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June 8, 1954

104570

Gordon Dunning, Biophysics

BASIS FOR ESTIMATION OF WHOLE BODY GAMMA DOSE TO EXPOSED PERSON EL IN PACIFIC

As reported in a previous memorandum, the best estimates of gamma doses are as follows:

Rongelap natives	150 r
Ailinginae natives (Transient from Rongelap)	75 r
Utirik	15 r
Air Weather Personnel on Eniwatak Island of Rongerik Atoll	40 - 50 (except 3 Army personnel with 98 r)

All available data were used in arriving at these estimates. These data are reported in an annex to this memorandum. Not included in the above estimates are the contributions of soft gammas (below 70 kev) nor betas. These undoubtedly contributed biologically significant doses.

Although uncertainties in arriving at an estimate are probably well known, they will bear repeating here to indicate the difficulty of computing the whole body gamma dose.

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1. Decay exponents have been reported ranging from -0.9 to -1.5+. What is desired here is the decay exponent for the time from fallout to the time of evacuation. This is not known with certainty and therefore -1.2 has been assumed.

2. Np^{239} contamination. If a single dose rate reading is made at the peak of the relative Np^{239} activity and then an integration made according to -1.2, a serious miscalculation might be introduced. Likewise, ignoring the radiation dose from Np^{239} would not be desirable. The above whole body estimates are made taking the Np^{239} contamination into account, since the amount produced has been estimated for this device.

3. Location of personnel. Dose rate readings vary by almost a factor of two for different localities where the natives might have been. Where they were and how long they remained has not been determined with certainty. The dose rate reading in the sleeping barracks of the Air Weather personnel was only about 1/3 of that outside; the dose rate inside of the native huts was almost as high as outside. The natives slept on the ground or on mats that were almost as hot as outside the huts, and in this horizontal position energetic betas could have delivered

OFFICE	W3P a more effective body rep dose.
SURNAME	Dunning:vks <i>[Signature]</i>
DATE	6-8-54

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326 U.S. ATOMIC ENERGY
COMMISSION
Collection DCS McCraw
Box 1 Job 1320
Folder Rongelap, Utirik, Tok 1954
Follet Following BRAY

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4. Sky shine. The phenomena of sky shine with the passage of the cloud was documented at St. George, Utah in the spring of 1953. The gamma dose from the sky shine might have been appreciable when one considers the relatively heavy fallout. This factor is extremely difficult to assess.

5. Dose rate readings were made by different individuals, at different times, at different locations, and by different types of instruments some of which were calibrated and some were not.

6. The exact time of initial fallout is not known. An hour or even half-hour difference in estimating initial time of fallout will make a difference in estimating doses in the early times after detonation.

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- Orig. - Dr. Eigher
- Green, pink & yellow - B&M files
- 1 cc - Lt. Robt Sharpe, NRI, NMC, Bethesda, Md.
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DATE ▶	6-8-54				

~~██████████~~
ROSELAP

- A. Estimated time of fallout: 5-6 hours.
- B. Time of evacuation and number of evacuees: R / 51 (16 by air)
43 by ship)
- C. Radiation levels.
1. (Evacuation Team)

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Predecontamination Readings - 3 March 1954

Time(L/2)	Place	Geiger Muller Reading (UL50)rs
0855	Ent at landing	1.0 R
0900	Ent 100 yards from landing	1. R
0903	120 yards from landing	1.5 R
0904	Ent 50 yards over / 50 yds. from landing	1.2 R
0905	Ent 25 yds. over / 50 yds. from landing	1.2 R
0906	20 yds. in 50 yds. from landing	1.4 R
0907	At landing BEST COPY AVAILABLE	
0915	200 yards from beach on ground	1.3 R
"	" " " " 3' level	1.3 R
0917	250 yards from beach on ground	1.6 R
"	" " " " trees	1.3 R
0920	150 yards from beach on ground	1.9 R
"	" " " " 3' level	1.5 R
0922	100 yards in at school house	1.3 R
0925	50 yards from beach	1.5 R
1020	100 yards in from landing on ground	1.6 R
"	" " " " " 3' level	1.2 R
1023	300 yards in on ground	1.5 R
"	" " " " 3' level	1.2 R
1025	400 yards in on ground	1.8 R
"	" " " " 3' level	1.3 R
1030	450 yards in / 200 yds. over on ground	1.6 R
"	" " " " " 3' level	1.3 R
1035	200 yards in / 400 over on ground	2.1 R
"	" " " " " 3' level	1.5 R
1037	200 yards in / 500 over on ground	2.3 R
"	" " " " " 3' level	1.6 R
1045	" " " " 550 " on ground	1.8 R
"	" " " " " 3' level	1.4 R

2. 1.4 r/hr at R / 31
2. 7 r/hr at R / 55
(1700 aerial survey)

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3. 1.4 r/hr at R / 36 (Lt. Larson of Task Force)
- ~~██████████~~

4.

Typical Readings in Rongelap Village, 8 March

<u>Location</u>	<u>Dose Rate (mr/hr)</u>
Rongelap Island (average)	375
Center of village	280
Near central cistern	300
Near southern cistern	220
Near northern cistern	350

(Scoville using TIB)

5. 40 mr/hr at D / 25 (Schdavono using PER-39)

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ALLIANCE ATOLL (SIFO ISLAND)

- A. Estimated time of fallout: 5-6 hours.
- B. Time of evacuation: H + 54 hours.
- C. Number of evacuees: 18 natives.
- D. Radiation levels:
1. 400 mr/hr at H + 31
240 mr/hr at H + 75
(SIFO aerial survey)
 2. 445 mr/hr at H + 53
(Member of Task Force using TIB)
 3. 100 mr/hr at D + 9
(Scoville using TIB)

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ROMBERIK

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- A. Estimated time of fallout: 7.5 hours.
- B. Time of evacuation and number of evacuees: 8 air weather personnel at H / 23 hours; 20 air weather personnel at H / 34 hours.
- C. Radiation levels.

1. Film badge readings:

- 93 roentgens (representing 3 Army personnel at one end of island. Was hung about 4 feet high on the tent pole)
- 82 roentgens (Hung between and against one wall of metal barracks)
- 44 roentgens
- 40 roentgens BEST COPY AVAILABLE
- 40 roentgens (representing 8 people)
- 39.5 roentgens (in an icebox)
- 33 roentgens (" " ")
- 37.5 roentgens (" " ")

- 2. NYOO automatic recorder went off-scale (100 r/hr) at H / 7.3 hours.
- 3. 1.8 r/hr at H / 23 hours (evacuation team)
- 4. (Secovillo using TIB)

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TYPICAL READINGS IN CAMP ON ENIWETOK IS. - 10 MARCH

<u>Location</u>	<u>Outside Dose Rate (r/hr)</u>	<u>Inside Dose Rate (r/hr)</u>
Eniwetok Island (average)	230	--
Mess hall	220	110
Tent, edge of main camp	270	175
Latrins	250	160
Sleeping quarters	250	90
Dispensary	220	110
Radio Station	230	160
Weather Station (N end of island)	230	110
Proj. 6.6 Station (S end of ")	240	--

[REDACTED]

17 March, 1200 HIKH

Living Area Readings:

Ness hall interior	40 - 100	nr/hr
Hospital interior	50 - 75	nr/hr
Walk from hospital to mess	100 - 110	nr/hr
Store room (behind mess)	50 - 55	nr/hr
Exterior store room tent	100 - 150	nr/hr
General Area exterior	100 - 150	nr/hr

Weather Station Site Readings:

Exterior areas local	125 - 150 - 160	nr/hr
Interior all tents	50 - 75	nr/hr
Interior building	50 - 60	nr/hr

Army Site Readings:

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General area	140 - 190	nr/hr
Interior tents	70 - 80	nr/hr
Adjacent to trailer	160 - 180	nr/hr

19 March, 1100 - 1220 HIKH

Landing on beach	42	nr/hr
Living area	60	nr/hr
Inside mess hall	22	nr/hr
Inside dispensary	26	nr/hr
Inside barracks	23	nr/hr
SEB end of island (Rawinsende)	47	nr/hr
Along road to Rawinsende area 40-42	- 40	nr/hr
Inside weather building	23	nr/hr
Work area outside building	60	nr/hr
Army area (around trailer)	40	nr/hr
Inside foilage area	40	nr/hr
Inside tent	19	nr/hr

19 March, 1200 HIKH

Inside weather building	21	nr/hr
Living area Still	60	nr/hr
Inside barracks	23	nr/hr
Inside dispensary	25	nr/hr

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(JTF 7.1)

~~5. P. R. Schifano using RDE-99 recently calibrated)~~

6. 1.7 r/hr at H / 31 hrs.
1.0 r/hr at H / 80 hrs.
(5100 aerial survey)

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- A. Estimated time of fallout: 16-18 hours.
- B. Time of evacuation: H + 73 hours.
- C. Number of evacuees: 154 natives.
- D. Radiation levels.

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- 1. 160 mr/hr at H + 55 (survey team from Task Force using TIB)
- 2. 120 and 150 mr/hr at H + 77 (Goodwin)
- 3. 100 mr/hr at H + 77 (Evacuation team)
- 4. 40 mr/hr at D + 8 (Scoville using TIB)
- 5. 3.3 mr/hr at D + 54 (highest reading)
- 6. 2.0 mr/hr at D + 54 (lowest reading)
- 7. 1.0 - 1.2 mr/hr at D + 54 (on sleeping mats)
- 8. 240 mr/hr at H + 34
160 mr/hr at H + 80
(R100 aerial survey)

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Distribution:

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- 1 cc - Lt. Sharpe, NMRI, NRC, Bethesda, Md.
- 2 cc's - BMI files (attached to yellow and pink copies of memo fm. Dunning to Bugher dated June 8, 1954)
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