.4283	0.1607	0.0846	0.0669	0.0363	0.0509	0.0160	0.0048	3.1952	2.11
FBM132	248.5	0.4292	0.1504	0.0820	0.0641	0.0356	0.0469	0.0145	0.0045	3.3720	0.8
FBM133	309.5	0.0653	0.0291	0.0251	0.0097	0.0068	0.0080	0.0052	0.0043	0.4747	0.83
FBM134	263	0.8012	0.3552	0.1390	0.1292	0.0653	0.0930	0.0288	0.0035	5.4584	2.26
FBM135	253	0.5279	0.1958	0.0937	0.0741	0.0321	0.0367	0.0105	-0.0097	4.8158	1.42
FBM136	282	0.0207	0.0171	0.0082	0.0067	0.0032	0.0041	0.0007	-0.0020	0.0004	0.93
FBM137	254.5	1.3528	0.5321	0.2440	0.1939	0.0932	0.1225	0.0396	-0.0005	11.1515	1.4
FBM138	282	0.7132	0.2418	0.1276	0.0942	0.0412	0.0343	0.0105	-0.0118	5.9961	1.84
FBM139	326.5	0.1680	0.0685	0.0337	0.0293	0.0139	0.0210	0.0056	0.0001	1.2189	0.85
FBM140	271	0.0112	0.0084	0.0078	0.0045	0.0030	0.0017	0.0003	-0.0037	0.2353	1.02
FBM141	325	0.1081	0.0289	0.0249	0.0136	0.0052	0.0046	0.0004	-0.0111	1.0957	0.64
FBM142	291.5	0.1572	0.0510	0.0307	0.0268	0.0152	0.0208	0.0041	0.0004	-0.1109	1.26
FBM143	286	0.1005	0.0436	0.0338	0.0165	0.0104	0.0114	0.0061	0.0011	0.8679	1.37
FBM144	291	0.0455	0.0204	0.0057	0.0086	0.0005	0.0018	-0.0022	-0.0099	0.3232	1.42
FBM145	294.5	2.2739	0.8325	0.4034	0.3511	0.1903	0.2657	0.0755	0.0143	17.1244	4.17
FBM146	218	20.6556	0.7113	0.3099	0.2875	0.1482	0.2098	0.0563	0.0029	13.4764	2.18
FBM147	273.5	0.4428	0.1787	0.0727	0.0636	0.0257	0.0278	0.0074	-0.0109	3.3955	2.69
FBM148	285.5	0.7058	0.2541	0.1182	0.1096	0.0597	0.0821	0.0209	0.0027	5.1583	1.8
FBM149	261	1.1862	0.4966	0.2172	0.1815	0.0915	0.1291	0.0414	0.0064	8.9712	5.47
FBM150	274.5	0.5525	0.2101	0.1013	0.0842	0.0465	0.0628	0.0197	0.0053	3.7926	3.04
FBM151	277.5	0.1123	0.0537	0.0187	0.0240	0.0121	0.0164	0.0023	-0.0029	0.6655	2.12
FBM152	199.5	6.0560	2.4119	1.0109	0.9636	0.5126	0.7202	0.1992	0.0231	38.8592	8.87
FBM153	266.5	5.3183	2.1670	0.9628	0.8556	0.4485	0.6282	0.1848	0.0282	36.3225	7.33
FBM154	285	0.1001	0.0446	0.0238	0.0184	0.0085	0.0138	0.0043	0.0006	0.6434	1.2
FBM155	239	4.7678	1.8942	0.8010	0.7544	0.3963	0.5587	0.1553	0.0214	31.4813	8.35
FBM156	280	15.6308	6.3569	3.3899	2.6951	1.5007	1.9534	0.6390	0.1024	113.2770	14.5
FBN079	246.5	16.5519	7.0019	3.6166	2.9304	1.6219	2.1283	0.6889	0.1033	116.7943	11.5
FBN080	245	2.9807	1.0731	0.5182	0.4725	0.2681	0.3629	0.1001	0.0186	20.2597	3.28
FBN081	214	22.5901	9.5360	4.9926	4.0412	2.2412	2.9028	0.9452	0.1287	162.2175	15.3
FBN082	236	2.8888	1.0731	0.4759	0.4680	0.2606	0.3596	0.0919	0.0101	18.3142	2.84
FBN083	277	0.6805	0.2566	0.1255	0.1053	0.0605	0.0827	0.0257	0.0091	4.4841	2.16
FBN084	281	19.1875	7.4670	4.6500	3.3086	1.8671	2.1218	0.7748	0.1123	149.6795	11.7
FBN085	243	5.2321	2.1306	1.0057	0.7739	0.3841	0.4153	0.1507	0.0014	38.1293	5.48
FBN086	285	0.8270	0.3675	0.1389	0.1304	0.0593	0.0816	0.0231	-0.0051	5.9511	2.51
FBN087	256	0.0586	-0.0610	0.0218	0.0111	0.0060	0.0073	0.0040	-0.0006	0.5320	2.3
FBN088	273.5	4.5794	1.8554	0.8577	0.7202	0.3730	0.5121	0.1579	0.0256	32.3068	3.64
FBN089	275.5	1.2870	0.5268	0.2341	0.1858	0.0891	0.1118	0.0379	-0.0036	10.0839	2.65
FBN090	277.5	0.0675	0.0301	0.0233	0.0106	0.0056	0.0076	0.0041	-0.0019	0.5939	3.13
FBN091	290	0.6558	0.2308	0.1295	0.0932	0.0432	0.0489	0.0161	-0.0074	8.6695	2.24
FBN092	217.5	0.4946	0.2132	0.0955	0.0759	0.0368	0.0473	0.0162	-0.0042	3.7945	2.41
FBN093	259.5	11.0850	4.6619	2.2674	1.7935	0.9312	1.0530	0.3684	0.0255	77.7938	11.4
FBN094	278	0.6482	0.2505	0.1182	0.0898	0.0420	0.0500	0.0174	-0.0064	5.5294	1.42

Table B-2 Data from the Externally Measured Gamma-spectrums on the 94 Drum Subsample

Drum	Net Weight				Counts/sec/kg						External dose
	(kg)	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	Total spectrum	(μSv/hr)
FBN095	192	0.6784	0.2506	0.1195	0.0962	0.0414	0.0426	0.0117	-0.0144	5.3903	1.64
FBN096	237.5	6.8918	2.8808	1.2303	1.0657	0.5291	0.7086	0.2186	0.0169	49.2143	7.95
FBN097	269	0.2034	0.0885	0.0374	0.0361	0.0166	0.0232	0.0044	-0.0037	1.6084	1.38
FBN098	268	0.1663	0.0781	0.0305	0.0321	0.0154	0.0211	0.0042	-0.0026	1.0659	1.02
FBN099	288	0.0916	0.0423	0.0157	0.0161	0.0042	0.0067	0.0004	-0.0087	0.7485	1.26
FBN100	246	0.2535	0.1029	0.0534	0.0409	0.0215	0.0282	0.0095	0.0010	1.9927	0.93
FBN101	275.5	0.1631	0.0748	0.0393	0.0260	0.0124	0.0154	0.0062	-0.0047	1.2391	0.75
FBN102	243	1.0987	0.4592	0.2035	0.1650	0.0781	0.1036	0.0344	-0.0011	8.9822	1.47
FBN103	281.5	0.0577	0.0330	0.0109	0.0133	0.0046	0.0073	0.0002	-0.0053	0.3227	1.09
FBN104	323	0.2518	0.1003	0.0460	0.0374	0.0154	0.0197	0.0051	-0.0065	2.2361	0.73
FBN105	282	0.2529	0.1083	0.0429	0.0397	0.0163	0.0195	0.0044	-0.0082	1.9313	1.14
FBN106	306.5	0.0634	0.0273	0.0187	0.0103	0.0043	0.0052	0.0020	-0.0074	0.5187	1.02
FBN107	303	0.3958	0.1559	0.0759	0.0581	0.0272	0.0347	0.0116	-0.0042	1.4383	1.83
FBN108	273	0.4242	0.1695	0.0765	0.0607	0.0274	0.0324	0.0106	-0.0080	3.1700	1.77
FBN110	313.5	4.0660	1.5794	0.8042	0.6250	0.3318	0.4495	0.1499	0.0359	18.1735	6.95
FBN111	264.5	3.5737	1.4642	0.6349	0.5634	0.2820	0.3943	0.1159	0.0110	26.5573	3.36
FBN112	268.5	0.1666	0.0802	0.0307	0.0295	0.0118	0.0148	0.0027	-0.0080	1.2011	1.24
FBN113	293	3.1895	1.2772	0.6301	0.4794	0.2474	0.3343	0.1165	0.0284	24.1435	4.04
FBN114	248.5	3.1231	1.2886	0.5369	0.4770	0.2349	0.3328	0.0978	0.0100	22.1996	3.75
FBN115	327.5	0.1417	0.0636	0.0350	0.0223	0.0106	0.0133	0.0051	-0.0052	1.1261	0.85
FBN116	278.5	1.2180	0.4021	0.2026	0.1794	0.1015	0.1346	0.0355	0.0060	8.9946	0.92
FBN117	272.5	2.4302	0.8705	0.4715	0.3272	0.1618	0.1580	0.0619	-0.0063	20.2028	0.53

Table **B-3**

γ-spectrometry Results Obtained with the Gamma-x Detector

Sample	Radionuclide (Bq g^{-1})						
	^{234}Th	^{230}Th	^{214}Pb	^{214}Bi	^{210}Pb	^{228}Ac	^{208}Tl
FBM156	6.5 ± 0.8	25 ± 7	22.8 ± 0.2	22.6 ± 0.2	20.4 ± 0.7	2.1 ± 0.3	1.5 ± 0.2
FBM153	4.5 ± 0.4	11 ± 4	10.40 ± 0.08	10.24 ± 0.09	10.4 ± 0.4	1.3 ± 0.2	0.9 ± 0.1
FBN93	3.1 ± 0.2	12 ± 1	8.35 ± 0.04	8.09 ± 0.04	12.0 ± 0.5	0.63 ± 0.07	0.46 ± 0.05
FBM150	0.57 ± 0.03	1 ± 0.8	0.718 ± 0.006	0.697 ± 0.006	0.93 ± 0.03	0.099 ± 0.009	0.092 ± 0.005
FBK4	0.37 ± 0.04	0.5 ± 0.3	0.343 ± 0.007	0.330 ± 0.008	0.48 ± 0.03	0.027 ± 0.008	0.020 ± 0.004
FBE99	0.012 ± 0.005	0.03 ± 0.02	0.015 ± 0.001	0.015 ± 0.001	0.025 ± 0.003	0.005 ± 0.001	0.005 ± 0.001

Activity concentration and total activity estimations

The following estimations are based on the Hart report [Attachment 1]

On the basis of surface dose measurement on 2893 drums and analysis of 6 drums Hart *et al* estimated that the average activity concentration of the material is 12 Bq/g. No adjustment was made for background radiation [~0.3 μSv/h] so all derived data are overestimates.

The detailed analysis on the 6 drums also suggests that ^{238}U was preferentially removed from the original ore and that the total activity is attributed in the ratios 10:1 to uranium and thorium chains. Total activity of the U chain was then be attributed to ^{234}Th, ^{230}Th, ^{226}Ra and ^{210}Pb in the ratios 1:1:5.5:2.5; that of the thorium chain is based on the $^{228}Th/^{228}Ac = 113$.

These issues are set out in Hart *et al*. [Table 3 of Attachment 1].

Consequences of these assumptions are tabulated below.

	Uranium chain					Thorium chain			Totals
Nuclide	^{234}Th	^{230}Th	^{226}Ra	^{210}Pb		^{228}Ac	^{228}Th		
Mass fraction	0.09	0.09	0.50	0.23		0.02	0.02		1.00
Activity Concentration Bq/g	1.08	1.08	6.00	2.76		0.24	0.84		1.20
Schedule 2 activity concentration "limit"	10^3	10^0	10^1	10^1		10^1	10^0		
[b]Total activity/10^9 Bq [A]	2.89	2.89	16.00	7.38		0.64	2.25		32.05
Schedule 2 activity value [B]	10^5	10^4	10^4	10^4		10^6	10^4		
A/B Bq	2.89×10^4	2.89×10^5	1.60×10^6	7.38×10^5		0.64×10^3	2.25×10^5		2.62×10^6

a) The *total* ***activity*** of material in the store is based on $275x9726x10^3$ grams of the waste [9726 drums weighing 275 kg].