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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

AUG 5 1970

C3
Bikini file

Martin B. Biles, Director, OS

TRIP REPORT ON 1970 BIKINI SURVEY

The 1970 survey team consisted of the following:

- 3 University of Washington
- 3 SWRHL
- 2 NV
- 1 OS HQ

Added to the team in Kwajalein was Mr. Kirk of Global Associates who was a boat operator. Mr. Thalgot of NV and Mr. Catlin of OS Headquarters visited the Atoll for the first few days of the trip. Also, with the group was Mr. Nakanisi and Miss Dancy who work for Trust Territory (TT). Mr. Tobin met the group in Kwajalein but could not make the trip to Bikini.

The team arrived at Eneu, Wednesday, May 27, 1970, on board the Hafa Adai. The situation found was that the Bikini workers were on strike and most had gone back to Kili. The few remaining Bikini workers left the following Saturday on the Hafa Adai. The strike was said to be due to the following:

1. A demand for increased pay.
2. Family problems and the desire for workers to be allowed to bring their families to Bikini while working there.
3. A demand that shoes be provided workers.
4. A demand for better food in the mess hall.

Other than the survey team and visitors, there remained in the Atoll (all on Eneu) Mr. Glenn, who was the Trust Territory representative for Bikini, a TT mechanic, a power plant operator, a cook, and two heavy equipment operators.

(nearly all dead)

The work being performed by TT workers consisted of the following:

1. Operation of mess hall, electric power, and latrine facilities on Eneu.

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2. Repair of equipment, mostly through cannibalization.
3. Digging holes for coconut plantings using heavy equipment on Eneu (no trees planted - just holes dug).
4. Driving tractor along cleared paths on Bikini to keep them open from new scrub growth.

Planting of coconuts had come to a halt since much of this is hand labor. Most of the equipment left after cleanup operations is now unusable due to lack of maintenance and spare parts. The one mechanic has no time for preventative maintenance and repair of equipment consists largely of temporary measures.

Mr. Glenn stated that he was expecting the arrival of a group of high school students who will work in the Atoll during the summer months. After leaving Bikini, Mr. Nakanisi was to recruit new workers for the agricultural project. Workers other than Bikinians will also be hired if the workers from Kili stay on strike.

One problem Mr. Glenn has that is a nuisance but could be serious is communications with the outside world. There was one tube type radio transceiver on Eneu and no backup equipment other than spare tubes. Majuro, Kwajalein, or a ship nearby could sometimes be contacted. At other times no station could be raised. Mr. Glenn reported that the radio set had broken down on occasion and they were once without any possibility of outside contact for several weeks until a ship arrived. This could be serious since there is only a first aid tent with some supplies left from cleanup days and no medical person on the Atoll.

Upon arrival at Eneu, the survey equipment was off-loaded. The team members carried a considerable share of this heavy work. As soon as the air samplers were ashore, they were lined up, fueled, and test runs made. Bob Catlin and I photographed the coconut tree nursery and the trees planted in rows SE of the runway. Photos were also taken of air samples checkout.

In discussions with Mr. Nakanisi about the vegetation that was knocked down in clearing the strips on Bikini, he stated he would very much like information on the powered shredders that can chop up vegetation. I agreed to obtain this and send it to him. He also stated they will soon be planting a garden on Bikini. I expressed an interest in obtaining samples which he said they would be happy to supply.

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Wednesday night we packed for the trip to Nam and to Bikini. Thursday morning we sailed in the Hafa Adai to Nam arriving about 10:30. Bob Catlin, Lynch (NVO) and I walked to the NW tip near the Bravo crater and back through the center past the earth covered bunker making photos as we went. Held and several of the ships crew collected fish and Ron Eagle (U. of Wash.) with assistance from several of the ships crew collected a bottom sample from the Bravo crater. Measured with a hand-held gamma instrument the two-gallon sample measured 30 $\mu\text{R/hr}$ with the background on the ship at 3 $\mu\text{R/hr}$. This and subsequent measurements were made with an E-500B instrument reading gamma only.

Thursday night we arrived at Bikini and set-up camp in two of the three latrine buildings in the old How camp area at the southern end of the island. Radio communications, using portable sets provided by NV, were established between Eneu and Bikini. We had the first drink of cistern water, from the 10,000 gallon cisterns, which tasted like concrete but good. The cisterns were full to the overflow level. The first of the problems with the M boats was experienced after off-loading the jeep, jeep trailer, air samplers, gasoline drums, and camp supplies on Bikini. The ramp could not then be lifted and was hanging in the water when the boat backed off the shore. The boat was later driven all the way back to Eneu with the ramp down and the crane on the dock was used to lift the ramp back in place. The ramps would not function on any of the three M boats. For additional discussion of this problem, see Attachment 1 and Attachment 2. *before*

Friday morning we made radiation measurements for the pile of aggregate East of the latrines. Al Smith confirmed that this material came from the Peter-Oboe complex and was used in constructing the cisterns. The instrument read 8 $\mu\text{R/hr}$ on top the pile. The area around the pile showed about 10 $\mu\text{R/hr}$. A hole about 1 foot deep was dug in the top of the pile and the instrument placed at the bottom. The meter then read 3-4 $\mu\text{R/hr}$. The nearby sand pile, used in cistern construction, showed 4-5 $\mu\text{R/hr}$ with the instrument partly buried.

Later in the day we boarded the Hafa Adai for a trip to the islands along the southern rim. On the way we received a radio call that several men were overdue in the Boston Whaler (none of the survey team were involved). They were outside the reef and it was suspected they may be adrift and without power. The Hafa Adai diverted to look for them. A hour or more later, the Whaler came into sight under power and it was explained that there was a mix-up in signals, they had seen the Hafa Adai searching, realized they were the object of the search, and had been chasing us. *thought to be* *possible, radio provided* *by NV*

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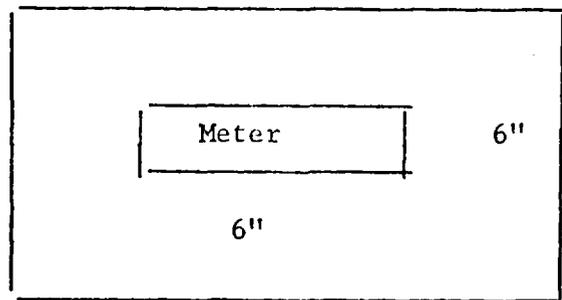
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The Hafa Adai dropped us at Enidrik so we could search for coconut crabs. The ship moved down to Aerokoj where they would pick us up later. No crabs were found. We took the small boat across the pass from Enidrik to Eneman. The low spot on Eneman where the highest radiation levels and highest Pu values were found was observed under water (the first time I had seen it this way in six visits). The water was about a foot deep in the middle. Ten cookie cutter soil samples were taken 5 feet apart in a dry area showing 100 to 150 $\mu\text{R/hr}$. The radiation level inside the photo bunker, a short distance down the island, was 2 $\mu\text{R/hr}$. Outside levels were between 1 and 3 $\mu\text{R/hr}$. A pile of lead scrap near the bunker showed 1 to 3 $\mu\text{R/hr}$. The first aggregate pile encountered walking East along the Peter-Oboe complex showed 1 to 2 $\mu\text{R/hr}$ with the meter placed in the aggregate. The second aggregate pile read the same. After making these measurements, we boarded the ship and went back to Bikini.

Saturday morning Mr. Catlin and Mr. Thalgott left Bikini on the Hafa Adai at 0900. Lynch and I set about trying to rig a house simulator using aggregate from the pile near the camp on Bikini (Peter-Oboe aggregate). Two cardboard boxes, one inside the other, were used to form wall spaces six inches thick.



Plan View

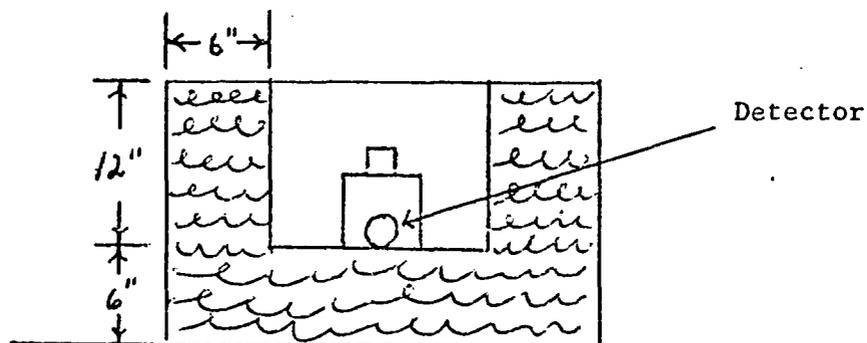
The boxes plus bags of aggregate we carried to a point 350 feet inland from the lagoon road near mid-island and East of a small concrete house. Radiation levels in the area were 120, 125, 130, and 125 $\mu\text{R/hr}$. Reading at ground level where the simulator was placed was 125 $\mu\text{R/hr}$. The large box was put in place and aggregate added to form a layer 6 inches deep. The meter was centered in the box over the 6 inch layer and the reading was 75 $\mu\text{R/hr}$. Next the smaller box was put in place and aggregate added as shown.

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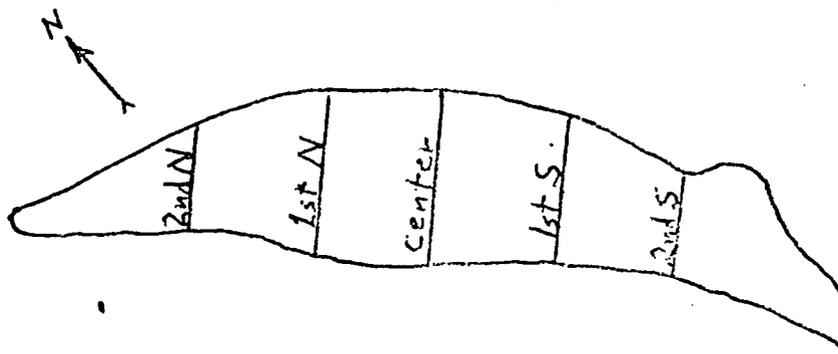
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The reading dropped to 45 $\mu\text{R/hr}$ or an overall reduction of a factor of three compared with the external level.

On Sunday morning, May 31, the team members on Bikini began soil sampling in groups of two along the cleared rows. Lynch and I sampled Row #7, 1st Baseline South, to the Center Line Road. See drawing for locations. Samples were taken, disturbed and undisturbed soil, every 100 feet resulting in 18 sampling locations. The cookie cutter sampler used takes a plug of soil about 4 inches in diameter and one inch deep. Sunday afternoon we rested and went fishing.

Monday morning we resumed soil sampling. Lynch and I sampled Row #9 2nd Baseline North to First Baseline North and from First Baseline North to the Center Line Road. The first stretch gave 25 sampling locations and the second 15. Soils varied considerably in organic content is just 100 feet of distance. Most undisturbed areas contained a mat of leaves and twigs all intermeshed. These had to be removed to a depth of 3 or 4 inches to get down to soil.



Note: Rows run lengthwise the island and the numbering system used is that developed during cleanup.

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Monday afternoon Held and I went to look for coconut crabs. We saw some signs but no crabs.

Tuesday morning we resumed soil sampling. Lynch and I sampled the 9th row from the 2nd Baseline Road North up to the end of the island. We then sampled along the lagoon road from the end of the island to the 2nd Baseline Road North. Held caught a coconut crab he spotted while soil sampling.

Wednesday morning Lynch and I sampled the 17th Row from the 1st Baseline Rd South to the 2nd Baseline Road south. Also that day we collected 300 pounds of coral aggregate from the pile near the How camp site.

Thursday, photographed the daily air sampler maintenance and refueling mission and dust production by the jeep on the lagoon road. Made background readings at the five air sampling locations. The following were obtained by making 5 readings around each station:

Station #1	+ 3 ft.	50 μ R/hr
		30 "
		25 "
		15 "
		30 "
		avg. = 30 μ R/hr

Station #2	+ 3 ft.	15 μ R/hr
		15 "
		30 "
		15 "
		15 "
		avg. = 18 μ R/hr

Station #3	+ 3 ft.	25 μ R/hr
		25 "
		20 "
		35 "
		20 "
		avg. = 25 μ R/hr

Station #4	+ 3 ft	20 μ R/hr
		10 "
		10 "
		15 "
		15 "
		avg. = 14 μ R/hr

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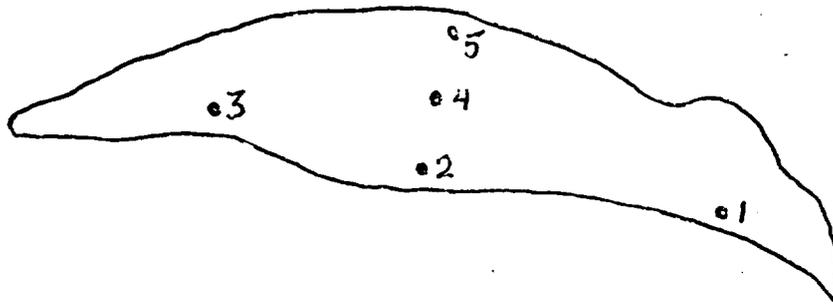
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Station #5	+ 3 ft.	20 μ R/hr
		10 "
		20 "
		30 "
		30 "
		avg. = 22 μ R/hr

The air sampler station locations were as follows:



Number 1 was just off the lagoon road near the How camp site in a position such that it would experience the dust from the road. Number 2, 4, and 5 were on the Center Line Road with 2 near the beach landing site on the lagoon side of the road, 4 on the concrete launch pad site mid-island, and 5 was near the ocean shore and upwind of the other two as the wind was blowing across the island from the ocean side toward the lagoon. Number 3 was near the North end of the island and inshore from the lagoon road.

Friday, made measurements at the soil pit dug by Eagle near the How camp site. At plus 3 feet above ground the instrument read 85 μ R/hr. At the bottom of the pit, about 3 feet down, it read 25 μ R/hr. Some surface soil had fallen into the pit.

Next we drained water from one cistern down to the level of the outlet pipe (it was almost empty from taking showers) and then pumped the level down further with a gasoline powered pump. There remained about 3/4 inch of water in the bottom of the cistern that the pump would not pick up. The cistern walls were about 6 inches thick. The thickness of the floor slab is not known.

Next I made measurements around the cistern out at a distance of about 20 feet.

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+ 3 ft. 12 μ R/hr
 11 "
 11 "
 10 "
 11 "
 avg. = 11 μ R/hr

Next, measurements were made at the four walls:

+ 3 ft. North wall 6 μ R/hr
 East wall 6 "
 South wall 7 "
 West wall 6 "

We then climbed inside the cistern. The readings were:

+ 3 ft. Center floor 3 μ R/hr
 North wall 2 "
 South wall 3 "
 East wall 3 "
 Center floor contact 2 "

Thus, the reduction factor for the cistern was about 4.

We then collected algae from the floor and walls. No sediment was found in the bottom of the cistern.

Living conditions on Bikini were primitive. The team members lived in two of the three latrine buildings in the old How camp area. During cleanup the fixtures had been removed. The buildings provided shelter from rain except that which blew in the open doors. Bedding, which was quite comfortable, consisted of air mattresses on the floor with mattress covers and blankets. Initially, food consisted of in-flight rations plus rice. Later, these were supplemented with fish and langusta caught by team members. *la mure*

A latrine was dug downwind out of doors. What it lacked from a human engineering aspect was compensated by a spectacular view. One user stated that this was the first time since he was 3 that he wished his mom was there to help. On the whole I would say these common inconveniences tended to add to the spirit of cooperation and the Bikini survey was not hindered in any way. This is a tribute to those who made up the team.

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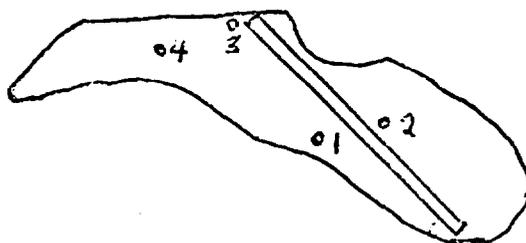
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There were a large number of rats in and around the camp area. They were a nuisance at night what with sleeping on the floor. The problem was more imaginary than real. However, there was some "running across."

One item not related to the survey is worth mentioning. A jet type Navy target drone aircraft with a wing span of about 18 feet was found washed up on the ocean shore near the How camp site. It bore the markings BQM-34A, VC-3,436. Compartments in the nose of the aircraft were damaged, were open to salt water, and equipment inside heavily corroded. I opened the rear compartment with Mr. Kirk's help and found it had remained sealed against the salt water and the equipment inside was undamaged. We removed the two major components in the compartment which consisted of the gyro portion and the receiver portion of the guidance and control systems. When examined these were found to be in good condition and were transported to Kwajalein and turned over to a Navy representative. It is my guess that this equipment would be valued at several thousand dollars.

Part of the team, of which I was one, went back to Eneu late Friday afternoon.

Saturday morning Lynch and I photographed the servicing of the four air samplers running on Eneu. These were located as shown below:



Those operating the samplers were experiencing difficulty with carbon loading of cylinder heads, valves, and spark plugs in the sampler engines. Engine heads were pulled frequently to clean out carbon. The gasoline was suspected to be the cause of this problem.

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On Sunday, 7 June, I monitored the scrap metal collected by the natives and stored in the bunker on the south tip of Eneu (near the large sheet metal building). Inside the bunker where the scrap was stored the radiation level was less than 1 μ R/hr. Contact readings over the scrap were also less than 1 μ R/hr.

Lynch and I collected disturbed and undisturbed soil samples at 200 foot intervals along the runway on Eneu (about 200 feet off to the south side). Twenty-two samples bagged separately were obtained. Held and Cluff sampled the Eneu camp area.

Lynch and I attempted to locate that part of Eneu showing higher radiation levels. The camp area measured 3 to 4 μ R/hr. The area of the island west and north of the camp and particularly the NW end of the island has been heavily bladed and the soil is quite disturbed. The surface is sandy like the beach area. There were only traces of rows or strips of vegetation, the area having been almost completely cleared. One small area under some pandanus trees showed 18 to 20 μ R/hr and the soil appeared undisturbed. Eagle took several cookie cutter soil samples here but it was decided that a soil pit collection would not be worth the effort.

On Monday, checked a barrel of scrap near the coconut nursery. This read 2 to 3 μ R/hr, the same as the camp area. Scrap consisted of copper tubing, copper wire, pipe fittings, and a large three bladed propeller. Photographed the coconut nursery from on top a nearby concrete bunker.

Tuesday, checked a barrel of scrap on the lagoon shore near the power plant. This measured 2 to 3 μ R/hr, the same as the camp area. The scrap consisted of copper wire, pipe fittings, and a large three bladed propeller.

Wednesday and Thursday were spent photographing Eneu. On Friday, June 12, Moore, Thrall, Kirk and I went back to Bikini in the Boston Whaler to pick up the last of the air filter samples. The air samplers themselves could not be brought back due to problems with the M boats. Saturday was spent working on reports and packing. In early afternoon Sunday, an aircraft sent from Kwajalein by Global Associates came to Eneu to pick up the team and equipment. The TT ship was not available to pick the team up when work was completed. The trip that had taken about 28 hours on the Hafa Adai was made in one hour and thirty minutes in the aircraft. The air samplers were to be shipped back to Kwajalein by TT ship at a later date.

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The following is a tentative summary of samples collected.

Bikini

Soils - 823 individual "cookie cutter" samples in 21 areas plus along portions of the lagoon road, at the 5 air sampling areas, and in the camp area. Both disturbed and undisturbed soils were obtained. Some groups of collected samples were composited. There were two series of separately bagged samples, one running East and West and one running North and South.

3 soil pit collections in 1 inch increments to 10 inches and then by horizons to 36 inches. Also by 1/2 cm increments to 3 cm.

Aggregate - 300 pounds from Peter-Oboe complex.

Water - 1 gal. from each of 3 well points plus collections of cistern water.

Algae - From one drained cistern. No sediment was found in the cistern.

Rats - 40 samples from 2 locations.

Coconut crab - 1 crab taken on Bikini.

Air - Filters from 5 samplers running continuously for 2 weeks (changed daily).

Langusta - Hepatopancreas only.

Eneu

Soils - About 50 samples from 3 areas including camp area, mid-island area, and at 200 foot intervals along runway, disturbed and undisturbed.

Water - Gallon samples of well water (tap water) and cistern water.

Air - Filters from 4 samplers running continuously for 2 weeks (changed daily).

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Nam

Fish - Goatfish from ocean side reef.

Crater sediment - Bravo crater.

Eneman

Soils - 10 samples at 5 foot intervals in area of highest external gamma.

Comments and Recommendations:

1. For any subsequent visits by AEC survey teams, TT communications and water transportation should not be relied upon unless significant improvements are made and confirmed by inspection.
2. Team members should be flown into and out of the Atoll since TT ship transport is very slow and quite undependable. Any equipment that cannot be flown to the Atoll should be shipped by TT ship sufficiently in advance to be available when the team arrives.
3. Provisions must be made to handle any medical emergency that should arise. Suggest one member be added to the team to perform this function.
4. The boat operator was most helpful. Such a capability within the team is essential to a successful survey.
5. The coordination of the survey plan with the High Commissioner was essential to obtain the full cooperation of the TT representatives in the Atoll. The TT people supported the team to the extent possible although they were handicapped through lack of facilities, useable equipment, and suitably trained personnel.
6. The problem of natives asking safety related questions of team members did not materialize since they were not in the Atoll due to the strike.

Tommy F. McCraw
Nuclear Explosives Environmental
Safety Branch
Division of Operational Safety

Enclosure:
Memo dtd 6/13/70

cc w/encl: ✓ R. J. Catlin, OS
N. F. Barr, BM
G. Bradshaw, PI

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