


Also enclosed are copies of pages from the published Livermore report, UCL-52853, Part 4. There is a discrepancy between this and the preliminary draft, the Pu value of 4 pCi/gram for Arbar did not appear in the published report.

With best regards,


W.J. Bair, Ph.D.
Manager
Life Sciences Center

WJB:taz

REPOSITORY P.N.N.L.
COLLECTION Marshall Islands
BOX No. 5689
FOLDER T4 Marshall Islands

DOCUMENT DOES NOT CONTAIN ECI

Reviewed by P. Schullis Date 5/1/97

COLOR CODING USED ON MAPS

The color coding used on the maps in "The Meaning of Radiation for Those Atolls in the Northern Part of the Marshall Islands that Were Surveyed in 1978" was based on the concentration of radionuclides (mainly Cs and Sr) in the top 5 cm of soil. These values were taken from a preliminary draft of the report by Dr. Bill Robison, Lawrence Livermore National Laboratory. The following are the soil values and the color codes for Rongelap. The color code used was:

	(pCi/g dry wt)	
	<u>Cs + Sr</u>	<u>Pu + Am</u>
4 (darkest intensity color)	> 100	> 50
3	20-100	15-50
2	2-20	1-15
1 (lightest intensity color)	< 1	< 1

The values for Rongelap follow:

	<u>Cs</u>	<u>Sr</u>	<u>Cs + Sr</u>	<u>Code</u>	<u>Pu</u>	<u>Am</u>	<u>Pu + Am</u>	<u>Code</u>
Boruk	36	17	53	3	7.2	2.6	9.8	2
Namen	40	46	86	3	14	6.7	20.7	3
Eneaetok	7	9.5	16.5	2	2	.71	2.71	2
Lomwilal	36	95	131	4	19	5	24	3
Ekoj	170	46	216	4	14.91	6.5	21.41	3
Rongelap	15	6.9	21.9	3	3.2	1	4.2	2
Mellu	71	45	116	4	14	5.8	19.8	3
Arbar	12	-	12	2	4	3.8	7.8	2
Naen	95	150	245	4	29	13	42	3

Table B-1. Average ^{137}Cs soil concentrations from the Northern Marshall Islands survey.

Atoll and island	Number of samples	^{137}Cs (pCi/g dry weight of soil)				
		0 to 5 cm	0 to 10 cm	0 to 15 cm	0 to 25 cm	0 to 40 cm
Likiep (L) ^a						
Agony (45) ^b	3	1	0.79	0.6	0.39	0.26
Kapenor (55)	6	0.65	0.43	0.32	0.21	0.15
Jeltonet (13)	3	0.34	0.24	0.18	0.12	0.088
Likiep (37)	12	0.65	0.45	0.35	0.24	0.17
Rikuraru (2)	12	1	0.68	0.5	0.34	0.24
Etoile (47)	4	0.43	0.39	0.33	0.26	0.19
Mejit (R)						
Mejit (1)	8	0.56	0.41	0.33	0.22	0.15
Ailuk (A)						
Enijabro (2)	4	0.64	0.46	0.37	0.25	0.18
Enejelar (4)	5	0.98	0.76	0.57	0.38	0.26
Bigen (7)	4	0.48	0.33	0.26	0.17	0.11
Agulue (53)	7	0.63	0.44	0.34	0.22	0.15
Aliet (20)	4	1.3	0.97	0.75	0.48	0.31
Ailuk (51)	13	0.6	0.44	0.35	0.25	0.18
Bererjao (33)	4	0.7	0.78	0.32	0.21	0.14
Kapen (1)	4	0.7	0.45	0.32	0.21	0.14
Utirik (I)						
Aon (8)	10	2.6	1.9	1.5	0.99	0.65
Pigowak (3)	8	4.4	3.3	2.7	1.8	1.1
Utirik (6)	28	2.4	1.8	1.4	0.96	0.66
Wotho (M)						
Medyeron (1)	8	1.4	0.86	0.62	0.4	0.29
Wotho (4)	15	0.37	0.29	0.25	0.17	0.12
Kabben (17)	6	0.16	0.16	0.14	0.11	0.079
Ujelang (J)						
Ennimenetto (23)	5	0.44	0.44	0.43	0.39	0.42
Burle (20)	3	0.8	0.67	0.51	0.37	0.30
Eimnlapp (22)	4	0.9	0.73	0.58	0.42	0.29

Eniwetak (11)	11	6.5	5.2	4.2	3	2.2
Bigonattam (5)	2	8.6	6.6	5.1	3.4	2.2
Jedibberdib (1)	1	7	6.9	5.6	3.9	2.5
Latoback (2)	4	16	13	9.8	6.4	4.3
Bock (12)	2	1.8	2.1	2.2	1.9	1.3
Rongerik (6)	7	33	23	17	11	7.2
Bikar (D)						
Jaboerukku (1)	4	0.35	0.22	0.19	0.16	0.11
Arumenii (2)	1	0.23	0.23	0.17	<0.10	<0.083
Bikar (4)	2	0.43	0.44	0.43	0.44	0.33

Table B-1. (Continued)

0 to 40 cm	Atoll and island	Number of samples	¹³⁷ Cs (pCi/g dry weight of soil)					
			0 to 5 cm	0 to 10 cm	0 to 15 cm	0 to 25 cm	0 to 40 cm	
	Jemo (S)							
0.14	Jemo (1)	3	0.33	0.31	<0.27	<0.18	<0.11	
0.084	Ailinginae (C)							
0.069	Ucchuwanen (15)	2	11	7	5.4	3.6	2.6	
0.2	Knox (10)	3	17	12	9	5.8	3.8	
	Mogiri (24)	6	6.1	5.4	4.4	3.2	2.3	
0.39	Sifo (27)	6	1.4	1.4	1.2	0.82	0.56	
<0.10	Ribinouri (19)	4	5.4	4.3	3.8	2.6	1.8	
	Enibuk (17)	9	4.4	3.5	2.9	2.2	1.7	
7.3	Manchinikson (25)	3	6.1	7.7	7	5.3	3.5	
11	Kuobuen (18)	3	6	4.5	3.9	2.7	1.8	
4.3	Majokoryaan (8)	2	3.4	2	1.7	1.3	0.94	

a Code letter for atoll.
b Code number for island.

22
30
5
24
5
29

2.2
2.2
2.5
4.3
1.3
7.2

0.11
<0.083
0.33

Objekt 197

Ennimenetto (23)	5	0.24	0.28	--	--	--
Burle (20)	3	0.2	0.2	--	--	--
Eimnlapp (22)	4	0.44	0.37	--	--	--

Table B-2. (Continued)

0 to 40 cm	Atoll and island	Number of samples	⁹⁰ Sr (pCi/g dry weight of soil)				
			0 to 5 cm	0 to 10 cm	0 to 15 cm	0 to 25 cm	0 to 40 cm
	Ujelang (J) (continued)						
0.14	Kalo (25)	5	0.12	0.13	0.14	0.12	0.096
0.085	Daisu (17)	6	0.12	--	--	--	--
--	Pokon (5)	3	0.12	--	--	--	--
0.11	Ujelang (18)	23	0.2	0.19	0.16	0.14	0.11
--	Taka (H)						
0.11	Taka (4)	8	1.19	1.0	0.85	0.58	0.43
	Eluk (5)	1	0.21	0.74	--	--	--
0.18	Rongelap (F)						
	Borukka (49)	3	17	14	12	--	--
--	Kabelle (13)	5	46	32	29	24	17
--	Eniaetok (33)	6	9.5	11	10	8.2	8.3
--	Lomuila (7)	4	95	81	66	49	35
0.13	Yugui (5)	1	46	38	30	20	14
0.20	Rongelap (42)	20	6.9	7.3	7.1	6.1	4.6
0.18	Mellu (23)	4	45	39	36	27	21
0.15	Arbar (43)	--	--	--	--	--	--
--	Naen (1)	7	150	134	110	77	53
	Rongerik (G)						
--	Eniwetak (11)	8	5.8	6.5	5.2	3.8	--
--	Bigonattam (5)	--	--	--	--	--	--
0.59	Jedibberdib (1)	--	--	--	--	--	--
	Latoback (2)	--	--	--	--	--	--
0.35	Bock (12)	1	4.6	4.3	4.7	4.2	3.3
0.057	Rongerik (6)	2	30	20	17	12	8.5
0.06	Bikar (D)						
	Jaboerukku (1)	4	6.8	5.3	--	--	--
--	Arumenii (2)	1	2.2	3.1	--	--	--
--	Bikar (4)	2	0.87	0.84	--	--	--
--							

-
- a Code letter for atoll.
 - b Code number for island.

Table B-3. Average $^{239+240}\text{Pu}$ soil concentrations from the Northern Marshall Islands survey.

Atoll and island	Number of samples	$^{239+240}\text{Pu}$ (pCi/g dry weight of soil)				
		0 to 5 cm	0 to 10 cm	0 to 15 cm	0 to 25 cm	0 to 40 cm
Likiep (L)						
Agony (45)	3	0.041	0.036	0.029	0.019	0.012
Kapenor (55)	--	--	--	--	--	--
Jeltonet (13)	--	--	--	--	--	--
Likiep (37)	5	0.054	0.043	0.033	0.022	0.014
Rikuraru (2)	--	--	--	--	--	--
Etoile (47)	3	0.034	0.034	0.029	0.022	0.015
Mejit (R)						
Mejit (1)	8	0.059	0.043	0.035	0.025	0.017
Ailuk (A)						
Enijabro (2)	1	--	--	--	--	--
Enejelar (4)	5	--	--	--	--	--
Bigen (7)	3	--	--	--	--	--
Agulue (53)	7	0.069	0.048	0.036	0.023	0.014
Aliet (20)	1	0.17	0.11	0.074	0.045	0.029
Ailuk (51)	13	0.098	0.081	0.059	0.038	0.024
Bererjao (33)	4	0.12	0.095	0.067	0.041	0.027
Kapen (1)	--	--	--	--	--	--
Utirik (I)						
Aon (8)	--	--	--	--	--	--
Pigowak (3)	--	--	--	--	--	--
Utirik (6)	16	0.51	0.39	0.3	0.18	0.12
Wotho (M)						
Medyeron (1)	8	0.072	0.049	0.035	0.023	0.015
Wotho (4)	9	0.031	0.022	0.016	0.010	0.0066
Kabben (17)	5	0.011	0.011	0.010	0.0073	0.0050
Ujelang (J)						
Ennimenetto (23)	--	--	--	--	--	--
Burle (20)	--	--	--	--	--	--
Eimnlapp (22)	--	--	--	--	--	--

Table B-3. (Continued)

Atoll and island	Number of samples	$^{239+240}\text{Pu}$ (pCi/g dry weight of soil)				
		0 to 5 cm	0 to 10 cm	0 to 15 cm	0 to 25 cm	0 to 40 cm
Ujelang (J) (continued)						
Kalo (25)	5	0.032	0.029	0.035	0.027	0.019
Daisu (17)	--	--	--	--	--	--
Pokon (5)	--	--	--	--	--	--
Ujelang (18)	14	0.04	0.033	0.028	0.019	0.013
Taka (H)						
Taka (4)	8	0.12	0.078	0.067	0.044	0.029
Eluk (5)	1	0.098	0.074	--	--	--
Rongelap (F)						
Borukka (49) <i>Boruka</i>	3	7.2	4.0	2.8	--	--
Kabelle (13) <i>Kabelle</i>	5	14	8.6	6.95	5.31	3.59
Eniaetok (33)	6	2	2.6	2.6	2.3	1.4
Lomuila (7)	4	19	16	13	8.6	5.5
Yugui (5) <i>Yugui</i>	1	15	8.6	5.9	3.7	2.3
Rongelap (42)	18	3.2	2.6	2.1	1.4	0.89
Mellu (23)	4	14	9.9	7.0	4.4	3.5
Arbar (43)	43	--	--	--	--	--
Naen (1)	7	29	25	20	13	8.4
Rongerik (G)						
Eniwetak (11)	8	2.5	1.9	1.4	0.87	--
Bigonattam (5)	--	--	--	--	--	--
Jedibberdib (1)	--	--	--	--	--	--
Latoback (2)	--	--	--	--	--	--
Bock (12)	1	0.49	0.54	0.66	0.66	0.44
Rongerik (6)	2	2.3	1.4	1.2	0.8	0.51
Bikar (D)						
Jaboerukku (1)	4	5.1	3.1	--	--	--
Arumenii (2)	1	2.1	2.6	--	--	--
Bikar (4)	2	0.045	0.054	--	--	--

Table B-3. (Continued)

Atoll and island	Number of samples	$^{239+240}\text{Pu}$ (pCi/g dry weight of soil)				
		0 to 5 cm	0 to 10 cm	0 to 15 cm	0 to 25 cm	0 to 40 cm
Jemo (S)						
Jemo (1)	--	--	--	--	--	--
Ailinginae (C)						
Ucchuwanen (15)	2	4.5	2.5	--	--	--
Knox (10)	3	2.7	1.7	--	--	--
Mogiri (24)	6	0.98	0.75	0.55	0.35	0.23
Sifo (27)	6	0.39	0.36	--	--	--
Ribinouri (19)	4	0.79	0.66	0.82	0.54	0.35
Enibuk (23)	9	2.4	1.4	--	--	--
Manchinikson (25)	3	1.1	1.0	--	--	--
Kuobuen (18)	3	1.3	0.70	--	--	--
Majokoryaan (8)	2	3.7	2.0	--	--	--

^a Code letter for atoll.

^b Code number for island.

Table B-4. Average ^{241}Am soil concentrations from the Northern Marshall Islands survey.

Atoll and island	Number of samples	^{241}Am (pCi/g dry weight of soil)				
		0 to 5 cm	0 to 10 cm	0 to 15 cm	0 to 25 cm	0 to 40 cm
Likiep (L) ^a						
Agony (45) ^b	3	0.019	0.017	0.013	0.0088	0.0056
Kapenor (55)	1	0.017	0.012	0.0081	0.0052	0.0034
Jeltonet (13)	3	--	--	--	--	--
Likiep (37)	5	0.031	0.025	0.019	0.013	0.0084
Rikuraru (2)	3	<0.021	<0.037	<0.040	<0.037	<0.037
Etoile (47)	3	0.016	0.014	0.011	0.0075	0.0047
Mejit (R)						
Mejit (1)	6	0.036	0.026	0.021	0.014	0.0095
Ailuk (A)						
Enijabro (2)	1	<0.021	<0.019	0.010	0.0059	0.0023
Enejelar (4)	5	0.039	0.026	0.032	0.021	0.014
Bigen (7)	4	<0.023	<0.025	<0.020	<0.014	<0.014
Agulue (53)	7	0.033	0.024	0.018	0.012	0.0074
Aliet (20)	2	<0.014	0.014	0.012	0.0078	0.005
Ailuk (51)	12	0.060	0.036	0.028	0.018	0.012
Bererjao (33)	2	0.068	0.058	0.042	0.026	0.016
Kapen (1)	4	0.063	0.032	0.023	0.014	0.0090
Utirik (I)						
Aon (8)	1	0.25	0.17	<0.12	<0.17	<0.14
Pigowak (3)	1	0.12	0.17	0.086	0.06	--
Utirik (6)	26	0.24	0.18	0.13	0.083	0.059
Wotho (M)						
Medyeron (1)	4	0.061	0.038	0.039	0.034	0.022
Wotho (4)	10	0.037	0.023	0.034	0.044	0.042
Kabben (17)	5	0.0067	0.0080	0.007	0.0053	0.0036
Ujelang (J)						
Ennimenetto (23)	4	0.047	0.030	<0.04	<0.042	<0.036
Burle (20)	2	0.019	0.015	<0.033	<0.071	<0.058
Eimnlapp (22)	3	0.069	0.043	<0.048	<0.043	<0.043

Table B-4. (Continued)

0 to 40 cm	Atoll and island	Number of samples	²⁴¹ Am (pCi/g dry weight of soil)				
			0 to 5 cm	0 to 10 cm	0 to 15 cm	0 to 25 cm	0 to 40 cm
	Ujelang (J) (continued)						
0.0056	Kalo (25)	5	0.011	0.010	0.0091	0.0080	--
0.0034	Daisu (17)	6	0.031	0.0099	0.045	0.052	0.055
--	Pokon (5)	2	0.0087	0.039	<0.041	<0.053	<0.078
0.0084	Ujelang (18)	18	0.013	0.012	0.0095	0.028	0.018
<0.037	Taka (H)						
0.0047	Taka (4)	8	0.12	0.096	0.071	0.044	0.029
	Eluk (5)	1	0.15	0.09	--	--	--
0.0095	Rongelap (F)						
	Borukka (49)	3	2.6	1.5	1.1	--	--
0.0023	Kabelle (13)	2	6.7	5.7	2.5	1.7	1.2
0.014	Eniaetok (33)	5	0.71	1.2	1.1	0.74	0.47
<0.014	Lomuila (7)	2	5	7	6.6	4.8	3.1
0.0074	Yugui (5)	1	6.5	4.0	2.8	1.7	1.1
0.005	Rongelap (42)	17	1	0.89	0.73	0.51	0.35
0.012	Mellu (23)	2	5.8	4.2	3.1	2	1.4
0.016	Arbar (43)	1	3.8	--	--	--	--
0.0090	Naen (1)	6	13	11	8.7	5.6	3.7
	Rongerik (G)						
<0.14	Eniwetak (11)	4	1.2	1.3	--	--	--
--	Bigonattam (5)	--	--	--	--	--	--
0.059	Jedibberdib (1)	1	1.9	--	--	--	--
	Latoback (2)	2	1.5	1.1	0.74	0.48	--
0.022	Bock (12)	1	0.44	0.40	--	--	--
0.042	Rongerik (6)	2	4.9	2.8	2	1.2	0.77
0.0036	Bikar (D)						
	Jaboerukku (1)	4	0.78	0.47	0.32	--	--
<0.036	Arumenii (2)	1	0.34	0.44	<0.30	<0.19	<0.13
<0.058	Bikar (4)	2	0.094	0.067	0.069	0.082	<0.061
<0.043							

Table B-4. (Continued)

Atoll and island	Number of samples	^{241}Am (pCi/g dry weight of soil)				
		0 to 5 cm	0 to 10 cm	0 to 15 cm	0 to 25 cm	0 to 40 cm
Jemo (S)						
Jemo (1)	1	0.011	0.0093	<0.016	<0.016	<0.018
Ailinginae (C)						
Ucchuwanen (15)	--	--	--	--	--	--
Knox (10)	1	0.63	0.35	<0.25	<0.18	<0.13
Mogiri (24)	4	0.39	0.31	0.23	0.15	0.098
Sifo (27)	6	0.18	0.19	0.18	0.13	--
Ribinouri (19)	3	0.43	0.34	0.33	0.22	0.14
Enibuk (23)	4	2.1	1.1	<0.75	<0.46	<0.32
Manchinikson (25)	3	0.41	0.44	0.34	0.25	0.16
Kuobuen (18)	3	0.45	0.27	0.19	0.13	0.08
Majokoryaan (8)	2	0.94	0.54	0.48	0.50	0.34

^a Code letter for atoll.

^b Code number for atoll.