



STATE OF HAWAII
 DEPARTMENT OF LAND AND NATURAL RESOURCES
 LAND DIVISION
 P.O. BOX 621
 HONOLULU, HAWAII 96809

AQUACULTURE DEVELOPMENT
 PROGRAM
 AQUATIC RESOURCES
 BOATING AND OCEAN RECREATION
 CONSERVATION AND
 RESOURCES ENFORCEMENT
 CONVEYANCES
 FORESTRY AND WILDLIFE
 HISTORIC PRESERVATION
 LAND DIVISION
 STATE PARKS
 WATER RESOURCE MANAGEMENT

Ref.:PB:THE

File: MO-2906

MAR 23 1999

MEMORANDUM

To: Gary Gill, Acting Director
 Office of Environmental Quality Control

From: Dean Y. Uchida, Administrator *[Signature]*
 Land Division, Department of Land and Natural Resources

Subject: Final Environmental Assessment (EA)/Finding of No
 Significant Impact (FONSI) for Puu O Hoku Ranch Single
 Family Residence, Pohakupili, Molokai, TMK parcels 5-8-
 15:portion of 03 and 5-8-8:02

The Department of Land and Natural Resources has reviewed the comments received during the 30-day public comment period that began on December 23, 1998 for the subject project. We have determined that this project will not have significant environmental effects, and have therefore issued a FONSI. Please publish this notice in the April 8, 1999 OEQC Environmental Notice.

We have enclosed a completed OEQC Bulletin Publication Form and four copies of the Final EA for the project. The summary for this project has not changed from that noted in Publication Form for the draft EA. Please contact Tom Eisen of our Land Divisions's Planning Branch at 587-0439 if you have any questions.

Enclosures

c: Rory Frampton

OFFICE OF ENVIRONMENTAL
 QUALITY CONTROL

99 MAR 23 P1:18

RECEIVED

40

1999-04-08-MO-FEA-Puu O Hoku Ranch

APR 8 1999

FILE COPY

(Crest of title in yellow)

FINAL
ENVIRONMENTAL ASSESSMENT

Single Family Residence

Pohakupili, Island of Molokai, Hawai'i
TMK: 5-8-15: portion of 03 &
5-8-8: 02



**CHRIS
HART
& PARTNERS**

Prepared for:

Mrs. Lavinia Currier
Puu O Hoku Ranch
c/o Perrigrine Financial Corp.
84 State Street
Boston, Massachusetts 02109

Prepared by:

Chris Hart & Partners
Landscape Architecture and Planning
1955 Main Street, Suite 200
Wailuku, Maui, Hawaii 96793
Phone: (808) 242-1955
Fax: (808) 242-1956

MARCH 1999

99 MAR 23 P 1:18

RECEIVED

TABLE OF CONTENTS

<u>I. OVERVIEW</u>	5
A. NATURE OF THE PROPOSED ACTION	5
B. IDENTIFICATION OF THE APPLICANT	5
C. SITE INFORMATION SUMMARY	6
D. MAJOR APPROVALS TO BE SOUGHT	7
E. SUMMARY OF PROPOSED ACTION AND POTENTIAL IMPACTS	7
<u>II. DESCRIPTION OF THE PROPOSED ACTION</u>	9
<u>III. ALTERNATIVES TO THE PROPOSED ACTION</u>	12
<u>IV. DESCRIPTION OF THE PROJECT SITE AND ENVIRONMENTAL SETTING</u>	12
A. PHYSICAL ENVIRONMENT	12
B. SOCIO-ECONOMIC CHARACTERISTICS	24
C. PUBLIC INFRASTRUCTURE	25
D. PUBLIC SERVICES	25
<u>V. PROJECT IMPACTS</u>	26
A. ARCHAEOLOGICAL, HISTORIC AND CULTURAL SITES	26
B. SITE CONDITIONS	28
C. SURROUNDING AREAS	28
D. TERRESTRIAL BIOTA	29
E. MARINE RESOURCES	30
F. AIR QUALITY	31
G. NOISE	32
H. VISUAL RESOURCES	32
I. SOCIO-ECONOMIC ENVIRONMENT	32
J. TRADITIONAL AND CUSTOMARY RIGHTS	33
K. PUBLIC SERVICES	34
L. INFRASTRUCTURE	34
<u>VI. RELATIONSHIP OF THE PROPOSED ACTION TO PUBLIC POLICIES AND OTHER APPLICABLE LAND USE REGULATIONS</u>	36
A. MAUI COUNTY GENERAL PLAN	36
B. MOLOKAI COMMUNITY PLAN	37

FINAL ENVIRONMENTAL ASSESSMENT
Proposed Single Family Residence
Puu O Hoku Ranch, Ltd.
Island of Molokai

C. SPECIAL MANAGEMENT AREA RULES PURSUANT TO HRS CHAPTER 205A	38
D. EVALUATION BASED ON CRITERIA FOR LAND USES IN THE CONSERVATION DISTRICT, SECTION 13-5-30 (C)	39
E. SECTION 13-5-23, HAWAII ADMINISTRATIVE RULES, RELATING TO SINGLE FAMILY RESIDENCES IN THE CONSERVATION DISTRICT	46
<u>VII. CONCLUSIONS</u>	<u>48</u>
<u>VIII. CONSULTED AGENCIES PRIOR TO DRAFT EA SUBMITTAL</u>	<u>50</u>
<u>IX. AGENCIES AND INDIVIDUALS COMMENTING ON THE DRAFT EA</u>	<u>51</u>

LIST OF EXHIBITS

1. Location Map
- 2a. Tax Map Plat 5-8-15
- 2b. Tax Map Plat 5-8-8
3. Land Survey depicting site area
- 3.a. Site Map
4. Site Plan
5. Site Elevation of Pohakupili House
6. Site Section of Pohakupili House
7. Site Axonometric (Top View of Pohakupili House)
8. Main House (Ground Level floor plan)
9. Main House (Upper Level floor plan)
10. Main House Elevations
11. Main House (Section)
12. Pavilion plan
13. Bath House plan
14. Perspective View from jeep trail approach
15. Perspective Views
16. Perspective Views from beach front
- 17.a. Map identifying archaeological sites nos. 236, 237, and 238 (Summers, 1971)

FINAL ENVIRONMENTAL ASSESSMENT
Proposed Single Family Residence
Puu O Hoku Ranch, Ltd.
Island of Molokai

- 17.b. Site Plan related to 1974 Archaeological Survey Map
- 17.c. Site Plan related to 1997 Project Archaeological Survey Map
18. Federal Flood Insurance Rate Map for the Project Site
19. Map Depicting Two (2) Points along Hwy. 45 where the Project Site is visible
20. Existing Jeep Trails at Puu O Hoku Ranch
21. State Land Use District Boundary Interpretation Map No. 98-20
22. Certified Shoreline Map
23. Letter dated June 6, 1997 from the Maui County Planning Department determining that the proposed single family residential project is not a "development" and is therefore exempt from the Special Management Area Rules for the Molokai Planning Commission.
24. Letter dated February 9, 1998 from the Maui County Planning Department stating the project site is within the Special Flood Hazard District, Zone V30, an area of 100 year coastal flooding with base elevations between 26 to 28 feet mean sea level and will require a flood development permit.

APPENDICES

ARCHAEOLOGICAL INVENTORY SURVEY
PRELIMINARY DRAINAGE AND EROSION CONTROL REPORT
SITE PHOTOGRAPHS
MISCELLANEOUS TECHNICAL INFORMATION
DRAFT EA COMMENT LETTERS AND RESPONSES
MANA'E COMMUNITY MEETING NOTES, MARCH 4, 1999

FINAL
ENVIRONMENTAL ASSESSMENT

I. OVERVIEW

A. Nature of the Proposed Action

Pursuant to Chapter 13-5, Hawaii Administrative Rules, the proposed action will require the filing of a Conservation District Use Permit application, since the action involves the construction of a single family residence and related improvements within the State Conservation District, "Limited Subzone", on property situated at Pohakupili, Island of Molokai, State of Hawaii (TMK 2nd Division 5-8-15: portion of 3 and 5-8-08: 2).

B. Identification of the Applicant

Tax Map Key (TMK) Nos.	2nd Division 5-8-15: por. of 3 and 5-8-08: 2
Property Owner/Applicant	Puu O Hoku Ranch, Ltd. 84 State Street, Suite 900 Boston, MA 02109
Planning Consultant	Chris Hart & Partners; Landscape Architecture and Planning 1955 Main Street, Suite 200 Wailuku, Maui, Hawaii 96793 Phone: (808) 242-1955 Fax: (808) 242-1956 Mr. Rory Frampton, Planner

boundary, pursuant to HRS Chapter 205A. Proposed action is exempt from permit requirement under HRS §205A-22.

Existing Use

The project site and the immediate surrounding area are undeveloped. Also, the subject parcels do not contain any other residential dwellings.

Proposed Use

Single family residence, and two ancillary structures (Total floor area: 2,000 square feet)

D. Major Approvals to be Sought

- Conservation District Use Permit: Board of Land and Natural Resources, State of Hawaii.
- Approval for Individual Wastewater System: Department of Health, State of Hawaii.
- Approval for Development in Flood Hazard Districts, Department of Planning, County of Maui.
- Shoreline Setback Approval for landscape planting within the 150-foot shoreline setback area, Department of Planning, County of Maui.

E. Summary of Proposed Action and Potential Impacts

The proposed action involves the construction of a single family residence in the State Conservation District, "L" Limited

Subzone, at Pohakupili Bay, Island of Molokai. The project site, which is vacant and undeveloped, encompasses an area of ± 0.5 acre and is within the "V" zone or area of potential tsunami inundation. The project site occupies a portion of two (2) separate parcels within the 14,000-acre Puu O Hoku Ranch. The project site is mostly within TMK 5-8-15: 3 (hereinafter referred to as Parcel 3). The proposed pavilion structure would also affect TMK 5-8-08:2 (hereinafter referred to as parcel 2). Parcel 3 is a large parcel, approximately 474 acres in size. Parcel 2 is located within Parcel 3 and is approximately .15 acre in size. According to our interpretation of the TMK plats, Parcel 3 extends along the coastline from Honoulimaloo to a Kuanaka, a distance of approximately 2 miles. The subject parcels do not contain other residential dwellings.

The proposed project will consist of three (3) separate structures with a total floor area of approximately 2,000 square feet, as follows: (a) a two-story dwelling of wood frame construction with a floor area of approximately 1,568 sq. ft. and building height of 25 feet; (b) a gazebo and storage structure of approximately 352 sq. ft.; and (c) a bath house structure of approximately 80 sq. ft.

The proposed structures will be sited on relatively level terraced sections of the site to minimize grading work. All structures will be setback a minimum of 150 feet from the shoreline. Trees, shrubs and groundcover within the shoreline setback area will be retained as a visual buffer and to maintain the existing natural character of the area. Also given the remote location,

sloped topography, and existing vegetative cover, the visual impact of the proposed structures along Highway 45, the main public road, will be minimal. The finish floor of proposed habitable structures will be set above the estimated tsunami inundation level of 28 feet. The proposed project will not adversely impact any known significant historic or archaeological sites nor any rare, endangered or threatened species of flora or wildlife or associated critical habitat areas. In addition, the proposed action will not hamper, impede or otherwise limit the exercise of traditional, customary or religious practices in the immediate area.

Based on historic research and field investigations, habitation structures and a school previously existed in the vicinity of the project site at Pohakupili Bay. The proposed single family residence therefore relates to historic uses of the area. The size of the proposed residential structure (1,568 sq. ft.) is substantially less than the 5,000 sq. ft. area allowed for a single family residence in the Conservation District. The proposed structures will be of wood-frame and rock construction and will reflect the simple design character of a beach house.

II. DESCRIPTION OF THE PROPOSED ACTION

The proposed action involves the construction of a single family residence in the Conservation District, "L" Limited subzone at Pohakupili Bay, Puu O Hoku Ranch, Island of Molokai. The project site, which is approximately 0.5 acre in area, is part of a larger 474-acre

parcel and is designated within the "V" zone or area prone to potential tsunami inundation in the Federal Flood Insurance Rate Maps.

The proposed single family residence will consist of three (3) separate structures with a total area of approximately 2,000 square feet, as follows: (a) a two-story dwelling of wood frame construction with a floor area of approximately 1,568 sq. ft. and building height of 25 feet; (b) a gazebo and storage structure of approximately 352 sq. ft.; and (c) a bath house structure of approximately 80 sq. ft. *See Concept Building, Floor and Site Plans.*

The proposed structures will be sited on relatively level terraced sections of the site and will be setback between 150 feet and 230 feet from the shoreline. Trees, shrubs and groundcover within the shoreline setback area will be retained as a visual buffer and to maintain the existing natural character of the area. The finish floor of proposed habitable structures will be set above the estimated tsunami inundation level of 28 feet. The size of the proposed residential structure (1,568 sq. ft.) is substantially less than the 5,000 sq. ft. area allowed for a single family residence in the Conservation District. The proposed structures will be of wood-frame and rock construction and will reflect a simple design character of a beach house.

Other related improvements include the following:

- Extension of an existing private ranch water line to service the proposed dwelling. The existing line is mostly above grade and is approximately 150 feet from the project site. Minimal trenching will be involved to set the new line. If necessary, replacement or

- repair of the existing water line may be necessary to maintain sufficient water pressure for fire protection purposes;
- Installation of a photovoltaic power system to supply household electrical power;
 - Installation of a solar water heater;
 - Installation of a composting toilet/graywater system;
 - Extension of an existing unimproved ranch road to service the proposed dwelling; and
 - Landscape planting around the structures, including additional tree planting. Also within the 150-foot shoreline setback area, pruning of existing kiawe trees and removal of kiawe trees in poor condition. Additional trees (i.e. milo) will be planted within the 150-foot shoreline setback area to replace trees that are removed.

The existing access road which provides access to the south portion of Pohakupili Bay will be utilized for long term access as well as for construction access and delivery of materials. A temporary transmission line will be used for delivering concrete to the house site. The temporary line will be extended from an area adjacent to an upper level of the existing access road, over and down the slope to the proposed house site.

The proposed single family dwelling will be maintained as a private family residence in conjunction with Puu O Hoku Ranch.

III. ALTERNATIVES TO THE PROPOSED ACTION

Other potential sites for a residential beach house on Puu O Hoku Ranch lands necessarily involve lands in the Conservation District, "L" Limited subzone. Other sites along the ranch's northeast coast, including Halawa Valley, were investigated for a proposed beach house. The project site at Pohakupili Bay was selected, due to its close proximity and access to ranch waterlines and other facilities, reduced exposure to the strong northeast winds, relatively safe and protected beach area, and its previous history of use for residential purposes.

IV. DESCRIPTION OF THE PROJECT SITE AND ENVIRONMENTAL SETTING

A. Physical Environment

1. Location. The project site is located on the East End of the island of Molokai and approximately 25 miles from the town of Kaunakakai at Puu O Hoku Ranch and on the west slope of Pohakupili Bay. *See Location Maps.*
2. Description of Puu O Hoku Ranch. The ranch encompasses approximately 14,000 acres and includes a 13-room lodge and structures accessory to the ranch operation, including office building, tack house, repair shop, six (6) dwelling units, and a cottage. Most of the structures were constructed in the 1930's and 1940's. Currently, the ranch maintains approximately 200 head of

cattle and 50 horses in pasture and recently began the experimental cultivation of kava and organically-produced crops on 10 to 15 acres of land. Also, the ranch plans to undertake a reforestation project.

3. Characteristics of the Project Site. The project site comprises approximately 0.5 acres in area and is a portion of a 0.2 acre parcel and a 474 acre parcel that is part of the Puu O Hoku Ranch. See *TMK maps*.

The project site is located on the *makai*-side of Highway 45 at Pohakupili Bay. The site is maintained in open space. The area proposed for the single family residential structures is situated approximately 150 feet inland of the shoreline. Ground elevations range from 20 to 60 feet above sea level with flat terraces in sections. The substrata is rocky.

Access is available from Kamehameha V Highway (Highway 45) on an unimproved road extending approximately 1/4 mile down to the south side of Pohakupili Bay. In addition, an unimproved ranch road terminates approximately 300 feet north of the project site.

A gulch traverses the northeast section of Pohakupili Bay and is adjacent to the project site. An intermittent stream flows at the bottom of the gulch and is augmented by a spring near the mouth of the stream. When full, the stream empties into the sea. The shoreline is a sandy

beach in the bay and rocky along the flanks. Weathered basalt outcroppings are scattered on the sides of the gulch which are fairly steep.

See Topographic Survey Map and Photographs of the project site.

4. Historic Traditional and Customary Uses of Pohakupili Bay. In traditional times, the east coast of Molokai was the most highly populated part of the island. Fishponds lined the shores, marine resources were easily accessible from the reefs, and rains nurtured the dry land agricultural fields planted on the slopes of the many gulches. As Pohakupili Bay was one of the few inlets protected by an offshore reef, as well as offering an easy land for canoes, it would have been an ideal location for settlement. A stream and spring produced fresh water, and the sides of the gulch could be cultivated as could sections along the stream. A review of recorded testimony in the 1840's and 1850's, indicates that there were at least four (4) house sites in the immediate vicinity of the project area and that one was fenced.

In 1859, the island of Moloka'i became one district known as Moloka'i District, and in 1909, Kalawao District (Kalaupapa Peninsula) was added. Pohakupili Bay was included in the property of Puu O Hoku Ranch and became popularly known as Fagan's Beach named after a previous owner who consolidated the ranch. His plans for

development of the Bay did not materialize except for a structure near the stream known as "Fagan's sauna". In 1946, a tsunami heavily impacted the south shore of Molokai.

In 1955, George Murphy purchased the ranch and maintained a cattle operation.

In 1987, the Puu O Hoku Ranch was sold to the current owner, Puu O Hoku Ranch, Ltd.

On March 4, 1999, the Ranch held a community meeting to discuss the project and to gather input from area residents regarding traditional and customary activities in the area. It is clear from the record of the community meeting that native Hawaiian area residents continue to practice traditional and customary activities along the shoreline in the vicinity of the project site. Based on the record of testimony, most of these activities involve subsistence gathering of resources from the ocean, i.e. fishing, opihi picking and limu gathering. Portions of Parcel 3, the large 474 acre parcel, have been utilized for shoreline access purposes. However, the proposed project site is not situated along any known access way or trail that was mentioned at the meeting. The nearest such access is the existing jeep road which is used by the ranch and kuleana owners for vehicle access. The lateral coastal trail which was discussed at the meeting and which

provides access along the shoreline in the area does not enter the project site.

5. Soil Characteristics. The soils within the project site are classified in the Koele series that generally consist of well-drained soils on fans and in drainageways. More specifically, the soils of the project site are identified within the Koele-Badland complex (KRL). This complex primarily occurs in large gulches and consists of Koele soils at the bottom of gulches and Badland on the sides of gulches. The Koele soils are similar to Koele silty clay loam, 3 to 7 percent slopes, except that the slope is mainly in the 7 to 20 percent range. The Koele soils are characterized with moderately rapid permeability, slow to medium runoff, and slight to moderate erosion hazard. The Badlands consist of highly weathered rock, mainly along the sides of gulches, and slope in the 40 to 70 percent range. There are a few rock outcrops and scattered stones and boulders. In most places, there are many deep, vertical gullies on the Koele soils, where the slope is more than 10 percent. The Koele soils are easily eroded if bare of vegetation. The Badland part of this complex typically has little vegetative cover.

6. Terrestrial Biota. Existing vegetation consists mainly of grasses and scattered *kiawe* (*Prosopis pallida*), a grove of ironwood (*Casuarina equisetifolia*) to the north of the

unimproved dirt road that approaches the bay. Between the bottom of the western slope and the banks of the stream were several indigenous and Polynesian introduced trees, including a number of *Milo (Thespesia populnea)* and clusters of *Niu (Cocos nucifera)*.

Existing bird and animal life in the project vicinity include species common in the East End area. Avifauna typically found in the subject area include the common mynah, several species of dove, cardinal, house finch, and house sparrow. Mammals common to the area include cats, dogs, mice, rats, and mongoose.

7. Climate. The average annual rainfall in this area of East Molokai is between 5 to 8 inches between the months of October through March and between 2 to 5 inches between the months of April through September.

The East End of Molokai Island generally has mild and uniform climate throughout the year. The average temperatures during the year are in the 60 to mid-80 degree range. The presence of consistent northeasterly tradewinds is a climactic characteristic of the project site for much of the year. Air quality is considered to be excellent, and typical urban sources of noise (i.e. high volume of vehicles) is not prevalent in this rural setting.

8. Marine Environment. Pohakupili Bay is a crescent beach with a protected offshore reef. The beach is relatively

shallow and safe for swimming and exposed to the northeast currents of the Pailolo Channel, a 7.5 mile wide channel between the islands of Molokai and Maui.

9. Surrounding Land Uses. Several vacant *kuleana* parcels are in the immediate vicinity of the project site. Family members have access to these lands and shoreline along the existing dirt road to Pohakupili Bay and are known to use the area for fishing and camping.
10. Agricultural Land Suitability. The project site and immediate surrounding area are part of a 200 to 300 acre paddock that is occasionally used for cattle grazing for a 2 to 3 week duration during the year. According to the Land Study Bureau, the overall agricultural productivity rating for the area is "E" (very low productive agricultural capacity), due to slope and rockiness. According to the reference maps, Agricultural Lands of Importance to the State of Hawaii (ALISH), the project site is unrated.
11. Visual Resources. The project site is not identified in Molokai Community Plan or other standard references as a scenic vista or resource. Due to the higher ground elevation of Highway 45 and the hilly terrain of the area, the project site is barely visible from this road.
12. Noise Characteristics. Due to the undeveloped nature of the area, the primary sources of background noise are attributed to natural conditions (i.e. wind and shore surf).

13. Air Quality. Air quality in the region of East Molokai is considered good, since point sources and non-point sources of emission are not significant to generate high concentrations of pollutants.
14. Flood Hazard. According to the Federal Flood Insurance Rate Maps, the project site is located in "Zone V-30" that designate areas along the coast inundated by the 100-year coastal flood with wave velocity (wave action). The base flood elevation is between 26 to 28 feet. The last major tsunami inundation to hit the southeastern coast of Molokai, including Pohakupili Bay, was in 1946.
15. Archaeological Resources. The following is a summary of information on the project site contained in previous archaeological reports by Catherine C. Summers (1971), the State of Hawaii (1974) and the Applicant (1997).

1971 Summers report. Summers recorded sites on the border between the *ahupua'a* of Lupehu and Pohakupili and for Pohakupili, as follows:

- Site 236. Kahua and Ko'a (?), Lepuhu: Situate on the bluff at Punolohi which adjoins the land of Pohakupili, this site is an unpaved enclosure made with upright stones averaging 2 ft. in height. The southern side, which measures 127 ft. is composed of a double line of upright stones, between the two lines are pieces of coral and small

stones. The other three sides have only one line of uprights . . . There are three low platforms in the enclosure . . . In the SE corner of the enclosure there is a large natural outcrop of rocks to which stones have been added . . . it suggests a *ko'a* or a boundary marker of an *ahupua'a*. The boundary line of Lupehu and Pohakupili runs through here. There is a house site to the N of the enclosure, and to the W is the site of a school.

- Site 237. Kaho'onoho Heiau, Pohakupili: This heiau is located at the edge of the sea on the E side of the bay of Pohakupili Gulch . . . Stokes wrote of it: "This foundation is a stone terrace built right at the water's edge. Its retaining wall is 11 feet high. Its small size, 50 by 30 feet, does not suggest a heiau, but the height of its retaining wall, and its command of the bay, include one to credit the local information that it was a heiau."

- Site 238. Pohakuhawanawana Stone, Pohakupili: "Whispering stone" was located at the gulch near the eastern side of the road. It was described as a tall upright, rectangular shaped stone. Mary Pukui recorded that fishermen would whisper requests to the stone not only concerning fish but for taro from the uplands.

1974 State survey. The state survey of archaeological sites throughout Molokai identified what was called the "Pohakupili Complex" which included the north sides of Pohakupili and Keaina Bays (Lupehu Ahupua'a) and

extending inland about 61 meters. The site was assigned the same number (236) as that in the Summers report, since it incorporated several of the previously described features. The complex included the narrow alluvial plain at the mouth of the stream, the sides of the gulch, and land sloping towards Keaina Bay to the south.

Twenty-two features including six different feature types are listed in the complex: enclosures, habitation sites (with structural remains), midden sites on the beach, *ko'a* (fishing shrines), planting enclosures, and stone alignments. The majority of the features are situated on the bluff at Punolohi Point, within TMK 5-8-08:4, a relatively large kuleana parcel, approximately 1.86 acres in size.

Features identified in Pohakupili Bay included open midden sites, one located at the mouth of the stream where it empties into the bay, and another below the rock face on the south side of the bay. Midden recorded for these sites consisted of fire-altered rocks, charcoal, and shells. Basalt flakes were exposed in the stream-cut banks.

Two religious features (*ko'a*) were identified within the complex. One is actually in the *ahupua'a* of Lupehu on the cliffs to the south of Pohakupili, the other is on the point overlooking Pohakupili Bay.

Stone alignments were located in various places. The most obvious example, being one that was parallel to the shoreline of Pohakupili Bay. Many of these stone alignments correspond to kuleana parcel boundaries, as is the case in many locations along this section of coastline.

Evaluation of the area referred to its high research and interpretive value. It was estimated that the complex encompassed a range of feature types within a temporal span of 200-300 years and that more study would contribute to the knowledge of coastal life ways.

Project Archaeological Inventory Survey (August 1997).

The Project Archaeological Inventory Survey was conducted to establish the presence and extent or absence of archaeological remains within the project area. Sites were mapped and photographed, limited testing was conducted, and assessments of significance and recommendations were determined for recorded sites. A two-person team conducted pedestrian sweeps in lines of several meters apart. Testing was done to determine the presence of cultural deposits. Excavations were plotted on maps, and collected materials were analyzed at the laboratory facilities of Scientific Consultant Services, Inc. in Honolulu.

Archaeological features identified during the inventory survey were contiguous to those previously identified as Site 236, and were included under the Site No. 50-60-05-

236. Ten (10) additional features were recorded in the project area on the southern slope of Pohakupili Gulch, as follows (Features 23-32): two (2) rock alignments (Features 23, 27); four (4) rock-faced/ soil-surfaced terraces (Features 24, 28, 29, 31); one (1) circle of basalt rocks (Feature 32), one (1) rock stack (Feature 30); and two (2) slope facings (Features 25 and 26). One (1) artifact, a basalt flake, was recovered from the project area.

Rock alignments and terraces (Features 23, 27, 29, 31) are structures typical of traditional habitation or agriculture. Feature 31 was interpreted as a planting circle likely associated with dryland crops. Several sections on the slope in close proximity to Feature 32 were probably modified with similar circle construction that has slumped over time, making definite identification difficult. Features 25 and 26 were interpreted as slope facing for soil retention. Random clusters of boulders and rocks on the slope below Feature 31 were also probably facing for soil retention that has slumped. Modified sections on the slope above Feature 31 were interpreted to be the remnants of dryland agricultural activities, such as sweet potato, rather than habitation, because of the steepness of the slope.

The exact upper limits of the two L.C.A.s directly associated with the proposed project are difficult to calculate. However, it appears that the western boundary of Kapule's L.C.A. (No. 4933) extends into the project area.

La'anui's survey (L.C.A. 4686) shows the land is called "paele" up slope from his *kuleana*. Paele is a variety of sweet potato, but testimony by Kapule indicates that Paele was actually a person and that it was known to be his land before and during the Mahele, although the land was not claimed by Paele. The location of Paele's land given in testimony by both Kapule and La'anui would place Paele's land at least partially within the project area, although the exact size of his land is not known. The land was referred to as a house lot, however, no artifacts associated with habitation structures or activities were identified on the surface or uncovered in the shovel probes on the natural terrace (Feature 31), the most likely place for a house. Feature 30 was interpreted as possibly a remnant boundary marker for the south-west corner of Kapule's L.C.A.

B. Socio-Economic Characteristics

1. The project site is situated in the rural setting of East Molokai that generally includes the area from Kamalo to Halawa Valley. The East Molokai area is characterized by scattered rural residential developments, expansive open space areas, and picturesque valleys and mountains.
2. According to the 1990 U.S. Census, the population of East Molokai was 1,761 residents, representing 27 percent of the island's total population of 6,587 residents.

C. Public Infrastructure

1. Water: a private water system services Puu O Hoku Ranch. An existing water line is located approximately 150 feet from the project site.
2. Access: available along an unimproved dirt road off of Highway 45, a two-lane State right-of-way.
3. Electricity and Telephone: overhead lines are available along Highway 45.
4. Sewage disposal: the project site is not serviced by a public wastewater treatment system. Wastewater is disposed of by individual wastewater systems.
5. Solid Waste disposal: The ranch collects its trash and disposes it in the County landfill.
6. Drainage: the project site is not improved with a drainage system. Storm water runoff is disposed of by sheetflow and percolation into the ground.

D. Public Services

1. Fire Protection: A fire substation is located at Pukoo
2. Police Protection: The main Police Station is headquartered at the Mitchell Pauole Center in Kaunakakai.
3. Emergency Medical: Ambulance service is headquartered in Kaunakakai.
4. Public Education: The Kilohana Elementary School is located in the East End approximately 8 miles from the project site.

5. Recreational Facilities: A County park is located at Halawa Valley.

V. PROJECT IMPACTS

A. Archaeological, Historic and Cultural Sites

The Project Archaeological Inventory Survey (August 1997) identified ten (10) additional features (Nos. 23 to 32) on the southern slope of Pohakupili Gulch. These sites were contiguous to those previously identified as Site 236, and were included under the Site No. 50-60-05-236.

Features 23, 27, 29, 31 were rock alignments and terraces that are typical of traditional habitation or agriculture. Feature 31 was interpreted as a planting circle likely associated with dryland crops. Several sections on the slope in close proximity to Feature 32 were probably modified with similar circle construction that has slumped over time, making definite identification difficult. Features 25 and 26 were interpreted as slope facing for soil retention. Random clusters of boulders and rocks on the slope below Feature 31 were also probably facing for soil retention that has slumped. Modified sections on the slope above Feature 31 were interpreted to be the remnants of dryland agricultural activities, such as sweet potato, rather than habitation, because of the steepness of the slope.

The features identified in the Project Archaeological Inventory Survey have been included as a previously unrecorded portion

of Site 236, the Pohakupili Complex. In general, Site 236 is considered significant under Criterion D on the basis of high research and interpretive potential and under Criterion E as cultural and/or religious significance, due to the presence of a religious feature on Punolohi Point.

The proposed single family dwelling will be situated over 360 feet away from Punolohi Point and therefore will not impact the religious feature of Site 236. In accordance with SHPD definitions, Features 31 and 32 of Site 236 are no longer considered significant, as sufficient data has been recovered in the form of maps, photos, notes and through excavation. Features 31 and 32 will be removed as part of the residential construction and no further archaeological work is necessary. Features 18, and 23 through 30 will be preserved as is. Prior to construction, a preservation plan will be prepared outlining how the features will be preserved during construction and afterwards.

Prior to construction, an archaeological inventory survey of the corridor for the temporary concrete line will be conducted. In addition, in the event the Ranch pursues the option of extending the north Ranch access road, a qualified archaeologist will prepared a supplemental inventory survey of this corridor as well. A report of the findings for these areas will be submitted to SHPD for review and approval. Should significant historic sites be found in these areas, an acceptable mitigation plan will need to be prepared and approved by SHPD.

Based on the project's archaeological inventory survey, proposed mitigation measures, and comments received from SHPD, the proposed action will not adversely impact significant historic or archaeological resources in the area.

B. Site Conditions

The proposed residential structures are modest in scale and will be constructed to minimize land alteration and physical intrusion on the shoreline area. The proposed structures will be sited on existing terraced sections of the site, thereby reducing extensive grading. All structures will be a sited at a minimum of 150 foot setback from the shoreline, in accordance with County standards. Existing healthy trees and vegetation within the 150 foot shoreline setback area will be retained as a visual buffer. The proposed three (3) structures will have a total combined floor area of approximately 2,000 square feet, which is substantially less than the allowable floor area of 5,000 square feet. In conclusion, existing site conditions will not be significantly altered with the construction of the proposed residential dwelling.

C. Surrounding Areas

The proposed dwelling will be maintained as a private family residence. Based on historical records, and public comments at the March 4, 1999 community meeting, residences were previously located at Pohakupili Bay. The proposed single family

residential use therefore represents a re-establishment of a historic use of the area. The proposed single family residence will be modest in scale and situated a considerable distance from the shoreline, in order to respect existing uses of the shoreline by adjacent *kuleana* landowners for camping and fishing.

D. Terrestrial Biota

There are no known significant habitats of rare, endangered, or threatened species of flora located on the project site. Existing shrub vegetation will be cleared for the proposed structures. Healthy mature trees in the area will be maintained. Some of the existing ironwood trees are in poor condition and may need to be removed. However, new tree plantings will be added to retain the character of the nearshore within the 150 foot shoreline setback. Additional tree plantings (i.e. milo) are also proposed in the vicinity of the house site to enhance the natural character of the area and visually buffer the proposed structures.

There are no known significant habitats of rare, endangered or threatened bird or animal life on the project site. However on occasion, a monk seal has been observed basking on the beach.

The nearshore beach area will not be impacted by the proposed project, since the proposed structures will be located at a minimum of 150 feet away and vegetative cover within the shoreline setback area will be maintained.

E. Marine Resources

Minimal impacts on the marine environment are anticipated during the construction and post construction phases of the project. The expected increase in stormwater runoff with construction of the proposed structures is 0.17 c.f.s., a very minimal amount. The additional runoff will sheetflow into Pohakupili Gulch similar to the existing drainage patterns. The State Department of Health regulates storm water discharge from construction projects greater than 5.0 acres through the National Pollution Discharge Elimination System Permit (NPDES). In the case of the proposed project, this permit is not applicable, since the project site is approximately 0.5 acre in area.

Landscape planting will be added in and around the proposed structures to incorporate similar species found in the area, including trees and ground cover. A gray water system will be installed to collect, filter, and store household wash water for re-use in landscape irrigation. The added landscape planting and maintenance of the existing vegetative cover within the 150 foot shoreline setback area will serve to retain and filter any stormwater runoff that sheetflows from the proposed structures to the ocean.

A composting toilet will be installed for the project's individual wastewater disposal system that is subject to regulation by the State Department of Health. This type of system is a self-contained unit that has been used successfully in Hawaii and other locales for a number of years. The composting toilet does

not require the use of chemicals or a leach field and is considered to be an environmentally safe system. See documentation for *Sun-Mar Cottage Toilets and Clivus compost toilet*.

The proposed dwelling will also feature a solar heating system for hot water and a photovoltaic home power system. Potable water will be provided from an existing water line located approximately 150 feet from the project site. This line is part of the private water system of Puu O Hoku Ranch.

In conclusion, the proposed project will not contribute to significant stormwater runoff or siltation and the discharge of other pollutants or wastewater that could affect the environmental quality of the nearshore and marine environment.

F. Air Quality

Air quality impacts attributed to the project will include dust generated by short-term, construction-related activities. Site work such as grubbing and construction of the residence may generate some airborne particulate. However dust control measures will be implemented, as needed, to minimize wind-blown emissions, including temporary berms or swales to divert runoff away from graded areas and watering and sprinkling of exposed areas. Given the limited scale of the proposed project, it is not anticipated that long-term adverse air quality impacts will occur.

G. Noise

As with air quality, ambient noise levels will increase during construction. However upon completion, it is anticipated that the project will not have an adverse impact on existing noise characteristics of the area.

H. Visual Resources

The project site is not identified in the Molokai Community Plan or other planning documents as a significant scenic corridor or vista. The proposed residence will be located below the grade of Highway 45 and will be barely visible from this public coastal roadway. Also, the proposed structures will be setback a minimum of 150 feet from the shoreline and will be visually screened from this area by existing vegetation. Given these factors and the relatively small scale of the proposed structures, the visual impacts of the project from the vantage point of a coastal highway or along the shoreline will not be significantly intrusive.

I. Socio-Economic Environment

In the short-term, the project will provide limited construction and construction-related opportunities. In the long term, the establishment of a single family residence will not result in a major population increase and attendant issues.

J. Traditional and Customary Rights

It is clear from the record of the community meeting held on March 4, 1999, that native Hawaiian area residents continue to practice traditional and customary activities along the shoreline in the vicinity of the project site. Based on the record of testimony, most of these activities involve subsistence gathering of resources from the ocean, i.e. fishing, opihi picking and limu gathering. Portions of Parcel 3, the large 474 acre parcel, have been utilized for shoreline access purposes. However, the proposed project site is not situated along any known access way or trail that was mentioned at the meeting. The nearest such access is the jeep road which is used by the ranch and kuleana owners for vehicle access. The lateral coastal trail which was discussed at the meeting and which provides access along the shoreline in the area does not enter the project site. As such, it has been concluded that the proposed project will not directly impact shoreline access in the area.

Most of the discussion regarding traditional and customary practices focused on ocean related activities. Based on their location and orientation, it appears that the religious related archaeological sites in the nearby vicinity, including heiau and koa, also had a strong functional relationship to the ocean. Due to the proposed shoreline setback and the distance of the

proposed dwelling from Punolohi point, the project will not significantly impact the ocean views from these coastal sites.

Based on the foregoing, the proposed action will not hamper, impede or otherwise limit the exercise of traditional, customary or religious practices in the immediate area.

K. Public Services

The proposed project is not anticipated to adversely affect or burden public services such as police or fire protection or medical services. Trash collection service for the proposed project will be taken to Puu O Hoku Ranch, which uses the services of a private disposal company.

L. Infrastructure

1. Wastewater-- A composting toilet will be installed for the project's individual wastewater disposal system that is subject to regulation by the State Department of Health. This type of system is a self-contained unit that has been used successfully in Hawaii and other locales for a number of years. The composting toilet does not require the use of chemicals or a leach field and is considered to be environmentally safe. *See documentation for Sun-Mar Cottage Toilets and Clivus compost toilet.*
2. Potable Water-- The proposed project will be serviced by the private water system of Puu O Hoku Ranch. An

existing waterline is located approximately 150 feet from the project.

3. Access-- An existing unimproved Ranch access road is located north of the project site and will be used for vehicular access. In addition, another unimproved Ranch access road is located to the south of the project site.
4. Drainage-- The grading of the site will be minimal. The estimated 10-year stormwater runoff from construction of the project will increase from 0.08 to 0.25 c.f.s. or an additional 0.17 c.f.s. based on formulas and tables in the "Rules for the Design of Storm Drainage Facilities in the County of Maui". The additional runoff will sheetflow into Pohakupili Gulch similar to current conditions. The increase in runoff is insignificant, and existing drainage patterns will not be altered. *See Preliminary Drainage and Erosion Control Study.*
5. Electrical Power-- The project will utilize solar water heating and a photovoltaic power system, thereby eliminating the need to extend power lines to the site.

VI. RELATIONSHIP OF THE PROPOSED ACTION TO PUBLIC POLICIES AND OTHER APPLICABLE LAND USE REGULATIONS

A. Maui County General Plan

The General Plan of the County of Maui is a long range policy plan that was adopted by Ordinance No. 2234 and effective on September 27, 1991. The purpose of this plan is "(to) recognize and state the major problems and opportunities concerning the needs and the development of the county and the social, economic and environmental effects of such development and shall set forth the desired sequence, patterns and characteristics of future development."

The proposed action respects the following objectives and policies of the General Plan:

- Policy: Identify and preserve significant historic and cultural sites (Land Use, Policy I.B.1.c). Comment: In planning the proposed project, an archaeological inventory survey was conducted, and it was concluded that significant historic and cultural sites would not be impacted by the project. In addition, it has been concluded that the proposed action will not hamper, impede or otherwise limit the exercise of traditional, customary or religious practices in the immediate area.

- Policy: Protect prime agricultural lands from competing nonagricultural uses (Land Use, Policy I.B.3.a). Comment: The

project site and immediate surrounding area is used occasionally for cattle grazing but is not classified as prime agricultural land, due to the relatively steep slopes and rocky terrain.

- Policy: To require that appropriate principles of urban design be observed in the planning of all new developments (Urban Design, Policy III.B.1.a). Comment: The proposed single family residence will be sited a minimum of 150 feet inland of the shoreline and above the base flood elevation for potential tsunami inundation. The project will incorporate a simple and energy efficient design compatible with a rural area and in a manner that minimizes pollution and degradation of the natural environment.

B. Molokai Community Plan

The Molokai Community Plan implements the broad policies of the Maui County General Plan and provides a relatively detailed scheme of the desired sequence, patterns and characteristics of future development, including a statement of standards and a land use map identifying the planned distribution and intensity of land uses and public facilities. The existing Molokai Community Plan was adopted by Ordinance No. 1052 on June 24, 1980.

The proposed action respects the following objectives and policies of the Molokai Community Plan:

- Policy: All zoning applications and/or proposed land uses and developments shall be consistent with the Community Plan policies (Land Use, Policy VI.B.2.h). Comment: The Community Plan land use designation is "Conservation" use and subject to the provisions of Chapter 13-5, Hawaii Administrative Rules, Conservation District. The proposed use is therefore consistent with the land use policies prescribed in the Community Plan.

- Policy: Recognize the importance of historically and archaeologically sensitive sites and encourage their preservation through development project review. Require development projects to identify all cultural resources located within the project area as part of initial project studies. Further require that all proposed activity include recommendations to mitigate potential adverse impacts on cultural resources (Support Systems: Human Services, Policy VI.D.1.k). Comment: As previously noted in planning the proposed project, an archaeological inventory survey was conducted, and it was concluded that significant historic and cultural sites would not be impacted by the project.

C. Special Management Area Rules Pursuant to HRS Chapter 205A

The project site is situated within the Special Management Area (SMA) boundary established under the rules of the Molokai Planning Commission. However, the Maui County Planning Department has determined that the proposed single family residence is not a "development" subject to permit

requirements, in accordance with HRS §205A-22 and applicable rules.

Also, the proposed single family residence will comply with County shoreline setback standards, since all structures will be sited a minimum of 150 feet from the certified shoreline, in accordance with the provisions of §12-4-4, Rules Relating to Shoreline Areas, Molokai Planning Commission.

D. Evaluation Based on Criteria for Land Uses in the Conservation District, Section 13-5-30 (c)

The proposed single family residential use complies with the criteria for land uses in the Conservation District, as follows:

1. The proposed land use is consistent with the purpose of the conservation district.

RESPONSE: Pursuant to Hawaii Administrative Rules §13-5-1, the purpose of the chapter is "to regulate land use in the conservation district for the purpose of conserving, protecting, and preserving the important natural resources of the State through appropriate management and use to promote their long-term sustainability and the public health, safety, and welfare." As presented in the project's Environmental Assessment, the proposed project has been designed to minimize potential adverse impacts on the area's natural resources. The structures will be sited on existing terraced sections, in order to minimize grading, and at a minimum of 150 feet from the shoreline.

Within the 150-foot shoreline setback area, existing healthy trees and vegetation will be maintained, in order to preserve the natural character of the area and to provide an appropriate visual buffer. The proposed residence is of modest scale and incorporates a total area of 2,000 square feet, which is substantially below the maximum allowable area of 5,000 square feet. The design of the structures reflects a rural character of simple woodframe and rock construction. A composting toilet will be utilized for sewage disposal. In the past, there were habitation structures at Pohakupili Bay, and the proposed action is therefore consistent with historic uses of the property. The proposed single family dwelling will be maintained as a private residence, and the occupation of same will not disrupt nor preclude the occasional fishing and camping use of Pohakupili Bay by adjacent *kuleana* landowners. In addition, the proposed action will not hamper, impede or otherwise limit the exercise of traditional, customary or religious practices in the immediate area. In conclusion, the proposed project is reasonable and appropriate for the area and includes adequate measures to protect natural and historic resources.

2. The proposed land use is consistent with the objectives of the subzone of the land on which the use will occur.

RESPONSE: Pursuant to HAR §13-5-12, the objective of the Limited (L) subzone is "to limit uses where natural conditions suggest constraints on human activities." The

project site is designated Zone "V30", which is a Special Flood Hazard Area subject to the 100-year flood and that have additional hazards due to wave action (potential tsunami inundation). Pursuant to HAR §13-5-23, L-6, an identified land use in the Limited subzone is "a single family residence in a floodplain or coastal high hazard area that conforms to applicable county regulations regarding National Flood Insurance Program and single family residential standards outlined in this chapter."

The proposed single family residence will re-establish a historic use of the area and in a manner consistent with environmental design principles. The proposed residence is modest in scale (2,000 square feet total floor area) and will be sited a minimum of 150 feet *mauka* of the shoreline. The existing healthy trees within the shoreline setback will be retained to maintain the area's character and soften the visual mass of the proposed structures. The proposed project will involve minimal grading, since the objective is to site the structures on existing terraced sections of the land. The proposed structures will not adversely impact any known significant historic, archaeological or cultural resources, based on the findings and conclusions of the Project's Archaeological Inventory Survey. The proposed residence will incorporate solar water heating, composting toilet, and a photovoltaic power system, all of which are energy-efficient and environmentally appropriate for this locale.

3. The proposed land use complies with provisions and guidelines contained in chapter 205A, HRS, entitled "Coastal Zone Management," where applicable.

The project site is located within the County's Special Management Area (SMA). Construction of a single family residence is exempt from the SMA permit requirements. (NOTE: See confirmation letter from the Maui County Planning Department.)

The project is subject to the County's Shoreline Setback requirements, pursuant to the Shoreline Area Rules of the Molokai Planning Commission. For the subject property, the applicable shoreline setback area is 150 feet. The proposed structures will be located a minimum of 150 feet from the shoreline.

4. The proposed land use will not cause substantial adverse impact to existing natural resources within the surrounding area, community or region.

There are no known significant habitats of rare, endangered or threatened bird or animal life on the project site. The nearshore beach area will not be impacted by the proposed project, since the proposed structures will be located at a minimum of 150 feet away and existing vegetation within the shoreline setback area will be maintained.

Minimal impacts on the marine environment are anticipated during the construction and post construction phases of the project. The expected increase in stormwater runoff with construction of the proposed structures is 0.17 c.f.s., a very minimal amount. The additional runoff will sheetflow into Pohakupili Gulch similar to the existing drainage patterns. The State Department of Health regulates storm water discharge from construction projects greater than 5.0 acres through the National Pollution Discharge Elimination System Permit (NPDES). In the case of the proposed project, this permit is not applicable, since the project site is approximately 0.5 acre in area.

Landscape planting will be added in and around the proposed structures to incorporate similar species found in the area, including trees and ground cover. A gray water system will be installed to collect, filter, and store household wash water for re-use in landscape irrigation. The added landscape planting and maintenance of the existing vegetative cover within the 150 foot shoreline setback area will serve to retain and filter any stormwater runoff that sheetflows from the proposed structures to the ocean.

A composting toilet will be installed for the project's individual wastewater disposal system that is subject to regulation by the State Department of Health. This type of system is a self-contained unit that has been used

successfully in Hawaii and other locales for a number of years. The composting toilet does not require the use of chemicals or a leach field and is considered to be an environmentally safe system. *See documentation for Sun-Mar Cottage Toilets and Clivus compost toilet.*

The proposed dwelling will also feature a solar heating system for hot water and a photovoltaic home power system. Potable water will be provided from an existing water line located approximately 150 feet from the project site. This line is part of the private water system of Puu O Hoku Ranch.

In conclusion, the proposed project will not contribute to significant stormwater runoff or siltation and the discharge of other pollutants or wastewater that could affect the environmental quality of the nearshore and marine environment.

5. The proposed land use, including buildings, structures and facilities, shall be compatible with the locality and surrounding areas, appropriate to the physical conditions and capabilities of the specific parcel or parcels.

RESPONSE: The proposed residential structures are modest in scale and will be constructed to minimize land alteration and physical intrusion on the shoreline area. The proposed structures will be sited on existing terraced sections of the site, thereby reducing extensive grading. All structures will be a sited at a minimum of 150 foot

setback from the shoreline, in accordance with County standards. Existing trees and vegetation within the 150 foot shoreline setback area will be retained as a visual buffer. The proposed three (3) structures will have a total combined floor area of approximately 2,000 square feet, which is substantially less than the allowable floor area of 5,000 square feet. In conclusion, existing site conditions will not be significantly altered with the construction of the proposed residential dwelling.

6. The existing physical and environmental aspects of the land, such as natural beauty and open space characteristics, will be preserved or improved upon, whichever is applicable.

RESPONSE: The project site is not identified in the Molokai Community Plan or other planning documents as a significant scenic corridor or vista. The proposed residence will be located below the grade of Highway 45 and will be barely visible from this public coastal roadway. Also, the proposed structures will be setback a minimum of 150 feet from the shoreline and will be visually screened from this area by existing vegetation. Given these factors and the relatively small scale of the proposed structures, the visual impacts of the project from the vantage point of a coastal highway or along the shoreline will not be significantly intrusive.

7. Subdivision of land will not be utilized to increase the intensity of land uses in the conservation district.

RESPONSE: The proposed project does not involve the subdivision of land in the conservation district.

8. The proposed land use will not be materially detrimental to the public health, safety and welfare.

RESPONSE: As documented in the Environmental Assessment, the project will comply with all appropriate governmental requirements relative to public environmental and health concerns during the construction and post-construction phases. The wastewater disposal system will be designed, in accordance with the requirements of the State Department of Health. Appropriate mitigative measures identified in the Environmental Assessment will be implemented to minimize the potential short-term construction impacts to air quality and marine water quality. Accordingly, the proposed project would not be detrimental to the public health, safety and welfare.

- E. **Section 13-5-23, Hawaii Administrative Rules, relating to Single Family Residences in the Conservation District**

The proposed single family residence and accessory structures are specified as permitted uses in the "Limited" subzone of the Conservation District, in accordance with HAR §13-5-23, item L-6 and L-7 and subject to board permit and/or site plan approval and compliance with County flood hazard district requirements.

The proposed single family residence complies with applicable rules as follows:

- The Applicant agrees to comply with standard conditions for single family residences, as specified in HAR §13-5-42.
- In accordance with Exhibit 4 (p. 5-40) of HAR Chapter 13-5 relating to "Single Family Residential Standards", compliance will be rendered, as follows:

Minimum Lot Size (10,000 square feet required):

TMK 5-8-15: 3-- 474.22 acre parcel for proposed single family dwelling and bath house);

TMK 5-8-08: 2-- 0.2 acre or 8,712 square feet parcel pavilion/storage building. NOTE: Existing non-conforming-sized lot.

Minimum Setback: For lots over one (1) acre: 25 feet (front); 25 feet sides; 25 feet (back). As proposed, all setbacks will be exceeded. In addition, the shoreline setback will be 150 feet for all structures.

Maximum Developable Area (5,000 square feet allowed):
2,000 square feet proposed.

Maximum Height Limit (25 feet allowed): 25 feet proposed

Compatibility Provisions: The proposed project will comply with the following: structures are designed to

incorporate landscape screening; color scheme of earth tone intensity; DOH wastewater permit/ water collection system; minimal grading/contouring with consideration of slope; all structures connected or best alternative; compliance with applicable building and grading code and shoreline setback provisions; and one kitchen.

VII. CONCLUSIONS

1. The proposed action is an appropriate use for the area and will not impact agricultural uses at Puu O Hoku Ranch and traditional uses of Pohakupili Bay by *kuleana* landowners in the immediate area. In addition, the proposed action will not hamper, impede or otherwise limit the exercise of traditional, customary or religious practices in the immediate area.
2. The Environmental Assessment describes the proposed action, the expected consequences, both primary and secondary, and the cumulative, as well as the short-term and long-term effects of the action, in accordance with §11-200-12, Environmental Impact Statement Rules. The following are conclusions as to the significance of potential environmental effects:
 - a. The proposed single family residence will not involve an irrevocable commitment to loss or destruction of any natural or cultural resources.
 - b. The proposed single family residence will not curtail the range of beneficial uses of the environment within the context of long-range plans, including the General Plan of the County of Maui and the adopted Molokai Community Plan..

- c. The proposed single family residence does not conflict with the state's long-term environmental policies or goals and guidelines as expressed in chapter 344, HRS, and any subsequent revisions and public actions.
- d. The proposed single family residence will not substantially affect the economic or social welfare of the community or State.
- e. The proposed single family residence will not substantially affect public health.
- f. The proposed single family residence will not involve substantial secondary impacts, such as population changes or effects on public facilities.
- g. The proposed single family residence will not cumulatively result in considerable effect on the environment nor does it involve a commitment for larger actions.
- h. The proposed single family residence will not substantially affect a rare, threatened, or endangered species or its habitat.
- i. The proposed single family residence will not detrimentally affect the air or water quality or ambient noise levels.
- j. The proposed single family residence is located in an environmentally sensitive area, namely an area prone to tsunami inundation. All structures will be sited above the base flood elevation.
- k. The proposed single family residence will not substantially affect scenic vistas and viewplanes identified in county or state plans or studies.

1. The proposed single family residence will not involve substantial energy consumption,
3. The project site is situated within the County's Special Management Area but is not a "development" subject to said permit requirements, in accordance with HRS §205A-22. The proposed single family residence complies with the County of Maui's shoreline setback area regulations, pursuant to HRS Chapter 205A and §12-4-4 of the Molokai Planning Commission rules relating to the shoreline area.
4. The proposed single family residence is a permitted use in the "Limited" subzone of the Conservation District, in accordance with §13-5-23, Hawaii Administrative Rules.
5. The proposed single family residence complies with standards for a single family residence, in accordance with §13-5-41, Hawaii Administrative Rules, and Exhibit 4 of said rules related to Single Family Residential Standards, September 6, 1994.

VIII. CONSULTED AGENCIES PRIOR TO DRAFT EA SUBMITTAL

1. County of Maui
 - a. Planning Department
 - b. Land Use and Codes Division, Department of Public Works and Waste Management
2. State of Hawaii
 - a. Conservation and Environmental Affairs, Department of Land and Natural Resources
 - b. Historic Preservation Division, Department of Land and Natural Resources

**IX. AGENCIES AND INDIVIDUALS COMMENTING ON THE
DRAFT EA**

See Appendix for Comment and Response Letters.

1. County of Maui
 - a. Planning Department

2. State of Hawaii
 - a. *Office of Hawaiian Affairs*
 - b. Department of Health
 - c. Department of Land and Natural Resources
 - Engineering Branch
 - Division of Aquatic Resources
 - Division of Forestry and Wildlife

3. Individuals
 - a. Walter Ritte

References

Balder, A.P., Marine Atlas of the Hawaiian Islands, University of Hawaii Press, 1991.

Clarke, John R.K., The Beaches of Maui County, University of Hawaii Press, Second Edition, 1989.

Community Resources, Inc., Maui County Community Plan Update Program Socio-Economic Forecast Report, March 1992.

County of Maui, Maui Planning Department, Molokai Community Plan, January 1984.

County of Maui, Maui Planning Department, The General Plan of the County of Maui, 1990 Update.

Spear, Robert L., Ph.D., and Leann McGerty, Scientific Consultant Services, Inc., An Archaeological Inventory Survey of a Land Parcel at Pohakupili Ahupua'a, Kona District, Molokai, Hawaii, August 1997.

State of Hawaii, Department of Agriculture, Agricultural Lands of Importance for the State of Hawaii, Map Mo-5, January 1977.

University of Hawaii-Hilo SBDC Network Business Research Library, Maui County Book, 1996-97.

University of Hawaii, Department of Geography, Atlas of Hawaii, Second Edition, 1983.

University of Hawaii, Land Study Bureau, Detailed Land Classification - Island of Molokai, L.S.B. Bulletin No. 10. June 1968.

FINAL ENVIRONMENTAL ASSESSMENT
Proposed Single Family Residence
Puu O Hoku Ranch, Ltd.
Island of Molokai

U.S. Bureau of the Census, Estimate of the Population of Counties and Demographic Components of Population Change: Annual Time Series, July 1, 1990 to July 1, 1996, Bulletin CO-96-8, 20 March 1997.

U.S. Department of Agriculture, Soil Conservation Service in Cooperation with the University of Hawaii, Agricultural Experiment Station. Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, 1972.

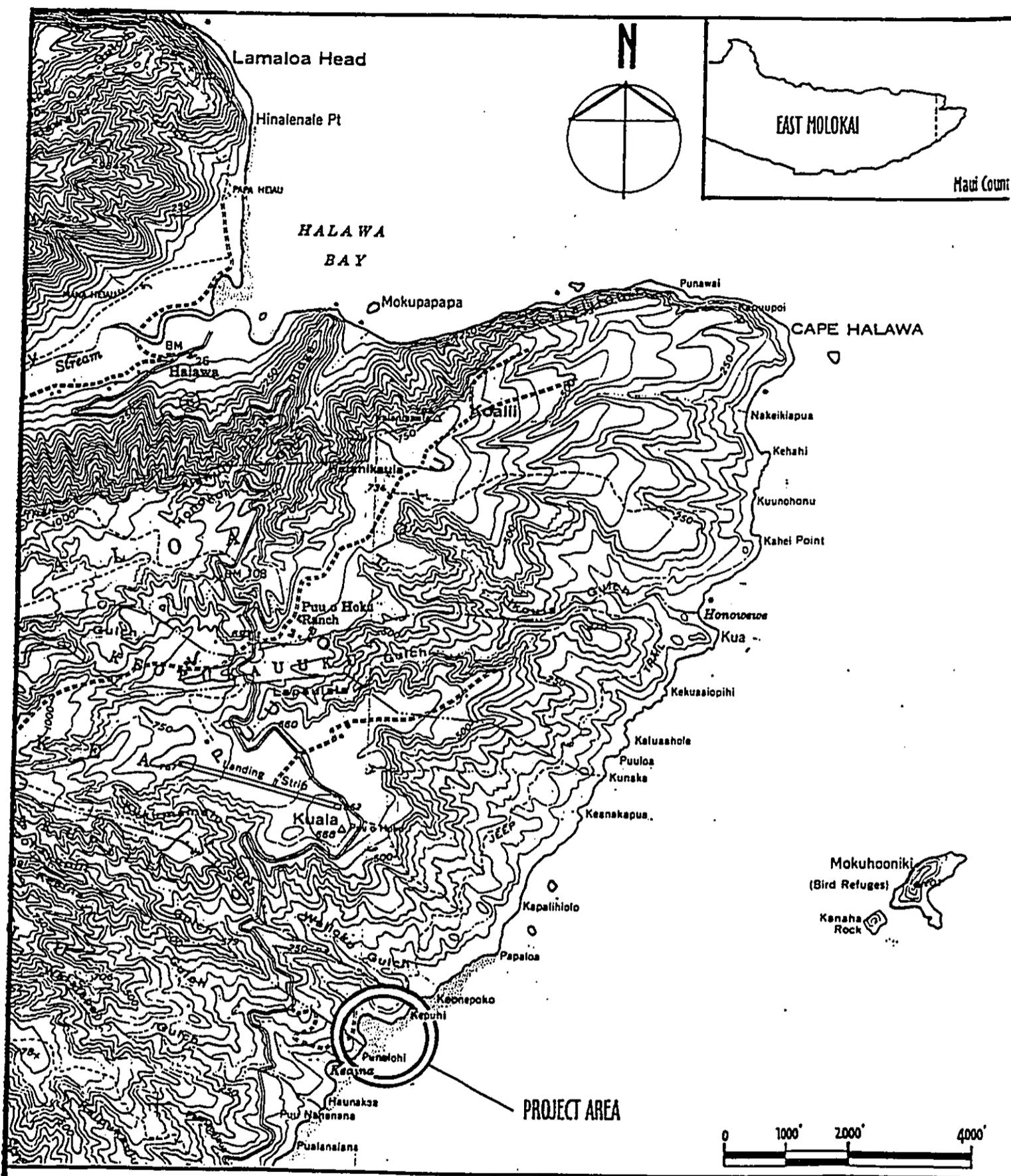


EXHIBITS

LIST OF EXHIBITS

1. Location Map
- 2a. Tax Map Plat 5-8-15
- 2b. Tax Map Plat 5-8-8
3. Land Survey depicting site area
- 3.a. Site Map
4. Site Plan
5. Site Elevation of Pohakupili House
6. Site Section of Pohakupili House
7. Site Axonometric (Top View of Pohakupili House)
8. Main House (Ground Level floor plan)
9. Main House (Upper Level floor plan)
10. Main House Elevations
11. Main House (Section)
12. Pavilion plan
13. Bath House plan
14. Perspective View from jeep trail approach
15. Perspective Views
16. Perspective Views from beach front
- 17.a. Map identifying archaeological sites nos. 236, 237, and 238 (Summers, 1971)
- 17.b. Site Plan related to 1974 Archaeological Survey Map
- 17.c. Site Plan related to 1997 Project Archaeological Survey Map

18. Federal Flood Insurance Rate Map for the Project Site
19. Map Depicting Two (2) Points along Hwy. 45 where the Project Site is visible
20. Existing Jeep Trails at Puu O Hoku Ranch
21. State Land Use District Boundary Interpretation Map No. 98-20
22. Certified Shoreline Map
23. Letter dated June 6, 1997 from the Maui County Planning Department determining that the *proposed single family residential project* is not a "development" and is therefore exempt from the Special Management Area Rules for the Molokai Planning Commission.
24. Letter dated February 9, 1998 from the Maui County Planning Department stating the project site is within the Special Flood Hazard District, Zone V30, an area of 100 year coastal flooding with base elevations between 26 to 28 feet mean sea level and will require a flood development permit.

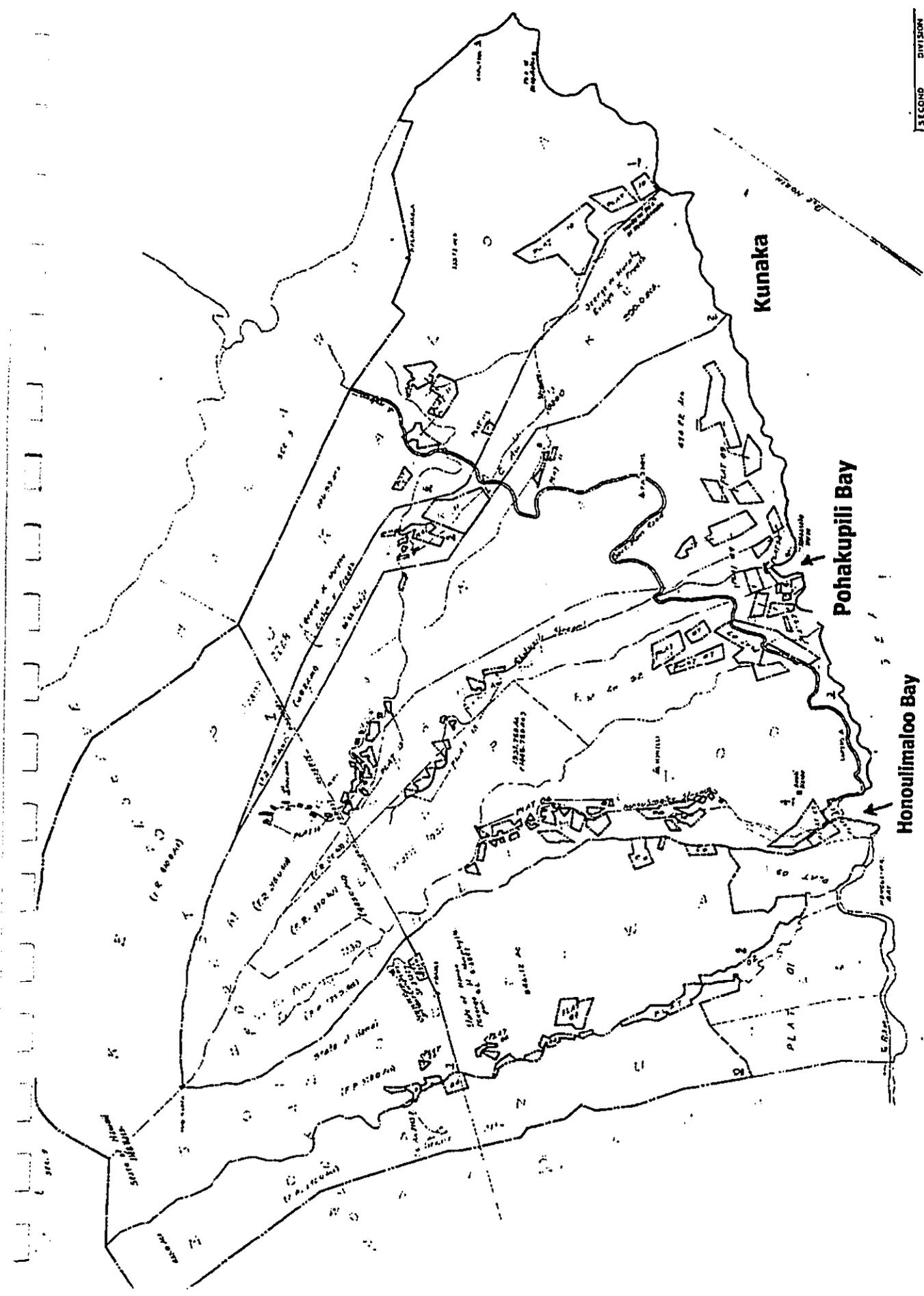


POHAKUPILI HOUSE - 01
LOCATION MAP

dx 12/10/97

MOLOKAI
 Scale 1" = 2000'

PROJECT AREA

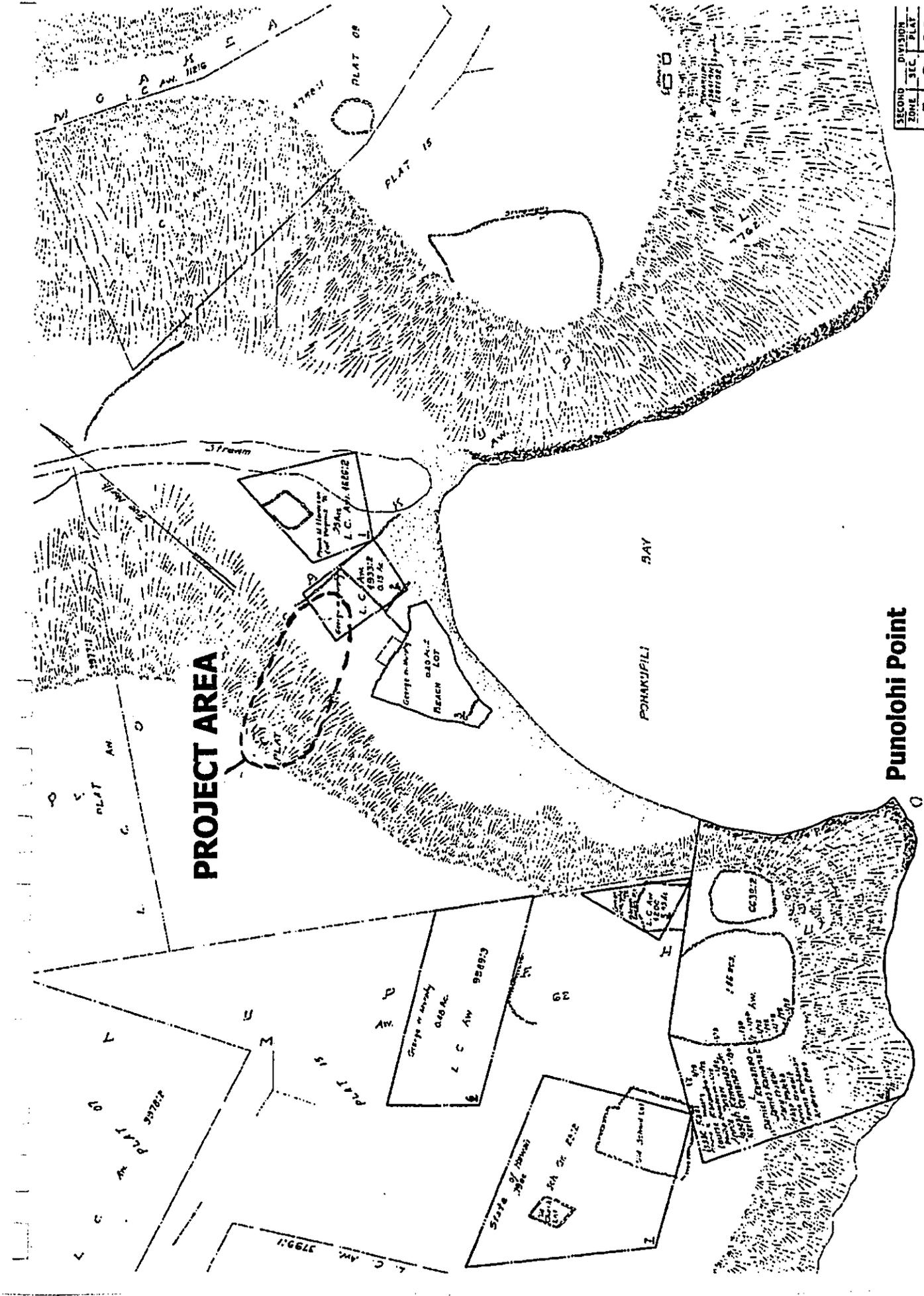


SECOND	DIVISION
ZONE	SEC
5	8
PLAT	15

Pohakupili House

Exhibit 2A

Molokai

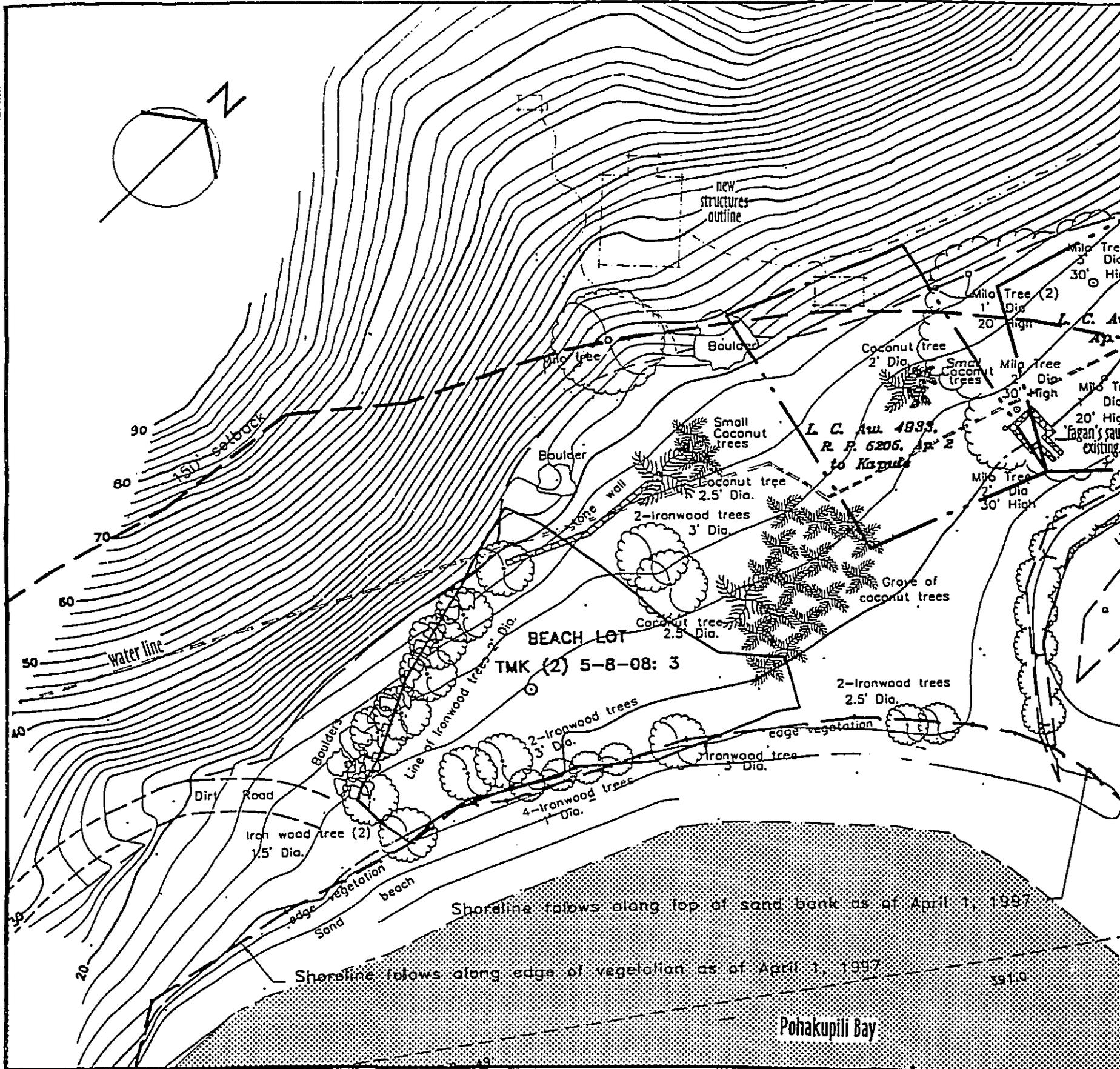


SECOND	DIVISION
ZONE	SEC.
5	8
	08

Pohakupili House

Exhibit 2B

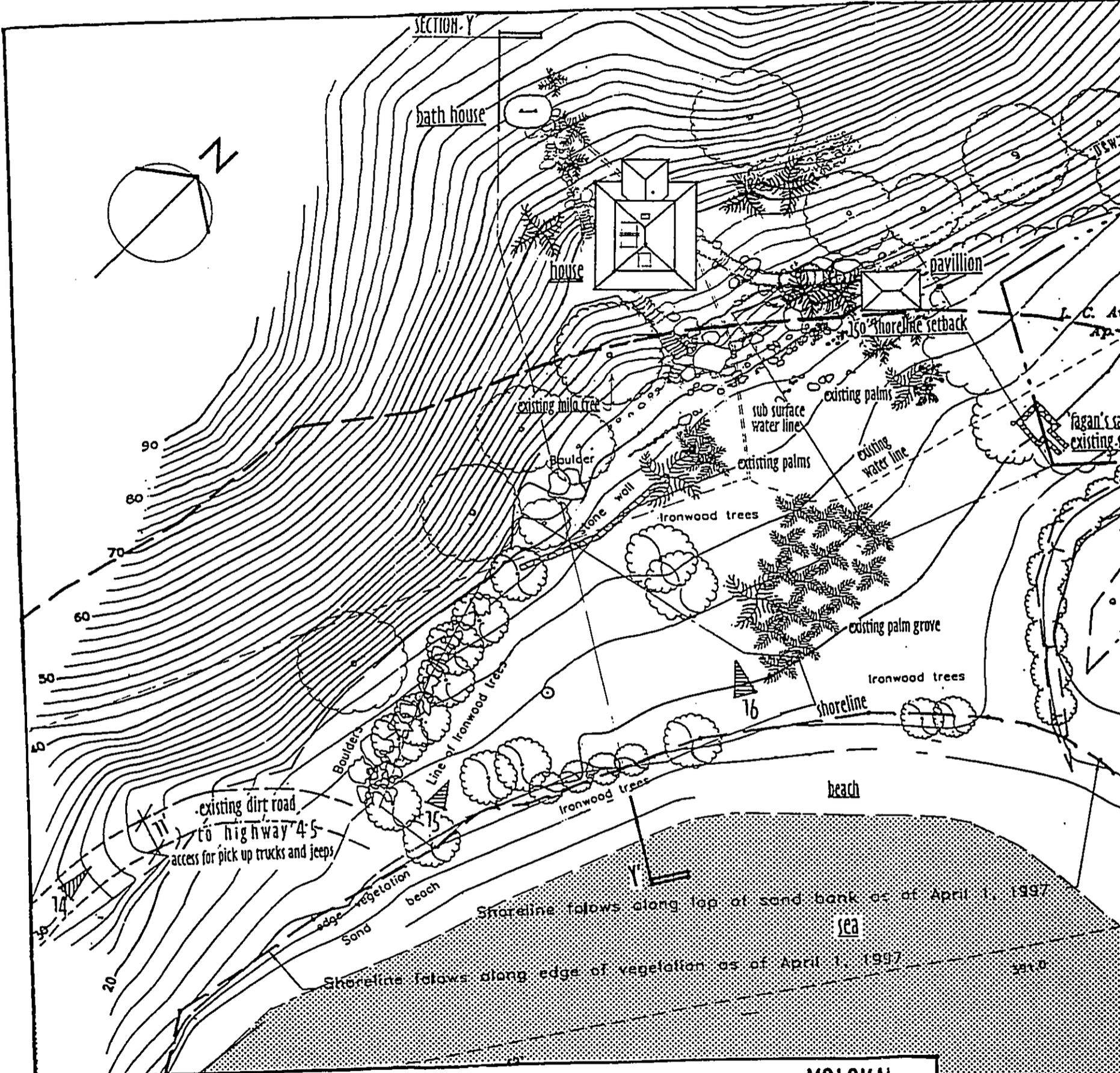
Molokai



POHAKUPILI HOUSE - 03
LAND SURVEY (site area)

dbc 12/10/97

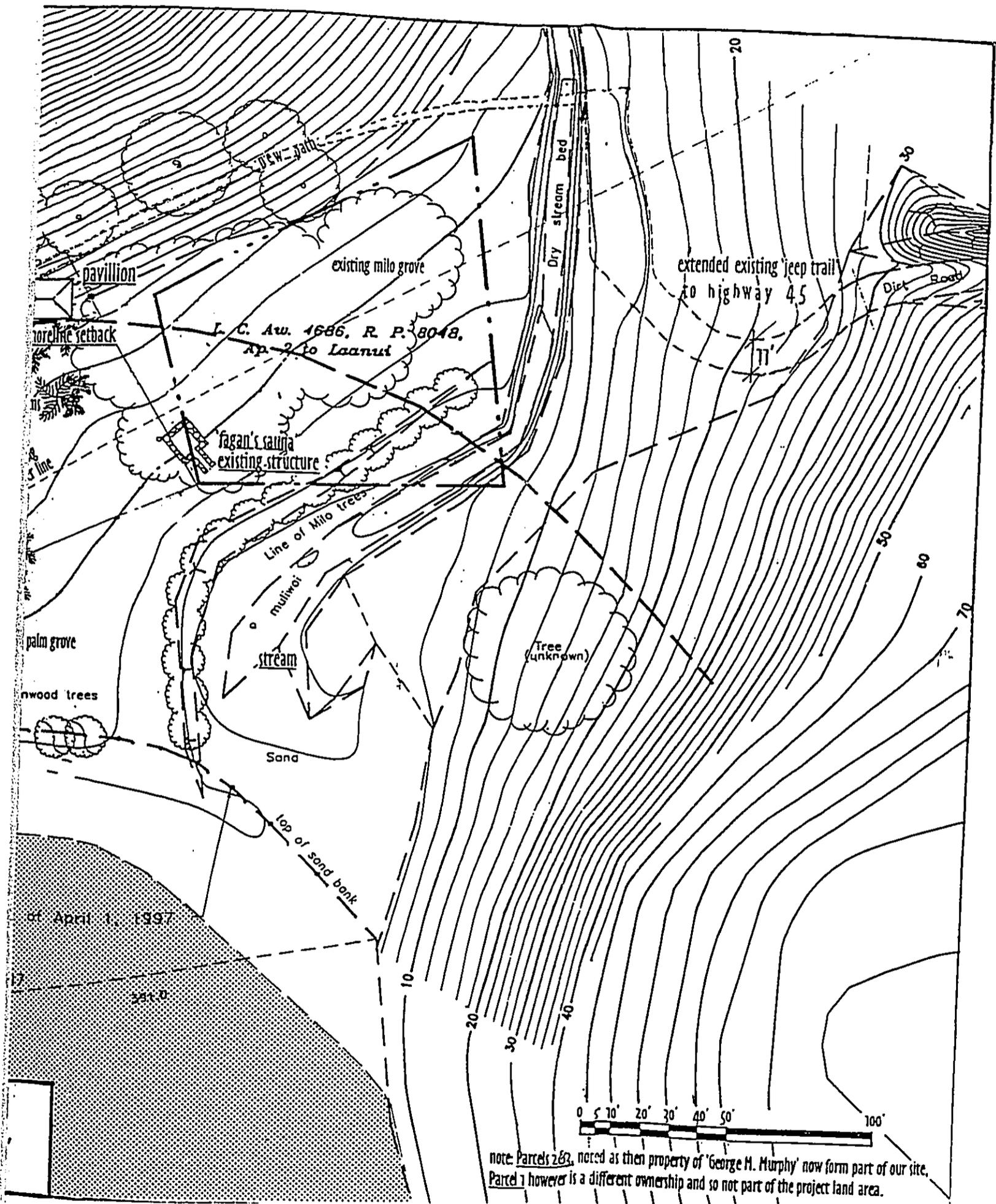
MOLOKAI
 Scale 1" = 40'



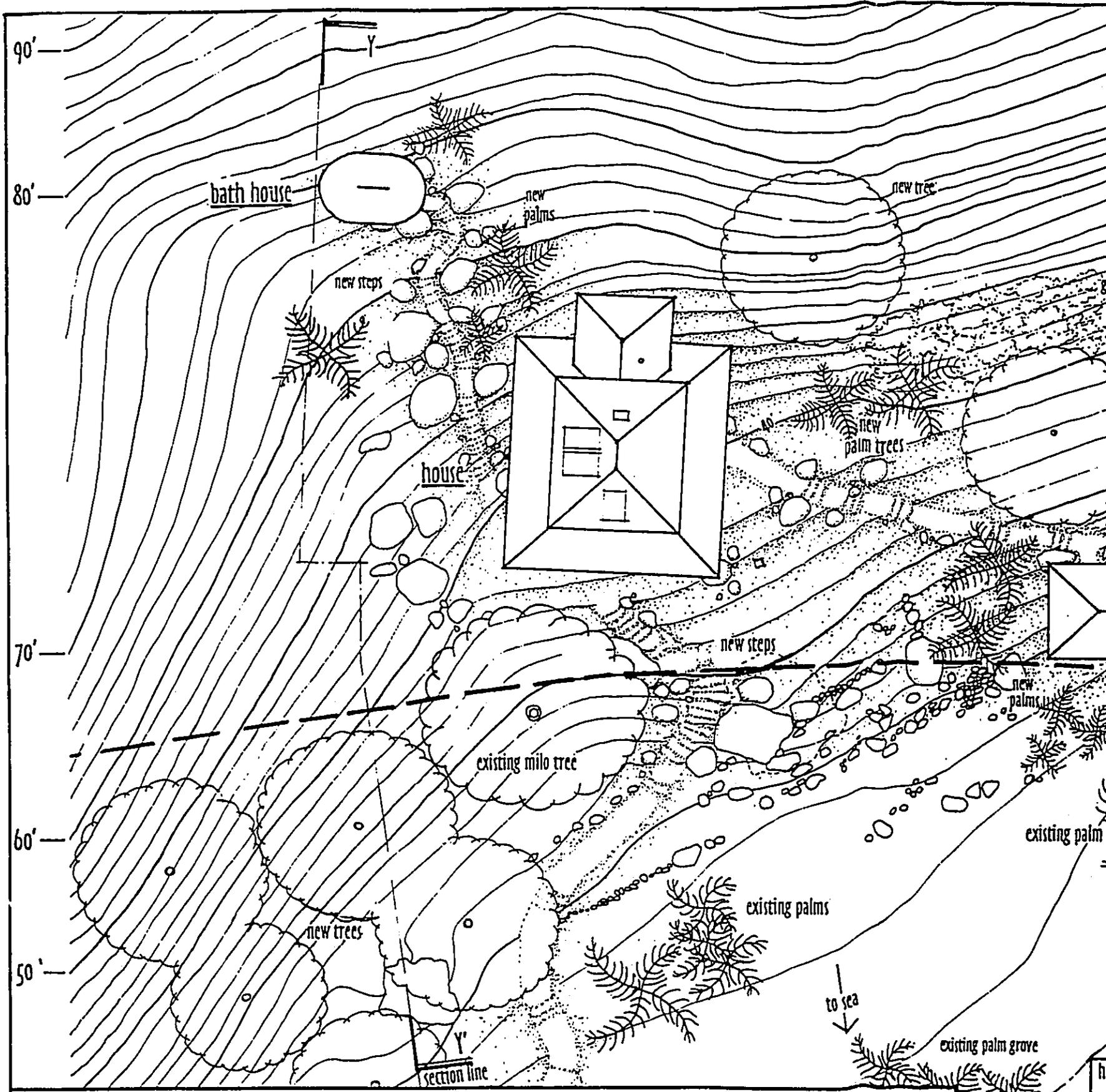
POHAKUPILI HOUSE - 03 a
SITE MAP

MOLOKAI
 Scale 1" = 40'

02x 12/10/97



note: Parcels 2 & 3, noted as then property of 'George M. Murphy' now form part of our site.
 Parcel 1 however is a different ownership and so not part of the project land area.



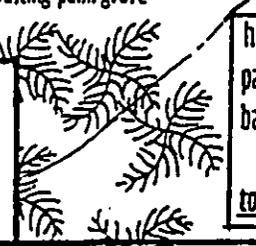
POHAKUPILI HOUSE - 04

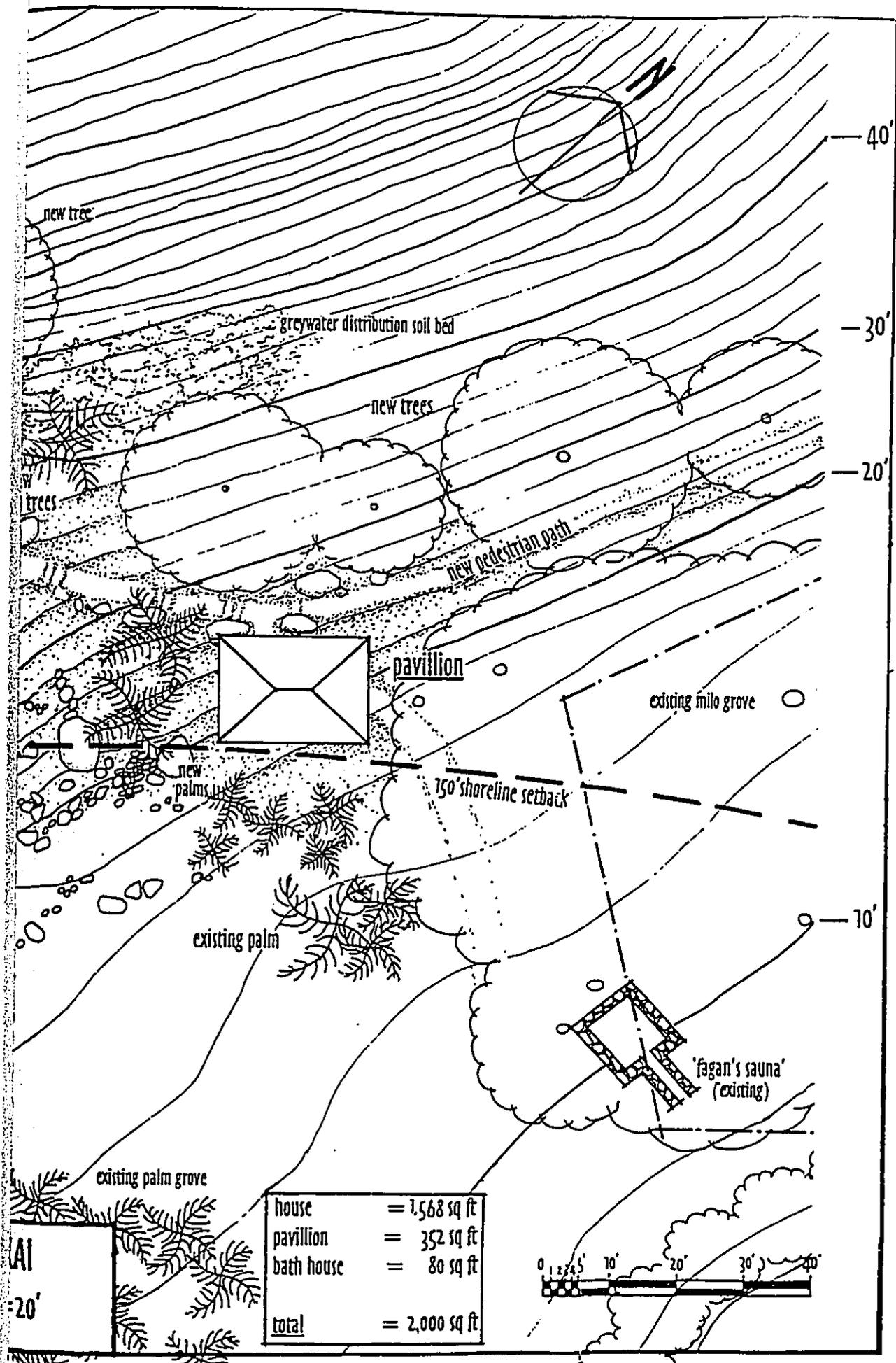
SITE PLAN

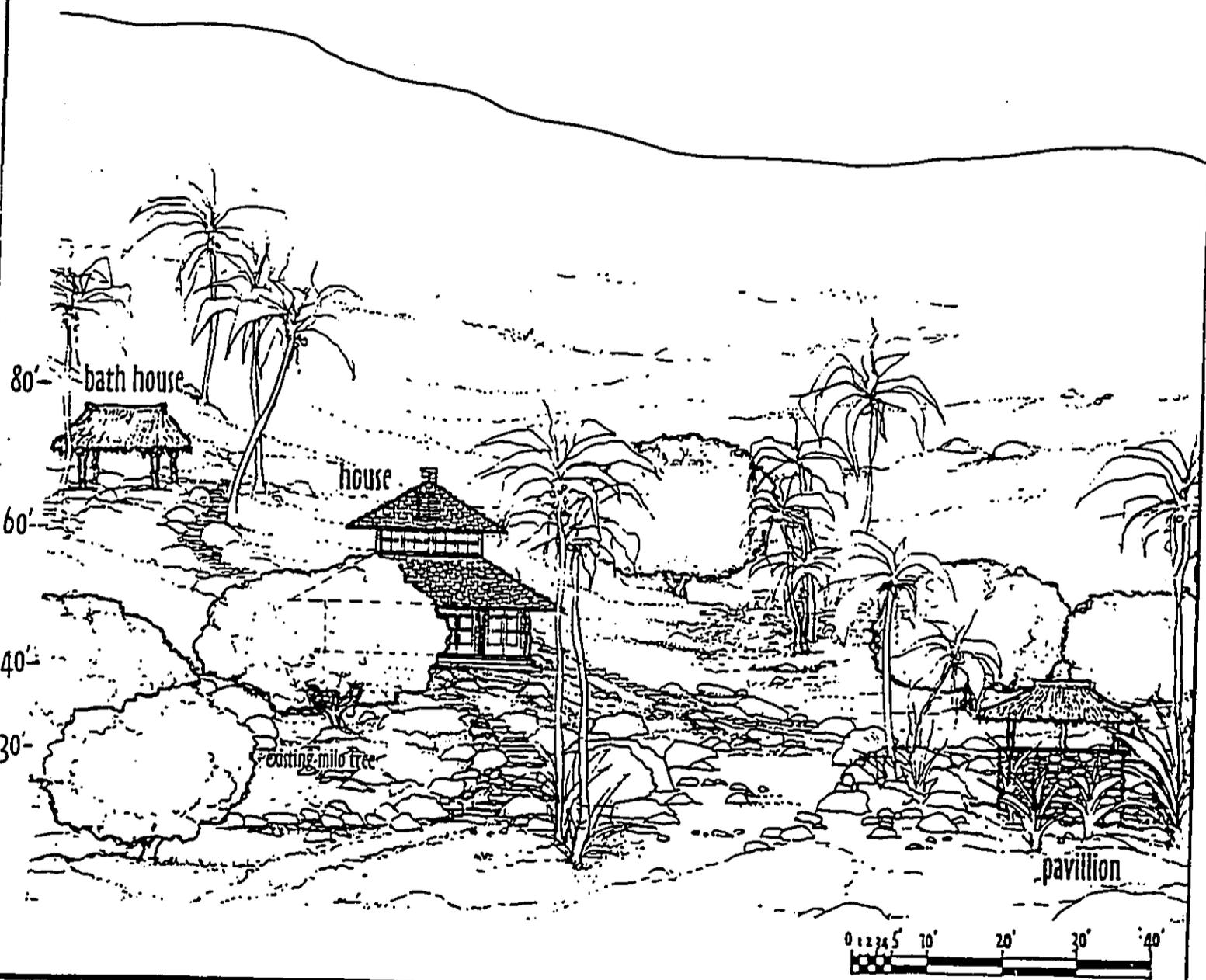
08c 12/10/97

MOLOKAI

Scale 1" = 20'



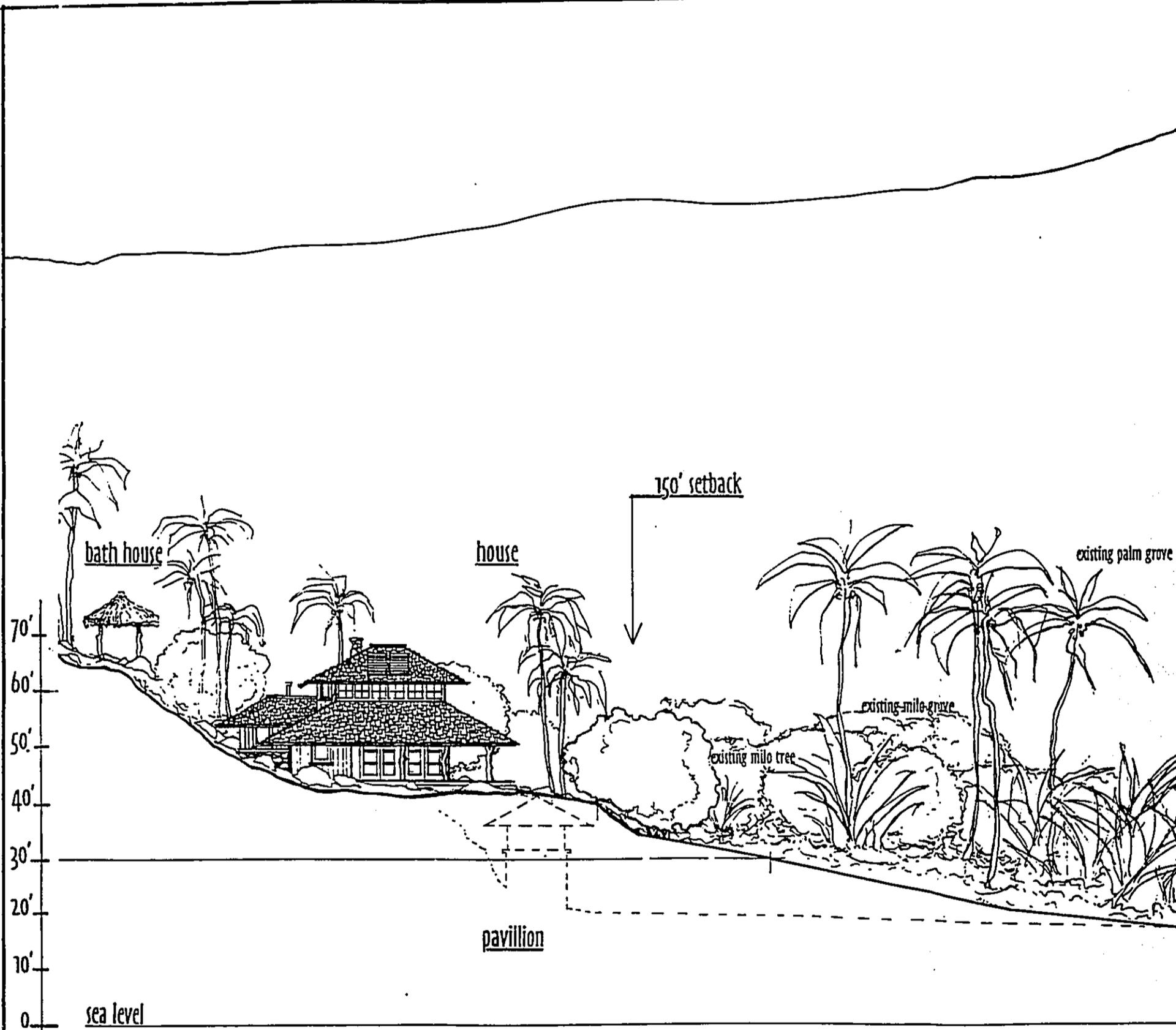




POHAKUPILI HOUSE - 05
SITE ELEVATION

15/10/22/XP

MOLOKAI
 Scale 1" = 20'



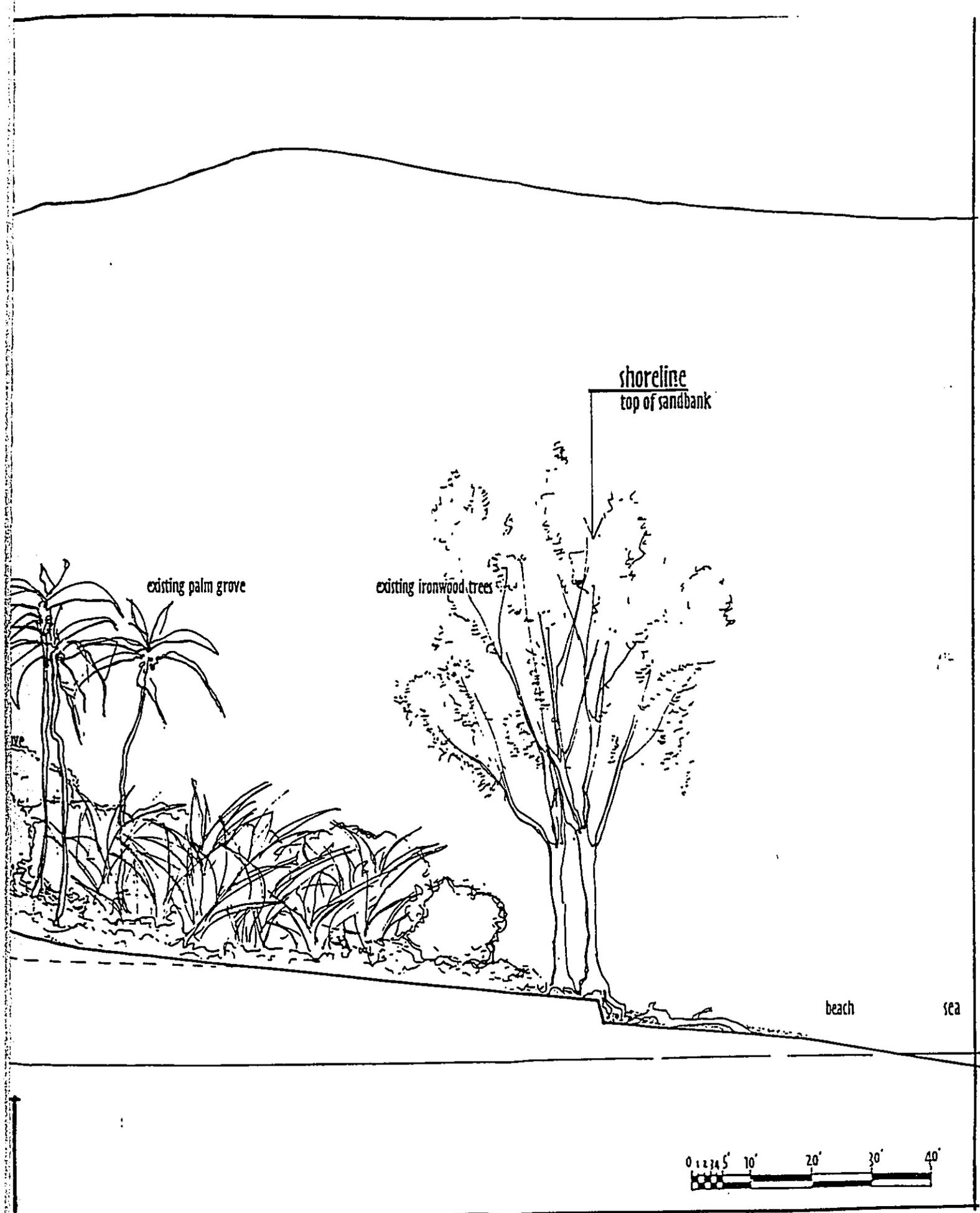
POHAKUPILI HOUSE - 06

SITE SECTION section YY'

06x 12/10/97

MOLOKAI

Scale 1" = 20'



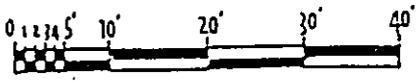
existing palm grove

existing ironwood trees

shoreline
top of sandbank

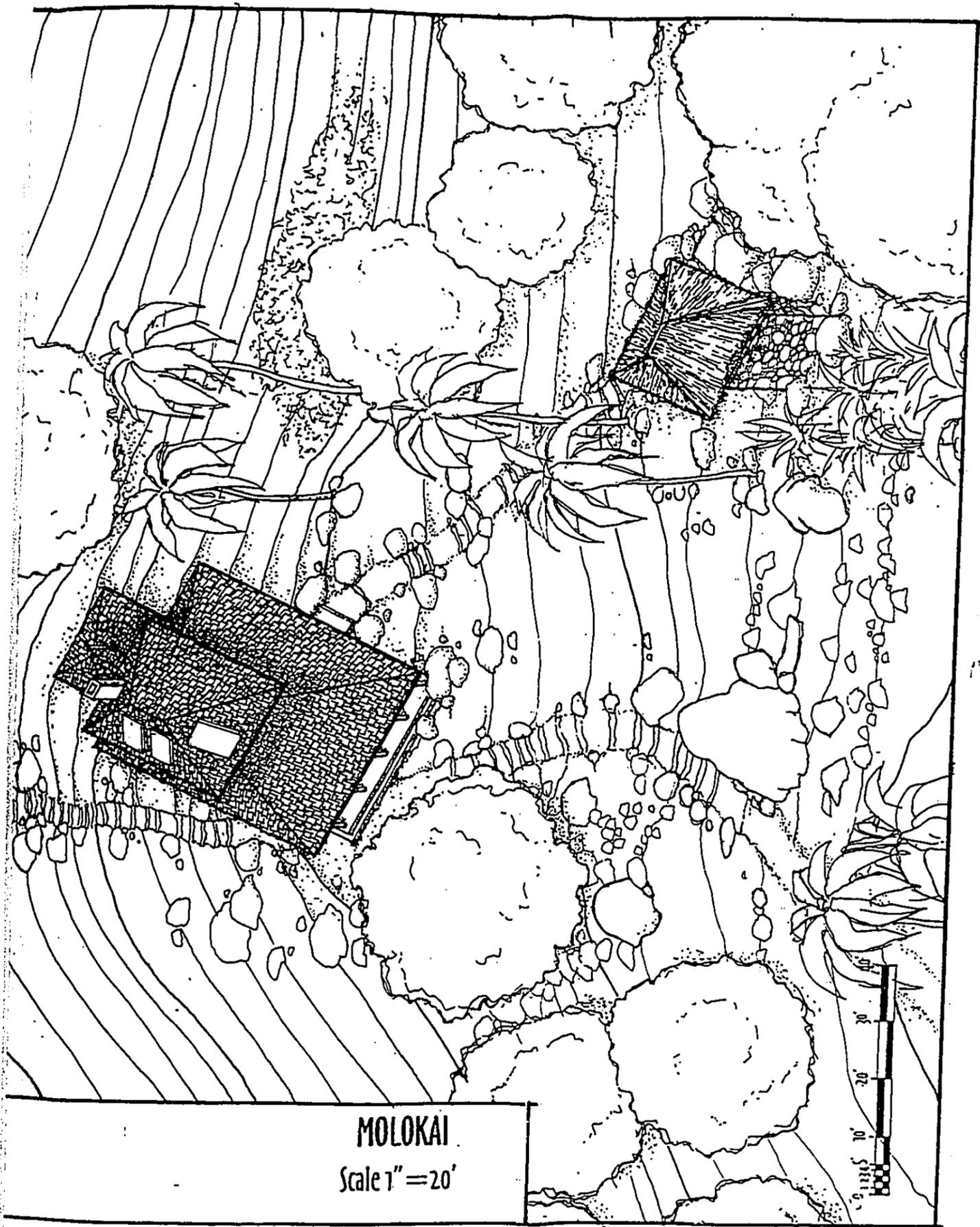
beach

sea



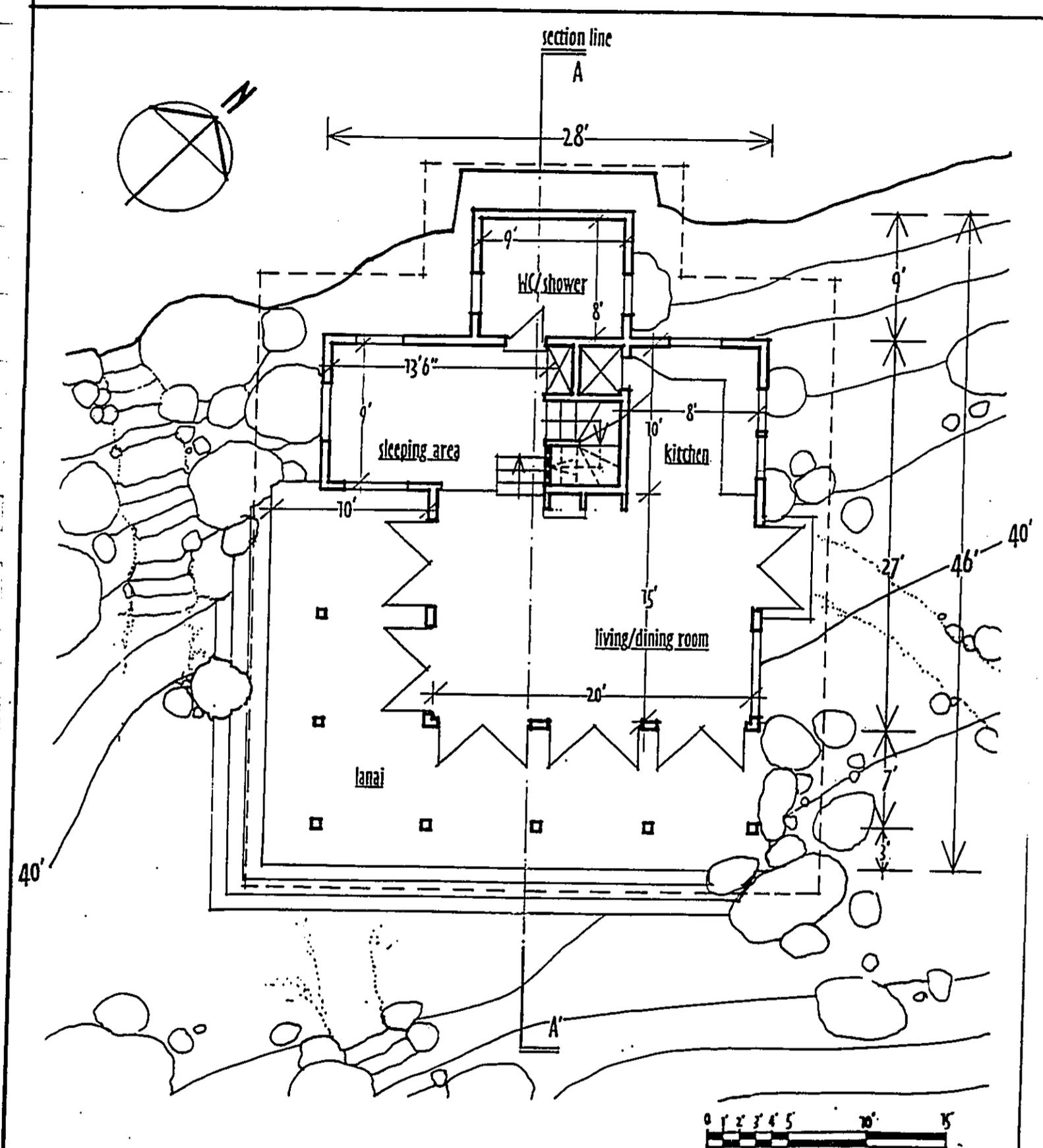


POHAKUPILI HOUSE - 07
SITE AXONOMETRIC



MOLOKAI
Scale 1" = 20'

0' 10' 20' 30' Feet



POHAKUPILI HOUSE - 08

HOUSE

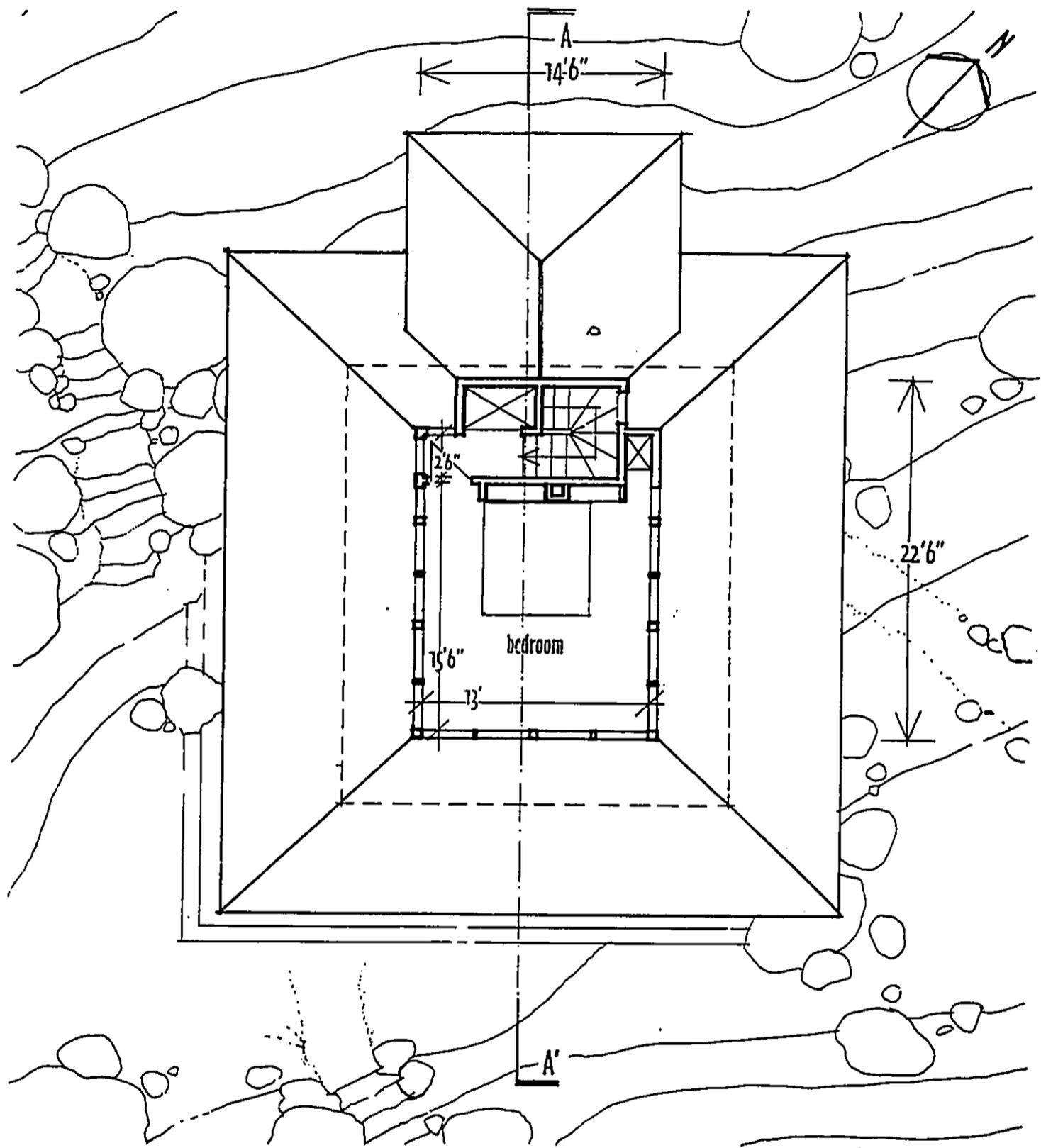
08/12/10/97

Ground Plan

1,250 sq.ft.

MOLOKAI

Scale 1/8" = 1'0"



POHAKUPILI HOUSE - 09

HOUSE

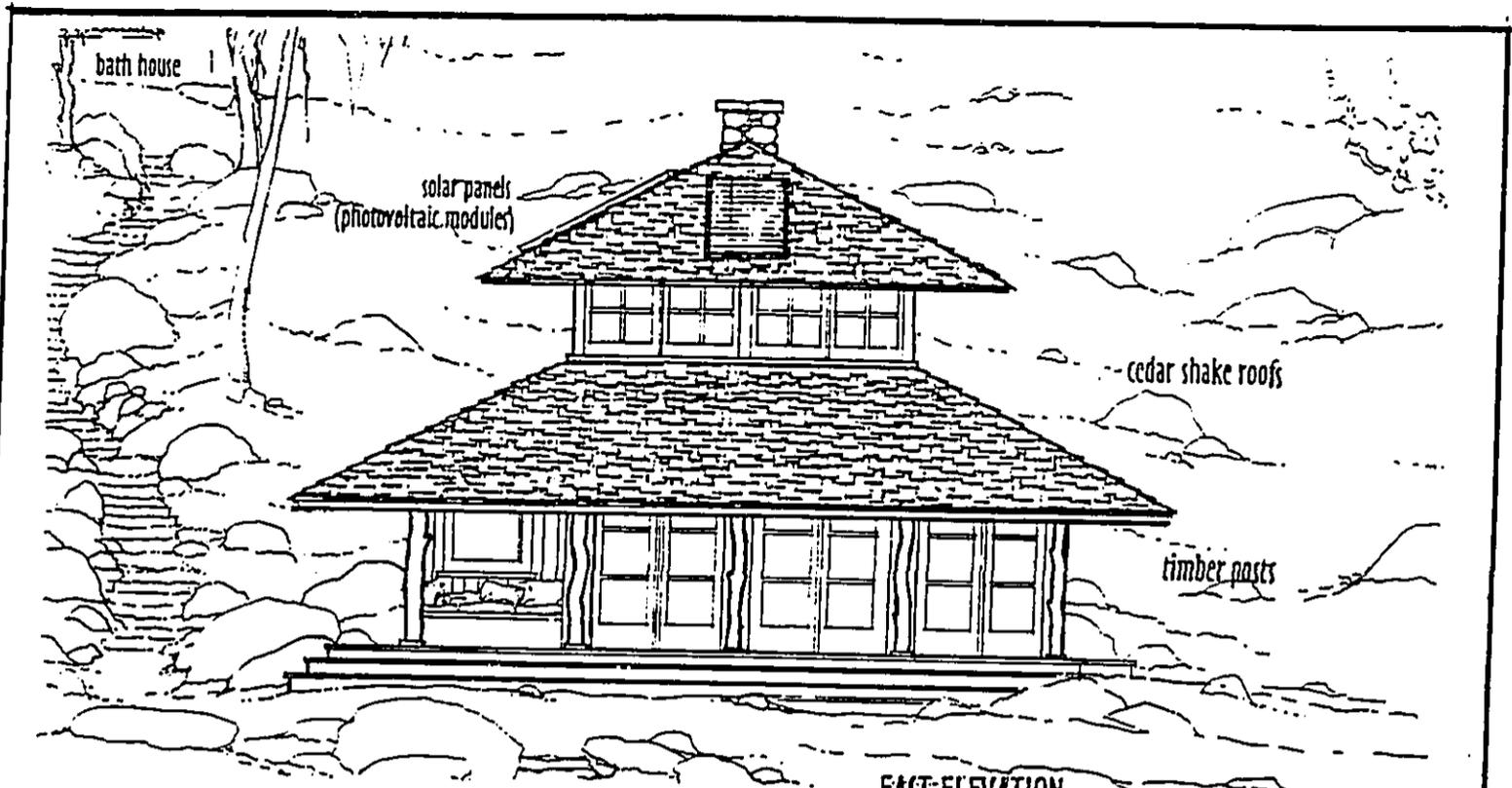
06/10/97

Upper Level Plan

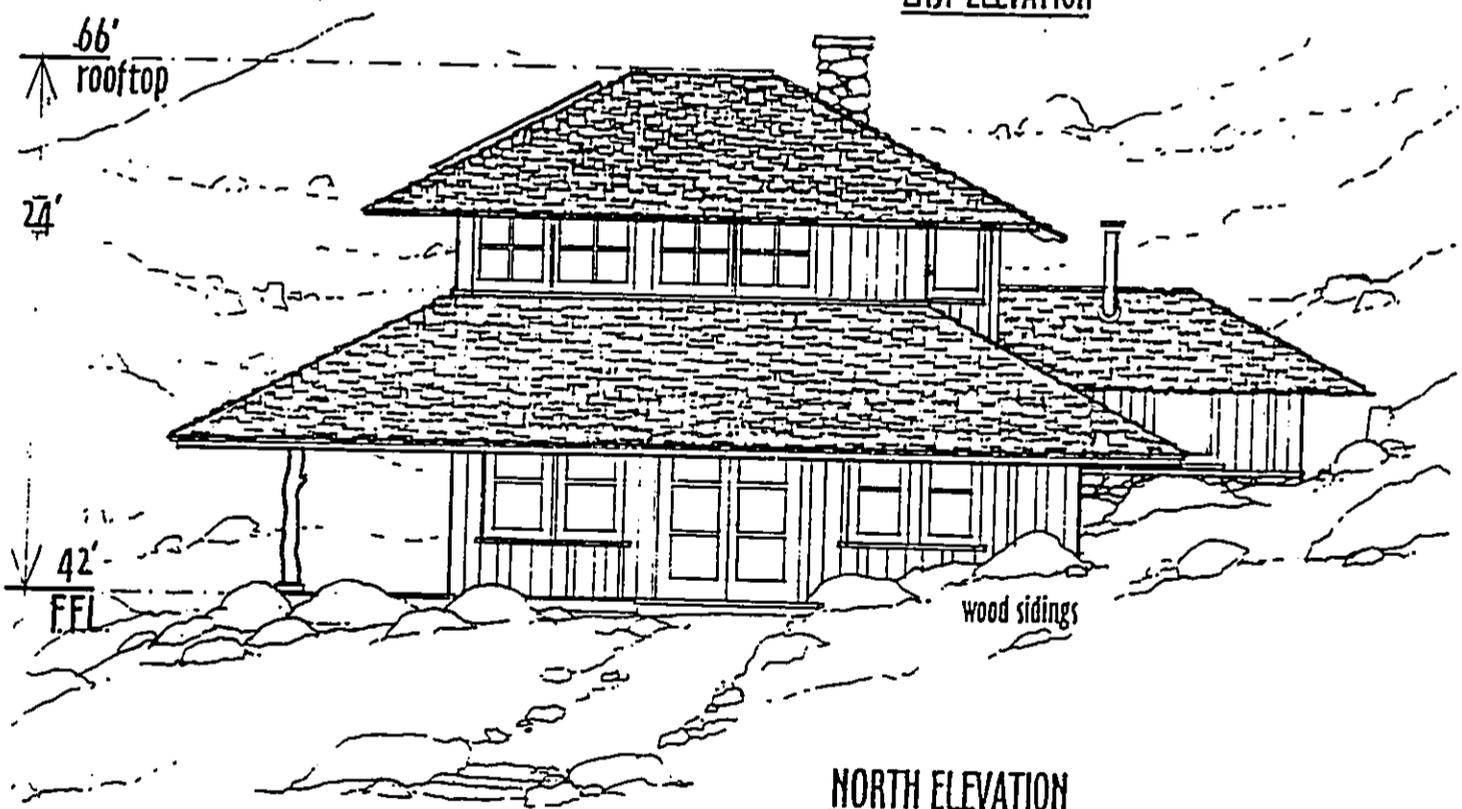
378 sq. ft.

MOLOKAI

Scale 1/8" = 1'0"



EAST ELEVATION



NORTH ELEVATION



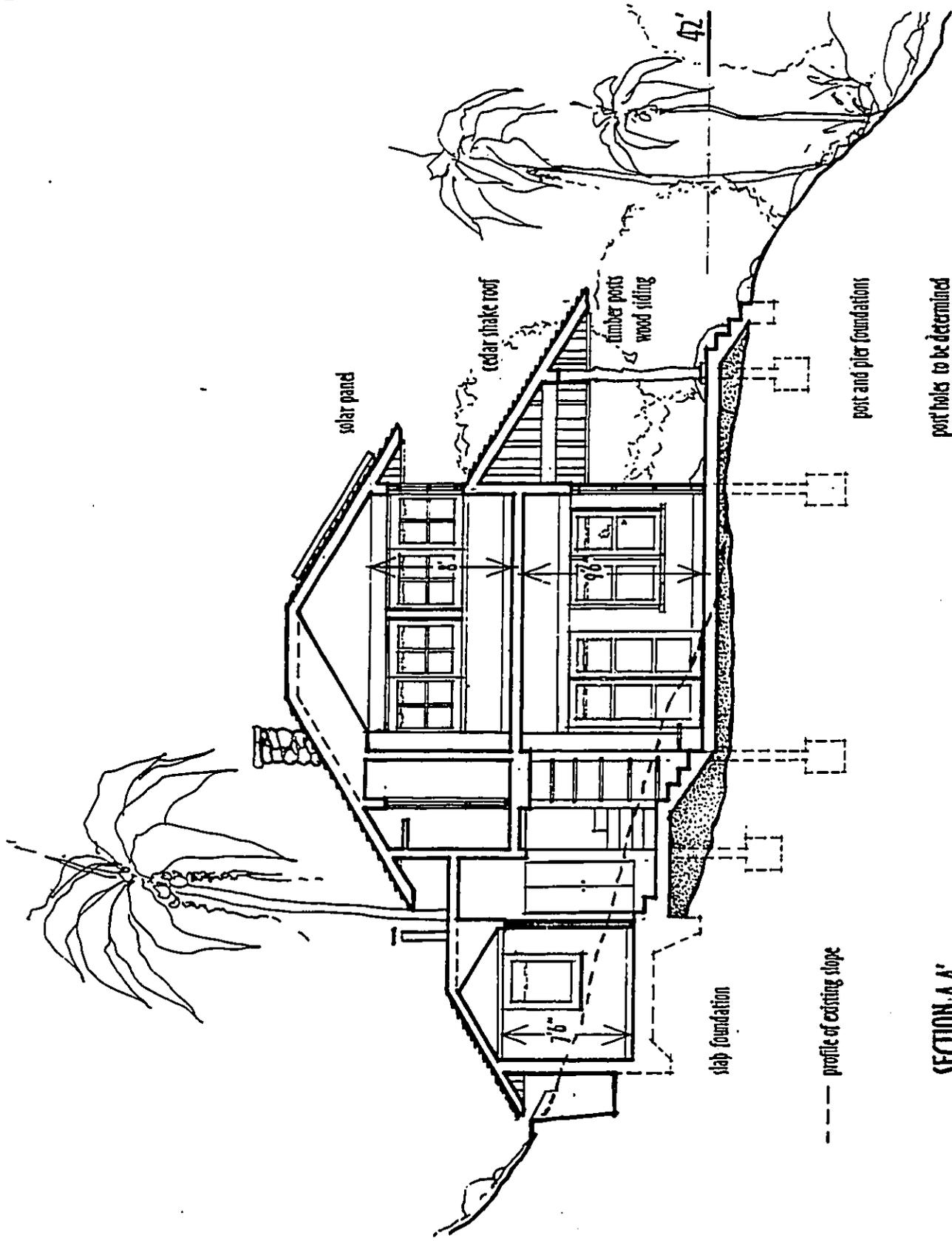
POHAKUPILI HOUSE - 10

HOUSE
dec 12/10/97

Elevations total house square footage: 1,568 sq. ft.

MOLOKAI

Scale 1/8" = 1'0"

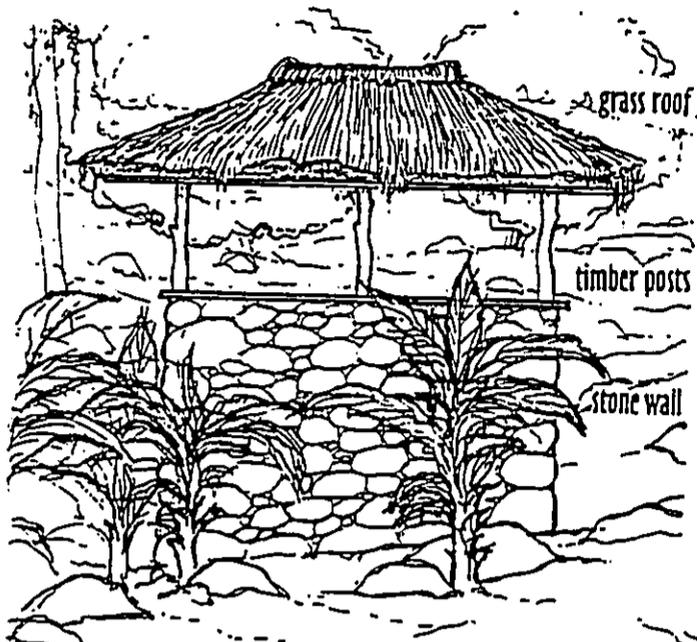


post holes to be determined
by engineering study and soil test

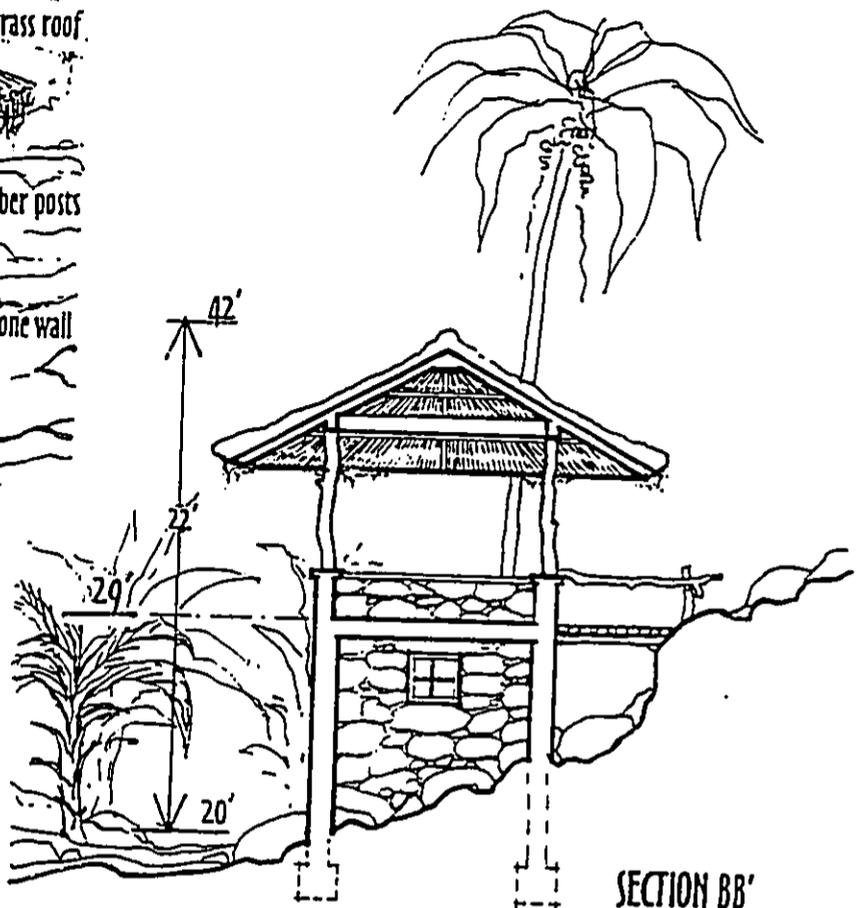
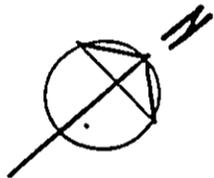
SECTION 'A-A'

POHAKUPILI HOUSE - 77
HOUSE Section AA'
 11/17/77

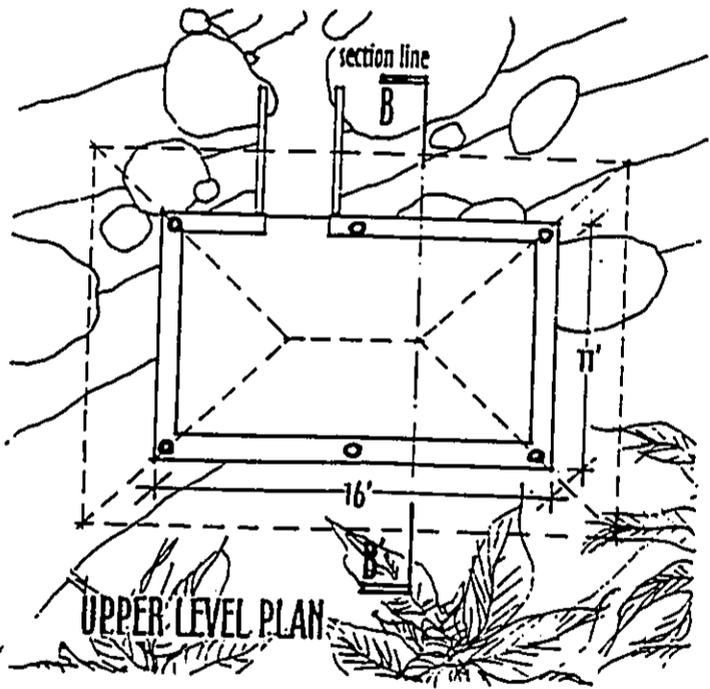
MOLOKAI
 Scale 1/8" = 1'0"



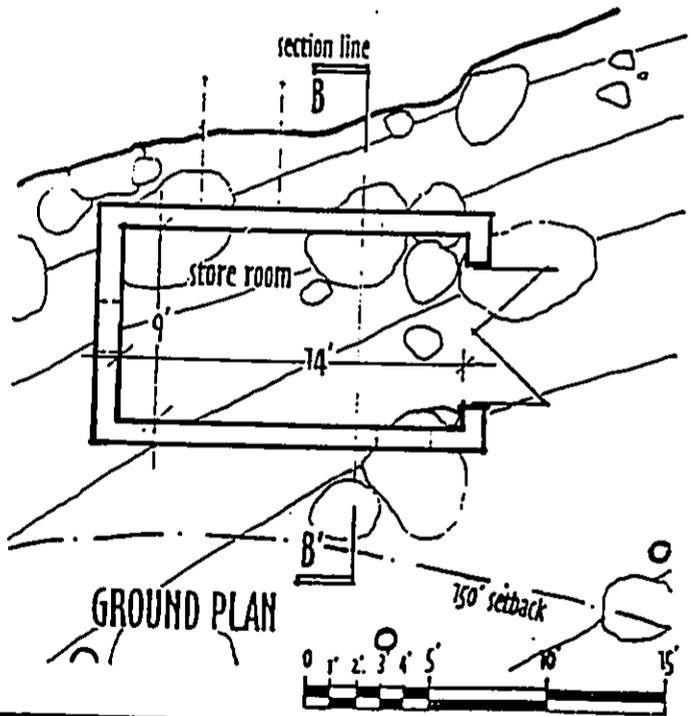
SOUTH ELEVATION



SECTION BB'



UPPER LEVEL PLAN



GROUND PLAN

POHAKUPILI HOUSE - T2

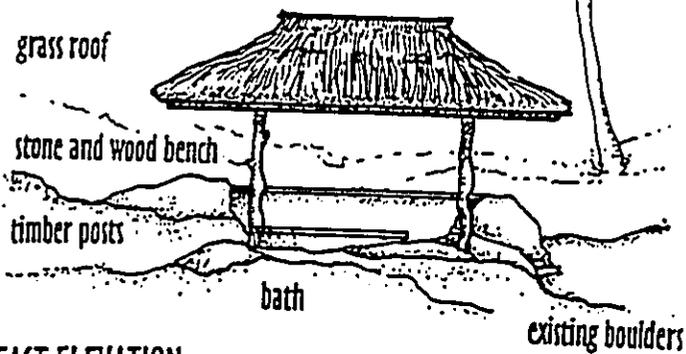
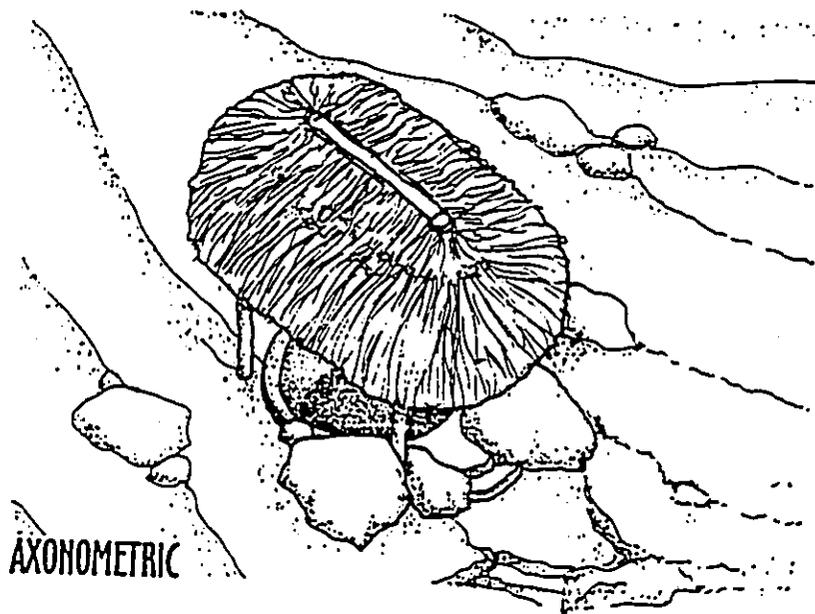
PAVILLION

15/10/97

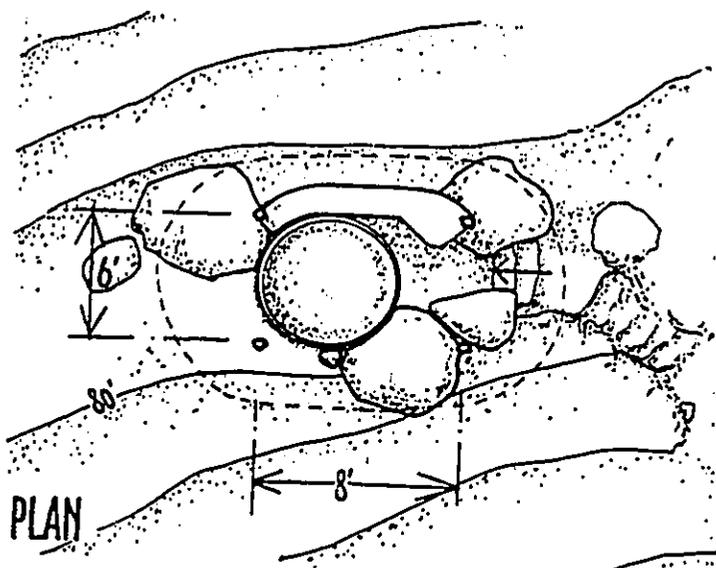
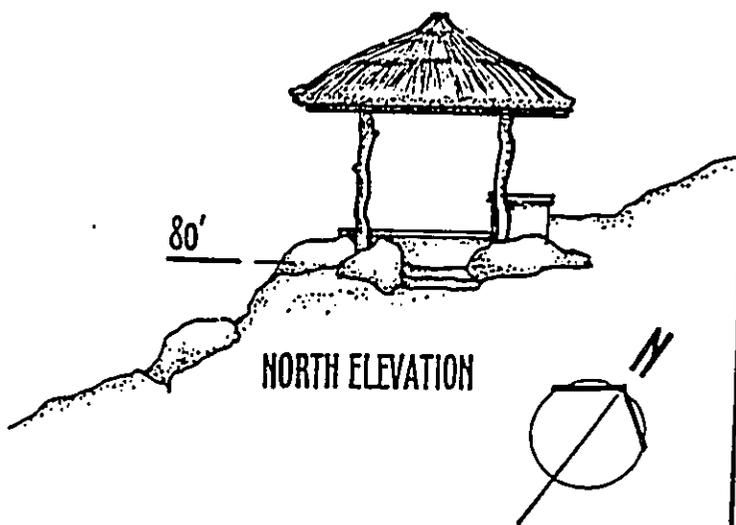
352 sq ft

MOLOKAI

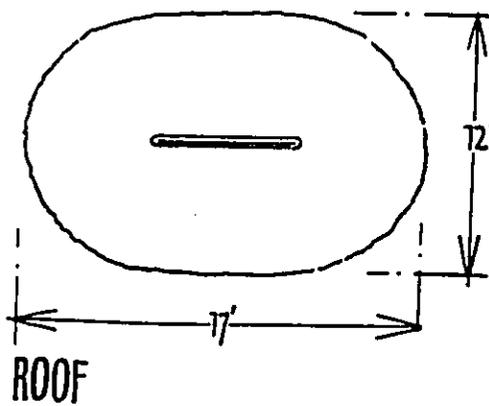
Scale 1/8" = 1'0"



EAST ELEVATION



PLAN



ROOF



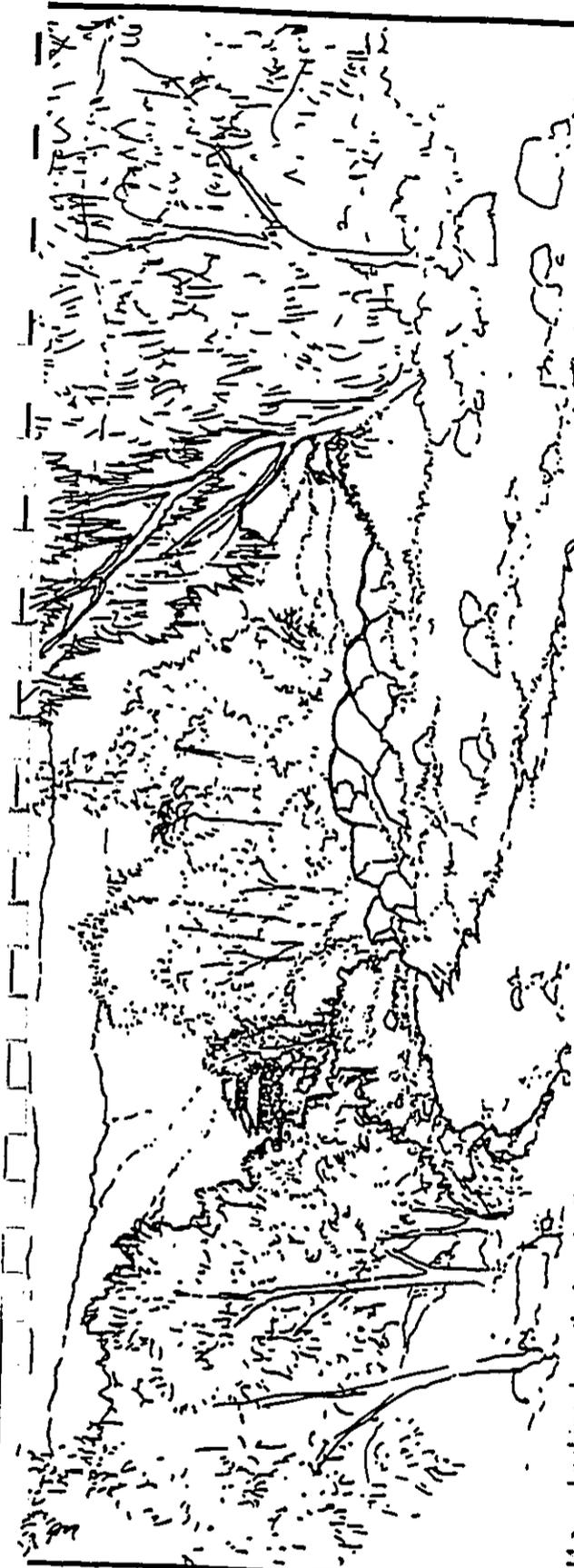
POHAKUPILI HOUSE - 13

BATH HOUSE 80 sq ft

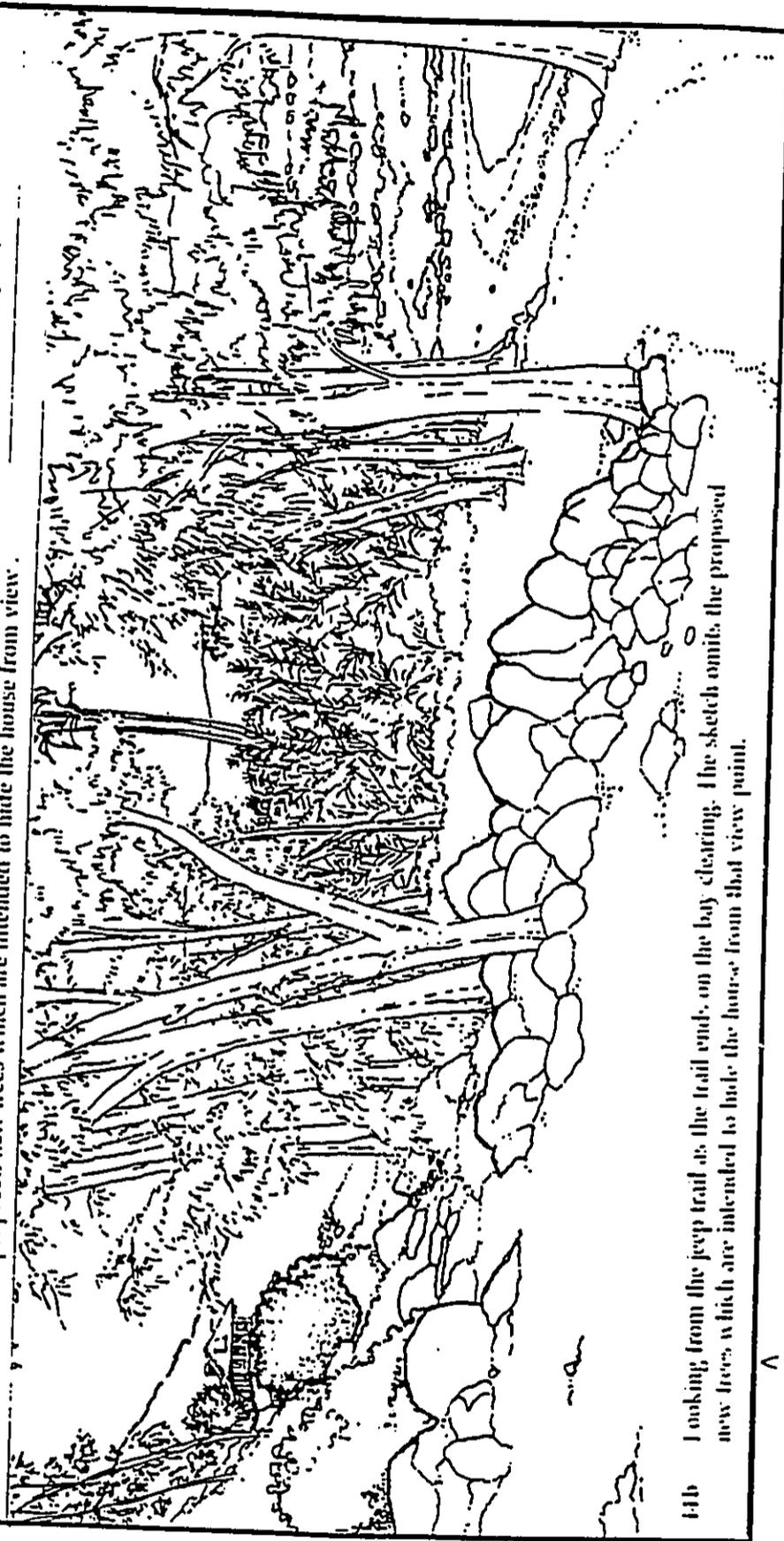
01x12/10/97

MOLOKAI

Scale 1/8" = 1'0"



14 a - Looking down the jeep trail, at the only point where the proposed house becomes visible. The sketch omits the proposed new trees which are intended to hide the house from view.



14 b - Looking from the jeep trail as the trail ends on the bay clearing. The sketch omits the proposed new trees which are intended to hide the house from that view point.

POHAKUPILI HOUSE - 14

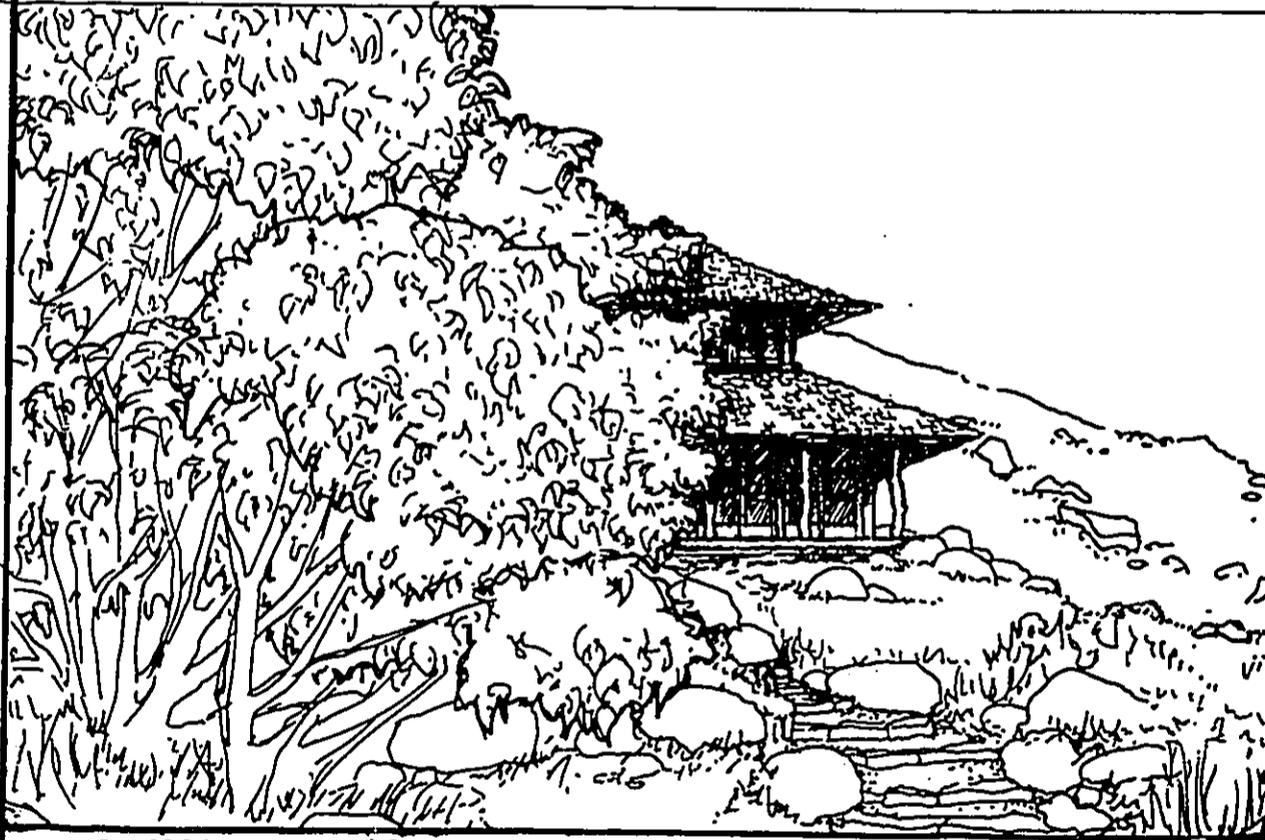
PERSPECTIVE VIEWS

from jeep trail approach

MOLOKAI



15 a - Proposed house as seen from the beach first clearing (cannot be seen at all from the second). Sketch omits new proposed trees.

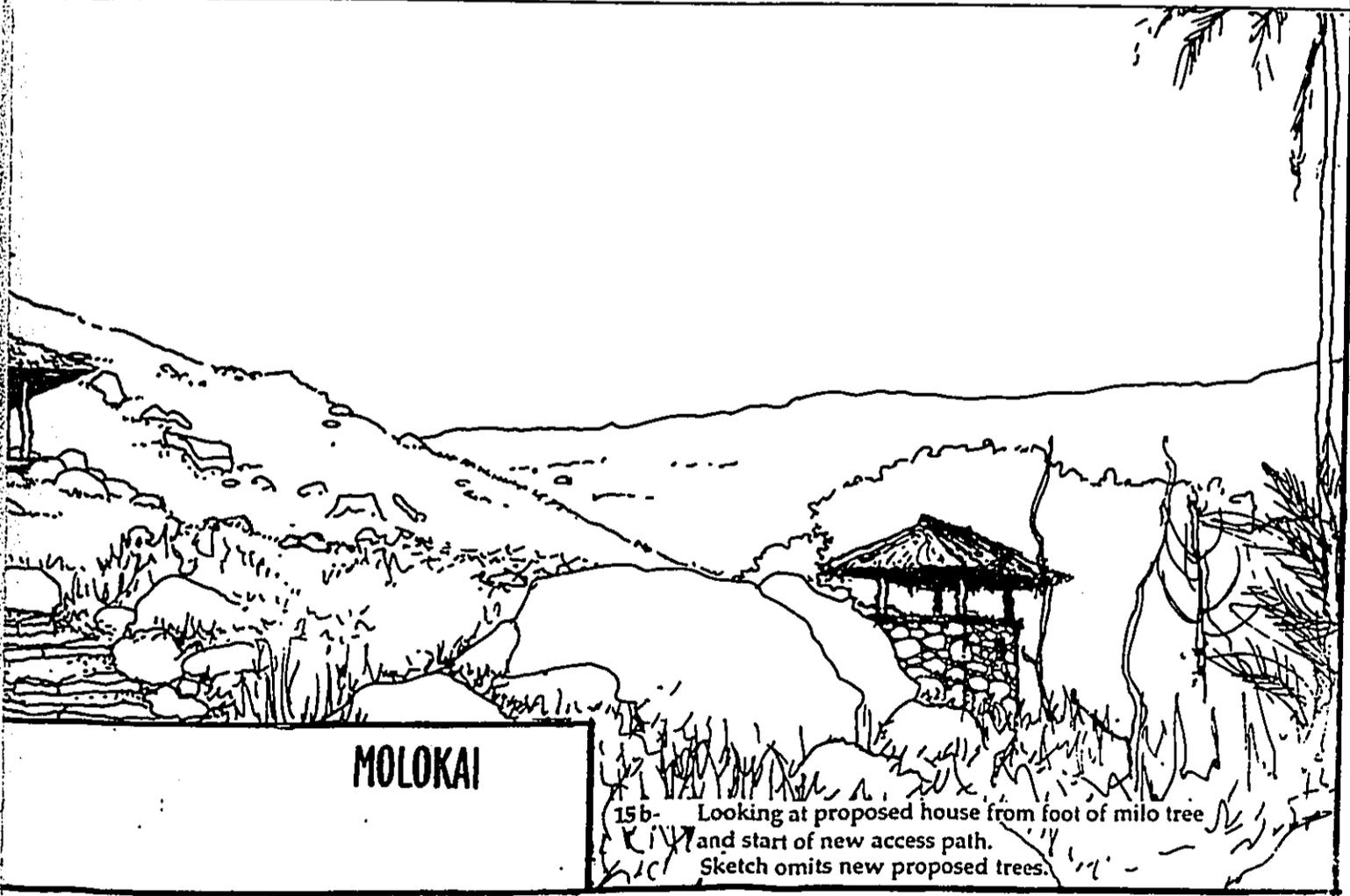


POHAKUPILI HOUSE -75
PERSPECTIVE VIEWS

DEC 12/10/97

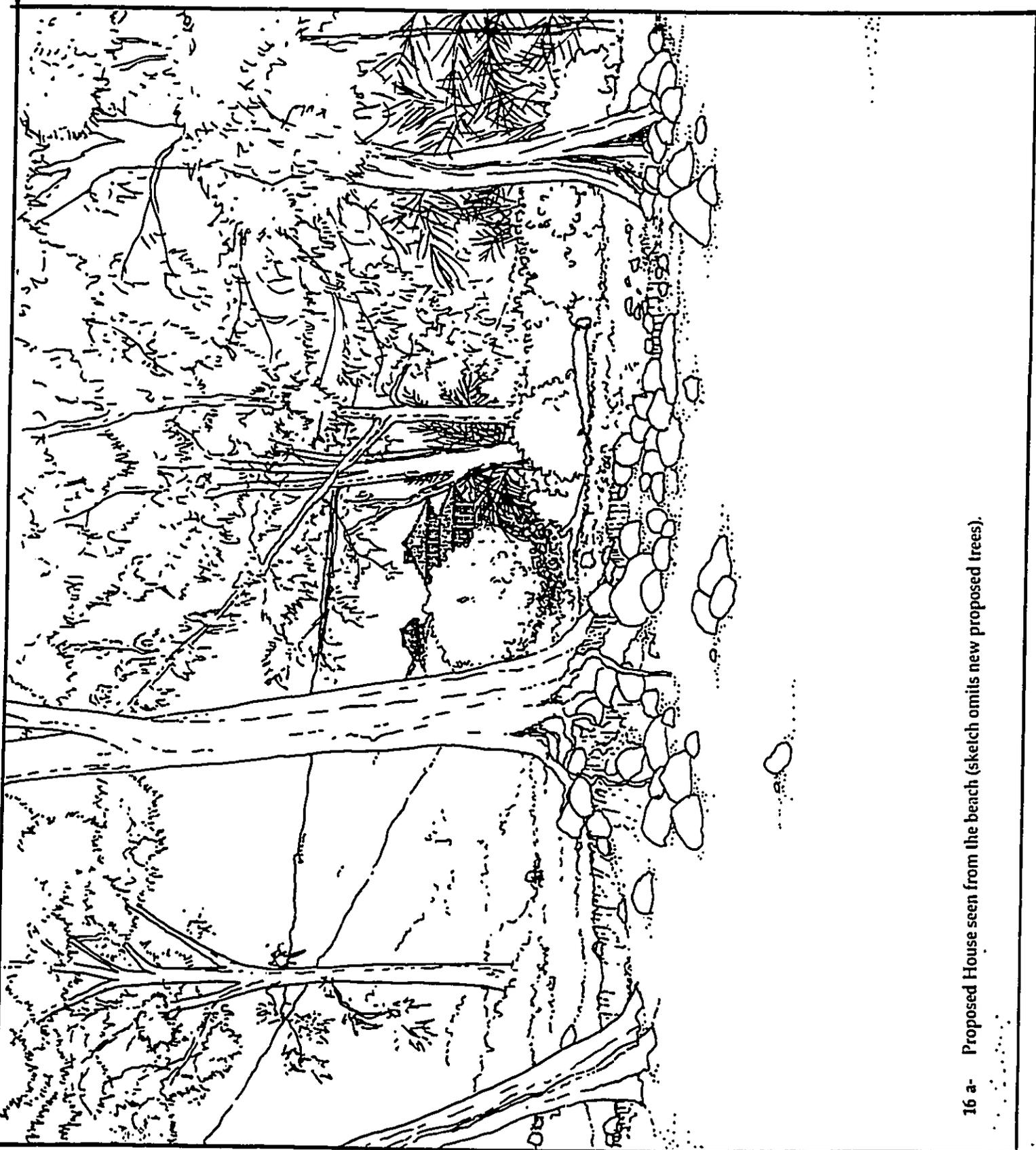


e seen at all from the second).



MOLOKAI

15b- Looking at proposed house from foot of milo tree
and start of new access path.
Sketch omits new proposed trees.



16 a- Proposed House seen from the beach (sketch omits new proposed trees).

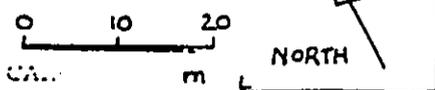
POHAKUPILI HOUSE - 16

PERSPECTIVE VIEWS

from beach front

dx 12/10/97

MOLOKAI



MAPPING TECH: ME: 03 & 04

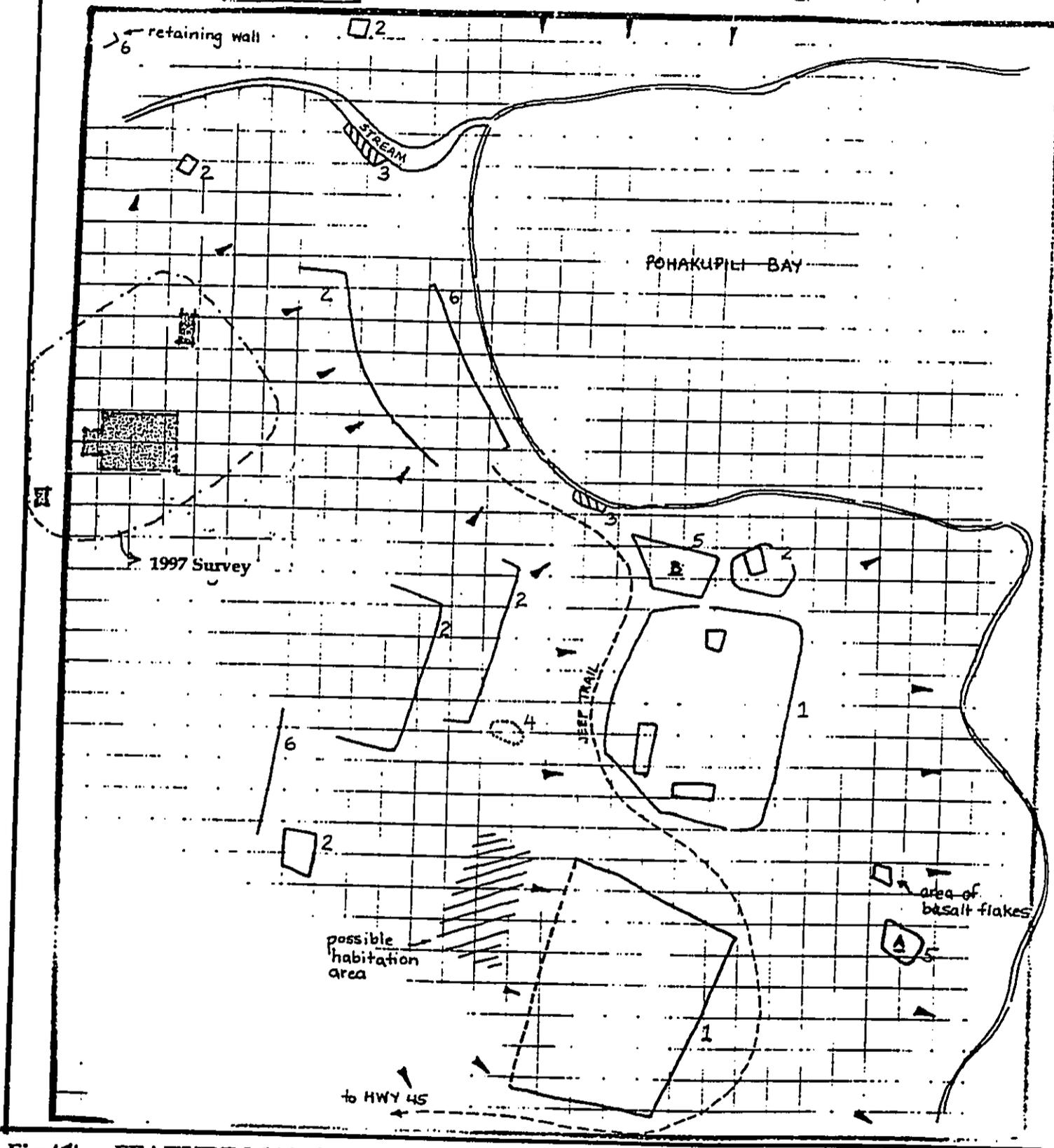


Fig.17b: **FEATURE MAP** from 1974 Archeological Survey

Corresponds to General Area of SITE 236 (extended)

ADDED: General Area Covered by 1997 Survey + Footprint of Proposed Structures.

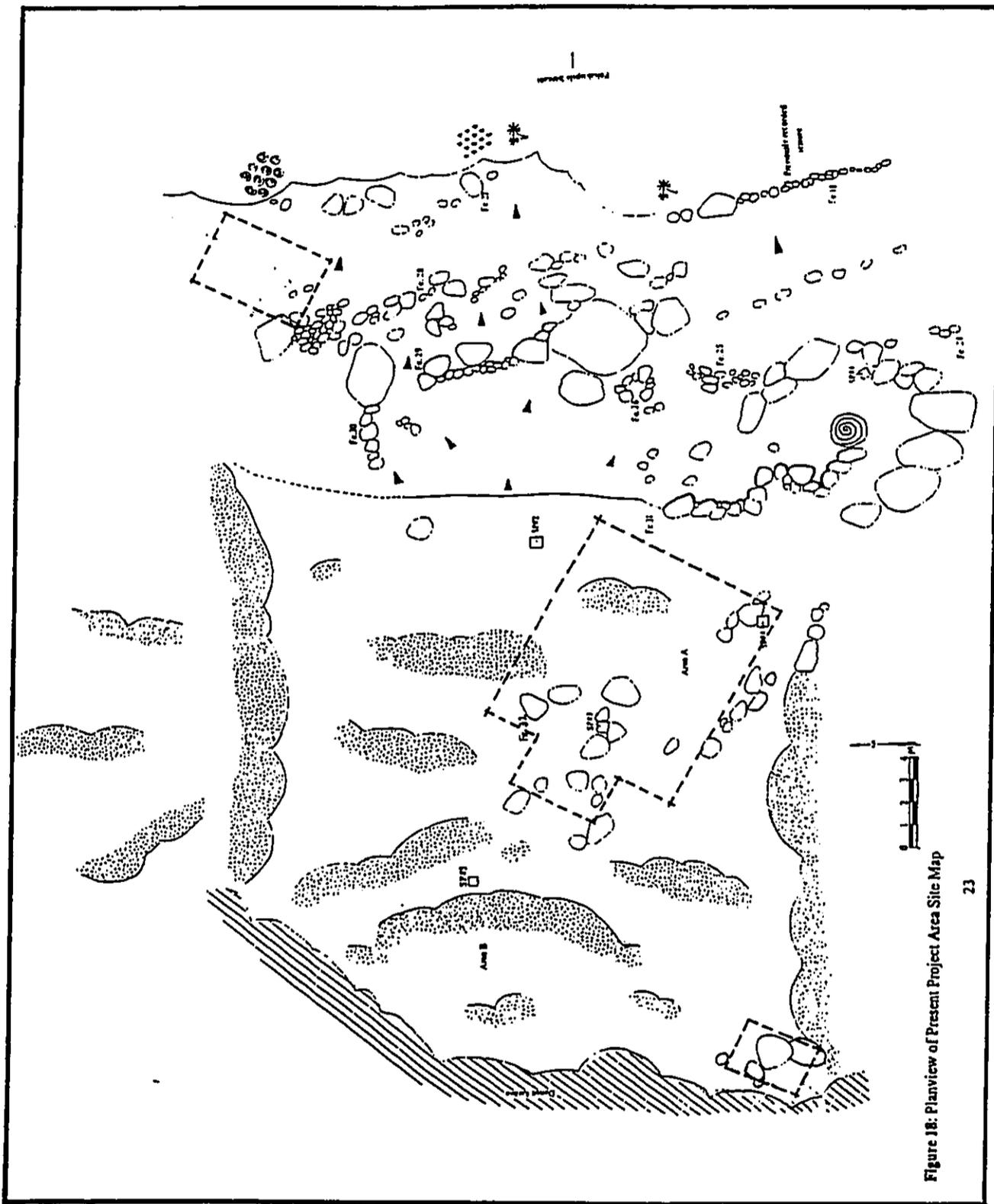
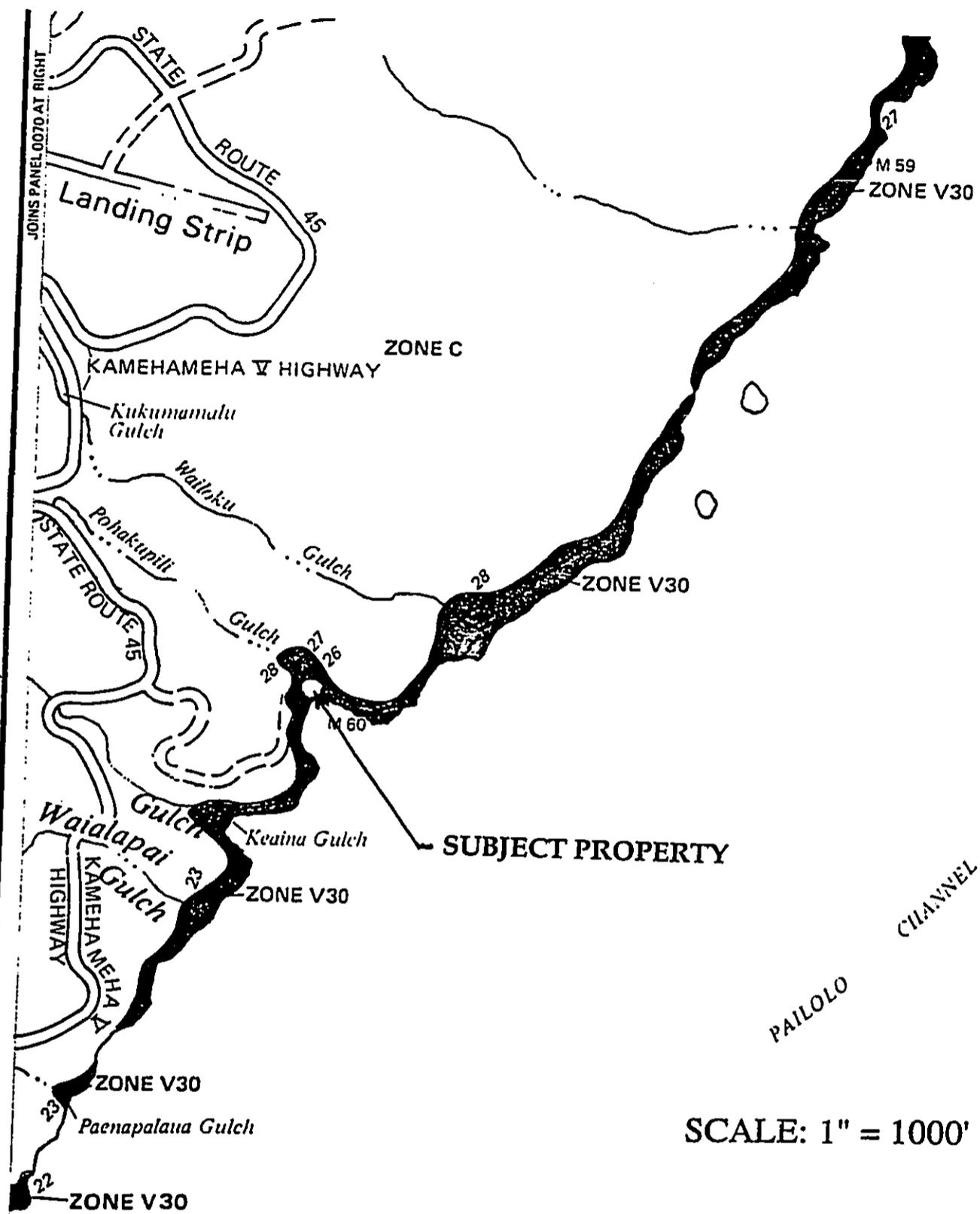


Figure 18: Planview of Present Project Area Site Map

Fig.17c: PROJECT AREA SITE MAP from 1997 Survey Report (by SCS Archeology).

ADDED: Footprint of Proposed Structures.



**FEDERAL FLOOD INSURANCE RATE MAP
FOR THE
SUBJECT PROJECT**

Figure No. **18**

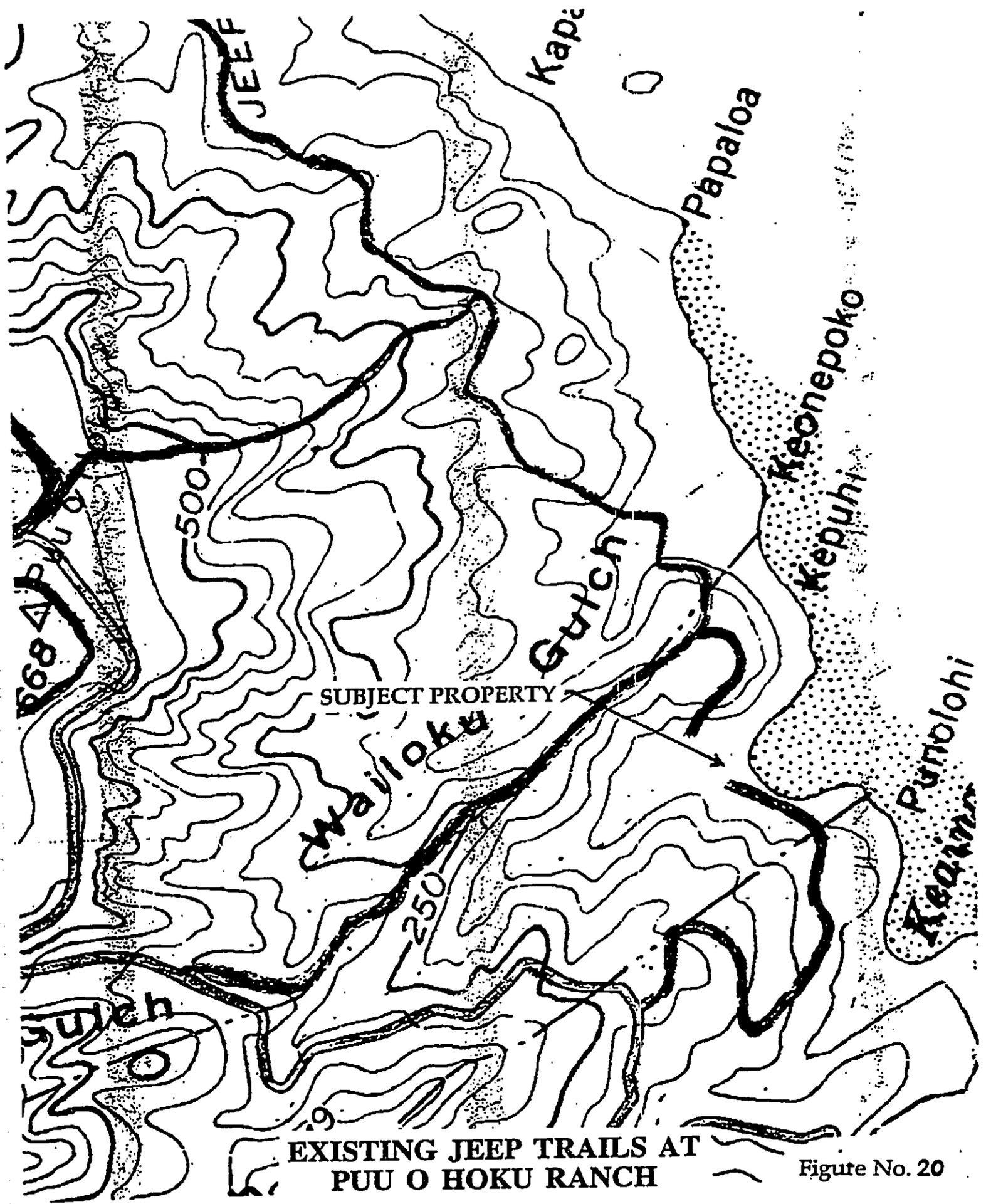
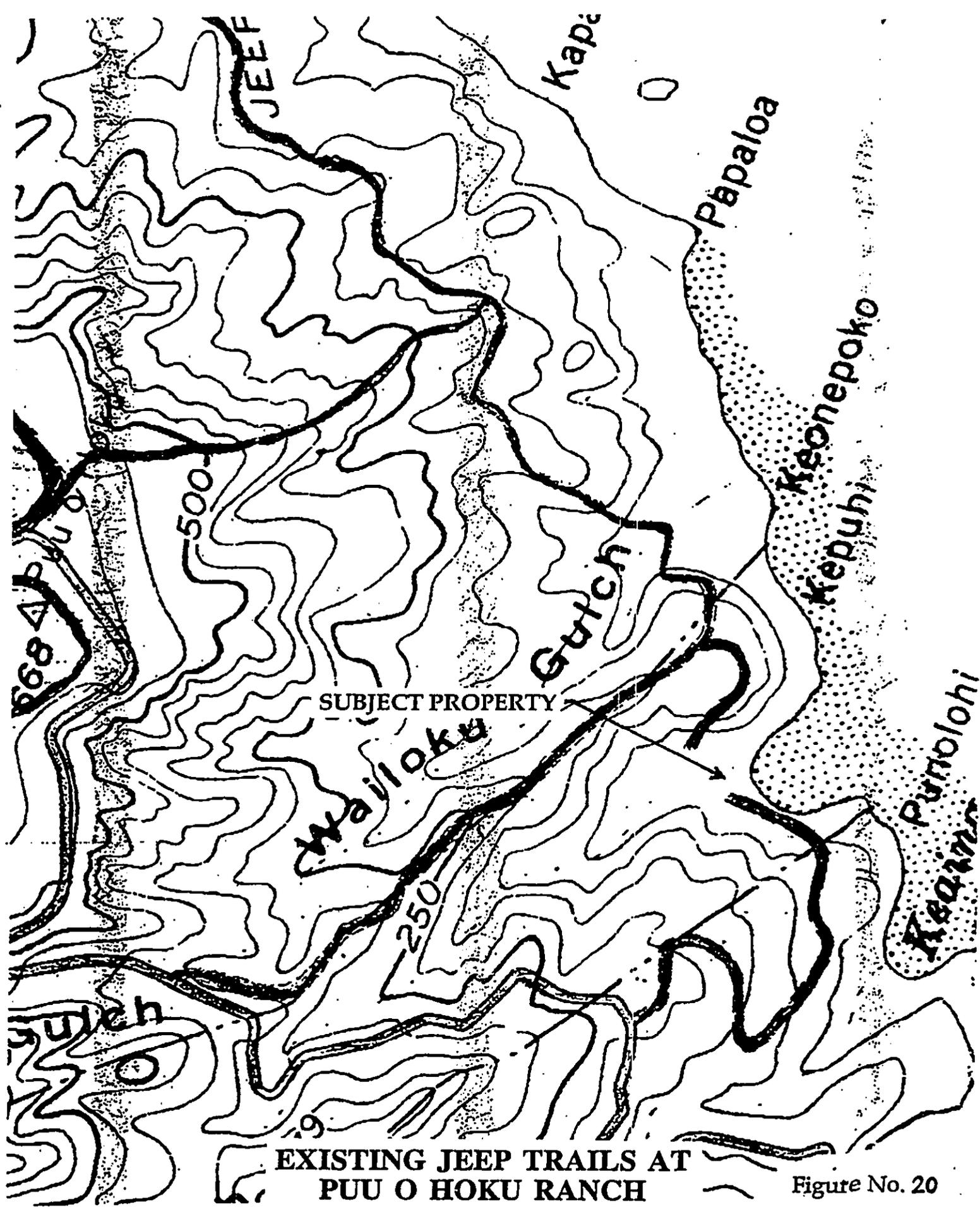


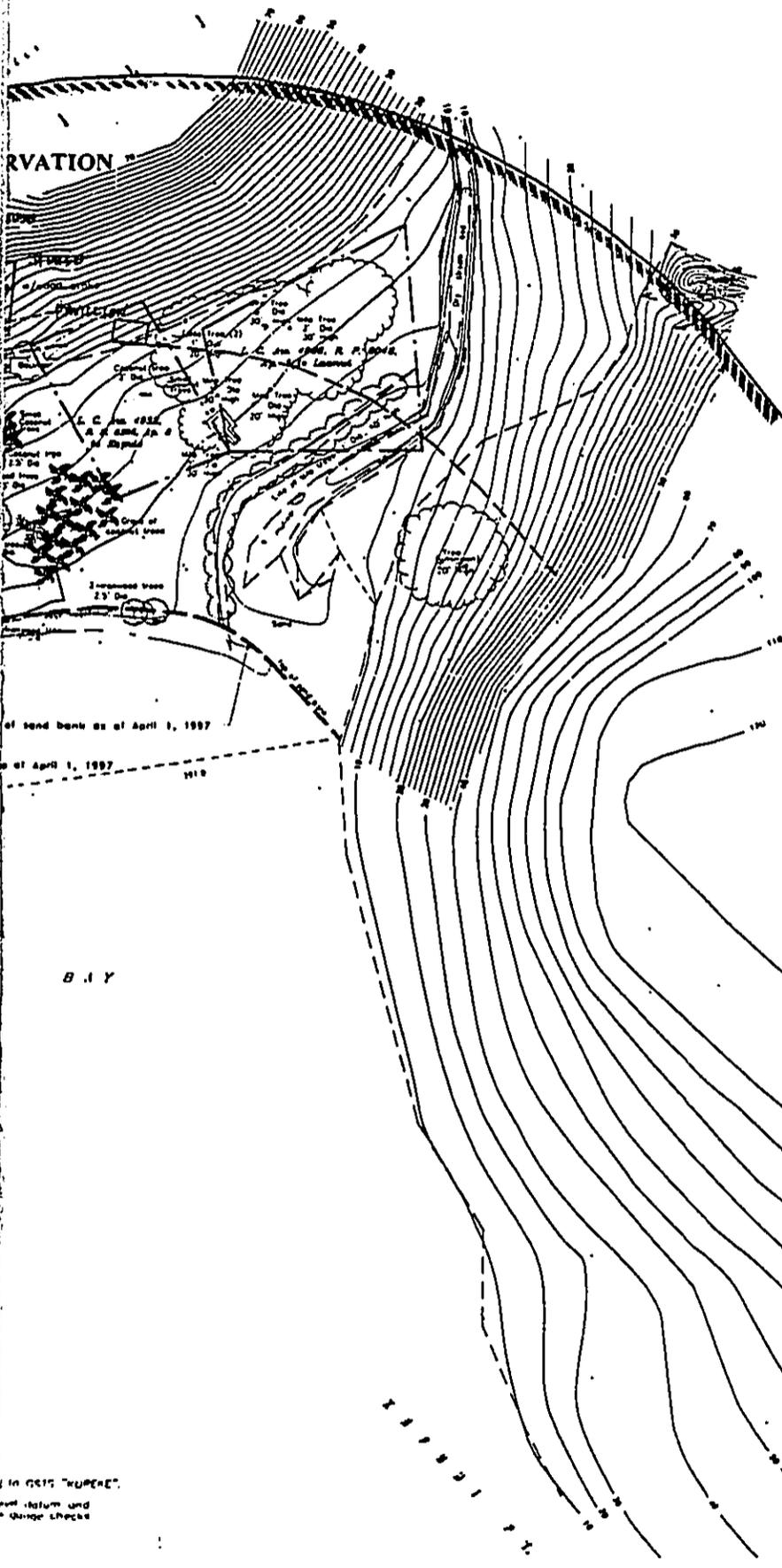
Figure No. 20



SUBJECT PROPERTY

EXISTING JEEP TRAILS AT
PUU O HOKU RANCH

Figure No. 20



PLAN SHOWING
 TOPOGRAPHY AND SURVEY LINE
 AFFECTING
 PORTION OF L.C. No. 1934
 TO KANINAUAH
 at Pelekepele, Kona, Mokai, Hawaii
 TMK: 2nd Div. 5-8-15

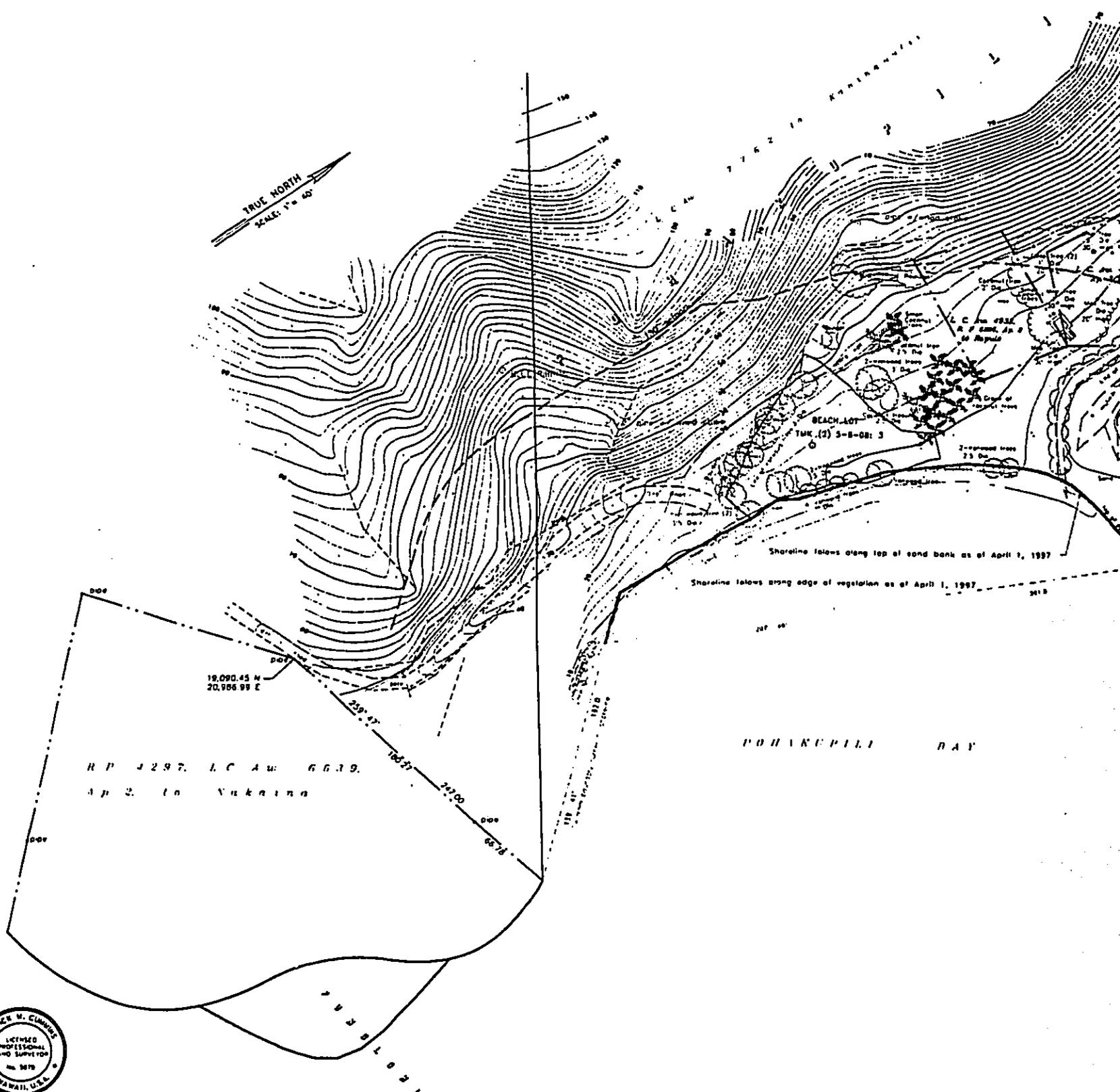
February 13, 1995
 Revised April 21, 1997
 Revised January 27, 1998

The boundary as located, named and
 delineated is hereby certified as the
 actual Land Use District Boundary
 adopted by the State Land Use
 Commission, Honolulu, Hawaii.

JUN 1 5 1998 by *[Signature]*
 Date Executive Officer

Boundary
 Interpretation No. 99-20

TRUE NORTH
SCALE: 1" = 40'



work was prepared by me
for my direct supervision

Darce M. Cummins
Darce M. Cummins
Professional Land Surveyor
No. Number 5078

1-19/97-03/98/DAW/DWF #22

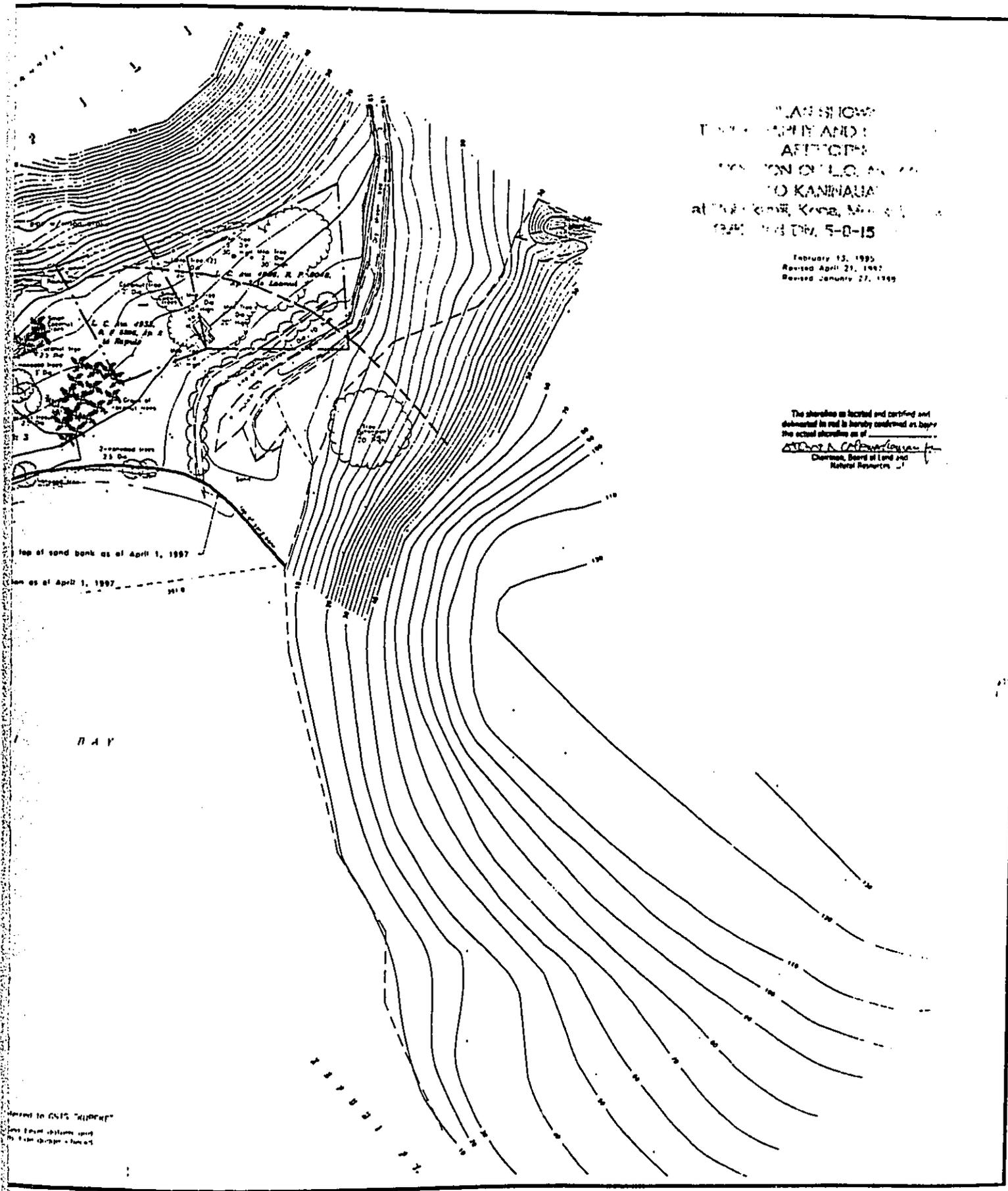
NOTES

1. Contours and elevations are colored in 5' intervals.
2. Elevation was obtained from a bench mark located on the beach at the top of the page.

PLANS SHOWING
 TIDE GAUGE AND
 AFFILIATED
 CONSTRUCTION OF L.O. AND
 TO KANINUAIA
 at the Kaninuaia, Kaneohe, Hawaii
 1947 and 1951, 5-0-15

February 13, 1952
 Revised April 21, 1952
 Revised January 27, 1953

The shoreline as located and certified and
 delineated in red is hereby confirmed, as being
 the actual shoreline as of
Arthur A. Calkins
 Chairman, Board of Land and
 Natural Resources



Referred to G.L.S. "KIPKIP"
 and other plans and
 to the original survey

LINDA CROCKETT LINGLE
Mayor



DAVID W. BLANE
Director
Lisa M. Nuyen
Deputy Director

COUNTY OF MAUI
PLANNING DEPARTMENT
250 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793

June 6, 1997

Ms. Daphne Becket
Puu-O-Hoku Ranch, Ltd.
HC-01, Box 900
Kaunakakai, Hawaii 96748

Dear Ms. Becket:

RE: Puhokapili Bay Residence, TMK: 5-8-015:003, Molokai, Hawaii

This letter is in response to your letter dated May 20, 1997, requesting preliminary Special Management Area (SMA) determination for the above-mentioned residence.

Pursuant to the Hawaii Revised Statutes, Section 205A-22, Definitions, a "development" does not include the construction of a single-family residence that is not part of a larger development. Therefore, the proposed residence would be exempt from the SMA Rules for the Molokai Planning Commission.

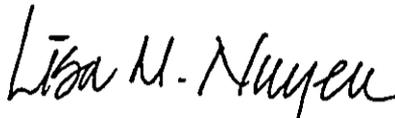
According to the Rules Relating to the Shoreline Area for the Molokai Planning Commission, Section 12-4-4, Applicability, these rules apply to all lands which abut the shoreline of the Island of Molokai. As such, the proposed residence would be subject to said rules. Based on the information submitted, we are unable to determine the setback requirements without a certified shoreline survey and the average lot depth of the entire parcel. However, it does appear that the lot has an average lot depth which is more than one hundred sixty (160) feet. Therefore, the shoreline setback line is either at one hundred fifty (150) feet from the shoreline or at a distance from the shoreline calculated by multiplying the average lot depth of a lot by .25, whichever is the least distance from the shoreline.

#23

Ms. Daphne Becket
June 6, 1997
Page 2

Should you have any questions, please contact Mr. Daren Suzuki of this office
at (808) 243-7735 or 1-(800) 272-0117.

Very truly yours,



 DAVID W. BLANE
Director of Planning

DWB:DMS:ghk

c: Clayton Yoshida, AICP, Planning Program Administrator
Daren Suzuki, Planner
Central File
S:\ALL\DAREN\MOLOKAI.LTR

LINDA LINGLE
Mayor

DAVID W. BLANE
Director

LISA M. NUYEN
Deputy Director



COUNTY OF MAUI
DEPARTMENT OF PLANNING

CLAYTON I. YOSHIDA
Planning Division

AARON H. SHINMOTO
Zoning Administration and
Enforcement Division

February 9, 1998

Daphne Becket, Architect
Puu-O-Hoku Ranch
HC-01, Box 900
Kaunakakai HI 96748

SUBJECT: Flood Information for Puhokapili Bay Residence
TMK (2) 5-8-015:003

Dear Ms. Becket:

The subject project site shown on the topographic map prepared by Patrick M. Cummins, dated April 21, 1997 is within Special Flood Hazard District areas zone V30, an area of 100 year coastal flooding with base flood elevations between 26' to 28' mean sea level, 1929 NGVD, and flood zone C, an area of minimal flooding.

Any construction within the flood zone V30 will require a flood development permit. The application forms are attached. There are no flood requirements for any construction within flood zone C.

If you have any questions regarding this letter, please call Francis Cerizo at 243-7253.

Sincerely,

AARON SHINMOTO
Planning Program Administrator

FAC
enclosures
xc: Francis Cerizo, Engineer
ZAED, General File
S:\ZONING\ZONE_CHK\FLOOD\FAC\PUUOHOKU.WPD

250 SOUTH HIGH STREET, WAILUKU, MAUI, HAWAII 96793
PLANNING DIVISION (808) 243-7735; ZONING DIVISION (808) 243-7253; FACSIMILE (808) 243-7634

24

ARCHAEOLOGICAL INVENTORY SURVEY

SCS Project Number 111-4

**AN ARCHAEOLOGICAL INVENTORY SURVEY
OF A LAND PARCEL IN PŌHAKUPILI AHUPUA`A,
KONA DISTRICT, MOLOKA`I, HAWAII
(TMK 5-8-15:03)**

By:
Leann McGerty, B.A.,
and
Robert L. Spear, Ph.D.
Revised March, 1999

Prepared for:
Pu`u-O-Hoku Ranch Ltd.
C/O Ms. Daphne Beckett
43 ½ N. Hayworth Ave.
Los Angeles, California 90048

SCIENTIFIC CONSULTANT SERVICES Inc.



711 Kapiolani Blvd. Suite 777 Honolulu, Hawaii 96813

ABSTRACT

At the request of Ms. Daphne Beckett representing Pu'u-O-Hoku Ranch Ltd., Scientific Consultant Services, Inc. (SCS) conducted an archaeological inventory survey of a land parcel in Pōhakupili Ahupua'a, Kona District, Moloka'i, Hawai'i (TMK: 5-8-15:03). The survey was conducted in June, 1997 and October, 1998.

Features that were identified were interpreted as an extension of Site 50-60-05-236, a site previously recorded by McCoy (1974). The newly identified features (Features 23 to 32) included terraces, remnant terraces, modified outcrops, and planting circles. Feature 18, a terrace previously identified by McCoy (1974) was also located in the project area.

Six stratigraphic trenches and three shovel probes were situated throughout the project area resulting in the recovery of two basalt flakes.

Features 31 and 32 have had sufficient work conducted on them so that they are considered no longer significant and no additional field work is recommended for them. Features 18, and 23 to 33 at Site 236 are considered significant under Criterion D and are recommended for preservation as is. The archaeological findings presented here are based on a 100% surface survey of the project area and limited sub-surface testing.

TABLE OF CONTENTS

ABSTRACT i

TABLE OF CONTENTS ii

INTRODUCTION 1

PHYSICAL SETTING 1

 SOILS 1

 VEGETATION 6

HISTORICAL FRAMEWORK 6

 TRADITIONAL LAND USE: PRE MĀHELE 6

 POLITICAL BOUNDARY 7

 HISTORICAL LAND USE 8

PREVIOUS ARCHAEOLOGY 15

 SETTLEMENT AND LAND USE IN PŌHAKUPILI 18

METHODOLOGY 19

 FIELD METHODS 19

 LABORATORY METHODS 20

FIELDWORK RESULTS 20

 PROJECT AREA: Site 236 20

 FEATURES 22

 EXCAVATIONS 26

 ARTIFACTS 30

DISCUSSION 30

INITIAL SIGNIFICANCE ASSESSMENTS 36

RECOMMENDATIONS 36

REFERENCES CITED 37

LIST OF FIGURES

Figure 1: USGS East Molokai Quadrangle Showing Project Area. 2

Figure 2: Tax Map Key (TMK) No. 5-8-15:03 Showing Project Area Parcels. 3

Figure 3: General Project Area View from East Side of Bay. View to South. 4

Figure 4: General Project Area View from East Side of Bay. Brush Clearers on Project Area.	
View to South.	4
Figure 5: Stream Valley North of Project Area. View to Southwest.	5
Figure 6: Natural Terrace in the Project Area as Viewed from Area C.	
View to Southwest.	5
Figure 7: Natural Vegetation in the Project Area. View to Southwest.	6
Figure 8: Native Register Record of LCA No. 4686 to Laanui	9
Figure 9: Patent Deed No. 8048, Laanui's 'Āpana.	11
Figure 10: Planview Map of Laanui's 'Āpana.	12
Figure 11: Fagan's Sauna in the Project Area. View to West.	14
Figure 12: Private <i>Kuleana</i> Within Pōhakupili Complex. View to Southwest.	14
Figure 13: General View of Pōhakupili Complex. View to West.	16
Figure 14: Planview of Features at Pōhakupili Complex.	17
Figure 15: Terrace Area A at Site 236. View to Southeast.	23
Figure 16: Upslope Area B at Site 236. View to Northwest.	23
Figure 17: Lower Area Terracing Designated Area C, Site 236. View to Northwest.	24
Figure 18: Planview of Present Project Area Site Map.	25
Figure 19: Feature 18, Site 236. View to West.	26
Figure 20: Alignment Feature 27, Site 236. View to West.	27
Figure 21: North End of Feature 28, Site 236. View to West.	28
Figure 22: Feature 28 and Feature 29, Site 236. View to Northwest.	28
Figure 23: Feature 29, Site 236. View to West.	29
Figure 24: Location of ST-4 in Feature 32, Site 236. View to West.	30
Figure 25: North Wall Photograph of ST-1, Site 236. View to North.	30
Figure 26: North Wall Profile of ST-1, Site 236.	31
Figure 27: Profile of West Wall ST-2, Site 236. View to West.	32
Figure 28: West Wall Profile ST-2, Site 236.	32
Figure 29: North Wall Profile of ST-3, Site 236.	33
Figure 30: Area of ST-3. View to West.	33
Figure 31: West Wall Profile of ST-4, Site 236.	34
Figure 32: Profile of South Wall ST-4, Site 236. View to South.	34
Figure 33: North Wall Profile of ST-5, Site 236.	36
Figure 34: Profile of North Wall ST-5, Site 236. View to North.	36
Figure 35: Profile of East Wall ST-6, Site 236. View to East.	37
Figure 36: East Wall Profile of ST-6, Site 236.	37
Figure 37: Shovel Probe (SP-1) Base of Excavation. View to West.	38
Figure 38: West Wall Profile of SP-1.	38
Figure 39: Shovel Probe (SP-2) Showing Cut and Filled Terrace. View to West.	39
Figure 40: West Wall Profile of SP-2.	39
Figure 41: Shovel Probe (SP-3) Base of Excavation. View to West.	41
Figure 42: North Wall Profile of SP-3.	41
Figure 43: Precision Scan of Basalt Graver Artifact No. 2.	42

INTRODUCTION

At the request of Ms. Daphne Beckett representing Pu'u-O-Hoku Ranch Ltd., Scientific Consultant Services, Inc. (SCS) conducted an archaeological inventory survey of a parcel of land in the *ahupua'a* of Pōhakupili, Kona District, East Moloka'i (TMK:5-8-15:03) (Figures 1 and 2).

Field work was conducted by Leann McGerty (Project Director), Pam Asbury-Smith and Elizabeth Pestana (Field Assistants) in June of 1997 and October 1998 under the overall direction of Robert L. Spear, Ph.D.

PHYSICAL SETTING

The project area was located on the west slope of Pōhakupili Bay, situated above a narrow alluvial plain at the mouth of Pōhakupili Gulch at the east end of Moloka'i. Access was gained from Highway 45 on an unimproved road extending approximately 1/4 of a mile down the slope to Pōhakupili Bay (Figures 3 and 4). An intermittent stream flows at the bottom of the gulch and is augmented by a spring near the mouth of the stream (Figure 5). When full, the stream empties into the sea. The shoreline is rocky except for the sandy beach at the bay. Weathered basalt outcrops are scattered on the sides of the gulch, an area that is fairly steep. Archaeological investigation was mainly limited to the areas containing the footprints of the proposed buildings. The footprint covered approximately 45.00 by 45.00 m and included a natural terrace (Figure 6).

SOILS

The soil represented in the project area is in the Koele Series and is listed as the Koele-Badland complex. Consisting of well-drained soils, the Koele Series are found at the bottoms of gulches and the Badland, on the sides of gulches. The Koele soils are similar to Koele silty clay loam with a slope of 40 to 70 percent. Badland consists of highly weathered rock, mainly on the slopes. In most places there are many deep, vertical gullies on Koele soils where the slope is more than 10 percent. The Koele soils are easily eroded if they are bare of vegetation. This complex occurs at elevations ranging from nearly sea level to 500 feet amsl (Foote *et al.* 1972:70, Map Sheet 82).

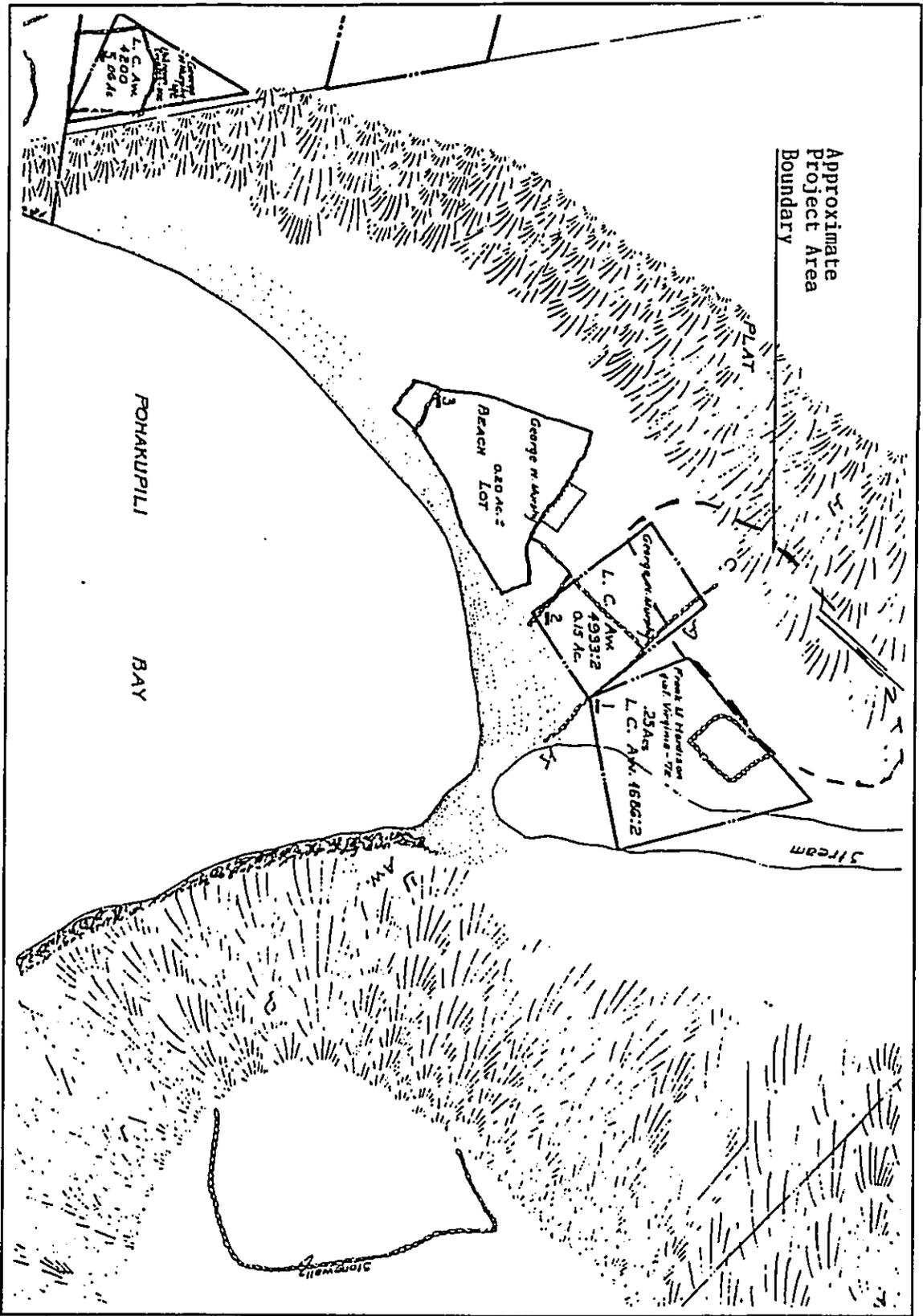


Figure 2: Tax Map Key (TMK) No. 5-8-15:03 Showing Project Area Parcels.

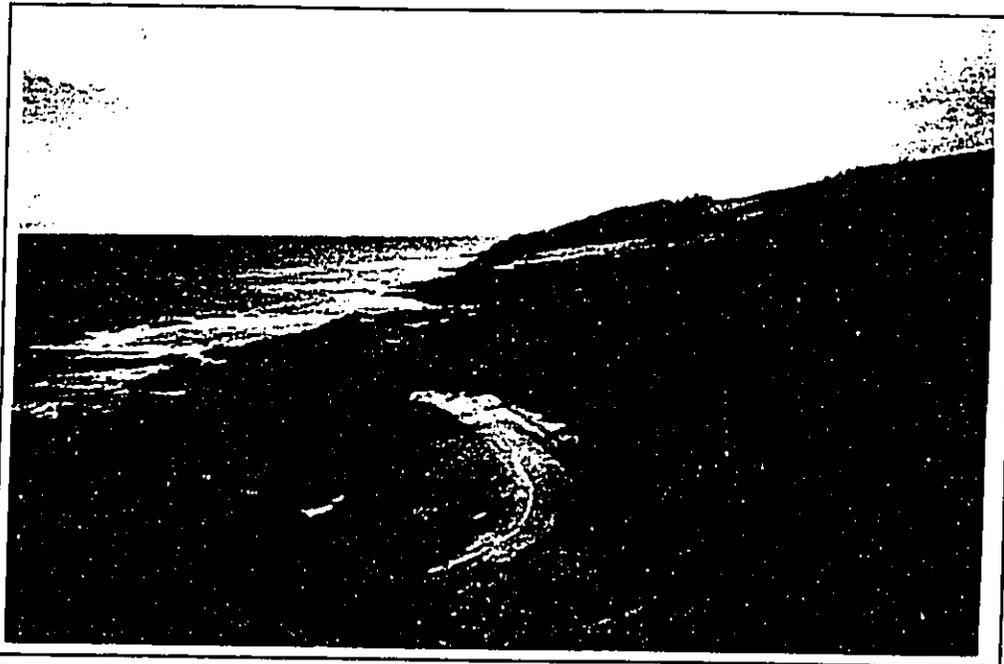


Figure 3: General Project Area View from East Side of Bay. View to South.



Figure 4: General Project Area View from East Side of Bay. Brush Clearers on Project Area. View to South.



Figure 5: Stream Valley North of Project Area. View to Southwest.



Figure 6: Natural Terrace in the Project Area as Viewed from Area C. View to Southwest.

VEGETATION

The slopes of Pōhakupili Gulch were covered by vegetation consisting mainly of grasses. *Kiawe* (*Prosopis pallida*) was scattered amongst the grasses. A grove of introduced ironwood (*Casuarina equisetifolia*) trees was visible to the north of the unimproved dirt road that approaches the bay. Between the bottom of the western slope and the banks of the stream were several traditionally useful indigenous and Polynesian-introduced trees including a large number of *Milo* (*Thespesia populnea*) and clusters of *Niu* (*Cocos nucifera*) (Figure 7).



Figure 7: Natural Vegetation in the Project Area. View to Southwest.

Hand clearing of the thick, tall grasses and *Kiawe* on the western slope (the project area) was mainly completed before the archaeologists arrived, allowing visibility of the terrain.

HISTORICAL FRAMEWORK

TRADITIONAL LAND USE: PRE MĀHELE

Moloka`i Island is the result of the eruption of two shield volcanoes, the flow of one volcano joining with the other and producing a central saddle region. The high mountains on the eastern half of the island catch most of the moisture, leaving West Moloka`i drier than the

stream-fed valleys at the eastern end. The extensive reef system spanning the length of the southern shore provided an ideal location for building fishponds (there were some 62 fishponds within 23 miles from Kalama`ula to Kumimi [Summers 1971:3]) and provided abundant shellfish, seaweed, and other marine animals. Because of the easily accessible resources, most of the island's population was concentrated in the southeastern portion of the island (Kirch 1984:124; Weisler and Kirch 1985:135).

Traditionally, *kalo* (*Colocasia esculenta*) was widely cultivated in the large, fertile valleys on the North Shore of Moloka`i. On the south-eastern shore, smaller streams fed *lo`i* systems which were built along meandering stream banks and at the mouths of the larger gulches. When the fertile alluvium found in floodplains could be irrigated, it was utilized for limited amounts of `uala (*Ipomoea batatas*) and *kalo*. Springs emerged near the shore providing excellent fishpond conditions and food was easily gathered off the reefs (Weisler and Kirch *ibid.*).

The walled fishponds are considered examples of intensification as the political economy expanded to that of chieftainship (Kirch 1984).

POLITICAL BOUNDARY

Moloka`i was not a political power in and of itself, but was caught between battling island factions and was controlled at various times by Hawai`i, O`ahu, and Maui island polities (Fornander Vol. II 1980:68, 289, 225; Summers 1971:12-20).

Traditionally, Moloka`i was divided into two districts: Ko`olau and Kona. The Ko`olau side contained large amphitheater-headed valleys with perennial streams that were ideal locations for settlements, providing all the necessary resources from the mountains and ocean. However, access to these areas was mainly by sea and rough water conditions often isolated the north coast from the rest of the island for months during the winter. Trails were long and extended over difficult mountain terrain, limiting communication with the rest of the island. The Kona side of the island incorporated V-shaped valleys, some with perennial streams. The area also contained the fishponds of East Moloka`i as well as the excellent fishing grounds and dense basalt of West Moloka`i that was quarried for tools. "In ancient times Waialua, with its two streams and extensive flats, was the largest terraced area on Molokai's south coast" (Handy 1940:101).

Early land tenure in Hawai'i was based on access to natural resources. Lands were divided into large land divisions, *moku* (on Moloka'i these were Ko'olau and Kona) and smaller land divisions, *kālana*. The districts, in turn, were divided into *ahupua`a*. These were (ideally) self-sufficient, pie-shaped pieces of land extending from the mountain ridge to, and including a portion of, the sea. Thus, the occupants of an *ahupua`a* were able to gather whatever resources they needed for support from within their own territory. Within the *ahupua`a* were smaller individually tended pieces of land called *'ili* which were especially significant to the *maka`āinana* (commoners). In the 1800s there were approximately 1,800 *ahupua`a* in all of Hawai'i (Moffat and Fitzpatrick 1995:20, 28). Approximately 58 *ahupua`a* are listed for the Kona District of Moloka'i.

The project area is located in the *ahupua`a* of Pōhakupili on the southeastern side of Moloka'i. No traditional references were found pertaining directly to the history of this particular *ahupua`a*.

HISTORICAL LAND USE

Emory estimated the population of Moloka'i at the time of Cook's arrival (1778) as having been 10,500 (Summers 1971:3). The missionaries reported the population of Moloka'i 57 years later as 8,700 (*ibid.*). Because of its lack of natural harbors, Moloka'i was by-passed by the foreign ships for the ports of Kailua, Kawaihae, Lahaina, and eventually Honolulu. It seems the lack of contact with foreign traders protected Moloka'i's populace from many of the introduced diseases that permeated the more popular ports and caused drastic reductions in native population. The decrease in Moloka'i's population was slight in comparison and was attributed to deliberate re-location by people to off-island centers of trade and activity (*ibid.*).

Influence from abroad eventually forced Kamehameha III, ruler of Hawai'i in the 1840s, to revise the traditional land tenure system to placate western desires of private ownership of property. The *ahupua`a* of Pōhakupili was given to Kaninaualii Kaleoku (LCA 7762) who said the land was an *'āina maoli* (land to which he believed he had a genuine right) and that he had ". . . lived a very long time on these claims" (Barrère 1994:25; Native Register Vol. 5:451). Lands that were divided among the King and his chiefs were all "subject to the rights of native tenants" (Chinen 1961:15).

Lands claimed by the *maka`āinana* (native tenants, commoners) were referred to as Land Commission Awards (LCA) and became awarded when the owner was issued a Royal Patent. Approximately 13 pieces of land were awarded during the Māhele adjacent to Pōhakupili Stream or on the beach at the Bay. Only two of these are shown to relate to the proposed project area: LCA 4686:2 and 4933:2 (See Figure 2). However, recorded testimony suggests additional *kuleana* (land holding of a tenant in an *ahupua`a*) were in the vicinity of the project area, but not awarded.

LCA 4686:2 was awarded to Laanui. In the records containing native testimony concerning this claim, it was recorded that Laanui had 7 *lele* (a detached lot or parcel belonging to an *ili*) and that he received them from Keli`iahonui in 1843. In the Indices of Land Commission Awards, the *ahupua`a* containing Laanui's lands was said to be Moakea, which is located directly northeast of and adjacent to the *ahupua`a* of Pōhakupili. Laanui's claim in Moakea consisted of 11 *lo`i* (pondfields for taro). This particular *ahupua`a* had been retained by Keli`iahonui's wife, Kekau`onohi, during the Māhele. Laanui lists the names of the *ili* in Moakea and the names of the *konohiki* (land agent appointed by chief) in the Native Register (Vol. 7:16, Figure 8). Pōhakupili *Ahupua`a* was not mentioned in this claim.

No. 4686 Laanui

I, Laanui, am in the Ahupua`a of Moakea, Island of Molokai. I have some lo`is in this Ahupua`a which are scattered about -- one lo`i in one ili, two in another, one in another, and so forth for all eleven lo`i. Here is my

Page 17

claim: 3 from Opu, 1 from Kale, 2 from Heleamalama, 1 from Kawahinehue, 1 from Makawea, 3 from Kamakaweliweli. These lo`i were given me by Keliiahonui and I have consumed their produce for a long time. The konohikis from the time the lo`is were conveyed have been: Kaunakakai, Kakanui, Kahuluaikaua. The people who heard the words /of Keliiahonui/ are Kahuluaikaua and Nalii and some people living on the land. Aloha to you, the Commissioners to quiet land titles. Moakea, Jan. 1848

LAANUI

Figure 8: Native Register Record of LCA No. 4686 to Laanui

Laanui was eventually awarded three *'āpana* (sections) which were listed on his Land Patent Deed (No. 8048), and was received by him from the Republic of Hawai'i in Oct. of 1896 (Figure 9). *'Āpana* 1 was described as *'āina kalo* (lands planted with taro) located in the *'ili* of Kukuimalu. *'Āpana* 2 was a 1/4 acre (housetlot) located in the *ahupua'a* of Pōhakupili and is the parcel on the slope below the project area. Figure 10 depicts Laanui's *'āpana*, showing his land in Pōhakupili (Ap 2) bordering the *kahawai* (stream). To the west was the (unclaimed?) land of Paele, south was the land of Kapule (LCA 4933), and to the east, the sea. When giving the southern boundary dimensions, the surveyor recorded that this boundary extended along the fence on Kapule's land or, at the very least, that a fence post marked the southeastern corner (*kahi pā*) where Kapule's *kuleana* joined Laanui's (see Figure 2). Laanui's third land section was taro land located in Kowailoa.

LCA 4933:2 was awarded to Kapule. Foreign testimony given by Mamaki in 1846 or 1847 recorded Kapule claimed that his ". . . house lot is in the ili of Pouli in Pōhakupili . . . He received it from his ancestors in ancient times and has dwelt there without interruption (word unclear in text) till recently" (Foreign Testimony Vol. 6:49). A description of the land given by Kapule states that Paele's (unclaimed?) land, situated towards the mountains, was a house lot and that there was another (unclaimed?) house lot belonging to someone named Kahuaina located below side of the gulch (ibid.). In the Native Testimony, Kapule names several of the former *konohiki* of this land.

Located to the northwest, LCA 3977 was awarded to Haole. He said in the Native Register that his land was in an *'ili* named Maniania. He named the adjoining lands, as well: *mauka* was called Palailaiha, the ridge was on the south-west, the *'ili* of Puaoina was on the sea side, and the stream was to the north. Haole names several past *konohiki*: Mamaki, Haole, Kaleoku, Kapule, and the present one (1840s), Kahalemake. He mentions Nakii, who had an LCA upstream (No. 4758), as being a witness to his claim as well as "the people living in this Ahupuaa". For some unknown reason, there is no known Royal Patent Award for this LCA, meaning Haole never took final possession of the land.

All of this testimony suggests that in the 1840s and 50s there were at least four house sites in the immediate vicinity of the project area and that one was fenced. Other claims registered, but not awarded in Pōhakupili were made by Aea (who claimed a *kīhapai* in the *'ili* of

Ape 1. Aina Hale maloto, ka hi o Hukunimahu. —
 Eho ma ka ana, me ka tahi. He He. alaila, aha
 He 55° He 37' i ka lani. e fili ana i ka Honohiki
 He 31° He 1' i ka lani ————— i ka Hakawai
 He 2° He 4' i ka lani —————
 He 32° He 2' ————— i ka Hale
 Eili ana i Perka

Ape 2. Iuhale maloto, ka ahupuna. Pohaku pili.
 Eho ma ka ana, me ka tahi. He He. alaila, aha
 He 28° He 1' i ka lani. e fili ana ka Kai
 He 78° He 2' ————— i ka Hakawai
 He 11° He 1' i ka lani ————— i ka Hale
 He 74° He 1' ————— i ka Hale
 Eili ana i Ruda. —

Ape 3. Aina Hale. "Hovailoa". Eho ma ka ana me
 ka Hakawai me ka tahi. He He. alaila.
 He 65° He 37' i ka lani. e fili ana i ka Honohiki
 He 80° He 4' i ka lani —————
 He 51° He 37' i ka lani —————
 He i ka Hale i ka lani e fili ana
 i ka Hakawai. Eili ana i Perka.

Molo ka i Oke 1851
 W. H. [Signature]

This Agreement, Made this _____ day of _____ 1881

Figure 9: Patent Deed No. 8048, Laanui's 'Āpana.

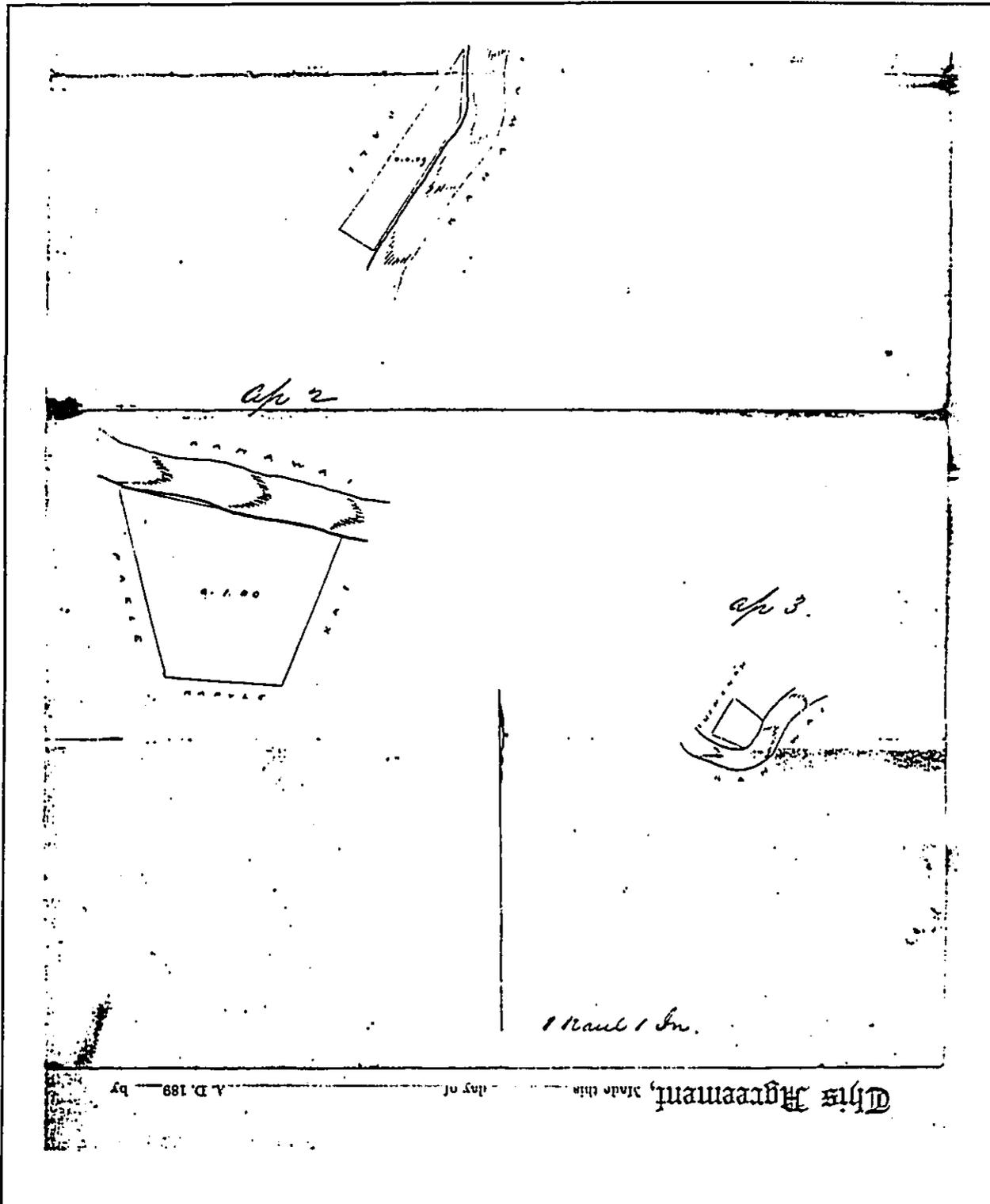


Figure 10: Planview Map of Laanui's 'Āpana.

Kaluanui somewhere near Haole's award and, therefore, somewhere near the project area), and I.E. Mamaki. Several people are mentioned as having had land close to the project area but it is not known if the parcels were claimed and these parcels were not awarded (Paele, Kahuaina, Kaheana [Native Testimony Vol. 6:169-70]).

Typically, claims made at the time of the Māhele reflected traditional land utilization which in some instances continued well into this century. The *ahupua`a* of Waialua, one of the largest land divisions located on the southeastern coast and west of Pōhakupili, was described in 1867 as "... a land of taro patches that are seen on every side from the shore and far inland. . . It was here that taro patches were built with the water coming in from springs in the patch itself. Here the patches extend from Waialua and toward the upland. . . On the western side of Waialua were *kula* (upland) areas producing *ʻuala* and dryland *kalo*" (*Au Okoa*, Sept. 26).

In 1931, descriptions were recorded pertaining to conditions pre-existing on the southeastern shore.

... Formerly the small streams on the southeastern coast carried more water than they do now, and it is certain that in many of the interior valleys there are small sections of terraces. Wet taro was seen at Keawnui, Puko`o, Kawaikapu, Waialua, Honouliwai, and Pohakupili (sic) (Handy 1940:515).

In 1859, the island of Moloka`i became one district known as Moloka`i District. Later, in 1909, Kalawao District was added.

Pōhakupili Bay was included in the property of Pu`u-O-Hoku Ranch and became popularly known as Fagan's Beach, named after the previous owner who consolidated the ranch. His plans for development of the bay did not materialize except for a structure near the stream known as "Fagan's sauna" (Figure 11). In 1955, George Murphy purchased the ranch from the Ward family. Cattle have freely grazed throughout the ranch lands and it is known that the 1946 tsunami heavily impacted the south shore. One *kuleana*, located on Punolohi Point within Pōhakupili Complex, remains separate from the ranch lands (Figure 12).



Figure 11: Fagan's Sauna in the Project Area. View to West.

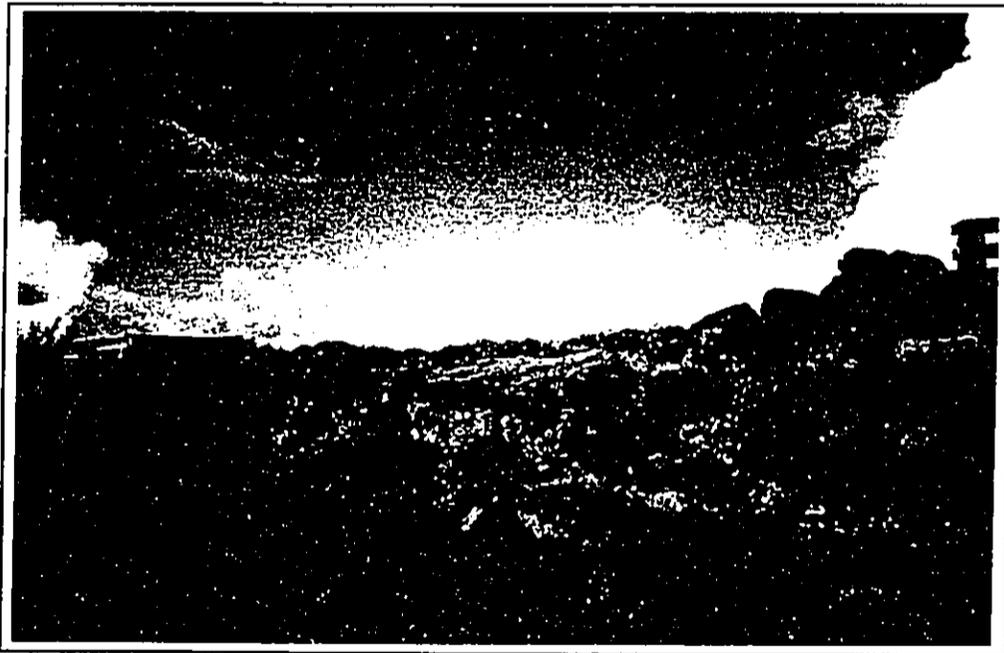


Figure 12: Private *Kuleana* Within Pōhakupili Complex. View to Southwest.

PREVIOUS ARCHAEOLOGY

A compilation of sites on Moloka'i was published in 1971 and contains locations and descriptions of archaeological and legendary sites (Summers 1971). Several sites are identified in the vicinity of the project area.

The border between the *ahupua`a* of Lupehu and Pōhakupili extends along the ridge to Punolohi Point. Summers records:

Site 236. KAHUA AND KO`A (?), LUPEHU

Situated on the bluff at Punolohi which adjoins the land of Pōhakupili, this site is an unpaved enclosure made with upright stones averaging 2 ft in height. The southern side, which measures 127 ft. is composed of a double line of upright stones; between the two lines are pieces of coral and small stones. The other three sides have only one line of uprights. . . .

There are three low platforms in the enclosure. . . In the SE corner of the enclosure there is a large natural outcrop of rocks to which stones have been added . . .it suggests a *ko`a* or a boundary marker of an *ahupua`a*. The boundary line of Lupehu and Pōhakupili runs through here.

There is a house site to the N of the enclosure, and to the W is the site of a school. . .

Summers (1971:153-4) lists two sites for Pōhakupili:

Site 237. KAHO`ONOHO HEIAU, PŌHAKUPILI

This heiau is located at the edge of the sea on the E side of the bay of Pōhakupili Gulch... Stokes wrote of it: "This foundation is a stone terrace built right at the waters edge. Its retaining wall is 11 feet high. Its small size, 50 by 30 feet, does not suggest a heiau, but the height of its retaining wall, and its command of the bay, incline one to credit the local information that it was a heiau.

Site 238 was called the Pohakuhawanawana Stone (Whispering stone) and was located at the gulch near the eastern side of the road. It was described as a tall upright, rectangularly-shaped stone. Mary Pukui recorded that fishermen would whisper requests to the stone not only concerning fish but for taro from the uplands (ibid.).

In 1974, a state survey of archaeological sites throughout Moloka'i identified what was called the "Pōhakupili Complex" which included the north sides of Pōhakupili and Keāina Bays (Lupehu Ahupua'a) and extending inland about 61 meters (Figure 13). The site was assigned the same number (236) as that in the Summers report since it incorporated several of the previously described features. The complex included the narrow alluvial plain at the mouth of the stream, the sides of the gulch, and land sloping towards Keāina Bay to the south.

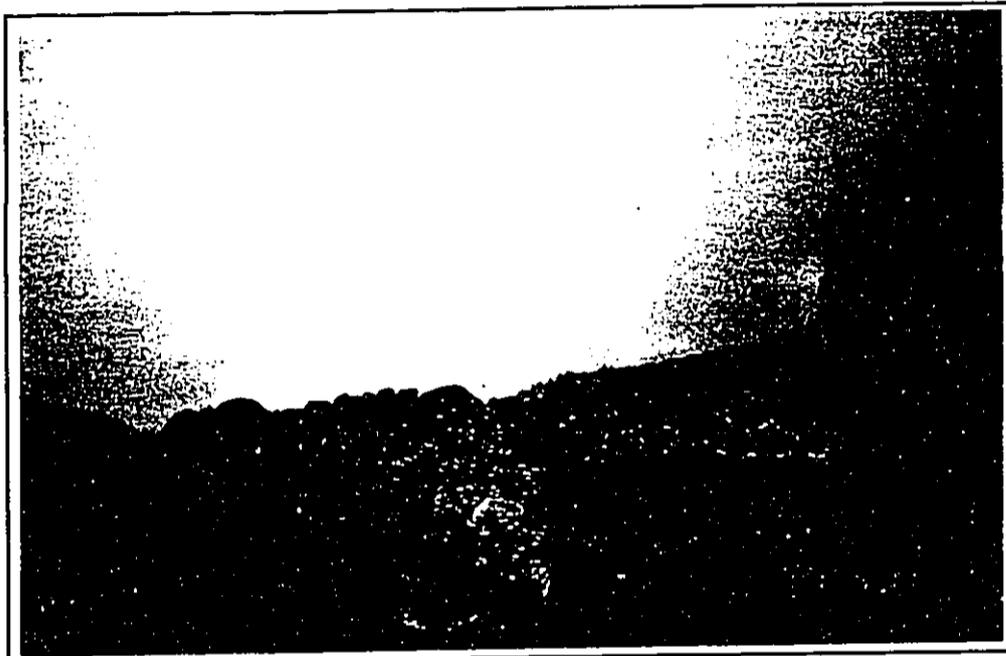


Figure 13: General View of Pōhakupili Complex. View to West.

Twenty-two features including six different feature types are listed in the complex: enclosures, habitation sites (with structural remains), midden sites on the beach, *ko`a* (fishing shrines), planting enclosures, and stone alignments (Table 1). The majority of the features are situated on the bluff at Punolohi Point (Figure 14).

Features identified in Pōhakupili Bay included open midden sites, one located at the mouth of the stream where it empties into the bay, and another below the rock face on the south side of the bay. Midden recorded for these sites consisted of fire-altered rocks, charcoal, and shells. Basalt flakes were exposed in the stream-cut banks.

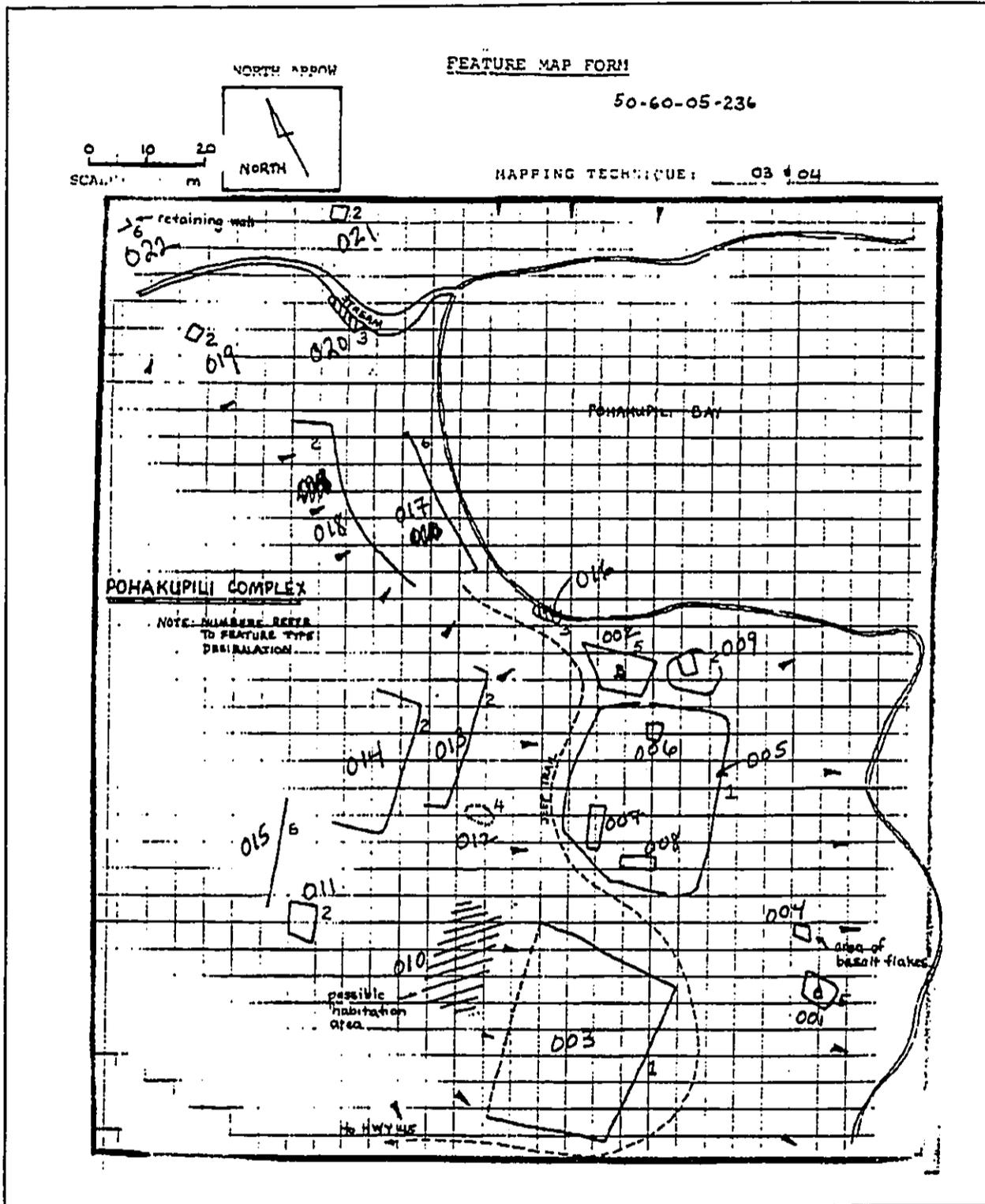


Figure 14: Planview of Features at Pōhakupili Complex.

Table 1: Pōhakupili Complex Features

Feature Number	Feature Form	Feature Function
001	irregular shaped unpaved enclosure with double-faced core-filled walls	<i>ko`a</i>
002	similar to 001 but less well-defined	<i>ko`a</i>
003	a large, low, double-walled enclosure	unknown
004	a concentration of basalt flakes and shells	associated with Fe. 001
005	a large, low, double-walled enclosure with two openings	unknown, possibly a <i>kahua</i> or habitation site
006	stone-lined, earthen mound	associated with Fe. 005
007	stone-lined, earthen mound	associated with Fe. 005
008	stone-lined, earthen mound	associated with Fe. 005
009, 011, 013, 014, 015, 018, 019, 021	low walls with single-course stone alignments	habitation
010	earthen faced terrace	possible habitation site
012	piled stone enclosure	agriculture
016, 020	open midden site	habitation
017, 022	rock alignment	unknown

Two religious features (*ko`a*) were identified within the complex. One is actually in the *ahupua`a* of Lupehu on the cliffs to the south of Pōhakupili. The other occurs on the point overlooking Pōhakupili Bay.

Stone alignments were located in various places. The most obvious example was one parallel to the shoreline of Pōhakupili Bay.

Evaluation of the area referred to its high research and interpretive value. It was estimated that the complex encompassed a range of feature types constructed within a temporal span of two to three hundred years terminating in the 19th century. More study would contribute to our knowledge of coastal life ways.

Modern archaeological studies on Moloka'i have confirmed the importance of fishing and tool production on the west side of the island. The eastern side of Moloka'i has been more thoroughly investigated with detailed studies having been conducted in Hālawā Valley, a wet, windward valley (Kirch and Kelly 1975), and Kawela, located on the dry, leeward coast (Weisler and Kirch 1985). These *ahupua`a* are situated on either side of the project area. Pōhakupili combines aspects of both windward and leeward environments. Although not topographically similar to the large amphitheater-headed valleys on the north side of Moloka'i, the southeastern leeward region is wetter than the western portion of the island with gulches capable of transporting large amounts of water intermittently and several springs that were tapped for *lo`i* irrigation near the shore.

A reconnaissance survey conducted in the *ahupua`a* of Kainalu, Puelelu, and Pūnui`ōhua 1 and 2 identified 29 sites ranging from pre-Contact to recent times and including habitation, *lo`i*, and dryland agricultural features (Hommon 1981). These were represented archaeologically by soil-faced terraces, irrigation ditches, rock-faced terraces, surface concentrations of midden and other cultural items, a modern cemetery, and five marked, probable burials. The slope region of Kainalu and Puelelu *Ahupua`a* had been altered by modern activities leaving no archaeological remains from 800 feet amsl to the shore. However, based on what was observed in the region, it was concluded that the cultivation of dryland crops (such as sweet potato) had predominated and included a small number of associated habitation sites. Some cultivation, based on intermittent stream flow, was probably conducted on the alluvial benches along two large gulches.

The one identified *lo`i* system was located (untypically) on a steep-sided ridge between two gulches and was believed to have been built by Chinese in the late 19th or early 20th century. Remnants of modern agriculture and ranching were also recorded.

Twelve sites were recorded during a one day archaeological reconnaissance in Pua`ahala *Ahupua`a* (McCoy and Nakamura 1993). Near the shore, a fishpond and a *heiau* (Malae Heiau), had previously been recorded. The 1993 survey concentrated on an unnamed gulch and the slopes on either side. Archaeological features included agricultural terraces, C-shaped shelters, enclosures, rock mounds, and a possible religious site located between the 200 and 250 ft. elevation level. Modern activities are believed to be responsible for the lack of sites below the 100-150 ft elevation mark. Site distribution was similar to that in Kawela, with the majority of

the residential and dryland agricultural complexes situated above 200 ft in elevation. As with Kawela, settlement was believed to have been only one or two centuries before human contact.

Additional research on Moloka`i has included adaptive and land-utilization patterns in the windward valleys (Hālawa) and the arid west end of the island (Kalua Ko`i), and the structure of settlement space (Kawela) (Kirch and Kelly 1975; Weisler and Kirch 1984).

SETTLEMENT AND LAND USE IN PŌHAKUPILI

In traditional times the east coast of Moloka`i was the most highly populated part of the island (Handy 1940). Fishponds lined the shores, marine resources were easily accessible from the reefs, springs were often located inland of the shore and rains nurtured the dry land field systems.

Previous archaeological studies conducted in *ahupua`a* further west along the leeward coast have confirmed the lack of surface archaeological sites near the shore due to modern day activities. The exception to this would appear to be fishponds and some religious features. Based on the previous studies, habitation and agricultural features were more common above the 250 ft elevation (Weisler and Kirch 1984, Hommon 1981, McCoy and Nakamura 1993).

As Pōhaku Bay was one of the few inlets protected by an offshore reef, as well as offering an easy landing for canoes, it would have been an ideal location for settlement. An intermittent stream and a spring produced fresh water, and the alluvial benches along side the gulch could have been cultivated, as could the slopes of the gulch.

Indeed, Pōhakupili encompasses a range of archaeological features that appear to reflect habitation, subsistence, and religious activities spanning both the pre-Contact and post-Contact periods. Site 236, referred to as the Pōhakupili Complex, contains enclosures, midden, planting features, alignments, modified sections off *in situ* boulders, and faced terraces. These structures were interpreted as functioning as religious shrines, habitation areas, and agricultural plots. The angle of the sloping hillside where the project area was located would have been suitable for dry land agriculture. Such a site might be architecturally represented by small earthen terraces that may or may not have been retained by a rock facing, crude boulder alignments, and/or rock mounds, all used for dry land agriculture and previously identified in areas on the eastern end of Moloka`i.

Land use changed with the arrival of foreigners. Emphasis on grazing of introduced animals became foremost as ownership of property shifted hands. The upland of Moakea, the *ahupua`a* directly to the east, was described in 1867 as:

... a fine plain for horse back riding or for walking and is level from the south to the southwest. It is a good land for melon and sweet potato cultivation and they were grown there before. Now it is a place for the dung of cattle and sheep and the inhabitants are mostly animals. This place was one famed for the `ohi`a planted by Kane`alai, the hill of Honolua [Pu`uhonoula], Pualanalana, Alapa`i's ti root oven, the Pukaula and many other things. It is a good place to live and grow sweet potato and dry land taro. The natives used to catch much fish in basket traps (Summers 1971:154).

Remnants of ranching and recreational activities, such as fence posts, water troughs, high, substantial rock walls, rock enclosures used for animal pens, modern fishing activities and camps were expected to be found representing this time period.

METHODOLOGY

FIELD METHODS

The inventory survey was conducted to establish the presence or absence of archaeological remains within the project area and the extent of those remains. Only the footprint of the proposed house and immediate area downslope was to be surveyed and tested with the understanding by the client that any construction outside of this section would require additional archaeological survey.

Sites were to be mapped, photographed, limited testing was to be conducted, and assessments of significance and recommendations were to be determined for recorded sites. Pedestrian sweeps were conducted by a crew of two within the project area. Since ground visibility was generally fair, the sweep lines were several meters apart.

Testing was done to determine the presence of cultural deposits. Six stratigraphic units (ST) and three shovel probes were excavated mostly by hand within the project area. Screening of the shovel probes was conducted (1/8 and 1/4 inch screen) and the backdirt of the stratigraphic units was carefully examined for any cultural material.

Excavations were plotted on the plan view maps and profiled; soil analysis was accomplished in the field. Artifacts were bagged and labeled with provenience, project number, and date collected. Soil layers were recorded using Munsell color charts (dry); soil layer composition was described, and profiles were drawn.

Field data was recorded in a standard SCS field book and photographs were taken using 35 mm color film. Mapping of the project area was done with tape and compass, and an effort was made to keep the tape level. Compass directions were taken in true north readings.

LABORATORY METHODS

Analysis of collected material was conducted at the SCS Laboratory facilities in Honolulu, Hawai'i. Artifacts were cataloged and assigned specific sequential accession numbers. All project materials and records are stored at the office of SCS in Honolulu, Hawai'i.

FIELDWORK RESULTS

Archaeological features identified during this survey were contiguous to those previously identified as Site 236, and were included under Site No. 50-60-05-236. Ten additional features were recorded in the project area on the southern slope of Pōhakupili Gulch.

PROJECT AREA: Site 236

Land sections to be impacted by the proposed structures were identified by the architect, Ms. Daphne Becket. These were located on the southern slope of the gulch, above the stream. Dense vegetation, consisting mostly of high grasses and *kiawe*, were cleared, revealing a natural terrace that had not been illustrated on the recently completed survey map of the bay.

The slope below the natural terrace consisted of modified sections incorporating large, *in situ* boulders. Continuing to the northeast, the slope culminated in high grasses, a grove of *milo*, a few *niu*, and the bank of the stream. The main impact area was the natural terrace and the upper slope extending to the southwest. The natural terrace was designated Area A (Figure 15). Above the natural terrace on the slope was Area B (Figure 16), and to the north, on the side of the

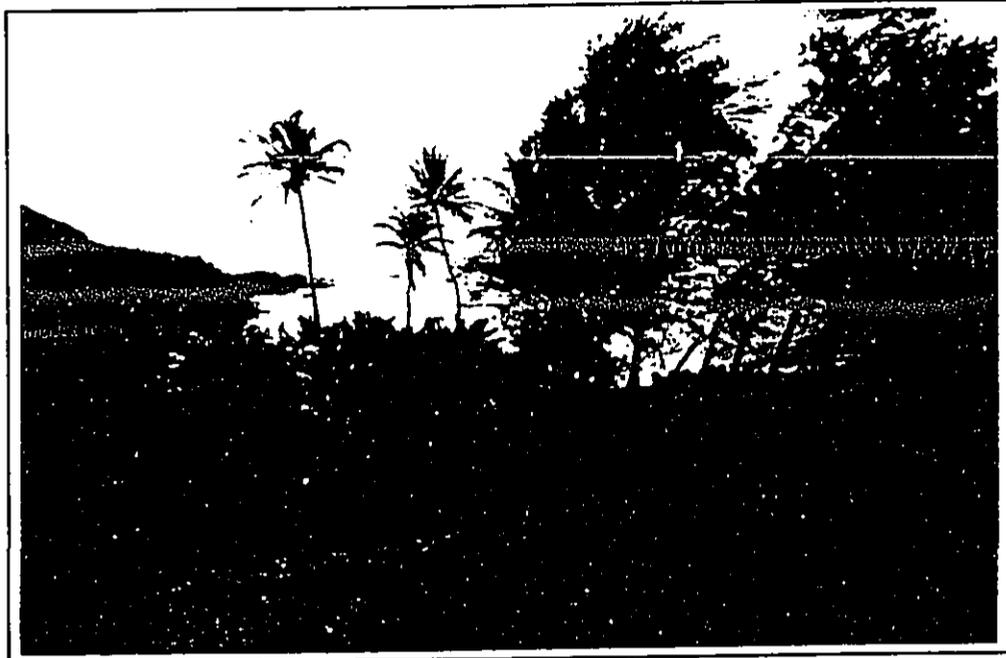


Figure 15: Terrace Area A at Site 236. View to Southeast.

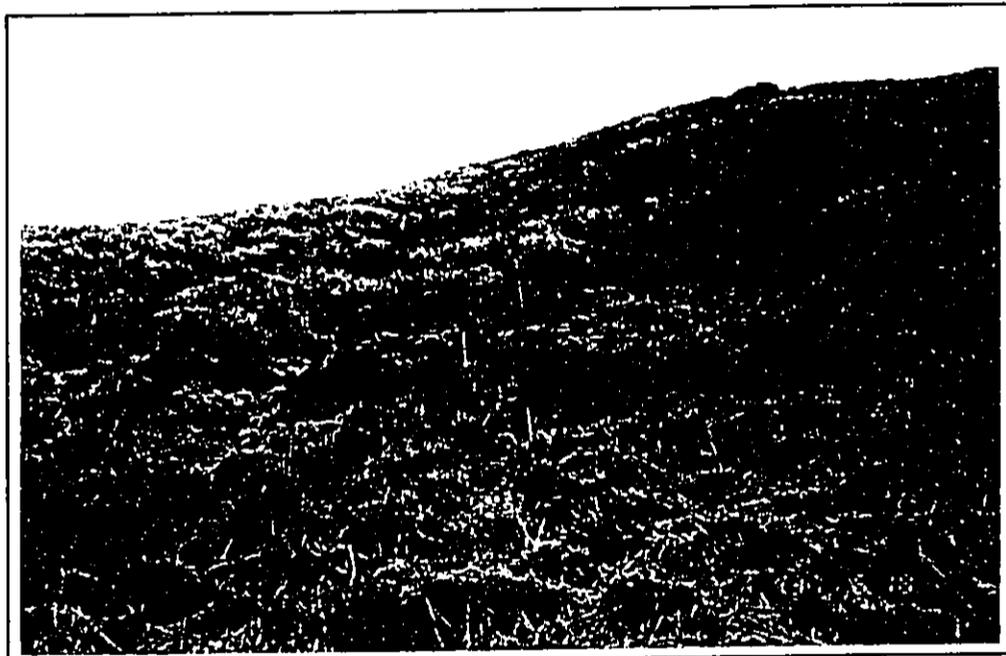


Figure 16: Upslope Area B at Site 236. View to Northwest.

sloping (030° slope) bluff, was Area C (Figure 17). Ten features were identified in the project area including terrace facings, alignments, and some planting circles. Feature numbers continued from the last feature number assigned in the 1974 site report (Figure 18).



Figure 17: Lower Area Terracing Designated Area C, Site 236. View to Northwest.

FEATURES

Feature 18 was previously identified and recorded on the 1974 Pōhakupili Complex site map (Figure 19). From some large, *in situ* boulders, Feature 18, a terrace facing constructed of small basalt boulders, extended approximately 7.00 m to another large basalt boulder and a grove of coconut trees. Portions of the facing were stacked (two courses) and stood 0.61 m high. Orientation was to the northwest. The terrace behind the facing was gently sloping and extended 3.00 m to the base of the slope faced with Feature 23.

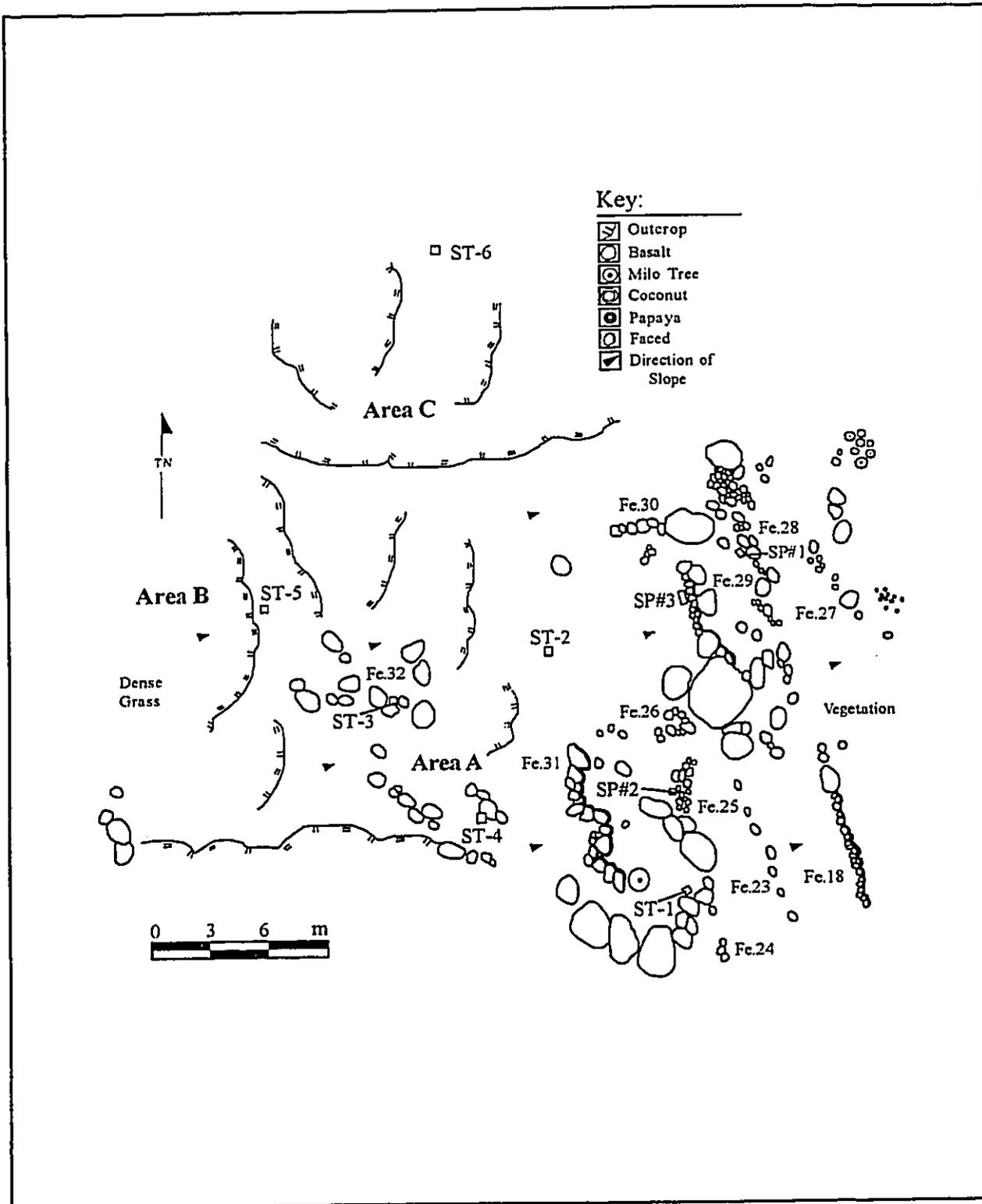


Figure 18: Planview of Present Project Area Site Map.



Figure 19: Feature 18, Site 236. View to West.

Feature 23 was a disturbed alignment extending 12.00 m on a north-west axis along the base of the slope, ending in a group of large boulders. It stood from 0.20 to 0.30 m high.

Feature 24 was a faced terrace remnant extending 17.00 m to the southeast. It was badly eroded with a few rock clusters standing 0.30 m high. The feature consisted mainly of single rocks, loosely aligned.

Feature 25 was a remnant rock facing on the slope below the natural terrace. This entire slope appeared to have been modified but only Features 25 and 26 still had some structure to them. Feature 25 was 3.50 m long on a northwest axis and stood 0.70 m high (two to three courses).

Feature 26 was another remnant rock facing cluster on the same slope, slightly to the northwest. It extended approximately 2.00 m towards some very large, *in situ* boulders.

Feature 27 was an alignment located below the slope of the natural terrace. It emerged from shoulder high grass and extended 12.00 m to more dense vegetation on the south and east and a grove of *milo* trees to the north (Figure 20). Portions of the feature were 0.58 m high.



Figure 20: Alignment Feature 27, Site 236. View to West.

Feature 28 was a remnant rock terrace facing located on the slope below the natural terrace (Figure 21). It is badly eroded but extended approximately 15.00 by 1.00 to 2.00 m wide and was 0.74 to 0.84 m high. On the north end is a cluster of stacked rocks lying against the slope, (two to three courses high) next to a large basalt boulder.

Feature 29 was a rock-faced, soil surfaced terrace on the slope below the natural terrace. Medium to large basalt boulders were used in its construction and were stacked between large *in situ* basalt boulders (Figure 22). It extended 7.00 m between a very large *in situ* boulder and a natural outcrop with stacking (Feature 30), was 2.00 m wide and 0.80 to 1.37 m high (Figure 23). The slope extended up to the south-west to the soil edge of the natural terrace.

Feature 30 was a natural outcrop with basalt rock stacking. It extended approximately 6.00 by 1.85 by 0.80 m high. The orientation of this feature was up-slope/down-slope.

Feature 31 was a partial rock-faced, soil-surfaced terrace. It extended approximately 21.00 m before it disappeared into the slope. Remnant facing occurred at the *makai* end, on the edge of the terrace above a large *milo* tree. The facing was 4.00 m by 1.00 by 1.40 m high.



Figure 21: North End of Feature 28, Site 236. View to West.



Figure 22: Feature 28 and Feature 29, Site 236. View to Northwest.



Figure 23: Feature 29, Site 236. View to West.

Tumbled boulders were spread down slope and are probably part of the collapsed facing. The widest end of the terrace measured between 8.00 and 10.00 m, becoming progressively narrower near Feature 30, and finally melding into the slope.

Feature 32 was a loose circle of basalt rocks and boulders on the edge of Feature 31. The diameter measured 2.50 m (Figure 24).

EXCAVATIONS

Six stratigraphic units (ST) and three shovel probes (SP) were placed within the project area.

ST-1 was a 0.75 by 0.50 by 0.30 m excavation situated up-slope from a tumble of boulders that may have contained a terrace at one time (Figure 25). A large *milo* was growing from the center. Features 25 and 26 extend off the down slope portion of the tumble. Layer I (0-0.6 to 0.10 meters below surface [mbs]) was a dark brown (10 YR 3/3) silty clay containing some tree roots, but nothing cultural. Layer II (0.06/0.10 to 0.30 mbs) was a light reddish brown (7.5 YR 4/4) silty loam containing nothing cultural (Figure 26).

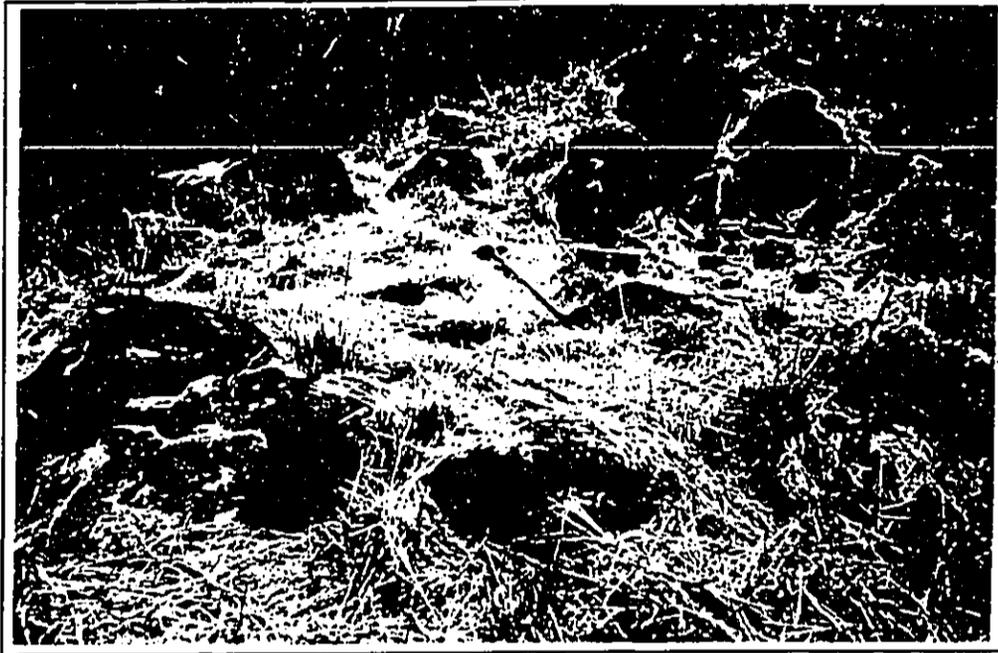


Figure 24: Location of ST-4 in Feature 32, Site 236. View to West.



Figure 25: North Wall Photograph of ST-1, Site 236. View to North.

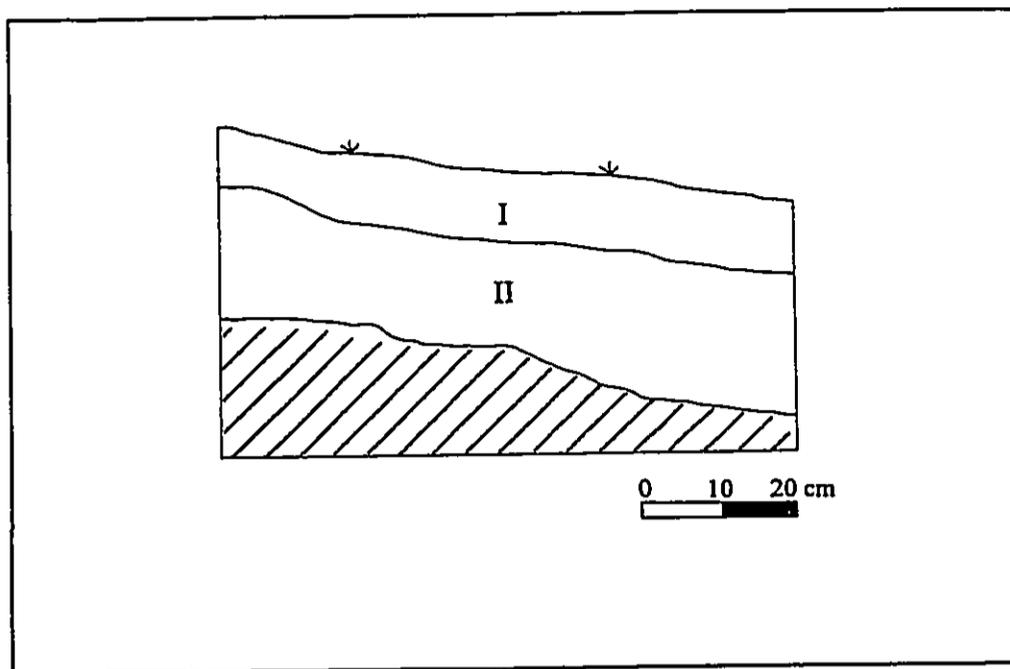


Figure 26: North Wall Profile of ST-1, Site 236.

ST-2 was a 0.35 by 0.30 by 0.53 m excavation located on Feature 31, the natural terrace (Figure 27). Layer I (0-0.04 mbs) was a very dark brown (10YR 2/2 moist) humic silty clay loam containing grass roots. Layer II (0.04-0.53 mbs) was a dark brown (7.5YR 3/3) very compact silty clay containing a few flecks of charcoal around 0.23 mbs which were too small to be collected (Figure 28). No other cultural material was identified.

ST-3 was a 0.40 by 0.40 by 0.30 m excavation located in Feature 32, a loose circle of basalt boulders (Figure 29). Layer I (0-0.02 mbs) was a humic layer full of grass roots. Layer II (0.03-0.30 mbs) was a light brown, slightly yellowed (10YR 3/2) compact silty clay containing nothing cultural (Figure 30).

ST-4 was a 0.30 by 0.30 by 0.25 m excavation located on Feature 32 within the footprint of a proposed structure (Figure 31). Layer I (0-0.03 mbs) and Layer II (0.03-0.25 mbs) were very dark brown (10YR 2/2 moist) humic silty clay loam layers containing grass roots (Figure 32). No cultural material was identified.

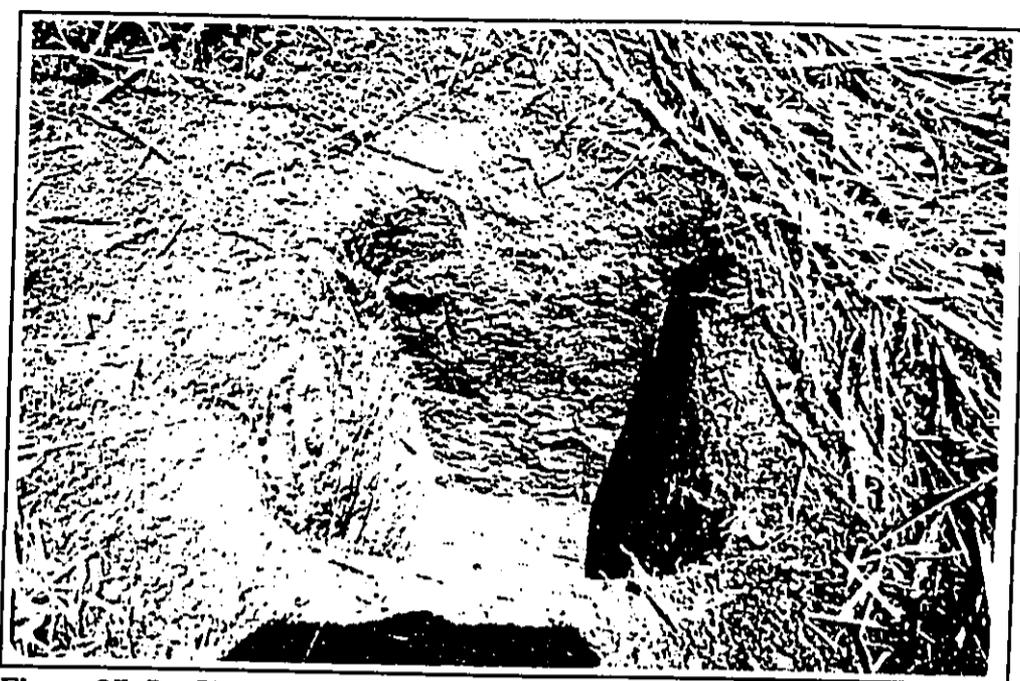


Figure 27: Profile of West Wall ST-2, Site 236. View to West.

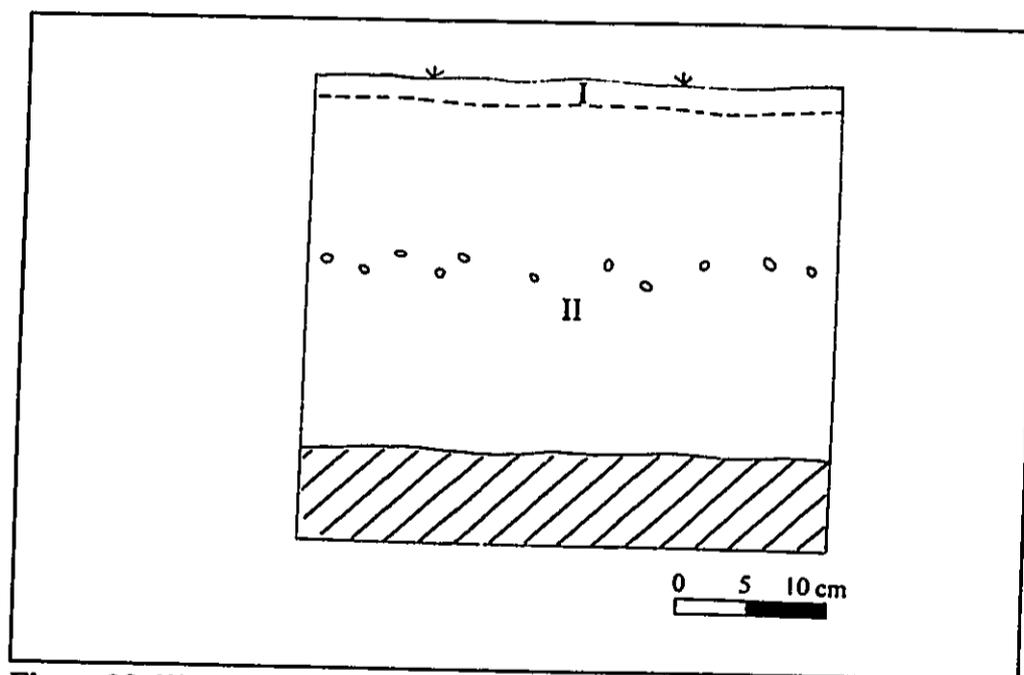


Figure 28: West Wall Profile ST-2, Site 236.

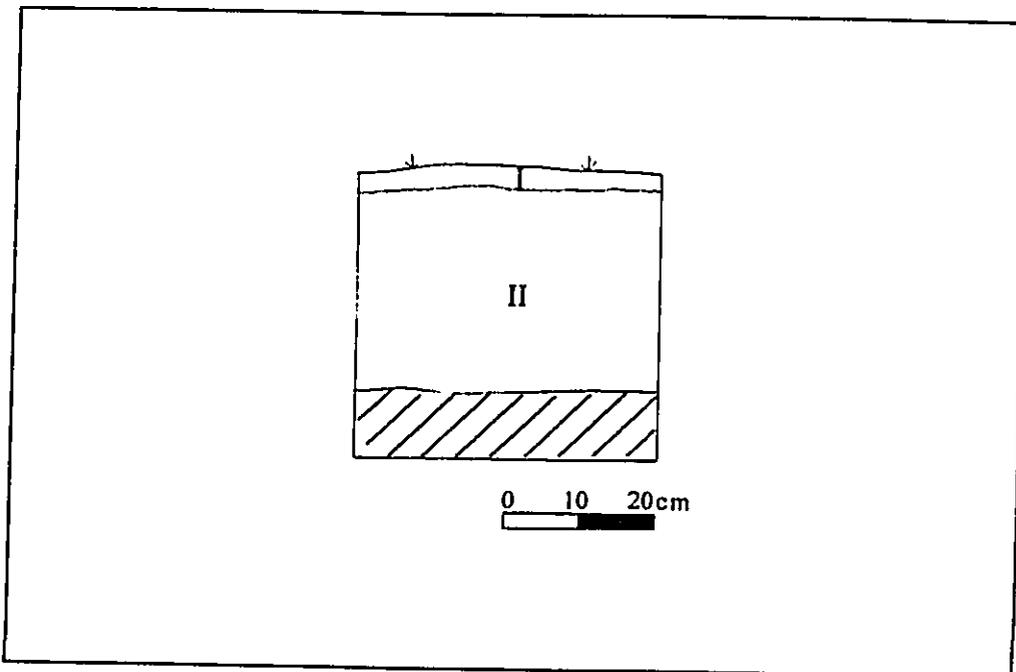


Figure 29: North Wall Profile of ST-3, Site 236.



Figure 30: Area of ST-3. View to West.

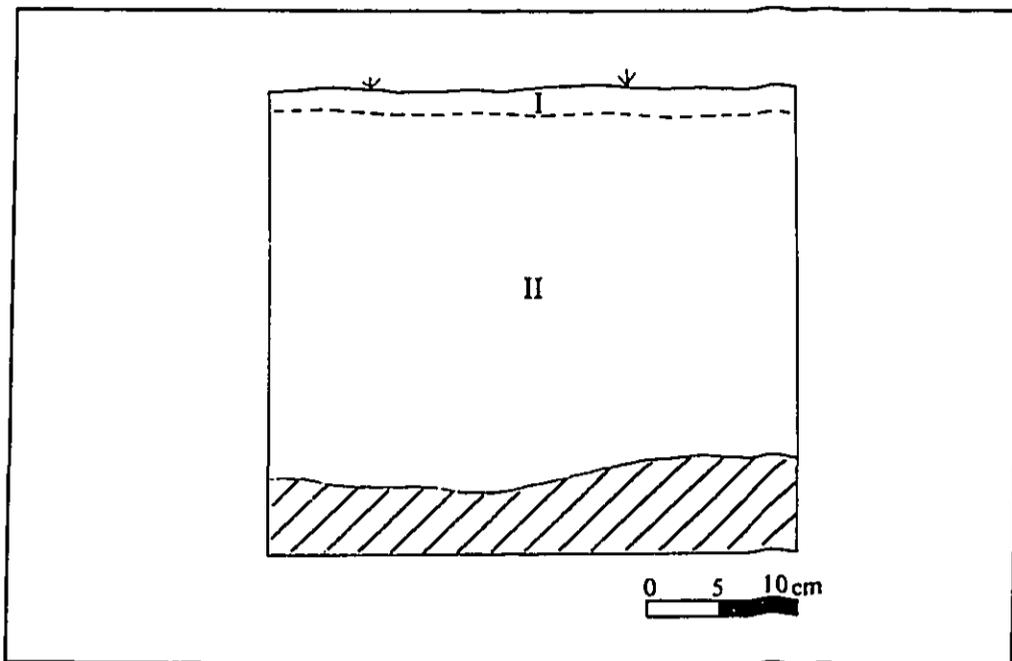


Figure 31: West Wall Profile of ST-4, Site 236.



Figure 32: Profile of South Wall ST-4, Site 236. View to South.

ST-5 was a 0.25 by 0.50 by 0.23 m excavation located on the upper slope in Area B (Figure 33). Layer I (0-0.10) was a thick humic layer that contained grass roots and one basalt flake. Layer II (0.10-0.23 mbs) was a very compact, light yellowish brown (10YR 4/3) silty clay. At 0.17 mbs, pieces of decomposing basalt were observed. Excavation was terminated at 23 cmbs because of the density of rocks (Figure 34).

ST-6 was a 0.35 by 0.35 by 0.30 mbs excavation located on the slope to the northwest designated Area C (Figure 35). Layer I (0-0.03 mbs) was a dark brown (7.5YR 3/3) thin humic layer containing grass roots. Layer II (0.03-0.30 mbs) was a reddish brown (5YR. 4/3) hard packed silty clay with some decomposing basalt rocks (Figure 36). No cultural material was identified.

SP-1 (0.50 by 0.50 by 0.46 mbs) was located on the slope (Feature 28) below the footprint of the proposed house (Figure 37). Layer I (0-3 cmbs) consisted of a thin, humic layer of matted roots containing a piece of old rope. Layer II (3-39 cmbs) consisted of a dark brown (10YR 3/3) hard packed clay/silt, containing a piece of plastic (at 15cmbs), some charcoal flecks (collected) and a fish scale. Layer III (39-46 cmbs) consisted of a dark reddish brown (5YR 3/3) extremely hard clay containing very few charcoal flecks at the top of this soil layer (Figure 38).

SP-2 (0.50 by 0.50 by 0.40 mbs) was located on the slope (Feature 25) below the footprint of the proposed house. Layer I (0-3 cmbs) consisted of a thin, humic layer of matted roots. Layer II (3-30 cmbs) consisted of a dark brown (7.5YR 3/3) hard clay/silt containing a *kukui* nut, two small water-worn pieces of coral, and charcoal flecks (collected). Layer III (30-35 cmbs) consisted of a dark reddish brown (5YR 3/3) extremely hard clay containing one *kukui* nut (Figure 39).

Excavation of SP-2 revealed that Feature 25 was a cut-and-filled terrace (Figure 40). Soil in the eastern portion of the SP directly behind the facing of Feature 25 was siltier and less compact than soil in the western portion of the SP. The profile of the south wall showed a smooth, clear boundary extending vertically from 3 to 30 cmbs and extended 10 to 15 cm wide directly behind the rock boulder facing of Feature 25. A piece of water-worn coral was identified in the fill section at 29 cmbs. A *kukui* nut was identified at the bottom of the fill behind one of the boulders used in the construction of the facing (placed on Layer III). The fill was a dark

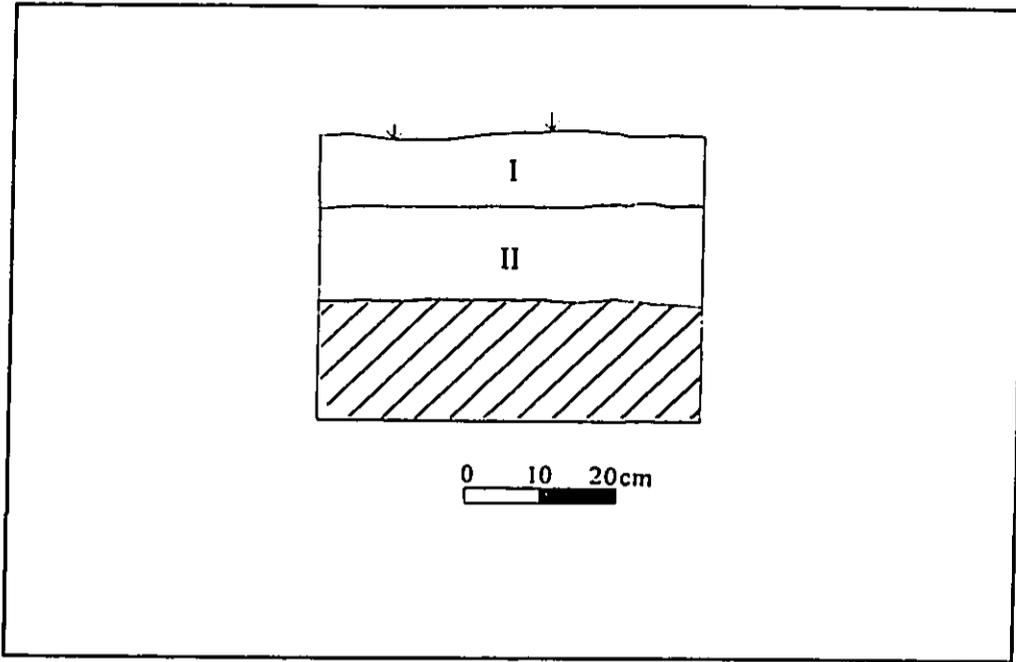


Figure 34: Profile of North Wall ST-5, Site 236. View to North.



Figure 33: North Wall Profile of ST-5, Site 236.

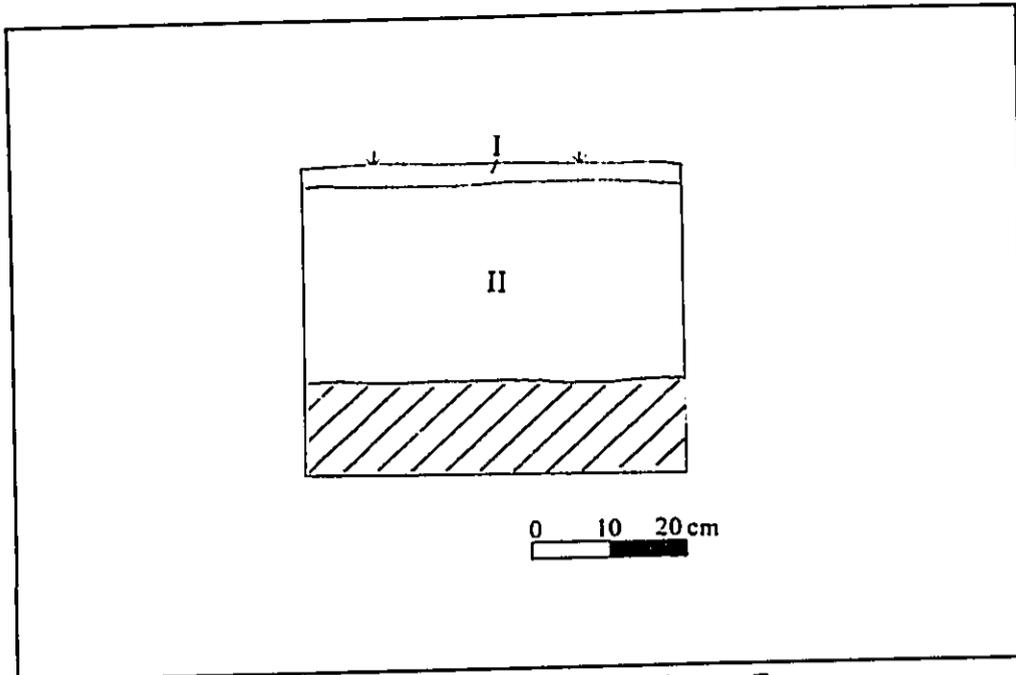


Figure 35: Profile of East Wall ST-6, Site 236. View to East.



Figure 36: East Wall Profile of ST-6, Site 236.

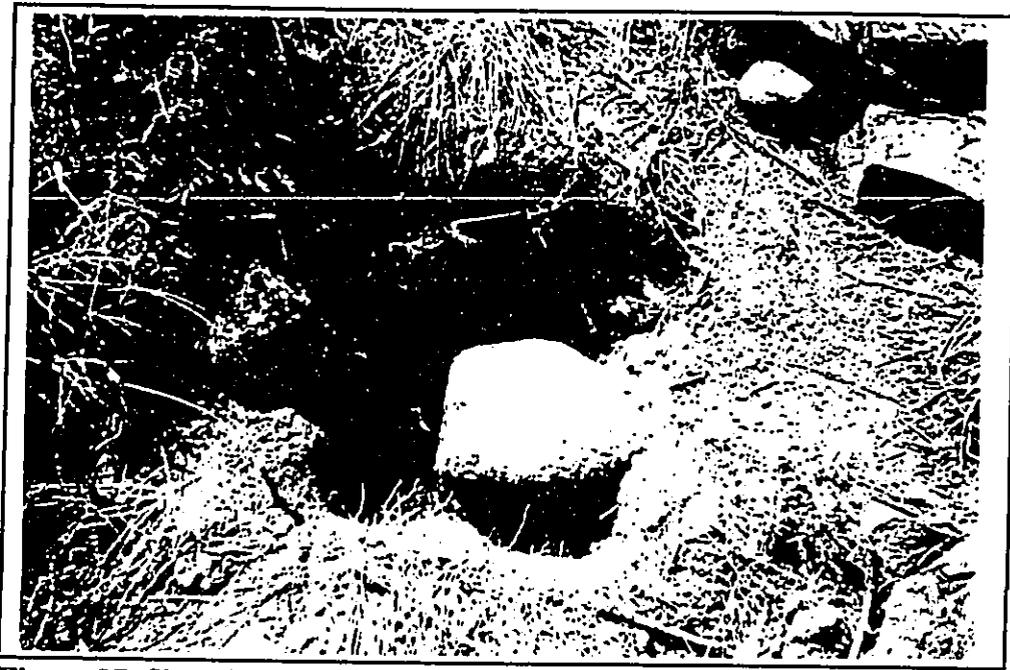


Figure 37: Shovel Probe (SP-1) Base of Excavation. View to West.

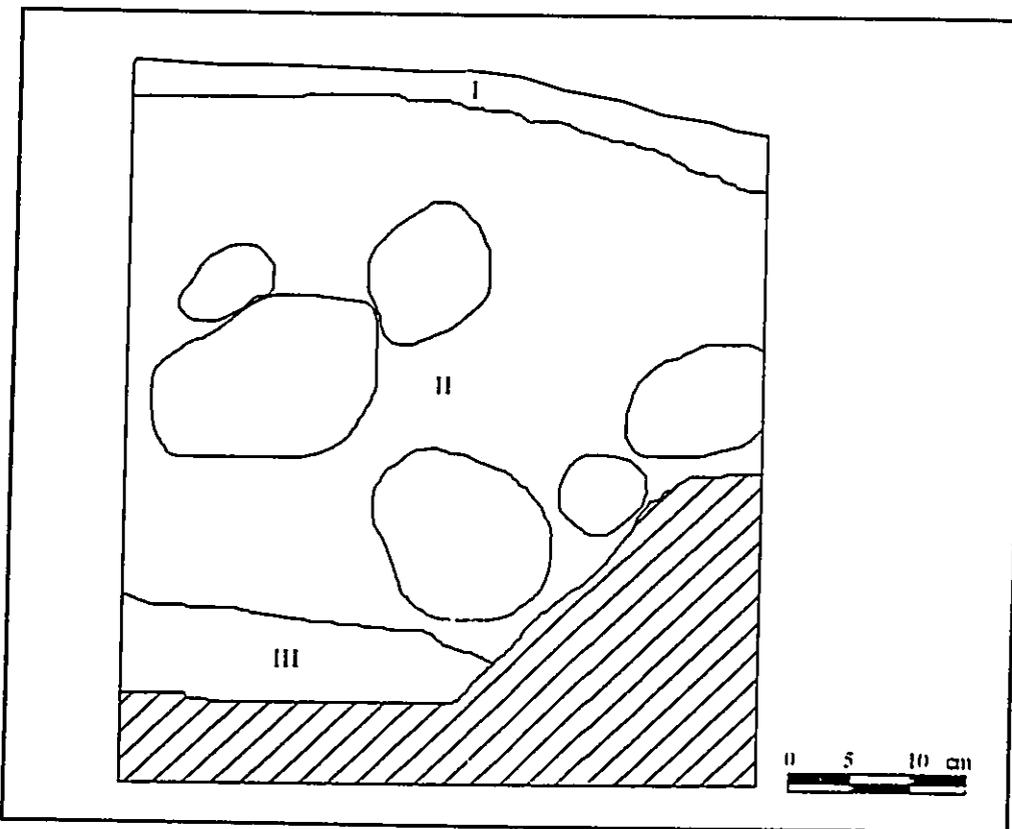


Figure 38: West Wall Profile of SP-1.

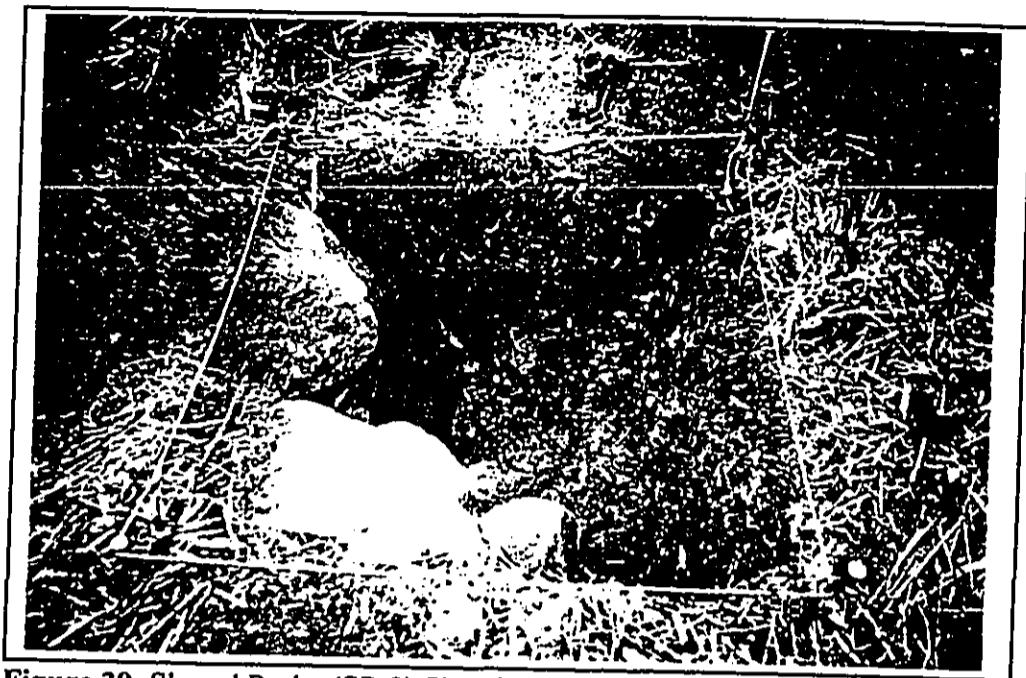


Figure 39: Shovel Probe (SP-2) Showing Cut and Filled Terrace. View to West.

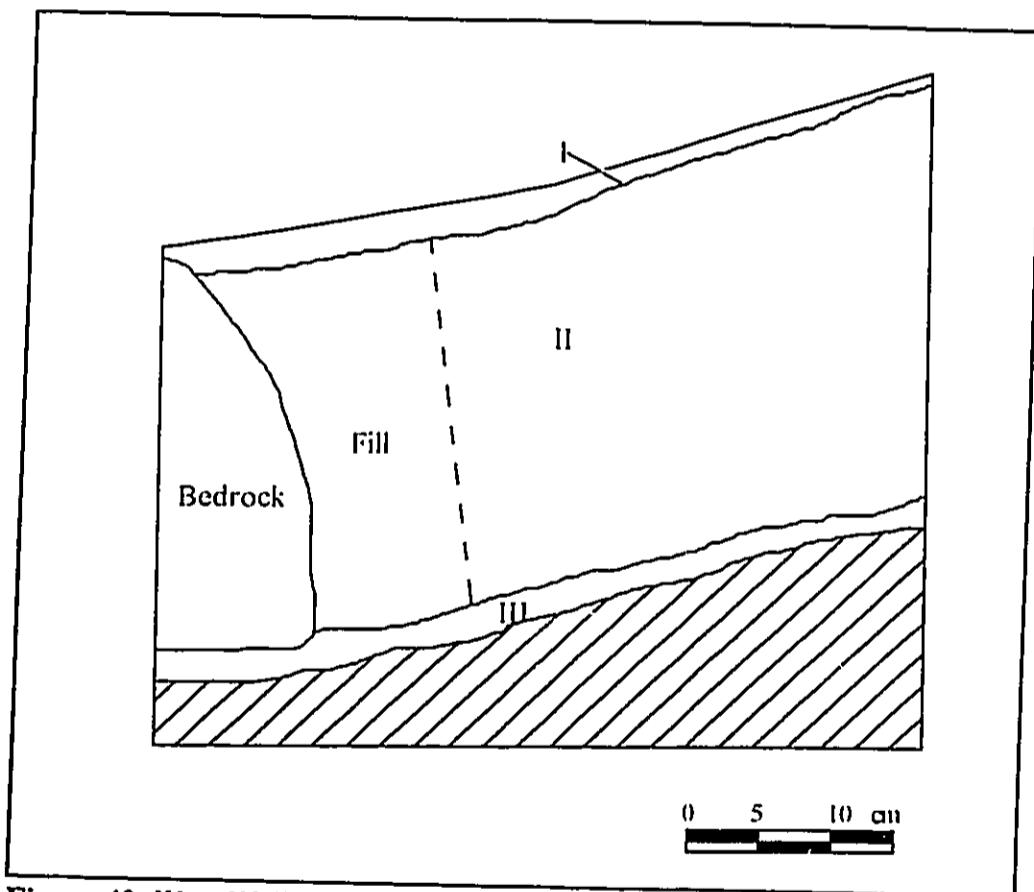


Figure 40: West Wall Profile of SP-2.

brown (7.5 YR 3/3) slightly hard silty/clay containing some charcoal flecks and the previously mentioned *kukui* nut.

Charcoal from SP-2, Layer II was collected and sent to Beta Analytic for radiocarbon dating. Sample number Beta-123612 (SCS-122); C13/12 ratio: -27.5 o/oo; conventional age: 130 +/- 50 BP. Using OxCal V2.14, at 95.4% confidence (two sigma) this date provided an age range of AD 1660 to 1950 (1.00%).

SP-3 (0.50 by 0.50 by 0.36) was located on the slope (Feature 29) below the footprint of the proposed house (Figure 41). Layer I (0-3 cmbs) consisted of a thin, humic layer of matted roots. Layer II (3-13 cmbs) consisted of a dark gray brown (2.5 Y 4/2) hard clay/silt consisting of one small piece of water-worn coral and a few charcoal flecks. Layer III (13-36 cmbs) consisted of a very dark grayish brown (10YR 3/2) hard clay/silt containing one basalt flake (Figure 42).

ARTIFACTS

Two artifacts were recovered from the project area. One was a basalt flake from ST-5, Layer I and the other, a basalt graver from SP-3, Layer II. The graver was retouched on one edge which joined the broken flake edge to form a point and measured 2.05 by 4.51 by 1.30 cm (Figure 43).

DISCUSSION

Ten new features were identified and added to the Pōhakupili Complex. These features (Features 23-32) included two rock alignments (Features 23, 27), four rock-faced/soil-surfaced terraces (Features 24, 28, 29, 31), one circle of basalt rocks (Feature 32), one rock stack (Feature 30), and two slope facings (Features 25 and 26). Also re-identified from McCoy's 1974 work was Feature 18, a terrace.

Two traditional artifacts were identified: a basalt flake and a basalt graver. Although charcoal flecking was observed in ST-2, there was not enough present to be collected for radiocarbon dating. The other five stratigraphic units, located on the slope above Feature 31, did not contain any charcoal flecking. It is possible that what small amounts of charcoal had been originally present had washed down slope to the stream or onto the relatively wide terrace (Feature 31), leaving the small sample that was identified in ST-2.

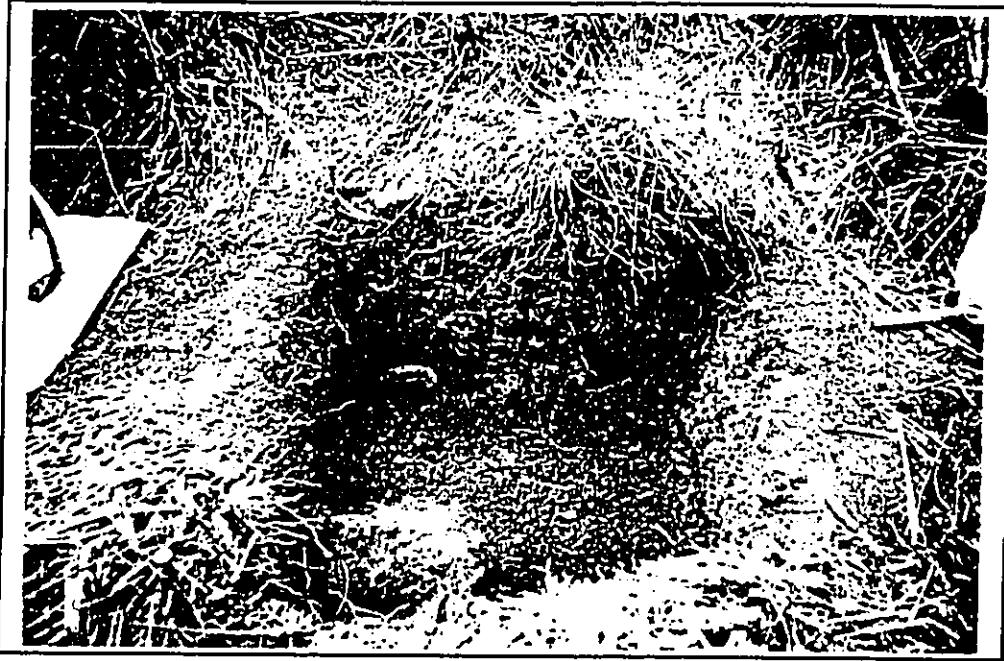


Figure 41: Shovel Probe (SP-3) Base of Excavation. View to West.

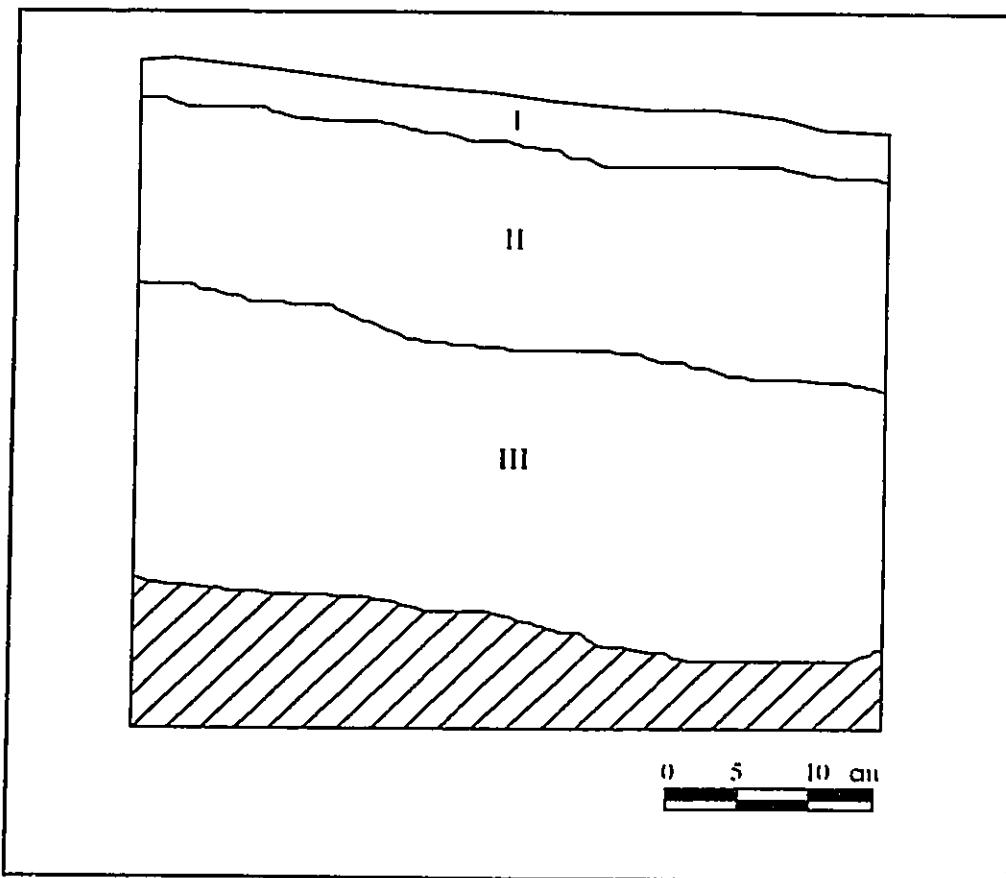


Figure 42: North Wall Profile of SP-3.

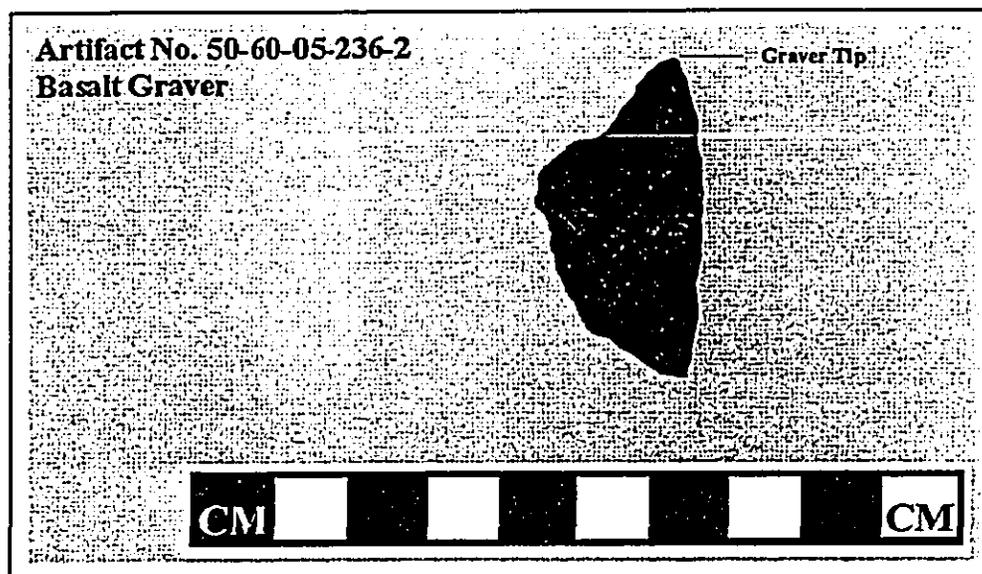


Figure 43: Precision Scan of Basalt Graver Artifact No. 2.

On the lower slope, below the house footprint, charcoal was observed in SP-1, 2, and 3. Although charcoal was collected from SP-1, the presence of plastic in the same soil layer precluded radiocarbon dating. However, charcoal from SP-2, the cut-and-filled terrace deposits was sent to Beta Analytic and resulted in a conventional date of 130 +/- 50 BP which would be consistent with the initial supposition that agricultural activities were occurring on the slope and were probably associated with land use before and during the Māhele.

Based on type, slope angle, and charcoal flecking (ST-2, SP-1, 2, 3), Features 23, 27-29, and 31 were interpreted as eroded agricultural terraces for the cultivation of dry land crops such as sweet potato. Such terraces are similar to what has previously been identified on southeastern Moloka'i at Pua'ahala, Kainalu, Puelelu, and Puniu'ōhua. Modified sections on the slope above Feature 31, in Area A and B, were less defined but also interpreted to be the remnants of dryland agricultural activities. Circles of basalt rocks, often incorporating large *in situ* boulders in the construction, were often common planting features for dryland crops (Cordy *et al.* 1991:383, Rosendahl 1972:89, Schilt 1984:41, Kirch 1985:38). Feature 12 of the Pōhakupili Complex was identified as a planting circle, as was Feature 32. Several sections on the slope of Area B, in close proximity to Feature 32, were probably modified with similar circle construction that has since slumped, making identification difficult. Features 25 and 26 were interpreted as slope facing for soil retention. Random clusters of boulders and rocks on the slope below Feature 31 were likely facing for soil retention that has since slumped.

It is difficult to calculate the exact upper limits of the two LCAs directly associated with the project but it would appear that the western boundary of Kapule's LCA (No. 4933) extends into the project area. La'anui's survey (LCA 4686) shows the land is called "paele" up slope from his *kuleana*. *Pāele* is a variety of sweet potato but, Kapule, when testifying to the boundaries of his land in Pouli, refers to his *mauka* boundary ". . . by Paele's houselot", identifying Paele as a person (Book of Foreign Testimony, Vol. 6:49). Paele never claimed this land, but it was obviously known to be his land before and during the Māhele. The location given by both Laanui and Kapule would place Paele's land at least partially within the project area (the exact size of Paele's land is not known, of course). The land was referred to as a houselot, however, no artifacts associated with habitation structures or activities were identified on the surface or uncovered in the shovel probes on the natural terrace (Feature 31) or any other tested feature. Feature 30 was interpreted as possibly a remnant boundary marker for the southwest corner of Kapule's LCA.

Recorded testimony from both Kapule and Laanui and information on the survey maps suggests more activity in the vicinity of, and partially in, the project area. Limited testing, however, did not identify anything other than probable dry land agricultural activities having taken place on the slope.

INITIAL SIGNIFICANCE ASSESSMENTS

The features in this report have been included as a previously unrecorded portion of Site 236, the Pōhakupili Complex. Site 236 is considered significant under Criterion D because its high research and interpretive potential. In addition, the site is considered to have cultural and/or religious significance due to the presence of a religious feature and is therefore also significant under Criterion E. For the purposes of this report, Features 31 and 32 of Site 236 are no longer considered significant, as sufficient data has been recovered in the form of maps, photos, notes and through excavation. Features 18, and 23 through 30 are considered significant under Criterion D.

RECOMMENDATIONS

No additional field work is recommended for Features 31 and 32 at Site 236. Features 18, and 23 through 30 are recommended for preservation as is. Prior to construction, a Preservation Plan needs to be prepared for the project area outlining how the features will be preserved during construction and afterwards.

The archaeological findings presented here are based on a 100% surface survey of the project area and limited sub-surface testing. The remaining portions of the slope, areas along the stream banks, and road access corridors were not surveyed. It is understood by the client that any development outside the project area would require further archaeological investigation. There is always the possibility that subsurface cultural deposits may be recorded during subsequent developmental activities or future archaeological investigations. If this occurs, archaeological consultation should be sought.

REFERENCES CITED

- Chinen, Jon J.
1961 *Original Land Titles in Hawaii*. Copyright 1961 Jon Jitsuzo Chinen.
- Cordy, Ross, Joseph Tainter, Robert Renger, Robert Hitchcock
1991 *An Ahupua`a Study: The 1971 Archaeological Work at Kaloko Ahupua`a North Kona, Hawaii*. National Park Service. Publications in Anthropology No. 58. University of Nebraska.
- Barrère, Dorothy B.
1994 *The King's Mahele: The Awardees and Their Lands*. Copyright 1994 Dorothy B. Barrère.
- Foote, D., E. Hill, S. Nakamura, and F. Stephens
1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii*. U.S. Dept. Of Agriculture, Soil Conservation Service. The University of Hawai`i Agricultural Experiment Station.
- Fornander, A.
1980 *An Account of the Polynesian Race*. Charles E. Tuttle Company. Rutland Vermont.
- Handy, E.S. Craighill
1940 *The Hawaiian Planter, Vol. 1*. Bishop Museum Bulletin 161. Bishop Museum Press. Honolulu.
- Hommon, Robert J.
1981 *An Archaeological Reconnaissance Survey of the Ahupua`a of Kainalu, Puelelu, Puniuohua 1 and Puniuohua 2; Molokai*. Prepared for Science Management Inc.
- Kirch, Patrick V.
1984 *Evolution of the Polynesian Chiefdoms*. Cambridge University Press. Cambridge.

1985 *Feathered Gods and Fishhooks*. University of Hawaii Press. Honolulu.
- Kirch, Patrick V. and Marion Kelly,
1975 *Prehistory and Ecology in a Windward Hawaiian Valley: Halawa Valley, Molokai*. Pacific Anthropological Records No. 24. Dept. Of Anthropology, Bishop Museum. Honolulu

- McCoy, Patrick C. and Barry Nakamura
1993 *Preliminary Historical and Archaeological Research at Pua`ahala, Moloka`i*.
Prepared for K & H Horizons.
- Moffat, Riley M. And Gary L. Fitzpatrick
1995 *Surveying the Mahele*. An Editions Limited Book. Hong Kong.
- Rosendahl, Paul
1972 *Aboriginal Agriculture and Residence Patterns in Upland Lapakahi, Island of Hawaii*. Ph. D. Dissertation. University of Hawai`i. Unpublished,
- Schilt, Rose
1984 *Subsistence and Conflict in Kona, Hawai`i*. Dept. of Anthropology.
Departmental Report Series 84-1. Bishop Museum. Honolulu.
- Summers, Catherine C.
1971 *Molokai: A Site Survey*. Pacific Anthropological Records No. 14. Dept. Of
Anthropology, Bishop Museum. Honolulu.
- Weisler, M. And P. V. Kirch
1984 "The Structure of Settlement Space at Kawela, Moloka`i". *New Zealand J. Of
Archaeology, Vol. 7:29-158*.

PRELIMINARY DRAINAGE AND EROSION
CONTROL REPORT

PRELIMINARY
DRAINAGE AND SOIL EROSION CONTROL STUDY
FOR
PROPOSED POHAKUPILI RESIDENCE

AT POHAKUPILI, MOLOKAI, HAWAII

TAX MAP KEY: (2) 5-8-08:02 (PORTION) &
(2) 5-8-15:03 (PORTION)

PREPARED FOR:

PUU O HOKU RANCH, LTD.
84 STATE STREET, SUITE 900
BOSTON, MA - 02109

PREPARED BY:

R. T. TANAKA ENGINEERS, INC.
871 KOLU STREET, SUITE 201
WAILUKU, MAUI, HAWAII - 96793
JOB NO. 98-14

MARCH 1998

TABLE OF CONTENTS

- I. LOCATION & PROJECT DESCRIPTION
- II. EXISTING SITE & DRAINAGE CONDITIONS
- III. FLOOD HAZARDS
- IV. STORM FLOW
- V. PROPOSED GRADING AND DRAINAGE FACILITIES
- VI. SOIL EROSION CONTROL
- VII. SUMMARY AND CONCLUSION
- VIII. REFERENCES
- IX. FIGURES
 - FIGURE 1 - LOCATION MAP
 - FIGURE 2 - SITE MAP
 - FIGURE 3 - FLOOD MAP

I. LOCATION & PROJECT DESCRIPTION:

The proposed Pohakupili Residence for Puu O Hoku Ranch, Ltd. will be located on the eastern tip of the island of Molokai as shown on Figure 1. It will be constructed on the western side of the mouth of Pohakupili Gulch, but will be sited outside of the 150 foot shoreline setback line.

The proposed residence will have three (3) detached structures consisting of a 1,250 square foot house, a 352 square foot pavilion and an 80 square foot bath house. The approximate location of the future structures are shown on Figure 2.

II. EXISTING SITE & DRAINAGE CONDITION:

A. General:

The proposed pavilion will be built on Parcel 2 of TMK 5-8-08 while the residential house and bath house will be constructed on Parcel 3 of TMK: 5-8-15. Parcel 2 is a 0.2 acre lot located at the mouth of Pohakupili Gulch. Parcel 3 is a large tract of land along the eastern coast of Molokai, containing an area of 474.22 acres.

B. Topography:

A topographic survey of the project area is shown on Figure 2. Based on this topographic survey map, the land at the building site slopes in an easterly direction toward Pohakupili Gulch at an average slope of about

thirty five (35) percent. The ground elevation ranges from 20 feet at the pavilion to 66 feet at the bath house site.

In general, the project site is covered with miscellaneous vegetation. There are also rock outcrops and scattered stones and boulders.

C. Drainage:

There are several drainageways that traverse Parcel 3, such as Wailoku Gulch, Pohakupili Gulch, Keaina Gulch, Waialapai Gulch and Honoulimaloo Stream.

The project area is part of the Pohakupili Gulch watershed. Storm runoff from the project area sheet flows in an easterly direction into the mouth of the gulch.

III. FLOOD HAZARDS:

Based on this preliminary study, the project area, in general, falls outside the established 100-year coastal flood hazard area as delineated on Figure 3. The coast below the project area is designated Zone "V30," which is a Special Flood Hazard Area inundated by a 100-year flood and that have additional hazards due to velocity (wave action). The established base flood elevation at the mouth of Pohakupili Gulch ranges between 26 and 28 feet.

According to the topographic survey map, the proposed pavilion will sit on elevations between 20 and 26 feet, which is within the designated Flood Zone V30.

Therefore, although the proposed finished floor elevation of the pavilion is 29 feet (above the 28 foot base flood elevation) the proposed pavilion must be constructed under the applicable standards set forth by Chapter 19.62, "Flood Hazard Areas," of the Maui County Code.

IV. STORM FLOW:

A. Basis of Calculations:

This drainage hydrologic calculation is based on applicable formulas, charts and tables from the "Rules for the Design of Storm Drainage Facilities in the County of Maui" [1]. The rational formula $Q = CIA$ was employed to determine storm runoff.

Where:

Q = Storm Runoff (c.f.s.)

C = Runoff Coefficient

I = Rainfall Intensity (in./hr.)

Recurrence Interval, $T_m = 10$ year (1 hr. - rainfall = 2.6")

A = Drainage Area, acre

A. Runoff Coefficient (c):

Runoff coefficient values are as follows:

Unimproved Areas = 0.30

Building, Roofs, Pavements, etc.

(Impervious area) = 0.95

B. Storm Flow Calculations:

(Note: Assume the proposed structures are attached to each other.)

1. Existing Conditions:

Area = 0.04 acres (occupied by proposed improvements)

Slope = 35%

Length of Slope = 60 ft.

Tc = 6 min. (Average Grass)

I = 6.40"

Thus:

$$Q_{\text{Existing}} = CIA = 0.30 \times 6.40 \times 0.04 = 0.08 \text{ c.f.s.}$$

2. Proposed Development:

Area = 0.04 acres

Slope = 2.0% (Assumed)

Length of Slope = 60 ft.

Tc = 5 min. (Paved)

$$I = 6.70''$$

Thus:

$$Q_{\text{Proposed}} = CIA = 0.95 \times 6.70 \times 0.04 = 0.25 \text{ c.f.s.}$$

The expected increase in runoff due to construction of the residential structures is $0.25 - 0.08 = 0.17 \text{ c.f.s.}$

V. PROPOSED GRADING & DRAINAGE FACILITIES:

Grading at the site will be minimal. It is anticipated that grading will be done only to properly receive the proposed building structures. Any exposed areas not occupied by the buildings and walkways will be landscaped.

There are no drainage facilities planned for this project. Runoff from the new building will drain into the yard to join the surface runoff waters generated by the surrounding lands. It will then sheet flow into Pohakupili Gulch similar to the existing drainage pattern previously described in Section IIC of this Study.

VI. SOIL EROSION CONTROL:

A. Soil Types:

The soil at the project area is classified as Koele-Badland Complex (KRL) by the Soil Conservation Service of the United States Department of Agriculture [2]. According to the soil survey, this soil complex occurs near Cape Halawa, Molokai at elevations ranging from nearly sea level to 500 feet.

The Koele portion of the soil complex is similar to Koele Silty Clay Loam (KrB) which is characterized as having moderately rapid permeability, slow to medium runoff and light to moderate erosion hazards. These soils however, are easily eroded if bare of vegetation.

The Badland portion of the complex consists of highly weathered rocks with few rock outcrop and scattered stones and boulders. They occur mainly along the side of gulches.

B. HESL Soil Loss for the Project During Construction:

Soil erosion is not expected to occur during construction of the building due to the minimal ground exposure (about 1/25 of an acre). It is expected that ground disturbance will be done only for the building structures and walkways that connect the various buildings. However, temporary erosion control measures should be implemented during construction such as:

- 1) providing temporary berms or swales to divert runoff away from the graded areas; and
- 2) installation of berms or silt fences downstream of the graded areas to prevent sediment-laden runoff from leaving the graded areas.

VII. SUMMARY AND CONCLUSION:

Based on this preliminary study, the construction of the proposed residence will increase the 10-year runoff at the project area from 0.08 to 0.25 c.f.s., an addition of 0.17 c.f.s. This increase in runoff is insignificant and existing drainage patterns will not be altered. Therefore, no adverse drainage affects on adjacent and downstream properties are anticipated.

VIII. REFERENCES:

1. Rules for the Design of Storm Drainage Facilities in the County of Maui, Title MC-15, Department of Public Works and Waste Management, County of Maui, Chapter 4.
2. Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii, prepared by U. S. Department of Agriculture, Soil Conservation Service, August 1972.
3. Rainfall-Frequency Atlas of the Hawaiian Islands, Technical Paper No. 43, U. S. Department of Commerce, Weather Bureau, 1962.
4. Flood Insurance Rate Maps for the County of Maui, September 6, 1989.

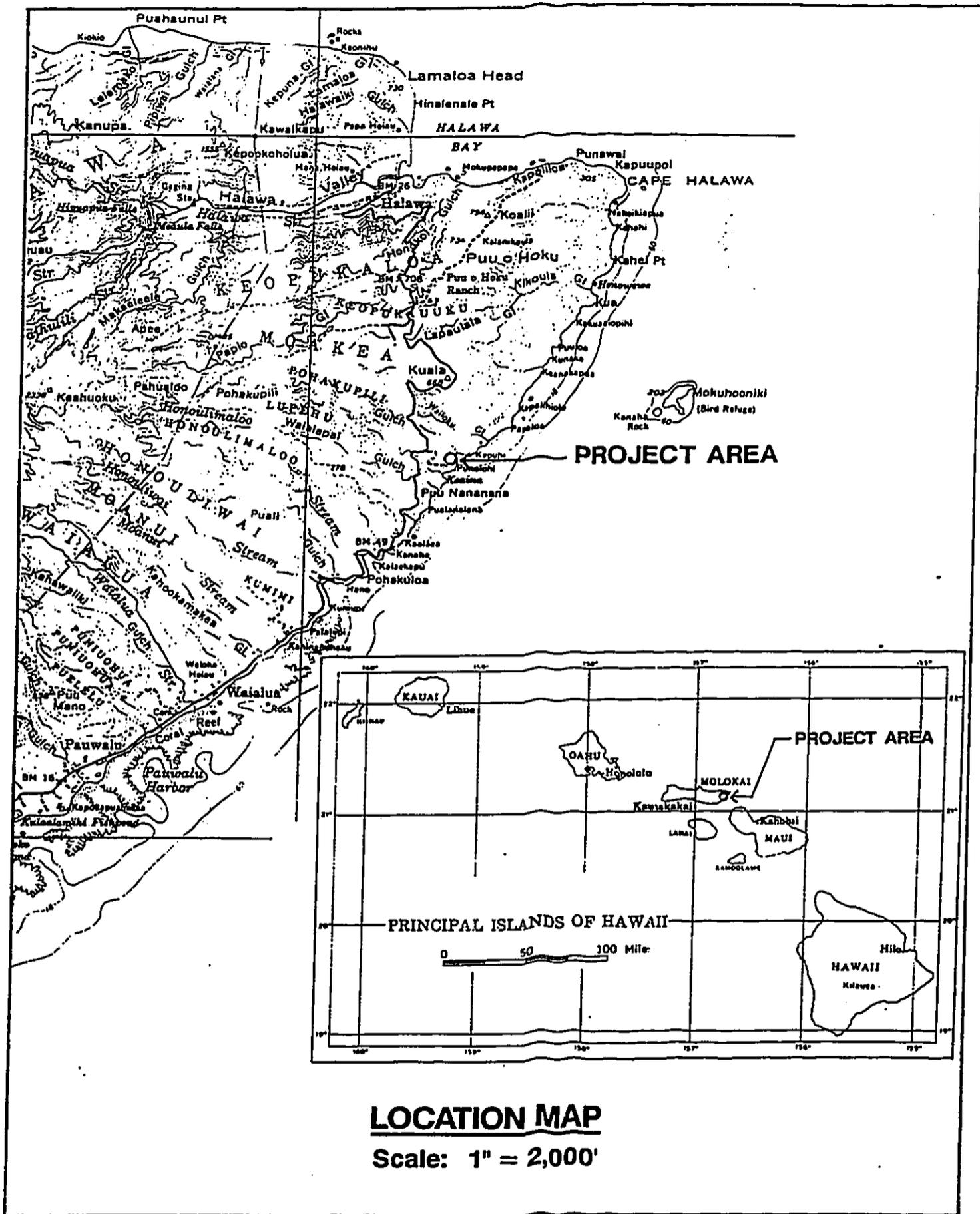
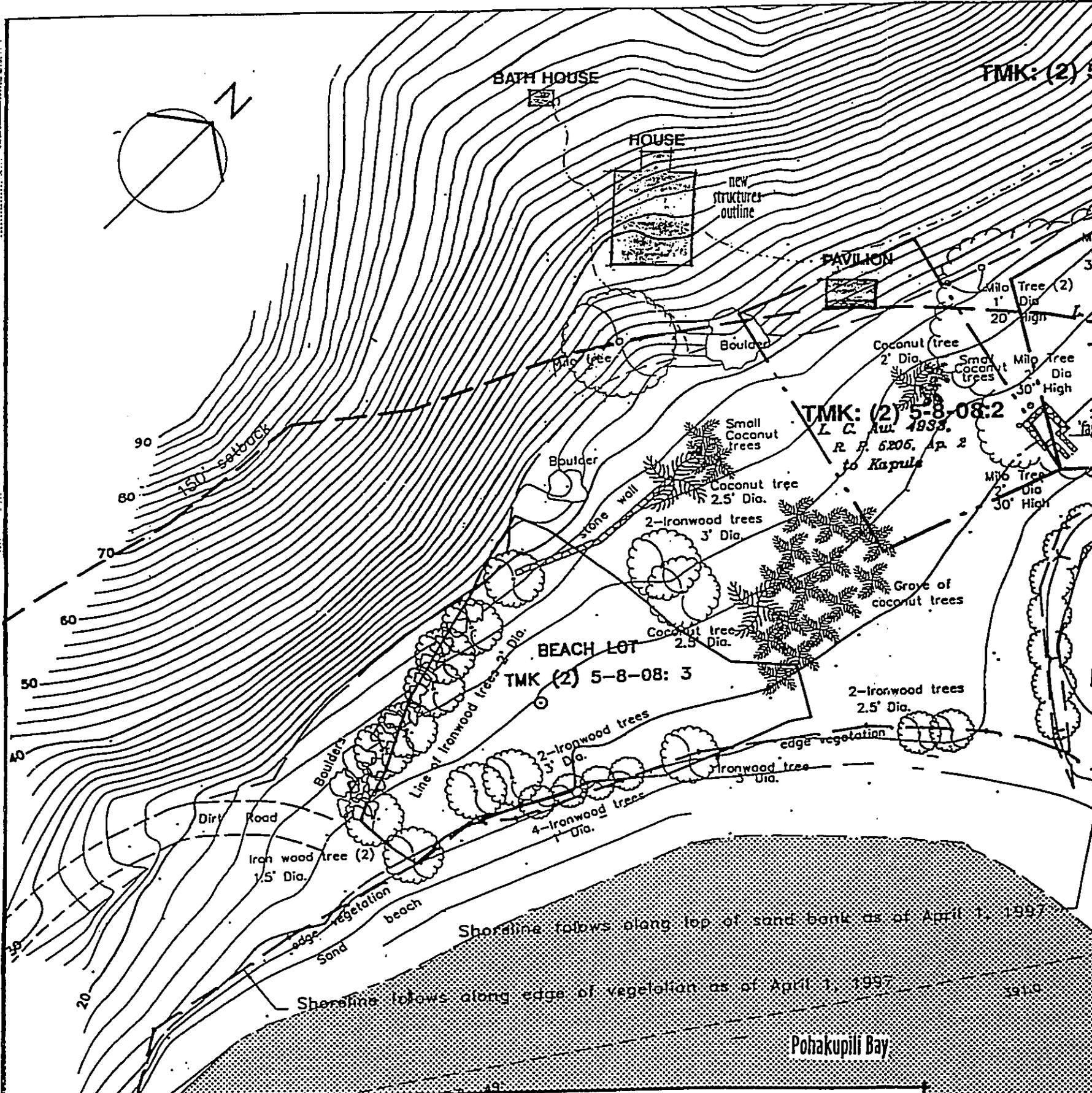


FIGURE 1

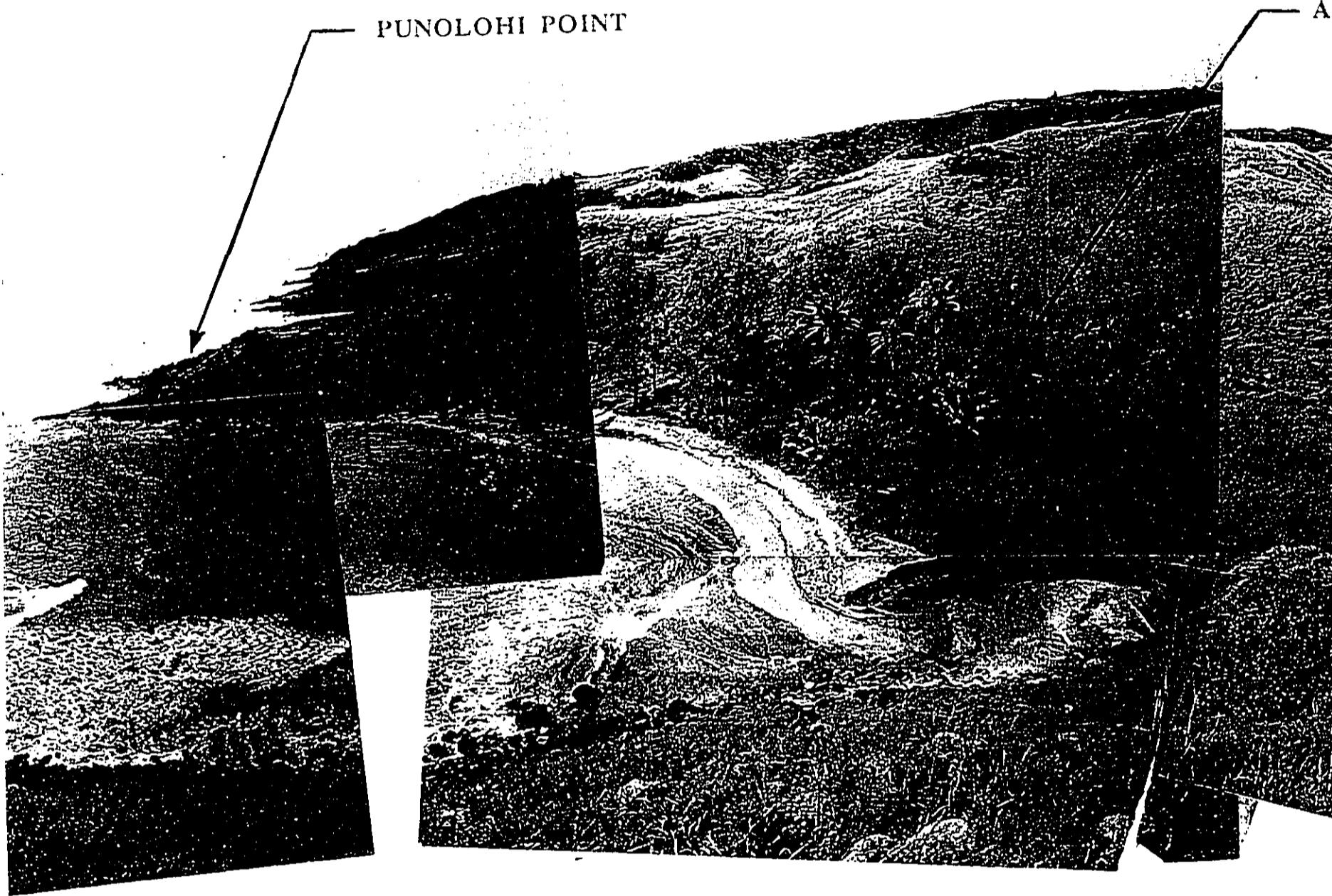


POHAKUPILI HOUSE - 03
LAND SURVEY (site area)

12/10/97

MOLOKAI
 Scale 1" = 40'

SITE PHOTOGRAPHS

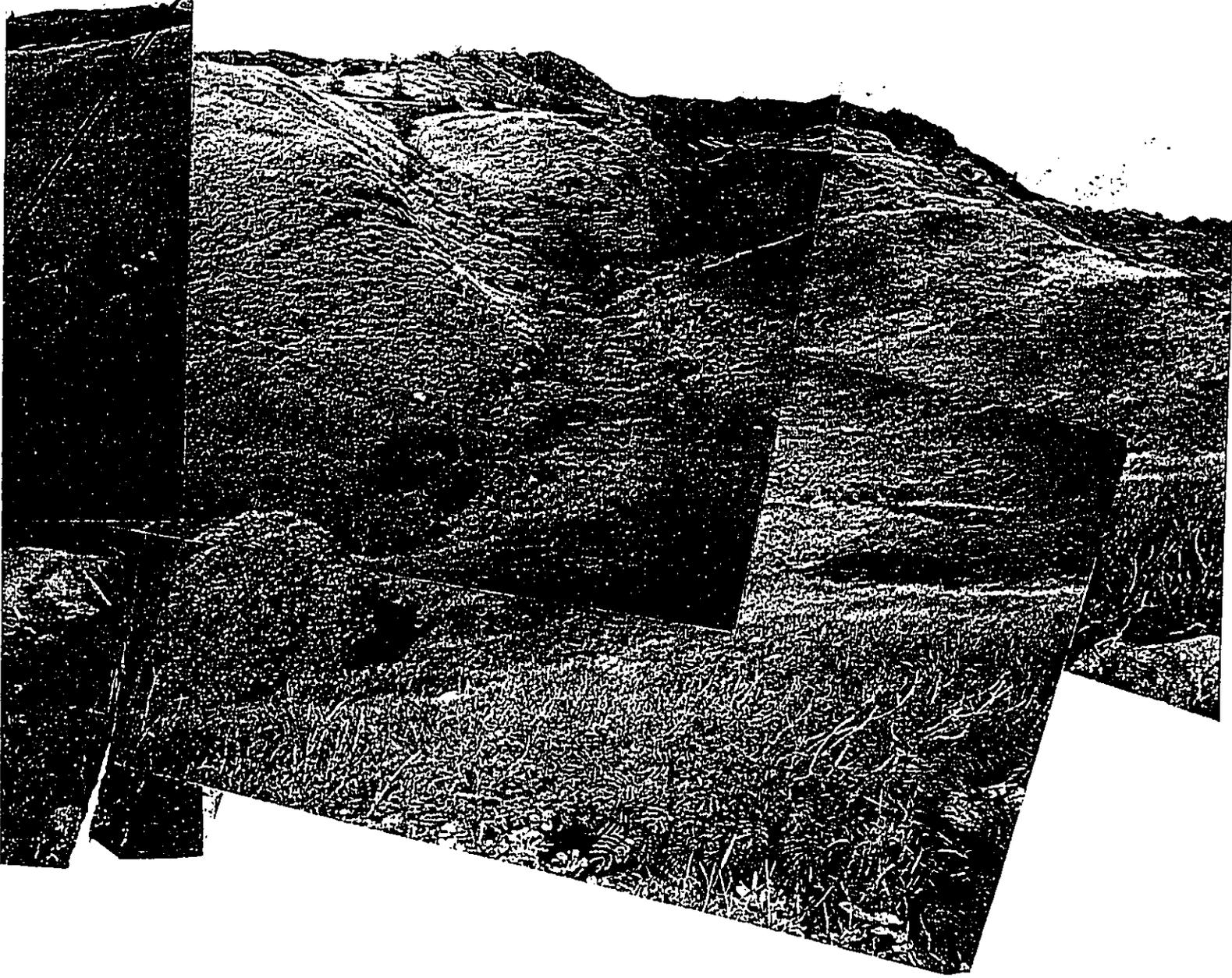


PUNOLOHI POINT

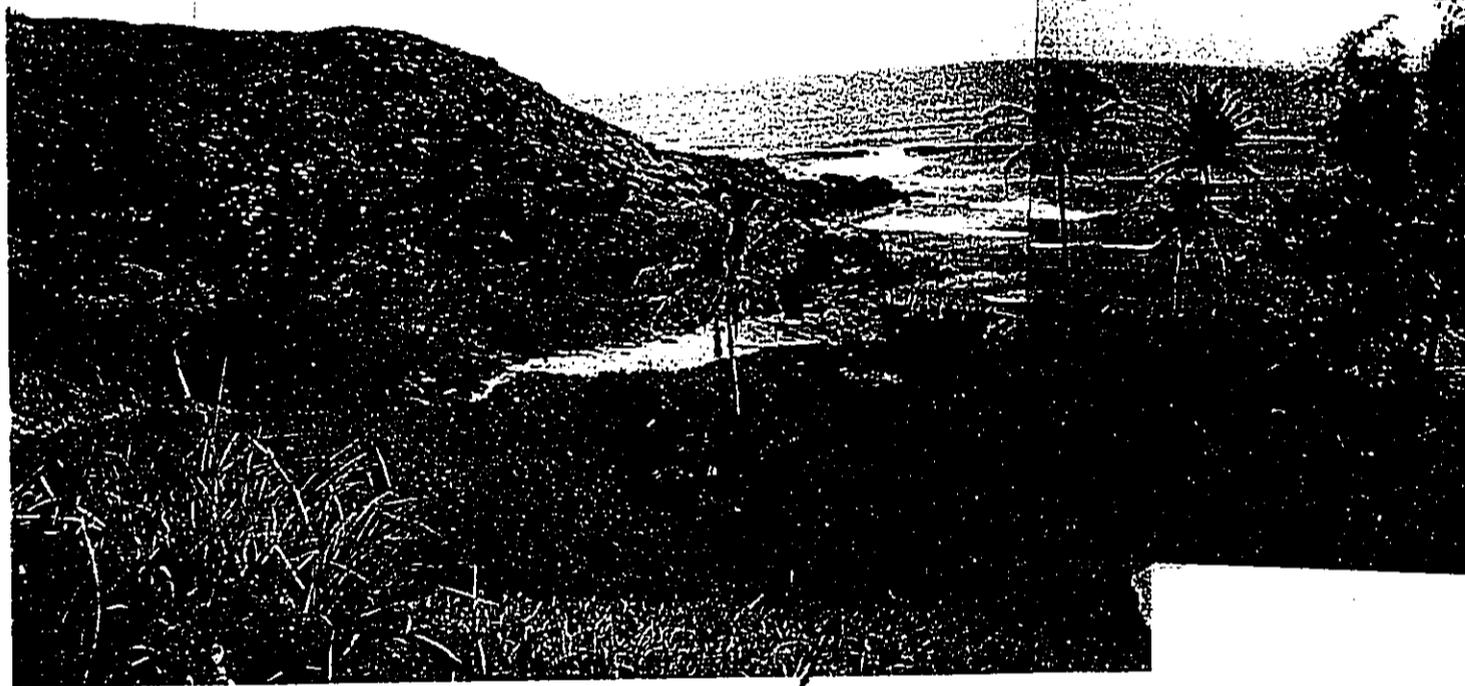
A

VIEW OF PROJECT SITE LOOKING

APPROXIMATE LOCATION OF PROPOSED
SINGLE FAMILY DWELLING

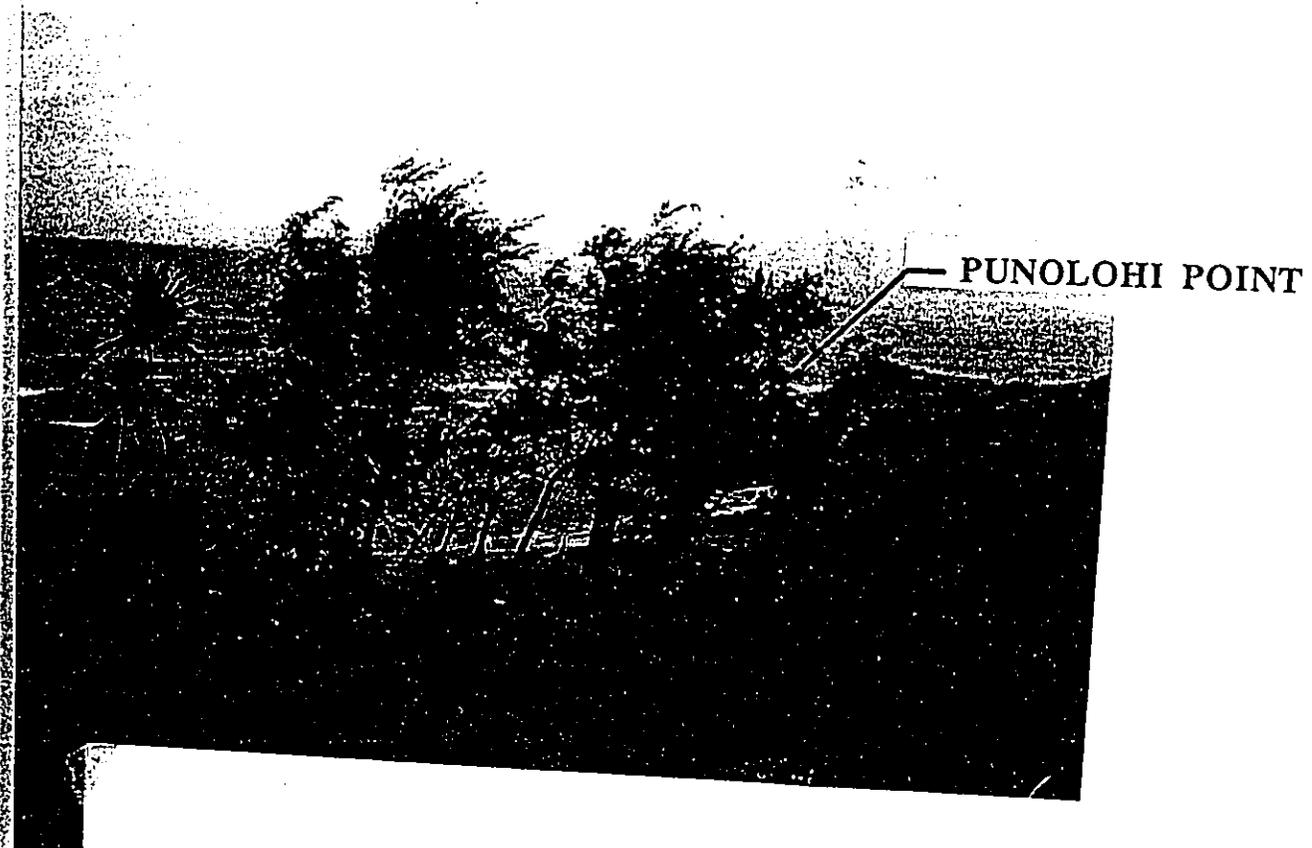


T SITE LOOKING SOUTH



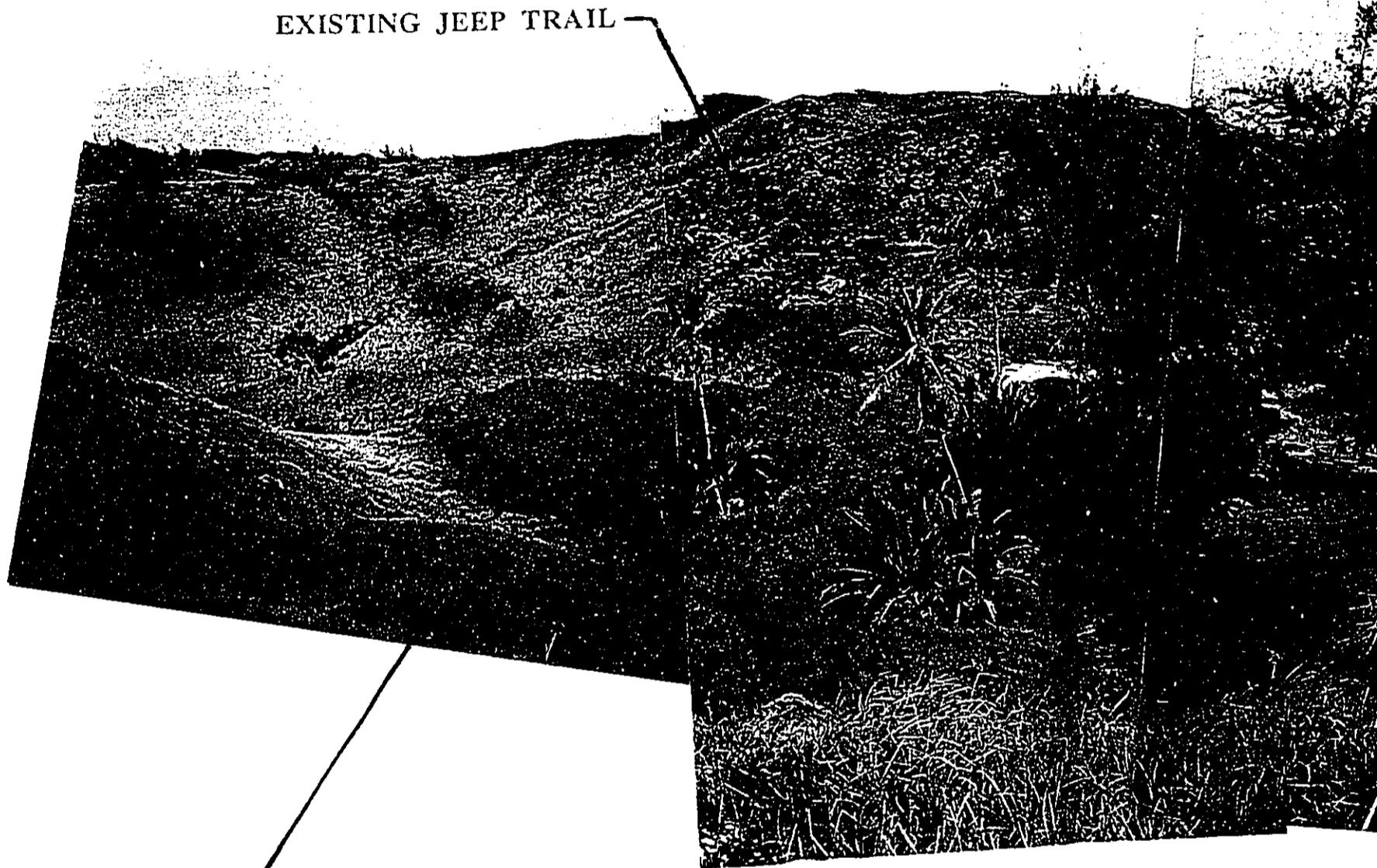
APPROXIMATE LOCATION OF PROPOSED
SINGLE FAMILY DWELLING

VIEW LOOKING MAKAI



KING MAKAI

EXISTING JEEP TRAIL



APPROXIMATE LOCATION OF PROPOSED
SINGLE FAMILY DWELLING

VIEW LOOKING NORTH



KING NORTH



KING NORTH

MISCELLANEOUS TECHNICAL INFORMATION

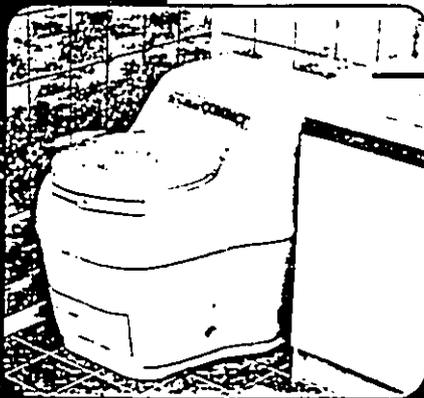
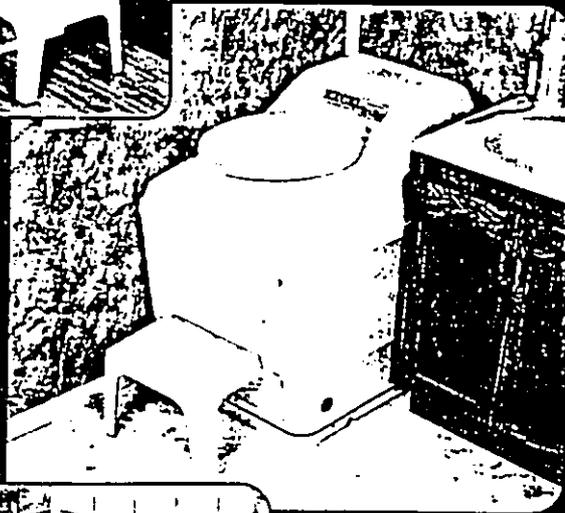
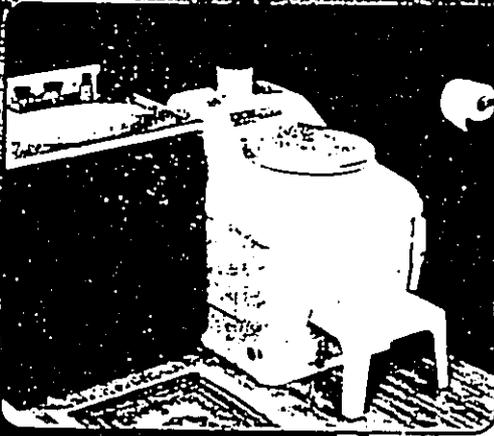
DOCUMENT CAPTURED AS RECEIVED

SUN-MAR

COTTAGE TOILETS

1-9-9-6-9-7-C-A-T-A-L-O-G

NO SEPTIC SYSTEM • NO CHEMICALS • ODORLESS



COMPOSTING TOILETS

SUN-MAR COMPOSTING TOILETS

SUN-MAR composting toilets have become the *ideal solution* for cottages, cabins, or camps; for remote work places; or simply for those who know that recycling waste is the right thing to do!

SUN-MAR toilet systems are economical, quick to install, and easy to use. Most models require no water supply or plumbing.

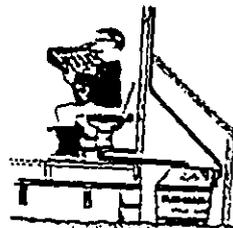
Wherever there is a poorly working septic system, a SUN-MAR can take care of the toilet waste; where there is an outhouse, we offer the *luxury* of an indoor facility; and where there is no toilet at all, a SUN-MAR provides the right environmental choice.

THE ENVIRONMENTAL SOLUTION

SUN-MAR composting toilets use the natural processes of *decomposition* and *evaporation* to recycle human wastes. Because waste entering the toilet is over 90% water content, it is *evaporated*, and carried back to the atmosphere through the vent system. The small amount of remaining material is converted to *fertilizing soil* by natural decomposition.

By recycling in this way, there are:
NO POLLUTANTS!

Now, **NO Septic Systems,**
NO Holding Tanks, and
NO Chemicals, are needed to handle toilet waste!



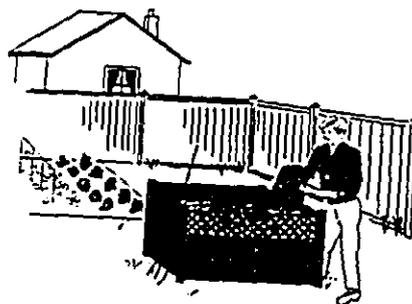
HOW COMPOSTING WORKS

Working like the compost heap in the backyard, but odorlessly, and much faster, SUN-MAR toilets and toilet systems decompose human waste and toilet paper. *Heat, oxygen, moisture, and organic material* are needed to allow natural organisms called microbes to transform the waste into a useful garden fertilizer.

Heat is generated by the compost itself, assisted by the heating elements (on electric models); while oxygen is provided by the ventilation system, and the periodic tumbling of the composting drum. Organic material in the form of SUN-MAR peat mix is added manually,

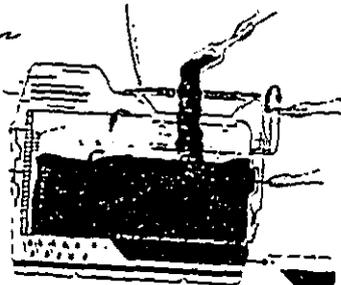
but regular peat moss may be used as an acceptable substitute.

Moisture is obtained directly from human waste, while the microbes are in the rich top soil which is added to the compost to *start* the process.



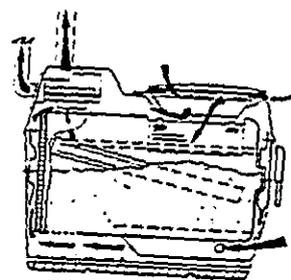
START UP AND USE

SUN-MAR units require very little maintenance. Peat mix (or peat moss) should be added at the rate of *one cupful* per person using the toilet per day. Toilet paper can and should be added. The compost should be mixed and aerated every third day (or at the end of the weekend) while the toilet is in use, simply by turning the drum handle and *rotating the drum*. In cottage use, some composted material is usually only extracted in the *spring*. In residential or commercial use, compost may be extracted more frequently.



ODOR FREE

The engineered airflow within SUN-MAR units ensures there is a *partial vacuum* which means that as air is continuously drawn into the toilet, there is no back draft, and hence *no smell*. In addition, the rotation and aeration made possible by the tumbling action of the drum, ensures a *fast, aerobic*, and therefore odorless breakdown of the compost. (Aerobic bacteria produce only *carbon dioxide* and *water vapor*, quite unlike the unpleasant anaerobic smell often found in a septic tank, outhouse, or backyard compost).

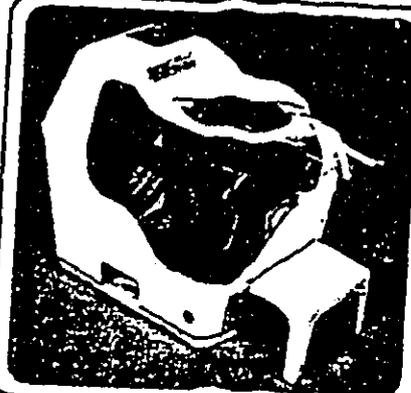


MICROBES AND THE BIO-DRUM™

SUN-MAR's unique composting drum (we call it the *Bio-drum™*) provides an ideal *warm, moist, and oxygen rich* environment for aerobic microbes to break down waste and toilet paper, quickly and odorlessly, back to their basic minerals. The high composting efficiency made possible by the *Bio-drum™* accounts for the *superior performance* of SUN-MAR products.

WINTER USE

SUN-MAR makes its units out of *fibreglass* and marine grade stainless steel, so freezing temperatures will do *no damage* even if the compost freezes in the drum. However, for extended winter use, the unit should be kept at a minimum temperature of about 60°F (15° C) and the vent pipe should be well insulated. For periodic use in winter, the toilet may be used as a holding tank.



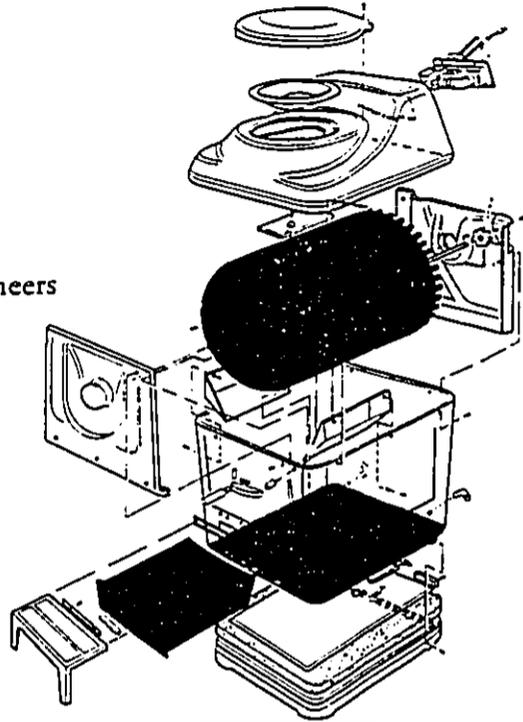
THE SUN-MAR THREE CHAMBER SYSTEM

A composting toilet must perform three separate tasks:

- 1 Compost the waste and toilet paper quickly and odorlessly.
- 2 Ensure that the finished compost is safe and easy to handle.
- 3 Evaporate the liquid.

Through many years of research and development, SUN-MAR engineers realized that these three different tasks required *separate chambers*, each with its own *independent environment*. The development and use of a Bio-drum™ as the composting chamber was key in keeping the compost oxygenated, mixed, moist and warm.

This revolutionary new three chamber approach first developed by SUN-MAR in 1979 proved so successful that composting speeds were doubled when compared to the old single chamber units with mechanical mixers. The last single chamber unit, the TROPIC, was dropped from our product line in 1995.



1 THE COMPOSTING CHAMBER

Waste and peat moss enters through a port in the top of the Bio-drum™. The drum handle on the front of the unit is turned periodically to rotate the Bio-drum™. 4-6 revolutions of the drum every third day, while in use, appears to be ideal.

This tumbling action thoroughly oxygenates and mixes every part of the compost, and keeps it uniformly moist. As the drum rotates, a door closes automatically to keep the waste inside the drum. After turning, a lock maintains the Bio-drum™ in a top dead centre position, ready to receive new material.

To prevent the compost from getting saturated, a screen at the rear of the drum filters any *excess liquid* directly into the evaporating chamber. By protecting the compost from direct heat, the Bio-drum also keeps the compost uniformly moist. Lastly, the Bio-drum™ can hold the necessary mass of material to retain the *natural heat* developed in the core of the

compost. On some units, insulation on the outside of the drum prevents heat loss from the Bio-drum™. In the spring time, or when the drum gets 2/3rds. full, some compost is extracted into the finishing drawer. This is done simply by pulling the drum lock, and rotating the drum *backwards*. Now, the drum door remains open, and compost falls into the second chamber, the compost finishing drawer.

2 THE COMPOST FINISHING DRAWER

The compost finishing drawer, the second independent chamber, is below the composting drum, and just above the evaporating chamber. Compost in this drawer is totally isolated from material in the Bio-drum™, is surrounded by *drying air*, and is no longer subject to *contamination* from fresh waste. It is here that the composting and sanitation processes are completed and the compost becomes safe to handle. Even so, to be doubly safe, compost should not be used on edible vegetables.

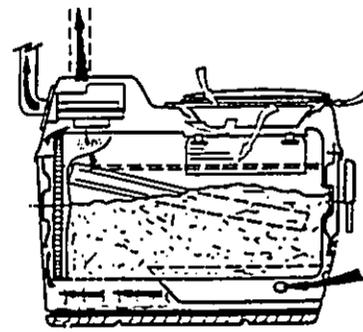
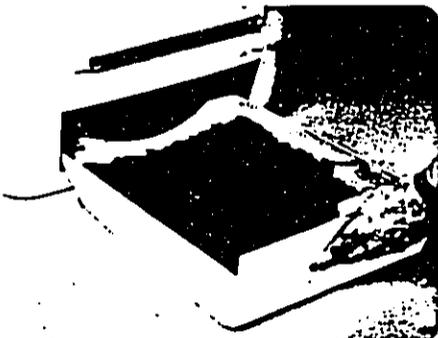
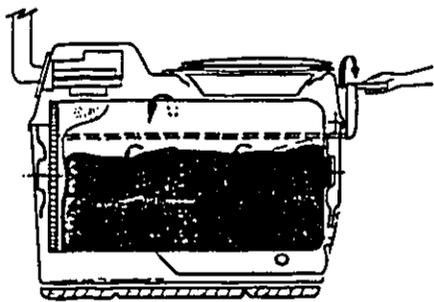
The pull-out finishing drawer is removed

by hand (no tools or screws are needed) and the sanitized compost may be emptied whenever it is necessary to extract more compost from the drum.

3 THE EVAPORATING CHAMBER

The third chamber, the base of the toilet, is the evaporating surface from where any *excess liquids* which cannot be absorbed by the compost are evaporated or drained. Air is drawn in through intake holes at the base of the toilet, over the evaporating surface, and up the vent stack. On electric models, air is drawn in by a fan, while non-electric models use natural draft, induced by the chimney effect of a 4" vent stack. In both cases a *partial vacuum* is maintained which ensures that no odors can escape.

Evaporation is assisted on electric models by a *thermostatically* controlled heating element in a sealed compartment underneath the evaporating chamber. This heater keeps the floor of the chamber hand warm without drying out the compost.



MODEL SELECTION

Although SUN-MAR has an array of some 15 models from 6 unique product lines to choose from, selecting the right model is not as difficult as you may think!

- If you want a toilet in the bathroom and the composting unit underneath or outside, then pick a Central Composting Toilet System. Otherwise choose a Self-Contained Unit.
- If you have 110V electricity you should select an electric model. If not, choose a non-electric model.
- If there is an option, we recommend selecting a unit with more capacity than you really need.

SELF-CONTAINED UNITS



ECOLET 110

Model designed for use where space is very limited. 19 1/2" Wide, 21 1/2" Long.

CAPACITY (PEOPLE)

Weekend & Vacation use: 3-5
Residential/Continuous use: 1-2

See page 5



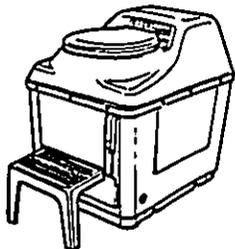
COMPACT

Elegant medium capacity electric unit with patented variable diameter Bio-drum™.

CAPACITY (PEOPLE)

Weekend & Vacation use: 3-5
Residential/Continuous use: 1-2

See page 5



EXCEL

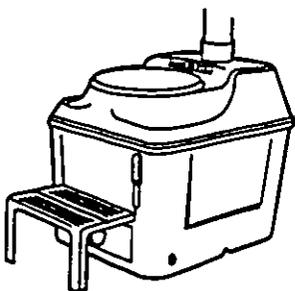
High capacity electric model with large Bio-drum™.

CAPACITY (PEOPLE)

Weekend & Vacation use: 6-8
Residential/Continuous use: 3-5

See page 6

NON-ELECTRIC



EXCEL NE

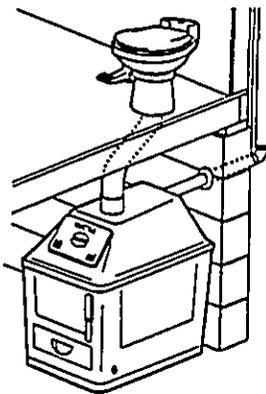
Non-electric version of the EXCEL with insulated Bio-drum™ and 4" vent.

CAPACITY (PEOPLE)

Weekend & Vacation use: 5-7
Residential/Continuous use: 2-3

See page 6

CENTRAL SYSTEMS



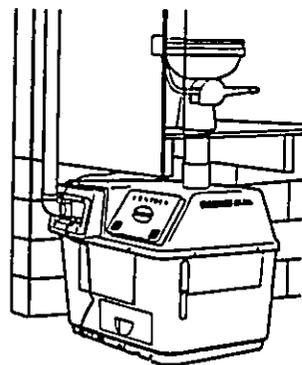
WCM

High capacity electric unit with rear venting, ideal for basements or narrow spaces.

CAPACITY (PEOPLE)

Weekend & Vacation use: 7-9
Residential/Continuous use: 4-6
(4 Adults or a Family of 6)

See page 7



CENTREX

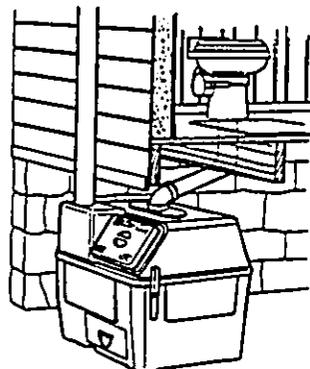
Low profile, high capacity electric unit with insulated Bio-drum™ and front venting.

CAPACITY (PEOPLE)

Weekend & Vacation use: 7-9
Residential/Continuous use: 4-6
(4 Adults or a Family of 6)

See page 8

NON-ELECTRIC



CENTREX NE

Non-electric version of the CENTREX with insulated Bio-drum™ and 4" vent.

CAPACITY (PEOPLE)

Weekend & Vacation use: 6-8
Residential/Continuous use: 3-4
(3 Adults or a Family of 4)

See page 8

OTHER MODELS AVAILABLE

AC/DC versions of the EXCEL, CENTREX, and CENTREX A/F models are dual vented units (2" and 4"). Ideal for those with generators or solar panels. See pages 6 and 8

CENTREX A/F and CENTREX A/F NE are waterless central systems designed for use with a SUN-MAR Dry Toilet. See page 9
ECOLET MARINE/RV is the mobile version of the ECOLET 110. See page 5

SUN-MAR

SELF-CONTAINED UNITS

All self-contained models are waterless and require no plumbing for either water connection or waste. Installation is quick and easy, since the only task is to assemble the vent stack supplied with the unit.

Capacity ratings vary with the size of the Bio-drum™, and these ratings can be doubled for short periods. Even so, it is always better to have a good safety margin, and if possible we suggest you pick a unit with more capacity than you need.

All self-contained units have a bowl liner beneath the toilet seat which can be removed for cleaning as necessary.

Electric, self-contained units evaporate all liquids under normal operation conditions, so approvals are not normally required.

Electric toilets plug into a standard three pin electrical outlet. A fan draws air in through intakes at the base of the toilet and up the vent stack (2" on most models). This vent stack is at the rear on most electric models, and may be led through a side wall so that the vent is hidden.

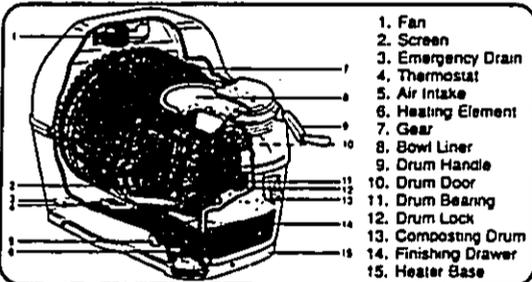
A thermostatically controlled heating element is in a sealed compartment at the bottom of the unit. This keeps the evaporating chamber hand warm which helps evaporation. Electric units should be unplugged if they are not used for 10 days or more.

Non-electric units have no fan or heater. Instead they have a 4" vent mounted at the top, which acts like a chimney on a wood stove. This vent draws air in through intakes in the base, over the evaporating surface, and up the vent stack.

COMPACT

The COMPACT is an elegant low profile unit with the looks to complement any bathroom. SUN-MAR engineers solved the challenge of incorporating a three chamber system into a low profile unit by designing and patenting a variable diameter Bio-drum™. Unlike all other units, this Bio-drum™ is large at the rear, but small at the front. The result is an electric composting toilet with an elegant rounded design which retains the well proven advantages of a three chamber system.

To maintain the uninterrupted lines of the COMPACT, a patented Bio-drum™ handle recesses into the body of the toilet, and pulls out to mix and aerate the compost. An emergency drain at the rear offers protection against heavy use or prolonged power outage.



1. Fan
2. Screen
3. Emergency Drain
4. Thermostat
5. Air Intake
6. Heating Element
7. Gear
8. Bowl Liner
9. Drum Handle
10. Drum Door
11. Drum Bearing
12. Drum Lock
13. Composting Drum
14. Finishing Drawer
15. Heater Base



CAPACITY: 3-5 people weekend/vacation use, 1-2 people residential/continuous use.

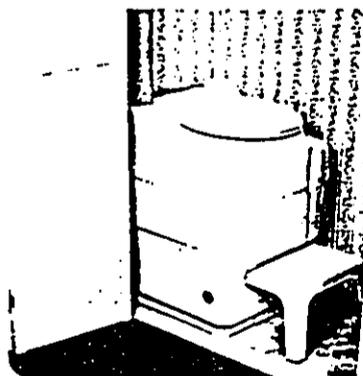
Electrical: 115 Volts, 2.0 Amps (Max.) 25 Watt Fan, 200 Watt Heater (Approx. Average Use 130 Watts). Vents: 2" Vent Pipe and Fittings (Supplied with Unit). Drains: 1/2" Emergency safety drain (Optional hook-up).

Dimensions: Width At Rear 22", Height 27 1/2", Length 33". Required installation length to remove drawer 45". Seat Height 21 1/2". Product weight: 50 lbs. Shipping weight: 90 lbs. Shipping carton: Width 27", Height 29 1/2", Length 35".

ECOLET 110

The ECOLET 110 uses a standard 110 volt supply. Its 19" width and 21" depth allows it to fit almost anywhere. Now even a closet or small corner can become a bathroom! Unlike other electric models, the 110 has a 3" vent. Evaporating capacity is limited by the smaller heater and evaporating surface, so the safety drains should be connected.

The U.S. Coast Guard certified ECOLET MARINE/RV, is the first composting toilet specifically designed to recycle waste on boats and RVs and so avoid "pump outs". The RV model is "marinized" to eliminate problems associated with violent motion. The unit has a fold up footrest, a 45° angle at the rear to accommodate most hull shapes, mounting brackets, and a 12 volt 3.4 watt fan beneath the 3" vent stack. A base compartment has both 12V and 110V heaters for when power is available. (For more details ask for an "RV" Brochure).



ECOLET 110

CAPACITY: 3-5 people weekend/vacation use, 1-2 people residential/continuous use.

Electrical: 115 Volts, 1.1 Amps (Max.) 3.4 Watt Fan, 120 Watt Heater (Approx. Average Use 75 Watts). Vents: 3" Vent Pipe and Fittings (Supplied with Unit). Drains: 1" Emergency Safety Drain (10 ft. Hose Supplied).

Dimensions: Width 19", Height 28", Length 21", (29 1/2" with footrest). Height (Footrest to seat) 17", Height (Footrest) 10", Width for installation: 20". Required length to remove drawer 31". Product weight: 40 lbs. Shipping weight: 75 lbs. Shipping Carton: Width 20", Height 35", Length 27".

SELF-CONTAINED UNIT

DOCUMENT CAPTURED AS RECEIVED



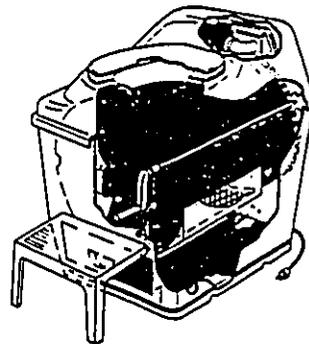
EXCEL

Long considered the standard in composting toilet performance, the EXCEL is the preferred self-contained electric model for heavy or residential use. Composting speed and capacity on this unit is *outstanding!* The large Bio-drum™ engineered into the EXCEL gives it twice the capacity of the COMPACT.

The EXCEL has been successfully tested by the National Sanitation Foundation for six continuous months at its maximum residential capacity of *four adults*. Key criteria were that the unit operated odorlessly, and produced a clean dry compost. For weekend and vacation use the capacity is 6-8 people, and even these numbers can be doubled for short periods.

For comfort, the EXCEL has a detachable footrest which can be removed to pull out the finishing drawer.

Although the EXCEL can normally evaporate all liquids, a 1/2" emergency drain is fitted at the rear and this can be connected if heavy use or prolonged power outages are expected.



CAPACITY: 6-8 people weekend/vacation use, 3-5 people residential/continuous use.

Electrical: 115 Volts, 2.5 Amps (Max.) 25 Watt Fan, 250 Watt Heater (Approx. Average Use 150 Watts).
Vents: 2" Vent Pipe and Fittings (Supplied with Unit).
Drains: 1/2" Emergency safety drain (Optional hook-up).

Dimensions: Width 22 1/2" (26" for handle), Height 32 1/2", Length 33" (42" with footrest). Height footrest to seat 18". Footrest height 11". Required length to pull out drawer: 51". Product weight: 60 lbs. Shipping weight: 100 lbs.
Shipping carton: Width 27", Height 35", Length 35".



EXCEL NE (Non-electric)

The success of the EXCEL design meant that a three chamber unit could be specifically designed for those with **NO** continuous 110 volt supply. First launched in 1981, the EXCEL NE has long been the standard toilet for those living *off the grid*.

Unlike the EXCEL, the EXCEL NE has no fan. Odorless operation is achieved by a 4" vent mounted at the top rear of the unit which acts like a chimney on a wood stove. For good air movement, the vent should be as close to vertical as possible. The EXCEL NE has no heater in the base but features an *insulated* Bio-drum™ to maintain the warmth of the compost.

If the EXCEL NE is used residentially or heavily, or is in a place which is subject to downdraft, an *optional 12 volt fan* should be installed in the vent stack. This fan draws 1.4 watts and can be powered by a solar panel and/or 12 volt battery.

Evaporating capacity on the EXCEL NE is variable, so the 1" drain at the rear should be connected to an approved drain pit, container, or other facility.

CAPACITY: 5-7 people weekend/vacation use, 2-3 people residential/continuous use.

Vents: 4" Vent Pipe and Fittings (Supplied with Unit).
Drains: 1" Drain (10 ft. hose Supplied).
Options: 12 Volt Electric Fan, 1.4 Watts (Installed in 11" length of 4" vent pipe).

Dimensions: Width 22 1/2" (26" for handle), Height 31 1/2", Length 33" (42" with step). Height footrest to seat 17". Foot rest height 11". Required length to pull out drawer 51". Product weight: 50 lbs. Shipping weight: 95 lbs.
Shipping carton: Width 27", Height 35", Length 35".

EXCEL AC/DC *Not Shown.

The EXCEL AC/DC is a standard 110 volt EXCEL unit, but with 1" safety drains at the rear and dual (2" and 4") vent stacks. A 12 volt 1.4 watt fan is included for use in the 4" vent stack. This unit is for those with *solar power/generators*, or for people expecting to have continuous 110 volt power available in the future.



Solar Panel (25" x 8" x 1")

CAPACITY: 5-7 people weekend/vacation use, 3-4 people residential/continuous use.

Electrical: DC 12 Volts, 0.12 Amps, 1.4 Watt Fan, AC 115 Volts, 2.5 Amps (Max.) 25 Watt Fan, 250 Watt Heater (Approx. Average Use 150 Watts).
Vents: 2" and 4" Vent Pipe and Fittings (Supplied with Unit).
Drains: 1" (10 ft. hose Supplied).

Dimensions: Width 22 1/2" (26" for handle), Height 32 1/2", Length 33" (42" with footrest). Height footrest to seat 18". Footrest height 11". Required length to pull out drawer 51". Product weight: 60 lbs. Shipping weight: 110 lbs.
Shipping carton: Width 27", Height 35", Length 35".

SUN-MAR

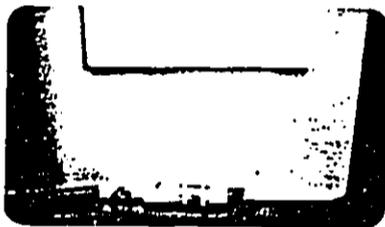
CENTRAL COMPOSTING SYSTEMS

Central Composting Systems have a 1 Pint Flush or Dry Toilet in the bathroom, with the composting unit outside or in the basement.

For units with *1 Pint Toilets*, installation involves hooking up the water and mounting the toilet in the bathroom, connecting 3" plumbing pipe from the toilet to the composter, and erecting the 2" vent stack supplied with the unit (4" on non-electric units). The extra flushing liquid on these units keeps the compost very moist which often means faster composting speeds.

To avoid blockages, the 3" waste piping should be either *vertical* (from 45° to 90°) and/or close to *horizontal* with a 1/8" to 1/4" drop per ft. Horizontal distances over 20 ft. are not normally recommended. Units have been successfully placed over 40 ft. away, although in such cases an extra weekly flush through may be needed. In Ontario, horizontal piping may be limited by regulations.

For all *Non-electric Central* units and all those using *1 Pint Toilets*, the overflow security drain must be connected (10 ft. of drain hose is supplied with the unit). *Excess liquid*, if any, should be collected and/or disposed of in an approved facility such as a recycling bed, old septic system, holding tank or drain pit. Electric units should be unplugged if they are not to be used for 10 days or more.



Evaporating capacity on electric central units

depends on climatic conditions, and on the volume, warmth, and absorption capacity of the compost. Electric units with a Dry Toilet are normally able to evaporate all the liquid they receive.

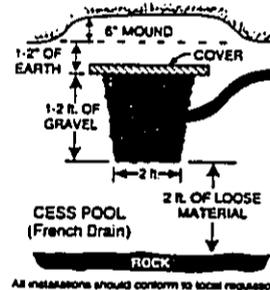
If a *Dry Toilet* is used, the toilet must be placed directly *over* the composting unit.

Peat moss is routinely added through the access port twice weekly on Central units (while they are in use) or on departure after weekend use.

For continuous winter use, the whole installation must be kept in a warm, insulated enclosure. The unit should be plugged in, and all piping should be well insulated. For limited use during winter (approx. 2-3 weekends) the Bio-drum™ can be used as a holding tank. Electrical units should be plugged in on arrival so the ventilation system is working, and the 1 Pint Toilet can be flushed manually with a container of water.

OVERFLOW SECURITY DRAIN

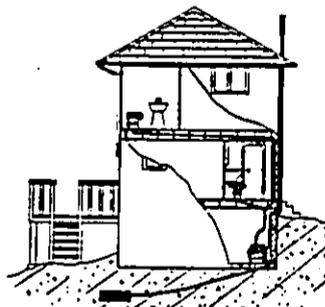
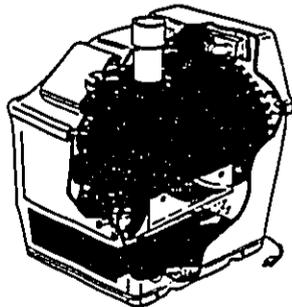
Drain pits for excess liquid should be installed in accordance with local regulations. In many areas this is about 1ft. deep and 2 ft. in diameter. A sturdy cover (plastic, tin or wood) and a 6" mound of earth should be placed over the drain pit to prevent soil and surface water from settling into the gravel.



All installations should conform to local regulations.

WCM (Water Closet Multrum)

The WCM, the original Central Composting unit, was first introduced in 1979. Current versions of this rugged and *highly successful system* incorporate all the improvements that have been made since that time. The *vent* and *drain* on the WCM are at the rear, and peat mix is easy to add since the port is in the top of the unit. These features make the WCM the best choice for installation where there is adequate headroom such as in a basement. Here the unit can be placed against a wall and the vent can be built through or directly up the wall. The WCM is only 22 1/2" wide, a feature which makes it the ideal unit for fitting into narrow spaces.



CAPACITY: 7-9 people weekend/vacation use, 4-6 people residential/continuous use.

Electrical: 115 Volts, 2.5 Amps (Max.) 25 Watt Fan, 250 Watt Heater (Approx. Average Use 150 Watts).
Vent: 2" Vent Pipe and Fittings (Supplied with Unit).
Drain: 1" Drain (10 ft. Hose Supplied with Unit).

Dimensions: Width 22 1/2" (26" for handle), Height 32 1/2", Length 33".
Required length to remove drawer 51". Height to Waste Pipe Inlet 31".
Product weight: 60 lbs. Shipping weight: 100 lbs.
Shipping carton: Width 27", Height 35", Length 35".

DOCUMENT CAPTURED AS RECEIVED

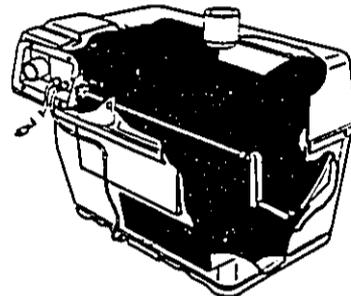


CENTREX

The CENTREX differs from the WCM in that the CENTREX Bio-drum™ is insulated and mounted transversely, the vent and fan are at the front, and the drains are on the side. These differences mean that the CENTREX is a lower profile, front serviceable unit. At only 27 1/2" high (the waste inlet is 26 1/2"), this unit is ideal for installations under, or to the side of buildings where height is important. If the CENTREX is exposed, electrical components should be protected from rain and flooding.

The CENTREX is supplied with a straight waste inlet connector. This can be replaced if necessary, by a 45° or 90° fitting to provide inlet access from any direction.

Where there is not enough height to gravity feed from the toilet to the CENTREX, extra height can be found either by raising the toilet, and/or lowering the composting unit. The waste inlet pipe can be raised by mounting the toilet on a step in the bathroom, and/or by installing a low profile toilet (a SEALAND 911 or 511) on a 6" platform. If the composting unit is lowered, ensure that rain water drains away from the unit, the finishing drawer can be removed, and the overflow drains are installed correctly.



CAPACITY: 7-9 people weekend/vacation use, 4-6 people residential/continuous use.

Electrical: 115 Volts, 2.5 Amps (Max.) 25 Watt Fan, 250 Watt Heater
(Approx. Average Use 150 Watts).
Vents: 2" Vent Pipe and Fittings (Supplied).
Drains: 1" Drain (10 ft. hose Supplied).

Dimensions: Width (excluding handle) 32", Height 27 1/2", Depth (incl. fan) 27".
Height to Waste Pipe Inlet 26 1/2", Required depth to remove drawer 40".
Width to rotate handle 37 1/2". Product weight: 50 lbs. Shipping weight: 95 lbs.
Shipping carton: Width 27", Height 29 1/2", Length 35".



CENTREX NE (Non-electric)

The CENTREX NE is the Non-Electric Version of the CENTREX, for those with no continuous 110 volt power. With no fan and heating element, the CENTREX NE has a 4" vent stack exiting from the front, which acts like a chimney on a wood stove. To maximize air flow, this vent stack should be erected as close to vertical as possible. An optional 12 volt fan should be installed if the unit is to be used heavily or residentially or is in a place surrounded by mountains or tall trees where downdraft can occur. This 1.4 watt fan can be powered either by a solar panel (5.5 watts) and/or 12 volt battery. It is supplied in an 11" long section of 4" pipe for installation in the vent stack.

The CENTREX NE is slightly lower and shallower than the CENTREX, otherwise all installation considerations are the same.



12 Volt Fan Assembly

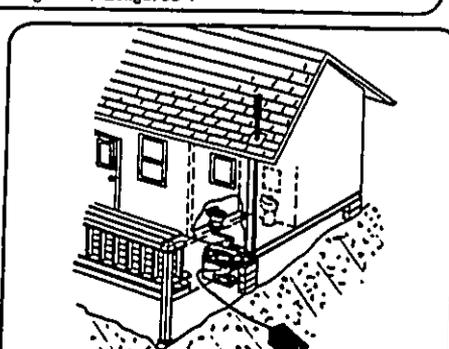
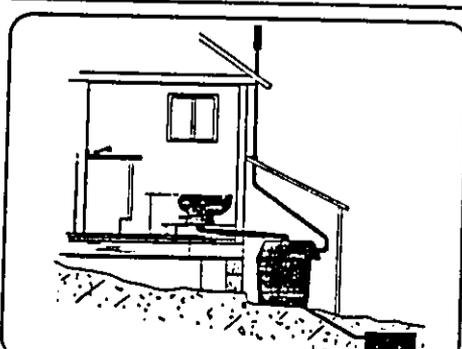
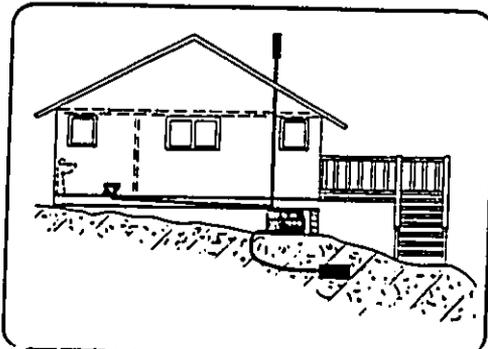
CENTREX AC/DC * Not Shown

The CENTREX AC/DC is a combination of both an electric and non-electric unit. It has twin 2" and 4" vent stacks and includes a 12 volt fan for the 4" stack. It is suitable either for those with solar power/generators who do not have continuous 110 volt power, or for those who expect to be connected to the grid in the future.

CENTREX NE CAPACITY: 6-8 people weekend/vacation use, 3-4 people residential/continuous use.

Vents: 4" Vent Pipe and Fittings (Supplied with Unit).
Drains: 1" Drain (10 ft. hose Supplied).
Options: 12 Volt electric fan, 1.4 Watt
(Installed in 11" long section of 4" vent pipe).

Dimensions: Width (excluding handle) 32", Height 26 1/2", Depth 23".
Required height to pipe inlet 25 1/2", Required depth to remove drawer 40".
Width to rotate handle 37 1/2". Product weight: 45 lbs. Shipping weight: 90 lbs.
Shipping carton: Width 27", Height 35", Length 35".



DOCUMENT CAPTURED AS RECEIVED

CENTREX A/F * Not Shown

The waterless CENTREX A/F (A/F stands for air flow) is a standard CENTREX unit designed for use with a SUN-MAR Dry Toilet (purchased separately). The Dry Toilet must be mounted directly above the composting unit. This is the unit of choice when there is *no water* available, or where it is *not practical to drain any excess liquids*. The CENTREX A/F is normally able to evaporate all liquids, so the drains must be connected only if heavy use or prolonged power outages are expected.

The CENTREX A/F is supplied with a 29 1/2" pipe piece (10" diameter). This is long enough if the floor of the bathroom is up to 67" above the surface the composter is placed on. The pipe piece can be cut to size and additional pieces ordered if necessary.

CENTREX A/F NE

The CENTREX A/F NE is the Non-Electric Version of the CENTREX A/F. It is designed for use where there is no continuous 110 volt supply. A 3.4 watt fan is included for installation in the 4" vent stack and this can be powered either with a solar panel and/or 12 volt battery. Evaporating capacity on this unit is variable, so the drain should be connected to a container or approved facility.



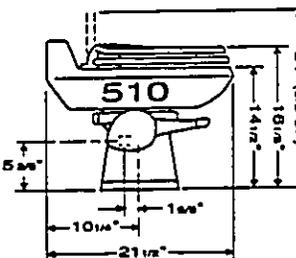
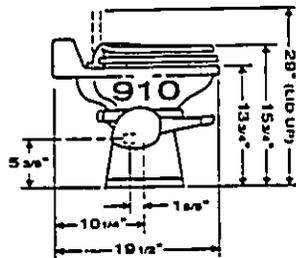
CENTREX A/F	CAPACITY: 7-9 people weekend/vacation use, 4-6 people residential/continuous use.
Electrical: 115 Volts, 2.5 Amps (Max.), 25 Watt Fan, 250 Watt Heater (Approx. average use 150 Watts).	Dimensions: Width (excluding handle) 32", Height 27 1/2", Depth (incl. fan) 27", Height to waste pipe inlet 35", Required depth to remove drawer 40", Width to rotate handle 37 1/2". Product weight: 55 lbs. Shipping weight: 100 lbs.
Vents: 2" Vent Pipe and Fittings. (Supplied with Unit).	Shipping carton: Width 27", Height 35", Length 35".
Drains: 1" Emergency Safety Drain (10 ft. hose Supplied. Optional hook-up).	

ONE PINT FLUSH TOILET

Using about *1 pint per flush*, these ultra low flush toilets provide all the advantages of a flush toilet while minimizing water usage. They are ideal for use with SUN-MAR Central Composting Systems, but can also be used with holding tanks, overloaded septic systems, and in RVs.

SUN-MAR offers several different models from the plastic AQUA MAGIC IV to the ceramic SEALAND 910 and 510 models. The 510 has a regular sized toilet seat and is 2" longer, and 1" wider than the 910. Low profile ceramic toilets, the SEALAND 511 and 911, are available for *platform mounted* applications on special order. Sealand toilets are supplied complete except that they need a *4 bolt floor flange* (or a 2 bolt flange with 2 extra holes drilled out). All ceramic toilets are available in white or bone, and offer superior hygiene, cleanability and elegance.

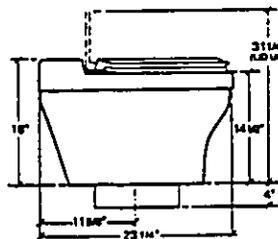
A simple foot pedal flush opens the water valve and gate when pushed down, and fills the bowl with water when lifted. A small amount of water is held in the toilet bowl which is sealed by a self cleaning ball valve and teflon seal. Even *gravity fed* water from a roof tank is sufficient to flush a 1 Pint Toilet, and in winter they can be flushed using a container if necessary.



DRY TOILET

This *elegant* SUN-MAR Dry Toilet is designed for use with the waterless CENTREX A/F and CENTREX A/F NE Central Composting Units. The vent systems on these composting units eliminate odors from the bathroom by drawing air down through the Dry Toilet. The toilet is supplied complete with a regular sized seat, has a standard seat height of 15", and is available in *white or bone*.

The base of the toilet mounts on the bathroom floor directly over the A/F composting unit. A bowl liner fits beneath the seat, and may be removed for cleaning as required. If the Dry Toilet is too high above the composter for air to be drawn down, the Dry Toilet can be vented directly



CENTRAL UNIT

DOCUMENT CAPTURED AS RECEIVED

CUSTOMER INSTALLATIONS

In this catalog we have shown you how SUN-MAR Composting Toilets work. We have also shown you how simple it is to select, install and operate your unit. Most sales come from word of mouth customer recommendations, so if you know a SUN-MAR user, we encourage you

to check with them. For those of you who do not, we visited some customers who invited us to their cottages when they saw us at a recent Trade Show. We hope you find this selection of snapshots and user comments helpful in choosing the best system for your needs.

TROPIC - Mr. & Mrs. G.K. Caldwell, Caldwell Island Installed - 1979

Mr. & Mrs. Caldwell in front of their cottage located on an island in the St. Lawrence River between Canada and the USA. Mr. Caldwell is showing his tomato plants which are fed with fertilizer from their TROPIC toilet. Some compost is extracted from their toilet every spring. The Caldwells use their toilet continuously from early spring to late fall, "when I get frozen out" says Mrs. Caldwell. They are very pleased with their toilet's performance over all these years.



EXCEL (Formerly Bowli-XL) - James Udrow, Healey Lake Installed - 1988

The Udrows are retired, and live at their cottage continuously for six months from the end of April to the beginning of November when they leave for Florida. James finds that his EXCEL can handle their needs comfortably, and he only has to extract some compost once a year in the spring, when they return from Florida. At that time they find the "compost is very nice and dry", and they remove about a pailful, which they use in their beautiful garden. We would like to think SUN-MAR deserves some of the credit!



EXCEL - Mr. & Mrs. Bryn Rennie, Lake Baptiste Installed - 1983

Mr. & Mrs. Rennie in their cottage at Baptiste Lake, north of Bancroft. The SUN-MAR EXCEL was used year round for the first two years, and since then has been used from April to late fall each year. Mrs. Rennie and her husband are very pleased with their toilet which "has absolutely no smell". Mrs. Rennie throws all her kitchen greens into the toilet, as well as peat moss. The system is used by 5-6 people throughout the summer.



EXCEL NE - Mac Ogden, Pointe-au-Baril Installed - 1982

Mr. Ogden has no electricity on his island. The cottage is rented out for 4-6 weeks every summer. He thinks the toilet is a wonder with high capacity and no smell. The toilet is heavily used throughout the summer. Mr. Ogden is shown in front of his compost pile which, to his surprise, was filled with tomato plants. Once a year, in spring, compost is extracted from the toilet. Mr. Ogden (in the background) and Mrs. Ogden (closest to the camera) with daughter and friends. Their son and girlfriend were also expected for the weekend.



EXCEL NE - Kim & Steve Dubeau, Proudfoot Lake Installed - 1991

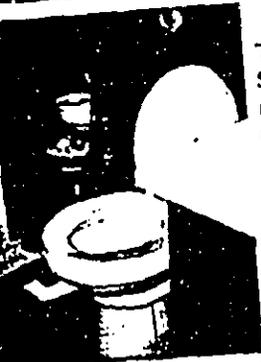
This EXCEL NE (formerly the SUN-MAR NE) is another of the many SUN-MAR installations around Proudfoot Lake. As Kim Dubeau says, "we've been very happy with it, and we'll also put one into the new cottage we're building." Bob Clarke, their neighbor, has a family of 4. He uses his NE "every weekend from about May on, when the ice goes out". When asked what happens to the toilet paper, Clarke said, "I just turn it before we leave, and when we come back everything is gone. I hope everyone buys one." We do too!



DOCUMENT CAPTURED AS RECEIVED

WCM - The Greenwoods, Healey Lake Installed - 1991

The Greenwood's WCM shown here installed with a handsome Sealand 910 in the bathroom, is one of the many SUN-MAR units installed on this lake. In a typical "word of mouth" sequence, the sceptical neighbors closely watched the first SUN-MAR (installed 1985) for several years before adopting it. One of these interested observers, Shirley Martin, finally had another

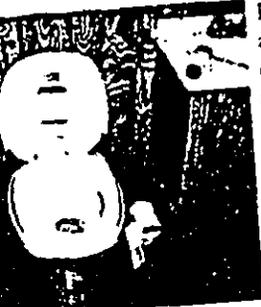


WCM user (her neighbor) put in a unit for her. Shirley spends all summer at her cottage, and is typically enthusiastic about her SUN-MAR. "I really love it", said Shirley, "it's so much better than the old outhouse, especially when I'm here alone".



WCM - W. Fletcher Keating, Horseshoe Lake Installed - 1983

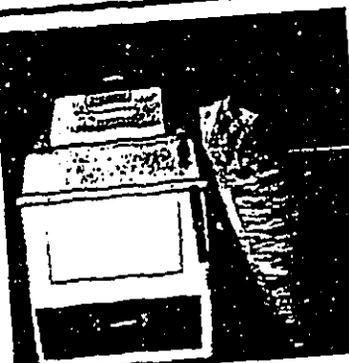
Fletcher Keating is shown in front of his SUN-MAR WCM unit which he purchased after seeing how well his neighbor's worked. Mr. Keating empties 2 or 3 drawers of compost every spring and does a minimum of maintenance. He just rotates the drum, adds peat moss and "absolutely nothing else". "I am a guy who wants to do a bare minimum" he said. The cottage is used throughout the summer by 2-3 people, and sometimes up to 12-15 people on weekends. Mr. Keating appreciates the fact that there is positively no smell. The low flush toilet is located inside the cottage above the SUN-MAR WCM.



Note:
The vent pipe (black) is installed along the outside wall with the diffuser on top.

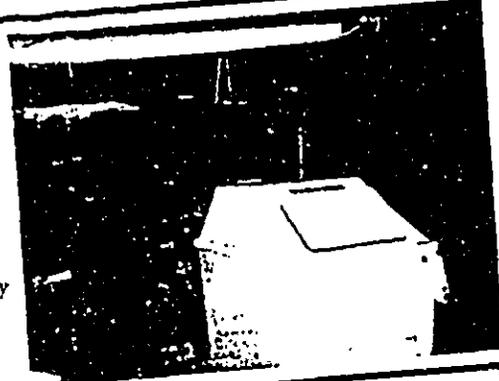
WCM - Frank Gauder, Lake Rosseau Installed - 1980

Frank Gauder and his brothers and sister jointly own their cottage which they use all summer. The SUN MAR WCM system is "very much appreciated by all members of the family who remember the old outhouse". The system has successfully handled parties of about 15 people. They have had no problems whatsoever. Peat Moss is added every weekend, and less than one drawer of compost is extracted once a year. Their low flush toilet is located straight above the WCM unit. When their own water supply is not working (shut off in the winter), they pour in water by hand to flush the toilet. It still works perfectly.



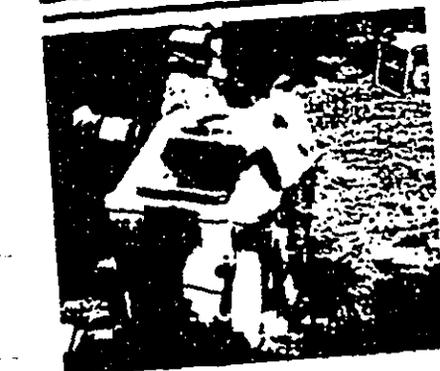
WCM - The Wagners, Blackstone Lake Installed - 1989

The Wagners use their cottage pretty well every weekend for four months over the summer, and rent it out for a two week period. When SUN MAR visited, we met the tenant, who was using the WCM for his second summer. "We have no problem operating it. We just put in two handfuls of peat moss per person every day," he said. The Wagners and their next door neighbors, the Healeys, (another WCM user) are vitally interested in preserving their lake. They feel that all lots should be required to put in SUN MAR units. *We certainly like that idea!*



WCM NE - The McCreadys, Proudfoot Lake Installed - 1992

Mr. McCready's cottage is one of about 30 on this remote lake where there is no electricity. "There are at least 4, and maybe up to 8, SUN MAR toilet systems installed here," he said. "The more the merrier as far as we're concerned". Mr. McCready installed his unit himself with the help of a friend from the Ministry of the Environment. The WCM N.E., (now Centrex N.E.) is used by 5 people, and with guests, sometimes up to 9 or 10. "It was fine, just fine," enthused Mr. McCready. "If you follow the directions that come with it, it does exactly what it says it will do." The photo shows the excellent compost extracted during our visit. Mr. McCready feels his system is "quite fine". "We're very pleased with it".

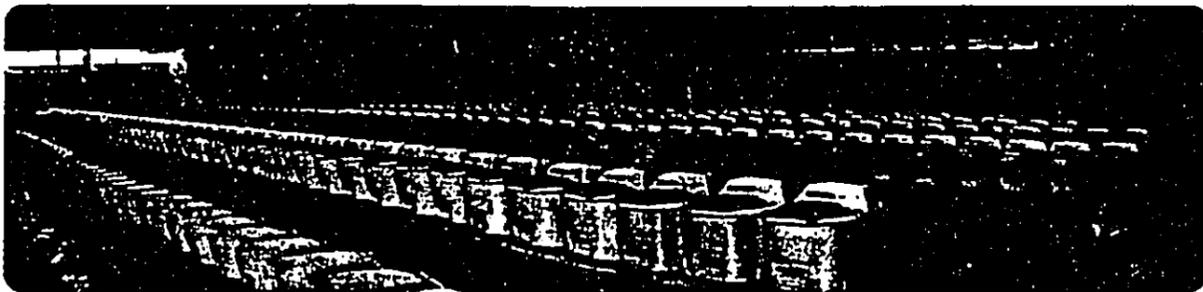


DOCUMENT CAPTURED AS RECEIVED

A QUARTER CENTURY OF TECHNICAL LEADERSHIP

The history of SUN-MAR closely parallels the development of cottage toilets over the last 30 years!

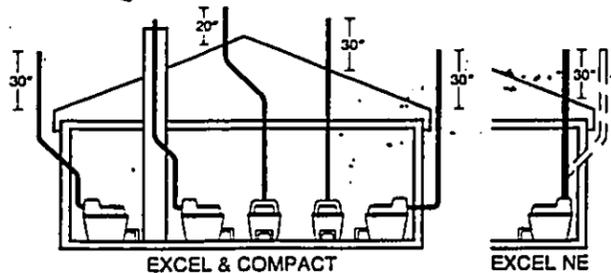
- | | |
|---|--|
| 1966 Our first cottage toilet (an incinerating design) was invented in Sweden. | 1989 The EXCEL became the first self-contained composting toilet to pass the long term composting tests of the National Sanitation Foundation. |
| 1971 The first self-contained composting toilet was developed by the Father of two SUN-MAR partners. | 1991 The first dual vented unit (the EXCEL AC/DC) was designed for those with a non-continuous 110 Volt supply. |
| 1974 The TROPIC, a new design incorporating several improvements, was first produced in Sweden. | 1993 The COMPACT, a lower profile unit with a patented variable diameter Bio-drum™, was introduced. |
| 1977 Production moved to North America, and the WCM, the first central composting unit, was manufactured. | 1993 The CENTREX family of lower profile, front vented central units was launched. |
| 1979 The first three chamber toilet was introduced using a Bio-drum™. (The forerunner of today's EXCEL unit). | 1994 The ECOLET MARINE/RV, the first self-contained composting toilet ever designed for marine and RV markets, was first introduced. |
| 1981 The Bio-drum™ design proved so successful that the non-electric EXCEL NE was introduced. | 1996 The CENTREX A/F, a waterless version of the CENTREX, is introduced for use with the SUN-MAR Dry Toilet. |
| 1987 A non-electric version of the WCM central composting unit (known as the CENTREX NE) was added to the line. | |



As the world leader for over 25 years SUN-MAR'S superior technology leaves all imitators far behind.

DO-IT-YOURSELF INSTALLATION

- All SUN-MAR units include (at no extra cost!) everything needed for installation. The package contains the complete vent stack, electrical hook-up cable, peat mix to start the compost, and an owner's manual which covers installation, start-up, and ongoing maintenance.
- All units with 1" drains include a 10ft. length of drain hose.
- Erection of the vent stack (see drawing) is the main task in installing self-contained units. Vent stacks for electric units include 10 ft. of 2" pipe (15 ft. for Central Units), pipe fittings, diffuser, roof flashing, caulking and nails. Self-contained electric units also include 6 ft. of vent pipe insulation.
- These same components are included with non-electric units except that the vent is 8 ft. of 4" diameter pipe (13 ft. for Central Units).
- The diffuser is a device originally patented by SUN-MAR principals, and is designed to facilitate updraft, avoid freeze up in winter, and protect the vent from downdraft and weather.



SUN-MAR QUALITY IS LEGENDARY

Simplicity of design and the use of superior quality materials allow SUN-MAR to offer unmatched performance and trouble free reliability. Essential qualities for those who know your bathroom is no place to take risks! Designed so that there is nothing to unscrew, break, get stuck, or corrode. SUN-MAR uses marine grade stainless steel and indestructible, long lasting fibreglass throughout!



SUN-MAR has the first self-contained composting toilet in the world to be tested and certified by NSF (The National Sanitation Foundation) NSF Listed Excel, 89

Our founder's first composting toilet received a gold medal at the International Inventor's Exhibition in Geneva, Switzerland



Electrical Features are:
CSA
APPROVED
LR 55929

25 YEAR WARRANTY

All units carry a Comprehensive 3 Year parts replacement warranty, with a full 25 YEAR replacement warranty on the fibreglass body.

UNITED STATES
COAST GUARD
CERTIFIED



SUN-MAR CORP.

Tel: (905) 332-1314 • Fax: (905) 332-1315 • E-mail: compost@sun-mar.com

5035 North Service Rd., C9 - C10
Tonawanda, ON CANADA L7E 5V2

600 Main Street, Tonawanda N.Y.
14150-0888 U.S.A.

Distributed by:

SUN-MAR

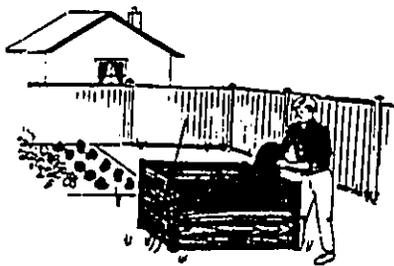
COMPOSTING TOILETS

"Sun-Mar" composting toilets have become the solution of choice for cottages, cabins, or camps; for remote work places; or simply for those who know that recycling waste is the right thing to do! Wherever there is a poorly working septic system, a "Sun-Mar" can take care of the toilet waste; where there is an outhouse, we offer the luxury of an indoor facility; and where there is no toilet at all, a "Sun-Mar" provides the right environmental choice.

THE ENVIRONMENTAL SOLUTION

"Sun-Mar" composting toilets use the natural processes of decomposition and evaporation to recycle human wastes. They are quick to install, easy to use, and most models require no water supply or sewer lines. Waste entering the toilet is over 90% water content, and this is evaporated, and carried back to the atmosphere through the vent system. The small amount of remaining material is converted to fertilizing soil by natural decomposition.

By recycling in this way, NO Septic Systems, NO Holding Tanks, and NO Chemicals are needed to handle toilet wastes.



To prevent the compost from getting saturated, a screen at the rear of the drum filters any excess liquid directly into the evaporating chamber.

When the drum gets 2/3 full, some compost is extracted into the finishing drawer. This is done simply by pulling the drum lock, and rotating the drum backwards. Now, the drum door remains open, and compost falls into the second chamber, the compost finishing drawer.



The Compost Finishing Drawer

Compost in this pull-out finishing drawer is totally isolated from material in the Bio-drum, and is no longer subject to contamination from fresh waste. It is here that the composting and sanitation processes are completed, and the compost becomes safe to handle.

The sanitized compost in the drawer can be emptied whenever it is necessary to extract more compost from the drum.

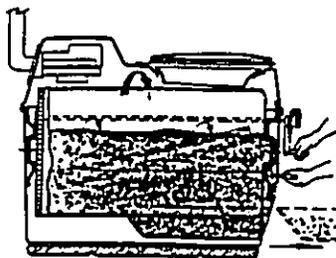
SUN-MAR'S THREE CHAMBER SYSTEM

A composting toilet system has three separate tasks to perform, each of which requires a separate chamber:-

- waste and toilet paper have to be composted quickly and odorlessly
- finished compost must be safe and easy to handle
- liquid must be evaporated

The Composting Chamber

"Sun-Mar" engineers found that the ideal conditions for fast, odorless composting could only be provided in a rotating drum, (we call it the Bio-drum), where the compost can be kept completely oxygenated, mixed, moist and warm.



Waste enters through an entry port in the top of the Bio-drum, and peat mix is added at the rate of one cupful per person using the toilet per day. Every third day while the toilet is in use, (or at the end of the weekend) the Bio-drum should be rotated by turning

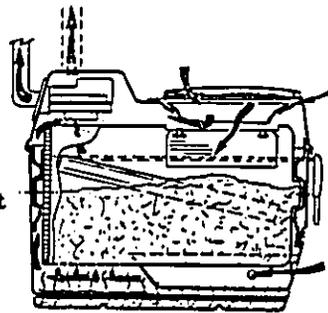
the drum handle on the front of the unit. This tumbles the compost to ensure it is completely mixed and oxygenated. A drum door closes automatically to keep the waste inside as the drum rotates.

The Evaporating Chamber

The third chamber, the base of the toilet, is the evaporating surface from where any excess liquids, which cannot be absorbed by the compost, are evaporated or drained. Air is drawn in through intake holes at the base of the toilet, over the evaporating surface, and up the vent stack. On electric models, air is drawn in by a fan, while non electric models use natural draft induced by the chimney effect of a 4" vent stack.

In both cases, a partial vacuum is maintained which ensures that no odors can escape.

Evaporation is assisted on electric models by a thermostatically controlled heating element in a sealed compartment underneath the evaporating chamber. This heater keeps the floor of the chamber hand warm. All models are fitted with a safety drain for connection to a drain pit or other approved facility. Use of this drain connection is optional on self contained electric units, but required on others.



Ask for

• 12 Page Color Catalog • 27 Minute Video

25 YEAR WARRANTY

All "SUN-MAR" units carry a Comprehensive 3 YEAR parts replacement warranty, with a full 25 YEAR replacement warranty on the fibreglass body.

Distributed by:

SOLO POWER

1-800-279-7656

1011A Sawmill Rd. NW
Albuquerque, NM 87125

SOLAR ELECTRIC SYSTEMS Phone: 505-242-8340 Fax: 505-243-5187

DOCUMENT CAPTURED AS RECEIVED

MODEL SELECTION

This selection guide is designed to help you pick the best model for your needs. The basic decision is whether to install a self contained toilet or a central composting unit. In either case, non-electric models are available for those who do not have a continuous 110 Volt power supply.

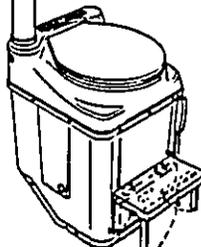
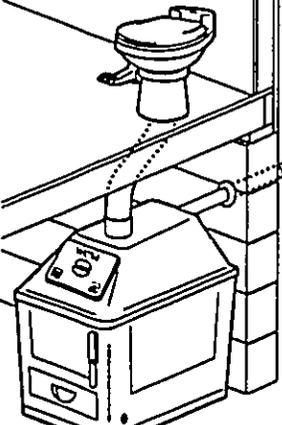
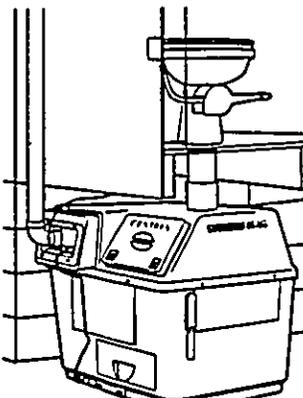
SELF CONTAINED UNITS

- Require no plumbing or water connection, and are quick and simple to install.
- Are more suited for winter operation than central units, because it is often easier to keep the bathroom warm.
- Most (especially electric units) can evaporate all liquids, so approvals are not normally required.
- Are available with different capacities. "SUN-MAR" recommends that you pick a unit with a capacity greater than you really need.

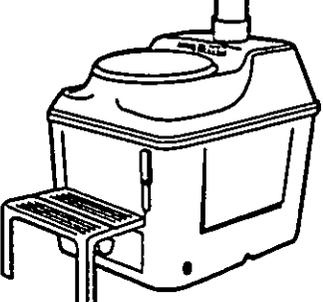
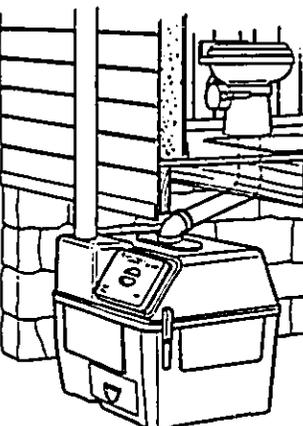
CENTRAL COMPOSTING SYSTEMS

- Are ideal for those who want a flush toilet in the bathroom, or who want to connect more than one toilet to the composting unit.
- Are normally placed under, or outside the bathroom, with 3" plumbing pipe connecting the unit to a 1 pint flush toilet (purchased separately). If possible, the central composting unit should be within 20 feet of the toilet.
- Are often unable to evaporate all the flushing liquid. This excess should be collected or drained into an approved facility.

ELECTRICAL MODELS (For those with a continuous supply of 110 Volt power available)

	<p>"ECOLET"</p> <p>Unit designed primarily for Marine/RV use, this three chamber toilet with Bio-drum is available with 110 Volt fan and heater for use where space is very limited. 19 1/2" Wide, 21 1/2" Long.</p> <p><i>Capacity (People)</i> Weekend & vacation 3-5 Residential/continuous 1-2</p>		<p>"WCM"</p> <p>High capacity three chamber unit with large insulated Bio-drum. Long narrow shape with rear venting and drain makes it the ideal unit for placing in a basement or between beams.</p> <p><i>Capacity (People)</i> Weekend & vacation 7-9 Residential/continuous 4-6 (4 adults or a family of 6)</p>
	<p>"COMPACT"</p> <p>Elegant, medium capacity unit with the looks to complement any bathroom. Incorporates standard three chambers with patented variable diameter, insulated Bio-drum.</p> <p><i>Capacity (People)</i> Weekend and vacation 3-5 Residential/continuous 1-2</p>		<p>"CENTRIX"</p> <p>High capacity three chamber unit with large insulated Bio-drum mounted transversely. Vented and fully serviceable from the front and only 27 1/2" high, this unit is ideal for placing under or to the side of a building.</p> <p><i>Capacity (People)</i> Weekend & vacation 7-9 Residential/continuous 4-6 (4 adults or a family of 6)</p>

NON ELECTRIC UNITS (For those who do not have a continuous supply of 110 Volt power)

	<p>"EXCEL N.E."</p> <p>Non-electric version of the EXCEL. Has the same three chambers with large insulated Bio-drum, but has a 4" vent exiting from the top rear of the unit. A 12 Volt fan is recommended for residential or heavy use.</p> <p><i>Capacity (People)</i> Weekend & vacation 5-7 Residential/continuous 2-3</p>		<p>"CENTRIX N.E."</p> <p>Non-electric version of the CENTRIX. Has the same three chambers and Bio-drum, but is fitted with a 4" vent exiting from the front of the unit. A 12 Volt fan is recommended for residential or heavy use.</p> <p><i>Capacity (People)</i> Weekend & vacation 6-8 Residential/continuous 3-4 (3 adults or a family of 4)</p>
---	---	--	--

OTHER UNITS AVAILABLE

"EXCEL AC/DC" and "CENTRIX AC/DC"

These AC/DC units are fitted with dual vent stacks (2" and 4"). They are ideal for those with generators and solar panels. (See pages 5 & 9)

"CENTRIX AIR FLOW" and "CENTRIX N.E. AIR FLOW"

These units are waterless versions of standard electric and non electric CENTRIX models. They use a "Sun-Mar Dry Toilet" (purchased separately) which is mounted directly above the composting unit. The dry toilet is 10" diam. 21" high. These come in 21 1/2" sections, and can be cut to size.

DOCUMENT CAPTURED AS RECEIVED

"Waste" is the name for any material put in the wrong place. We can make waste of anything, or we can choose, instead, to make good use of everything. "Human waste" is now the number one source of pollution and disease throughout the world. Conventional "solutions" such as septic tanks and sewers have proven to be no solutions at all. Clivus subscribes to the principle that prevention, rather than cure, is the sound and efficient approach to the pollution crisis caused by our present patterns of living. Clivus Multrum offers a management system that conserves water, prevents pollution of water, and recovers the great value of "human waste" for the enrichment of the earth.

Clean water. Fertile soil. The Earth restored.



"We have a Clivus Multrum system. Our system has been in operation since 1980. We have an annual visitation of 130,000 people. On weekend days, the visitation is between 700 and 1,000 people per day. Our system was originally chosen because the location where we chose to build was not suitable for a septic system. Thus, we chose a Clivus Multrum system because it was self-contained and used virtually no water. Moreover, as a nature conservancy, we felt a special obligation to set an environmentally sound example. After 10 years of operation, we would not go any other way."

L.S. Wagoner
Administrator & Curator
Frank Lloyd Wright's 'Fallingwater'
The Western Pennsylvania Conservancy
Mill Run, Pennsylvania



Clivus Multrum, Inc.
104 Mt. Auburn St.,
Harvard Square
Cambridge, MA 02138 USA

clivus® Authorized Representative
HANSON ASSOCIATES
Lewis Mill
Jefferson, Maryland 21755
(301) 371-9172 • FAX (301) 371-9844



What does the Clivus Multrum give you?

A return on your investment that will do the Earth a lot of good: human excreta (what we now call "human waste") and food scraps are converted into products instead of problems. These products come in two forms: compost, which is a stable, rich humus resembling the best garden soil, and compost "tea", a balanced, high-nitrogen liquid fertilizer. Both are odorless, safe, and ready to use. Put the compost in flowerbeds, around trees and shrubs; dilute the compost "tea" and feed nitrogen-loving plants such as grass, trees and flowers.



The Clivus composting process has proven itself throughout the world in many thousands of installations since 1939. Customers include the US, Canadian, UK, Australian, Korean, and Swedish governments, as well as thousands of satisfied homeowners in over 15 countries.



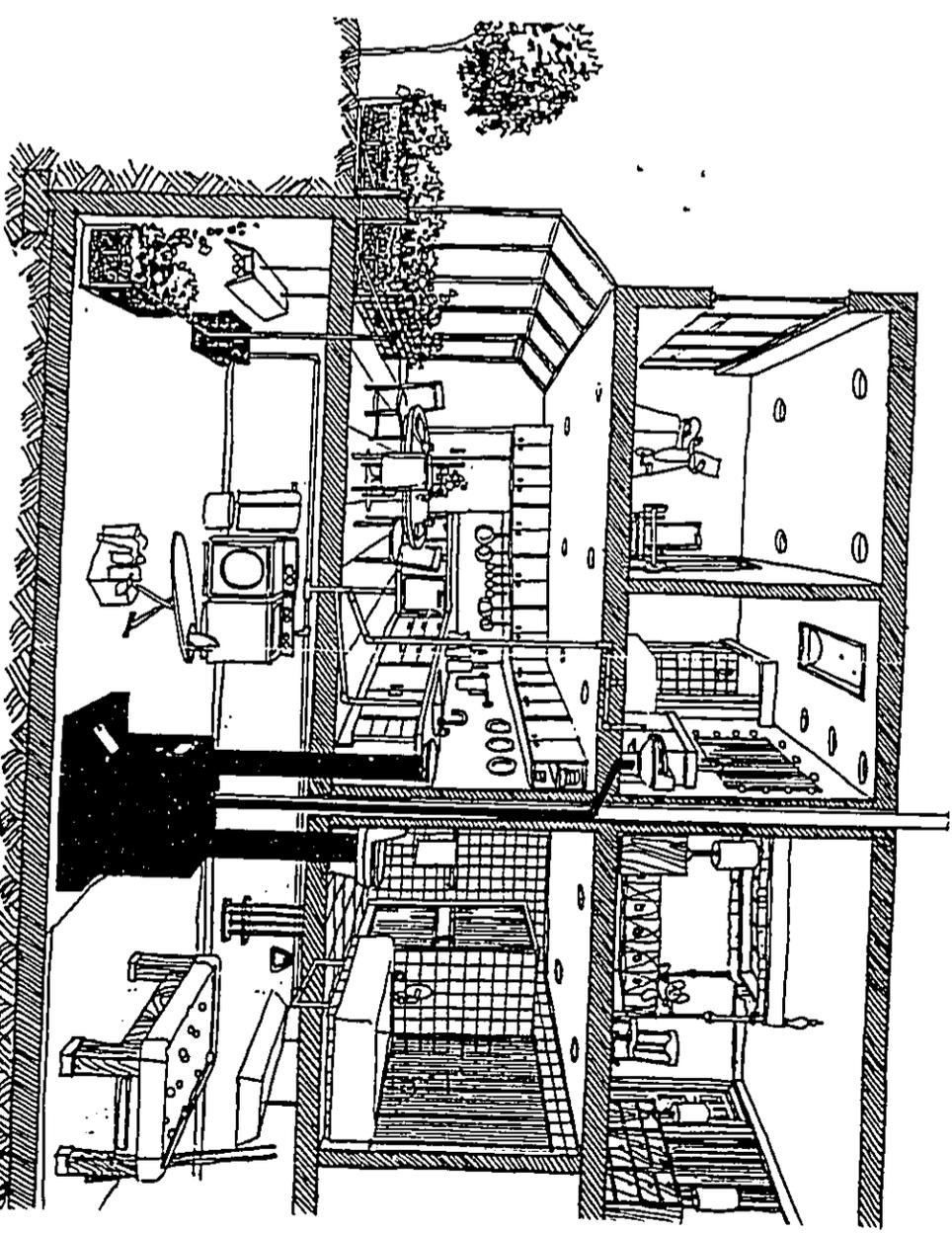
UR27697



APPROVED UNDER STANDARD A1
M12, M15, M18, M22, M25, M28
M32, M35



APPROVED AS A WATER
CONSERVATION DEVICE



LEGEND:

- Clivus Multrum Composter and Chutes
- Clivus Multrum Fixtures
- Clivus Ventilation System

- Clivus Greywater Fixtures and Collection Pipes
- Clivus Greywater Roughing-filter/Pump Station
- Clivus Soil/Planter Beds

Clivus Multrum™ and Greywater Purification™ are registered International Trademarks of Clivus Multrum, Incorporated. All rights reserved.

1-800-4CLIVUS

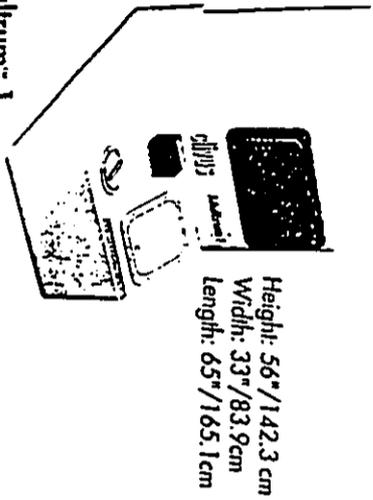


USA
104 Mt. Auburn St., Harvard Square
Cambridge, MA 02138
617-491-0051 • FAX 617-491-0053

CANADA
P.O. Box 3212, Winnipeg, MB R3C 4E7

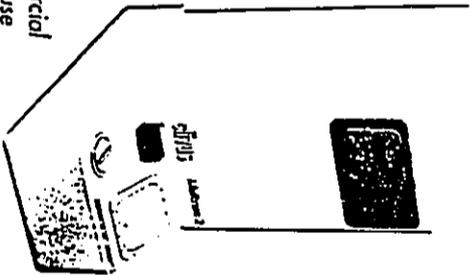
CLIVUS COMPOSTERS

Clivus offers a complete range of composters — from the compact cottage unit to the largest capacity system that can handle over 65,000 uses per year. Our composters are made of 100% recyclable plastic and all are compatible with waterless and ultra-low flush toilets. All are true composters and all can have built-in liquid fertilizer storage directly under them. The liquid storage chamber has a port which can be equipped with an electric or manual pump to conveniently assist the recycling of this high-quality, odor-free fertilizer.



Height: 56"/142.3 cm
Width: 33"/83.9cm
Length: 65"/165.1cm

The Multrum™-1
This unit is designed for seasonal use in cabins, camps, and cottages. It is easy to install in an existing crawl space or in a shallow excavation under the structure.



Height: 66"/167.7cm
Width: 33"/83.8cm
Length: 65"/165.1cm

The Multrum™-2
Suited to higher seasonal use, small residences, small commercial establishments, and some low use public facilities.

The Multrum™ 10, 20 and 30 Series: These larger composters are designed for high volume use and are best suited to public facilities such as highway washrooms, parks, and resorts. They are also well suited to residences, schools, community centers, libraries, clinics, restaurants and new construction office buildings.

CLIVUS FIXTURES

Ultra-low Flush Toilets

We have two ultra-low flush toilet fixtures: a one pint (1 1/2 liter) flush toilet and a 3 oz. foam toilet. These are especially convenient for retrofit situations where the composter must be offset from the bathroom. In multi-story buildings with more than one toilet, it is often an advantage to have a waterless toilet on the ground floor and an ultra-low flush one upstairs.

Urinals

We recommend the use of urinals as sanitary conveniences in homes as well as in commercial/institutional facilities. There are three models available, all completely odorless.

- Clivus-designed flushless model
- standard porcelain model
- stainless steel model appropriate for cabins as well as remote public facilities.

CM Waterless Toilet
This Clivus-designed waterless toilet is the simplest of all to use and maintain. The constant draft down the toilet whenever the lid is open functions as a ventilator for the bathroom keeping it odor-free at all times.

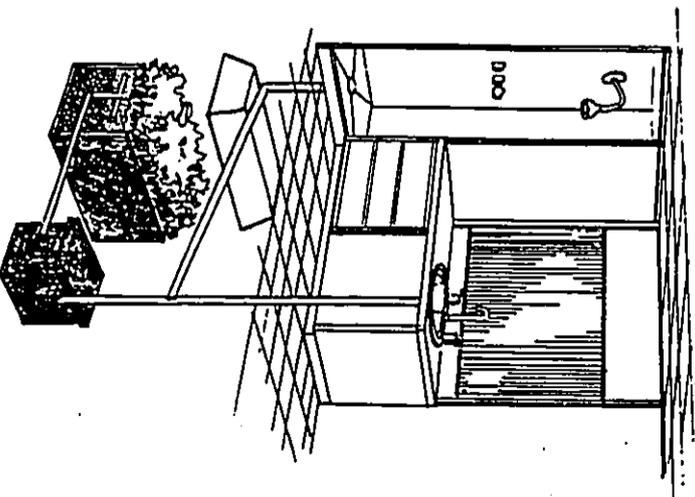
CLIVUS GREYWATER PURIFICATION

What is Greywater?

Greywater is washwater. That is, "waste" we from all fixtures and appliances except toilets, garbage disposals. Greywater sources include showers, tubs, dishwashers, laundry machines, sinks. Although greywater represents about 60% the total wastewater of a conventionally plumbed home, its characteristics are very different from combined sewage. The importance of this difference is that separated greywater processing permits easier recovery and re-use of this valuable irrigation fertilization resource.

Clivus offers complete Greywater Purification solutions, including greywater roughing filters, custom site designs for indoor and outdoor splaning beds.

Clivus greywater filter and indoor soilbed/planter



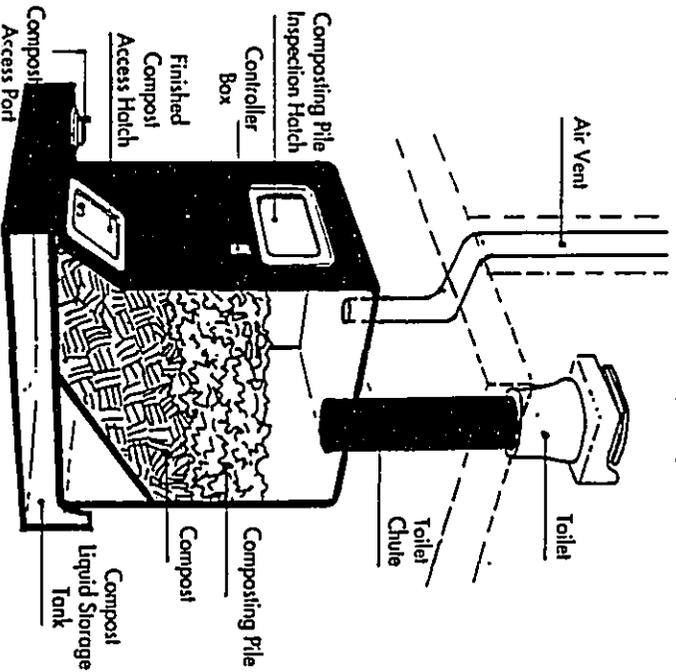
For more information about Clivus Greywater Purification™ Systems call: 1-800-4CLIVUS

... your environment, with a natural solution...

What is the Clivus Multrum?

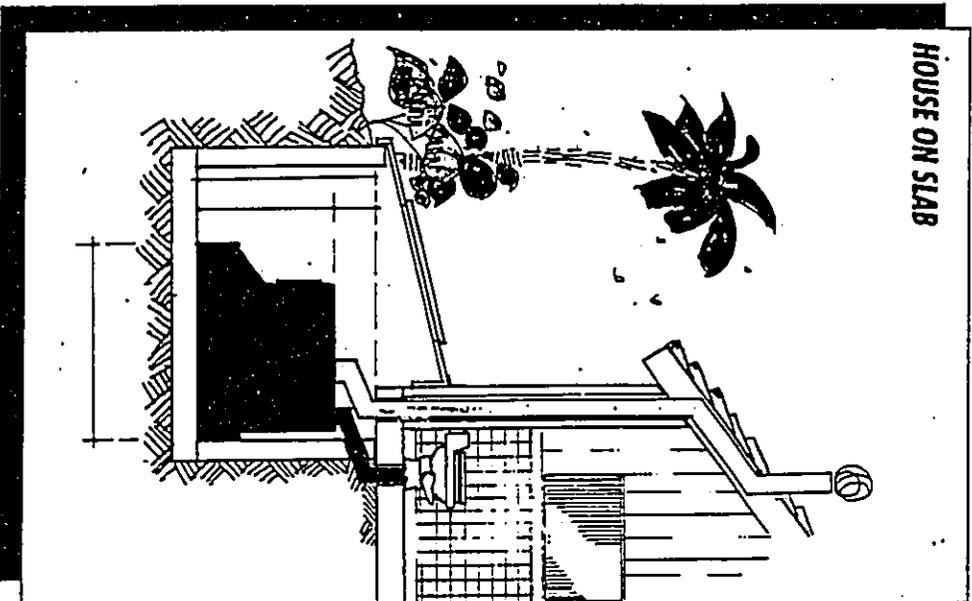
The Clivus Multrum is the first — and still the most advanced — compost toilet in the world. "Clivus" means "inclining" and "Multrum" means "compost room." And that's what it is: a composter with a sloping floor. Everything in the Clivus slides very slowly toward the compost removal chamber, decomposing naturally as it goes. During the process, solids are reduced in volume by up to 90%, leaving odor-free, pathogen-free recyclable end products.

The Clivus process is simple. That's why it works so well. All you do to assist it is add a little high-carbon material such as coarse sawdust, woodshavings, or dry shredded leaves. A small fan (AC/DC, electric or solar) draws air through the system. This air flow promotes the decomposition process while keeping the bathroom/washroom completely odor-free.

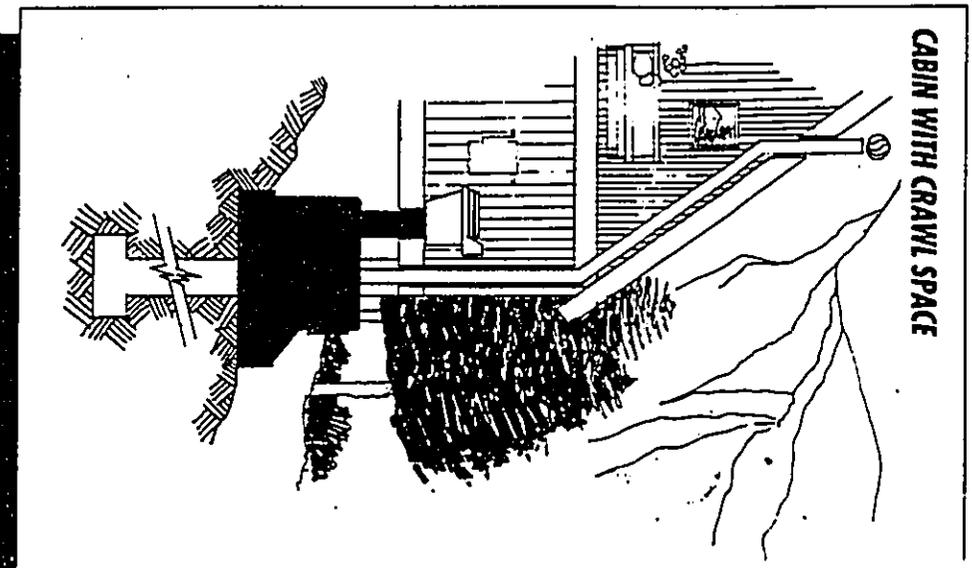


CLIVUS: THE PROBLEM SOLVER

Clivus offers environmentally sound solutions for problem sites suffering from low "permeability" rate and high ground water conditions, with ledge, clay, sandy soils, difficult topography: no water, permafrost, or inadequate lot-size. Clivus offers a full range of designs for homes with full basements, crawl spaces, or no basements at all.



For residences on slab, with no basements, or in areas where a septic tank/leach field is impractical, the Multrum™ 1 or Multrum™ 2 can be installed in a watertight concrete structure with service access available through a bulkhead. An ultra-low flush toilet can be attached to lateral plumbing.



In cabins, camps, cottages, and ski chalets, the Clivus can be installed in a protected or unprotected space (depending on climate and usage) under the building. Either waterless or the ultra-low flush toilet can be used.

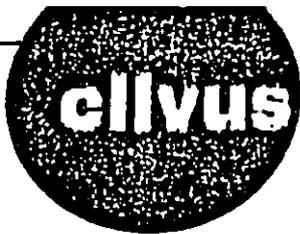
1-800-4CLIVUS

(from Canada and the USA)

ECOLOGICAL RESOURCE RETRIEVAL TECHNOLOG

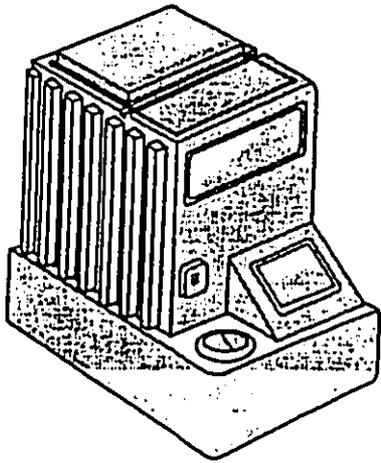


DOCUMENT CAPTURED AS RECEIVED



Clivus Multrum™, 1 Elliot Square, Cambridge MA 02138 1-800-4CLIVUS

Multrum™ 2 Composter 1 - 3 bedroom residential



The *Multrum™* provides odorless, cost effective, pollution-preventing sanitation for vacation retreats and small residences. The *Multrum™* safely processes solid and liquid toilet excreta through natural, aerobic de-composition.

This composting process reduces biomass input by 95%, releasing carbon dioxide and water vapor, and produces valueable, safe-to-handle fertilizer end-products. On an annual basis, approxi-

mately 2-3 gallons of compost will be generated per person. The *Multrum™* is available with both waterless and foam-flush toilet fixtures.

The *Multrum™* is constructed of 100% recycled linear polyethylene plastic. The unit consists of two major components: the solid waste composting chamber and the liquid fertilizer storage cradle.

The composting chamber is designed to fit through most doorways (≥32") and can be installed in full basements and crawl spaces with 72" headroom. Clivus provides several flexible installation options where space is restricted or where no basement exists. A compost removal hatch is provided in the lower front part of the solid waste chamber for convenient removal of finished compost.

The liquid storage cradle supports the composting chamber and acts as a storage container for the Clivus liquid fertilizer. An easy access drainage port is provided for retrieval/removal of the liquid fertilizer end-product. The support cradle is designed to fit through doorways for ease of installation.

The *Multrum™* features a built-in moistening system to ensure optimal composting conditions. A programmable timer allows for variable settings of spray frequency.

The *Multrum™* package is complete with a compost starter bed and vermiculature kit.

Clivus Multrum™ Inc. • One Elliot Square • Cambridge, Ma 02138 • Tel. 617 491-0051 Fax 617 491-0053

DOCUMENT CAPTURED AS RECEIVED

FEATURES

Linear Polyethylene Construction

The composter shell and attached liquid storage cradle is molded of 3/8" thick 100% recycled and recyclable high-density linear polyethylene. This material is both corrosion-proof and leak-proof.

Liquid Support Cradle

The composter comes with a storage cradle which stores Clivus liquid fertilizer and acts as a support for the composter.

Moistening system

The system features a built-in moistening system to maintain optimal composting conditions and promote vermiculture.

Natural Biological Treatment Process

Solid and liquid toilet residues safely break down in the composter through natural aerobic decomposition. This process releases carbon dioxide and water vapor and transforms the liquid to an odor-free nitrate rich fertilizer and the solids into humus.

Ventilation

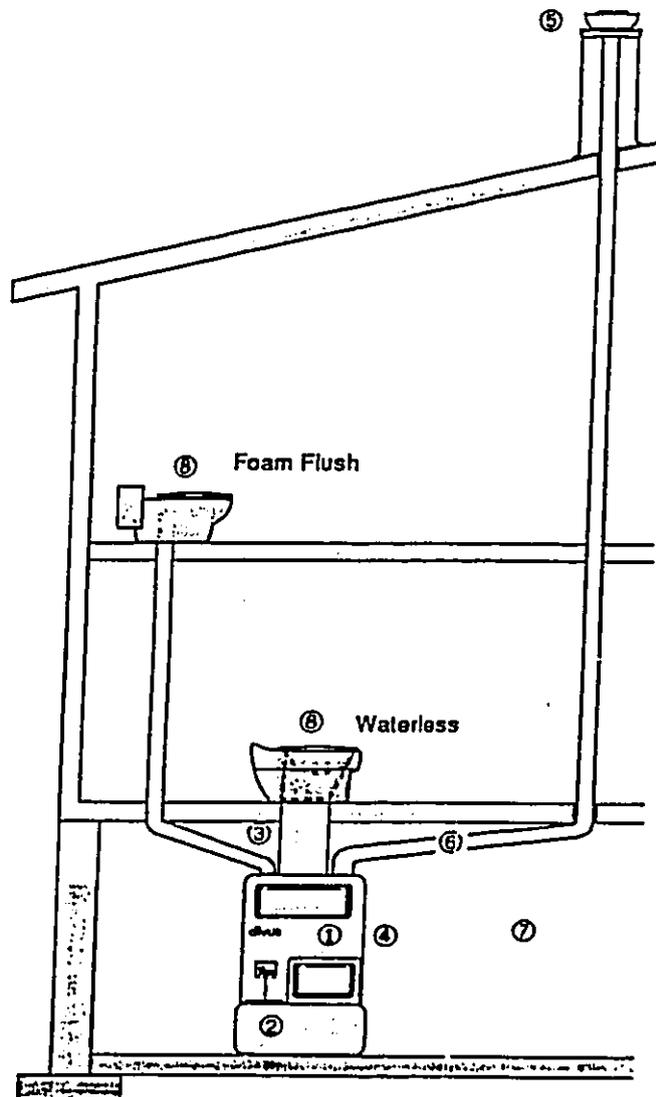
The *Multrum™* has a highly efficient ventilation system powered by a 115V AC blower (solar optional). Fresh air enters the tank through the vent and is drawn across the top of the composting mass and up the vent stack. Fresh air is also drawn down the toilet and urinal openings. Negative pressure in the composter is created by the ventilation system, creating an odor-free environment. This direction of air movement ensures that the restroom enclosure is odor-free, and that oxygen is available to facilitate the composting process and suppress anaerobic residues. The ventilation system also facilitates the evaporation of liquids from the composting mass.

Flexible Venting

When installing the vent system, the PVC multi-ply tape construction, wire reinforced flexible ducting permits angle changes that are not possible with metal ducting.

Installation Flexibility

The *Multrum™* can be installed in full basements or crawl spaces. For homes without basements, Clivus designs that allow for installation in situations without these limitations.

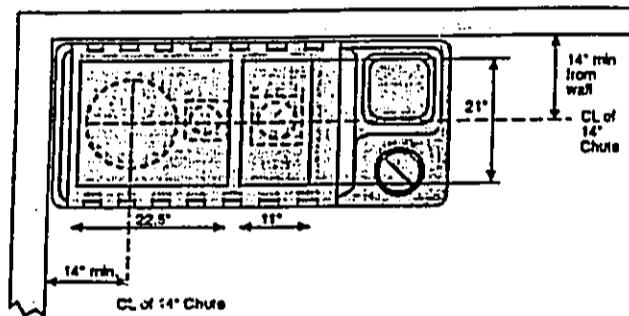


- ⑧ Toilet Options
The *Multrum™* has two different toilet options: waterless and a foam-flush toilet model. Refer to the toilet spec sheets for more information.

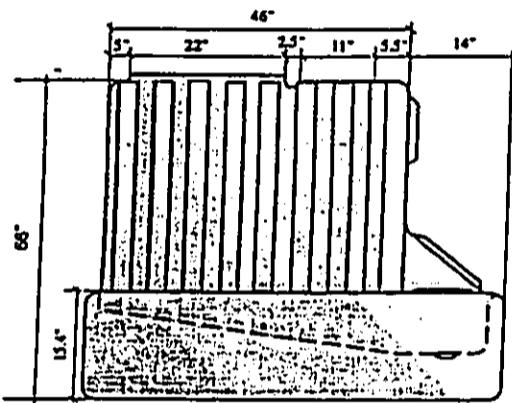
DOCUMENT CAPTURED AS RECEIVED

Clivus Multrum™, 1 Elliot Square, Cambridge MA 02138 1-800-4CLIVUS

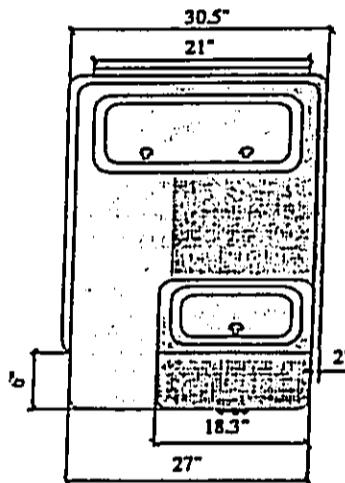
Overall Dimensions
 Height: 66"
 Width: 33"
 Length: 65"



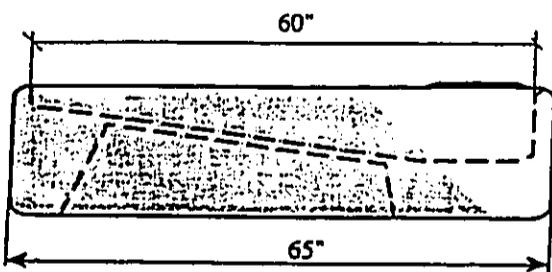
PLAN: MINIMUM Clearances



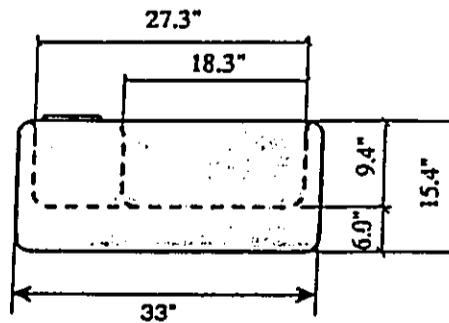
Composite Tank Elevation



Composite Tank Front Elevation



Liquid Base Right Side Elevation



Liquid Base Front Elevation

DOCUMENT CAPTURED AS RECEIVED

MATERIALS AND SPECIFICATIONS

Materials

Tank and base construction is rotationally moulded using LL84-61 linear polyethylene using 100% recycled material with nominal wall thickness of 3/8" (9.5cm). This process and construction material allows the tank and base to be recycled on decommission of unit.

Dimensions

Tank Dimensions

Length: 65" Width: 33" Height: 66"

Tank	200 lbs	260 gal.
Cradle	85 lbs	45 gal.

Capacity

Year-round (continuous): 3 bedroom

Seasonal (intermittent): 4 bedroom

Capacity estimates assume an average daily temperature above 60 degrees. Lower temperatures will reduce capacity. Consult with your Clivus representative for accurate sizing.

Ventilation Fan & Blower

Ventilation is provided by a 115V AC, 60 Hz, totally enclosed, ball-bearing motor with automatic reset thermal protection. The configuration is a low profile, direct drive, up-blast ventilator which throws the air from the composter upward and away from the roof. The up-draft also has the advantage of placing the entire ventilation duct inside the house under a low pressure, which ensures that any leak point will not cause any odour inside the house. Mounted on top of a 45cm x 45cm plywood and clapboard chimney the up-draft blower needs no other top cover.

Ventilation/Interior Vent Ducting

Wire-reinforced, 6" diameter PVC multi-tape construction. One 25' long section is provided; additional sections may be required for an installation.

Optional ventilation systems available

Also available is an in-line blower with 4" or 6" ducting. These are less quiet options that require a higher degree of care during installation in order to ensure that no odour can escape from the fan and duct above the fan and also makes cleaning of the ventilation duct more difficult.

Electrical/Services

115 volt service to the composter is provided by the customer and installed according to local codes. All electrical hook-ups between the composter and the control unit are to be done by a licensed electrician.

Toilet

Two toilet options exist: waterless and foam-flush.

Waterless: This fixture is constructed of impact resistant ABS construction in a sanitary white finish. The seat and lid is made of plastic; the liner, of rotationally moulded polyethylene. This toilet must be located directly over the composter which is situated in a space or room below. The toilet is connected with a 14" diameter chute.

Height: Normal - 14"; Handicapped - 18"

Width: 18.5"

Length: 23.75"

Foam flush: This fixture is constructed of vitreous ceramic and is available in several colors. Seat and lid is made of plastic. This toilet consumes approx. 3 oz. of water per flush. Micro-computer mixes water with biodegradable foam, creating a foam blanket for flushing. This toilet allows for angling of the waste pipe, with a minimum angling of 25 degrees. The toilet is connected with standard 4" PVC pipe.

Height: 21"

Width: 14.5"

Length: 31"

Warranty and Service:

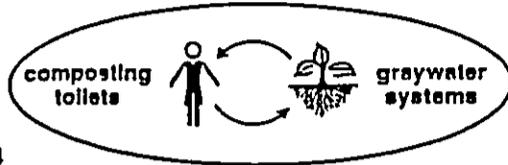
A limited 5-year warranty against defects in materials and workmanship is provided by Clivus Multrum™ on the composter and toilet fixtures. All electronic and electrical equipment provided by Clivus Multrum™ is warranted for 1 year or for the period provided by the component manufacturer. Warranties are contingent upon the documented installation of the composting system in strict accordance with Clivus Multrum™'s instructions.

An authorized representative of Clivus Multrum™ is designated and available for consultation and/or service at a reasonable fee for the life of the Multrum™ Composter.

DOCUMENT CAPTURED AS RECEIVED

Hanson Associates

Lewis Mill, Jefferson, MD 21755
301-371-9172 • FAX 301-371-9644



John Hanson
Bob Hanson

clivus®

Authorized Representative

GRAYWATER USE SYSTEMS SUMMARY

Graywater systems described here use graywater in the landscape instead of disposing it underground where it contaminates groundwater. These systems distribute aerobic (not septic) graywater over, or in, the root zone for direct irrigation and nutrient absorption (fertilization). Public health is protected by separate composting of human body products, and by providing in all systems a physical barrier to direct human contact with the graywater. Graywater systems are designed to complement the site: indoors in soil beds or green houses; outdoors at-grade or elevated; attached to the building or remote; any shape. System sizing depends on graywater flow, percolation rate, depth of limiting zone, which system is chosen, and landscape position. Graywater use systems generally take less land area than sewage disposal systems and range in cost from \$2,000 to \$8,000 for a typical residence.

The Irrigation Trough: A flooding dose delivers graywater to a level soil interface, defined by a bottomless trough, located 6" below grade in a root zone. The trough's removable lid allows for periodic inspection and leveling of the graywater to soil interface. No prefiltration is required.

The Mulch Basin: A flooding dose delivers graywater to a level-bottomed, mulch filled top soil basin created directly over the root zone of trees or large shrubs. No prefiltration is required.

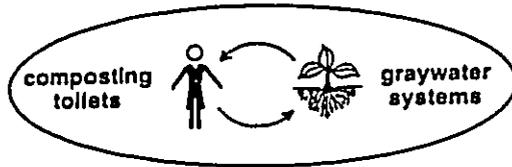
The Mulch Bed: Graywater is prefiltered by a Clivus Graywater Filter and then distributed to the soil bottom of a mulch bed through Clivus Graywater Pipes.

Drip Irrigation: Graywater is prefiltered by a Clivus Graywater Filter, then goes through a secondary micro-filter, then to a drip irrigation system installed under 3" of mulch or soil (seasonal outdoors, year-round indoors).

The Constructed Wetland: Graywater is prefiltered by a Clivus Graywater Filter, then passes through the rhizome network of aquatic plants (such as cattails) growing in a watertight, shallow bed, filled with gravel or soil. The effluent can be used for surface irrigation or disposed in a reduced size subsurface infiltration chamber.

Hanson Associates

3205 Poffenberger Rd. (Lewis Mill)
Jefferson, Maryland 21755
301-371-9172 • FAX 301-371-9644



Clivus Multrum, Inc.
Authorized Representative

HANSON NUTRIENT RECYCLING SYSTEMS

Composting Toilets

• Compost and Liquid Fertilizer Use Plan

• Graywater Flower Bed

- All nutrients and organic matter safely recycled to the land based food chain (site vegetation)
- Less expensive than mound systems, other "innovative" systems, sewers, and some "conventional" systems (typical residential - \$14,000; commercial and public facility - \$5,000 and up)
- Can make unbuildable lots buildable, can correct existing failing septic systems, and can make indoor plumbing possible

The Clivus Multrum **composting toilet** (NSF approved) converts human body products and food scraps into odor-free, safe-to-handle, compost and liquid fertilizer.

The **compost and liquid fertilizer use plan** for a typical residence would specify that the 2 bushels of compost generated per year shall be raked into the lawn or used as a fertilizer around shrubs or trees, and that the 300 gallons of liquid fertilizer generated per year shall be applied to a 30 foot by 40 foot area of lawn.

The **graywater flower bed** includes: the dosing station where all washwater from sinks, showers, and laundry accumulates; and is dosed to the flower bed(s); the flower bed(s) designed aesthetically into the landscape; and the irrigation trough running down the middle of the bed(s), installed level so a flooding dose will be distributed evenly to the ends of the trough. Vegetation growing around the trough is irrigated and fertilized, and clean water is returned to the soil under the bed. The system uses no septic tank and is permanent, fully automatic, non-clogging, and low maintenance. The low flow, low pollutant load, and shallow design enables the graywater flower bed to overcome many of the site restrictions relevant only to sewage systems.

Hanson Nutrient Recycling Systems

Hanson Associates -- Nutrient Recycling System Specialists

- Free Consultation
- Site Visits
- Plan Review
- Design Service
- Demonstration Site
- Assistance with Permits
- Installation Service
- Maintenance Service

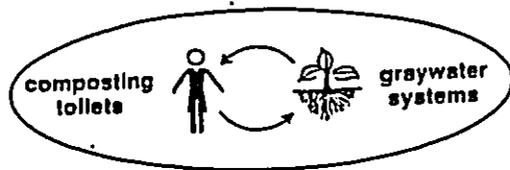
Enc: Demonstration Site (Hanson Associates)
Clivus Flyer/Price List
Testimonial
Graywater Flower Bed Systems in Maryland
Clivus Installations

Upon Request:

Regulatory Needs
Land Application of Clivus Liquid Fertilizer
Design Guidelines -- Graywater Flower Bed

Hanson Associates

3205 Poffenberger Rd. (Lewis Mill)
Baltimore, Maryland 21755
301-371-9172 • FAX 301-371-9644



Clivus Multrum, Inc.
Authorized Representative

DESIGN GUIDELINES GRAYWATER FLOWER BED SYSTEM Residential/Experimental/MD,DE,VA,WV December, 1996

The Hanson Associates Graywater Flower Bed safely uses graywater to irrigate and fertilize site vegetation. It is designed to compliment a totally separate composting toilet system which converts human body products into compost and liquid fertilizer, also for beneficial use on site vegetation. With the composting toilet/graywater flower bed system, there is no sewage, no septage, and no groundwater pollution. The system is a permanent, low cost, low maintenance, reduced size, and beneficial, alternative to a septic system.

I. THE IRRIGATION TROUGH DISTRIBUTION SYSTEM (see Detail, attached)

A. Construction: Pressure treated lumber or Trex wood/polymer composite lumber walls; open bottom; openable white cedar (non warping) lid; stainless steel screws.

B. Sizing

1. General: shall be long and narrow to maximize root zone access.

2. Formula: $150 \text{ gpd/BR (standard design flow for sewage)} \times 50\% \text{ for composting toilets, low flow shower heads, and no garbage grinder} = 75 \text{ gpd/BR} + 2.5 \text{ gpd/sq ft for low pollutant load (approximately double the soil application rate for sewage in soils with a 2-30 minute perc rate)} = 30 \text{ sq ft/BR soil absorption area, or trough bottom area, required (about 75\% less that required for sewage)}$.

3. Typical: $30 \text{ sq ft/BR} = 2 - 1 \text{ ft wide} \times 15 \text{ ft long troughs per bedroom}$.
For a 3 bedroom house there would be $6 - 1 \text{ ft wide} \times 15 \text{ ft long troughs}$.
More troughs may be used in order to irrigate a larger area.

C. Installation: must be level to accept flooding dose; may need stabilization stakes if in fill soil; graywater to soil interface to be 6 in. below grade.

II. SITING

- A. Growing area required: allow a minimum 1 ft wide growing area along each side of the trough; a 30 sq ft trough (1 BR) including 30 sq ft on each side for growing area = 90 sq ft; estimate 100 sq ft/BR or 300 sq ft of growing area for a typical 3 BR house.
- B. Shall blend with landscape; along side of structure; parallel to property line, sidewalk, hedge row, or natural or architectural borders; terraced into hillside, etc.
- C. Should have southern exposure and wind protection for warmth.
- D. Horizontal Separation Distance shall be 50% of the distances required for sub-surface sewage disposal, including: 12.5 ft to steep slopes, drainage ways, rock outcrops; 50 ft to streams and water wells in unconfined aquifers; 25 ft to water wells in confined aquifers.
- E. The treatment zone shall be the root zone and shall have an unsaturated depth of 2 ft below the graywater to soil interface (2 ft 6 in. below grade) with a perc rate of 2-30 minutes/inch taken at 6 in. below grade.
- F. Topsoil fill may be used to level the trough, to gain an adequate treatment zone, to create a large basal absorption area so that natural soils with a perc rate slower than 30 minutes/inch can be used without increasing the trough size, or for landscaping aesthetics. Fill soils shall be good quality sandy loam top soil capable of supporting an active root zone, and may be contained with durable waterproofed retaining walls, or graded off at a slope not to exceed 3:1 (33%).

III. THE FLOODING DOSE

A. Sizing the Dose

- 1. General: The dose volume shall be small in order to avoid septic conditions, yet large enough to flood the soil interface in the trough to a minimum depth of 1.5 in. (225 gpd/3 BR house ÷ 24 hr/day = 9.4 g/hr x 3 hr maximum desirable retention time = 28 gallon/dose)
- 2. Formula: Trough width x trough length, converted to square inches, x flooding dose depth, divided by 231 cu in/gal = the flooding dose.

3. The typical dose is 28 gallons: 30 sq ft of interface (1 BR; 2 - 1 ft x 15 ft troughs) x 144 sq in/sq ft = 4,320 sq in of interface x 1.5 in minimum flooding dose depth = 6,480 cu in + 231 cu in/gallon = 28 gallons.

B. The dosing chamber shall be sized to accept the dose, a high water alarm 3" above the pump-on level, and an additional full dose above the high water alarm; typical size - 100 gallon.

C. The dosing pump shall be an effluent pump capable of passing 1/2 in. solids and sized to deliver the specified dose to the trough(s) with a minimum of 2 ft of head at the discharge point. The pump shall be positioned so as to deliver all graywater solids to the trough.

D. Dosing to two or more troughs can be accomplished by using a controller set to open motorized ball valves in sequence with each pump-on event, or by using duplex or triplex pump systems.

E. Multiple discharge points for the same dose must be at the same elevation and should be at least 1 pipe size smaller than the force main.

F. Each discharge point shall have a splash block.

G. Install ball valves as needed to control discharge erosion or equalize multiple discharges.

H. A water meter or event counter shall be installed to determine actual graywater flow excluding hose bibbs.

IV. VEGETATION

A. A minimum growing area 1 foot wide around the outside of each trough shall be maintained.

B. All types of vegetation, including flowering annuals, grass, weeds, vegetables, shrubs, and small trees, are likely to thrive and perform adequately in removing nutrients from the graywater.

C. Preferred vegetation includes:

1. Evergreen perennials--in order to maintain an active root zone year round
2. Plants at least 2-3 feet high in order to maintain a root zone size similar to the graywater wetted area.
3. Fast growing plants that love fertile, wet soils.
4. Avoid acid loving plants--graywater is usually slightly basic.
5. Avoid root crops that may be eaten raw.

V. OPERATION

- A. The dosing system is fully automatic.
- B. Use only biodegradable non-sodium based cleaners; the best are "biocompatible" (tested on plants -- such as Oasis Products available from Real Goods, Inc., 1-800-762-7325)
- C. All garbage and grease goes into the composter, not into the graywater system.

VI. MAINTENANCE -- every 6 months or when composting toilet is serviced

- A. Check dosing system for proper operation.
- B. Check vegetation condition--add plants, pull weeds, thin, prune, harvest as needed for aesthetics, trough lid access, and nutrient removal. Vegetation that dies during the growing season is either too sensitive or indicates too much sodium or toxics in the graywater.
- C. Check graywater-to-soil interface (inside trough) for proper characteristics: color of wet soil; rough, perforated texture from soil biological activity; presence of hair, lint or food particles from recent dose; presence of decomposer organisms such as ants, sow bugs, earthworms and their castings, spiders, centipedes, etc.; presence of roots or root hairs; deposit on side walls indicating proper flooding dose depth of 1.5 inches. If these characteristics are present, DO NOT DISTURB!
- D. Check graywater to soil interface for even distribution of the flooding dose--add soil, subtract soil, rake, level, tamp, as needed.
- E. A thin, gray biomat may appear on the whole interface area during the cold season and is normal. If the biomat is over one-quarter inch thick or black, then the system should be checked for toxics in flow, too high flow,

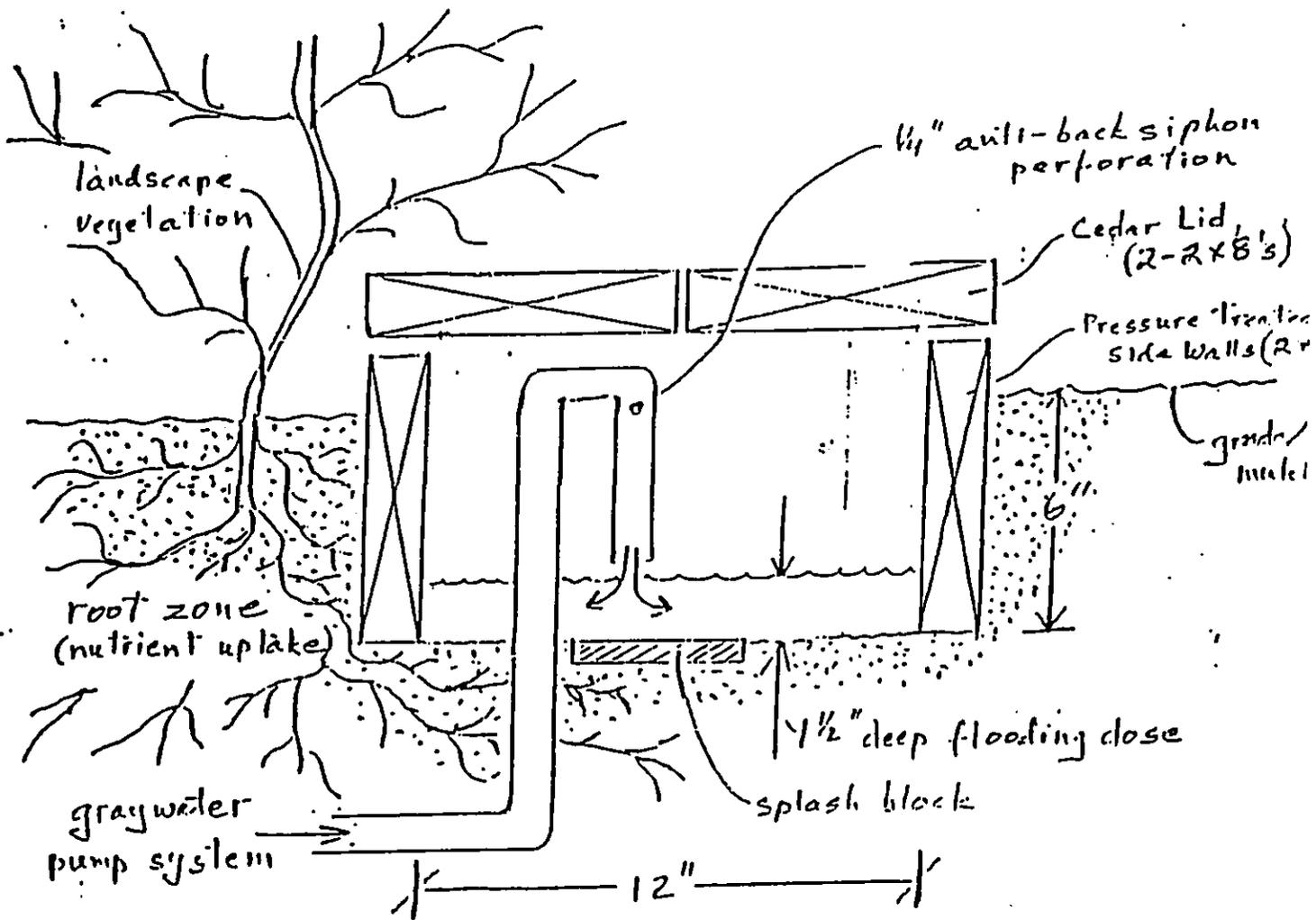
malfunctioning dose operation, uneven dose distribution, or mistakes in design or construction.

VII. PLANS, typical (attached)

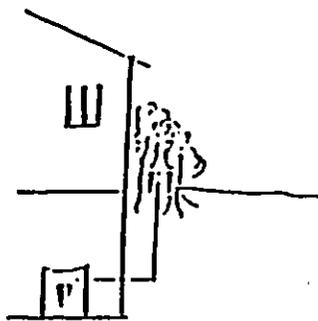
- A. Detail, Graywater Irrigation Trough
- B. Site Plan, Graywater Irrigation Trough
- C. Profile Plan, Graywater Irrigation Trough

VIII. REFERENCE, available upon request

- A. Rationale - Graywater Design Criteria
- B. Land Application of Clivus Liquid Fertilizer



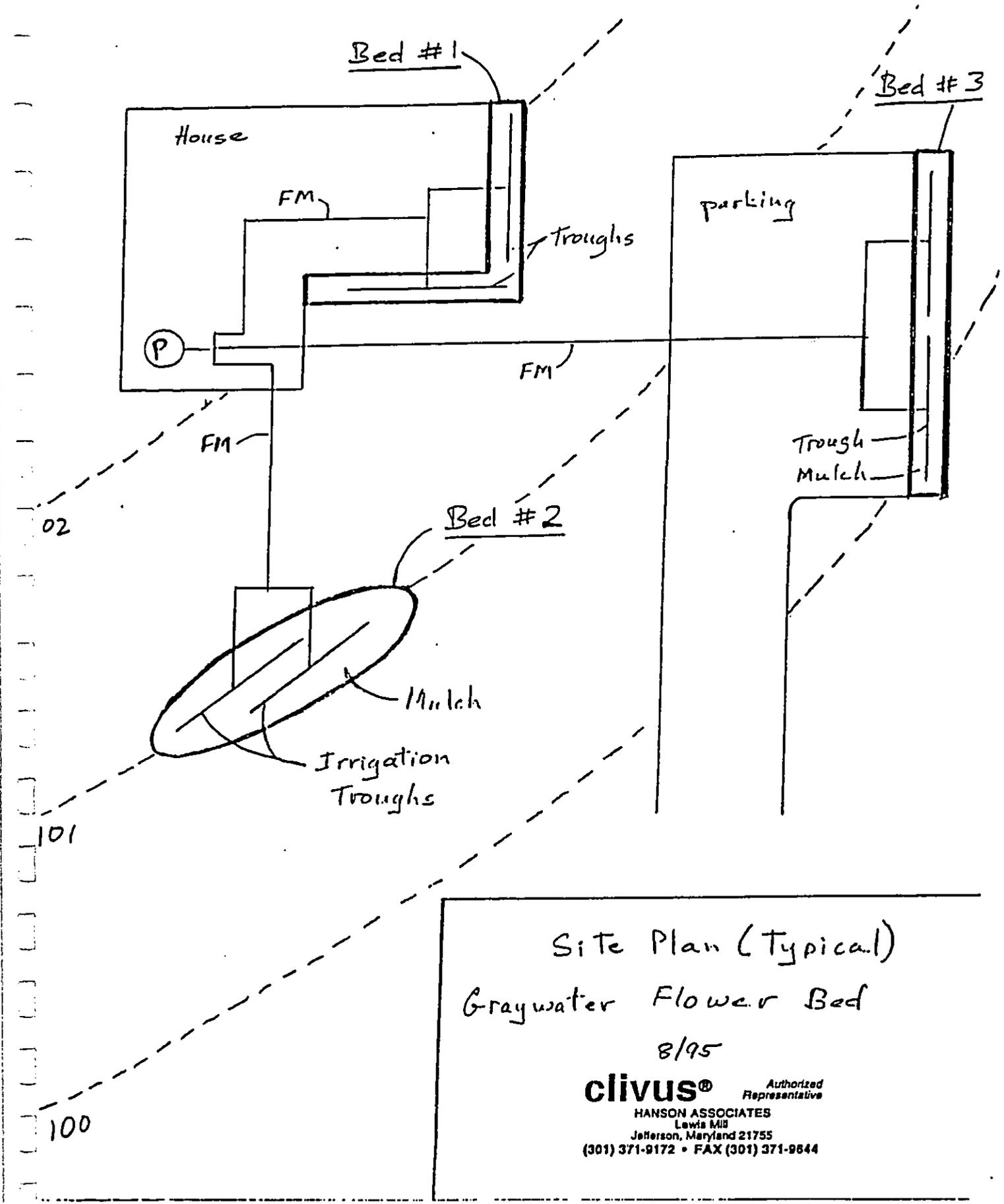
- No septic tank -- hair, grease, food particles decompose at interface
- High loading rates -- shallow interface has high microbial, invertebrate, and root zone activity to prevent bio-mat growth
- Flooding dose distribution system -- no perforations to clog
- Free access -- lid opens for observation and easy maintenance



Detail (Typical)

Graywater Irrigation Trough
8/95

clivus® Authorized Representative
HANSON ASSOCIATES
Lewis Hill
Jefferson, Maryland 21755
(301) 371-9172 • FAX (301) 371-9844

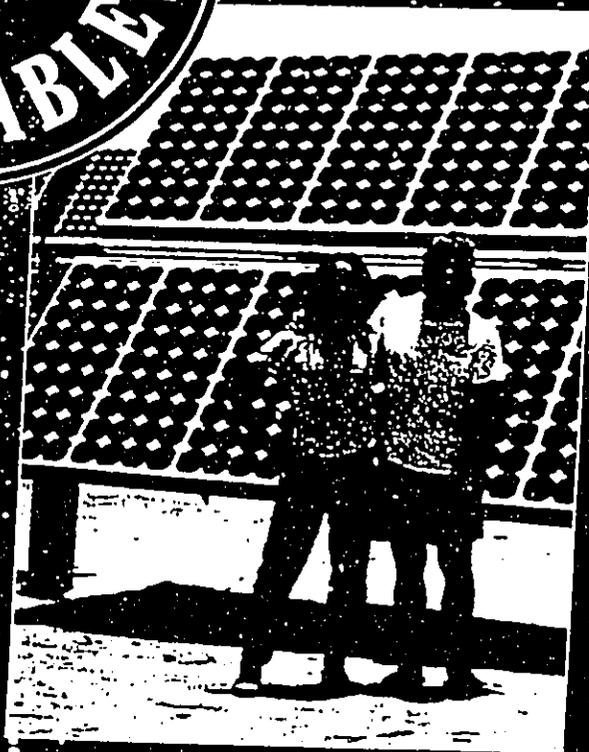
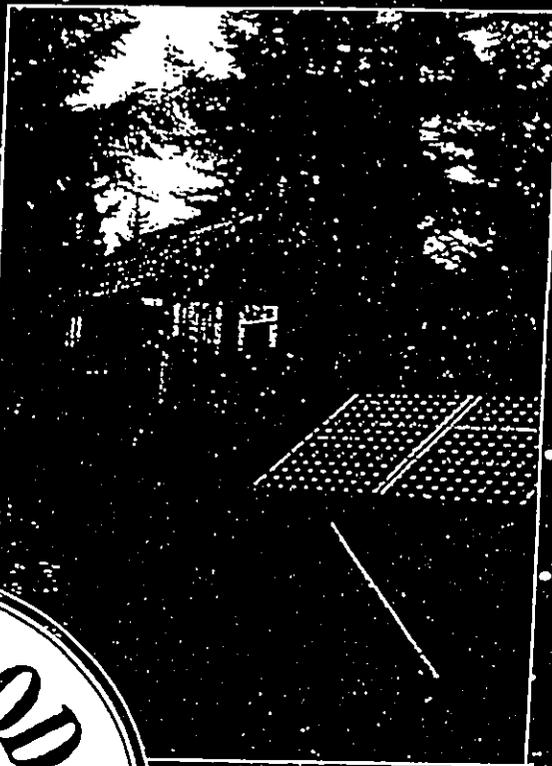


Site Plan (Typical)
 Graywater Flower Bed

8/95

clivus® Authorized Representative
 HANSON ASSOCIATES
 Lewis Mill
 Jefferson, Maryland 21755
 (301) 371-9172 • FAX (301) 371-9644

SUMMER 1997



Providing Stellar Power Systems To Over 25,000 Homes & Villages Worldwide Since 1978

HOW RENEWABLE ENERGY SYSTEMS WORK



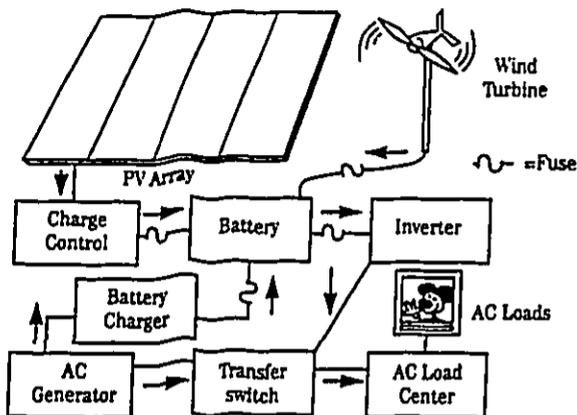
RENEWABLE ENERGY

A MERCIFULLY BRIEF INTRODUCTION

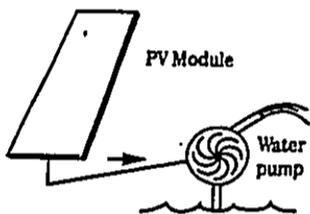
Renewable energy can be collected from direct sunlight, using photovoltaic (PV) modules; from 9 mph or higher winds, using wind turbines; or from falling water, using hydro turbines. What makes all these sources renewable is that the amount of energy we take from any one of them today in no way diminishes the amount we can take tomorrow, and tomorrow, and so on.

PV collection is by far the most common method in use today, and is the technology that requires the least maintenance, and appears to be the most long-lived. In remote locations batteries are used with PV modules to store the collected energy for later use. In less remote areas, excess energy can be delivered to the utility grid, often turning your meter backwards. Our examples below use PV modules, but the energy could just as well be delivered in whole or part by wind or hydro in the right site.

center provides very important fusing and safety equipment. The monitor displays system operation, and may provide visual or aural alarms.



TYPES OF RENEWABLE ENERGY SYSTEMS



SOLAR ARRAY-DIRECT SYSTEM

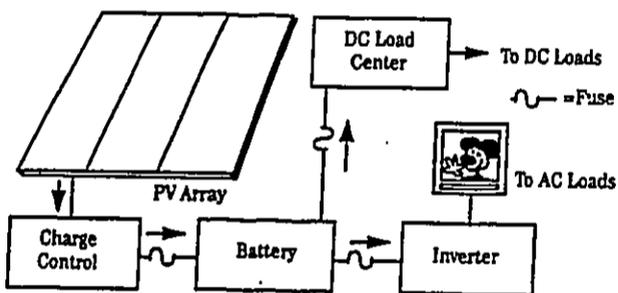
The solar array-direct system is the simplest solar energy system, consisting of an appropriately sized solar array powering an electrical

appliance directly without batteries. Examples of these would be solar powered fans and pumps. These offer simplicity and high operating efficiencies but won't run the appliance under heavy cloud cover or at night. Performance is enhanced with the addition of current boosters, electronic devices which permit motors to start or run under low light conditions.

HYBRID PV-GENERATOR SYSTEM

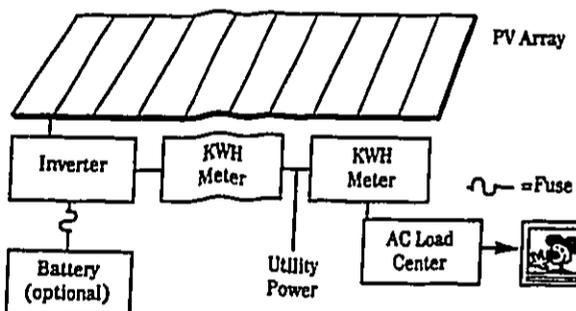
This is the kind of system that most remote home sites will utilize. Adding a generator or a small wind turbine to a stand-alone system is less expensive than sizing for worst-case weather conditions. A fossil-fueled generator, combined with a high-powered battery charger can supply an energy boost when weather or financially-induced undersizing causes the PV array to fall short. A generator is sometimes used for peak loads such as deep-well pumping, washing machines, or stationary shop tools, while simultaneously charging batteries. While not fully "environmentally-correct," a well-designed system will probably put less than 50 hours of use on the generator per year, and will greatly increase system reliability. A generator size of 5,000 to 7,500 watts is usually about right for this kind of use.

In a good site, a small wind- or hydro-turbine may provide enough boost in the energy-intensive wintertime months so that a fossil-fueled generator is unnecessary.



SMALL STAND-ALONE SYSTEM

A stand-alone system depends entirely on renewable source(s). It can provide power for lighting and entertainment in a remote cabin, RV, or boat. The size of the PV array and battery depend on individual requirements or, more commonly, the individual pocketbook. See our System Sizing on page 8 to do it right, then compare with what you can afford. When exposed to direct sunlight the PV array will charge the battery, and the battery supplies energy directly to DC loads and through the inverter to AC loads as needed. The Charge controller prevents overcharging when the battery is full. The load



UTILITY INTERTIE SYSTEM

There are two common uses for utility intertie. One, the most common, is because normal utility power is unreliable, and the homeowner needs a reliable power supply for some or all household appliances. Computer users are familiar with this system as a UPS, or uninterruptible power supply. We just scale it up as needed. This is most common in developing nations. Storage batteries are used to provide dependable power. Charging can come from a renewable source, the utility, or both.

continued on page 6



RENEWABLE ENERGY



9th Edition Sourcebook

For a complete information compendium on renewable energy sources, photovoltaics, wind, and falling water, see our newly updated *Solar Living Sourcebook*, the bible of the renewable energy industry, with over 800,000 in print in 44 English speaking countries. 80-515 9th Edition Sourcebook \$24⁹⁵

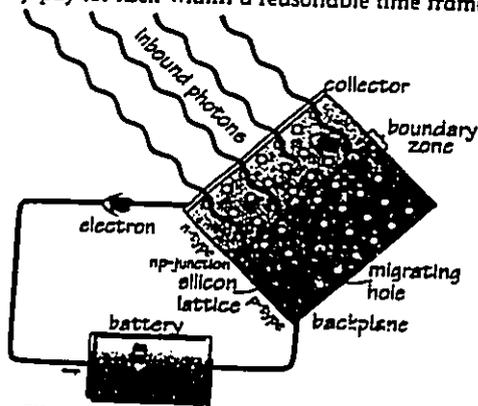
DON'T MESS WITH... THE SHADOW

PV modules aren't like solar hot water panels. Small shadows will drastically affect PV output. Even a fist-sized bit of shade will completely stop all electrical output from a standard PV module! This happens because a shaded area has very low voltage. Voltage is like water level, electrons flow to the lowest point. If the lowest voltage point is a patch of shade, these electrons are stuck to us. Avoid partial shading when planning where to mount your modules, particularly during the prime output hours of 10am to 3pm.

Visit our website at: [realgoods.com](http://www.realgoods.com)
<http://www.realgoods.com>

continued from page 5

The second type of utility intertie allows the homeowner to sell any excess renewable energy, beyond the immediate household needs, to the utility company. This scheme doesn't always need storage batteries, but often uses them to provide emergency backup in case of utility failure. This is the system used at our twelve acre Solar Living Center in Hopland, California. These systems require specialized low-distortion inverters to produce acceptable energy for utility distribution, and to provide safety for utility workers. They also need the approval of your local utility. Many utilities are now offering net-metering rates for small amounts of residential PV-generated energy. This means you have only a single kilowatt-hour meter, which either runs forward or backward depending on the energy flow at the moment. With net-metering, a PV system may pay for itself within a reasonable time frame.



How Photovoltaic Modules Work

Over 90% of the renewable energy systems we design use PV (or solar electric) as the primary power source. Sunlight is the one renewable energy source that just about everyone receives. So let's start with a basic PV introduction.

In the early 1950s scientists tinkering with the new wonder, semiconductors, found that by introducing minute amounts of certain impurities called dopants to the mix, they could produce a silicon with an excess or a deficit of electrons. By combining a thin layer of each doped silicon type, and exposing the combination to the photon bombardment of sunlight, some of the loosely bonded electrons in the n-type layer are knocked loose. If collected by a printed circuit grid and given an electrical path, these electrons will produce a current flow as they move toward the p-type layer, which has a deficit of electrons. A battery, light, or motor that happens to be in this circuit will get charged, lit, or run by the stream of electrons.

This is a gross simplification of the PV process. For the full explanation (and quite a few other enlightening and entertaining facts), see our *Sourcebook* or *The Independent Home* by Michael Potts, one of the

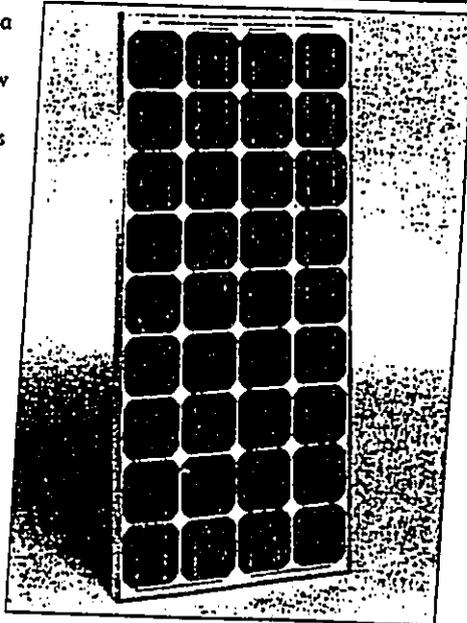
Real Goods Independent Living series of books.

All PV cells, regardless of size, produce approximately 0.45 volts at optimum power. Larger cells will produce more amperage, but voltage remains constant. Most battery charging, pumping, and other work needs higher voltage. This is accomplished by connecting a number of cells in series and packaging them together in a PV module. The most common configuration is 36 series-connected cells which produces a nominal output of 16 to 17 volts, known as "standard" voltage. It's no coincidence that this happens to be a great voltage for charging 12-volt batteries effectively. The higher voltage gives the batteries a good strong charge, and also allows for the slight voltage fade that comes with high temperature operation.

Standard voltage modules of any brand or wattage can be parallel connected in a system and each will produce full output, regardless of individual differences in amperage rating or manufacturer. If we have a 24-volt battery system we simply connect two modules in series. (See the Appendix for graphic explanations of series and parallel electrical connections.) For series connection, modules must be identical, or the smaller module will limit output.

Any number of modules can be grouped together with series and parallel wiring as needed into an array. A small RV or weekend cabin might get by with a single module, while a full-time suburban-style household needs a sizable array.

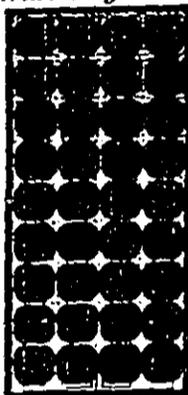
For more on PV modules see our *Sunshine to Electricity* booklet (page 9) or the *9th Solar Living Sourcebook*.



REAL GOODS RENEWABLES

Siemens is now offering a 25 year warranty on all 46 watts and larger modules! How many consumer products can you name with a 25 year warranty?

25 YEAR Warranty



SP75

SIEMENS PV MODULES

Siemens has been the recognized PV industry leader for years. Made in the USA, all Siemens modules use the highest quality single-crystal cells with tempered low-iron glass, anodized aluminum frames, and tedlar backsheets. Siemens modules all have UL-approval, and pass JPL Block 6 environmental requirements, which include salt fog testing for corrosion resistance. A 10- or 25-year warranty is standard depending on model.

Siemens has recently started introducing new "clean room" technology to their manufacturing processes. This has resulted in slightly higher wattage ratings for several modules.

Siemens SP75 (formerly PC4-JF)

Siemens has created the ProCharger line of photovoltaic modules with much lower prices. There's no sacrifice in quality and reliability with these 75-watt single crystalline panels. The secret to bringing the price down is that the cells are larger, and they're grown in the same shape that they're used—something like an octagon. Less trimming, less waste, and much lower prices! Cells are wired 36 in series for higher voltage output. The SP75 module has a conventional anodized aluminum frame and junction box. It can be used with any system voltage up to 600 volts open circuit. Made in the USA.

- Rated Watts: 75 watts @ 25°C
- Rated Power: 17 volts, 4.4 amps
- Open Circuit Volts: 22 volts @ 25°C
- Short Circuit Amps: 4.8 amps @ 25°C
- L x W x D: 47.3" x 20.8" x 2.5"
- Construction: single crystal, tempered glass
- Warranty: within 20% of rated output for 25 yrs.
- Weight: 16.7 lb/7.6 kg

11-106 Siemens SP75 \$495⁰⁰

25 YEAR Warranty

SM50-H



Siemens SM50-H (formerly M-75)

The Siemens SM50-H is efficient, attractive, easy to install, and comes with a wired-in bypass diode in each junction cover. The SM50-H consists of 33 cells in series. Each module includes an easy-to-understand instruction manual. The SM50-H has been the industry standard battery charging module for many years. Not for hot climates (above 80°F). UL-listed. Made in USA.

- Rated Watts: 50 watts @ 25°C
- Rated Power: 15.9 volts, 3.15 amps
- Open Circuit Volts: 19.82 volts @ 25°C
- Short Circuit Amps: 3.4 amps @ 25°C
- L x W x D: 48" x 13" x 1.4"
- Construction: single crystal, tempered glass
- Warranty: within 20% of rated output for 25 yrs.
- Weight: 11.6 lb/5.2 kg

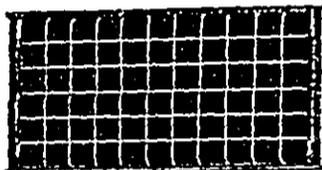
11-101 Siemens SM50-H \$349⁰⁰

Siemens SM55 (formerly M-55)

The SM55 is a higher voltage standard module, consisting of 36 cells in series. It is ideal for water pumping applications, hotter climates, or rooftop RV applications where higher voltage is required. It is the best module to use in extremely hot climates as high-temperature voltage drop is kept tolerable. UL-listed. Made in USA.

- Rated Watts: 55 watts @ 25°C
- Rated Power: 17.4 volts, 3.15 amps
- Open Circuit Volts: 21.7 volts @ 25°C
- Short Circuit Amps: 3.45 amps @ 25°C
- L x W x D: 50.9" x 13" x 1.4"
- Construction: single crystal, tempered glass
- Warranty: within 20% of rated output for 25 yrs
- Weight: 12.0 lb/5.5 kg

11-105 Siemens SM55 \$379⁰⁰



Siemens SM6 PV Module

Uses Siemens proven single crystal technology with 33 cells in series, tempered glass, anodized aluminum frame, and cable output. Has 10 year mfg. warranty. Made in USA.

- Rated Watts: 6 watts @ 25°C
- Rated Power: 15 volts, 390 milliamps
- Open Circuit Volts: 19.5 volts @ 25°C
- Short Circuit Amps: 420 milliamps @ 25°C
- L x W x D: 13" x 6.9" x 1.4"
- Construction: single crystal, tempered glass
- Warranty: ten years
- Weight: 2.2 lb/1.0 kg

11-100 Siemens SM6 \$115⁰⁰

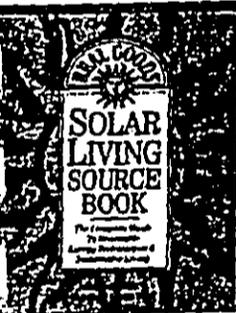


Siemens SM20 (formerly M20)

The SM20 is a compact, self-regulating module ideal for RVs, boats, and remote homes where needs are minimal, use is intermittent, or space is limited. As the battery approaches full charge, the SM20 decreases the current output from 1.37 amps to less than 0.25 amp, eliminating the need for a charge controller. Siemens recommends at least 70 amp-hours of battery storage for each SM20 module. Not recommended for hot climates. Made in USA.

- Rated Watts: 22 watts @ 25°C
- Rated Power: 14.5 volts, 1.38 amps
- Open Circuit Volts: 18.0 volts @ 25°C
- Short Circuit Amps: 1.60 amps @ 25°C
- L x W x D: 22.3" x 12.9" x 1.3"
- Construction: single crystal, tempered glass
- Warranty: within 10% of rated output for ten yrs
- Weight: 5.6 lb/2.5 kg

11-107 Siemens SM20 \$285⁰⁰



9th Edition Sourcebook
 a complete information compendium on renewable energy sources, photovoltaics, wind, and falling water, see our newly updated Solar Living Sourcebook, the bible of the renewable energy industry, over 300,000 in print in English speaking countries.
 15th 9th Edition Sourcebook \$24⁹⁵



To Order:
REAL GOODS RENEWABLES
 Phone: 800-919-2400 Fax: 707-462-4807
 E-mail: techs@realgoods.com
 200 Clara St., Ukiah CA 95482

IN USE AS FAR AS POSSIBLE ON THE SOLAR BAL. see page 23



WATER HEATING

AQUASTAR INTRODUCES NEW MODELS!



Aquastar 125

An Aquastar, besides being the most efficient water heater you can use, is the last water heater you'll ever purchase for your house. All parts are repairable or replaceable, and all parts that actually touch water are non-corrosive stainless steel, brass, or copper, with a ten-year warranty on the heat exchanger.

Aquastar was purchased by Robert Bosch Corp. last year, and we're starting to see some new models as a result. The biggest changes are to the most popular 125 model. Now with a more efficient heat exchanger it burns 6.5% less fuel, but supplies the same amount of hot water. Activation flow rate is down from 0.76 to 0.5 gpm making this unit less prone to turning off at low flow rates. Other new standard equipment includes a piezo ignitor, a pressure relief valve to comply with US plumbing code, and a drain plug for easier, complete draining to prevent freeze damage. Cabinets have also been redesigned. Happily the one thing that stayed the

same was the price!

As always all models are thermostatically controlled to maintain your set water temperature. Adjustment range is 80° to 140°F approximately. For safety all models have a standing pilot thermocouple, an overheat fuse, and a manual shut-off valve.

The smallest model 38 will run a low-flow shower so long as incoming water temperature is above 45°F, making it ideal for summer cabins. The model 80 (which is unchanged by Bosch) will serve households of one or two people. The model 125 is our "standard" for multi-person households with normal suburban demands. Model 170 has a high activation flow rate of 1.0 gpm, and is designed for restaurants, dairies, carwashes, or filling large Jacuzzi-type tubs. All 170 models are equipped with the "S" type gas modulation.

Optional "S" models are for installations that have (or may have in the future) solar preheated water. S models will modulate the gas burner all the way down to zero if needed to maintain set output temperature. This option won't affect normal operation with or without preheated water, but costs a whole lot more to add as a retrofit in the future.

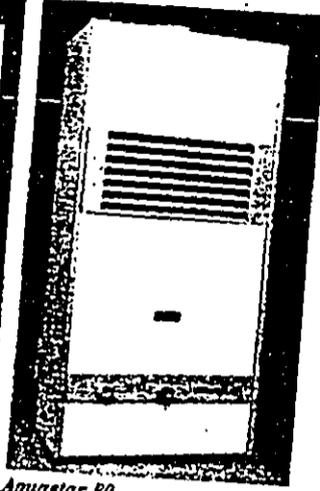
Mfg. warranty is ten years on heat exchanger, two years on everything else. AGA approved. Specify LP (propane), or NG (natural gas) when ordering.

Call for sizing and clearance specs on individual models.

45-101LP	Aquastar 38LP	\$359 ⁰⁰
45-101NG	Aquastar 38NG	\$359 ⁰⁰
45-102LP	Aquastar 80LP	\$549 ⁰⁰
45-102NG	Aquastar 80NG	\$549 ⁰⁰
45-108LPS	Aquastar 80LPS	\$599 ⁰⁰
45-108NGS	Aquastar 80NGS	\$599 ⁰⁰
45-105LP	Aquastar 125LP	\$689 ⁰⁰
45-105NG	Aquastar 125NG	\$689 ⁰⁰
45-107LPS	Aquastar 125LPS	\$699 ⁰⁰
45-107NGS	Aquastar 125NGS	\$699 ⁰⁰
45-104LP	Aquastar 170LP	\$949 ⁰⁰
45-104NG	Aquastar 170NG	\$949 ⁰⁰



Aquastar 38



Aquastar 80



A Direct-Vent Tankless Water Heater

Direct-vent means that all air for combustion is drawn from outside. The combustion chamber is completely sealed off from the house interior. This is safer, as combustion gases and by products can't possibly be drawn or pushed into the home. It's more energy efficient, as already-warmed inside air isn't sucked up for combustion, forcing cold air leakage to replace it. And it is usually less expensive to install, as the vent pipe is included with this heater and there's nothing further to buy.

The 100,000 Btu/hr. Myson heater must be installed on an outside wall, and will run a single shower, or multiple smaller fixtures like sinks or dishwashers. Thermostatically controlled, it adjusts the gas flow to achieve a relatively steady output temperature, or to compensate for solar preheated incoming water just like the Aquastar S models. Has piezo (matchless) electronic igniter. Mfg. warranty is 10 years on heat exchanger, 1 year on all else.

⊙45-090 Myson Direct-Vent Water Heater \$695⁰⁰
(Includes vent kit for 6" to 10" thick walls)
Specify LPG or Natural Gas.

⊙45-092 Wall Protector Kit \$59⁹⁵

(Needed if outside wall surface is flammable)

⊙45-091 Vent Extension Kit \$49⁹⁵

(For walls up to 2 1/2" thick)

⊙45-093 Freeze Protection Kit \$89⁹⁵

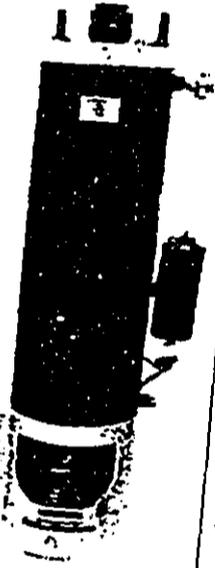
(Thermostatically controlled, requires 120VAC)

REAL GOODS RENEWABLES

☞ Means shipped freight collect.

☞ Means shipped directly from manufacturer.

Visit our website at:
[realgoods.com](http://www.realgoods.com)
<http://www.realgoods.com>



Wood Or Oil-Fired Water Heater

A simple 15-gallon Mexican water heater is the low cost answer for many summer camps, hunting cabins, simple hot tubs, or remote homesteads. Provides hot water quickly by burning wood, corn cobs, pine cones, cow chips, or trash. The dual-fuel model, with its 1.75 liter stainless dribble tank and removable burner pot, can also use kerosene, heating oil, wood alcohol, or diesel (not gasoline!). Heavy-gauge steel design has a weatherproof, heat treated base and standard 3" vent stack. Inlet & outlet fittings are 1/2" standard. Tank is pressure tested to 100 psi. Special 75 psi Pressure/Temperature relief valve is included for safety. Has ash drawer under burner rack. 12" diameter, 49" tall. Outdoor use recommended. Color may vary from picture. Shipped freight collect. Shipping Wt. 45 lbs.

45-427 Wood-Fired Water Heater \$279⁰⁰

45-428 Dual-Fuel Water Heater \$299⁰⁰



Jade Mountain



Summer 1997

Vol. XI No. 1

PACKAGED SYSTEM KITS

Q. How much PV do I need for my house?

How much PV you need depends on your power loads and their duty cycles. If you wanted to completely replace your current electrical purchases from the utility with a PV system, you could look at your kWh usage on your electric bills for a year, calculate a daily average, and divide that by the number of average daily sun hours for your location. (3600 kWh/yr divided by 365 days/yr equals approximately 10 kWh/day, divided by 5 sun-hours per day (for locations in middle America), equals 2 kW. This would indicate that a 2-kW system would, over the course of an average year, produce enough energy to replace the power you are currently using.

However, if you design an energy efficient home, you could cut the annual electricity usage dramatically, reducing the size of the system. In the real world, the majority of home systems range from 1 kW to 2 kW. Where you live, if you are on the grid or off, and how you live, will dictate the size of your system, and its ultimate cost and value.

Q. How long will PV last?

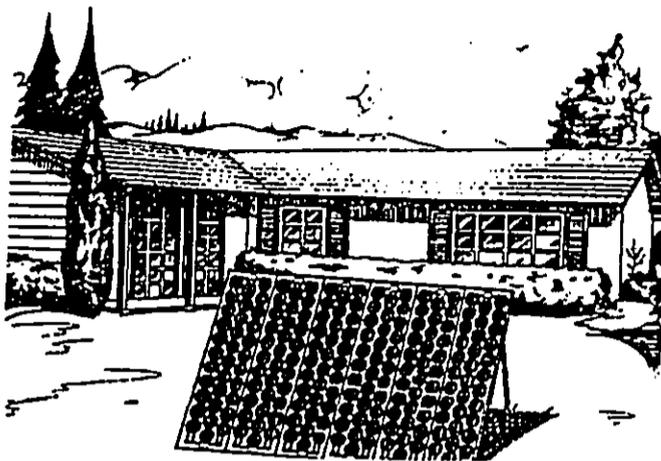
PV modules have been tested in controlled settings and in the field, with results showing module lifetimes in excess of 20 years. Other system components have varied lifetimes (batteries can last 2-15 years, and power electronics are the most sensitive components).

- Mark Fitzgerald

Transportable, Containerized Solar System

Complete "turn-key" PV systems worldwide

Standard and custom systems built in 20' shipping containers. Mounting platform for up to 4000 watts of PV, 150 sq.ft. interior space, and a weatherproof high security shelter. Transport by boat, rail or truck. Ready within 60 days.



Home Power Systems

How much does a solar electric system cost? Different people's solar electric systems vary as much as different people's utility bills. The best way to design a system is to list all the appliances and lights you think you will use, find out how much power each uses, and estimate how long per average day you will use them. Multiply the watts each uses by the hours of daily usage. Add the totals to get your daily energy requirement. Our \$2 PV Design & Sizing booklet will help you determine this as well as battery bank size and other components. Our \$2 Home Power Systems booklet describes 39 different systems listing parts, costs and capabilities. The five systems listed here will give you an idea of what some systems will do and how much they will cost.

System	Power Output	Cost
System PS100	600 watt hours/day	\$1350
System PS101	1200 watt hours/day	\$2525
System PS102	2400 watt hours/day	\$5900
System PS103	5000 watt hours/day	\$12,500
System PS104	10,000 watt hours/day	\$29,200

Marine Solar Electric Systems

Nowhere is a steady, reliable source of electricity more vital than when traveling on water. In most marine settings, solar power is abundant without obstruction from trees and buildings. Solar electric power for ships and boats is a natural—the most reliable source of electricity on earth matched with the most critical of loads. The maintenance system solves the problem of battery self-discharge and includes a special battery. Weekend Sailor System 1 powers lighting, radio and electronic loads. System 2 adds use of refrigeration. Serious Sailor Systems include the special LifeSaver module and provide large power requirements.



System	Power Output	Cost
Maintenance (#PS200)	175 watt hours/week	\$290
Weekend Sailor 1 (#PS201)	270 watt hours/day	\$670
Weekend Sailor 2 (#PS202)	540 watt hours/day	\$1190
Serious Sailor 1 (#PS203)	600 watt hours/day	\$1575
Serious Sailor 2 (#PS204)	1200 watt hours/day	\$3200



SIEMENS PHOTOVOLTAICS

Siemens Prochargers

Higher Output, Lower Cost

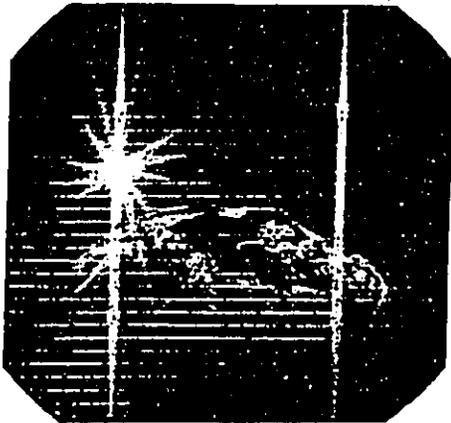
Made with new larger, more efficient "Power Max" solar cells. The same single crystal technology as Arco/ Siemens M series modules at a much lower price per watt. Frames are lighter weight but quality is good. These single crystal cells outperform semi-crystalline and polycrystalline versions in overcast sky conditions. They generate charging voltages in as little as 5% of "full noon" sunlight. All modules equipped with aluminum frames and conduit ready junction boxes. Good for larger systems. All 17V, 10-year warranty.

#PV184 SP18, 17 watt, 1 amp \$208

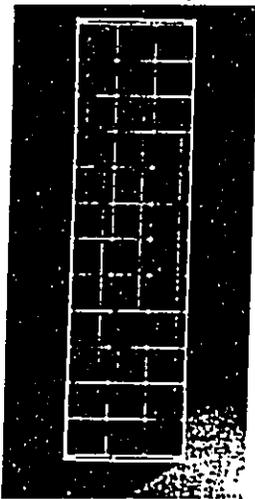
#PV185 SP36, 35 watt, 2.1 amps \$292

#PV186 SP75, 75 watt, 4.4 amps \$455

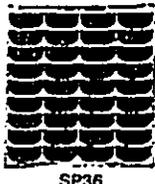
(47.3" x 20.8")



SIEMENS



SP18



SP36



SP75/SP70



SM50-H



SM55



SM46

Siemens Solar Modules Specifications

Model	SM50H (PV175)	SM46 (PV165)	SM55 (PV155)
Watts	48	45	53
Amps	3.0	3.4	3.05
Volts	16.0	14.5	17.4
Size	48x13x1.4	42.4x13x1.4	50.9x13x1.4
Weight	11.6	10.5	12.6
Price	\$319	\$295	\$345
Typical Uses	most common uses	1-2 panel systems	for hot areas & pumping

"If 10% of our electricity were solar generated by the year 2002, we would eliminate up to 170 million tons a year of carbon dioxide—and help save the Earth from the worst effects of global warming. We'd have our country on the road toward environmentally sound, sustainable energy."

—National Audubon Society



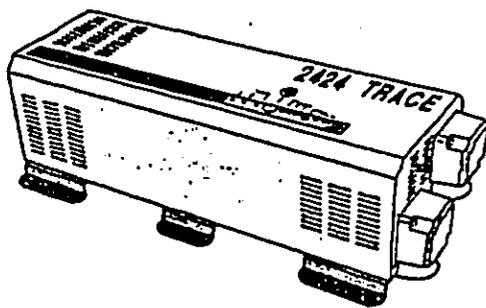
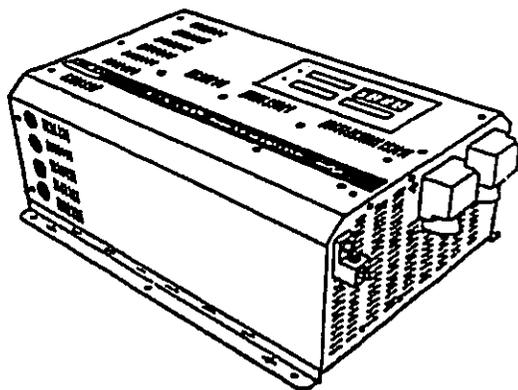
Inverters

Inverters take DC power from a battery bank and change it into AC (regular household) power. This allows you to run almost any AC appliance from your solar, hydro, wind, or generator-charged batteries. With an inverter you can run small equipment like computers and TVs or large appliances like washing machines and water pumps. An inverter will power AC tools if you're building a house away from power lines and then run appliances when the house is finished. On boats and ships an inverter provides power while saving space and fuel. In RVs and motor homes an inverter can eliminate the need to carry a bulky generator. You can also use an inverter to protect yourself against power blackouts. Even if the power goes out in an AC home, an inverter system will insure water, lights, and other necessities.



Trace SW-Series II Sine-Wave Inverters

As Trace Engineering's top-of-the-line models, the SW-series deliver sine wave power without compromise. Motorized equipment runs without a hitch, and audio equipment, light fixtures and power transformers don't buzz. High efficiency, high surge ability and low idle current draw. Series II improvements include easier programming, enhanced reliability, easier AC wiring and conduit access, and improved generator start capability which handles more generator types. Stack (two) 120VAC inverters for 220/240 systems. Used as battery chargers, they offer 3-stage, temperature-compensated charging for maximum battery life. High efficiency design ensures better charging, even with smaller generators. When connected to a generator or power grid, the SW inverter synchronizes it's waveform to that of the AC source, making it an ideal choice for grid-intertie (requires approval of your local utility,) or backup systems. 120VAC, 60Hz output unless otherwise noted. Powdercoated steel enclosure rated for indoor use. 2-year warranty. 52D x 68.6W x 39.5H (centimeters). ETL certified to UL standards will make your electrical inspector happy.



SW2512: 12V Input, 2500VA output (IN1260)	\$2585	\$2435
SW4024: 24V Input, 4000VA output (IN111)	\$3345	\$3145
SW4048: 48V Input, 4000VA output (IN1788)	\$3345	\$3145
SW5548PV 48V Input, 5500 VA output (for batteryless utility intertie systems only) (IN1381)	\$3865	\$3685

SW4120: 120V Input, 4000VA output. Not an official Trace product, but based upon a 4000-series inverter. 120VDC input is well suited for situations where the batteries or solar modules must be located a long distance from the inverter.
(IN1382) \$3200

220VAC, 50Hz SW-series inverters

Same great features as above, but with 220V, 50Hz output.

SW3024E: 24V Input, 3300VA output (IN185)	\$3345	\$3195
SW3048E: 48V Input, 3300VA output (IN1789)	\$3345	\$3245
SW4024W: 24V Input, 4000VA output (2-wire 220VAC only) (IN113)	\$3345	\$3145

Many other models for overseas use available; contact us with your requirements

Accessories for SW-series

Outdoor enclosure for (1) inverter. ETL listed (IN1790)	\$371
25' LCD remote control (IN175)	\$265
50' LCD remote control (IN176)	\$292
Stacking interface (IN181)	\$37
AC or DC Conduit Box (IN178)	\$85

RECHARGEABLE DRY CELL BATTERIES



Dry Cell Batteries

Each year Americans throw away over 2 billion flashlight and toy batteries. In a city of 500,000 people this means almost 9000 pounds of mercury entering our air, earth and water. Batteries corroding in landfills also leak silver, lead, nickel, and cadmium, all dangerous toxins. You can reuse these Ni-cad batteries up to 1000 times. They initially cost more than standard and alkaline batteries but over a period of time they mean big savings. As you can see from our charts, not all Nicads are created equal and the cheapest price may not really be as economical as it appears. Amp rating determines how long a battery will go between recharges. Nicad batteries between charges run out of power more quickly than alkaline "throw-away" batteries so it's good to have a second set charging while using your first. Always store batteries in a cool place when not in use. All prices on this page are for individual batteries.

AC or 12V Omnicharger

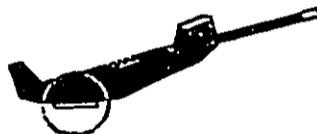
Recharge almost any battery pack in one hour. Use with a long range or cellular phone, notebook computer, camcorder, remote control toy, almost anything! Works for NiCads, Metal Hydride, or Li-Ion. Connect directly to an 18-25 watt solar module and use anywhere. Switch for 4.8, 6, 7.2, or 9.6 volt battery. Prevents over-charge and LEDs indicate status. Includes AC adapter for use with grid power.

#BC1286 \$79

Power Booster

Solar cordless telephone charger—talk while your phone sun or any light source to continually charge your cord to twice as long between regular charging and extend battery life. Installs in seconds and includes bright red LED indicator. Highly recommended for long range cordless phones with solar charging stations.

#CP103 \$20

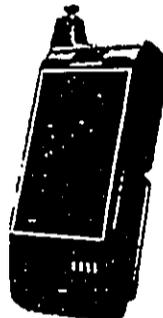


Power Booster 8000

Solarize your Motorola flip phone

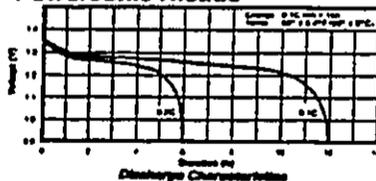
Continually charge your cellular phone. If you use your system for 10 minutes an hour or less, you'll never run out of power while the sun is shining! Triples standby time and increases talk time up to 100%. Costs only a little more than the original Motorola battery but greatly extends battery life. Completely discharged batteries recharge fully in 4 hours but can be used in as little as 60 minutes. Fully compatible with Motorola chargers too. No tools or modifications required.

#CM1477 \$79



Recycle your used nickel cadmium rechargeable batteries with us: bring in, mail, or call 1-800-8-BATTERY for recycling programs in your area.

Powersonic Nicads



Powersonic Nicads

Designed for industrial applications, Powersonic Nicads have higher capacities and longer life than Panasonic and other brands commonly found in stores. Heavy plates permit high discharge rates and stable performance over a wide range of temperatures. In a cool place, these batteries will keep over 60% of their energy for more than 8 months.

AAA 180 mAh (RB104)	\$2.75
AA 1100 mAh (RB100)	\$2.75
C 2000 mAh (RB101)	\$6.75
D 4000 mAh (RB102)	\$11.50
9V 110 mAh (RB105)	\$12.25



Type	Capacity	Brand	Cost
AA	850 mAh	Powersonic	\$2.75
AA	500 mAh	Panasonic	\$4.87
AA	500 mAh	GoldenPower	\$2.95
C	1200 mAh	Panasonic	\$6.27
C	1800 mAh	GoldenPower	\$6.95
C	1800 mAh	Powersonic	\$6.75
D	1200 mAh	Panasonic	\$6.27
D	1500 mAh	GoldenPower	\$7.95
D	4000 mAh	Powersonic	\$11.50

Nicad-Alkaline Cost Comparison

	1 month	1 year	3 years
	\$15	\$15	\$15
	\$53	\$530	\$1750

(From Parent Magazine and based on 1000 charges)

WE MATCH ANY PRICE. BUY FROM US, FIND A LOWER PRICE IN 30 DAYS & WE REFUND THE DIFFERENCE!

SOLAR WATER HEATING



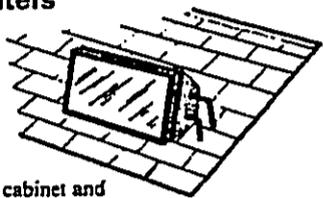
Solar Heater Control Package

Wanting solar water? We've done the hard part for you! Includes mounted controller, sensors, pump, 2-gal. expansion tank, pressure relief valve, pressure gauge, drain-fill assembly and separate air pressure relief valve, and 2 sensors. Mounted on a plywood panel, pre-plumbed and ready to install! Options available for larger systems.

HW122 \$575

Catcher Water Heaters

Reduce most or all of your heating costs with this easy-to-install, passive solar collector. Sunlight passes through two tempered glass panes then heats a black chrome-coated storage tank. An insulated cabinet and venting keep the water hot. The heated water flows into a backup water heater or directly to point of use. Can be installed on ground or roof—no pumps, electricity or moving parts to worry about. Easy to install, just 2 connections—cold water in and hot water out. Best for warm climates, preheating water, summer only in cold climates, or when hot water needed only in afternoons & evenings. 40 gallon tank.

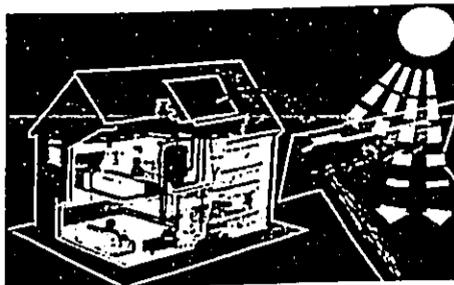


Catcher I (HW 1356) 26" x 36" x 78", 150 lbs \$900

Heliotope Solar Sidebar

Modernize your solar water system. Small PV module and eliminate freeze-ability caused by 115 vac controller error. You no longer need an oversized circulation pump, controller or expansion tank in your solar water heating system! Solar Sidebar installs on the side of electric water heater. (at the bottom drain connection), and provides a safe, reliable, 12V DC system. Monitor performance with digital thermometer and flow rate sensors. Can't freeze up in cold weather. Uses less than 1/3 the normally required power—just the included 10W PV panel. Digital monitors make it fun to watch your system as the sun moves across the sky—a digital meter indicates the amount of water flowing through your system, and a digital temperature monitor with LCD displays water temperature in your storage tank and in the manifold coming from your collectors. (Use with Thermomax thermal collectors from 24 to 96 sq. feet.) Heliotope has confidence in their products: they've made over 1/2 million of them since 1974 and give a 10 year warranty.

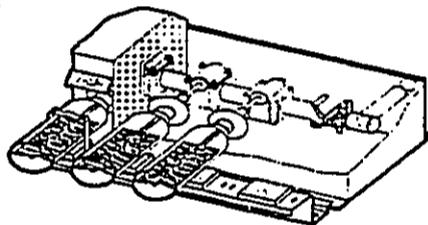
Heliotope Sidebar (HW1582) \$750



Thermomax Solar Collectors

70% of domestic hot water in worst case climates

When US tax credits stopped, most companies went out of business. New research & development almost completely stopped. In Europe, progress continued and evolved into the Thermomax. Over one million now in use in 30,000+ locations in 30+ countries. Nine major international awards. Provides 100% of domestic hot water in good solar areas. Converts twice the energy of a good quality flat plate collector with exceptional performance in cloudy and cold weather. So light and modular one person can install, it pays for itself many times over. (Return on investment generally 5-10%.) Annually saves the equivalent pollution of one automobile. Great for central heating and swimming pools. Small home system includes 20 Thermomax tubes, manifold, roof mount, valves, pump, control, expansion tank with safety relief, control circuits, etc. Medium size has 30 tubes. Please call for design and sizing help.



Small home/cabin system with low use (HW1544) \$2450
 Off-grid version (HW1547) \$2600
 Medium size home, full time (HW1548) \$3120
 Off-grid version (HW1549) \$3470



THERMOMAX

30

31

Here's:
 the most
 100 BTU
 100 BTU
 andie
 less tha
 sur at it's
 at 0.066
 vest!).
 er ensure

single
 ow gives
 me with
 instruction
 tank an
 tank 32
 fade in
 available
 Rustique
 bronze
 Jormand

\$975

\$1900

\$1560

heat 1!

bsorber
 t back i
 pulates
 ver on a
 it—only
 30 lbs.

\$315

2,000 1

4,000 3

6,000 4

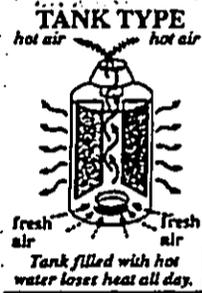
1,449.6

WHEN ANY PRICE. BUY FROM US. FIND A LOWER PRICE IN 30 DAYS & WE REFUND THE DIFFERENCE!



Tankless Water Heaters

your bills in half with a tankless
 or natural gas water heater. You'll
 run out of hot water again!
 Additional water heaters keep a tank of
 hot water night and day—whether you're
 in or not. The tankless heater goes
 only when you want hot water and since
 it heats the water so fast, a whole crowd
 can have hot water, and the last person will have
 hot water as the first. This
 efficiency means a tankless water heater
 pays for itself in two years. Water
 heaters are the second biggest user of
 energy in a typical home and one of the
 most effective places to slash energy
 costs. You can save hundreds of dollars
 each year by replacing a tank-type water
 heater with a tankless, on-demand unit.
 You don't have to replace tank-type
 heaters every few years, tankless heaters
 last a lifetime—even more savings!



Additional Tank Heaters:

Waste costly fuel by keeping water
 constantly heated when not needed.
 Low water temperature—hot
 water turning to cold
 water—our wait for more hot water
 tank used
 A tank water heater only lasts 5-8
 years with higher fuel bills.

BTUs	GPM*	GPM**	GPM***	Cost
10,000	.95	.75	1.2	\$334
15,000	1.2	.8	1.4	\$450
20,000	1.8	1.3	2.3	\$494
25,000	2.3	1.6	2.85	\$579
30,000	3.25	2.11	3.8	\$579
35,000	4.4	2.95	5.3	\$895
40,000	4.5	3.2	5.7	\$1270

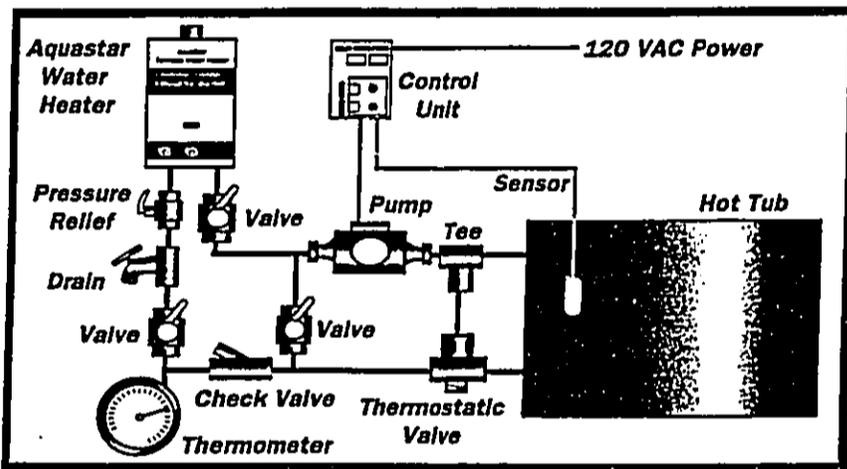
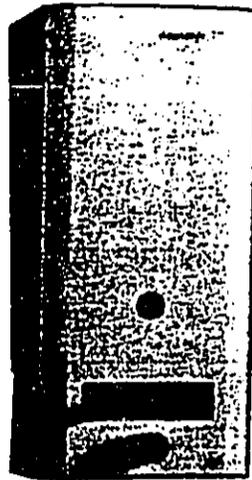
*@90° **@80° temperature rise

New Aqua Star/Bosch Tankless Water Heaters



Instant energy savings and endless hot water. Ideal to back up a solar water heating system in cloudy weather, the Aqua Star gives a boost to water temperatures, or stands alone to provide all your hot water needs—automatically. Aqua Star uses the best materials, tests each unit 5 times before it leaves the factory, and even has a 10-year full warranty on the heat exchanger. A consumer magazine survey recently ranked Aqua Star first in tankless heaters. Easy to install—just mount on a wall, vent, and light. Bosch recently bought the Aqua Star company and brings new models including one designed for hydronic space heating and improved features like lower a lower psi minimum of only 8 and lower gpm requirement of only 1/2 gpm.

Model 38	LP (HW102)	NG (HW1963)	\$334
Model 80	LP (HW100)	NG (HW1383)	\$494
Model 80 solar	LP (HW101)	NG (HW1384)	\$589
Model 125	LP (HW105)	NG (HW1385)	\$579
Model 125 solar	LP (HW106)	NG (HW1386)	\$614
Model 125 hydronic	LP (HW1962)	NG (HW1963)	\$614
Model 170	LP (HW110)	NG (HW1387)	\$895



Aqua Star Sizing Guide

Usage/Appliance	Model 80	Model 125	Model 170
one sink (1 gpm)	yes	yes	yes
two sinks (2 gpm)	yes	yes	yes
shower	2 gpm yes	3 gpm yes	4 gpm yes
Two showers (same time)	no	no	2 gpm yes
Bath Tub	yes-slowly	yes	yes
Washing Machine	no	yes	yes
Dishwasher	no	yes	yes
Whirlpool Bath	no	yes	yes

large
 tion

il? Here's
 te the mo:
 0,000 BTU
 2,500 BTU
 mandie
 tes less th
 hour at it
 just 0.066
 owest!).
 rizer ensur
 on.
 ia single
 idow give
 lame with
 onstructi
 D flue ar
 oil tank 3
 Made in
 s availabl
 d Rustique
 Bronze
 Normanc

\$975
 \$1900
 \$1560

1 heat 15

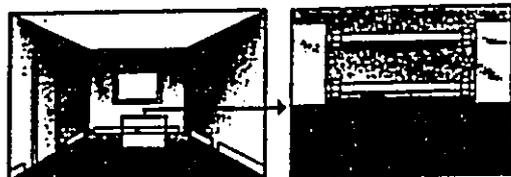
absorber
 it back in
 egulates
 iver on ar
 ent—only
 30 lbs. /

\$315
 12,000 15
 24,000 30
 38,000 45
 13,449.87

ANY PRICE. BUY FROM US, FIND A LOWER PRICE IN 30 DAYS & WE REFUND THE DIFFERENCE!



SOLAR SPACE & WATER HEATING



Radiantpanel

The most advanced concept
In baseboard heating—100% radiant heat

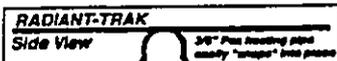
Looks like baseboard molding (only extends 1" from the wall) but gives heating comfort similar to an in-floor system. Gives higher levels of comfort at much lower thermostat settings and maintains a consistent temperature throughout a room. Avoids the "heat blanket" effect that accumulates at the ceiling with forced air, radiator and conventional baseboard systems as well as the "dried out" stuffy air feeling. Easy to install with PEX pipe. Lengths from 1.5' to 8.5' (all 1" deep and 5 1/8" high).

#HW1545 \$15/foot

Radiant-Trak

The fastest, most effective under-floor heating. Just pop PEX heating pipe into the top channel and Radiant-Trak uses the thermal conductivity of aluminum (120 times that of concrete) to spread the water heat into your room. No space, weight, or installation difficulties associated with concrete or gyprocrete. Also easy to use in walls, ceilings and from above or below subfloors.

#HW1548 \$1.75/foot



Radiant-Floor Pipe

Flexible, strong, easy-to-use

PEX heating pipe with the most flexibility—6 to 9" bending. Aluminum layer acts as oxygen barrier and thick side walls resist nicks and holes. Use in Radiant-Trak, in concrete or as a snow-melt system in your sidewalk or driveway.

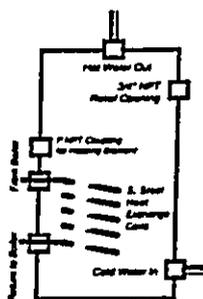
#HW1550 66¢/foot

Thermolink Solar Super Tanks

Highest quality, most versatile, stainless steel

The best storage tanks for solar water and space heating systems. Lower pressure drops, higher heat transfer rates, designed for long life and easy installation. Use twin coil versions and combine solar domestic water heating with hot tub, pool or hydronic heating. More expensive but totally worth the difference.

single coil 60 gallon	(HW1538)	\$1262
single coil 80 gallon	(HW1539)	\$1625
single coil 120 gallon	(HW1540)	\$2314
twin coil 60 gallon	(HW1541)	\$1492
twin coil 80 gallon	(HW1542)	\$1902
twin coil 120 gallon	(HW1543)	\$2620

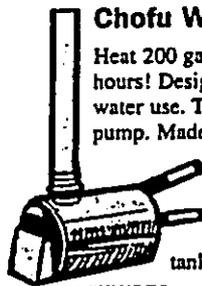


Complete System Packages: Send us your specifications

Send us a set of blueprints or as much information as you have. We can quote the best set of components, pre-plumb the small parts, and send customized schematics to make installation straight forward.

Chofu Wood Water Heater

Heat 200 gallons of water from 55°F to 105° F in 2.5 hours! Designed for hot tubs but also good for any hot water use. Thermosyphons to circulate water without a pump. Made in Japan to exacting efficiency and quality specifications. 22 gauge stainless steel with 1" water jacket. Holds 17" wood. 4" chimney, 1 1/2" inlet & outlet pipes. Insulated cedar kits available that transform an inexpensive stock tank into luxurious hot tub.



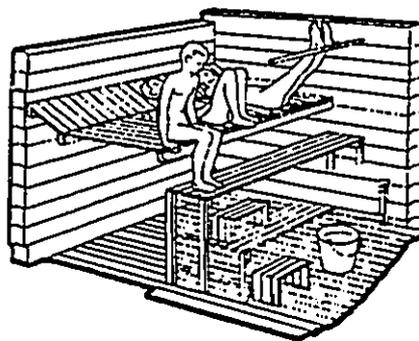
#HW350 \$635

Nippa Sauna Stoves

Woodburning or gas saunas

For over 2000 years, saunas have been a way of life in Finland. Finns brought this tradition to America in 1638 when they settled in Delaware and started making these Sauna Stoves in 1930. All Nippa wood burning Sauna Stoves have cast grates and doors, a scoop-type ash pan, 6" flue, and hold 125-150 lbs. of rock. The 18" model heats rooms up to 8' x 8', the 22" heats rooms 8' x 12', and the 24" heats rooms 12' x 15'. A \$175 Firing Extension option lets you put wood in the stove from outside the sauna room. An \$85 water tank option heats water very quickly and works great when you don't have a nearby shower. The gas stoves have an automatic thermostat and extension for drawing combustion air from outside the sauna room. Specify natural gas or propane or wood.

18" Wood	(HW370)	\$535
22" Wood	(HW371)	\$608
24" Wood	(HW372)	\$698
Firing Extension	(HW375)	\$175
Water Tank	(HW376)	\$85
18" Gas	(HW373)	\$946
22" Gas	(HW374)	\$1054

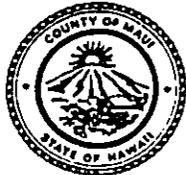


DRAFT EA COMMENT LETTERS AND
RESPONSES

JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director



COUNTY OF MAUI
DEPARTMENT OF PLANNING

January 8, 1999

RECEIVED
DIVISION OF
LAND MANAGEMENT
JAN 12 9 45 AM '99

Mr. Dean Uchida, Administrator
Department of Land and Natural Resources
Land Division
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Uchida:

Re: Conservation District Use Application (CDUA) No. MO-2906 and
Draft Environmental Assessment for a Single-Family Residence
TMK: 5-8-15:003 (Portion) and 5-8-08:002, Pohakupili, Island of
Molokai, Hawaii

Thank you for the opportunity to comment on this CDUA and Draft
Environmental Assessment.

In general, the Maui Planning Department agrees with the draft documents that
this residence will not have a significant effect on the environment.

If you have any questions, please contact Mr. William Spence, Staff Planner, of
this office at 243-7735.

Very truly yours,

Handwritten signature of Clayton Yoshida in cursive.

CLAYTON YOSHIDA, AICP
Deputy Director of Planning

CIY:WRS:osy

c: John E. Min, Director of Planning
William Spence, Staff Planner
Project File
General File S:\ALL\WILL\AACORES\1998\UCHIDA2

PHONE (808) 594-1888



STATE OF HAWAII
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAII 96813

FAX (808) 594-1865

RECEIVED
MAR 11 1999

CHRIS HART & PARTNERS
Landscape Architecture & Planning

March 9, 1998

Dean Uchida, Administrator
State of Hawaii
Department of Land & Natural Resources
Land Division
P.O. Box 621
Honolulu, Hawaii 96809

PA #171

Re: Conservation District Use Application and Environmental Assessment for Pu'u O Hoku Ranch, Ltd., MO-2906, Single Family Residence, Pohakupili, Molokai, TMK: 5-8-15:por.3 and 5-8-08:2

Dear Mr. Uchida:

As you may recall, OHA submitted a comment letter dated December 16, 1998 regarding Pu'u O Hoku Ranch, Ltd.'s Conservation District Use Application (CDUA) for a single family residence at Pohakupili, Molokai. Because of the richness of the archaeological sites in the area and our concern that extant traditional practices associated with Pohakupili may be affected by the project, we suggested that the application be held until the following would be completed:

"(1) a cultural impact statement with detailed sections on gathering and religious rights [] be prepared and included with the application and (2) a formal acknowledgement or easement [be] included in the conservation district use permit which assures that the project proponents will not hamper, impede or otherwise limit the exercise of traditional, customary or religious access or practice."

In response to this request by OHA, Pu'u O Hoku Ranch, along with its archaeologist and environmental consultant conducted a community meeting on Molokai on March 4, 1999. The meeting was well attended and representatives of several Hawaiian families with kuleana lands in Pohakupili, concerned members of the community as well as Colette Machado, OHA Trustee for Molokai participated in the meeting.

Dean Uchida, Administrator
State of Hawaii
Department of Land & Natural Resources
Land Division
March 9, 1998
Page two

The meeting generated a lot of information on the project area. Information given by the kuleana families and traditional practitioners identified additional important archaeological and cultural sites including: heiau, a punawai (freshwater spring), ancient burial grounds, agricultural mounds, traditional access trails from the mountain, and a well-used fishing trail providing lateral, shoreline access to Pohakupili.

From the standpoint of the community, the archaeologist's report was incomplete and inadequate, prompting suggestions that the consultant meet with native cultural practitioners and/or kuleana family members who have an intimate knowledge of Pohakupili.

Kuleana owners also raised concerns about access to their parcels, given that only one family was given a non-duplicate key by Pu'u O Hoku to open the locked gate and expected to accommodate the other numerous families who were not given a key. A more realistic plan to accommodate access will have to be worked out by the project proponents.

In general, those attending the meeting agreed that Pohakupili should not be open to unlimited public access. However, kuleana owners and traditional practitioners have an inherent right of access to the area. Two issues remain unresolved: (1) identification of all kuleana families and native traditional practitioners, and subsequent agreements with the Ranch ensuring that rights of access, customary and religious practices be honored; and (2) protection of archaeological and cultural sites while maintaining traditional and customary uses.

We believe that the applicant has made considerable progress in addressing the issues that concerned OHA in our December 16, 1998 letter. Not all of the issues have yet been resolved, however, we believe that the applicant and the community are making good progress towards finding mutually satisfactory answers. We hope to keep you informed on the progress of the community consultation.

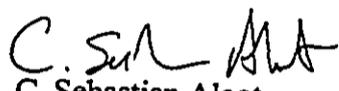
OHA would like to commend the applicant for their efforts to meet with the community to identify native customary and traditional practices associated with Pohakupili. This process can serve as an effective model for meeting the State constitutional mandate of addressing native Hawaiian customary rights in the regulatory and permitting process.

Dean Uchida, Administrator
State of Hawaii
Department of Land & Natural Resources
Land Division
March 9, 1998
Page two

If you have any questions please contact OHA Trustee, Colette Machado, or EIS Planner
Lynn Lee at 594-1951.

Sincerely,


Colin Kippen
Deputy Administrator


C. Sebastian Aloat
Land and Natural Resources Division

cc: Board of Trustees

Rory Frampton
Chris Hart & Partners

PHONE (808) 594-1888

FAX (808) 594-1865



STATE OF HAWAII
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAII 96813

RECEIVED
DIVISION OF
LAND MANAGEMENT
DEC 21 1 50 PM '98

December 16, 1998

Dean Uchida, Administrator
State of Hawaii
Department of Land and Natural Resources
Land Division
P.O. Box 621
Honolulu, Hawaii 96809

PA #171

Re: Conservation District Use Application and Environmental Assessment for Puu o Hoku Ranch, Ltd., MO-2906, Single Family Residence, Pohakupili, Moloka'i, TMK: 5-8-15: por. 3 and 5-8-08:2

Dear Mr. Uchida:

Thank you for the opportunity to comment on Puu o Hoku Ranch, Ltd.'s, conservation district use application (CDUA) for a single family residence at Pohakupili, Moloka'i. The ranch proposes to build a single-family residence in the State Conservation District, Limited Sub-zone. The residence will consist of three separate structures with a total floor area of approximately 2,000 square feet. The structures will include (a) a two story wood frame dwelling of approximately 1,568 sq. ft., (b) a gazebo and storage structure of approximately 352 sq. ft. and (c) a bath house of approximately 80 sq. ft. The Office of Hawaiian Affairs has the following concerns.

Currently, the project area has a small population. However, in previous times the area was heavily populated and contained a thriving Hawaiian community. The EA explains that under the Kuleana Act, several kuleana were acknowledged to exist in this area and the parcel is rich in archaeological resources.

It appears that none of the archaeological sites will be impacted by the construction of these building. However, at several places in both the CDUA and EA the proponents suggest that some of the archeological sites are no longer significant because the knowledge they offer has been gathered. We find this statement disturbing for several reasons. First, if the sites will not

Dean Uchida, Administrator
Department of Land and Natural Resources
Land Division
December 16, 1998
Page two

be impacted the statement is unnecessary. Second, there is no confirmation of this opinion by the State Historic Preservation Division. More importantly, no cultural impact was done for this project which would address this position.

The CDUA includes a section on confirmation of ownership. The parcel descriptions are carefully listed. Each and every description includes a statement that ownership is subject to:

"Any trails, easements or rights-of-way which may exist by reason of the existence of any heiaus, claims to which, including claims to the heiaus, may be predicated upon prescriptive use or ancient Hawaiian use or custom".

Our concern is that in spite of the owner's claim that current kuleana owners will have unimpeded access to the shoreline, a full discussion of access, gathering and religious practice is missing from the document.

As noted above, the area was once more heavily populated. Several kuleana exist in the area. Therefore, we know that gathering practices were established in the area of this project. In addition, the remains of religious structures establish that religious practice was an essential part of the former community. The existence of these practices is strengthened by the parcel descriptions noted above. These gathering and religious rights may continue to exist today notwithstanding the current ownership of the property. The parcel is now undeveloped. It is essential that these rights be determined before a decision to build on the property is approved.

In addition, we suggest that the Hawaiian cultural expert chosen to work on the statement should be persons who are recognized within the Hawaiian community for his/her cultural expertise. The concerns of the community will not be addressed if the cultural impact statement contains information and analysis provided solely by a person whose knowledge of Hawaiian culture is limited to a study of archaeology or anthropology.

We urge you to hold this application until (1) a cultural impact statement with detailed sections on gathering and religious rights can be prepared and included with the application and (2) a formal acknowledgement or easement is included in the conservation district use permit which assures that the project proponents will not hamper, impede or otherwise limit the exercise of traditional, customary or religious access or practice.

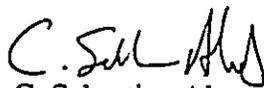
Dean Uchida, Administrator
Department of Land and Natural Resources
Land Division
December 16, 1998
Page three

Finally, we would appreciate receiving a copy of the cultural impact statement when completed.
If you have any questions, please contact Lynn Lee, EIS Planner at 594-1936.

Sincerely,



Colin Kippen
Deputy Administrator



C. Sebastian Aloit
Acting Land and Natural Resources
Division Officer

cc: Board of Trustees
Moloka'i Community Affairs Office
Office of Environmental Quality Control



March 18, 1999

Mr. Colin Kippen, Deputy Administrator
Mr. C. Sebastian Aloit, Land and Natural Resources Division
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Re: Conservation District Use Application and Environmental Assessment for Pu`u O
Hoku Ranch, Ltd., MO-2906, Single Family Residence, Pohakupili, Molokai
TMK: 5-8-15: por. 3 and 5-8-08:2

Dear Mssrs. Kippen and Aloit:

This letter is in response to your letters dated December 16, 1998 and March 9, 1998 regarding Pu`u O Hoku Ranch, Ltd.'s Conservation District Use Application (CDUA) for a single family residence at Pohakupili, Molokai. As you are aware, a community meeting was held on March 4, 1999 on Molokai in response to your request to gather additional information regarding traditional and customary access, gathering and religious practices at the site. Mahealani Davis, a community outreach worker from the Queen Liliuokalani Children's Center served as a moderator for the meeting. (See enclosed meeting notes which will be included in the Final Environmental Assessment.) As noted in your March 9, 1999 letter, the meeting was well attended. In addition, we also held an on-site meeting with Ms. Sara Collins of the State Historic Preservation Division (SHPD) regarding outstanding archaeological issues.

Prior to discussing the results of these meetings, we wish to make a clear distinction between the project site and the larger area in the vicinity of the project. The actual project site is located on the southwestern portion of Pohakupili Bay where the proposed residence and two ancillary structures would be located. The project site is mostly within TMK 5-8-15: 3 (hereinafter referred to as Parcel 3). The proposed pavilion structure would also affect TMK 5-8-08:2 (hereinafter referred to as parcel 2). Parcel 3 is a large parcel, approximately 474 acres in size. Parcel 2 is located within Parcel 3 and is approximately .15 acre in size. According to our interpretation of the TMK plats, Parcel 3 extends along the coastline from Honoulimaloo to a Kunaka, a distance of approximately 2 miles.

Archaeology

A number of the sites and access trails that were discussed at the community meeting involve areas that will not be affected by the project. For example, the most significant features of the site 236 complex are situated within TMK 5-8-08: 4, a relatively large kuleana parcel approximately 1.86 acres in size, which encompasses Punolohi point. In addition, TMK plats for the surrounding area indicate the presence of boundary walls associated with kuleana parcels and also note the presence of heiau and burials. However, none of these significant features are within the project site, this was confirmed by the

Mssrs. Kippen and Aloit
Office of Hawaiian Affairs
Re: Pu'u O Hoku Ranch CDUA
March 18, 1999
Page 2

project archaeologist. We have enclosed copies of TMK plat maps for your review and will include these maps in our Final Environmental Assessment.

The archaeological inventory survey prepared by Scientific Consultant Services, Inc., focused on the project site, that is the area which will be affected by the project, as required by SHPD. As such, while the presence of nearby sites were noted and discussed, they were not studied in detail since it was determined that they would not be affected by the proposed action.

On March 4, 1999, a site visit was made to the project site by Mr. Robert Spear, the project archaeologist, Ms. Sara Collins, SHPD, Mr. Jack Spruance, Pu'u O Hoku Ranch, and myself, representing Chris Hart & Partners. As a result of the site visit and in acknowledgment of the intention to preserve all but two of the newly identified features in place, the wording of the archaeological report *relating to significance has been amended*. A letter from SHPD is forthcoming. The amended archaeological report will be included in the Final EA.

Traditional and Customary Rights

It is quite clear from the record of the community meeting that native Hawaiian area residents continue to practice traditional and customary activities along the shoreline in the vicinity of the project site. Based on the record of testimony, most of these activities involve subsistence gathering of resources from the ocean, i.e. fishing, opihi picking and limu gathering. Portions of Parcel 3, the large 474 acre parcel, have been utilized for shoreline access purposes. However, the proposed project site is not situated along any known access way or trail that was mentioned at the meeting. The nearest such access is the jeep road which is used by the ranch and kuleana owners for vehicle access. The lateral coastal trail which was discussed at the meeting and which provides access along the shoreline in the area does not enter the project site. As such, it has been concluded that the proposed project will not directly impact shoreline access in the area.

As noted above, most of the discussion regarding traditional and customary practices focused on ocean related activities. Based on their location and orientation, it appears that the religious related archaeological sites in the nearby vicinity, including heiau and koa, also had a strong functional relationship to the ocean. Due to the proposed shoreline setback and locational siting, the project will not significantly impact the ocean views from these coastal sites.

Based on the foregoing, the proposed action will not hamper, impede or otherwise limit the exercise of traditional, customary or religious practices in the immediate area.

Many issues were discussed at the meeting which will continue to exist with or without the proposed project. These issues include access to kuleana parcels by kuleana owners, identification of native traditional practitioners, stewardship and protection of archaeological features not within the project site, and disrespectful practices (e.g. littering) by users of the area. The Ranch is committed to working towards long term solutions to these issues together with the community.

Mssrs. Kippen and Aloo
Office of Hawaiian Affairs
Re: Pu'u O Hoku Ranch CDUA
March 18, 1999
Page 3

In conclusion, within the context of the proposed CDUA, we feel that we have adequately addressed your concerns regarding archaeology and traditional and customary native Hawaiian rights. We look forward to working with the Mana'e community in order to achieve long term solutions to these important issues.

Respectfully submitted,



Rory Frampton

encls.

cc: Tom Eisen, DLNR
Colette Machado, OHA Trustee
Jack Spruance, Pu'u O Hoku Ranch
Daphne Becket
Robert Strand, esq.
Robert Spear, SCS
Sara Collins, SHPD
Mahealani Davis, QLCC

LD

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



LAWRENCE MIIKE
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

In reply, please refer to:

December 29, 1998

96-220A/epo

TO: The Honorable Michael D. Wilson, Chairperson
Department of Land and Natural Resources

Attention: Dean Y. Uchida, Administrator
Land Division

FROM: Lawrence Miike *Lawrence Miike*
Director of Health

SUBJECT: CONSERVATION DISTRICT USE APPLICATION

Applicant: Puu O Hoku Ranch, Ltd.
File No.: MO-2906
Request: Single Family Residence
Location: Pohakupili, Molokai
TMK: 5-8-15: por. 3

RECEIVED
DIVISION OF
LAND MANAGEMENT
DEC 31 3 02 PM '98

Thank you for allowing us to review and comment on the subject request. We have the following comments to offer:

Wastewater

The subject project is located in the critical wastewater disposal area as determined by the Maui County Wastewater Advisory Committee. No new cesspools will be allowed in the subject area.

As there is no sewer service system in the area and none will be constructed in the near future, the Department of Health (DOH) concurs with the proposed

The Honorable Michael D. Wilson
December 29, 1998
Page 2

96-220A/epo

installation of a composting toilet as long as all domestic wastewater is treated and disposed of properly. As of this writing, we have not received any wastewater plans for review. Should sewer connection become available in the near future, connection will be required.

All wastewater plans must conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems." We do reserve the right to review the detailed wastewater plans for conformance to applicable rules.

Should you have any questions, please contact the Planning/Design Section of the Wastewater Branch at 586-4294.

c: WWB



March 18, 1999

Bruce Anderson, Director
State Department of Health
P.O. Box 3378
Honolulu, HI 96801

Re: Conservation District Use Application and Environmental Assessment for Pu`u O
Hoku Ranch, Ltd., MO-2906, Single Family Residence, Pohakupili, Molokai
TMK: 5-8-15: por. 3 and 5-8-08:2

Dear Mr. Anderson:

This letter is in response to your memorandum to Mr. Dean Uchida, dated December 29, 1998 regarding Pu`u O Hoku Ranch, Ltd.'s Conservation District Use Application (CDUA) for a single family residence at Pohakupili, Molokai. We acknowledge your comments regarding the need to conform to Department of Health Rules and policies regarding wastewater disposal.

If you have any further comments or questions please do not hesitate to contact me at 242-1955.

Respectfully submitted,

Rory Frampton

cc: Tom Eisen, DLNR
Jack Spruance, Pu`u O Hoku Ranch
Daphne Becket

STATE OF HAWAII RECEIVED
DEPARTMENT OF LAND AND NATURAL RESOURCES
Land Division: U 7 #2. 48
Planning and Technical Services Branch
Honolulu, Hawaii

DEC - 7 1998
REGISTER &
SUBSEQUENT

Re: PB:THE

File Number: CDUA MO-2906

Acceptance Date: Nov. 1, 1998
180-Day Exp. Date: April 30, 1999
SUSPENSE DATE: 21 Days from
stamped date

MEMORANDUM

TO: Engineering Branch Maui District Land Agent; Aquatic Resources,
Conservation and Resource Enforcement; Forestry & Wildlife;
Historic Preservation

FROM: Dean Y. Uchida, Administrator
Land Division *[Signature]*

SUBJECT: REQUEST FOR COMMENTS
Conservation District Use Application

APPLICANT: Puu O Hoku Ranch, Ltd.

FILE NO.: MO-2906

REQUEST: Single Family Residence

LOCATION: Pohakupili, Molokai

TMK: 5-8-15:por.3 and 5-8-08:2

PUBLIC HEARING: YES ___ NO X

DOCARE: Please conduct field inspection

Should you require additional information, please call Tom Eisen at 587-0386.

If no response is received by the suspense date, we will assume there are no comments.

(X) Comments Attached

Attachment

Signed: *[Signature]*
ANDREW M. MONDEN, Chief Engineer

Date: 12/15/98

90 DEC 15 AM 11:56

Received
Chief Engineer

ENGINEERING BRANCH

COMMENTS

We suggest that the proposed single family residence follow Chapter 19.62 Flood Hazard Ordinance of the Maui County Code.

We confirm that the proposed project site, is located in Zone V30. This is an area of 100-year coastal flooding with velocity (wave action), and base flood elevations and flood hazard factors determined.



March 18, 1999

Mr. Andrew Monden
Engineering Division
State Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Re: Conservation District Use Application and Environmental Assessment for Pu`u O
Hoku Ranch, Ltd., MO-2906, Single Family Residence, Pohakupili, Molokai
TMK: 5-8-15: por. 3 and 5-8-08:2

Dear Mr. Monden:

This letter is in response to your memorandum to Mr. Dean Uchida, dated December 15,
1998, regarding Pu`u O Hoku Ranch, Ltd.'s Conservation District Use Application
(CDUA) for a single family residence at Pohakupili, Molokai.

As noted in the Environmental Assessment, the applicant will conform to the County's
Flood Hazard Ordinance.

If you have any further comments or questions please do not hesitate to contact me at 242-
1955.

Respectfully submitted,

Rory Frampton

cc: Tom Eisen, DLNR
Jack Spruance, Pu`u O Hoku Ranch
Daphne Becket

SUSPENSE DATE: December 29, 1998

STATE OF HAWAII
Department of Land and Natural Resources
Division of Aquatic Resources

MEMORANDUM

To: William Devick, Acting Administrator *MDA*
From: Richard Sixberry, Aquatic Biologist
Subject: Comments on Conservation District Use Application MO-2906

Comments Requested By: Dean Uchida - Land Division

Date of Request: 12/7/98

Date Received: 12/8/98

Summary of Project

Title: Single Family Residence

Proj. By: Puu O Hoku Ranch, Ltd.

Location: Pohakupili, Molokai

Brief Description:

The applicant proposes to construct a single family residence with related improvements on a portion of the Puu O Hoku Ranch about 150 feet inland from the shoreline at Pohakupili Bay.

COMMENTS:

The following comments are from our on-site Molokai Biologist:

"I went over the document and see that they have addressed most, if not all, environmental concerns quite adequately. It was one of the better environmental assessment plans I've reviewed thus far. I have only two relatively minor comments:

(1) there is a potential that their grading activities, both for the structures and access path, may become sources for soil runoff into Pohakupili Bay which is downhill only 150 feet away. Pohakupili Bay, last surveyed in 1992, is seldom visited and to this day remains one of the few untouched marine environment on the south side of the island; therefore, grading activities should be conducted during periods of low rainfall to reduce potential adverse soil runoff into the bay in order to ensure habitat integrity;

(2) while the intermittent Pohakupili Stream drains a relatively small watershed, the muliwai at its base is home to several important native stream fish, o'opu nakea (*Awaous guamensis*) and o'opu o'ou (*Eleotris sandvicensis*); therefore it is important that the normally dry stream bed above the muliwai should not be used as a convenient rubbish depository for left over construction material, plant clippings, and human waste; all such unwanted material should be hauled out for proper disposal".

Finally, Puu O Hoku Ranch may choose to access the project site via a new road cut from the west (as hinted to in the document). If so, they will have to cross Pohakupili Stream and thus may be required to obtain some kind of permit from CWRM.



March 18, 1999

Mr. William Devick, Acting Administrator
Division of Aquatic Resources
State Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809
Island of Molokai

Re: Conservation District Use Application and Environmental Assessment for Pu`u O
Hoku Ranch, Ltd., MO-2906, Single Family Residence, Pohakupili, Molokai
TMK: 5-8-15: por. 3 and 5-8-08:2

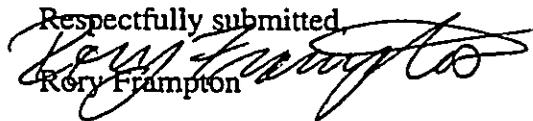
Dear Mr. Devick:

This letter is in response to your memorandum to Mr. Dean Uchida regarding Pu`u O Hoku Ranch, Ltd.'s Conservation District Use Application (CDUA) for a single family residence at Pohakupili, Molokai. The following responses correspond to your comments.

1. The proposed grading activities for the house site will be very minor, as they will only affect a portion of the house foundation area. This area amounts to less than 1,000 square feet. Any potential negative impacts from the construction site during a rainstorm will be minimal compared to the overall impacts from the upslope properties. The applicant is opposed to a condition which would restrict grading activities to "periods of low rainfall" due to the vagueness of this condition and the minimal potential for negative impacts due to the short duration and limited nature of the earthwork activities.
2. The applicant agrees that it will be important not to use the dry stream as a rubbish depository for left over construction material, plant clippings, and human waste. All constructed and domestic waste will be recycled re-used or otherwise properly disposed of.
3. The applicant is aware that any work within the Pohakupili stream bed will require a Stream Course Alteration permit from CWRM as well as other potential permits from the Department of Army. However, if the applicant decides to use the west (north) access road, any work to improve the road conditions will stop prior to reaching the stream bed. In other words, there are no construction activities, grading or otherwise, proposed within the streambed as part of the subject CDUA request.

If you have any further comments or questions please do not hesitate to contact me at 242-1955.

Respectfully submitted,



Rory Frampton

cc: Tom Eisen, DLNR
Jack Spruance, Pu`u O Hoku Ranch
Daphne Becket

LANDSCAPE ARCHITECTURE AND PLANNING

1955 MAIN STREET, SUITE 200 • WAILUKU, MAUI, HAWAII 96793-1706 • PHONE: 808-242-1955 • FAX: 808-242-1956

Division of Forestry & Wildlife

1151 Punchbowl Street, Rm. 325 • Honolulu, HI 96813 • (808) 587-0166 • Fax: (808) 587-0160

December 8, 1998

MEMORANDUM

TO: Tom Eisen, Planner
Division of Land Management

THRU: Dean Uchida, Administrator
Division of Land Management

FROM: *fn* Michael G. Buck, Administrator
Division of Forestry and Wildlife

Paul J. Conroy

SUBJECT: CDUA File #MO-2906, Request to Construct Single Family Residence and other improvements on 0.5 acre and 474 acre parcel that is part of Puu O Hoku Ranch, Pohakupili, Moikakai, Hawaii TMK 5-8-15:03 and 5-8-08:02.

We have reviewed this CDUA with respect to its impacts on DOFAW's natural resources management programs and endangered species in particular. The property is in the Limited subzone of the State Conservation District. The proposed structure will be constructed on relatively level terraced sections of the property and the structure will be setback between 150 and 230 feet from the shoreline. The draft EA indicates no known significant habitats of rare, endangered or threatened bird or animal life on the property. The project site and surrounding area are part of a 200 to 300 acre paddock that is occasionally used for cattle grazing. Therefore, we have no objections to the proposed request to construct a single family residence and other improvements on State Conservation District land designated as Limited subzone.

C: Maui DOFAW

DEC 10 8 33 AM '98

Jan-20-99 10:57A

OFFICE OF ENVIRONMENTAL QUALITY CONTROL
D.L.N.R.
1151 Punchbowl Street
Honolulu, Hawaii 96813

RECEIVED
DIVISION OF
LAND MANAGEMENT
JAN 20 11 23 AM '99

Dear Mr. Eisen,

My name is Walter Ritte, and I have some concerns regarding Pua O Hoku Ranch Single Family Residence on TMK 5/8/08/2.

The area is secluded, has many historic sites, and contains one of the rare sand beaches on that side of the island.

There is a State parcel, and some Kulcana land owners near this site.

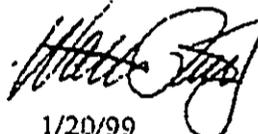
This site may very well be a wahi pana or special Hawaiian site, for Hawaiians. I would recommend community meetings to find out through oral history and research what this site means to this community. How was this area used traditionally, and what was its significance. This will tell us if this proposed use is appropriate.

I am also concerned about how close to the ocean and beach this house will be. This will be creating a private beach of a now public beach.

Technical questions about such a large house in SMA and in limited subzone areas, and what kind of infrastructure will be needed of sewer, electric, roads, and water.

This project will change this pristine area for ever.

Walter Ritte



1/20/99



March 18, 1999

Mr. Water Ritte

Molokai, Hawaii

Re: Conservation District Use Application and Environmental Assessment for Pu`u O Hoku Ranch, Ltd., MO-2906, Single Family Residence, Pohakupili, Molokai
TMK: 5-8-15: por. 3 and 5-8-08:2

Dear Mr. Ritte:

This letter is in response to your memorandum to the Department of Land and Natural Resources, received on January 20, 1999 regarding Pu`u O Hoku Ranch, Ltd.'s Conservation District Use Application (CDUA) for a single family residence at Pohakupili, Molokai. The following responses correspond to your comments.

As you are probably aware, a community meeting was held on March 4, 1999 on Molokai in response to yours and OHA's request to gather additional information regarding traditional and customary access, gathering and religious practices at the site. Mahealani Davis, a community outreach worker from the Queen Liliuokalani Children's Center served as a moderator for the meeting. The meeting was well attended.

Prior to discussing the results of the meetings, we wish to make a clear distinction between the project site and the larger area in the vicinity of the project. The actual project site is located on the southwestern portion of Pohakupili Bay where the proposed residence and two ancillary structures would be located. The project site is mostly within TMK 5-8-15: 3 (hereinafter referred to as Parcel 3). The proposed pavilion structure would also affect TMK 5-8-08:2 (hereinafter referred to as parcel 2). Parcel 3 is a large parcel, approximately 474 acres in size. Parcel 2 is located within Parcel 3 and is approximately .15 acre in size. According to our interpretation of the TMK plats, Parcel 3 extends along the coastline from Honoulimaloo to a Kunaka, a distance of approximately 2 miles.

Pohakupili Bay has a history of residential use which continued at least up until the tidal wave in 1946. Historical residential use of the area was confirmed by records of Land Court Claims and Awards, archaeological studies and testimony provided at the community meeting. Thus, the proposed residential use is not inconsistent with historical use of the area.

It is quite clear from the record of the community meeting that native Hawaiian area residents continue to practice traditional and customary activities along the shoreline in the vicinity of the project site. Based on the record of testimony, most of these activities involve subsistence gathering of resources from the ocean, i.e. fishing, opihi picking and limu gathering. Portions of Parcel 3, the large 474 acre parcel, have been utilized for shoreline access purposes. However, the proposed project site is not situated along any known access way or trail that was mentioned at the meeting. The nearest such access is the jeep road which is used by the ranch and kuleana owners for vehicle access. The lateral

LANDSCAPE ARCHITECTURE AND PLANNING

1955 MAIN STREET, SUITE 200 • WAILUKU, MAUI, HAWAII 96793-1706 • PHONE: 808-242-1955 • FAX: 808-242-1956

Mr. Ritte
Re: Pu'u O Hoku Ranch CDUA
March 18, 1999
Page 2

coastal trail which was discussed at the meeting and which provides access along the shoreline in the area does not enter the project site. As such, it has been concluded that the proposed project will not directly impact shoreline access in the area.

A number of archaeological sites and access trails that were discussed at the community meeting involve areas that will not be directly affected by the project. For example, the most significant features of the site 236 complex are situated within TMK 5-8-08: 4, a relatively large kuleana parcel approximately 1.86 acres in size, which encompasses Punolohi point. TMK plats for the area indicate the presence of boundary walls associated with kuleana parcels and also note the presence of heiau and burials. However, none of these significant features are within the project site, this was confirmed by the project archaeologist. We have enclosed copies of TMK plat maps for your information and will include these maps in our Final Environmental Assessment.

The proposed structures will be sited on relatively level terraced sections of the site and will be setback between 150 feet and 230 feet from the shoreline. Trees, shrubs and groundcover within the shoreline setback area will be retained as a visual buffer and to maintain the existing natural character of the area. The actual size of the residential dwelling will be approximately 1,568 (this area includes a large deck). The Conservation District rules allow for a maximum house size of 5,000 square feet, thus, the size and scale of the proposed dwelling is modest and is not considered relatively large.

Technical questions regarding provision of infrastructure and limited subzone development criteria are addressed in the Environmental Assessment. Water will be provided via an existing transmission line, hot water and electricity will utilize solar energy, a composting toilet and graywater system will be utilized for wastewater disposal, access will be via existing roads with minimal improvements. These facilities have been chosen and designed in order to minimize potential for adverse environmental impacts.

Thank you for your comment letter, if you have any further questions or comments please do not hesitate to contact me at 242-1955 (Maui).

Respectfully submitted,


Rory Frampton

cc: Tom Eisen, DLNR
Jack Spruance, Pu'u O Hoku Ranch
Daphne Becket

March 4, 1999
Mana'e Community Meeting Notes

MANA'E COMMUNITY MEETING
KILOHANA COMMUNITY CENTER
MARCH 4, 1999
5:30PM - 9:30PM

PU'U O HOKU RANCH ... discussion with kuleana owners and community about traditional, subsistence gathering patterns at Pohakupili, Molokai.

Background:

The Office of Hawaiian Affairs, in comment on a permit application for a single-family dwelling at Pohakupili, Molokai (copy of application at the Molokai Library), requested the applicant host a community discussion with subsistence gatherers and land owners, to identify sites and traditional, subsistence activities in the area, and the possible effects if any of the proposed "project".

While not required by law, OHA suggests this is a reasonable way for community concerns and issues to be addressed, in hopes of avoiding after-the-fact confrontations and also bringing further clarity to the developing definition of the relationship between Native Hawaiian practitioners and private land owners. PuuOHoku agreed, and welcomes this opportunity for discussion.

PULE: Pilipo Solatorio

INTRODUCTION: Mahealani Davis. Purpose of meeting (above). QLCC involvement as facilitators and recorders when requested, and encouraging community discussions on issues of concern to the Hawaiian community.

DESCRIPTION OF PROJECT: Rory Frampton, consultant for the applicant PuuOHoku.
DESCRIPTION OF PASH and HAWAIIAN RIGHTS: Malia Akutagawa, Esq.
DESCRIPTION OF OHA CONCERNS AND REQUEST: Colette Machado, Trustee.

DISCUSSION:

- Concerns and Questions noted... (Answer, response if any).**
- Concern expressed about the physical presence of the house... will it be imposing? (House has been set back from the beach, and landscaping is designed to provide privacy for the owner and screen view partially from the beach)
- When trees are planted for privacy will they block the road or trail? (A'ole. Also, the house itself is not on any access route or sites)
- Kuleana owners want a key, to open the gate on the highway and get to their land, and the beach...
(Keys were provided to three owners, Pilipo Solatorio, Nani Kaai, and one other, when requested. There have been problems in the past with too many copies made, and also access to area for commercial activities. Ranch would like owners to work out sharing those keys among themselves, for family or subsistence activities)

- Road from highway to the beach adds to siltation into the bay after heavy rains. Built in Murphy's time. Is there any plan to improve road, or mitigate effects?
(No new road is planned... No large trucks will be driving down to project site during construction. If anything, potholes will be filled, but no plans to pave or otherwise change the nature of the access... No plans to create any kind of "public access" to the area. Yes, this is an original access trail that was widened over time... there may be other trails in the area besides this one)
- Will the taxes for the neighboring kuleana owners increase because of this house?
(The zoning will not change from agriculture... zoning changes usually affect tax rates. Land value usually increases when a structure is built on a particular parcel. Although no change in taxes is anticipated, nobody in the room was sure what effect this will have on a neighbor's parcel)
- Why is a permit for a house even being considered... I thought houses were not allowed in Conservation areas?
(Single-family dwellings are allowed in Conservation districts with a permit... but the State requires applicants to provide plans and information that are substantial. It is also an expensive process. Single family dwellings are also allowed on kuleana parcels even if they are within conservation zones, with a permit. These are for single-family dwellings and agriculture uses... not commercial activities. This area is zoned agriculture)
- Is this a private residence only?
(Yes. This house is for the applicant and her family use only. It will not be rented out or used for any commercial purposes)
- Why here? Preservation of natural areas is important... a house would change the feel of the place, forever. There's too many houses on the island now.
(The owner has a right to build and wants a house here because it is beautiful, is quiet and allows her to spend private time with her children and family, and the only other beach is at Halawa where the Ranch recognizes substantial use by our community. She doesn't want to disrupt any traditional use at Pohakupili, doesn't plan to, and doesn't feel the presence of this house will do so. Permit allows for a structure up to 5000 square feet; this house will be 1500 square feet. Owner doesn't want to change the nature of the area either)
- PASH: Malia was asked to present information about the present state of Native Rights, and PASH in particular, before discussion continued:
 - (Land law in Hawai'i differs from property laws elsewhere in the United States... The Rights of the Native Tenants are preserved... all private property has varying degree of right of "exclusivity" depending on whether the property is undeveloped, less than fully developed, or developed.
- Case law further clarifies Hawaiian rights, as cases are brought to court... Defining Hawaiian rights is a work in progress...

- (Kalipi) ... right to gather for subsistence, religious and cultural purposes within the ahupuaa you live in.
 - (Pele) ... Right to access for traditionally, customarily exercised purposes, even if NOT a resident in that ahupuaa.
 - (PASH) ... also if there is a generational association with that 'aina and it is still "undeveloped"
 - (Hanapi) ... access is ok on someone else's property if one can show three things... 1. That you are a descendant of someone that was here prior to contact in 1778, and 2. That what you are doing is a constitutionally protected traditional activity, and is actually being practiced, and 3. Occurs on un-developed or less than fully developed land. If questioned, the burden-of-proof is on the practitioner. Kama'aina witnesses are accepted as expert witnesses in the Supreme Court.
- Interested parties hope for...

**A BALANCE of RIGHTS OF PRIVACY AND SECURITY with
PRESERVATION of TRADITIONAL NATIVE RIGHTS... IN THE SPIRIT
OF NON-INTERFERENCE AND HARMONY.**

- Will building this house make this aina "developed" ?
(It is now undeveloped, and building one structure on 14,000 acres will not likely change the description of this aina to "developed" . It will still be in one of the two lesser categories... un-developed, or less-than-fully-developed)
- Access to the ocean should be ok to make food. Some have experienced asking, and being told "no", so they just go without asking.
- If we go holoholo to gather for subsistence, how is that going to affect property ownership? We're getting food... not stealing land!
- Concern that favoritism is involved in granting access now, not reasonable. Before times, nobody asked, we just went. It was fine with previous owner, there was more trust and respect between everyone. Ranch owner would once a month kill one cow for community people... it was a better relationship than now... waivers, permits, passes make a different kind of relationship.
- Shoreline access is always ok. It's just coming down from different places on the main road that is at issue.
(Lateral shoreline access has long been upheld in Hawai'i's courts... anyone can walk along the shoreline, up to the high water mark, vegetation line. Community and/or landowner should identify foot-trails that are traditional ways for gatherers to go from mauka to makai)

- POHAKUPILI was always open access, for the people to make fish, limu, opihi, medicine, and to feel good. Before times: People gathered enough to eat... there was no icebox, so you only could take enough to eat, and share. Now: People take to sell, there's plenty rubbish, plenty kapulu... no wonder the owner is unhappy.
- This discussion is good... between PuuOHoku and the community... other big owners on Molokai just come and do whatever they like... not even one public hearing or meeting.
- East End Molokai people have lots of aloha... can we reach concensus on what is reasonable access? Yes, of course. We need respect on both sides for the other... and there's been abuse of privileges on both sides.
- We need Clarification and Documentation of any agreements or concensus that we come to.
- Kuleana owners have rights, and their rights are clear and protected... but community practitioners need to know what their rights are, and need clarification.
- Access for subsistence is a right, not a privilege granted by a private property owner.
- Why isn't the owner/applicant here to speak with us? Is it that unimportant to her, our feelings about this?
(Yes, it matters to her. She's just busy, but will be here in April)
- OHA's concern was about archaeological sites (their maintenance-necessary stabilization and continued or renewed use). Also, that those with distinct and "superior" rights would be identified and the continuation of those rights preserved. Kupuna and kuleana owners have "superior" rights.... Reference was made to the recent decision on Maui granting the Luuwai family fishing rights in an area designated conservation, because they have shown a long, intimate relationship with the place that precedes the present social-legal system.
- We all need to respect the aina, and not be greedy.
- Why can't the owner build something for the community, like a pavilion?
(The owner has provided water at the area, but then the water has been left running by community people. The owner has allowed access at places, and asked that people not use the area as a rubbish dump... gates were installed but left OPEN, until someone dumped rubbish and a horse carcass. Lanikaula has been fenced, at owner's expense. The owner has been open to doing things that are nice, but people have to appreciate and take care too)
- PuuOHoku consultant says all archaeological sites are in the report. Applicant does not anticipate that the house will impact on these sites, or on traditional access. But.

owner might be held liable (responsible) for happenings on the property, because of the location. Consultant says he did what he was contracted to do - a standard survey. (Generally, many community people at this gathering do not feel the archaeological report was complete or sufficient. There should be more input directly from practitioners from this community included. For example, Kauai Nao'o's mother recorded much history, and that wasn't included. Also, spatial arrangement was not shown, so individual sites are reviewed "out of context" and lose their meaning. The survey was too limited.)

- Why are there pipi (cattle) on the ranch lands at all, after the environmental impact statement in the 70's? There is no excuse for cows in the area and in the whole of Pohakupili-PuuOHoku.
- Consensus seems to already exist in the community for archaeological sites and areas to be left alone... used for education. Where does the owner stand?
- If present owner sells, we'll all be in deeper s--- (worsens trouble). How do we know she's staying... they all say that before they get their permits.
- Deed notes that trails to heiau and access by Hawaiians to them are reserved.

GENERAL CONCLUSIONS:

- Traditional activities continue today, using several access trails. These need to be identified. These are not "Public Access" trails....
- Applicant's project will not intentionally disrupt traditional activities for subsistence purposes, but this community would like clarification and documentation.
- Shoreline access is not a problem. Respectful use of the land continues to be a problem we all deal with....
- All community members need to learn about, respect and know the land... includes new people and our young people too. Also, some who access based on subsistence-economy rights but use the area for market-economy activities make it even more difficult to defend the traditions of the native people.

Old Hawaiian way was "reciprocal aloha". Yes, we always asked... Permission was almost always given. It was a society of sharing... give and take. Can we get back to that style of life? There's only need for lots of rules when people behave badly. A clear understanding, and mutual respect, amongst neighbors could be better.

FOLLOW-UP:

Following the applicant's statement, in writing, to the BLNR about the outcome of this meeting: This community would like some "Good Faith" effort by the ranch... to

preserve the ongoing access to the Pohakupili area for subsistence purposes, and also to work to develop a learning relationship with Mana'e community elders and PuuOHoku. (Suggestion that owner will be here in April, and maybe that would be a good time for neighbors to meet and talk story)

Archaeologist will send copies of his report to Mahea Davis at QLCC, where copies can be provided to any interested persons, and one kept in community file permanently.

Meeting pau at 9:30pm

(These notes from the discussion will be sent to all participants)

Respectfully submitted,
kmdavis