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HEADQUARTERS TASK UNIT 1
Task Group 7.1
APO 187 (HOW) P.O. Box 8
c/o Postmaster
San Francisco, California

TU-13-54-375

12 March 1954

SUBJECT: Radiological Survey of Downwind Atolls Contaminated by BRAVO

1. Acknowledgement

The members of the survey team wish to express their appreciation to the Captain, officers and members of the crew of the USS NICHOLAS (DDE 449) for their assistance and cooperation in conducting the survey herein reported. Captain Elliot turned over all possible facilities of his ship in order to assist in the survey. LT Frink, the Executive Officer, organized all the operations of the boat parties, and it was only through his personal direction and participation that it was possible to carry out the small boat surveys under extremely difficult conditions. Since most of the lagoon waters were not navigable by a DDE, it was necessary to make long boat trips in high seas and land on tricky coral reefs. That it was possible to make, without mishap, a detailed survey of five widely separated atolls in the course of three days with only two boats was largely due to his efforts.

2. Introduction

The BRAVO Shot contaminated a number of atolls in generally eastward direction from Bikini to such an extent that it became necessary to evacuate the native populations from Rongelap, Ailinginae and Utirik Atolls and the military personnel on Rongerik Atoll. Following this evacuation CJTF SEVEN organized the subject detailed radiological survey of the atolls to the eastward of Bikini (Ref. CJTF SEVEN Eniwetok 060400Z). The data from this survey were required for the following purposes:

- a. The evaluation of the radiation effects on evacuees.
- b. The estimation of the elapsed time before reoccupancy.
- c. The estimation of the residual radiation effects of large yields surface detonations.

In connection with this survey, teams from various Task Groups and Mr. Wilds, Trust Territory Representative, returned to the atolls to secure the evacuated habitations, service military equipment, and obtain documentary photography.

3. Operational Schedule

8 March - 0800

Survey team rendezvous aboard USS NICHOLAS (DDE 449) in Rongelap Lagoon.

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that one survey meter could not be properly zero adjusted. The four remaining AN/PDR-39, still operated efficiently and seemed to be in good working order.

One (1) each Bockman MX-5, and one (1) each AN/PDR-27A was brought along for any low intensity checks necessary. Two (2) each calibrated AN/PDR-TLB, were on hand to serve as spares in the event of operational failure with the AN/PDR-39. None of these instruments were required.

6. The average and maximum gamma dose rates measured on the various islands of each atoll are plotted in Figures 1 through 5. All measurements were made at waist height unless otherwise indicated. The maximum readings do not include measurements made with the instrument next to a contaminated surface.

Detailed surveys were made of all the inhabited localities. Typical readings are given in Tables 1 and 2 for the native village of Rongelap Island, and the TG 7.4 camp on Eniwetak Island. In general, the villages and the camps appeared to have slightly lower average dose rates than the remainder of the island. This can perhaps be ascribed to different geometry of the contamination and to slightly greater penetration into the loose gravel in the native villages. The dose rates inside the native huts appeared to be almost the same as the dose rate outside. The dose rate in the middle of the military barracks, tents, and shacks was 1/3 to 1/2 that outside. This reduction is probably largely a geometrical effect. The dose rate fell off rapidly on the beach below the high tide mark. There was no evidence of rain washing off the contaminated material. The foliage on the windward sides of the islands appeared to be slightly above average contamination.

TABLE 1

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

TABLE 2

TYPICAL READINGS IN CAMP ON ENIWETAK IS. - 10 MARCH

<u>Location</u>	<u>Outside Dose Rate (mr/hr)</u>	<u>Inside Dose Rate (mr/hr)</u>
Eniwetak Island (average)	280	--
Mess hall	220	110
Tent, edge of main camp	270	175
Latrine	260	160
Sleeping quarters	260	90
Dispensary	220	110

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Radio Station	290	160
Weather Station (N end of island)	280	110
Proj 6.6. Station (S end of island)	240	--

In order to estimate the rate of decay between 8 and 11 March, the following radiation measurements were taken on three days on Rongelap Island:

	<u>8 March</u>	<u>11 March</u>
Central living area (village)	280 mr/hr	170 mr/hr
Southern most cistern	220 mr/hr	145 mr/hr
Roof of cistern (Southern most)	240 mr/hr	140 mr/hr
Ground (contact) cistern area	220 mr/hr	110 mr/hr

An area was selected 30 yards inland from the Rongelap cemetery as a measuring point for future decay measurements. This area is outlined with 2X4s placed on pails. The waist height reading was 210 mr/hr at 1000 hours, 11 March 1954.

7. Sample collections

Water samples were collected from the water supplies of all inhabited areas. About two quarts of water were transferred to a polyethylene bottle at each site. These will be turned over to the New York Operations Office, AEC analysis.

Soil samples were collected at all inhabited areas and also at several uninhabited islands. In collecting the soil samples a one foot by one foot square was marked on the ground and soil to about one inch of depth was removed from the square and transferred to a cardboard container. The primary samples will be turned over to the New York Operation Office, AEC, for analysis, and some smaller samples will be analyzed by Program 2 of TU 13.

Listed in Table 3 are the samples taken with the dose rate measured at waist height at the location where they were taken.

TABLE 3 - SOIL

<u>Sample No.</u>	<u>Atoll</u>	<u>Island</u>	<u>Date</u>	<u>Mr/hr</u>
1*	Rongelap	Rongelap (North end)	8 Mar	440
2	Rongelap	Rongelap (Center of village)	8 Mar	280
3	Rongelap	Rongelap (1 mile north of village)	8 Mar	340
4	Rongelap	Rongelap (near South cistern of village)	8 Mar	220
5*	Rongelap	Eriirippu	8 Mar	2200
6*	Rongelap	Eniaetok	8 Mar	900
7*	Rongelap	Kabelle	8 Mar	2000
8*	Utirik	Utirik	9 Mar	40
9	Bikar	Bikar	9 Mar	160
10	Rongerik	Eniwetak	10 Mar	280
11*	Ailinginae	Sifo	10 Mar	100

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*Small additional sample taken for analysis by Program 2 of TU 13.

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TABLE 3 - WATER

<u>Sample No.</u>	<u>Atoll</u>	<u>Island</u>	<u>Date</u>	<u>Mr/Hr</u>
1	Rongelap	Rongelap (central cistern)	8 Mar	300
2	Rongelap	Rongelap (North part of village)	8 Mar	350
3	Rongelap	Rongelap (Northernmost cistern)	8 Mar	400
4	Rongelap	Rongelap (Southernmost cistern)	8 Mar	220
5	Utirik	Utirik (cistern near church)	9 Mar	40
6	Utirik	Utirik (cistern at south of village)	9 Mar	40
7	Rongerik	Eniwetak (Distillation water)	10 Mar	240

In addition to the above, a sample of foliage was taken at the windward side of Bikar Island. The radiation field was 180 mr/hr on 9 March 1954 at this point.

8. Conclusions and Recommendations

a. The radiological survey proved that a large yield surface detonation can produce extremely serious radiological contamination over a distance more than 120 miles downwind and important contamination about 250 miles downwind.

b. The center of the contamination pattern from the BRAVO Shot lies somewhat north of Rongelap and Rongerik Atolls and probably not far from a line between Bikini and Bikar.

c. Although the fall-out was serious on Rongelap Island located at the extreme southeast tip of the atoll, the contamination was about ten times greater at the north side of the atoll, twenty miles away.

d. The contamination decreased by a factor of about eight over the downwind distance of 50 miles between Rongelap and Rongerik.

e. Standard military field housing provides a significant degree of protection to personnel inside.

f. The AN/PDR-39 proved to be a very satisfactory instrument for field survey work under rigorous environmental conditions.

g. A single DDE with two (2) whale boats is not a completely satisfactory method of conducting a broad radiological survey of the type just completed. Future surveys should consider using vessels capable of entering more of the atolls and of handling a helicopter and several small boats.

6 Incls:

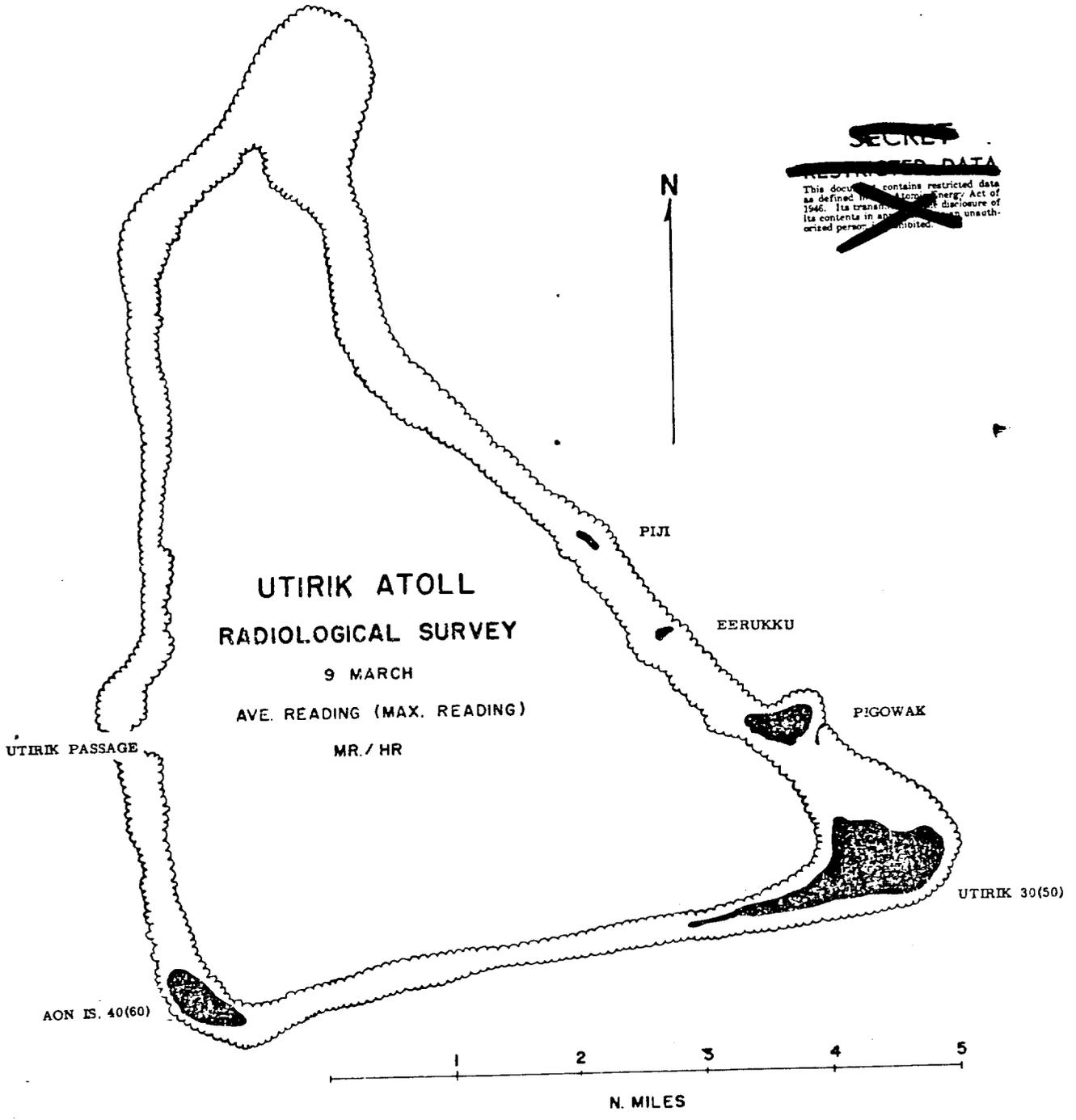
1. Rad. Survey Rongelap
2. Rad. Survey Utirik
3. Rad. Survey Bikar
4. Rad. Survey Rongerik
5. Rad. Survey Ailinginae
6. Summary of Rad. Survey

/s/ Herbert Scoville
DR. HERBERT SCOVILLE
Technical Director
AFSWP

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FIG. 2

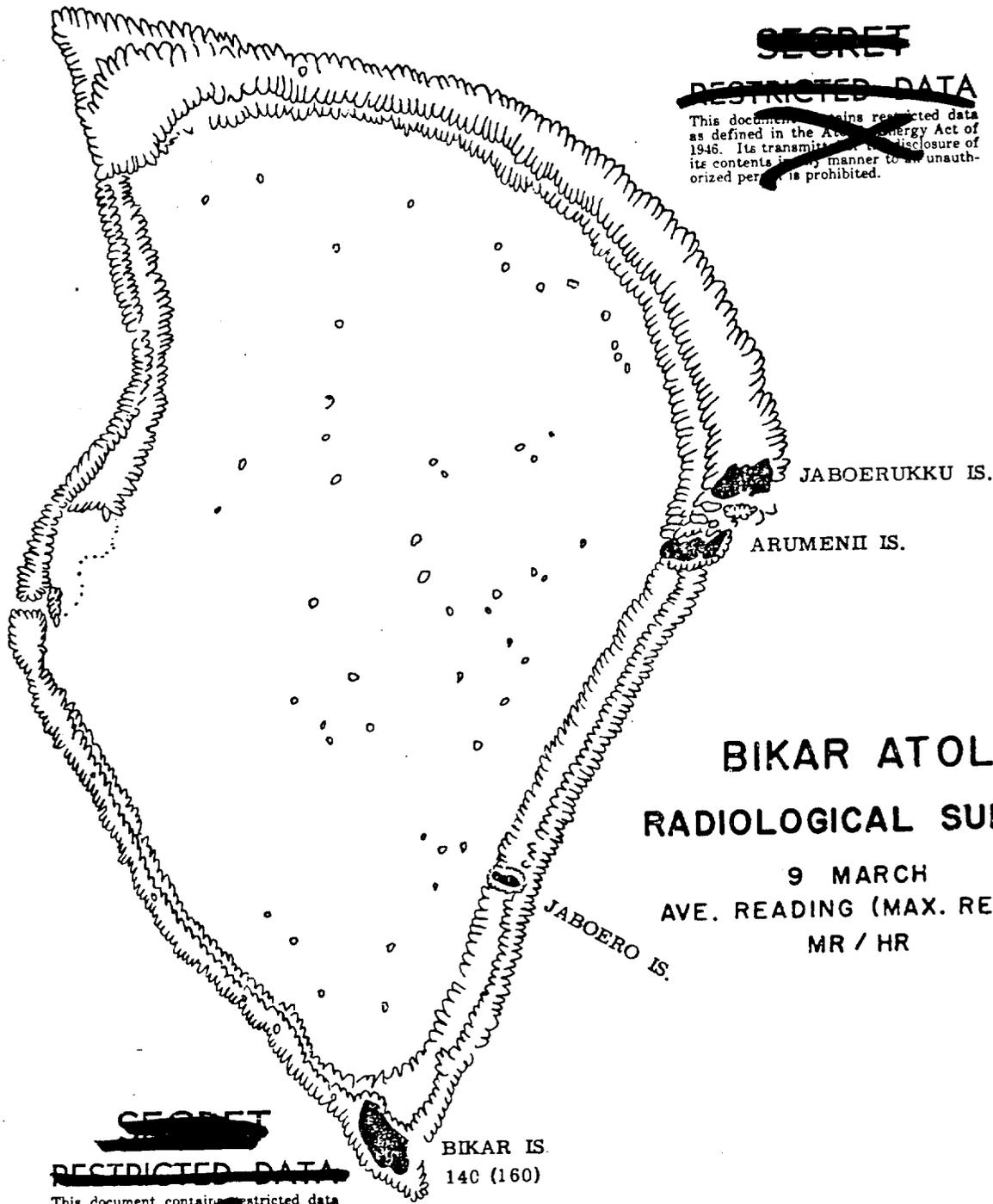
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BIKAR IS.
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FIG. 3

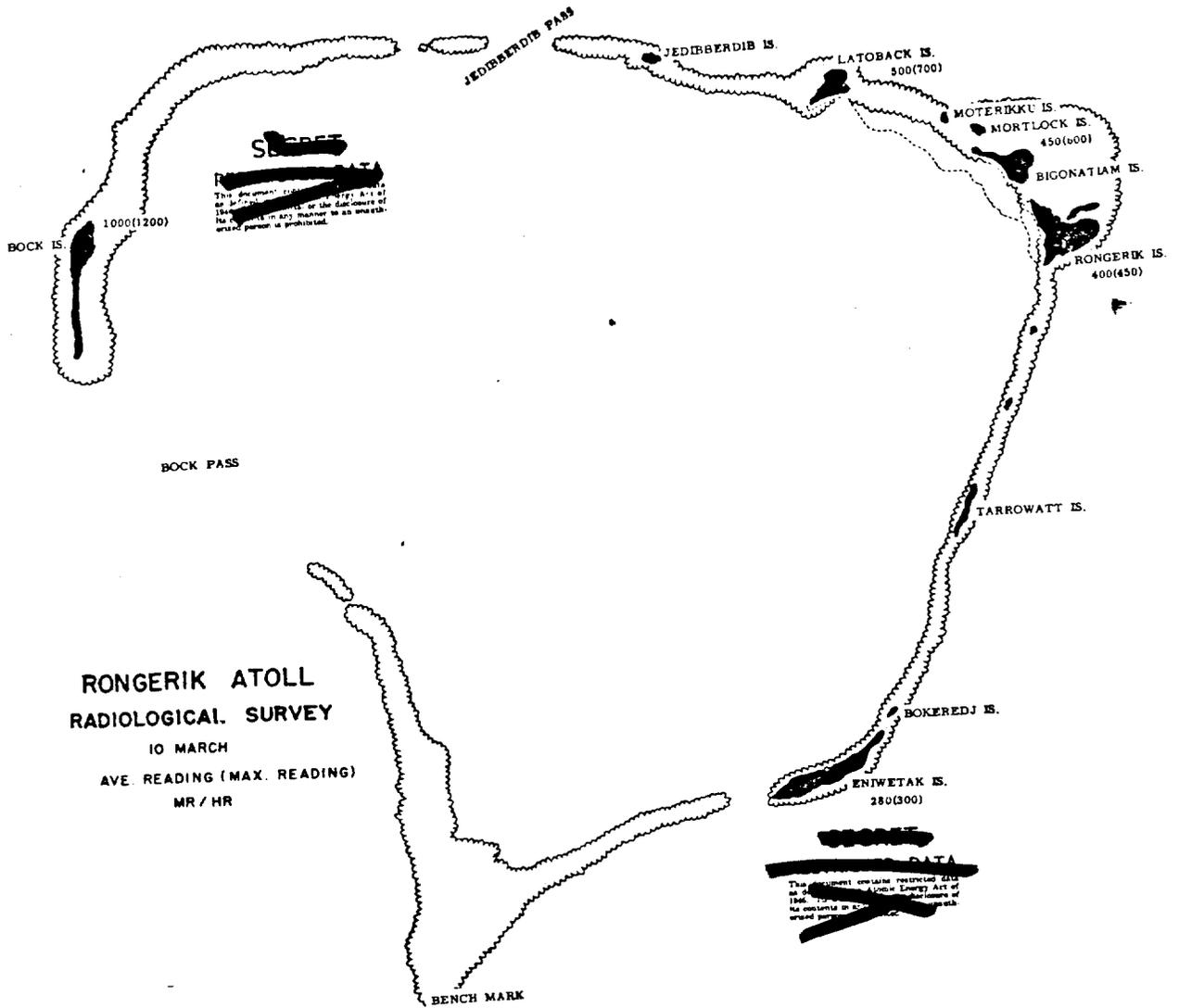
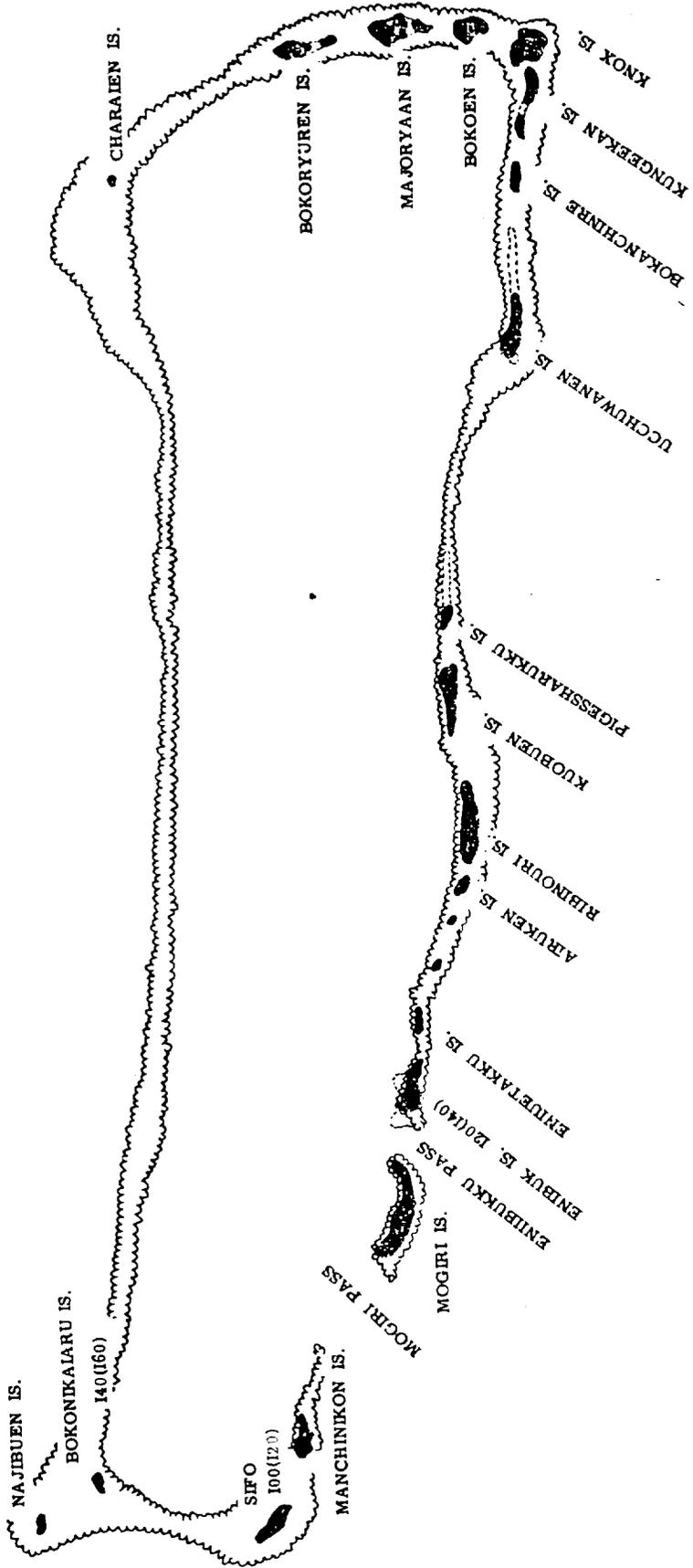


FIG. 4

AILINGINAE ATOLL
RADIOLOGICAL SURVEY

10 MARCH
 AVERAGE READING (MAX. READING)
 MR/HR.

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FIG. 5

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SUMMARY OF RADIOLOGICAL SURVEY

NOTE

ALL VALUES ARE R/HR AT REFERENCE TIME OF ONE HOUR AFTER BURST, EXTRAPOLATED BY MEANS OF T^{1/2} DECAY LAW. THESE VALUES DID NOT ACTUALLY EXIST SINCE TIMES OF ARRIVAL OF CONTAMINANT WERE CONSIDERABLY LATER

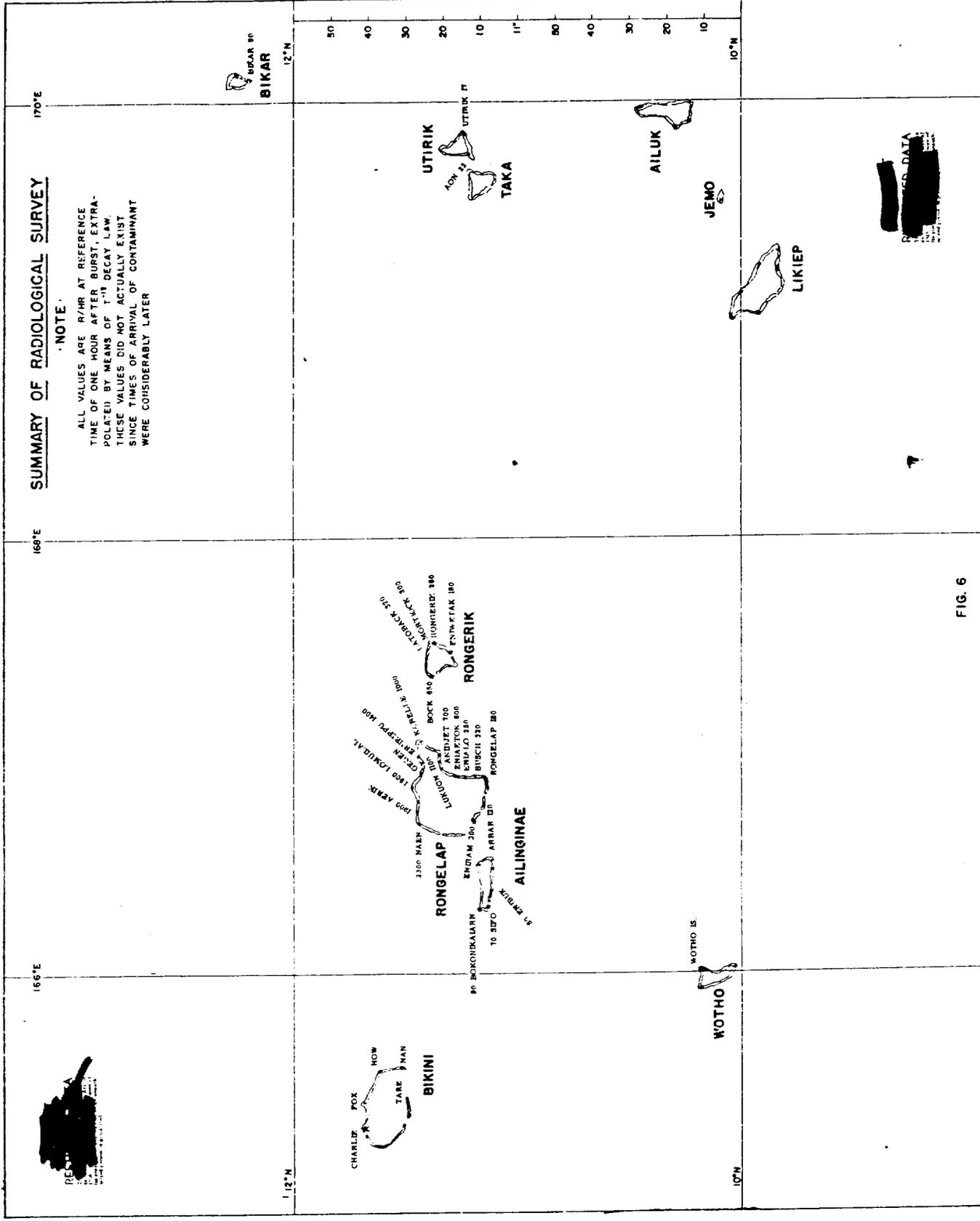


FIG. 6

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