



UNIVERSITY
OF HAWAII
HILO

August 14, 1995

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OFC OF ENVIRONMENTAL
QUALITY CONTROL

Mr. Gary Gill, Director
Office of Environmental Quality Control
220 S. King Street, 4th Floor
Honolulu, HI 96813

Dear Mr. Gill

Subject: Negative Declaration
for National Astronomy Observatory of Japan (NAOJ)
Proposed Hilo Base Facility at University Park
University of Hawaii at Hilo
TMK: (3) 2-4-01: Portion of 7

No comments have been received during the 30 day public comment period which begin on July 8, 1995. Therefore, the University of Hawaii at Hilo has determined that this project will not have significant environmental effect and has issued a Negative Declaration. Please publish this notice in the September 8, 1995 OEQC Bulletin.

We have enclosed a complete OEQC Bulletin Publication Form and four copies of Final EA.

Please contact me at 933-3595, if you have any questions.

Sincerely,

Lo-Li Chih
UH Registered Architect I

encl

CC: Chancellor Perrin
Kiyoji Nariai
Sidney M. Fuke

Administrative Affairs

200 W. KAWILI STREET
HILO, HAWAII 96720-4091
PHONE: (808) 933-3446
FAX: (808) 933-3622

An Equal Opportunity/Affirmative Action Institution

107

1995-09-08-HI-PEA-National Astronomy Observatory of Japan
Hilo Base

SEP 8 1995

FILE COPY

FINAL ENVIRONMENTAL ASSESSMENT
FOR THE PROPOSED
HILO BASE OF THE SUBARU OBSERVATORY IN HAWAI'I,
NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN
WAIAKEA, SOUTH HILO, HAWAI'I
TAX MAP KEY: (3) 2-4-01: PORTION OF 7

This document is prepared pursuant to Chapter 343, HRS.

Proposing Agency:

University of Hawai'i at Hilo
Office of the Chancellor
200 W. Kawili Street
Hilo, Hawai'i 96720

Prepared By:

Sidney Fuke & Associates
100 Pauahi Street, Suite 212
Hilo, Hawai'i 96720

August 1995

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- Appendix A - Botanical Survey, University of Hawai'i - Hilo, Proposed Infrastructure for Research and Technology Lots, South Hilo District, Island of Hawai'i, by Char & Associates, December 1992
- Appendix B - Archaeological Survey and Testing of Lands Proposed for Research and Technology Lots at the University of Hawaii at Hilo (TMK 2-4-01: 7 and 41), by Douglas Borthwick, B.A., Joy Collins, B.A., William H. Folk, B.A., and Hallett H. Hammatt, Ph.D. for Engineering Concepts by Cultural Surveys, April 1993; Revised Nov 1993
- Appendix C - Supplemental Archaeological Survey and Testing of the Proposed University of Hawaii at Hilo Expansion Area, by Cultural Surveys, Nov 1993

INTRODUCTION

1.1 Applicant

The applicant, National Astronomical Observatory of Japan (hereinafter, NAOJ), is proposing to construct its astronomy base facility and related improvements on 3.8 acres of land owned by the State of Hawai'i and leased to the University of Hawai'i at Hilo.

The NAOJ is sponsoring Subaru Telescope whose observatory is now under construction at the summit of Mauna Kea amid other observatories of international ownership. The proposed facility will provide a facility for its support staff at sea level.

Said area (3.8 acres) is a portion of a 202.736 acre parcel (see section 2.1 for further discussion) located in the district of Waiakea, South Hilo, Hawai'i, Tax Map Key: 2-4-01: portion of 7.

1.2 Approving Agency

An Environmental Assessment (EA) was required as the proposed action involves the use of State land leased to the University of Hawai'i at Hilo. A Draft EA was prepared pursuant to the requirements of the State Environmental Impact Statement (EIS) law and associated rules. The approving agency was the University of Hawai'i at Hilo.

1.3 Agencies Consulted

The following agencies and organizations were consulted in the process of preparing this environmental assessment:

- * State
 - Department of Land & Natural Resources
 - Department of Transportation, Highways
 - University of Hawai'i at Hilo
- * County
 - Planning Department
 - Public Works Department
 - Water Supply Department

2. DESCRIPTION OF PROPOSED ACTION

2.1 Location and Ownership

The subject parcel is located makai of Komohana Street, generally between Puainako Avenue and Mohouli Street, Waiakea, South Hilo, Hawai'i, and identified by Tax Map Key: 2-4-01: 7. The location of the proposed improvements is a 3.8 acre portion of this parcel. The specific area of the proposed improvements is located makai of Komohana Street, off Nowela Street (Figure 1), adjacent and to the north of the Joint Astronomy Centre on North Aohoku Place.

It should be noted that there is a slight discrepancy relative to the size of the actual total acreage of parcel 7. According to the files at the Planning Department (Figure 2), there was a consolidation and resubdivision action resulting in the creation of a 20.0 acre parcel (now parcel 41) and the remaining parcel (now parcel 7). This occurred on June 16, 1977, file number 3965.

In that action, parcel 7 (the subject parcel) was identified as having an area of 142.450 acres. The current tax map, however, shows a parcel consisting of approximately 202.763 acres, with two lots. One of the lots consists of 152.5 acres, and the other has 36.08 acres (Figure 3).

It should be noted that in an Environmental Assessment for the infrastructural improvements of this area, the site was described as having 116 acres.

Like the other existing facilities (Agriculture Center, Joint Astronomy Centre, and the soon-to-be constructed California Institute of Technology sea-level base facility) on the subject parcel, the proposed facility will be located on a portion of the entire parcel.

For the purpose of this Environmental Assessment, it is assumed that the area of the entire parcel is 202.76 acres, consistent with the existing tax maps. This assessment, however, will cover only the 3.8 acre area, the area of the proposed NAOJ facility.

Waiākea
Reservoir Site
HELCO
Substation

PROPOSED SITE

KOHOHANA

STREET

AGRICULTURE
CENTER

CALTECH

NOHELA ST

JOINT
ASTRONOMY
CENTER

EXIST. ROAD "E" N. AOHOKE PL

STREET

Exist. Waterline Easement

Exist. 50' Wide
Electrical Easement

EXIST. ROAD "A"

URBAN

URBAN

PUIAIKAO

Waiākea
River

and
It's
Flood Control
Project

Tributaries

University

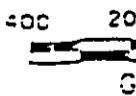
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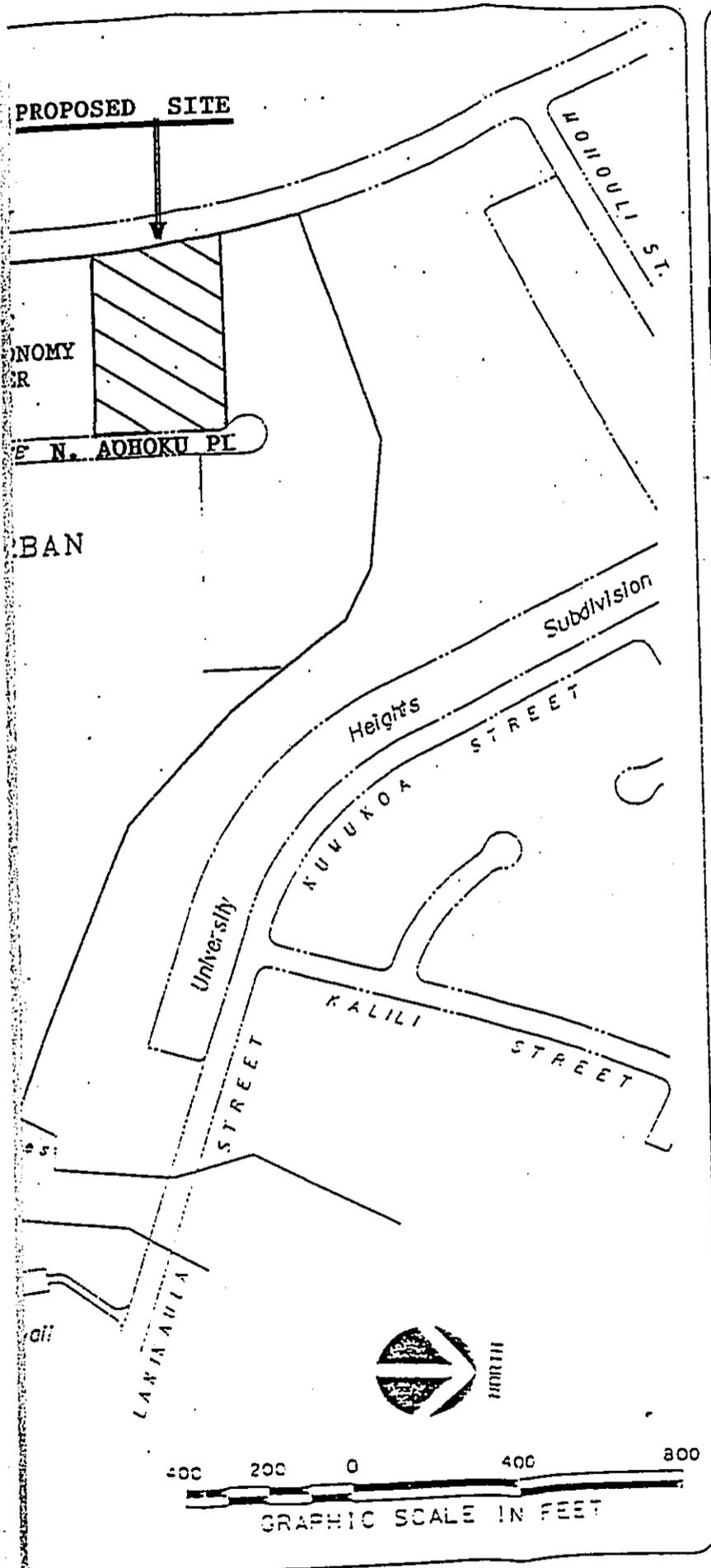
LEGEND

- EXIST. PROPERTY LINE
- STATE OWNED PARCEL

University of Hawaii
(Hilo Campus)

LANIKAU
STREET





Prepared By:
**ENGINEERING
 CONCEPTS, INC.**
 Honolulu, Hawaii

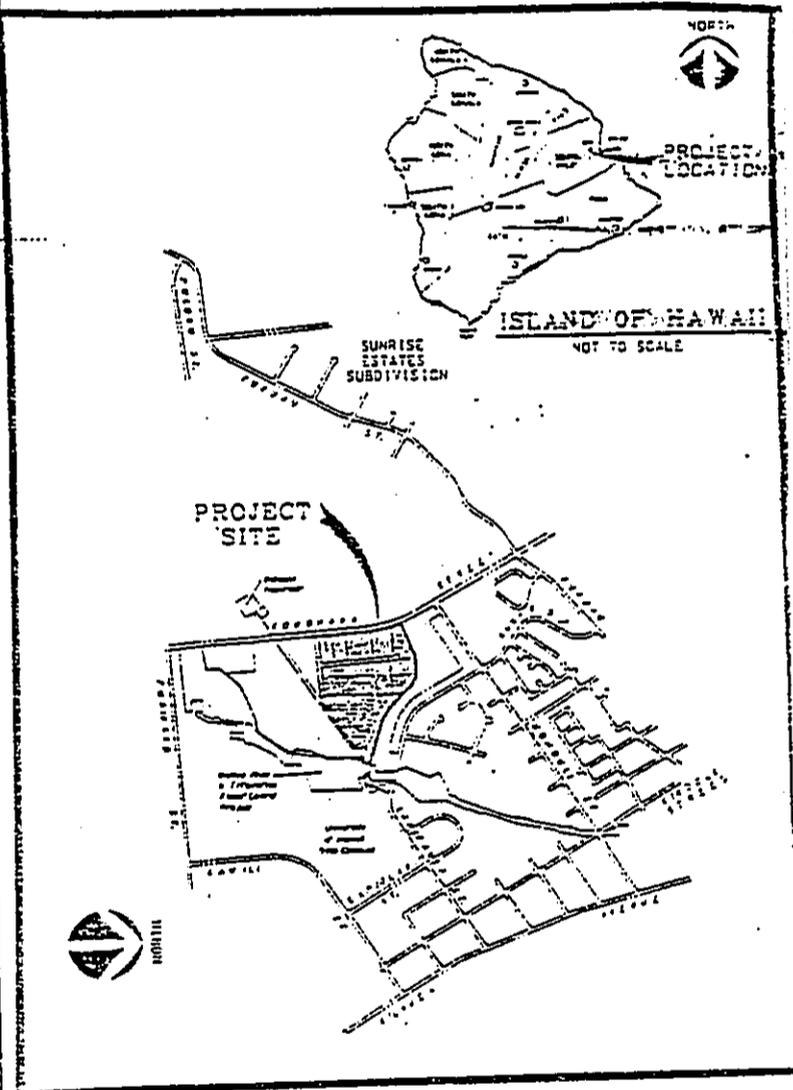
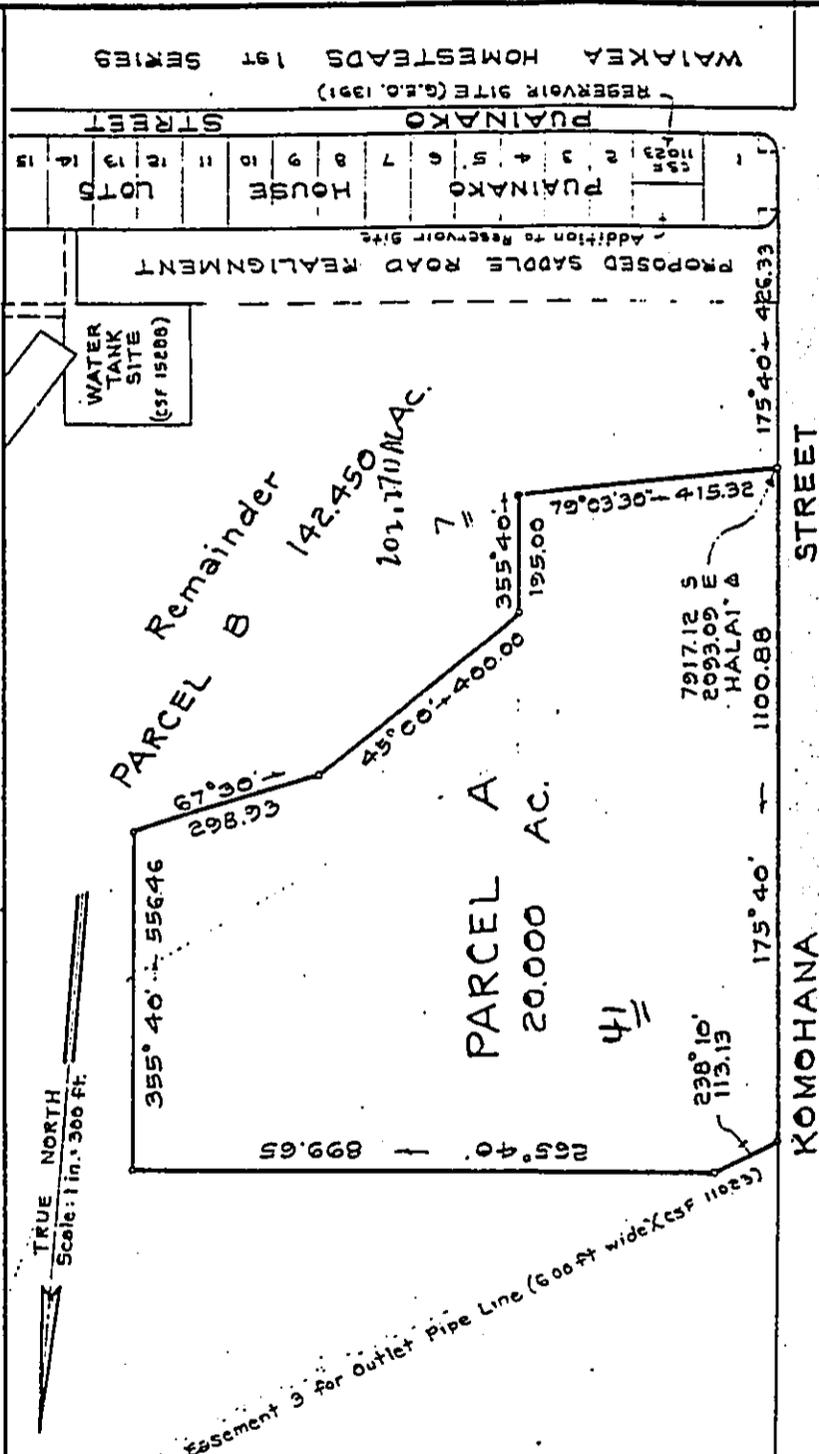
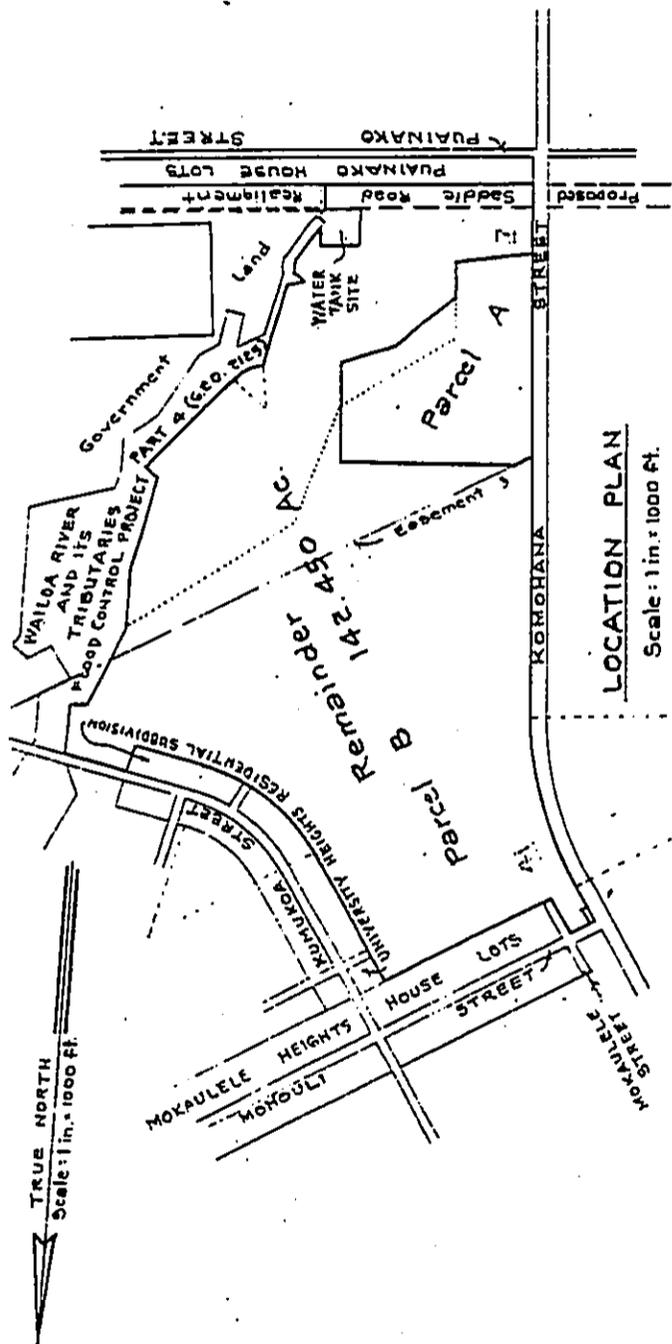


FIGURE 1



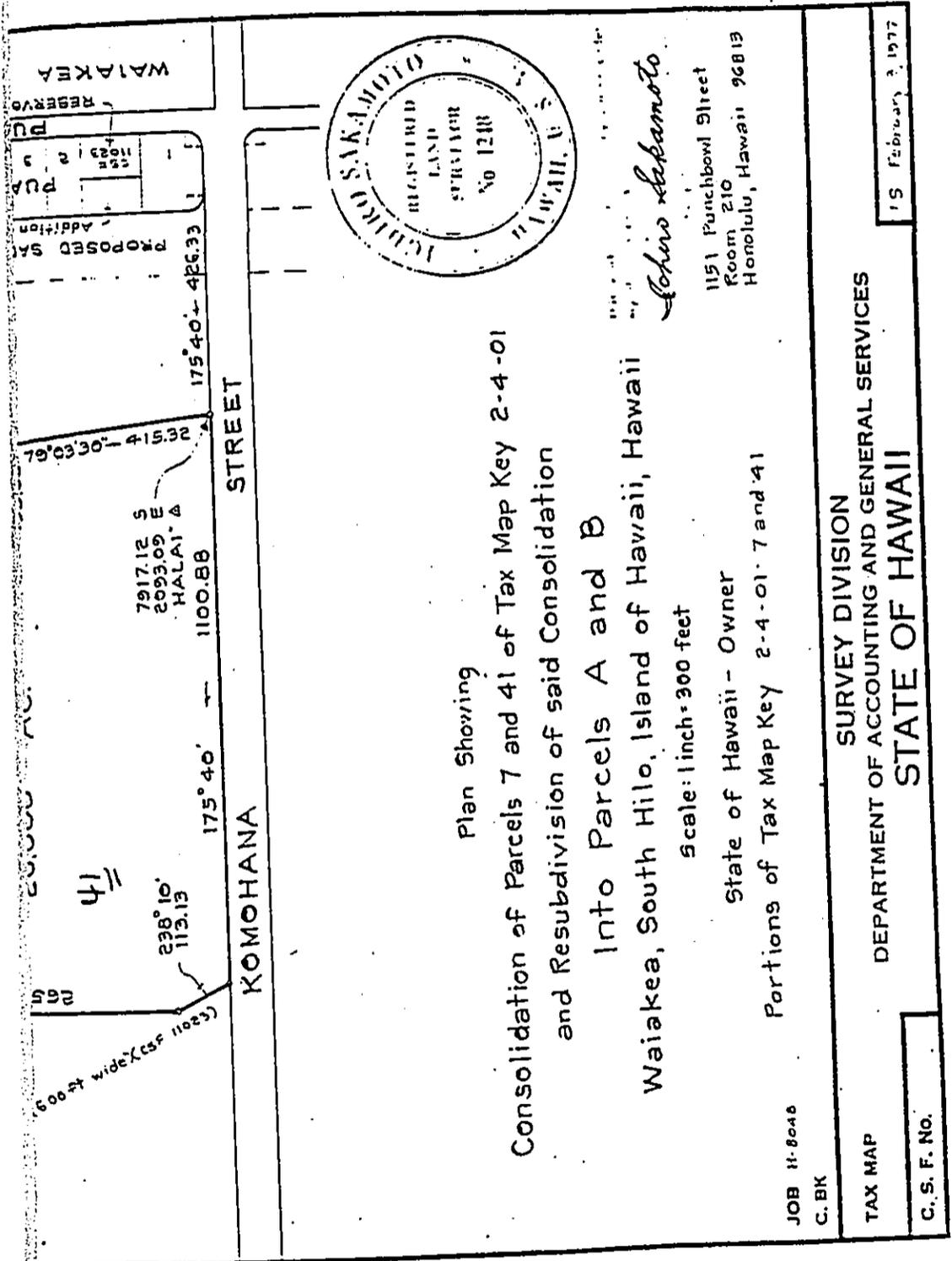
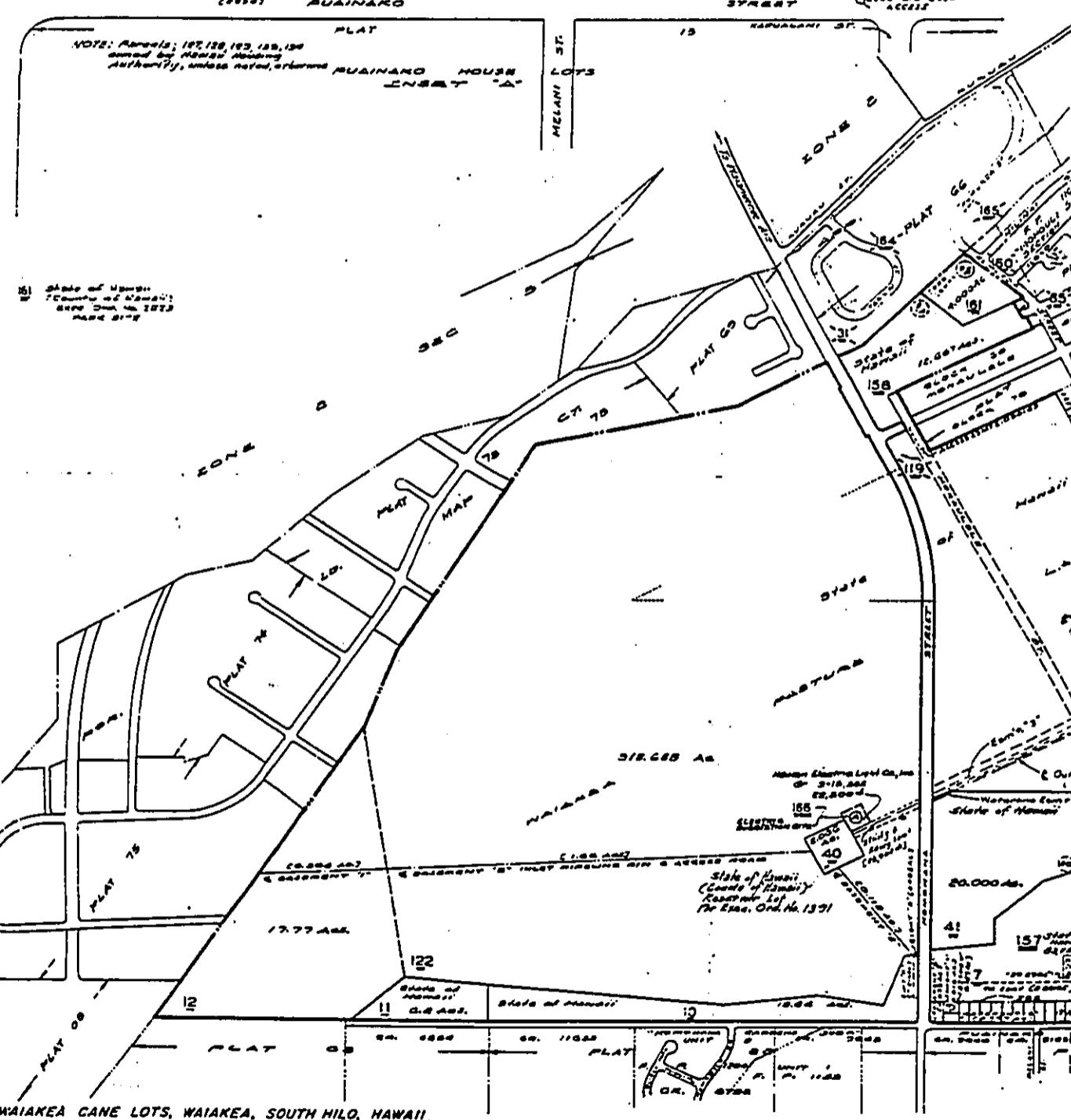


FIGURE 2

140	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
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156	155	154	153	152	151	150	149	148	147	146	145	144	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
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ENGINEER: RICHARD L. BROWN, 9/1/1967
 DRAFTER: JAMES W. BROWN
 BY: RLB

WAIAKAE CANE LOTS, WAIAKAE, SOUTH HILO, HAWAII.

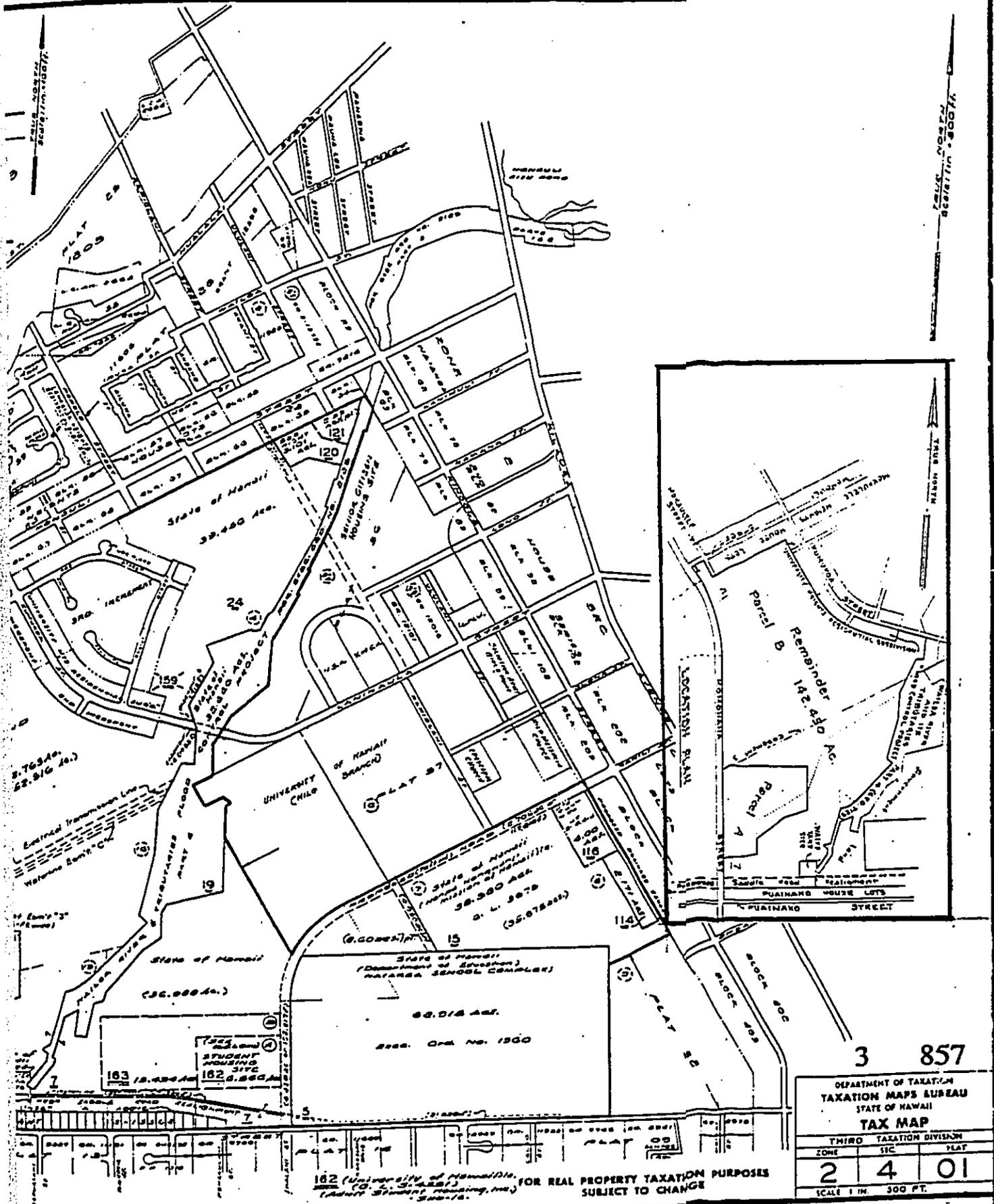


FIGURE 3

Owned by the State of Hawai'i, the entire parcel is being leased and utilized by the University of Hawai'i at Hilo for the development of a research and technology park. The Joint Astronomy Centre and the University Agriculture Center are located on portions of the parcel. The California Institute of Technology (Cal-Tech) will be constructing its sea-level base facility on a portion of the subject parcel.

2.2 Existing Uses

The subject area is currently vacant of any structures. The topography is fairly level, with less than a 10% change in elevation, running in a westerly to easterly direction. Ohia-uluhe and an introduced mixed forest material dominate the property, as well as the nearby properties.

Surrounding land uses include the Joint Astronomy Centre to the south; vacant State-owned lands located mauka or west of Komohana Street; the University Agriculture Center generally to the south or Puna side of the proposed site, including the soon-to-be constructed Cal-Tech facility; and the University campus makai or east of the site.

2.3 Project Description

2.3.1 Historical Description

The proposed use of the subject site is a new use. There is no associated contemporary or recent past use of the site. However, historical use of the site, as explained in the section on archaeology, has been some form of agricultural use, i.e., sugar cane or pasture.

It should be noted that an Environmental Assessment for the infrastructure of the entire parcel was prepared in November 1993. A botanical survey, an archaeological survey, and a supplemental archaeological survey that also covers the subject area were done in conjunction with that assessment.

2.3.2 Physical Characteristics and Use

The applicant intends to construct a

36,800± square foot, two-story office building to serve as its headquarters for base support and research personnel for the astronomy observatory now under construction at the summit of Mauna Kea (Figure 4). The basic building would be reinforced concrete with steel truss roof. The roof is planned to be of a non-reflective color, like gray.

The first floor would consist of 24,700± square feet (Figure 5). It would house the more public area of the facility, such as the office, conference room, library, and the like. There would also be a courtyard.

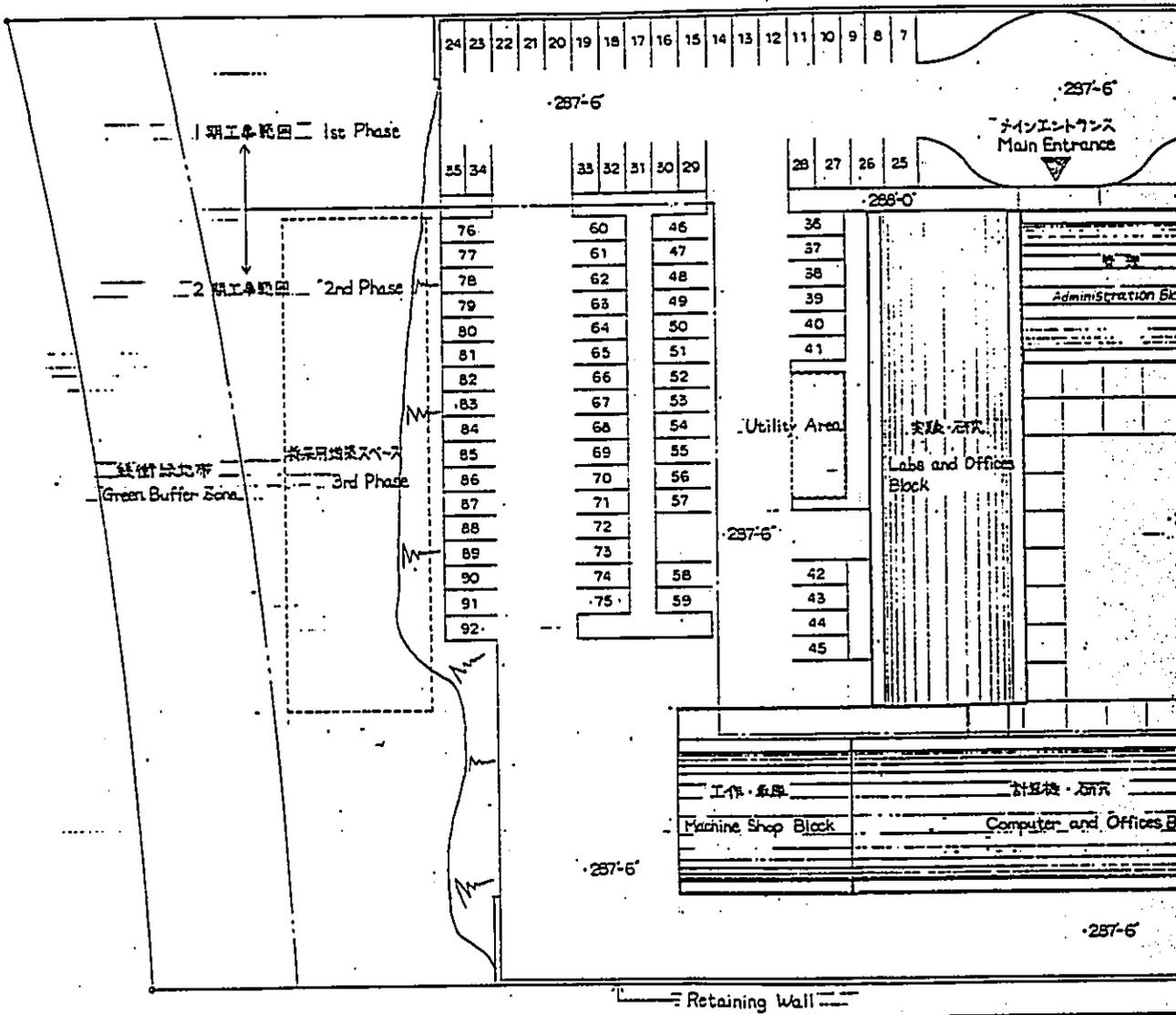
The second floor, consisting of 12,100 square feet, would be oriented more to the offices of the individual researchers and scientists (Figure 6).

The height of the structure from finished elevation would be 38'-6" (Figures 7 & 8). Although the preliminary plan reflects 92 full-sized stalls, additional stalls (if needed) and the required handicapped stall can be accommodated on the site. (See Figure 4)

As shown on the preliminary site plan (Figure 4), the closest structure would be set back at least 30 feet from the front property line; 80± feet along the north property line; 200± feet from the rear property line, which abuts Komohana Street; and 30± feet from the south property boundary, which abuts the Joint Astronomy Centre boundary.

The NAOJ intends to construct the project in two phases. The first phase would consist of the wings identified as the "Administration Bloc" and "Labs and Office Bloc" in Figure 4. The 11-month construction period is expected to begin by end of 1995.

The wing identified on the site plan as the "Machine Shop Bloc" and "Computer and Office Bloc" would be the second phase. This phase would begin in May 1996, also with an anticipated 11-month construction period. The phasing



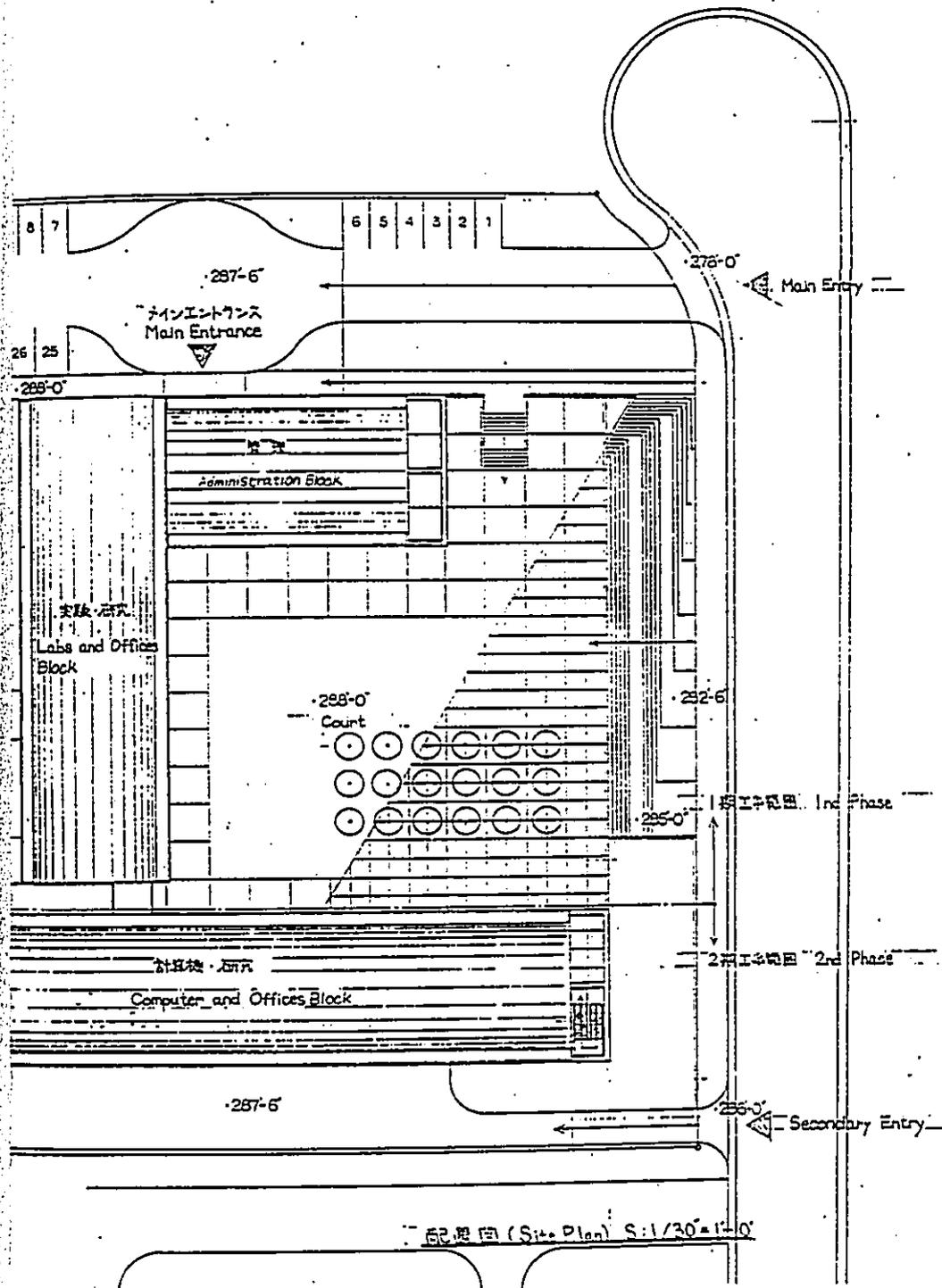


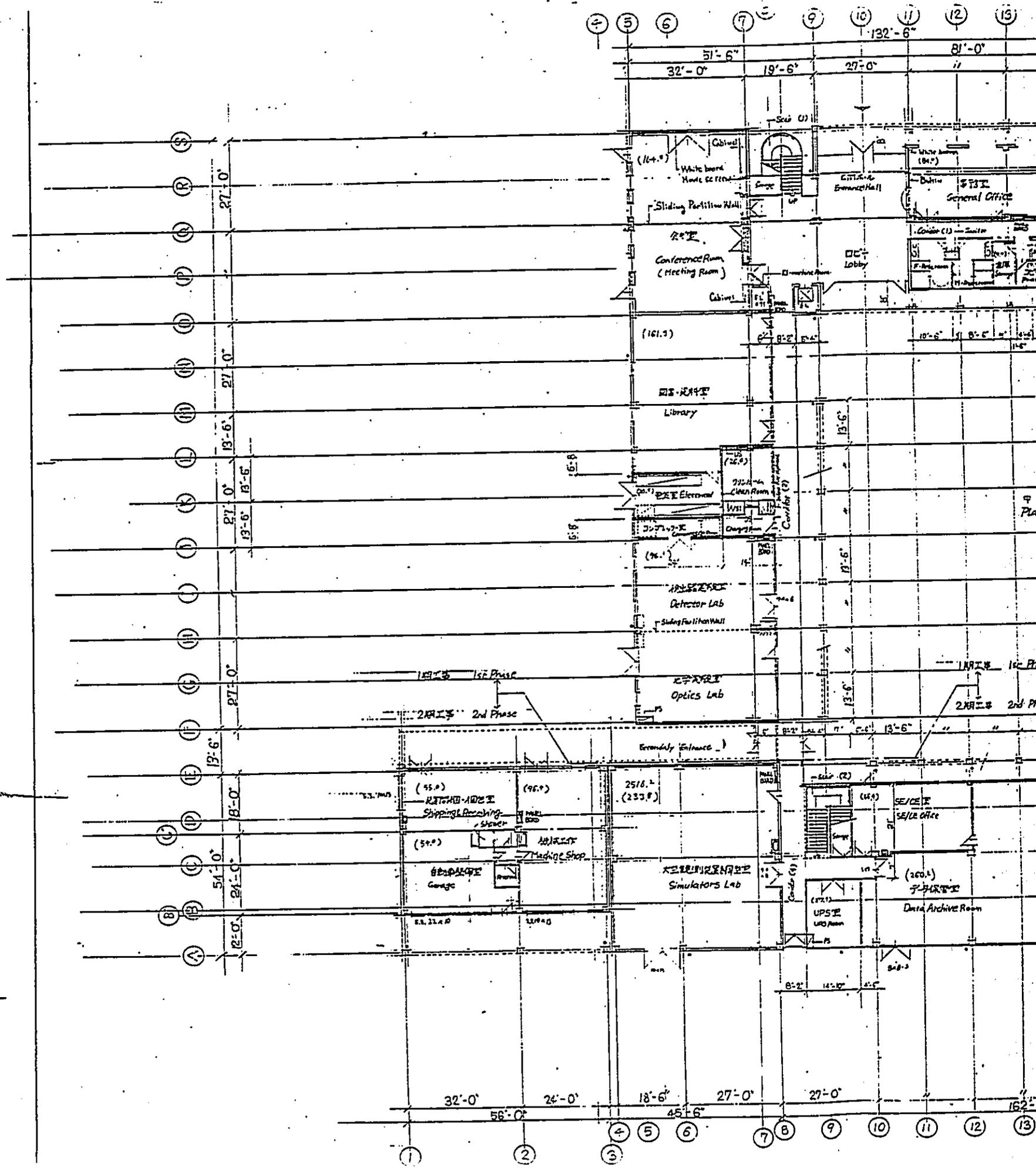
FIGURE 4

IS

ISHIMOTO ARCHITECTURAL & ENGINEERING FIRM, INC.
 6-102, Nakano-cho, Nakano-ku, Tokyo, Japan 166
 TEL: 03-3345-1111 FAX: 03-3345-2344

Project Name	
Client	
Date	
Drawing No.	

Case: June 5 '75
 Job No.
 Drawing No.



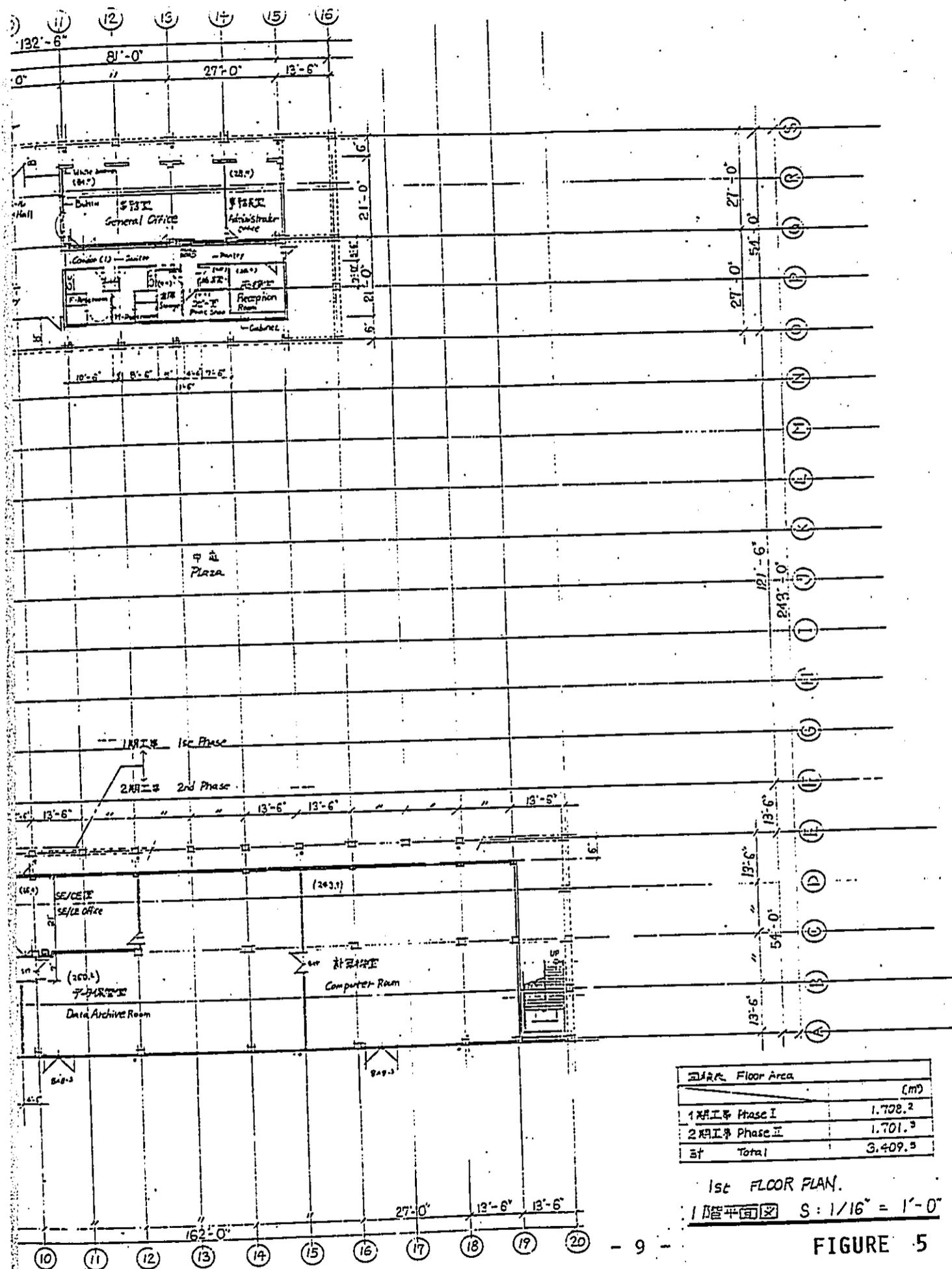
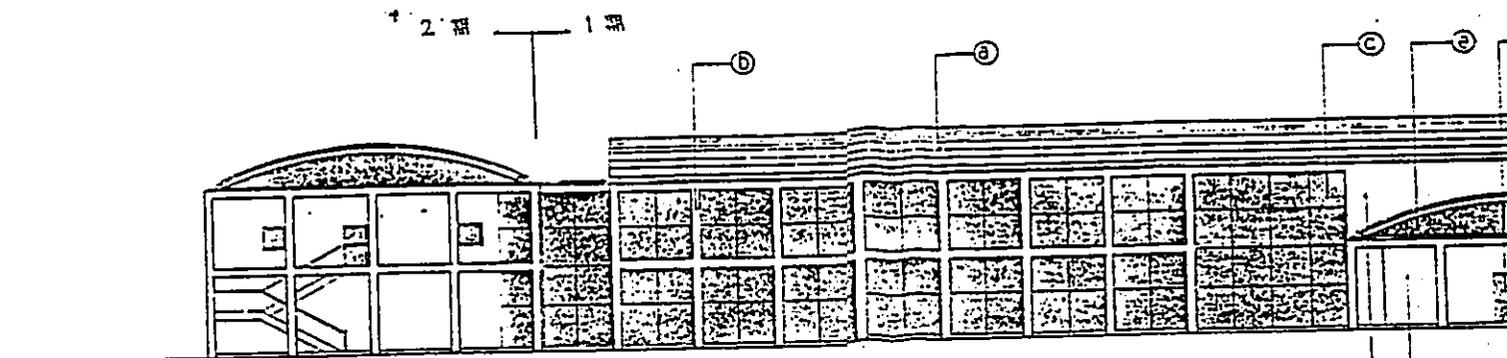
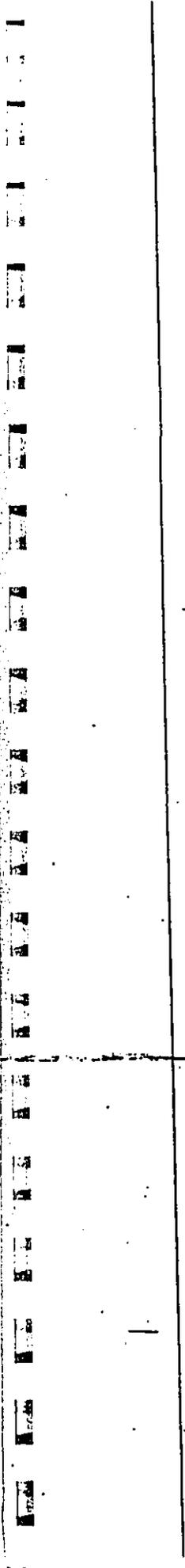


FIGURE 5

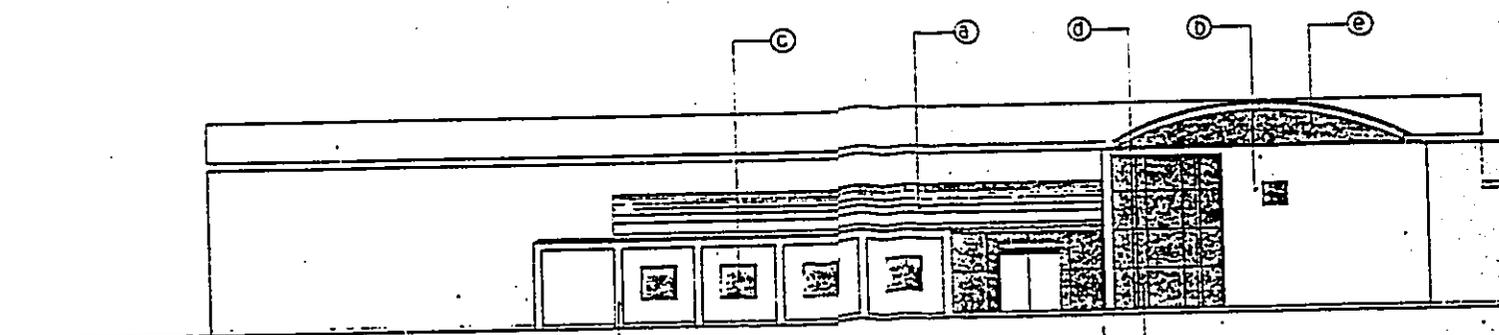
ISHIMOTO ARCHITECTURAL & ENGINEERING FIRM, INC.
 0-12, Kojimachi 4-chome, Chiyodaku, 100 Jyo, Japan 100
 Tel: Tokyo (03) 5561-7111 Tokyo (03) 5561-6511

Project Title: _____
 Drawing: _____

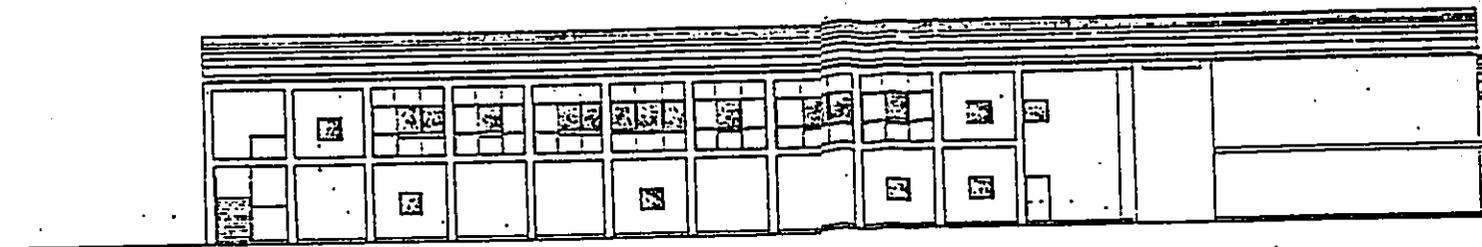
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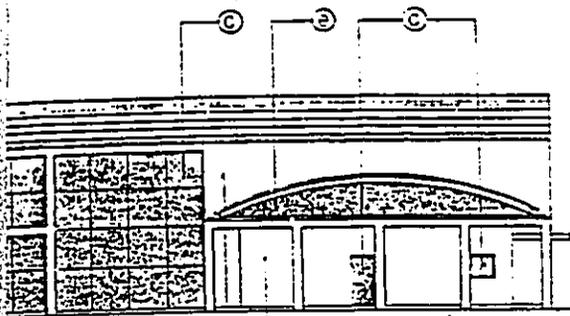
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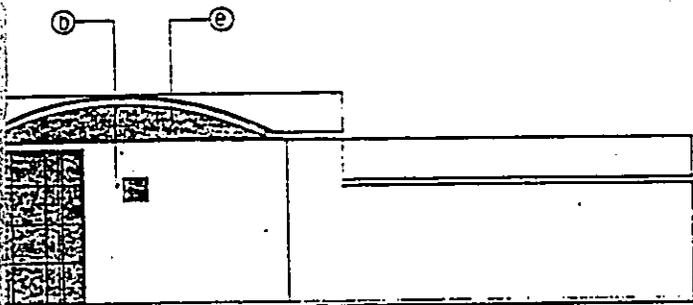
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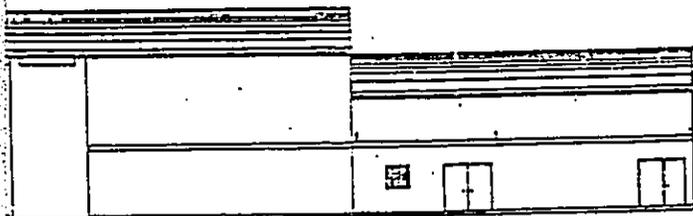
外部仕上 External Finish	
仕上 Finish	
㊸	フッ素樹脂被膜鋼板 仕上げシート Fluoropolymer enamel coated steel sheet
㊹	Dry-Vit (ガラスの吹付フィルム)
㊺	ガラス Glass
㊻	アルミパネル Aluminum Panel
㊼	スパンドレルガラス Spandrel Glass



East Elevation Scale = 1:16
東側立面図



North Elevation Scale = 1:16
北側立面図

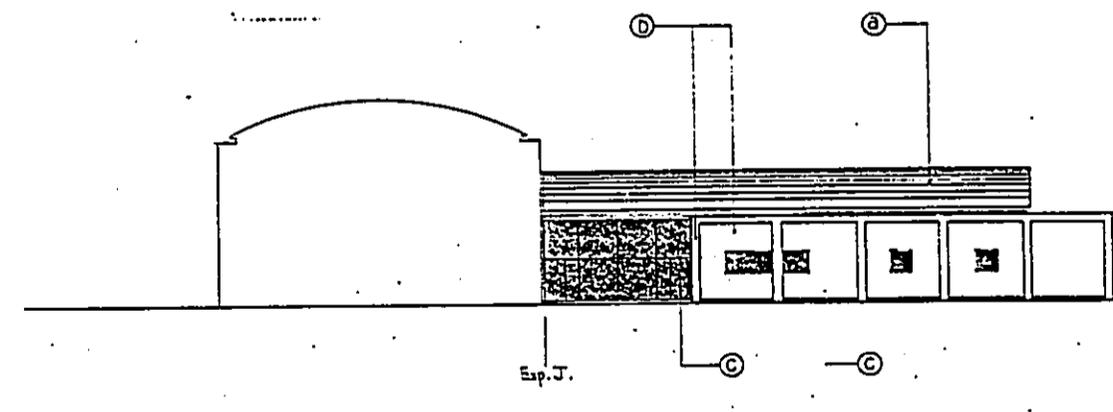
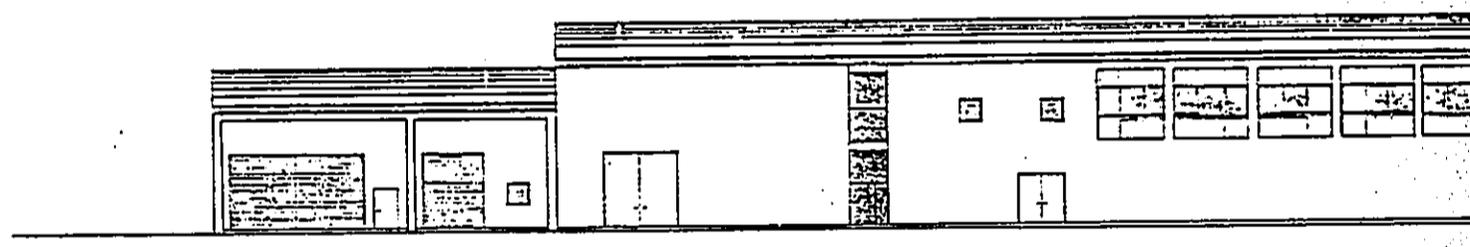
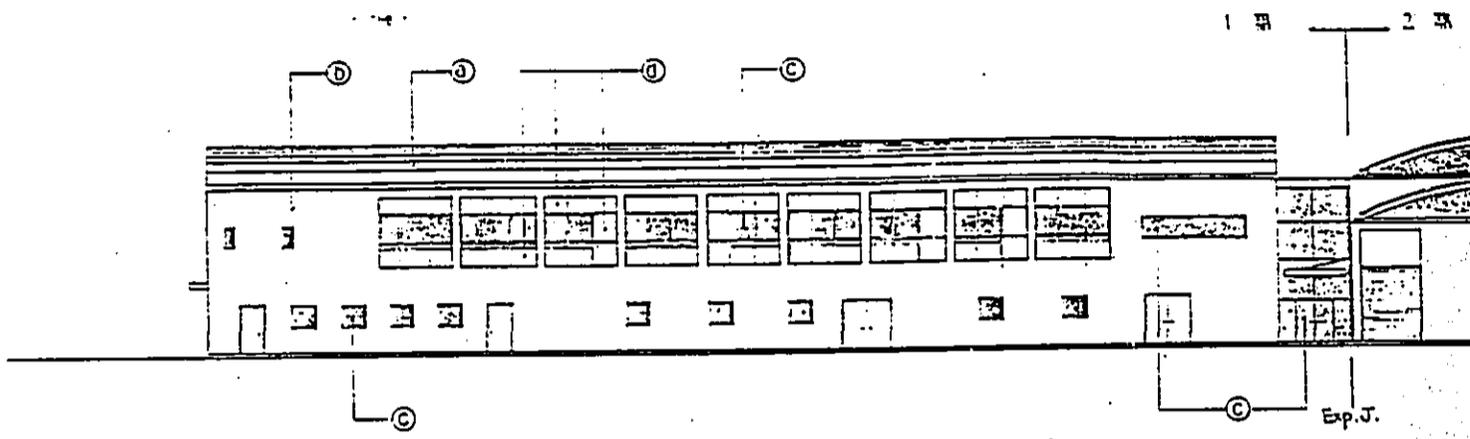
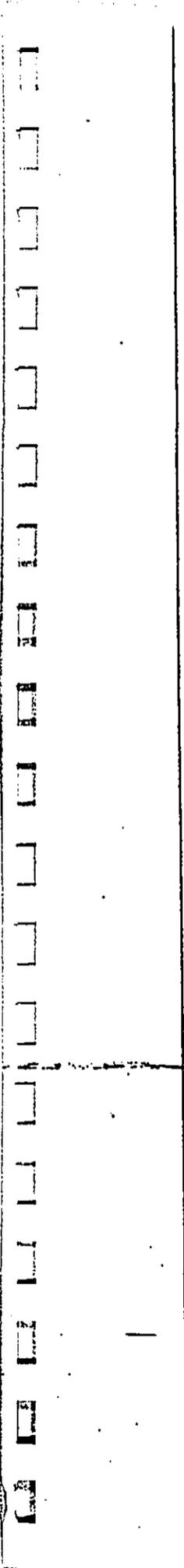


North Elevation Scale = 1:16
北側立面図

IS

ISHIMOTO ARCHITECTURAL & ENGINEERING FIRM, INC.
 6-12, Nishikojima 2-chome, Chiyoda-ku, Tokyo, Japan 100
 Tel: TEL: 3556-1111 FAX: 3556-1111

Project Architect	Client
Project Title	Date
S/D	Design
C/D	Date
Date	Job No.
Date	Drawing No.



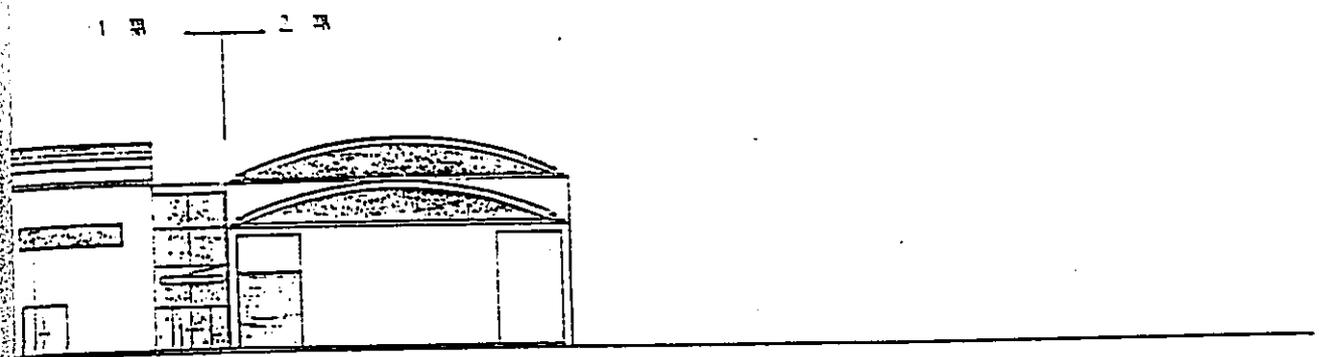


ISHIMOTO ARCHITECTURAL & ENGINEERING FIRM, INC.
 1515 Kashiwa-cho, Chiyoda-ku, Tokyo 100, Japan TEL: 3-3211-2711 FAX: 3-3211-2712

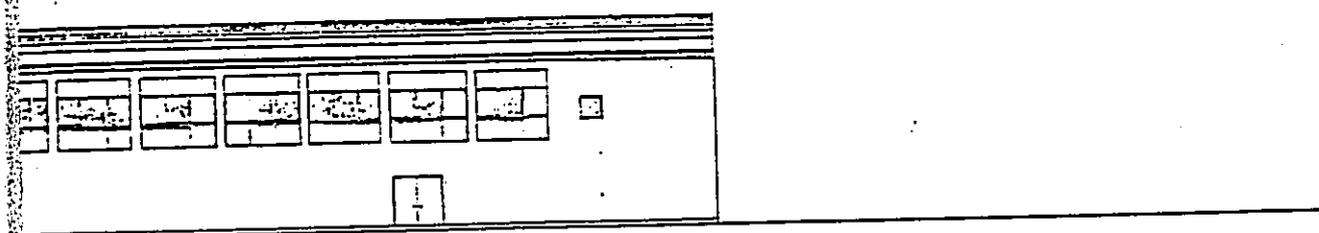
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 Checked: [Blank]
 Drawn: [Blank]

Project Title: [Blank]
 Date: [Blank]

Scale: 1/16
 Date: May 5 '95
 Job No.: [Blank]
 Drawing No.: [Blank]



West Elevation Scale = 1 : 16
 西側立面図



South Elevation Scale = 1 : 16
 南侧立面図

South Elevation Scale = 1 : 16
 南侧立面図

concept is to enable the early occupancy and use of a portion of the facility while the other wing is being constructed. Occupancy can thus occur shortly after or near the completion of the Subaru telescope now under construction.

Approximate construction cost of the proposed facility will range from \$10 to \$12 million in 1995 dollars. When completed, it will provide staff and research work for an estimated fifty (50) personnel. Half of these employees are expected to be in the clerical and technical support areas. The other half are expected to be scientists.

There is an area for future expansion, identified as the third phase on the site plan. There are no immediate construction plans for this area. The size of the structures mentioned earlier does NOT include this area.

Access will be via N. Aohoku Place, an improved County-dedicable street that intersects with Nowela Street. Nowela Street intersects with Komohana Street (Figure 1). Although the site abuts Komohana Street, no direct access is planned from said Street.

Installation of underground utilities and drainage improvements within the park began in early 1995. These improvements should be completed prior to the start of construction of the first phase of this project.

Landscaping will be added around the building and the site.

The facility's staff will most likely work Monday through Friday, generally between the hours of 7:00 AM to 5:00 PM. The scientists and some researchers may work during the evenings and possibly much later.

2.3.3 Timetable and Cost

The applicant plans to begin construction of the first phase immediately upon securing all necessary County permits, and hopefully during the latter part

of 1995. An 11-month construction period is anticipated.

Construction of the second phase would begin in May 1996, also with an anticipated 11-month completion date.

Estimated cost to construct this facility is \$10 to \$12 million in 1995 dollars.

3 ENVIRONMENTAL SETTING, IMPACT, & MITIGATION

3.1 Physical Characteristics

3.1.1 Climate

The mean annual rainfall in this area is estimated at 141 inches. Rainfall is more frequent during the months of October through April.

Hilo, being located on the easterly or windward side of the island, is exposed to the traditional "trade" wind. Daytime Fahrenheit temperatures range between the upper 70's to the low 80's and from the low 60's to the upper 70's during the evenings.

3.1.2 Topography & Soils

Terrain of the parcel was comprised predominantly of lava flows covered with thick vegetation.

The Land Study Bureau's Detailed Land Classification report designates the site E 306, which is essentially poorly suited for intensive agricultural activities. The soil series is almost bare pahoehoe with very little or no soil material. It is moderately drained, with slopes generally less than 35 percent. It is very poorly suited for machine tillability.

Under the Agricultural Lands of Importance to the State of Hawaii (ALISH) classificatory system, the subject site is not classified.

The U.S. Department of Agriculture's Soil Survey report classifies the soil types in this area to be of the Keaukaha extremely rocky muck, Pahoehoe Lava flows, and the Panaewa very rocky silty clay loam.

The actual topography, however, shows an east to west slope. The elevation is about 320 feet, and the slope ranges from 6 to 10 percent, although there are areas where the slope may slightly exceed 10 percent.

3.1.3 Natural Hazards

Tsunami, earthquake and subsidence, and lava flow represent the major natural hazards on the island of Hawaii. None of these natural hazards appear to be uniquely applicable to this site.

The subject site is located more than 2 miles from the shoreline. As such, it would not be vulnerable to tsunamis and subsidence.

According to the Flood Insurance Rate Map (FIRM), the subject site is designated Zone X, areas determined to be outside the 500-year flood plain.

According to the US Geologic Survey report, the degree of volcanic hazard of this area is "3" out of a scale of 9. The lower the number, the greater the degree of hazard. While this may be of concern, it should be noted that the entire city of Hilo has been designated Zone 3. In 1881, an historic lava flow from Mauna Loa flowed into Hilo within one mile of Hilo Bay.

3.1.4 Flora

A walk-through field study of the subject parcel and the surrounding area's botanical resources was conducted by Char and Associates in November 1992. The results of this study are attached as Appendix A.

The survey found the site to be characterized by Ohia trees and matted uluhe ferns. Visual observation also suggests guava thicket. Based on the study, none of the plants inventoried were listed as threatened and endangered species; nor were any proposed or candidate for such status. As such, no restrictions, conditions, impediments or recommendations are discussed for this site.

3.1.5 Fauna

No commissioned faunal survey was conducted of this site. According to records on file with the State

and County, however, this area does not have any history of serving as a habitat for rare or endangered animal life.

3.1.6 Historic/Archaeological Resources

An archaeological inventory survey was conducted (December 1992 to January 1993) of the subject parcel by Cultural Surveys Hawaii (Appendix B). This survey was done in conjunction with the processing of plans for the construction of on-site infrastructural improvements within the subject parcel. The survey area covered 163 acres.

The report noted that bulldozing had occurred within the study area for an old water main and an electric power line. In addition, two structures (Agriculture Center and Joint Astronomy Centre) and their associated parking lots and paved roadways were completed prior to the archaeological survey.

Sites were located within the southern portion of the parcel, of which four were described and mapped. Two agricultural complex sites (18668 and 18669) and a mound feature of a third site (18667) were hand excavated and tested to document stratigraphy in the sites and to search for cultural remains to date the sites. No subsurface cultural deposits were found.

Based on the type and age indicated by the data collected and analyzed, no further archaeological research was recommended.

In September 1993, a supplemental archaeological survey was done by Cultural Surveys Hawaii, covering approximately 11 acres within the adjacent flood control channel east (makai) and adjacent of the subject parcel (Appendix C).

During this survey, four (4) plantation-era (circa 1870 to 1940) rock clearance features or mounds and a portion of a rock wall continuing from the State-owned parcel were identified. These features were included in the original survey under State Historic Site No. 50-10-35-18670. Based on subsurface testing of the largest mound within the flood control channel, and another mound located within the State-owned parcel, these features were determined to be part of

the commercial sugarcane cultivation of the Waiakea Cane Lots. As such, no further archaeological research was deemed necessary.

Relative to the area of the proposed 3.8 acres of improvement, no archaeological features were found. (Figure 9) As such, there should be little or no adverse archaeological impacts resulting from the proposed improvements.

Should any unanticipated archaeological features be uncovered, however, the applicant will halt work and notify the proper government agency.

3.1.7 Air Quality

The South Hilo district has pollution, natural and man-made. Those associated with the automobile and geothermal development are man-made; while the more significant one is a natural one, coming from the fumes of ongoing volcanic activity.

It should be noted, however, air emission pollution within the area is generated by traffic from Komohana Street, which is a main thoroughfare from the Waiakea district to the downtown and mauka areas of Hilo town.

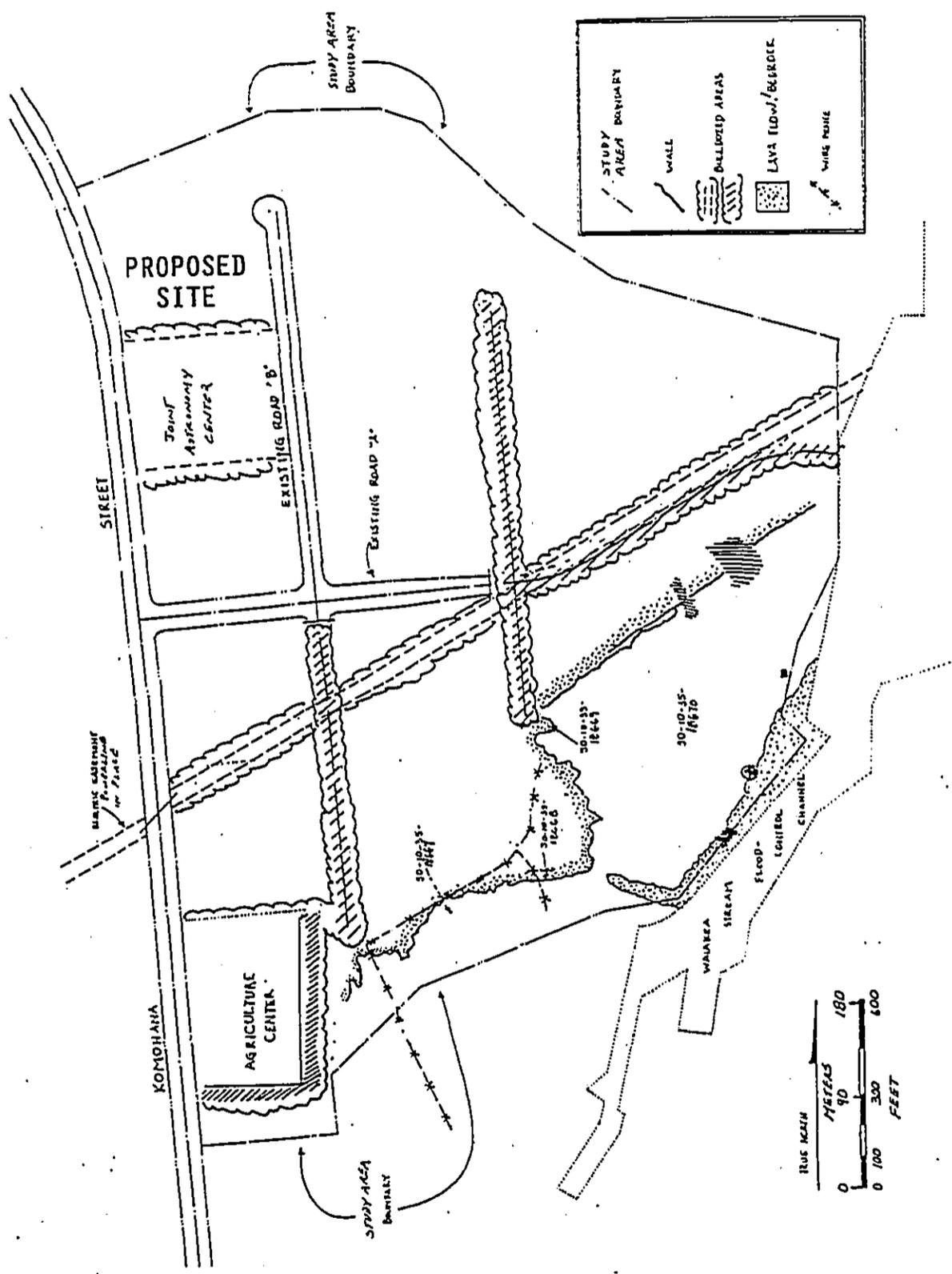
3.1.8 Noise

There will be short-term noise impact associated with the construction of the facility. However, that would be short-term and would occur during normal working hours and not on weekends. Further, there are no immediate surrounding residential uses.

The subject area is generally associated with ambient noise levels associated with the traffic from Komohana Street. Expected noise impact would be from the area's general location, and not from the use of the proposed building after construction impacts. Noise level of the use of the proposed building is expected to be equivalent to the existing two buildings in the park, which is very negligible.

3.1.9 Scenic Resources

The location of the proposed structure will be



Study Area, Showing Existing Roads, Powerline Easement and Areas of Previous Bulldozing

makai of Komohana Street. As the land slopes makai at that point, there would thus be some interference with the makai viewplane.

The structure, however, would be a maximum of 38 feet-six inches high, and there would be ample view corridors. It should also be noted that the view is not listed as a critical viewplane in any of the County's published planning documents (General Plan and Hilo Community Development Plan.)

3.2 Socioeconomic Characteristics

The proposed action will not involve any relocation of residents, as the site is currently vacant. As the proposed facility will be a new business to the island, short-term construction employment will be generated for nearly two years (first and second phases); and new long-term employment for fifty (50) persons.

Estimated annual income expected to be generated to the County of Hawaii is \$5 million. This is exclusive of the short-term construction activities.

Although governed by existing zoning and County land use policies, the proposed action is also not expected to significantly affect surrounding land values. The surrounding land in this area is essentially owned by the State.

3.3 Public Facilities, Utilities and Services

3.3.1 Roads

Access to the facility would be via N. Aohoku Place, a County-standard cul-de-sac road off of Nowela Street. This road is improved with curbs, gutters, and sidewalks. Its right-of-way is 60 feet, and the pavement width is 20+ feet.

Nowela Street intersects with Komohana Street. Komohana Street serves as the principal thoroughfare access to this research park area. It is a two-lane County-owned roadway with an 80-foot right-of-way in the vicinity of the proposed improvements. There is a left-turn storage lane leading onto Nowela Street.

The overall road condition of Komohana Street, Nowela Street and N. Aohoku Place, a cul-de-sac fronting the subject area, comports to County standards. Anticipated traffic for the facility should not be significant to warrant additional road improvements in this area.

These factors suggest that the traffic impacts resulting from the use of the proposed structure should not be significant.

3.3.2 Water System

There is an existing 8-inch County water line along Komohana Street. This line has been extended to the subject site via Nowela Street. A 12-inch water line within Nowela Street is now under construction and should be completed in June. Potable County water is thus available for the proposed use.

3.3.3 Wastewater System

Also under construction and with a June 30 completion date is an 8-inch sewer line within Nowela Street and to the subject site. This line will connect to the line that presently serves the University. That line in turn connects to the County sewer system along Lanikaula Street. The wastewater requirements of this project will thus be satisfied in that manner.

3.3.4 Drainage System

The subject site is designated Zone X, areas of minimal flood and/or drainage hazards. The proposed parking area should increase the area of semi-impervious surface, and the structure's roof should also add to on-site drainage.

However, given the existing permeable condition of the land and the construction of County-approved drywells and related on-site drainage systems, on- and off-site drainage problems associated with this project are not anticipated.

3.3.5 Solid Waste

The proposed use should not generate a significant amount of waste. Nonetheless, whatever

waste is generated, they will be hauled off by commercial haulers to the County's landfill.

3.3.6 Electrical/Telephone

Electrical and telephone services are currently available to the area and parcel.

3.3.7 Other Public Facilities

Additional public services should not be required for the proposed use. Located within an urban environment, this site is readily accessible to fire and police protective services. Further, this proposed use is not expected to significantly add to the demand for those services.

As the proposed use will create new jobs, it is possible that there may be additional demand for school support services, either for relocated workers or out-of-state workers.

There are existing schools and the University of Hawai'i at Hilo proximate to the proposed site.

RELATIONSHIP TO PLANS, POLICIES, AND CONTROLS

4.1 State Land Use Law

The subject parcel is classified Urban by the State Land Use Commission. No further action and/or land use permit is required of the State.

4.2 Hawaii County General Plan

The subject site is designated for University Use on the County General Plan Land Use Pattern Allocation Guide. The proposed use would thus be compatible with that designation, and no amendments would be required.

4.3 Community Development Plan

The Hilo Community Development Plan was adopted by the Planning Commission in 1975. The land use guide map of this Plan suggests a RS-10 designation, a designation that is also similar to the balance of the University site.

4.4 Zoning

The County zoning of the subject parcel is split between RS-10 and A-1a. The area of the proposed improvement is zoned A-1a. Under the County Zoning Code, schools would be allowed in both of those zones, provided that a Use Permit is secured from the Planning Commission. In this case, the proposed use would be related to the University. There is a possibility, however, that the proposed use may not require a Use Permit, as it amounts to an extension of the existing uses. That is a determination to be made by the Planning Department.

4.5 Other Regulations

The subject area is not located within the County Special Management Area (SMA). Thus, a SMA Use Permit would not be required.

Beyond the possibility of a Use Permit, other permits required would be Plan Approval and applicable building and related construction permits.

The Code also requires vehicular parking at a ratio of one (1) stall for every four hundred (400) square feet of space. Based on a 36,800 square foot building, preliminary plan calls for the provision of ninety two (92) stalls.

In that regard, there may be some adjustments to the number when the project is reviewed during the Plan Approval process. The preliminary 36,800 square foot figure is the gross square footage, and it includes lobby, corridors, and other non-office areas. At any rate, once the final calculation is determined and if there is a need for additional stalls, there is ample room on the balance of the site to accommodate whatever may ultimately be required by the County.

5 ALTERNATIVES

5.1 No Action

The installation of the infrastructure allowed the orderly development of the research and technology park for the University of Hawai'i at Hilo. This park is to integrate the University's research and technical activities with good access to communications between the University and the community.

The availability of public services; good on- and off-site infrastructure; and the site's proximate location to the University, community, and two other astronomy-related facilities were important factors that led the National Astronomy Observatory of Japan to propose its new base facility at this site.

This facility would be considered a permanent site, which in turn would foster long-term economic benefit to the island. The observatory and its support staff could generate approximately \$5 million annually to the island's economy.

Thus, no action could result in the loss of this important economic addition to the Hilo area and the island of Hawai'i. It could also hamper the research interests and efforts of other related uses, such as the University of Hawai'i and other astronomy base facilities in this area.

5.2 Alternate Site

The location of the facility and staff close to an area with related research and technical facilities (University of Hawai'i at Hilo, the Joint Astronomy Centre, and Caltech) would better facilitate its resources for the NAOJ's research project. The proposed site is thus ideal.

While alternate sites on this island could have been considered, those alternate sites - because of its distance from the University and other similar facilities - cannot provide the required or needed scientific "economies of scale" that the present site offers.

6 DETERMINATION WITH SUPPORTING FINDINGS AND REASONS

The proposed facility is not expected to cause significant impacts to the environment, pursuant to the significance criteria established by the State Environmental Commission as discussed below. As such, the determination is to issue a Negative Declaration.

Specifically:

- * The proposed project will not involve an irrevocable commitment to loss or destruction to any natural or

cultural resources.

The site upon which the proposed facility would be located does not have any significant natural resources. While there are some archaeological features on the property, there is none in the area of the proposed improvements.

- * The proposed project will not curtail the range of beneficial uses of the environment.

The requested use would not interfere with any of the existing surrounding uses. Its noise and vehicular impacts will be negligible. Any associated drainage and wastewater requirements will be handled in a manner meeting with the requirements of the appropriate governmental agencies. Thus, environmental options for the surrounding area should still exist in spite of the proposed facility.

- * The proposed project will not conflict with the State's long-term environmental policies.

The requested use complies with the environmental policies and standards of the State. All required improvements - wastewater and drainage - will be done in accordance with the requirements of the State and/or County. There should also be minimal impacts to air and noise quality.

- * The proposed project will not involve substantial secondary impacts, such as population changes or effects on public facilities.

The requested use is part of the University's plans to implement a research and technology park in this area. This park and the growth implications were considered by the State's previous action of creating this park and the construction of the required on-site infrastructure.

Notwithstanding the foregoing, the proposed facility would employ fifty (50) people. As such, it would help to strengthen and diversify the County of Hawai'i's economic base.

- * The proposed project will not involve a substantial degradation of environmental quality.

The requested use will not involve unusually high extensive on-site improvements. The land will be cleared for the proposed improvements. However, landscaping will be provided in selected areas to minimize the impact. All other environmental impacts (noise, air, etc.) should be negligible.

- * The proposed project will not substantially affect any rare, threatened or endangered species of flora or fauna or habitat.

It is not anticipated that rare or endangered plant or animal life would be threatened by the requested use.

- * The proposed project will not detrimentally affect air or water quality or ambient noise level.

The only discernible air quality impacts associated with the proposed facility would be from the vehicular traffic. The frequency and volume of traffic, however, should not be too substantial to create any appreciable impact.

Like the air impact, possible noise impacts would be attributable to the vehicular traffic. Traffic would not be high as a commercial area, but more in the pattern of a business office. The noise ambient level should thus not be significantly affected, particularly in light of the existing use of Komohana Street.

- * The proposed project is not located in an environmentally sensitive area.

The project is not located in any environmentally sensitive area.

7 FINAL ENVIRONMENTAL ASSESSMENT

A Negative Declaration of significant environmental impacts was expected by the proposed construction action of National Astronomical Observatory of Japan's base facility. As such, a Draft Environmental Assessment (DEA) was submitted to the Office of Environmental Quality Control (OEQC). Bulletin publication occurred on August 8, 1995 for public comment.

No comments were received within the thirty (30) day comment period.

Therefore, the University of Hawai'i at Hilo, the approving agency, has prepared a Negative Declaration determination of impacts for the proposed action.

This Final Environmental Assessment is submitted, with revisions, and a Negative Declaration for publication in the OEQC Bulletin for comment on the Negative Declaration.

DOCUMENT CAPTURED AS RECEIVED

APPENDIX A

BOTANICAL SURVEY
UNIVERSITY OF HAWAII - HILO
PROPOSED INFRASTRUCTURE FOR RESEARCH AND TECHNOLOGY LOTS
SOUTH HILO DISTRICT, ISLAND OF HAWAII

BY

CHAR & ASSOCIATES

BOTANICAL SURVEY
UNIVERSITY OF HAWAI'I - HILO
PROPOSED INFRASTRUCTURE FOR RESEARCH AND TECHNOLOGY LOTS
SOUTH HILO DISTRICT, ISLAND OF HAWAI'I

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Prepared for: ENGINEERING CONCEPTS, INC.

December 1992

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BOTANICAL SURVEY
UNIVERSITY OF HAWAI'I - HILO
PROPOSED INFRASTRUCTURE FOR RESEARCH AND TECHNOLOGY LOTS
SOUTH HILO DISTRICT, ISLAND OF HAWAI'I

INTRODUCTION

The proposed infrastructure for research and technology lots is located within a 116 acre State-owned parcel. The parcel is bounded by Komohana Road to the west, the Wailoa River and the existing University of Hawai'i Hilo (UHH) campus to the east and south, and a small, unnamed stream to the north. An existing 50-foot wide electrical easement runs through the property, roughly in a mauka-makai direction. Portions of the property are currently in use by the UH Agriculture Center (8.0 acres) and by the Joint Astronomy Center (JAC) Facility (4.4 acres). In addition, parts of the main access road (Road "A") and the road below the JAC facility (Road "B") have already been constructed.

Field studies to assess the botanical resources found on the project site were conducted on 06-07 November 1992; a total of three botanists were used for the field studies. The primary objectives of the survey were to: 1) provide a description of the general vegetation types; 2) compile an inventory of the flora; and 3) search for threatened and endangered plant species protected by Federal and State laws.

SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Topo-

graphic maps, the preliminary lot layout map, and soil maps (overlay of soil types on a photobase) were examined to determine access, boundaries, reference points, terrain characteristics, and vegetation cover patterns.

The less disturbed areas, which are more likely to harbor native plant communities, and, perhaps, rare plants were more intensively surveyed. The electrical easement served as the primary access; from the easement a number of surveyor's transects and long overgrown trails can be found.

A walk-through (pedestrian) survey method was used. Notes were made on plant associations and distribution, substrate types, topography, exposure, drainage, etc. Plant identifications were made in the field; plants which could not be positively identified were collected for later determination in the herbarium (UH, Manoa - HAW) and for comparison with the most recent taxonomic treatment of the flora.

The species recorded are indicative of the season ("rainy" vs. "dry") and the environmental conditions at the time of the survey. A survey taken at a different time and under varying environmental conditions would no doubt yield slight variations in the species list, especially of the weedy, annual plants.

DESCRIPTION OF THE VEGETATION

To our knowledge, there have been no detailed botanical reports dealing specifically with the project site. A short, but incomplete list of the "predominant flora" was compiled for the University of Hawaii Hilo Long Range Development Plan (State of Hawai'i 1977).

The mauka (west) half of the project site, along Komohana Road,

is mapped as "rLW", pahoehoe lava flow (Sato et al. 1973), although, in places, there are jumbled heaps of 'a'a lava outcroppings. This flow is part of the 1881 Mauna Loa flow (Macdonald and Abbott 1970). Along the northern and central portion of the site, the substrate is mapped as "rKFD", Keaukaha extremely rocky muck, 6 to 20% slopes (Sato et al. 1973). This consists of well-drained, thin organic soils overlying pahoehoe lava bedrock. Both the 1881 flow and the Keaukaha soil series support a native-dominated forest of 'ohi'a trees and dense, matted uluhe ferns. Along the south and eastern portion of the site, the substrate is mapped as "PeC", Panaewa very rocky silty clay loam, 0 to 10% slope (Sato et al. 1973). This is a moderately well-drained, dark brown silty clay loam over pahoehoe bedrock; the depth to pahoehoe bedrock ranges from 15 to 20 inches. The vegetation on this soil series is composed largely of introduced species, mostly secondary forest trees, and the area appears to have been cultivated. There are a number of rock terraces and other features on this part of the site.

More detailed descriptions of the 'ohi'a-uluhe forest and the introduced mixed forest are presented below. All the plants inventoried during the field studies are presented in the checklist at the end of this report.

'Ohi'a-Uluhe Forest

The 'ohi'a-uluhe forest occurs on wetter areas of the island, on both 'a'a and pahoehoe substrates. Its general physiognomy is of widely spaced 'ohi'a trees (Metrosideros polymorpha) within an almost continuous mat of uluhe fern (Dicranopteris linearis).

There are three variants of this vegetation type on the project site. On the relatively younger 1881 Lava Flow, around the JAC facility and the Agriculture Center, the forest is typical of the

earlier stages of succession. The majority of the 'ohi'a trees are of about even age and size, ranging from 15 to 25 ft. tall. The uluhe fern is very dense and forms an almost impenetrable mat between the trees, varying in height from 6 to 9 ft.; in places where the fern has climbed onto the trees, the tangled mats can be 12 ft. high. Because the uluhe cover is so dense, there are few other smaller species. Occasionally, a few plants of melastoma (Melastoma candidum), bamboo orchid (Arundina graminifolia), and strawberry guava (Psidium cattleianum) may be observed.

Where the forest occurs on the somewhat geologically older flow which has been mapped as "rKFD", Keaukaha rocky muck, the uluhe mat becomes patchy. Hala or pandanus (Pandanus tectorius) is frequently observed; if left undisturbed, the next step in natural succession would probably be to an 'ohi'a-hala dominated forest. However, the forest in this area supports a number of introduced species. Some fairly large-sized thickets of strawberry guava and melastoma shrubs, 12 to 15 ft. tall, are found here. Emerging above the 25 to 40 ft. tall 'ohi'a are scattered plants of gun-powder tree (Trema orientalis) and melochia (Melochia umbellata). The ground cover consists largely of strawberry guava and melastoma seedlings along with patches of hairy sword fern (Nephrolepis multiflora). Blechnum fern (Blechnum occidentale) and shampoo ginger (Zingiber zerumbet) may be locally common. Moss-covered rocks are also frequent. Lygodium japonicum, a lacy, slender, climbing fern, is locally abundant along the edges of this forest and along the trails cut through the forest, especially along the powerline easement. Lygodium has escaped from gardens around Hilo town and has established itself in surrounding woods and gulches (Char 1992).

The third and minor variant of this vegetation type includes the plants found in the disturbed areas within the 'ohi'a-uluhe forest. The plants in these areas consist of an assortment of

largely introduced grasses, herbs, shrubs, and saplings. These include torpedo grass (Panicum repens), molasses grass (Melinis minutiflora), broomsedge (Andropogon virginicus), partridge pea (Chamaecrista nictitans), sensitive plant or puahilahila (Mimosa pudica), pluchea (Pluchea symphytifolia), melastoma, a number of Desmodium and Crotalaria species, and saplings of melochia and gunpowder tree. Two native species occur in fairly large numbers in these more open, sunny areas. Neneleau (Rhus sandwicensis), a small tree, 6 to 24 ft. tall, belonging to the mango family, is common along the powerline easement. Scleria testacea, a sedge with sharp-edged leaf margins, is locally abundant along "Road B", near the JAC facility. Also found in this area are a few plants of 'akiohala (Hibiscus furcellatus), a native, pink-flowered hibiscus.

Introduced Mixed Forest

This vegetation type occurs on the portion of the property with Panaewa soil ("PeC"), a relatively deep, dark brown silty clay loam. The forest consists primarily of large gunpowder and melochia trees, 30 to 50 ft. tall. Other tree species found in this forest type include Chinese banyan (Ficus microcarpa), guarumo (Cecropia obtusifolia), bingabing (Macaranga mappia), African tulip (Spathodea campanulata), satin leaf (Chrysophyllum oliviforme), and avocado (Persea americana). Large groves of Alexandra or king palm (Archontophoenix alexandrae) are common along the western portion of this forest, near the Waiola River and across from the University of Hawai'i Hilo campus. A stand of very old mango trees (Mangifera indica) is also found in this forest type.

The common yellow guava (Psidium guajava) forms somewhat dense shrub layers in some places of the forest. Seabean (Dioclea wilsonii), a large woody liana which produces clusters of dark

purple flowers, is occasionally observed climbing over the trees and shrubs.

Ground cover is variable. Where the tree canopy cover is dense, only the more shade-tolerant plants such as wood fern (Christella parasitica) and Oplismenus compositus can be found, however, much of the ground is barren, wet soil. Where the trees thin out and there is more light available, clumps of palmgrass (Setaria palmifolia), up to 3 ft. tall, and low, rambling prickly shrubs of thimbleberry (Rubus rosifolius) are abundant.

Along the eastern edge of the forest where it abuts the Waiola River, it is open and the ground is covered by a thick blanket of California grass (Brachiaria mutica) and wedelia (Wedelia trilobata). Scattered through the California grass and wedelia are plants of honohono (Commelina diffusa), primrose willow (Ludwigia octovalvis), and a few guava shrubs. Also found along or near the river are clumps of banana (Musa X paradisiaca), ti (Cordyline fruticosa), elephant grass (Pennisetum purpureum), and yellow ginger (Hedychium flavescens).

DISCUSSION AND RECOMMENDATIONS

In summary, the native-dominated 'ohi'a-uluhe forest occurs on the younger substrates -- the 1881 Lava Flow and Keaukaha extremely rocky muck. The geologically older Panaewa soil type supports a forest composed primarily of introduced species. The 'ohi'a-uluhe forest represents a fairly early stage in plant succession on wet lava flows, and, although, both of these native species make up the bulk of the vegetation, this type of forest does not have a rich array of other native species.

Of a total of 122 species inventoried on the site, 100 (82%) are introduced or alien species, 6 (5%) are originally of Polynesian

introduction, and 16 (13%) are native. Of the natives, 12 are indigenous, that is, they are native to the Hawaiian Islands and also elsewhere, and 4 are endemic, that is, they are native only to the islands. The majority of the introduced species are weedy plants which prefer open, disturbed sites. The native species can be found in similar environmental habitats throughout the islands. None of the plants inventoried on the State-owned parcel are officially listed threatened and endangered species; nor are any proposed or candidate for such status (U.S. Fish and Wildlife Service 1989, 1990).

Given the findings above, the proposed project is not expected to have a significant negative impact on the botanical resources. Whenever possible native plants should be used for landscaping. The following recommendations are offered. On portions of the property covered by the 'ohi'a-uluhe forest, there are some areas with slopes greater than 10% and it would be difficult to build on these areas without substantial grading. It is suggested that these areas be left intact, and incorporated into the landscape design wherever feasible. These strips of 'ohi'a-uluhe forest would provide a buffer between the different facilities planned for the site; they would function as a noise screen and also protect the visual quality of the site. Costs for grading and then revegetating these areas could be eliminated.

As for landscaping material, it is recommended that some of the more easily cultivated native species found in the general region (Hamakua-Hilo-Puna) be used. These include 'ohi'a, tree ferns (Cibotium), 'ahanui (Machaerina), 'ohe (Tetraplasandra), loulu palm (Pritchardia), etc. Botanists and horticulturists on the UH Hilo and Hilo Community College facility, who are more familiar with the local flora, can also be approached to provide a list of native species suitable for landscaping the project site.

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PLANT SPECIES LIST -- Proposed Infrastructure for Research and
Technology Lots at UH - Hilo

A checklist of all those terrestrial, vascular plant species inventoried on the project site during the field studies is presented below. The species are arranged alphabetically within each of three groups: Ferns, Monocots, and Dicots. The taxonomy and nomenclature of the Ferns follow Lamoureux (1984); the flowering plants, Monocots and Dicots, are in accordance with Wagner et al. (1990), for the most part.

For each species, the following information is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name, when known.
3. Biogeographic status. The following symbols are used:
 - E = endemic = native only to the Hawaiian Islands
 - I = indigenous = native to the Hawaiian Islands and also elsewhere throughout the Pacific
 - P = Polynesian = plants originally of Polynesian introduction prior to Western contact (Cook's discovery of the islands in 1778); not native
 - X = introduced or alien = all those plants brought to the islands by humans, intentionally or accidentally, after Western contact; not native.
4. Presence (+) or absence (-) of a particular species within each of two vegetation types recognized on the project site (see text for discussion):
 - o = 'Ohi'a-Uluhe Forest
 - i = Introduced Mixed Forest

Vegetation type

o i

StatusCommon nameScientific name

FERNS

BLECHNACEAE (Blechnum Family)
Blechnum occidentale L.

blechnum fern

X

+

+

DICKSONIACEAE (Tree Fern Family)
Cibotium glaucum (J. Sm.) Hook. & Arnott

hapu'u

E

+

-

GLEICHENIACEAE (Vine Fern Family)
Dicranopteris linearis (Burm.) Underw.

uluhe

I

+

+

HEMIONITIDACEAE (Gold Fern Family)
Pityrogramma calomelanos (L.) Link

silver fern

X

-

+

LINDSAEACEAE (Lace Fern Family)
Sphenomeris chinensis (L.) Maxon

pala'a

I

+

-

LYGODIACEAE (Climbing Fern Family)
Lygodium japonicum (Thunb.) Sw.

lygodium

X

+

+

NEPHROLEPIDACEAE (Sword Fern Family)
Nephrolepis multiflora (Roxb.) Jarrett
ex Morton

hairy sword fern

X

+

+

POLYPODIACEAE (Common Fern Family)
Phlebodium aureum (L.) J. Sm.

laua'e-haole

X

-

+

Phymatosorus scolopendria (Burm.) Pic.-Ser.
Pleopeltis thunbergiana Kaulf.

laua'e, lauwa'e

X

-

+

pakahakaha, 'ekaha-'akolea

I

-

+

THELYPTERIDACEAE (Woodfern Family)
Christella parasitica (L.) Levl.

woodfern, oakfern

X

+

+

Scientific name

Vegetation type

Status

Common name

FLOWERING PLANTS

MONOCOTS

AGAVACEAE (Sisal Family)

Cordyline fruticosa (L.) A. Chev.

ARACEAE (Aroid Family)

Dieffenbachia picta Schott

ARECACEAE (Palm Family)

Archontophoenix alexandrae (F. v. Muell.)
H.A. Wendl. & Drude

COMMELINACEAE (Dayflower Family)

Commelina diffusa N.L. Burm.

CYPERACEAE (Sedge Family)

Cyperus halpan L.

Fimbristylis dichotoma (L.) Vahl.

Kyllinga brevifolia Rottb.

Machaerina mariscooides ssp. *meyenii*
(Kunth) T. Koyama

Pycneus polystachyos (Rottb.) P. Beauv.

Scleria testacea Nees

DIOSCOREACEAE (Yam Family)

Dioscorea bulbifera L.

Dioscorea pentaphylla L.

MUSACEAE (Banana Family)

Musa X paradisiaca L.

ti, ki

dieffenbachia

king palm, Alexandra
palm

honohono

green kyllinga, kilii'opu

'ahaniu, 'uki

bitteryam, pi'oi
pi'ia

banana, maia

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<u>Scientific name</u>	<u>Common name</u>	<u>Status</u>	<u>Vegetation type</u>
ORCHIDACEAE (Orchid Family)			
<i>Arundina graminifolia</i> (D. Don) Hochr.	bamboo orchid	X	-
<i>Spathoglottis plicata</i> Blume	Philippine ground orchid	X	+
PANDANACEAE (Hala Family)			
<i>Pandanus tectorius</i> S. Parkinson ex Z.	pandanus, hala	I?	-
POACEAE (Grass Family)			
<i>Andropogon virginicus</i> L.	broomsedge	X	-
<i>Brachiaria mutica</i> (Forsk.) Stapf	California grass	X	+
<i>Coix lachryma-jobi</i> L.	Job's tears	X	+
<i>Digitaria</i> sp.	crabgrass	X	-
<i>Eragrostis</i> sp.	<i>Hamakua eragrostis</i>	X	-
<i>Melinis minutiflora</i> P. Beauv.	molasses grass	X	+
<i>Oplismenus compositus</i> (L.) P. Beauv.	Guinea grass	X	-
<i>Panicum maximum</i> Jacq.	torpedo grass, Mainaku grass	X	+
<i>Panicum repens</i> L.	Hilo grass, mau'u Hilo	X	-
<i>Paspalum conjugatum</i> Bergius	ricegrass, mau'u laiki	I?	+
<i>Paspalum scrobiculatum</i> L.	napier grass, elephant grass	X	-
<i>Pennisetum purpureum</i> Schumacher	Natal redtop	X	-
<i>Rhynchelytrum repens</i> (Willd.) Hubb.	Glenwood grass	X	-
<i>Sacciolepis indica</i> (L.) Chase	yellow foxtail	X	-
<i>Setaria gracilis</i> Kunth	palmgrass	X	+
<i>Setaria paimifolia</i> (J. König) Stapf			
ZINGIBERACEAE (Ginger Family)			
<i>Hedychium flavescens</i> N. Carey ex Roscoe	yellow ginger	X	+
<i>Zingiber zerumbet</i> (L.) Sm.	shampoo ginger, 'awapuhi kuahiwi	P	-
DICOTS			
ACANTHACEAE (Acanthus Family)			
<i>Justicia betonica</i> L.	white shrimp plant	X	+

<u>Scientific name</u>	<u>Common name</u>	<u>Status</u>	<u>Vegetation type</u>	
			o	i
ANACARDIACEAE (Mango Family)				
Mangifera indica L.	mango, manako	X	+	+
Rhus sandwicensis A. Gray	neneleau	E	+	-
Schinus terebinthifolius Raddi	Christmas berry.	X	-	+
APIACEAE (Parsley Family)				
Centella asiatica (L.) Urb.	Asiatic pennywort, pohe kula	X	+	-
ARALIACEAE (Ginseng Family)				
Schefflera actinophylla (Endl.) Harms	octopus tree, umbrella tree	X	+	+
ASTERACEAE (Sunflower Family)				
Ageratina riparia (Regel) R. King & H. Robinson	pamakani	X	-	+
Ageratum houstonianum Mill.	maile hohono	X	+	-
Bidens alba var. radiata (Schultz-Bip.) Ballard ex Melchert	white-flowered bidens	X	-	+
Crassocephalum crepidioides (Benth.) S. Moore	crassocephalum	X	+	-
Eclipta alba (L.) Hassk.	false daisy	X	+	-
Emilia fosbergii Nicolson	pua lele	X	+	-
Erechtites valerianifolia (Wolf) DC.	fireweed	X	+	-
Pluchea symphytifolia (Mill.) Gillis	pluchea, sourbush	X	+	-
Sonchus oleraceus L.	sow thistle, pua-lele	X	+	-
Wedelia trilobata (L.) Hitchc.	wedelia	X	+	+
BALSAMINACEAE (Touch-me-not Family)				
Impatiens wallerana J.D. Hook.	impatiens	X	-	+
BEGONIACEAE (Begonia Family)				
Begonia foliosa var. miniata (Planch.) L.B. Sm. & B.G. Schubert	fuscia begonia	X	-	+
Begonia hirtella Link	white-flowered begonia	X	+	-
BIGNONIACEAE (Bignonia Family)				
Spathodea campanulata P. Beauv.	African tulip	X	-	+

<u>Scientific name</u>	<u>Common name</u>	<u>Status</u>	<u>Vegetation type</u>	
			<u>o</u>	<u>i</u>
BOMBACACEAE (Bombax Family) Indet. sp.		X	-	+
BUDDLEIACEAE (Butterfly Bush Family) Buddleia asiatica Lour.	Asiatic butterfly bush, huele- 'ilio	X	+	-
CAMPANULACEAE (Bellflower Family) Hippobroma longiflora (L.) G. Don	star-of-Bethlehem	X	+	-
CARYOPHYLLACEAE (Pink Family) Drymaria cordata (L.) Willd. ex Roem.	pipili	X	-	+
CECROPIACEAE (Cecropia Family) Cecropia obtusifolia Bertol.	guarumo	X	-	+
CLUSIACEAE (Mangosteen Family) Clusia rosea Jacq.	autograph tree, copey	X	+	+
CONVOLVULACEAE (Morning-glory Family) Ipomoea alba L. Ipomoea indica (J. Burm.) Merr. Ipomoea triloba L.	moonflower, koali pehui koali 'awahia little bell, pink bindweed	X I X	+	- - -
EUPHORBIACEAE (Spurge Family) Macaranga mappa (L.) Mull. Arg. Phyllanthus debilis Klein ex Willd. Ricinus communis L.	bingabing niruri castor bean, koli, pa'a'ila	X X X	- + +	+ - -
FABACEAE (Bean Family) Caesalpinia major (Medik.) Dandy & Exell Chamaecrista nictitans (L.) Moench Crotalaria cf. lanceolata E. Mey. Crotalaria pallida Aiton Crotalaria retusa L.	kakala'ioa, hihikolo partridge pea, lauki smooth rattlepod, pikakani	X? X X X X	+	- - - - -

Scientific name	Common name	Status	Vegetation type	
			o	i
Desmodium cajanifolium (Kunth) DC.	tick clover	X	+	-
Desmodium incanum DC.	Spanish clover, ka'imi	X	+	-
Desmodium intortum (Mill.) Urb.		X	-	+
Desmodium tortuosum (Sw.) DC.	Florida beggarweed	X	+	-
Desmodium sp. 1		X	+	-
Desmodium sp. 2	sea bean, maunaloa	X	+	-
Dioclea wilsonii Standl.		X?	-	+
Mimosa pudica var. unijuga (Duchass. & Malp.) Griseb.	sensitive plant, sleeping grass, pua hilahila	X	+	-
LAMIACEAE (Mint Family)				
Hyptis pectinata (L.) Poit.	comb hyptis	X	+	-
LAURACEAE (Laurel Family)				
Persea americana Mill.	avocado, alligator pear	X	-	+
LYTHRACEAE (Loosestrife Family)				
Cuphea carthagenensis (Jacq.) Macbr.	tarweed, Colombian cuphea	X	+	-
MALVACEAE (Mallow Family)				
Hibiscus furcellatus Desr.	'akiohala, 'akiahala, hau hele	I	+	-
Sida rhombifolia L.	Cuba jute	X	+	-
MELASTOMACEAE (Melastoma Family)				
Dissotis rotundifolia (Sm.) Triana	dissotis	X	+	-
Melastoma candidum D. Don	melastoma	X	+	+
MORACEAE (Mulberry Family)				
Ficus microcarpa L. f.	Chinese banyan	X	-	+
MYRTACEAE (Myrtle Family)				
Metrosideros polymorpha Gaud.	'ohi'a, 'ohi'a lehua	E	+	-
Psidium cattleianum Sabine	strawberry guava	X	+	+
Psidium guajava L.	guava, kuawa	X	+	+

<u>Scientific name</u>	<u>Common name</u>	<u>Status</u>	<u>Vegetation type</u>
			o i
OMAGRACEAE (Evening Primrose Family) Ludwigia octovalvis (Jacq.) Raven	primrose willow, kamole	P?	- +
OXALIDACEAE (Wood Sorrel Family) Oxalis corymbosa DC.	pink wood sorrel, ihi pehu	X	- +
PASSIFLORACEAE (Passionflower Family) Passiflora edulis Sims Passiflora foetida L.	passionfruit, liliko'i scarlet-fruited passionflower, pohapoha	X X	- + + -
PIPERACEAE (Pepper Family) Peperomia leptostachya Hook. & Arnott	'ala 'ala wai nui	I	- +
POLYGALACEAE (Milkwort Family) Polygala paniculata L.	bubble-gum plant	X	+ -
POLYGONACEAE (Buckwheat Family) Polygonum sp.		X	- +
ROSACEAE (Rose Family) Rubus rosifolius Sm.	thimbleberry	X	+ +
RUBIACEAE (Coffee Family) Hedyotis corymbosa (L.) Lam. Paederia scandens (Lour.) Merr. Spermacoce assurgens Ruiz & Pav. Spermacoce mauritiana Gideon	maile-pilau buttonweed	X X X X	+ + + + + + + +
SAPINDACEAE (Soapberry Family) Filicium decipiens (Wight & Arnott) Thwaites ex J.D. Hook.	fern tree	X	- +
SAPOTACEAE (Sapodilla Family) Chrysophyllum oliviforme L.	satin leaf	X	- +

<u>Scientific name</u>	<u>Common name</u>	<u>Status</u>	<u>Vegetation type</u>	
			<u>o</u>	<u>i</u>
SCROPHULARIACEAE (Figwort Family) Castilleja arvensis Cham. & Schlechtend.	Indian paintbrush	X	+	-
STERCULIACEAE (Cacao Family) Melochia umbellata (Houtt.) Stapf Waltheria indica L.	melochia 'uhaloa, hi'aloa, kanakaloa	X I?	+	+
ULMACEAE (Elm Family) Trema orientalis (L.) Blume	gunpowder tree, charcoal tree	X	+	+
URTICACEAE (Nettle Family) Pilea microphylla (L.) Liemb.	artillary plant, rockweed	X	-	+
VERBENACEAE (Verbena Family) Lantana camara L. Stachytarpheta dichotoma (Ruiz & Pav.) Vahl	lantana, lakana owi, oi	X X	+	- +

APPENDIX B

ARCHAEOLOGICAL SURVEY AND TESTING
OF LANDS PROPOSED FOR RESEARCH AND TECHNOLOGY LOTS
AT THE UNIVERSITY OF HAWAII AT HILO

BY

CULTURAL SURVEYS HAWAII

**Archaeological Survey and Testing
of Lands Proposed for Research and
Technology Lots at the University of Hawaii at Hilo
(TMK 2-4-01:7 and 41)**

by

Douglas Borthwick, B.A.
Joy Collins, B.A.
William H. Folk, B.A.
and
Hallett H. Hammatt, Ph.D.

for

Engineering Concepts

by

Cultural Surveys Hawaii
April 1993
Revised November 1993

ABSTRACT

During the weeks beginning December 14, 1992 and January 5, 1993 Cultural Surveys Hawaii conducted an archaeological inventory survey of approximately 163 acres of forested land in Waiākea *ahupua'a*, South Hilo district on the island of Hawai'i. The parcel under study is owned by the University of Hawaii at Hilo. Portions of this parcel are slated for the development of three research and technology lots. Construction of water, sewer, drainage, and electrical systems to service the three lots are proposed. The purpose of the study was to locate, and describe any and all archaeological resources within the survey area.

Two recent structures - the School of Agriculture Building at the southwest corner of the study area, and the Joint Astronomy Building in the central, *mauka* portion - are extant within the study area as well as portions of the access road system. Large swaths have also been bulldozed across the study area in a northwest-southeast orientation for an old water main, and in a generally east-west direction for an electric power line.

Archeological sites were located in the southern portion of the study area. Four sites were described and mapped to scale. Two of the sites - 18668, and 18669 - and a mound-feature within a third site - 18667 - were tested by hand excavations to document stratigraphy in the sites and to search for cultural remains to help in dating the sites.

The larger of the sites are two (2) expansive historic, agricultural fields (sites - 18667 and -18670). Field-rock clearing mounds are dispersed throughout both fields. The two other sites identified - 18668 and 18669 - were tested by excavation and were found to have no subsurface cultural deposits.

Based on the type and age of the sites found, and the data collected and analyzed, no further archaeological research specific to the sites within the study area is recommended.

Supplemental Inventory Survey

Cultural Surveys Hawaii was requested to conduct an inventory level archaeological survey of an approximately 11-acre parcel adjacent to the 163-acre study area reported on in this report. The parcel is at the *makai* (east) side of the proposed U.H. Hilo Research and Technology Park and includes a section of the Waiakea Flood Control Channel. The survey was done as proposed infrastructure-related construction, associated with the development of the Research and Technology Park, is planned to traverse through this adjoining area.

During the supplemental survey, four (4) plantation-era (ca. 1870s-1940s) rock clearance features (mounds) and a wall were observed and recorded. These features were associated with commercial sugar cane cultivation within the former Waiakea Cane Lots. The four mounds and wall are included under State Historic Site # 50-10-35-18670 which was designated during the original survey.

Subsurface testing was conducted at two mounds within Site -18670 to address functional, chronological, and sampling concerns. Testing confirmed plantation-era style of construction. A supplemental report for the newly surveyed area - which details the survey and testing results is included here as an attachment.

ACKNOWLEDGEMENTS

Field work for this project was carried out by Cultural Surveys Hawaii crew members Bryce Myers, Tyler Campbell, John Winieski, Tim Barr, Paul Kim and the authors. Each of us learned something new about ourselves from the *uluhe*.

Site descriptions for the report were compiled by Tim Barr. Drafting of field maps was done by Paul Kim and Joy Collins. Dr. Vickie Creed contributed her indefatigable energies and her typing and computer skills to the production of this report.

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INTRODUCTION

For a period of seven days during the weeks beginning December 14, 1992 and January 5, 1993 Cultural Surveys Hawaii conducted an archaeological inventory survey of approximately 163 acres of forested land in Waiākea *ahupua'a*, South Hilo district on the island of Hawai'i (Figure 1-3). The parcel under study is located north of Waiākea Stream, *mauka* of the University of Hawaii at Hilo campus - a portion of which will be developed into 3 research and technology lots. The bed of Waiākea Stream has been rerouted recently, by mechanized equipment, probably under the name of flood control. The old stream bed is the actual south boundary of the study area, with the new stream bed farther south.

Two structures - the School of Agriculture building at the southwest corner of the study area, and the Joint Astronomy building in the central, *mauka* portion - are extant within the study area as well as portions of the access road system (Figure 4). Two sections of the new access road alignments are completed and in use, while other areas have been bulldozed although they are currently overgrown with vegetation. Large swaths have also been bulldozed around the Joint Astronomy building, across the study area in a northwest-southeast orientation for an old water main, and in a generally east-west direction for an electric power line.

Study Area Description

The study area comprises approximately 163 acres in the *ahupua'a* of Waiākea. The lands are located within the district of South Hilo on the windward coast of Hawai'i Island. The study area, located in Hilo Town on the campus of the University of Hawai'i at Hilo, is bound by Komohana Street to the west, Waiākea Stream flood control channel

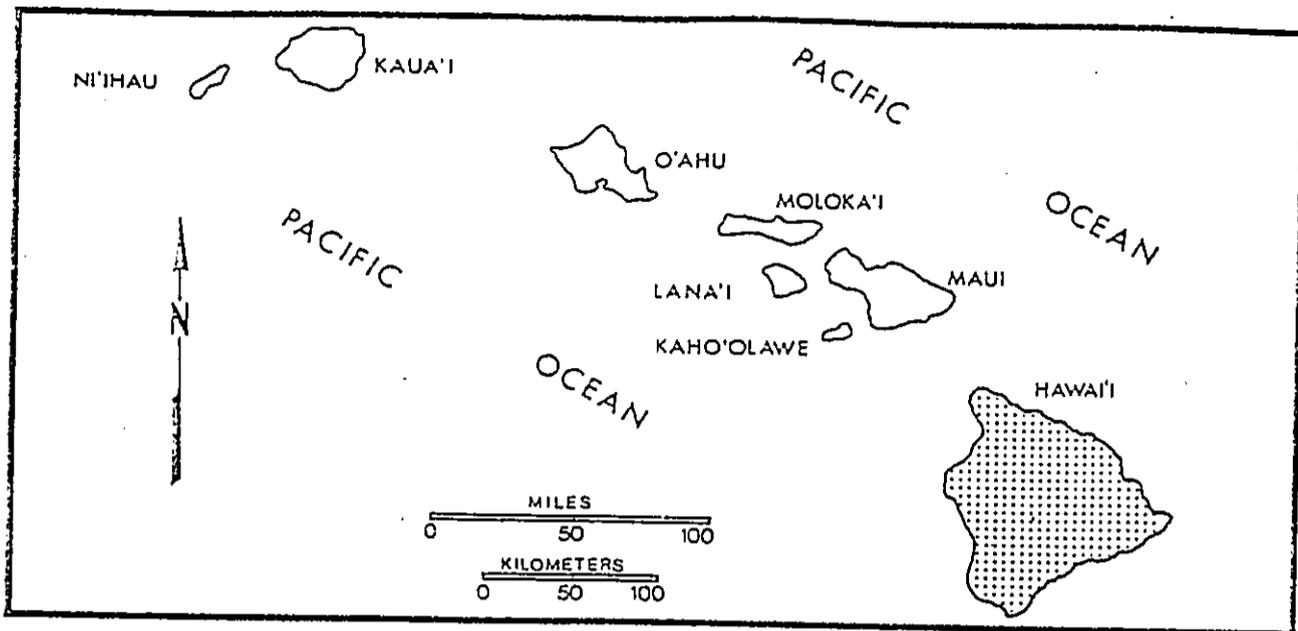


FIGURE 1
State of Hawaii

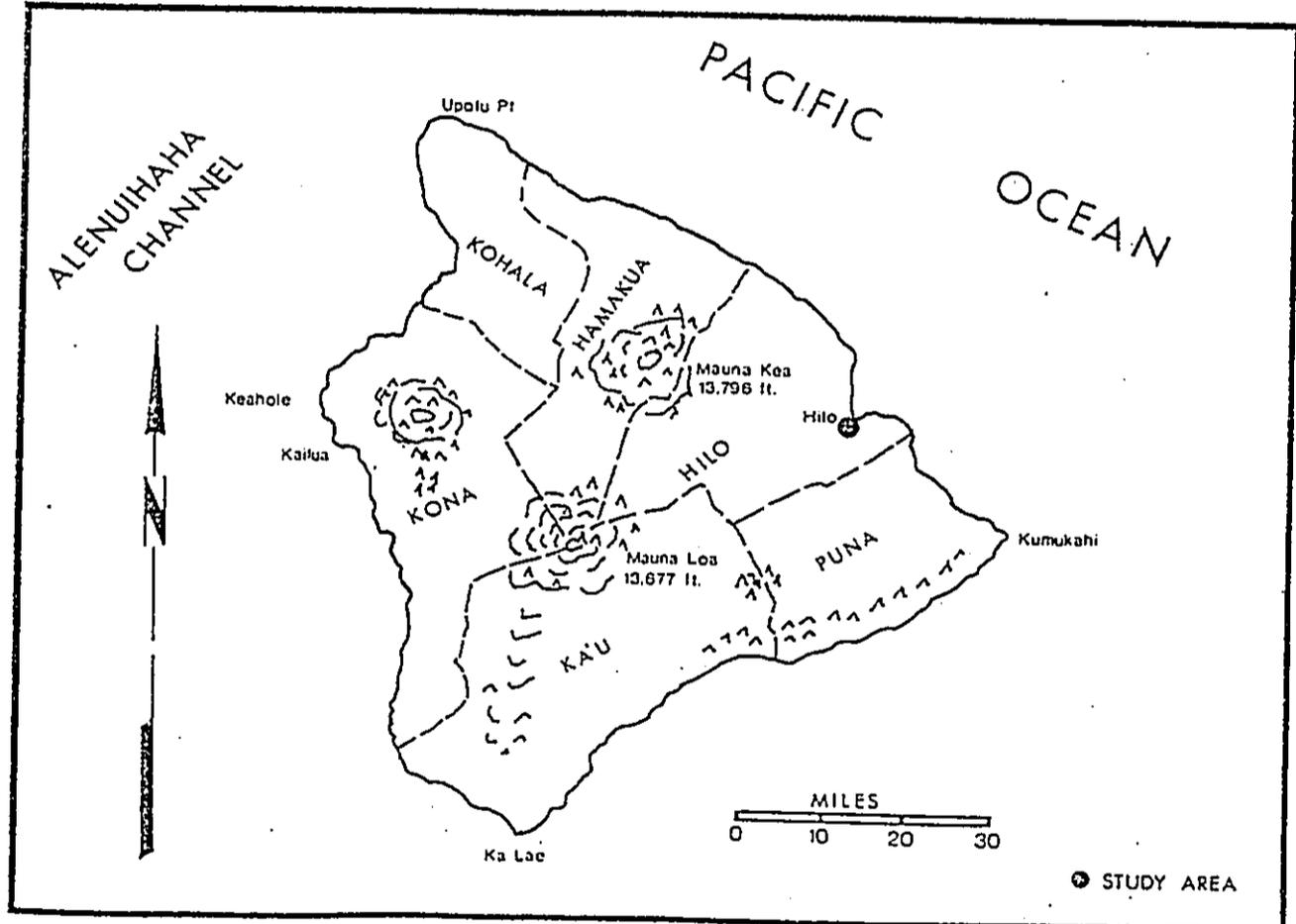


FIGURE 2
General Location Map, Hawaii Island



Figure 3 Portion of USGS Topographical Map, 7.5 Minute Series, Hilo Quadrangle, Showing Study Area

to the east, the old Waiākea Stream bed to the south, and a man-made drainage ditch to the north. Elevations within the study area range from roughly 140 ft. a.m.s.l. to 330 ft. a.m.s.l. on the lower east slope of Mauna Loa Volcano.

Several historic flows from Mauna Loa Volcano have affected the terrain along its eastern slope. An 1881 flow affected much of the Waiākea *Ahupua'a*, flowing into Hilo to within a mile of Hilo Bay. A part of the east end of this 1881 flow is present along the north side of the study area.

Rainfall in Waiākea *Ahupua'a* below the 5,000 ft. elevation averages 150 to 200 inches per year (Kelly et al. 1981); *makai* lands above the 5,000 ft. elevation receive an average of 30 inches of rain per year (McEldowney 1979). Waiākea Stream represents the only fresh water source within the study area.

The terrain is comprised predominately of lava flows thickly covered by vegetation. The *Soil Survey of the Island of Hawaii* (Sato et al., 1973) classifies the study area lands in three basic types as follows: 1) Pana'ewa very rocky, silty clay loam, 2) Keaukaha extremely rocky muck, and 3) pahoehoe lava flow. Although lava flows predominate in the study area, vegetation is dense due to the vast amounts of rain on the windward side of Hawaii Island.

The Pana'ewa very rocky, silty clay loam occurs along the southeast side of the study area. The vegetation in this area is characterized predominately by large guava trees (*Psidium cattleianum*) with little or no understory.

The Keaukaha extremely rocky muck which covers the largest portion of the study area, occurs in the central and north sections of the study area. The vegetation is characterized by guava thicket (*Psidium cattleianum*).

The pahoehoe lava flow occurs within the western half of the study area. The

vegetation is characterized by *uluhe* fern.

Development within the study area includes the aforementioned buildings; (Agriculture and Astronomy) associated parking lots, paved roads, and bulldozed swaths. In addition, a path for a water line has been cleared by bulldozing. These recent alterations to the landscape are a marked difference to the "jungle" of the rest of the study area. The speed of re-vegetation is quite evident where the bulldozed areas are in some cases barely discernible from the surrounding "jungle."

CULTURAL HISTORY

The *ahupua'a* of Waiākea, South Hilo, is large, encompassing some 95,000 acres. It extends from the coast to approximately the 6,000 feet elevation on the windward slope of Mauna Loa (Figure 4). In 1979 Holly McEldowney prepared an "Archaeological and Historical Literature Search and Research Design," as part of a "Lava Flow Control Study" (McEldowney 1979). In her report McEldowney describes five zones of land use and associated resources. The five zones, which are applicable to Waiākea, include: I. Coastal settlement; II. Upland Agricultural; III. Lower Forest; IV. Rain forest; and V. Sub-Alpine or Montaine (*Ibid.*). The zones are described below from *mauka* (Zone V) to *makai* (Zone I) or in order of ascending importance in terms of settlement patterns.

Zone V (Sub-alpine), which is defined as being above the 5,500 ft. elevation, was probably of only marginal importance in terms of land utilization during prehistoric (pre-A.D. 1776) times. As McEldowney indicates "Use of major trails, although important to settlement and land use in all zones, probably dominated the utilization of this zone" (*Op. cit.*:30). Resources probably procured from this zone include birds like *nene* (geese) and *'ua'u* (petrel) for food, timber products, and possibly lithic materials. Though Waiākea extends into this sub-alpine zone it is not one of the major *ahupua'a* associated with this zone or the saddle region like Humu'ula which "cuts off" Waiākea at roughly the 6,000 foot elevation.

Zone IV (Rain Forest) is defined as ranging from 2,500 to 5,500 feet in elevation. Resources of bird feathers, medicinal plants, and possibly some timber products would have been procured from this zone with bird feathers probably of greatest importance. Habitation within this zone was probably exclusively temporary though possibly lava

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

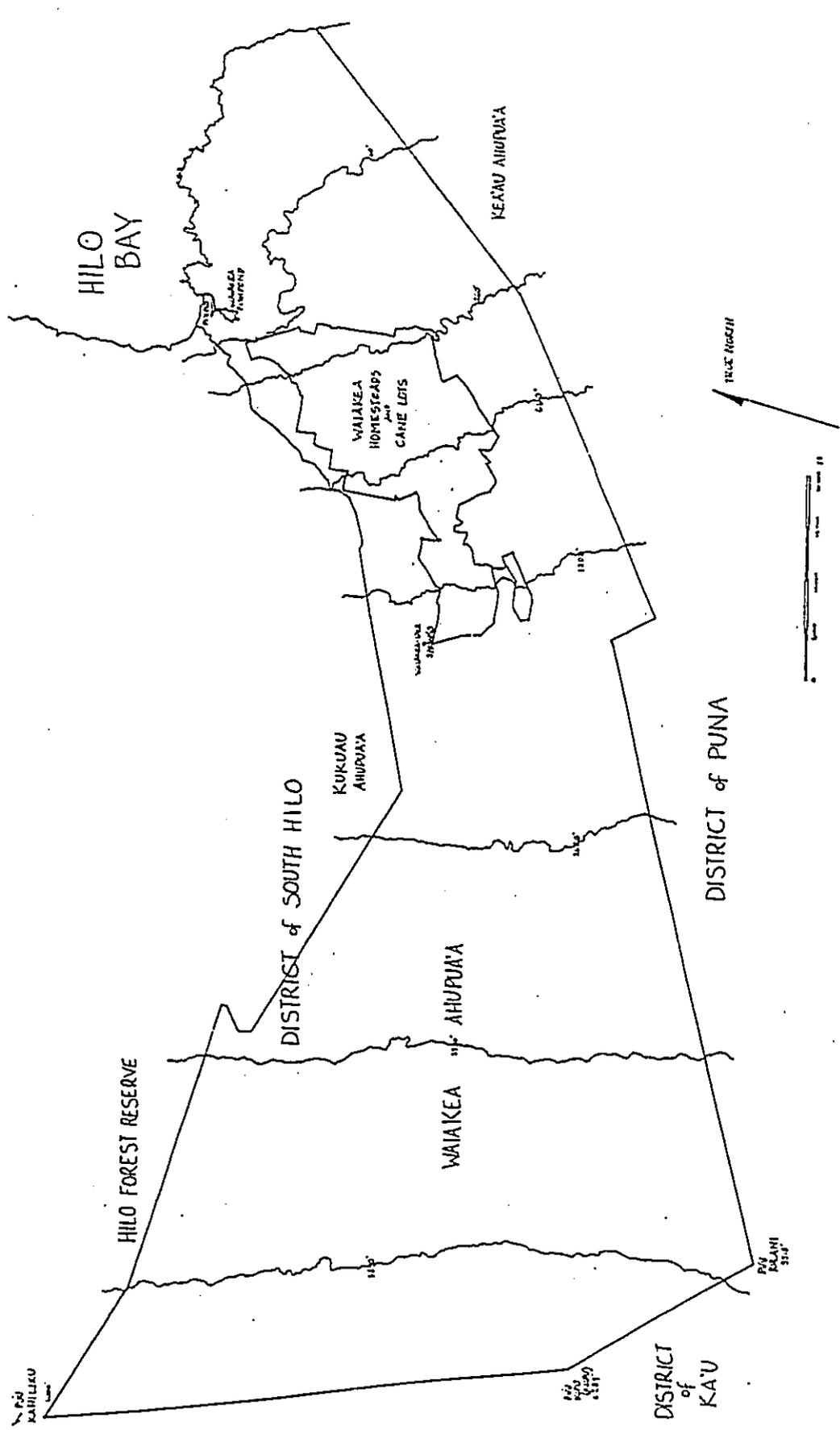


Figure 4 Ahupua'a of Waiakea (after USGS Topographic Map)

tubes or other site areas were utilized recurrently. In general, as McEldowney states because of "the less diversified use of this zone, and the implications of overnight visits rather than extended stays, make the overall potential for sites in this zone even lower" (i.e., compared to Zone III) (*Ibid.*).

Zone III (Lower Forest) is defined as ranging from 1,500 to 2,500 feet in elevation. McEldowney suggests that it is within this zone that the upper limits of the pre-historic farming took place. However, the main usage was probably still resource procurement of naturally occurring forest products. The farming or "supplemental food sources" would have included, "banana, wet and dry-land taro, ti, and yams (*Dioscorea* sp.) which were planted along streams and trails and in small patches of cleared forest" (*Op. cit.*:26). The forest products would have included a variety of timber, including Koa for canoes, bird feathers, dye and medicinal plants, mamaki which was used for a variety of bark cloth or kapa, 'ie'ie for basketry, *olonā* for cordage and a source of famine type foods, such as *hapu'u*. Habitation was still dominantly temporary though recurrent use is indicated by forest cultivation and the probably tending of specific forest products such as *olonā* (*Ibid.*).

Zone II (Upland Agricultural) is defined as ranging from 50 to 1,500 feet in elevation. The zone was described by "early visitors to Hilo Bay" as "an open parkland gently sloping to the base of the woods." ... "an expanse broken by widely spaced cottages" or huts, neatly tended gardens, and small clusters of trees" (*Op. cit.*: 19).

The present study area is situated within this upland agricultural zone. Though described as a vast "expanse" it would appear that only the more agriculturally productive areas were intensively farmed. In the 1820s it was "estimated that 1/20 of the expanse (i.e., zone of cultivation) in N. and S. Hilo was planted in crops" (Goodrich 1826:4 IN McEldowney 1979:21). The reasons for what appeared to the early visitors as a "lack of

more extensive planting " (*Ibid.*) include, the need for fallow periods especially in soils where nutrients are rapidly leached out, but more important to intensive agricultural use in the Hilo area is soil type or lack thereof. Intensive agricultural in Zone II was focused on area with a soil mantle leaving younger exposed lava areas for plants not needing continuous care (e.g., grasses, ferns).

Habitation within the upland agricultural zone (i.e., Zone II) apparently including some permanent occupation sites but was still dominantly temporary. The description of habitations refer to "scattered huts" with adjacent "garden plots" or "cottages" with "neatly tended gardens " (*Op. cit.*: 18-19) but no descriptions of village complexes like those along the coast.

Zone 1 (Coastal Settlement) is defined as " from sea level to roughly 20 to 50 ft. elevation or 1/2 mile inland" (*Op. cit.*: 15). This zone contained the majority of the population in village settings. The Hilo Bay area, of which Waiākea ahupua'a encompasses the southern half, was described "as a nearly continuous complex of native huts and garden plots interspersed with shady groves of trees, predominately breadfruit (*Artocarpus altilis*) and coconut (*Cocos nucifera*)." (*Op. cit.*:16). Additional sites mentioned included, "canoe sheds, several heiau, and large complexes catering to chiefs and their retainers" (*Ibid.*). Thus the coastal zone included virtually all of the permanent habitation sites and was the focal point of resource utilization procured elsewhere within the ahupua'a.

Based on the above zonal characterization of Waiākea the tradition or pre-contact (i.e., pre-A.D. 1776) settlement pattern included, a heavily populated coastal zone, an upland agricultural zone with forest zones beyond. The coastal zone included the village clusterings of the permanent habitations with direct access to rich and varied marine

resources including fishponds, and probably the majority of agricultural production as well.

The upland agricultural zone was probably expanded into as the prime lands within the coastal zone were intensively utilized. Over time the upland agricultural zone was converted from forest to an "open parkland" where plantings occurred on soil mantled lava flows. Habitation for most part was probably temporary with a few scattered permanent occupation complexes.

Beyond the upland agricultural zone was the forest which ranged from rain forest to sub-alpine forest. In Waiākea these forest zones were quite large which allowed for extensive gathering of forest products. The products in part included, timber, especially Koa for canoes, birds, for consumption (nene, 'ua'u) and feathers, medicinal and dye plants, and famine type foods.

Late Prehistoric Early Historic ca. 1790-1840

The rich and varied resources that Waiākea offered made it one of the most important locales on Hawaii Island. Traditional accounts concerning Waiākea include references to it being the seat of chiefly residences as early as ca. A.D. 1550 (Kelly, Nakamura, Barrère 1981). Chiefly associations with Waiākea continued through traditional times and into the historic era. Kamehameha retained Waiākea after he had conquered all of the islands (ca. 1800), and upon " his death his personally held Hilo lands, including Pi'i-honua, Punahoa, and Waiākea, descended to Liholiho, his son and heir to the kingdom,"..additionally " Kamehameha had given the ili kupono of Pi'opi'o to his favorite wife Ka'ahumanu" (*Op. cit.*: 11). The 'ili of Pi'opi'o is in Waiākea and is situated between Hilo Bay and Wailoa River and its associated fishponds.

Land use during the early historic period was still essentially subsistence based though aspects of major changes were occurring. The sandalwood trade, establishment of the American Board of Commissioners for Foreign Missions (ABCFM) station in Hilo, and the arrival of whalers began the shift away from subsistence to a market based economy. Settlement was still focussed on the coastal zone as was most of the agricultural production of both indigenous food crops and newly introduced plants.

During this early historic period the Forest and Sub-Alpine Zones land use was changing also. Besides the more traditional procurement of timber products and even bird feathers for taxes (McEldowney 1979:35). Cattle, goats, and sheep were being hunted in the upper zones. These animals were introduced in the 1790s and after an imposed 10 year prohibition on their killing had spread over large portions of the interior of Hawaii Island, especially the Waimea area. However, "by the 1830s substantial amounts of hides, jerked meat, and tallow were exported from Hilo" (*Op. cit.*:36).

Mid 1800s

Traditional land tenure changed during this time span to the privatization of land ownership. Generally referred to as the "Great Mahele" privatization actually included a number of government acts from the late 1840s to the mid 1850s. The Kamehameha dynasty's control over the valuable Waiākea *ahupua'a* was evidenced in that virtually the entire *ahupua'a* became Crown Lands with the 'ili of Pi'opi'o awarded to Victoria Kamamalu (LCA 7713;16), a granddaughter of Kamehameha I and heir to Ka'ahumanu as well.

Twenty-six (26) Land Commission Awards (LCAs) were granted within Waiākea (Figure 5). None of these LCAs are within the present study area. The LCAs were all

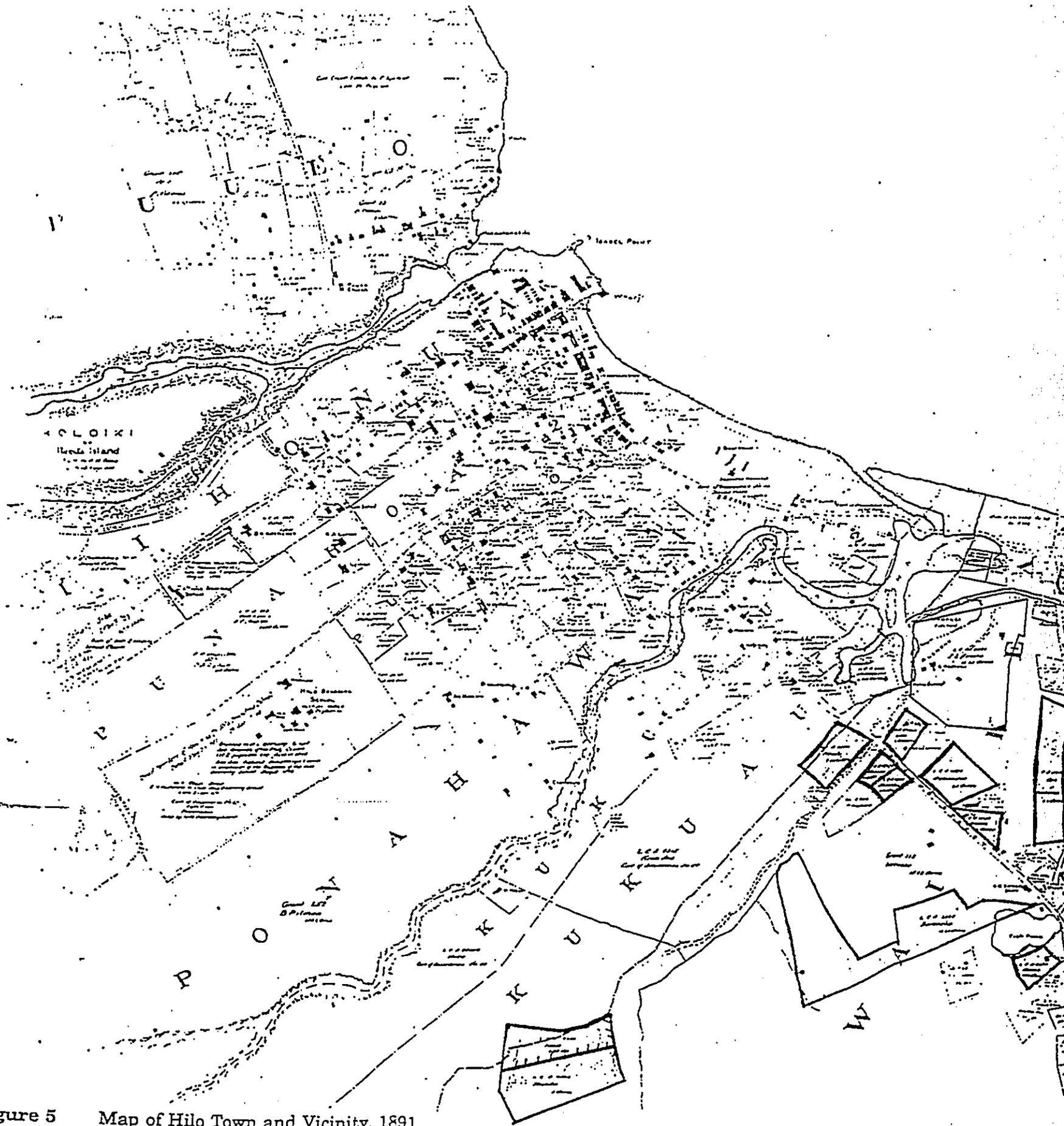
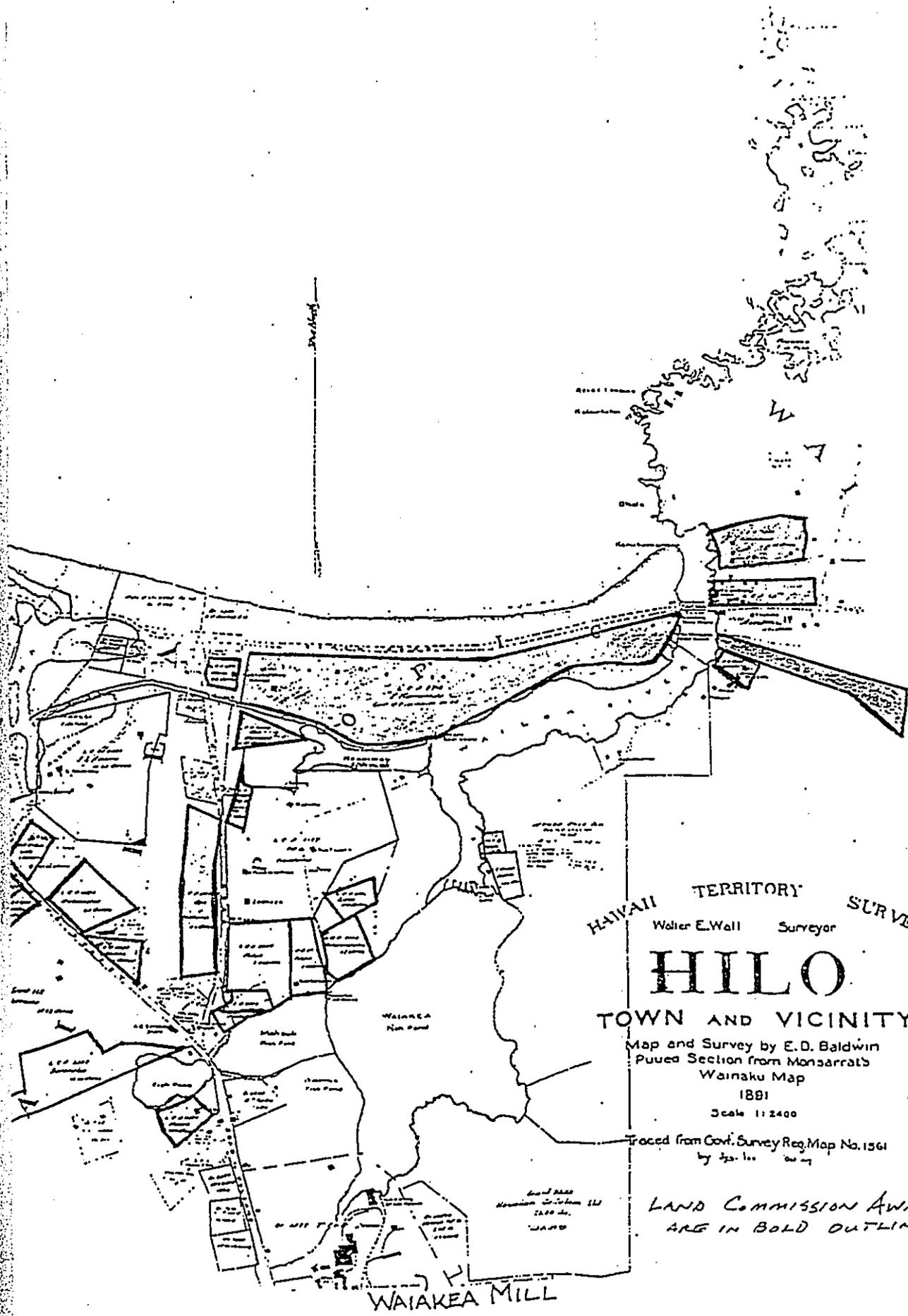


Figure 5 Map of Hilo Town and Vicinity, 1891



HAWAII TERRITORY SURVEY
 Walter E. Wall Surveyor

HILO

TOWN AND VICINITY

Map and Survey by E. D. Baldwin
 Puued Section from Monsarrat's
 Wainaku Map
 1881

Scale 1:2400

Traced from Govt. Survey Reg. Map No. 1561
 by J. L. ...

LAND COMMISSION AWARDS
 ARE IN BOLD OUTLINE

WAIKEA MILL

within the coastal zone, except for two (2663 and 2402) which were in the lower portion (i.e., ca. 100 ft. a.m.s.l.) of the upland agricultural zone. The LCAs or *kuleana*(s) were for the most part focussed around the edges of the large fishponds of Waiākea. Land use information of the *kuleana* generally refer to cultivated fields with house lots indicating habitation and agricultural production within the same zone, unlike leeward Hawaii Island where in many cases *kuleana* included coastal house lots with the need of corresponding upland agricultural lots, because of elevation dependent rainfall.

Interior land use during this period was progressing toward more organized ranching, especially cattle ranching. Timber for firewood and housing was also still being exploited, as Hilo was being transformed into an entirely wooden-framed "New Bedford type Whaling Town" (*Op. cit.*:37).

Though the coastal zone still contained the vast majority of the population houses and stores were concentrated in the northern half of the bay, away from Waiākea, because the main pier for Hilo was at the mouth of Wailuku River (See Figure 5). This indicates a substantial change from the traditional settlement pattern of a "nearly continuous complex of native huts" along the bay's shoreline.

Late 1800s

During this period commercial sugar cane became the economic mainstay of the Hilo area with Waiākea Mill Company becoming one of the largest. Plantation operations generally developed ca. 1860s and for Waiākea this was on leased Crown lands. Waiākea Mill Company was in operation by the late 1870s and through its agents, Theo H. Davies and Alexander Young, had procured the lease of all of Waiākea by 1888 (Kelly, Nakamura, Barrère 1981:89). The mill was located at the head (*mauka* end) of Waiākea

Fishpond and sugar was transported by barge through the pond and down Wailoa River to Hilo Bay.

Immigrant labor (Chinese, Japanese, Portuguese) were living in "camps" set up by the plantation for its workers. Waiākea Mill Co. would eventually have some 10 camps situated along major rail lines of the plantation (Figure 6).

Land use was dominated by commercial cane activities within Zones I to III (Coast to Lower Rain Forest). Ranching became formalized though not specific to Waiākea. "Other examples of business, not directly related to sugar cultivation, were the continued use of the Waiākea fishponds, an active Chinese fish market, small pastures above Hilo supporting dairy cattle, and scattered vegetable gardens" (McEldowney 1979:39).

Early 1900s

Sugar and its associated industries continued to expand during this period. The Hawaii Consolidated Railway was built eventually extending "from Waiākea Mill and wharf through Puna, most of Ōla'a and along the N and S Hilo coast" (*Op. cit.*:41). Many of the immigrant laborers from the late 1800s moved off the plantation, being replaced by new Filipino laborers. Hilo continued to grow and become the second largest urban center in the new Territory of Hawaii.

Ranching in the Hilo areas, but not specifically in Waiākea, came under the control of two large enterprises; the Parker and Shipman Ranches. In Waiākea a large portion of Zone II (Upland Agricultural Zone) too rocky for sugar cane cultivation became available for lease as Waiākea pasture lands. The present study area is mostly former Waiākea pasture land. The specific use of the pasture land is not known but McEldowney indicates that "A substantial amount of grazing land adjacent to Hilo or to sugarcane

fields supported dairy cows for Hilo's several dairies" (*Ibid.*).

In 1918 the 30-year lease of the Waiākea Mill Co. expired and because Hawaii had become a Territory the "land fell under homesteading laws that required the government to put some of it up for lease to homesteaders who would be willing to grow sugar cane on it. Waiākea Mill was to grind the crop for them. A total of about 700 acres of land was divided into cane lots (between 10 and 76 acres each) and house lots ranging from 1 to 3 acres..." (Kelly, Nakamura, Barrère 1981:121). The present study area includes a portion of cane lot #16 (refer to Figure 6). The homestead and cane lots eventually reverted to the overall mechanized cultivation of the mill company as the homestead and cane lots "experiment was declared a failure" (*Op. cit.*:121).

By the 1920s the Waiākea Mill Co. had some 7,000 acres in cane production. Also, in the 1920s large tracts of remaining forest in Waiākea were "designated as forest reserve" (McEldowney 1979:42). The main reason appears to have been for maintaining the "forest as a 'watershed' to capture, retain, and support the continuous flow of water necessary to the sugar industry" (*Ibid.*). Clearly, sugar was the dominate economic factor during this period including the formation of settlements (i.e. camps).

Mid 1900s till present

Plantation life dominated the early portion of this time span but in 1948 Waiākea Mill Co. was liquidated (Condé and Best 1973:119). However, a major industry associated with cane by-products, canec, was begun in 1928. The canec plant was located adjacent to Waiākea Mill with bagasse, the cane by-product utilized, pumped through pipes from the mill to the plant. The canec plant shut down operations in 1966.

During this period major construction jobs started in the 1920s were completed.

These major construction jobs, in part, included Hilo Bay, wharfs and breakwater and bridges. Some of these projects were actually major reconstruction work from damage during the winter of 1923, which included storm surf in January and a tidal wave in February (Kelly, Nakamura and Barrère 1981:171). During the World War II period in Hilo, expansion and designation of Hilo airport as General Lyman Field and the construction of the Saddle Road were major projects undertaken as part of the military presence on the island, which was very substantial.

Prior to the closing of the Waiākea Mill Co. there were at least 10 "camps" or plantation villages. Only Camp 1 was within the coastal zone with Camps 2 to 10 within the upland agricultural zone with Camp 10 the highest at ca. 1300 ft. a.m.s.l. (Refer to Figure 6). The present study area included active mechanized cane cultivation probably right up until closing (1948), and leased pasture lands. The lease of the Waiākea pasture lands during this period was to a Mr. Kazuo Miyasaki (G.L. #2751 exp. 6/17/60). Specific use of the pasture is not known, but as mentioned previously, dairy cattle pasturage is a distinct possibility.

After statehood (1959) and with the closing of the mill and canec plant, tourism was looked at as the next economic mainstay. In Waiākea, C. Brewer & Co. built a hotel complex at the site of the old canec plant. Other hotels were built along the Hilo Bay frontage of Waiākea near Coconut Island or Mokuola. Large tracts of former Waiākea Homestead and Cane lots were converted to housing or sub-division tracts adjacent to the study area. U.H. Hilo campus was expanded as it continues to do presently. The study area itself ceased to be utilized for pasturage (ca 1960s?) and recently there has been construction of the School of Agriculture building and the Joint Astronomy building.

Summary

In summary, the traditional settlement pattern included, almost exclusively, permanent coastal habitation with associated intensive agriculture. Immediately upslope of the coastal zone was an area cleared for extensions of agricultural production though not as intensively utilized as in the coastal zone. Beyond or *mauka* of the cleared upland agricultural zone was forest which ranged from dense rain forest to sub-alpine forest at the upper limit of Waiākea (ca. 6,000 feet). Habitation for the zones beyond the coastal zone was essentially temporary in nature, associated with exploitation of forest products. This pattern changed over time as the historically introduced religion(s), economy, and socio-political system replaced the traditional Hawaiian system. The major impetus for change was the development of commercial sugar cane within Waiākea. Settlement patterns during the period from the mid 1800s to the mid 1900s were almost exclusively set by the Waiākea Mill Co. Camps for immigrant laborers were constructed at specific locations based on the plantation organization. Most of these permanent housing locations were in areas previously associated with sparsely scattered temporary habitations in the upland agricultural zone of Waiākea. Because most of the study area was too rocky (i.e. exposed pahoehoe) for commercial cane, associated camps were not present. It appears that historically most of the study area was utilized as pasture land.

Hilo eventually became the second largest urban center in the State of Hawaii. Permanent housing is no longer dependent on a specific set of environmental conditions as it was during traditional Hawaiian times. The large acreage involved in subsistence agriculture and utilization of resources specific to certain elevations is no longer a necessity because of the market-based economy of today.

PREVIOUS ARCHAEOLOGICAL RESEARCH

There have been a number of archaeological and historic studies that are pertinent to the *ahupua'a* of Waiākea within which the study area lies. Notable among these somewhat regional studies are, Alfred E. Hudson's 1930s East Hawaii Site Survey, Holly McEldowney's "Archaeological and Historical Literature Search and Research Design, Lava Flow Control History," and "Hilo Bay: A Chronological History" (Marion Kelly, Barry Nakamura and Dorothy B. Barrère 1981). Review of these documents, and others, indicated that no previously documented sites with state site numbers were located within the present study area. These regionally oriented studies, however, were the basis for describing the settlement pattern specific to Waiākea *ahupua'a*. The discussion of settlement patterns is contained within Cultural History section of this report.

Additionally, a "Summary of Prior Archaeological Work" compiled by Ms. Jadelyn J. Moniz (1992) for Waiākea list ten studies ranging from field inspections to inventory surveys. The studies include research from 1979 to 1992. The description of each of the ten previous studies includes a basic review of findings and relating "adequacy" for the individual reports in terms of inventory level survey," based on Title 13, Subtitle 6, Chapter 147: Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports" (Moniz 1992).

The following discussion of previous research will focus on work specifically related to the present study area (Figure 7).

There have been no previous inventory-level archaeological surveys specific to the current study area. However, "field inspections" and a reconnaissance-level survey for the proposed Puainako Street Extension (Hunt, 1992) indicate the presence of archaeological sites in an area adjacent to the present study area.

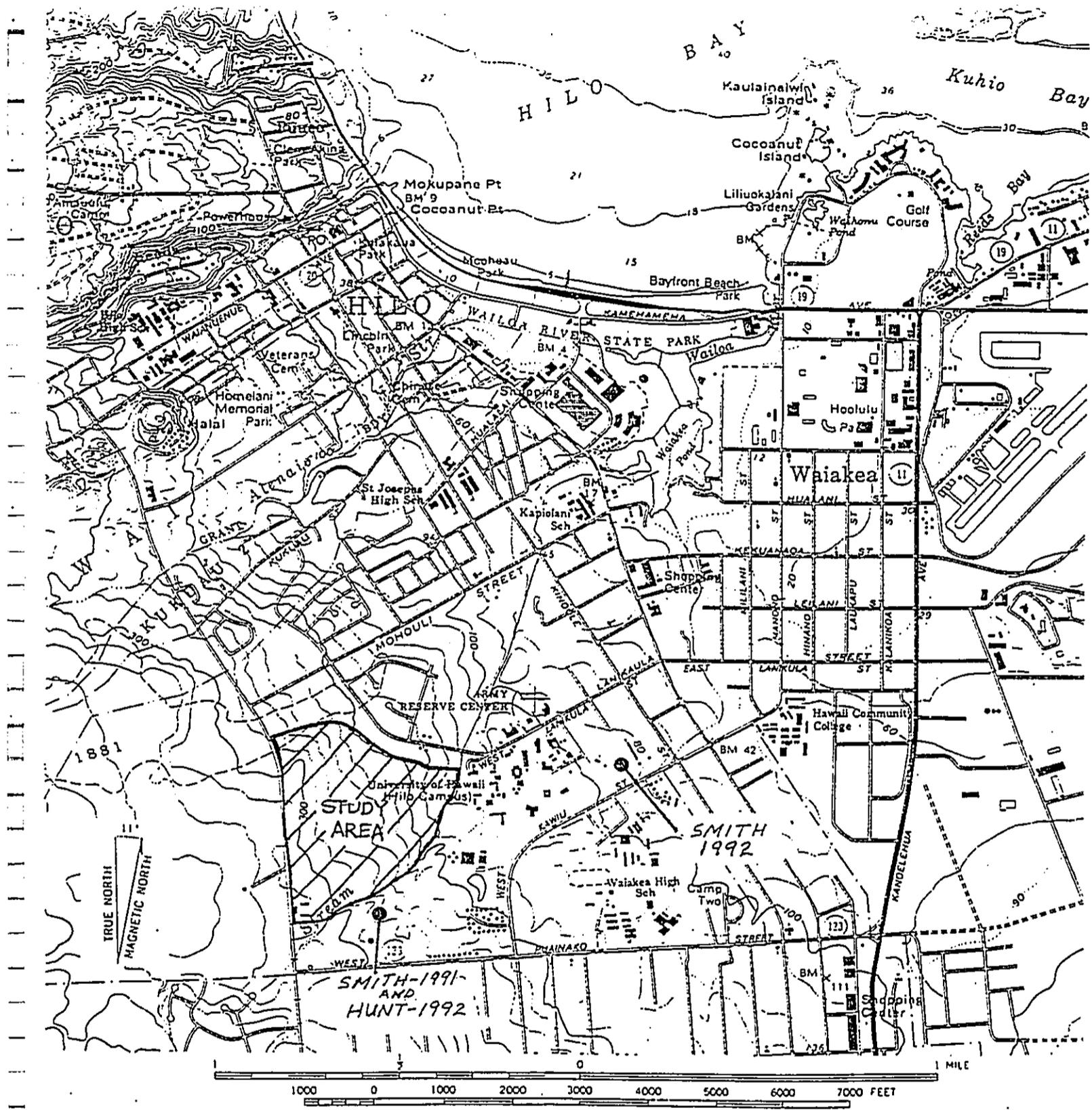


Figure 7 Portion of USGS Topographic Map, Hilo Quadrangle Showing Areas of Study Adjacent to the Present Project Area

Field inspections were conducted by Mr. Marc Smith, a staff member of the State Historic Preservation Division of the Department of Land and Natural Resources (SHPD/DLNR). The locations of the inspections include portions of the present study area and an undeveloped lot (Waiākea Cane Lots) abutting Ululani St.

Field inspections in to the present study area were conducted in October 1991. The impetus for these inspections were "calls from concerned students and faculty of University of Hawaii-Hilo about the possible presence of historic sites in the proposed Research & Technology Park" (SHPD/DLNR 5/7/92). Marc Smith conducted three separate field checks, October 18, 24, and 27, 1991. Observed during the field checks were a number of historic sites including "large faced platforms, modified outcrops, enclosures which may be house sites, and a large walled enclosure" (Smith 11/8/91).

Additionally, Smith noted three different lava flows in the area. The flows include: 1) a portion of the 1881 Mauna Loa pahoehoe flow; 2) a pahoehoe flow "dating to 1.5 - .75 KA (1,500 to 750 B.P)"; and 3) the oldest flow which has "a more level soil surface" and dates to ">4,0 KA (greater than 4,000 B.P.)" (*Ibid.*). The lava-flow age determinations are based on work by Lovelace as referenced in Marc Smith's letter.

The age of the flows has a direct correlation to site distribution. The only sites observed were "on the >4,000 year old flow," except one site which "appears to be constructed along the margin of the 1,500-to-750-year-old flow, suggesting others may exist" (Smith 11/3/91). Based on the field checks it was recommended that an inventory survey be conducted for the proposed area of the construction of utilities.

In December 1991 Marc Smith (SHPD/DLNR) conducted a field inspection for the proposed Department of Water Supply Office project site. The project area, bounded by Ululani, Kawili, and Kapiolani Streets, is located within the former "Waiākea Cane Lots"

with "apparently the same soil type and flow underlying archaeological site types recorded above the University of Hawaii Hilo in the proposed Research and Technology Park" (Smith, 1/3/92). Observed within the parcel were "several stacked stone walls and linear mounds, ... a large rectangular enclosure ... several wall remnants and C-shapes" (*Ibid.*). An inventory level survey was recommended prior to any land disturbance.

The survey for the proposed Puainako Street Extension (Hunt 1992) covered an area approximately 150 ft. wide from the 200 to 1500 feet in elevation, through "multiple *ahupua'a* including Waiākea, Kukuau 1 and 2, and a small part of Pono Hawaii" (*Op. cit.*:5). A total of 48 sites were observed and recorded. Site types included "walls, mounds, platforms, and faced terraces" (*Op.cit.*:9). The highest concentration of sites is "in one area...Alternative B (Lower section) near the University of Hawaii-Hilo" (*Op.cit.*:11). This cluster of sites, which "appear to be associated with Hawaiian occupation and cultivation along the intermittent drainage during prehistoric and historic times" (*Ibid.*), includes some of the same sites observed by Marc Smith during his field inspections of the proposed Research and Technology Park (Smith 11/8/91). The sites are situated within the former Waiākea Cane Lots and also appear to be on the same soil-mantled lava flow (i.e., >4,000 B.P.) as described by Marc Smith (Smith 11/8/91 and 1/3/92).

Based on the field checks by Smith and survey by Hunt, the site distribution (including that within the present study area) correlates to the lava-flow ages. The three different ages and relative degrees of soil development include: 1) a small portion of the 1881 flow with no soil cover or development; 2) the 1500-to-750-year-B.P. pahoehoe flow with no soil or weathering-related development but with some pockets of organically derived soil (i.e., leaf litter) - this flow covers the majority of the study area; and 3) the soil-mantled >4,000- year B.P. flow. Archaeological sites within and near the present

study area are confined to the oldest, soil-mantled flow associated with the former Waiākea Cane Lots. Site types, function and probable ages have ranged from agricultural mounds and platforms, habitation enclosures, and platforms with both prehistoric- and historic-era usage hypothesized.

Based on the information gathered from the field inspections and reconnaissance-level survey discussed above, three expectations regarding site distribution in the current study area can be stated. First, the 1881-flow portion of the study area would contain no sites. Second, the 1500-to-750-year-old pahoehoe flow comprising the majority of the study would contain few sites concentrated along the perimeter or edge of the flow. Third, the oldest flow would contain a higher site density with the understood possibility that earlier (i.e., prehistoric) sites might have been altered for commercial sugar cane cultivation.

SURVEY RESULTS

Methodology

The study area was surveyed by traversing the property on foot. The dense vegetation in disturbed areas was a seriously inhibiting factor in visibility, horizontally as well as of the actual ground surface.

The most difficult vegetation to survey through was *uluhe* or false staghorn fern which predominated in the western portion of the study area especially between Komohana Street and the existing "Road B" alignment that extends to the south of existing "Road A" as a previously bulldozed strip. Range of the *uluhe* conforms closely with the reconnaissance soils type of rLW or pahoehoe lava, and with the mechanically disturbed areas. North-south traverses were pushed through the forest north of "Road A" (Figure 8), and east-west traverses through the triangular parcel delineated by Komohana Street, "Road A", and the previously bulldozed powerline easement. The *uluhe* covers as much as 70 percent of this area *mauka of the "Road B" alignment*.

Roughly east-west traverses were walked through the remaining land east or *makai* of "Road B" and north of the powerline easement. The existing "Road A" and the powerline easement were used to guide on through the dense stand of strawberry guava (*Psidium cattleianum*) which covers this portion of the study area. The trees grow on the average less than 12 inches apart making passage extremely difficult, but are only one to 4 or 5 centimeters thick and visibility is surprisingly good. One can see a minimum of 20 to 30 feet horizontally and the ground underfoot is clear except for leaf litter and sphagnum moss on the unweathered pahoehoe lava of low undulating topography.

East-west traverses were also made through the lands south of the powerline easement, which completed the coverage of the entire study area. The undeveloped

portion of this land between Komohana Street, the powerline, and the bulldozed extension of the "Road B" alignment is covered with *uluhe*. The undeveloped southern extension of "Road B" and a portion *makai* have been bulldozed and since revegetated. Going *makai* on the south side of the powerline the ground underfoot changes to the undisturbed, little weathered pahoehoe lava supporting the strawberry guava thicket, and visibility of the ground becomes good again.

Traverses throughout the study area were done by two to six individuals at intervals from one another of 20 feet to 100 feet depending upon vegetation.

Test excavations were done and the testing process included: pre-excavation photographs, removal of rocks from the specified test unit; excavation of soil by natural stratigraphic layer (or 10 cm. level within natural strata); screening of all soil sediments through 1/8" mesh screen; recovery of all cultural material (artifacts, midden, charcoal); one profile and stratigraphic description per unit; post excavation photographs; and reconstruction of test unit locale.

The site of the existing School of Agriculture is at the southwest corner of the study area. The Waiakea Stream floodplain and its associated alluvial sediments extends along the southern study area boundary widening to *makai*. This is the old sugarcane field and vegetation here is larger guava trees with almost no understory. As much as 90 percent of the ground is bare with excellent visibility.

Fieldwork

The archaeological survey and testing located archeological sites in the southern portion of the study area. Four sites were described and mapped to scale. Two of the sites - 18668, and 18669 - and a mound-feature within a third site - 18667 - were tested by hand excavations to document stratigraphy in the sites and to search for cultural

remains to help in dating the sites.

The larger of the sites are two (2) expansive historic, agricultural fields (sites - 18667 and -18670) bounded by low rock walls and fences that follow the natural boundaries of stream bank and unweathered lava flow (Figure 9). Field-rock clearing mounds are dispersed throughout both fields. The two other sites identified were assigned State site numbers 18668 and 18669 and were tested by excavation. These latter two sites each have a low wall defining their interiors and have historic bottles on the surface within the sites. The sites and the test excavation results are described in detail in the following Site Descriptions section.

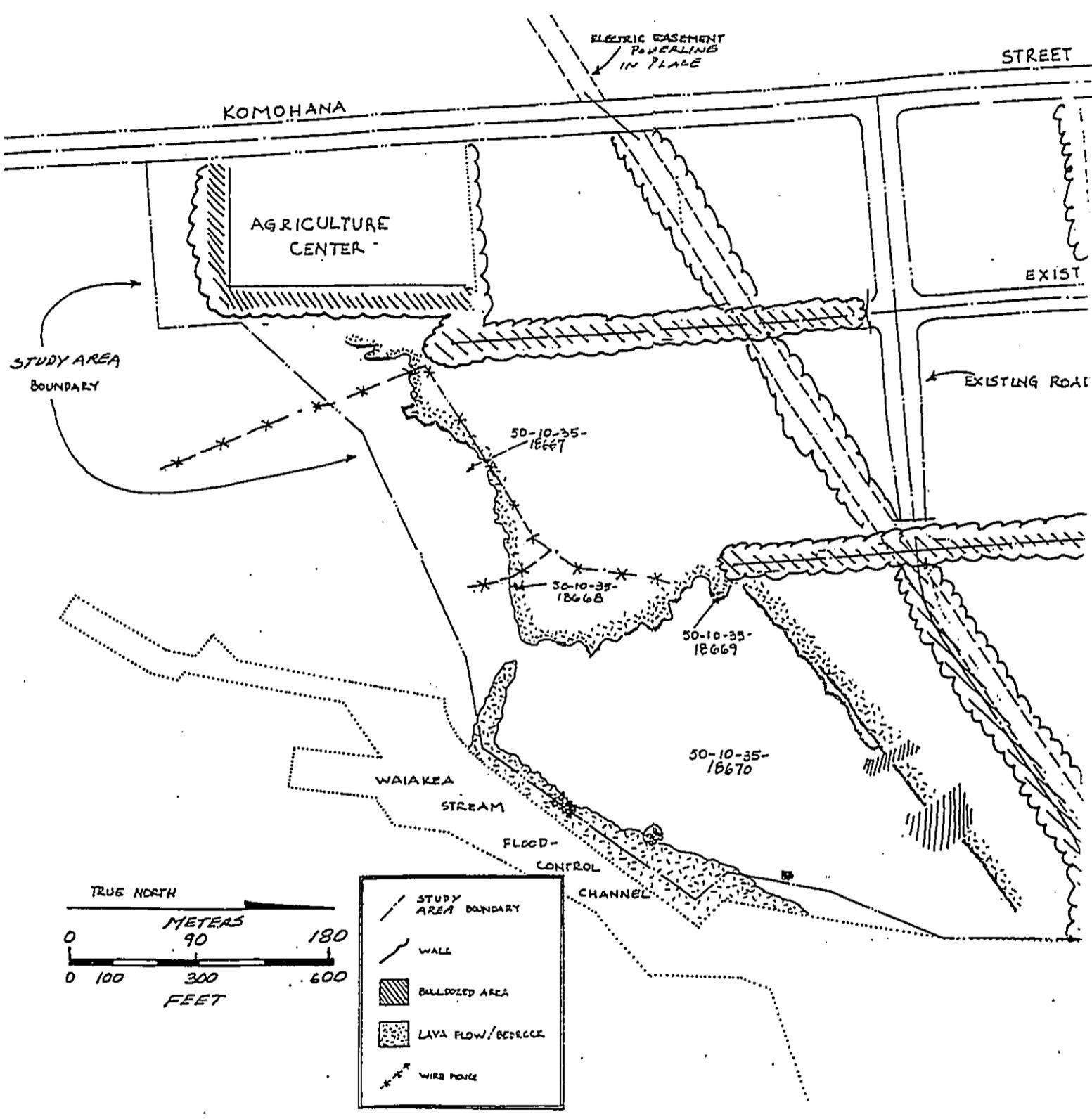


Figure 9 Portion of Study Area Showing Archaeological Sites

SITE DESCRIPTIONS

The table below summarizes the basic site information. It is followed by a detailed description of sites.

Table: Site Summary of Survey Area

State Site #50-10-35-	CSH Site #	Site Type	Function	Significance	Age	Recommen
18667	10	Field Complex	Agriculture	D	Historic	NFW
18668	11	Enclosure	20 century camp	D	1900s	NFW
18669	40	Enclosure/Wall	Lunch station	D	1900s	NFW
18670	12&13	Field	Agriculture	D	1900s	NFW

D - Site may be likely to yield information important in prehistory or history
 NFW - No Further Work

CSH Site: 10

State Site # 50-10-35-18667
 Site Type: Field Complex
 Function: Agriculture
 Features (#): 3
 Dimensions: 6500.0 m² (21325.2 ft²)

Description: Site 18667 (Figure 10) is a large area consisting of two discontinuous and separate walls and numerous (approx. 25) mounds. The site is located in the southwest corner of the study area and Feature A, a wall, in part runs along the study area boundary. To the south of Feature A, outside of the study area, there is what appears to be an old stream gulch. A large undulating expanse of guava forested terrain lies to the north of Feature A - dotted intermittently by mounds (Feature B). Feature C is a wall

which runs roughly parallel to Feature A but is generally more discontinuous and in poorer condition than Feature A. Feature C lies between 40-60 m. (131.2 ft. to 196.8 ft.) to the north of Feature A. The mounds are located between the walls.

Feature A is a long and discontinuous wall which runs along the upper bank of the old stream gulch. Feature A is oriented roughly northeast/southwest. The entire length of Feature A measures approximately 140.0 m. (459.2 ft.). The wall is generally well-faced to the downslope side, toward the stream. Facing in these sections measures to a maximum height of 1.5 m. (4.9 ft.). Several constructed breaks exist along the wall and appear to serve as pathways through the wall to the stream. Toward the northeast end of the feature the wall becomes thicker and resembles narrow platforms or "ramparts." The wall varies in width from 1.0 m. (3.3 ft.) to 3.0 m. (9.8 ft.) at the "ramparts."

Parallel sections of wall lie to the south of Feature A. One parallel section is located at the southwest end of Feature A in the stream bottom and runs approximately 35.0 m. (114.8 ft.) long, at a distance of 10.0 m. (32.8 ft.) south of Feature A. A second parallel section is located approximately midway along the length of Feature A. This section measures 10.0 m. (32.8 ft.) long and is nearer the top edge of the stream bank.

No midden or artifacts were observed.

Feature A is in fair condition and excavation potential is poor.

Feature B comprises approximately 25 mounds - located primarily between Features A and C. The mounds vary in both size and formality of construction. Several of the larger mounds are well-faced and measure up to 4.0 m.² (43.0 ft.²). The mounds are arranged randomly; they do not appear to be aligned in rows. The mounds of Feature B range in height from 0.6 m. (2.0 ft.) to 1.4 m. (4.6 ft.). Feature B mounds are probably agricultural clearing mounds.

No midden or artifacts were observed.

The mounds of Feature B are in fair condition and excavation potential is poor (see Testing Results and Figure 11).

Feature C is a second wall feature located to the north of Features A and B. Feature C runs roughly northeast/southwest, but unlike Feature A, this wall follows the edge of a pahoehoe flow. Pahoehoe outcropping connects the discontinuous segments of Feature C. The construction of Feature C is poor compared to Feature A and less vertical facing was observed. Feature C measures approximately 70.0 m. (229.6 ft.) long and ranges in width from 1.0 m. (3.3 ft.) to 2.0 m. (6.6 ft.). The heights range from 0.4 m. (1.3 ft.) to 1.0 m. (3.3 ft.).

No midden or artifacts were observed.

Feature C is in poor condition.

Site 18667 complex is agricultural in function, but the age of the site is difficult to determine. However, based on historical information concerning field boundaries of the Waiākea Mill Co. it would appear that this complex represents sugar cane cultivation practices.

Testing Results

Subsurface testing was conducted at Site 18667, Feature B (See Figure 11), in an effort to better interpret site function. A 1.0 by 1.5 m. trench was placed in a single mound of Feature B. The excavation demanded that the mound be disassembled. No

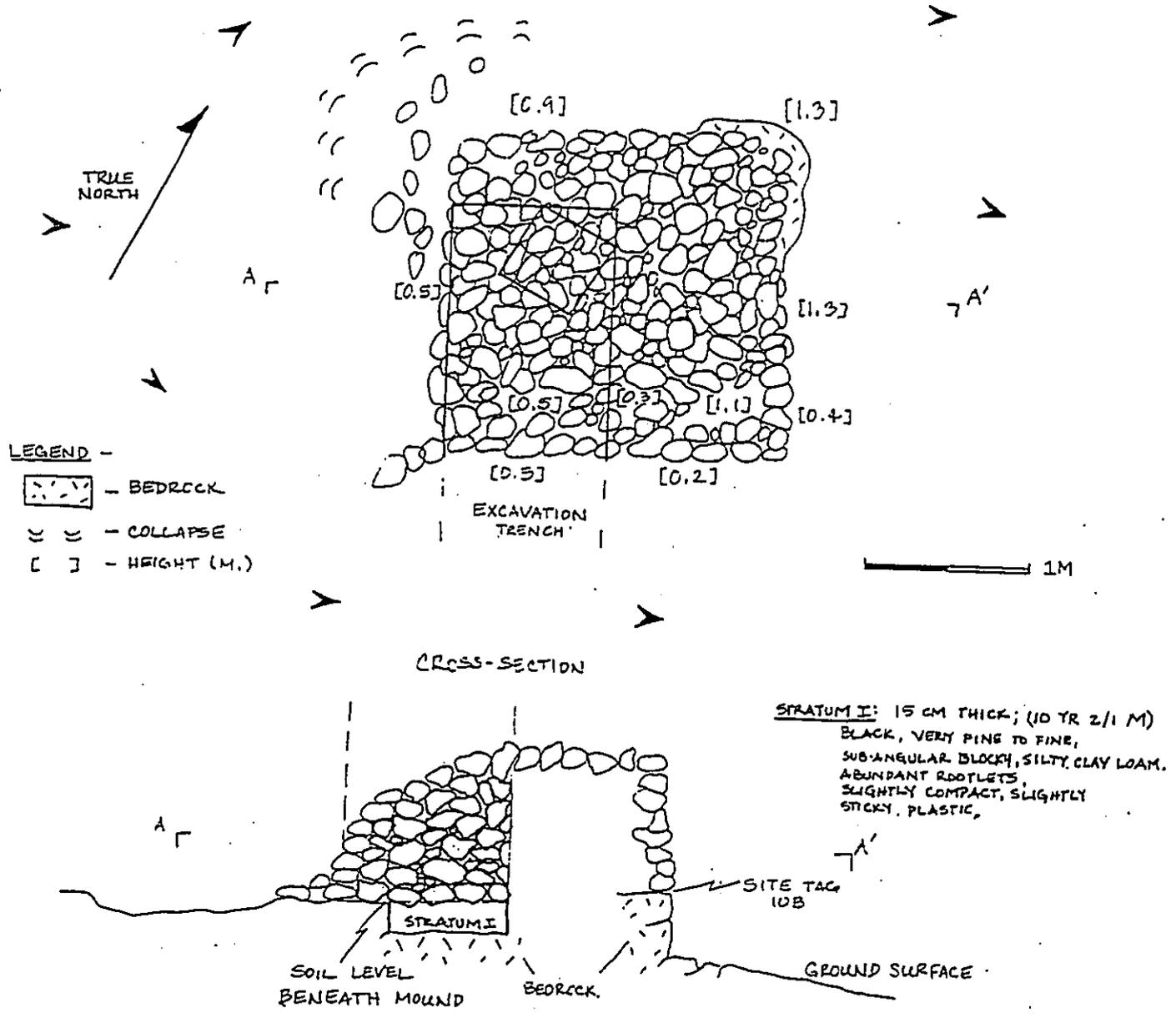


Figure 11 Site 50-10-36-18667 Feature B, Plan View of Mound (Top), and Cross Section Showing Stratigraphic Relationship of Rock Mound to Sediments (Bottom)

midden or artifacts were encountered through the mound construction. At the base of the mound was exposed bedrock and soil. The excavation continued through the 15 cm. thick deposit of soil (Stratum I) until bedrock was encountered there also. Stratum I (Munsell 10 YR 2/1 black) consisted of very fine to fine subangular, blocky, firm, slightly compact and sticky, silty clay loam. No midden or artifacts were observed. The mound was reconstructed subsequent to recording the excavation data. The excavation confirmed the rock clearing functional interpretation.

State Site #: 50-10-35-18668
Site Type: Enclosure
Function: 20th century camp
Features (#): 1
Dimension: 24.0 m.² (258.2 ft.²)

CSH Site #: 11

Description: Site 50-10-35-18668 (Figure 12) comprises an oval enclosure and adjacent L-shaped wall segment located on the edge of undulating pahoehoe terrain. In the site area, there are shallow soil deposits supporting moderately dense strawberry guava trees, ferns, three mango trees, and one royal palm tree.

The enclosure is a single course alignment of pahoehoe stones measuring 4.0 m. (13.1 ft.) N/S by 3.0 m. (9.8 ft.) E/W. The height of the alignment above the ground surface measures 0.1 m. (0.3 ft.). A pahoehoe outcrop ridge is located to the northeast of the enclosure and is approximately 1.0 m. (3.3 ft.) high. See **Testing Results** below.

The adjacent L-shaped wall segment lies directly south of the enclosure. The long leg of the wall measures 2.4 m. (7.9 ft.) long N/S and the short leg of the wall extends 1.8 m. (5.9 ft.) to the west from the long leg's south end. The wall measures 0.4 m. (1.3 ft.) thick and (2 to 3 courses) 0.8 m. (2.6 ft.) high, maximum.

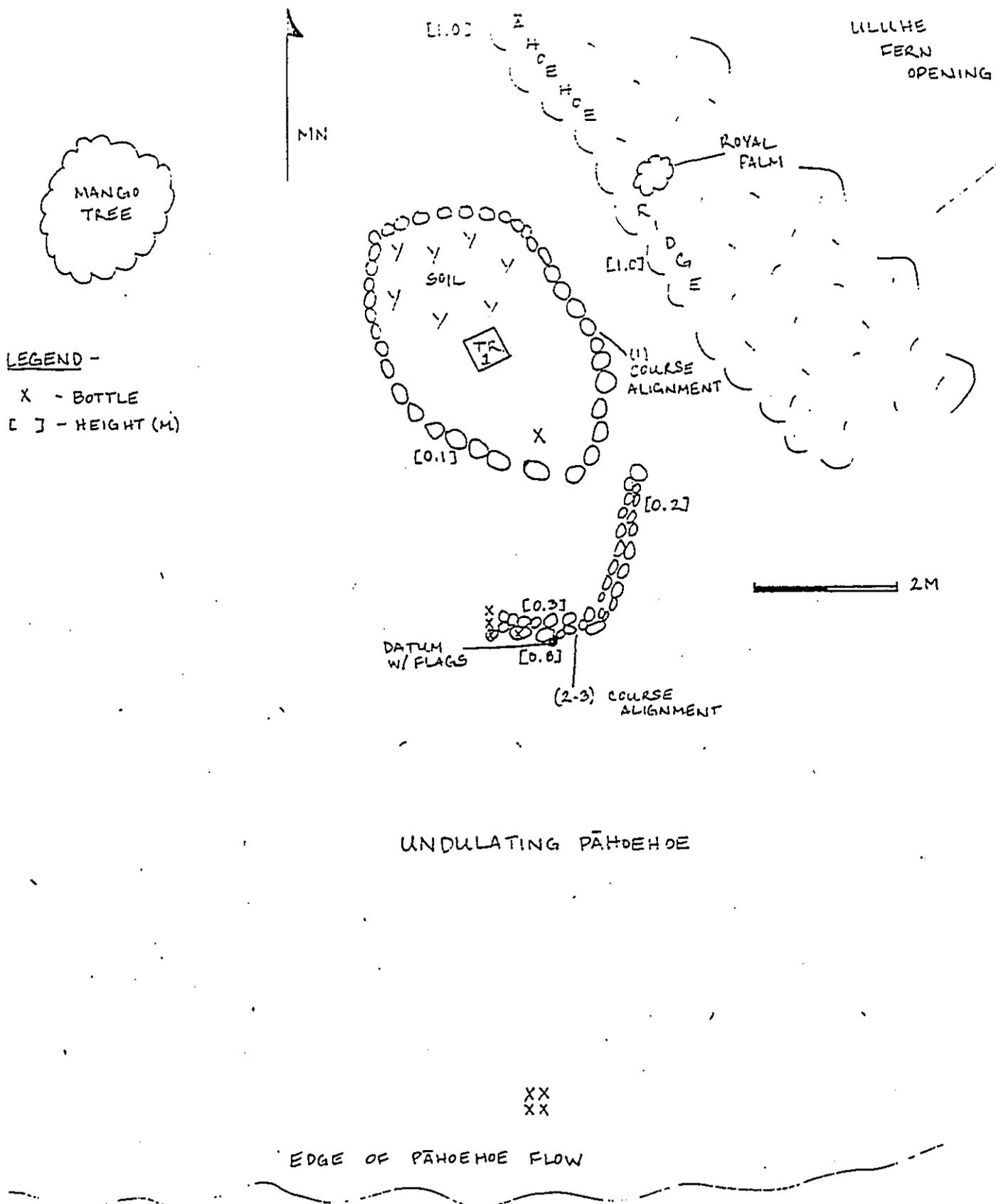


Figure 12 Site 50-10-35-18668, Plan View Showing Excavation Unit

No indigenous artifacts or midden were observed. Several clear and brown liquor glass bottles were observed at this site.

Site 18668 is probably a temporary camp with the oval single course alignment representing the perimeter of a tent pitching site.

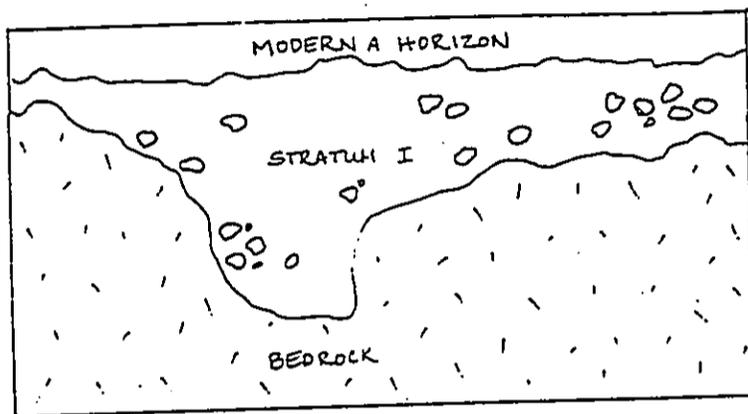
Testing Results

Subsurface testing was conducted at Site 18668 (Figure 13). A single 0.5 m. by 0.5 m. trench was placed in the center of the enclosure. The trench was excavated through 4 cm. of modern forest litter and through Stratum I to a maximum depth of 25 cm., where bedrock was encountered. Stratum I measured between 4 to 25 cm. below the ground surface. Stratum I consisted of a dark brown to black, compact, moist, silty clay. The soil was organized into small (5 mm. diameter) peds or grains. There was high root and rootlet intrusion. Approximately 10% of Stratum I consisted of small pahoehoe cobbles. No cultural material was observed in this trench.

State Site #:	50-10-35-18669
Site Type:	Site complex
Function:	Lunch station
Features (#):	2
Dimension:	224 m. ² (2409.9 ft. ²)

CSH Site #: 40

Description: State site 18669 (Figure 14, top) is a site comprised of an enclosure and a wall segment, designated Features A and B. The site is located in gently sloping terrain of moderately deep soil deposits. Vegetation at the site includes guava, ti, royal palm, and hibiscus.



STRATUM I: 25 CM. THICK; BLACK-DARK BROWN, COMPACT,
STRUCTURELESS, MOIST, ROOTS AND ROOTLETS ABUNDANT,
10% COBBLE INCLUSION; NO CULTURE

Figure 13 State Site 50-10-35-18668, Trench 1 Profile: East Face

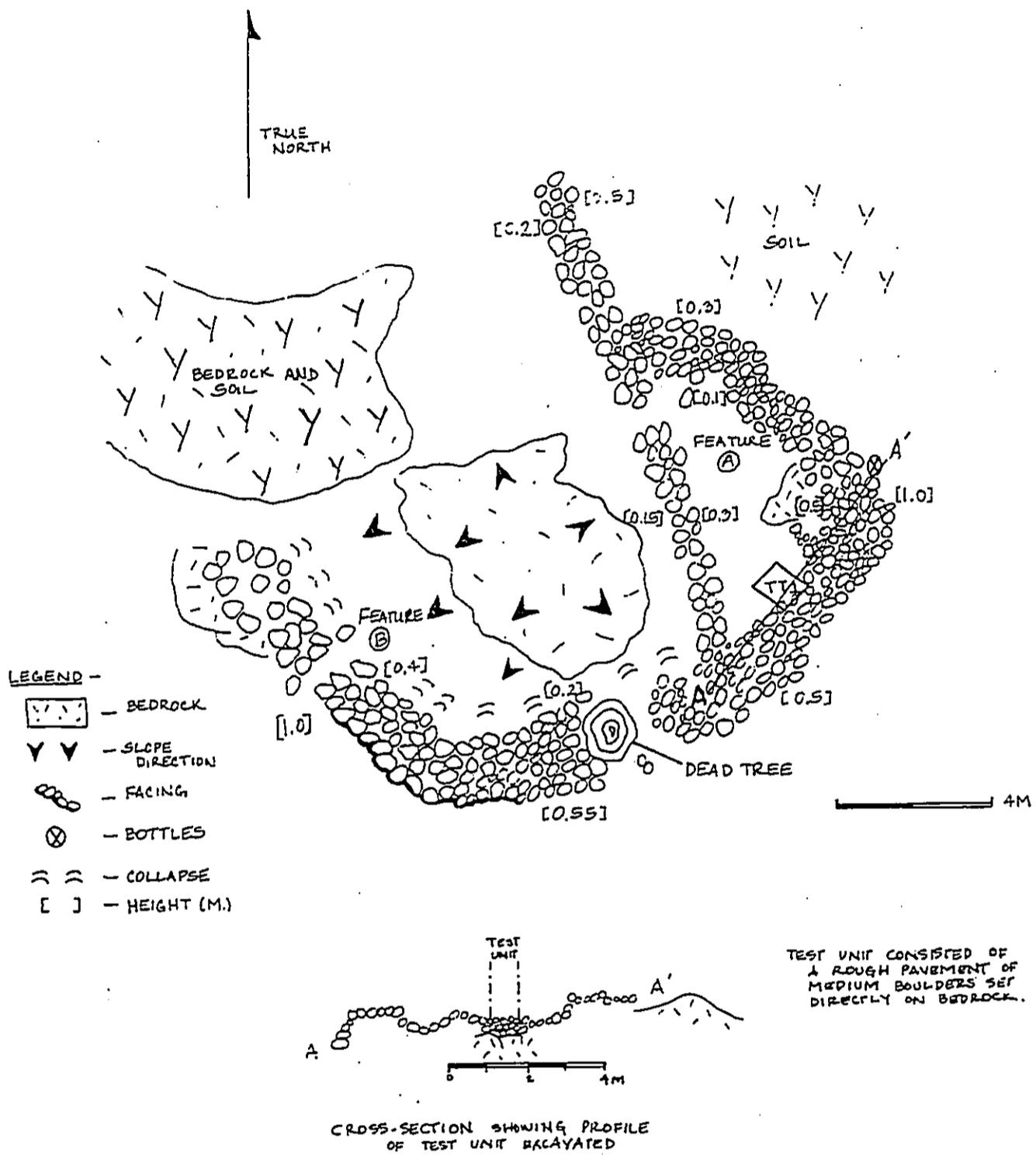


Figure 14 Site 50-10-35-18669, Plan View and Cross Section Showing Excavation Unit

Feature A is a rough, irregular, modified outcrop enclosure, measuring 11.0 m. (36.1 ft.) N/S by 6.4 m. (21.0 ft.) E/W. The walls of this enclosure are generally thick, measuring 1.8 m. (5.9 ft.) maximum, and 1.0 m. (3.3 ft.) average. A maximum wall height of 1.0 m. (3.3 ft.) is measured at the south exterior side of Feature A. The interior of the enclosure consists of a shallow soil deposit covering bedrock. At the north end of the west wall there is a constructed break measuring 0.75 m. (2.5 ft.). A 4.0 m. (13.1 ft.) long wall extends to the northwest off of the north corner of Feature A. See Testing Results below.

Feature B is a wall extension contiguous to the southwest corner of Feature A. The wall extends west for 6.0 m. (19.7 ft.) then doglegs to the north for an additional 2.3 m. (7.5 ft.). The wall measures 2.0 m. (6.6 ft.) thick, and 1.0 m. (3.3 ft.) high. A pahoehoe outcrop lies between Features A and B.

No midden was observed but Soda bottles, three railroad ties, and barbed wire were present at this site.

Site 18669 is in fair condition.

Testing Results

Subsurface testing was conducted at Site 18669, Feature A (Figure 14, bottom). A single 1.0 m. by 0.8 m. trench was placed in Feature A, against the south wall, near a concentration of 7 "Pacific Sodaworks" bottles. A single soil layer was present, Stratum I, which ranged in depth from 10 to 25 cmbs. Stratum I consisted of a very dark brown (Munsell 10YR 2/2) silty clay soil, slightly compact, and organized into small blocky grains or peds. No cultural materials were observed.

State Site #: 50-10-35-18670
Site Type: Field
Function: Agricultural
Features (#): 1
Dimension: 36.0 m.² (987.8 ft.²)

OSH Site #: 12&13

Description: Site 50-10-35-18670 (refer to Figure 9) is a remnant of a commercial sugar cane agricultural field. This site is defined by a pahoehoe lava flow to the north and west by a stream gulch to the south. The lava flow and stream gulch converge at both *mauka* and *makai* ends of the site area, resulting in an "almond" shape. The site is generally level with undulations following the pahoehoe substrate. The field area has a substantial soil deposit and moderately dense guava and fern vegetation. There are also some isolated royal palm trees in areas where pahoehoe bedrock is exposed.

The site area is characterized by long, shallow, and narrow furrows, oriented generally north/south (cross-slope). This cross-slope orientation of the furrows suggest that contour plowing to reduce erosion was being utilized. The furrows measure, from trough to trough, 1.4 m. (4.6 ft.) wide and 0.2 m. (0.7 ft.) deep.

Within the site area there are subfeatures indicative of rock-clearing activity. One subfeature is a square enclosure located in level pahoehoe lava terrain (Figure 15). The enclosure measures 7.0 m. (23.0 ft.) N/S by 6.5 m. (21.3 ft.) E/W. The north and south sides of the enclosure are natural, raised pahoehoe outcrop ridges, measuring 0.7 m. (2.3 ft.) high. The east and west sides are constructed of pahoehoe boulders and cobbles, measuring 0.8 m. (2.6 ft.) thick and to a maximum height of 0.55 m. (1.8 ft.). A constructed break in the west wall measures 1.2 m. (3.9 ft.) wide. Three royal palms are growing within the enclosed area. A single plastic milk crate (Foremost 1979) was observed 8.4 m. (11.2 ft.) to the south of the enclosure.

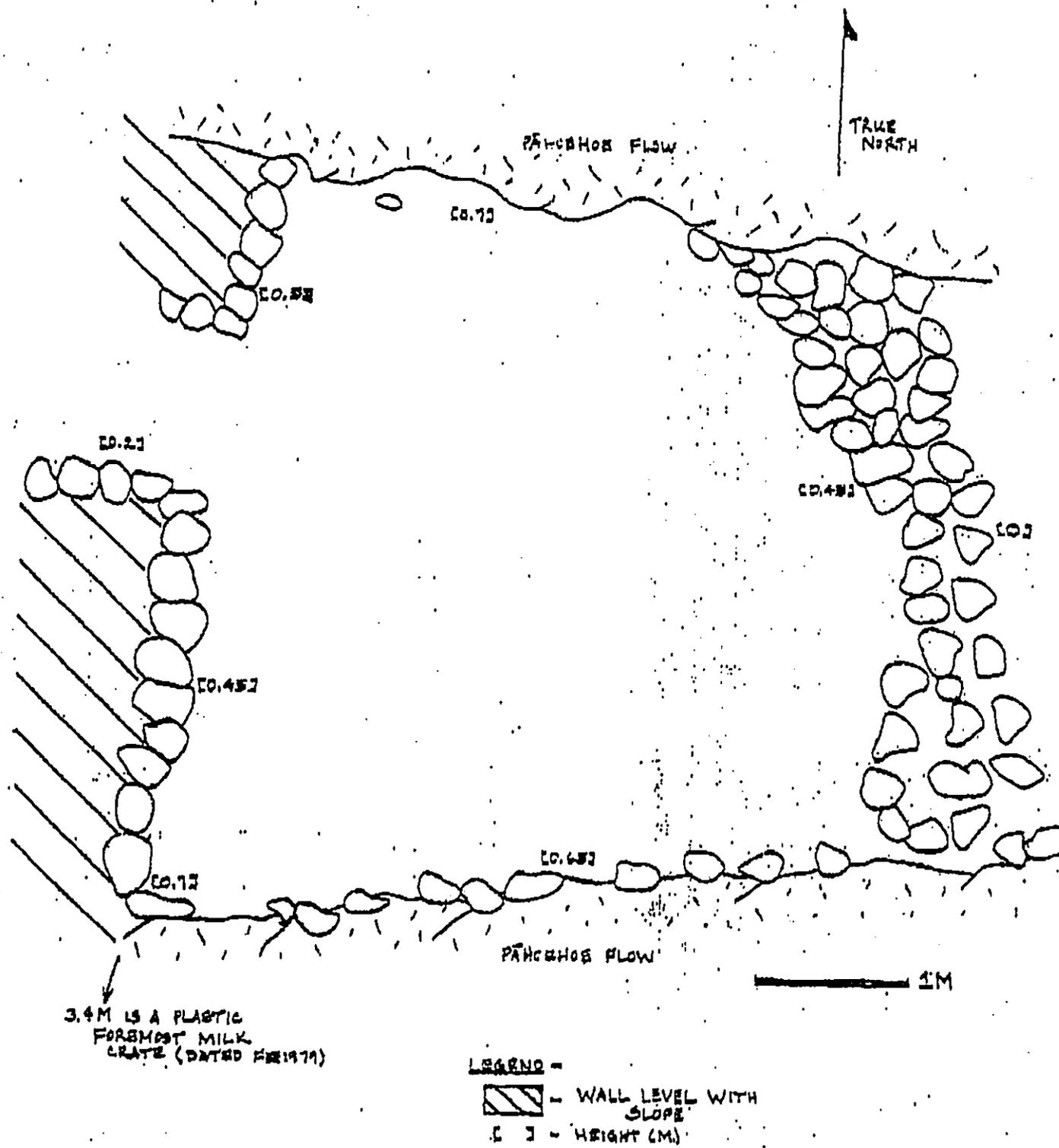


Figure 18 Enclosure Sub-Feature of Site 60.10-85-18670 (CSH12)

Another subfeature (Figure 18) example of rock-clearing is a large, rectangular mound. The mound measures 8.2 m. (26.9 ft.) N/S by 7.5 m. (24.6 ft.) E/W. The top of the mound surface measures approximately 2.5 m. (8.2 ft.) above the surrounding ground surface. Some vertical facing still exists though most of the sides are somewhat collapsed.

Approximately 14 other amorphous rock clearing features exist within the field. These consist of mounds, piled rocks on bedrock ledges and in one case a pile of rocks within a shallow bedrock drainage channel. A large banyan tree grows out of the piled rocks at the head of the channel.

Based on historic research including a review of the Waiakea Mill Co. map (See Fig. 6 in Cultural History Section) Site 18670 field was once Cane Lot #16. Lot 16 encompassed some 22 acres of which .13 was "waste" or areas of rock (i.e., clearing mounds, etc.).

SUMMARY AND SIGNIFICANCE

Archaeological survey of the land area *mauka* of the University of Hawaii at Hilo Campus has located definitive evidence that the agriculturally productive land there was plowed and planted in sugar cane as recently as the 1940s. Furrows are still visible in the tillable lands that comprise the south end of the study area, and a sample of the rock mounds tested by excavation contained no cultural material. Stratigraphically the mounds are built upon the sediments of the fields or upon shallow bedrock up-croppings, thus are contemporaneous with sugar planting in the study area - in all probability field-rock clearing mounds. The entire field is bounded by a continuous low rock wall. Along the north field boundary the wall follows the natural edge of tillable soil, delineated by the edge of a pahoehoe flow which has not weathered significantly from its original state. The wall along the south boundary of the field follows the natural edge of the old bed of Waiākea Stream. This wall is essentially the south boundary of the study area. At the west (*mauka*) and east (*makai*) ends of the field the wall is disturbed by the rerouting of the Waiākea Stream bed and construction of the School of Agriculture building, and by the flood control 'improvements' to the stream bed, respectively.

Two small sites - 18668 and 18669 - located along the northern fringe of the tilled land were tested and were found to contain no stratified deposits or cultural material below the surface. On the surface within the sites were twentieth century bottles, for whiskey and soda water at sites 18668 and 18689 respectively. These sites are interpreted as lunch stations - temporary or single use sites - of the sugar field workers, homesteaders, or possible the cowboys or mule skimmers associated with the pasture land.

Site 18667 is nothing more than the constricting *mauka* end of the sugar field.

Furrows were not observed on the bare ground here, which is the primary reason for differentiating it from the *makai* portion of the field. The ubiquitous field-rock clearing mounds are more numerous, but smaller, generally no larger than 2 meters by 2 meters square with maximum heights of and a meter and a half. Their stratigraphic relationship to the surrounding sediments is similar to the mounds in the *makai* portion of the field, that is, of recent historic age and without any cultural material to suggest they are anything other than clearing mounds.

The entire remaining portion of the study area contained no cultural resources related to archaeology. This land is comprised mostly of a pahoehoe lava flow little altered by weathering. Vegetation is supported primarily by quantities of humus and leaf litter deposited by gravity in the low basins of the lava flow's undulating surface, their roots finding moisture ponded in the basins or deep in the natural cracks and fissures of the lava sealed by a thick, but discontinuous carpet of sphagnum moss. It is likely that prehistoric use of this land was for collection of feral or wild plants and animals. Variation between this pahoehoe lava of old and the lavas of the 1881 flow that entered the study area at the northwest corner is not clearly discernable due to the mechanized land alteration and the present heavy, ground-obscuring vegetation.

Significance

Archaeological remains in the study area, which are limited to the southern portion where old sediments are present, are borderline to even be considered historical properties in that they were last in use at least as recently as the mid-1940s. Initial homesteading of these "cane lots" occurred around 1918. So it is possible that construction of some of the field-stone clearing mounds had been begun by this time, and the mounds could have

been continuously added to through the years as is the nature of such mounds. Nevertheless, based on the archaeological mapping of the fields, and the testing results of type-mounds we believe all of the archaeological sites and features within the study area to be without other significance than Criterion D (i.e., site is likely to yield information important to prehistory or history) as historical properties, according to National Register significance and State Historic Preservation Division draft rules on significance criteria.

Recommendations

Archaeological work accomplished includes, scale mapping of the limits of the cane field and its boundary walls, testing of two peripheral sites, and testing of a field-stone clearing mound feature. Thus, it is felt sufficient data has been collected, analyzed, and reported on to satisfy Criterion D. Therefore, no further archaeological work is recommended for the study area.

Archaeological monitoring is not recommended for site grading and preparation work or other construction activities, based on the results of the archaeological survey and testing in the study area. However, as is the general case with historic preservation concerns in the event inadvertent discoveries are made during any phase of construction the State Historic Preservation Division shall be notified in each incidence to determine an appropriate course of action for mitigation.

APPENDIX C

SUPPLEMENTAL ARCHAEOLOGICAL SURVEY AND TESTING
OF THE PROPOSED UNIVERSITY OF HAWAII AT HILO EXPANSION AREA

BY

CULTURAL SURVEYS HAWAII

**Supplemental Archaeological Survey
and Testing of the Proposed University of Hawaii
at Hilo Expansion Area
(TMK 2-4-01:19)**

by

Douglas F. Borthwick, B.A.
and
Hallett H. Hammatt, Ph.D.

for

Engineering Concepts

by

Cultural Surveys Hawaii
November 1993

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INTRODUCTION

Cultural Surveys Hawaii conducted, at the request of Engineering Concepts, an archaeological inventory survey of an approximately eleven (11) acre parcel located adjacent to the proposed U.H. Hilo Research and Technology Park. The purpose of the survey was to locate and describe any archaeological sites and/or features within the specific area through which infrastructure-related construction is proposed.

The present inventory survey project area is situated along the Waiakea Flood Control Channel adjoining (to the east) the larger parcel of the Research and Technology Park previously surveyed by Cultural Surveys Hawaii (Borthwick and Hammatt 1993) (Fig. 1). The need to conduct this additional survey was reached after survey and report production of the larger parcel was completed. The present research is thus included as a supplemental report to the previous Cultural Surveys Hawaii's study which detailed background research pertinent to the entire Research and Technology Park.

SURVEY RESULTS

Methodology

The present inventory survey was conducted by two archaeologists, Douglas Borthwick and Dr. Hallett H. Hammatt on Sept 30, 1993. The first phase of the survey included walking roughly north/south-oriented transects to locate any archaeological sites. The space between archaeologists during the transects was never greater than 15 meters and averaged 10 meters. The entire area was covered in four transects. The vegetation ranged from fairly dense grass-covered areas to open terrain under Royal Palms and/or Guava, thus ground visibility ranged from fair to good. A portion of the Waiakea Flood Control Channel is encompassed within the project area. The channel and associated

land alterations generally define the southern and eastern boundaries of the project area. The northern boundary is a bulldozed swath related to existing water and overhead power lines. The western or *mauka* boundary is a surveyed line marked by survey flags, from the previous Cultural Surveys Hawaii's project, and more recently survey work by R.M. Towill Corp. The contour and boundary map developed by R.M. Towill's work was utilized to accurately plot site locations (Fig. 2).

Test excavations were conducted at two rock mounds. The testing process included: pre-excavation photographs, removal of rocks from the specified test unit; excavation of soil by natural stratigraphic layer (or 10 cm. level within natural strata); screening of all soil sediments through 1/8" mesh screen; recovery of all cultural material (artifacts, midden, charcoal); one profile and stratigraphic description per unit; post excavation photographs; and reconstruction of test unit locale.

Results

Survey of the flood control channel and the area to the east of the channel, indicated that this portion of the project area had been entirely mechanically altered. Mechanical alteration includes bulldozing, cut and fill, and channel embankment construction. Due to these modern alterations no archaeological sites exist within the channel or along the channel's embankment, including the area between the eastern embankment and the existing UH Hilo structures. The existing U.H. Hilo structures include dormitories and associated grounds (i.e., parking lot and landscaped areas).

West of the flood channel four rock clearance mounds and a rock wall were observed and plotted on the survey map (See Fig. 2). The mounds range in size from a

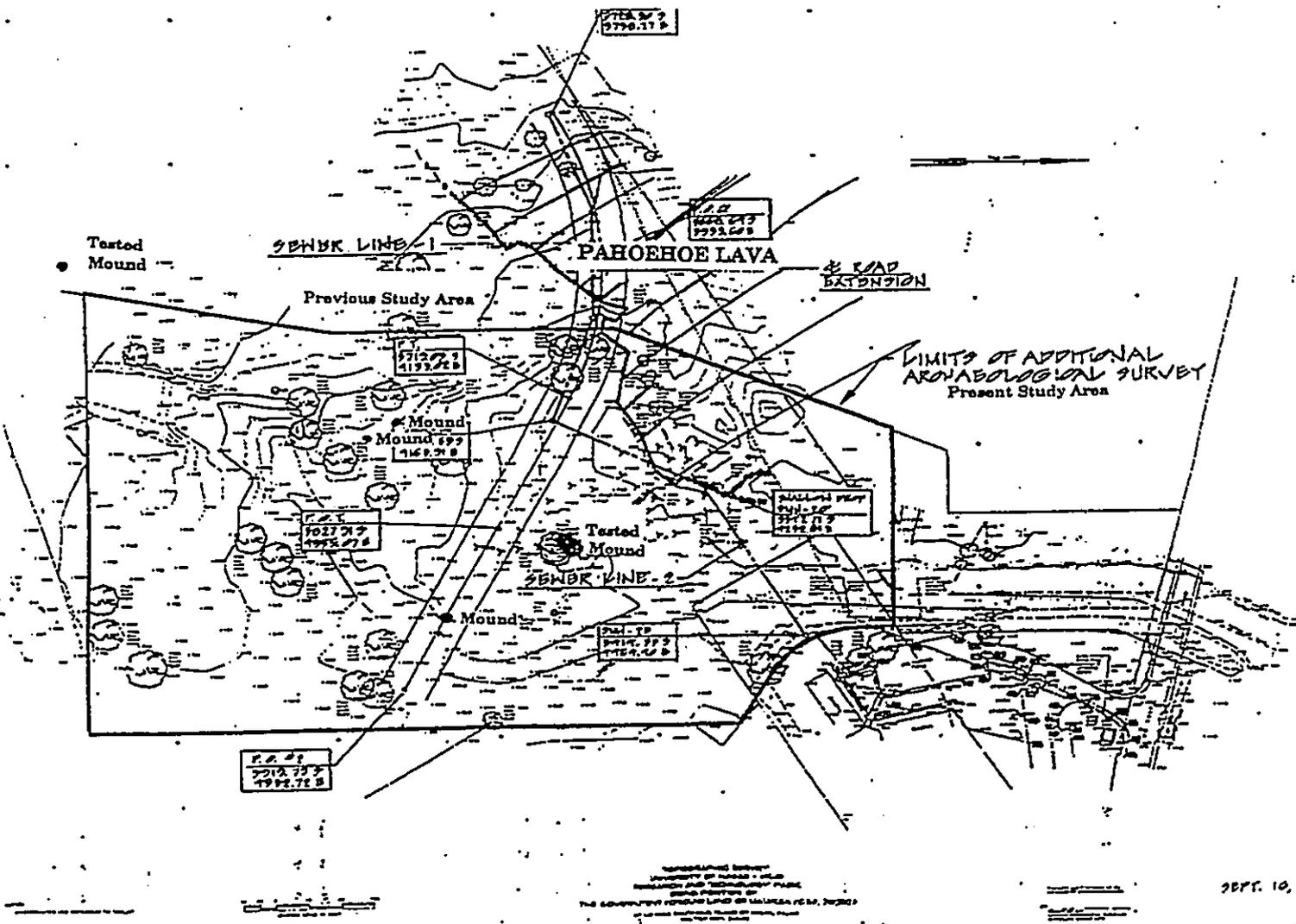


Fig. 2 Project Area Map Showing Archaeological Features

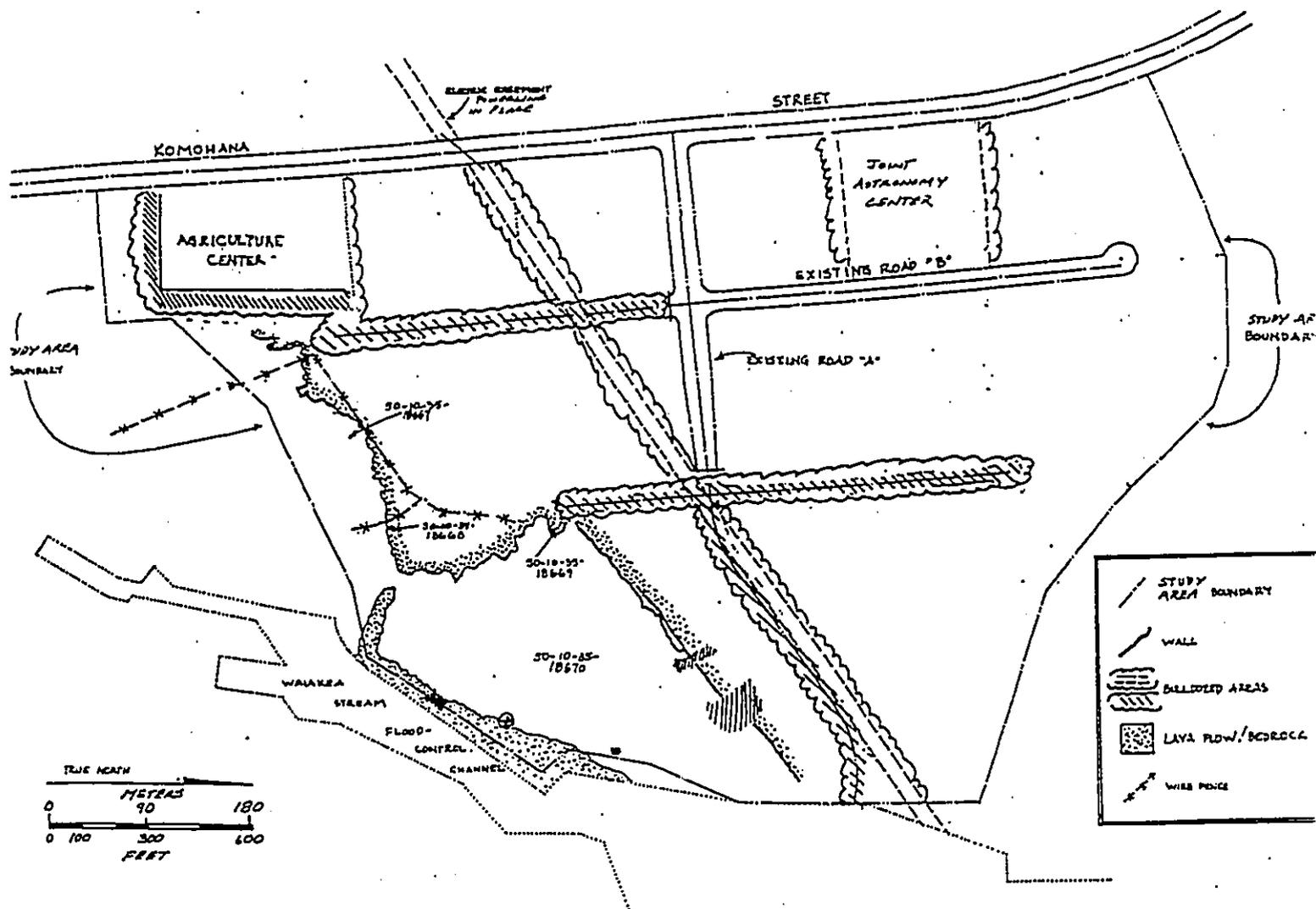


Fig. 3 Previous Study Area Map with Archaeological Sites (Borthwick et al. 1993:Fig. 8)

maximum of 5 meters by 10 meters to 2 meters by 6 meters. The mounds are constructed on high points (i.e., bedrock undulations) in the mostly soil terrain where former cane furrows are still visible. The wall observed, which is of mounded construction, is the *makai* extension of the wall noted and described previously (Borthwick *et al.* 1993:25-27, and 43) (See Fig. 3). The wall defines the interface between soil-mantled terrain to the south, which was formerly under commercial sugar cane cultivation and the non-cultivated soil-less pahoe-hoe terrain to the north. The wall varies greatly in condition and size throughout its length but averages 1.5 m. wide and .50 m. in height.

The largest, most visibly distinct of the four newly identified mounds, was mapped to scale (Fig. 4), photographed and subjected to limited surface testing. A 1 m. by 2 m. test unit was excavated into the roughly faced west edge of the mound. The excavation revealed a maximum thickness of rock construction of 50 cm. The construction was of loosely piled boulders, of fairly consistent size (15-25 cm. in diameter), with no filtered soil matrix. No cultural material (artifacts, midden, or charcoal) was present within the rock fill. Below the rock structure three soil stratigraphic layers (I, II and III) were encountered (Fig. 5). Stratum I was 2 to 4 cm. thick, and consists of very loose, very dark grayish brown (10YR 3/3) silt loam with a high percentage of organics (leaf litter). Stratum I represents the modern filtered forest litter postdating the mound's construction. Stratum II was a maximum of 25 cm. thick and consists of loose dark brown (7.5YR 3/2) silt loam with 5 to 10 percent rockiness. One fragment of volcanic glass (.9 grams) and a piece of *kukui* nut (.2 grams) were recovered from Stratum II. Stratigraphically, Stratum II represents a natural soil layer predating the construction of the mound, thus the volcanic glass and *kukui* nut fragments are not associated with construction and/or use of the mound. Stratum III consists of slightly compact rocky dark yellowish brown

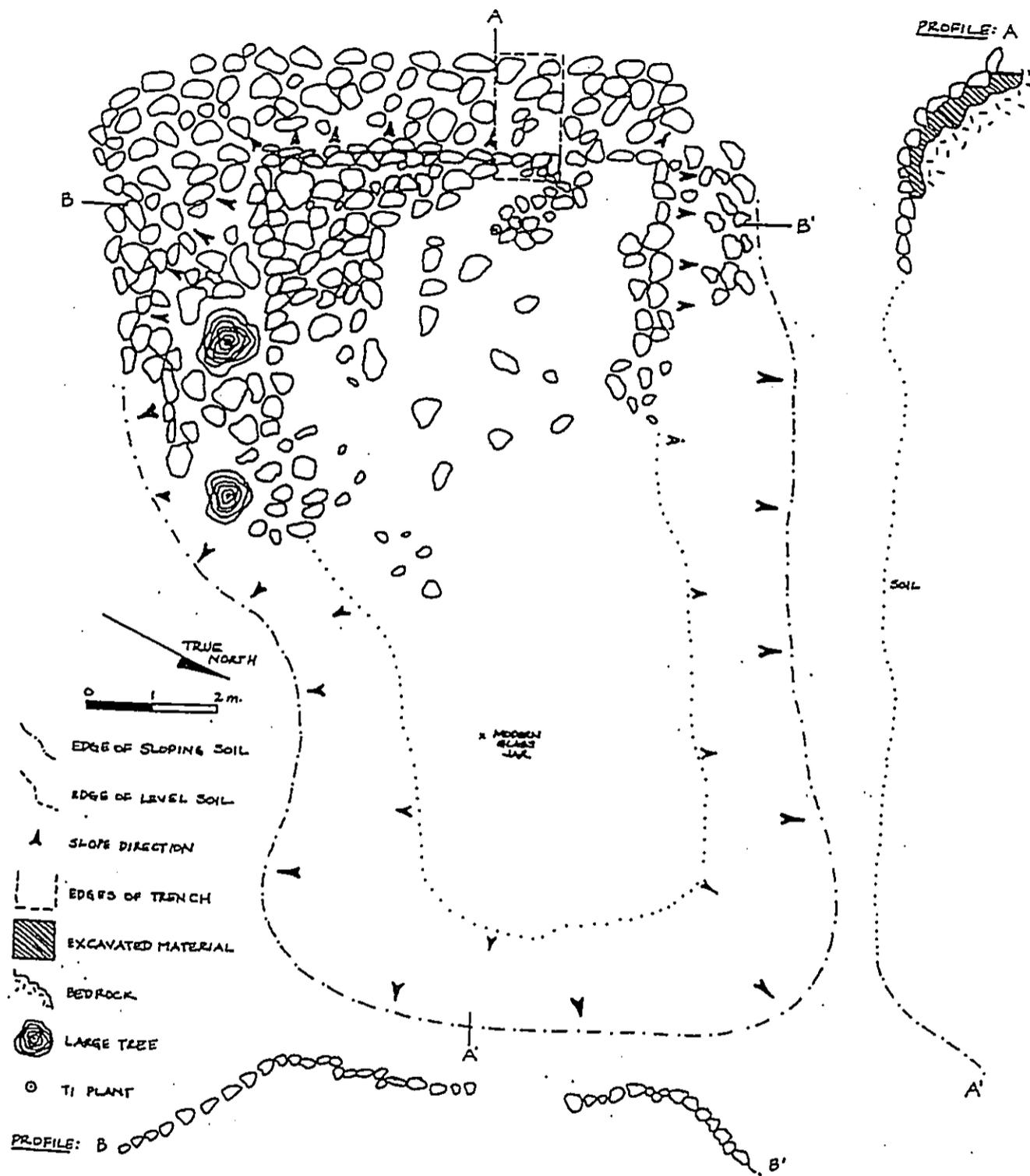


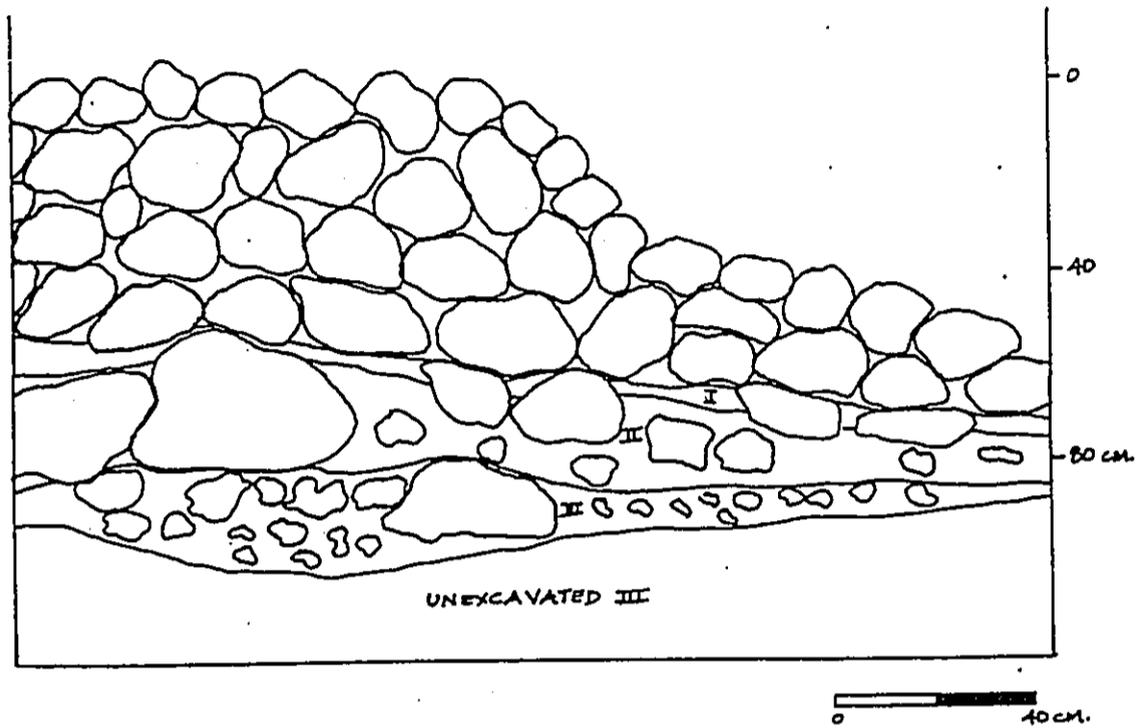
Fig. 4 Plan View and Cross Section of Tested Mound within Present Project Area, Feature of Site -18670

(10YR 3/6) silt loam. Stratum III represents the parent material soil layer or C Horizon which contains a high percentage of soft decomposing rock. No cultural material was within Stratum III.

The survey and testing within the present project area and previous background research for the Research and Technology Park (Borthwick *et al.* 1993:6-23) indicates that the features observed were associated with commercial sugar cane cultivation. Specifically, the features are situated within the former Waiakea Cane Lots (Portion of Lot #16). During the previous study a State Historic Site number (50-10-35-18670) was allotted for the cane lots' associated features within that specific project area (*ibid.*:39-42) (See Fig. 3). Since the four newly identified mounds were also associated with the same lot or sugar cane field we are including these features under the same State site number, 50-10-35-18670.

To further address functional interpretation, feature association, and sampling concerns, another mound within Site -18670 was subjected to sub-surface testing. The particular mound was chosen because of its size and location. The mound represents the largest, best defined stacked stone feature within Site -18670 boundaries (Fig. 6). The mound had been previously noted and drawn to scale (Borthwick *et al.* 1993:41,42), and accurately plotted on the study area map (*ibid.*, Figure 8:25) thus facilitating locational and feature type sampling choices as well as necessary field tasks (i.e., mapping and location).

A roughly 1.5 m. by 1.5 m. test unit was excavated into the southern side of the mound. The excavation revealed that the rock structure of the mound consists of a loose network of small boulders with no paving, no cultural material (i.e., midden or artifacts), and no filtered soil matrix. The mound is essentially sitting on top of underlying soil



STRATUM I: 4 CM. THICK; (10 YR 3/2) VERY DARK GRAYISH BROWN SILT LOAM; HIGH % ORGANICS; VERY LOOSE GRANULAR STRUCTURE; NO CULTURE

STRATUM II: 25 CM. THICK; (7.5 YR 3/2) DARK BROWN SILT LOAM; LOWER % ORGANICS; GRANULAR AND LOOSE; 5-10% ROCKS; ONE PIECE OF VOLCANIC GLASS AND ONE BURNT KUKUI SHELL

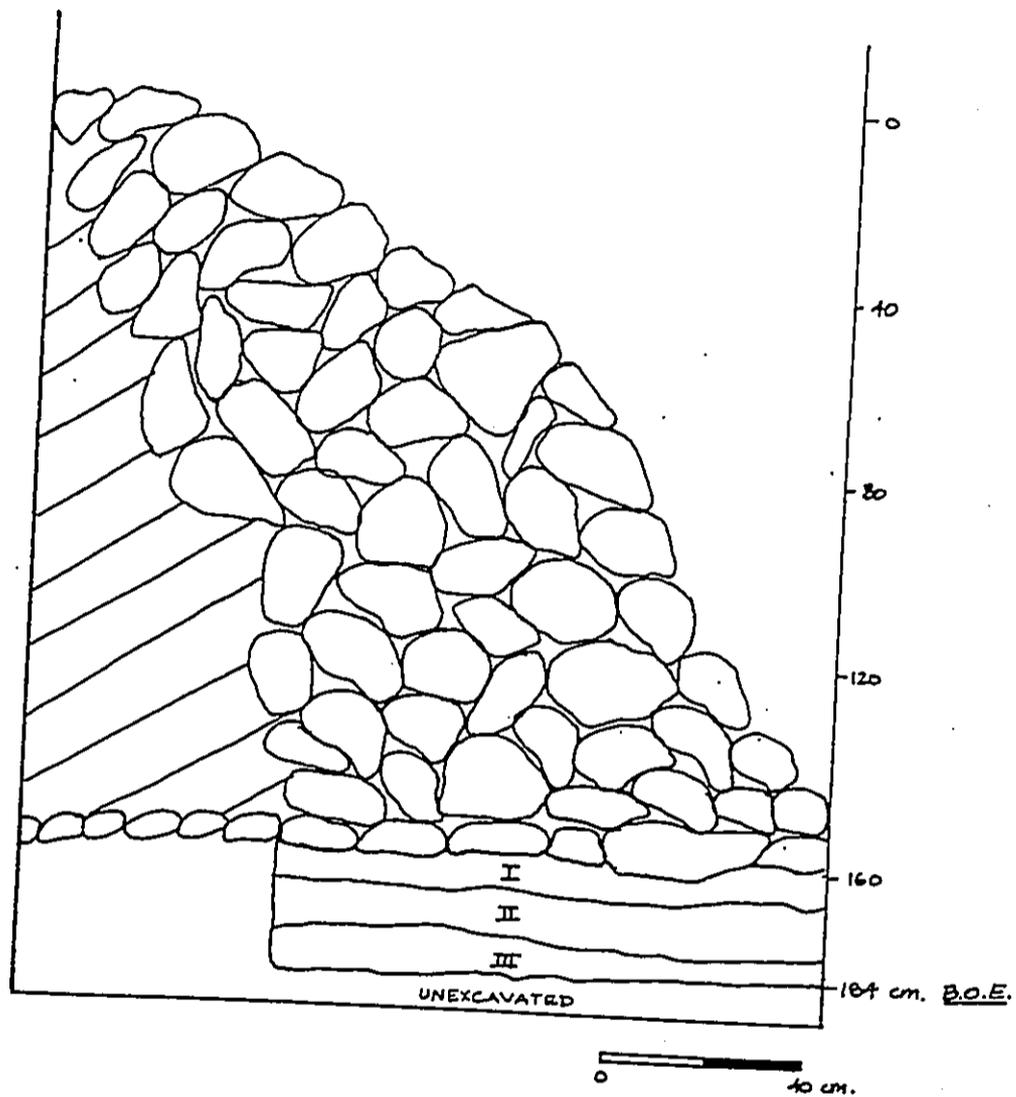
STRATUM III: 22 CM. THICK; (10 YR 3/6) DARK YELLOWISH BROWN SILT LOAM; "C HORIZON"; NO CULTURE.

Fig. 5 South Profile of Test Unit within Tested Mound in Present Project Area, Feature of Site -18670

layers which, inclusive of the above-listed attributes, indicates the structure is relatively youthful age as there has not been sufficient time for soil to have filtered through the rocks and accumulated as a soil matrix within the mound. Additionally, the absence of cultural material and surface paving (pebble and/or coarse surface) argues against traditional Hawaiian usage (i.e. habitation and/or ritual).

Below the rock structure three soil stratigraphic layers (I, II and III) were encountered. No cultural material (midden, artifacts or charcoal) was within any of the strata which ranged from very dark brown (10YR 2/2) silty clay loam (Str. I) to dark yellowish brown (10YR 3/4) silty clay loam (Str. III). The degree of rockiness increased with depth ranging from 10% rockiness in Stratum I to a maximum of 40% in Stratum III. The soil layers clearly predate the construction of the mound and the profile represents natural *in situ* soil development (Fig. 7).

The sub-surface testing of this large mound did not reveal any evidence of traditional Hawaiian usage associated with the mound. The rock free, furrowed soil area surrounding the mound, construction style, and absence of cultural material indicate that the mound is a rock clearance feature associated with historic commercial sugar cane cultivation practices.



STRATUM I: 9 CM. THICK; (10 YR 2/2) VERY DARK BROWN SILTY CLAY LOAM TO SILT LOAM; 10% ROCKS

STRATUM II: 10 CM. THICK; (10 YR 5/2) VERY DARK GRAYISH BROWN SILTY CLAY LOAM; 10-20% ANGULAR PEBBLES

STRATUM III: 10+ CM. THICK; (10 YR 5/4) DARK YELLOWISH BROWN SILTY CLAY LOAM; 20-40% ANGULAR PEBBLES; STRONG CRUMB STRUCTURE

Fig. 7 East Profile of Test Unit within Previously Located Mound, Site -18670

SUMMARY AND RECOMMENDATIONS

The present project area includes four rock clearance features (mounds) and a portion of a stacked boulder wall. The features were constructed and maintained historically as part of Waiakea Mill Co.'s sugar cane operations. The construction and maintenance of the mounds and wall were done to increase the cultivatable soil area by removing rocks from the fields and piling them into mounds and/or along field edges (e.g., the wall).

The extremely sparse material collected from the roughly 3 square meters of excavation (1 volcanic glass fragment and 1 *kukui* nut fragment) precludes any meaningful analysis. Both items could be naturally occurring within Waiakea Flood Plain soils. The volcanic glass fragment has not been utilized as a tool, based on absence of edge wear and/or retouching, as well as the poor vesicular quality of the material. The burnt *kukui* nut fragment may indicate previous forest clearing. However, such an assumption (or any other) based on a single .2 gram fragment is tentative at best.

Research for the proposed Pu'ainako Street Extension (Hunt and McDermott 1993), which includes similar stacked stone features within the former Waiakea Cane Lots, also indicated commercial sugar cane-related construction and maintenance of the rock structures. Hunt and McDermott, after "compiling diverse lines of complimentary evidence," which included oral interviews, photographs, newspaper articles, historic map analysis, inventory survey, and sub-surface testing, conclude that "The archaeological structures documented in the inventory survey are plantation-era in origin dating to the late nineteenth and early twentieth" (*ibid.*:93, 94).

The same conclusions were reached independently for the structural features reported on in our original report (Borthwick *et al.* 1993) for the survey of the Research

and Technology Park. The four mounds and wall, noted during the present survey are component features of the furrowed field (portion former Cane Lot #16) given State Site number 50-10-35-18670 (*ibid*:39-42) and thus should be included under the same (-18670) site designation.

Site -18670 was preliminarily (Cultural Surveys Hawaii recommendation) assessed solely under Significance Criterion D (site may be likely to yield information important in prehistory or history) and we are recommending inclusion of the four newly identified mounds (wall is already part of -18670) under the same significance assessment. That is, we are still recommending Criterion D only for Site -18670 and that the four mounds become part of the site.

The present study has neither altered significance assessment nor the recommendations of the original survey, for no further archaeological work specific to Site -18670, inclusive of the four newly-identified mounds. Sufficient data has been collected, analyzed, and reported on to define age and functional interpretation of Site -18670. Therefore it is our opinion that no further archaeological work is necessary. These significance assessments and recommendations are consistent with those made previously, for Site -18670 and described previously in the main body of the report.

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