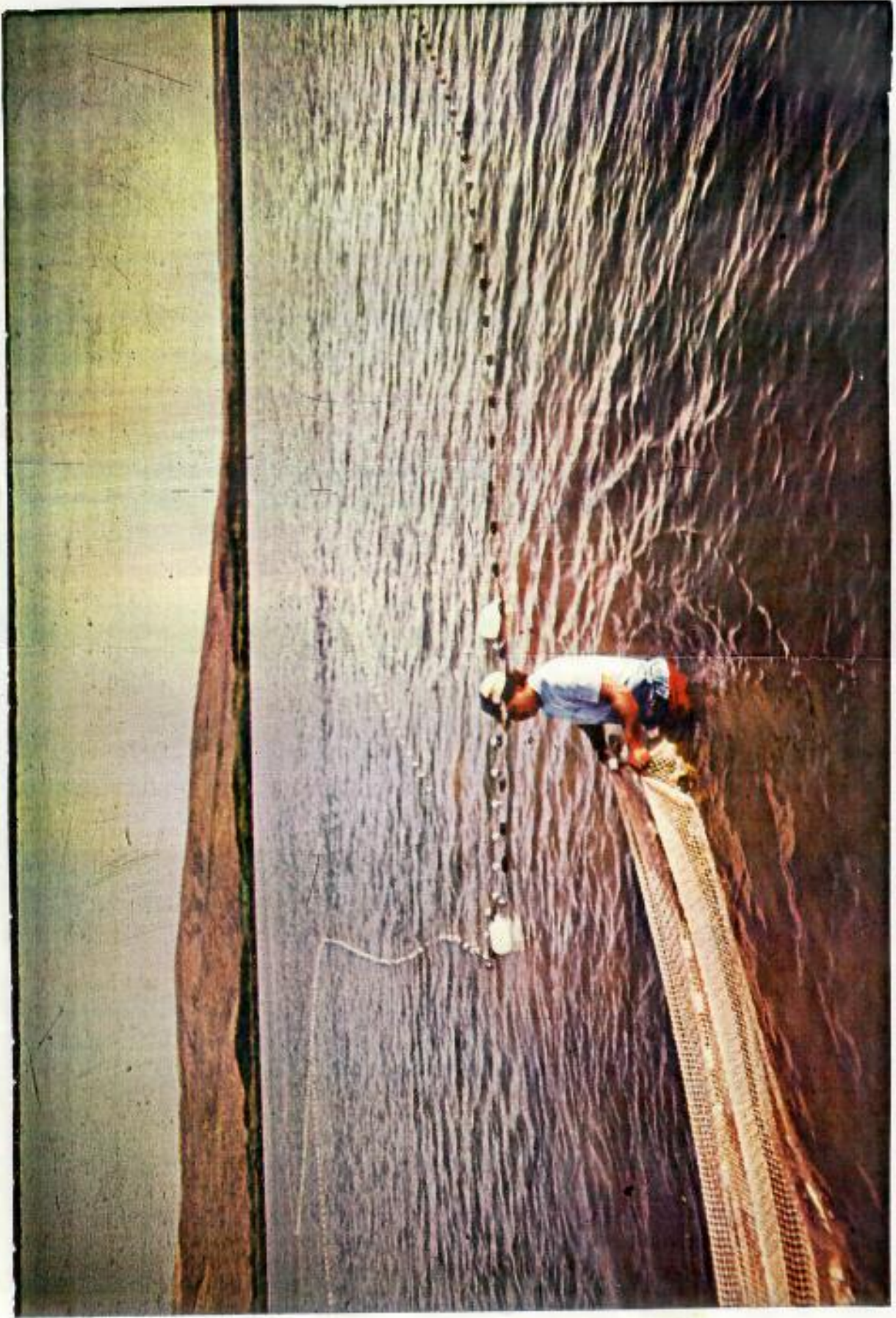


MOLOKAI

FILE

1980S DEDICATED TO
BILL PULELOA BY GEORGE BALAZS
PART 2 of 2



NUMBER OF GREEN TURTLES CAUGHT BY "BAKLAD" TRAP NET FISHING ALONG THE
SOUTH COAST OF MOLOKAI (3,600' LONG NET GUIDE SET PERPENDICULAR TO SHORE)

Compiled by

G. H. Balazs
May 1983

(Based on data supplied by Ed and Diane Medeiros and Bill Puleloa)

Date	No. of turtles	Date	No. of turtles
September 2, 1982	1	October 21	1
3	23	26	7
4	9	-----	-----
9	3	December 22	1
10	1	23	0
15	1	25	0
21	2	30	0
23	3	31	1
24	1	January 3, 1983	1
30	3	4	0
October 1	1	11	4
5	2	12	0
7	2	13	0
8	2	14	1
12	1	22	1
13	1	25	0
18	1	26	5
19	18	27	2
20	7	28	2
		29	1

Date	No. of turtles	Date	No. of turtles
January 30	0	April 6	0
February 8	1	7	0
9	0	12	0
11	0	13	1
25	0	21	0
26	2	22	0
March 26	0	27	1
		28	2

Between 9/2/82 and 10/26/82, 21 overnight sets were made in which turtles were captured. Sets that did not catch turtles during this period were not recorded by the fisherman.

Between 12/22/82 and 4/28/83, 32 overnight sets were made with both "turtle" and "no turtle" catches being recorded.

12/22/82 to 4/28/83 - 26 turtles or .81 turtles per set.

9/2/82 to 4/28/83 (overall, with bias) - 116 turtles or 2.2 turtles per set.

NATIONAL MARINE FISHERIES SERVICE
 HONOLULU LABORATORY
 P. O. BOX 3830
 HONOLULU, HAWAII 96812

SIZE DISTRIBUTION OF 81 GREEN TURTLES TAGGED BY BILL PULELOA AND ED MEDEIROS
 ALONG THE SOUTH COAST OF MOLOKAI, MAY 1982 - MAY 1983

Compiled by
 G.H. Balazs-May 1983

<i>Curved carapace length in cm</i>	No. of Turtles
35 - 40	4
40 - 45	10
45 - 50	4
50 - 55	6
55 - 60	13
60 - 65	6
65 - 70	8
70 - 75	13
75 - 80	10
80 - 85	4
85 - 90	1
90 - 95	1
95 - 100	1

Approximate size categories:
 (for curved carapace length)

Juvenile (35 - 70 cm)	63.0%
Sub-adult (70 - 85 cm)	33.3%
Adult (>85 cm)	3.7%

TRIAL CALCULATIONS OF THE TOTAL SIZE OF THE HAWAIIAN GREEN TURTLE POPULATION

by

G. H. Balazs
May 1983

Size Categories:

Molokai (based on net captures)

juveniles - 63.0%

subadults - 33.3%

adults - 3.7%

Kau, Hawaii (based on hand captures)

juveniles - 71.4%

subadults - 22.1%

adults - 6.5%

Breeding population size estimate based on analysis by J. A. Wetherall
(unpublished, 1983) - 750 females.

Assuming at equal sex ratio - 1,500 adults.

Using the Molokai data, total population size would be 40,540 turtles
consisting of: 25,540 juveniles, 13,500 subadults, and 1,500 adults.

Using the Kau data, total population size would be 23,077 turtles consisting
of: 16,477 juveniles, 5,100 subadults, and 1,500 adults.

The human population of the State of Hawaii is about 1,000,000 people.
Using the Molokai data, there would be .041 turtle per person, or 1 turtle for
every 25 people. Using the Kau data, there would be .023 turtle per person, or
1 turtle for every 43 people.

There are about 728 miles of coastline in the 8 main Hawaiian Islands.
Using the Molokai data, there would be an average of 56 turtles per mile.
Using the Kau data, there would be an average of 32 turtles per mile.

October 25, 1983

George,

Thanks for the articles you sent. Glad you received the recent batch of turtle sighting reports.

I got back to Sam Luuloa and he told me he did not actually see the shark swallow the turtle but only that it had it in its mouth. The shark (tiger) was larger than the boat he was in which was 22'. It broke surface about 15-20 feet away so he got an excellent view and swears the turtle was about 45 to 50 inches in length. The shark actually came out of the water with the turtle in its jaws and then splashed back in and disappeared into the depth. It was holding the turtle between the front right flipper and the head. He distinctly remembers the shark being a little "greenish" in color. Sam was out with a couple of other guys turtle hunting. They were going to a well defined turtle "house" and were planning to gaff a few when the incident happened. Needless to say, they suspended their plans for the day after they saw the shark.

In regards to Ed Mederios' netting rays...yes, of course! Both sting-rays and eagle rays are commonly trapped within the confines of the net and are bagged along with the other fish. If the rays are very large (usually the eagles, *Aetobatus narinari*), they are dispatched with the power head just before the killing bag is closed off and hauled on board. Smaller rays are bagged along with the other fish and thrown overboard after pulling the killing bag in. Expect for the trauma, the smaller rays don't appear to be hurt too badly. We wrap our hands around the tails and carefully toss them over. The larger ones of course don't see the beginning of another day.

On another line, Ed told me that he is still netting fish to make a living. However, he admitted that his net configuration is not exactly kosher...his bag section still can be construed to be a "receptacle" if examined by DOCARE. He said he was going to keep fishing until he is caught and convicted. Touchy situation.

In regards to you catching and tagging turtles in Palaau, why don't you pay Ed to set up his nets in the regular "bullpen" fashion with the understanding that all you're after are the turtles. It sure would be easier for you and also an absolute guarantee for turtles. I suppose if you did it under the guise of "research" and cleared it first with Molokai's DOCARE, it can be possible. Much better than hauling your nets over and sitting overnight on some lonely mosquito infested beach.

Aloha,

Bue

January 5, 1983⁴

George,

Enclosed are a couple more tagging data. The animals were caught in Ed's nets as usual.

Also enclosed is an article I thought might interest you. I found the newspaper on Hawaiian Airlines during our trip over to Honolulu for the holidays. Oddly enough, after looking over the Federal regs I could not locate any wording which prohibits this sort of activity. If you can find any, please let me know.

I had a chance meeting with one of the MOP students from Hilo who informed me that she had given you a hand in tagging turtles on the Big Island lately. She couldn't name the exact location of your tagging activity and said she only stayed with the group for one night. Said ten turtles were tagged during that one night she was there. Pretty good! How many did you tag altogether and where was this spot? Informants name = Roxane Adams. Father and mother work here on Molokai.

Here's a belated wish for a prosperous New Year. Good health and good luck to y'all.

Aloha,

Pai

Name

Prog LNR 153-Coon Fsh

Prog LNR 401-Aqua Res

Non-Fed Aid: Fsh Stat (8201)
Others (8212)

Non-Fed Aid: Mar (8210)
FW (8211)
AFRC (8212)

Fed Aid: Coord (8213)
(D-J) FW (8214)
Mar (8215)

No. Staff	Location	What Was the Project-Problem	What Was Done
		Responded to several calls during the month concerning the island. Only the beaching which occurred adjacent to the staff biologist. The other sightings were reported by beaches within private land. After discussions with the i was responsible for at least three of the sightings reported to NMFS, Honolulu.	
		Responded to a call from the Molokai Police Dept. concerning night of the 15th. Upon inspection of the animal, it was and its neck slit. The turtle measured 94.5 cm across the	
		Investigated another anonymous report of turtles at a dump of at least 7 turtles recently discarded. The length of t (straight measurements). Both incidents were reported to turtles were measured, tagged, and released during the mon and released. 139 turtles tagged to date with 8 recoverie	
		Attended the proposed humpback whale national marine sanct month on Molokai. Pertinent information from testimonies Honolulu office.	
CONTINUED ON BACK			

1984

Prog LNR 805-Aqua Rec

Non-Fed Aid: Mar (8240)
AFRC (8241)
Coop Fsh(8242)

Fed Aid: Coord (8243)
Fsh Dist (8244)
Ala Wai (8245)
Cri Cens (8246)
Fsh & Mab(8248)
Art Reef (8249)
NWHI (8250)

Results-Conclusions-Remarks

sighting of monk seals at the west end of the
1st fairway at Kaluakoi Golf Course was confirmed
two other informers and occurred on remote
informer, it was suspected that the same animal
died this month. All incidents were recorded and

found a dying turtle on the beach at Kawela on the
discovered that all four flippers were cut off
back with a length of 105.0 cm (curved measurements)
sighting site at Kalumaula and discovered the remains
the turtle shells ranged from 70 cm to 85 cm
DOCARE and NMFS. In addition, 13 green sea
turtles and 2 turtles previously tagged were re-measured

5.

January public meeting convened by NOAA during the
of speakers were recorded and forwarded to the

12/6/84

Bill -

How did the hatchling
hawkbill turn out?

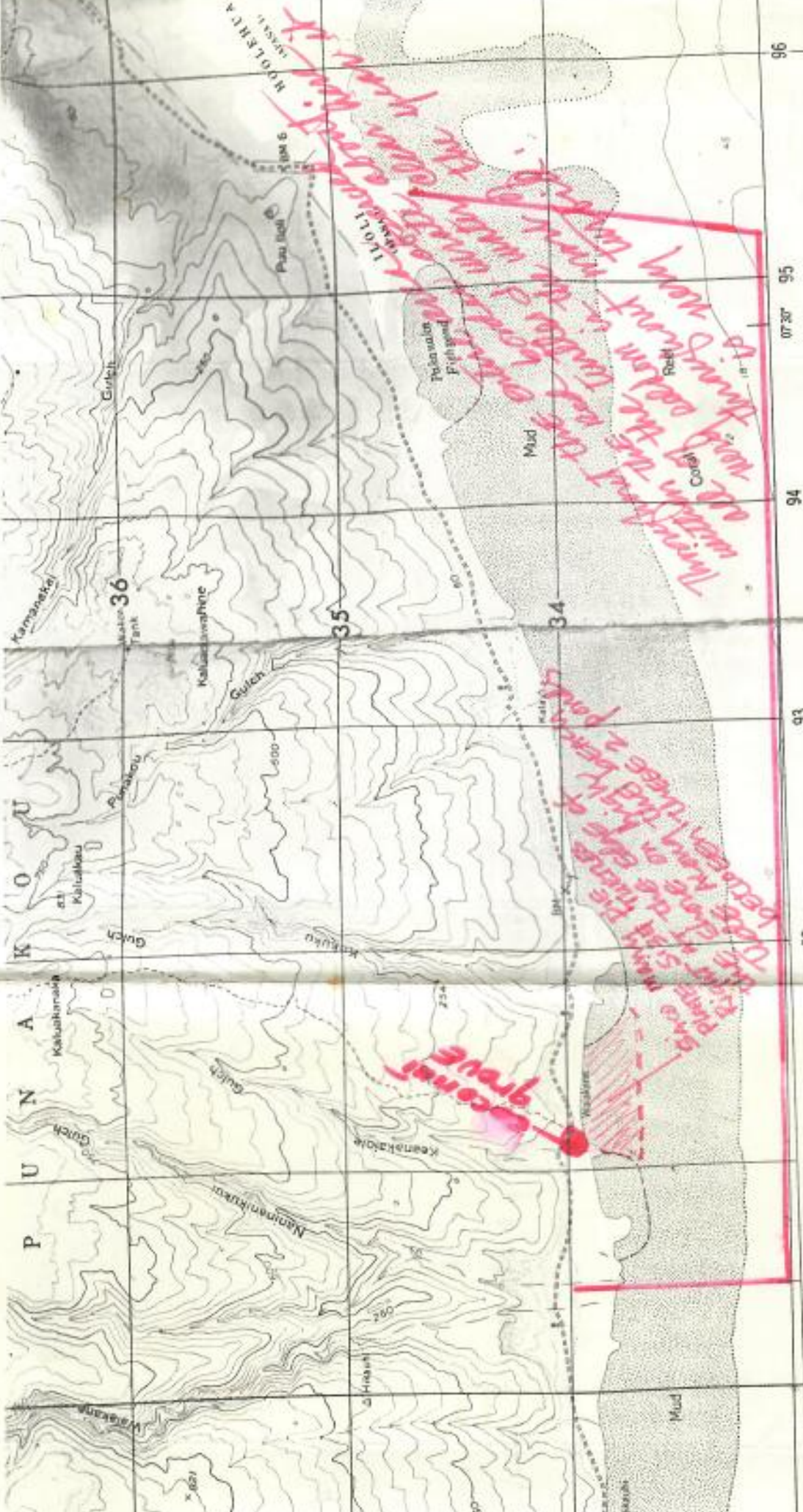
Never heard anything from Noah.

Best regards,
Guy

12/7

George,

Decided to rear hawkbill myself. Contacted
Nitta and got verbal okay. Finally got
him to ~~eat~~ eat. Has been munching on
lime for about 4-5 days. Just yesterday
got him to accept raw meat from a toothpick.
Still refuses shrimp. Just like old days
in Majuro when we used to hold greens
in our aquarium. I'll keep you informed.
Bill.



Scale 1:25,000
 1000 500 0 1000 2000 Meters
 1000 500 0 1000 2000 Yards
 1 Nautical Mile
 1 Statute Mile

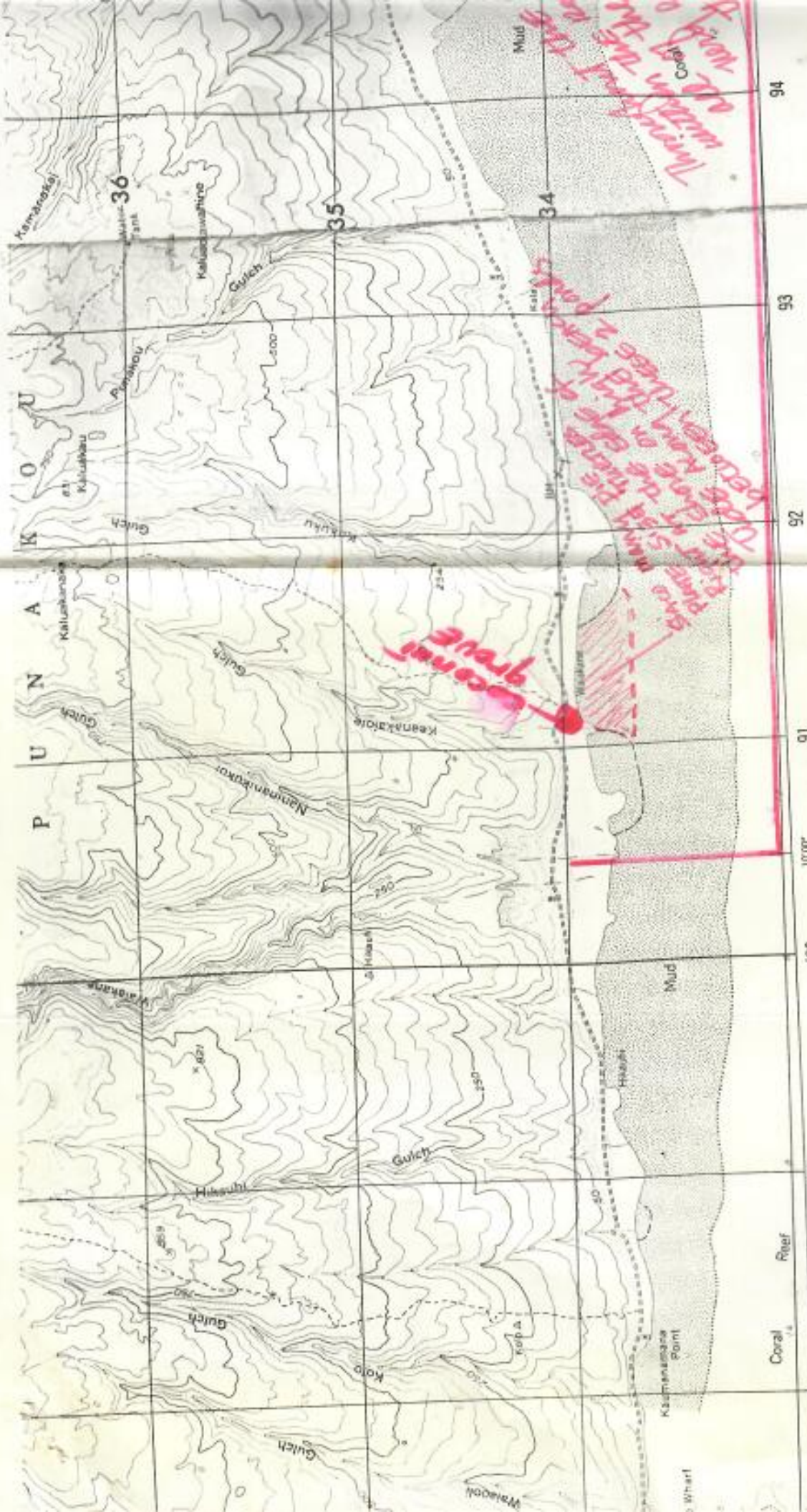
GEORGE H. BALZS
 UNIVERSITY OF HAWAII
 Hawaii Institute of Marine Biology
 Coconut Island - P. O. Box 1348 - Kaneohe, Hawaii 96746
 from Noah Pakelar
 December 1980

DIV. OF CONSERVATION & RESOURCES ENFORCEMENT
DEPT. OF LAND AND NATURAL RESOURCES
 1151 Punchbowl Street
 Honolulu, Hawaii 96813

CONTOUR INTERVAL 50 FEET
 SUPPLEMENTARY CONTOURS 10 FEET

- Spheroid
- GRID
- PROJECTION
- VERTICAL DATUM
- HORIZONTAL DATUM
- INTERNATIONAL 1:000 METER UTMA, ZONE 4
- TRANSVERSE MERCATOR
- SEA LEVEL 1979
- OLD HAWAIIAN

This is a topographic map of a coastal area. The map features contour lines and a grid system. A red line is drawn along the coastline, and various areas are labeled with 'Mud'. Handwritten red notes include 'P.O. Box 1348 - Kaneohe, Hawaii 96746', 'Mud', and 'FRESH WATER TRENCH'. The map is oriented with North at the top.



88 89 90 91 92 93 94
 1000 500 0 0 0 0
 Scale 1:25,000
 CONTOUR INTERVAL 50 FEET
 SUPPLEMENTARY CONTOURS 10 FEET
 SPHEROID 1,000 METER UTM, 20
 GRID TRANSVERSE MERE
 PROJECTION SEA LEVEL
 VERTICAL DATUM OLD HAWAIIAN
 HORIZONTAL DATUM HAWAIIAN LOW

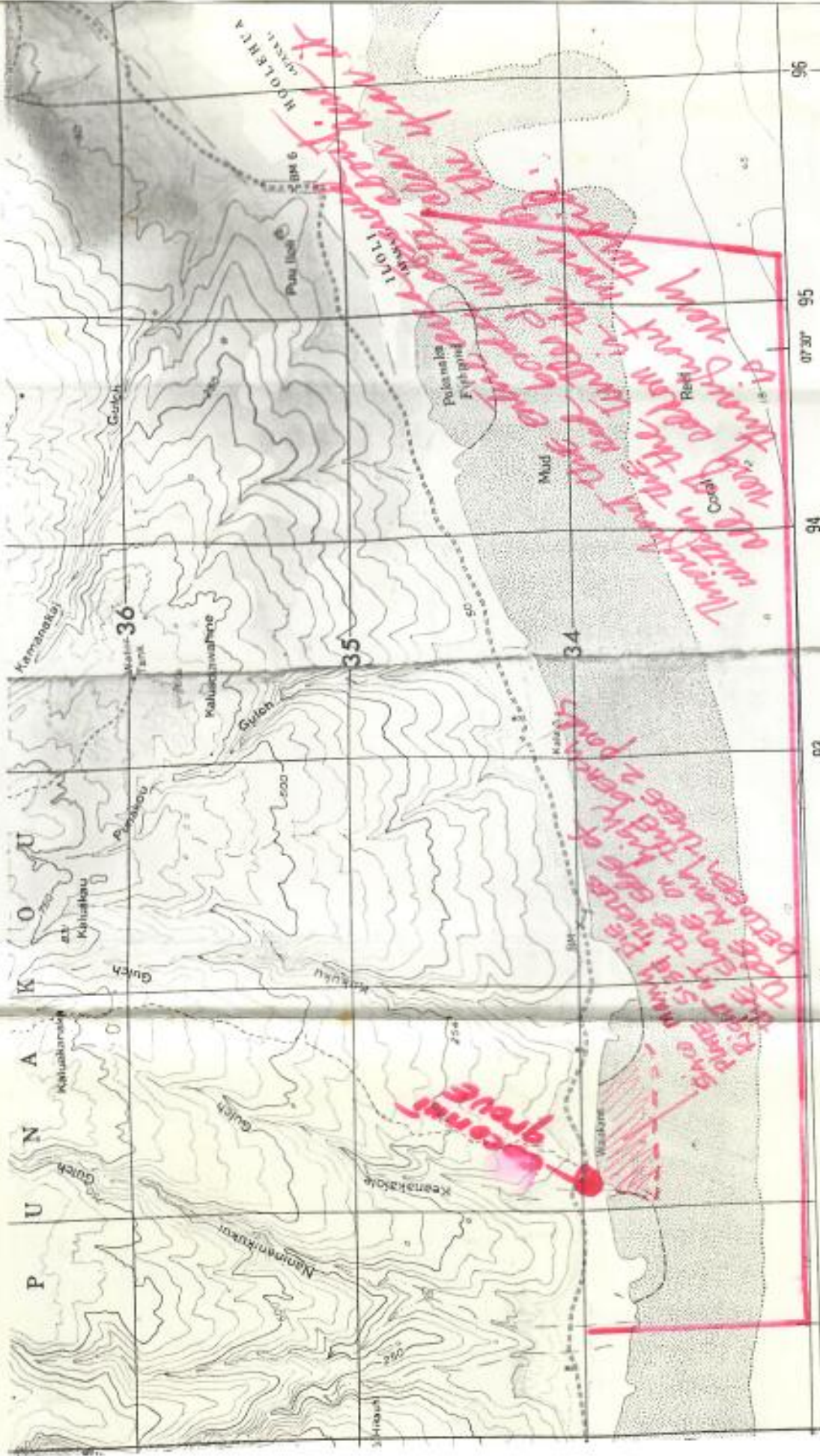
GEORGE H. BALAZS
 UNIVERSITY OF HAWAII
 Hawaii Institute of Marine Biology
 Coconut Island • P. O. Box 348 • Kaneohe, Hawaii 96744
from Noah Pakalen December 1980

DIV. OF CONSERVATION & RESOURCES ENFORCEMENT
DEPT. OF LAND AND NATURAL RESOURCES
 1161 Punchbowl Street
 Honolulu, Hawaii 96813

Prepared and published by the Defense Mapping Agency
 Topographic Center, Washington, D. C.

LEGEND
 MAP INFORMATION AS OF 1968

Impervious light city, Street	149	150	151
Unimproved dirt	149	150	151
Turf	149	150	151
Stone markers	149	150	151
Intermittent, Federal State	149	150	151
Overpass, Underpass	149	150	151
Interruption lake, Sand	149	150	151
BOUNDARIES	149	150	151



90 10'00" 91 92 93 94 95 96

GEORGE H. DALAZZ

UNIVERSITY OF HAWAII
 Hawaii Institute of Marine Biology
 and P. O. Box 1346 Kaneohe, Hawaii 96741

from Noah Pakaloa
 December 1980

DIV. OF CONSERVATION & RESOURCES ENFORCEMENT
DEPT. OF LAND AND NATURAL RESOURCES
 1151 Punchbowl Street
 Honolulu, Hawaii 96813

Scale 1:25,000



CONTOUR INTERVAL 50 FEET
 SUPPLEMENTARY CONTOURS 10 FEET

SPHEROID INTERNATIONAL
 GRID 1,000 METER UTM, ZONE 4
 PROJECTION TRANSVERSE MERCATOR
 VERTICAL DATUM SEA LEVEL 1929
 HORIZONTAL DATUM OLD HAWAIIAN
 UNADJUSTED LOW WATER

GRID NORTH



very light observations of turtles

P A C I F I C

MAGNETIC NORTH
12 MEAN
ON 1952

Map by the Geological Survey
Hawaiian Territorial Survey
Scale maps of Halawa,
Point, and Ilio Point
1952
Metric methods



*Heavy turtle concentrations
observed here.*

C

O C

GEORGE H. BALAZS
UNIVERSITY OF HAWAII
Hawaii Institute of Marine Biology
Coconut Island - P. O. Box 1343 - Kaneohe, Hawaii. 96744

FORM CD-45
(REV. 3-76)

U. S. DEPARTMENT OF COMMERCE

2. CHECK APPROPRIATE BLOCK

SUPPLY, EQUIPMENT OR SERVICE ORDER

 PROCUREMENT OTHER (Specify) *Gas*FOR: National Marine Fisheries Service

1. THE NUMBER SHOWN IN BLOCK 5 MUST APPEAR ON ALL SHIPMENTS AND/OR DOCUMENTS RELATING TO THIS ORDER ↓

3. REQUISITIONER DOCUMENT NO.

4. BUREAU CONTROL NO.

5. PURCHASE ORDER NO.
84-JJ-00459

6. ISSUED TO:

Edward Medeiros
P.O. Box 1216
Kaunakakai, Molokai, HI 96740

7. DESTINATION

S
H
I
P
T
O
National Marine Fisheries Service
P.O. Box 3830
Honolulu, Hawaii 96812

8. ACCOUNTING CODE

FSR200/PL283VW0/2517

9. QUOTATION REF. OR CONTRACT NO.

open market

10. DISCOUNT TERMS

11. DELIVERY
F.O.B.

12. GOVT. B/L NO.

13. DELIVERY DATE

From Aug. 1984 -

14. FUNDS AVAILABLE (Budget Office)

14a. STATION

ITEM NUMBER		17. DESCRIPTION	18. QUANTITY	19. UNIT	20. ESTIMATED TOTAL COST	21. ACTUAL	
15. LINE NO.	16. DO NOT USE					UNIT PRICE	TOTAL COST
		Provide time and space on board fishing vessel for NMFS representative to tag sea turtles captured incidentally during normal fishing operations. Estimated requirement: Ten (10) turtles per month for a period of six (6) months.	6	MO		100.00	\$600.00

22. SIGNATURE OF REQUISITIONER

DATE

23. SIGNATURE APPROVING OFFICER

DATE

TITLE

TITLE

24. ACCOUNTABLE PROPERTY

INITIALS

25. NOT AVAILABLE -
 BUREAU STOCK/
EXCESS

INITIALS

26. SIGNATURE-BUREAU CONTROL OFFICER

27. NOT AVAILABLE -
 DEPARTMENT
STOCK/EXCESS

INITIALS

28. APPROVAL

DATE

29. PURCHASING AGENT
t. nakamura
t. nakamuraDATE
8/16/84

30. RECEIPT ACTION - Quantities shown in Column 18 above have been received and accepted, except as follows: (If additional space is needed, use reverse side.)

31. SIGNATURE-RECEIVING OFFICER

DATE

32. PROPERTY CONTROL NO.

 TRADE-IN RECEIVING REPORT33. SEND INVOICES
IN DUPLICATE
TO: →

Turtles - Molokai July 8 thru July 20, 83^{mop} PROJECT

- Site 5, 2 turtles of 1 foot, spotted separately, both approx. 75 lbs, water depth ~20'
- Site 7, 1 turtle, inshore on reef flat, water depth ~7', reef flat ~200 yds off shore
- Site 7, 3 turtles, 50 lbs, 75 lbs, 200 lbs, resting in sand channels, water depth 40 to 50'
- Site 12, 24" turtle - 20' - 30' off water, 50m ~~off~~ offshore
- Site 16, 75 to 100 lbs turtle, 15' of water sitting in small cave.
- Site 25 2 turtles one 80 lbs, one 30 lbs. sited on surface, water depth 25'
- Site 39, 3 turtles, 50 yds offshore? in area were waterfalls run in to ocean
- Site 42, 1 turtle, 4' shell, on surface, water depth 50'
- Site 44, 4 turtles, 2 small, 2 medium size at surface, ~10 yds off of rock outcrop.
- Site 45 2 turtles, one medium, one small, sited by dive site
 - 1 turtle, medium size, spotted close to Moku Pt., east

Molokai
Algae transects?

RECEIVED

MAY 31 1985

(To be made one and twelve copies)

THE SENATE

Div. of Aquatic Resources

THIRTEENTH..... LEGISLATURE, 1985.

STATE OF HAWAII

ACT 129

S.B. NO.

1224
S.D. 1
H.D. 1
C.D. 1

A BILL FOR AN ACT

RELATING TO FISHING.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:

1 SECTION 1. Section 188-28.5, Hawaii Revised Statutes,
2 is amended to read as follows:

3 "§188-28.5 Bullpen trap; description; prohibitions.

4 (a) For the purpose of this chapter, a "bullpen trap" has a
5 pen and guide or guides of a length or lengths of net or
6 material designed to guide aquatic life into the pen
7 situated to prevent the escape of some or all of the aquatic
8 life entering the pen, whether or not the guide or guides
9 are connected to the pen.

10 (b) It is unlawful for any person to capture or
11 attempt to capture aquatic life with a bullpen trap which
12 exceeds two thousand feet in total length [exceeds seven
13 hundred fifty feet]. The total length of a bullpen trap
14 shall include the length of the guide or guides and pen.

15 (c) It is unlawful for any person engaged in bullpen
16 trap fishing to leave the trap in the same place for a
17 period of more than [twelve hours.] sixteen hours.

1 (d) It is unlawful for any person to capture or
2 attempt to capture aquatic life with a bullpen trap within
3 one thousand yards from the shoreline, except as provided in
4 subsection (e).

5 (e) Notwithstanding subsection (d), it is lawful to
6 capture or to attempt to capture aquatic life with a bullpen
7 trap in the area seaward from five hundred yards from the
8 shoreline of the island of Molokai west of Kaunakakai wharf (in hand)
9 and in the area seaward from two hundred yards from the
10 shoreline of the island of Molokai east of Kaunakakai wharf;
11 provided that the department may designate other areas of
12 similar characteristics in which the use of bullpen traps
13 within one thousand yards from the shoreline may be allowed
14 under this subsection."

15 SECTION 2. Statutory material to be repealed is
16 bracketed. New statutory material is underscored.

17 SECTION 3. This Act shall take effect upon its
18 approval.

19 Approved by the
20 Governor on MAY 28 1985

21
22
23
24

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FISH AND GAME
1151 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

SUSUMU ONG, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
CONSERVATION AND
RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Aug. 2, 1985

George,

Mea culpa! Mea culpa! Looking very carefully over your letter and my data book there were indeed several mistakes in the reporting of the tag numbers. I also found another typo for the single turtle tagged and reported on 6-28-85. The tag number on the left front flipper should be 8620 and not 6820 as originally reported. Thanks to your keen eyes and alert scrutiny, these discrepancies were caught early on. (However, makes you wonder about all the other reportings doesn't it??)

Attached is the report for the turtles tagged during July, 1985. Fifteen new taggings and one recovery.

I take it the frozen turtle blood got to you safe and sound. Also, when you find time and can remember...please send me the tagging data for the turtles you worked on during this last trip. Might come in handy if we recover some of these in the future. No rush.

Aloha,

Bill

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FISH AND GAME
1151 PUNCHBOWL STREET
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WATER AND LAND DEVELOPMENT

Sept. 5, 1985

George,

I forgot to ask you for a replacement measuring tape in my last letter! If I remember right, we used it to hold turtles' mouth agap while you probed for stomach contents at Palaau. If you returned it to me, I have misplaced it. I'm using Linda's sewing measuring tape now and I don't think she's too happy about it!

I just now got back from Moomomi with Nathaniel Burrows and another guy called Sam Luuloa. We went there to see if we could locate some turtles reported seen over the Labor Day holiday. According to Leroy Mollena, his kids spent the past weekend there fishing and diving. His older daughter and several other kids walked along the seashore towards Kawa'aloa Bay and saw "many turtles of all different sizes floating on the water eating limu". Some of them were apparently quite small because she was tempted to jump in the water to catch one or two for pets (she did not). In any case, we did not find or see any turtles today...maybe it was too choppy or perhaps they moved on. I did notice some sargassum and lipoa on the beach. Maybe they were feeding on these. As an aside, Nathaniel informed me that he remembers as a kid (back in the 20's and 30's) he used to visit Kawa'aloa Bay with his father and uncles to gather turtle eggs for food. I think next time you come over, we definitely caught to scout this area out. I suspect it to be a hot spot for turtles.

All for now,

Bue

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FISH AND GAME
1151 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

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FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Oct. 24, 1985

George,

I've got a few minutes so I thought I'd drop you a line and enclose this month's tagging data a little earlier.

Ed and Diane are fishing again on a regular basis. DOCARE checked them out in the water last month and declared them legitimate. Also inspected was Hocado who was also declared kosher. Leroy is supposed to dash off a note to that effect to some legislator who help push for the latest amendments to the bullpen regulations.

I went out with them a couple of times this month and tagged a total of 29 new taggings with 5 recoveries so far. One of the turtles (#3 on 10/16) was very heavily infested with tumors all over its body. On the inside of the right front flipper the growth was so large that when I first saw it in the water I thought it was its intestines hanging outside! I don't know how much longer it can possibly live. Only one tag was applied to it as no one wanted to touch the other flipper. I was reluctant to release the turtle thinking (or not knowing if other healthy turtles could be contaminated) maybe we should destroy it. Is there some prescribed way to handle this type of situation? It didn't look like it would last much longer anyway. I took pictures of the growths and will forward you some after they are developed.

I recently met with Kapuiki from Lanai (the one who did the honu chant and hula at the Merry Monarch Festival. Very interesting encounter! She related stories about catching turtles at Pōihua Beach and bring them back on mules. She also told me about a local fisherman who was surfcasting at Polihua and spotted a large turtle on the beach. When he tried to turn it on its back, the animal was too large for him to handle and it escaped. This apparently happened about 3-4 years ago. She and her husband seemed to know their stuff and probably would be an excellent source should you need one on Lanai. His name is Solomon Kapuiki.

I wrote away for several copies of NMFS recent publication concerning the review of subsistence use of sea turtles in the Pacific area and sent one copy to Bob Carpenter in Majuro. There are definitely some violations of the conditions as outlined in the document by Marshallese who take turtles for subsistence. I don't know what Bob can do about it but I felt obligated to at least point the discrepancies out to him.

I'm down to 13 tags and you might want to sent more over as Mederios indicated he will be fishing full time now. Mortgage payments due I guess.

Bice

*P.S. Hope latest addition of funds
doing okay. Adopted right?*

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII



STATE OF HAWAII
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FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Oct. 30, 1985

Dear George,

I had a hunch 17.5 cm over three years was fishy...especially since another one recaptured the same day over the same period of time was measured out to only 8.0 cm. I was too much in a rush and unfortunately too lazy to double check the numbers. I'm glad you caught it. PK's copy was not sent yet so I made the necessary corrections. No...it was not a test but just another mistake on my part. I wouldn't do anything like that because I respect you and your work too much to make a game out of it! You can be assured that I would never pull a backhanded stunt like that on you (didn't we have this discussion before?). Any mistakes I make will be honest mistakes...and if I have a problem with something I'll be sure you'll be the first to hear about it and you won't be getting it from someone else. That's the way it's supposed to be. George, I'm going to say it again...if you can't trust me you won't be able to trust anyone else. Enough said. Actually, the above mistake is embarrassing enough for me and I could have just said yah, it was a test. But that's not the truth. I just plain screwed up!

Looking over your recovery papers, I must admit it stirred up a feeling I thought I had conveniently buried inside. When you first asked if I'd consider approaching Henry about being on the recovery team, I wasn't too eager because I was just burned out doing things like that in the Marshalls. I deliberately told Henry I wanted to be placed on Molokai to avoid meetings, trips, conventions, etc. and just wanted to be left alone for a while. After fisheries treaty negotiations in Tokyo, boundary treaties with Nauru, Solomons, UNDP in Apia, fisheries exchange programs in Taiwan, etc., etc., I was just burned out and wanted to relax a little. Well, I suspect I've relaxed enough and got a little excited reading about your recovery activities and wondered if it would be fun again to get more involved...I still haven't come to terms with that yet. In any case, it looks like PK will be representing DAR but maybe if you feel inclined, you might put in a good word for me when appropriate. I don't suppose it would be too bad to be PK's alternative if he couldn't make it. I suspect I could really be involved personally in a turtle recovery project as I am very interested in sea turtles. Anyway...food for thought.

I haven't been to Halawa lately nor have I heard of any hawksbill juveniles but I'll definitely keep an eye and ear out for them. In regards to the tumor slides, I'll be sure you get copies. Also, I got the tags okay.

Buc

*P.S. Glad to hear you're
enjoying the new
addition!!*

*Will be sure
to visit when next in
Honolulu*

SPC Fisheries Newsletter No. 31 - December 1984

COASTAL FISHERIES AND THE MANAGEMENT OF MANGROVE RESOURCES IN FIJI

by

Padma Narsey Lal
Environment and Policy Institute, East-West Center
Honolulu, Hawaii

1. Introduction

The term "mangrove" raises different images in the minds of different people. To some mangrove areas are nothing but stinky, sloshy muddy areas encouraging mosquitoes and sandflies. To others mangroves are "wastelands" of no value until they have been "developed" through conversion or other means. However, to the indigenous island peoples who depend partly on mangroves for their subsistence or livelihood, mangrove forests provide a source of fuel, timber for construction of houses and canoes, and a variety of fish and crustaceans for food and income.

Mangroves in Fiji have been estimated to comprise between 19,684 ha and 49,777 ha, largely present on the two major islands of Viti Levu and Vanua Levu. Mangrove plants belonging to three families (Rhizophoraceae, Meliaceae and Combretaceae) and four genera have been catalogued. There are about 60 species of plants that are found exclusively in mangrove habitats, which is a characteristic forest ecosystem. Different species of mangroves around the world have been used for a multitude of purposes, as shown in Table 1. In Fiji, as in other Pacific Islands such as Papua New Guinea, Solomon Islands, and Tonga, mangroves are known to be used mainly by rural dwellers on a sustainable basis for firewood, charcoal production, construction purposes, tannin, medicinal purposes, and the collection of fish, shellfish and other animals. As discussed below, mangroves are important contributors to coastal and estuarine fisheries. Apart from these "onsite" benefits, which are generally recognised, mangroves also act as a buffer to storm damage, prevent shore erosion and provide nutrient input into the coastal system because of their presence on the land-water interface.

2. A study of mangrove-associated fishes in Wairiki Creek, near Suva

2.a) Purpose of the study

Although some efforts have been made to study the flora and fauna associated with mangroves, detailed studies of ichthyofauna have not been undertaken. The present study was undertaken by the Fisheries Division of Fiji's Ministry of Agriculture and Fisheries (MAF) with the main objective of obtaining more information on fishes associated with mangroves to assist with the arbitration procedures discussed in section 4. Though initially the study was conceived as a multidisciplinary one aimed at investigating the relationship between mangrove productivity and coastal fisheries, due to a number of unforeseen problems the project was narrowed down to a study of mangrove associated fishes.

Table 1: Products of Mangrove EcosystemsA. Mangrove Forest ProductsFUEL

Firewood (cooking, heating)
Charcoal
Alcohol

CONSTRUCTION

Timber, scaffolds
Heavy construction (e.g. bridges)
Railroad ties
Mining pit props
Boat building
Dock piling
Beams and poles for building
Floor, panelling
Thatch or matting
Fence posts, water pipes,
chipboards, glues

FISHING

Poles for fish traps
Fishing floats
Wood for smoking fish
Fish poisons
Tannins for net and line preservation
Fish attracting shelters

TEXTILES, LEATHER

Synthetic fibres (e.g. rayon)
Dye for cloth
Tannins for leather preservation

FOODS, DRUGS, BEVERAGES

Sugar
Alcohol
Cooking oil
Vinegar
Tea substitute
Fermented drinks
Dessert topping

Condiments from bark
Sweetmeats from propagules
Vegetable from propagules, fruit
or leaves
Cigar substitute

HOUSEHOLD ITEMS

Furniture
Glue
Hairdressing oil
Tool handles
Rice mortar
Toys
Matchsticks
Incense

AGRICULTURE

Fodder, green manure

PAPER PRODUCTS

Papers of various kinds

OTHER PRODUCTS

Packing boxes
Wood for smoking sheet rubber
Wood for burning bricks
Medicines from bark, leaves,
fruit

B. Other Natural Products

Fish
Crustaceans
Shellfish
Honey
Wax
Birds
Mammals
Reptile and reptile skins
Other fauna (amphibia,
insects)

2.b) Study area

Wairiki Creek, which is about 15 km west of the Fisheries Division headquarters at Lami, was chosen as the study site because of its relatively undisturbed catchment area with only a few houses and limited agricultural development. The mean tidal range is about 0.9 m during neap tides and 1.3 m during spring tides. Mangroves in the Wairiki Creek area cover about 60 ha and Rhizophora stylosa, R. x sellala, R. samoensis, Bruguiera gymnorrhiza, Xylocarpus granatum and Lumnitzera littorea, representing all three families which occur in Fiji, have been recorded here. The Wairiki Creek bottom is mainly mud of 0.3m or deeper along the main creek but coralline and rocky surfaces are also present along the coast.

2.c) Sampling method

Monthly sampling of 6 stations in Wairiki Creek was undertaken using 2.5 inch mesh gill nets, which were set in the late afternoon or evening incoming or outgoing half-tides and cleared at the following low or high tides. Efforts to use other qualitative sampling methods such as bush traps or box traps for smaller fish were not successful because of tidal currents.

The fishes were identified using various published keys. With some families, where the taxonomy is uncertain or under review (e.g. Mugilidae, Leiognathidae, Lutjanidae and Sphyraenidae) unpublished keys were kindly made available by specialists working on these groups who also verified identifications in some cases. Standard lengths, weight, gonad weight and stage of gonad development were noted.

2.d) Results

In the 12-month study period, 1,308 individuals belonging to 42 families of fish and two families of crustaceans were caught while utilising the mangrove area as habitat for feeding and/or nursery grounds during various times of the year. The total number of species caught was 92, of which at least 70 species are of direct food value in Fiji. Of the estuarine and coastal fish species, which comprise over 70% of the fish sold in Fiji's markets, 60% were caught during the study period. Table 2 lists the families represented in the catch while Table 3 shows the more common fish species taken.

The species composition of the catch was typical of highly saline estuarine waters. Some species such as Kuhlia bilunulata and Mesopristis kneri were caught mainly after heavy rainfall. These species were also caught in other mangrove rivers with high freshwater runoff. Wairiki Creek, with its low freshwater runoff and low-tide salinity in the range of 20-32 ppt even after heavy rains, and with the presence of coral reefs and deep waters nearby, attracts a number of coralline, coastal species such as those belonging to the Plectrocythidae (harlequin fish), Triakidae (dog-sharks), Chaetodontidae (butterfly fish), and Lutjanidae (snapper) families. Species such as Siganus vermiculatus, and Lethrinus harak were caught in large numbers during dry periods when the water was less turbid.

Table 2: Families of fish and crustaceans caught using 2.5" Gill Net
in Weiriki Creek during May 1982-April 1983

Family	No.	%	Wt.(g)	%
<u>Fish</u>				
Mugilidae	211	16.6	55 704	23.0
Leiognathidae	152	11.6	7 852	3.2
Lutjanidae	140	10.8	31 641	13.0
Mullidae	127	9.7	21 402	8.8
Siganidae	118	8.9	23 989	9.9
Lethrinidae	75	5.5	12 287	5.1
Gerridae	66	5.0	6 832	2.8
Carangidae	67	5.1	8 155	3.4
Apogonidae	14	1.1	-	-
Kuhliidae	28	2.1	3 558	1.5
Polynemidae	25	1.9	3 716	1.5
Acanthuridae	28	1.8	2 430	1.0
Theraponidae	23	1.7	3 233	1.3
Tetradontidae	15	1.1	4 976	2.0
Bothidae	9	.7	352	.01
Monodactylidae	5	.5	-	-
Belonidae	6	.5	3 830	1.6
Sphyracnidae	7	.5	4 056	1.7
Muraenidae	3	.2	4 164	1.7
Serranidae	5	.4	610	.02
Scombridae	2	.2	750	.03
Plotosidae	2	.2	220	.01
Chaetodontidae	3	.2	260	.01
Eleotridae	2	.2	329	.01
Hemirhamphidae	2	.2	582	.02
Dasyatidae	2	.2	1 770	.07
Dactylopteridae	2	.2	170	.10
Trichiuridae	1	.1	600	.2
Megalopidae	1	.1	600	.2
Triakidae	1	.1	1 576	.7
Periophthalmidae	1	.1	70	.01
Platacidae	1	.1	110	.1
Chirocentridae	1	.1	-	-
Muraenesocidae	2	.2	2 300	.9
Solidae	1	.1	350	.1
Priacanthidae	1	.1	-	-
Scaridae	1	.1	-	-
Scorpaenidae	1	.1	-	-
Plectrotychidae	1	.1	140	.1
Fistularidae	1	.1	-	-
<u>Crustacean</u>				
Portunidae	154	11.8	32 829	13.5
Xanthidae	1	.1	-	-
TOTAL	1 308	100	242 422	

Table 3: List of species of which 10 or more individuals were caught using 2.5" gill net in Wairiki Creek during May 1982-April 1983

	No.	Average Weight (gm)	Average Length (mm)	Length Range (mm)
<u>Mullidae</u>				
<i>Upeneus sulphureus</i>	23	186	186	125-270
<i>Upeneus vittatus</i>	71	185	225	105-316
<i>Parupeneus indicus</i>	33	120	214	112-305
<u>Gerridae</u>				
<i>Gerres macrosonna</i>	94	104	124	125-185
<u>Carangidae</u>				
<i>Caranx sexfasciatus</i>	28	96	151	135-215
<i>Caranx papuensis</i>	35	111	163	130-230
<u>Leiognathidae</u>				
<i>Gazza minuta</i>	31	46	123	95-160
<i>Leiognathus equula</i>	107	53	121	80-180
<i>Leiognathus fasciata</i>	14	50	117	96-141
<u>Siganidae</u>				
<i>Siganus vermiculatus</i>	117	198	173	100-290
<u>Lutjanidae</u>				
<i>Lutjanus argentimaculatus</i>	45	429	258	116-470
<i>Lutjanus fulvus</i>	71	126	165	125-255
<u>Lethrinidae</u>				
<i>Lethrinus harak</i>	69	167	195	124-310
<u>Mugilidae</u>				
<i>Valamugil seheli</i>	72	337	259	190-420
<i>Valamugil buechanani</i>	37	268	236	140-271
<i>Liza subviridis</i>	77	203	229	185-340
<i>Liza tade</i>	19	200	220	185-276
<u>Kuhliidae</u>				
<i>Kuhlia bilunulata</i>	27	132	178	155-230
<u>Polynemidae</u>				
<i>Polydactylus plebius</i>	22	147	205	160-303
<u>Acanthuridae</u>				
<i>Acanthurus xanthopterus</i>	28	87	126	100-185
<u>Theraponidae</u>				
<i>Therapon jarbua</i>	22	147	182	135-195
<u>Crustaceans</u>				
<i>Scylla serrata</i>	79	383	135	60-205
<i>Portunus pelagicus</i>	45	-	69	30-105
<i>Portunus sanguinoleucus</i>	39	-	91	40-140

2.e) Discussion

Because of high diversity, the small standing crop of any one species, limitations of the sampling techniques and few individuals being caught during any one sampling trip, it was not possible to ascertain definitely which species utilised mangrove for spawning purposes and/or as nursery grounds and feeding areas. However, some general observations on the more common species can be made.

Mullidae (goatfishes), and Mugilidae (mulletts) which were caught all the year round appear to use mangroves as a habitat for feeding as well as nursery grounds, as do Leiognathidae (pony fish), and Gerridae (slipmouths), of which families individuals with mature gonads were also caught. Juvenile Lutjanus argentimaculatus (mangrove jack), various species of Carangidae (trevallies), and Acanthuridae (butterfly fish) were caught all year round and appear to use the mangrove creek as a nursery ground. No adults of these species were caught.

Siganidae (rabbit fish) were caught all the year round, though only two individuals caught in January had ripe gonads. Juveniles of commercially important species such as Sphyraenidae (barracudas), and Carangidae (trevallies) were also caught. Other species such as the eels, though caught in small numbers, appear to utilise mangroves as a habitat for breeding and feeding as well as nursery grounds. Crustaceans, of which Scylla serrata (mangrove crab) is the most important species, were caught all the year round, at various stages of maturity.

3. Mangroves and the Coastal Fishery

Commercial fisheries in the tropics are largely dependent upon coastal and estuarine fishes. In Fiji, over 70% of the fishes landed in municipal markets are coastal or estuarine species mainly dominated by Mugilidae, Siganidae, Carangidae, Lutjanidae and Lethrinidae. Of these over 60% of the species were found to spend some time in the mangroves. It has been roughly estimated that at least 30% of the commercial fishery is intimately tied in with mangroves.

Mangrove estuaries are one of the most productive natural systems, the mangroves being the primary source of nutrients for the aquatic organisms which provide the basis for the secondary productivity of the estuarine and coastal zone. In Fiji, about 1,100 gm/m²/year of litterfall have been recorded, which compares with litterfall of 1,000 gm/m²/year in Queensland recorded by J. Bunt and co-workers at the Australian Institute of Marine Sciences. Detritus forms the basis of the food chain within the estuary and coastal zone; detritivorous fauna then in turn provide food for organisms of higher trophic levels. Though the actual correlation between the fishery production and mangrove estuarine area is not fully understood, as few specific examples are available, it is gradually becoming apparent that coastal fisheries are often dependent upon mangrove survival. For example in Indonesia, recent investigations have indicated close correlation between mangrove estuarine acreage and annual yield of penaeid shrimps.

For developing countries and particularly for the small island nations of the Pacific with limited natural resources and considerable dependence on coastal fisheries, rational management of mangrove resources is essential for the conservation of their coastal fisheries. This can be achieved by managing mangroves for multipurpose utilisation and by avoiding or preventing activities which reduce natural primary productivity.

4. Historical 'development' of Fijian mangrove areas

Though the value of mangrove areas may be recognised, policy in many countries places emphasis on short-term economic development rather than longer-term objectives. This frequently results in a piecemeal approach to provide solutions to immediate problems under which mangroves have been allowed to be irreversibly converted or exploited for various purposes. For example, in Fiji where there are increasing demands for flat lands for agriculture and aquaculture, and for waterfront lands for industrial and residential purposes, and where an apparent shortage of land has resulted from the present land tenure system, "new lands" have been "created" by reclaiming mangrove areas. In the process highly productive mangroves have been reclaimed for recreational and industrial purposes (Table 4). Also, with increasing urban populations and mounting waste disposal problems, mangrove swamps have been used as refuse dumping sites by local councils and public. These irrational conversions to provide short-term solutions to immediate problems are not only found in Fiji but have also been prevalent on the South American, Asian and Australian continents.

In Fiji several attempts have been made to "manage" the mangroves. Management measures have included a moratorium on mangrove exploitation, the issue of forestry licenses for timber and charcoal production, and the creation of an arbitration procedure to compensate the indigenous Fijians who own customary fishing rights, for estimated losses incurred as a result of mangrove reclamation. The moratorium was lifted after numerous complaints from the indigenous population who were also prevented from subsistence use of resources. The forestry licences are still issued but only for domestic use of mangroves for fuel, firewood, etc., where large scale reclamations are not licenced. The arbitration procedure is the only form of "management", if it can be called that, which is presently enforced.

Under the arbitration procedure, the value of loss of resources and the right to fish due to "development" changes is determined by the government appointed arbitrator and is to be paid to the traditional fishing right owners by the developer. The value of this compensation has varied from F\$900 for 20 ha to F\$9,500 for 7.6 ha. Though the arbitrator's decision is based upon submissions made by the Fisheries Division and Forestry Department of MAF and traditional fishing right owners, it has been recognised that meaningful information on the real value of mangrove resources is limited, that decisions must therefore be made on an ad hoc, individual basis and that more information and a structured approach to management is required. Also, it is accepted that the arbitration system is not adequate for conservation as usually the arbitration hearing is the last step before the actual destruction of mangroves.

5. Future management of mangrove resources

The Fisheries division, realising the need for a structured management approach to conserve mangroves, organised an interdepartmental workshop in February 1983. The general conclusion of the workshop, which was subsequently endorsed by the Fiji Government Cabinet in August 1983, was that a National Mangrove Management Plan was urgently required and that a zone map should be prepared and adopted indicating areas where different types of mangrove use were to be allowed. The workshop report is available from the MAF as Fisheries Division Technical Report Number 5.

Table 4: Mangrove Reclamations approved since 1980

Where comments are not made reclamations have been for urban or industrial development

Location	Area (ha)	Comments
<u>Suva Peninsula</u>		
Narain Construction, Lami	4.5	
Tamavua River by Ministry of Lands	13	
Bhindi Brothers, Vatuwaqa	2.6	
Fiji Industries, Lami	11	
Lami Town Council Park	13	Recreation
Ika Corporation, Lami	1	
Suva City Council	39	Mangrove plus mudflat
Lami Town Council	2.9	
Nabua Road, PWD	7.6	
Laulala Beach Estate, Burgess Interstate Ltd.	20	
Walu Bay, Edinborough Drive	.5	
<u>Rewa Delta</u>		
Waidamu River	200+	Agricultural purposes
<u>Ba Delta</u>		
Sarava	70	Agricultural
Votua	25	"
<u>Labasa Delta</u>		
Seaqaqa sawmill	4.5	Approved in principle
Malau-Simpson Brothers	1.5	Approved in principle
Malsu, Fiji Industries	8.5	
Vakamasuasua	22+	
Malau, Ministry of Commerce	2.2	
Bua reclamation	71	Agriculture
<u>Lautoka-Nadi</u>		
Maqalevu	32	Agriculture
Drasa North, Central and Southern	95	"
Saweni Beach Tourist Development Fiscal Industries	493	Approved in principle
Vitogo	18	Agriculture
Lovu	40	"
Teidamu	5	"
Lomolomo	60	"
Navaksi	50	"
Lomawai	20	"
	1,300	
Other large-scale reclamation undertaken prior to 1980		
Penang	160 ha	
Rarawai	320 ha	
Tabicola	120 ha	
Wailevu	900 ha	
Dreketi	150 ha	
Nasea	1,230 ha	
Wainikoro	470 ha	

However, problems still remain with the preparation of a National Mangrove Management Plan. Figure 1, which was prepared at the recently held Mangrove Workshop at the Environment and Policy Institute at the East-West Center, Honolulu, Hawaii provides a preliminary guideline. Even where resources for compiling mangrove data bases are limited, management plans can and should still be developed, although later modifications may be needed.

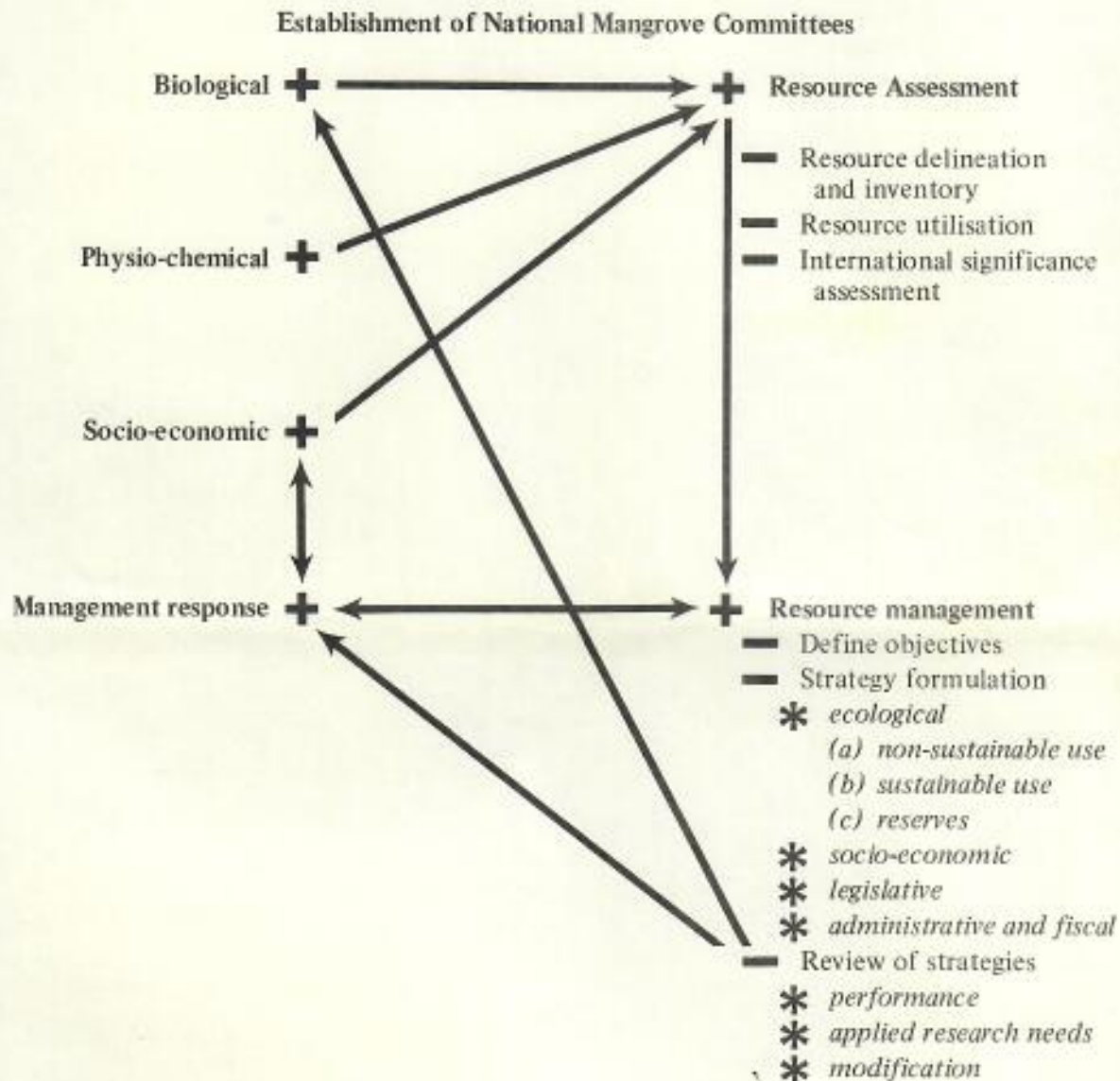


Figure 1: Features of National Plans and Mangrove Data Base, showing most important linkages.

Source: Mangrove Managers Handbook (in preparation), Environment and Policy Institute, Honolulu, Hawaii.

Island nations in the Pacific need to prepare their own national mangrove management plans for the rational utilisation of mangroves which would take into account the need for conservation of coastal fisheries.

REPORT OF CONSULTATION

Family Name	First Name	Middle Name	Room No.	Hosp. No.
From: Attending Physician			To: Consulting Physician	
				Date

Findings:

Box 789
~~Box~~ Kawakabai (2 Nov 85)
 96748

Dear Mr. Balogh,

Sorry to take so long to answer.

Diagnosis:

Thank for the information. Yes, I

regularly visit and dive the Moomomi

area on Molokai. In (1984) I saw

10 or 12 nesting "hacks"; two in Jan and

Recommendations:

the rest June-July. I observed no

Keiki's. No nesting in '85. I'll

keep you a Bill posted if I see.

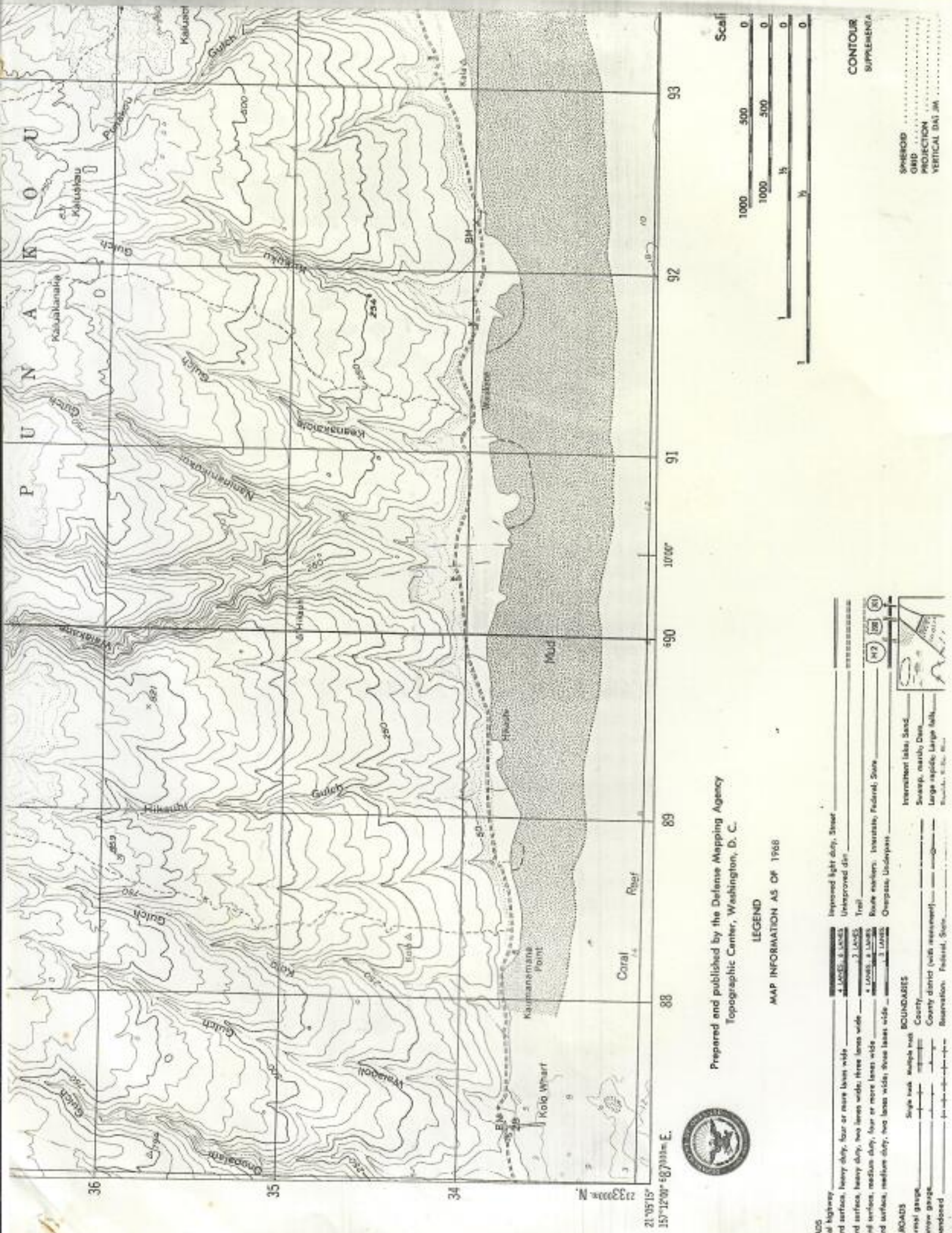
Thanks,

Dick Longen M.D.

Date of consultation: _____

Signature of Consultant

M.D.

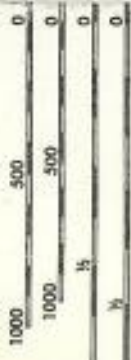


Prepared and published by the Defense Mapping Agency
 Topographic Center, Washington, D. C.



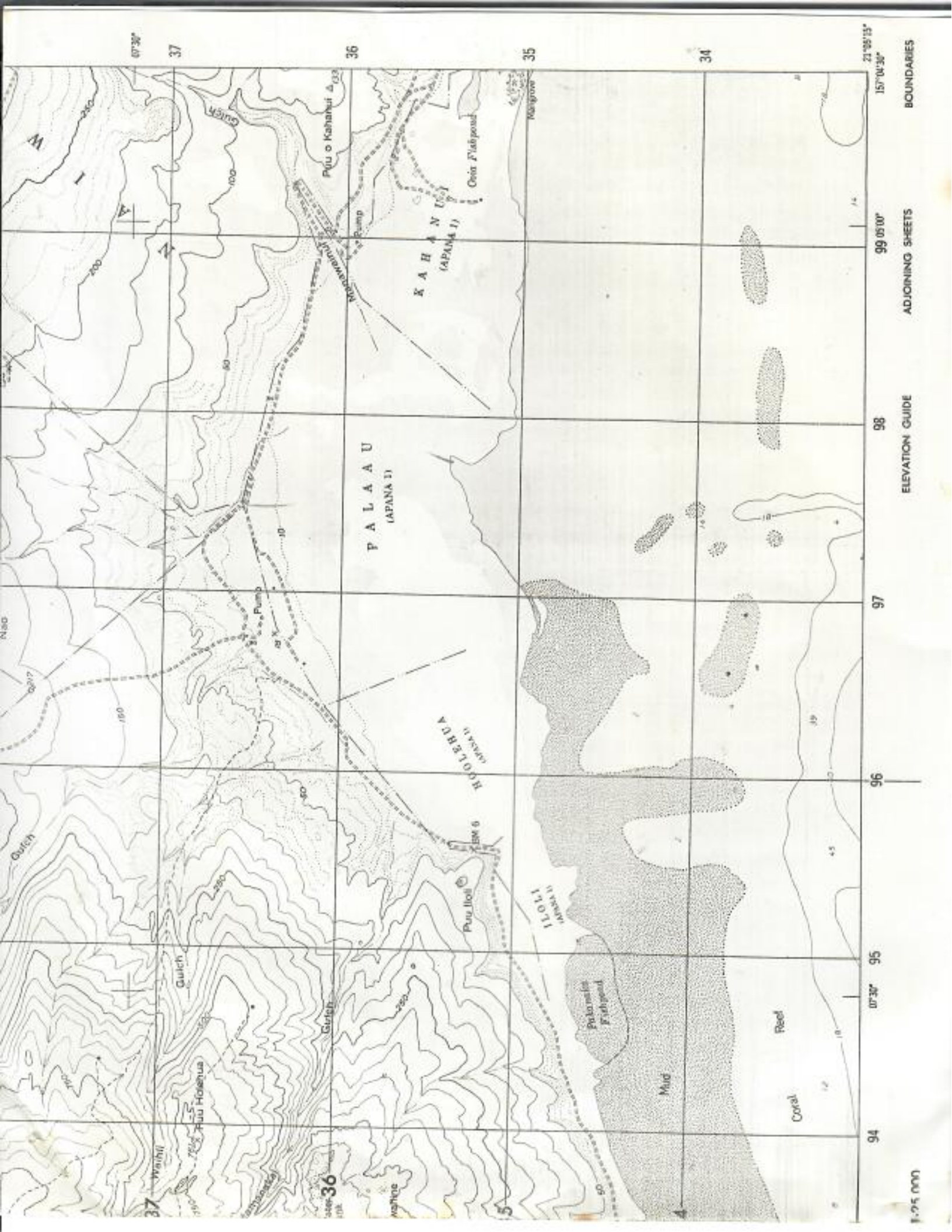
LEGEND
 MAP INFORMATION AS OF 1968

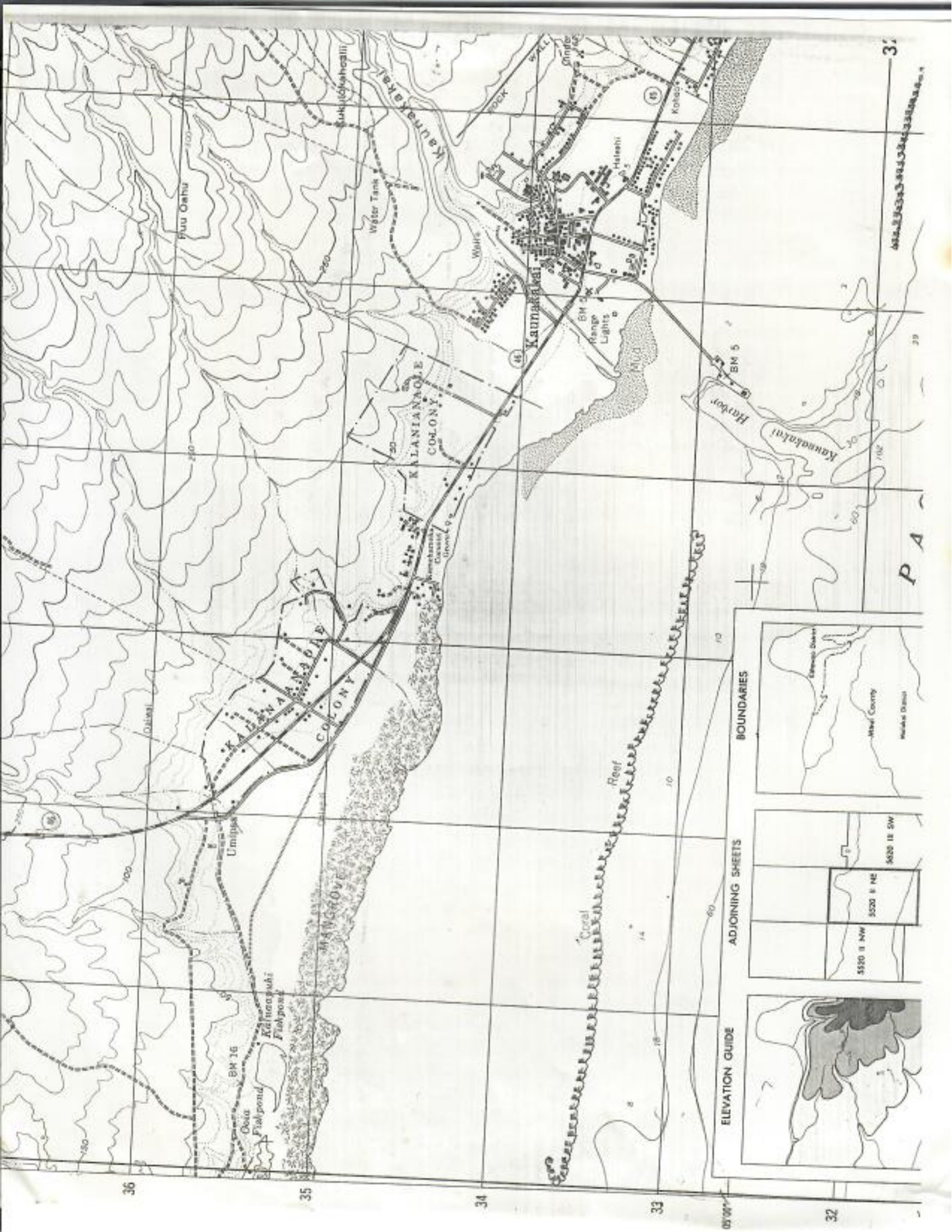
ROADS	Interstate highway	Improved light duty, Steep
Interstate highway	4 LINES, 3 LINES	Unimproved dirt
Interstate highway	3 LINES, 2 LINES	Trail
Interstate highway	2 LINES, 1 LINE	Route markers: Interstate, Federal, State
Interstate highway	1 LINE	Overpass, Underpass
Interstate highway	2 LINES, 1 LINE	Intermittent (aka) Sand
Interstate highway	1 LINE	Swamp, marshy Dune
Interstate highway	1 LINE	Large rapids, Large falls
Interstate highway	1 LINE	Reefs, etc. See
BOUNDARIES	Single line	County
County	Multiple line	County district (with measurement)
County district (with measurement)	Dashed line	Reservation, Federal, State
Reservation, Federal, State	Dotted line	
	Dotted line	
	Dotted line	



CONTOUR
 SUPPLEMENTA

SPHEROID
 GUMB
 PROJECTION
 VERTICAL DATUM





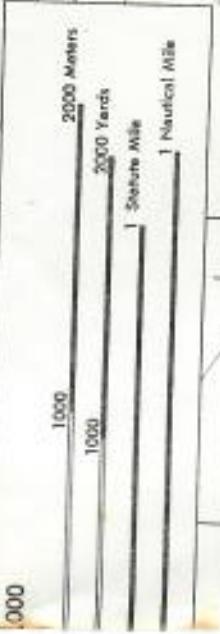
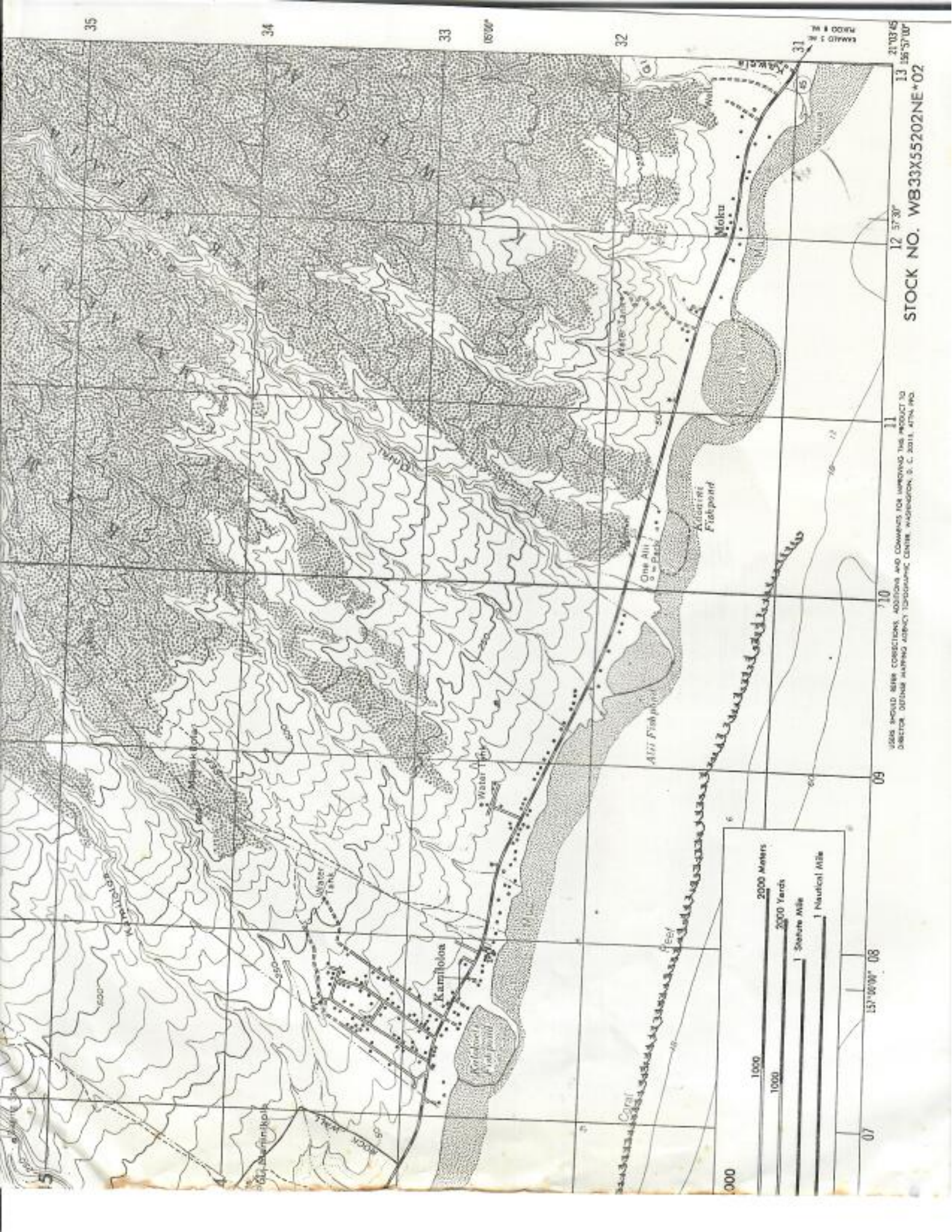
ELEVATION GUIDE

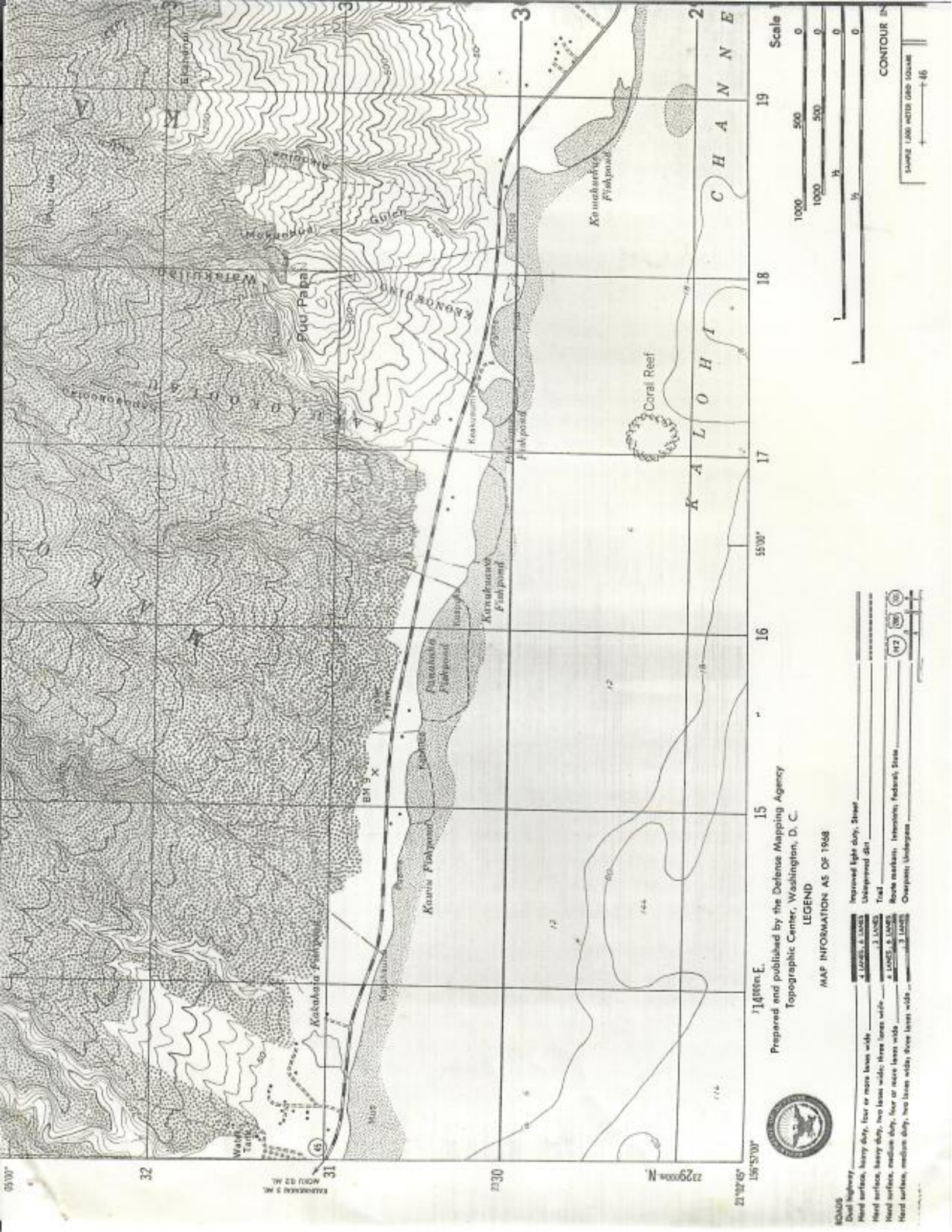
ADJOINING SHEETS

	5550 ft NW	5550 ft NE	5620 ft SW

BOUNDARIES

Edmonds District
Maunaloa District
Kaneohe District





21°37'45" N
156°57'00" E

32

31

229000 N
1565700 E

30

29

28

27

26

25

24

23

22

21

20

19

18

17

16

15

14

229000 N
1565700 E

32

31

229000 N
1565700 E

30

29

28

27

26

25

24

23

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21

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19

18

17

16

15

14



Prepared and published by the Defense Mapping Agency
Topographic Center, Washington, D. C.

MAP INFORMATION AS OF 1968

LEGEND

- Dual highway
- Hard surface, heavy duty, four or more lanes wide
- Hard surface, heavy duty, two lanes wide; three lanes wide
- Hard surface, medium duty, four or more lanes wide
- Hard surface, medium duty, two lanes wide; three lanes wide
- Improved light duty, three
- Unimproved dirt
- Trail
- Route markers: International; Federal; State
- Overlays: Underpass

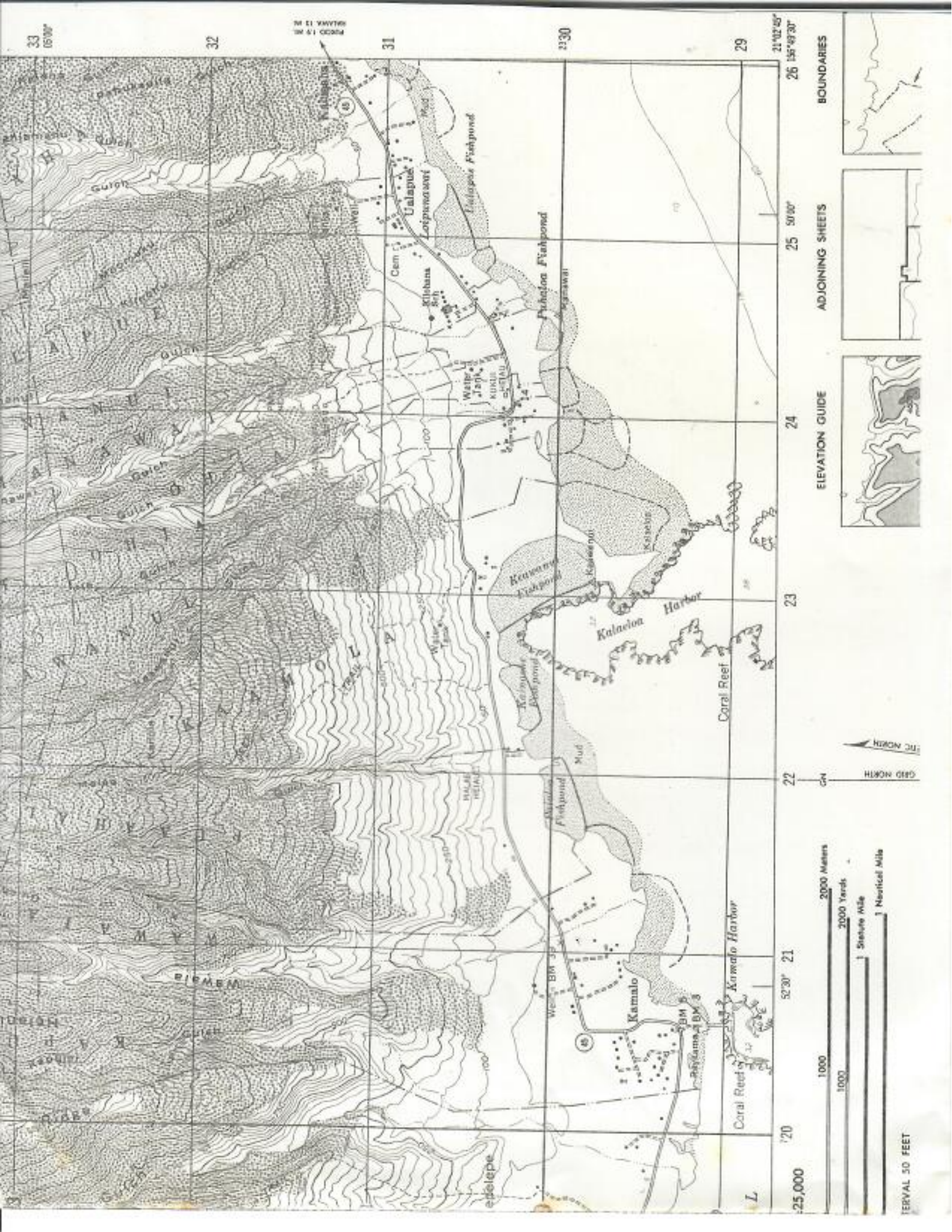
Scale



CONTOUR IN



1:46



33
15°00'

32

15° 11' 30" N
156° 41' 00" W

31

30

29

21°02'45"
156°49'30"

26

25

24

23

22

21

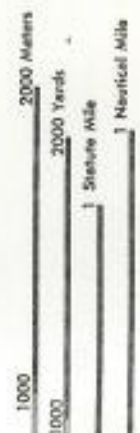
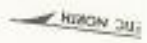
20

BOUNDARIES

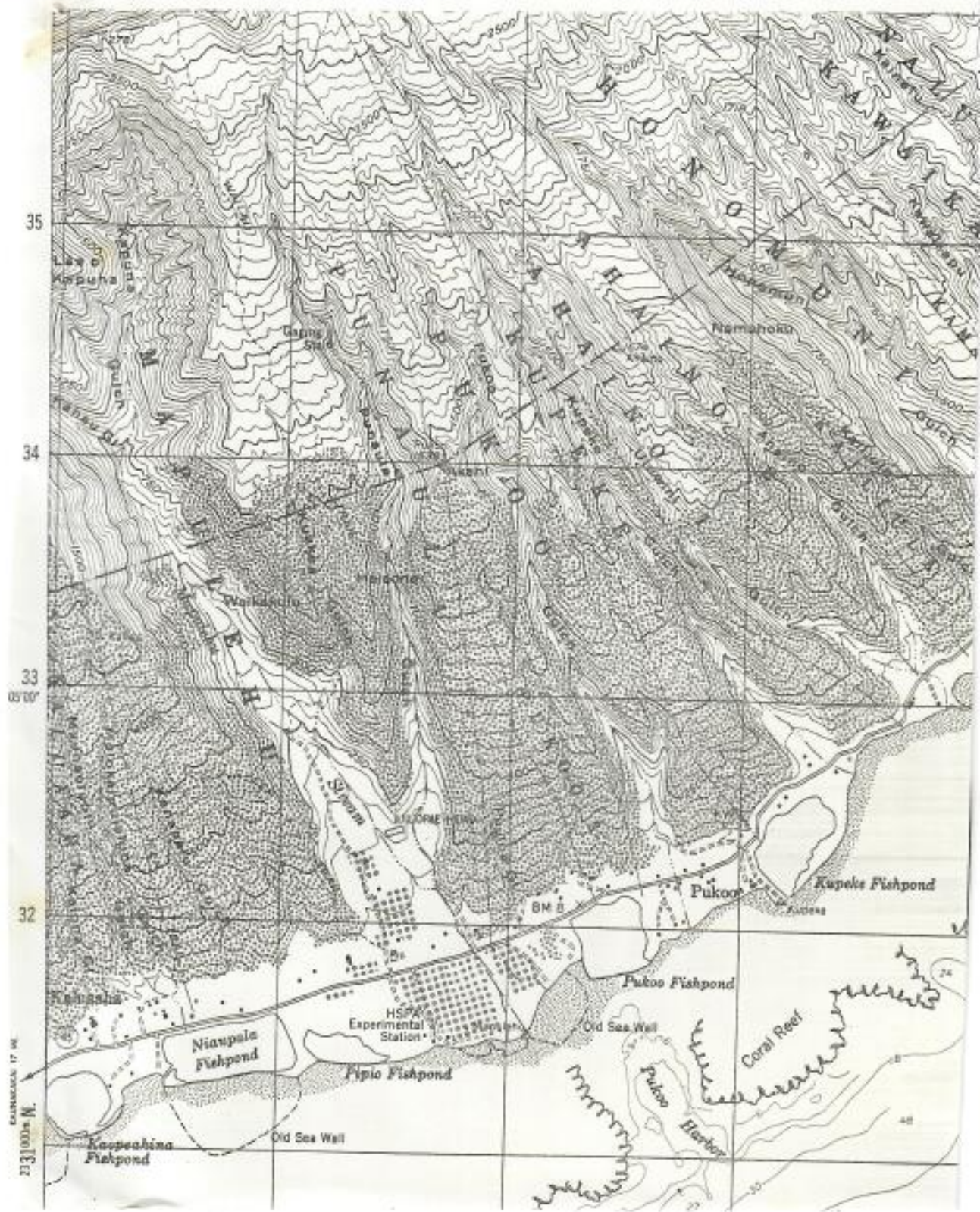
ADJOINING SHEETS

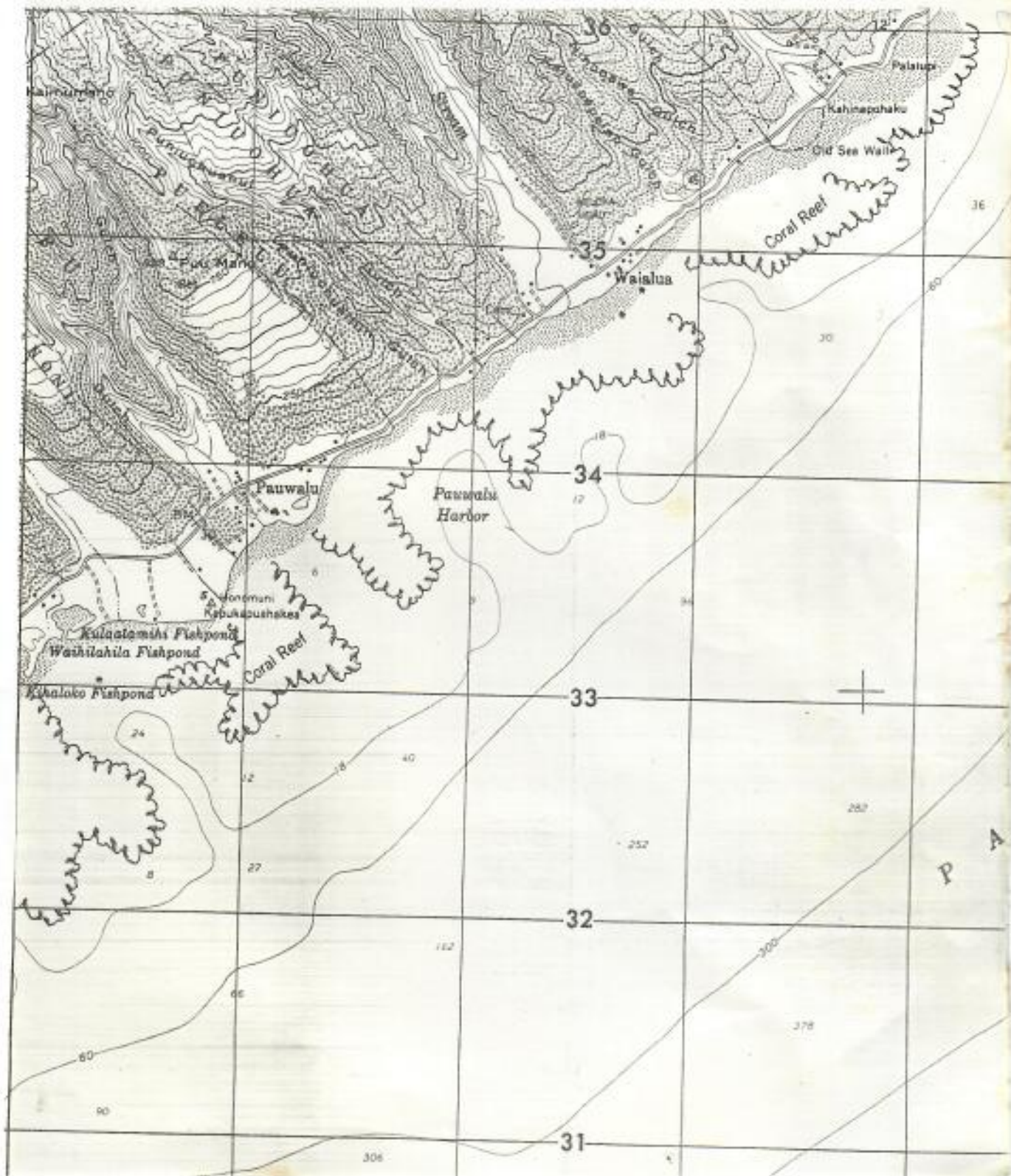
ELEVATION GUIDE

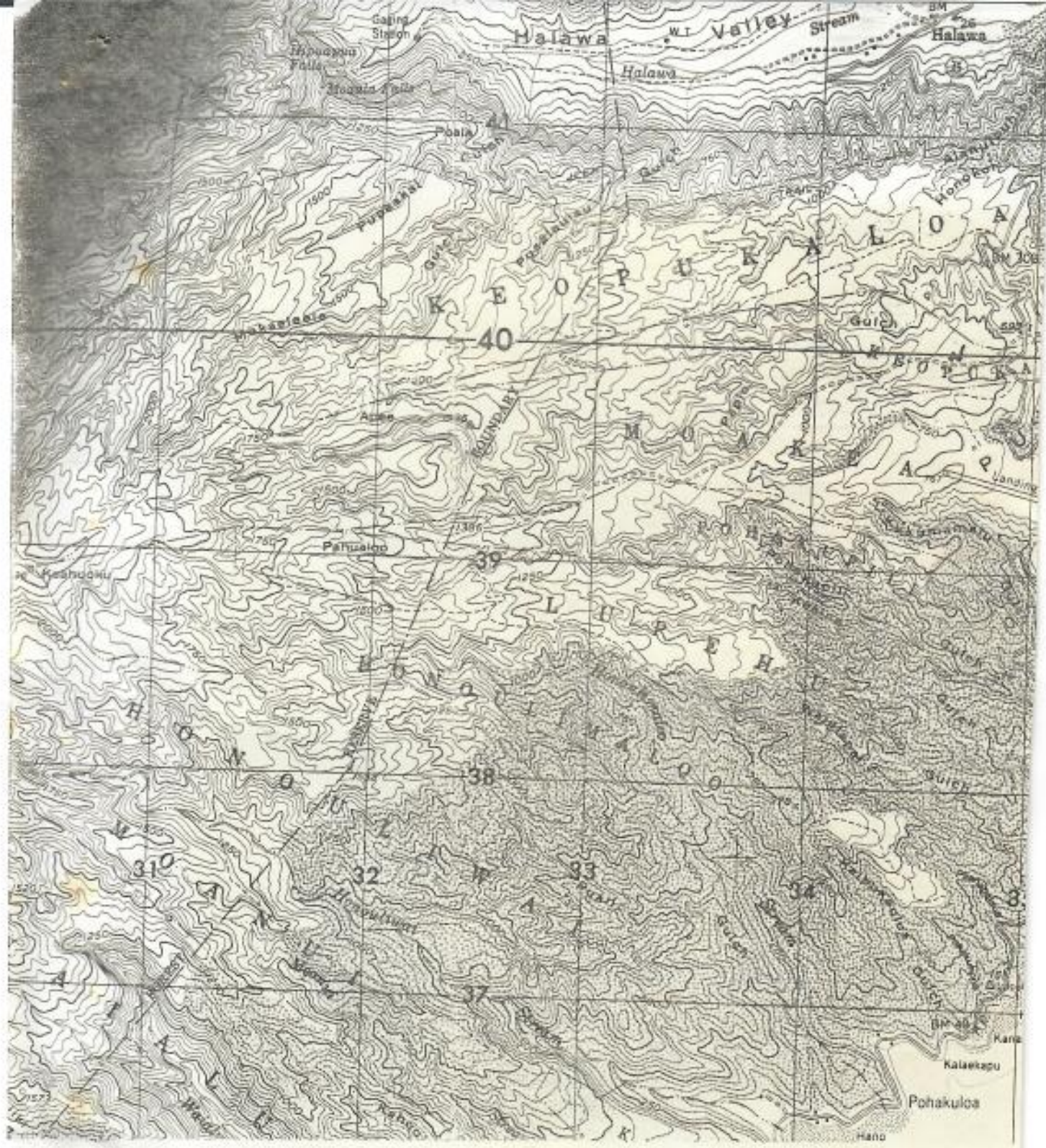
GRID NORTH

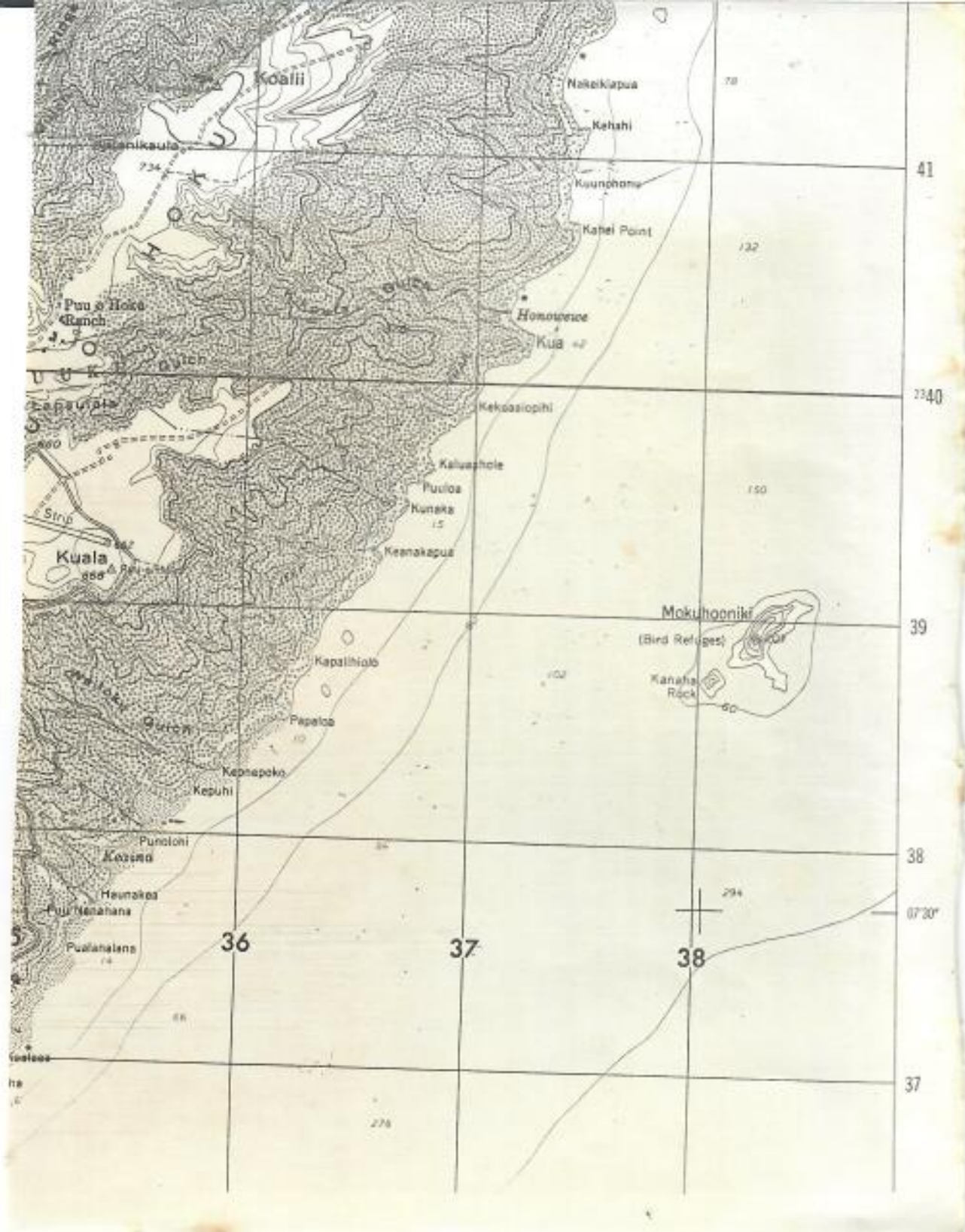


INTERVAL 50 FEET











U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center
Honolulu Laboratory
P. O. Box 3830
Honolulu, Hawaii 96812

MR. NATHANIEL BURROWS
Box 396
KAUNAKAKAI, MOLOKAI

19 FEB 1986

DEAR MR. BURROWS:

MR. BILL PULELOA GAVE ME YOUR NAME AND ADDRESS, AT MY REQUEST, AFTER I LEARNED THAT YOU ARE VERY FAMILIAR WITH THE PALA'AU COASTLINE OF MOLOKAI, INCLUDING WHAT IT WAS LIKE YEARS AGO. I AM INVOLVED IN STUDIES OF THE HAWAIIAN GREEN TURTLE AND, WITH BILL'S HELP, HAVE CAPTURED TURTLES FOR TAGGING AT PALA'AU. I WOULD LIKE TO OBTAIN INFORMATION ON THE HISTORY OF TURTLES AT PALA'AU. DID THEY EVER LAY EGGS ALONG THERE? WERE THEY MORE ABUNDANT IN THE PAST? WAS IT COMMON TO CAPTURE LARGE ONES THERE (OVER 200 LBS)?

WOULD IT BE POSSIBLE FOR YOU TO WRITE TO ME WITH ANSWERS TO THESE QUESTIONS? OR, IF YOU PREFER, SEND ME YOUR TELEPHONE NUMBER AND I WILL CALL YOU.

I HAVE ENCLOSED SOME MATERIAL ABOUT SEA TURTLES THAT YOU MAY ENJOY.

BEST REGARDS,
GEORGE BALAZS
ZOOLOGIST

FORM CD-45
(REV. 3-76)

U. S. DEPARTMENT OF COMMERCE

2. CHECK APPROPRIATE BLOCK

SUPPLY, EQUIPMENT OR SERVICE ORDER

 PROCUREMENT OTHER (Specify)

FOR: National Marine Fisheries Service

1. THE NUMBER SHOWN IN BLOCK 5 MUST APPEAR ON ALL SHIPMENTS AND/OR DOCUMENTS RELATING TO THIS ORDER †

3. REQUISITIONER DOCUMENT NO.

4. BUREAU CONTROL NO.

5. PURCHASE ORDER NO.

82-JJA-00408

6. ISSUED TO:

Edward Medeiros
P.O. Box 1216
Kaunakakai, Molokai, Hawaii
96748

7. DESTINATION

S
H
I
P
T
ONational Marine Fisheries Service
P.O. Box 3830
Honolulu, Hawaii 96812

8. ACCOUNTING CODE

FT2000/88C5H1MS/2517

9. QUOTATION REF. OR CONTRACT NO.

open market

10. DISCOUNT TERMS

11. DELIVERY
F.O.B.

12. GOVT. B/L NO.

13. DELIVERY DATE

14. FUNDS AVAILABLE (Budget Office)

14a. STATION

ITEM NUMBER		17. DESCRIPTION	18. QUANTITY	19. UNIT	20. ESTIMATED TOTAL CGST	21. ACTUAL	
15. LINE NO.	16. DO NOT USE					UNIT PRICE	TOTAL COST
		Service for preliminary survey of sea turtles on the island of Molokai.			agreed sum of		\$100.00

22. SIGNATURE OF REQUISITIONER

DATE

23. SIGNATURE APPROVING OFFICER

DATE

TITLE

TITLE

24. ACCOUNTABLE
PROPERTY

INITIALS

25. NOT AVAILABLE-
BUREAU STOCK/
EXCESS

INITIALS

26. SIGNATURE-BUREAU CONTROL OFFICER

27. NOT AVAILABLE-
DEPARTMENT
STOCK/EXCESS

INITIALS

28. APPROVAL

DATE

29. PURCHASING AGENT

DATE

Lynakamura

8/23/82

30. RECEIPT ACTION - Quantities shown in Column 18 above have been received and accepted, except as follows: (If additional space is needed, use reverse side.)

31. SIGNATURE-RECEIVING OFFICER

DATE

32. PROPERTY CONTROL NO.

 TRADE-IN RECEIVING REPORT33. SEND INVOICES
IN DUPLICATE
TO: →

Southwest Fisheries Center
Honolulu Laboratory
2570 Dole Street
Honolulu, HI 96822-2396

May 7, 1986 F/SWC2

Mr. Wadsworth Y. H. Yee
Grand Pacific Life Insurance Co.
888 Mililani Street
Honolulu, HI 96813

Dear Wads,

Many thanks for your informative letter of April 17th calling attention to the concentration of green sea turtles in resident foraging and resting habitat at Palaau on Molokai. Our biologists have been aware of this important site for several years now. Habitat assessments and tagging studies have been started and we hope to do more work there as funds and personnel permit. Our research at Palaau has been conducted in close cooperation with a commercial fisherman on Molokai and the resident State of Hawaii aquatic biologist. One of our findings at this important location is that the turtles grow at a slow rate, in the order of only 2.5 cm (or 1 inch) per year in straight-line carapace length. Green turtles in Hawaii reach sexual maturity at a minimum of 32 inches in carapace length, or a mean carapace length of 36 inches.

Your concern about the incidental take of turtles in gill nets at Palaau is shared by us, as we have documented this source of mortality on several occasions. We have previously notified our enforcement branch about this problem, but will do so again by copy of this letter.

Sincerely,

Richard S. Shomura
Director, Honolulu Laboratory

cc: Gene Witham

Balazs
DO
HL

**GRAND PACIFIC
LIFE INSURANCE CO.**

888 Mililani Street
Honolulu, Hawaii 96813
Telephone 808/548-5101

WADSWORTH Y. H. YEE, J.D.
Chairman of the Board
Chief Executive Officer

April 17, 1986

*4/23
RBS
Shue
P. H.
provide info
to Wadsworth
A.*

Mr. Richard Shomura
Director
Honolulu Laboratory
National Marine Fisheries Service
P. O. Box 3830
Honolulu, Hawaii 96812

Dear Dick:

As I mentioned to you before, Paalaa located on the leeward side of Molokai has been an excellent resting spot for Green Sea Turtles. Whenever we fish in the area, we see some turtles bobbing up and down in the water. I am enclosing a few pictures showing the turtles swimming away from us as we get close.

It bothers me a lot because I see some fishermen laying a mile of gill nets in this area, and I can't help but feel that they catch some turtles from time to time. Whether or not they let them go, I have no idea. But, I certainly feel that your office should make your presence known on Molokai to prevent any depletion or illegal taking of Green Sea Turtles.

Sincerely,



WADSWORTH YEE

WY:ly

Enclosure

35

34

33

32

31

21°53'45"

13 31'30"

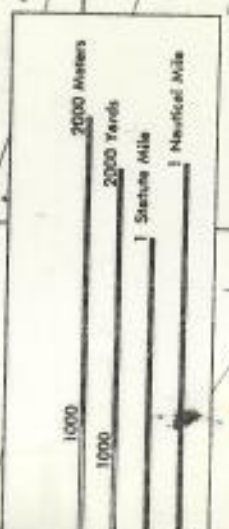
13 18'57"00"

STOCK NO. W833X55202 NE*02

USGS SHOULD WITH CORRECTIONS, ADDITIONS AND COMMENTS FOR UNUSING HAS SUBJECT TO DIRECTOR OFFICE MARINE AGENCY HYDROGRAPHIC CENTER WASHINGTON, D. C. 20513 4174 140

From Bill Fubla
Arthur Pura 1-28-86
Site " "

Some where in the
general area
(flowy map!)
get the see



157°00'00" 08

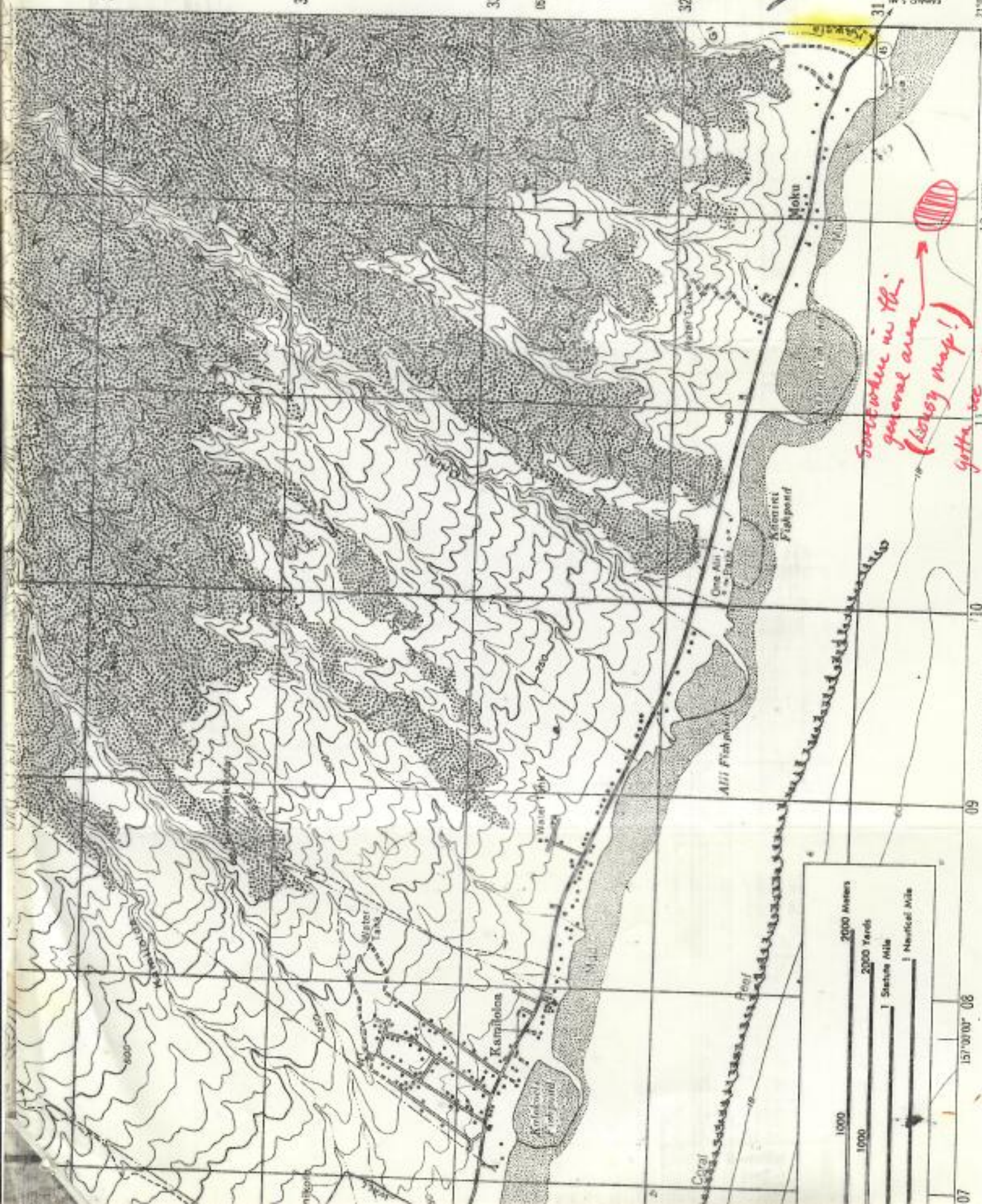
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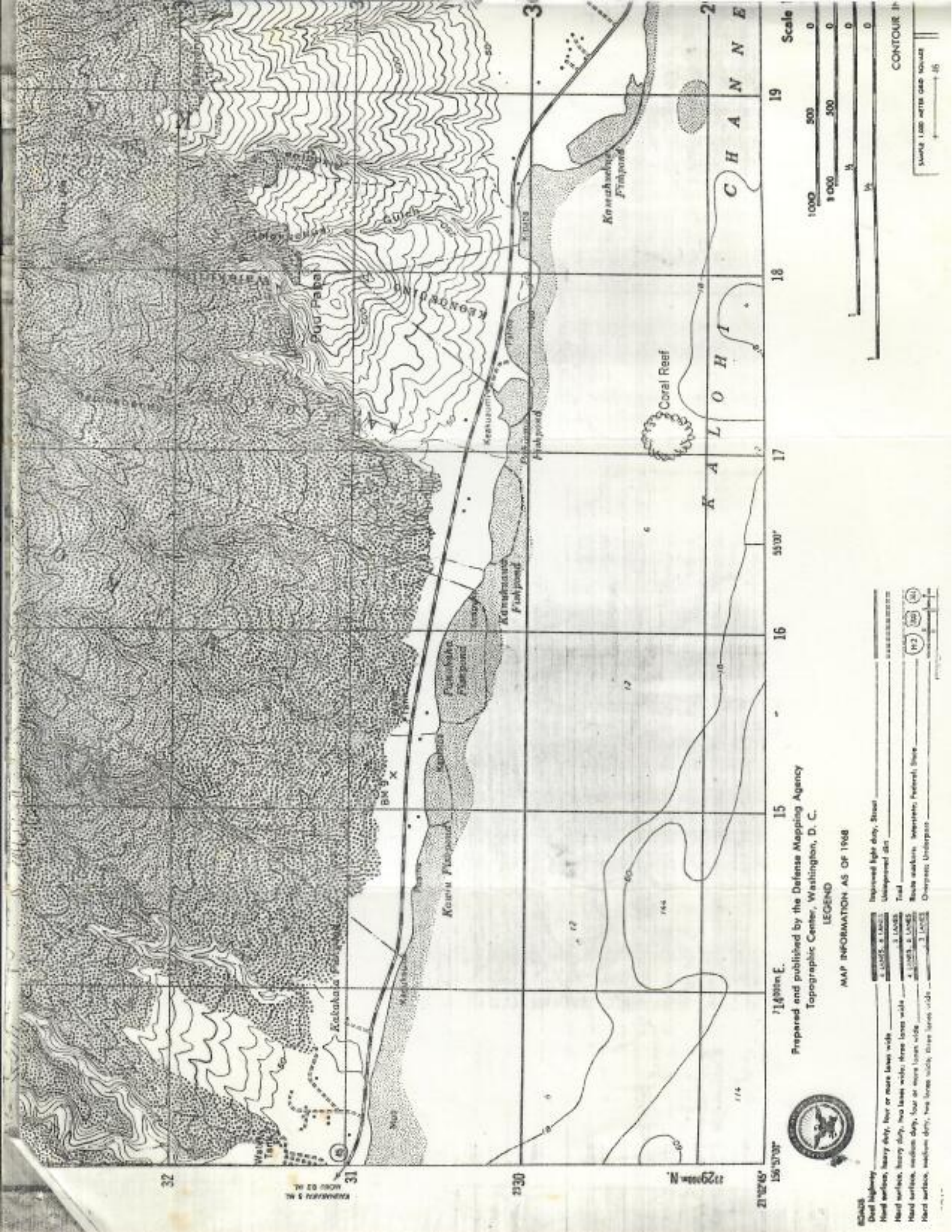
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12 31'30"

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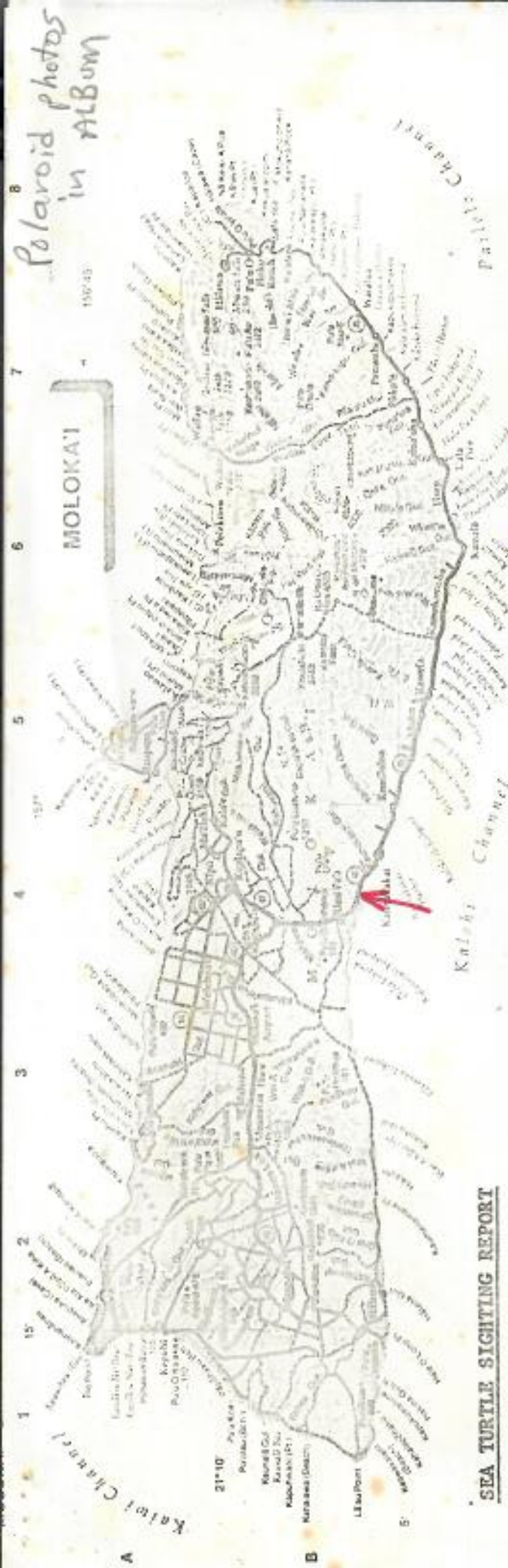
Prepared and published by the Defense Mapping Agency
 Topographic Center, Washington, D. C.

LEGEND
 MAP INFORMATION AS OF 1968

- | | |
|---|-----------------------------|
| Dead highway | Improved light duty, 3-lane |
| Head surface, heavy duty, four or more lanes wide | Unimproved dirt |
| Head surface, heavy duty, two lanes wide; three lanes wide | Trail |
| Head surface, medium duty, four or more lanes wide | Track |
| Head surface, medium duty, two lanes wide; three lanes wide | Drainage Underpass |



CONTOUR 10
 SCALE 1:50,000 METERS
 0 500 1000



SEA TURTLE SIGHTING REPORT

Thank you for your cooperation

Observation made by Bill Puelo Date 4/22/84 Time _____

Address & Tel. No. (optional) _____

Location (indicate on chart) _____

Observation made from: shore;
 boat; or while skin
 SCUBA diving.

Estimated size (shell length) 70cm - 85cm (straight)

Turtle seen on: _____ surface; or at depth
of approx. _____ ft.

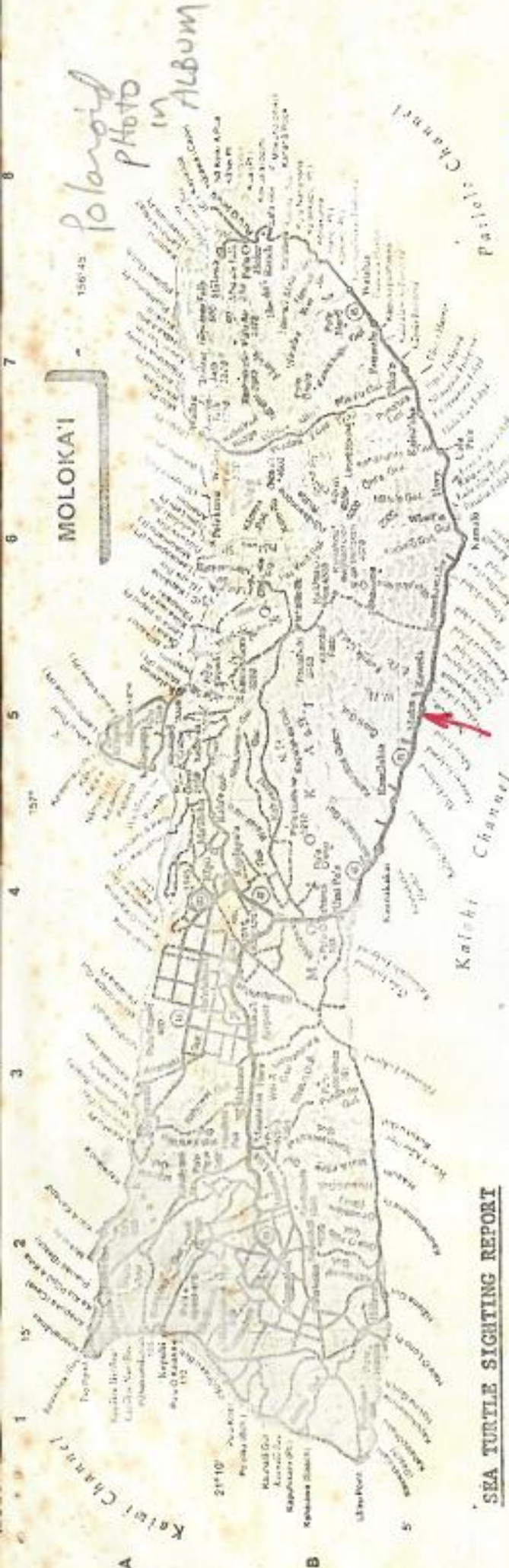
Distinguishing characteristics (species
I.D. if known, long tail, shell color,
tags, injuries, etc.): Remains

seen at dumping site
at Kalamauka.

Other comments: Evidence reported
to DOCARE & NMFS
4/23/84.



Please return to: George H. Balazs; Hawaii
Institute of Marine Biology; P. O. Box 1346;
Lanai, HI 96744; Tel. 247-6631



Observation made by Bill Puleloa Date 2-15-84 time

Address & Tel. No. (optional)

Location (indicate on chart) KAWELA

Observation made from: shore; ~~boat~~
SCUBA diving; or while skin

Estimated size (shell length) 98.0 cm x 72.0 cm
 (straight)

Turtle seen on: surface; or at depth 105.0 cm x 94.5 cm
 of approx. ft. (curve)

Distinguishing characteristics (species I.D. if known, long tail, shell color, tags, injuries, etc.):

All four flippers cut off
NECK SUIT.

Other comments: Reported to
NMFS 2/16/84.

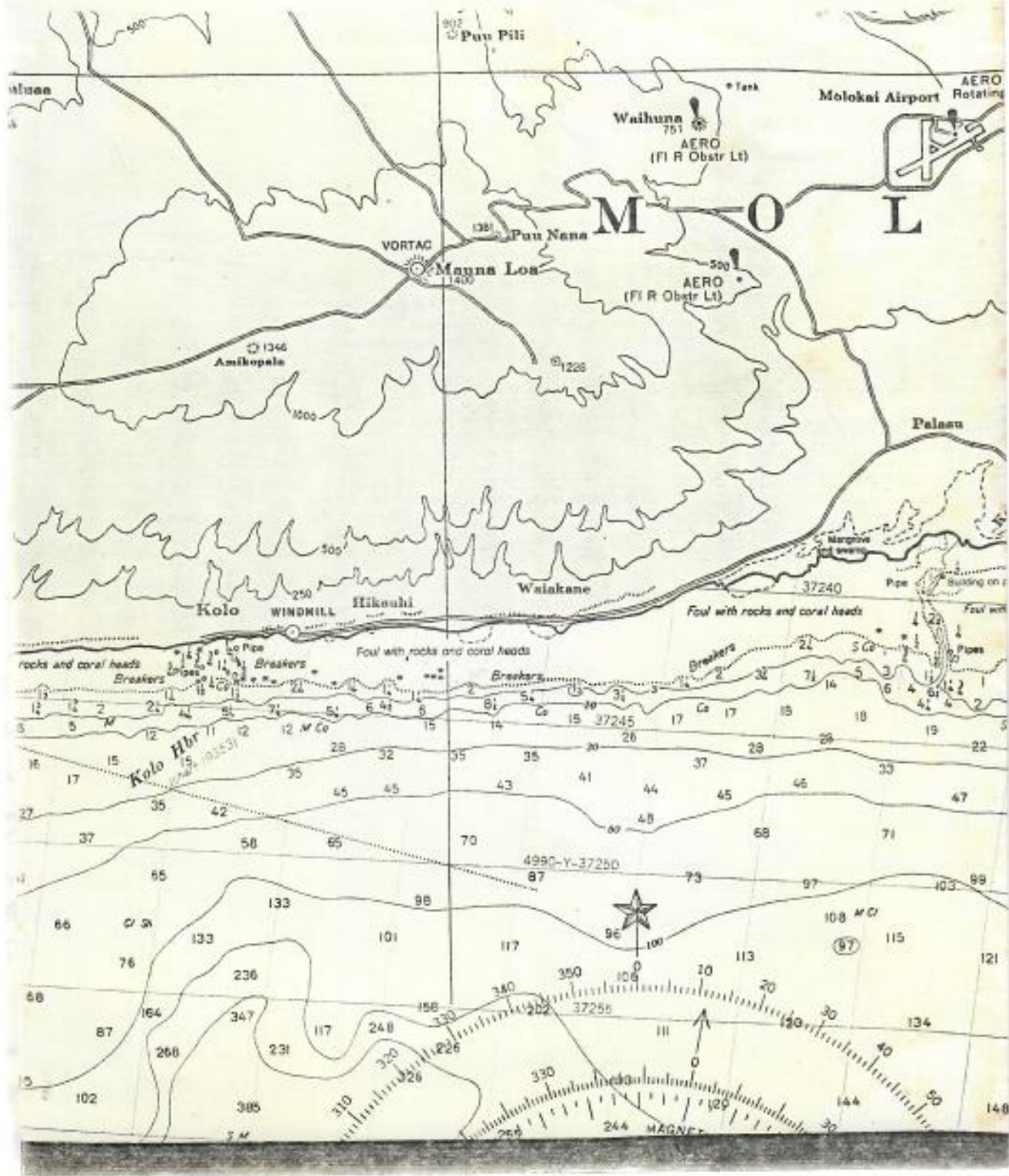
DOCARE Notified same night.

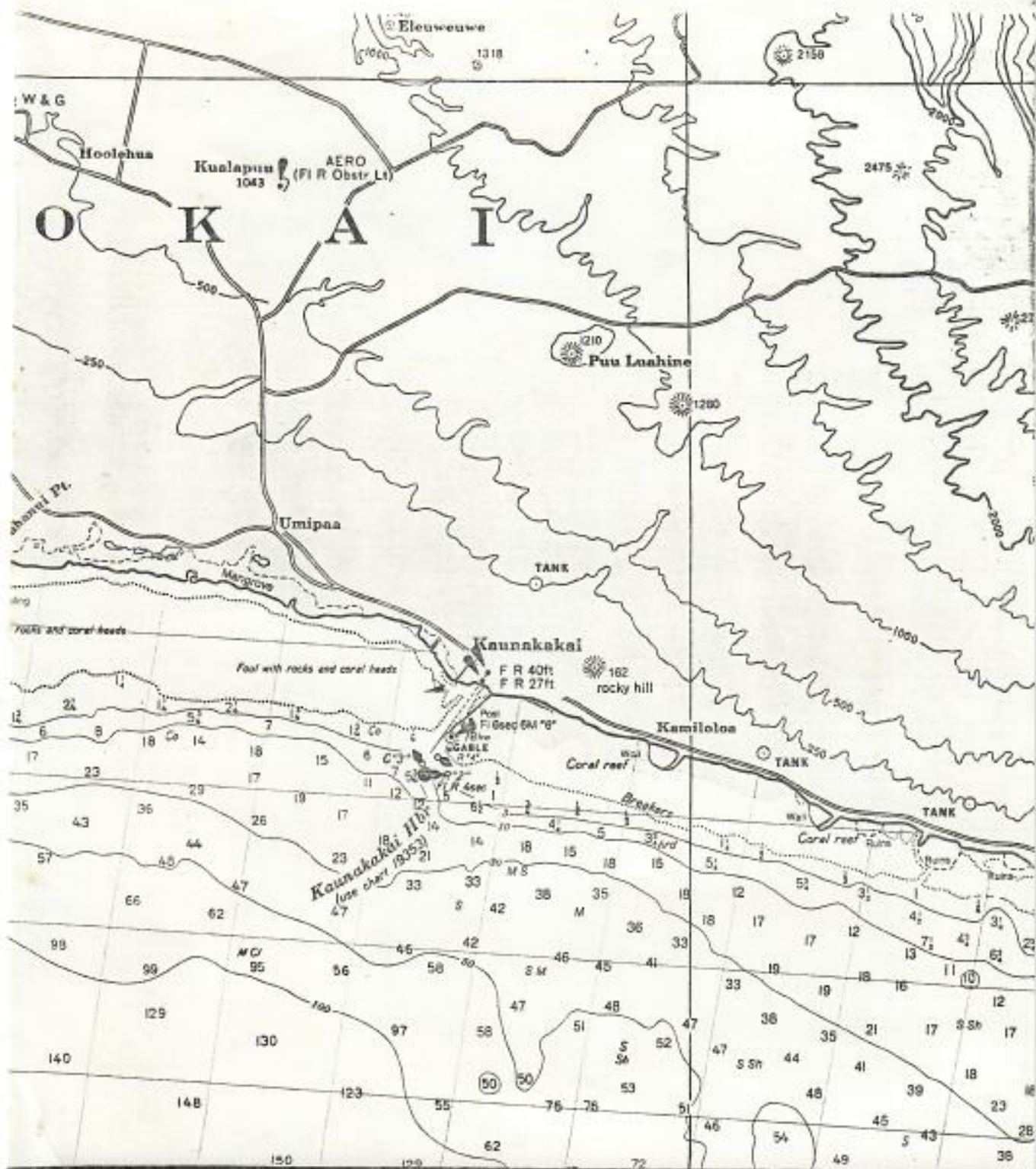
SEA TURTLE SIGHTING REPORT

Thank you for your cooperation



(Please return to: George H. Balazs; Hawaii Institute of Marine Biology; P. O. Box 1346; Kaneohe, HI 96744; Tel. 247-6631)





nets or the gate [makole], the mud was swept into the 'oussai and so carried out."

According to Carlson (n.d., p. 17), "The people once or twice each year had to go out into the pond and with coconut halves scoop the mud out. At the same time the pond was firmed on the bottom creating a better bed for the fish plants and the fish food."

The earliest recorded date for the building of a *loko 'ama'i* is in the middle of the 15th century. At this time Kanohakamohamahi built the pond at Keone'o'o on Maui (Forrander, 1880, p. 71). Ponds were probably built before this time, for by the 13th century, or perhaps earlier, the chiefs had enough power to command the number of people required to build a large *loko 'ama'i*. (It is known from archaeological evidence that the Hawaiian Islands were well populated by A.D. 1000. See Emory, Bonk, and Simons, 1959, p. ix.)

Ponds were built over the years until the early part of the 19th century. Some were destroyed by the sea or by volcanic action; others were abandoned due to the decrease of the population. In some cases the very existence of a pond has been forgotten. Such was the case of two ponds on Molokai whose foundations appear on aerial photographs. One pond was adjacent to the land of West 'Ohi'a, and the other adjacent to the seaward wall of Ni'aupele Pond at Kalua'aha. No claim was made to either pond during the Land Commission hearings in the 1800's. Presumably the ponds had been destroyed so long ago that they had been forgotten.

The following list of *loko 'ama'i* which were still being used commercially in 1960 was compiled by the State Department of Agriculture and Conservation:

OAHU	MOLOKAI
Heaia Pond, Heiaia	Kaopahala Pond, Kaopahala
Pond, Hanalei	Keawani Pond, Keawani
Kahouua Pond, Kahouua	Kupeke Pond, Kupeke
Kunpa Pond, Maunaloa	Ualapee Pond, Ualapee
Meili Pond, Kooloa	
Waikaha Pond, Kaneohe	

There were no *loko 'ama'i* reported as being used commercially on the islands of Hawaii, Maui, or Kauai.

LOKO 'AMAI

A *loko 'ama'i* is a shore pond "surrounded by a low wall that is submerged at high tide and has openings, walled on each side like lanes, leading in or out of the pond" (Beckley, 1883, p. 20). (See Fig. 10.) Both Beckley (1883) and Stokes (1911) give *loko 'ama'i* as the name for this type of pond.

It was a form of fish trap, but was regarded as a pond by the Hawaiians. Beckley (1883, p. 20) uses the term "pond" in describing *'ama'i*; Kenwehi

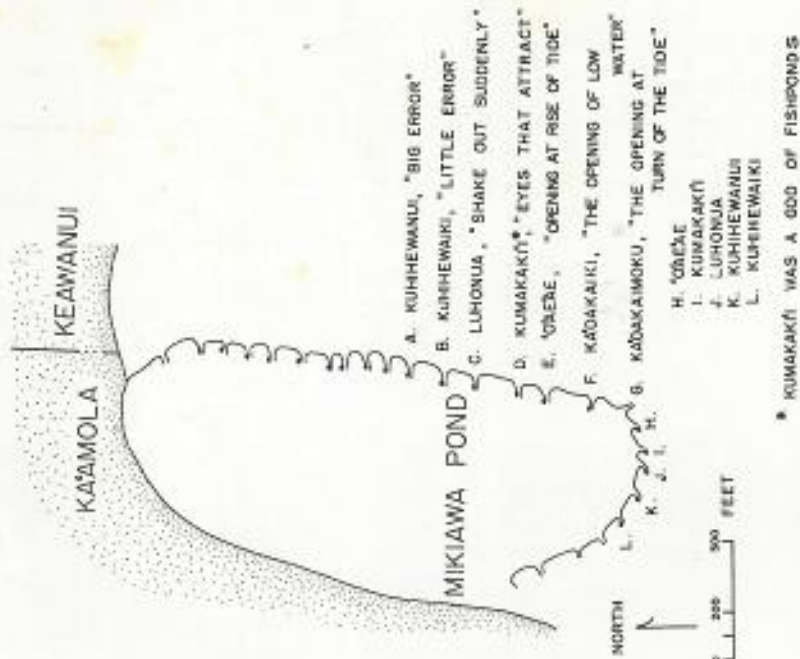


FIGURE 10.—Plan of a *loko 'ama'i*. The inward lines were used when the tide was coming in, the outward lines when the tide ebbed. Mikiwa Pond, Kamomola, Molokai; area, 20 acres. When known, the name of the lane is given. (Adapted from plan made by John F. C. Steiner.)

(n.d.) refers to Mikiwa Pond, which was a *loko 'ama'i*, as "Ka loko o Mikiwa"; and Cobb (1902, pp. 429-430) includes them in his list of Molokai fishponds, making no distinction between *loko 'ama'i* and *loko 'ama'i*.

There were at least ten *loko 'ama'i* on Molokai. No record of this type of pond has been found for the islands of Kauai, Oahu, and Maui. (See: Be-

net, 1931; McAllister, 1933; Stokes, 1909a; and Walker, 1931.) Whether there were any on Hawaii or Lanai is not known.

In 1909, John F. G. Stokes surveyed and drew plans of five loko 'iwaiki on Molokai: Kaamahilo'oko; Mikiawa; Papa'ilili; Paha'u; and Nainai-kul'au'e. He made notes on two others: Ho'olehua and Pukamaka. The foundations of three more can be seen on aerial photographs (Aerial Photographs, 1949). Six of the ponds were located on the southeastern portion of Molokai, the other four on the southwestern part of the island, as shown in Figure 11.

A loko 'iwaiki was generally used by the people for catching one fish at a time, and it provided a means for a number of individuals to conveniently catch their day's supply. The fish caught in one of these ponds, Mikiawa Pond, Mo-

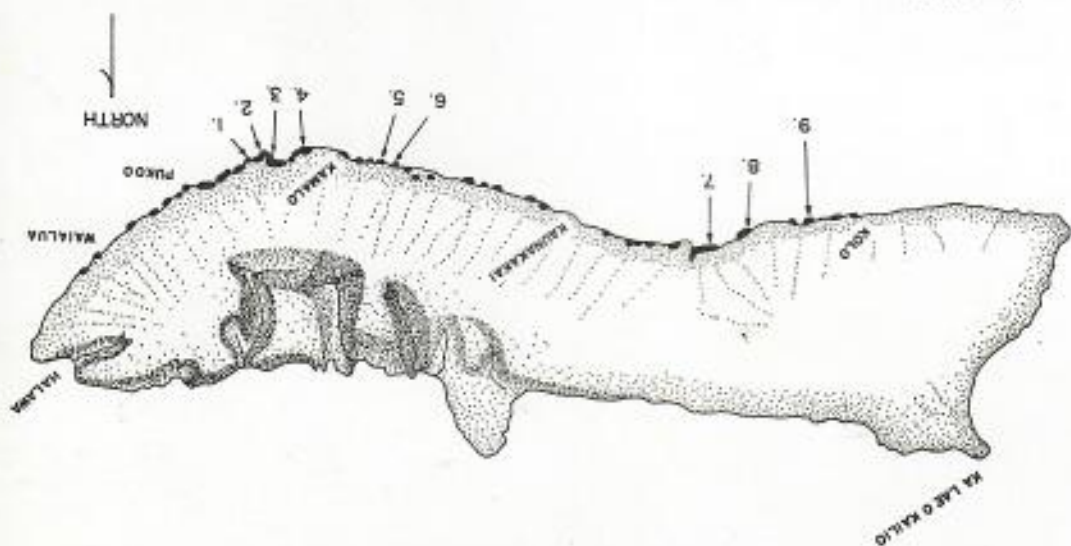


FIGURE 11.—Map of Molokai. Dark areas on south coast are fishponds. Arrows indicate loko 'iwaiki. Numbers refer to ponds listed in Table 1. (Adapted from Cook, 1902, Plate 27.)

POND



SCALE 0 40 FEET NORTH

FIGURE 12.—Section of the wall of Papa'ilili Pond, Ka'amola, Molokai. A, Inward lane showing platform on eastern side of the end of the lane; western wall of lane was 21.6 feet long. B, Closed inward lane, 2.6 feet wide at wall, 16 feet long, 14 feet wide (inside dimension). Note platform on western side. (Adapted from plan by Stokes.)

loka'i, were the 'ama'ama, ana, awake, akua, mo'i, haka, 'o'io, and palani (Stokes, 1909b, p. 11).

The ponds were operated in the following manner: At night when the tide was coming in, a man or a woman (Beckley, 1883, says more frequently a woman) waded out to the end of an inward lane. Here he, or she, sat on a raised stone platform which was situated at the end of one side of a lane (see Figs. 10 and 12). The fisherman held a net which was just wide and deep enough to cover the opening of the lane. The mouth of the net was faced toward the sea.

[The man or woman] sits very quiet until a jerk in the net is felt, when it is immediately pulled up before the fish have time to return, and the fish dropped into a gourd or basket, when the net is immediately returned to the water and waiting and watching are resumed. Two persons generally go to this kind of fishing and sit on opposite sides of the entrance, so that as one net is raised another is still there, and under certain conditions of the water and weather, two persons will be kept busy scooping up fish as fast as the nets can be lowered. No fish must be allowed to get free as that would put a stop to the fishing at that entrance during that turn of the tide.

These entrances are favorite stations for the ground sharks of the neighborhood to prey on the fish as they go in or out, and so when the tide is about medium height, the fishing people return to shore, as their platforms would be entirely submerged at high tide (Beckley, 1883, p. 20).

When the tide turned and the platforms were once again exposed, other people waded out to the outward lanes, faced the nets toward the pond, and fished in the same manner as described above.

The above description is adapted from Beckley (1883), who at one time had part ownership in a loko 'umeki located on the eastern section of Moloheai. Stokes (1911) was given the same information about the operating of these ponds as Beckley describes, "except in regard to two people fishing at one opening simultaneously." It seems more likely that only one person used an opening at a time. The platforms were located on only one wall of an individual lane; and the walls of the lanes being fairly narrow, they would not provide a good seat for a fisherman.

"Sometimes one person had a prior right to fish at a certain inward and a certain outward opening both of which bore the same name. [See Fig. 10, A and K, B and L, etc.] . . . Other persons might use the same openings in the proprietor's absence" (Stokes, 1911).

Some loko 'umeki were owned "by proprietors of two adjoining lands, the people of one owning the right to fish during the rise of the tide known as the *Aai-ki*, and the others during the ebb, *hai-ow*" (Beckley, 1883, p. 20). Such was the case of Miihawa Pond at Ka'amola, Moloheai (Fig. 10). When the tide was coming in, the people of Ka'awunui could use the lanes. When the sea ebbed, "the fish belong to Ka'amola" (Ka'awunui, n.d.).

Long nets were also used in these ponds, but they could only be used by the people of the land who had the right to use the pond at that particular condition of the tide.

Due to the functioning of this type of pond, the features and dimensions vary considerably for an individual pond had to be adapted to its own location. The features and dimensions of each pond are given in Table 1.

Pond Nos. 4, 5, and 6 were deteriorated in 1901 (Cobb, 1902, p. 430). However, the portions of their foundations which appear on the aerial photographs are similar to the dimensions of Kaunahilo'oku Pond (No. 1). Only half of the foundation of No. 4 remains, therefore the number of its lanes reported is probably incomplete. Presumably there were more outward lanes.

TABLE 1
STATISTICS FOR LOKO 'UMEKI OR MOKOAI*

Pond	Area (Acres)	No. Lanes		Inward Lanes		Outward Lanes		Class						
		Inward	Outward	Inward at High	Outward at High	Inward at Low	Outward at Low							
1. Kaunahilo'oku, West Oahu	13.0	2	9	11	10-15	20	1.6	9-15	20-40	2-5.6	1	1	1	1
2. Miihawa, Kaunohi	44.0	16	10	26	27-36	47-70	5-7	19-22	22-50	4-5.5	1	1	1	1
3. Papa'iahi, Kaunohi	6.5	3	4	8	9	16-24	---	---	24-31	---	2	1	1	1
4. Waiwai	40.0	4	4	8	---	---	---	---	---	---	2	1	1	1
5. Kaunohi	30.0	3	7	14	---	---	---	---	---	---	3	1	1	1
6. Punahele, Moloheai	35.0	5	9	17	---	---	---	---	---	---	3	1	1	1
7. Palau, Palau	200.0	27	27	54	---	---	---	---	---	---	3.5	1	1	1
8. Palauka, Titi (approx.)	68.8	20	20	40	---	---	---	---	---	---	13	1	1	1
9. Kaunohi	22.0	8	8	16	---	---	---	---	---	---	4-6	1	1	1

* The statistics used are from Stokes (1883, 1892); and from Merrill (1901).

The six eastern ponds had lanes leading both into and out of the pond. All inward lanes were located on the eastern portion of the pond, and all outward lanes in the center or western portion. The arrangement of the lanes was probably made to take advantage of the currents. The currents along the shore line of Molokai, between Kalua'aha and Kaunakakai, usually run from east to west, in the same direction as the prevailing wind. Therefore, it is logical that the inward lanes, which were used when the tide was coming in, should be located on the eastern side, and the outward lanes, which were used at ebb tide, should be located to the west. Stokes (1909a, p. 29) found a similar situation in the Pearl Harbor fish traps:

It is interesting to note what advantage of natural conditions was taken by the early fishermen in constructing their traps on the banks jutting out into the channel. . . . The natives say that the incoming tide flows more strongly against the east side of the channel, while the west side bears the heavier proportion of the ebb. To reap the full benefits of the condition, the entrances of the ponds [traps] were built opposed to the stronger current.

On the eastern wall of an inward lane, at its end, was the platform which the fisherman sat upon (see Figs. 10 and 12). The platform for an outward lane was located at the end of the western wall. All the platforms recorded were in the same relative location. The fact that the Hawaiians are mainly a right-handed people probably accounts for the positions of the platforms.

Three of the ponds had closed lanes which opened either toward the sea, as shown in Figure 12, B, or toward the pond. Here, too, platforms were located in a similar manner as on the open lanes. The walls of these ponds were from 4 to 7 feet in width. The platforms averaged 6 feet in width, and were from 1½ to 2½ feet high.

The western ponds differ somewhat from those on the east. Instead of having lanes leading both into and out of the pond, as was the case in the eastern ponds, all the lanes of a western pond led in one direction, either into or out of the pond. Despite this difference, Stokes (1911) was of the opinion that the western and eastern ponds functioned in the same manner. No platforms are reported for western ponds.

Of the four western ponds, only one, Ho'olehua Pond, had lanes leading inward. When Stokes saw this pond in 1909, it was almost entirely covered with mud. However, he did find the walls of six inward lanes (Stokes, 1909a).

The lanes of the other three ponds all led outward. Pala'au Pond, which was the largest loko 'o'o on Molokai, had walls 3½ feet high with a maximum width of 5 feet. They were constructed of coral and basalt. The height of the walls of Pukamaka Pond is 2½ feet. They vary in width from 3 to 6½ feet, and are loosely constructed of basalt and some coral.

Stokes (1911) was told that Pala'au Pond was a loko *po'oihi* which he considered was a local term for loko *'auae'ihi*.

The earliest date for a loko *'auae'ihi* is before the 16th century. Kawawanui Pond, Molokai, was being used at the beginning of the 16th century (Kewewai, n.d.), and according to Stokes (1911), Mikiaewa Pond was built by the same chief that built Kawawanui Pond. Papa'i'i'i'i Pond was built later for its walls connected on the east to the wall of Kawawanui Pond and on the west to the wall of Kaina'ohu Pond. Pala'au Pond, according to one account (Anon., 1922) was built during the time of Kameliameha I. It was constructed after Ho'olehua Pond, for the western wall connected to Ho'olehua Pond.

It is evident that Mikiaewa Pond was originally built as a loko *'auae'ihi*. The shape of its curving walls and the length of the lanes indicate that it was built with the intention of being used as a fish trap. Pala'au Pond, with its 6,300-foot wall and 27 lanes, seems likely to have been in its original form. The other loko *'auae'ihi* could have been loko *kupe* which were converted into loko *'auae'ihi*.

The open lanes and the closed lanes of these ponds are similar to features found in Polynesian fish traps.

Portions of Pukamaka Pond at Makaleinu can still be seen at low tide. Pukamaka Pond at Toi'i and Naimanuku'e'e Pond at Kalunoo's are damaged, but most of their walls can be seen.

INLAND PONDS

The following is a description of the inland ponds at Waikiki in 1824:

The whole distance to the village of Whyotee is taken up with innumerable artificial fishponds extending a mile inland from the shore. In these the fish taken by nets in the sea are put, and though most of the ponds are fresh water, yet the fish seem to thrive and fatten. Most of these fish belong to the chiefs, and are caught as wanted. The ponds are several hundred in number and are the resort of wild ducks and other water fowl (Blooxer, 1925, pp. 35-36).

The inland ponds were of three types: those which connected with the sea, *po'ouae*; those in which wet land taro grew, loko *'o'o* *ho'o*; and fresh-water ponds, loko *aoe*. The majority of these ponds were built and used by the land agents (*konohiki*) and the common people. A few were for the exclusive use of the chiefs.

PO'OUAE

Po'ouae were located near the sea and were connected to it by a ditch (Fig. 13) or a stream (Fig. 14). They had either brackish water or a combination of brackish and fresh water. Some ponds were fed by springs, and some by streams flowing into them from the interior.

The ponds were of two kinds: those which were small, needed little artificial work in their construction, and were usually built by the farmers who cared for and used them in addition to cultivating their fields; and those which were large, from several acres to over 300 in area, required many workers in their construction, and were for the use of the chiefs.

HAWAIIAN ARCHAEOLOGY

HAWAIIAN FISHPONDS

By
Catherine G. Summers

BERNICE F. BISHOP MUSEUM SPECIAL PUBLICATION 52



PUBLISHED BY THE BISHOP MUSEUM PRESS

1964



is made for a rock at Kailua, Hana, Maui" (1909:45, footnote a). He also gave the following information about Ka'ana:

*Kaana ke aloha i na lehua o Kaana...*a spot where travelers were wont to rest and where they not infrequently made up wreaths of the scarlet lehua bloom which there abounded. It took a large number of lehua flowers to suffice for a wreath, and to bind them securely to the fillet that made them a garland was a work demanding not only artistic skill but time and patience. If a weary traveler, halting at Kaana, employed his time of rest in plaiting flowers into a wreath for some loved one, there would be truth as well as poetry in the saying, "Love slaves for the lehuas of Kaana" (N. B. Emerson, 1909:207, footnote c).

Emerson located Ka'ana, in the above quotation, as being "...on the road from Keaau to Olaa [Hawaii]." Mrs. M. K. Pukui does not know of a Ka'ana in this location and is of the opinion that the information applies to the Ka'ana on Molokai.

SITE 96. HEIAU, KALUAKO'I

Cartwright (n.d.g) located the structure on the cliffs on the E side of the head of Waiahewahewa Gulch. Carlson was told that at one time there was a permanent spring near the head of Waiahewahewa stream, and water flowed from it the year long (1952).

MO'OHELAI, KALUAKO'I

This place on Maunaloa is mentioned in chants in connection with the hula (Appendix C). 'Mo'o-helala. A female deity, a *kupua*, who at death became one of the divinities, *au-makua*, of the hula. Her name was conferred on the place claimed as her residence, on Mauna-loa, island of Molokai" (N.B. Emerson, 1909:33, footnote a).

PETROGLYPHS, KALUAKO'I

These petroglyphs were on boulders situated just N of Site 98; the area was bulldozed in the late 1950s and the petroglyphs were destroyed (Henry Meyer, personal communication, 1966).

'ILOLI 1

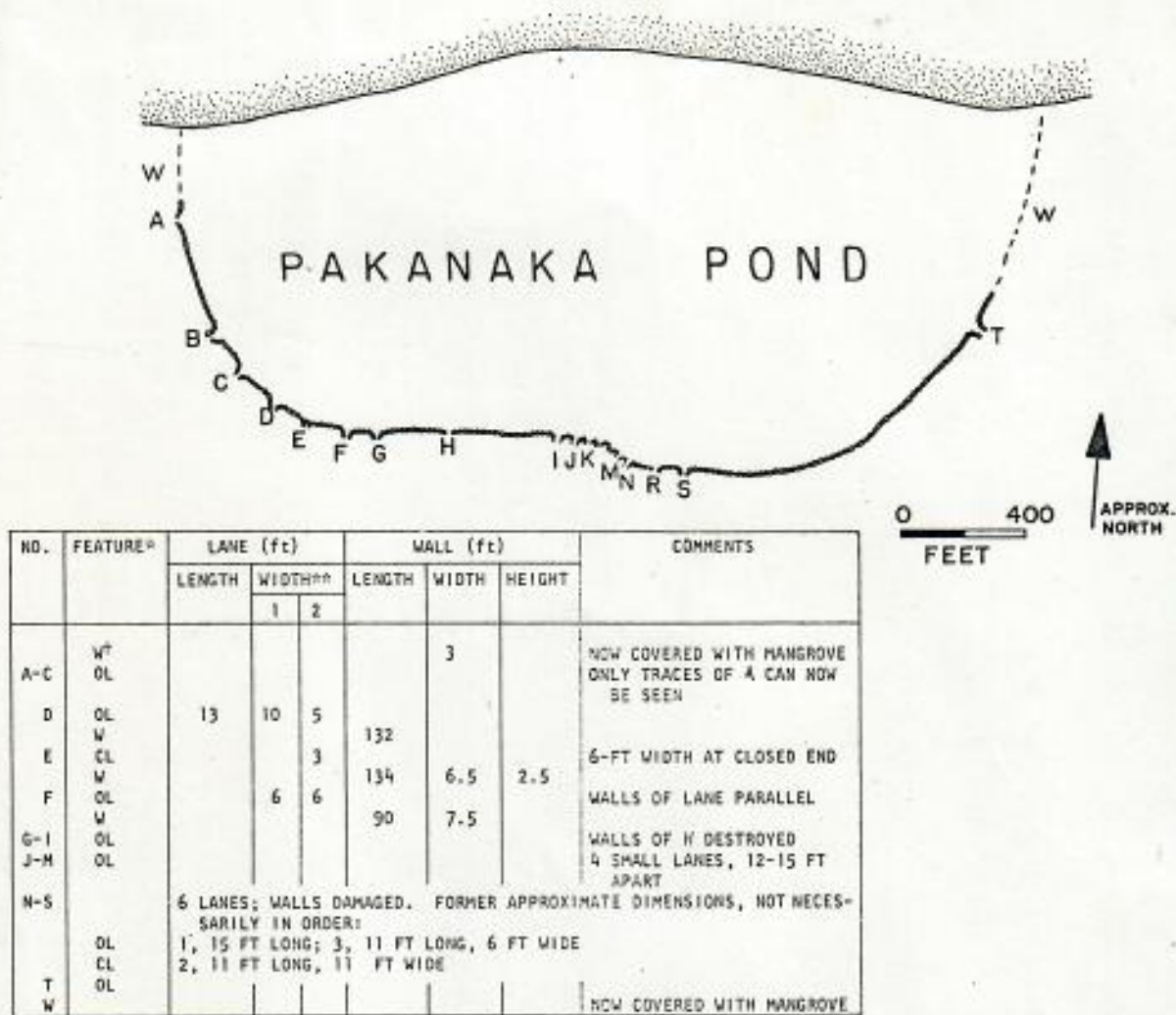
The land section called 'Iloli 1 was formerly known as the *ahupua'a* of 'Iloli. It is located on the southern shore of central Molokai adjoining Kaluako'i and consists of the fishpond, Pakanaka (Site 97), and the "kula of Huea." The latter comprised an area of 10.33 acres (Royal Patent 8138, n.d.). The *ahupua'a* had one *lele*, which is now called 'Iloli 2, located in the uplands overlooking Kalaupapa Peninsula. No sites have been found in this land section. The Pa'upili, "soak pili grass," is the "gentle" wind of 'Iloli.

In the legend of Pele and Hi'iaka, 'Iloli 1 is referred to as the dry, hot shore: "Akua heahea i ke kaha o 'Iloli (The god calls from the dry, hot shore of 'Iloli)" (M.K. Pukui translation).

SITE 97. PAKANAKA POND, 'ILOLI 1 (Figs. 24-27)

The name Pakanaka, "Touched by people," implies that the pond could be used by commoners (M.K. Pukui, personal communication). Cobb (1902:429) gave the area of this pond as being 43 acres; according to Royal Patent 8138 (n.d.:177), which was issued in 1902, the area was 68.85 acres. The latter figure is probably correct.

This loko 'umeiki had at least 20 lanes (Figs. 24-27), all leading outward. In 1961, a large portion of this pond was overgrown with mangrove, and some of the walls were badly damaged. A



(Stokes, n.d.b; and Summers, 1961)

^a Starting from the N above A and continuing around the wall^t W - wall OL - open lane CL - closed lane^{aa} Width 1 - opening at wall Width 2 - opening at outer end of lane

(Plan adapted from Aerial Photos, 1941 and 1955)

Figure 24. PLAN OF PAKANAKA POND (Site 97).

point of interest was noted in the wall between E and F (Fig. 24). Here the wall had stone facings with a coral and chunks of coralline-algae fill. The secreting of the coralline-algae had cemented together the coral fill and the stone facings, thus forming a smooth surface on the top of the wall. As noted earlier, "It is probable that the Hawaiians were aware of the characteristics of coralline algae" (Summers, 1964:6).

HILIA

Hilia is an off-shore area extending eastward from Pakanaka Pond through Kalama'ula. It is now covered with mud, but formerly the shores had sandy beaches. Fish were very numerous here, especially small mullet, which often came in great schools near the shore. At times they were so numerous that "This little fish darkened all of the beaches" (Tape, n.d.d).

There is a well-known saying, "*Ka i'a ka wawas o Hilia* (The fish of Hilia, kicked by the foot)." The fish were kicked, "*ka wawas*," sideways instead of being kicked by the toe (Pukui, n.d.a). As an informant recounted, "With one swift kick, the fish lie scattered, ashore, that



(Photo by R. Summers, 1961)

Figure 25. PAKANAKA POND (Site 97), LOOKING E FROM W SIDE OF LANE I. Note Lane J and damaged lanes K through S and eastern portion of pond. East Molokai in background.

was all there was to it...If you have a small net, just one scoop [on the beach], that is enough, go home" (Tape n.d.o).

According to tradition, 'Ai'ai traveled through Hilia and, as Beckwith remarked, "All the places named in the legend of Aiai remain as authentic fishing grounds and stations for fishermen in island waters" (1940:20). Thrum wrote of this area:

After making the circuit of Lanai he ['Ai'ai] went over to Molokai, landing at Punakou and travelled along the shore until he reached Kaunakakai. At this place he saw spawns of mullet, called *puā 'i'i*, right near the shore, which he kicked with his foot, landing them on the sand. This practice of kicking fish with the feet is carried on to this time, but only at that locality (1907:239).

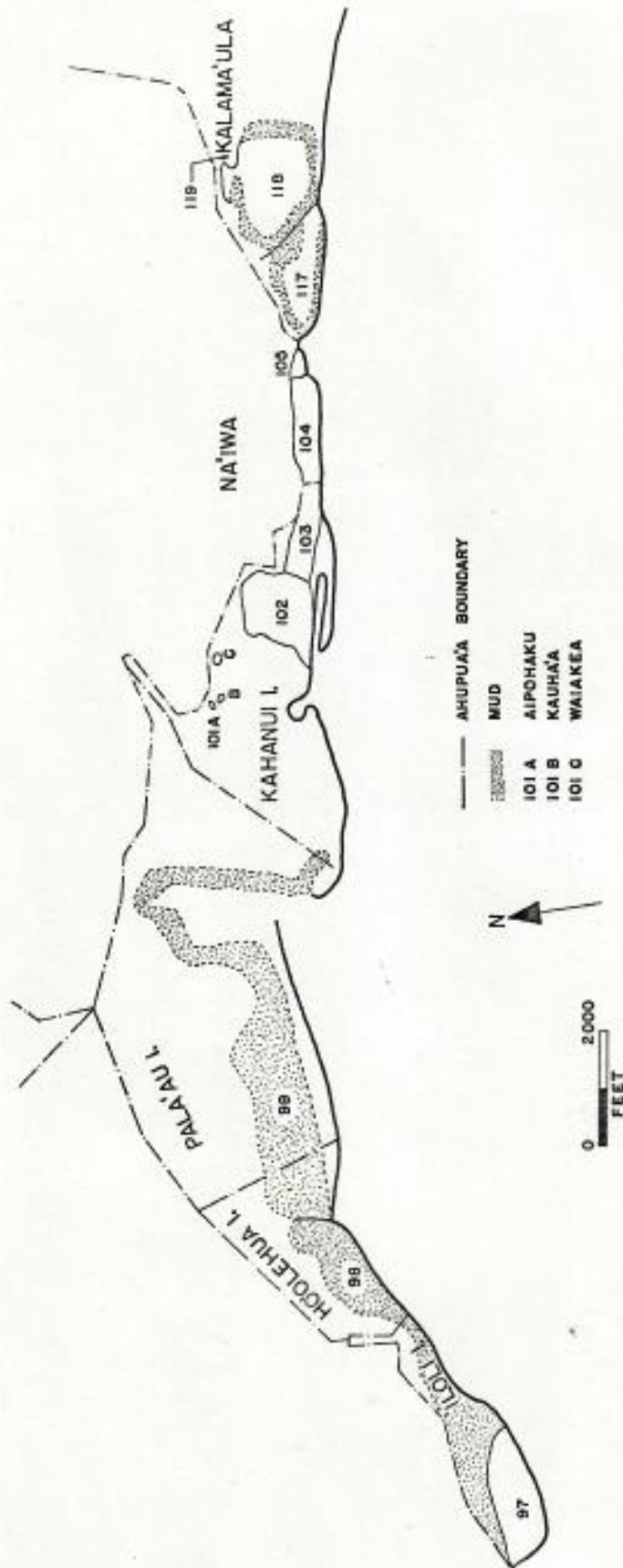
HO'OLEHUA 1

This land section was a *lele* of Ho'olehua 2.

SITE 98. FISHPOND, HO'OLEHUA 1

The pond was a *loko 'umeiki*, and the only one in the western portion of Molokai which had lanes going inward. The wall of Poho'ele Pond (Site 99) connected to the eastern side of this pond (Fig. 28).

Stokes said of this site: "In 1909 there were traces of six lanes, three north of the junction [of Poho'ele's wall] and three south of the junction. No other features were found due to the pond being covered with mud" (n.d.b).



(Adapted from map by Monserrat, 1886)
Figure 28. MAP SHOWING THE LOCATIONS OF FISHPONDS FROM 'ILOLI L_ TO KALAMA'ULA.

PALA'AU 1

This land section was a *lele* of Pala'au 2. "In the grassy marsh below the deep well [at Pala'au], big springs come out for a distance of 700 feet. Many old taro patches indicate that this water has been used" (Lindgren, n.d.:19-20).

A native writer said that taro was planted at Pala'au by Ho'olepanui and his men from Hawaii, who came to Molokai after Kamehameha I had conquered Oahu.

It was said that when one ascended to the top of Ka'ana and looked down on Pala'au on a clear moonlight night, the taro patches seen below are as close together as the stars above. Each patch made by the men of Hawai'i was named and the biggest one in the center of the many little ones was called Pehu. There is a tale attached to this name. These patches were planted only with the best liked varieties of taro: the *piko*, *haokea*, *kai*, *nohu* and *owens*. These were hard and long-rooted taros that did well in these brackish water patches. In mashing the taro the stone was worked back and forth (*'ana'i*) instead of bringing the stone down on the mass (*Ka Nupapa Ku'oko'a*, 1922c).

Many of the stone walls still standing on this land are the former cattle pens of the village of Pala'au. This village was abandoned in the 1850s, when "...virtually every man in Pala'au was guilty of cattle thefts" (Judd, IV, 1936:9).

SITE 99. POHO'ELE OR PALA'AU POND, PALA'AU 1

This was the largest of the Molokai fishponds; its size has been estimated as being from between 200 and 500 acres. Cobb referred to it as "Nameless extensive pond, in Pala'au, filled with mud" (1902:429). On the 1897 Hawaiian Government Survey Map of Molokai, the broken walls of the pond are shown, although the pond itself is labelled "mud"; it is not shown on later maps. In 1922 portions of the stone wall could still be seen, "...and traces of an old-fashioned sluice gate" (*Ka Nupapa Ku'oko'a*, 1922b).

A native writer gave the name of the pond as Poho'ele, "Dark hollow," and said that it was built by Ho'olepanui, a favorite of Kamehameha I, who came from Hawaii to live on Molokai after Kamehameha had conquered Oahu:

...the men of Hawai'i looked at the shoreline, the capes and nooks and then Ho'olepanui's "engineers" planned to enclose some of the nooks from one point to another, thus converting them into fishponds...

The men arose at the command of Ho'olepanui and laid the stones along the sea from Pu'uapo'o to Puhaka in Ho'olehua, and the pond was given the name of Poho'ele. This was a famous pond at Pala'au and had gates that were skillfully made. All kinds of fish were caught in this pond at the time when it was being well cared for.

The Hawai'i people were indeed skilled workers. Let us notice this, it was said that the deepest part in the pond had a depth of five fathoms and was somewhat like the harbor of Kou (now Honolulu) in depth (*Ka Nupapa Ku'oko'a*, 1922a).

Stokes was told the pond was a *loko po'oiki*, but he considered this as a local term for *loko 'amsiki* (1911). When he saw the pond in 1909, he found 27 lanes, all leading outward. The walls commenced on the W at the wall of Ho'olehua Pond (Site 98), and extended for a distance of over 6100 ft. The following statistics of the pond (Table 3) are from Stokes (n.d.b).

SITE 100. BOUNDARY STONE, PALA'AU 1

The stone marks the point where the *akupua'a* of Pala'au 1, Kaluako'i, Ho'olehua 2, and Na'iwa meet. In 1898 the stone stood waist high, or about 3 ft above the ground surface. When it was relocated in 1923, it was a foot under the ground, covered by silt that had washed down over it from above in the intervening 25 years (Cooke, 1949:46).

TABLE 3. STATISTICS OF POHO'ELE OR PALA'AU POND, STARTING WITH WESTERNMOST WALL AND MOVING E

Wall Length (ft)	Lane	Lane Width at Pond (ft)	Lane Length (ft)	Lane Width at Sea (ft)	Wall Length (ft)	Lane	Lane Width at Pond (ft)	Lane Length (ft)	Lane Width at Sea (ft)
906	1	10	10	-- ^a	62 ^e	16	4.5	17	3
366	2	7	7	--	84	17	6	17.5	3.5
100	3	7	8	--	88	18	6	15.5	4
152	4	5.5	13	--	52	19	6	16	4.5
272	5	5.5	10	--	50	20	6.5	14	4
104	6	5	7	--	70	21	7.5	18	4.5
190	7	--	--	--	46	22	6.5	12.5	4
106	8	--	--	--	106	23	6	13.5	3
179	9	--	--	--	118	24	7.5	15.5	4
130 ^b	10	--	--	--	82	25 ^f	7	13	3.5
106	11	7	16.5	4	142	26	5.5	17	3.5
90	12	5	18	5	--	27	4	15	3.5
80 ^c	13	6	13	4					
88 ^d	14	6	18.5	4					
74	15	6	17	4					

^aSo deteriorated they could not be measured

^bHeavy wall

^c3.5 ft high, little coral

^d3.5 ft high, 5.5 ft wide

^eW side, 5 ft wide

^fShelter

HEIAU NOT LOCATED, PALA'AU 1

The following heiau were "...reported by natives but not seen..." by Stokes (n.d.:33):

Kahimakau, southern portion of Pala'au

Manai, near Kalama'ula

Pu'unana

Panuhu; for rain purposes; a female deity.

KAHANUI 1

This land section was a *lele* of Kahanui 2.

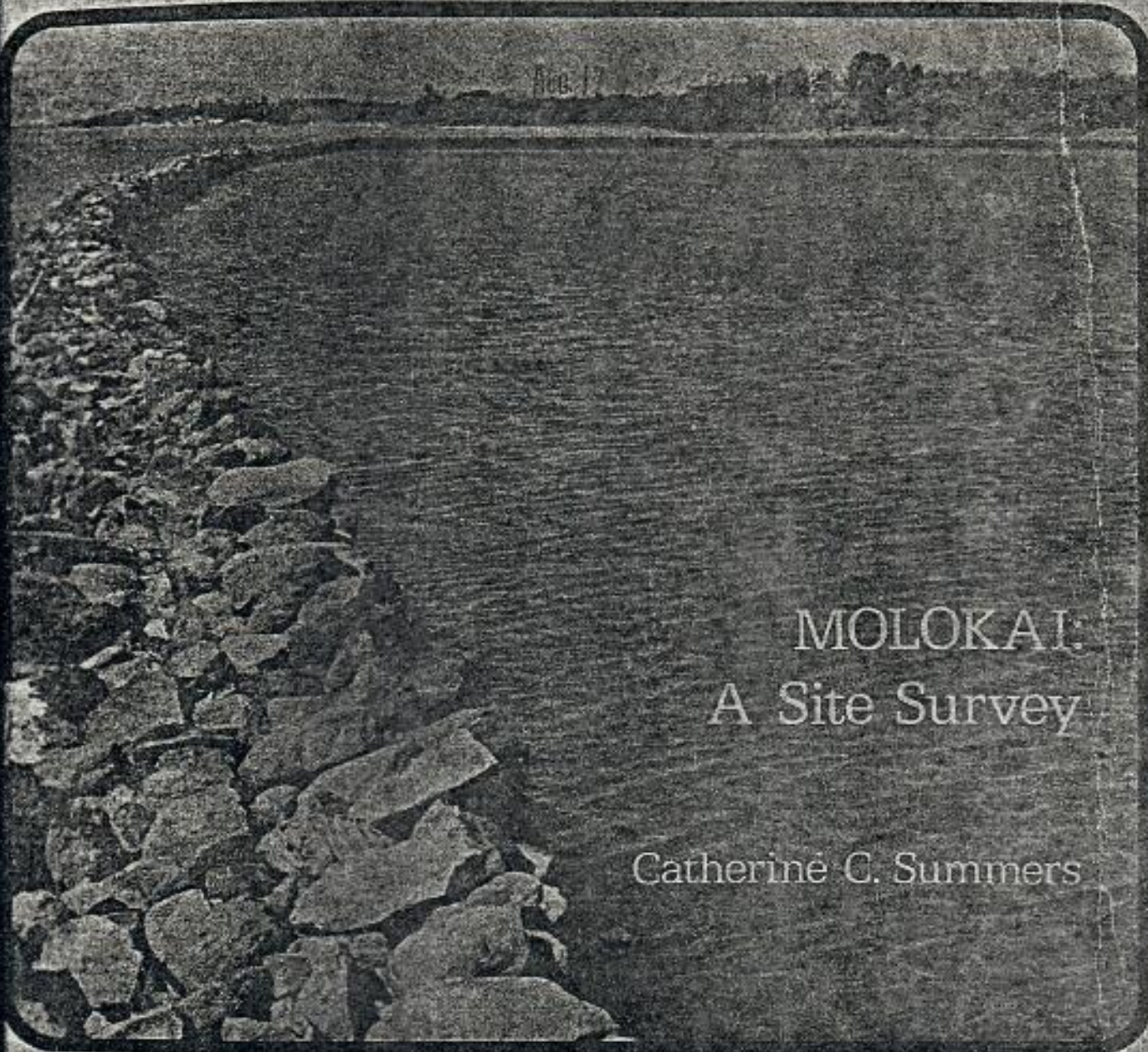
SITES 101A, B, AND C. AIPOHAKU, KAUA'A, AND WAIKAKA PONDS, KAHANUI 1

These three small inland ponds, located just SE of the well in Kahanui 1, were less than an acre in area (Monsarrat, n.d.:34). The ponds are now filled.

SITE 102. PUNALAU POND, KAHANUI 1

Punalau, "Many springs," had an area of 20 acres and was used commercially in 1901 (Cobb, 1902:429). It was almost filled in by 1922 and is now completely filled.

NOV. 17



MOLOKAI:
A Site Survey

Catherine C. Summers

NUMBER 14

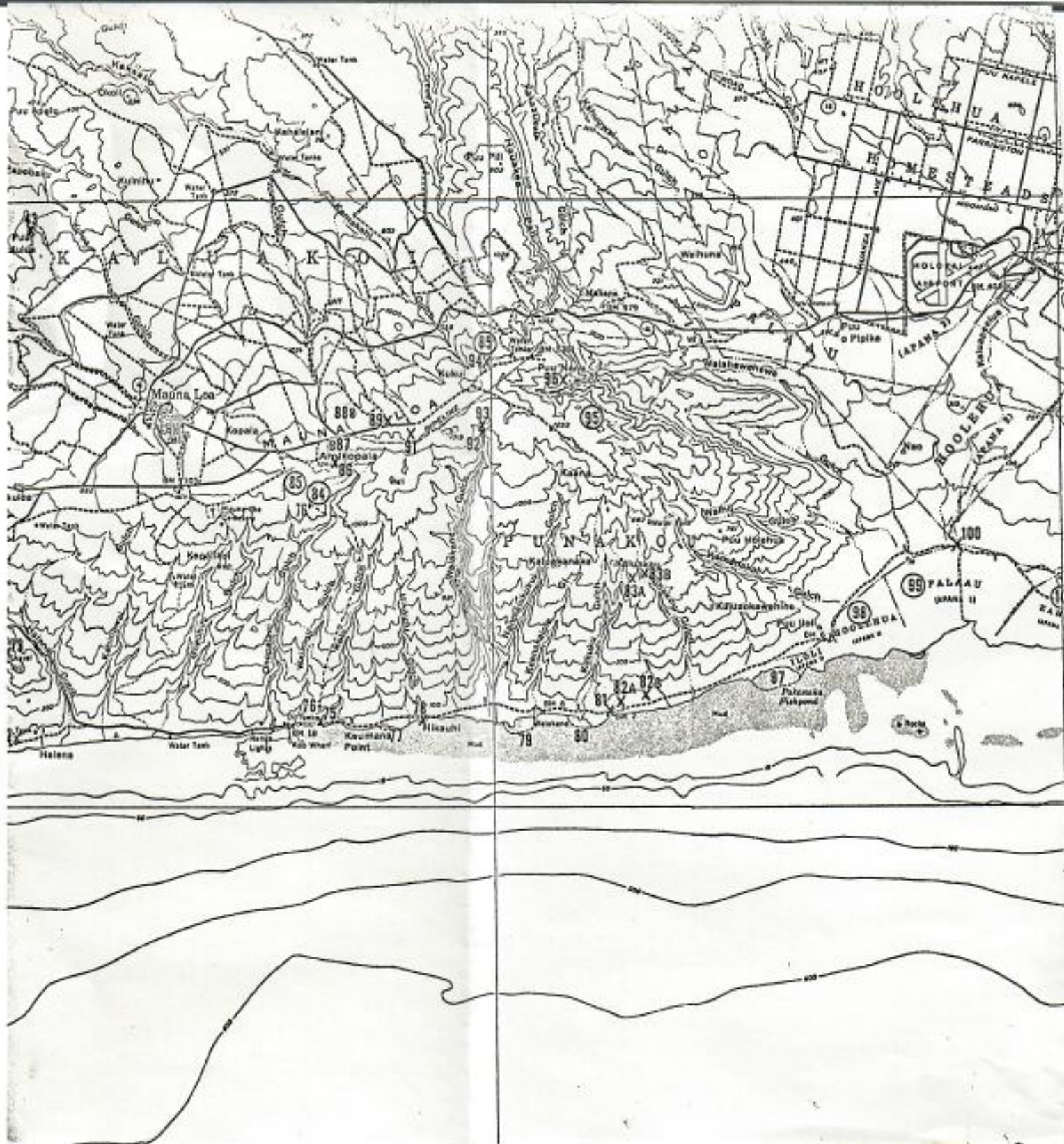
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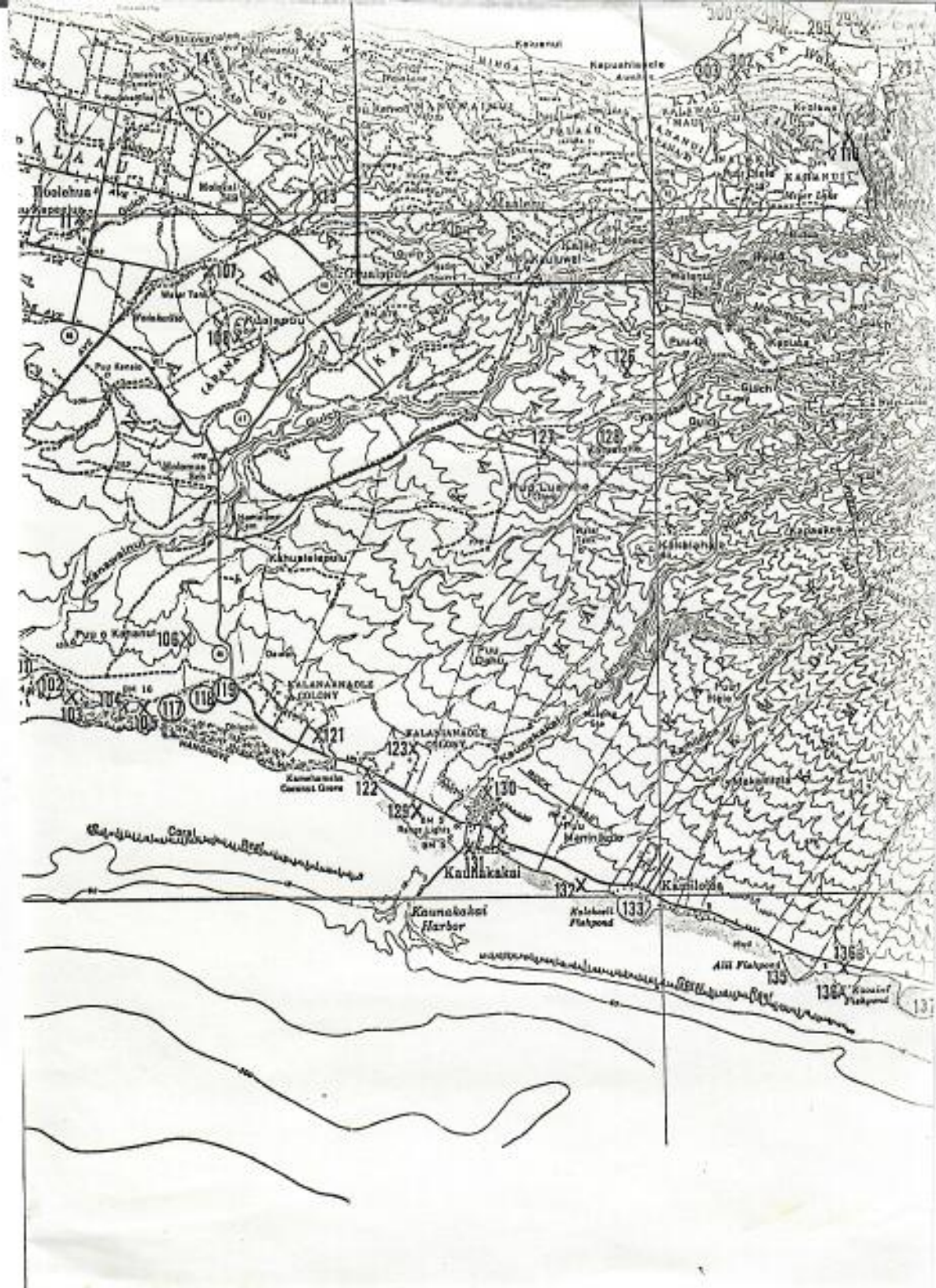
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In July 1975 by Hui Ahala, a group formed specifically to seek public access to parts of Mo'okoa'i that have been kept off-limits to the general public. Kawakia is located on land previously belonging to Mo'okoa's Ranch, Ltd. The ranch was started in 1897 by a group of men who purchased the ahupua'a of Kahuako'i I and II and the Kaunakakai ranch lands formerly owned by Kamehameha V. These combined holdings encompassed almost one-third of the island of Mo'okoa's and the entire west end. Since the formation of the ranch, this entire area including all of its beaches had been accessible only to Mo'okoa's Ranch employees, stockholders, and guests with passes. Hui Ahala members and supporters marched from Mo'omomi Beach to Kawakia on the Fourth of July weekend in 1975 to demonstrate the public's need and desire for access. Kawakia has since been opened to the public. On October 18, 1975, Hui Ahala led another march along the Pal'au Point to Hale o Lolo, to protest restricted access along the portion of the Pal'au Pond controlled by Mo'okoa's Beach, Ltd.

Kawakia Beach is a wide crescent of white sand at the head of Kawakia Bay. The beach has a moderately steep slope, and the offshore bottom drops off quickly to overhead depths. Kawakia is safe for swimming when the ocean is calm, primarily during the summer months. During times of heavy surf, however, especially during the winter and spring, the bay's waters are very dangerous, with powerful rip currents and a pounding shorebreak. To the rear of the beach is a dense grove that provides a shady picnic area. The area is totally unimproved except for the dirt access road which begins at Maunaloa Highway. The turnout is marked by a public right-of-way sign and is located 2.5 miles north from the turnout to the Sheraton Mo'okoa's.

Kawakia Bay, located just beyond the right point of Kawakia Beach, is a smaller version of Kawakia Bay. Except that the beach is primarily rocky with small pebbles of sand. It is not particularly appealing as a swimming area and is very dangerous during the winter months.

(19-21)
Mo'omomi Beach

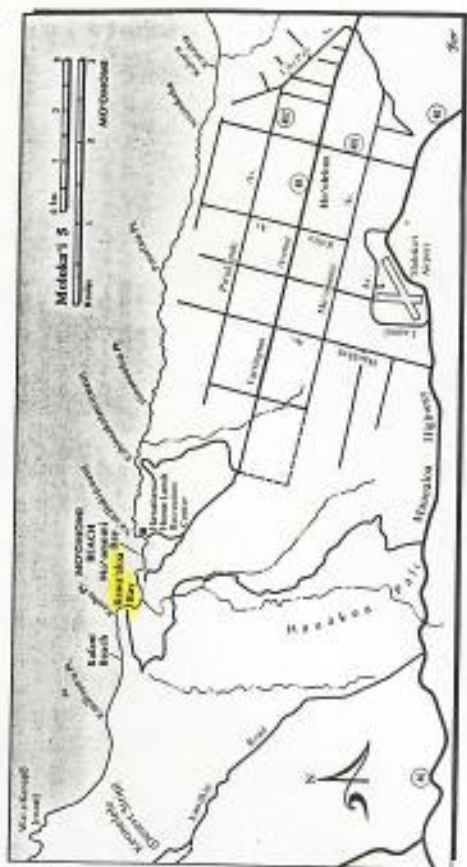
Mo'omomi is a very large coastal area that extends several miles inland from the ocean and encompasses a por-

tion of one of the most impressive sand dune developments in the Hawaiian Islands. These dunes are still being formed and expanded by sand from the beaches within the Mo'omomi shoreline. This side of the island is exposed to prevailing trade winds which sweep almost continuously across the area. Over centuries these winds have created the massive dunes in this northwestern corner of Mo'okoa's by carrying the shoreline sand inland, in some places for over four miles. This desolate, sandy region, which includes some older, solidified sand dunes, is sometimes referred to as the Desert Strip. It is also known as Koaetele, "the wind-blown sand."

Mo'omomi was once a popular fishing area. One traditional story says that before the turn of the century the inhabitants of Pelekunu, an isolated valley eleven miles away, often journeyed by canoe during the summer to Mo'omomi. There they caught and dried fish to take back to Pelekunu. Pelekunu is accessible from the ocean only during certain months of the year. Heavy winter surf prevents boats from landing. Pelekunu also has very high valley walls which permit direct sunlight in the valley's interior only for five hours a day, and during the winter months the valley experiences heavy rains. All these factors, in addition to the better shallow-water fishing grounds and the better drying areas at Mo'omomi, made the expedition a treasured one as well as a food-procuring trip. Fishing and drying were also done at Kalawao and Kalanipae.

Besides being a fishing grounds for the people of Pelekunu as well as others, Mo'omomi was also a quarry site for stones to make adzes. The name of the ahupua'a which encompasses the entire west end of the island including most of Mo'omomi is Kahuako'i, "the adze pit." Although stone was quarried at Mo'omomi, the largest quarries in Kahuako'i were located at Maunaloa and covered an area of thirty acres. Prior to their contact with foreign cultures, the Hawaiians had no sources of metal. For weapons and tools they were entirely dependent on shell and bone, and wood and stone, so hard rocks that could be quarried were very valuable.

To legitimate residents of Mo'okoa's, Mo'omomi Beach is the entire three-mile length of shoreline from the Hawaiian Home Lands recreation center to the high sea cliffs that run past Mokuio to 'Ilio Point. This long stretch of shoreline, however, includes at least three dif-



front and easily discernible beaches. Scientific shoreline studies of the Mo'omomi area have used two old map names, Kalani and Kawa'aloa, to indicate the first two beaches, while the name Mo'omomi is applied to the third beach. Although Kalani and Kawa'aloa are considered by many people to be only names on a map, they are useful designations for pinpointing and discussing the individual beaches.

Kalani means "the sky" or "the royal chief," and it is the first of the three Mo'omomi beaches. Kalani Beach is a storm beach lined along its entire seaward edge by beach rock. Inland of the beach rock is a fairly wide white sand beach created by storm surf carrying sand over the rocks. Unprotected from the open ocean, the beach is assaulted by prevailing trade wind swells as well as by heavy winter surf. The offshore bottom is deep and the area is subject to strong alongshore currents. The entire backshore is edged by low sand dunes, many of which have solidified, forming some very interesting sculptures. The cliffs at the left end of the beach, also composed primarily of solidified sand, are continu-

ally being eroded by the wind and waves. Large, jagged blocks of fallen rock line their base. The heavy winter surf, which often sweeps completely across the flat beach, deposits driftwood and other items on the sand.

Kawa'aloa means "the long canoe." Kawa'aloa Beach is a long, wide crescent of white sand at the head of a large bay. The sand is subject to seasonal erosion and accretion. The left end of the beach is wide and flat, and strewn with driftwood, seaweed, and other items deposited by heavy surf. As the beach progresses to the right, it gets narrower and is very steep at the water's edge. This end of the beach is somewhat protected by the right point of the bay and the broken reef offshore, offering a clearer, calmer, and safer swimming area than does the left end. Occasionally the waves offshore are good enough for surfing. Inshore, on a bluff above the beach, is a large beach house that was built by the Del Monte Corporation for its white-collar employees. Both Kawa'aloa and Kalani are sometimes called Ranch Mo'omomi because Mo'okoa's Ranch, Ltd., owns all of the land south of these beaches.

The section of the Mo'ouani shoreline that is called Mo'ouani Beach is the bay where the Hawaiian Home Lands Commission has a community recreation center. The large pavilion is located on the low escarpment above the beach. The small pocket beach of white sand in the inner right corner of the bay is shallow and rocky, but a good swimming area for children. The bay is well protected by its fairly long right point. To the left of the sheltered bay is a rocky headland with several small sand pockets fringed by rocks and tidal pools. This area is frequented primarily by fishermen. It is sometimes called Honeatua Mo'ouani to differentiate it from Beach Mo'ouani.

There is no public access to any part of the three-mile length of the Mo'ouani shoreline. The gates leading to the beaches are all controlled by private concerns.

(22)

Kalaupapa Peninsula

Kalaupapa translates as "the flat plain" or as "much level land." The peninsula was formed principally from lava that came from Kaubaho Crater, flowing against the sea cliffs of the main island and seaward of the

crater. The crater is more than 450 feet deep and extends below sea level. The inner slopes of the crater formed into a large, high-walled pit that is partially filled with bluish-green brackish water. The pond is easily visible from the lookout at Pe'e Ulo, the highest point of Kaubaho Crater. Kalaupapa Peninsula is made up of three ahupua'a: Kalaupapa, Mokuanaia, and Kalaupapa. The entire peninsula is called Kalaupapa because Kalaupapa has been the primary landing and center of population since the late 1800s. No one has lived permanently on the peninsula outside of Kalaupapa since the 1930s.

Prior to the mid-1800s Kalaupapa Peninsula was the home of a community of Hawaiian fishermen and their families. In 1866, however, the Board of Health selected Kalaupapa to be the site of an exile colony for lepers. Leprosy had been introduced to the Hawaiian Islands from the Orient and had grown to epidemic proportions among the Hawaiian people.

At that time no means were available to arrest the disease, so those who contracted it were simply removed from their families and society, and isolated. The Kalaupapa Peninsula provided a perfect natural prison. The Hawaiian government had acquired the ahupua'a's

of Mokuanaia and Kalaupapa in 1848, which included the valleys of Waikolu, Waialua, and Waikaha. The ahupua'a of Kalaupapa was purchased in 1873, giving the government complete ownership of the peninsula. The Hawaiians residing there were given the option of remaining or of relocating to Kaimali, on the other side of the island. Almost forty of the original residents chose to remain and were given access to all areas of the settlement. This intermingling was allowed until 1895, when the Board of Health decided that the situation was unhealthy and evicted all the nonleper residents.

When the settlement at Kalaupapa was created, the Board of Health had felt that the lepers would be able to support themselves by working the land and fishing, as the residents before them had done. The officials thought that after a few years the epidemic would abate and then end once all the lepers had been isolated. The epidemic escalated into the twentieth century, however, and the settlement never became self-sufficient. The first boatload of lepers landed on the peninsula on January 6, 1866. As more and more people were exiled, the conditions at Kalaupapa, the size of the original settlement, became unbelievably bad. The Hawaiian monarchy had established an organized hospital settlement on Kalaupapa, but in reality there was very little order, very little help, and every conceivable type of crime. Many lepers were simply left to die when they could no longer care for themselves. Boatloads of new patients were greeted with this phrase of despair: "A'ole hana'ana ma'ae kela waha..." "In this place there is no law."

In 1873, seven years after the start of the settlement, a young Catholic priest named Father Damien arrived at Kalaupapa on a small vessel carrying fifty lepers and a few head of cattle. Damien was the first resident priest on the peninsula, and his work among the lepers is legendary. Joseph De Veaster was born at Tremelo, Belgium, on January 3, 1840. He entered the Congregation of the Sacred Hearts in Louvain, taking the name of a physician-saint, Damien; volunteered for duty as a missionary in Hawaii; and arrived in Honolulu on March 19, 1864. Shortly after, he was ordained a priest in the Cathedral of Our Lady of Peace in Honolulu and was assigned to the island of Hawaii. Damien spent nine years on the big island, first in Puna and then in the Kohala and Hamakua districts.

In 1872 a Sacred Hearts brother spent six weeks at

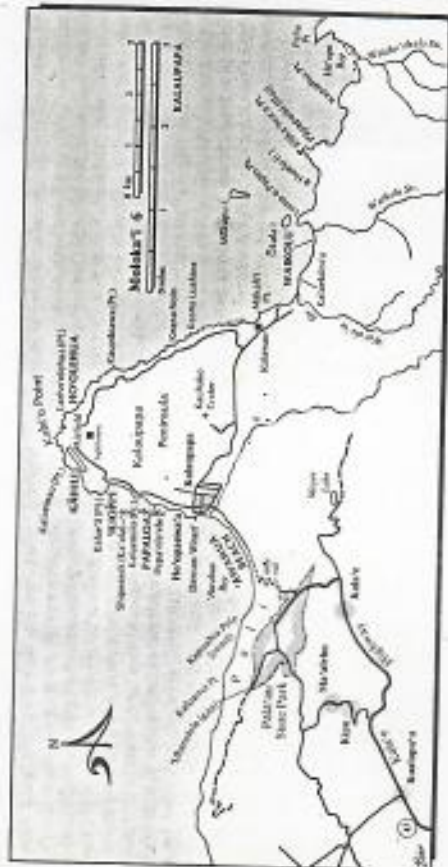
Kalaupapa erecting St. Philomena Church. Damien and three other priests decided to rotate the duties at the new church. Damien drew the first tour of duty, arrived on May 10, 1873, and stayed for the next sixteen years.

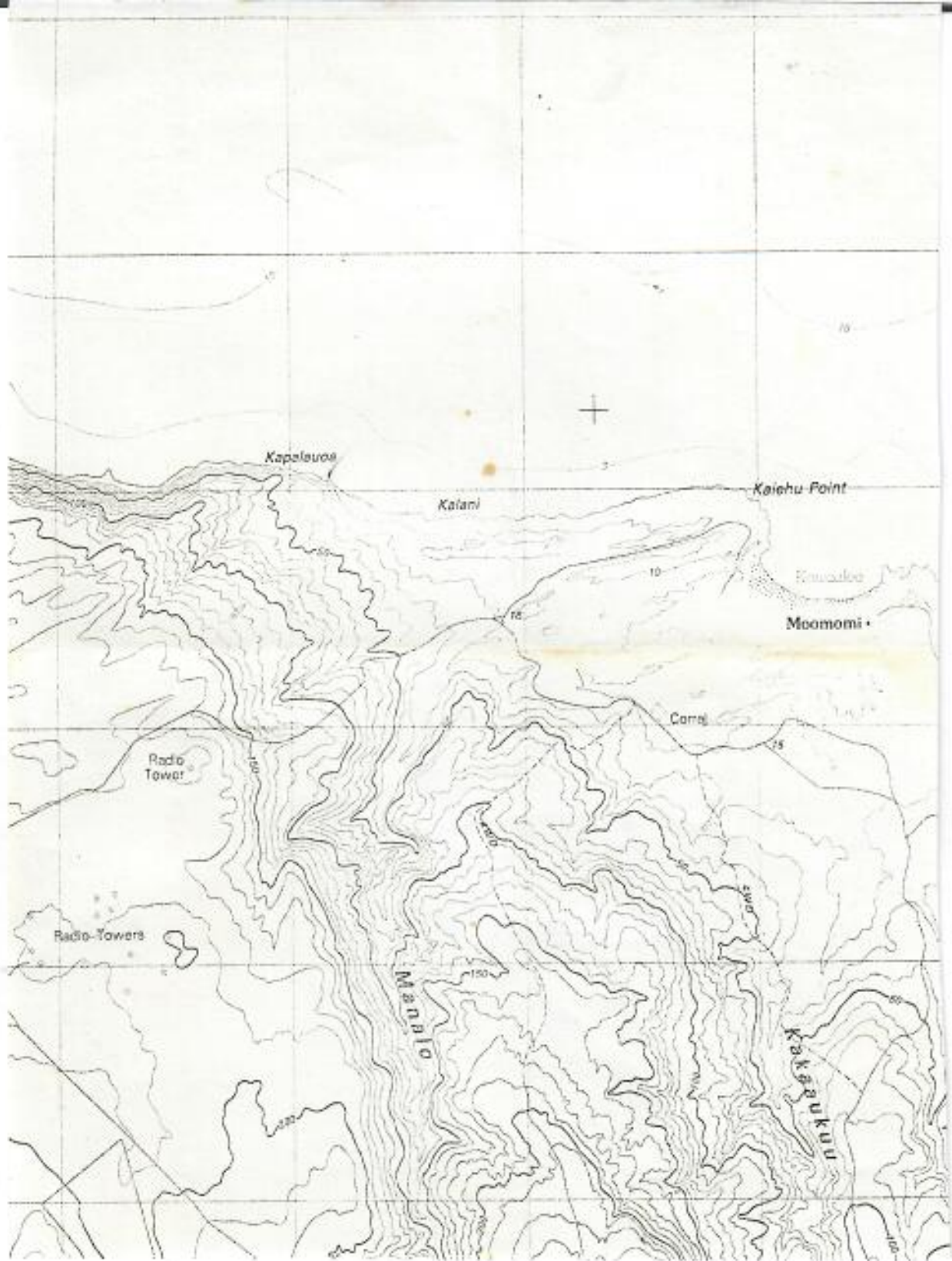
Damien contracted leprosy and died at the settlement on April 15, 1889. His remains were returned to Louvain, Belgium, in May of 1936 and buried in the crypt of the church where he first entered religious life. Pope Paul VI declared him the Venerable Father Damien on July 7, 1977. Veneration is the first step toward sainthood in the Catholic church; the second is beatification, and the third and final step, canonization.

On November 11, 1977, the Damien Museum and Archives were blessed and opened to the public. Located on O'ahu, at St. Patrick's Church in Kaimuki, the museum contains personal possessions, papers, letters, and other memorabilia of Father Damien. Although many individuals assisted and followed Damien, it is his name that has become synonymous with the settlement on Kalaupapa Peninsula. The museum and archives are a good place to start for anyone seeking more information about Damien or the settlement.

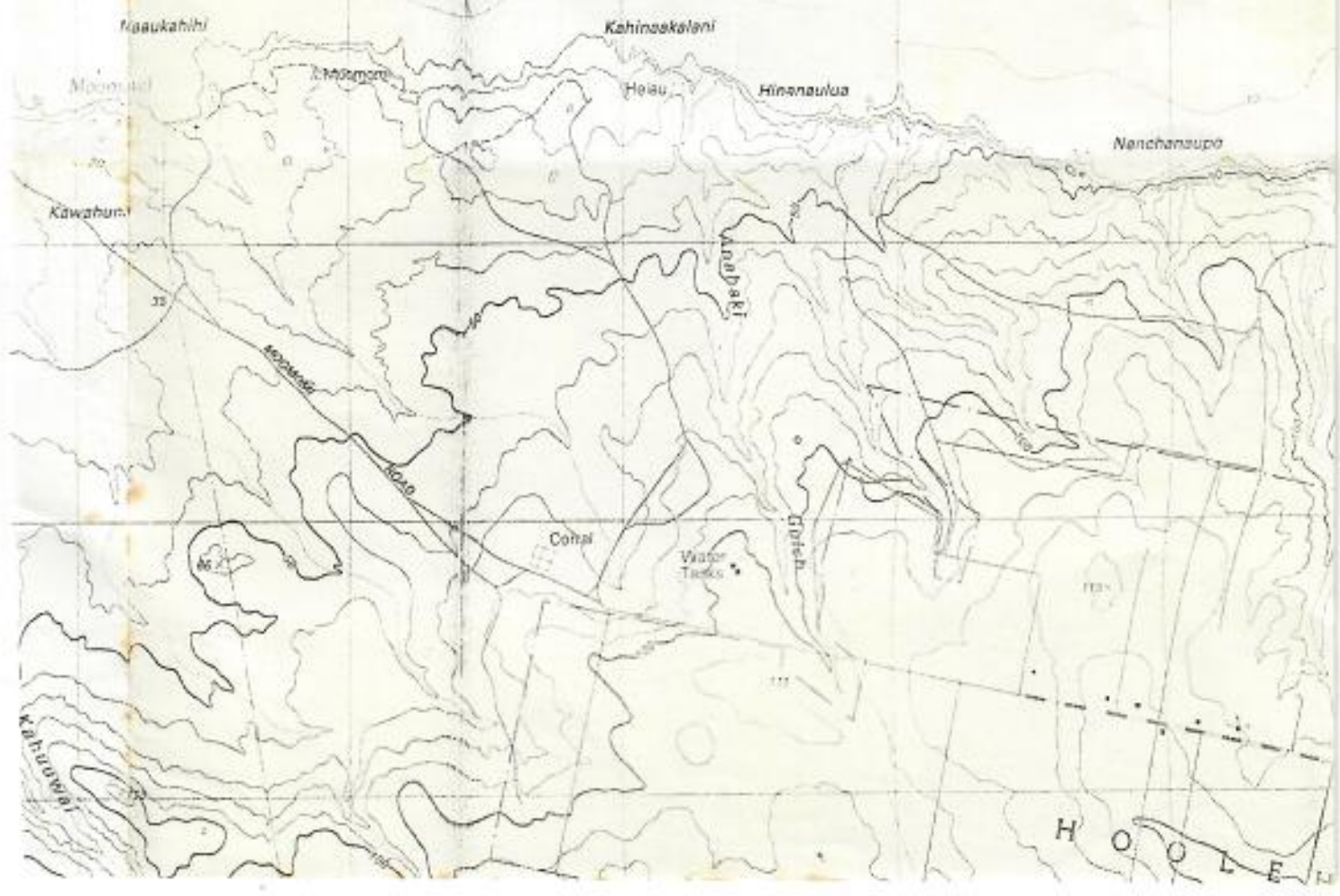
Today the leprosy treatment center at Kalaupapa Peninsula is administered by the State Department of Health. The thirteen-square-mile district is a county of its own, Kalaupapa County, although it has no formal county government. There are 125 patient-residents, 37 non-patient employees, and three members of religious orders living on the peninsula (as of October 1979). No new patients are admitted to Kalaupapa. The median term of residence of the present patients is 33.5 years, the median patient age is 58.8 years, and only eight of the 95 patients over 50 years of age are able-bodied. Kalaupapa Peninsula and the entire county of Kalaupapa are closed to all outsiders. Official visitors and guests of the patient-residents are allowed limited stays by permit only. Trespassers are subject to arrest by the resident sheriff or his deputies. Signs are posted in conspicuous places to advise visitors of the laws and the consequences. Authorized guided tours of the peninsula are available to the public through several commercial firms.

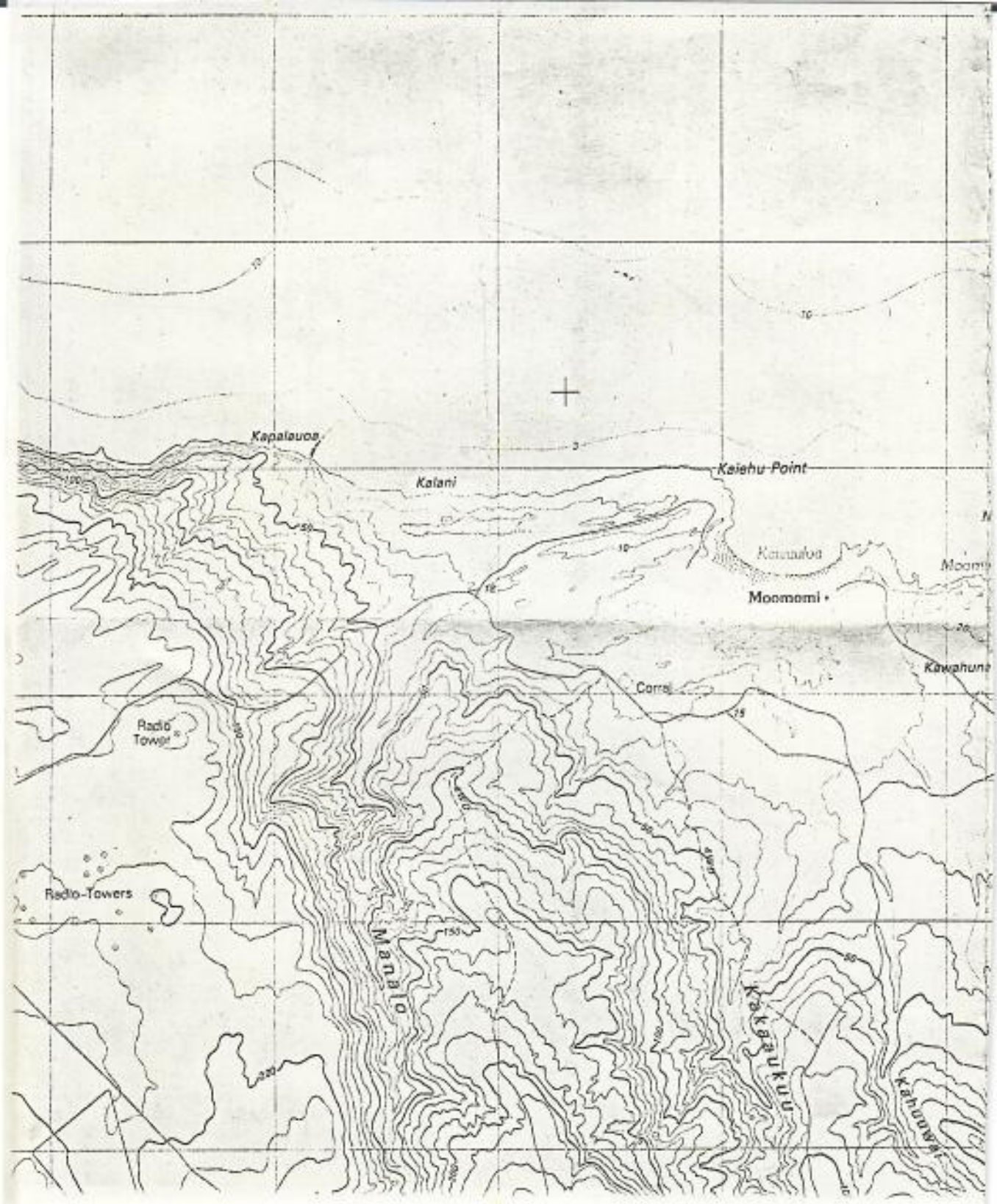
There are five beaches on Kalaupapa Peninsula: 'Awahani, Papehau, 'Iliope'i, Kahihi, and Ho'ohua. All of them can be seen from the public lookout next to the start of the path trail 1,664 feet above the peninsula.





MOLOKAI





Molokai



SIGHTING INFORMATION: TURTLE AND SEAL

Animal sighted (circle): TURTLE SEALNumber of animals: 3 Type, if known: _____Date: 19. Aug. 86 Observer: Som Gon, Alan Holt, Rob Rydell

Address & phone

Time: 12:00 (optional) Nature Conservancy 537-4508Location: Mo'omoni beach, MolokaiObserved from (circle): shore; boat (name: _____);

while skin or SCUBA diving (on surface or at _____ feet deep).

Estimated size (length): Adult female

COMMENTS: (color pattern; injuries; scar patterns; tumors; flipper tags: present Y/N, tag color, and if readable tag number; bleach marks (number/letter); behavior; and weather.

egg pits had been dug in sand. female tracks in wet sand of high tide that morning.

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC & ATMOSPHERIC ADMIN.
NATIONAL MARINE FISHERIES SERVICE, F/SWC2
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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE F/SWC2
P. O. BOX 3830
HONOLULU, HAWAII 96812

MAR 30 1206L741 09/06/86
NOTIFY SENDER OF NEW ADDRESS
NAT MAR FISH SVC
2570 DOLE ST
HONOLULU HI 96822-2396

PETER CONNALLY
Pho 572-1499

June 2, 1984
2765 Soloni St
Pukalani Hi
96768-8734

Dear George,

Called your home this p.m. + spoke to your wife. I wanted to relate to you a turtle observation by several w-workers of mine at Haleakala Natl. Pk.

Location: N. Shore Molokai, West of Moemomi Beach Park less than 1 mile

Observation: tracks leading to leas (dug out pits) on shoreline, apparently made by several turtles. Only leas were observed + no mounds.

Contact for more info: Scott Spleen at 572 8910 (H)
or 572 9306 H.N.P.

Hope this is helpful.

What ever happened to the turtles that hatched by Ren's house?

Our daughter is now 7 mos. + already has a mouth full of teeth. Any day now, Mom will quit breast feeding.

Hope to see ya soon, preferably on Maui.

I work at Haleakala Natl Pk now on a seasonal fence crew. It is meaningful + satisfying work, but too hard for old men like me.

Aloha, PTC

June 5, 1986

To: George

From: John

537-4508

1116 SMITH
SUITE 201

I received a call today from Paul Chang of The Nature Conservancy. He reported that he had seen (on June 1) evidence of turtle nesting on Mo'omomi Beach on Molokai...specifically, at least 5 trails, some of which had more than one pit. (I explained how pits weren't necessarily nests, etc.) He said it had been windy, and that he expected the trails were fairly recent (i.e. not obliterated by blowing sand).

I told him to write you a short note w/descriptions of what he'd seen, maybe with a map showing the beach and the orientation of the trails and pits. He'll probably be expecting a call when you return.

He also inquired about volunteering for us (you).

Saw hatchlings on TV

7/9/86 Call to Steve SLP, haole fellow telling
about nesting Moomomi, Molokai.

Wants to film hatchlings

A spokesman for the Fisheries Agency said it was hoped that the tagging program would reveal the migration, growth and population structure of the tuna, particularly skipjack, in the western Pacific.

The Fisheries Agency has requested that anyone catching one of the tagged tuna note the date and place of capture as well as the tag number and length and weight of the fish, and return the information, together with the finder's name and address, to: Fisheries Agency, Tohoku Regional Fisheries Research Laboratory, Shinhamacho 3-27-5 Miyagi Pref., Japan 985.

The release data concerning that particular fish, and a T-shirt, will then be sent to the finder in return.

Mangrove promotion

A CAMPAIGN to promote the importance of proper management of mangroves and wetlands to protect estuary and freshwater environments has been launched in Queensland.

The campaign was launched by the director-general of the Queensland Department of Primary Industries, Dr Graham Alexander, who said mangroves and wetlands were especially important in conserving commercial and recreational fisheries.

'Juveniles of mullet and bream, various crabs and yabbies shelter and feed in mangroves, in addition to many other species of birds, reptiles and crustaceans which are found in mangrove habitats,' Dr Alexander said.

'Mangroves also act to stabilise the banks on which they grow and thus reduce erosion.'

Dr Alexander said the Department's fisheries management branch had produced a series of posters on mangrove management and was also conducting an educational program of mangrove conservation through schools and other educational institutions.

NSW inspector honoured

THE former Chief Inspector of the New South Wales Department of Agriculture, Fisheries Division, has been awarded the Medal of the Order of Australia in the recent Queen's Birthday Honour List.

Mr Frank Bonser retired from his position last year after 34 years service to the fishing industry.

The Director-General of the Department of Agriculture, Mr G. H. Knowles, said the job of fisheries inspector was a combination of policeman, public relations officer and conciliation counsellor.

Mr Bonser served as the district inspector for the Illawarra and Port Jackson Regions. In 1971 he was given the task of organising a complete training course for new fisheries law enforcement recruits.

He was appointed Assistant Chief Inspector in 1975 and Chief Inspector in 1980.

Mr Knowles said Mr Bonser had helped to create a better working relationship between all those involved in fishing.



Frank Bonser.

Higher service for Melb. Seaphone

SEAPHONE, the Overseas Telecommunications (OTC) marine service that enables phone calls to be made at sea, has been upgraded in Melbourne.

The service has been moved from 300 m above sea level at Cape Schank to a new perch on Arthur's Seat, almost 400 m above sea level.

OTC claims the move has resulted in a dramatic improvement in the performance of Seaphone, particularly in the bays and inlets around Melbourne.

Reports have been received of boats as far away as Devonport in Tasmania making successful phone calls through the upgraded service.

Fishing for science

FISHERMEN in Queensland are being asked to take part in a unique experiment to measure the vulnerability of Great Barrier Reef fish to hook and line.

Great Barrier Reef Marine Park Authority (GBRMPA) management officer Konrad Beinssen said the results would have far reaching application in the management of reef fish stocks.

The experiment would be conducted by the Queensland National Parks and Wildlife Service around Boulton Reef, 100 kilometres east of Gladstone, in the Great Barrier Reef Marine Park's Capricornia Section.

Mr Beinssen said Boulton Reef would be re-opened to fishing on December 1 after being closed for more than three years to allow fish stocks on the reef to recover.

Before then several hundred fish would have been caught, tagged and released in the area in a project funded partially by GBRMPA.

After December 1, fishermen visiting Boulton Reef would be asked to record their catch and fishing times in a logbook to assess the

553-3778

Bill - Several items shown spotted that need to be corrected, or clarified.

DISCREPANCIES FOR MOLOKAI DATA NOTED BY SK AND GHB
SEPTEMBER 1993

DATE	STUDY SITE/ BILL'S COMPUTER #	TAGS	COMMENTS
1. 10-21-82	PalauuH-#1	6553/6554	No hard copy record sent to GHB.
2. 02-11-84	PalauuI-#11	7335/7334	Tag 7334 should be 7335.
3. 04-26-85	PalauuI-#20	6729/6730	Date should be 04-26-84.
4. 05-11-84	PalauuI-#25	7237/7238	No hard copy record sent to GHB.
5. 07-03-86	PalauuI-#27	9579/9580	Tags should be 9577/9578.
6. 05-10-90	PalauuI-#28	Z32/Y829	Leave as Site "G" according to GHB's data.
7. 07-11-91	PalauuI-#29	V349/V350	Leave as Site "G" according to GHB's data.
8. 07-11-91	PalauuI-#30	V351/V352	Leave as Site "G" according to GHB's data.
9. 03-24-84	PalauuJ-#1	7335/7336	Measurements are in inches. needs to change to centimeters (54.6/49.5).
10. 05-07-85	PalauuJ-#2	7246/7247	Hard copy sent to GHB states site released same as capture site.
11. 05-07-85	PalauuJ-#3	8614/8615	Hard copy sent to GHB states site released same as capture site.
12. 05-07-85	PalauuJ-#4	8616/8617	Need to change SW to 33.5. Hard copy sent to GHB states site released same as capture site.
13. 05-07-85	PalauuJ-#5	8618/8619	Hard copy sent to GHB states site released same as capture site.
14. 05-07-85	PalauuJ-#6	8620/8621	Hard copy sent to GHB states site released same as capture site.
15. 05-05-84	PalauuK-#6	6741/6742	CL should be 43.9.
16. 05-05-84	PalauuK-#10	6749/6750	CL is 43.5.

GHB for SITE, USC, whenever Bill computer sheet showed

ATTACHED

ATTACHED

OK for change to many charts.

OK

Hard copy sent to GHB states site released same as capture site.
 Hard copy sent to GHB states site released same as capture site.
 Need to change SW to 33.5. Hard copy sent to GHB states site released same as capture site.
 Hard copy sent to GHB states site released same as capture site.
 Hard copy sent to GHB states site released same as capture site.
 CL should be 43.9.
 CL is 43.5.

K'Kai Pier

GB needs hard copy or explanation in order to phone. Attached

Bill's data say released at K'KAI wharf

Date Tagged: February 11, 1984

Location Caught: Palaaau Outside of Biomass Plant

Method of Capture: Nets

42 entries

Revised
Kawer
Kawer

7336 SATURDAY NOT 7304

Number	Curved Length (cm)	Curved Width (cm)	Tag Number On Left Front Flipper	Tag Number On Right Front Flipper
1	68.0 (64.0)	59.0 (51.0)	7333	7334
2	55.0 (52.5)	49.5 (41.5)	7335	7336
3	67.5 (63.5)	62.0 (52.0)	7337	7338
4	50.0 (46.5)	45.0 (38.0)	7339	7340

RECOVERYRECOVERY***RECOVERY***RECOVERY***RECOVERY***RECOVERY***

RT-5 76.5 (71.5) 72.0 (57.5) 6453 6454

The above turtle was originally tagged on Molokai 16 months ago approximately 2 miles west of today's site. Both tags were in good shape with puncture holes on both flippers very well healed over. The turtle was robust and in good shape. The increase in curved length was 1 1/2 cm and the increase in curved width was 1.0 cm.

Remarks: one chip in the rear end of the shell of #3 as described
On the original report form 1/28/83 still evident. 150 turtles
tagged to date with 12 recoveries.

Date Tagged: 4-26-84 not 85

Location Caught: Palaaau Just outside the biomass plant

Method of Capture: nets

Number	Curved Length (cm)	Curved Width KMKKKK (cm)	Tag Number On	
			Left Front Flipper	Right Front Flipper
✓ 1*	44.0 (41.5)	38.0 (33.0)	6700 ✓	6726 ✓
✓ 2	41.0 (39.5)	37.0 (32.5)	6727 ✓	6728 ✓
✓ 3	62.5 (58.5)	57.0 (48.5)	6729 ✓	6730 ✓

See P19 Book 3

Remarks: *See Attached Sheet #1. 153 turtles tagged to date with
12 recoveries.

[63 JUL 23 1993]

Remarks: 148 turtles tagged to date with 11 recoveries.

Date Tagged: May 5, 1984

Location Caught: 1/4 mile east of Kolo Wharf

Method of Capture: Nets

Study Site: PALAANK "ASBF 9-10-92"

Move to location

Number	Straight measurements in parenthesis		Tag Number On Left Front Flipper	Tag Number On Right Front Flipper
	Curved Length (cm)	Curved Width (cm)		
★✓ 1*	83.0 (79.5)	78.5 (62.5)	6731	6732
★✓ 2	88.0 (82.5)	80.0 (64.5)	6733	6734
★✓ 3	74.0 (69.5)	63.5 (52.5)	6735	6736
★✓ 4	69.5 (65.0)	63.5 (53.5)	6737	6738
★✓ 5	48.0 (44.5)	43.0 (37.5)	6739	6740
★✓ 6	43.5 (40.0)	39.0 (33.0)	6741	6742
★✓ 7**	47.0 (43.5)	40.5 (35.5)	6743	6744
★✓ 8	43.0 (40.5)	38.0 (33.5)	6745	6746
★✓ 9***	53.5 (51.0)	46.0 (39.0)	6747	6748
★✓ 10	43.5 (40.5)	38.5 (33.0)	6749	6750

Remarks: 163 turtles tagged to date with 12 recoveries.
 2 more turtles were in the bag today but not tagged because they were too big to handle.

CONTINUED FROM P. 75

Date Tagged: May 7, 1985

Location Caught: 1/4 mile west of Biomass plant, Palaau, Molokai

Method of Capture: Nets

Bull Pen

Bill Gates released @ KK Pen

* 2 entries

Number	Curved Length (cm)	Curved Width XXXXXX (cm)	Tag Number On Left Front Flipper	Tag Number On Right Front Flipper
* 1*	82.0 (74.5)	76.0 (61.5)	7246	7247
* 2**	73.5 (68.5)	65.5 (54.0)	8814	8815
* 3	43.0 (40.5)	39.5 (33.5)	8816	8817
* 4***	43.5 (41.5)	39.0 (33.5)	8818	8819
* 5	48.0 (44.5)	43.5 (37.5)	8820	8821

NOTE: Straight measurements in parenthesis.

1* This is a recapture from 5-16-84 which was also tagged in this same general area. Released at: ^{See below}

2** Plates on carapace odd. See attached sheet #1.

4*** Left rear flipper deformed. See attached

Remarks: All of the above was released at site of capture.

249 turtles tagged to date with 20 recoveries.

JUL 27 1993

info was
on page
107

K. S. Pen

106

9/10/93

Bill - Thanks for your letters. I appreciate all of this info.

Sorry I didn't explain about confusion regarding ID of sites. The problem is (was) that we didn't know you had gone back and assigned old captures to new alphabet sites that you've assigned. I guess that happened a year or so ago (?). Anyway, now that we know the "what and where" we can proceed to change old records and create new sites accordingly in the data base. This is a very powerful program, so we must proceed carefully, and accurately. Yours too, I'm sure. Anyway, here are two questions and concerns that came up that need your advice/comment.

1. The data sheet you sent me in April 85 (copy attached) says the tagging location was "just outside Papanaka Fishpond." But in your data you've now assigned those

(over)



← something else to scan.

Loggings to a new site "L", which from your map is outside Waiakane. Which is correct? We have a designated site "D" off Paharaka. Would you want to assign them to that site? ~~Yes!!~~ ~~No!!~~ ~~Yes!!~~ ~~No!!~~ **=NO: KEEP AS "L"**

2.) In May 85 you sent me data sheets (also attached) for turtles tagged by Hooajo at Kawela. But in your computerized version (if I'm reading correctly) you've assigned them to a new site "M" off coconut grove. **YES!! CAPTURED AT "M", but released at KAWELA "G".**

Let me know how you want to handle the above. FORTIPS

I have an interesting trip coming up at the end of the month. Rose Atoll (haven't been there since 1986). Will be deploying 3 satellite transmitters down there (Am. Samoa paying, but me!). Two weeks ago we put two more out at FFS. Will let you know if they go to Molokai.

BEST, JGC

Date Tagged: April 11, 1985

WAIKANE PALAAM

1/94 from Bill
PANAUA "L"Location Caught: Just outside Pakanaka Fishpond = SITE

Method of Capture: Nets

THIS STATEMENT IS INCORRECT!
ORIGINAL FIELD NOTES INDICATE
"WAIKANE"SOME SITE =
"L"

Number	Curved Length (cm)	Curved Width (cm)	Tag Number On Left Front Flipper	Tag Number On Right Front Flipper
1	83.0 (77.0)	72.5 (58.0)	7867	7868
2	76.0 (71.5)	71.0 (56.0)	7869	7870
3	43.5 (41.0)	39.5 (33.0)	7871	7872
4	56.0 (52.5)	49.5 (41.5)	7873	7874
5	61.0 (56.5)	53.0 (44.5)	7875	7926
6	66.0 (60.5)	56.5 (45.5)	7927	7928
7	74.0 (63.0)	64.0 (58.0)	7929	7930
8	70.0 (64.0)	62.5 (49.5)	7931	7932 only
9	49.0 (46.0)	43.0 (35.0)	7933	7934
10	61.0 (57.5)	53.5 (45.5)	7935	7936
11	61.5 (57.5)	52.0 (44.5)	7937	7938
12	64.0 (59.5)	56.0 (47.0)	7939	7940

Remarks: Released at Dock. 198 turtles tagged to date with 15

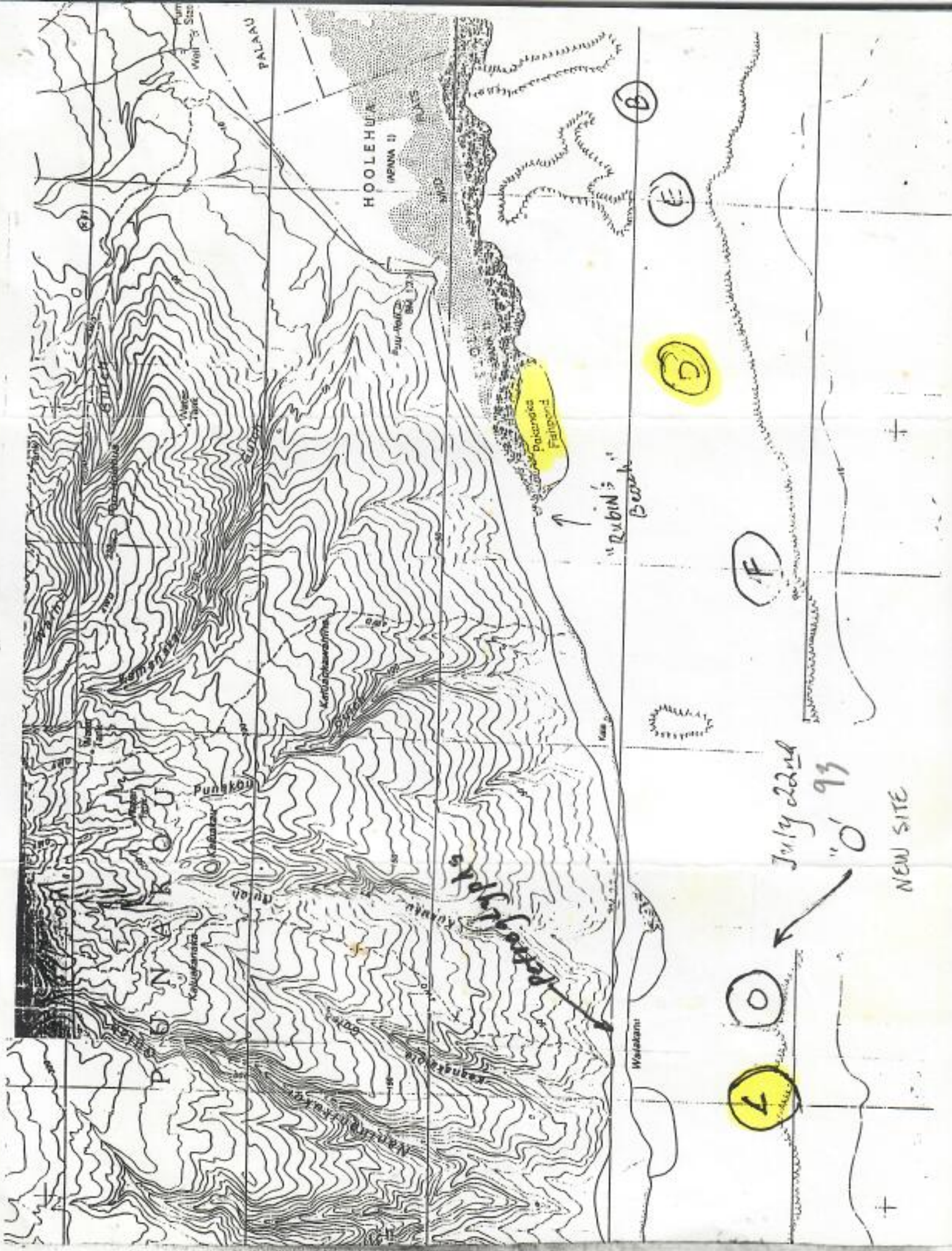
recoveries.

Cart (PROGHT IN
S-89 Gillet
tags mailed
NO NAME
return
address

Resigning -
tags mailed, 80
tags

7/88
7/189
5/83

30 JUL 1985



Palau "M" 1/24 from Bill notes
 original capture M, but
 indicate Palau M, but

5-19-85

Date Tagged:

Location Caught: Kawela

Method of Capture: Incidental catch in nets of Hocaajo

at Kawela

RECONFIRMED
 w/ Hocaajo
 5/25/90

6/3/87

Palau
 MRS

Number	Curved Length (cm)	Curved Width (cm)	Tag Number On Left Flipper	Tag Number On Right Flipper
1*	53.0 (50.5)	48.0 (42.0)	6698	6699
2**	47.0 (44.0)	40.5 (35.0)	8604	8605
3	45.0 (42.5)	38.5 (33.5)	8606	8607
4	71.0 (66.0)	62.0 (52.0)	8608	8609

*Recapture from 4-25-84. Initially caught and tagged and released at Palau. This recovery indicates:

- (1) an increase in curved length of 2.0 cm;
- (2) an increase in curved width of 3.0 cm;
- (3) an increase in straight length of 2.5 cm;
- (4) an increase in straight width of 2.0 cm;
- (5) a eastward movement of approximately 7 miles.

**See attached sheet #1 for shell deformity.

Remarks:

All turtles released at Kawela. 255 turtles tagged to date with 22 recoveries.

JUL 27 1985

Date Tagged: May 20, 1985

Location Caught: Kawela

Method of Capture: Fisherman's nets (Hocajo)

Number	Curved Length (cm)	Curved Width Depth (cm)	Tag Number On	
			Left Front Flipper	Right Front Flipper
★ 1	42.5(40.0)	37.5(33.0)	8610	8611

Remarks: Turtle released at Kawela, 256 turtles tagged to date with 22 recoveries.

Palau "M"



Received United States Department of the Interior
WPPO

DEC 8 1986

FISH AND WILDLIFE SERVICE

300 ALA MOANA BOULEVARD
P. O. BOX 50167
HONOLULU, HAWAII 96850

National Marine
Fisheries Service

Mr. Christopher L. Hart
Deputy Planning Director
County of Maui Planning Department
200 S. High Street
Wailuku, Hawaii 96793

12/8/86 JX
12/9: Call from Maui
County. Told them out
of our jurisdiction, 2
300 yards back from high
water mark. gave them
DEC 5 1986
Within 1000 yds # 10
turtle nesting.

Dear Mr. Hart:

This letter is in response to your November 21, 1986 request for our review of the Land Use Commission Special Use Permit Application by Mr. Roger Davidson (Ameron HC&D) for sand mining at Moomomi, Kaluakoi, Molokai. The Service has reviewed the materials provided with your request and offers the following comments for your consideration.

Our principal concern is that mining activities may disrupt the use of the beach and dune area at Moomomi for breeding by the Green Sea Turtle (Chelonia mydas), a listed threatened species, and possibly by the Hawksbill Turtle (Eretmochelys imbricata), a listed endangered species. Moomomi is certainly one of the most important sea turtle breeding areas remaining within the five major Hawaiian Islands. Increasing the area's accessibility may increase the incidence of direct harassment (poaching) of adult turtles and eggs, and predation of eggs and hatchlings by dogs. The use of heavy equipment and vehicles on the beach and dunes can cause sand compaction and possible nest destruction. Lights on or near the beach might disorient newly hatched turtles, decreasing their chances of reaching the sea. We strongly suggest that you contact the National Marine Fisheries Service for additional information on the breeding biology of these threatened and endangered species.

Additionally, there are a number of candidate endangered plants which are important components of the native strand community at Moomomi (one of the few that remain essentially undisturbed within the State). These include two varieties of akoko (Euphorbia skotsbergii and E. degeneri var. molokaiense), ohai (Sesbania molokaiensis), two tetramolopium varieties (Tetramolopium rockii var. rockii and T. rockii var. calcisabulorum), and ena ena (Gnathalium sandwicense var. molokaiense). Partial destruction of the extensive native strand community at Moomomi will seriously reduce the range of these rare strand plants and elevate their priority for listing as endangered species.

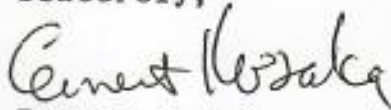
Dec 16 1986
Kauaiakakai Cafeteria



The Service recommends that the applicant seek alternative sites for sand mining activities which will not involve detrimental impacts to threatened and endangered species and rare native plant communities.

We appreciate this opportunity to comment. Please don't hesitate to call on us if we can be of further assistance.

Sincerely,



Ernest Kosaka
Project Leader
Environmental Services

cc: RD, FWS, Portland, OR (AFWE)
✓ NMFS-WPPO, Honolulu, HI
DOFAW
DOCARE
DAR
The Nature Conservancy of Hawaii

./4/82

State of Hawaii
Department of Land and Natural Resources
DIVISION OF AQUATIC RESOURCES

Date . December 9, 1986

MEMORANDUM

TO: Paul Kawamoto, Program Manager, Aquatic Resources
THROUGH: Alvin Katekaru, Chief, Marine Section
FROM: Alton Miyasaka, Aquatic Biologist
SUBJECT: Comments on 1. Conservation District Use Application
x 2. Special Land Use Permit Application

Comment		Date of	Date
Requested by <u>Maui County Planning Department</u>		Request <u>11/24/86</u>	Rec'd <u>11/26/86</u>

Summary of Proposed Project

Title: SAND MINING
Project by: Ameron HC&D
Location: Kawa'aloa Bay, Moemomi, Kaluakoi, Molokai

Brief Description:

The applicant proposes to mine sand 300' inland from Kawa'aloa Bay on Northern Molokai within a 14.9 acre parcel (TMK: 5-1-02 por. 35). The sand is intended for construction use in concrete or as fill.

Comments:

In view of the parcel's distance from the shoreline, the lack of streams, and the porous nature of the sand, the proposed project is not expected to adversely impact aquatic resources.

Although green sea turtle nesting has been reported at Kawa'aloa Bay, the proposed site is sufficiently distant from the shoreline with mining activity scheduled during daylight hours only to mitigate any potential for adverse impacts to adults or hatchlings. The Green Sea Turtle Recovery Team of the National Marine Fisheries Service should be asked to express their concerns.


ALTON MIYASAKA

George,

The nest was located just below the vegetation line on the beach closest to the settlement.

I spoke with my friend and he can recall seeing the broken shells in the nest area but he couldn't give me a date.

mike Colter

7/21/86 Log:

Saw tracks & 2 nest sites on a large remote beach at Kahaupapa.

Mule train employees will keep track.

received
4/6/87

(over)

(0121)
3/26/87 JOHN NAUGHTON
VISITED Kalaupapa - was
told that nesting has been
seen a couple of times
near old houses south
of Ka Laea (see map)

Date)

Administration Office - Oahu

157° 03' 00" 08 09 10 11 51° 30' 12

N

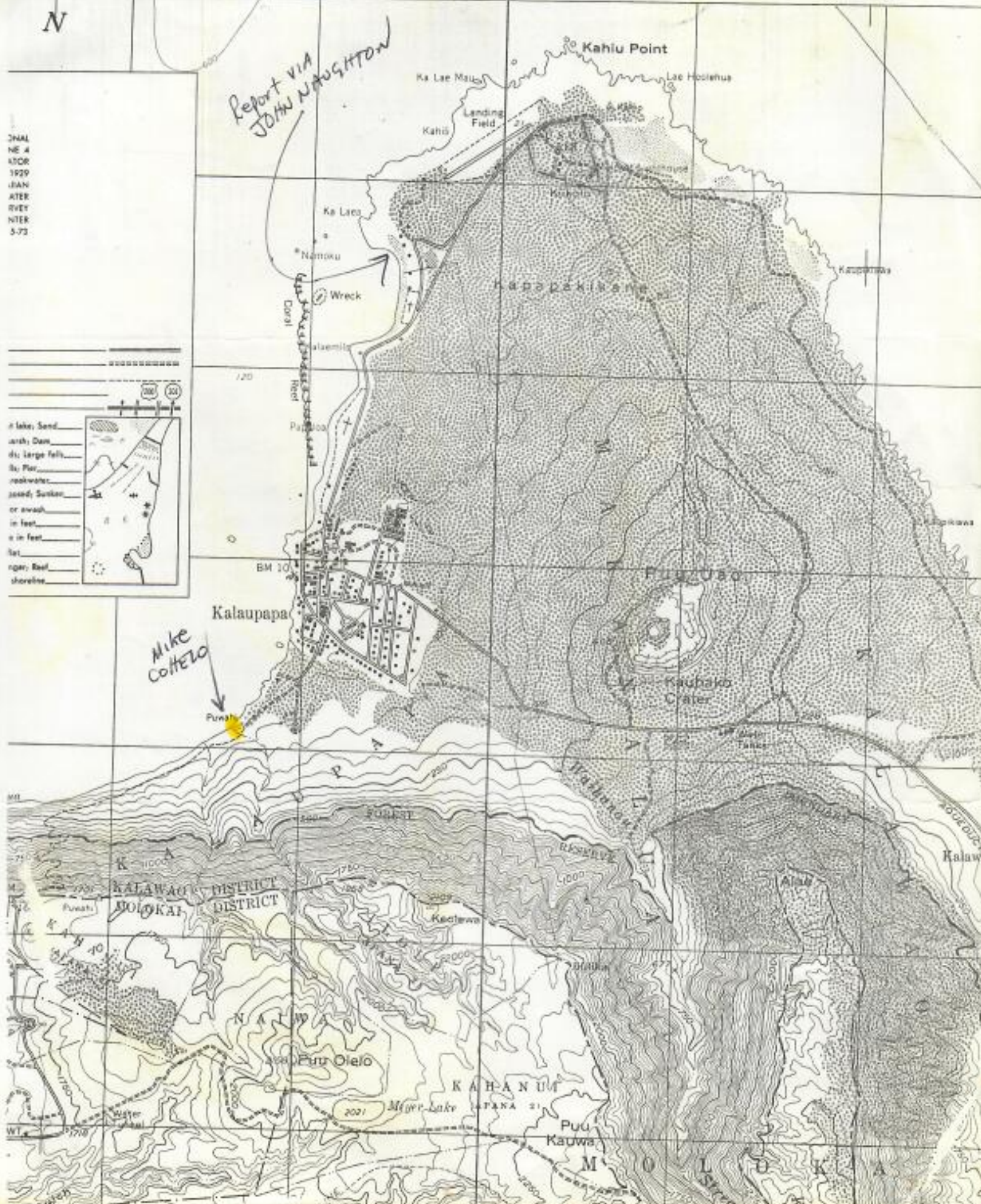
Report via JOHN NAUGHTON

3MAY
NE 4
MOR
1929
JAN
ATER
RYE
NTER
5-73

Scale: 0 100 200 feet

Legend:

- lake; Sand
- marsh; Dam
- ds; Large falls
- fs; Flow
- rockwater
- road; Surface
- or wash
- in feet
- in feet
- ft
- nger; Reef
- shoreline



Mike Coltrano

Puu Uao

Growth rates of immature green turtles tagged and recaptured at Palaaau, Molokai, in June 1987. (Compiled by G. H. Balazs.)

Tag No.	Date first tagged and measured	Initial carapace length, cm		Carapace length at recovery, cm		Elapsed time in months	Growth rate cm/year inches/year
		Curved	Straight	Curved	Straight		
6698, 6699*	4/25/84	--	48.0	--	52.1	37 (1 yr, 1 mo)	1.33 0.52
6397, 6398	9/3/82	57.5	--	73.5	--	57 (4 yr, 9 mo)	3.37 1.33
6421, (9876)	9/3/82	63.0	--	68.5	--	57 (4 yr, 9 mo)	1.15 0.45
6541, 6542	10/19/82	46.0	--	56.5	--	55.5 (4 yr, 7.5 mo)	2.27 0.89

*Extensive tumors on the eyes and front flippers. Not present when originally tagged on 4/25/84, or when resighted on 5/19/85.

Kresge Challenges Hawaii to Raise \$725,000 by Year's End

The Kresge Foundation has issued a challenge to the people of Hawaii: raise \$725,000 before the end of 1987, and the Foundation will give \$500,000 toward the purchase of Mo'omomi Dunes on the island of Molokai.

The Kresge challenge opens a critical new phase for the Islands of Life campaign. The grant will be the focus of a direct mail campaign aimed at broadening grassroots support for the Conservancy.

Mo'omomi Dunes is one of eight "islands of life"—important natural areas in Hawaii designated for preservation as part of the campaign. Located on the northwest end of Molokai, the windswept dunes shelter five globally endangered plant species. The endangered Hawaiian green sea turtle and rare sea birds such as the Laysan albatross are trying to recolonize the area; the Hawaiian monk seal may follow the same course.

The dunes are also rich in buried



The Hawaiian monk seal, one of the creatures that may someday recolonize Mo'omomi.

archaeological treasure. Fossils and deposits in petrified dunes show abundant evidence that the ancient Hawaiians lived there, and that the dunes once hosted some 40 species of birds—including distant cousins of the nene—all now extinct.

TNCH, long aware of the significance of the area, recently concluded negotiations to buy the land from Molokai Ranch. The Conservancy's plans include establishing trails that will allow the public to enjoy the area without jeopardizing the fossil sites and rare plants found only at Mo'omomi.

Friends who want to help meet the Kresge challenge should send their gifts to TNCH, 1116 Smith Street, Suite 201, Honolulu, Hawaii 96817. And remember that every new member you sign up during this critical segment of the campaign also helps us reach our challenge goal.



1116 Smith Street
Suite 201
Honolulu, Hawaii 96817

Address Correction Requested

Non Profit Org.
U.S. Postage
PAID
Permit No. 141
Honolulu, Hawaii

1165153H-1K-057-01/88-NX
MS LOUISE F LEMBECK
352 WAILUPE CIRCLE
HOHOLULU, HI 96821

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Richard A. Cooke III

The Dunes of Mo`omomi

by Samuel M. Gon III

THE RISING SUN reveals tracks left by sea turtles that came ashore the previous night to lay their eggs, and morning glory vines wreath the nesting excavations in the white coral sands. The cool air and the mild voice of the sea give no portent of the predictable, salt-laden winds that will arise later in the day—winds that shape the dunes of Mo`omomi.

Created by strong and steady northeast trade winds that carry beach sands far inland, these linear dunes sometimes extend a mile long and hundreds of feet wide. When seen from above, they cut across the lowlands of West Molokai—isolating Kalaeoka`ilio (The Dog's Point) from the rest of the island—and, like pale fingers, disclose the path of the prevailing trades. A section of the coastline here is aptly named Keonelele—"the flying sands."

The winds that design Mo`omomi's dunes sweep with moisture-laden air past the lowlands and then

upslope to altitudes where the moisture can no longer be held. There the montane rain forests are dark green with trees festooned in moss. Yet fewer than five miles away at Mo`omomi, the desert-like coast feels none of this moisture.

Coastal dunes like those of Mo`omomi were once common throughout the Hawaiian islands, but almost all have been destroyed by sand mining and urban development. As a result, Hawaiian green sea turtles were extirpated from the eight main islands of the Hawaiian chain and today are found primarily on the farthest northwestern islands and shoals. Only recently protected, they now are attempting to regain their prehistoric breeding grounds at such places as Mo`omomi.

AT FIRST GLANCE the dunes of Mo`omomi appear nearly barren. The far cliffs of Moku are dim in the salt haze, and arid scrub—wind-

whipped into curious forms—clings tenaciously to the sandy soils. And yet the site is rich in life; indeed, it is a last refuge for Hawaiian coastal vegetation. Within vast, integrated communities of nearly undisturbed native grasses and shrubs grow more rare coastal species than in any other single place in the islands. What remains at Mo'omomi is a vestige of a major Hawaiian coastal ecosystem, a holdover from an ancient era.



Alan Root

Here, shrubby ocean naupaka (*Scaevola sericea*)—the most common of the islands' native coastal plants—shares the coastal strand with a beach morning glory, pohuehue (*Ipomoea pes-caprae*), and with a mix of less frequently seen endemic Hawaiian plants. Carpets of rolling 'aki'aki grasslands provide a stabilized bed in the shifting dunes for a rare native nightshade, *Solanum nelsoni*. In exposed patches of red volcanic soil, an endangered beach legume, the 'ohai (*Sesbania tomentosa*) flaunts its brilliant salmon flowers set on low-lying branches that seem espaliered by the wind against a backdrop of rocky terrain. No fewer than five globally endangered plant species make their last stand at Mo'omomi.

Among these is a native *Gnaphalium*, called 'ena'ena by the Hawaiians, that punctuates the sandstone plain with radiant white foliage. Its

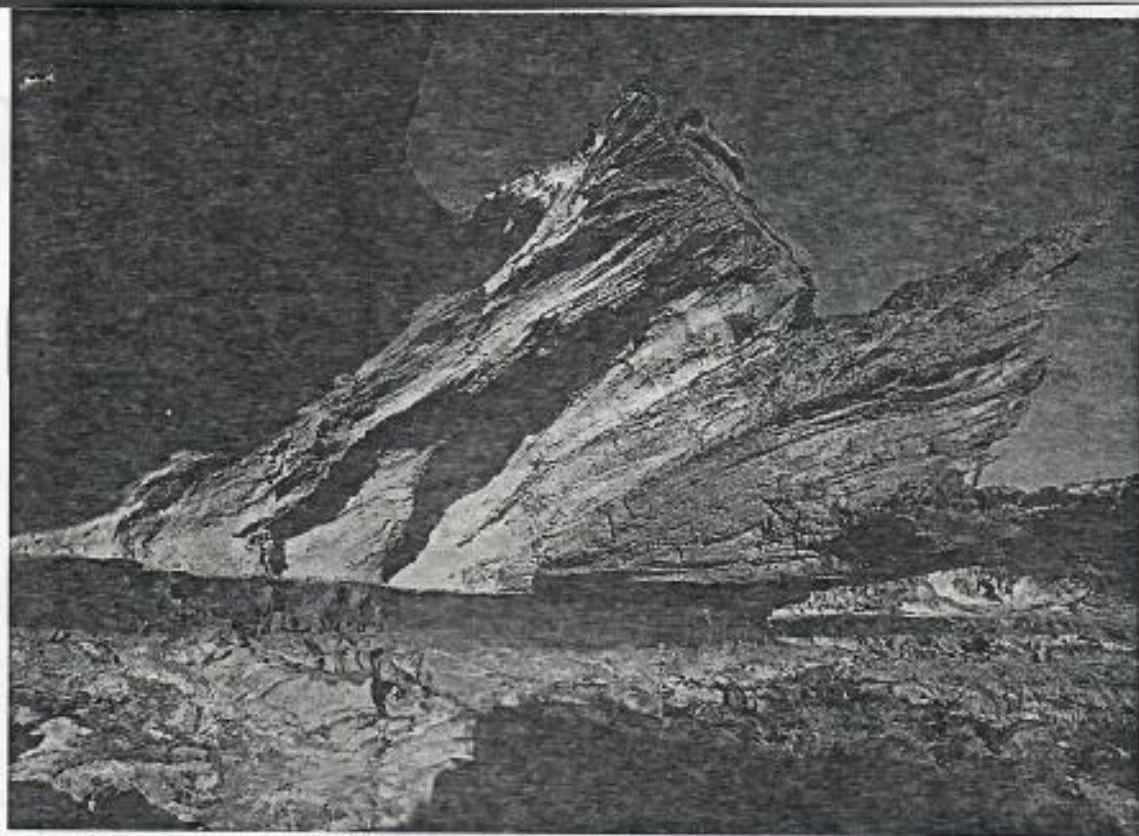


Richard A. Cooke III



William P. Mull

Mo'omomi is the finest remaining refuge for Hawaiian coastal vegetation in the main Hawaiian islands. *Gnaphalium sandwicense* var. *molokaiense* (upper left)—a candidate for federal listing—and *Heliotropium anomalum* (above) are both native species that grow fine, sun-reflective hairs on their leaves to protect them from the parched environment. *Sesbania tomentosa* var. *molokaiense* (left), a beach legume known only from Mo'omomi and also a candidate species, grows in exposed patches of volcanic soil adjoining the dunes.



Richard A. Cooke III

Lithified dunes—settled sand that has petrified because of the dry conditions—sometimes expose evidence of ancient occupation by native Hawaiians.

succulent leaves are thickly covered with fine, sun-reflecting hairs—a protective strategy common on the parched flats of Mo'omomi. Another native plant, a heliotrope, forms silvery mats in the lee of consolidated dune crests. Its whorled, diminutive leaves also are clothed with delicate reflective hairs. The heliotrope's Hawaiian name, *hinahina*, evokes an image of the moon rising fully over an ocean horizon. (In Hawaiian mythology, the moon embodied a goddess, Hina—the mother of the island of Molokai. It seems appropriate that the island chain's best examples of *hinahina* occur on Molokai.)

MO'OMOMI is far more than a superb showcase for shoreline vegetation. The dry conditions that predominate here on the coast cause settled sand to lithify—to petrify or turn into stone. Where ocean waves cut low escarpments into some of these lithified dunes and soil layers, they sometimes expose evidence of long occupation by native Hawaiians. Layers of crab claws and the shells of *'opihi* (a limpet still savored today) glint in the dark red volcanic clays, and a thin band of charcoal-stained soil reveals where a coastal house site once stood. The fishing was good long ago at Mo'omomi, even as it is today.

But more than good fishing lured early Hawaiians. Scattered shards of dark volcanic stone contrast starkly with the salt-crusting white sandstone

of the petrified dune flats. They are the residuum of ancient adze makers. Dense basalt from the throats of volcanoes were the best materials for making stone adzes, the Hawaiian's major hewing tools. Near Mo'omomi, the extinct cinder cone Pu'u Kaeo was a prime source of the fine-grained basaltic rock. Archaeologists also have found the hammerstones used to shape the tools in addition to the rectangular, roughly adze-sized products—called "blanks"—that were then carried away for final working in villages throughout the island.

Mo'omomi is still a special place for the Hawaiian people, some of whom recall the medicinal uses of the area's coastal herbs. Others continue to enjoy the rich marine resources through fishing, harvesting *'opihi* and edible seaweeds, or swimming in the clear aquamarine waters.

THE DUNES of Mo'omomi hold other treasures as well, some discovered more recently. In places where the lithified dunes are overlain by red volcanic clays (sedimentary in origin), and where wind or waves have cut through the clay and sand layers, the fossils of extinct Hawaiian birds or shells of land snails often are revealed. Some of the most interesting discoveries in Hawaiian paleontology have been made at Mo'omomi. For instance, a giant flightless native goose once foraged in the dry forests of the upper gulches.

The Mo'omomi fossils show that the Hawaiian avifauna, already famous as an example of diversification in an island environment, must have been far more varied than we previously had thought. Although no native eagles now occur in the islands, the bones of one were unearthed at Mo'omomi. So were the fossils of a long-legged bird-eating owl, a thick-billed crow, a flightless ibis, and a series of small honeycreepers similar to those inhabiting Hawaiian rain forests today. No scientist has ever seen any of these creatures alive. Yet the above now-extinct species along with extant bird species currently relegated to the islands' most isolated peaks once existed side-by-side at sea level—at Mo'omomi.

The extinct birds of prey, in particular, filled a niche now occupied by only two relatively rare Hawaiian raptors: the 'io, or Hawaiian hawk, and the pueo, or Hawaiian owl. If Hawaii's original avifauna included as many predatory species as the fossil evidence indicates, then the raptors' effect on the small forest birds (their primary prey) must have been great. This fact may well explain why many of today's Hawaiian forest birds are green when immature: camouflaged within their forest foliage, they perch hidden from the eyes of predators now extinct.

On some of Mo'omomi's partially lithified dunes are large "stands" of what appear to be branched lightning bolts of sand. As plants were smothered by drifting dunes, moisture and chemicals leaching from their roots caused the sand nearest the roots to

Resembling abstract sculpture, root casts survive as testimony to the restless forces of wind and sand on Mo'omomi.



Richard A. Cooke III

Fritz Lanning



Just looking for a home: Hawaiian green sea turtles are trying to recolonize Mo'omomi after having been driven from the inhabited Hawaiian islands long ago.

solidify first and hardest. Later, as eroding winds gradually wore away the less consolidated sands surrounding the roots, only the sand casts remained: ghosts of the dune-choked vegetation.

IT IS DIFFICULT to picture the ancient dry forest that once stood where Mo'omomi's dunes now hold sway. But, from what we know of remnant lowland dry forests at other sites in the Hawaiian islands, a diverse blending of trees with no single dominant species might have existed. Here in the dappled sunlight beneath the forest canopy, honks of giant flightless geese once joined the chorus of the ocean waves. Today the dunes and their specialized flora distinguish Mo'omomi, and the sands have preserved the area's singular fossils and artifacts.

As a protection priority of the Hawaii Field Office's "Islands of Life" Campaign, Mo'omomi truly reflects Hawaii's phenomenal range of native habitats and natural communities. These botanical gems set in the arid coast lie only 15 miles from where the clouds hide the delicate rain forests of the Conservancy's Kamakou Preserve.

The coastlines of the Hawaiian islands perhaps have seen more change than any other biological zone in the entire chain. No wonder so many people regard saving Mo'omomi as a rare opportunity to preserve a living portion of the past for the future. The Hawaiian green sea turtles attempting to recolonize here are a hopeful sign that the coastal dunes can endure, even recover, if we acknowledge their significance with action.

The ecologist for the Hawaii Heritage Program, Dr. Samuel Gon III is a biologist who has spent more than ten years pursuing field research in Hawaii's backcountry. He has published many scientific papers dealing with ecology, botany, and invertebrate biology.

Summary of green turtles tagged and resighted at Palaau, Molokai
11-15 July 1988.

Compiled by George H. Balazs
Southwest Fisheries Center Honolulu Laboratory
2570 Dole Street
Honolulu, Hawaii 96822-2396

Inconel tag No.	Colored plastic tag No.	Straight carapace length, (cm)	Curved carapace length, (cm)	Notation
7/11-12/88 Site A (19 turtles with 3 tag resightings)				
10756-58	gr-HF-b1	93.9	100.5	female; tumor
10759-60	gr-HG-b1	67.2	72.0	
10762-63	gr-HB-b1	75.2	80.5	
10764-65	gr-HD-b1	64.6	69.0	
10766-67	gr-HJ-b1	62.8	67.0	
10768-69	or-PM-b1	54.7	58.0	
10770-71	--	43.4	46.5	
*9884-85	--	41.3	44.0	a
10772-73	--	48.9	52.0	
10774-75	--	44.7	47.5	stomach sampled
10776-77	--	47.5	51.0	
*9589-90	--	50.1	54.5	b
10778-80	rd-W-b1	75.7	81.0	
*7947, 49	--	60.8	65.5	c
10781-82	gr-HR-b1	67.0	71.5	
10783-84	--	45.4	48.5	
10785-86	ye-BF-b1	59.6	64.5	stomach sampled
10787-88	--	48.9	52.5	
10789-90	--	42.7	45.0	

Inconel tag No.	Colored plastic tag No.	Straight carapace length, (cm)	Curved carapace length, (cm)	Notation
7/12-13/88 Site A (19 turtles with 3 tag resightings)				
10791-92	gr-HP-b1	62.1	66.0	
10793, 95	--	50.6	53.5	
10796-97	gr-HK-b1	63.2	67.0	
10799-800	gr-HM-b1	61.3	66.5	
10801-02	gr-HW-b1	59.9	64.0	
10803, 05	--	54.4	58.5	
*9877-78	gr-HZ-b1	59.8	64.5	d
10806-07	gr-HY-gr	59.8	64.0	
*7945-46	--	47.9	50.5	e
10808-09	--	54.1	57.5	
10810-11	gr-HU-gr	66.3	71.5	
10812-13	or-PR-rd	62.7	69.0	
10814-15	ye-BA-or	61.6	65.5	
10816-17	--	43.5	46.3	
10818-19	or-PG-or	53.3	57.0	tumors; stomach sampled
10820-21	--	51.2	48.5	
10822-23	--	39.7	42.0	
10824-25	--	49.7	53.0	
*9874-75	--	56.2	60.0	mortality; f

Inconel tag No.	Colored plastic tag No.	Straight carapace length, (cm)	Curved carapace length, (cm)	Notation
7/13-14/88 Site E (65 turtles with 8 tag resightings)				
10826-28	rd-AB-or	74.7	78.5	
10829-30	rd-AG-or	68.0	72.5	
*7835-36	or-PB-or	72.2	77.0	tumors; g
10831-32	--	59.8	64.5	
10833-34	ye-BD-or	68.1	73.5	
10835-36	--	47.7	51.0	
10837-38	--	48.5	52.5	
10839-40	--	53.4	57.5	
10841-42	or-FW-rd	62.1	67.0	
*6539-40	--	54.0	57.5	h
10843-44	ye-BJ-rd	69.3	75.5	tumors
10845-46	ye-BS-rd	67.4	72.5	
*8527-28	--	56.1	59.5	i
10847-48	--	49.7	53.0	
*9486-87	ye-BL-rd	61.7	66.5	j
*8543-44	ye-BW-rd	59.6	65.5	k
10849-50	--	60.6	65.0	
10851-52	ye-BZ-rd	62.9	67.5	
10853-54	--			
10855-56	ye-BU-bl	73.7	79.0	

Inconel tag No.	Colored plastic tag No.	Straight carapace length, (cm)	Curved carapace length, (cm)	Notation
10857-58	--	52.5	56.5	
10859-60	--	49.3	53.0	
10861-62	--	56.8	59.0	healed notch
10863-64	--	51.1	54.5	6 centrals
10865-66	--	56.3	61.5	
10867-68	ye-BG-rd	72.5	78.0	
10869-70	--	51.4	54.0	
10873-74	--	61.2	65.5	
*8601, 8650	--	47.1	50.5	1
10875-76	--	56.8	60.5	
10877-78	--	56.3	60.5	
10879-80	ye-BP-rd	63.4	69.0	
10881-82	--	53.6	58.0	
10883-84	--	54.5	58.0	
10885-86	--	50.7	53.5	
10887-88	--	52.5	56.5	
10889-90	--	52.7	57.0	
10891-92	ye-BK-rd	64.2	69.5	
10893-94	--	48.7	52.0	
10895-96	--	60.1	65.0	
10897-98	--	54.0	58.0	
10899-900	--	40.9	43.5	

Inconel tag No.	Colored plastic tag No.	Straight carapace length, (cm)	Curved carapace length, (cm)	Notation
10901-02	--	40.4	43.0	
10903-04	ye-BR-bl	72.7	78.5	
10905-06	--	46.0	49.5	
10907-08	--	46.8	50.0	
10909-10	--	57.1	60.5	
10911-12	--	57.9	62.0	
*8519-20	--	56.6	62.0	m
*7825-26	--	46.9	50.0	n
10915-16	--	62.7	67.5	
10917-18	--	62.1	67.5	
10919-20	ye-BM-rd	69.4	76.0	
10921-22	--	60.2	65.0	tumors
10923-24	ye-BY-rd	72.1	78.0	tumors
10925-26	--	56.3	59.5	
10927-28	ye-BN-rd	74.7	81.0	
10929-30	--	45.4	48.0	hawkbill
10931, 33	--	54.4	58.5	
10934-36	--	65.9	71.0	
10932, 37	--	59.4	64.0	
10938-39	--	63.0	69.0	
10940-42	--	69.4	75.0	

Inconel tag No.	Colored plastic tag No.	Straight carapace length, (cm)	Curved carapace length, (cm)	Notation
7/14-15/88 Site E (23 turtles with 2 tag resightings)				
10943-44	--	45.1	48.5	
10945-46	--	55.1	58.0	
10947-48	--	48.7	53.0	
10949-50	wh-MW-or	65.4	69.5	
10951-52	--	57.6	62.5	
10953-54	--	46.0	49.0	
10955-56	--	41.5	43.5	
10957-59	--	57.0	61.5	
10960-61	--	50.5	53.0	
*7875, 7926	wh-MY-or	62.3	67.5	o
10962-63	--	47.1	49.5	
10964-65	--	50.2	53.5	
10966-67	--	53.0	56.0	healed notch
10968-69	--	49.0	51.5	
10970-71	--	55.5	58.5	
10972-73	--	53.7	57.5	
10974-75, 11000	wh-MP-or	80.1	86.5	
10976-77	wh-MD-or	65.5	70.0	
*8531-32	wh-MM-or	69.0	74.0	p
--	wh-MK-or	57.2	61.0	
10978-79	wh-MB-or	63.1	67.5	

Inconel tag No.	Colored plastic tag No.	Straight carapace length, (cm)	Curved carapace length, (cm)	Notation
10980-81	wh-MR-or	65.4	70.5	
10982-83	wh-MG-or	65.0	70.5	
7/11/88 (5 captive-reared Sea Life Park green turtles released at Palaau)				
D156, D157 (10751)	--	26.8	--	
D171 (10752)	--	21.8	--	
D166, D167 (10753)	--	24.1	--	pc's partly missing
D164, D165 (10754)	--	25.9	--	
D158, D159 (10755)	--	21.7	--	

*Growth rates for tag resightings at Palaau.

	<u>Tag No.</u>	<u>Initial straight carapace length, (cm)</u>	<u>Recapture interval, (yr/mo)</u>	<u>Growth rate, (cm/yr)</u>
a	9884-85	40.6	1-1	0.65 (1/4 in)
b	9589-90	47.0	1-10	1.69 (5/8 in)
c	7947, 49	51.9	3-3	2.74 (1-1/16 in)
d	9877-78	57.4	1-1	2.22 (7/8 in)
e	7945-46	38.8	3-3	2.80 (1-1/16 in)
f	9874-75	54.0	1-1	2.03 (3/4 in)
g	7835-36	68.6	3-0	1.20 (1/2 in)

	<u>Tag No.</u>	Initial straight carapace length, (<u>cm</u>)	Recapture interval, (<u>yr/mo</u>)	Growth rate, (<u>cm/yr</u>)
h	6539-40	40.5 (curved meas.)	5-9	2.96 (1-1/8 in)
i	8527-28	48.8	3-0	2.43 (1 in)
j	9486-87	57.0	2-9	1.71 (5/8 in)
k	8543-44	51.8	3-0	2.59 (1 in)
l	8601, 8650	40.6	3-3	2.00 (3/4 in)
m	8519-20	49.0	3-0	2.53 (1 in)
n	7825-26	39.6	3-0	2.43 (1 in)
o	7875, 7926	56.5	3-3	1.78 (3/4 in)
p	8531-32	58.7	3-0	3.43 (1-3/8 in)
	Mean -	50.7	31 months	2.15 (7/8 in)
	Range -	38.8-68.6	13-39 mo	0.65-3.43

Anyway, the "V" notch escaped my notice; although I did note the anomalous carapacial scutes. Looking at the photos I took, I can see a shallow slightly emarginate edge to that particular scute Jim mentions.

8/23/85 LARRY OGBON

Caught one Kemp's ridley and 1000 pounds of sting rays at Cedar Key last week. Next trip we will "strike" the turtles with a large-meshed net, ie, encircle the critters and drive them into the webbing where they entangle themselves. Good for shoal waters, rough bottom situations. Plus you continually move from one area to another — a more active fishing method and should be more productive I hope.

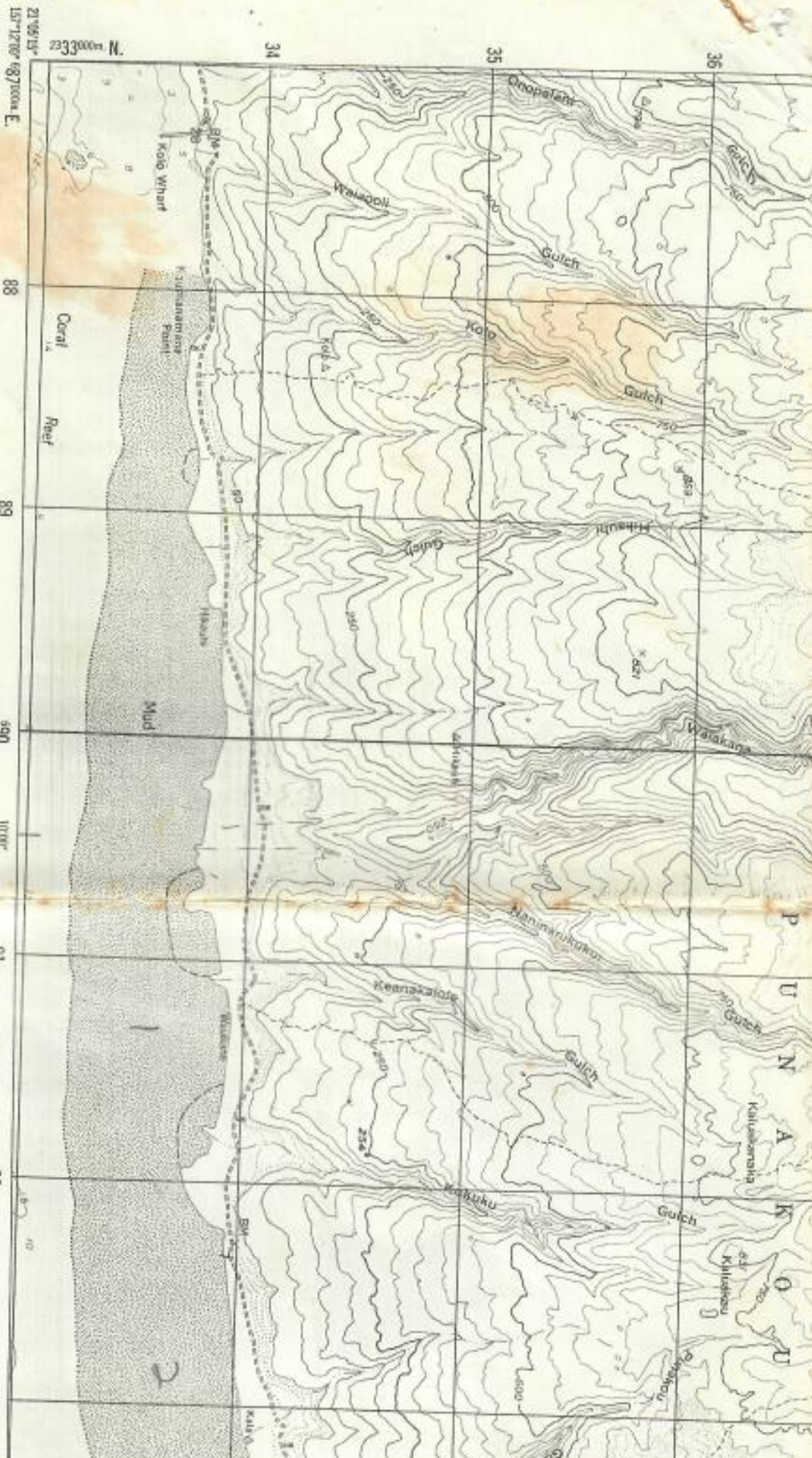
(over)

Don't be too disappointed at the performance of some folks in dealing with the "user" groups. It's a sticky situation and requires a good politician type to handle ^{it}, I'm afraid you & I might be too critical, but someone needs to provide the facts to give our administrators the leverage — that's our role, I believe.

Best ever,

Jamy

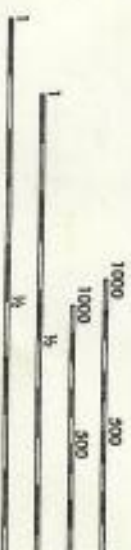
MAPS OF THE SOUTH COASTLINE OF MOLOKAI EXTENDING FROM KOLO WHARF TO THE EAST END



Prepared and published by the Defense Mapping Agency
Topographic Center, Washington, D. C.

LEGEND
MAP INFORMATION AS OF 1968

- ROADS**
- Dark highway
 - Hard surface, heavy duty, four or more lanes wide
 - Hard surface, heavy duty, two lanes with three lanes wide
 - Hard surface, medium duty, four or more lanes wide
 - Hard surface, medium duty, two lanes wide, three lanes wide
 - Unimproved light duty, Street
 - Unimproved dirt
 - Trail
- RAILROADS**
- Single track, single track
 - Double track
 - County district (with passenger)
 - Reservation
 - Federal, State
 - Overpass, Underpass
- BOUNDARIES**
- International Water, Canal
 - Survey, month, Dam
 - Large maps, large falls
 - Small, falls, etc.
- SYMBOLS**
- GRID
 - PROJECTION
 - VERTICAL DATUM

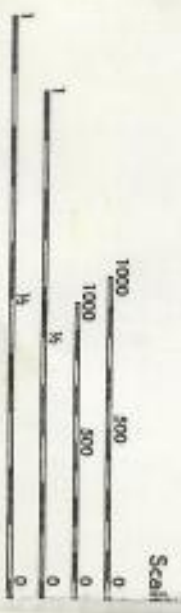
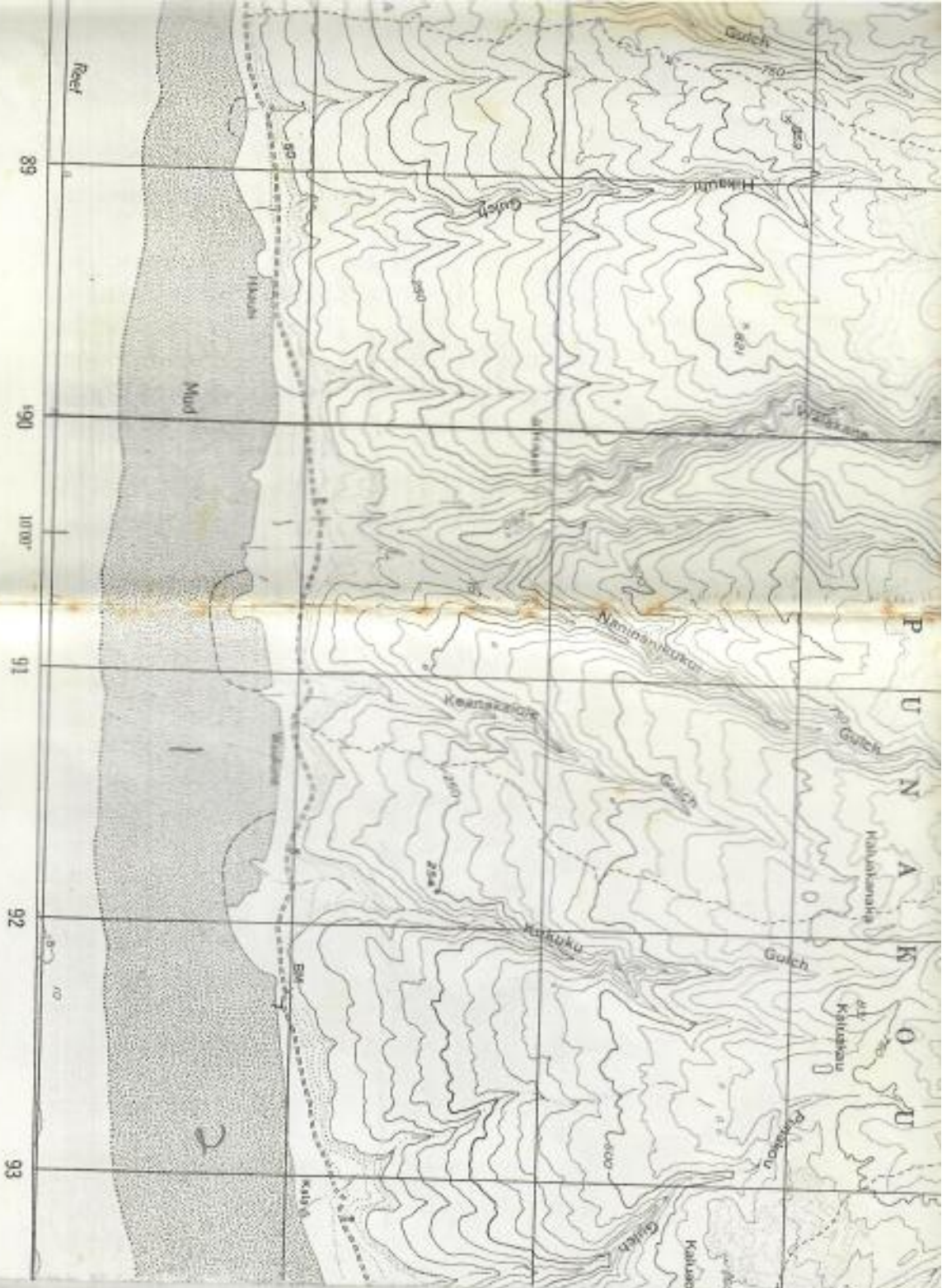


CONTINGENT SUPPLIES

The Defense Mapping Agency
Washington, D. C.

LEGEND
ACTION AS OF 1968

Imagined light duty, Steel
Unimproved dirt
Trail
Route markers, Interstate, Federal, State
Overpass Underpass
Interstate Lake, Steel
Swamp, marsh, Dam
Large regular large lake
Small, fishy, river

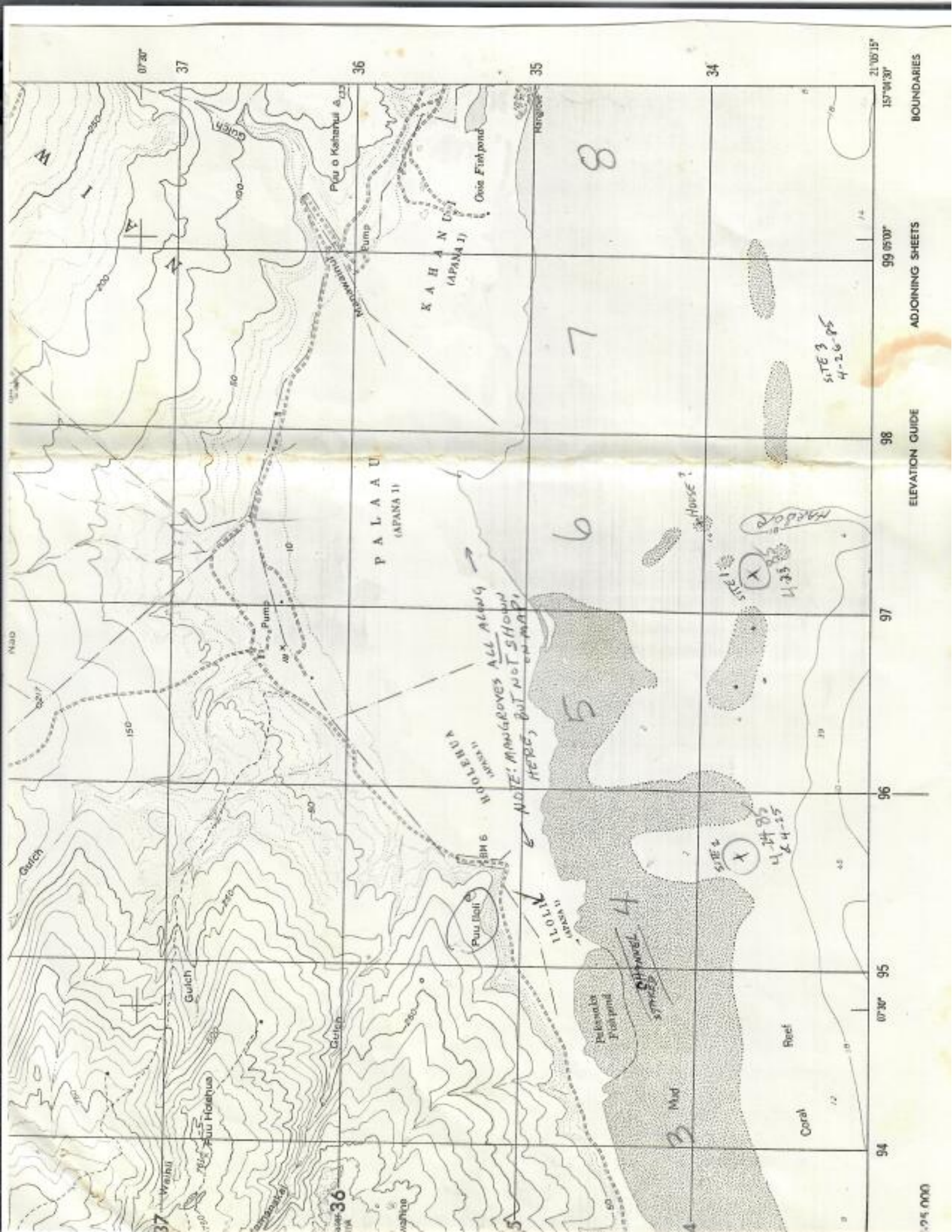


CONTOUR
SUSPENDED

SPHEROID
MERCATOR
PROJECTION
VERTICAL DATUM

TO ACCOMPANY DATA TABLE, "NUMBER OF TURTLES CAPTURED"
PLEASE MARK (BY NUMBER) THE LOCATIONS WHERE
FISHING TAKES PLACE. RETURN TO: GEORGE BALAZS

NATIONAL MARINE FISHERIES SERVICE
HONOLULU LABORATORY
P. O. BOX 3830
HONOLULU, HAWAII 96812



PALAU (APANA I)

KAHAN (APANA 1)

NOTE: MANGROVES ALL ALONG HERE, BUT NOT SHOWN ON MAP!

6

7

8

34

36

37

SITE 3
4-2-6-95

SITE 1
11-33

SITE 4
4-24-95 & 4-15

CHANNEL 4

CHANNEL SYMPLOSIS

Pelican Bay Fishpond

Mud

Reef

Coral

3

4

1.2

4.5

3.9

11.4

14

Gulch

Gulch

Naib

Puu Holoheue

Puu Belli

Puu O Kotehau

Puu O Kotehau

Puu O Kotehau

Puu O Kotehau

Puu O Kotehau

Puu O Kotehau

Puu O Kotehau

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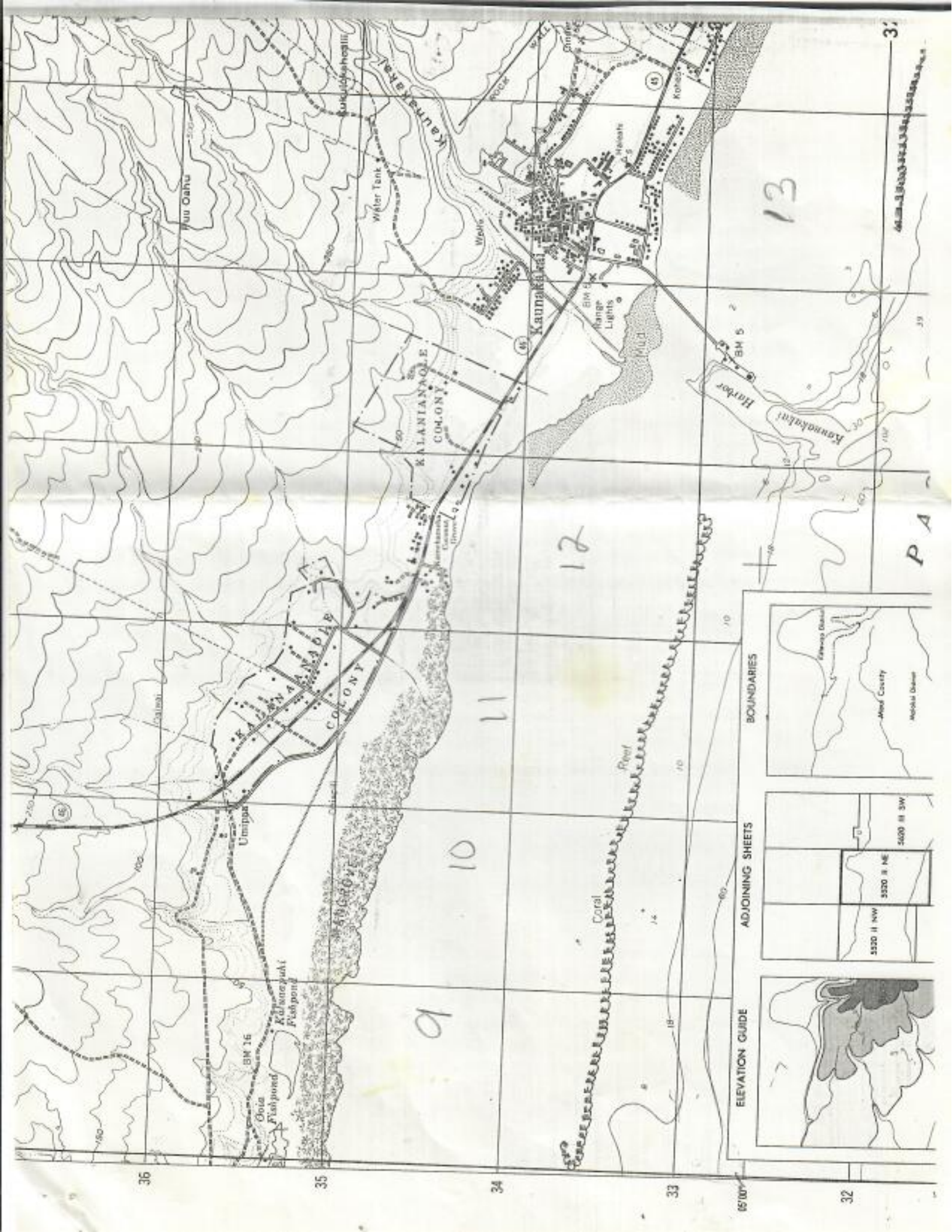
Puu O Kotehau

Puu O Kotehau

Puu O Kotehau

Puu O Kotehau

Puu O Kotehau



36

35

34

33

32

31

Vu Oahu

Wreter Tank

Kannakudi

13

KALANTIANAOUE COLONY

12

KANIYANA NABADAB COLONY

11

10

Umippa

BM 16

Chica Fishpond

Kaniyana Nabadab Fishpond

Coral

River

10

BOUNDARIES

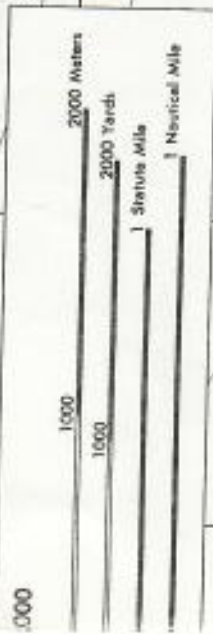
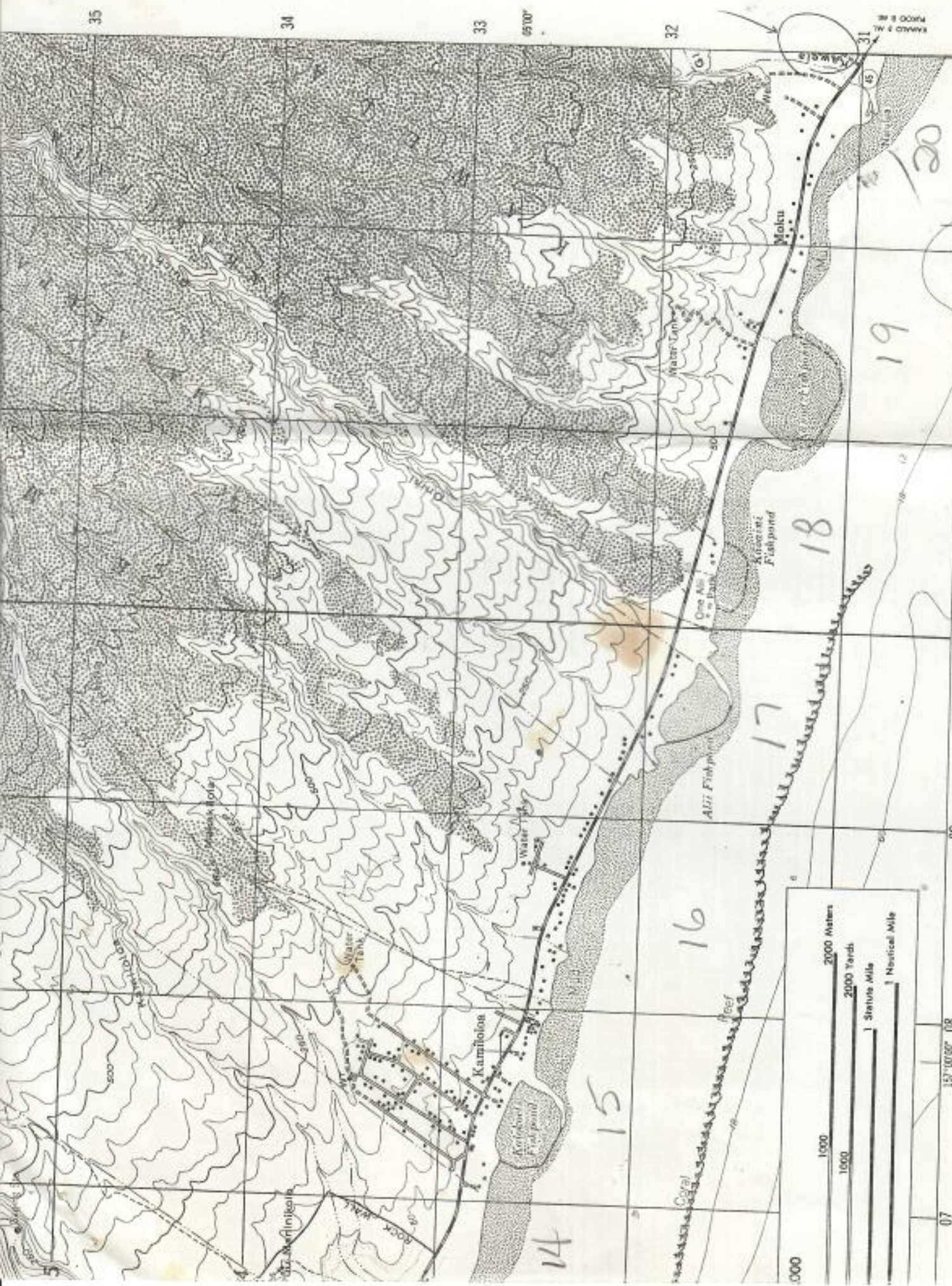
ADJOINING SHEETS

ELEVATION GUIDE



PA

1:50,000



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STOCK NO. W833X55202NE*02

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6510'

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21°07'45"

13 08°37'00"

12 57'30"

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157°07'00" 08

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Water Tank

Kamiloia

Kamiloia Fishpond

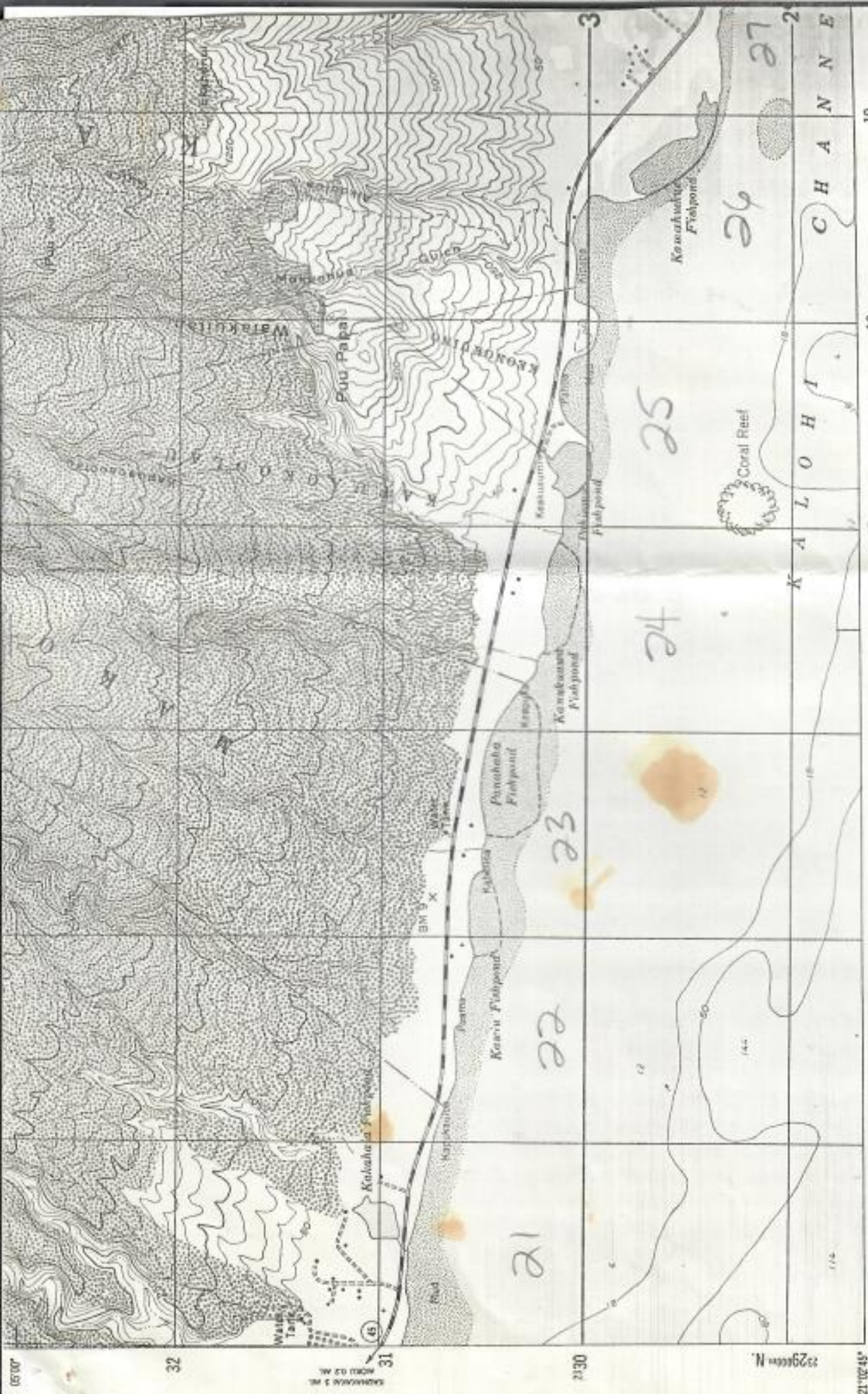
All Fishpond

Kauai Fishpond

Moku

Nawaka

KAWAII



Scale

1000 500 0

1000 500 0

1 1/2 1 3/4 1 5/8 1 1/2 1 1/4 1 1/8 3/4 1/2 1/4 1/8

CONTOUR IN FEET

MAP INFORMATION AS OF 1968

714000m. E. 15
 Prepared and published by the Defense Mapping Agency
 Topographic Center, Washington, D. C.

21°02'45" N. 156°37'00" W.

714000m. E. 15
 Prepared and published by the Defense Mapping Agency
 Topographic Center, Washington, D. C.

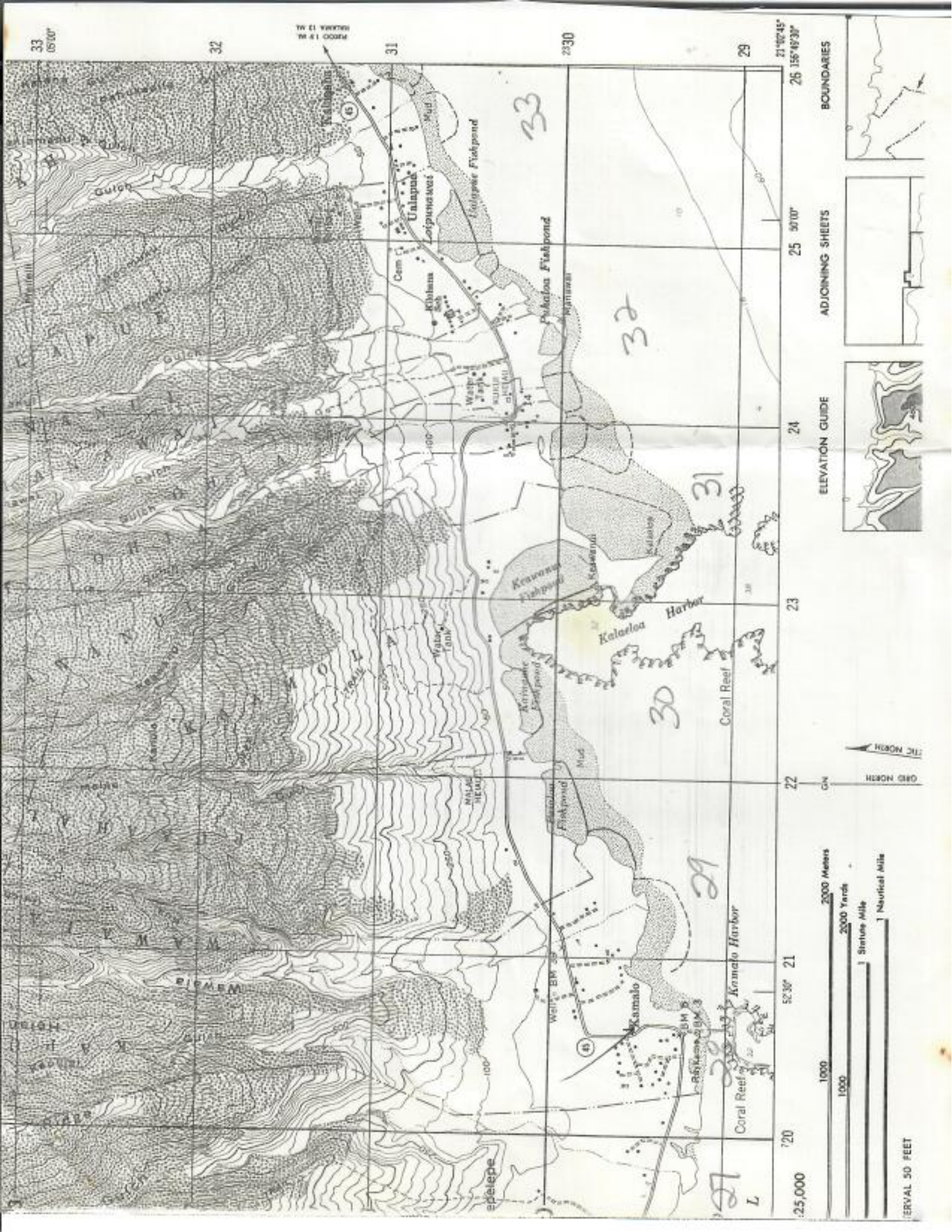
LEND

MAP INFORMATION AS OF 1968

ROADS

- Dual highway
- Hard surface, heavy duty, four or more lanes wide
- Hard surface, heavy duty, two lanes wide, three lanes wide
- Hard surface, medium duty, four or more lanes wide
- Hard surface, medium duty, two lanes wide; three lanes wide
- Improved light duty, Street
- Unimproved dirt
- Trail
- Road markers, Interstate, Federal, State
- Overpass, Underpass

(47) (28) (21)



33 05'00"

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TM 11 100000
TM 11 00000

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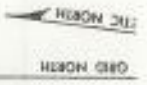
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21°02'45"
25 156°49'30"

BOUNDARIES

ADJOINING SHEETS

ELEVATION GUIDE



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30'

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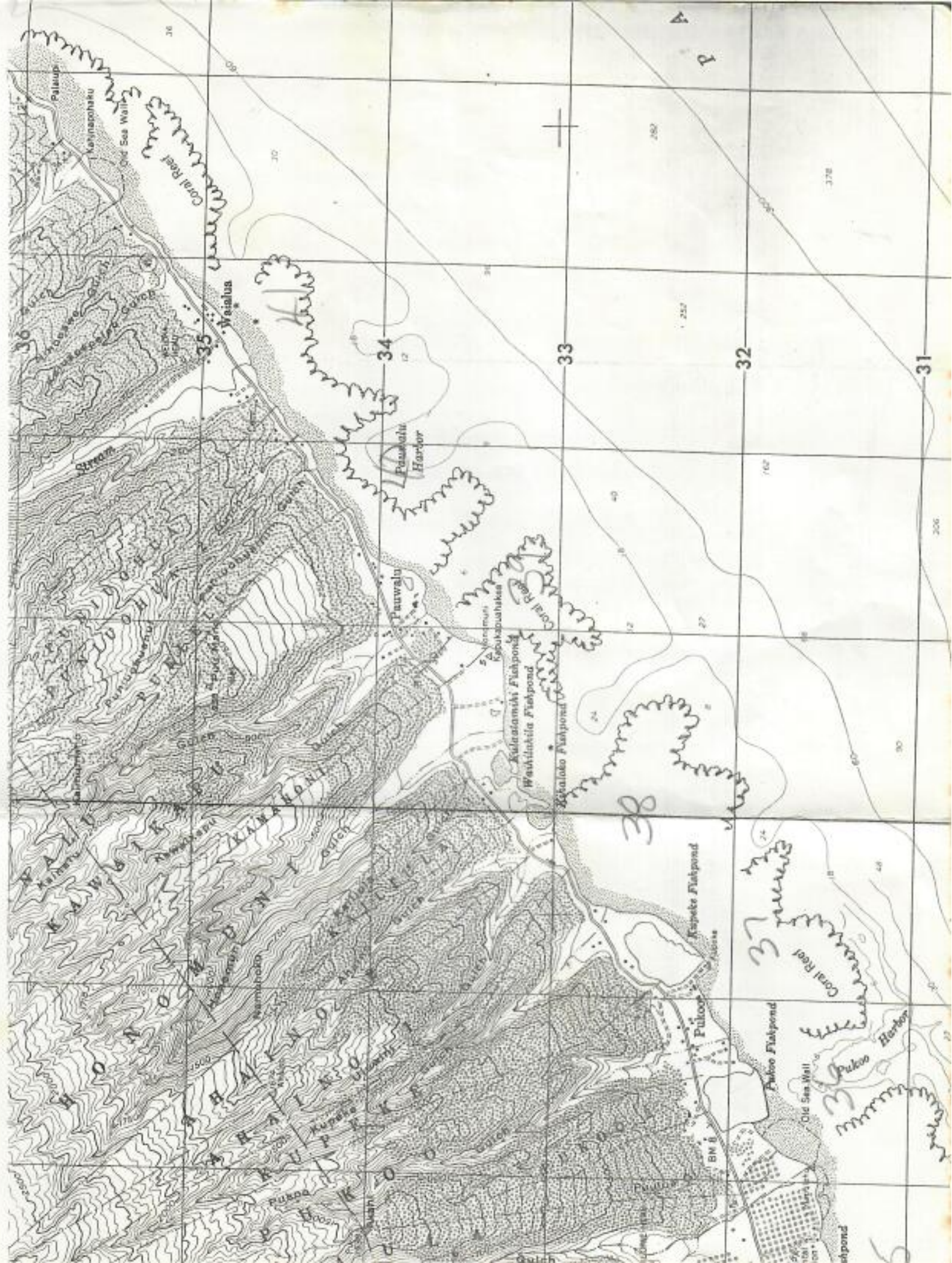
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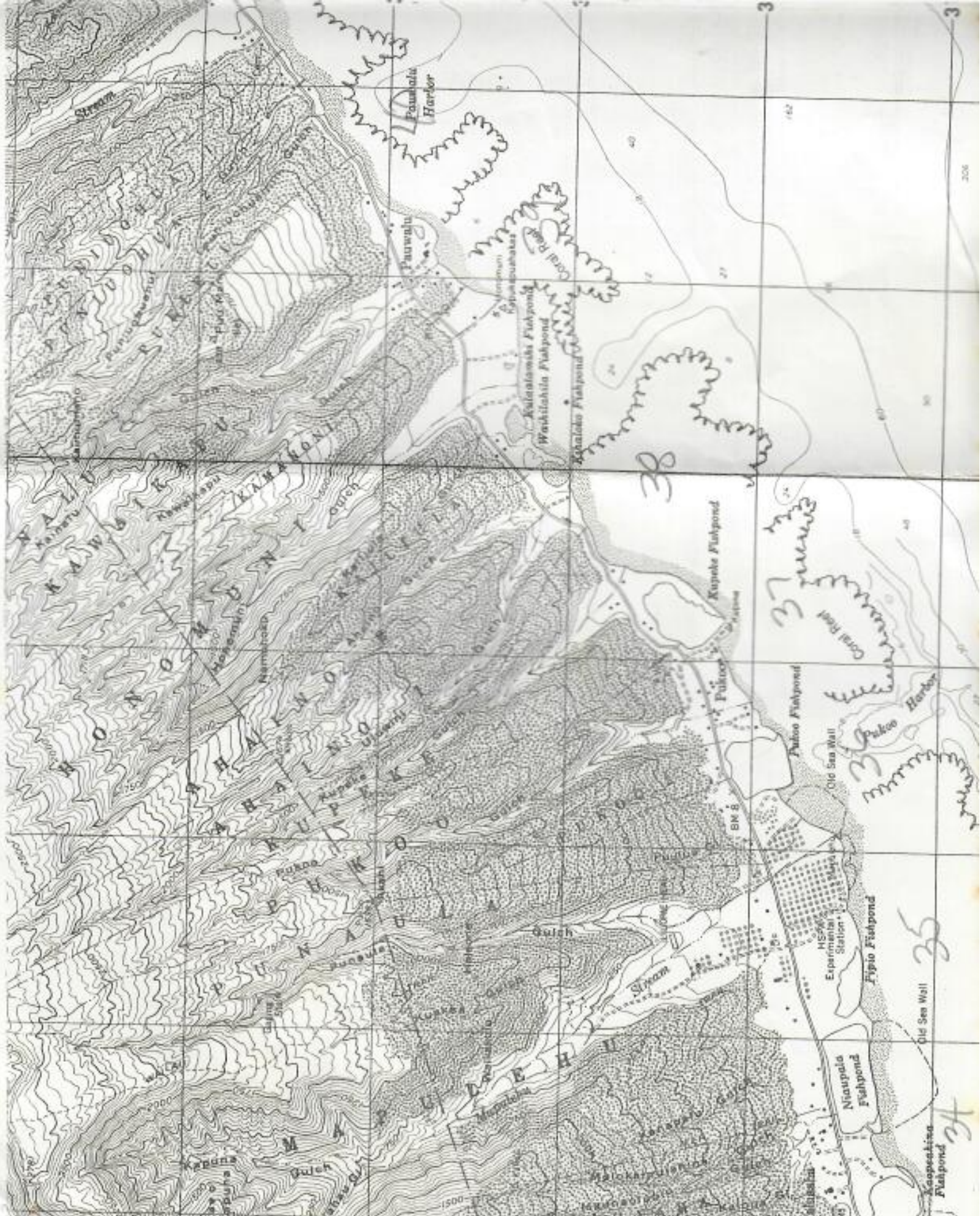
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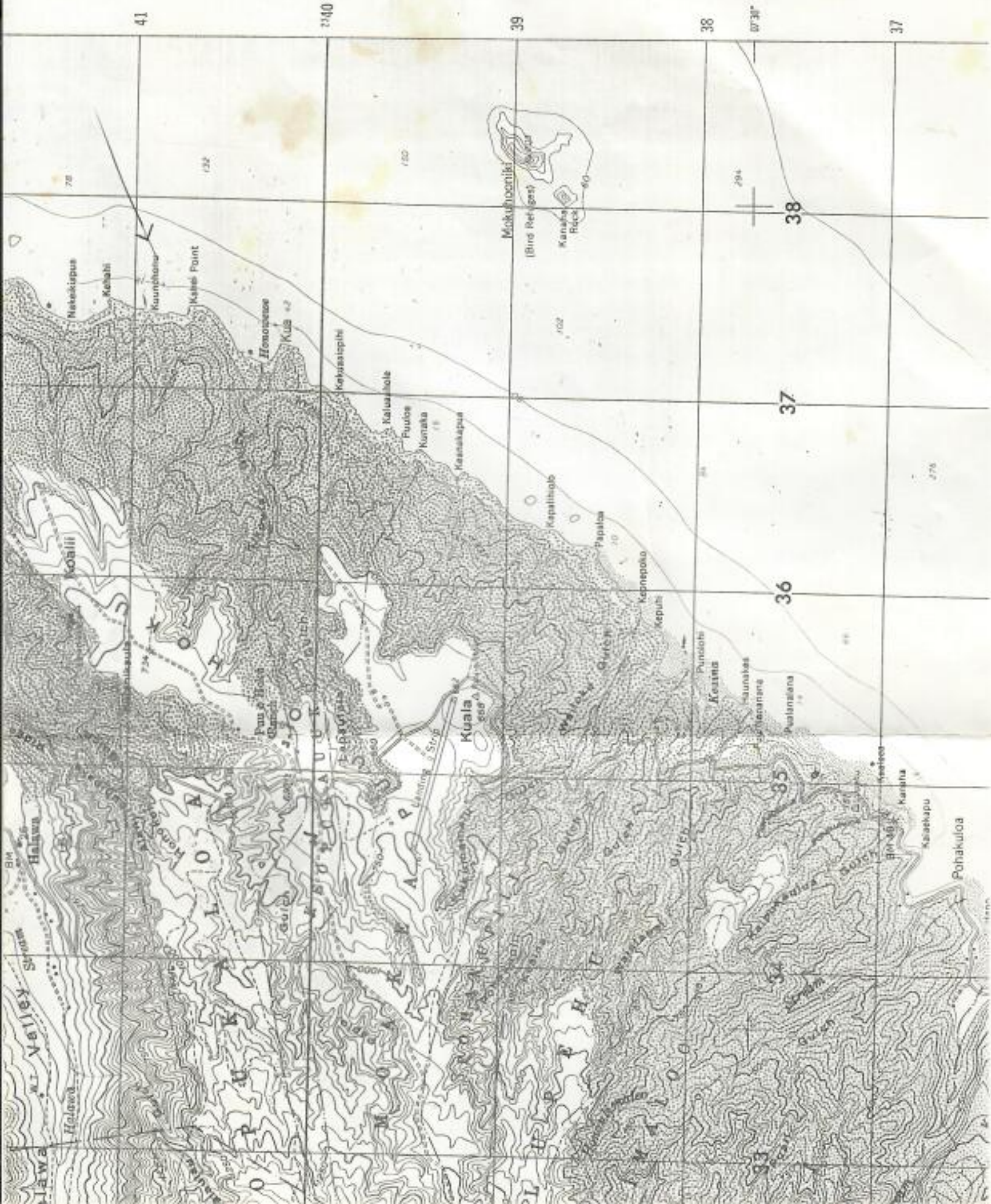
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05' 00"

05' 10"



1. SHERATON-MOLOKAI — The essence of Polynesia is captured in this peaceful resort nestled on Kepuhi Beach on Molokai's western coast. Sumptuous dining, comfortable guest rooms and suites, an 18 hole championship golf course and 4 lighted tennis courts highlight this get-away-from-it-all retreat.

2. BEACHES — Take a look at the map. They abound — miles of them — and virtually uninhabited. If you've ever had fantasies about what you'd like to do on a deserted beach, now's the time to make them a reality.

3. GOLF — Our great course awaits you on Molokai. Ask for complete information at the Activities Desk. The Kalua Koi Golf Course is an 18-hole championship course, with 5 of the holes right along the ocean. It's a par 72 layouts measuring 6,725 yards.

4. MOAULA AND HIPUAPUA FALLS — These misty waterfalls are also located in Halawa Valley and, if you're thinking of going for a nice cool dip, bring along a ti leaf! According to legend, it's only safe swimming when a ti leaf floats in their pools.

5. KALAUPAPA PENINSULA — In this isolated northern corner of Molokai, Father Damien built his church and spent the major part of his life caring for his people. A statue to this great man stands here today in his honor.

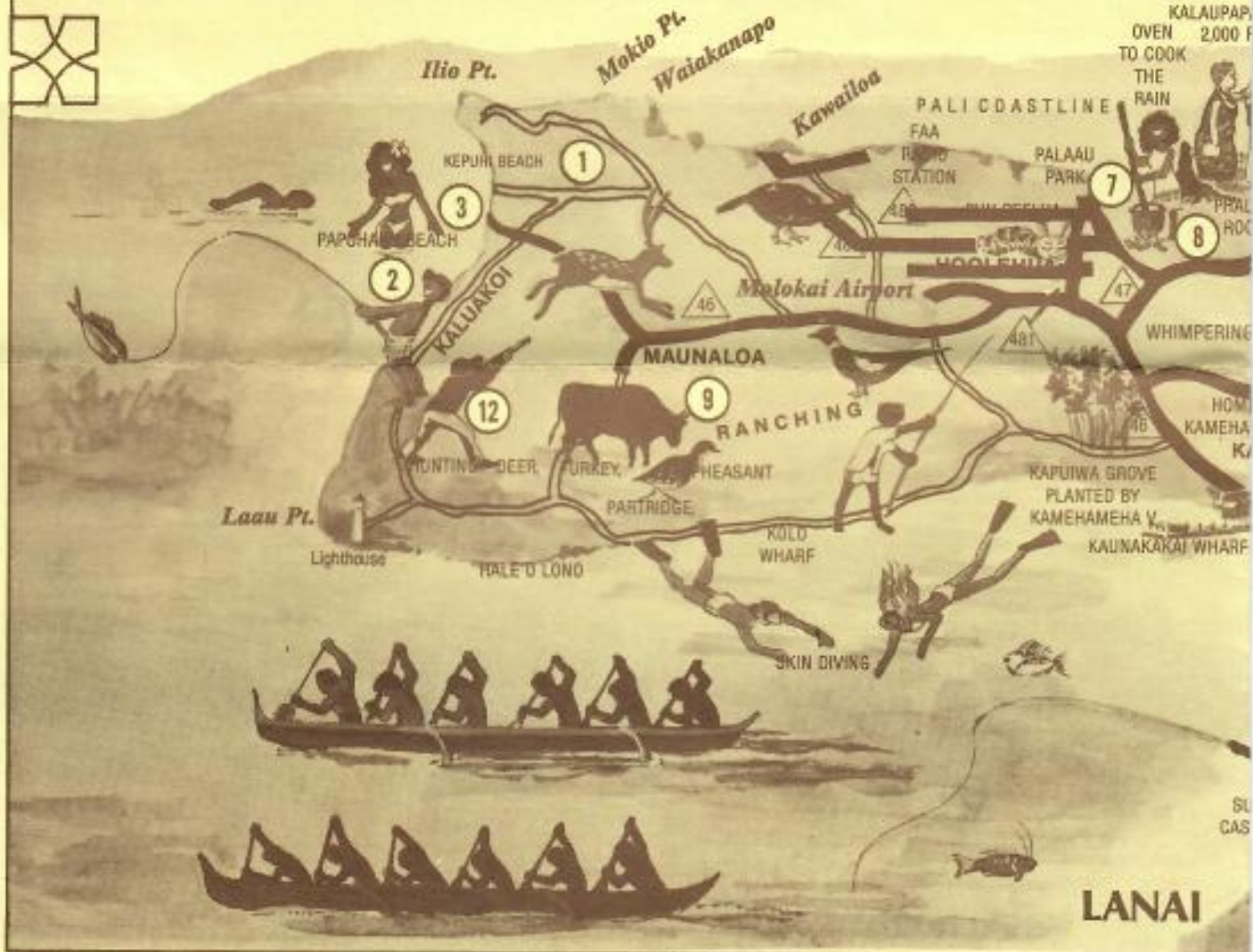
6. GREAT MOLOKAI MULE TRAIL — An exciting and fun way to view the spectacular beauty of the Kalaupapa Peninsula — carefully trained, escorted mules wind down a lush 2,000 ft. cliff trail to and through Father Damien's famous settlement.

7. PALAAU PARK — A large State forest and park overlooking the Kalaupapa Peninsula and offering ample picnic areas, hiking trails and a lookout which offers a truly breathtaking view of Molokai.

8. PHALLIC ROCKS — In the vicinity of the park and the lookout, there rise quite a few phallic rocks. One in particular, a six foot image, was supposed to contain the power to

**SHERATON
RESORT**

ISLAND OF MOLOKAI



MOLOKAI PORT

conceive to all those who rubbed their hands over it. Some say the power still remains.

9. MAUNALO A — If you have a picture in your mind of what an old plantation town would look like, this would fit that picture to a T. Bring your camera!

10. KAUNAKAKAI — There's an old song entitled "Cockeyed Mayor of Kaunakakai" — and, yep, this is the town they were talking about. Today, it's the business district of Molokai and the Island's population center. Check out the quaint old general stores.

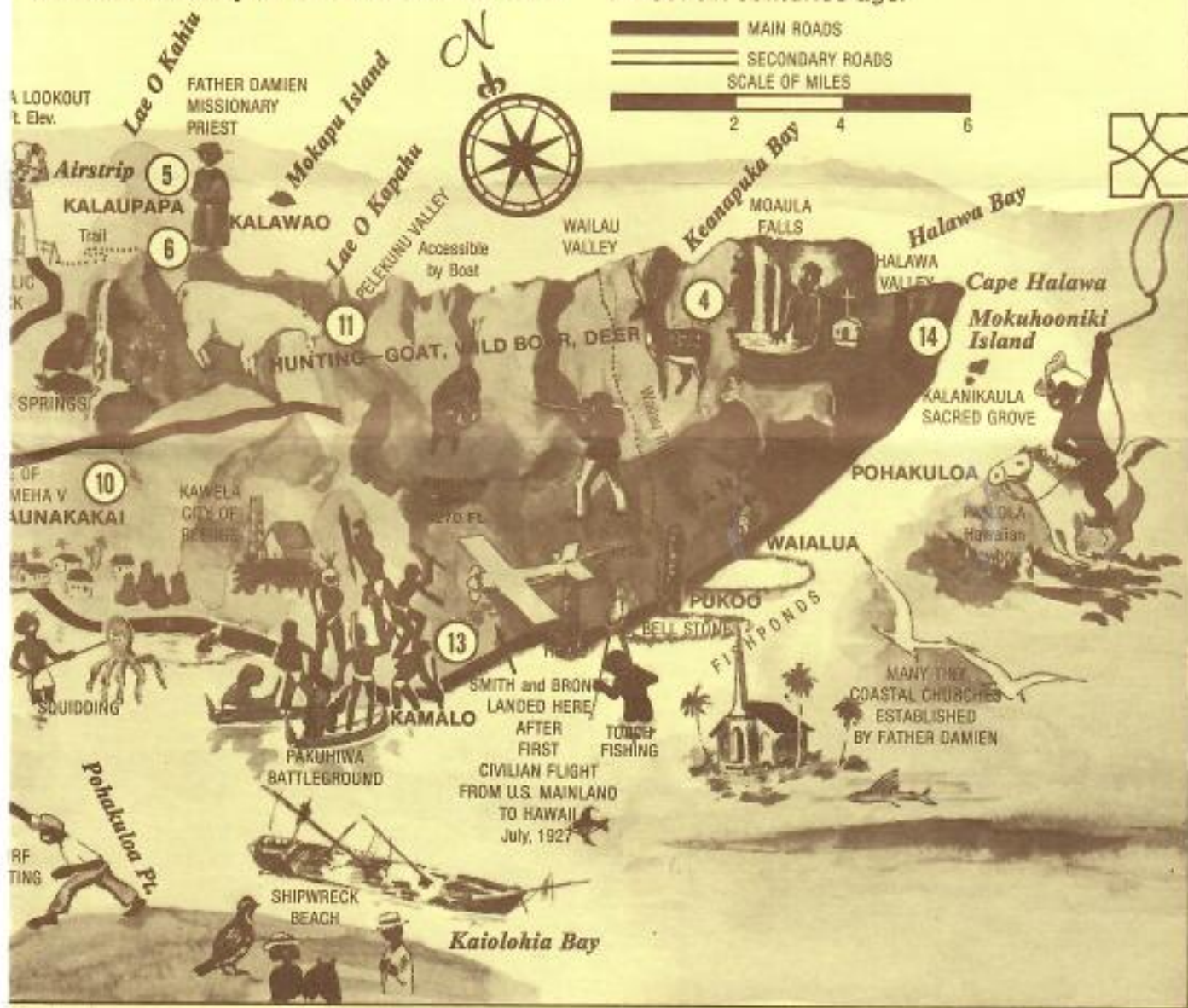
11. WAIKOLU LOOKOUT — People who may never have heard of Molokai before they came to the Hawaiian Islands often come away from Waikolu thinking here is the most fantastic scenery of all. A four-wheel drive

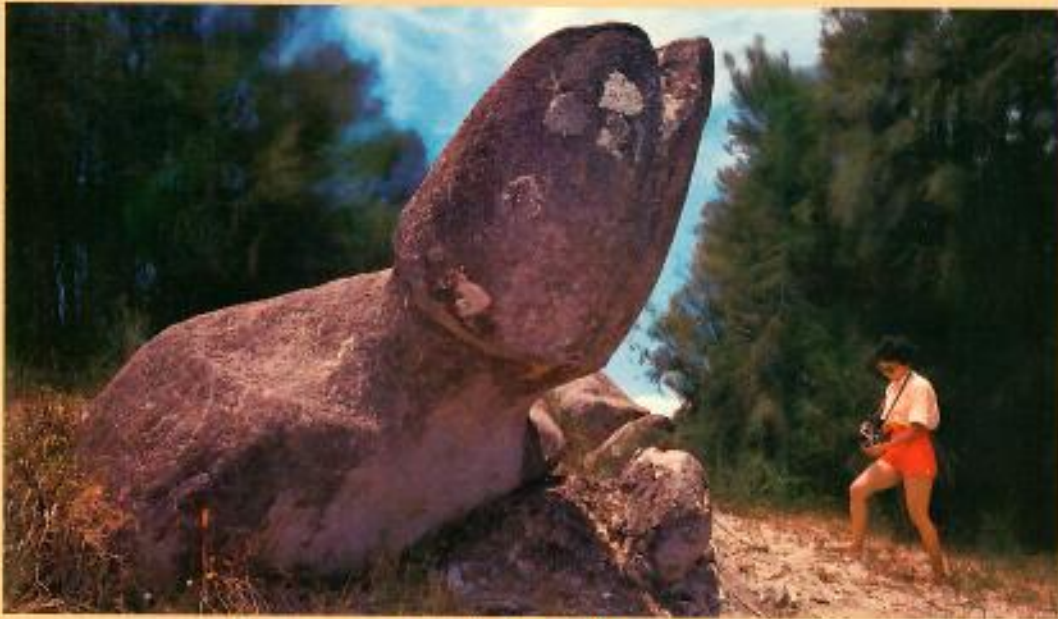
takes you to the top — where an incredible rain forest and countless waterfalls tumble down steep cliffs to the cavernous valley below. As the old saying goes — "You gotta see it to believe it."

12. MOLOKAI RANCH WILDLIFE PARK — A photographer's dream come true — a camera safari tour by van through herds of exotic animals, including giraffe, impala and kudu, roaming freely over 1 square mile of terrain similar to that of Kenya and Tanzania.

13. KAMALO — On the coast near here, it is said that ancient menehunes — Hawaii's version of leprechauns — built a series of 54 fishponds out of coral and rocks up to a half ton in size. All for the comfort and pleasure of Hawaii's royalty.

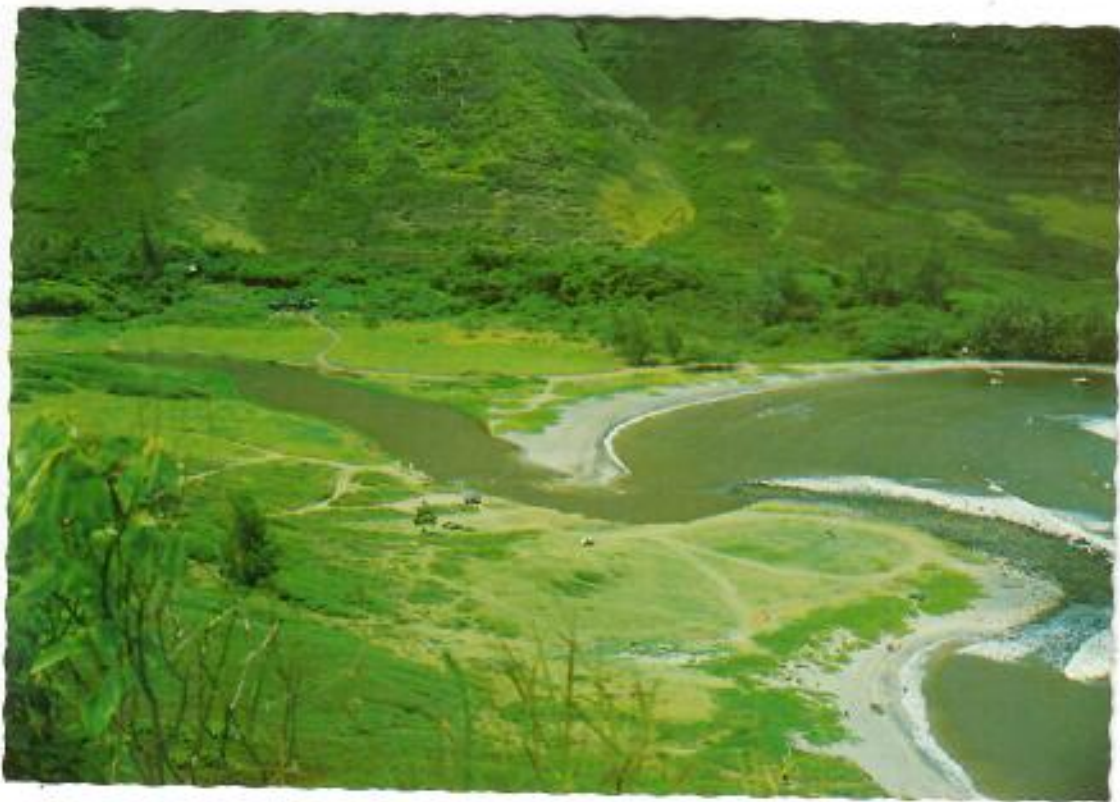
14. HALAWA VALLEY — A natural paradise today which once was the center of Molokai's population. It is full of many old Heiaus, Hawaiian burial grounds, some of which are almost as big as football fields and were built almost six centuries ago.





Ancient Phallic Rock

Island of Melos



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PHALLIC STONE, HAWAII . . . This ancient Phallic Rock, worshipped as a symbol of generative power by early Hawaiians, is a fascinating scenic attraction on the Island of Molokai.

Photograph by R. Werham

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Hakawa Valley, located at the end of the road on East Molokai. This luscious valley, once the center of Molokai's population, is today almost deserted.

C-398

G & R Enterprises, Molokai

Photograph by P. Masaki

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Halawa Bay, Island of Molokai, Hawaii

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HALAWA BAY, MOLOKAI . . . is a most beautiful bay and the terminus of Halawa Stream which is fed by two spectacular waterfalls in the valley.

Photograph by Richard Sakata

HAND-CRUMPED CARD BY H. S. ENGLISH CO., INC., SAN BRUNO, CALIF. 94066



The only luxury resort with an Hawaiian island to itself, Sheraton-Molokai offers championship golf, tennis, endless water sports and breathtaking scenery.

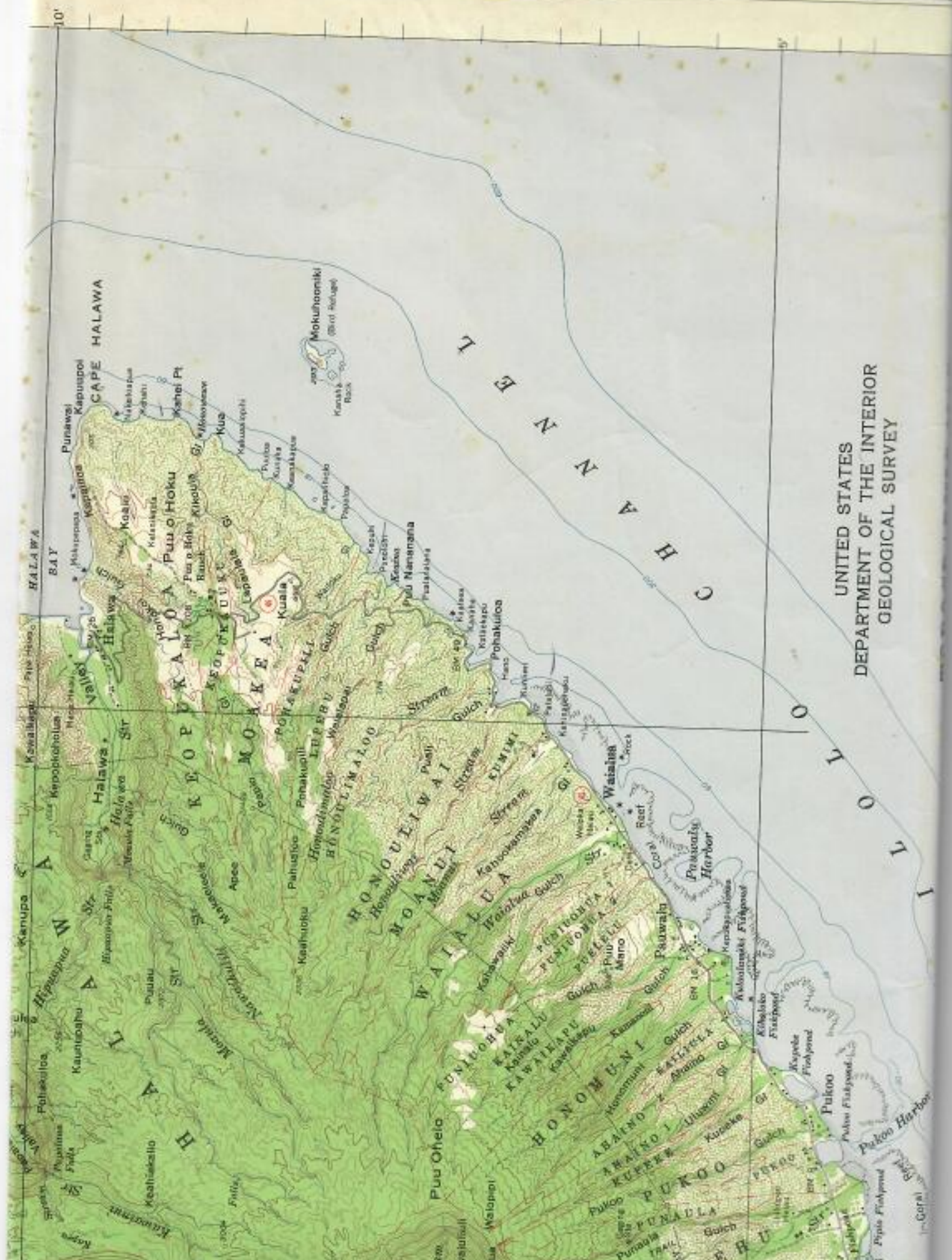


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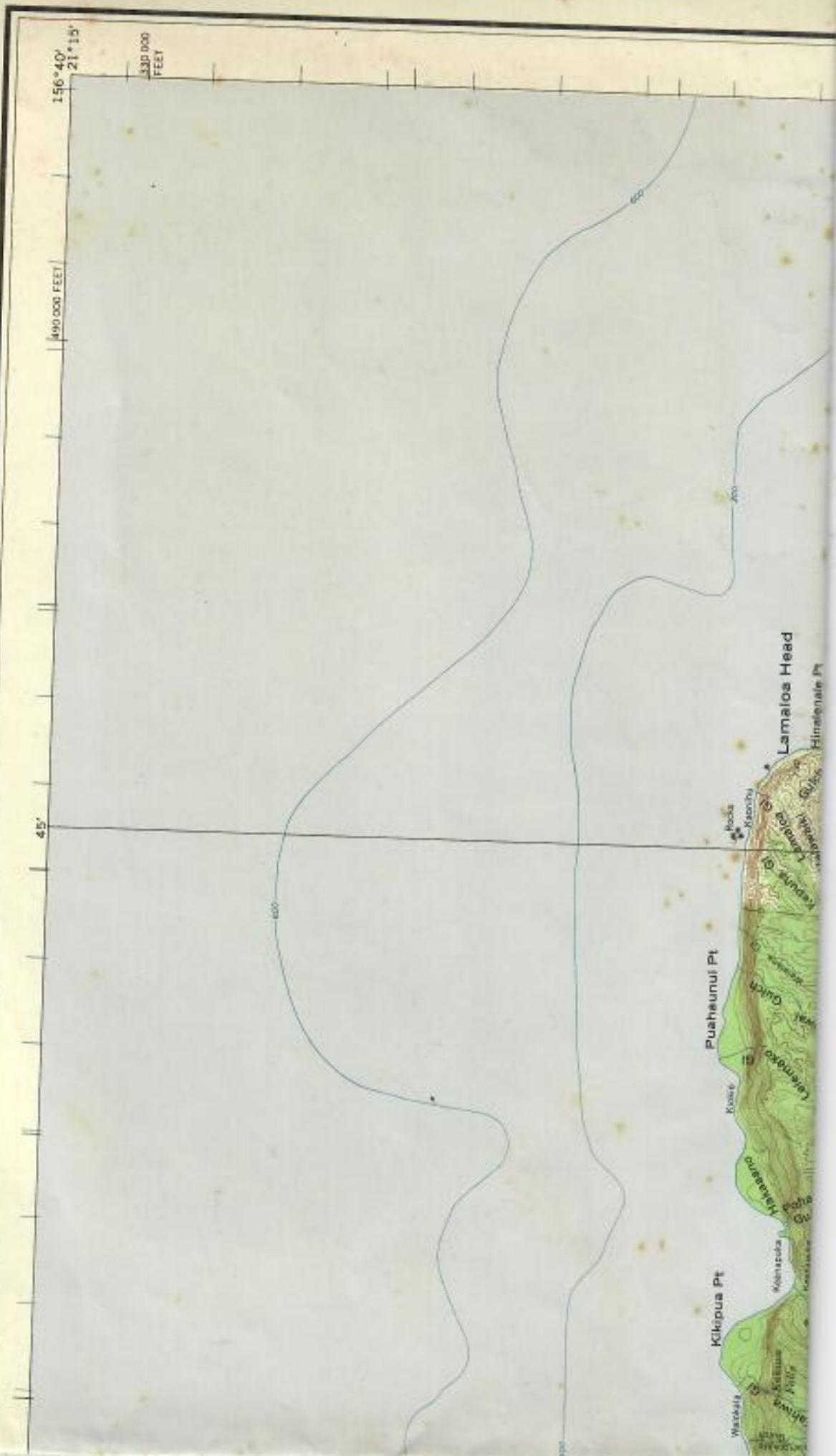
Sheraton-Molokai Hotel

SHERATON HOTELS & RESORTS
KAPUAE BEACH, ISLAND OF MOLOKAI, HAWAII 96770-0881 MAE 1980

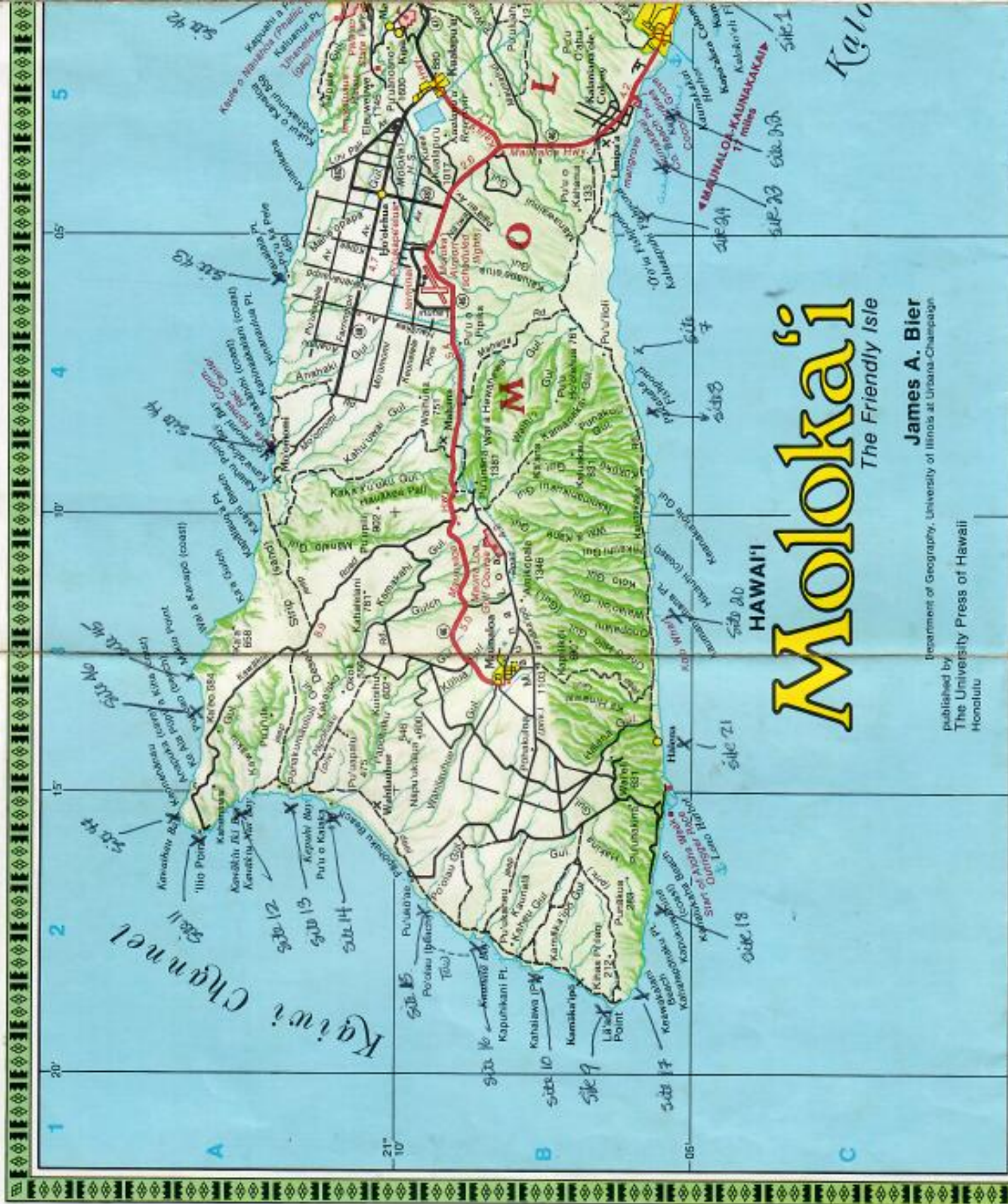


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

TERRAZAPUIT MAD



Approximate Site locations



Molokai

The Friendly Isle

James A. Bier
 Department of Geography, University of Illinois at Urbana-Champaign
 published by
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