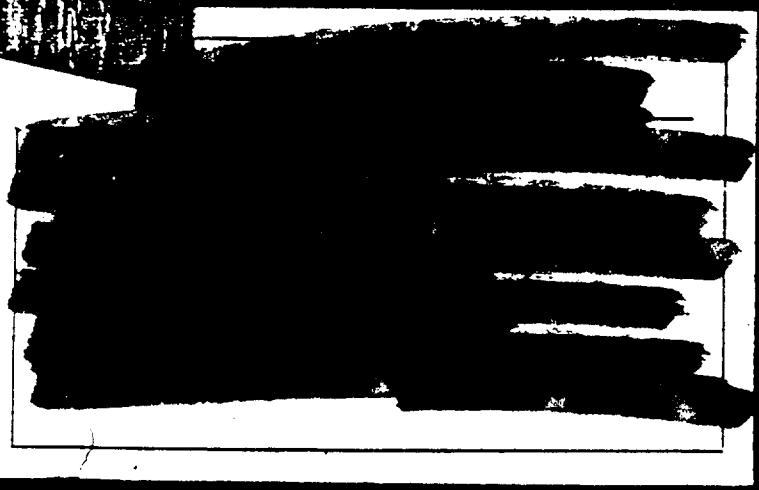
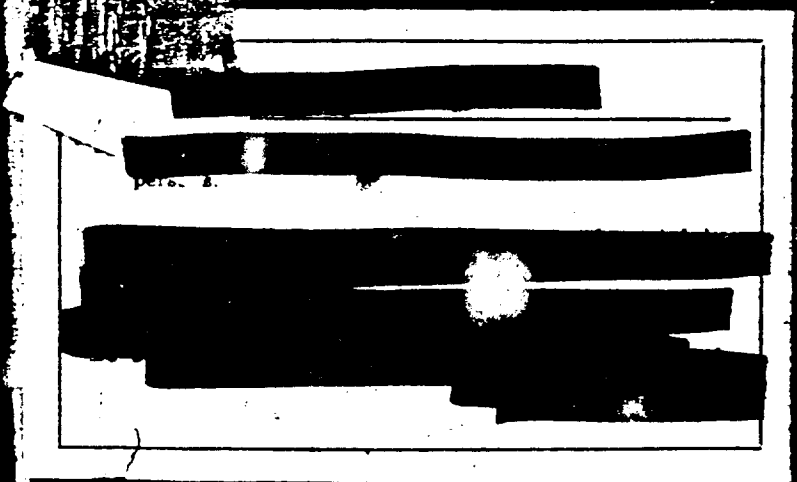
OPERATION CASTLE

PRELIMINARY REPORT



OPERATION BASTLE

A PRELIMINARY REPORT OF [redacted]



PROGRAM 2 - NUCLEAR RADIATION STUDIES

Program Director - LtCol E.A. Martell, USA

Project 2.1 - GAMMA RADIATION DOSIMETRY

Project Officer - Major R. Dempsey

The objective of this project was to measure gamma radiation exposure at various locations surrounding a nuclear detonation.

Gamma film and chemical dosimeters, placed in blast shields, were used to measure the gamma radiation at various land and water stations.

TABLE 2.1-1
RESULTS: LAND STATIONS

Station Number	Location	Dose Rate at Recovery Time (r/hr)	Total Dose (r)	Recovery Time (hrs)	Value X in $A = A_o t^{-x}$
23	Airukiiji	.6	180	82	.85
27	Airukiraru	.37	130	82	.92
30	Bigiren	.30	100	82	.90
4	Eniirikku	.14	56	100	.87
7	Chieerete	.12	50	100	.90
8	Arriikan	.10	50	100	.95
9	Ourukaen	.16	60	100	.85
10	Bokoaetokutoku	.20	70	100	.84
11	Bokororyuru	.20	70	100	.84
12	Yurochi	10.	6000	78	1.10
15	Uorikku	9.	6250	78	1.12
16	Aomoen	3.8	3000	78	1.15
18	Rozurikku	12.	6500	78	1.08
21	Aomoen	8.	5000	78	1.10

For all land stations, except those in the Yurochi-Aomoen Complex, the average decay law exponent is 0.88.

For the Yurochi-Aomoen Complex the average exponent was 1.1. The variation in the Yurochi-Aomoen exponent may be due to the fractionation of the contamination. The results of the water stations rule out the possibility of cloud or initial radiation contribution.

TABLE 2.1-2
RESULTS: WATER STATIONS

Station Number	Location	Dose Rate at Recovery Time (r/hr)	Total Dose (r)	Recovery Time (hrs)
25	Airukiraru	.028	30	82
29	Bigiren	.020	30	82
31	Reere-Bigiren	.020	37	82
32	Eniirikku	.040	17	100
13	Yurochi	10.	1300	78
14	Yurochi-Uorikku	5.	1400	78
17	Romurikku	6.	1500	78
19	Romurikku	6.	2400	78
20	Romurikku-Aomoen	2.	2400	78
8	Namu Reef	.10	515	78
9	Namu Reef	.10	412	78
10	Namu Reef	.10	420	78
11	Namu Reef	.10	562	78

The reef stations show that the initial gamma exposure was insignificant beyond 16,000 ft.

30-20
s. 221

OPERATION CASTLE

A PRELIMINARY REPORT OF [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

EST AVAILABLE COPY

[redacted]

TASK UNIT 7 - J. D. SERVIS, MAJ, USA

(J. D. Servis, Maj, USA)

RADIOLOGICAL SAFETY

A damage and radiation survey was conducted at H+4 hours on [redacted] day. This survey covered the islands of the atoll and was conclusive enough to limit reentry to Enyu and Airukiiji on the first day. This survey indicated that recontamination was extensive throughout the atoll and lagoon both to the east and west. No significant secondary fall-out was encountered at Bikini as a result of this detonation.

Lagoon water was heavily contaminated with radioactive sediment. Readings of 1 r/hr were obtained at 100 feet altitude in the vicinity of zero point on [redacted] +1 day. Floating objects revealed readings of 1 to 3 r/hr on shot day. Small boats and barges in Bikini - Enyu anchorage were contaminated to a moderate degree (1 - 6 r/hr). Lagoon flushing through the southwest passage materially increased radiation levels in Eniirikku - Bokororyuru areas. Results are shown in Table 7-1.

[redacted]

[redacted]

TABLE 7-1

[redacted] SUMMARY

Island	Extrapolated H+4 hrs	[redacted] + 1 day	[redacted] + 5 days**	Background
Enyu	18.	2.0	.44	.02
Bikini	225.	25.	2.0	.32
Aomoen	50.	6.	.80	1.0
Romurikku	65.	7.5	1.2	1.0
Uorikku	95.	12.	2.0	.25
Yurochi	95.	12.	4.0	1.0
Namu	10.	- -	1.0	.80
Bokobyaadaa	- -	- -	.95	3.0
Ourukaen	3.5(?)	.50*	.12*	.01
Arriikan	1.3	.60*	.10*	.08
Eniirikku	.18	.01	.01 - 1.0	.03
Airukiiji	.505	.01	.01	.01
Crater	- -	1.0***	- -	- -
Lagoon	- -	- -	80(West)	- -

* Radiation shine from water in southwest passage.

** Final aerial survey.

*** Reading at 100 feet.

[redacted]

OPERATION CASTLE

A PRELIMINARY REPORT OF

[redacted]

[redacted]

TABLE 2.1-1
GAMMA EXPOSURES - [redacted]

tion	Type	Location	Exposure (r)	Rate at Recovery (r/hr)	Recovery Time (hrs)	Act* Rate (r/hr)
	Land	Yurochi	215	.500	78	1.4
	Beach	Yurochi	16.9	.060	78	.120
	Beach	Yurochi-Uorikku	19	.075	78	.120
	Land	Uorikku	214	.600	78	1.40
	Bluff	Aomoen	83	.200	78	.500
	Beach	Romurikku	19.6	.100	78	.150
	Land	Romurikku	258	.600	78	2.10
	Beach	Romurikku	37.1	.120	78	.100
	Beach	Romurikku-Aomoen	37.1	.120	78	.200
	Land	Eniirikku	4.1	.032	100	.014
	Land	Chieerete	4.0	.040	100	.010
	Land	Arriikan	4.6	.035	100	.010
	Land	Ourukaen	5.4	.042	100	.014
	Land	Bokoaetoku	6.6	.041	100	.015
	Land	Bokororyuru	8.0	.050	100	.014

Act rate is the rate existing at the time the detectors were [redacted] in the field (minus 209 hours.) The residual radiation [redacted] as a result of the detonation of [redacted] at [redacted] minus [redacted] hours.

TABLE 2.1-2
GAMMA EXPOSURES - [redacted]

[redacted]	Total Exposure (r)	[redacted] Exposure (r)*	[redacted] Exposure (r)**
	4.1	2.8	1.3
	4.0	2.0	2.0
	4.6	2.0	2.6
	5.4	2.8	2.6
	6.6	3.0	3.6
	8.0	2.8	5.2

Calculated from [redacted] minus 209 hours to [redacted] plus 100 hours [redacted] $\Delta \cdot \Delta_0$ t-1.2.

Total exposure minus [redacted] exposure.

[redacted]

[redacted]

Project 2.2 - GAMMA DOSE VS TIME

Project Officer - P. Brown

(P. Brown)

Objective

To obtain gamma rates vs time for various distances [redacted] a nuclear detonation.

Instrumentation

Gamma exposure rates were obtained using scintillation [redacted]ectors set one foot above ground. The detector outputs were [redacted]orded as a function of time on continuous recorders.

Instrument stations on Bokobyaadaa and Namu had been [redacted]troyed by blast from [redacted] detonation, making it impossible [redacted] install instrumentation for close-in measurements.

Stations were installed on Airukiiji, Airukiraru and [redacted]ed Islands, Bikini Atoll, for the detonation of the [redacted] device.

Results

All stations operated, and showed negligible gamma [redacted]osure rates for the period of zero time to plus 36 hours.

[redacted]

Project 2.3 - NEUTRON FLUX MEASUREMENTS

Project Officer - T. D. Hanscome

Objectives

Participation in [redacted] was arranged on the basis of [redacted] participation without duplication of Project 14.1 work. [redacted] physical installation for [redacted] was planned and effected on [redacted] Islands west of Aomoen. When the shot location was changed, participation was reduced to the amount indicated. The project objective is to provide data on neutron fluxes from boosted or thermonuclear devices for comparison with neutron fluxes from previously tested devices. The project is also concerned with the introduction of plutonium and germanium as neutron detectors in order to test their usefulness.

Instrumentation

Detectors were installed on the 1403 line as shown in Table 2.3-1.

TABLE 2.3-1
DETECTOR INSTALLATIONS

[redacted]	Range (ft)	Detectors	Remarks
[redacted]	5100	Np, U, Pu, Ge	Recovered except Np
[redacted]	5400	Np, U, Pu, Ge	Station Destroyed
[redacted]	5700	U, Pu, Ge	Station Destroyed
[redacted]	6000	U, Pu, Ge	Complete Recovery
[redacted]	6300	Ge	Complete Recovery

[redacted]

[redacted]

UNIT 7 - J. D. Servis, Maj. USA

RADIOLOGICAL SAFETY

(J. D. Servis)

[redacted] Rad-Safe Survey Summary *

A partial Rad-Safe survey was conducted on [redacted] y with incomplete atoll results. Results of this initial rvey were conclusive enough to cancel all activities for +1. First complete survey was conducted on B+2 days. As result of wind conditions during B and B+1 day areas had come "spotty" in nature so the extrapolated values repre-nting the H+4 hour readings can only be considered ap-roximate. These extrapolated values are based on a $t^{-1.2}$ v whereas laboratory analyses indicate a $t^{-1.8}$ decay ng this period, thus indicating values in excess of se noted in Table TU-7-1.

Lagoon contamination, of consequence, was confined lagoon areas containing suspended sediment. For the first days this area was confined to the western quarter of the oon. This radioactive sediment washed over the western , out through the southwest passage or settled to the om of the lagoon in a period of three days.

No alpha activity was detected in swipes about the ng areas of the Task Group.

* Included here because of inadvertantly omitting it from [redacted] Report.

[redacted]

TABLE TU-7-1
[redacted] SUMMARY (r/hr)

sland	Extrap. H+4 hours	B+2 days	B+7 days
nyu	40 - 60	1 - 3	.38 - .40
ikini	70 - 125	6 - 9	.8 - 2.1
omoen	25 - 180	1.2 - 9	.75
omurikku	400.	20.	.90
nrochi	600.	30.	1.0
amu Sta. 1200)	125.	6.	.45 - .6
ater		.1	.02
okonejien	1500.	75.*	
obyaadaa	280.	15.	2.0
elta Sta. 1341)	65.	3.0	
okororyuru thru rukiiji	6 - 10	.1 - .22	.025 - .035
iroko 30 mi. SE of Enyu)	.25		

l readings with radiac instrument AN/PDR-39

AN/PDR-18

[redacted]

[redacted]

TK UNIT 7 - J. D. Servis, Maj. USA

RADIOLOGICAL SAFETY

(J. D. Servis)

[redacted] Rad-Safe Survey Summary

A partial Rad-Safe survey was conducted on [redacted] day with incomplete atoll results. Results of this survey (Table TU-7-2), indicated no extensive recontamination of the atoll except within the Bokobyaadaa - Namu chain. An unforeseen fallout of radioactive material less than 5 microns in size did occur on the night of R+1. This fallout covered the atoll and raised radiation levels by approximately 100 mr/hr. Because of the late period of fallout this radiation level would have corresponded to 3.5 r/hr fallout at H+2 hours. This fallout, because of small particle size, was much more difficult to decontaminate than the macroscopic particles of [redacted]

Secondary fall out levelled off between 0700-0800, R+2. Residual top-side levels on ships were: Ainsworth - [illegible] mr/hr, Estes - 12 mr/hr, and Bairoko - 30 mr/hr. Maximum levels were 20 mr/hr to 45 mr/hr.

Lagoon contamination covered the western quarter of the lagoon with levels comparable to that of [redacted] Lagoon flushing through the southwest passage materially increased background radiation levels in the vicinity of Ourukaen, Bokoaetokutoku, and Bokororyuru.

[redacted]

[redacted]

TABLE TU-7-2
[redacted] SUMMARY (r/hr)

Island	Extrap. H+4 hours	R+1 day	R+2 days	[redacted] background at [redacted]
Enyu	.03	.03	.06	.03
Bikini	.20	.12	.14	.12
Nomoen	.80	.80	.60	.22
Nomurikku	1.6	1.7	.75	1.1
Norikku	.8 - 1.4	1.4	.85	1.2
Furochi	.8 -1.0	1.3	1.0	1.3
Aamu	2000.		100.	.6
Bokobyaadaa	1000.	50.0#	55.	1.2
Erukaen	.04	.10 *	.16 *	.04
Yiikan	.02	.40 *	.32 *	.02
Miirikku	.005	.005	.05	.01
Erukiiji	.02	.01	.08	.01
Kinman	.012	.012	.06	
Water			.03	
Ships			.02 - .04	

Two hundred ft altitude.
* Radiation shine from water in southwest passage.

Underlined islands indicate islands contaminated by [redacted] shot.

[redacted]

[redacted]

[redacted]

[redacted]

THIS DOCUMENT CONSISTS OF 134 PAGES
NO. 22 OF 30 COPIES, SERIES A

OPERATION CASTLE

A VERY PRELIMINARY REPORT

ON THE

RESULTS OF THE [redacted]

Submitted by

Task Group 7.1

[redacted]

W. E. Ogle,
CTG 7.1

W. D. Gibbins for
A. J. Hudgins,
CTU-12

H. K. Gilbert,
CTU-13

[redacted]

JF-8305

27 April 1954
(Date)

[redacted]

[redacted]

TASK UNIT 7 - J. D. Servis, Maj, USA

RADIOLOGICAL SAFETY

(J. D. Servis)

A partial Rad-Safe survey was conducted on [redacted] day with incomplete atoll results. Results of this survey did indicate that Bokobyaadaa, Namu, Enirikku, Bikini, and the Yurochi - Aomoen chain were materially contaminated. Reentry and recovery were accomplished to a large degree on shot day. No secondary fall-out was detected as having resulted from this shot.

Lagoon contamination was restricted to a V shape pattern with apex at Eninman and tips covering the Bokobyaadaa - Aomoen area. A reading of 100 mr/hr was obtained over the Eninman anchorage at H+4 hours. Enyu anchorage was clear of contamination while Bikini anchorage showed traces of contamination at H+4 hours.

[redacted] crater was materially different from that of [redacted] in that radiation levels within crater were dependent on "shine" from the lip of crater, and surrounding "sand dunes."

[redacted]

[redacted]

TABLE TU-7-1

[redacted] SUMMARY (r/hr)

Island	H+4 hrs Extrapolated	D+1 day	D+7 days	Pre-shot Background
Enyu	.03	.03	.03	.03
Bikini	5.0	.67	.07	.10
Aomoen	20.0	2.5	1.6	.35
Romurikku	10.0	1.6	.80	.50
Borikku	5.0	1.0	.60	.47
Yurochi	5.2	1.0	.60	.45
Namu	250.	30.0	16.0	1.5
[illegible]yaadaa	600.		16.0	9.0
[illegible]ukaen	.60	.08	.02	.012
[illegible]rrikan	.50	.07	.01	.008
[illegible]lirikku	210.0	2.4 T	1.8	.008
[illegible]inman			.02	.010
[illegible]rukiiji	.02	.02	.02	.018
[illegible]ater	5000.	50.*	60.	

* Reading at 100 feet

* Reading at 200 feet

[illegible]erlined islands indicate islands contaminated by [redacted]

[redacted]

OPERATION CASTLE

A PRELIMINARY REPORT

[redacted]

THIS DOCUMENT CONSISTS OF 169 PAGES
NO. 22 OF 30 COPIES, SERIES a

OPERATION CASTLE

A VERY PRELIMINARY REPORT OF THE RESULTS OF [redacted]

Submitted by

Task Group 7.1

W. Ogle
W. E. Ogle,
CTG 7.1

R. L. Aamodt
R. L. Aamodt,
CTU-1

H. K. Gilbert
H. K. Gilbert,
CTU-13

[redacted]

JO-8

15 May 1954
(Date)

[redacted]

Program 2 - NUCLEAR EFFECTS

Program Director - E. A. Martell, LtCol, USA

Project 2.1 - GAMMA RADIATION DOSIMETRY

Project Officer - R. H. Dempsey

Objective

To measure the gamma radiation exposure at various locations following a nuclear detonation.

Instrumentation

Film and chemical dosimeters were placed in ¼-inch wall aluminum cannisters mounted on 2-inch aluminum stakes. The detectors were placed at a height of 3 feet above ground for the land stations. The beach stations were set so that the detectors 1 foot above maximum high tide level. Both detecting systems were calibrated against an 11-Mev betatron.

Results

Results are as shown in Table 2.1-1.

Discussion

The results for stations 37, 38, and 39 give a meaningful decay expression exponent. The residual from the previous detonation is a large portion of the total exposure, with the variations in this residual due to slight assumed variations in the [redacted] decay exponent being a significant part of the [redacted] exposures.

Land stations 72, 73, and 41 give an average decay exponent of .94. Station 18 had a decay exponent of .85. This is to be expected when it is noted that station 18 broke and fell

ol , ground during passage of the shock wave. This resulted in a smaller contribution from the previous residual than that calculated using a straight $A_0T^{-1.3}$ expression. Decreasing the [redacted] contribution would increase the X value at this station.

The beach stations, 19 and 20, had a higher decay exponent, averaging 1.23. This is natural since tidal washing removal of contamination is added to the normal decay in the decay factor obtained.

Station 16 is a bluff station which sees the beach on one side. Thus, it lies somewhat between the land and beach stations in decay exponent. Attention is called to the report [redacted] in which station 16 was analyzed with the land stations and produced the highest decay exponents of any of the stations.

Station	Type	Location	Total Exp (r)	Rec* rate (r/hr)	Act** rate (r/hr)	[redacted] exp (r)	[redacted]** exp (r)	X*****
210.72	Land	Bikini	405	.800	.120	19	386	.91
210.73	Land	Rochikarai	60	.100	.080	12	48	.97
210.15	Land	Uorikiu	Chem	2.600	.600	93		
210.16	Bluff	Aomoen	1300	1.400	.440	68	1232	1.12
210.18	Land	Romurikku	1300	3.000	1.00	150	1150	.85
210.19	Beach	Romurikku	1000	.600	.160	25	975	1.29
210.20	Beach	Aomoen	730	.700	.220	33	697	1.16
210.21	Land	Aomoen	Chem	2.700	.900	140		
210.37	Land	Chieerete	3.8	.004	.022	3.3	.50	
210.38	Land	Arriikan	3.3	.018	.010	1.5	1.8	
210.39	Land	Ourukaen	4.8	.016	.016	2.5	2.3	
210.41	Land	Bokororyuru	11	.020	.010	1.5	9.5	.93

* Rate at recovery time, [redacted] plus 10^4 hours

** Rate at activation time, [redacted] minus 328 hours [redacted] plus 128 hours)

*** Total exposure calculated to be due to [redacted] contamination assuming a [redacted] decay expression of $A = A_0 T^{-1.3}$.

**** Total exposure minus [redacted] exposure equals [redacted] exposure.

***** Decay exponent for portion of contamination attributed to [redacted]

NOTE: Stations 15 and 21 had all film destroyed. Total exposures will be determined from final analysis of chemical detectors.

Station 18 recovered but lying on ground.

[redacted]

ASK UNIT 7 - J. D. Servis, Maj, USA

RADIOLOGICAL SAFETY

(J. D. Servis)

A damage and radiation survey was conducted on [redacted] day. This survey covered the eastern and northern islands of the atoll and was conclusive enough to limit reentry to Enyu, Bikini and Airukiiji on the first day. The survey on D+1 day indicated that recontamination was limited to the Yurochi - Aomoen chain and the Bikini - Enyu sequence of islands. No material secondary fall-out was encountered at Bikini Atoll as a result of this detonation.

Lagoon water was materially contaminated with radioactive sediment. Readings of 4.2 r/hr were obtained at an altitude of 50 feet over zero point. This contamination moved to the west and southwest so that small boat operations could be conducted in the area. Lagoon flushing through the southwest passage materially increased radiation levels in the vicinity of Ourukaen, Bokoaetokutoku and Bokororyuru.

[redacted]

TABLE TU-7-1

[redacted] SUMMARY (r/hr)

Island	H+4 hrs Extrapolated	D+1 day	D+4 days	Pre-shot Background
Envu	.75	.10	.03	.01
Bikini	70.	8.5	.80	.03
Komoen	140.	15.0	2.0	.40
Romurikku	140.	15.0	2.4	.40
Lorikku	85.	10.0	1.0	.36
Namu			1.0	2.5
Yurochi	85.	10.0	1.0	.40
Bokobyaadaa		1.2	2.2	4.0
Aurukaen		.01	.50 T	.01
Ikan		.01	.60 T	.01
Eniirikku		.06	.10 T	.90
Shinman Crater		6.5	4.0	100.
Mirukiiji		.01	.01	.01
Crater	42.0*			

*Reading at 500 feet

T: Shine from contaminated water.

Underlined islands indicate islands contaminated by [redacted] shot.

[redacted]

OPERATION CASTLE

PRELIMINARY REPORT

[redacted]

Program 2 - NUCLEAR EFFECTS

Program Director - E. A. Martell, LtCol, USA

Project 2.1 - GAMMA RADIATION DOSIMETRY

Project Officer - R. H. Dempsey

Objective

To measure the gamma radiation exposure at various locations following a nuclear detonation.

Instrumentation

Film and chemical dosimeters were placed in ¼" aluminum cannisters mounted on 2" aluminum stakes. The detectors were placed at a height of 3 feet above ground. Both detecting systems were calibrated against an 11 Mev betatron.

Results

Shown in Table 2.1-1.

Discussion

Analysis of the data was made assuming a fall-out time of ½ hr. Stations 76, 77, 78, and 79, show evidence of having been exposed to considerable initial radiation in addition to the residual radiation which must have been present. Unfortunately, the films from stations 76, 77, and 78 were partially destroyed, the data from 78 being based on the single piece of film found. It is hoped to be able to plot an RD^2 vs D curve for the initial radiation when the chemical detectors are analyzed.

The decay exponent was calculated for the remaining stations and gave an average value of 1.13.

TABLE 2.1-1
RESULTS - GAMMA EXPOSURES

Station	Type	Location	Total Exp. (r)	Rec. Rate* (r/hr)	X**
210.74	land	Bogallua	126	0.210	1.07
210.75	land	Bogombogo	123	0.150	1.18
210.76[1]	land	Ruchi	chem.	0.210	
210.77[1]	land	Cochiti	chem.	0.250	
210.78[2]	land	Sanildefonso	1450	4.20	
210.79	land	Bogon	640	0.055	
210.80	land	Engebi	20.5	0.030	1.12
210.81	land	Engebi	20.5	0.030	1.12
210.82	land	Engebi	19.5	0.022	1.20
210.83	land	Muzin	15	0.021	1.14
210.84	land	Kirinian	13	0.015	1.19
210.85	land	Yeiri	5.9	0.008	1.15
210.86	land	Yeiri	6.0	0.012	1.00

* Rate at recovery time, [redacted] plus 80 hours.

** Decay exponent in the expression $A = A_0 T^{-x}$

[1] Stations 76 and 77 had film destroyed. Total exposures will be determined from final analysis of chemical detectors.

[2] Station 78 film recovered lying on ground.

[redacted]

TASK UNIT 7 - J. D. Servis, Maj, USA

RADIOLOGICAL SAFETY

(J. D. Servis)

A damage and radiation survey was conducted at approximately H+4 hours [redacted] This survey covered the islands of the atoll and was conclusive enough to limit reentry to the southern and eastern islands of the atoll. This survey indicated that radioactive contamination extended north of a line from Bogallua to Pirasi. Secondary fall-out amounting to 2 mr/hr was experienced at Parry on the evening of [redacted]

Lagoon water was moderately contaminated in the vicinity of the chain Bogallua - Teiteiripucchi and cleared within two days.

[redacted] TABLE TU-7-1
SUMMARY (r/hr)

Island	Extrapolated H+4 hrs	D + 1 day*	D + 2 days
Eniwetok	0	0	0
Parry	0	0	0
Japtan	0	0	0
Chinimi	0	0	0
Aniyaanii	0	0	0
Chiniaero	0	0	0
Bmit	0	0	0
Pirasi	0.05	0.006	0.006
Aruanbiru	0.08	0.01	0.01
Lojoa	0.10	0.01	0.01
Mijiri	0.12	0.014	0.01

[redacted]

TABLE TU-7-1 (Continued)
[redacted]OMMARY (r/hr)

Island	Extrapolated H+4 hrs	D + 1 day*	D + 2 days
Aomon	0.17	0.02	0.02
Eberiru	0.17	0.02	0.02
Rujoru	0.10	0.012	0.02
Aitsu	0.14	0.016	0.02
Yairi	0.17	0.02	0.02
Bokonaarappu	0.17	0.02	0.02
Kirinian	0.35	0.04	0.04
Musin	0.42	0.05	0.06
Engebi	0.70	0.08	0.08
Bogon	0.98	0.12	0.14
Bogairikk	?	0.22	0.60
Teiteiripucchi	60.0	6.8	7.0
Cochiti	70.0	8.0	12.
San Ildefonso	75.0	8.4	1.0
Ruchi	8.0	0.80	0.36
Bogombogo	3.9	0.44	0.36
Bogallua	2.2	0.26	0.28
Rigili	0	0	- -
Ciriinien	0	0	- -
Ribaioni	0	0	- -
Pokon	0	0	- -
Mni	0	0	---
Igurin	0	0	- -

* Period preceded by heavy rainfall.