

JOHN WAIHEE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

93 SEP 24 A 7:56
P. O. BOX 621
HONOLULU, HAWAII 96809

OFFICE OF ENVIRONMENTAL
QUALITY CONTROL

SEP 22 1993

5257
KEITH W. AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES
JOHN P. KEPPELER, II
DONA L. HANAIKE

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

REF:OCEA:SKK

FILE NO.: KA-2656
I.D. NO.: 3473

MEMORANDUM

TO: Mr. Brian Choy, Director
Office of Environmental Quality Control

FROM: Honorable Keith W. Ahue, Chairperson *KAH*
Department of Land and Natural Resources

Subject: Negative Declaration on Conservation District Use Application
KA-2656 to Use Limahuli Valley Special Subzone for Educational,
Recreational, and Research Purposes via the Establishment of a
Tropical Botanical Garden at Haena, Kauai

The Department of Land and Natural Resources has reviewed the comments received during the 30-day public comment period which began on August 8, 1993. We have determined that this project will not have significant environmental effect and have issued a negative declaration. Please publish this notice in the OEQC Bulletin as soon as possible.

We have enclosed a completed OEQC Bulletin Publication Form and four copies of the final EA. Please contact Cathy Tilton of our Office of Conservation and Environmental Affairs at 587-0377, if you have any questions.

Enclosure

1993-10-08-KA-PEA-Limahuli Valley Special Subzone
for Educational, Recreational and Research Purposes

OCT - 8 1993

CONSERVATION DISTRICT USE APPLICATION

AND

FINAL ENVIRONMENTAL ASSESSMENT

FOR THE

LIMAHULI VALLEY SPECIAL SUBZONE

Ha'ena, Kaua'i, Hawai'i

September 1993

KA-2656

CONSERVATION DISTRICT USE APPLICATION

AND

FINAL ENVIRONMENTAL ASSESSMENT

FOR THE

LIMAHULI VALLEY SPECIAL SUBZONE

Ha'ena, Kaua'i, Hawai'i

September 1993

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PREFACE

This Conservation District Use Application (CDUA) asks the Department of Land and Natural Resources (DLNR) to allow the applicants to use the Limahuli Valley Special Subzone within the Conservation District of Hawaii according to the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve.

The Act of Congress creating the National Tropical Botanical Garden (Public Law 88-449) requires the NTBG *"to establish, develop, operate, and maintain for the benefit of the people of the United States an educational and scientific center in the form of a tropical botanical garden or gardens"*.

The Limahuli Valley was offered to the NTBG by the Wichman family of Kaua'i as a site for a satellite garden and preserve (NTBG's headquarters is located in Lawai, Kaua'i). Ecologically and logistically, Limahuli Valley is an ideal location for a garden and preserve that focuses on growing and protecting the threaten and endangered plants of Hawai'i.

Additionally, the natural and cultural resources that exist in Limahuli Valley make it an ideal site for educating people about the natural history of Hawai'i, the need to protect our environment, and the ancient Hawaiian culture that once existed here. In order to provide proper stewardship of these valuable resources, the objectives of the Master Plan go far beyond the botanical and educational goals mandated by Congress.

In October 1991, the applicants petitioned the DLNR to amend Title 13-2 Administrative Rules of the Department of Land and Natural Resources, State of Hawai'i, and establish the Limahuli Valley Special Subzone for the purposes of education, recreation, and research. In December 1992, the requested amendment to Title 13-2 was signed into law by Governor John Waihee and the Limahuli Valley Special Subzone was established.

The Master Plan for Limahuli Gardens and Preserve, which was an essential part of the application to amend Title 13-2, and also this CDUA, is somewhat unique in several ways:

- 1) Rather than being centered around a detailed map of physical facilities, this Master Plan focuses on the programs and management plans that will allow its objectives and purposes to be fulfilled. The physical facilities (conceptional infrastructure) needed to effectively manage both the Gardens and the Preserve, as well as support their respective programs are included, but not as the focal point of the Master Plan.
- 2) An Environmental Assessment (EA) is integrated into the Master Plan and immediately assesses the potential impacts of the project in relation to the area the impacts could occur in. As such, it became an effective planning tool in the master planning process.

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

CONSERVATION DISTRICT USE APPLICATION

AND

FINAL ENVIRONMENTAL ASSESSMENT

FOR THE

LIMAHULI VALLEY SPECIAL SUBZONE

Ha'ena, Kaua'i, Hawai'i

September 1993

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Additionally, the natural and cultural resources that exist in Limahuli Valley make it an ideal site for educating people about the natural history of Hawai'i, the need to protect our environment, and the ancient Hawaiian culture that once existed here. In order to provide proper stewardship of these valuable resources, the objectives of the Master Plan go far beyond the botanical and educational goals mandated by Congress.

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- 1) Rather than being centered around a detailed map of physical facilities, this Master Plan focuses on the programs and management plans that will allow its objectives and purposes to be fulfilled. The physical facilities (conceptional infrastructure) needed to effectively manage both the Gardens and the Preserve, as well as support their respective programs are included, but not as the focal point of the Master Plan.
- 2) An Environmental Assessment (EA) is integrated into the Master Plan and immediately assesses the potential impacts of the project in relation to the area the impacts could occur in. As such, it became an effective planning tool in the master planning process.

3) The Master Plan was developed using a "feedback" process in which the features of the plan were modified or made more specific after considering the environmental impacts that would occur from their implementation. The culmination of this feedback process, which included two previous CDUAs (KA-2065 & KA-2277) and over five years of research, planning, review, and revision, was an "early review" of the Master Plan by numerous public agencies, environmental groups, concerned individuals, and adjoining landowners (see CDUA Appendix 5). Although most of the responses to this early review are endorsements of the Master Plan, several reviewers included specific concerns or suggestions which contributed to a final revision and editing of the circulated draft.

This CDUA is also unusual in that the applicants are making three special requests of the DLNR in regards to the time limits [Title 13-2 Section 13-2-21 (a)(15)] that are normally applied when a CDUA is approved by the Board of Land and Natural Resources (BLNR). These special requests are detailed on pages 5-7 of this CDUA.

Thus, with these unique characteristics in mind, the applicants present this Conservation District Use Application and the attached Master Plan for Limahuli Gardens and Preserve to the State of Hawai'i's Department of Land and Natural Resources for approval.

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
CONSERVATION DISTRICT USE APPLICATION
FOR THE
LIMAHULI VALLEY SPECIAL SUBZONE

I. LANDOWNERS

National Tropical Botanical Garden
Post Office Box 340
Lawai, Kaua'i, Hawai'i 96765
(808) 332-7324

Signature: Marv E. Code Title: ACTING DIRECTOR

Date: JUNE 10, 1993

Charles R. Wichman
Post Office Box 656
Honolulu, Hawai'i 96809
(808) 523-2500

Signature: Charles R. Wichman

Date: June 15, 1993

Charles R. Wichman, Jr.
Post Office Box 753
Hanalei, Kaua'i, Hawai'i 96714
(808) 826-5547

Signature: Charles R. Wichman, Jr.

Date: June 22, 1993

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
MASTER APPLICATION - SECTIONS I - IV

II. APPLICANTS

- A. National Tropical Botanical Garden
Post Office Box 340
Lawai, Kaua'i, Hawai'i 96765
(808) 332-7324
Owner of Lots 140, 141, 142, 143, 144, and 145 (CDUA Appendix 4).

- B. Charles R. Wichman
Post Office Box 656
Honolulu, Hawai'i 96809
(808) 523-2500
Owner of 11.28% of Lot 152-A, and of Roads P-1, and P-2 (CDUA Appendix 4).

- C. Charles R. Wichman, Jr.
Post Office Box 753
Hanalei, Kaua'i, Hawai'i 96714
(808) 826-9147
Owner of 88.72% of Lot 152-A, and of Roads P-1, and P-2 (CDUA Appendix 4).

III. TYPE OF PERMIT APPLYING FOR

The applicants are applying for the use of the Limahuli Valley Special Subzone within the Conservation District of Hawai'i.

IV. LAND PARCEL LOCATION

District: Halelea

Island: Kaua'i

County: Kaua'i

<u>Lot Number</u>	<u>Tax Map Key</u>	<u>Area of Parcel (Acres)</u>	<u>Owners</u>
145	05-09-06-02	1.31	NTBG
144	05-09-06-03	2.19	"
143	05-09-06-04	2.40	"
142	05-09-06-05	3.32	"
141	05-09-06-06	2.73	"
140	05-09-06-09	0.94	"
152-A	05-09-01-03	988.33	Wichman
Road P-1	05-09-06-08	0.45	"
Road P-2	05-09-06-08	0.31	"

FINAL ENVIRONMENTAL ASSESSMENT
OF THE
NATIONAL TROPICAL BOTANICAL GARDEN'S
USE OF THE
LIMAHULI VALLEY SPECIAL SUBZONE

FINAL ENVIRONMENTAL ASSESSMENT

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(Responses to the Draft Environmental Assessment are located in CDUA Appendix 7)

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
MASTER APPLICATION -- SECTION V (Final Environmental Assessment)

1. IDENTIFICATION OF APPLICANTS:

The applicants are the National Tropical Botanical Garden (NTBG), Charles R. Wichman, and Charles R. Wichman, Jr. The NTBG is a non-profit organization chartered by the 88th United States Congress to create a national resource in tropical horticulture and botany. The Wichman family are *kama'aina* of Kaua'i, who have been active in preserving and perpetuating the natural and cultural resources of Hawai'i for more than 150 years.

Contact person for this CDUA is Charles R. Wichman, Jr. Mr. Wichman is in charge of the NTBG's operations at Limahuli Gardens and should be contacted directly at:

Charles R. Wichman, Jr.
Assistant Director - Limahuli
National Tropical Botanical Gardens
P.O. Box 808
Hanalei, Kaua'i, Hawai'i 96714

Phone (808) 826-5547
FAX (808) 826-4759

2. IDENTIFICATION OF APPROVING AGENCY:

Since the applicants are applying for the use of a Special Subzone within the Conservation District, the approving agency is the Department of Land and Natural Resources (DLNR) of the State of Hawai'i.

3. IDENTIFICATION OF AGENCIES CONSULTED IN MAKING ASSESSMENT:

A detailed Environmental Assessment (EA) of the potential impacts that could result from the implementation of the NTBG's Master Plan for Limahuli Gardens and Preserve was prepared by the NTBG with the help of professional consultants. This EA is incorporated into the Master Plan on pages 63-74, 85-88, and 92. As such, it is positioned so that it immediately assesses potential impacts in relation to the area that they could occur in.

Used in this way, the EA became an effective planning tool that the NTBG used to evaluate the impacts of its proposed programs and improvements in Limahuli Valley. It is also used to detail specific mitigation measures that can be taken to lessen the effect of those impacts that are unavoidable. After six (6) months of review (October 1990 to April 1991), by both the private and public sectors, the Master Plan and its incorporated EA were revised to include the comments and concerns of the reviewers. It is the revised Master Plan and its EA that are the basis for the information contained in this Draft Environmental Assessment section of the NTBG's Master Conservation District Use Application.

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
MASTER APPLICATION - SECTION V (Final Environmental Assessment)

PROFESSIONAL CONSULTANTS

Archaeologists *

Dr. Paul Cleghorn
Dr. Aki Sinoto
Prof. Hemanta Jayatilake
Mr. Tomasi Patolo

Applied Research - Bishop Museum
Applied Research - Bishop Museum
Applied Research - Bishop Museum
Applied Research - Bishop Museum

Environmental Consultants

Mr. Thomas S. Witten
Mr. Chris Kimura
Mr. Jim Hankey

Vice President-PBR Hawai'i
Assistant Planner-PBR Hawai'i
Graphic Artist-PBR Hawai'i

Aquatic Biologists *

Dr. Amadeo S. Timbol
Mr. Mike Kido, M.S.
Mr. Todd Mayer

Kauai Community College
Field Assistant
Field Assistant

Botanists *

Dr. David Lorence
Mr. Timothy Flynn

National Tropical Botanical Garden
National Tropical Botanical Garden

* Individual reports from these consultants are submitted as appendices of the Master Plan.

As part of the NTBG's preparation of this CDUA (in compliance with HRS 11-200-9) the following agencies, organizations, and individuals have reviewed and commented on the NTBG's Master Plan for Limahuli Gardens and Preserve. The comments received from these reviewers were used by the NTBG to further improve and revise its Master Plan. Their comments, as received by the NTBG, are contained in Appendix 5 of this CDUA. In addition, the staff from many of these agencies were repeatedly consulted about specific sections of this CDUA. Their cooperation, comments, and insight were invaluable in the preparation process.

STATE GOVERNMENT

Mr. Michael G. Buck, Administrator, Division of Forestry and Wildlife, DLNR; Mr. Roger Evans, Administrator, Office of Conservation and Environmental Affairs, DLNR; Mr. Don Hibbard, Director, Historic Preservation Program; Dr. Marvin T. Miura, Director, Office of Environmental Quality Control; Mr. Ralston Nagata, Administrator, Division of State Parks, DLNR; Mr. Pohaku Nishimitsu, Hawaiian Studies Resource Teacher, Kaua'i District, DOE; Mr. Henry Sakuda, Administrator, Division of Aquatic Resources, DLNR; Mr. Bruce S. Anderson, Ph.D., Deputy Director of Environmental Health, Department of Health.

UNIVERSITY OF HAWAII

Dr. John Harrison, Environmental Coordinator, Environmental Center, UHM.

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
MASTER APPLICATION -- SECTION V (Final Environmental Assessment)

OFFICE OF HAWAIIAN AFFAIRS

Mr. Richard K. Paglinawan, Administrator, Office of Hawaiian Affairs.

FEDERAL GOVERNMENT

Mr. Robert P. Smith, Field Supervisor, Pacific Islands Office, U.S. Fish and Wildlife Service; Ms. Laurie Ho, District Conservationist, U.S. Department of Agriculture, Soil Conservation Service.

COUNTY GOVERNMENT

Mr. Peter Nakamura, Director, County Planning Department, County of Kaua'i.

PRIVATE SECTOR

Mrs. Nan Ka'aumoana, Chairperson, The Hanalei/Princeville Improvement Advisory Committee; Mr. Michael Kido, President, Conservation Council, Kaua'i Chapter; Ms. Suzanne Marinelli, Chairperson, The Sierra Club, Kaua'i Group; Mrs. Annette Cassidy, President, 1000 Friends of Kaua'i; Mr. William H. Sager, President, Olson Sager Ltd., Mr. Tim Dunn, Owner of Lot 137; TMK 5-9-6:12, Mr. and Mrs. Ira and Teresa Goldberg, Owners of Lots 138 & 139; TMK 5-9-6:10 & 11; Mr. and Mrs. Gordon and Roberta Haas, Owners of Exclusion 27; TMK 5-9-6:7; Mr. and Mrs. Donald and Jill Canaparo, Owners of Exclusion 26; TMK 5-9-6:1.

4. GENERAL DESCRIPTION OF THE ACTION'S TECHNICAL, ECONOMIC, SOCIAL, AND ENVIRONMENTAL CHARACTERISTICS:

This CDUA requests the use of the Limahuli Valley Special Subzone (which was established at the request of the applicants on December 21, 1992) by the National Tropical Botanical Garden (NTBG) for the purposes set forth in the NTBG's Master Plan for Limahuli Gardens and Preserve.

The complete details of this action's characteristics are contained in the Master Plan for Limahuli Gardens and Preserve which is part of this application. In brief, this action will allow the NTBG to protect, preserve, and perpetuate the natural and cultural resources of this area; and allow them to be used for educational, recreational, and scientific purposes on a controlled basis. (All following page references are to the Master Plan (MP) unless otherwise stated.)

Because the NTBG is a non-profit organization that must raise the funds needed for each of the implementation phases described in the Master Plan on pages 44, 63, and 85, the applicants are asking the DLNR for special consideration in regards to the submission of detailed construction and maintenance plans, and on the time limits that are normally applied by law to a CDU Permit pursuant to Section 13-2-21(a)(15) (e.g., any work or construction must commence within one year and be completed within three years, effective on the day the permit is issued by the BLNR).

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
MASTER APPLICATION - SECTION V (Final Environmental Assessment)

Special Requests

- a. The applicants are asking the BLNR to approve the physical facilities proposed in the Master Plan for Limahuli Gardens and Preserve as part of this CDUA, while allowing the applicants to submit detailed construction and maintenance plans to the to the Office of Conservation and Environmental Affairs (OCEA) for approval when the NTBG is prepared, financially, to construct each individual facility in the future. Conceptual drawings and descriptions, including estimated sizes, locations, and architectural style of the various facilities, are included in the Master Plan at this time.
- b. The applicants are also asking that the time limits normally associated with the construction of an individual physical facility [Section 13-2-21(a)(15)] commence only after the building plans for a specific facility have been processed and approved by the OCEA as requested in (a) above.

Because the NTBG is a non-profit organization with a limited annual operating budget, it will have to raise the funds needed for the detailed design and construction of the physical facilities by soliciting donations. Funds for capital improvements rarely come out of the NTBG's general operating budget (MP page 102). The solicitation and acceptance of donations by the NTBG for infrastructure improvements in Limahuli Gardens and Preserve places the NTBG under a legal obligation to spend the funds only on the construction of the facilities for which the donations were given. However, construction of any physical facility in Limahuli Valley is illegal until permitted by DLNR. In order to avoid placing NTBG under a legal obligation to do illegal acts, the NTBG must postpone raising the funds needed for the design and construction of the planned physical facilities until after the BLNR has issued a CDUP that will allow the NTBG to implement its Master Plan.

Thus, the NTBG needs to have the physical facilities approved, as they are presented in the Master Plan, so that the NTBG can begin to solicit funding for them. The NTBG also needs the ability to submit the detailed construction and maintenance plans to the to the Office of Conservation and Environmental Affairs (OCEA) for approval when the NTBG is prepared, financially, to construct a specific facility in the future. This will eliminate the need for the NTBG to file a separate CDUA each time they want to construct one of the facilities proposed in the Master Plan.

Additionally, due to the broad scope and nature of the proposed facilities (MP 42-43, and 84), the NTBG will not be able to comply with the time limits set forth in Section 13-2-21(a)(15) unless these limits are applied only after the final building plans for a specific facility have been processed and approved by the OCEA as requested in (a) above.

By approving these first two (2) special requests, the BLNR will make possible the improvement of Limahuli Gardens and Preserve according to the phases envisioned in the Master Plan (MP pages 44, 63, and 85).

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
MASTER APPLICATION - SECTION V (Final Environmental Assessment)

- c. The third request the applicants are making is for the BLNR to clarify, for the record, that the time limits normally applied to "work" or "construction" ~~[Section 13-2-21 (a)(15)] will not be applied to the programs or activities~~ contained within the Master Plan. The reasons for this request are as follows:

This clarification is needed because the programs and/or activities outlined in the Master Plan could mistakenly be considered as "work" [a term used in Section 13-2-21 (a)(15)] and thus subject to time limits. Most of these programs and activities should never be completed. Efforts to preserve endangered species through habitat improvement and planting should never cease, nor should the NTBG's efforts to instruct visitors through its educational programs. Even the research programs should not be restricted by time limits. Granting this request is essential if the NTBG's programs are to become perpetual.

To conclude this section, all of the above special requests have previously been explored with the DLNR's Office of Conservation and Environmental Affairs (Refer to OCEA File No. 91-47; Doc. No. 9270E and File No. KA-2532 Doc. ID. 1274). These three (3) special requests are further discussed in relation to Section 13-2-21 (c) (justification for deviation from standard conditions) on pages 5-7 of Appendix 6 in this CDUA.

Technical Characteristics

Technically this action will allow the NTBG to:

- a. Establish, develop, operate, and maintain for the benefit of the people of the United States an educational and scientific center in the form of a tropical botanical garden designed especially for the preservation of plants of the Hawaiian mesophytic and lowland rain forests, varieties of traditional Hawaiian ethnobotanical plants, and rare and endangered species in an area naturally suited to their cultivation (MP pages 11-41).
- b. Maintain for the purposes of research and education a natural area of approximately 982 acres for the preservation of the flora and fauna native to the area (MP pages 75-92).
- c. Provide a beneficial facility which will contribute to the education, instruction, and recreation of the people of the United States; and instruct them in the purposes of this site and the National Tropical Botanical Garden in its entirety (MP pages 7-9).
- d. Construct the infrastructure needed to support Limahuli Gardens and Preserve (MP pages 42-63, & 84).
- ~~e. Submit final construction plans for the necessary infrastructure as funding becomes available, rather than at the issuance of the CDU Permit.~~

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
MASTER APPLICATION - SECTION V (Final Environmental Assessment)

- f. Provide the public, on a controlled basis, a chance to experience the educational, recreational, and research opportunities available in Limahuli Gardens and Preserve (MP pages 40-41, & 83-84).
- g. Manage the 980 acres of Limahuli Preserve in a manner that will be most beneficial for the native biota, through an active effort to control the most noxious of the alien plants and herbivores (MP pages 79-81, & 90).
- h. Protect, preserve, and study the pristine Limahuli Stream; and to use the stream as an educational tool to instruct the public about the fragile balance which exists in Hawaiian Streams (MP pages 97-99).
- i. Stabilize, protect, preserve, and study the many ancient archaeological sites within Limahuli Valley; and to use these sites as educational tools (MP pages 93-95).

Economic Characteristics

The proposed action will have a small, but positive, impact on the economy of Kaua'i. Although the Limahuli Gardens and Preserve could eventually provide job opportunities for as many as 10 or more employees, this is not anticipated to have any noticeable impact on the economy of Kaua'i. As the Gardens and Preserve become established and recognized throughout the world, it is possible that tourists will be drawn to Kaua'i, or may extend their stay on Kaua'i in order to see Limahuli Gardens. This action could slightly increase revenues for hotels, restaurants, rental cars and other tourist related services, and thus have a small positive impact on the economy of Kaua'i and the State as a whole. (MP pages 67,71, and 73).

Social Characteristics

The proposed action would have the following social characteristics:

- a. The on-site educational programs offered in Limahuli Gardens will increase the public's awareness of the fragility of our natural and cultural resources, and stress the importance of preserving these resources for future generations. These programs could have far reaching impacts in increasing the public's awareness and attitude towards protecting our natural and cultural resources (MP pages 34, 37-38, and 82-84).
- b. The recreational opportunities available at Limahuli Gardens have been planned to accommodate all kinds of visitors. Facilities and tours will be able to accommodate visitors with children as well as the handicapped, the elderly, and those unable to walk around the Gardens. The NTBG also plans a Community Day that will provide residents access to the Gardens free of charge on a regular basis (MP pages 40-41).

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
MASTER APPLICATION - SECTION V (Final Environmental Assessment)

- c. Limahuli Gardens will provide the setting and impetus for the establishment of a volunteer organization that is drawn from the local community. It is ~~hoped that this organization will become a valuable asset to the Gardens by providing help in the running of the Gardens' operations and programs (MP page 41).~~
- d. The establishment of Limahuli Gardens and Preserve will remove six house lots (Lots 140 to 145) from the real estate market. This will reduce the chance that this area will be developed as a residential subdivision (MP page 73).

Environmental Characteristics

Environmental characteristics include the following:

- a. 1,002 acres of land in the Limahuli Valley on the North Shore of Kaua'i will be protected ad infinitum from adverse usage.
- b. This area will be managed for the benefit of the native Hawaiian organisms living there, as well as to preserve and perpetuate the natural beauty of this magnificent area.
- c. The aquatic environment of Limahuli Stream will be maintained in its pristine condition, while its study will further enhance our limited knowledge about the fragile balance that exists therein.
- d. The archaeological sites located within this area will be protected, preserved, stabilized and studied. This will add to our limited knowledge about the colonization and utilization of this area by the ancient Hawaiian people.
- e. An area of approximately 15 to 20 acres in the mouth of Limahuli Valley (the Limahuli Gardens) will be managed as a botanical garden and will allow the NTBG to cultivate native Hawaiian plant species, especially the rare and endangered species native to the mixed mesophytic forest and the lowland rainforest.
- f. Approximately 600 acres of land (the Lower Limahuli Preserve) will be managed in a manner that will improve and maintain the habitat for the existing native flora and fauna through the control and eradication of the most noxious of the alien plants and herbivores present in the area, and the reintroduction of plant species native to the area.
- g. Approximately 400 acres of land (the Upper Limahuli Preserve) will be managed as a natural area for the flora and fauna native to this area.

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- h. The public will have controlled access to the Limahuli Gardens and the Lower Limahuli Preserve through the NTBG's Visitors Programs. These programs will provide the public unique educational, recreational, and research opportunities while protecting this fragile area from being exploited and over utilized.
- i. Infrastructure to support the operations of the Gardens and Preserve will be constructed in a manner that will not impact the natural and cultural resources of Limahuli Valley.
- j. The amount of alien allelopathic vegetation in both the Gardens and Preserve will be reduced.
- k. The number of alien animals in these areas will be reduced.

Environmentally, the expansion of the existing Garden Area to its planned 15 to 20 acre size (MP Exhibit 3&4) will entail the removal of all unwanted alien plant species. This will be accomplished in a manner that will prevent soil erosion and avoid injury to existing native vegetation. Initially, this area will be replanted with grass to prevent soil erosion. Secondary plantings will emphasize the NTBG's desire to grow native plant species, especially rare and endangered species of the mixed mesophytic and low land rain forests. These two ecosystems are the natural habitat of over 70% of Kauai's, and roughly 56% of the Hawaiian Islands', endangered species of flowering plants (MP pages 24, 27-28).

The removal of the existing alien trees and replanting of the area will act to stabilize the existing archaeological features located within this area, and allow them to be easily mapped and studied (MP page 34). Eventually, this area will become the primary educational resource for the NTBG. It will be used as a living classroom to educate visitors about the importance of preserving our natural and cultural resources. Educational programs currently planned for this area include a School Resource Program, an Environmental Awareness Program, and a Hawaiian Cultural Awareness Program (MP pages 34, 37-39). The public will be allowed controlled access to this area through the Visitors Program planned for this area (MP pages 40-41).

Environmentally, the improvement of the habitat in the Lower Limahuli Preserve will also be a beneficial action. Due to the aggressive and invasive nature of the alien vegetation currently naturalized in this area, if no action is taken to maintain or improve the habitat for the native species, the area will soon become completely overrun by alien species. The NTBG's plan to improve the habitat and control the alien plant species will not increase soil erosion or negatively impact the environment in any way. Rather, the control of the alien species and replanting with native species over many years, will prompt a gradual shift towards a native dominant community. (MP pages 75-82)

**5. SUMMARY DESCRIPTION OF THE AFFECTED ENVIRONMENT, INCLUDING
SUITABLE AND ADEQUATE LOCATION AND SITE MAPS:**

Limahuli Valley is located in the *ahupua'a* of Ha'ena on the North Shore of Kaua'i (MP Exhibit 1). Kuhio Highway 560 runs across the mouth of the valley about one-half mile back from the shore line (MP Exhibit 2). The highway separates the valley proper from the coastal plains that extend from Ke'e Beach on the west to Wainiha Valley on the east.

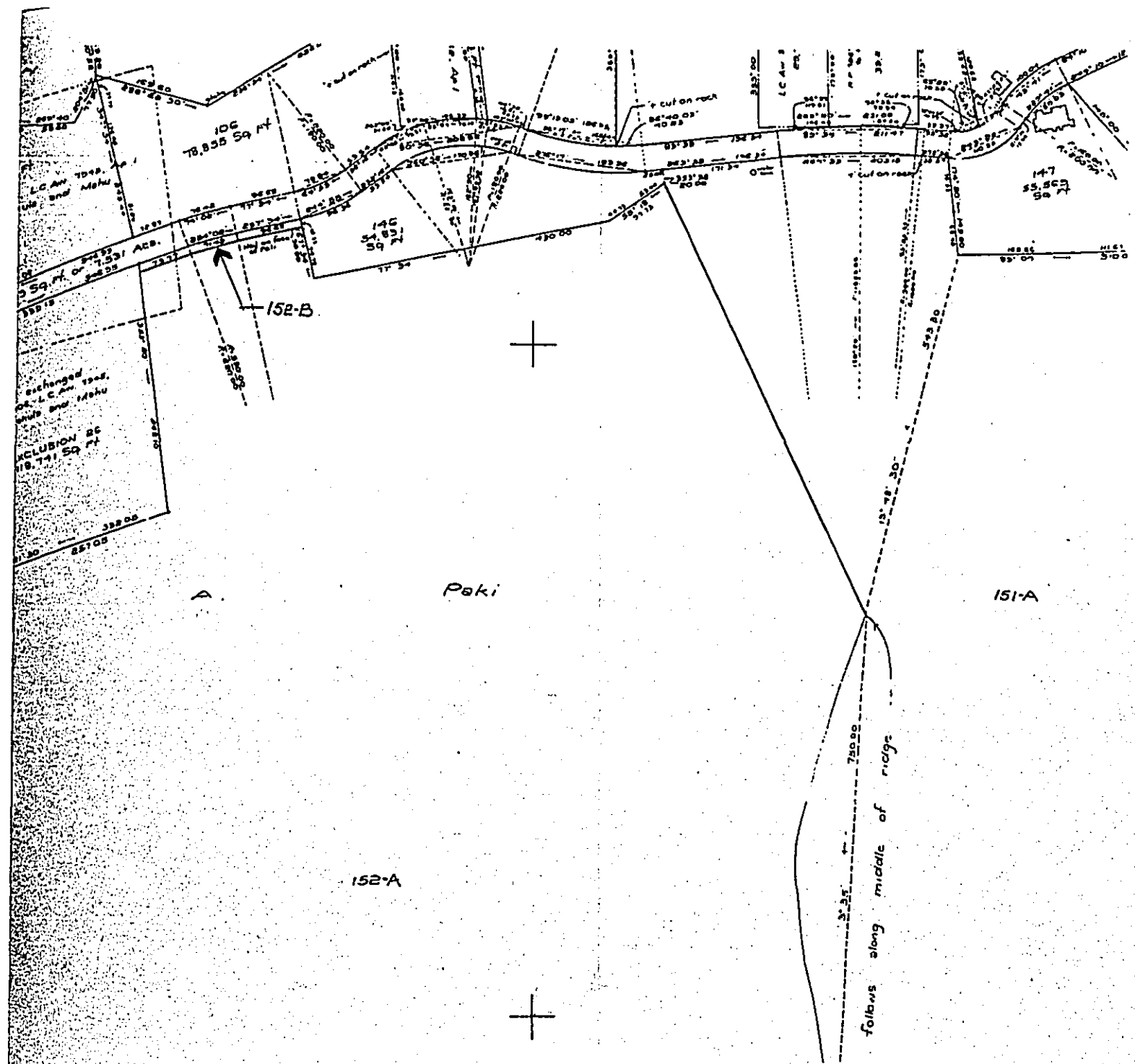
During the period of 1955 to 1967, Limahuli Valley was divided into 12 house lots (Lots 135-146), one large mountainous lot (Lot 152), two exclusions (Exclusions 26 and 27 based on independent Land Commission Awards), and two easement roads (Roads P-1 and P-2) by the Fifth Circuit Court during the partition of the lands owned by the Hui Kuai 'Ala o Ha'ena (CDUA Exhibits 1 & 2). Basically, the Court created a 12-lot subdivision in the mouth of the valley with this action. In 1964, the DLNR designated the entire *ahupua'a* of Ha'ena as part of the Conservation District (MP Exhibit 22).

Today the Limahuli Valley Special Subzone includes a total of 1,001.98 acres of land, consisting of Lot 152-A (988.33 acres) and Roads P-1 and P-2 (.76 acres) owned by Charles R. Wichman and Charles R. Wichman, Jr., and Lots 140, 141, 142, 143, 144 and 145 (12.89 acres) owned by the NTBG (CDUA Exhibits 1 & 2).

Roads P-1 and P-2 were created during the partition to provide access to the aforementioned lots as well as Lots 137, 138, 139 and Exclusion 27. Because Lots 137, 138, 139, 146, as well as Exclusions 26 and 27 are owned by persons other than the applicants, they are thus not part of the Limahuli Valley Special Subzone. This application therefore covers Lots 140, 141, 142, 143, 144, 145, 152, and Roads P-1 and P-2.

Immediately following the completion of the partition process in 1967, the late Mrs. Juliet Rice Wichman, the original owner of Lots 140-145, 152, and Roads P-1 and P-2, began creating a garden of beauty and science on her property. In 1976-77, Mrs. Wichman and her son, Charles Rice Wichman, gave Lots 140-145 to the NTBG. This property contained the garden Mrs. Wichman had started nine years earlier. This area is now referred to as the "Existing Garden Area" (MP Exhibit 3 & 5). Since 1976, it has been maintained by the NTBG while they developed a master plan that would address the preservation of the natural and cultural resources of the valley.

In 1991 the Wichman family filed CDUA KA-2484, which requested permission from the DLNR to consolidate and subdivide Lot 151 (62.70 acres) and Lot 152 (992.00 acres). In October 1991, the DLNR approved the request and the Wichmans completed the consolidation process. This action was taken to correct a mapping error that was made during the partition of the Ha'ena Hui lands in 1967. The end result of this process was the transfer of 3.59 acres from Lot 152 to Lot 151 and the creation of three new lots (Lots 152-B, 151-B, and 151-C totalling 0.385 acres) which were dedicated to the State of Hawaii for the future widening of Kuhio highway. Lot 151-A is now 65.99 acres and Lot 152-A is 988.33 acres (CDUA Exhibit 4).



LEGEND

 SECTION OF LIMAHULI VALLEY SPECIAL SUBZONE

SOURCE: MAP OF PARTITION, HAENA HUI LAND, EXHIBIT "B",
CIVIL NO. 30, R.M. TOWILL CO., OCT. 20, 1967

**CDUA EXHIBIT 2
BOUNDARY MAP**

**LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN**



3000 W

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An important natural resource in Limahuli Valley is Limahuli Stream. The headwaters of Limahuli Stream are located in the upper reaches of the valley at about 3,000 feet elevation. From this point they follow a convoluted course down to Limahuli Falls, where they plunge nearly 800 feet into the lower valley. Once in the lower valley, the stream follows a fairly straight course to the sea. Its volume is increased by small springs and tributaries as it flows through this lower area. Its cool, clear waters are of a pristine condition, with a high-oxygen content and low turbidity. Biologically, the native fish and crustaceans found in Limahuli Stream represent 11 different species. Aquatic surveys have indicated that although several different alien insect and crustacean species have become naturalized in the stream, 100% of the fish are native (MP Appendix III).

6. IDENTIFICATION AND SUMMARY OF MAJOR IMPACTS:

The Environmental Assessment (EA) that is contained within the Master Plan for Limahuli Gardens and Preserve (MP pages 63-74, 85-88, and 92) indicates that the establishment and operation of Limahuli Gardens and Preserve will result in three general classes of action: Habitat Improvement, Construction of Physical Facilities, and Public Use of the Area. Each of these classes of action has been analyzed in context to the area in which the action will take place (i.e., the Garden Area, the Lower Limahuli Preserve, and the Upper Limahuli Preserve).

The following is a list of the impacts identified and discussed in the EA. Rather than reprinting the entire discussions pertinent to each impact, page references to the Master Plan have been cited following each identified impact.

- Soil erosion (pages 64,68,72,86,87, & 88).
- Use of heavy equipment (pages 65 & 69).
- Translocated herbicide (65 & 86).
- Accidental injury to native vegetation (pages 65 & 86).
- Displaced organisms (pages 65 & 86).
- Limahuli Stream (pages 65,69,72,86,87, & 88).
- Archaeological sites (pages 64,69,72,86,87, & 88).
- Noise (pages 66,70,72,86,87, & 89).
- Air quality (pages 66,70,72,86,87, & 89).
- Compatibility with the existing environment (pages 67,70,72,86,87, & 88).
- Public services (pages 67,71,73, & 88).
- Economy (pages 67,71, & 74).
- Demography (pages 67,71, & 74).
- The removal of existing alien vegetation including allelopathic vegetation (pages 63,85, & 86).
- A reduction in the number of feral chickens (page 63).
- Increased scenic value (page 64).
- Increased educational opportunities for the public (pages 68 & 87).
- More efficient Habitat Improvement and Research Programs in the Lower Limahuli Preserve (page 87).
- More efficient administration and maintenance of the Garden Area and Preserve (page 68).

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As detailed on the pages cited above, the Master Plan contains measures to avoid nearly all the negative impacts which otherwise could result from the proposed action. Those impacts which cannot be avoided can be mitigated so that they will become mild short-term impacts. It should also be noted that there will be several positive environmental impacts that will result from the proposed action. When the proposed project is viewed as a whole it becomes clear that the benefits which will result from the implementation of the Master Plan will far outweigh the few short-term negative impacts.

The increased level of care and protection this area's natural and cultural resources will receive, as well as the increased opportunities for education, recreation and research, make the establishment of the Limahuli Gardens and Preserve a very valuable asset for the people of Hawai'i.

7. ALTERNATIVES CONSIDERED, IF ANY:

As part of the EA process, the NTBG looked at several different alternatives. Assuming that the alternatives considered are supposed to reduce the impact of the proposed action, the NTBG determined that one or more of the three major classes of action (Habitat Improvement, Construction of Physical Facilities, and Public Use of the Area) must be eliminated or modified to reduce perceivable impacts. As each alternative was considered, it was determined that the loss of positive benefits outweighed the decline in unavoidable negative impacts. Thus, the final outcome of this process was to return to the original course of actions as presented in the Master Plan. Clearly this is the option which most benefits both the natural and cultural resources as well as the public. It is the option which includes more positive aspects than any other, while incurring few, if any, perceivable negative impacts.

8. PROPOSED MITIGATION MEASURES:

Several mitigation measures are planned by the NTBG to alleviate the effects of those impacts that are not avoidable. Specific impacts that will be mitigated naturally or by specific actions taken by the NTBG are:

- Soil erosion (pages 72, & 88).
- Use of heavy equipment (page 69).
- Displaced organisms (page 65).
- Limahuli Stream (pages 65, 69, & 86).
- Noise (pages 66, 70, 72, 86, & 87).
- Air quality (pages 66, 70, 72, & 86).
- Compatibility with the existing environment (page 70).

In addition to the mitigation measures discussed above, the NTBG will establish a committee to assess the environmental impacts of its actions in Limahuli Valley on an annual basis (MP page 23). This committee will evaluate both the positive and negative impacts associated with the operations of Limahuli Gardens and Preserve and submit an annual report to the NTBG. This will give

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the community, the Wichman family, and the NTBG an official opportunity to assess the direction of the Gardens and Preserve, and to make formal recommendations that could help to avoid or mitigate any unforeseen future impacts.

9. DETERMINATION:

This determination is to be made by the accepting agency, in this case the the OCEA of DLNR. However, it is the applicants' opinion that, in view of the determinations discussed below under "**REASONS AND FINDINGS SUPPORTING DETERMINATION**", the OCEA, as the accepting agency, should make the determination that no EIS is required for the proposed action. Thus, in compliance with HRS 343 11-200-11, a **NEGATIVE DECLARATION** should be filed with the Office of Environmental Quality Control (OEQC).

10. REASONS AND FINDINGS SUPPORTING DETERMINATION:

Reasons

Once a species is gone, it is gone forever. The attainable goals and objectives of this proposed action have the potential to play an important role in saving the ever-increasing number of threatened and endangered plant species in the Hawaiian Islands. Saving plants from extinction will also help to keep endangered species of native birds and insects that feed on them or live in them from becoming extinct. The extinction rate of Hawai'i's endemic biota is one of the highest in the world. The Limahuli Gardens and Preserve will provide a valuable opportunity for humans to become responsible stewards of Hawai'i's natural resources by using our knowledge and abilities to help stabilize Hawai'i's diminishing number of native plant species.

Not only will this project provide increased protection for the natural and cultural resources of Hawai'i, but it will also provide increased educational, recreational and research opportunities to the public, without having a negative impact on the environment of Limahuli Valley.

Findings

After considering all of the phases and implications of the proposed project (its major impacts, how these impacts will either be avoided or mitigated, and the benefits that will result from the proposed action), the following determinations were made. These determinations are based on HRS 343 11-200-12, and fully support, the determination of a **Negative Declaration** for the proposed action as stated above.

It has been determined that:

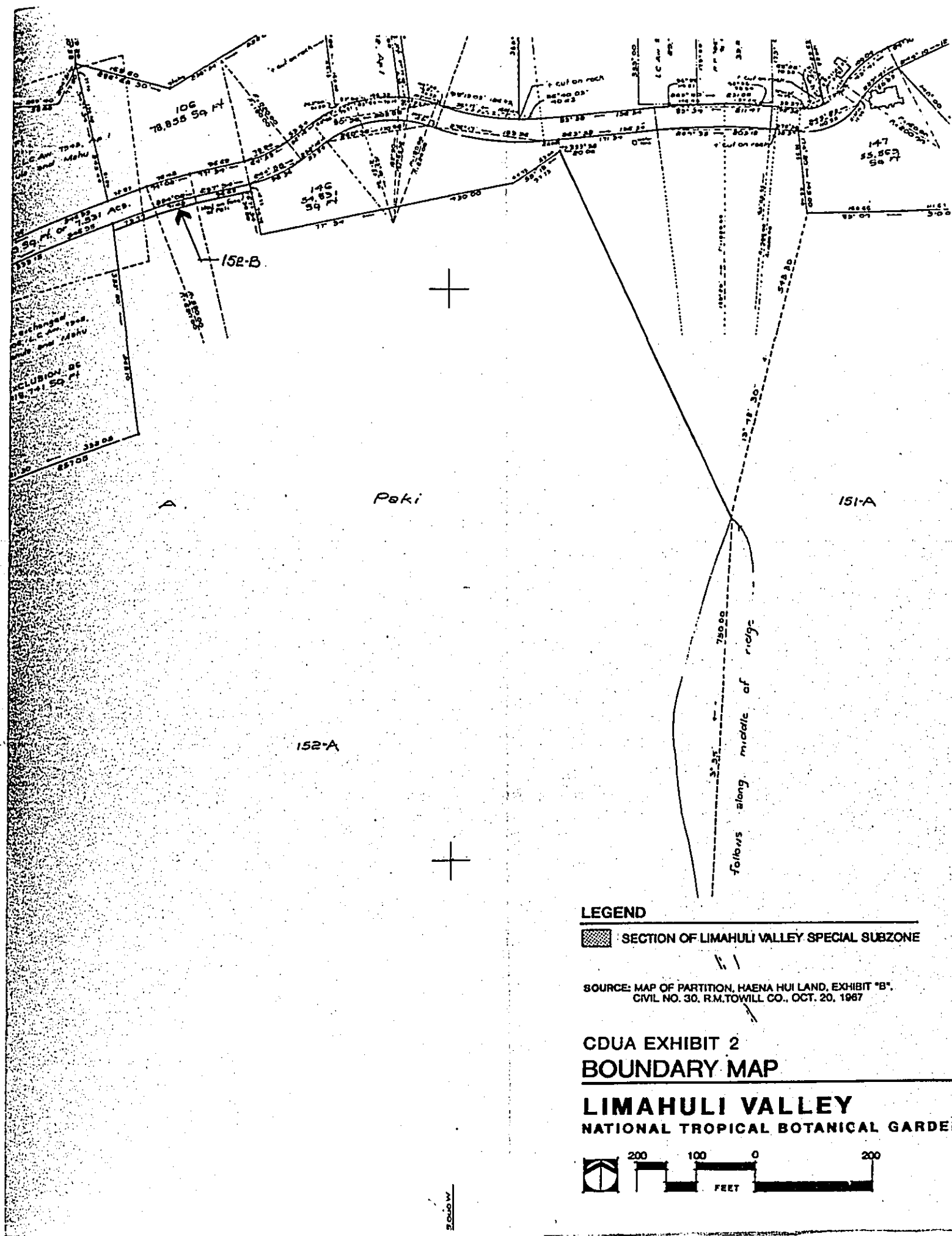
- The proposed action will not involve a loss or destruction of any natural or cultural resources. Rather, it will enhance the protection and value of said resources in Limahuli Valley.

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- The proposed action will not curtail the range of beneficial uses of the environment. Rather the proposed action will create more opportunities for the public to use and appreciate Limahuli's environment which would otherwise have been off-limits to them.
- The proposed action will not conflict with the State's long-term goals or guidelines as expressed in Chapter 344, HRS. Rather, the proposed action will enhance the State's ability to fulfill its proclaimed objectives of the Conservation District by providing: *Effective protection and prudent use of Hawai'i's unique, fragile, and significant environmental and natural resources; Protection for rare or endangered species and habitats native to Hawai'i; Effective protection and management of Hawai'i's open and natural areas* (State Conservation Lands Plan).
- The proposed action will not substantially affect the economic or social welfare of the community or State. Rather, it will have a positive impact on both the economy and our society.
- The proposed action will not adversely affect the health and welfare of the public. Rather, it will promote good health by providing recreational opportunities to the public that will improve their physical and mental condition.
- The proposed action will not create substantial secondary effects, such as population changes or infrastructure demands. Rather, it has been planned so that even when operating at its daily limited capacity of 120 visitors a day, it will not create a substantial impact on the infrastructure available in the Ha'ena area. (i.e., roads, water, electricity, telephone, etc.) In fact, by opening up an additional area to the public, and providing facilities for those who wish to learn more about Hawai'i's natural and cultural history; Limahuli Garden and Preserves will reduce the present burden on the educational infrastructure of Ha'ena State Park.
- The proposed action will not have a negative cumulative effect on the environment. Rather it will have a positive cumulative effect on the environment. This will be achieved through the fulfillment of the long-term objective of providing an improved habitat for native species, stabilizing and studying the ancient archaeological sites, and preserving and studying the pristine Limahuli Stream.
- The proposed action will not and does not commit or involve the State in larger actions, nor does it commit any State owned resources to the realization of the objectives of the proposed action.
- The proposed action will not negatively affect a rare, threatened, or endangered species or its habitat. Rather, it will provide increased protection and care for the Hawai'i's rare, threatened, or endangered species and their habitats.

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING



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Also in October 1991, the applicants of this CDUA petitioned the DLNR to amend Title 13-2 Administrative Rules of the Department of Land and Natural Resources, State of Hawai'i, and establish the Limahuli Valley Special Subzone for the purposes of education, recreation, and research. In December 1992, the requested amendment to Title 13-2 was signed into law by Governor John Waihee and the Limahuli Valley Special Subzone was established. Thus, the stage is now set for the applicants to obtain permission from the DLNR, via this CDUA, to implement their Master Plan for the Limahuli Gardens and Preserve.

Ecologically, Limahuli is a lush tropical valley that contains a nearly pristine Hawaiian stream with a waterfall that plummets nearly 800 feet into the lower valley. Encompassed in this striking setting are three ecological zones (the mixed mesophytic forest, the lowland rain forest, and the montane rain forest), as well as many ancient Hawaiian archaeological sites. Rainfall in the front of the valley averages 100 inches per year and increases as one proceeds southward up the valley. At its northern point along Kuhio Highway the elevation in Limahuli is about 80 feet above sea level, while its southernmost point (Hono-o-na-pali) is 3,330 feet in elevation.

Topographically, Limahuli Valley is divided into two sections; an inaccessible upper valley of about 400 acres, and the lower valley bowl of about 600 acres (MP Exhibit 2). The upper valley extends from an elevation of about 1,600 feet at the top of Limahuli Falls to 3,330 feet at Hono-o-na-pali. Although this area has been invaded by alien mammals (pigs and rats) and some invasive alien plants, the vegetation continues to maintain a nearly pristine lowland/montane rainforest character.

The lower valley bowl is surrounded on three sides by precipitous ridges 2,000 feet high. These majestic "knife edge" peaks and ridges have been immortalized in several popular movies and create the backdrop for some of Kaua'i's most famous scenery. This area was used and modified extensively by the ancient Hawaiian people who recognized it as an ideal agricultural site (MP Appendix II). Remains of hundreds of terraces extend from near the ocean all the way back to the base of Limahuli Falls.

In the modern era of 1778 to the present, Limahuli (below the falls) was possibly inhabited and used by the immigrant Chinese to plant coffee and rice. From 1875 to 1967, the *Hui Kuai 'Aina O Ha'ena* used this area to pasture their cattle. The cattle were responsible for extensive damage to the remnant native forests and to many of the archaeological sites that exist in Limahuli Valley (MP Appendix I). Although the cattle were removed in 1967, destructive alien animals that continue to exist in this area include feral chickens, rats, and naturalized alien birds. Recent botanical surveys indicate that alien plants, many invasive, have come to dominate most of this area. Thus, today we find that the dominant plants in this area are invasive alien species; primarily different guavas (*Psidium spp.*), java plum (*Syzygium cumini*), christmasberry tree (*Schinus terebinthifolius*), octopus tree (*Schefflera actinophylla*), and autograph tree (*Clusia rosea*).

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The increased level of care and protection this area's natural and cultural resources will receive, as well as the increased opportunities for education, recreation and research, make the establishment of the Limahuli Gardens and Preserve a very valuable asset for the people of Hawai'i.

7. ALTERNATIVES CONSIDERED, IF ANY:

As part of the EA process, the NTBG looked at several different alternatives. Assuming that the alternatives considered are supposed to reduce the impact of the proposed action, the NTBG determined that one or more of the three major classes of action (Habitat Improvement, Construction of Physical Facilities, and Public Use of the Area) must be eliminated or modified to reduce perceivable impacts. As each alternative was considered, it was determined that the loss of positive benefits outweighed the decline in unavoidable negative impacts. Thus, the final outcome of this process was to return to the original course of actions as presented in the Master Plan. Clearly this is the option which most benefits both the natural and cultural resources as well as the public. It is the option which includes more positive aspects than any other, while incurring few, if any, perceivable negative impacts.

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This determination is to be made by the accepting agency, in this case the the OCEA of DLNR. However, it is the applicants' opinion that, in view of the determinations discussed below under "**REASONS AND FINDINGS SUPPORTING DETERMINATION**", the OCEA, as the accepting agency, should make the determination that no EIS is required for the proposed action. Thus, in compliance with HRS 343 11-200-11, a **NEGATIVE DECLARATION** should be filed with the Office of Environmental Quality Control (OEQC).

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Once a species is gone, it is gone forever. The attainable goals and objectives of this proposed action have the potential to play an important role in saving the ever-increasing number of threatened and endangered plant species in the Hawaiian Islands. Saving plants from extinction will also help to keep endangered species of native birds and insects that feed on them or live in them from becoming extinct. The extinction rate of Hawai'i's endemic biota is one of the highest in the world. The Limahuli Gardens and Preserve will provide a valuable opportunity for humans to become responsible stewards of Hawai'i's natural resources by using our knowledge and abilities to help stabilize Hawai'i's diminishing number of native plant species.

Not only will this project provide increased protection for the natural and cultural resources of Hawai'i, but it will also provide increased educational, recreational and research opportunities to the public, without having a negative impact on the environment of Limahuli Valley.

Findings

After considering all of the phases and implications of the proposed project (its major impacts, how these impacts will either be avoided or mitigated, and the benefits that will result from the proposed action), the following determinations were made. These determinations are based on HRS 343 11-200-12, and fully support, the determination of a **Negative Declaration** for the proposed action as stated above.

It has been determined that:

- The proposed action will not involve a loss or destruction of any natural or cultural resources. Rather, it will enhance the protection and value of said resources in Limahuli Valley.

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- The proposed action will not curtail the range of beneficial uses of the environment. Rather the proposed action will create more opportunities for the public to use and appreciate Limahuli's environment which would otherwise have been off-limits to them.
- The proposed action will not conflict with the State's long-term goals or guidelines as expressed in Chapter 344, HRS. Rather, the proposed action will enhance the State's ability to fulfill its proclaimed objectives of the Conservation District by providing: *Effective protection and prudent use of Hawai'i's unique, fragile, and significant environmental and natural resources; Protection for rare or endangered species and habitats native to Hawai'i; Effective protection and management of Hawai'i's open and natural areas* (State Conservation Lands Plan).
- The proposed action will not substantially affect the economic or social welfare of the community or State. Rather, it will have a positive impact on both the economy and our society.
- The proposed action will not adversely affect the health and welfare of the public. Rather, it will promote good health by providing recreational opportunities to the public that will improve their physical and mental condition.
- The proposed action will not create substantial secondary effects, such as population changes or infrastructure demands. Rather, it has been planned so that even when operating at its daily limited capacity of 120 visitors a day, it will not create a substantial impact on the infrastructure available in the Ha'ena area. (i.e., roads, water, electricity, telephone, etc.) In fact, by opening up an additional area to the public, and providing facilities for those who wish to learn more about Hawai'i's natural and cultural history; Limahuli Garden and Preserves will reduce the present burden on the educational infrastructure of Ha'ena State Park.
- The proposed action will not have a negative cumulative effect on the environment. Rather it will have a positive cumulative effect on the environment. This will be achieved through the fulfillment of the long-term objective of providing an improved habitat for native species, stabilizing and studying the ancient archaeological sites, and preserving and studying the pristine Limahuli Stream.
- The proposed action will not and does not commit or involve the State in larger actions, nor does it commit any State owned resources to the realization of the objectives of the proposed action.
- The proposed action will not negatively affect a rare, threatened, or endangered species or its habitat. Rather, it will provide increased protection and care for the Hawai'i's rare, threatened, or endangered species and their habitats.

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--The proposed action will not negatively affect an environmentally sensitive area, rather, it will provide an increased level of protection for the natural and cultural resources, scenic value, open spaces, and natural areas that make up the Limahuli Valley.

11. AGENCIES TO BE CONSULTED IN THE PREPARATION OF EIS, IF APPLICABLE:

Due to the determination of a NEGATIVE DECLARATION this section is not applicable.

VI. SUMMARY OF PROPOSED USE

The applicants are requesting the DLNR to allow them to use the Limahuli Valley Special Subzone according to the NTBG's Master Plan for Limahuli Gardens and Preserve. This action will allow the NTBG to operate, for the purposes of education, recreation, and research, a 15 to 20-acre botanical garden in the mouth of Limahuli Valley. The focus of this garden will be on growing the threatened and endangered species native to the mixed mesophytic and lowland rain forests of Hawai'i. The public will have access to Limahuli Gardens through a visitors program that will require reservations, an entrance fee, and guided and self-guided tours, as well as a Community Day (MP pages 40-41).

An adjoining area of about 600 acres will be managed as the Lower Limahuli Preserve. This area will see the establishment of a Habitat Improvement Program that seeks to control, and if possible, eradicate the most noxious of the alien plants and herbivores living there. The public will have access to the Lower Limahuli Preserve only through a visitors program that will include reservations, an entrance fee, and a guided tour (MP page 83).

Immediately south of and above the Lower Limahuli Preserve is the inaccessible 400-acre Upper Limahuli Preserve. This area will remain in its natural state and will be used only on a very limited basis for research. There will be no public access to this remote area.

An important aspect of the Master Plan is the preservation and improvement of the natural and cultural resources located within the Limahuli Valley Special Subzone. This includes the stabilization, preservation, and study of the many archaeological sites located within the Garden area and the Lower Limahuli Preserve. The NTBG recognizes these sites as valuable assets to its programs and will provide the best care possible for them. Research programs are planned that should reveal not only the age and use of these sites but also the story of the colonization and utilization of Ha'ena by the ancient Hawaiians.

The preservation and study of the pristine Limahuli Stream is also vitally important to the NTBG. The NTBG recognizes that the stream is a valuable asset to its educational and research programs. Aquatic biologist Dr. Amadeo Timbol wrote: "*the endemic fish and crustaceans now found in Limahuli Stream are priceless.*" The Master Plan details a research program that will not only add to our limited knowledge of this aquatic environment, but also provide a means of safeguarding its quality.

INFORMATION REQUIRED FOR ALL USES

I. Description of Parcel

A. Existing Structures/Use. (Attach description or map.)

Currently there are two tool-house structures located on the applicants' property (CDUA Exhibit 3). One of these is an old structure built during the 1960's and currently used to store the tools and equipment needed in the maintenance of Limahuli Gardens. The second tool-house was constructed on Lot 142 and finished in the summer of 1992 (refer to CDUA KA-2277, for details of this facility).

B. Existing utilities. (If available, indicate size and location on map. Include electricity, water, telephone, drainage, and sewage.) See attached map (CDUA Exhibit 3) in addition to the following descriptions.

Currently, electricity is supplied by Kauai Electric (KE) to the North Shore of Kauai. KE's transmission system terminates at the junction of easement road P-1 and Kuhio Highway with a 40-foot utility pole (CDUA Exhibit 3). This system has both primary (2.4 Kilovolts) and secondary (120/240 volt) hookups available.

Telephone service is supplied to the North Shore by GTE Hawaiian Telephone Co. Currently, GTE has a main distribution line extending to the 40 foot utility pole described above. This line is capable of providing service for 25 separate telephone lines.

Potable water is supplied to the North Shore by the County of Kaua'i's Department of Water. Currently, there is a three inch submain and fire hydrant located on the lower section of easement road P-1. The NTBGS has a single water meter located at the end of the submain. (CDUA Exhibit 3)

Currently, Ha'ena is outside of the County's sewer service area. The County has no plans to extend sewer service to this area in the near future.

Rain water drainage is currently handled by a system of culverts and gutters that allow the water to follow its natural course down to Limahuli Stream. There currently is no County or State drainage system in this area. The NTBGS has requested assistance from the USDA Soil Conservation Service in designing a drainage system that will be integrated with its planned system of concrete roads.

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
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The NTBG has three separate irrigation systems currently functioning in Limahuli Gardens. Two of these use water from Limahuli Stream, while the third carries water from a high elevation spring located on Lot 152-A to a water tank located above the Garden Area (CDUA Exhibit 3, CDUA Appendix 3). These systems are, and will always be, completely independent of the potable water system supplied by the County of Kaua'i (see above).

- C. Existing access. (Provide map showing roadways, trails, if any. Give street name. Indicate width, type of paving and ownership.) See attached map (CDUA Exhibit 3) in addition to the following descriptions.

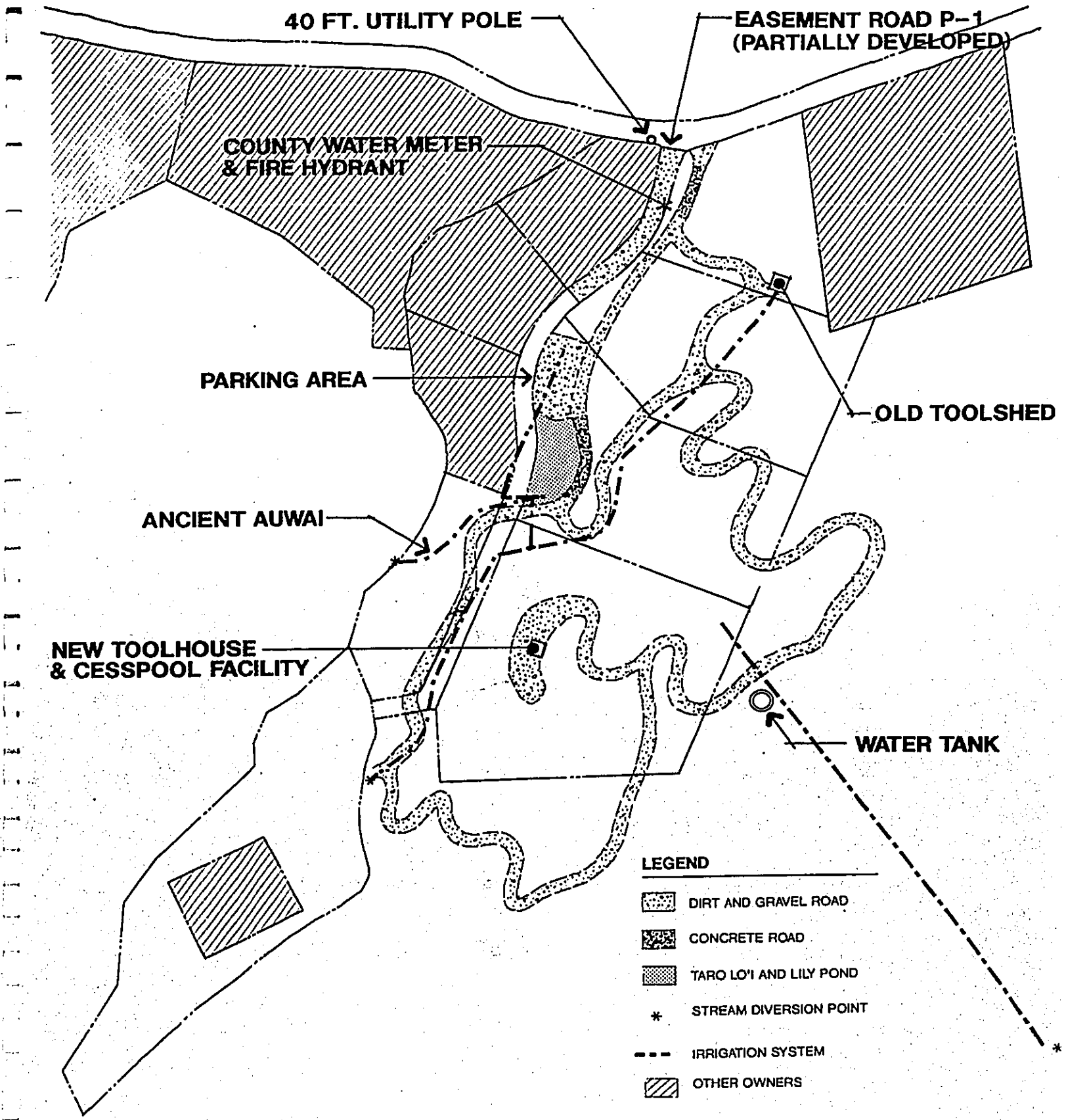
The northernmost boundary of applicants' property abuts Kuhio Highway. Legal access from Kuhio Highway is provided with easement roads P-1 and P-2. Both of these roads are 30 feet wide and provide for utility transmission as well as vehicular and foot access (CDUA Exhibit 1).

Currently, road P-2 has not been developed, and only the lower portion of road P-1 has been developed as a dirt and gravel road. The applicants do not use road P-1 for their access, rather they use a private dirt and gravel road that is on an average 20 feet in width (CDUA Exhibit 3). Two small sections of this road have been paved with concrete. Because roads P-1 and P-2 were created on paper to run through several ancient Hawaiian archaeological features, the NTBG and Wichman family have an oral agreement to allow the owners of Exclusion 27 access to their property along this private road. This oral agreement is the subject of current negotiations that could make it a legal easement for the owners of Exclusion 27. None of the roads have been given any formal name at this time, other than the designation given to roads P-1 and P-2 at the time of the Ha'ena Hui partition.

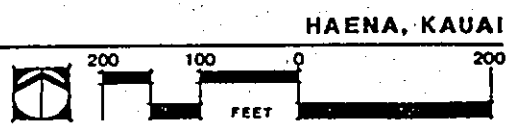
The only existing trail on the applicants' property is an old cow/horse trail that follows Limahuli Stream up the valley to the base of Limahuli Falls. Currently, most of this trail is overgrown, and only the first half of the trail is still easily negotiable (MP Exhibit 21).

- D. Vegetation. (Describe or provide map showing location and types of vegetation. Indicate if rare native plants are present.) Refer to MP Exhibit 7 and MP Appendix IV in addition to the following descriptions:

As described earlier in Section 5 of the Environmental Requirements, most of the applicants' property has undergone several hundreds of years of modification and use by the ancient Hawaiians, immigrant Chinese laborers (possibly), and feral cattle. Chiefly as a result of these pressures, the vegetation found today in most of the Garden Area and Lower Limahuli Preserve is of an alien character, while the native plants represent only remnant populations of the ecosystems that once flourished here long ago. With this in mind, the following are brief descriptions of the three designated areas of Limahuli Gardens and Preserve.



CDUA EXHIBIT 3
 EXISTING INFRASTRUCTURE
LIMAHULI VALLEY
 NATIONAL TROPICAL BOTANICAL GARDEN



CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
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The Existing Garden Area (MP Exhibit 3) is about nine acres in size and abuts Kuhio Highway on the northern part of the applicants' property. It has been cleared of about 70% of the noxious alien vegetation that was growing there. Today, this area consists of well established lawns with pockets of alien trees that still need to be removed. Scattered throughout the lawns are plantings of primarily native Hawaiian plants. Many of these plantings are rare and endangered species like *Hibiscadelphus distans*, *Flueggea neowawraea*, *Caesalpinia kavalensis*, *Gardenia brighamii*, *Abutilon menziesii* and *Kokia kauaiensis*. Planting of this area has not been restricted exclusively to native plants, but has also included plants of Hawaiian ethnobotanical value and plants of ornamental value (CDUA Appendix 1).

The Lower Limahuli Preserve is the area immediately surrounding the Garden Area and extending south to Limahuli Falls (MP Exhibit 2). This area is about 600 acres in size and is currently unimproved. It was this area that was used extensively by the ancient Hawaiians for hundreds of years, then possibly by the Chinese, and then by the feral cattle. Although there are still significant populations of native plants existing in this area, they are only remnants of the original native forest.

The dominant tree in the northern section of the Lower Limahuli Preserve is *Schefflera actinophylla* (octopus tree). This tree has been able to out-compete all other vegetation including other invasive alien plants in the area surrounding Limahuli Gardens. As one proceeds south into the valley, the dominant tree becomes *Psidium guajava* (common guava). The guava maintains its dominance off and on all the way to the base of Limahuli Falls. Other alien plants that locally dominate areas of the Lower Limahuli preserve are *Psidium cattleianum* (waiawi), *Aleurites moluccana* (kukui), *Phyllostachys nigra* (black bamboo), *Hibiscus tiliaceus* (hau), and *Pueraria lobata* (kudzu vine). In spite of these aggressive alien plants, the number and diversity of the native plants on the valley floor increases dramatically as one proceeds towards the falls. Native species frequently encountered along the last half of the trail include: *Metrosideros polymorpha* var. *glaberrima* (Ohia lehua), *Pisonia wagneriana* (Papala kepau), *Hedyotis acuminata* (pilo), *Charpentiera elliptica* (papala), *Hibiscus waimeae* subsp. *hannerae* (koki'o ke'oke'o), *Pittosporum glabrum* (ho'awa), *Psychotria mariniana*, and *Psychotria greenwelliae* (kopiko).

A number of other native species are found where the many small tributaries or watercourses drain into Limahuli Stream. These include *Cyrtandra wainihaensis*, *Cyrtandra confertiflora*, *Boehmeria grandis* (akolea), *Urera glabra* (opuhe, hopue, hona), *Touchardia latifolia* (olona), *Selaginella arbuscula* (lepelepe-a-moa), *Cyanea hardyi*, and *Cyanea sylvestris*. All of these native species are components of the lowland rainforest ecosystem that once flourished along the moist valley floor.

The ridges and steep slopes of Limahuli Valley are well drained and exposed to the drying effects of the constant trade winds. They have thus developed vegetation that is characteristic of the drier mixed mesophytic forest. Native

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species that exist in these drier areas include: *Diospyros sandwicensis* (lama), *Metrosideros polymorpha* var. *glaberrima* ('ohi'a), *Nestegis sandwicensis* (olopua), *Psydrax odoratum* (alahe'e), *Bobea elatior* (ahakea), *Santalum* sp. ('illahi), *Elaeocarpus bifidus* (kalia), *Eugenia reinwardtiana* ('ohi'a ha), *Pittosporum kauaiense* (ho'awa), *Hibiscus kokio* subsp. *saintjohnianus* (kokio), *Ochrosia kauaiensis* (holei), *Pteralyxia kauaiensis* (kaulu), *Rauvolfia sandwicensis* (hao), *Pritchardia limahullensis* (loulu), *Pleomele aurea* (halapepe), *Dodonaea viscosa* ('a'ali'i), *Myrsine* sp. (kolea), *Xylosma hawaiiense* (maua), *Alyxia oliviformis* (maile), *Bidens forbsii* subsp. *forbsii* (koko'olau), *Wikstroemia* spp. (akia), *Chamaesyce celastroides* (akoko), *Cyanea* spp., *Lobelia* sp., *Delissea rhytidosperma*, *Bonamia menziesii*, *Schiedea wichmanii* (kawelu), and *Isodendron* sp. (aupaka).

In spite of the fact that these drier, less-accessible areas were not modified directly by man, a number of invasive alien species have become locally dominant over the native plants. These aliens include: *Schefflera actinophylla* (octopus tree), *Schinus terebinthifolius* (christmasberry), *Clusia rosea* (autograph tree), *Psidium guajava* (guava tree), *Psidium cattleianum* (walawi), *Aleurites moluccana* (kukui), and *Lantana camara* (lantana).

The Upper Limahuli Preserve is directly south and above the Lower Limahuli Preserve (MP Exhibit 2). Because of its remote nature and inaccessibility, this area has never been directly modified by man, or dominated by aggressive alien plants. At its lower elevations of 1,600 to 2,500 feet, the vegetation is characteristic of the native 'ohia/'olapa lowland rainforest. Dominant species in this section are the *Metrosideros polymorpha* ('ohi'a) and the *Cheirodendron* sp. ('olapa), while other natives include *Gardenia remyi* (nanu), *Syzygium sandwicensis* ('ohi'a ha), *Antidesma platyphyllum* (mehame), *Bobea elatior* (ahakea), *Santalum* sp. ('illahi), *Elaeocarpus bifidus* (kalia), *Hibiscus walmeae* subsp. *hannerae* (koki'o ke'oke'o), *Pittosporum* spp. (ho'awa), *Psychotria* spp. (kopiko), *Pritchardia limahullensis* (loulu), *Lysimachia* spp. (kolokolo kuahiwi), *Dicranopteris linearis* (uluhe), *Cibotium* spp. (hapu'u), *Cyanea* spp., and *Cyrtandra* spp.

This area is so remote and rugged that only a limited portion has ever been surveyed on foot. Helicopter reconnaissance of the remaining area has indicated that the dominant trees continue to be the 'ohia and the 'olapa, while there is an increased presence of *Cibotium* spp. (hapu'u) and other ferns. Other native species that were distinguishable from the air were, *Pritchardia* sp. (loulu), and *Dicranopteris linearis* (uluhe).

It should be noted that although the Upper Limahuli Preserve is very remote and isolated it is continually suffering from the effects of the feral pigs, rats, and naturalized birds that live there. Over the last 15 years these alien animals, combined with the presence of invasive alien plants like *Clidemia hirta* (Koster's curse), *Rubus rosifolius* (thimble berry), *Schefflera actinophylla* (octopus tree), and *Spathodea campanulata* (African tulip), have led to a noticeable reduction in the overall percentage of native vegetation. Limited reconnaissance surveys

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conducted in the 1970's indicated an overall percentage of native plants at 99% for the surveyed areas, while reconnaissance surveys conducted in 1988-89 indicated an overall percentage of native plants at 95%. Thus, this isolated area can no longer be considered totally pristine and immune to the impacts of man's imported plants and animals.

- E. Topography; if ocean areas, give depths. (Submit contour maps for ocean areas and areas where slopes are 40% or more. Contour maps will also be required for uses involving tall structures, gravity flow and other special cases.)

There are no ocean areas in the proposed subzone. For contours, see MP Exhibits 2, 3, & 4.

- F. If shoreline area describe shoreline.

The applicants' property does not encompass any shoreline area.

- G. Existing covenants, easements, restrictions. (If State lands, indicate present encumbrances.)

The applicants' property is not subject to any covenants or restrictions other than the "restrictive covenants" that were imposed by the BLNR when they approved CDUA KA-2277 on December 1, 1989 (for a new toolhouse), and CDUA 2484 on October 11, 1991 (for the consolidation and subdivision of Lots 151 and 152).

The only legal easements on the applicants' property are Roads P-1 and P-2, which provide access to Lots 137-145, 152-A, and Exclusion 27 (CDUA Exhibit 1). Although these roads represent the legal easement to these lots, only the lower portion of Road P-1 has been developed and currently provides access to the private residence being built on Lot 137. The NTB and the owners of Exclusion 27 utilize the private dirt and gravel road that passes through Lots 140-145, and 152-A before reaching Exclusion 27 (CDUA Exhibit 3). Lots 137 and 138 are privately owned and currently undeveloped.

The Wichman family has also granted the Board of Water Supply of the County of Kaua'i an easement over the lower portion of Road P-1. This allowed the County to install a sub-main and fire hydrant on the east side of Road P-1.

- H. Historic sites affected. (If applicable, attach map and description.)

Although there are no historic sites currently on either the State or Federal register located on the applicants' property, there are many ancient archaeological sites located in both the Garden Area and the Lower Limahuli Preserve (MP Exhibit 11, and Appendix II). The proposed action will effect these sites by stabilizing, protecting, and studying them. Pages 93 to 95 of the Master Plan for Limahuli Gardens and Preserve detail the NTB's management plan for the archaeological sites in these areas. The NTB has been working closely

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
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with the State's Historic Preservation Program to insure that this management plan not only fulfills the State's requirements, but that it will also be the most beneficial course of action taken to preserve and interpret these sites.

ii. **Description:** (Describe activity proposed, its purpose and all operations to be conducted).

Details of the activity proposed, its purposes and all operations to be conducted are contained in the Master Plan for Limahuli Gardens and Preserve. The following is a brief summary of the Master Plan:

The applicants are requesting permission from the DLNR to implement the NTBG's Master Plan for Limahuli Gardens and Preserve in the Limahuli Valley Special Subzone. This action will enhance the NTBG's ability to fulfill its Congressional mandate, its purposes for Limahuli Gardens and Preserve, and its Master Plan Objectives (MP pages 7-9). This action will also assist the State and Federal governments in the preservation and perpetuation of Hawai'i's threatened and endangered plant species, natural and open areas, and the natural and cultural resources of Limahuli Valley. Approval of this application will provide the public with access to Limahuli Valley on a controlled basis. Access to Limahuli Gardens and Preserve will provide the public with numerous educational, research, and recreational opportunities that currently do not exist on the North Shore of Kaua'i.

The Master Plan details the improvement of Limahuli Gardens into a 15 to 20 acre botanical garden located in the mouth of Limahuli Valley. The primary focus of the Gardens will be to grow Hawai'i's threatened and endangered plant species and to educate the public about the importance of preserving, protecting, and perpetuating our natural and cultural resources. An adjoining area of about 600 acres will be utilized as the Lower Limahuli Preserve. The primary focus of this area will be to provide an improved habitat for the flora and fauna native to this area and serve as a secondary educational resource. Immediately south and above the Lower Limahuli Preserve is the isolated Upper Limahuli Preserve. The focus of this remote and rugged area will be as an unimproved, *in situ* sanctuary for the flora and fauna native to this area. This area will not be used as an educational resource and only on a very limited basis for research.

An important aspect of the Master Plan which applies to all of the areas is the preservation, stabilization, and study of the ancient Hawaiian archaeological sites located in the valley. These sites are considered to be valuable resources that merit the utmost care and management. Also of equal importance is the preservation and study of the pristine Limahuli Stream. Its aquatic environment and the native species that live in it are especially important to the NTBG, and they will be managed as priceless resources for future generations to appreciate.

Operations that will be conducted in Limahuli Gardens include:

1. Improvement of the infrastructure necessary to support the operations of both the Gardens and Preserve (MP pages 42-61).

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
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2. Implementation of the NTBG's programs for this area (MP pages 23-41).

Operations that will be conducted in Lower Limahuli Preserve include:

1. Construction of physical facilities needed to support the NTBG's programs for this area (MP page 84).
2. Implementation of the NTBG's programs for this area (MP pages 81-84).

Operations that will be conducted in Upper Limahuli Preserve include:

1. Limited research surveys and a possible future Habitat Improvement Program that will depend upon the availability of new technologies (MP page 91).

III. Commencement Date:

The NTBG would like to begin the implementation of its programs immediately, and commence with the construction of its planned physical facilities as soon as the necessary funds have been raised.

Completion Date:

The perpetual nature of the programs outlined in the Master Plan means that they may never be considered completed. The NTBG will, however, strive to complete the construction of its physical facilities within the time limits that are required by law (refer to Special Requests section on page 6 of this application).

IV. Type of Use Requested:

Permitted use of the Limahuli Valley Special Subzone for educational, recreational, and research purposes.
[DLNR Title 13, Chapter 2, Section 13-2-15(7)]

Area of Proposed Use:

1,001.98 acres (see CDUA page 2 and CDUA Exhibits 1-2).

Name & Distance of Nearest Town or Landmark:

Approximately .75 miles past the County's Ha'ena Beach Park (traveling west along Kuhio Highway), and immediately east and adjacent to the Ha'ena State Park (see MP Exhibit 22).

Conservation District Subzone:

The applicants' property is currently located within the Limahuli Valley Special Subzone.

County General Plan Designation:

Open.

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
MASTER APPLICATION

INFORMATION REQUIRED FOR CONDITIONAL USE

I. **Plans:** (All plans should include north arrow and graphic scale.)

A. **Area Plan** - See CDUA Exhibits 1-2, & 4 in addition to the following information:

TMK 5-8-2:2

Lot 201

Owner: Helen Robinson, Keith P. Robinson, and Bruce B. Robinson.
Makawelei, HI 96769

Present Use: Conservation with Wainiha stream used for Hydroelectric power.

Future Use: Same.

TMK 5-9-1:1

Owner: State of Hawaii.

Present Use: Na Pali - Kona Forest Reserve.

Future Use: Same.

TMK 5-9-1:3

Lot 151-A

Owners: Charles R. Wichman, P.O. Box 656, Honolulu, HI 96809.

Frederick B. Wichman, P.O. Box 297, Hanalei, HI 96714.

Holbrook W. Goodale, 3429 Hinahina St., Lihue, HI 96765.

Present Use: Conservation.

Future Use: Same.

TMK (Kuhio Highway)

Lot 151-B

Owners: State of Hawaii, Department of Transportation

Present Use: Conservation.

Future Use: Widening of Kuhio Highway.

TMK (Kuhio Highway)

Lot 151-C

Owners: State of Hawaii, Department of Transportation

Present Use: Conservation.

Future Use: Widening of Kuhio Highway.

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHLI VALLEY SPECIAL SUBZONE
MASTER APPLICATION - INFORMATION REQUIRED FOR CONDITIONAL USE

TMK (Kuhio Highway)
Lot 152-B
Owners: State of Hawaii, Department of Transportation
Present Use: Conservation.
Future Use: Widening of Kuhio Highway.

TMK 5-9-1:21
Lot 71
Owner: F. Langwith Berry, P.O. Box 999, Los Altos, CA 94022
Present Use: Conservation.
Future Use: Same.

TMK 5-9-1:3
Lot 153
Owner: State of Hawai'i.
Present Use: Conservation/State Park.
Future Use: Same.

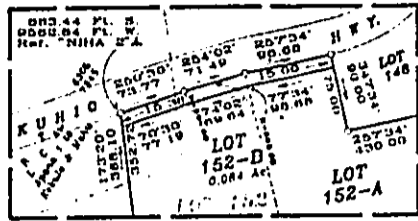
TMK 5-9-3:30
Lot 147
Owner: Holbrook W. Goodale, 3429 Hinahina St., Lihue, HI 96765.
Present Use: Home site.
Future Use: Same.

TMK 5-9-3:38
Lot 146
Owner: Alexander L. Faye, Jr., 7495 Alder Ct., Pleasanton, CA 94566
Present Use: Conservation.
Future Use: Same.

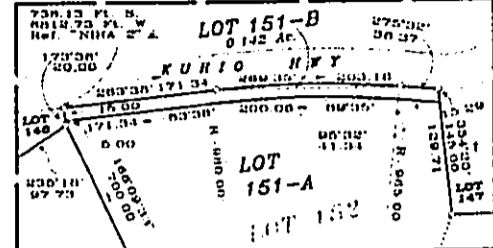
TMK 5-9-6:01
Exclusion 26
Owner: Donald and Jill Canaparo, P.O. Box 382, Aptos, CA 95001
Present Use: Home site.
Future Use: Same.

TMK 5-9-6:07
Exclusion 27
Owner: Gordon and Roberta Haas, P.O. Box 237, Hanalei, HI 96714
Present Use: Home site.
Future Use: Same.

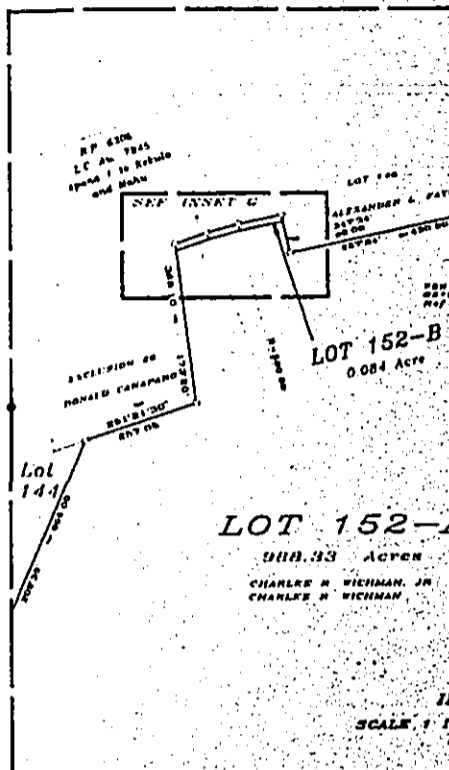
TRUE NORTH
SCALE 1 INCH = 1000 FEET



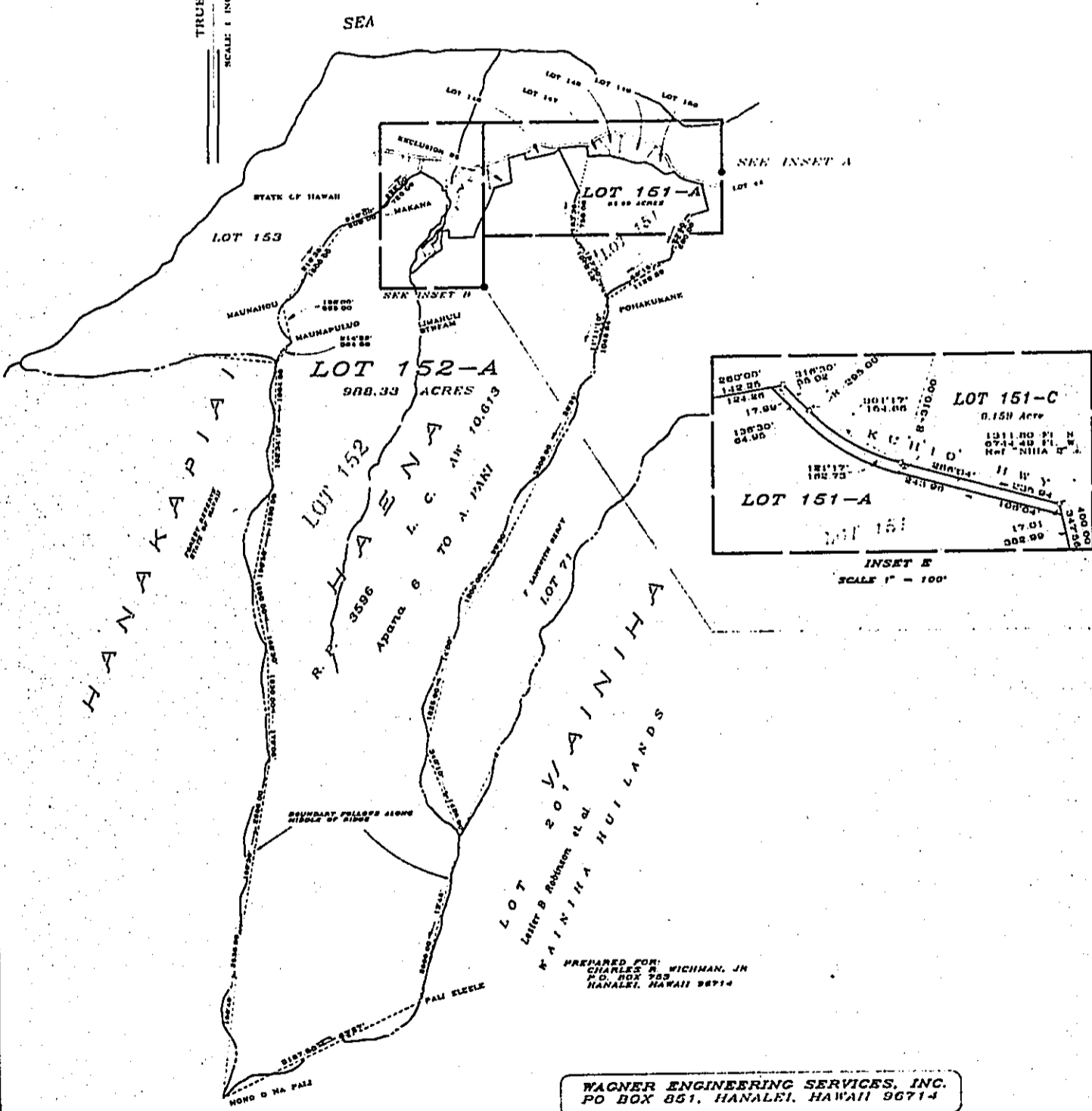
INSET C
SCALE 1" = 100'



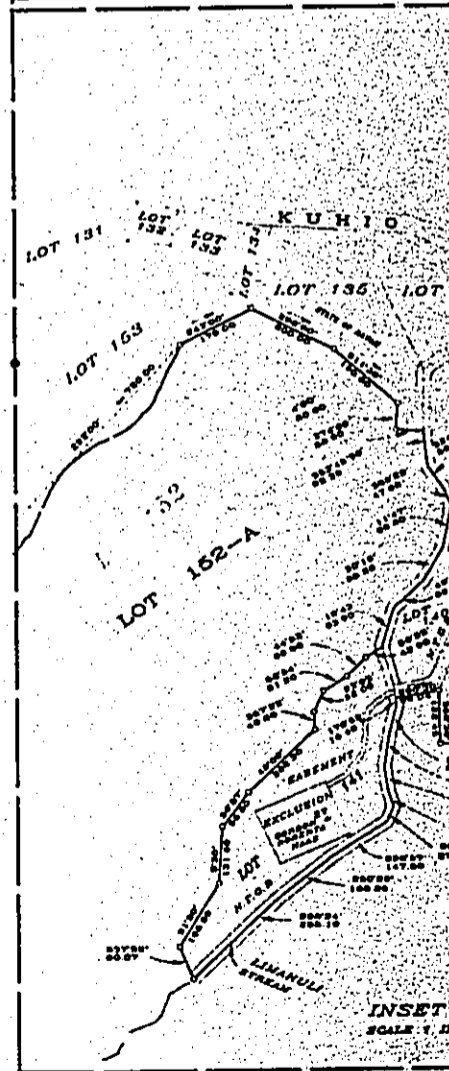
INSET D
SCALE 1" = 100'



SCALE 1 INCH = 100 FEET



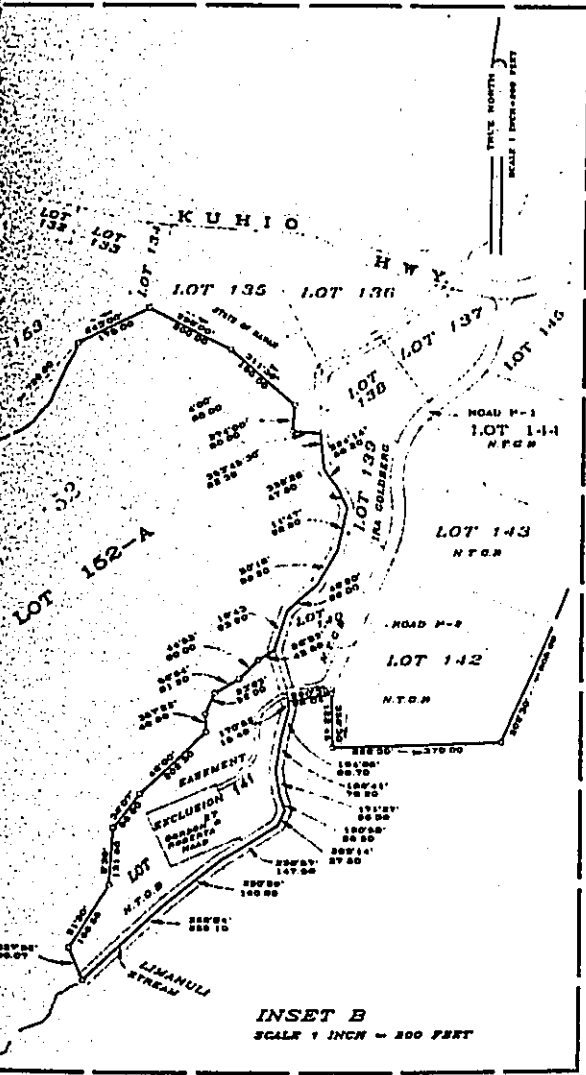
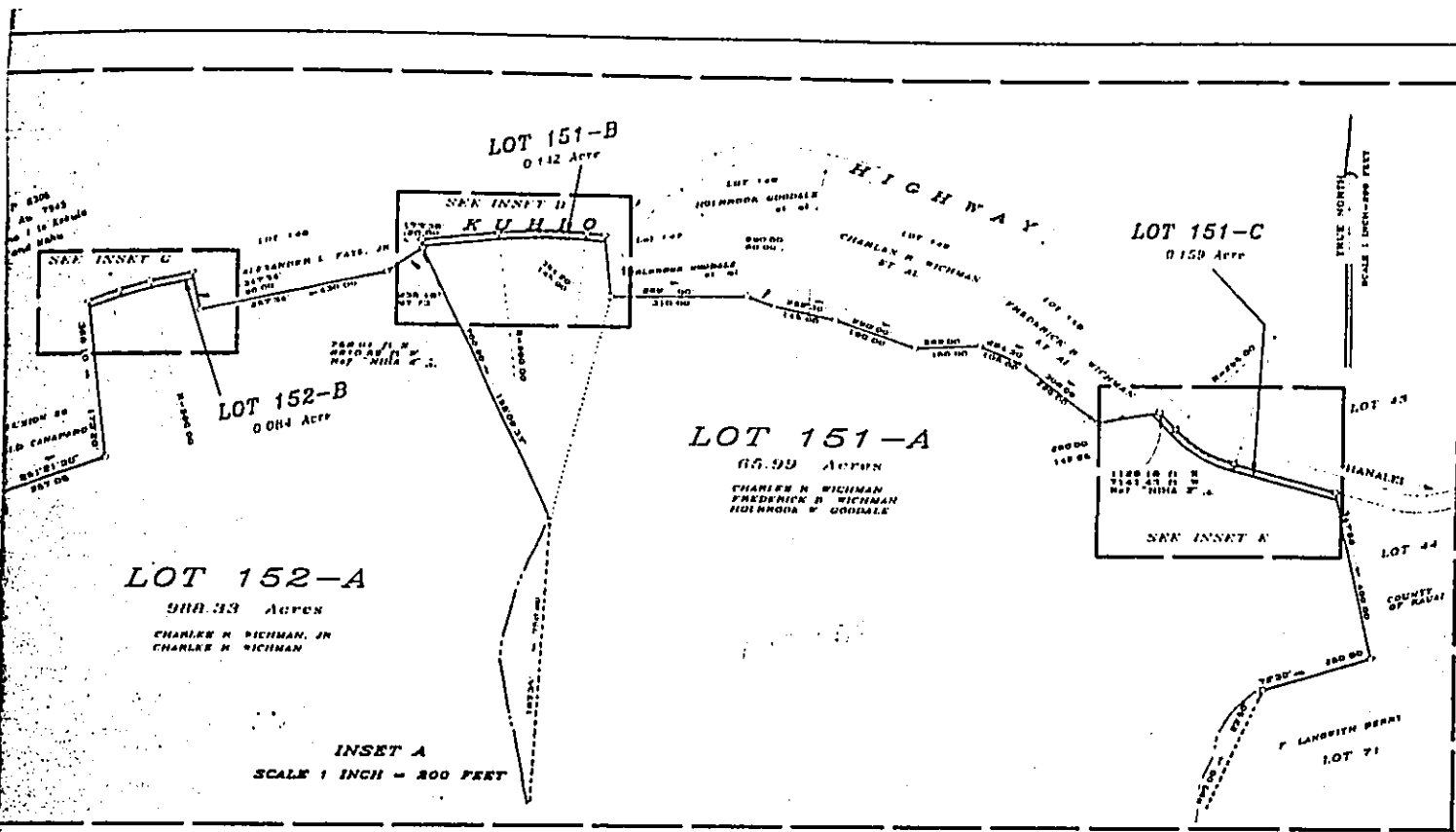
WAGNER ENGINEERING SERVICES, INC.
PO BOX 851, HANA LEI, HAWAII 96714



INSET E
SCALE 1" = 100'



INSET F
SCALE 1" = 100'



MAP SHOWING
CONSOLIDATION of
LOTS 151 and 152
HAENA HILL LANDS
AND SUBDIVISION
ETC
LOTS 151-A, 151-B, 151-C, 152-A, and 152-B
 Being
Portions of the AHUPUAA OF HAENA
ROYAL PATENT 3596, LAND COMMISSION AWARD 10,613
APANA 6 to Abner Paki and
ROYAL PATENT 6306, LAND COMMISSION AWARD 7945
APANA 1 to Kekula and Mahu
 Situated at
HAENA, HALELEA, KAUAI, HAWAII

NOTE: NAMES OF ADJOINING OWNERS FROM AVAILABLE TAX MAPS



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
Ronald J. Wagner
RONALD J. WAGNER
 Registered Professional Land Surveyor
 Certificate No. 5074
 October 21, 1991

FINAL MAP ACCEPTED ON **JUN 15 1992**
 (Date)
[Signature]
 Planning Department



This map was approved by the Planning Committee of the County of Kauai, at their meeting on **JUN 25 1992**
[Signature]
 Approved by **[Signature]**
 Chairman, Planning Committee
 County of Kauai

CDUA EXHIBIT 4
CONSOLIDATION & SUBDIVISION MAP
LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDENS

PROJECT No. 0128

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
MASTER APPLICATION - INFORMATION REQUIRED FOR CONDITIONAL USE

TMK 5-9-6:10

Lot 139

Owner: Ira and Lasca Goldberg, 3386 Haas Dr., Aptos, CA 95003

Present Use: Conservation

Future Use: Possible home site.

TMK 5-9-6:11

Lot 138

Owner: Ira and Lasca Goldberg, 3386 Haas Dr., Aptos, CA 95003

Present Use: Conservation

Future Use: Possible home site.

TMK 5-9-6:12

Lot 137

Owner: Tim Dunn, P.O. Box 3238, Hanalei, HI 96714

Present Use: Home site.

Future Use: Same.

TMK 5-9-6:13

Lot 135

Owner: State of Hawaii

Present Use: Conservation/State Park.

Future Use: Same.

TMK 5-9-7:01

Lot 134

Owner: State of Hawaii

Present Use: Conservation/State Park.

Future Use: Same.

B. Site Plans

Site Plan including dimensions and shapes of lots, their metes and bounds, and easement roads P-1 and P-2 (CDUA Exhibits 1-2, and 4).

Existing Features including vegetation, water areas, utilities, and roads (CDUA Exhibit 3, and MP Exhibit 7).

C. Construction Plans

At this time, only conceptual drawings, descriptions, and maps have been included in the Master Plan (MP Exhibits 12-20, and 21; pages 42-43, and 84) to indicate the general nature and design of the physical facilities, their tentative locations, and the types of structures (including their architectural style and approximate size) the NTBG plans to construct.

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
MASTER APPLICATION – INFORMATION REQUIRED FOR CONDITIONAL USE

As part of this application (see Special Requests on page 8), the NTBG is requesting permission from the DLNR which will allow them to submit the detailed construction and maintenance plans required for each of its physical facilities, after the funds have been raised for the design and construction of that specific facility. If the special requests are approved by the DLNR, the construction of the planned physical facilities (MP pages 41-42, 61 and 84) should be completed according to the Phases indicated in the Master Plan (MP pages 44, 63, 85, and 92).

D. Maintenance Plans

Detailed maintenance plans for the NTBG's underground transmission of its electrical, telephone and water utilities, its drainage systems and roads will be submitted with the detailed construction plans at the appropriate time (see above).

E. Management Plans

Management plans have been developed that address both the natural and cultural resources in Limahuli Valley. These management plans seek not only to preserve and protect these resources, but under the appropriate circumstances to improve them (MP pages 12, 23, 79-81, 90, and 93-99).

F. Historic or Archaeological Site Plans

None of the historic or archaeological sites located on the applicants' property are currently on the State or Federal Register. It is probable that when the NTBG completes its planned study and documentation of the archaeological sites that exist in Limahuli Valley, they will be added to the State Register (Nancy McMañon HPP, pers. comm.).

II. Subzone Objective: Demonstrate that the intended use is consistent with the objective of the subject Conservation District Subzone (as stated in Title 13, Chapter 2).

The objective of the Special Subzone (as stated in Title 13, Chapter 2, Section 13-2-15) is: *to provide for areas possessing unique developmental qualities which complement the natural resources of the area.* Furthermore, Section 13-2-15(7) states that the Limahuli Valley Special Subzone is designated for *educational, recreational, and research purposes.*

The National Tropical Botanical Garden's intended use of Limahuli Valley for educational, recreational, and scientific use is entirely consistent with the objective of the Special Subzone as stated above. In fact, the Limahuli Valley Special Subzone was created at the request of the applicants for the purposes of the NTBG's Master Plan for Limahuli Gardens and Preserve. The applicants did this because they believe that the development of the Limahuli Gardens and Preserve

CONSERVATION DISTRICT USE APPLICATION FOR THE LIMAHULI VALLEY SPECIAL SUBZONE
MASTER APPLICATION - INFORMATION REQUIRED FOR CONDITIONAL USE

will not only compliment the natural resources of the area, but will enhance their preservation and protection.

Some of Limahuli's natural resources that will benefit from the proposed action are its native biota, pristine stream, natural beauty, and ideal environment for many native plants. These resources will make possible the development of a garden and preserve dedicated to preservation, education and research. At the same time, the development of the garden and preserve will act to protect, perpetuate, and in many cases, improve the existing state or condition of these resources.

This action will not only benefit the people of Hawai'i and the United States by protecting their natural and cultural resources, and providing educational and recreational opportunities for them, but it will also benefit researchers throughout the world who are interested in Hawai'i's unique flora. Thus this action not only compliments the natural resources of the area, but it also compliments the interests of the people of the United States and researchers throughout the world.

Several of the unique qualities that make this area ideal for the development of a botanical garden and preserve dedicated to growing the threatened and endangered plants species of Hawai'i are:

- (1) Limahuli Gardens and the Lower Limahuli Preserve contains representative portions of ecosystems which are the natural habitat for over 70% of Kauai's and roughly 56% of the Hawaiian Islands endangered species of flowering plants;
- (2) The area is already dominated by alien plant species. In the Proposed Garden Area (MP Exhibit 4) there is no need to remove native plants, no matter how common, to make room for others, no matter how rare. The 1% of this area's vegetation which is still native plants consists mostly of mature trees around which clearing can be easily done;
- (3) The development and operation of a botanical garden and preserve is economically feasible only in an area which has good access, available utilities, adequate irrigation water, and nearby residential areas from which to draw staff.

The Limahuli Valley is thus a unique area which meets all the criteria of the Special Subzone designation. Realizing this, the BLNR established the Limahuli Valley Special Subzone in December 1992. Approval of this CDUA will now allow the NTBG to implement its master plan for this area, which in turn will further protect, preserve, and perpetuate the natural and cultural resources of the area while providing unique educational, recreational, and research opportunities to the public.

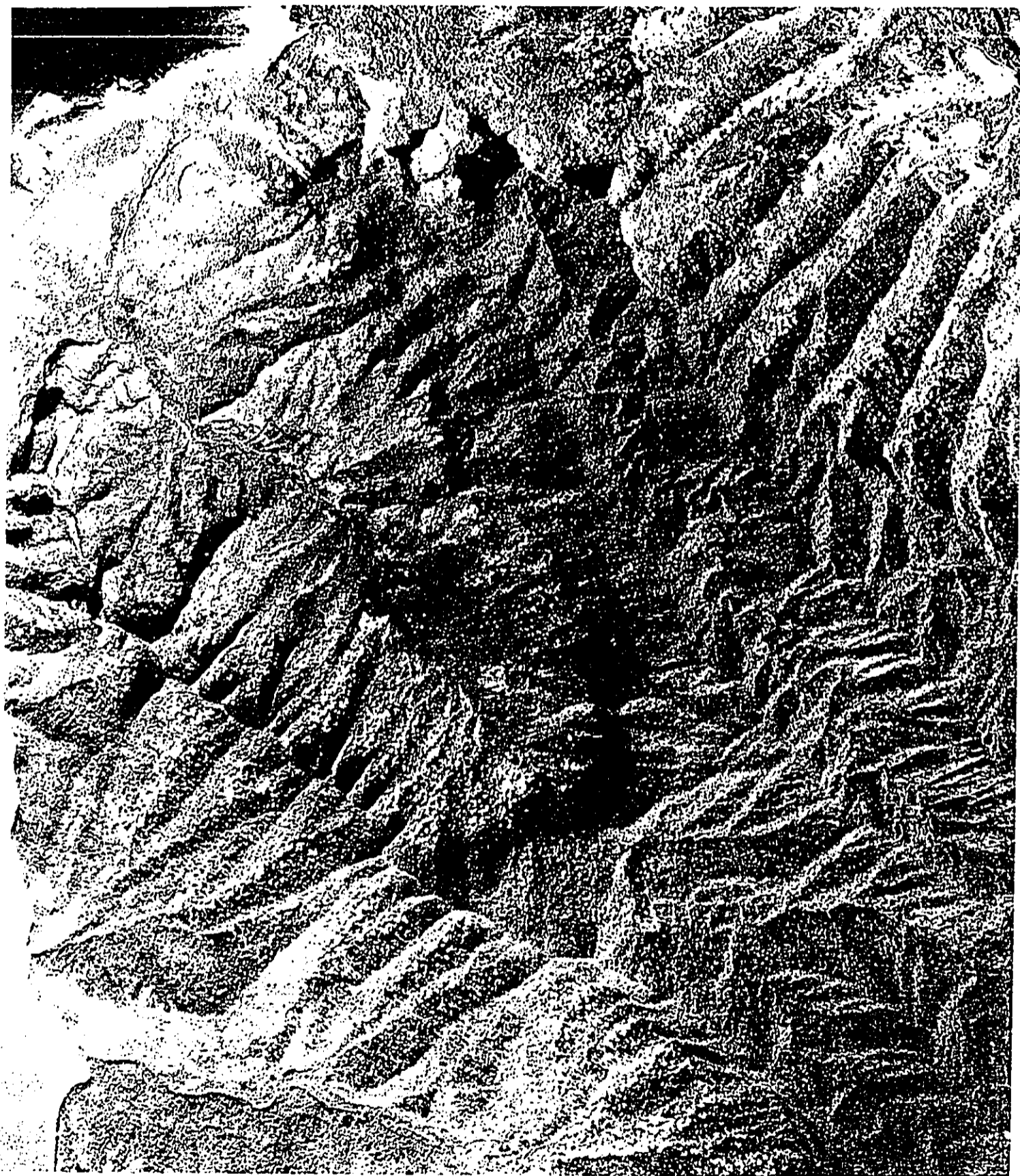
**LIMAHULI GARDENS AND PRESERVE
CONSERVATION DISTRICT USE APPLICATION
APPENDICES**

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHLI GARDENS AND PRESERVE
MASTER APPLICATION

APPENDIX 1

PHOTOGRAPHS OF APPLICANTS' PROPERTY

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Overview of Limahuli Valley Taken by R. M. Towill Corp., 1963

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Hill planted with day lilies and iris



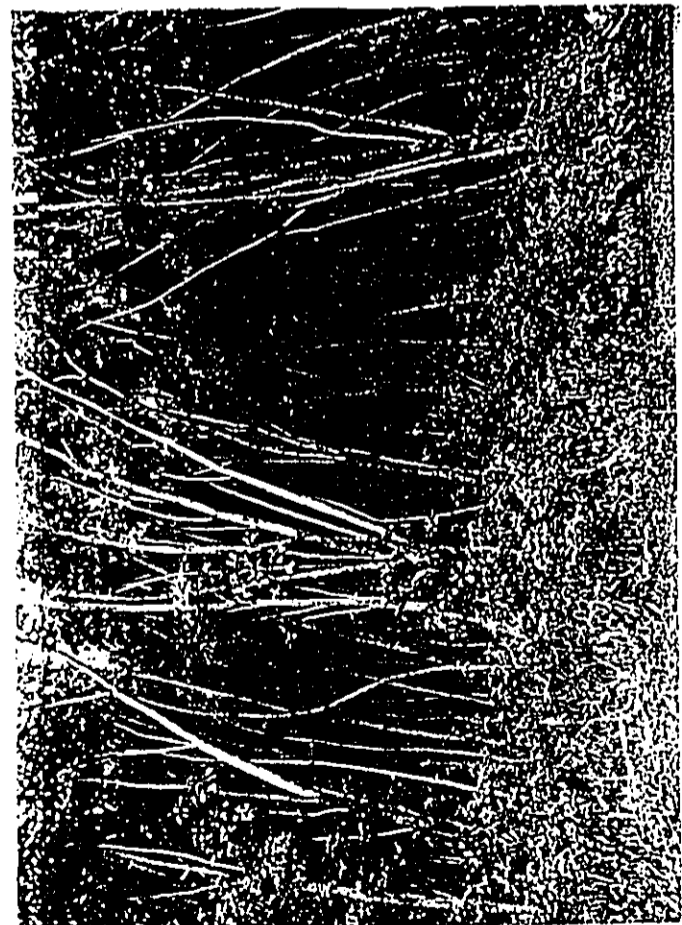
Existing Garden Area



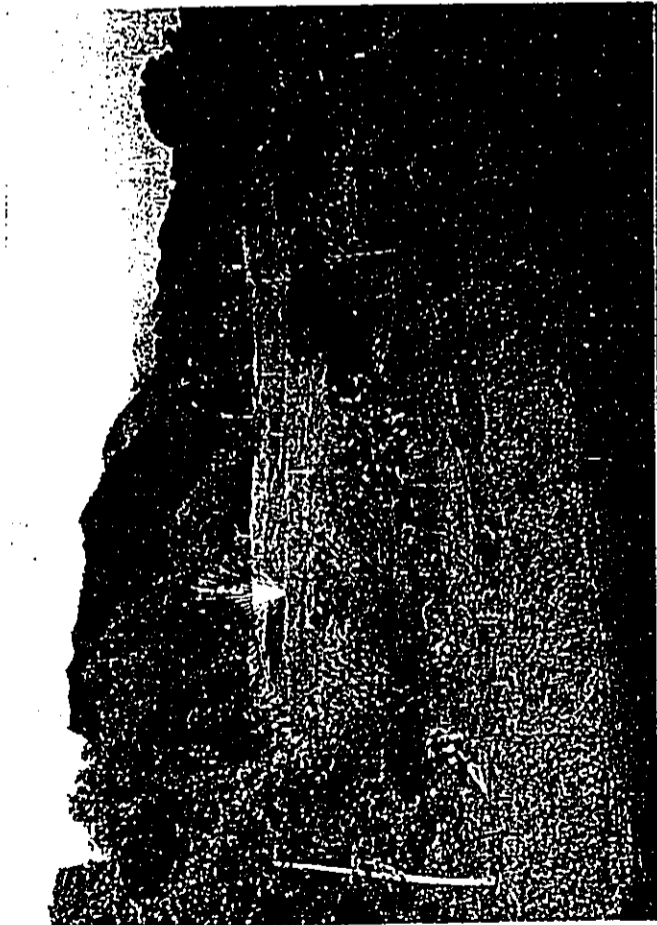
Location designated for new toolhouse



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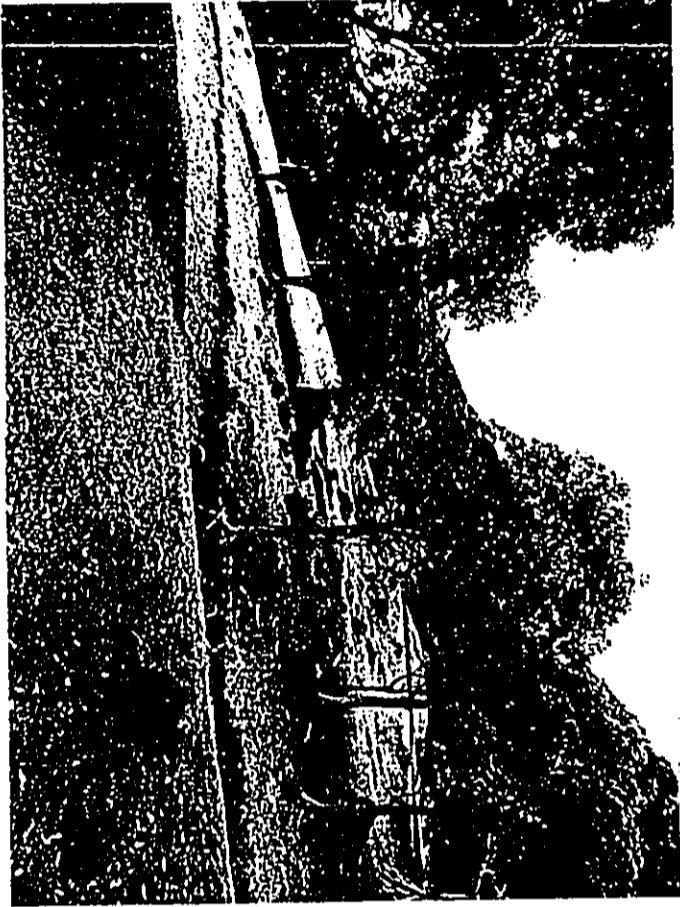


Aggressive alien plants surrounding the Garden Area



Existing Front Entrance at Kuhio Highway

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Existing Garden Area



Existing Garden Area



Location designated for new toolhouse



100

APPENDIX 2

A TOUR OF LIMAHULI GARDENS

BY

Doug and Barbara Luhmann

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CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE MASTER APPLICATION - APPENDIX 2

INTRODUCTION

We invite you on a photographic journey of beauty and adventure as we tour the north west coast of Kaua'i. Here you will find 15 miles of rugged and magnificent scenery known as the Nā Pali coast, which is only accessible by boat, helicopter or the Kalalau trail.

Join us as we discover the gentle white beaches and tranquil shores of summer whose abundant treasures beckon beachcombers; the many sea caves whose mysteries add adventure for the daring traveler; and the raging surfs of winter which crash against the towering black lava cliffs. Inland on the trail you will find hanging valleys with ancient terraces in which cultivated *taro* patches grow among the gnarled *kukui* trees; where tumbling streams form magnificent waterfalls and cascade 3000 feet over the cliffs to the ocean below.

Come with us now, as we travel along the Nā Pali coast, sharing with you its picturesque beauty and describing its ancient myths and legends.



Limahuli Valley with Ha'ena State Beach in the foreground. To the right of the valley is Makana Point, the beginning of the Nā Pali coast.

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CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE MASTER APPLICATION - APPENDIX 2

LIMAHULI VALLEY

Leaving our base in Princeville, we drove the short distance down highway 560 to the Ha'ena area, to keep our appointment with Charles Wichman, Jr., Superintendent-Horticulturist at the National Tropical Botanical Garden's satellite in the Limahuli Valley. Limahuli is not considered part of the Nā Pali coast, but much of Nā Pali's history, legends and plant life have ties with this valley, so it was a natural starting point for our tour. Charles Wichman was a wonderful source of information, and the text that follows, only scratches the surface of the facts he gave us.

Limahuli is located in the *ahupua'a* (land division) of Ha'ena on the northwest coast of Kaua'i. The ancient Hawaiian *ahupua'a* system was created so that each division of land would be self sufficient. The *ahupua'a* of Ha'ena was a classic example, for it included all of the resources found in Limahuli (eg., the stream, the fertile soil, the plants and animals) as well as the marine resources of the off-shore reefs and deep sea fishing rights.

Mr. Wichman told us that people often ask him, "what is the meaning of Limahuli?" An interpretation that was given to him by a native-speaking *kupuna* (elder) is "turning hands", and refers to the hands of the *maka'āinana* or common people who lived and worked in Limahuli Valley. It was their hands that over hundreds of years, turned and cultivated the soil for their crops and turned thousands of rocks while making the countless stone *lo'i* terraces that still exist today in this valley. It was the "turning hands" of the *maka'āinana* that searched daily among the rocks in the stream for the *iwi* (shellfish), the *ōpae* (shrimp) and the *o'opu* (endemic fresh water fish).

The large number of ancient *lo'i ai*, or agricultural terraces (literally food terraces) in Limahuli indicate that the valley was densely populated, as was all of Hawaii before the arrival of foreign diseases. There are still remnants of the crops the ancient Hawaiian's cultivated, such as *kalo* or *taro*, banana, *'awa* (used to make an intoxicating beverage), *olonā* (used for cordage), *māmaki* (used for making *tapa* cloth) and *ōlena* (used for medicine and spices).

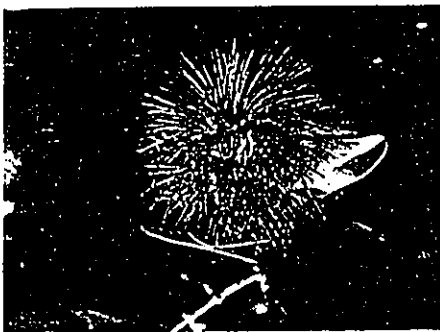
Habitation of the valley is thought to have started approximately 1,000 years ago and, through the practice of *mālama'aina* (caring for the land as if it was a child), the essential natural resources of the valley were never exhausted or polluted. The ancient Hawaiians carefully rotated their crops and allowed the *lo'i ai* to lie fallow while enriching them with organic matter. Their *kapu* system enforced a strict code of conservation by limiting the times and amounts of natural resources that could be harvested within the *ahupua'a*. It also addressed their pollution of the stream, ocean and earth, and the penalty for breaking a *kapu*, in severe cases, was death. Although it was a strict, well-enforced system, it allowed the ancient Hawaiians to live on these islands, islands that contained a limited amount of natural resources, for over 1,000 years. (Continued on page 7)



Mr. Charles "Chipper" Wichman, Jr.,
Superintendent-Horticulturist, of the
Limahuli Gardens, Ha'ena.

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CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE MASTER APPLICATION -- APPENDIX 2



*At the entrance of the Limahuli Garden, ancient terraces have been re-cultivated, as they were over 1,000 years ago (above). The Ō'hi'a lehu (*Metrosideros polymorpha*) is commonly known as the rain flower and is one of the native plants of the island. Its flowers can be red, salmon or yellow (left).*

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CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE MASTER APPLICATION - APPENDIX 2

Legend tells us that the Menehune people were some of the original inhabitants of the valley, and that they left en masse to avoid contamination of their blood-line by later arrivals. Today, there is the same kind of concern for preserving the integrity of Limahuli's plant life. When the island of Kaua'i was first formed, a new plant arrived about every 70,000 years. With the arrival of the white man, the native ecosystems were dealt a near-fatal blow by the introduction of herbivores and alien plants (not native to Hawaii).

Between 1778 and 1800, cattle, goats and sheep (herbivores) were introduced to Hawaii. Because these new animal introductions were valuable sources of meat, they were protected and encouraged to multiply. The cattle even gained protection under a royal kapu, and eventually they proliferated to the point that large herds roamed the islands severely damaging the native forests. In addition to the immense damage done by the cattle, the goats and sheep ate the native plants in many steep rocky areas that were inaccessible to the cattle.

A few alien plants were first introduced by the ancient Hawaiian, but after the coming of the white man, the alien plants began arriving in ever-increasing numbers. Today, botanists estimate that over 4,600 alien plant species have been brought to Hawaii in the last 200 years. This compares with the 280 plants that nature brought to Hawaii over 5.5 million years. Today, man has completely altered the balance of nature, and many hundreds of these alien plant species have become naturalized and are occupying an ever-increasing percentage of Hawaii's many ecosystems.

The end result is that today, scientists have only remnants of Hawaii's unique biota left to study. It is the goal of the Limahuli Gardens and Preserve to protect and preserve the last vestiges of Hawaii's natural history, and to educate the public about their importance.

The modern history of this area shows a real lack of proper management. After the Great *Māhele* (division of land) of 1848, the Limahuli Valley became the property of an absentee landlord from Oahu, who had no real *aloha* (love) for either Kaua'i or in particular, Limahuli Valley. During this period it had no designated use and was used primarily to graze wild cattle belonging to the inhabitants of the Ha'ena area. This was a very destructive time for Limahuli Valley. Not only were the native ecosystems greatly degraded, but also a vast number of archaeological sites were severely damaged by these large clumsy animals.

In 1955, at the request of the Ha'ena Hui (the Ha'ena Hui had bought the ahupua'a of Ha'ena in 1875), the fifth circuit court of Hawaii began partition proceedings on the land. It was a difficult process and took 12 years, or until 1967, to complete. During the process, the court recognized the desire of Mrs. Juliet Rice-Wichman to see the valley preserved and, thus, assigned her 1,005 acres of Limahuli Valley. Mrs. Wichman, a *kama'āina* of Kaua'i (native born), moved to Ha'ena in 1946 and immediately recognized the need to preserve and protect Limahuli Valley. In 1967, following her wishes, the cows were removed and the valley was fenced in. From 1967 to 1971, a garden was developed and roads were put in. In 1971, the project was put on hold because of Mrs. Wichman's involvement with the establishment of the Kaua'i museum. During the hiatus, invasive alien plants took over the areas that had previously been denuded by the wild cattle. In 1976, Mrs. Wichman decided the future of the valley. She wanted to preserve the native plants and the pristine stream for future generations.

At this time, 15 acres at the mouth of the Limahuli Valley were donated to the National Tropical Botanical Gardens. The remaining 990 acres she gave to her grandson, Charles Wichman, Jr. (Continued on page 11)

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CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION – APPENDIX 2



View of the garden looking north to the ocean. This part of the garden has been cleared (above). Much of the garden though, is still overgrown (left).

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CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE MASTER APPLICATION - APPENDIX 2

After having served his apprenticeship at NTBG in Lawai, and having earned a degree in tropical horticulture from the University of Hawaii, he took over as superintendent-horticulturist of the Limahuli Gardens. Although Charles Wichman is the owner of most of the Limahuli Valley, he considers himself more the steward of the land. The original inhabitants of the valley believed that the gods owned the land and they were merely the caretakers. The concept of ownership was as foreign to them, as it is to Mr. Wichman.

Presently, Limahuli Valley is not open to the general public, although NTBG is currently asking the State for permission to operate a visitors program in the valley. Until the State grants approval of this program, the Limahuli Gardens may be visited only by members of the NTBG. (Membership information is available from the N.T.B.G., P.O. Box 340, Lawai, Kaua'i, HI 96765 or Limahuli Gardens, P.O. Box 808, Hanalei, Kaua'i, HI, 96714.) In addition to visitation by members, the garden is also used as a living classroom for students, who are brought on tours.

NTBG is currently developing a master plan for the gardens and the valley. Its main goal will be to preserve and protect the native plants and especially those on the endangered list. The *'ohi'a lehua* tree is one of the native trees being preserved, and its flowers can be red, salmon or yellow. There are examples of all three in the Limahuli Gardens. Examples of other endemic species currently being preserved or planted in the gardens are: pinwheel gardenias (*Gardenia remyi* and *Gardenia brighamii*), various species of hibiscus and the majestic *koa* trees which the Hawaiians brought with them and/or utilized after finding them here in Hawaii. A few examples of these plants are the *kalo* or *taro* (*Colocasia esculenta*), the banana (*Musa troglodytarum*), the *hala* (*Pandanus tectorius*), the *hau* (*Hibiscus tilliaceus*), and the *kukui* (*Aleurites moluccana*). The front part of the garden is dedicated to growing tropical plants of beauty like gingers, heliconias and other ornamental plants adapted to Limahuli's environment.

The valley is a natural treasure house of native plant materials, and during a recent survey of the flora conducted by NTBG, sixteen types of plants which exist nowhere else in the world were identified. The very nature of the valley's shape and isolation is perhaps partly responsible for this situation. These plants have developed over thousands of millions of years isolated in the bottom of Limahuli Valley by the precipitous valley walls that rise to some 2,000 feet. These plant species have developed in two botanical ecosystems: the "Lowland Rainforest" and the "Mixed Mesophytic Forest." These two ecosystems were the original homes of 70% of Kaua'i's endangered plant species and 59% of the state's. It is therefore extremely important that these areas be preserved.

In addition to these valuable plant resources, Limahuli also contains one of the few easily accessible pristine streams on Kaua'i, with many of the native fish and crustaceans still living in it. In the back of the valley there is a magnificent waterfall which drops 1,000 feet to feed the stream. The area above the waterfall, is almost inaccessible, and when research work needs to be done in this area, scientists are flown in by helicopter. It was this area of the valley that was used by the ancient Hawaiian's to collect colorful feathers from the native birds to make the intricate feather cloaks and helmets for the *ali'i*. The feather cloaks required thousands of feathers, and the collectors developed an interesting technique for getting them. (Continued on page 16)

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CONSERVATION DISTRICT USE APPLICATION FOR LIMAHLI GARDENS AND PRESERVE
MASTER APPLICATION - APPENDIX 2



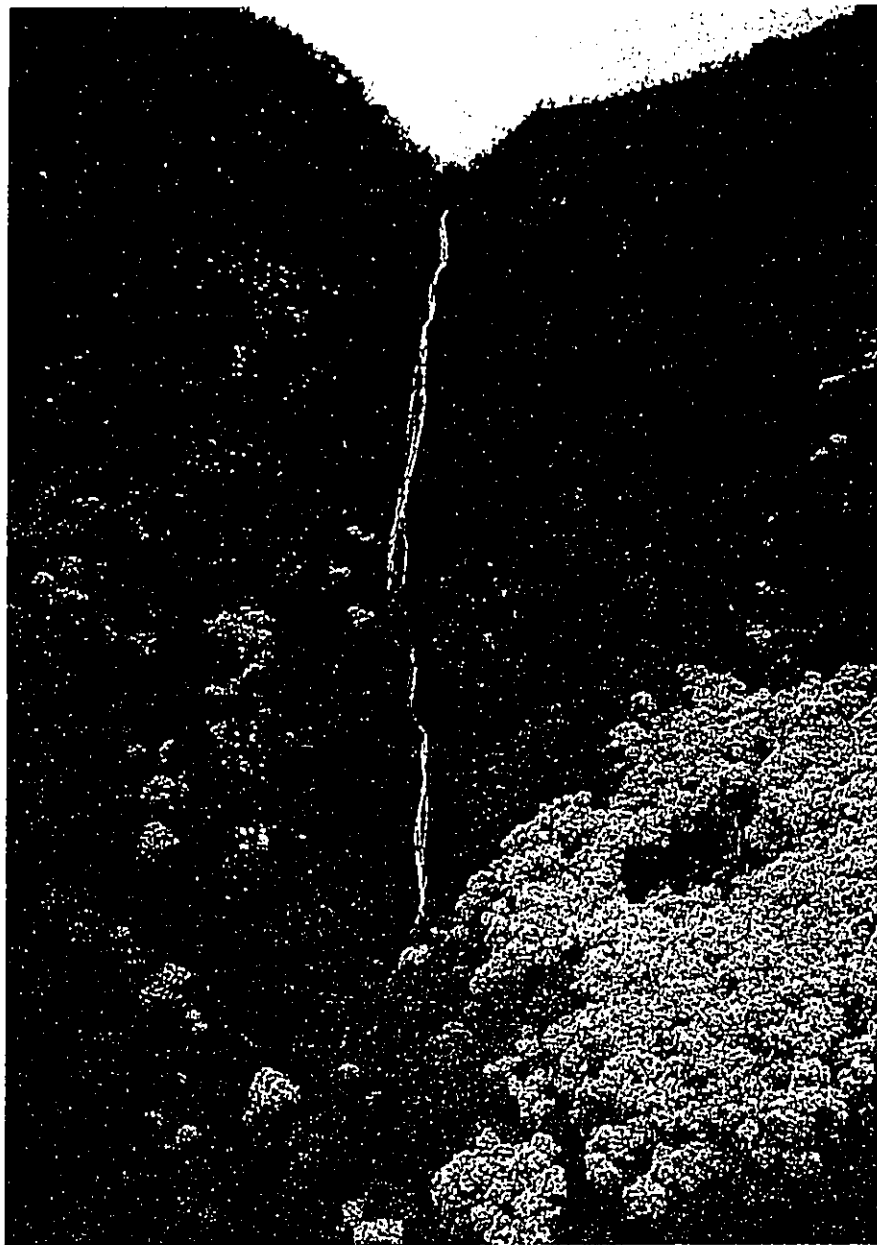
The Pāpala Kepau tree contains a gummy substance which was used by feather hunters to trap the birds.

*The yellow strawberry guava trees (*Psidium cattleianum* f. *lucidum*) are alien trees that pose a serious threat to the native ecosystems in Hawaii.*

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CONSERVATION DISTRICT USE APPLICATION FOR LIMAHLI GARDENS AND PRESERVE
MASTER APPLICATION -- APPENDIX 2

The magnificent Limahuli waterfall drops 1,000 feet to the valley floor, feeding the pristine stream.

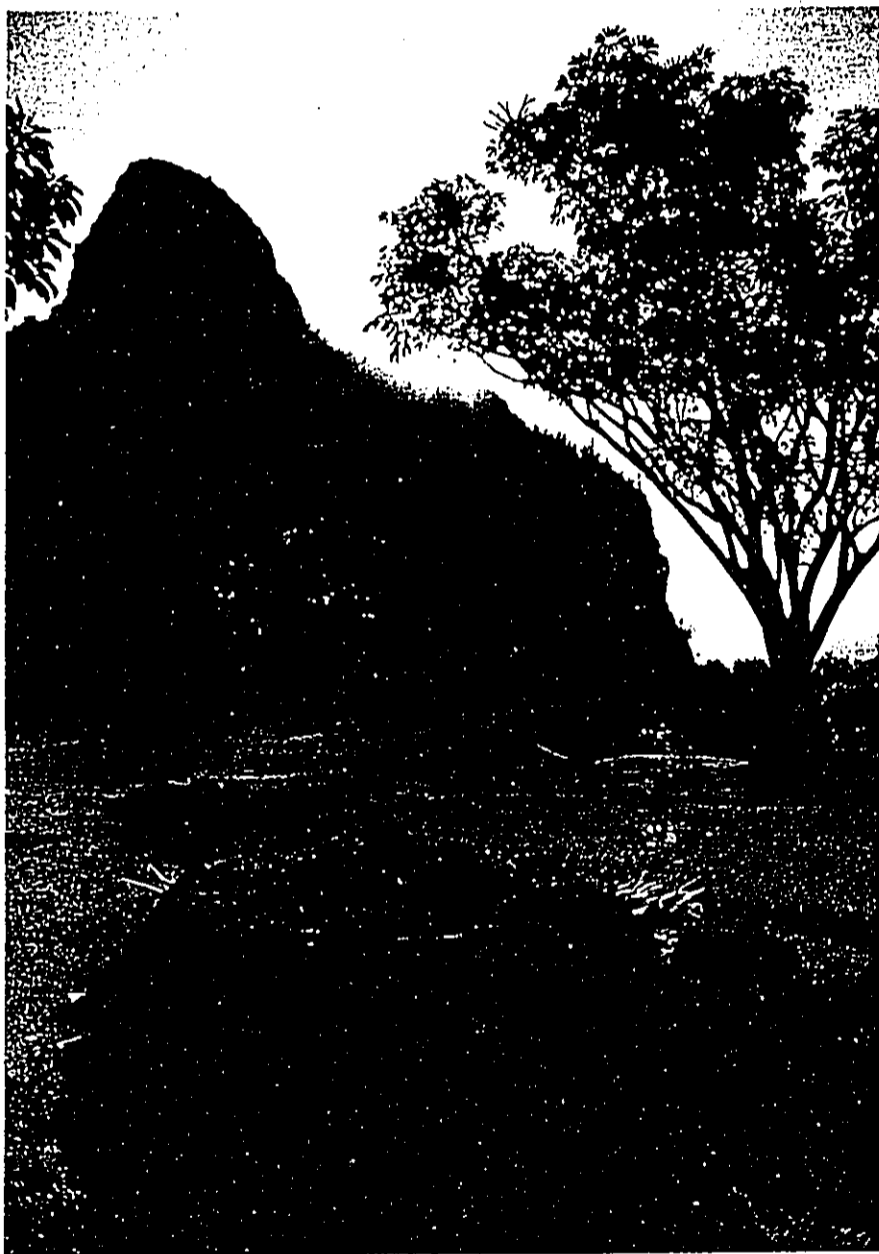


The Koa (Acacia kaulaensis) is endemic to Hawaii. These trees are what the ancient Hawaiians used to carve their canoes out of.



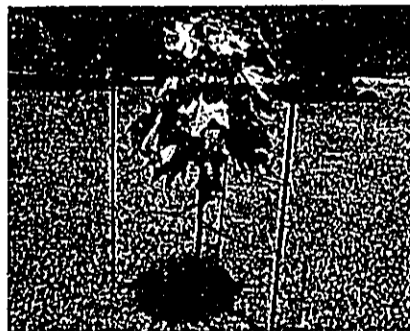
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MASTER APPLICATION - APPENDIX 2



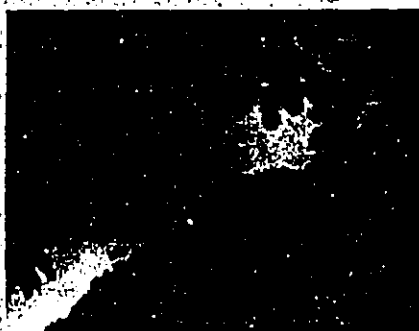
Sunset at Makana Point illuminates an ancient agricultural altar which was used by the Hawaiians to ensure a bountiful harvest.

This Kokio hauheleula (Kokia kanaiensis) is one of the rarest endemic trees in Hawaii today.



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CONSERVATION DISTRICT USE APPLICATION FOR LIMAHLI GARDENS AND PRESERVE MASTER APPLICATION - APPENDIX 2



Legend of Pōhaku-o-Kāne

The *pāpala kepau* tree contains a gummy substance which is very sticky. The hunters would put this gum on the end of a stick, and attach a flower to it, which attracted the birds. The stick was then put in a tree, and when the bird alighted on it, the gum would trap it. The birds' feathers were then plucked and the birds released. In theory the feathers were to be taken without killing the birds. In order not to have to return to the village for food, the feather hunters planted kalo and bananas in natural drainages. Remnants of these plants still exist in this area even after 200 years.

It is not known what archaeological treasures the valley may yield since very little archaeological survey work has been done and no excavations have taken place, except in the coastal sand dunes fronting the valley. In several locations in the garden, there are huge rocks, which were obviously placed there for a specific purpose. One such rock is believed to have been an agricultural altar. It was believed that by offering taro to the gods the harvest would be made more bountiful. The valley is undoubtedly an archaeological treasure house, as well as a botanical one.

It is difficult to describe Limahuli, for not only is it a place of infinite beauty, but it has a certain mystical quality. According to Mr. Wichman, Limahuli is full of "mana" (supernatural, or divine power), which can be felt by those in close communion with nature. Mystics from all over the world have visited Limahuli and affirmed its power. One mystic attributed it to the two huge mountains at either side of its entrance, *Pōhaku-o-Kāne* and *Makana*. *Makana*, is famous as the peak from which firebrands were hurled out over the ocean and viewed from both Limahuli and Kē'ē. *Pōhaku-o-Kāne* has a legend concerning the large stone perched near its summit. In the early times before man, rocks had life, and three rocks, two brothers and a sister decided to journey to Kaua'i. Leaving the ocean, the sister, *O'o-a'a* decided to stay on the reef and fell asleep in the warm sun. Reaching the sand dune, one of the brothers, *Pōhakuloa* decided this was the place for him, and he fell asleep. The third brother decided he wanted to climb the tall mountain, so that he could watch everything that went on. Every time he tried to reach the top, he would fall back down, breaking off pieces of himself. He caused so much commotion that the great god, *Kāne*, came to him and asked him what he was doing. He told *Kāne* his reasons, and *Kāne* said that he would get up there and fall asleep like his brother and sister. He promised *Kāne* he wouldn't, and so *Kāne* lifted him to the summit, and in return he would watch over everything and report to *Kāne*. According to the legend, if the rock ever falls from the mountain, the world will end.

At the end of our tour, we all felt overwhelmed by the magnitude of NTBG's and Mr. Wichman's project in Limahuli Valley, and relieved that there are people who care so much about the natural and cultural history of Hawaii. We lingered in the garden enjoying its beauty and tried to imagine how it must have been hundreds of years ago.

The following day we planned to visit the heiau at Kē'ē and survey the Kalalau trailhead there:

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CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION

APPENDIX 3

LIMAHULI WATER USE DECLARATIONS

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JOHN WAIHEE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P. O. BOX 621
HONOLULU, HAWAII 96809

WILLIAM W. PATY
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MICHAEL J. CHUN, Ph.D.
ROBERT S. NAKATA
RICHARD H. COX
GUY K. FUJIMURA
MANABU TAGOMORI
DEPUTY

April 18, 1990

Mr. Charles R. Wichman, Jr.
Limahuli Gardens
National Tropical Botanical Garden
P.O. Box 808
Hanalei, HI 96714-0808

File Reference: NATL TROP BOT

Dear Mr. Wichman:

Notice to Declarants of Water Use

Enclosed is a copy of amended recommendations regarding declarations of water use which were adopted by the Commission on Water Resource Management at its special meeting on February 28, 1990. These recommendations replace the earlier staff recommendations which were a part of the submittal mailed to all declarants last December.

There is now a 180 day deadline in effect to amend declarations which describe instream uses (Category 2), no existing use (Category 3), or which are incomplete (Category 4). This deadline does not affect declarations which have been accepted as being reasonably complete and describing an actual existing use (Category 1). The commission staff will verify the Category 1 uses and conduct other activities necessary to issue certificates of water use.

Our records currently show that your declarations have been placed in Categories 1 and 3. Category 3 refers to unused existing sources, proposed future uses, or claims for water rights. The commission staff has described your actual existing use (Category 1) as follows:

Water is taken from Limahuli Stream via a 3" pipe at each of two diversion points, and from an unnamed tributary via two 2" pipes at a third diversion point. The water is used for irrigation of 0.3 acres of taro and kalo, and approximately 0.2 acres of specimen plants on 8 acres of grounds for Limahuli Gardens. During periods of drought, approximately 8 acres of lawns are irrigated as well.

NOTE: Please confirm whether the pipe sizes (estimated from photos) are accurate.

April 18, 1990

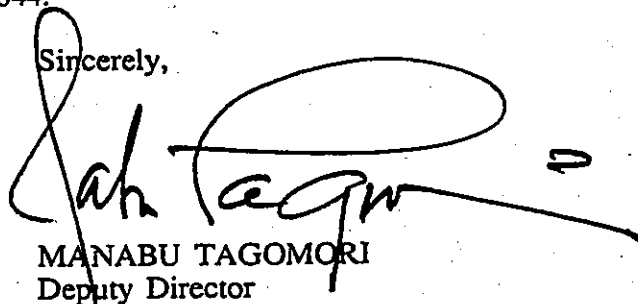
Page 2

If you have not already done so, please write to confirm whether this summary is accurate, advise us of any changes which should be made, and provide additional information. The enclosed sheet dated March 21 (Enclosure #2) describes what is required and how to amend your declarations. When you write to us, clearly indicate that it is regard to file reference *NATL TROP BOT, Kauai*, which has been assigned to you.

The deadline for you to amend your Category 3 declaration(s) is October 15, 1990. You are required to do this only if you have an actual existing use (as of May 1988) which we placed in Category 3 because it was not properly declared.

If you have questions regarding additional information to amend your declaration, please phone the commission staff in Honolulu at 548-2316 or 548-3948. Neighbor island residents can reach these and other state government numbers toll-free through the government switchboard at 1-800-468-4644.

Sincerely,



MANABU TAGOMORI
Deputy Director

Encls.:

- (1) Amended Recommendations
- (2) Additional Information Sheet



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

May 25, 1990

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Commission on Water Resources
DLNR, State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96813

RE: *NATL TROP BOT, Kauai*

Dear Mr. Tagomori:

I am writing you in response to your letter of April 18, 1990 requesting more information about our water use in Limahuli Gardens, Ha'ena, Kaua'i.

The description of our declared use is not totally accurate. Water is taken from Limahuli Stream at two different points. The diversion located on Lot 152, elevation @ 180 feet, uses a single 4" pipe. The other diversion located on Lot 140, elevation @ 120 feet, uses two 4" pipes. Our diversion from an "unnamed tributary" is correctly described.

I hope that the above information fulfills your needs. Please feel free to contact me at anytime should you need more information or intend to make a site inspection.

Sincerely,

Charles R. Wichman Jr.
Diversion Works Operator
Limahuli Gardens

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION

APPENDIX 4

APPLICANTS' INTEREST IN PROPERTY

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHLI GARDENS AND PRESERVE
MASTER APPLICATION - APPENDIX 4

Appendix 4 provides the written evidence (as required in the Master Application) of the applicants' interest in Lots 140, 141, 142, 143, 144, 145, and 152, which are the subject of this Conservation District Use Application.

Proof of the NTB's ownership of Lots 140, 141, 142, 143, 144, and 145:

A Deed of Gift, dated December 21, 1976, conveying Lot 140, together with a nonexclusive easement over roads P-1 and P-2, from CHARLES RICE WICHMAN to the PACIFIC TROPICAL BOTANICAL GARDEN, is recorded at the DLNR's Bureau of Conveyances of the State of Hawai'i in Liber 11897, Pages 415 et seq.

A Deed of Gift, dated March 14, 1977, conveying Lots 141 and 142, together with a nonexclusive easement over roads P-1 and P-2, from CHARLES RICE WICHMAN to the PACIFIC TROPICAL BOTANICAL GARDEN, is recorded at the DLNR's Bureau of Conveyances of the State of Hawai'i in Liber 12273, Pages 194 et seq.

A Deed of Gift, dated March 14, 1977, conveying an 11.28% interest in Lots 143, 144, and 145, together with a nonexclusive easement over roads P-1 and P-2, from CHARLES RICE WICHMAN to the PACIFIC TROPICAL BOTANICAL GARDEN, is recorded at the DLNR's Bureau of Conveyances of the State of Hawai'i in Liber 12273, Pages 202 et seq.

A Deed of Gift, dated June 16, 1977, conveying an 88.72% interest in Lots 143, 144, and 145, together with a nonexclusive easement over roads P-1 and P-2, from JULIET ATWOOD WICHMAN to the PACIFIC TROPICAL BOTANICAL GARDEN, is recorded at the DLNR's Bureau of Conveyances of the State of Hawai'i in Liber 12273, Pages 211 et seq.

Proof of Charles Rice Wichman's 11.28% ownership of Lot 152, Roads P-1 & P-2:

A COMMISSIONERS' DEED, dated November 17, 1967, conveying an 11.28% interest in Lot 152, and Roads P-1 and P-2, from the COMMISSIONERS of the Fifth Circuit Court of Hawai'i to CHARLES RICE WICHMAN, is recorded at the DLNR's Bureau of Conveyances of the State of Hawai'i in Liber 5871, Pages 271 et seq.

Proof of Charles Rice Wichman Jr.'s 88.72% ownership of Lot 152, Roads P-1 & P-2:

A WARRANTY DEED, dated December 9, 1988, conveying an 88.72% interest in Lot 152, and Roads P-1 and P-2, from the TRUSTEES of the unrecorded Revocable Trust dated December 20, 1976, made by Juliet Atwood Wichman to CHARLES RICE WICHMAN JR, is recorded at the DLNR's Bureau of Conveyances of the State of Hawai'i in Liber 22733, Pages 382 et seq.

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHLI GARDENS AND PRESERVE
MASTER APPLICATION – APPENDIX 4

APPENDIX 5

**RESPONSES TO THE EARLY REVIEW
OF THE NTBGS MASTER PLAN FOR
LIMAHLI GARDENS AND PRESERVE**

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION - APPENDIX 5

THE MASTER PLANNING PROCESS

The preparation of this Conservation District Use Application (CDUA) and Master Plan for Limahuli Gardens and Preserve began over three years ago in early 1988, shortly after the withdrawal of the applicants' earlier application (CDUA KA-2065) in late 1987. During this time, the preparation process took on the following three stages:

1. **Consultation Period** (1/88 - 1/90). This first stage focused on studying and documenting the natural and cultural resources found in Limahuli Valley and the impacts of the applicants' proposal on them. Environmental, archaeological, and biological consultants were hired to provide the data necessary for an accurate environmental assessment of the applicants' Master Plan. During this stage the NTBG also solicited input from the community through public meetings and personal contacts. This process identified concerned groups and individuals, as well as issues that needed to be properly addressed in the Master Plan.
2. **Refinement Period** (1/90 - 10/90). As information became available from the applicants' consultants, the community, and concerned environmental groups; the preparation process began to focus on refining and modifying the applicants' original proposal. A new and much more detailed Master Plan was developed that outlined the many educational, recreational, and research opportunities that would be available for the public, while still preserving and protecting the natural and cultural resources of Limahuli Valley. A final draft of the new Master Plan for Limahuli Gardens and Preserve was finished in October 1990, and it included an indepth environmental assessment of the proposal.
3. **CDUA Preparation and Master Plan Review Period** (10/90 - 4/91). Once the final draft of the Master Plan had been prepared, the NTBG distributed copies for "early review" to all pertinent Federal, State, and County agencies, adjacent property owners, environmental groups, and concerned individuals. Using the comments received during this review, the Master Plan underwent a final analysis and refinement by the NTBG's staff. This CDUA was then prepared, based upon the revised Master Plan for Limahuli Gardens and Preserve.

RESPONSES TO THE EARLY REVIEW

Thus, from October 1990 until April 1991, the NTBG, in compliance with HRS 11-200-9, consulted with those agencies, citizen groups, and individuals that have either a vested interest in, or jurisdiction over, the future use of Limahuli Valley. All reviewers were asked to respond in writing directly to Charles R. Wichman, Jr., Assistant to the Director - Limahuli.

Appendix 5 contains 20 letters of response received by the NTBG during the review period, and the NTBG's written replies recognizing the comments and concerns that were voiced. Due to the significance and number of archaeological sites and features located on the applicants property, it is not surprising that several correspondences, and numerous phone conversations took place between the State's Historic Preservation Program (HPP) and the applicants. Since they directly relate to this review process, we have also attached copies of correspondences between the HPP and the applicants' archaeological consultants at the Bishop Museum.

JOHN WAIHEE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 821
HONOLULU, HAWAII 96809

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HISTORIC PRESERVATION
PROGRAM
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:OCEA:JN

File No.: 91-216
Doc. No.: 9494E

Mr. Charles R. Wichman, Jr.
Assistant to the Director - Limahuli
National Tropical Botanical Garden
Limahuli Gardens
P. O. Box 808
Hanalei, Kauai 96714

Dear Mr. Wichman:

Subject: Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i.
TMK: 5-9-01: 3; 5-9-06: 2-6, 8, and 9

Thank you for giving our Department the opportunity to comment on this matter. We have reviewed the materials you submitted and have the following comments.

Division of Aquatic Resources

We suggest caution be taken in any effort to improve the Limahuli Stream habitat through the removal of exotic organisms. Dr. Timbol's report indicates that there are currently no exotic fish species present. The Tahitian prawn, Macrobrachium lar, is ubiquitous in Hawaiian streams, and any attempt to control it could probably do more harm than good to the stream habitat. Otherwise, we find the Plan to be appropriately geared toward preventing adverse effects rather than intervening to mitigate adverse impacts.

We would like you to consider the implementation of a long-term monitoring program to evaluate natural population cycling of stream organisms. Please contact Bill Devick at 548-5897 in our Honolulu Office to discuss the details.

Division of State Parks

The Limahuli Gardens and preserve are adjacent to Haena State Park. The proposed development and public programs established by the master plan for Limahuli Valley do not appear to have a significant impact on our state park. However, the park may significantly affect public use demands on the valley.

Haena State Park currently has an estimated visitor attendance of 600,000+ visitors per year or well over 2,000 visitors per day when the weather is relatively good. Annual visitation has been increasing rapidly in the past few years, apparently as part of a general increase in Kauai's tourist industry. Limited recreation opportunities and limited space to develop and provide support services has led to crowded conditions in the park. Consequently, visitors may be looking for other attractions in neighboring areas and could create a demand that would be significantly greater than the 120 people per day proposed in the master plan.

In order to eliminate traffic congestion at the end of the road by Kee Beach, the parking lot near the wet cave will be improved and the road beyond this point will be closed. This will locate our main parking lot within 800 feet of the entrance road to Limahuli Valley. The park entrance at Limahuli Stream is only 100+ feet from their entrance road and this entrance needs to be improved with a sign, landscaping, and possibly a gate. Therefore, coordination of entrance designs should be of mutual benefit. If visitation to the Limahuli Gardens and Preserve is to be very limited, the valley road entrance should not attract the casual tourist seeking places of interest to visit.

In terms of the cultural and archaeological resources, the project areas in Limahuli Valley and Haena State Park form a single cultural unit. There is a continuity of features and cultural history between the two areas that is evident in the preliminary development of interpretive programs at the two sites. Therefore, it is important to recognize this continuity and seek to develop complementary programs, rather than duplicate one another. We support the effort of design facilities that blend with the cultural setting. It is recommended that buffers be created between the modern facilities and the traditional Hawaiian areas to maintain the historical integrity of the area.

In conclusion, we would encourage communication between NTBG and our Division of State Parks during the planning for these areas to address the above concerns.

Historic Preservation Program

We have reviewed the archaeological report (Appendix II) under a separate cover. For your information, it would be best to use the State of Hawaii Inventory Number for your site (50-30-02-1005 Limahuli complex) as the official site number. The Bishop Museum has their own numbering system, just as do many other contract archaeological firms. These numbers are either temporary numbers or numbers for their own information. Our numbers are official and used if the site is nominated to the State and National Registers of Historic Places.

An adequate archaeological inventory survey will be needed for the entire Special Subzone (page 19) in this Master Plan. The archaeological report actually only discusses sites within the current garden area (page 13). We agree with the Garden's conceptual plan to stabilize, preserve and interpret all significant sites. However, the survey is not thorough enough to establish which sites are significant. Limited subsurface testing needs to be done to obtain information on function and age of sites.

Once significant sites are clearly identified, then if these sites will be impacted in your development plan, a mitigation plan will need to be executed prior to development. For the sites to be preserved, a preservation plan with details for interpretation (i.e. brochures, sign text, etc.) and maintenance will need to be submitted to our office for review, in order to ensure adequate and accurate interpretation.

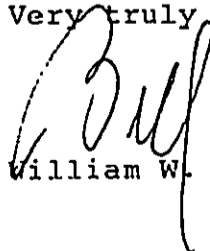
If you have any questions or need any information, please contact Ms. Nancy McMahon, our staff archaeologist, handling the County of Kauai, at 587-0047.

Division of Land Management

Although this proposal does not affect land or programs under our control, we support the idea of a Master Plan as opposed to piecemeal planning of uses for this special valley.

Thank you for your cooperation in this matter. Please call me or Cathy Tilton at our Office of Conservation and Environmental Affairs, at 548-7837, if you have questions.

Very truly yours,


William W. Paty



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

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WILLIAM L. THEOBALD
DIRECTOR

MICHAEL J. SHEA
GENERAL COUNSEL

Dear Mr. Paty:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

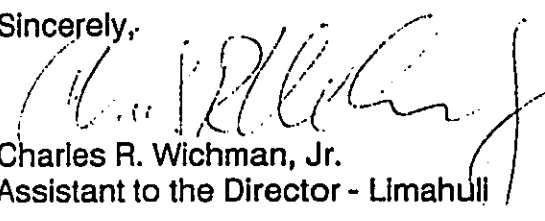
Thank you for taking the time to review and comment on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We greatly appreciate your support for our project in Limahuli Valley.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991.

In response to the comments received in your letter, Document No. 9494E (File No. 91-216), the NTBG has replied directly to the Division of Aquatic Resources, State Parks, and the Historic Preservation Program. Copies of these responses are enclosed.

Once again, I thank you for the time you and your staff have spent on this review and the strong support shown by the different divisions of the DLNR for our Master Plan. Feel free to call me at anytime if I can be of any help to you or your staff.

Sincerely,


Charles R. Wichman, Jr.
Assistant to the Director - Limahuli

Enclosures



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

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Mr. Ralston Nagata, Administrator
Division of State Parks
P.O. Box 621
Honolulu, Hawai'i 96809

Dear Mr. Nagata:

MRS. ALEXANDER S. ATHERTON
MRS. H. DILLINGHAM BARON
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**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

Thank you for taking the time to review and comment on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We received your comments through the Office of Conservation Environmental Affairs (OCEA), and we greatly appreciate your concerns and support for our project in Limahuli Valley.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991.

In reply to your comments we received through OCEA (Document No. 9494E, File No. 91-216), the NTBG shares your concern that, ". . .the Park may significantly affect public use demands of the valley". It is in this regard that the NTBG has incorporated the many limitations on its visitors program for both the Gardens and the Preserve (pages 40-41, 83-84). We are concerned that our focus remains as that of an educational resource, and not as a tourist attraction. We also agree that the design and construction of our entrance will be very important in controlling unwanted traffic from visitors going to the Ha'ena State Park.

We are looking forward to working with the Division of State Parks in coordinating the design of our entrance with that of the Ha'ena State Park. Please let me know immediately who I can contact in your Division to discuss this aspect of our Master Plan. It is imperative that we communicate now since two of our adjacent property owners who share Easement Road P-1, located between our entrance and Limahuli Stream, have expressed an interest in putting in a gate on Road P-1. I have encouraged them to sit down with me so that together we can formulate a unified entrance facility for Road P-1 and Limahuli Gardens. I am more than happy to include a representative from your Division in this process.

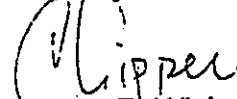
Mr. Ralston Nagata
April 18, 1991
Page 2

In regards to the interpretation of the archaeological and cultural resources in the Ha'ena area, we are in complete agreement that both of our interpretive plans need to be coordinated. I have communicated informally with Ms. Martha Yent (Archaeologist for the Division of State Parks) in the past, and I will continue to work with Ms. Yent and Ms. Nancy McMahon (Archaeologist for the State Historic Preservation Program) towards coordinating our interpretive plans so that they complement those being developed for the Ha'ena State Park.

As you have noted, we have spent considerable efforts in designing Garden facilities that blend in with the cultural settings. We will definitely use buffers between modern facilities and traditional Hawaiian areas to maintain the historical integrity of said areas.

Once again, I thank you for the time you and your staff spent on this review and the strong support you have shown for our Master Plan. Please inform me as soon as possible of a contact person at the Division of State Parks that I can work with on the design of our entrances and the coordination of the interpretation of the archaeological and cultural resources that are located in the *ahapua'a* of Ha'ena. Feel free to call me at anytime if I can be of any help to you or your staff.

Sincerely,



Charles R. Wichman, Jr.
Assistant to the Director - Limahuli

cc: Mr. William W. Paty
Chairperson, BLNR

JOHN WAIHEE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
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November 14, 1990

Mr. Charles R. Wichman, Jr.
Assistant to the Director
Limahuli Gardens and Preserve
National Tropical Botanical Garden
P. O. Box 808
Hanalei, Kauai, HI 96714

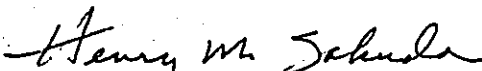
Dear Mr. Wichman:

In accordance with your request of October 31, 1990, we have reviewed the Master Plan for Limahuli Gardens and find it to be supportive of your request for a "Special Subzone" within the Conservation District.

We suggest caution be taken in any effort to improve the Limahuli Stream habitat through the removal of exotic organisms. Dr. Timbol's report indicates that there are currently no exotic fish species present. The Tahitian prawn, Macrobrachium lar, is ubiquitous in Hawaiian streams, and any attempt to control it could probably do more harm than good to the stream habitat. Otherwise, we find the Plan to be appropriately geared toward preventing adverse effects rather than intervening to mitigate adverse impacts.

We would like you to consider implementation of a long-term monitoring program to evaluate natural population cycling of stream organisms. Please call Bill Devick at 548-5897 in our Honolulu office to discuss the details.

Very truly yours,


HENRY M. SAKUDA, Administrator
Division of Aquatic Resources



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

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WILLIAM L. THEOBALD
DIRECTOR

MICHAEL J. SHEA
GENERAL COUNSEL

Mr. Henry M. Sakuda, Administrator
Division of Aquatic Resources
Department of Land and Natural Resources
1151 Punchbowl Street, Room 330
Honolulu, Hawai'i 96813

Dear Mr. Sakuda:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

Thank you for taking the time to review and comment on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We greatly appreciate your support for our project in Limahuli Valley.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991.

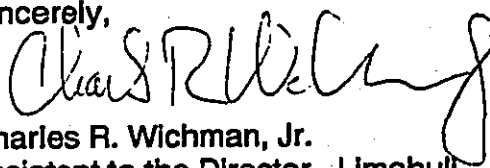
In response to your comments of November 14, 1990, the NTBG will, of course, use extreme caution in any effort to improve the habitat of Limahuli Stream through the removal of alien organisms. In order to clarify this point even more in our Master Plan, we will rephrase Guideline #5 which is found on page 99 of the Master Plan. It will now read, "*The NTBG should take advantage of. . . and thus improve the habitat for the native organisms without adversely affecting the aquatic environment of Limahuli Stream or any of the native organisms that live there. No attempt to improve the habitat of Limahuli Stream should be undertaken without prior consent of the State's DAR.*"

In response to your second comment, we feel that the Aquatic Research Program described on page 83 of the Master Plan does indeed constitute a long-term monitoring program that will evaluate the natural population cycling of stream organisms. In order to clarify this point, this section has also been revised to now read, "*. . . macrofauna in the Limahuli Stream. Over a long period of time, this program will yield valuable information on the natural population cycling of stream organisms. In order to be comprehensive, this program will also include the study of sections of the stream. . .*".

Mr. Henry M. Sakuda
April 18, 1991
Page 2

Once again, I thank you for the time you and your staff spent on this review and the strong support you have shown for our Master Plan. Feel free to call me at anytime if I can be of any help to you or your staff. I look forward to working with the Division Aquatic Resources in the future to protect and preserve the priceless resource of Limahuli Stream.

Sincerely,



Charles R. Wichman, Jr.
Assistant to the Director - Limahuli

cc: Mr. William W. Paty
Chairperson, BLNR

JOHN WAIHEE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
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December 11, 1990

Charles R. Wichman, Jr.
Assistant to the Director-Limahuli
National Tropical Botanical Garden
P.O. Box 808
Hanalei, Hawaii 96741

Dear Mr. Wichman:

SUBJECT: Historic Preservation Review -- National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve
TMK: 5-9-01: 3, 5-9-06: 2-6, 8, and 9
Haena, Hanalei, Kauai

We have reviewed the archaeological report (Appendix II) under a separate cover. For your information, it would be best to use the State of Hawaii Inventory Number for your site (50-30-02-1005 Limahuli Complex) as the official site number. The Bishop Museum has their own numbering system, just as do many other contract archaeological firms. These numbers are either temporary numbers or numbers for their own information. Our numbers are official and used if the site is nominated to the State and National Registers of Historic Places.

An adequate archaeological inventory survey will be needed for the entire Special Subzone (page 19) in this Master Plan. The archaeological report actually only discusses sites within the current garden area (page 13). We agree with the Garden's conceptual plan to stabilize, preserve and interpret all significant sites. However, the survey is not thorough enough to establish which sites are significant. Limited subsurface testing needs to be done to obtain information on function and age of sites.

Once significant sites are clearly identified, then if these sites will be impacted in your development plan, a mitigation plan will need to be executed prior to development. For the sites to be preserved, a preservation plan with details for interpretation (i.e. brochures, sign text, etc.) and maintenance will need to be submitted to our office for review, in order to ensure adequate and accurate interpretation.

If you have any questions or need any information, please contact Ms. Nancy McMahon, our staff archaeologist, handling the County of Kauai, at 587-0047.

Sincerely,

A handwritten signature in black ink, appearing to read "Don Hibbard".

DON HIBBARD, Director
Historic Preservation Program

COPY



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

January 10, 1991

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DIRECTOR

MICHAEL J. SHEA
GENERAL COUNSEL

Mr. Don Hibbard
Director, Historic Preservation Program
State Historic Preservation Division
33 South King Street, 6th Floor
Honolulu, Hawaii 96813

Dear Mr. Hibbard:

Subject: Historic Preservation Review -- National Tropical Botanical Garden's Master Plan for Limahuli Gardens and Preserve

Thank you for your letter of December 11, 1990 which included your comments about our Master Plan for Limahuli Gardens and Preserve. I was able to discuss your suggestions and concerns with Nancy McMahon and would like to respond with the following information.

As stated in the Master Plan on pages 94 and 95 (points 2,3,5,6, & 9), the NTBG does plan to complete indepth archaeological surveys and studies of the entire Garden Area and the Lower Limahuli Preserve. These will include mapping, subsurface testing, age, use, and site significance data that will make them adequate "inventory" surveys useful in the interpretation and preservation of these sites.

Unfortunately, due to the high cost of quality archaeological field work, the NTBG cannot afford to have all of this work performed at one time. Instead, the archaeological work will be done in steps or phases that will correspond with the development of the Garden Area and the Lower Limahuli Preserve.

NTBG's highest initial priority is the implementation of its programs in Limahuli Gardens (page 61). Because of this, the completion of subsurface testing and interpretation of the sites located within the Proposed Garden Area (Exhibit 4, page 15) will naturally precede the archaeological work planned in the Lower Limahuli Preserve (even though this area has many interesting and valuable sites).

Mr. Don Hibbard
January 10, 1991
Page 2

Once funding for the Gardens' programs has been secured, work on the Lower Limahuli Preserve will be initiated with the establishment of a well-maintained trail (page 85). This will then allow NTBG staff and other researchers, including archaeologist, access to this vast area (about 600 acres). Due to the sheer size of this area, the large number of sites and features, and the dense vegetation the archaeological study of this area will undoubtedly be a long-term project requiring many years to complete (page 83). In spite of the large expense and long-term nature of the archaeological work planned in Limahuli Gardens and the Lower Limahuli Preserve, it is a very important part of the NTBG's Master Plan.

The NTBG does not, however, plan any archaeological work for the Upper Limahuli Preserve. This area is nearly inaccessible and will not be developed by the NTBG. It will be used only on a very limited basis for research (pages 89 - 92). Past reconnaissance surveys in this area for native plants have not indicated the existence of any archaeological sites. Physically, it would be almost impossible to conduct an archaeological survey of this area due to the dense vegetation, rugged terrain, and lack of accessibility (access requires the use of a helicopter).

Due to these factors, the NTBG respectfully requests that the Historic Preservation Program reconsider its recommendation that the NTBG complete an adequate inventory survey of the entire Special Subzone. The NTBG feels that the Upper Limahuli Preserve should be exempt from this recommendation or requirement. If future research surveys conducted in this area indicate any archaeological sites or features, these can and will be studied on an individual basis to determine their age, use, and significance.

On the subject of site significance, the NTBG will work with our archaeological consultants at the Bishop Museum to give a significance rating to the sites that have already been mapped. Although a significance rating will be helpful in prioritizing future archaeological field work and site interpretation, the NTBG continues to feel that all of the ancient archaeological features and sites, both on and off our property, are significant and worth preserving (see page 69). We do not plan to limit our preservation efforts to only those sites that are deemed significant by our archaeological consultants or by the State's Historic Preservation Program, but will attempt to preserve any authentic site or feature within our control.

Mr. Don Hibbard
January 10, 1991
Page 3

Because of this outlook, the NTBG does not anticipate a negative **Impact** to occur on any of Limahuli's sites or features as a result of our development plans. As our Master Plan indicates on pages 63 and 86, the removal of the alien vegetation and replanting of the Garden Area and Lower Limahuli Preserve will act to stabilize the archaeological features located in these areas. Your staff has seen the value of this kind of work during their visits to the Gardens. To safeguard all archaeological sites and features from the impacts of construction, all physical facilities will be located and constructed in a manner that will avoid any negative impact to surrounding sites or features (pages 68 - 69, & 87). Of course, **prior** to the construction of any physical facility the NTBG will provide your office with detailed site plans, construction plans, and if necessary mitigation plans for approval. In addition, your staff is always welcome to personally visit Limahuli to discuss your concerns and offer suggestions and ideas that will help us in our preservation effort.

On the interpretation and preservation of these sites, the NTBG is looking forward to working with your staff on the interpretation and preservation of not only the sites located in Limahuli Valley but also the study, interpretation, and preservation of the many other sites located within the *ahupua'a* of Ha'ena (pages 93-95). We value your staff's expertise and experience in the accurate presentation and interpretation of ancient sites. We will be consulting with them not only out of requirement, but out of a true and genuine desire to provide the most adequate and accurate interpretation possible. The accurate interpretation of the many archaeological sites located within the *ahupua'a* of Ha'ena is essential for our educational programs and for the NTBG to reconstruct the series of events and changes that the Limahuli Valley has undergone since the arrival of the ancient Hawaiian immigrants.

The preservation, study, and interpretation of the many archaeological sites and features located in Limahuli Valley is a very high priority to the NTBG. As your staff knows from past visits (including the recent field trip that was a part of the Curator Workshop of December 8-9, 1990) the NTBG's staff spends many hours of hard labor maintaining the sites and features located in Limahuli. We are committed 100% to the preservation of our cultural resources.

Mr. Don Hibbard
January 10, 1991
Page 4

Today it seems that many of the developers and property owners in Hawai'i are not aware or admitting the significance of the archaeological sites located on their property. Regardless of the reasons for this, it seems that the public has now been stereotyped (perhaps rightly so) as a poor steward of the cultural resources of our State. I hope as time goes by, you will realize that this is not the case in Limahuli Valley. It is, and always has been, the goal of our family and the NTBG (starting with my grandmother, Juliet Rice Wichman in the 1940's, and continuing with the NTBG in the 1990's) to preserve and perpetuate Limahuli's natural and cultural resources. In this regard, the goals of the Historic Preservation Program and the NTBG's Limahuli Gardens and Preserve are one and the same. We thus can look forward to many years of future cooperation as partners in protecting this area together.

Sincerely,



Charles R. Wichman, Jr.
Assistant to the Director - Limahuli

JOHN WAIHEE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
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March 5, 1991

Charles Wickman
Assistant to the Director - Limahuli
National Tropical Botanical Garden
Limahuli Gardens
P.O. Box 808
Hanalei, Kauia, Hawaii 96714

Dear Mr. Wickman:

SUBJECT: Historic Preservation Review - National Tropical
Botanical Garden's Master Plan for Limahuli Gardens
and Preserve
Haena, Hanalei, Kauai

Thank you for your letter of January 10, 1991. I appreciate the time you took to respond to our concerns. I understand that you have spoken with Ms. McMahon of my staff and have gone over some of the details of this letter.

I appreciate your concerns for historic sites and realize that a survey of the entire project area (Special Subzone) at this time would be impossible to complete. I agree that adequate inventory surveys can be conducted at a later date in various phases of proposed development for the Garden Area and Lower Limahuli Preserve.

Thus, we will alter our recommendation that an adequate archaeological inventory survey be conducted over the entire Special Subzone. Since the Upper Limahuli Preserve is inaccessible and will not be developed, this area can be excluded. At this point, adequate archaeological inventory survey is needed only in areas of proposed development.

A revised archaeological survey report has been submitted to our office by the Bishop Museum. In brief, it addresses our concerns which were sent to the museum (letter dated 12/11/90). The museum has addressed all our concerns at this point.

We greatly appreciate your effort in attempting to preserve all historic sites and features found in the project area. The next

Charles Wichman
March 5, 1991
Page Two

step that will be needed to ensure that preservation acceptably occurs is to develop preservation plans (interpretation, etc.). These should be submitted to our office for review. Since much of Limahuli is under dense vegetation, when future garden development occurs in new areas, additional survey work will be needed and quite likely mitigation in the form of preservation or archaeological data recovery.

We hope this information will be useful for your CDUA. If you have any questions, please contact Ms. Nancy McMahon at 587-0006.

Sincerely,



DON HIBBARD, Administrator
State Historic Preservation Division

Attachment

cc: Roger Evans, OCEA

JOHN WAIHEE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
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December 11, 1990

Paul Cleghorn, Ph.D.
Bishop Museum
Applied Research Group
1525 Bernice Street
Honolulu, Hawaii 96817

Dear Dr. Cleghorn:

SUBJECT: Historic Preservation Review - Archaeological Mapping
and Reconnaissance Survey in Lower Limahuli Valley
(Patolo and Cleghorn June 1990, Bishop Museum)
TMK: 5-9-06: 2,3,4,5,6 (por. 8,9, and portions of
5-9-01:3)
Haena, Hanalei, Kaua'i

Thank you for submitting the above report and map for our review. Mr. Wichman has asked us to review this report. We believe the report is satisfactory as a reconnaissance survey report, but we wish you to know that it would not be acceptable as an archaeological inventory survey.

First, the project area is not completely surveyed. Your maps indicate dense vegetation covered some of the area, so those areas have yet to be surveyed. Thus, we cannot conclude that all historic sites are likely to have been found.

Second, only one site number was designated for the entire area. It seems that there are several sites in the area (i.e. house site (feature 80); agricultural terraces (feature 1-28, 56-64); mounds (feature 69,70). It seems actually that your one site is a complex consisting of multiple sites. This point needs to be clarified. [Also, Feature 87 on the map is not located. The report lists 89 features, only 87 features are discussed and only 86 features are located on the map. These points need resolution.]

Third, the report does not present sufficient information to evaluate the significance of the sites. Surface descriptions are often too brief, lacking site and feature measurements, construction style, size of cobbles, boulders, etc. Representative photographs need to be included. No subsurface testing was done, so the depth and nature of deposits are unclear. Function is not given for every site (feature), and

Paul Cleghorn, Ph.D.
December 11, 1990
Page 2

there is no information on age of the sites. Overall settlement patterns of the ahupua'a and the project area are not summarized, either in the background section (using Mahele information and prior archaeology) or in the conclusions -- so context of the findings is difficult to evaluate.

Fourth, there are no significance evaluations of the site(s) using the criteria of the Hawaii Register of Historic Places.

Once the above items have been addressed in a future study, the findings will need to be submitted for review to our office.

If you have any questions on these matters, please contact our staff archaeologist handling the County of Kauai, Ms. McMahon, at 587-0047.

Sincerely,



DON HIBBARD, Director
Historic Preservation Program

CC: Charles Wichman, NTBG, Limahuli

JOHN WAIHEE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
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WATER RESOURCE MANAGEMENT

March 4, 1991

Dr. Paul Cleghorn, Leader
Bishop Museum
Applied Research Group
1525 Bernice Street
Honolulu, Hawaii 96817

Dear Dr. Cleghorn:

SUBJECT: Historic Preservation Review - Revised Archaeological
Mapping and Reconnaissance Survey in Lower Limahuli
Valley (Patolo and Cleghorn January 1991, Bishop
Museum)
TMK: 5-9-06: 2,3,4,5,6 (por. 8,9, and portions of
5-9-01:3)
Haena, Hanalei, Kaua'i

Thank you for submitting the above report. The revisions address
the concerns in our letter of December 11, 1990. We believe we
now can conclude our review.

Based on these revisions, we believed that the survey adequately
covered the current garden area. The survey map was very good and
will be quite useful as a reference tool. At present, we agree
that only one site number be designated for the features found,
although we may work with the Garden later to subdivide the
features into multiple sites. We concur that the Lumahuli Complex
(50-30-02-1005) is a significant historic site (under criteria D)
for its potential to yield information that is important to the
prehistory and history of the region and the state.

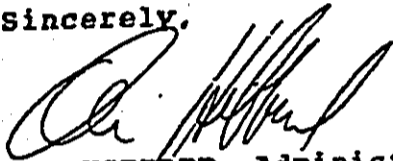
It is our understanding the National Tropical Botanical Gardens
will be preserving this historic site and its features. Based on
this information, we can agree with your recommendations that
development plans in the garden area will have "no adverse effect"
on significant historic sites. Eventually, a preservation plan
will need to be developed for the site. This will help the
landowner with interpretation, adequate buffers, maintenance,
etc. If plans change in the future, the mitigation plan will need
to be formally amended.

Paul Cleghorn
March 5, 1991
Page Two

We also agree that since much of the garden is in dense vegetation and therefore has not been surveyed, when any land altering activities take place in these areas, an adequate archaeological inventory survey will be required.

If you have any questions on these matters, please contact our staff archaeologist handling the County of Kauai, Ms. McMahon, at 587-0006.

Sincerely,



DON HIBBARD, Administrator
State Historic Preservation Division

cc: Charles Wichman, NTBG, Limahuli



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

Mr. Don Hibbard, Director
Historic Preservation Program
State Historic Preservation Division
33 South King Street, 6th Floor
Honolulu, Hawaii 96813

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WILLIAM L. THEOBALD
DIRECTOR

MICHAEL J. SHEA
GENERAL COUNSEL

Dear Mr. Hibbard:

SUBJECT: Historic Preservation Review - National Tropical Botanical Garden's Master Plan for Limahuli Gardens and Preserve, Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.

Thank you for your letter of March 5, 1991, in which you revised your comments in regards to the early review of the Master Plan for Limahuli Gardens and Preserve.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991.

In reply to your letter of March 5, 1991, we are pleased that you agree that "... *adequate inventory surveys can be conducted at a later date in various phases of proposed development for the Garden Area and Lower Limahuli Preserve.*" We also clearly understand the need to prepare "*adequate preservation plans*" which include the accurate interpretation of the archaeological sites located in Limahuli Valley. We are currently seeking funds for subsurface testing of the features in the Garden Area that were identified and mapped by the Bishop Museum. Once information gained from this subsurface testing becomes available, we will work closely with your staff to prepare preservation plans that are acceptable with your Division.

As you have indicated, since much of Limahuli Valley is under dense vegetation, it cannot be surveyed at the present time. As funding becomes available (after the approval of our CDUA) and the Habitat Improvement Programs for the Garden Area and the Lower Limahuli Preserve proceed, archaeological features in these area will be surveyed, mapped, and studied. Adequate preservation plans that address all of these new features will be developed at that time.

The Division of State Parks (DSP) also has concerns regarding our development of interpretive plans for the cultural and archaeological resources located in Limahuli Valley. Because these resources and those of the Ha'ena State Park form a single cultural unit, the DSP would like to see

LIMAHULI GARDENS - POST OFFICE BOX 808, HANALEI, KAUAI, HAWAII 96714

Mr. Don Hibbard
April 18, 1991
Page 2

the NTBG develop interpretive plans that complement those (plans) being developed for the Park.

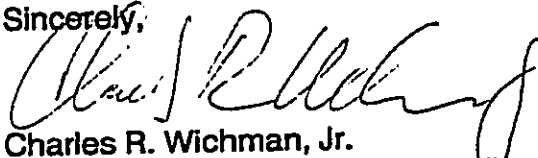
In order to address all of these concerns the NTBG has modified MANAGEMENT OBJECTIVES #3 and #6 on page 94 of its Master Plan to read as follows: "3. To gain more understanding about the age and various uses of archaeological site 50-30-02-1005 through subsurface testing of selected features within the Garden Area, and to develop preservation plans in conjunction with the State's Historic Preservation Program that produce an accurate interpretation of these features.", and "6. To gain more information ... features, and to develop adequate preservation plans for these sites." I should also note that we have replaced all references to the Bishop Museum's site number (50-Ka-D5-11) with the State of Hawai'i Inventory Number 50-30-02-1005 assigned to the Limahuli Complex.

Regarding your initial review of the report submitted under a separate cover from our archaeological consultants at the Bishop Museum, and the subsequent review of their revised report (refer to your letters to Dr. Paul Cleghorn, dated December 11, 1990, and March 4, 1991), the NTBG is pleased you now agree that our development plans will have "no adverse effect" on significant historic sites in the Garden Area. We are very grateful for the time and effort your staff took to work with Dr. Cleghorn to revise and upgrade this important part of our Master Plan (Appendix II). The addition of a significance rating (as a significant historic site with the potential to yield information that is important to prehistory and history of the region and the State), photographs, and five pages of descriptive data truly increase the scope and value of this report.

The NTBG looks forward to working with your staff and the staff of the Division of State Parks (Ms. Martha Yent) to develop interpretive plans for Limahuli Gardens that complement those that will be developed for the Ha'ena State Park, and to insure that "preservation acceptability" occurs in the Limahuli Complex. As you are aware, the preservation and accurate interpretation of the cultural resources located not only in Limahuli Valley, but in the entire Ha'ena area, are of great importance to the NTBG.

In this regard, if I can be of help to you or your staff, please feel free to contact me at anytime.

Sincerely,



Charles R. Wichman, Jr.
Assistant to the Director - Limahuli

cc: Mr. William W. Paty
Chairperson, BLNR

JOHN WAIHEE
GOVERNOR OF HAWAII



JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96801

December 26, 1990

In reply, please refer to:
EPHSD

90-3-267

Mr. Charles R. Wichman, Jr.
Assistant to the Director
Limahuli Gardens and Preserve
P.O. Box 808
Hanalei, Kauai, Hawaii 96714

Dear Mr. Wichman:

Subject: Early Review of The National Tropical Botanical Garden's Master Plan
for Limahuli Gardens and Preserve,
Ha'ena, Kauai
TMK: 5-9-01: 3
TMK: 5-9-06: 2-6, 8, and 9

We have reviewed the material on the subject project submitted by your office. The following comments are offered:

Wastewater Disposal

1. The subject project is located in a proposed critical wastewater disposal area as determined by the Kauai County Wastewater Advisory Committee. In the future, no cesspools will be allowed in the subject area.
2. It has been determined that the subject project is not within the County's sewer service area. The details of wastewater treatment and disposal are general in nature and incomplete.
3. The proposed wastewater treatment and disposal consists of septic tanks and soil absorption systems. Although this proposal meets the current requirements of Chapter 11-62, Wastewater Systems, please be informed that proposed revisions to Chapter 11-62 may require additional technical requirements. We do reserve the right to review the detailed wastewater plans for conformance to applicable rules.

Drinking Water

1. According to the master plan, the County of Kauai, Department of Water will supply potable water to the visitors center, office, toolhouse/nursery complex, and the

December 26, 1990

caretaker's cottage. Thus, the Department's Administrative Rules, Title 11, Chapter 20, "Potable Water Systems," will not be applicable.

2. The plan also states that the County water system will be completely independent of the National Tropical Botanical Garden's (NTBG) existing irrigation system and will not be used for irrigation purposes. The potable water piping must be carefully designed and operated to prevent cross-connections and backflow conditions with any non-potable systems. All water lines must be carefully labelled to avoid any confusion.
3. According to the maps provided, the entire project area is situated above the Department's Underground Injection Control (UIC) line. Land areas located above the UIC line are generally considered to contain underground sources of drinking water. These areas should therefore be protected against all sources of groundwater contamination.
4. The plan briefly mentions improvements to the rain water drainage systems. However, it does not discuss the ultimate method of disposal. If drywells will be used for the disposal of surface water runoff, they would be classified as injection wells. All injection wells must comply with the Department's Administrative Rules, Title 11, Chapter 23, "Underground Injection Control." Chapter 23 requires UIC permits for the construction and operation of all injection wells.

Housing Rules

The proposed infrastructures (caretaker's cottage and tool house/maintenance complex) are shown straddling the property line. The structures shall either be relocated away from the property line or the property line shall be moved to be in compliance with Chapter 14, Housing, Title 11, Administrative Rules, State of Hawaii.

Due to the general nature of the proposed project, we reserve the right to impose further environmental health restrictions when more detailed information is submitted.

Sincerely,



BRUCE S. ANDERSON, Ph.D.
Deputy Director for
Environmental Health

cc: Kauai, District Health Office



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

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Dear Mr. Anderson:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kauai. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

Thank you for taking the time to review and comment on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We appreciate the concerns mentioned about our project in Limahuli Valley in your letter of December 26, 1990.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991.

In response to your letter of December 26, 1990, (Document No. EPHSD 90-3-267), the NTBG is, of course, very concerned about protecting and preserving the environment of Limahuli Valley. As such, we would never consider wastewater disposal systems that do not meet the Department of Health's criteria. The NTBG will hire a certified engineer to design acceptable wastewater treatment and disposal systems for the Gardens. This engineer will consider any future revisions to the Department of Health's Chapter 11-62, Wastewater Systems in his design. In order to clarify this, the NTBG will revise page 42 its Master Plan to read as follows: "4. *Wastewater disposal systems that meet the requirements of the Department of Health (Chapter 11-62, Wastewater Systems). These wastewater systems will service the visitors center, office, toolhouse/nursery complex, and caretaker's cottage. (Detailed plans specifying the type and location of these systems will be completed in the future by a certified sanitary/environmental engineer.)*"

In response to comment #2 under Drinking Water, the NTBG will use its discretion in designing and operating its potable water system. We realize the importance of preventing any physical connection of the two systems. In this regard, the potable water system will be clearly labeled and maintained as a separate entity from the irrigation systems that already exist throughout the Gardens.

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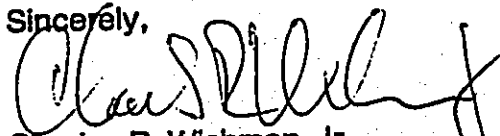
Mr. Bruce S. Anderson
April 18, 1991
Page 2

In regards to comment #4 under Drinking Water, the NTBG does not plan to use any dry wells in its future drainage systems. Rather, future improvements to the existing drainage systems will simply allow rainwater run-off to follow its natural course of flow down to Limahuli Stream. In order to clarify this, the NTBG will revise Page 42 of its Master Plan to read: "**6. Improvement of the existing rainwater drainage systems. These improvements will consist of concrete gutters, culverts, waterbars, and swales intimately tied into the systems of concrete roads that will allow run-off from heavy rains to follow its natural course of flow down to Limahuli Stream without causing severe soil erosion. (The USDA/Soil Conservation Service has been asked to assist in the design of this system.)**"

In regards to Housing Rules, when the NTBG completes its detailed construction and maintenance plans for each of these structures, they will either be relocated away from the property lines or the property lines shall be moved so that they will be in compliance with Chapter 14 Housing, Title 11, Administrative Rules, State of Hawai'i.

Once again, I thank you for the time you and your staff spent on this review. I look forward to working with the Department of Health in the design and construction of adequate wastewater systems. It is our desire to maintain, preserve, and protect the existing pristine environment of Limahuli Valley for future generations to use and enjoy.

Sincerely,



Charles R. Wichman, Jr.
Assistant to the Director - Limahuli

JOHN WAIHEE
GOVERNOR



CHARLES T. TOGUCHI
SUPERINTENDENT

STATE OF HAWAII
DEPARTMENT OF EDUCATION
OFFICE OF THE DISTRICT SUPERINTENDENT
KAUAI SCHOOLS
3060 EIWA STREET
LIHUE, HAWAII 96766-1310

November 29, 1990

Mr. Charles R. Wichman, Jr.
Assistant to the Director, Limahuli
P.O. Box 808
Hanalei, Hawai'i 96714

Aloha mai kua, e Chipper,

It is with great pleasure that I extend my support for the proposed Master Plan for the Limahuli ahupua'a. It is of vital importance to the future generations of Hawai'i, that they have access to, and be exposed to a traditional Hawaiian ahupua'a, where they can physically experience the grandeur and beauty of the flora and fauna of Hawai'i, and thus be made aware of the inherent values that are in the 'aina.

Since there are so few extant Hawaiian ahupua'a throughout the state of Hawai'i which offer modern man a glimpse at the diverse natural resources of the past, it is hoped that Limahuli and its educational component will provide a learning experience that will heighten and broaden the respect for, and understanding of, the native Hawaiian environment by the children of the public schools.

Once again, I offer my full support for the establishment of a "Special Subzone" within the Conservation District, with its applicability to education and the Hawaiian Studies Program here on Kaua'i, as well as the state.

'O wau no me ka ha'aha'a,

Pohaku
Peter Pohaku Nishimitsu
Hawaiian Studies Resource Teacher
Kaua'i District

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER



NATIONAL TROPICAL BOTANICAL GARDEN
 CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

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Mr. Peter Pohaku Nishimitsu
 Hawaiian Studies Resource Teacher
 Kaua'i District, DOE
 3060 Eiwa Street
 Lihu'e, Hawai'i 96746

Aloha mai, e Pohaku:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
 Master Plan for Limahuli Gardens and Preserve,
 Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

Thank you for taking the time to review and comment on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We greatly appreciate the support you have shown for our project in Limahuli Valley.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991. The CDUA process will include a public hearing to allow the community an opportunity to voice their concerns. The hearing will probably be held on Kaua'i sometime in late summer or early fall 1991. If you are interested in testifying at the hearing, please contact me in May and I will keep you informed about when and where the hearing will be held.

Once again, mahalo nui loa no kou mana'o a me kou aloha no ke awawa 'o Limahuli. I look forward to working with you and our other Hawaiian Studies Resource Teachers through out the State in making Limahuli Gardens and Preserve one of the unique educational resources in Hawai'i nei.

A hui hou aku, e malama pono.

Sincerely,

Charles R. Wichman, Jr.
 Charles R. Wichman, Jr.
 Assistant to the Director - Limahuli

JOHN WAIHEE
GOVERNOR



STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
465 SOUTH KING STREET, ROOM 104
HONOLULU, HAWAII 96813

Bruce S. Anderson, Ph.D.
Acting DIRECTOR
TELEPHONE NO.
548-6915

November 08, 1990

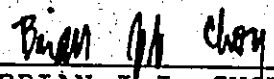
National Tropical Botanical Garden
Limahuli Gardens
P.O. Box 808
Hanalei, Kauai, Hawaii 96714
Attn: Mr. Charles R. Wichman, Jr.

Dear Mr. Wichman:

SUBJECT: Early Review of The National Tropical Botanical
Garden's Master Plan for Limahuli Gardens and
Preserve, Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3;
5-9-06:2-6,8, and 9.

Thank you for providing the opportunity to review and
comment on the subject project. We do not have any
comments to offer on the subject project at this time.

Sincerely,


BRIAN J.J. CHOY
for: Bruce S. Anderson, Ph.D.
Acting Interim Director, OEQC



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

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GENERAL COUNSEL

Mr. Bruce S. Anderson, Ph.D.
Acting Interim Director
State of Hawai'i
Office of Environmental Quality Control
465 S. King Street, Room 104
Honolulu, Hawai'i 96813

Dear Mr. Anderson:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

Thank you for your letter of November 8, 1990 in response to the early review of the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve.

Having just completed the early review process, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991. Should you have any questions, please feel free to contact me. Thank you very much.

Sincerely,


Charles R. Wichman, Jr.
Assistant to the Director - Limahuli



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

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MICHAEL J. SHEA
GENERAL COUNSEL

Mr. Michael G. Buck
Division of Forestry and Wildlife
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mike:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

Thank you for taking the time to review and comment orally on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We greatly appreciate the support you have shown for our project in Limahuli Valley.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991.

Once again, I thank you for the time you spent talking with me about our Master Plan.

Sincerely,

Charles R. Wichman, Jr.
Assistant to the Director - Limahuli



University of Hawaii at Manoa

Environmental Center
A Unit of Water Resources Research Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 956-7361
April 10, 1991

Mr. Charles R. Wichman, Jr.
Assistant to the Director
Limahuli Gardens
Post Office Box 808
Hanalei, Kauai, Hawaii 96714

Dear Mr. Wichman

Master Plan
Limahuli Gardens and Preserve
Ha'ena, Kauai

The referenced document describes a coordinated strategy for creation and maintenance of a botanical garden and two natural area preserves with the intent of providing public educational facilities and preserving terrestrial, aquatic, and archaeological resources in Limahuli Valley under the auspices of the National Tropical Botanical Garden. The Environmental Center has conducted a brief review of the Master Plan with the assistance of Dieter Mueller-Dombois, Emeritus Professor of Botany, and Charles Lamoureux, Department of Botany.

Our reviewers complimented the preparers of this master plan for the thoroughness and care with which project details were considered, and in particular they applauded the educational outreach aspects of the project. It was felt that the principles of stewardship embodied by the project could well be considered a model for other conservation and management projects nationwide due to the extraordinary sensitivity to cultural, educational, and environmental values inherent in the plan.

One minor addition to topics which might be addressed in educational programs listed on p. 30 is the impact of the environment on human activities, both in historic and modern contexts. Frequently, dynamic weathering processes with attendant erosional events and resultant episodes of landform instability exert significant influences on human activities. Consequently, in addition to considering the impact of modern man on the environment, it is instructive to consider the inverse relationship as well.

AN EQUAL OPPORTUNITY EMPLOYER

Mr. Charles R. Wichman, Jr.

Although no federally listed threatened or endangered plant species were identified in the botanical survey, efforts are underway presently to upgrade the listing of native Hawaiian flora. Our reviewers recommended that resources available at the U.S. Fish and Wildlife Service, as well as the Heritage Program of the Nature Conservancy be consulted in the process of implementing transplanting and botanical management plans to accommodate potential additions to the list.

We appreciate the opportunity to comment on this Master Plan, and we hope that our suggestions assist in your already commendable efforts.

Sincerely,

John T. Harrison, Ph.D.
Environmental Coordinator

cc: D. Mueller Donbois
C. Lamoureux



NATIONAL TROPICAL BOTANICAL GARDEN
 CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

Dr. John Harrison, Environmental Coordinator
 Environmental Center, UHM,
 2550 Campus Road, Crawford 317
 Honolulu, Hawaii 96822

April 18, 1991

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Dear Dr. Harrison:

SUBJECT: The NTBG's Master Plan for Limahuli Gardens and Preserve

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 MICHAEL J. SHEA
 GENERAL COUNSEL

Thank you for taking the time to review and comment on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We greatly appreciate your support for our project in Limahuli Valley.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991. The CDUA process will include a public hearing to allow the community an opportunity to voice their concerns. The hearing will probably be held on Kaua'i sometime in late summer or early fall 1991. If you are interested in testifying at the hearing, please contact me in May and I will keep you informed about the status of the hearing.

In your letter of April 10, 1991, your suggestion that we include " ... *the impact of the environment on human activities, both in historic and modern contexts* ... " in our Educational Programs is well-taken. After all, it was the topography and abundance of fresh water in Hawai'i that made the large-scale *kalo* production of the ancient Hawaiians possible, and it is the present environment of Limahuli Valley that makes possible our focus of growing and protecting the threatened and endangered plants of Hawai'i. Although not directly stated in our Master Plan, discussing the two-way interaction between man and his environment will be an important component of our Educational Programs. It is only when we realize that our surrounding environment directly effects us, will we become better stewards of our natural resources.

Once again, I thank you for the time you and your staff spent on this review and the strong support you have shown for our Master Plan. Feel free to call me at anytime if I can be of any help to you or your staff.

Sincerely,

Charles R. Wichman, Jr.
 Assistant to the Director - Limahuli

February 12, 1991

Mr. Charles R. Wickman, Jr.
Assistant to the Director - Limahuli
P. O. Box 808
Hanalei, Hawaii 96714

Re: Limahuli Gardens and Preserve
Ha'ena, Kaua'i
TMK's: 5-9-01:03; 5-9-06:2-6, 8 and 9

Dear Mr. Wickman:

Thank you for the opportunity to review the Master Plan for
Limahuli Gardens. We have the following comments and concerns.

1. Since the emphasis and direction of the Master Plan is in the protection and preservation of native Hawaiian plant species, the inclusion of exotic plants in the garden, if done at all, should be done in a very limited and controlled manner.
2. Since the number of daily visitors to the garden/preserve will be limited, care should be taken to insure that educational tours and local visitors have a preference.

We have no other comments or concerns at this time.

Sincerely,

Richard K. Paglinawan
RICHARD K. PAGLINAWAN
Administrator

RKP:jc

cc: Moses K. Keale, Sr., Chairperson
Board of Trustees



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Honolulu, Hawai'i 96814
Ph: (808) 946-2642



NATIONAL TROPICAL BOTANICAL GARDEN

CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

Mr. Richard K. Paglinawan
Office of Hawaiian Affairs
1600 Kapi'olani Blvd., Suite 1500
Honolulu, Hawai'i 96814

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Dear Mr. Paglinawan:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

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MICHAEL J. SHEA
GENERAL COUNSEL

Thank you for taking the time to review and comment on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991. The CDUA process will include a public hearing to allow the community an opportunity to voice their concerns. The hearing will probably be held on Kaua'i sometime in late summer or early fall 1991. If you are interested in testifying at the hearing, please contact me in May and I will keep you informed about when and where the hearing will be held.

In response to your comments and concerns, the inclusion of alien plants in the Gardens will be done in a limited and controlled manner. Our planting programs (pages 27-29, 82 of the Master Plan) have been designed so that all candidate plants will be closely screened prior to planting in the Gardens or the Preserve. Although our primary focus is on the preservation and protection of native Hawaiian plant species, the inclusion of alien plants is necessary for the realization of several of our programs. For example, the Habitat Improvement Program for Limahuli Gardens will depend upon alien species of grass to prevent soil erosion in newly cleared areas. The Planting Program for Limahuli Gardens will utilize alien ornamental species such as ginger and heliconias as important components of the tropical landscaping found near the entrance to the Gardens. Educational programs will all touch upon the importance of the Hawaiian culture and its role in, and use of, Limahuli Valley. Because the ancient Hawaiians brought with them many alien plants important to their culture (which include *kalo*, *kukui*, *ki*, *wauke*, etc.), we have incorporated a Hawaiian ethnobotanical area (Exhibit 8) to display these important plants. Thus, alien plants will be a necessary part of the overall planting of the Garden Area.

Mr. Richard K. Paglinawan
April 18, 1991
Page 2

Your concern that educational tours and local visitors should receive preference in visiting the Gardens is well taken. The focus of Limahuli Gardens and Preserve is that of an educational, recreational, and research resource, and not as a tourist attraction. Because of this, all of our tours will be educational tours designed to impart a knowledge about the natural and cultural history of Hawai'i to the participants. Special groups (e.g., school children, Hawaiian Studies Resource Teachers, etc.) will, of course, be given preference, including exemptions to several of the limitations on our visitors programs. In order to make the Gardens and its educational programs more accessible to the community, local residents will be able to tour the Gardens free-of-charge on the Community Day that will be held at least once monthly.

Once again, I thank you for the time spent reviewing and commenting on our Master Plan. If you have any questions, or if I can be of help to you or your staff, please feel free to contact me. Mahalo.

Sincerely,



Charles R. Wichman, Jr.
Assistant to the Director - Limahuli

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

4334 RICE STREET,
ROOM 104
HONOLULU, HI 96825

March 20, 1991

Mr. Charles R. Wichman, Jr.
Assistant to the Director
Limahuli Gardens
P.O. Box 808
Hanalei, HI 96714

Dear Mr. Wichman,

Thank you for giving me the opportunity to review the National Tropical Botanical Garden's master plan for Limahuli Gardens and Preserve, Ha'ena, Kaua'i. I have read through the parts of the plan you have asked me to comment on and the following are my findings:

Chapter II - Master Plan for Limahuli Gardens

The NTBG'S PROGRAMS

The Habitat Improvement Program - page 24 - I like this approach to reclaiming the habitat that you have listed in #1. Clearing by hand with the use of chain saws and/or the use of translocated herbicides that are either painted on the stumps or injected into the trees or shrubs is very labor intensive but will cause the least amount of disturbance to the soil and definitely cause the least amount of erosion.

The Composting Program - page 29 - The use of mulch and compost will not only improve your soil texture but, as a more short term benefit, will be the use of organic mulch to cover up the bare soil and protect the soil from erosion. The humus will conserve the moisture you have in the soil and prevent the soil from drying out.

The Educational Programs - page 35 - Just a word choice, in item #3, may be you would like to talk about the "geologic" erosion the islands are constantly undergoing? Rather than the 'SLOW' erosion.

The Visitors Program - page 40 - The second to the last paragraph which talks about the use of the four-wheel drive vehicle to be used by individuals unable to walk the steep terrain is a good concept so that the Gardens will be assessable to everyone but, can we add something about the vehicle staying on the designated dirt road (which will eventually be concreted) and maybe minimizing the use of four-wheel drive vehicles during the wetter times of the year so that the vehicle's tires do not destroy the ground cover and expose the fragile soil to chance for erosion.

Basic Infrastructure - page 42 - Chipper, I am still trying to convince the engineer and the people in our State office that this is a good project and we should be helping you. May be this item #6 should read, (The USDA Soil Conservation Service is being asked to assist in the design of this system). Unfortunately, to date I have not heard from our people in Honolulu yet.

Chapter III - Master Plan for the Lower Limahuli Preserve The NTBG'S PROGRAMS

The Habitat Improvement Program - page 81 - Again, I really like this approach of reclaiming the area gradually and letting the native vegetation take hold and not going in and denuding areas. This is a good erosion control method of clearing land.

The plan seems to address all our concerns about the soil conservation and I would like to go on record supporting your request for the establishment of the "Special Subzone," so that NTBG can fully implement this master plan.

I realize NTBG would like to keep to revegetating with natives but I would like to offer an alternative for you to just think about and maybe try in the future. It is the use of Paspalum hieronymii, or Tropic Lalo. The Amy B.H. Greenwell Ethnobotanical Garden on the Big Island uses this grass extensively for erosion control. Tropic Lalo could be used on your footpaths and roadways or in your diversions to stabilize the soil. It only produces 2 percent viable seed and seed production is sparse. Enclosed you will find a pamphlet about the grass.

Another grass I think you could use is the bunchgrass I know as Pili grass. It can be grown in rows cross the slope or on the contour to act as a filterstrip to catch moving sediment and debris. I have not done any work with this grass but it may be worth a try.

Page 3

C. Wichman

I would also like to offer our Plant Materials Center and our plant Materials Specialist, Robert Joy, as other sources of information as you begin to work on implementing your plan. Bob has been working with the U.S. Navy on revegetating Kahoolawe and we have been propagating Aki Aki grass and Pa'u O Hi'iaka to be planted there. So, we are getting into using native plants in our erosion control work also.

Please call me if you have any questions. 245-6513

Sincerely,

Laurie Ho

Laurie Ho
District Conservationist
Lihue Field Office



NATIONAL TROPICAL BOTANICAL GARDEN
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April 18, 1991

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GENERAL COUNSEL

Ms. Laurie Ho, District Conservationist
U.S. Department of Agriculture
Soil Conservation Service
4334 Rice Street, Room 104
Lihu'e, Hawai'i 96766

Dear Laurie:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

Thank you for taking the time to review and comment on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We greatly appreciate your support for our project in Limahuli Valley.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991. The CDUA process will include a public hearing to allow the community an opportunity to voice their concerns. The hearing will probably be held on Kaua'i sometime in late summer or early fall 1991. If you are interested in testifying at the hearing, please contact me in May and I will keep you informed about when and where the hearing will be held.

In response to your letter of March 20, 1991, we have amended our Master Plan to address all of your concerns. The new wording under Educational Programs (page 35) will use "geologic erosion", as you have suggested. Under Visitors Program (page 40-41), we have amended this section to include the following: "*As soon as it is feasible ... available at this site. The use of this vehicle should be limited during very wet conditions to prevent damage to the Gardens' dirt and gravel roads, and even under dry conditions this vehicle must stay only on designated vehicle roads. Once the roads are cemented, this vehicle should provide all-weather access to the grounds for physically challenged individuals.*"

Under Basic Infrastructure, we have amended this section to read as follows: "*Improvement of the existing rainwater drainage systems. These improvements will consist of concrete gutters, culverts, waterbars, and swales intimately tied into the systems of concrete roads will allow run-off*

LIMAHULI GARDENS • POST OFFICE BOX 808, HANAIEI, KAUAI, HAWAII 96714

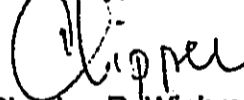
Ms. Laurie Ho
April 18, 1991
Page 2

from heavy rains to follow its natural course of flow down to Limahuli Stream without causing severe soil erosion. (The USDA Soil Conservation Service has been asked to assist in the design of this system.)"

I really appreciate your comments and suggestions on different grass species that will be effective in controlling the erosion in the Gardens. I am always looking for effective ground covers to use in the Gardens since it is not practical to use only native grass species. If Tropic lalo (*Paspalum hieronymii*) proves to be a non-invasive grass species as you indicated, we will be happy to consider using it in the Gardens.

Once again, I thank you for taking the time to review and comment on our Master Plan, and for the strong support you have shown for our project. Please feel free to contact me at anytime if I can be of assistance to you or your staff. I look forward to working with you and the other members of the Soil Conservation Service to limit and control any unnecessary soil erosion in Limahuli.

Sincerely,



Charles R. Wichman, Jr.
Assistant to the Director - Limahuli



United States Department of the Interior

FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE

P.O. BOX 50167
HONOLULU, HAWAII 96850

APR - 3 1991

Mr. Charles R. Wichman, Jr.
Limahuli Gardens
P.O. Box 808
Hanalei, Kauai 96714

Re: National Tropical Botanical Garden, Master Plan for Limahuli Gardens and Preserve, Haena, Kauai

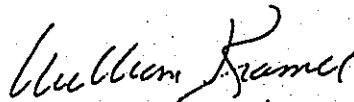
Dear Mr. Wichman:

The U.S. Fish and Wildlife Service (Service) has reviewed the Master Plan for Limahuli Gardens and Preserve, Haena, Kauai. The Service offers the following comments for your consideration.

We support the master plan objectives for the Limahuli Gardens and Preserve. The incorporation of Limahuli Valley into a protected and managed preserve would benefit wildlife, botanical, and aquatic resources of concern to the Service. The master plan provides a thorough description and analysis of the proposed management activities to be conducted within the Limahuli Gardens and Preserve. The Service wishes you success on this ambitious undertaking.

We appreciate the opportunity to comment.

Sincerely,


for Robert P. Smith
Field Supervisor
Pacific Islands Office



NATIONAL TROPICAL BOTANICAL GARDEN
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April 18, 1991

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Mr. Robert P. Smith, Field Supervisor
United States Department of Interior
Fish and Wildlife Service
Pacific Islands Office
P.O. Box 50167
Honolulu, Hawai'i 96850

Dear Mr. Smith:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

Thank you for taking the time to review and comment on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We greatly appreciate the support you have shown for our project in Limahuli Valley.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991. The CDUA process will include a public hearing to allow the community an opportunity to voice their concerns. The hearing will probably be held on Kaua'i sometime in late summer or early fall 1991. If you are interested in testifying at the hearing, please contact me in May and I will keep you informed about when and where the hearing will be held.

Once again, I thank you and the other members of the U.S. Fish and Wildlife Service for the time spent reviewing and commenting on our Master Plan.

Sincerely,

Charles R. Wichman, Jr.
Assistant to the Director - Limahuli

JOANN A. YUKIMURA
MAYOR



COUNTY OF KAUAI
PLANNING DEPARTMENT
4280 RICE STREET
LIHUE, KAUAI, HAWAII 96766

PETER A. NAKAMURA
PLANNING DIRECTOR

ROLAND D. SAGUM, III
DEPUTY PLANNING DIRECTOR

TELEPHONE (808) 245-3919

March 6, 1991

Mr. William W. Paty, Chairman
Board of Land & Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Subject: Conservation District Use Application
National Tropical Botanical Garden
Master Plan for Limahuli Gardens and Preserve
TMKs: 5-9-01:3, 5_9-06:2-6, 8 and 9 Haena, Kauai

We have reviewed the draft Master Plan for the Limahuli Gardens and Preserve and find that this proposal is consistent with the goals and objectives of the North Shore Development Plan. Realization of this project will provide for preservation of nearby 1000 acres in Limahuli Valley of native plant and animal species, restoration of cultural/historic sites, and controlled public access (where there were none previously).

We support the efforts by the National Tropical Botanical Gardens in making this preserve one of cultural, recreational, and educational opportunities.

ROLAND D. SAGUM III
Deputy Planning Director



NATIONAL TROPICAL BOTANICAL GARDEN
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April 18, 1991

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Dear Mr. Sagum:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
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Once again, I thank you and the other members of the County Planning Department, for the time you spent reviewing and commenting on our Master Plan. If I can be assistance to you or your staff, please feel free to contact me. Mahalo nui loa.

Sincerely,

Charles R. Wichman, Jr.
Assistant to the Director - Limahuli

Hanalei-Princeville Improvement Advisory Committee
P.O. Box 279; Hanalei, Kauai, HI 96714

February 5, 1991

Department of Land & Natural Resources
P.O. Box 621
Honolulu, HI 96802

Subject: NTBG Limahuli Gardens and Preserve; Haena, Kauai

Dear Mr. Paty,

The Hanalei-Princeville Improvement Advisory Committee, a group of citizens appointed by the Mayor and approved by the Kauai County Council, is mandated to advise the Planning Department of the County regarding development plans in our area. We have studied a copy of the Master Plan for Limahuli Gardens and Preserve and have taken a field trip to examine the area and discuss the plans with Mr. Charles Wichman, Jr. and we want to share our conclusions with your department.

Hanalei-Princeville Improvement Advisory Committee supports the purposes of the National Tropical Botanical Garden's plans for Limahuli Gardens and Preserve.

We applaud the preservation of that environment and the further development of the indigenous botanical garden as well as the preservation of the existing ecosystems at higher elevations.

It is our belief that limited public access and educational facilities will enhance public awareness and appreciation of the history of Hawaii's environmental natural resources and that allowing study of ancient, archeological sites will benefit knowledge of Kauai's unique history.

Hanalei-Princeville Improvement Advisory Committee has no problem with the minimum building which the plan entails nor with the limited appointment based public access contemplated for the site. It is our concern that approvals be predicated upon legal assurances that the land remain as proposed to insure that Limahuli Gardens and Preserve remains primarily an educational resource and not a tourist attraction.

We urge that the Department of Land and Natural Resources approve the requested Conservation District Use Application.

Sincerely,

Nanette Slavin Kaunooana

cc: Charles Wichman Jr.



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MICHAEL J. SHEA
GENERAL COUNSEL

Mrs. Nan Ka'aumoana, Chairperson
The Hanalei/Princeville Improvement
Advisory Committee
P.O. Box 279
Hanalei, Kaua'i, Hawai'i 96714

Aloha Nan:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

Thank you for taking the time to review and comment on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We greatly appreciate your concerns and the support you have shown for our project in Limahuli Valley.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991. The CDUA process will include a public hearing to allow the community an opportunity to voice their concerns. The hearing will probably be held on Kaua'i sometime in late summer or early fall 1991. If you are interested in testifying at the hearing, please contact me in May and I will keep you informed about when and where the hearing will be held.

Once again, I thank you and the other members of the Hanalei/Princeville Improvement Advisory Committee for the time spent reviewing and commenting on our Master Plan and for your visit to the Limahuli Gardens. If I can be of any assistance to you, please feel free to contact me.

Sincerely,

Charles R. Wichman, Jr.
Assistant to the Director - Limahuli

CONSERVATION COUNCIL FOR HAWAII
kauai chapter po box 352 kilauea, HI 96754 (808)828-1342

Chipper Wichman
National Tropical Botanical Garden
PO BOX 808
Hanalei, HI 96714

26 November 1990

Aloha Chipper,

Thank-you for giving CCH Kauai an opportunity to comment on the master plan for Limahuli Valley. Having been involved in the aquatic survey of Limahuli Stream with Amadeo Timbol I was very interested in reviewing the findings of the botanical and archaeological studies as well as the master plan for the valley. We are in absolute support of your efforts to re-establish the native ecosystem in the valley and to protect it in perpetuity with continuing research and public education.

It is important (as you point out) that the entire *ahupua'a* be included in the plan and you have a unique opportunity to impact a relatively intact ecological unit. This is especially important for the stream ecosystem which as you know reaches from its source high in the mountains and flows out to sea. All of the native stream fauna is specifically adapted to this continuous flow and must have access to the ocean in order to complete their life cycle. As these makai areas closer to the ocean are not under your control, I would encourage you to closely monitor the use of these areas because it will directly affect the biological quality of the more mauka reaches of the stream system.

Your holistic approach for the restoration of the archaeological resources is also well taken. Too often "preservation" involves protection for only a few so-called "representative" features while the remainder are destroyed for the proposed project. These remaining artifacts are then quite meaningless when taken out of context from the overall complex. It would certainly be valuable to restore the Limahuli sites in the context of their relation to the extensive neighboring sites in Haena if that is possible. This surely would be a preservation first in Hawaii!

Your plans for the botanical restoration are justifiably cautious and having been in the valley, I am not envious of your task of eradicating the established weedy plant species. Although a horrendous job, I would urge you to consider cutting back the *hau* from the channel in the

middle reach of the stream before it completely overgrows it. We have seen this occur in a tributary of Hanalei River where its aggressive and extensive root system overgrew the channel to the point where upstream migration of native stream animals was severely hampered or blocked altogether.

Other than these few general comments I think your efforts to develop a master plan for the valley have been responsible, ecologically sensitive and thorough. My organization strongly supports your efforts and offer our help in any way possible.

Michael H. Kido

Mike

Kauai CCH President

cc Rick Scudder



NATIONAL TROPICAL BOTANICAL GARDEN
 CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

Mr. Michael H. Kido, President
 Conservation Council for Hawaii, Kauai Chapter
 P.O. Box 352
 Kilauea, Kaua'i, Hawai'i 96754

April 18, 1991

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Aloha Mike:

SUBJECT: Master Plan for Limahuli Gardens and Preserve, Ha'ena, Kaua'i

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As you suggested, we will closely monitor the use and condition of the *makai* areas of Limahuli Stream that are not under our control, as well as the *hau* that is growing in the stream channel in the Lower Limahuli Preserve. We realize how important it is for many of our native stream organisms to be able to freely migrate back and forth from the ocean up to the inner reaches of Limahuli Valley. Fortunately, the primary estuary for Limahuli Stream is located in the Ha'ena State Park and should thus be protected from future degradation. The secondary estuary for Limahuli Stream abuts both the eastern boundary of the State Park and the western boundary of a private estate. The owner of this private estate has recently become very interested in the natural and cultural history of Hawai'i, and is now very receptive towards protecting the natural features of the stream abutting her property.

Once again, I thank you for the strong support you have shown for our Master Plan, and I look forward to working with the CCH-Kaua'i Chapter in the future to protect our valuable natural and cultural resources. Please feel free to contact me if I can be of any assistance to you. Mahalo.

Sincerely,

Charles R. Wichman, Jr.
 Assistant to the Director - Limahuli

1000 Friends of Kauai • P.O. Box 99 • Hanalei, Kauai, Hawaii 96714
March 20, 1991

Charles Wichman, Jr.
Assistant to the Director-Limahuli
National Tropical Botanical Garden
Limahuli Gardens
PO Box 808
Hanalei, HI 96714

Re: Review of Master Plan for Limahuli Gardens and Preserve, Haena, Kauai

Dear Mr. Wichman,

It has been a pleasure to review your proposal. It should stand as an example of concern and consideration for the many aspects of change on the land. Your plan, overall, will be an asset both to the general and the educational community of Kauai. The opportunity to support the growth of truly native landscape plus the archeological study provides a unique educational experience. The archeological study may prove to be of great value to many; it is rare that a study is done simply for the information it will reveal, rather than in preparation for development. The educational potential for both the Garden and Preserve is exciting for the school system as well as the general public. We are pleased to note that serious limitations have been put upon the number of people that will be allowed daily. We encourage the strict adherence to this plan as greater numbers would surely alter the general health of the whole development. We look forward to implementation of this proposal.

Sincerely,


Annette Cassidy
President

Preserve
Our Islands





NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

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Dear Mrs. Cassidy:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
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Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

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Once again, I thank you and the other members of 1000 Friends of Kaua'i for the time spent reviewing and commenting on our Master Plan.

Sincerely,

Charles R. Wichman, Jr.
Assistant to the Director - Limahuli



Kaua'i Group of the Hawaii Chapters
Post Office Box 3412
Lihu'e, Kaua'i, Hawaii 96766
February 18, 1991

Mr. Chipper Wichman, Superintendent
Horticulturalist
Limahuli Garden
National Tropical Botanical Gardens
Haena, Kauai, Hawaii 96714

Dear Mr. Wichman:

I appreciate being given the opportunity to review the 'National Tropical Botanical Garden's Master Plan for Limahuli Gardens and Preserve' on behalf of Kauai's Sierra Club. I have forwarded a copy of the document to Jack Lundgren for his comments as well. Jack should be able to provide very helpful input, based on his years of environmental protection and concentration on matters most pertaining to our island. He will submit his comments separately from these, and also on Sierra Club letterhead.

My overall reaction to your study is one of approval. The effort and thought that have gone into the plan are evident, as is the depth of commitment and love you bring to the work. Within that context, I offer a few specific comments:

1. There were four minor presentation errors that would need correction if this document is to be re-written:

a) p. 8, objective #3, bottom of page: delete the word 'a' in the first line.

b) p. 35, first line of first ¶: 'an essential aspect. . .is its people [not are].

c) p. 40, ¶4: 'once a core. . .is available [not are].

d) p. 94, ¶3, overview, last line: delete 'and'.

2. P. 29 (Gardens) and p. 82 (Preserve): The composting program seems very strong. Two questions: 1) What effect do herbicides have on composting? 2) Are herbicide-treated cuttings to be composted with untreated ones?

3. P. 36, the Hawaiian cultural Awareness Program: ' . . . includes a functioning lo'i kalo system and offers an ideal spot to recreate an ancient Hawaiian hale surrounded by the plants that the Hawaiians used.' Is there a plan to build such a hale? It sounds great, but I don't see such a structure mentioned in any of your building plans.

February 18, 1991

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4. P. 37, Exhibit 11. This exhibit was not helpful to me, in that its print is too small to read.

5. P. 36, Plant of the Month Program. Are many plants given away? Is the number increasing? Decreasing? Are the types of plants changed from time to time?

6. P. 39, §1, b, ¶2: The idea of eventually publishing a manual 'concerning the horticultural requirements of native plant species' is an excellent one. Such a manual would answer a real need.

7. P. 40, ¶6: Your plans to provide 4-wheel-drive transportation to the physically challenged is indicative of the fine tuning I like so well in this plan.

8. P. 41, Community Day. I'm very glad to see this offered to the citizens of Kauai.

9. P. 42, Basic Infrastructure, §1. Does the Haas family use the same right-of-way? If so, are restrictions placed on the amount or type of traffic allowed? Would any of that information change upon approval of this master plan?

10. P. 64, §6, Soil erosion. Are the grasses used for lawns native or alien? If alien, will they be changed in the future? Why or why not?

11. P. 64, §9, Displaced organisms. This section led me to wondering about the balance between organisms and their supporting habitats. It seems to indicate that gradual removal of alien plants simply causes the concomitant organisms to relocate to neighboring plant communities. How does this information mesh with that mentioned on p. 81, Habitat improvement program, §3: 'Once the native plants have become dominant factors in the ecosystem [of the lower preserve], the other components such as birds, insects, fungi, etc. can be encouraged to return, by actually restocking them or other means.'?

12. P. 73, §10, Economy of Kauai and Hawaii. This ties in very well with Mayor Yukimura's promotion of 'cultural tourism.'

13. P. 80. Conant's quote about ecosystem restoration is excellent. If this study is re-written, I'd recommend using this paragraph as an introductory page.

14. P. 84, Limitations, #2: Will you allow any waivers of an entrance fee for hiking in the Preserve, similar to that mentioned on p.41 (Community Day), for the Gardens?

15. P. 84, Physical Facilities, §1: Perhaps Sierra Club can help with your 'establishment of a well-maintained trail to Limahuli Falls.' The Hawaii Chapter has an activity section unique in the nation, in that we supply trail building and maintenance crews, and leaders, very inexpensively for in-state projects such as this one. The 'Hawaii Service Trip Program' has worked

February 18, 1991
Page three

extensively for the Department of Land and Natural Resources on Kauai - opening Nu'alolo Trail and its connector to Awa'awapuhi, and re-opening Koaie Canyon trail are some of the projects we've completed in recent years. You could speak to Alvin Kyono of the DLNR to get a larger view of our work if you are interested in exploring this possibility further.

16. P90, Management Guidelines, §2, Habitat improvement: Why do you wait for new methods of controlling alien plant and animal species in the upper preserve? How would conventional methods be harmful? Are the concerns topographic?

17. P. 93, §3, (3): '...how an original colony could evolve from a lone unit concentrating on its subsistence to a stratified unit within a larger politically stratified society.' This is hard to understand, at least for me.

18. P. 94, Overview, first half of page: The information here gives a good presentation of Limahuli's archaeological concerns. I think it would have been more helpful if it had come at the beginning of the study's archaeological discussions, so that further input could fit into its larger context.

19. P. 94, Management Objectives, §8. 'To protect, through educational means, those sites and features that are not located on property controlled by the NTB.G.' I'm glad to see this very important feature emphasized.

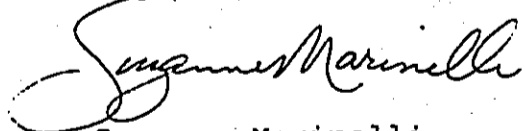
20. Appendix I, Background Information, pp. 1-2: The Genesis of this Master Plan for Limahuli Valley: This is a superb section that clearly presents the global need for preservation of tropical rain forests. I appreciate you having given me verbal permission to submit it for consideration as a small article in our local newsletter.

21. Appendix IV, Botanical Survey, p. 4: Tim Flynn's discussion mentions the spread of clidemia and kudzu along the trail. Have these pests been eradicated since his study was done, or do they still spread? Can we help?

22. Is Limahuli stream legally open to the public as a right-of-way, or is the stream bed private, like its banks? Jack Lundgren, as Chair of Kauai's advisory council to the state's Na Ala Hele program, may be able to answer this.

Thank you again for this opportunity. I look forward to working with you again in the future, to further the life of this precious land.

Regards,



Suzanne Marinelli
Group Chair

cc: Mark Batchelor, HSTP Board
Jack Lundgren, Conservation
Vice-Chair



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

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GENERAL COUNSEL

Ms. Suzanne Marinelli, Chairperson
Kaua'i Group of the Hawaii Chapters
The Sierra Club
P.O. Box 3412
Lihu'e, Kaua'i, Hawai'i 96766

Aloha Suzanne:

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I appreciate your obviously well-thought out comments. I would like to take this opportunity to answer the questions you raised in your letter of February 18, 1991.

Comment #2. Herbicides that adversely affect beneficial soil organisms could slow or stop the composting process. This is especially true if they are applied in a manner that brings them into direct immediate contact with the beneficial organisms (e.g., spraying directly onto a compost pile).

The use of herbicide in both the Gardens and Preserve will be limited primarily to translocated herbicide that will be painted on freshly cut stumps or injected into living alien trees. Additionally, herbicides may sometimes be judiciously sprayed throughout the Gardens (not the Preserve) to kill small, hard to control herbaceous weeds like *Elephantopus mollis*.

Based upon these types of use, herbicides are not expected to have any effect on the Composting Programs in either the Garden Area or the Lower Limahuli Preserve for the following three reasons:

LIMAHULI GARDENS - POST OFFICE BOX 808, HANAIEI, KAUAI, HAWAII 96714

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

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Ms. Suzanne Marinelli, Chairperson
Kaua'i Group of the Hawaii Chapters
The Sierra Club
P.O. Box 3412
Lihu'e, Kaua'i, Hawai'i 96766

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Suzanne Merinelli/Kaua'i Sierra Club
April 18, 1991
Page 2

1) Primarily for aesthetic reasons we do not plan to inject any living alien plants with herbicide in the Garden Area. Instead, the alien plants will be cut down and, if necessary, their stumps will be treated with translocated herbicide to prevent regrowth. The stumps and root systems of these plants will be allowed to rot *in situ* and thus not be used in the composting program.

2) The small herbaceous weeds that may be sprayed in the Garden Area will also be allowed to shrivel up and decompose *in situ* and thus not used in the composting program.

3) Because translocated herbicides may be injected into alien trees and shrubs during the habitat improvement of the Lower Limahuli Preserve, and because all organic material generated by this program will be composted, some herbicide-treated material will undoubtedly be added to the compost piles. This is not anticipated to cause any adverse effects since trees or shrubs that are injected with herbicide will not be added to the compost piles for several months (after they have died, and maybe even allowed to fall down). By then, the active ingredients in the herbicide should be well on their way towards breaking down and becoming inert. (How long it takes for a herbicide to completely break down depends upon the half life of the organic compounds used in the herbicide, and the environmental conditions like the temperature, moisture, etc.). In addition, herbicides that will be used in this area will be carefully selected, and only those that quickly bind to soil particles and become biologically inert will be chosen for use. This will prevent any adverse impact on the beneficial soil organisms (e.g., earthworms, fungi, etc. that turn the dead organic matter into humus), and it will prevent the herbicide from being washed into Limahuli Stream while still in an activated form.

In order to adequately address this concern, we have added a new section to the Environmental Assessment in our Master Plan entitled, *Translocated Herbicides* (now found on pages 65 and 86).

Comment #3. This is an excellent observation. You are correct in that we neglected to include the Hawaiian *hale* as part of the infrastructure needed to support our educational programs. After discussing this with the County Planning Department, I found out we will probably need a building permit for the *hale*. We have thus amended our Master Plan to include a Hawaiian *hale* as part of the infrastructure associated with the Visitors Program for Limahuli Gardens.

Comment #4. Due to the constraints of reproducing and binding the Master Plan, I could not make this exhibit any larger than 11 X 17 inches. The original map is nearly 4 X 6 feet and in the reduction process the text and features have become nearly unreadable. In spite of the lack of clarity, the exhibit does impart some idea of the locations and intensity of archaeological features found in Limahuli Gardens. I have sent an original to the State's Historic Preservation Division and also have one available at the Gardens.

Suzanne Merinelli/Kaua'i Sierra Club
April 18, 1991
Page 3

Feel free to contact me if you would like to see the original map for details.

Comment #5. Unfortunately, the Plant of the Month Program is being scaled down and will now be called the Native Plant Giveaway in the future since plants will not be distributed on a monthly basis. In the past, we have tried to disseminate different types of plants at every distribution, and depending upon the species featured, between 60 and 200 specimen plants are usually given away.

Comment #9. Currently, the Haas family does use our road for access to and from their property. We have not placed any restrictions on the amount, or type, of traffic allowed, and have no legal agreement with them at this time. We are currently negotiating a legal easement that will provide the Haas family access to and from their property over a portion of our road in exchange for their rights to build a road through the ancient Hawaiian *lo'i* located on their existing legal access roads of P-1 and P-2.

Comment #10. The grasses currently used for our lawns are alien species. The reason for this is that due to the topography of the Gardens we need aggressive, low growing, wear-tolerant grass species. Unfortunately, the exclusive use of native grass species (species that are not adapted for this type of use) would result in an increase in soil erosion and damage to the grounds during torrential rain storms. Thus, it is unlikely that our lawns will ever be totally replaced with native species of grass (in the future).

Comment #11. Your observation that "*... gradual removal of alien plants simply causes the concomitant organisms to relocate to neighboring plant communities*" is correct. An exception to this would be for a host-specific organism whose host is removed and no available host exist nearby. In this situation, the host-specific organism would perish due to the lack of an available host.

In fact, this has happened to many of our native organisms over the last 200 years. As our native forests have slowly become invaded with alien species, native organisms that have evolved in close relationship to a particular plant species either migrate to different plant communities or perish from lack of available hosts.

How this meshes with the information mentioned on page 81, is as follows: Actually, what we envision happening is a reverse of the above mentioned scenario. A gradual increase in the number of host plants will naturally encourage the migration of native organisms back into the Lower Limahuli Preserve from surrounding plant communities. If native organisms no longer exist in neighboring plant communities because of their predominantly alien character, then they can be reintroduced by restocking. Keep in mind this is a long term process that will take many, many years to accomplish, and much research is need to determine exactly what native

Suzanne Merinelli/Kaua'i Sierra Club
April 18, 1991
Page 4

organisms should be restocked in Limahuli. It is a lofty goal that will not easily be accomplished. To help make it a little clearer in the Master Plan, I will reword page 81 to read: "3. *Once the native plants have become dominant factors in the ecosystems, the other components such as birds, insects, fungi, etc. should naturally return or, if necessary, the NTBG can attempt to restock them.*"

Comment #14. Since the Lower Limahuli Preserve will not be a primary educational resource used by school groups and teachers, but rather as a unique educational/recreational experience for individuals or small groups, a waiver is unlikely (although not totally out of the question). I believe that the NTBG will be allowed to use its discretion in this type of matter.

Comment #15. I may take you up on this generous offer after we have received DLNR approval for the Master Plan.

Comment #16. Yes, the topography and lack of access to the Upper Limahuli Preserve renders conventional methods of habitat improvement (like those to be used in the Garden Area and Lower Limahuli Preserve) impractical. Also, due to the nearly pristine nature of the existing plant communities, any large-scale activity by man will undoubtedly damage some of the understory plants and open new niches for alien weed seeds (brought by the wind, birds, pigs, and man) to get established. In our view, a conventional habitat improvement program for this area would do more harm than good.

Comment #17. There are currently several prevailing theories about the ancient Hawaiian colonization and cultural growth in Hawai'i. Most of the theories support the idea that the original colonists arrived sometime during the 3rd to 5th centuries A.D. As time went by, several independent colonies were established on all of the major islands. These early colonies were not internally stratified (socially within themselves), nor were they units of a larger politically stratified society.

Sometime around the 11th to 13th centuries there occurred an intensive period of two-way voyaging between Hawai'i and Polynesia. Many scholars believe that this period brought about several fundamental changes in the religion and culture of the Hawaiian people. These changes resulted in the internal stratification of the society (there were now different classes of people), and the concept of a *mo'i* (or supreme chief) that ruled an island or several islands (political stratification).

The above is a very crude and brief synthesis of the archaeological and anthropological theories that are currently accepted. How these theories apply to Limahuli remains to be known. Hopefully, future research will give us a clear picture of the evolution of the Hawaiian culture that once dominated Limahuli Valley.

Suzanne Merinelli/Kaua'i Sierra Club
April 18, 1991
Page 5

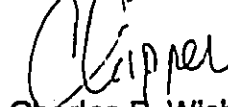
Comment #21. No, these pest are still present in Limahuli Valley. We are not allowed to take any action in eradicating these pests until our Master Plan has been approved by the DLNR. Yes, if the DLNR sees fit to approve our Master Plan, the Sierra Club can help us in our efforts to eliminate these serious pests.

Comment #22. It is my understanding that the stream bed of Limahuli Stream is private, like its banks. Our deeds show that the property boundary actually extends out into the middle of the stream from each side, and since we own the property on both sides of the stream we, in effect, own the stream bed.

The exception to this case is the "Cold Pond" located just *mauka* of Kuhio Highway. When the Fifth Circuit Court partitioned the *ahupua'a* of Ha'ena (owned by the Ha'ena Hui) during the period of 1955 to 1967, they actually cut out a portion of the stream bed (the cold pond) and designated it for public use. This small area is the only portion of Limahuli Stream that the public has legal access to *mauka* of Kuhio Highway.

Once again, I thank you for the time spent reviewing and commenting on our Master Plan, and I look forward to working with the Kaua'i's Sierra Club in the future to protect our valuable natural and cultural resources.

Sincerely,



Charles R. Wichman, Jr.
Assistant to the Director - Limahuli

P.S.: I never did hear from Jack Lundgren.



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

Mr. William H. Sager, President
OLSON SAGER LTD.
44-221 Mikiola Drive
Kaneohe, Hawai'i 96744

Dear Mr. Sager:


**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

Thank you for taking the time to review and comment orally on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We greatly appreciate your advice and the support you have shown for our project in Limahuli Valley.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991. The CDUA process will include a public hearing to allow the community an opportunity to voice their concerns. The hearing will probably be held on Kaua'i sometime in late summer or early fall 1991. If you are interested in testifying at the hearing, please contact me in May and I will keep you informed about when and where the hearing will be held.

Once again, I thank you for the time spent reviewing and talking to me about our Master Plan. Feel free to contact me if I can be of any assistance to you. Thank you very much.

Sincerely,


Charles R. Wichman, Jr.
Assistant to the Director - Limahuli

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◊ Admitted in Hawaii

+ Admitted in California

~ Admitted in Mississippi

February 21, 1991

TO WHOM IT MAY CONCERN
c/o Charles Rice Wickman, Jr.
Botanist Limahuli Gardens of
National Tropical Botanical Gardens

Subject: National Tropical Botanical Garden's
Proposed Master Plan

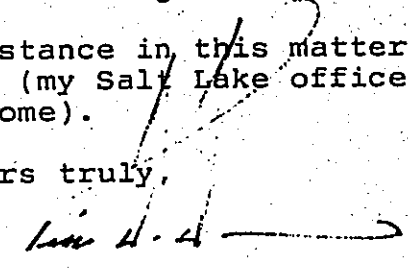
Please receive this letter in strong support of the Master Plan prepared by Charles Rice (Chipper) Wickman, Jr. for the Limahuli Gardens of the National Tropical Botanical Gardens.

I have reviewed the Master Plan and endorse it and Mr. Wickman's decent and honorable plans for the Limahuli Valley.

I live between the Limahuli Gardens and the Haena State Park and consider the Limahuli Gardens of the National Tropical Botanical Gardens and Chipper as valued neighbors.

If I can be of any further assistance in this matter, please contact me at (801) 521-6666 (my Salt Lake office) or (801) 521-6349 (my Salt Lake City home).

Yours truly,


TIM DALTON DUNN

TDD/rd



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

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Aloha Tim:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

Thank you for taking the time to review and comment on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We greatly appreciate your support for our project in Limahuli Valley.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991. The CDUA process will include a public hearing to allow the community to voice their concerns. If you are interested in testifying at the hearing, please contact me in May and I will let you know when and where the hearing will be held.

Once again, I thank you for the time spent reviewing and commenting on our Master Plan.

Sincerely,

Charles R. Wichman, Jr.
Assistant to the Director - Limahuli



P O BOX 237, HANALEI, HAWAII 96714

April 2, 1991

Charles R. Wichman, Jr.
Asst to Director-Limahuli
P. O. Box 808
Hanalei, Hawaii 96714

Dear Chipper:

Roberta and I have read and reviewed your comprehensive report regarding the proposed future plans for Limahuli Valley.

To begin with, we are very impressed with the immense effort you have expended in dealing with such a demanding and complex project. As full time residents of Limahuli Valley, we can readily appreciate the need to protect and preserve the indiginous species, while maintaining the beauty of this rare and pristine place.

We are in agreement with the majority of your concepts and supportive of your environmental philosophy. From our own personal point of view, we are especially appreciative of the buffer area you intend to create, surrounding our little kuleana. Obviously, our greatest personal concern is maintaining and respecting our privacy. Your sensitivity to the unique location of our land, as expressed in the report is of major value and significance to us.

As always, we wish to cooperate with you in a harmonious and sensible way, and are truly hopeful that your well thought out plan wil protect and preserve this inspiring place.

CREATIVE CENTER • NIKKO, JAPAN



P O BOX 237, HANAIEI, HAWAII 96714

Charles R. Wichman, Jr.

Page 2

One other area of particular concern to us has to do with the hiking tours back into the valley. It is our fervent hope that these tours will be by escort only, and in small numbers. We are not in favor of people wandering freely throughout the valley, and believe this would contradict the conservative approach expressed in your very thorough report.

If Roberta and I may be of any assistance in further expressing our observations, please feel free to call on us. In our opinion, you are doing an outstanding job of carrying on your Grandmother's intentions as the keeper of the valley.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Gordon and Roberta Haas", written over a horizontal line.

Gordon and Roberta Haas



NATIONAL TROPICAL BOTANICAL GARDEN
 CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

Mr. and Mrs. Gordon and Roberta Haas
 P.O. Box 237
 Hanalei, Hawai'i 96714
 Owners of Exclusion 27; TMK 5-9-6:7

April 18, 1991

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Aloha Gordon and Roberta:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
 Master Plan for Limahuli Gardens and Preserve**

Thank you for taking the time to review and comment on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We greatly appreciate your concern and support for our project in Limahuli Valley.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991. The CDUA process will include a public hearing to allow the community to voice their concerns. If you are interested in testifying at the hearing, please contact me in May and I will let you know when and where the hearing will be held.

Both the NTBG and the Wichman family share your concern about " ... *the hiking tours back into the valley We are not in favor of people wandering freely throughout the valley*" To prevent visitors from wandering freely throughout the valley, we have incorporated limitations on the Visitors Program for the Lower Limahuli Preserve. These strict limitations will require all visitors who wish to tour this area to make reservations, pay an entrance fee, and be accompanied by trained docents. There will not be any unguided tours in the Lower Limahuli Preserve. Tour groups will be limited in size, and docents will see that all visitors stay on the defined trail and abide by all of the other requirements (see Master Plan page 84).

As you are aware, it has been a real challenge to develop programs that utilize the incredible educational potential of Limahuli Valley without adversely impacting the qualities that make this place so special. Your continued support and concern will undoubtedly help us meet this challenge. Mahalo nui loa.

Sincerely,

Charles R. Wichman, Jr.
 Assistant to the Director - Limahuli

Teresa Goldberg
3386 HAAS DR. J
APTOS CA 95003

Dear Charles Wickman Jr.,

We have reviewed NTSB
master plan for the
Tumuhuli Garden and preserve
and we support your goals
of preservation and education
in Tumuhuli Valley. We feel
that you have adequately
addressed all of our concerns
that we previously had
with your 1987 proposal
C.DUA KA 2065

We hope that the focus
of the garden and preserve
does not turn into a

Tourist attraction and
remains one of education
and preservation.

Sincerely with
best wishes
Teresa Goldberg



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

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3386 Haas Dr.
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Aloha Ira and Teresa:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

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Once again, I thank you for your time spent reviewing and commenting on our Master Plan.

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GENERAL COUNSEL

Sincerely,

Charles R. Wichman, Jr.
Assistant to the Director - Limahuli



ILARO

February 18, 1991

Chipper Wichman
National Tropical Botanical Garden
Limahuli Garden
Hanalei, Hi.

Dear Chipper:

In regard to the proposed plan to improve and extend the existing Limahuli Garden in function, activities, and public attendance, we as patrons and fellows of the Garden, are in support of the proposed plan: however, we have great concern as to the possible negative impact on the immediate environment as well as to the original purpose of the Garden itself. We understand and fully support the need to expose a greater number of people to the purpose of the Garden and the National Tropical Botanical Garden organization; however, the impact on the surrounding area and the people of Kauai could be of significant concern.

We are concerned that the Limahuli Garden remain an educational center, which has only the most positive effect on the immediate environment, and that it not become a tourist attraction which could have a potentially devastating effect on the physical environment, the Limahuli staff and its efforts, and on the National Tropical Botanical Garden efforts as a whole.

We believe the need for a committee made up of a representative group of people, including representation from the surrounding community, is imperative. We believe this committee could ensure that the needs of the Limahuli Garden, the National Tropical Botanical Garden, and the community would continue to be addressed and met to the satisfaction of all concerned: as well as providing valuable information which would further serve the people of Kauai in addition to providing the public with the opportunity to experience the Garden and the purpose intended without having a negative impact on a very valuable resource.



ILARO

The evaluation by this committee of the negative and positive environmental impact would surely lead to a greater balance in effort and result, through optimum representation.

We will continue to support the National Tropical Botanical Garden and Limahuli Garden, with the hope that a representative committee will be formed to assist and insure that all efforts taken will be successful and fulfill the purpose designed. Thankyou for your attention.

Yours truly,

Donald Canaparo, Jill Canaparo



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

April 18, 1991

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Aloha Donald and Jill:

**SUBJECT: Early Review of The National Tropical Botanical Garden's
Master Plan for Limahuli Gardens and Preserve,
Ha'ena, Kaua'i. Tax Map Keys 5-9-01:3; 5-9-06:2 - 6, 8, and 9.**

Thank you for taking the time to review and comment on the National Tropical Botanical Garden's (NTBG) Master Plan for Limahuli Gardens and Preserve. We greatly appreciate your concern and support for our project in Limahuli Valley.

Having just completed the early review of our Master Plan for Limahuli Gardens and Preserve, the NTBG is now preparing to file a Conservation District Use Application (CDUA) with the Department of Land and Natural Resources (DLNR) in late April 1991. The CDUA process will include a public hearing to allow the community an opportunity to voice their concerns. The hearing will probably be held on Kaua'i sometime in late summer or early fall 1991. If you are interested in testifying at the hearing, please contact me in May and I will keep you informed about when and where the hearing will be held.

As you know, the NTBG and the Wichman family are very concerned about the possibility that the focus of the Gardens and Preserve could change to that of a tourist attraction in the future. To prevent this from happening, we have included limits on the Visitors Programs described in the Master Plan that should insure that Limahuli Gardens and Preserve will only be used as an educational, recreational, and research resource, and not as a tourist attraction. It is my understanding that if the State of Hawai'i's DLNR approves our CDUA and Master Plan, these limits cannot be changed without the submission of a new CDUA and Environmental Assessment (EA). A new CDUA/EA process will allow for public review and commenting at that time, and should give the public an opportunity to voice their concerns over any changes to the original Master Plan.

LIMAHULI GARDENS - POST OFFICE BOX 808, HANAIEI, KAUAI, HAWAII 96714

Canaparo
April 18, 1991
Page 2

Both the NTBG and the Wichman family think that your suggestion of " ... a committee made up of a representative group of people, including representation from the surrounding community ..." is an excellent one. As a result, we have added a new program to the Master Plan that is called the "Environmental Assessment Program" (see enclosure). Basically, this program will include the formation of a committee that will evaluate both the positive and negative impacts of the operations and improvements of Limahuli Gardens and Preserve, as approved by the DLNR. The committee will be chaired by the Director of the NTBG, while committee members will equally represent the NTBG, the Wichman family, and the North Shore community. The committee will author an annual report stating their findings and suggestions, which will be submitted to the NTBG's Board of Directors. Although the suggestions and finds of the committee will be non-binding on the NTBG, it will allow for an annual review process in which concerned individuals and groups can submit testimony and make suggestions to improve the operations of the Gardens and Preserve.

As you are aware, it has been a real challenge to develop programs that utilize the incredible educational potential of Limahuli Valley without adversely impacting the qualities that make this place so special. Your suggestions, as well as your continued support, will undoubtedly help us meet this challenge. Mahalo nui loa.

Sincerely,



Charles R. Wichman, Jr.
Assistant to the Director - Limahuli

Enclosure
Master Plan, page 24

APPENDIX 6

**ADDITIONAL INFORMATION REQUESTED
BY THE OCEA**

APPENDIX 6

ADDITIONAL INFORMATION REQUESTED BY THE OCEA

Just a few days before Hurricane Iniki hit Kaua'i on September 11, 1992, the NTBG received the following letter from the Office of Conservation and Environmental Affairs (OCEA) requesting that additional information on nine (9) subjects be included in the CDUA for the Limahuli Valley Special Subzone. It is in response to this request by the OCEA that this appendix has been prepared and included in this CDUA.

JOHN WAIHEE
GOVERNOR OF HAWAII



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

REF:OCEA:CT

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AUG 28 1992

FILE NO.: KA-2532
DOC. ID.: 1274

Mr. Charles R. Wichman, Jr.
P. O. Box 753
Hanalei, Kauai, Hawaii 96714

Dear Mr. Wichman:

We are pleased to inform you that your petition to amend Title 13, Chapter 2, Hawaii Administrative Rules (HAR) in order to establish a Special Subzone at Limahuli Gardens and Preserve at Haena, Kauai was approved by the Board of Land and Natural Resources (Board) on August 12, 1992. The Board approved the following amendments to Title 13, Chapter 2, HAR:

I. Title 13-2-9, HAR, "Establishment"

Map "K-3" is amended to depict the boundaries of the proposed Special subzone in Limahuli Valley, Haena, Kauai as represented in this petition request.

II. Title 13-2-15, HAR, "Special (SS) subzone."

The addition of a seventh Special subzone which states the following:

- (7) Limahuli Valley Special Subzone. Subzone designation for educational, recreational, and research purposes as delineated on map entitled "K-3, Ha'ena, Kauai," dated August 12, 1992, on file with the department.

Please provide one full-sized mylar and two colored copies of subzone map K-3, Haena, Kauai that depicts the boundary change for Limahuli Valley Special Subzone. We will continue to process the amendment to Title 13, Chapter 2, HAR. Upon completion of the process, we will send you a copy of the amended rule.

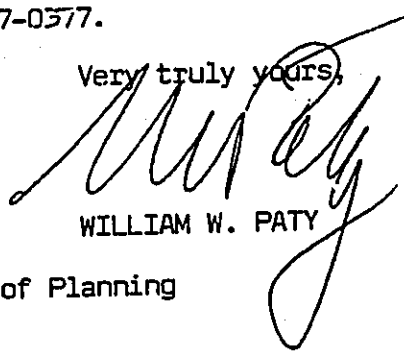
Additionally, please address the following items in the CDUA for the Limahuli Valley Special Subzone:

- Operational days and hours for employees and visitors.
- What is the carrying capacity of the Garden? (That is, what is the maximum number of visitors that the garden can support without degrading the environmental and cultural attributes of the area.)
- Methods to encourage car pools for visitors and employees.
- Are there other types of activities planned for the garden (such as weddings and parties)?
- Are there any evening activities planned?
- What is the proposed fee structure for visitors? (For example, the entry fee for non-residents, Hawaiian residents, Kauai residents, National Tropical Botanical Garden's members.)
- Please address Section 13-2-21(c) of our Administrative Rules regarding the deviation of standard conditions as it relates to your three (3) special requests regarding the construction of facilities at the garden.
- Are there plans to periodically update your Master Plan? If so, have you developed a timetable?
- Are there procedures to handle emergencies and natural disasters (such as fires, floods, landslides, etc.)?

Also, the CDUA for the Limahuli Valley Special Subzone will be reviewed by numerous public agencies as well as the Board. When submitting your application, please provide 25 copies of the CDUA. As a reminder, when submitting photographs, please submit one set of originals and 25 copies.

Thank you for your cooperation in this matter. If you have any questions, please contact Cathy Tilton of the Office of Conservation and Environmental Affairs at 587-0577.

Very truly yours,



WILLIAM W. PATY

cc: County of Kauai Dept. of Planning

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION - APPENDIX 6

ADDITIONAL INFORMATION REQUESTED BY THE OCEA

1. OPERATIONAL DAYS AND HOURS FOR EMPLOYEES AND VISITORS.

As outlined in the Master Plan for Limahuli Gardens and Preserve, dated April 1991 (referred to in this section as the Master Plan or MP), the NTBG needs to maintain flexibility in operating both the Gardens and Preserve. The NTBG will have to find a balance between the needs of its various programs including the maintenance of the grounds, the research programs, and the visitors programs. This balance will ultimately be determined through the actual implementation of these programs and is not possible in a conceptual master plan.

This flexibility does not mean that the limitations that are recommended for the Visitors Programs in both the Limahuli Gardens and the Lower Limahuli Preserve might be ignored, but rather, that the NTBG should be able to change the days and hours of its operations while staying within the recommended limits. This will give the NTBG the ability to balance the needs of its visitors, scientists, and grounds maintenance workers who will be using the Gardens and Preserve.

DAYS OF OPERATIONS IN LIMAHULI GARDENS

Limahuli Gardens could operate five (5) to seven (7) days each week. However, the Visitors program for Limahuli Gardens as described on pages 40-41 of the Master Plan will be limited to a maximum of five (5) days with grounds maintenance possibly occurring on the other two (2) days.

Until an operational visitors program is established and local and off-island visitors' preferences are determined, the NTBG has no way of determining which will be the most appropriate days to operate this program. However, it is our initial feeling that, in order to accommodate our local residents, the visitors program will be operational at least one (1) day each weekend.

HOURS OF OPERATIONS IN THE GARDENS

The hours of operation in the Gardens could extend from 7:00 a.m. to 8:00 p.m. depending upon the time of year, the maintenance needs of the grounds, and the time it takes for staff to complete their work and close the Gardens after all visitors have left.

The hours of operations of the Visitors Program for Limahuli Gardens have been limited to a maximum of eight (8) hours the (see Limitations, #5, page 41 of the MP). Because the Gardens is cool and pleasant in the late afternoon, it is possible that the visitors program could operate from late morning until close to sunset year round. This would mean that during the summer months, it could be as late as 7:30 to 8:00 p.m. before the staff have completed their work, closed the Gardens and actually left. In the winter months the Gardens would close earlier, probably between 6:00 and 7:00 p.m.

The hours of maintenance operations are not expected to change from the existing 40 hour work week. Currently, employees are scheduled to work from 7:00 a.m. to 3:30 p.m. in the summer months and 8:00 a.m. to 4:30 p.m. in the winter months.

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION - APPENDIX 6

DAYS OF OPERATION IN LIMAHULI PRESERVE

Limahuli Preserve will probably operate five (5) days each week. The Visitors Program for the Lower Limahuli Preserve (as described on pages 83-84 of the Master Plan) is limited to a maximum of three (3) days and the maintenance and habitat improvement of this area could possibly occur on the other two (2) days.

Until an operational visitors program is established and visitors' preferences are determined, the NTBG has no way of determining which will be the most appropriate days to operate in this area. At least one (1) day per weekend will probably be used to accommodate our local residents.

HOURS OF OPERATION IN LIMAHULI PRESERVE

The hours of operation in the Preserve could extend from 7:00 a.m. to 7:00 p.m. depending upon the time of the year, and the needs of various researchers, and Garden staff.

The visitors program for this area is limited to a maximum of eight (8) hours per day (page 84 of the MP) with hikes probably taking place between 9:00 a.m. and 5:00 p.m. year round. At this time, the hours of operation for the habitat improvement and research programs are not defined, although they will probably follow those used in the Gardens.

2. **WHAT IS THE CARRYING CAPACITY OF THE GARDEN? (THAT IS, WHAT IS THE MAXIMUM NUMBER OF VISITORS THAT THE GARDENS CAN SUPPORT WITHOUT DEGRADING THE ENVIRONMENTAL AND CULTURAL ATTRIBUTES OF THE AREA.)**

The NTBG believes that the actual carrying capacity of the Gardens, when defined as the maximum number of visitors that the Gardens can support without degrading the environmental and cultural attributes of the area, is quite substantial, probably well over 500 visitors per day. The NTBG has however, chosen to limit the number of visitors allowed to tour the Gardens to about 25% of this figure, or 120 visitors per day.

In determining the carrying capacity of Limahuli Gardens, the NTBG first examined the visitors programs for several other operations and evaluated the impact these operations are having on the environmental and cultural attributes of their respective areas. These operations included but were not limited to:

- NTBG's visitor operations in Lawai;
- Waimea Falls Park and Arboretum on Oahu;
- Ho'onaunau City of Refuge on Hawai'i;
- Kilauea Point National Wildlife Refuge on Kaua'i;
- Ka Ulu O Paoa Heiau on Kaua'i; and
- Olopuia Gardens on Kaua'i.

Four (4) of these operations, Waimea Falls Park and Arboretum, Ho'onaunau City of Refuge, Kilauea Point National Wildlife Refuge, and Ka Ulu O Paoa Heiau are fairly large-scale visitor attractions that normally have about 1,000 or more visitors daily.

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION - APPENDIX 6

The other two (2) operations, the NTBG's visitor program in Lawai, and Olopua Gardens on Kaua'i, are mid- to small-sized operations that averaged 25 to 100 visitors daily.

After examining these operations, it was very apparent that several key factors play a role in controlling the impact an operation is having and ultimately the carrying capacity of the site. Perhaps the single most important factor is how the visitors are directed and controlled from the moment they enter the site until they leave. Also important are the adequacy of the physical facilities available at a given site and the number of acres (size of the site) available to the visitors to use.

Two examples of large scale operations that are similar in nature to the NTBG's proposed operations in Limahuli, and which have not resulted in any noticeable degradation to the resources of their areas, are the Kilauea Point National Wildlife Refuge on Kaua'i and the Waimea Falls Park and Arboretum on Oahu. The Kilauea Point National Wildlife Refuge is located on the north shore of Kauai and is operated by the US Fish and Wildlife Service. It has an annual visitor count of over 300,000. The area used by these visitors is relatively small, only 32 acres, yet the impact from the visitors to the environmental and cultural attributes of the area is minimal. The carrying capacity of this area is thus over 300,000 per year. This is made possible because of the control exerted over the visitors (signage and fencing) and adequate physical facilities like parking, established trails, a visitor center, an environmental education center, and restrooms.

Waimea Falls Park and Arboretum also has an annual visitor count of over 300,000. Their site is a valley on the north shore of Oahu with a climate similar to that found in Limahuli Gardens. Visitors there are allowed access to about 150 acres, although most of them concentrate along the main road and path which lead from the main gate to the falls and back. With the exception of fences at the main gate and for safety along the edge of cliffs, the only fence used to control wandering visitors is around a pit in a heiau. Most visitors are guided by brochures and signs in addition to the well maintained roads and trails. Over its more than 15 years of operations, the visitor's program at Waimea Falls Park has not resulted in any apparent damage to the environment or the archaeological sites, while it has provided literally millions of visitors with a greater appreciation for Hawaii's unique flora, and cultural history.

In determining the carrying capacity of Limahuli Gardens, the NTBG considered the infrastructure proposed in the Master Plan, the expansion of the grounds to about 20 acres, and the control of visitors on the proposed guided and self-guided tours. It appeared that the character of the environmental and cultural attributes of Limahuli valley did not preclude having a large operation at the Gardens. These attributes could be adequately protected through control of the Gardens visitors and the proposed physical facilities. What appeared to be the most limiting factor was the lack of an area on the Gardens' grounds that would be big enough to provide adequate parking for a large number of visitors. If visitors could be bussed in, or park elsewhere and be shuttled to the Garden, the carrying capacity could conceivably approach those of other large scale operations, that is about 500 to 1,000 people per day.

In establishing the number of visitors that would be allowed to visit Limahuli Gardens, the NTBG considered not only the potential carrying capacity of the Garden and its limited parking area, but

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
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also the impact its operations could have on the residences immediately adjacent to the Gardens. After discussing out situation with our consultants and our neighbors, it was decided to limit the number of visitors that could normally come to the Garden to 120 per day. With a maximum of 260 operational days per year (5 days per week), this works out to a maximum of 31,200 visitors a year, a figure well within the carrying capacity of the Gardens.

3. METHODS TO ENCOURAGE CARPOOLS FOR VISITORS AND EMPLOYEES.

EMPLOYEES

Currently, the greatest incentive for employees to carpool is the very high cost of gas on the North Shore of Kaua'i. With future gas prices bound to increase, this will continue to be a strong motivational factor. Additionally, the majority of the Gardens' staff are, and will be, scheduled to work at the same time, thus facilitating carpooling. Currently, of the Gardens' seven (7) employees, five actively carpool, one rides a bike, and one lives .25 miles away and drives his own truck to work. As our work force expands in the future we will continue to promote carpooling among our employees.

VISITORS

With about 2,000 visitors-per-day visiting the Ha'ena State Park at the end of Kuhio Highway, the NTBG does not anticipate that its small-scale operation in Limahuli will create any noticeably increase in traffic on the north shore. Nonetheless, it is very interested in ways to get its visitors to use carpools. Unfortunately, the NTBG has not been able to find a method that will effectively do this.

One of the methods explored was to charge visitors a high per-car rate and a low per-person rate. While this could encourage visitors to carpool, it could also lead to visitors parking off the applicant's property, and walking back to Limahuli Gardens. This idea was thus rejected by the NTBG because it would probably not reduce the actual number of cars used by NTBG visitors.

Another option that was considered and also rejected included various arrangements with tour companies and hotels. While at first this seemed appealing, it was rejected because the NTBG does not want to "mass market" Limahuli Gardens through tour companies. Because we are taking a quality-verses-quantity approach with our visitors programs, we prefer to have genuinely interested visitors who can enjoy the Gardens and Preserve without the pressure of being on a "packaged tour".

Since Hurricane Iniki hit Kaua'i in September 1992, Kaua'i has had a free bus service called the Iniki Express. This system currently provides our staff with an alternative method of getting to the Gardens. However, due to the present cost of running the bus system, it is unclear whether the county will elect to continue to fund this system after federal emergency funds have been exhausted.

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
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Because carpooling will benefit the NTBG by reducing the number of cars going in and out of the Gardens, and by reducing the congestion in its limited parking areas, the NTBG will continue to explore ways to promote both its visitors and its staff to carpool.

4. **ARE THERE OTHER TYPES OF ACTIVITIES PLANNED FOR THE GARDEN (SUCH AS WEDDINGS AND PARTIES)?**

Although the Master Plan, written in 1990, specifically states that wedding ceremonies will be allowed in the Gardens subject to the proposed limitations of the visitors program (MP page 41), the NTBG's Board of Trustees has since then decided that weddings, other than for staff and volunteers, will not be allowed at the NTBG's gardens. (This is a good example of why the Master Plan will undergo a periodic review as mentioned in Section 8 below.)

This change has been made to prevent the commercialization of the gardens by professional wedding consultants. It is not the intention of the NTBG to be in the business of hosting commercial weddings or parties. The focus of the NTBG's visitors operations is meant to be on education not on social events. However, Limahuli will most likely follow the lead established by the NTBG's Lawai garden and host an occasional reception. **These will always be garden related.** Examples of receptions hosted in the past in Lawai include a Christmas staff party, the volunteers annual meeting, the graduation of NTBG's interns, the annual lunch for the Garden's staff hosted by the Trustees, and the presentation of the bi-annual Allerton Award and medal to a botanist for his distinguished work in tropical botany.

5. **ARE THERE ANY EVENING ACTIVITIES PLANNED?**

Currently there are no specific evening activities planned for either the Gardens or Preserve. However, the NTBG should be able to conduct educational lectures, meetings, or receptions (as mentioned above) in the evening at its facilities should the opportunity present itself. Also, certain researchers, especially entomologists, may find that the evening or night is the most appropriate time for them to conduct their studies.

6. **WHAT IS THE PROPOSED FEE STRUCTURE FOR VISITORS? (FOR EXAMPLE, THE ENTRY FEE FOR NON-RESIDENTS, HAWAIIAN RESIDENTS, KAUAI RESIDENTS, NATIONAL TROPICAL BOTANICAL GARDEN'S MEMBERS.)**

Although the fee structure at Limahuli Gardens has not yet been officially set by the NTBG's Board of Trustees, the staff have informally agreed that the fee structure at Limahuli should basically follow that used by the NTBG's headquarters in Lawai. An exception to this is that a lower initial fee will be charged until guided tours are offered to visitors.

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
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Once the visitors program and infrastructure are fully implemented, the fee schedule is expected to rise to match that currently used in Lawai. Rather than having separate rates for non-residents, Hawaiian residents, and Kauai residents, the NTBG uses a single fee for all visitors. Residents are urged to become NTBG members and enjoy unlimited free admission to all of the NTBG's gardens. The fee schedule thus planned for Limahuli is as follows:

<u>CATEGORY</u>	<u>INITIAL FEE</u>	<u>EVENTUAL FEE</u>
All Visitors	\$10.00	\$15.00
NTBG Members	FREE	FREE
School Groups	FREE	FREE

7. **PLEASE ADDRESS SECTION 13-2-21(C) OF OUR ADMINISTRATIVE RULES REGARDING THE DEVIATION OF STANDARD CONDITIONS AS IT RELATES TO YOUR THREE (3) SPECIAL REQUESTS REGARDING THE CONSTRUCTION OF FACILITIES AT THE GARDEN.**

Because the NTBG is a non-profit organization that will have to raise funds to design and construct the conceptual facilities that are detailed in the Master Plan, we have asked the BLNR to consider three (3) special requests (see pages 6-7 of this CDUA). These requests will:

1. Allow the NTBG to submit detailed construction plans to the Office of Conservation and Environmental Affairs (OCEA) for approval when the NTBG is prepared, financially, to construct an individual facility.
2. Allow time limits associated with the construction of an individual facility [Section 13-2-21(a)(15)] to commence only at the time that building plans for a facility are stamped for approval by the OCEA; and
3. Clarify that the time limits associated with the construction of an individual facility [Section 13-2-21(a)(15)] not be applied to the NTBG's programs.

These requests are discussed below in regards to the four (4) points of justification listed in Section 13-2-21(c) of the DLNR's Administrative Rules entitled Title 13 Chapter 2.

Point No. 1. *The deviation is necessary because of the lack of practical alternatives.*

As mentioned in detail on Pages 6 and 7 of this CDUA, the NTBG's funding for capital improvement projects results directly from donations solicited expressly for that project. Without BLNR approval of the NTBG's three (3) special requests, funding for all of the physical facilities proposed in the Master Plan will have to be raised before this CDUA has been approved by the BLNR. This would place the NTBG in very difficult position, financially, and raise ethical questions about soliciting donations for projects that, until permitted by the BLNR, are considered illegal.

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION - APPENDIX 6

Furthermore, it is completely unrealistic to think that the NTBG could begin construction on all of its planned physical facilities within one year and complete them within three years! Being forced to construct all of the physical facilities that are proposed in the Master Plan (see MP pages 42-43, and 84) within three years, defeats the process of producing a long-range master plan for a special subzone.

Regarding the programs, because Limahuli Gardens and Preserve will be a perpetual project that will benefit many future generations, the programs outlined in the Master Plan should not be regulated by the time limits described in Section 13-2-21(a)(15) of Title 13-2. Efforts to preserve endangered species through habitat improvement and planting should never cease, nor should the NTBG's efforts to instruct visitors through its educational programs, or its ability to conduct research programs.

It appears to the NTBG, that the time constraints cited in Section 13-2-21(a)(15) were not intended to apply to master plans developed for special subzones but more for individual construction projects. Deviation (as put forth in the NTBG's three (3) special requests) from the rules included in Title 13-2 is clearly necessary if the NTBG's programs at Limahuli are to be perpetual and if the Gardens and Preserve are to be improved incrementally, according to the phases described in the Master Plan.

Point No. 2. *The deviation shall not result in any significant adverse effects on the environment.*

No significant adverse effects on the environment will result from the granting of the NTBG's special requests. This is clearly shown in the environmental assessment of the NTBG's Master Plan which assumed the incremental improvement of Limahuli Gardens and Preserve and that the Gardens' programs would be perpetual in nature (see MP 63-74, 85-88, 92).

Point No. 3. *The deviation does not conflict with objective of the subzone.*

Section 13-2-15 describes the objective of the Special Subzone as: ... *to provide for areas possessing unique developmental qualities which compliment the natural resources of the area.* Further more, Section 13-2-15(7) which describes the Limahuli Valley Special Subzone reads: *Subzone designation for educational, recreational, and research purposes*

Approval of the special requests will enhance, not conflict, with the NTBG's ability to fulfill the objectives of the Special Subzone in general and the Limahuli Valley Special Subzone in detail. This is because these special requests will allow the NTBG to implement it's Master Plan for Limahuli Gardens and Preserve in an incremental and orderly manner.

Point No. 4. *The deviation is not inconsistent with the public health, safety, or welfare of the public.*

Approval of the special requests is not inconsistent with the public health, safety, or welfare of the public. The NTBG spent considerable time safeguarding the health, safety, and welfare of its staff, visitors, and the general public when it developed it's Master Plan for Limahuli Gardens and

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION - APPENDIX 6

Furthermore, it is completely unrealistic to think that the NTBG could begin construction on all of its planned physical facilities within one year and complete them within three years! Being forced to construct all of the physical facilities that are proposed in the Master Plan (see MP pages 42-43, and 84) within three years, defeats the process of producing a long-range master plan for a special subzone.

Regarding the programs, because Limahuli Gardens and Preserve will be a perpetual project that will benefit many future generations, the programs outlined in the Master Plan should not be regulated by the time limits described in Section 13-2-21(a)(15) of Title 13-2. Efforts to preserve endangered species through habitat improvement and planting should never cease, nor should the NTBG's efforts to instruct visitors through its educational programs, or its ability to conduct research programs.

It appears to the NTBG, that the time constraints cited in Section 13-2-21(a)(15) were not intended to apply to master plans developed for special subzones but more for individual construction projects. Deviation (as put forth in the NTBG's three (3) special requests) from the rules included in Title 13-2 is clearly necessary if the NTBG's programs at Limahuli are to be perpetual and if the Gardens and Preserve are to be improved incrementally, according to the phases described in the Master Plan.

Point No. 2. *The deviation shall not result in any significant adverse effects on the environment.*

No significant adverse effects on the environment will result from the granting of the NTBG's special requests. This is clearly shown in the environmental assessment of the NTBG's Master Plan which assumed the incremental improvement of Limahuli Gardens and Preserve and that the Gardens' programs would be perpetual in nature (see MP 63-74, 85-88, 92).

Point No. 3. *The deviation does not conflict with objective of the subzone.*

Section 13-2-15 describes the objective of the Special Subzone as: ... *to provide for areas possessing unique developmental qualities which compliment the natural resources of the area.* Further more, Section 13-2-15(7) which describes the Limahuli Valley Special Subzone reads: *Subzone designation for educational, recreational, and research purposes*

Approval of the special requests will enhance, not conflict, with the NTBG's ability to fulfill the objectives of the Special Subzone in general and the Limahuli Valley Special Subzone in detail. This is because these special requests will allow the NTBG to implement it's Master Plan for Limahuli Gardens and Preserve in an incremental and orderly manner.

Point No. 4. *The deviation is not inconsistent with the public health, safety, or welfare of the public.*

Approval of the special requests is not inconsistent with the public health, safety, or welfare of the public. The NTBG spent considerable time safeguarding the health, safety, and welfare of its staff, visitors, and the general public when it developed it's Master Plan for Limahuli Gardens and

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION - APPENDIX 6

Preserve. This is clearly demonstrated in the environmental assessment of the NTBG's Master Plan which assumed the incremental improvement of Limahuli Gardens and Preserve and that the Gardens' programs would be perpetual in nature.

8. ARE THERE PLANS TO PERIODICALLY UPDATE YOUR MASTER PLAN? IF SO, HAVE YOU DEVELOPED A TIME TABLE?

Yes. The NTBG has plans to initially update the Master Plan after approximately one to two years of actual operations. At that time, the NTBG will evaluate its programs, especially the visitors programs, and make the necessary long-range changes as needed. After that initial update, the NTBG plans to review the Master Plan every five (5) years and, if necessary, draft an updated version.

9. ARE THERE PROCEDURES TO HANDLE EMERGENCIES AND NATURAL DISASTERS (SUCH AS FIRES, FLOODS, LANDSLIDES, ETC.)?

The NTBG has examined the need to develop detailed natural disaster contingency plans for tsunamis and high surf, floods, hurricanes, earthquakes, fires, and landslides. At this time, we feel that only flooding poses a serious threats to the Gardens and Preserve and the personnel that will work and visit there. As a result, we have developed plans and policies to deal with potentially dangerous floods. We have not developed any specific plans or policies to deal with the other listed natural disasters. It should be noted that all NTBG employees are trained in First Aid and CPR so that they can effectively deal with emergency situations as they arise.

A brief discussion about each of the potential natural disasters looked at by the NTBG, and the threat it poses to the Gardens and Preserve follows.

FLOODS

Because Limahuli Valley is located on the wet windward side of Kaua'i where flooding is a frequent occurrence, the NTBG has developed the following procedures to handle high rainfall and flooding situations.

Limahuli Gardens

The majority of the Garden Area, in which almost all of the Gardens' facilities, staff, and visitors will be located, is outside Limahuli stream's flood zone. This is primarily due to the topography of the Garden Area (see Exhibit 4, MP). A second factor is the deep stream channel where the stream passes through the Garden Area. Local informants have indicated that, to their knowledge, the Limahuli stream has never risen to such heights that it overflowed noticeably into the Garden Area. It should be noted that in July 1989, Limahuli and Wainiha streams experienced what was determined to be a 100-year flood. This resulted from a tropical depression that dumped rain in excess of 20 inches over a 10-hour period! The extent of the flooding was such that the swollen stream did not rise significantly into the Garden Area and all access roads were passable!

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION - APPENDIX 6

In spite of the non-threatening nature of floods in the Garden Area, the NTBG has developed a policy and procedures for closing the Gardens and sending staff home under adverse weather conditions. This is primarily because the Gardens can be isolated by the localized flooding of Manoa stream in Ha'ena (1 mile east of Limahuli), and the Hanalei river (about 7 miles east of Limahuli). As a result of this policy, the Gardens is closed several days each year. The decision to close the Gardens is made by the administration based upon local weather conditions and rainfall, National Weather Service forecasts, warnings, and watches, local news bulletins received over the radio, and reports from the Kaua'i Police Department. The Gardens' policy is to get all Garden-related personnel out of the Hanalei and Ha'ena areas before localized flooding occurs. This system has worked well over the last 10 years and the Gardens' staff have never been isolated at the Gardens.

Limahuli Preserve

Flooding is also a concern for NTBG's visitors program in the Lower Limahuli Preserve. The NTBG has developed plans to limit the possibility that visitors on a hike into the valley could get caught by a flash flood. These plans include a policy of canceling a scheduled hike into the Preserve, before the hike commences, if there is a chance of flooding occurring. Additionally, Gardens staff will monitor the National Weather Service forecasts and local weather conditions throughout the day. All tours into the valley will be docent guided, with the docents staying in touch with the visitors center via two-way radio. Any drastic change in the local weather conditions or forecast can be communicated directly to the tour guide who can then abort the hike and bring the visitors immediately back to the Garden area.

The topography of the lower Limahuli valley is such that it does not lend its self to life-threatening flash floods. This is because the valley floor is fairly wide without any narrow "bottle necks" where flood waters can get backed up by a temporary blockage of debris (see MP Exhibit 21). Additionally, in times of unexpected flooding, visitors that are in the Preserve can be brought out of the valley without crossing the stream (the trail normally crosses the stream in two places) thus reducing the hazard to both docents and visitors.

HURRICANES

Because hurricanes are usually preceded by an advance warning, allowing people time to prepare their homes and families and proceed to a safe shelter, the NTBG did not feel it needed to prepare an evacuation/disaster plan for this type of disaster. Additionally, as our recent experience with Hurricane Iniki has shown, emergency hurricane preparation for plants and physical facilities in a garden is very difficult to do. It appears that the best preparation is to build strong structures initially and hope the plants can weather the storm on their own. Because of this, the NTBG has not prepared a natural disaster contingency plan specifically for dealing with hurricanes.

TSUNAMIS AND HIGH SURF

The applicant's property does not abut the shoreline. Because the entire Limahuli Valley Special Subzone is outside the tsunami inundation zone (as depicted on the maps prepared for the civil defense) and because the applicant's property was not inundated during the last two major tsunamis to hit Ha'ena in 1946 and 1957, the NTBG has not prepared a natural disaster contingency plan specifically for dealing with tsunamis and high surf. However, the Gardens is

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION - APPENDIX 6

well aware of the civil defense warning system and will monitor all tsunami and high surf warnings and take appropriate action as deemed necessary.

EARTHQUAKES

Earthquakes are very difficult to predict and prepare for. As with hurricanes, the best preparation seems to be initially well-built structures. A second concern in Hawai'i is a locally generated tsunami resulting from an earthquake. Because none of the physical facilities planned by the NTBГ for Limahuli are multi-story structures requiring an earthquake evacuation strategy, and because the entire Limahuli Valley Special Subzone is outside the tsunami inundation zone as depicted on the maps prepared for the civil defense, the NTBГ has not prepared a natural disaster contingency plan specifically for dealing with earthquakes or locally generated tsunamis.

FIRES

It appears that the threat of a natural disaster fire is not very likely in Limahuli valley due to an average annual rainfall of about 120 inches per year, and the extent of the lush tropical vegetation that covers the valley. Historically, no recorded natural disaster fire has ever occurred in this area that the NTBГ is aware of.

Because the threat of fire is ever present when flammable fuels, like gasoline, are used, the NTBГ's employees are trained in First Aid and CPR and only OSHA approved storage containers are used. Additionally, as the physical facilities are developed in the Garden, fire escape plans, and OSHA approved flammable substance storage facilities will be developed and the staff instructed in their use.

The Composting Program, outlined in the Master Plan (pages 28-33), will offset the need to burn organic material generated in the maintenance and improvement of the Gardens and Preserve. This will lessen the chance of a catastrophic fire originating on the NTBГ's property. Because of these factors, the NTBГ has not prepared a contingency plan specifically for dealing with a natural disaster fire.

LANDSLIDES

Although the topography of Limahuli valley appears to encourage landslides, it also works against the possibility of a catastrophic landslide occurring. Because the valley walls are so steep (see Exhibit 2, MP), small landslides are constantly occurring. This is a natural part of the erosion process that has been forming the valley for millions of years. These small landslides tend to remove the outer layer of soil and decomposed rock, revealing the solid rock base underneath. This process, combined with the extreme slope of the valley walls prevents the formation of deep profile soils on the ridges that are classified mostly as rRO, or Rock Outcropping by the USDA (see Exhibit 9, MP). Because of this, the possibility of a large natural disaster type landslide occurring in Limahuli is very slight. The NTBГ has thus not prepared a natural disaster contingency plan specifically for dealing with landslides.

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION - APPENDIX 7

APPENDIX 7

RESPONSES TO THE DRAFT ENVIRONMENTAL ASSESSMENT

CONSERVATION DISTRICT USE APPLICATION FOR LIMAHULI GARDENS AND PRESERVE
MASTER APPLICATION - APPENDIX 7

RESPONSES TO THE DRAFT ENVIRONMENTAL ASSESSMENT

In compliance with Chapter 343, Hawaii Revised Statutes, and Act 241, Sessions Laws of Hawaii, the Conservation District Use Application and Draft Environmental Assessment for the Limahuli Valley Special Subzone underwent a formal 30-day review from August 7 to September 7, 1993. During this period of time, the Office of Conservation and Environmental Affairs (OCEA) received several comments, most of which were solicited from within the Department of Land and Natural Resources. The NTBG did not receive any requests for applications or any comments from the public directly, even though Mr. Charles Wichman was listed as the contact person in the Office of Environmental Quality Control's (OEQC) Bulletin.

All of the comments received by the OCEA, including those received outside of the formal review period, were officially forward to Mr. Wichman on September 14, 1993, for his response. This Appendix includes all of the comments received by Mr. Wichman, as well as his response to each one. Based upon the comments received by Mr. Wichman, the NTBG determined that the contents of neither the EA nor the CDUA needed to be revised. Thus, the inclusion of these comments and their responses, as well as changes to the title pages, tables of contents, and the EA's running header, constitutes the only differences between the Draft EA and the Final EA.

JOHN WAHEE
GOVERNOR OF HAWAII



KEITH W. AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

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JOHN P. KEPPELER, II
DONA L. HANA'IKE

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

P. O. BOX 621
HONOLULU, HAWAII 96809

REF:OCEA:VKKH

SEP 14 1993

FILE NO.: KA-2656
DOC. NO.: 3449

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

Mr. Charles R. Wichman, Jr.
Assistant Director - Limahuli
National Tropical Botanical Gardens
P.O. Box 808
Hanalei, Kauai, Hawaii 96714

Dear Mr. Wichman:

SUBJECT: Conservation District Use Application KA-2656 to Use
Limahuli Valley Special Subzone at Haena, Kauai

The Environmental Assessment (EA) submitted with the subject Conservation District Use Application (CDUA) was published in the OEQC Bulletin on August 8, 1993, as a Draft EA. The Draft EA underwent a formal 30-day review period which ended September 7, 1993. Pursuant to the Office of Environmental Quality Control's (OEQC) rules, the applicant is responsible for responding to all comments postmarked within the 30-day review period.

According to OEQC, following the end of this 30-day review period, any comments received along with their responses must be incorporated into the Final EA. If appropriate, the text, figures, tables, maps, and other ancillary parts of the EA should be revised. We have enclosed comments received within the 30-day review period. We have also enclosed comments received outside of the 30-day review period which we would appreciate your response to.

We have tentatively scheduled your application for the November 19, 1993, Board meeting on Maui. In order to meet OEQC's and the Department's processing deadlines, we suggest that your immediate attention be given to finalizing the subject EA and submitting five copies to the Department by September 20, 1993.

Mr. C. Wichman

-2-

File No.: KA-2656

Please be advised that non-compliance with Chapter 343, Hawaii Revised Statutes, will result in negative action on your application.

Thank you for your cooperation in this matter. Please feel free to contact Cathy Tilton of our Office of Conservation and Environmental Affairs at 587-0377, should you have any questions.

Very truly yours,


KEITH W. AHUE

Attachments



NATIONAL TROPICAL BOTANICAL GARDEN
 CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

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GENERAL COUNSEL
 MICHAEL J. SHEA

September 16, 1993

Mr. Keith W. Ahue, Chairperson
 Board of Land and Natural Resources
 P.O. Box 621
 Honolulu, Hawaii 96809

Dear Mr. Ahue:

SUBJECT: CDUA for the Limahuli Valley Special Subzone; KA-2656

Thank you for your letter of September 14, 1993 (Document No.: 3449). Per your request, I have enclosed five (5) CDUAs (and Final EAs) that have been revised to include all of the comments you enclosed as well as our response to each one. Attached to this letter you will also find a letter from the County of Kauai Planning Department indicating that our project is outside of the county SMA.

It is encouraging for us to know that our application is tentatively scheduled for November 19, 1993 on Maui. We look forward to your meeting any processing deadlines that your department may have before then. Please don't hesitate to have your staff call me at 826-5547 should they have any questions or need any additional information.

Sincerely,

Charles R. Wichman, Jr.

Charles R. Wichman, Jr.
 Assistant Director - Limahuli Gardens

Attachment
 Enclosures

✓ Oct.

JOANN A. YUKIMURA
MAYOR



COUNTY OF KAUAI
PLANNING DEPARTMENT
4280 RICE STREET
LIHUE, KAUAI, HAWAII 96766

JEFFREY LACY
PLANNING DIRECTOR

DEE M. CROWELL
DEPUTY PLANNING DIRECTOR

TELEPHONE (808) 245-3918

August 31, 1993

Charles R. Wichman, Jr.
National Tropical Botanical Garden
Limahuli Gardens
P.O. Box 808
Hanalei, Kauai, Hi 96714

Subject: CDUA for the Limahuli Valley Special Subzone; KA-2656

Dear Mr. Wichman,

We have reviewed the draft Environmental Assessment for the Limahuli Valley Special Subzone and find this proposal consistent with the goals and objectives of the North Shore Development Plan and consistent with the General Plan objectives.

The subject property occurs primarily in the State Conservation District and is outside of the County Special Management area. We support the efforts by the National Tropical Botanical Gardens in making this preserve one of cultural, recreational, and educational opportunities. We concur with Mr. Wichman on his decision not to allow the gardens to be commercialized for wedding parties.

Thank you for the opportunity to comment on this application.

Yours Truly,

Dee Crowell
Deputy Planning Director

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

August 10, 1993

MEMORANDUM

To: Paul Kawamoto, Program Manager
Aquatic Resources and Environmental Protection

From: Bill Devick, Program Manager
Recreational Fisheries

Subject: CDUA Review

Comments Requested By: Roger C. Evans, OCEA

Date of Request: July 22, 1993

Date Received: August 9, 1993

Summary of Proposed Project

Title: KA-7/2/82-2656. To Use Limahuli Valley Special Subzone for Educational, Recreational, and Research Purposes via the Establishment of a Tropical Botanical Garden

Project By: National Tropical Botanical Garden, Charles R. Wichman, and Charles R. Wichman, Jr.

Location: Haena, Kauai

Brief Description: A 15 to 20 acre botanical garden will be located in the mouth of Limahuli Valley for the purpose of growing threatened and endangered species native to Hawaii. An adjoining 600 acres will be managed as the Lower Limahuli Preserve, including a habitat improvement program emphasizing control of alien plants and animals. The public will have access to both areas through reservations and an entrance fee. Above these areas is the 400 acre Upper Limahuli Preserve, which will remain in its natural state and be used on a limited basis for research. Public access to this area will be prohibited.

Comments: We strongly endorse all aspects of this project, which includes a commendable management plan for Limahuli Stream, and would like to see approval of the application expedited accordingly. We would like to suggest that the applicant consider entering into a cooperative long term stream monitoring program with the Division of Aquatic Resources. In addition, we suggest that, insofar as possible and without violating the guidelines of the plan, riparian vegetation management be directed in a manner that may shed light on the following questions: (1) what is the true structure of a Hawaiian native riparian community according to elevation; (2) can entirely native riparian communities be restored elsewhere in Hawaii; (3) how wide a terrestrial vegetated buffer zone is needed to protect stream habitats; and (4)

what would be the preferred composition of such a buffer zone? Native riparian-vegetation communities have been so highly altered throughout Hawaii, especially at lower and middle elevations, that we are uncertain about what the natural species relationships should be or, given the massive invasions of alien species, whether restoration is realistically possible.


Bill Devick

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MICHAEL J. SHEA

September 14, 1993

Mr. Bill Devick, Program Manager
Recreational Fisheries
Division of Aquatic Resources
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Devick:

**SUBJECT: Aquatic Resources Review of the EA and CDUA KA-2656
for the Limahuli Valley Special Subzone, Ha`ena, Kaua`i, Hawai`i;**

Thank you for your review of the National Tropical Botanical Gardens DRAFT EA and CDUA for the Limahuli Valley Special Subzone. I received your comments dated August 10, 1993, from the Office of Conservation and Environmental Affairs (OCEA).

We appreciate your strong endorsement of our project in Limahuli valley. As you know, we are very interested in maintaining the long-term health of Limahuli stream and developing more information on the interrelationship of both native and alien riparian vegetation with the stream's environmental conditions. As such, I believe that it would be beneficial to both the NTBG and the DLNR to work together to monitor and study the project area and to try to determine the answers to the questions that you posed.

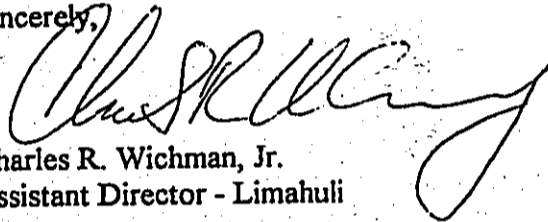
In addition to the information you are seeking, it will be very interesting to monitor the long term effects of Hurricane Iniki upon the quality of Limahuli stream. Iniki opened up the canopy along several sections of the stream and caused lots of siltation from uprooted trees and landslides. Combined with the recent drought and accompanying low water levels in the stream, these changes have had a major impact upon the character of the stream. It will be very interesting to monitor the long term impacts of these changes to the stream, as well as the long term impact from Iniki on the character of the riparian vegetation.

Mr. Bill Devick, Program Manager
Recreational Fisheries
Division of Aquatic Resources
September 14, 1993
Page 2

Surveys of Limahuli immediately after the hurricane indicated that the native trees were structurally more hardy, with fewer uprooted and deformed natives compared to the alien trees. However, a recent survey in the lower Limahuli valley indicated that a large number of native trees have since died from hurricane induced stress and those that are alive are recovering much slower than their alien competitors. While these results don't look encouraging we are hoping that over a longer period of time the native trees will recover to their pre-Iniki condition and regain their place in the riparian canopy.

In closing, I wish to once again thank you for your support of our project. Please feel free to call me anytime to discuss how we can cooperate on the future monitoring of the Limahuli Stream.

Sincerely,



Charles R. Wichman, Jr.
Assistant Director - Limahuli

cc: Mr. Keith Ahue, Chairperson DLNR

OK!
- ST

CCED

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Office of Conservation and Environmental Affairs
Honolulu, Hawaii

JUL 22 1993

FILE NO.: KA-7/2/82-2656
180-Day Exp. Date: 2/29/92
SUSPENSE DATE: 21 Days
DOC. NO.: 3153

C

MEMORANDUM

TO: Aquatic Resources; Conservation & Resources Enforcement; Forestry & Wildlife; Historic Preservation; Land Management; Natural Area Reserves System; State Parks; Water and Land Development; Water Commission

FROM: Roger C. Evans, Administrator
Office of Conservation and Environmental Affairs

SUBJECT: REQUEST FOR COMMENTS
Conservation District Use Application

APPLICANT: National Tropical Botanical Garden, Charles R. Wichman, and, Charles R. Wichman, Jr.

FILE NO.: KA-2656

REQUEST: To use Limahuli Valley Special Subzone for Educational Recreational, and Research Purposes via the Establishment of a Tropical Botanical Garden

LOCATION: Haena, Kauai

TMK(s): 5-9-6: 2, 3, 4, 5, 6, 8, 9 and 5-9-1: 3

PUBLIC HEARING: YES NO

DOCARE: Please conduct a field inspection on this project. Should you require additional information, please call Cathy Tilton at 7-0377.

If no response is received by the suspense date, we will assume there are no comments.

Attachment(s)

DOFAW HAS NO COMMENTS
OR OBJECTIONS TO THE
PROPOSED REQUEST.

[Handwritten Signature]

QUEEN

3:30
11:11

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GENERAL COUNSEL
MICHAEL J. SHEA

September 14, 1993

Mr. Mike Buck, Administrator
Natural Area Reserves System
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Buck:

**SUBJECT: Natural Area Reserves System Review of the EA and CDUA KA-2656
for the Limahuli Valley Special Subzone, Ha'ena, Kaua'i, Hawai'i;**

Thank you for your review of the National Tropical Botanical Gardens DRAFT EA and CDUA for the Limahuli Valley Special Subzone. I received your comments dated July 22, 1993, from the Office of Conservation and Environmental Affairs (OCEA). Please feel free to call me anytime should your division have any future concerns.

Sincerely,

Charles R. Wichman, Jr.
Assistant Director - Limahuli

cc: Mr. Keith Ahue, Chairperson DLNR

CCEA

RECEIVED

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Office of Conservation and Environmental Affairs
Honolulu, Hawaii

'93 JUL 22 P3:18

FORESTRY & WILDLIFE
STATE OF HAWAII

JUL 22 1993

FILE NO.: KA-7/2/82-2656
180-Day Exp. Date: 2/29/92
SUSPENSE DATE: 21 Days
DOC. NO.: 3153

MEMORANDUM

CS

TO: Aquatic Resources; Conservation & Resources Enforcement;
Forestry & Wildlife; Historic Preservation; Land
Management; Natural Area Reserves System; State Parks;
Water and Land Development; Water Commission

FROM: Roger C. Evans, Administrator
Office of Conservation and Environmental Affairs

SUBJECT: REQUEST FOR COMMENTS
Conservation District Use Application

APPLICANT: National Tropical Botanical Garden, Charles R. Wichman,
and, Charles R. Wichman, Jr.

FILE NO.: KA-2656

REQUEST: To use Limahuli Valley Special Subzone for Educational
Recreational, and Research Purposes via the Establishment
of a Tropical Botanical Garden

LOCATION: Haena, Kauai

TMK(s): 5-9-6: 2, 3, 4, 5, 6, 8, 9 and 5-9-1: 3

PUBLIC HEARING: YES _____ NO X

DOCARE: Please conduct a field inspection on this project. Should you require additional information, please call Cathy Tilton at 7-0377.

If no response is received by the suspense date, we will assume there are no comments.

Attachment(s)

DOFAW HAS NO COMMENTS
OR OBJECTIONS TO THE
PROPOSED REQUEST.

Q. N. Burt

COPY



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

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Mr. Mike Buck, Administrator
Division of Forestry and Wildlife
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Buck:

**SUBJECT: Forestry and Wildlife Review of the EA and CDUA KA-2656
for the Limahuli Valley Special Subzone, Ha'ena, Kaua'i, Hawai'i;**

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Thank you for your review of the National Tropical Botanical Gardens DRAFT EA and CDUA for the Limahuli Valley Special Subzone. I received your comments dated July 22, 1993, from the Office of Conservation and Environmental Affairs (OCEA). Please feel free to call me anytime should your division have any future concerns.

Sincerely,

Charles R. Wichman, Jr.
Assistant Director - Limahuli

PRESIDENT EMERITUS
MATEO LETTUNICH

DIRECTOR EMERITUS
WILLIAM S. STEWART

DIRECTOR
WILLIAM L. THEOBALD

GENERAL COUNSEL
MICHAEL J. SHEA

cc: Mr. Keith Ahue, Chairperson DLNR

KA-2656

August 4, 1993

LOG NO: 8979
DOC NO: 9307NM16

MEMORANDUM

TO: Roger Evans, OCEA

FROM: *Don Hibbard*
Don Hibbard, Administrator
State Historic Preservation Division

SUBJECT: Historic Preservation Review -- EA and CDUA KA-2656
National Tropical Botanical Gardens,
Charles R. Wichman and Charles R. Wichman Jr.
TMK: 5-9-6: 2,3,4,5,6,8,9, and 5-9-1: 3
Haena, Hanalei, Kauai

We have reviewed this application and EA. We have been involved in some earlier drafts of this project. The Bishop Museum conducted an archaeological survey in 1990. We have accepted the report. In general this plan will cause minimal changes to the land use of the area. By maintaining the natural area for education and science, it will protect the ecosystem and the historic sites in the project area. It is our understanding that further archaeological work will be done when funds permit. This will help in setting up the interpretation of the Haena area, and in particular, this valley. It is our understanding that all significant historic sites will be preserved. We concur with the management plan for the historic sites, submitted on page 95.

Therefore, we recommend the following condition be attached to this application to ensure "no adverse effect" to significant historic sites:

1) To ensure that preservation acceptably occurs a preservation plan shall be approved by the State Historic Preservation Division, before implementation can occur.

If you have any questions, please call Nancy McMahon 587-0006.

NM:amk

c: Jeff Lacy, County of Kauai



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY



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DIRECTOR
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GENERAL COUNSEL
MICHAEL J. SHEA

August 12, 1993

Mr. Don Hibbard, Administrator
State Historic Preservation Division
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Hibbard:

**SUBJECT: Historic Preservation Review of the EA and CDUA KA-2656
for the Limahuli Valley Special Subzone, Ha'ena, Kaua'i, Hawai'i;**

Thank you for your review of the National Tropical Botanical Gardens DRAFT EA and CDUA for the Limahuli Valley Special Subzone. I received your comments dated August 4, 1993, from the Office of Conservation and Environmental Affairs (OCEA).

As you noted we have worked closely with your Division over the past four years to insure that our project is acceptable with the requirements of your division. I am glad that you concur with the archaeological management plan presented on page 95 of our application. It is truly our desire to preserve and protect all of the significant historic sites in Limahuli valley.

As a point of clarification for the record, when I received your comments I was uncertain just what you meant by the phrase, *before implementation can occur*. To clarify this I called Ms. Nancy McMahon, Kaua'i Archaeologist for your division on August 11, 1993, and spoke with her about your comments. She informed me that the intention of your statement was to require that the NTBG seek the approval of the Historic Preservation Division before implementing its "preservation plan" in Limahuli valley.

Nancy agreed that developing a preservation plan for the Limahuli Complex in the future, as funding becomes available to study the various features, is acceptable with the Historic Preservation Division, and that a completed preservation plan will not be required prior to approval of our CDUA by the BLNR.

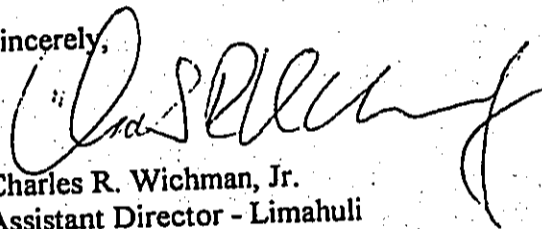
Mr. Don Hibbard
August 12, 1993
Page 2

I also spoke with Nancy about the need to coordinate the development of our preservation plan for Limahuli valley with the preservation plan and interpretive work being developed for the Ha'ena State Park. I informed her that I had previously spoken with staff at State Parks about this and hope to meet in the near future with representatives from both State Parks and Historic Preservation to coordinate our interpretive efforts.

The NTBГ looks forward to working with your staff and those at State Parks to insure that "preservation acceptability" occurs in the Limahuli Complex. As you know, the preservation and accurate interpretation of the cultural resources located not only in Limahuli, but in the entire Ha'ena area, are of great importance to the NTBГ. We view these resources as educational assets that will enhance our educational programs and understanding of what makes Hawai'i so special.

Please feel free to call me anytime to discuss any additional concerns that your staff may have in the future.

Sincerely,



Charles R. Wichman, Jr.
Assistant Director - Limahuli

cc: Mr. Keith Ahue, Chairperson DLNR

JOHN WAIHEE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF LAND MANAGEMENT
3060 Ewa Street, Rm. #306
Lhue, HI 96766-1875

August 5, 1993

KA-2654

AQUACULTURE DEVELOPMENT
PROGRAM
AQUATIC RESOURCES
CONSERVATION AND
ENVIRONMENTAL AFFAIRS
CONSERVATION AND
RESOURCES ENFORCEMENT
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FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

KA-93:1318

Cathy Tilton
Office of Conservation and Environmental Affairs
P.O. Box 621
Honolulu, Hawaii 96809

Subject: File No.: KA-7/2/92-2656, CDUA request by National
Tropical Botanical Garden, Charles R. Wichman, and
Charles R. Wichman, Jr.

We have no objections to the Conservation District Use Application and Draft Environmental Assessment in order to use Limahuli Valley Special Subzone for educational, recreational, and research purposes via the establishment of a Tropical Botanical Garden. The masterplan was well thought out, and adequately addresses our concerns.

We appreciate the opportunity to comment on this application.

Very truly yours,

SAM LEE
District Land Agent

cc: Mason Young
Herbert Apaka, Jr.

ML:vr

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NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

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September 14, 1993

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Mr. Sam Lee, Kauai District Land Agent
Division of Land Management
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Lee:

**SUBJECT: Land Management Review of the EA and CDUA KA-2656
for the Limahuli Valley Special Subzone, Ha'ena, Kaua'i, Hawai'i;**

CHAIRMAN EMERITUS
DEANE W. MALOTT

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Thank you for your review of the National Tropical Botanical Gardens DRAFT EA and CDUA for the Limahuli Valley Special Subzone. I received your comments dated August 3, 1993, from the Office of Conservation and Environmental Affairs (OCEA). We appreciate the support you have shown for our project in Limahuli valley. Please feel free to call me anytime should your division have any future concerns.

PRESIDENT EMERITUS
MATEO LETTUNCH

DIRECTOR EMERITUS
WILLIAM S. STEWART

DIRECTOR
WILLIAM L. THEOBALD

GENERAL COUNSEL
MICHAEL J. SHEA

Sincerely,

Charles R. Wichman, Jr.
Assistant Director - Limahuli

cc: Mr. Keith Ahue, Chairperson DLNR

OCEH

KA-2656

Department of Land and Natural Resources
DIVISION OF STATE PARKS

August 12, 1993

CDUA File No.: KA-2656

MEMORANDUM

TO: Roger C. Evans, Administrator
Office of Conservation and Environmental Affairs

FROM: Ralston Nagata, Administrator
Division of State Parks

SUBJECT: CDUA and Draft EA: To Use Limahuli Gardens Special Subzone for Educational, Recreational, and Research Purposes via the Establishment of a Tropical Botanical Garden.

The proposed Limahuli Gardens and Preserve are adjacent to Ha'ena State Park, which is located at the end of the Kuhio Highway beyond Limahuli Stream. We believe that the Master Plan for Limahuli Gardens and Preserve as developed by the National Tropical Botanical Garden (April 1991) is in keeping with the intent and stated purpose of the Special Subzone. We support the goals and objectives as outlined in both the CDUA and the Master Plan:

- To stabilize, preserve, and protect the archaeological sites in the valley and to promote this protection through educational programs and interpretive devices.
- To coordinate efforts in archaeological research, interpretation, and planning between the National Tropical Botanical Garden (Limahuli Gardens), State Parks (Ha'ena State Park), and the Historic Preservation Division (Ke'e Preserve).

It should be noted that the archaeological sites of Limahuli Valley, Ke'e, and the Ha'ena coastal flat are all part of the same cultural unit, such that an integrated, coordinated effort between the three agencies involved, would prevent duplication and would promote a unified interpretive story. Interpretive themes, interpretive techniques (signs, brochures, demonstrations, etc.), visitor facilities, and the preferred visitation pattern should be considered in the coordinated effort. Since all three agencies are in the planning stage for their individual projects, we suggest that coordination would be both feasible and productive.

- To implement management strategies for the protection of the scenic,

cultural, and natural resources and to avoid impacting these resources with facilities.

To establish, develop, operate, and maintain a tropical botanical garden at Limahuli that will perpetuate the natural beauty of the area.

Since Haena State Park is dominated by exotic vegetation, the preservation and interpretation of a native ecosystem in Limahuli will provide an interpretive theme not possible at the park but which complements the other themes.

MY/SS:ss

cc: Mr. Don Hibbard, Historic Preservation Division
Ms. Martha Yent, State Parks Interpretive Branch

COPY



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

September 14, 1993

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DIRECTOR
WILLIAM L. THEOBALD

GENERAL COUNSEL
MICHAEL J. SHEA

Mr. Ralston Nagata, Administrator
Division of State Parks
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Nagata:

**SUBJECT: Division of State Parks Review of the EA and CDUA KA-2656
for the Limahuli Valley Special Subzone, Ha'ena, Kaua'i, Hawai'i;**

Thank you for your review of the National Tropical Botanical Gardens DRAFT EA and CDUA for the Limahuli Valley Special Subzone. I received your comments dated August 12, 1993, from the Office of Conservation and Environmental Affairs (OCEA).

We appreciate the strong support you have shown for our project in Limahuli valley. As you know, the NTBG is committed maintaining and accurately interpreting the historic sites in Limahuli valley. I agree with your comment that we need to coordinate our interpretive work with the staff at the Historic Preservation Division as well as your staff at State Parks. To this end, I spoke with Ms. Nancy McMahon of the Historic Preservation Division as well as Ms. Sheri Samules of State Parks on August 11, 1993. It is the intention of all involved to meet in the near future to coordinate our interpretive efforts.

In closing, I wish to once again thank you for your support of our project. Please feel free to call me anytime to discuss how we can best coordinate our interpretive efforts.

Sincerely,

Charles R. Wichman, Jr.
Assistant Director - Limahuli

cc: Mr. Keith Ahue, Chairperson DLNR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Office of Conservation and Environmental Affairs
Honolulu, Hawaii

Met.
Puu

JUL 22 1993

50 JUL 23 AM 10:03
FILE NO.: KA-7/2/82-2656
180-Day Exp. Date: 2/29/92
SUSPENSE DATE: 21 Days
DOC. NO.: 3153

MEMORANDUM

TO: Aquatic Resources; Conservation & Resources Enforcement;
Forestry & Wildlife; Historic Preservation; Land
Management; Natural Area Reserves System; State Parks;
Water and Land Development; Water Commission

FROM: Roger C. Evans, Administrator
Office of Conservation and Environmental Affairs

SUBJECT: REQUEST FOR COMMENTS
Conservation District Use Application

APPLICANT: National Tropical Botanical Garden, Charles R. Wichman,
and, Charles R. Wichman, Jr.

FILE NO.: KA-2656

REQUEST: To use Limahuli Valley Special Subzone for Educational
Recreational, and Research Purposes via the Establishment
of a Tropical Botanical Garden

LOCATION: Haena, Kauai

TMK(s): 5-9-6: 2, 3, 4, 5, 6, 8, 9 and 5-9-1: 3

PUBLIC HEARING: YES _____ NO X

DOCARE: Please conduct a field inspection on this project. Should you
require additional information, please call Cathy Tilton at 7-0377.

If no response is received by the suspense date, we will assume there are
no comments.

Attachment(s)

Thank you, but we have no comments
specific to our DWRM programs.

Berger S. Watson
7-27-93

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NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

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GENERAL COUNSEL
MICHAEL J. SHEA

September 14, 1993

Mr. George Matsumoto, Branch Chief
State Water Commission
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Matsumoto:

**SUBJECT: Water Commission Review of the EA and CDUA KA-2656
for the Limahuli Valley Special Subzone, Ha'ena, Kaua'i, Hawai'i;**

Thank you for your review of the National Tropical Botanical Gardens DRAFT EA and CDUA for the Limahuli Valley Special Subzone. I received your comments dated July 27, 1993, from the Office of Conservation and Environmental Affairs (OCEA). Please feel free to call me anytime should your division have any future concerns.

Sincerely,

Charles R. Wichman, Jr.
Assistant Director - Limahuli

cc: Mr. Keith Ahue, Chairperson DLNR

JOHN W. HEE
GOVERNOR

CHARLES T. TOGUCHI
SUPERINTENDENT



STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

STATE OF HAWAII
DEPARTMENT OF EDUCATION

August 2, 1993

MEMO TO: Honorable Keith W. Ahue, Chairperson
Department of Land and Natural Resources

F R O M: Charles T. Toguchi, Superintendent
Department of Education *Charles T. Toguchi*

SUBJECT: Conservation District Use Application
National Tropical Botanical Garden
Haena, Kauai
TMK: 5-9-6: 2, 3, 4, 5, 6, 8, 9 and 5-9-1: 3

We have reviewed the subject application and environmental assessment and have no comment on the proposed use of Limahuli Valley as a garden and preserve.

Thank you for the opportunity to comment.

CTT:hy

cc: A. Suga
S. Akita



NATIONAL TROPICAL BOTANICAL GARDEN
 CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

August 12, 1993

Mr. Charles T. Toguchi, Superintendent
 Department of Education
 P.O. Box 2360
 Honolulu, HI 96804

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PRESIDENT EMERITUS
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DIRECTOR EMERITUS
 WILLIAM S. STEWART

DIRECTOR
 WILLIAM L. THEOBALD

GENERAL COUNSEL
 MICHAEL J. SHEA

Dear Mr. Toguchi:

SUBJECT: Department of Education Review of the National Tropical Botanical Garden's CDUA KA-2656 for the Limahuli Valley Special Subzone, Ha`ena, Kaua`i, Hawai`i;

Thank you for your review of the National Tropical Botanical Garden's DRAFT EA and CDUA for the Limahuli Valley Special Subzone. I received your review dated August 2, 1993, from the Office of Conservation and Environmental Affairs (OCEA).

Although you chose not to comment on our CDUA you should be aware that the National Tropical Botanical Garden is currently used as a destination for DOE children on the island of Kaua`i. Our educational programs instruct children in environmental awareness, Hawaiian culture, plant propagation, and an appreciation for our native Hawaiian plant species. Every year hundreds of Kaua`i's school children visit the Gardens and participate in our educational programs.

Should you or your staff have any future questions about our CDUA or our involvement with the school children on Kaua`i please feel free to call me.

Sincerely,

Charles R. Wichman, Jr.
 Assistant Director - Limahuli

cc: Mr. Keith Alue, Chairperson DLNR

JOHN WAIHEE
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

REX D. JOHNSON
DIRECTOR

DEPUTY DIRECTORS
JOYCE T. OMAE
AL PANG
KANANI HOLO
CALVIN M. TSLA

IN REPLY REFER TO
STP 8.5370

10 JUL 28 10:19

STATE OF HAWAII

July 27, 1993

TO: The Honorable Keith W. Ahue, Chairperson
Board of Land and Natural Resources

FROM: Rex D. Johnson
Director of Transportation *Rex*

SUBJECT: CDUA and Draft EA for the Limahuli Valley Special Subzone; National Tropical Botanical Garden Master Plan for Limahuli Gardens and Preserve; Haena, Kauai; TMK: 5-9-6:2-6, 8-9 and 5-9-1:3

Thank you for your letter of July 22, 1993, requesting our review of the subject application and draft EA.

Access plans of the proposed facility and plans for any construction work within the State highway right-of-way must be submitted for our review and approval.

RECEIVED
JUL 28 1993

COPY



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

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GENERAL COUNSEL
MICHAEL J. SHEA

September 14, 1993

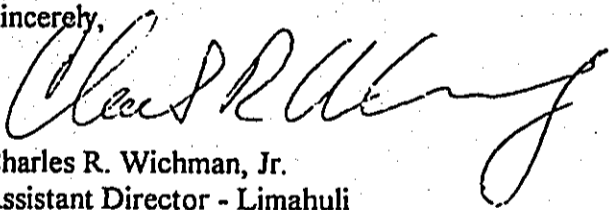
Mr. Rex D. Johnson, Director of Transportation
Department of Transportation
889 Punchbowl Street
Honolulu, HI 96813

Dear Mr. Johnson:

SUBJECT: Department of Transportation Review of the EA and CDUA KA-2656 for the Limahuli Valley Special Subzone, Ha`ena, Kaua`i, Hawai`i;

Thank you for your review of the National Tropical Botanical Gardens DRAFT EA and CDUA for the Limahuli Valley Special Subzone. I received your comments dated July 27, 1993, from the Office of Conservation and Environmental Affairs (OCEA).

The NTB is currently using an established private dirt and gravel road for access to their property from Kuhio Highway. In the future, when improvements are made to the portion of our access road that abuts the State's highway right-of-way, plans will be submitted to DOT for review and approval. Please feel free to call me anytime should your division have any other concerns in the future.

Sincerely,

Charles R. Wichman, Jr.
Assistant Director - Limahuli

cc: Mr. Keith Ahue, Chairperson DLNR

JOHN WAIHEE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96801

JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

KA 23 56

In reply, please refer to:

August 26, 1993

93-220/epo

To: The Honorable Keith W. Ahue, Chairperson
Department of Land & Natural Resources

From: John C. Lewin, M.D. *John C. Lewin for SA*
Director of Health

Subject: Request for Comments
Conservation District Use Application

Applicant: National Tropical Botanical Garden
Request: To use Limahuli Valley Special Subzone for Educational
Recreational and Research Purposes via the
Establishment of a Tropical Botanical Garden
Location: Haena, Kauai
TMK: 5-9-06: 2-6, 8, 9, and 5-9-01: 3

Thank you for allowing us to review and comment on the subject request.
We have the following comments to offer:

1. The proposed botanical garden is situated in an area that is designated as critical wastewater disposal area with no exception. The type of wastewater system permitted shall meet the minimum applicable requirements of Hawaii Administrative Rules, Title 11, Chapter 11-62, "Wastewater Systems."
2. The proposed gift shop, office tool house - maintenance complex, visitor center and possible caretaker's cottage shall comply with the applicable requirements of the Hawaii Administrative Rules, Title 11, Chapter 11-11, "Sanitation," pertaining to natural light and ventilation; Chapter 11-14, "Housing;" and Chapter 11-39, "Air Conditioning and Ventilating."
3. In accordance with Hawaii Administrative Rules, Title 11, Chapter 11-60, "Air Pollution Control," the property owner/developer shall be responsible for ensuring that effective control measures are provided to prevent or minimize any fugitive dust emission caused by the construction work from impacting the surrounding areas including the off-site roadways used to enter/exit the project. These measures include but are not limited to the use of water wagons, sprinkler systems, dust fences, etc.

The Honorable Keith W. Ahue
August 26, 1993
Page 2

4. In accordance with Hawaii Administrative Rules, Title 11, Chapter 11-55, "Water Pollution Control" and Chapter 11-54, "Water Quality Standards," the property owner/developer shall be responsible for ensuring that the Best Management Practices (BMP) are provided to prevent or minimize the discharge of sediments, debris, and other water pollutant into state waters.
5. In accordance with Hawaii Administrative Rules, Title 11, Chapter 11-58, "Solid Waste Management Control," the property owner/developer shall be responsible for ensuring that grub material, demolition waste and construction waste generated by the project are disposed of in a manner or at a site approved by the State Department of Health. Disposal of any of these wastes by burning is prohibited.
6. The proposed development shall be provided with potable water from an approved source.
7. The irrigation system shall meet the requirements of Hawaii Administrative Rules, Title 11, Chapter 11-21, "Cross-Connection and Backflow Control."

Due to the general nature of the application submitted, we reserve the right to implement future environmental health restrictions when more detailed information is submitted. If there are any questions regarding this matter, please contact Mr. Clyde Takekuma, Chief Sanitarian, Kauai District Health Office at 241-3323.

c: Kauai District Health Office



NATIONAL TROPICAL BOTANICAL GARDEN
 CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

September 14, 1993

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John C. Lewin, M.D., Director of Health
 Department of Health
 P.O. Box 3378
 Honolulu, HI 96801

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Dear Dr. Lewin:

**SUBJECT: Department of Health Review of the EA and CDUA KA-2656
 for the Limahuli Valley Special Subzone, Ha`ena, Kaua`i, Hawai`i;**

Thank you for your review of the National Tropical Botanical Gardens DRAFT EA and CDUA for the Limahuli Valley Special Subzone. I received your comments dated August 26, 1993, from the Office of Conservation and Environmental Affairs (OCEA).

CHAIRMAN EMERITUS
 DEANE W. MALOTT

The NTBG is fully committed to maintaining the quality of the environment and natural resources found in Limahuli valley. Because of this we will not only comply with all of the stated sections of the Hawaii Administrative Rules, but we will strive to maintain the quality of the environment and resources at a level beyond that prescribed by the law.

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In responding to your comments I will address them in the order in which they were presented.

PRESIDENT EMERITUS
 MATEO LETTUNICH

Comment #1. The NTBG is aware that Limahuli is in an area designated as critical waste water disposal area with no exception. As indicated on page 42 of the Master Plan for Limahuli Gardens and Preserve only waste water disposal systems that meet the requirements of Chapter 11-62 will be constructed in the botanical garden.

DIRECTOR EMERITUS
 WILLIAM S. STEWART

Comment #2. All structures that will be built will go through the county building permit process at which time they will be reviewed by the DOH for compliance with the sections of Chapter 11 you have stated.

DIRECTOR
 WILLIAM L. THEOBALD

Comment #3. The NTBG is aware that construction of its facilities could cause fugitive dust emission. As indicated in item (9)(a) on page 70 of the Master Plan, the NTBG will employ whatever dust control measures are deemed necessary to mitigate this impact.

GENERAL COUNSEL
 MICHAEL J. SHEA



NATIONAL TROPICAL BOTANICAL GARDEN
CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

John C. Lewin, M.D., Director of Health
September 14, 1993
Page 2

Comment #4. The NTBG recognizes that the pristine Limahuli stream represents an irreplaceable resource. We will make every effort to prevent sediments, debris, or pollutants from washing into the stream. Pages 97-99 of the Master Plan describe in detail a management plan for the Limahuli Stream. It is our intention to provide the Best Management Practices (BMP) possible to protect the stream's waters.

Comment #5. As indicated in several places in the Master Plan, the NTBG does not intend to burn any of its solid waste. Organic material will be recycled as described in the Composting Program on pages 28 & 33, and all non-recyclable materials, including construction waste, will be disposed of by a private refuse collection firm that will haul it to a state approve facility.

Comment #6. As described on page 23 of the CDUA and shown on CDUA Exhibit 3, the NTBG has an existing county water meter to provide a source of potable water.

Comment #7. As indicated in item 3 on page 42 of the Master Plan, the NTBG is well aware of the need to prevent a physical connection between the county potable water system and the irrigation systems employed in the Gardens. Under no circumstances shall these systems be tied together allowing irrigation water to backflow into the potable water system.

In closing we recognize your right to implement further environmental health restrictions in the future when more detailed information is available. I am sure that all of our future infrastructure improvements will come before your department for review before they are permitted by either the state or county. Please feel free to have your staff call me anytime should they have any other concerns in the future.

Sincerely,

Charles R. Wichman, Jr.
Assistant Director - Limahuli

cc: Mr. Keith Ahue, Chairperson DLNR

DEPARTMENT OF WATER
COUNTY OF KAUAI
P.O. BOX 1706
LIHUE, HAWAII 96766-5706
PHONE NO: (808) 245-6986 FAX NO. 245-5813

August 3, 1993

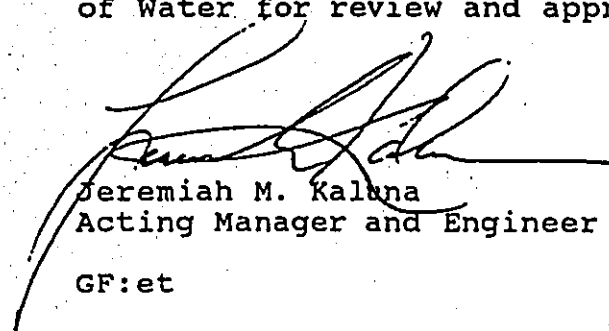
Mr. Keith W. Ahue
Department of Land
and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Re: Conservation District Use Permit Application, File No.
KA-7/2/92-2656, National Tropical Botanical Garden, Haena,
Kauai, TMK: 5-9-06:2,3,4,5,6,8&9

We have no objections to this Conservation District Use Permit Application provided the applicant is made aware that due to the high elevations of the project, a dependable supply of County water supply cannot be assured.

The applicant for water services will be required to sign an elevation agreement with the Department of Water upon application for water service; agreeing to accept such water service as the Department is able to render and agreeing to install and maintain suitable booster pumps and tanks, if necessary. County water service is not available above the 40-foot mean-sea level ground elevation.

In the event that a booster pump is required to provide adequate water service, the applicant shall submit construction drawings of the pump facilities including backflow preventers to the Department of Water for review and approval.


Jeremiah M. Kalua
Acting Manager and Engineer

GF:et



NATIONAL TROPICAL BOTANICAL GARDEN
 CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

August 12, 1993

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Mr. Jeremiah M. Kaluna
 Acting Manager and Engineer
 Kaua'i County Department of Water
 P.O. Box 1706
 Lihue, HI 96766-5706

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DIRECTOR EMERITUS
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DIRECTOR
 WILLIAM L. THEOBALD

GENERAL COUNSEL
 MICHAEL J. SHEA

Dear Mr. Kaluna:

SUBJECT: Kaua'i County Water Department Review of the National Tropical Botanical Garden's CDUA KA-2656 for the Limahuli Valley Special Subzone, Ha'ena, Kaua'i, Hawai'i;

Thank you for your review and support of the National Tropical Botanical Garden's DRAFT EA and CDUA for the Limahuli Valley Special Subzone. I received your comments dated August 3, 1993, from the Office of Conservation and Environmental Affairs (OCEA).

We are currently aware that due to the high elevation of our project, a dependable supply of County water cannot be assured. As noted on page 23 and shown on Exhibit 3 of our CDUA, the Kaua'i Water Department has already installed a 3" sub-main, fire hydrant, and water meter at the entrance to Limahuli Gardens. At the time that we applied for these facilities in April 1989, the NTBG signed an elevation agreement with the Department of Water.

We are also aware of the need to provide construction drawings of the pump facilities, including backflow preventers to the Department of Water for review and approval should we decide that we need a booster pump in the future to provide adequate pressure to our proposed facilities.

Please feel free to call me anytime to discuss any additional concerns that your staff may have in the future.

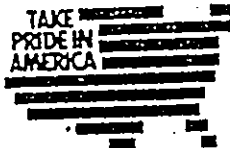
Sincerely,

Charles R. Wichman, Jr.
 Assistant Director - Limahuli

cc: Mr. Keith Ahue, Chairperson DLNR



United States Department of the Interior



FISH AND WILDLIFE SERVICE

Pacific Island Office
P.O. Box 50167
Honolulu, Hawaii 96850

1993 SEP 10 PM 1:28

Honolulu, Hawaii 96850

DLNR
OCEA

In reply refer to: MMB

SEP 07 1993

Keith W. Ahue, Chairperson
Board of Land and Natural Resources
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ahue:

The U.S. Fish and Wildlife Service (Service) has reviewed the Conservation District Use Application No. KA-2656 to Use Limahuli Valley Special Subzone for Educational, Recreational, and Research Purposes via the establishment of a Tropical Botanical Garden. The Service offers the following comments for your consideration.

We support the master plan objectives for the Limahuli Gardens and Preserve, and applaud National Tropical Botanical Garden's (NTBG) efforts to enhance the garden and preserve areas with the least impact to the native habitat. We are especially pleased that care will be taken to limit impacts on the more pristine Upper Limahuli Preserve. In addition to the cleaning of hikers shoes before entry into the Upper Preserve, we also suggest cleaning of helicopter skids. There have been incidences of helicopter transport of alien seeds to pristine areas in Hawaii.

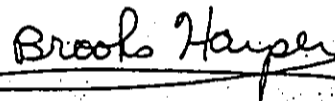
The Service also commends NTBG's efforts to maintain the genetic integrity of the native species already occurring in Limahuli Valley by augmenting populations only with material collected in the Limahuli area. We also suggest that NTBG consider the potential negative impact of planting species in the garden area that are closely related to native species occurring naturally in the preserve areas. Many Hawaiian endemic species are known to hybridize with closely related species when artificially placed together, and care should be taken to avoid such hybridizations. This is especially important since

there are several proposed endangered and candidate species in the Lower and Upper Limahuli Preserves.

I have enclosed a list of proposed and candidate species presently under review by this Service for consideration as endangered or threatened. If you determine that your project is likely to impact a candidate species, you may wish to request technical assistance from this office.

If you have further questions, please contact me or Marie Bruegmann of our Pacific Islands Field Office at (808) 541-2749.

Sincerely,



for

Robert P. Smith
Field Supervisor

Enclosure

PROPOSED ENDANGERED AND THREATENED SPECIES
AND CANDIDATE SPECIES THAT MAY OCCUR IN THE AREA
OF THE PROPOSED LIMAHULI GARDEN AND PRESERVE

Lower Limahuli Preserve:

- C1 Bonamia menziesii
- C2 Cyrtandra kealiae
- P Delissea rhytidosperma
- C1 Flueggea neowawraea
- C2 Gardenia remyi
- C2 Hedyotis elatior
- C2 Hibiscus kokio ssp. saintjohnianus
- C2 Hibiscus waimeae ssp. hannerae
- C2 Labordia helleri
- C2 Lentipes concolor
- C2 Lepidium serra
- E Lobelia niihauensis
- C2 Myrsine linearifolia
- P Peucedanum sandwicense
- C2 Pisonia wagneriana
- C2 Pittosporum napaliensis
- P Pteralyxia kauaiensis

Upper Limahuli Preserve:

- C2 Chamaesyce remyi var. remyi
- P Cyrtandra limahuliensis
- C2 Gardenia remyi

(E) - Endangered (T) - Threatened (P) - Proposed

(1) - Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.

(2) - Category 2: Taxa which existing information indicates may warrant listing, but for which substantial biological information to support a proposed rule is lacking.

(3) - Category 3(c): Taxa more common than previously thought, no longer being considered for a listing proposal at this time.

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CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

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DIRECTOR
WILLIAM L. THEOBALD

GENERAL COUNSEL
MICHAEL J. SHEA

September 14, 1993

Mr. Robert P. Smith, Field Supervisor
US Fish and Wildlife Service
P.O. Box 50167
Honolulu, HI 96850

Dear Mr. Smith:

**SUBJECT: US Fish and Wildlife Service Review of the EA and CDUA KA-2656
for the Limahuli Valley Special Subzone, Ha'ena, Kaua'i, Hawai'i;**

Thank you for your review of the National Tropical Botanical Gardens DRAFT EA and CDUA for the Limahuli Valley Special Subzone. I received your comments dated September 7, 1993, (referred to as MMB) from the Office of Conservation and Environmental Affairs (OCEA).

Thank you for your support of our project in Limahuli valley. Your concern about the *potential negative impact of planting species in the garden that are closely related to native species occurring naturally in the preserve areas* is well taken.

This same concern is addressed in point number 2 on page 27 of the Master Plan for Limahuli Gardens and Preserve. This section reads as follows:

To prevent the unintentional alteration of the existing native gene pools, all candidate plants should be researched to determine the chance of their being able to interbreed with the existing populations of native species existing in Limahuli valley and surrounding areas.

Recognizing that both native and alien plants could possibly interbreed with native species, the NTBG is committed to researching all candidate plants before they are planted in Limahuli to determine if they pose a threat to the integrity of the existing native gene pools. We appreciate your offer of technical assistance in this regard, and will contact you should we need your help.



NATIONAL TROPICAL BOTANICAL GARDEN

CHARTERED BY CONGRESS TO CREATE A NATIONAL RESOURCE IN TROPICAL BOTANY

Mr. Robert P. Smith, Field Supervisor
US Fish and Wildlife Service
September 14, 1993
Page 2

I am sure that you are aware that the NTBG has, and is, working closely with the Fish and Wildlife Service to document and save the endangered plant species in Hawai'i. The Hawaii Plant Conservation Center (HPCC) which is part of the NTBG has State and Federal permits to collect and grow federally listed endangered species. I am sure that this close working relationship will continue in the future with our consultations on what is appropriate to grow in Limahuli Gardens and Preserve.

Thanks again for your support of our project, and please feel free to have your staff call me anytime should they have any other concerns in the future.

Sincerely,

Charles R. Wichman, Jr.
Assistant Director -- Limahuli

cc: Mr. Keith Ahue, Chairperson DLNR

CLH

07/23/93

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF CONSERVATION AND RESOURCES ENFORCEMENT

DOCARE-18 (Rev. 6/93)

7/25/93
71

Site Visit/Field Inspection Report

BRANCH: Kauai REPORT IS DUE AT DOCARE ADMIN BY: 08/22/93

1. CASE DATA

- a. FILENUMBER: 2656 KA-07/02/92
- b. INITIATOR: WICHMAN, C.R. *
- c. LOCATION: TMK (4) 5-9-6: 2, 3, 4, 5, 6, 8, & 9; and 5-9-1: 3. See att Narr.
- d. SUMMARY: Operate 15-20 ac. Limahuli Valley botanical gdn; manage 1000 ac.
- e. REMARKS: *Also C.R. WICHMAN Jr. & National Tropical Botanical Gardens.



60:110000000

2. INSTRUCTIONS FOR OFFICER

- a. Study the attached CDUA paperwork, then conduct an inspection as directed by your Supervisor.
- b. Determine if action described in the CDU proposal would have any apparent conflict with the situation/conditions at the site or with any statute, law, or regulation of which you are aware.
- c. Attach any pertinent photographs and/or information as exhibits.

FA

3. FILL-IN THE FOLLOWING BLANKS:

- a. Branch Report Number: Ka-2656
- b. Time and Date Case Referred to Officer: 7/24/93 12:30 PM
- c. Time and Date of Site Visit/Inspection: 7/30/93 10:00-11:00 AM
- d. Had any project work been done? Yes (); No (x). If "yes," describe briefly:

Flora Garden existing
Proposed structures NOT STARTED

CONTINUED ON REVERSE

e. Did you detect any discrepancy in the applicant's description of the site condition/situation? Yes (); No (X). If "yes," describe:

f. Did you note anything that might be a bar to approval of the applicant's proposal? Yes (); No (X). If "yes, describe (continue on a separate sheet, if necessary.

g. General comments, if any. (Along with any other observations, you should include opinions on possible impact of the proposal on flora, fauna, archeological site, and/or historical sites:

Site well kept & managed, Proposal unique
to area, Productive & well addressed.
in the area of the Master Plan.

Milton Ching

Inspecting Officer's Signature,
Typed or Printed Name, & Badge No.

MILTON CHING 166

MA Andread Br. Ching

Reviewer's Signature,
Typed or Printed Name, & Badge No.

NATIONAL TROPICAL BOTANICAL GARDEN

MASTER PLAN

FOR

LIMAHULI GARDENS AND PRESERVE

Ha'ena, Kaua'i, Hawai'i

**Approved by the NTBG Board of Trustees
October, 1990**

**Revised per Community and State Concerns
April, 1991**

NATIONAL TROPICAL BOTANICAL GARDEN

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April, 1991**

To Juliet Rice Wichman,

The woman who made this possible with her aloha for Hawai'i.

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

NATIONAL TROPICAL BOTANICAL GARDEN

MASTER PLAN

FOR

LIMAHULI GARDENS AND PRESERVE

Ha'ena, Kaua'i, Hawai'i

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To Juliet Rice Wichman,

The woman who made this possible with her aloha for Hawai'i.

MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE

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MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE

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ISLAND OF KAUAI

**LIMAHULI VALLEY
PROJECT SITE**

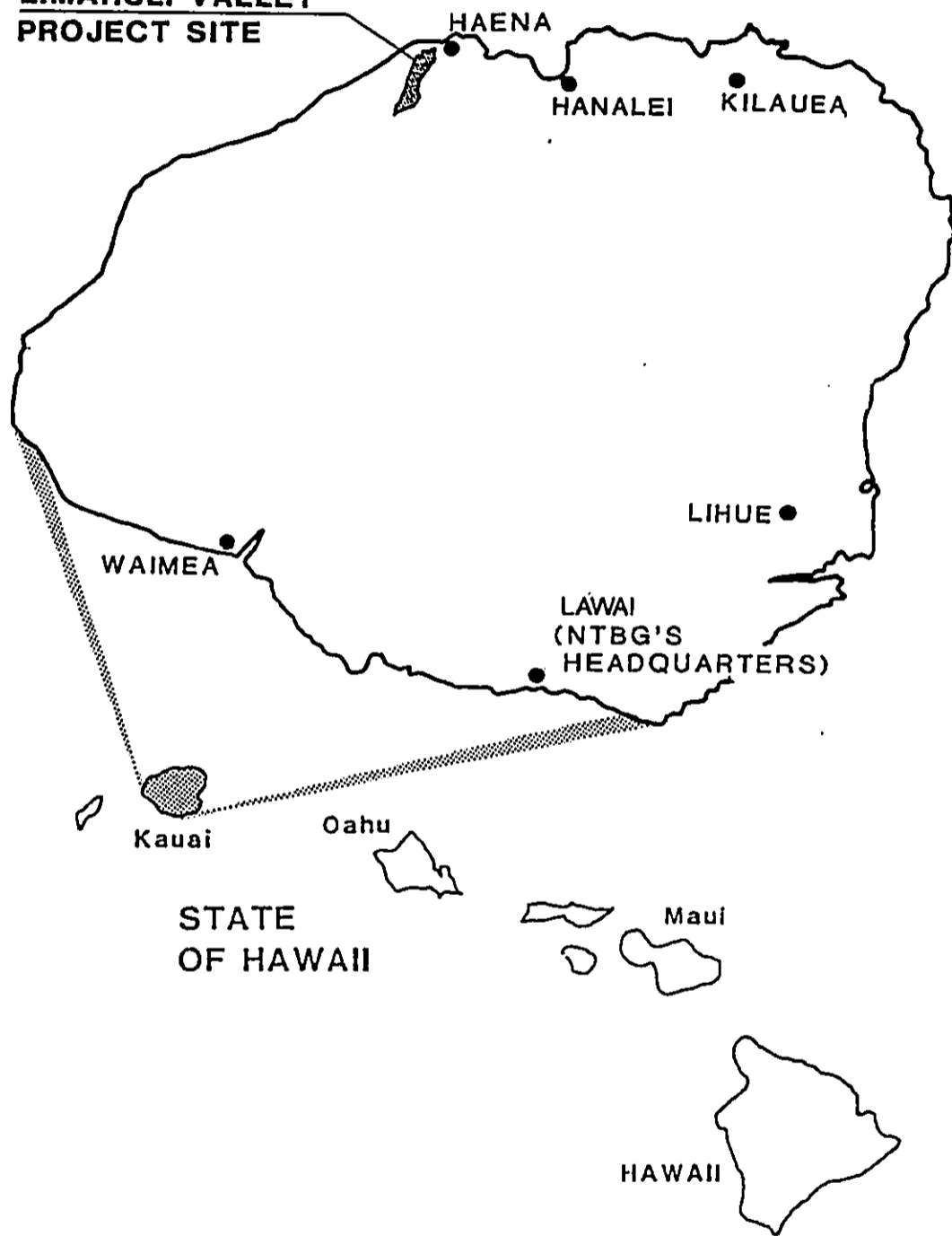


EXHIBIT 1
LOCATION MAP

LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN



MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

INTRODUCTION

The Limahuli Valley is a tremendous potential asset to the National Tropical Botanical Gardens (NTBG). Its location on the North Shore of Kaua'i near the end of Kuhio Highway 560 in Ha'ena makes it the last readily accessible valley before the famous Napali coast (Exhibit 1). Limahuli's unique topography has resulted in a "hanging" upper valley that extends from about 1,600 feet elevation up to 3,330 elevation at its highest point near the Alaka'i Swamp. The lower valley is primarily a bowl that is surrounded on three sides by precipitous ridges 2,000 feet high. These majestic "knife edge" peaks and ridges have been immortalized in several popular movies and create some of Kaua'i's most famous scenery. At the base of these famous peaks is the Limahuli Gardens (Exhibit 2).

Limahuli is a lush tropical valley that contains a nearly pristine Hawaiian stream with a waterfall that plummets nearly 800 feet into the lower valley. Also encompassed in this striking setting are three separate ecological zones and ancient Hawaiian archaeological sites. Botanical surveys have indicated that although much of the lower valley has been modified in the past, it is still a tremendous resource for native plant and animal species (Wichman 1978, Theobald 1987, Flynn 1990). The objectives of this Master Plan seek not only to utilize these resources but also to preserve them for future generations.

The entire Limahuli Valley is located within the State of Hawai'i's Conservation District. This district is strictly governed by the Department of Land and Natural Resources (DLNR). Any changes or improvements to property within the Conservation District must first be approved by the Board of Land and Natural Resources. In order to fulfill the objectives of this Master Plan, the NTBG will ask the DLNR to establish a "Special Subzone" within the Conservation District that will allow the implementation of this Master Plan.

The Limahuli Valley Special Subzone will encompass about 1,005 acres of land. Currently, 12.89 are owned by the NTBG, while 992 are owned by the Wichman family. It is the desire of the Wichman family to have this entire area managed as a botanical garden and preserve by the NTBG, and they intend to give this vast area to the NTBG in the near future (Appendix I). Thus, with the Wichman's consent, the NTBG has included the 998 acres, owned by the Wichman family, as part of its Master Plan for Limahuli Gardens and Preserve.

In order to facilitate the NTBG's master planning process, Limahuli Valley has been divided into two principal areas. These are defined as: Limahuli Gardens and Limahuli Preserve. Due to the topography of the valley and the resulting inaccessibility of the upper area above the Limahuli Falls, the Preserve has been further divided into the Lower Limahuli Preserve and the Upper Limahuli Preserve (Exhibit 2).

INTRODUCTION

MASTER PLAN CHAPTERS

The following is a brief synopsis of the arrangement and content of the NTBG's Master Plan for Limahuli Gardens and Preserve.

Chapter I sets forth the Foundations of this Master Plan as established in the NTBG's Congressional Charter, Statement of Purposes for Limahuli Gardens and Preserve, and the Master Plan Objectives.

Chapter II details the NTBG's plans for Limahuli Gardens. Included in this chapter are an overview and description of the area, management plans, future programs, future physical facilities, an implementation schedule, and anticipated impacts resulting from the implementation of this Master Plan in this area.

Chapter III details the NTBG's plans for the Lower Limahuli Preserve. Again this chapter includes an overview and description of the area, management plans, future programs, future physical facilities, an implementation schedule, and anticipated impacts resulting from the implementation of this Master Plan in this area.

Chapter IV details the NTBG's plans for the Upper Limahuli Preserve. This chapter details the management and use of this isolated area.

Chapter V details the NTBG's management of the archaeological sites located within the 1005 acres of the Limahuli Gardens and Preserve.

Chapter VI details the NTBG's management of the Limahuli Stream.

Chapter VII defines the factors limiting the implementation of this Master Plan.

MASTER PLAN APPENDICES

Appendix I details the circumstances and events that led to the production of the NTBG's Master Plan for Limahuli Gardens and Preserve.

Appendix II is a report prepared by the Bishop Museum after completing an archaeological surface survey and instrument-aided mapping of Limahuli Gardens.

Appendix III is a report prepared by Dr. Amadeo Timbol, Aquatic Biologist, after conducting a survey and study of the Limahuli Stream.

Appendix IV is a report prepared by the NTBG's Assistant Botanist, Mr. Timothy Flynn, who performed a botanical survey of Limahuli Valley.

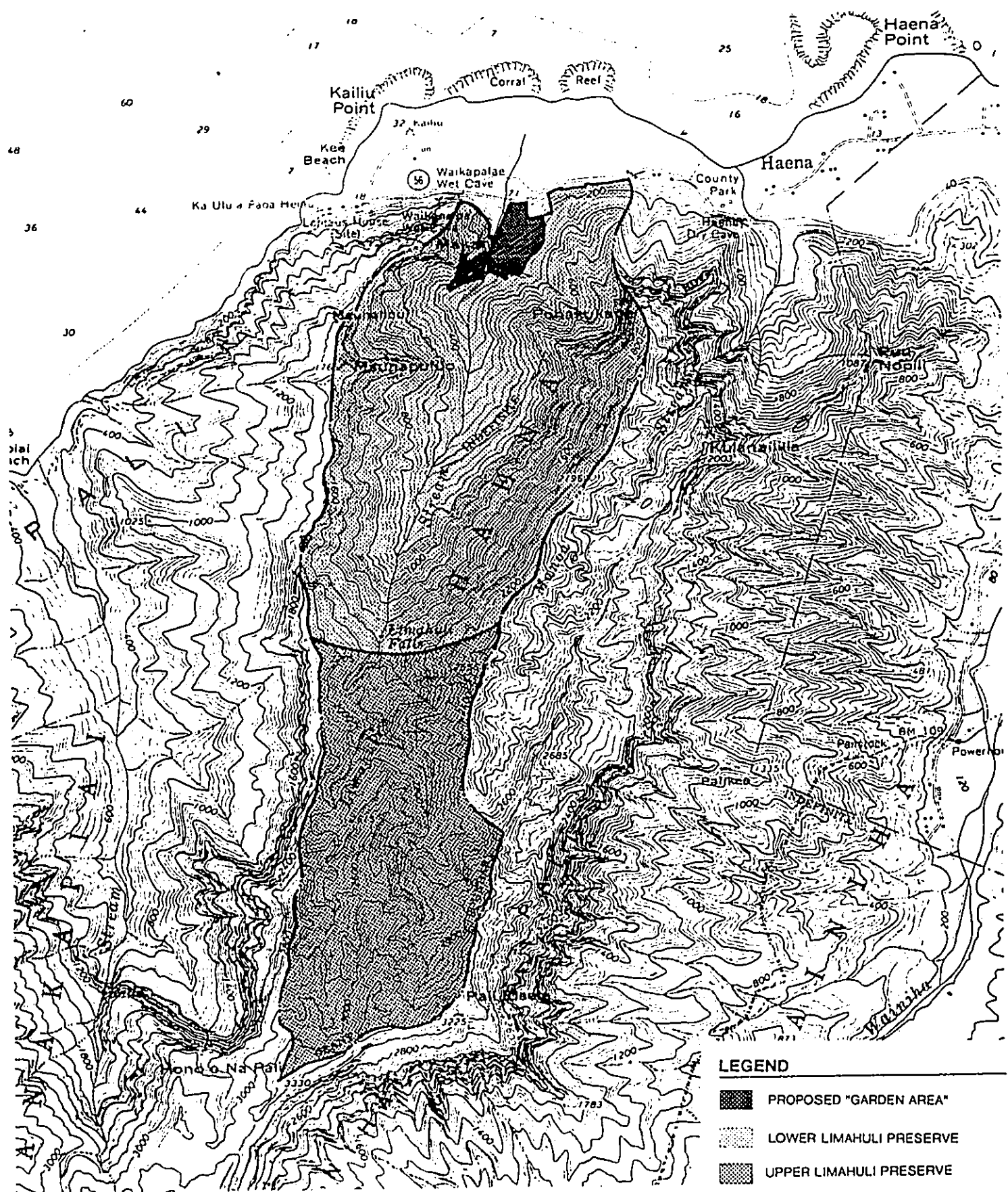
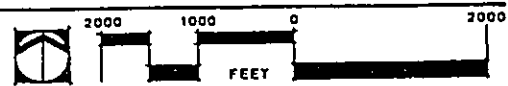


EXHIBIT 2

LOCATION OF PROPOSED AREAS AND TOPOGRAPHY

HAENA, KAUAI

LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN



MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

CHAPTER I

THE FOUNDATIONS OF THIS MASTER PLAN

OFFICIAL STATEMENTS OF PURPOSES

The basic foundations of this Master Plan are found in two official statements of purposes. These are the NTBG's 1964 Congressional Charter, and the NTBG's 1989 Statement of Purposes for Limahuli Gardens and Preserve.

In 1964, the 88th Congress of the United States recognized the need to conserve and protect the tropical plant resources of the world, especially the threatened and endangered species. To help meet this goal, the 88th Congress passed Public Law 88-449, *An Act to Charter by Act of Congress the Pacific Tropical Botanical Garden*, which established the National Tropical Botanical Garden (then known as the Pacific Tropical Botanical Garden) as a non-profit organization with the following purposes:

- (a) to establish, develop, operate, and maintain for the benefit of the people of the United States an educational and scientific center in the form of a tropical botanical garden or gardens, together with such facilities as libraries, herbaria, laboratories, and museums which are appropriate and necessary for encouraging and conducting research in basic and applied tropical botany;
- (b) to foster and encourage fundamental research with respect to tropical plant life and to encourage research and study of the uses of tropical flora in agriculture, forestry, horticulture, medicine, and other sciences;
- (c) to disseminate through publications and other media the knowledge acquired at the gardens relative to basic and applied tropical botany;
- (d) to collect and cultivate tropical flora of every nature and origin and to preserve for the people of the United States species of tropical plant life threatened with extinction;
- (e) to provide a beneficial facility which will contribute to the education, instruction and recreation of the people of the United States.

In its effort to fulfill the objectives of its Congressional Charter, the NTBG has acquired three satellite gardens. These are, Kahanu Gardens on Maui, Kampong Gardens in Florida, and Limahuli Gardens in Ha'ena, Kaua'i. On September 20, 1989, the Board of Trustees of the National Tropical Botanical Garden adopted separate statements of purposes for each of these three gardens. The following is the official Statement of Purposes for Limahuli Gardens and Preserve.

CHAPTER I
THE FOUNDATIONS OF THIS MASTER PLAN

The Limahuli Gardens and Preserve was added to the National Tropical Botanical Garden to enhance the Garden's ability to fulfill the purposes set forth in its Congressional Charter of August 19, 1964 by providing a satellite garden and preserve with the following primary functions:

- A) to maintain for the purposes of research and education a garden of approximately 15-20 acres devoted to the cultivation of plants native to the Hawaiian Mesophytic and Lowland Rain Forests, especially rare and endangered species; varieties of Hawaiian ethnobotanical plants (such as taro, banana, olona, etc.) and other plants capable of growing in the garden's environment;
- B) to maintain for purposes of research and education a natural area of approximately 985 acres for the preservation of the flora and fauna native to the area;
- C) to provide a beneficial facility which will contribute to the education, instruction and recreation of the people of the United States and instruct them of the purposes of this site and the National Tropical Botanical Garden in its entirety.

THE ESTABLISHMENT OF MASTER PLAN OBJECTIVES

With the basic direction having been set forth in the NTBG's Congressional Charter and Statement of Purposes for Limahuli Gardens, the next step in the development of this Master Plan's foundation was the establishment of the Master Plan Objectives. These Objectives are quite broad in nature and emphasize the desire of the NTBG to not only utilize the area for its botanical value but also to preserve, protect, and (when possible) improve the natural and cultural resources of Limahuli Valley. The NTBG realizes that responsible management of these resources will greatly enhance Limahuli's value as an educational resource and the NTBG's ability to foster scientific research in fields other than botany and horticulture.

The establishment of these Objectives has been a cooperative effort. The process initially involved outlining the objectives used by Mrs. Juliet Wichman in her management of the valley from 1967 to 1976 (Appendix I). The NTBG then solicited input from its trustees, staff, visitors, and environmental consultants, as well as from public education instructors, Hawaiian culture experts, and concerned members of the community. All of this input was then synthesized into the following Objectives:

MASTER PLAN OBJECTIVES

1. *To protect, preserve and improve the environment and scenic value, as well as the natural and cultural resources of Limahuli Valley for future generations.*
2. *To develop and maintain a botanical garden as described in the section A) of the Statement of Purposes for Limahuli Gardens and Preserve.*
3. *To maintain two natural-area preserves dedicated to the preservation and restoration where possible of the existing ecosystems.*

CHAPTER I
THE FOUNDATIONS OF THIS MASTER PLAN

4. *To use Limahuli Valley as an educational tool that will provide the public with a better understanding of the natural and cultural history of Hawai'i and the impact that humans have had on Hawai'i's environment.*
5. *To protect and preserve the aquatic environment of Limahuli Stream, and to use Limahuli Stream to educate the public about the fragility and importance of Hawai'i's natural resources.*
6. *To protect, preserve and stabilize the ancient Hawaiian archaeological sites located throughout Limahuli Valley, and to make these sites available for study by qualified professionals so that they may provide a better understanding of the time-frames, extent and uses of the area by the ancient Hawaiians.*
7. *To use Limahuli Gardens and Lower Limahuli Preserve to provide the public with recreational opportunities in appropriate intensities of use as to protect and to preserve the environment and scenic value of Limahuli Valley.¹*

¹ Recreational opportunities will normally be limited to walking and hiking tours of the garden and preserve.

CHAPTER II

MASTER PLAN FOR LIMAHULI GARDENS

OVERVIEW AND DESCRIPTION

The 1005 acres of Limahuli Valley that this Master Plan addresses is a very diverse area with numerous intertwining factors governing its use. One of the most important factors is the accessibility of the different areas in the valley. Limahuli Gardens, which is located in the mouth of the valley, is readily accessible from Kuhio Highway, while the Lower Limahuli Preserve is accessible only on foot via a hiking trail. The Upper Limahuli Valley is nearly inaccessible on foot and requires individuals to use a helicopter to gain access to this area.

Because of Limahuli Gardens' location and accessibility, it will be the most utilized and improved area of the valley. This area will thus require a different type of management than the other areas of the valley. The following is a brief physical description of the Limahuli Gardens.

As it exists today, Limahuli Gardens (also referred to as the "Garden Area") encompasses about 8 acres of land (Exhibits 2 & 3). The NTBG proposes to expand the Garden Area in the future to a total of approximately 15 to 20 acres in size (Exhibit 4). The Proposed Garden Area will consist of Lots 140 - 145, Roads P-1 and P-2, and the portion of Lot 152 within the existing dirt road and just outside of it. (Although Lot 141 is included in this area, it will not be improved on the same schedule as the rest of this area because it surrounds Exclusion 27 (Exhibit 5). By not developing this lot, it will act as both an audio and visual buffer, mitigating the NTBG's impact on the residence currently under construction on Exclusion 27.)

The Garden Area is much drier than the areas immediately to the south (or inland) of it. Average rainfall in this area approaches 100 inches per year. Because of the exposure to the tradewinds and the varying degrees of slope found in this area, much of the rainfall either runs off or is dried out by the wind. This has resulted in the development of two overlapping ecosystems, which botanists have termed the "Mixed Mesophytic Forest" and the "Lowland Rain Forest" (Wagner et al. 1985). The more exposed and steep areas have developed into the drier Mixed Mesophytic type of vegetation, while the more protected, flat areas have developed into the Lowland Rain Forest type of vegetation.

Today, the entire Garden Area is practically devoid of native vegetation. This is the result of several different environmental pressures on the original ecosystems. The first of these pressures was caused by the ancient Hawaiians who cleared the original native forest to make room for their crops. Sometime in the 1800s, the Hawaiians

CHAPTER II
MASTER PLAN FOR LIMAHULI GARDENS

stopped cultivating the area and cattle were introduced. The cattle ate and damaged the existing native vegetation, while trampling on the ancient Hawaiian archaeological site located in this area (Exhibit 11). The impact of the cattle, combined with the ever-increasing number of aggressive alien plants, made it impossible for the native plants to revegetate the areas originally cleared by the ancient Hawaiians. When the cattle were removed in 1967, the area they had grazed down was quickly overrun by aggressive alien plants and, within a few years, the alien plants had become a dominate part of the Garden Area. Several botanical surveys between 1977 and 1990 have revealed that less than 5% of the vegetation in this area is native (Exhibit 7).

MANAGEMENT PLAN

The Limahuli Gardens will be the most utilized area of Limahuli Valley. As such, it will become the focal point of the NTBG's Educational Programs and Living Collections. The management of the Garden Area will seek to fulfill the foundations of this Master Plan as set forth in Chapter I.

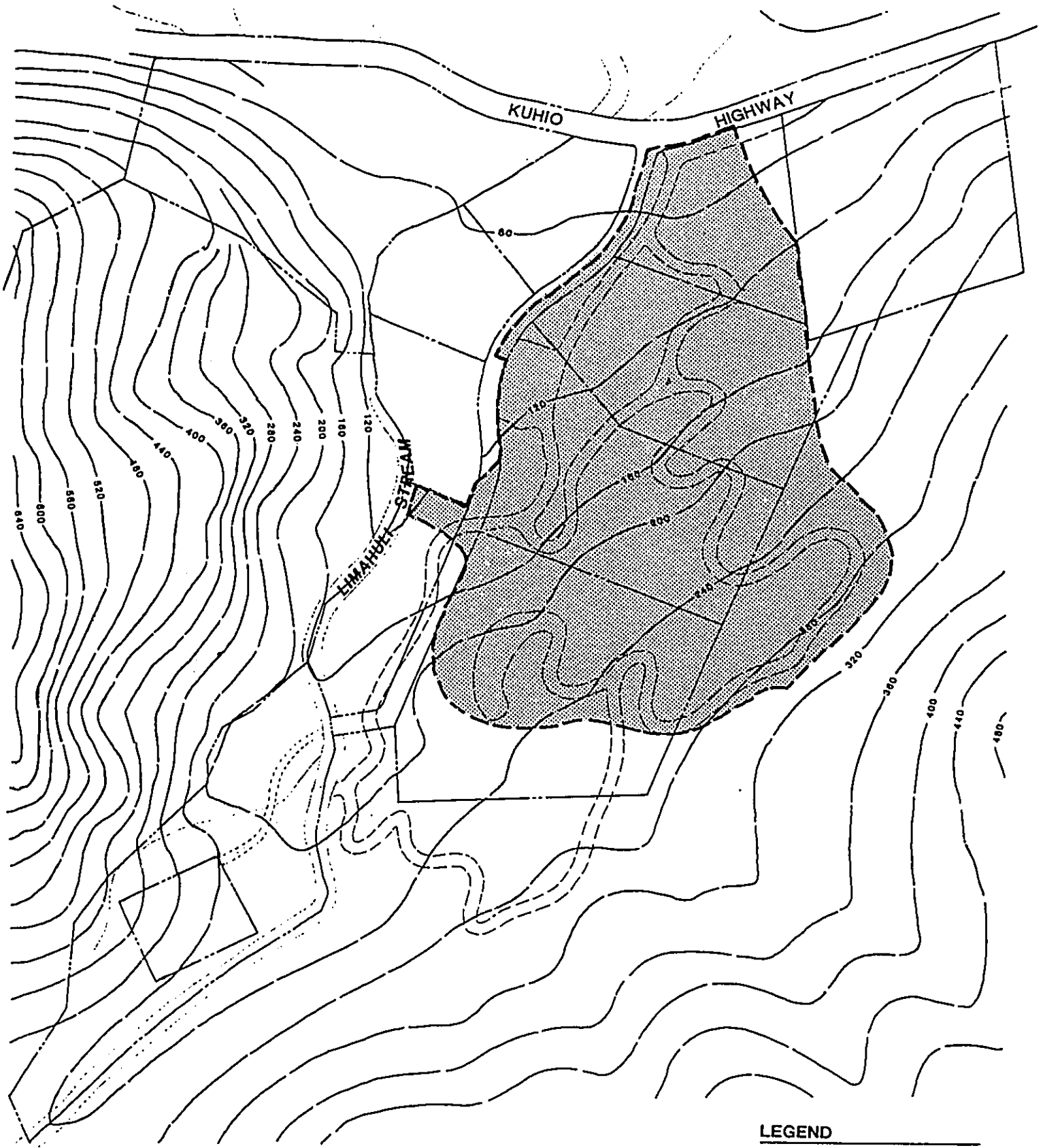
Function

The primary function of the Limahuli Gardens is set forth in sections A) and C) of the NTBG's Statement of Purposes for Limahuli Gardens and Preserve.

- A) to maintain for the purposes of research and education a garden of approximately 15-20 acres devoted to the cultivation of plants native to the Hawaiian Mesophytic and Lowland Rain Forests, especially rare and endangered species; varieties of Hawaiian ethnobotanical plants (such as taro, banana, olona, etc.) and other plants capable of growing in the garden's environment;
- C) to provide a beneficial facility which will contribute to the education, instruction and recreation of the people of the United States and instruct them of the purposes of this site and the National Tropical Botanical Garden in its entirety.

Management Objectives

1. To improve the existing habitat of the Garden Area so that it is more hospitable to the NTBG's Living Collections as established by the Statement of Purposes (quoted above), and to make this area useful as a research and educational garden.
2. To use the Garden Area as a fundamental component of the NTBG's research and educational programs as outlined in its Congressional Charter.
3. To use the Garden Area to provide visitors with educational opportunities that will include learning about the fragile endemic Hawaiian flora and the need to protect it, the ancient Hawaiian culture and the impact that it had upon the natural history of Hawai'i, and the fragility of our natural resources and the need to protect our environment today.
4. To use the Garden Area to disseminate information about the Garden's research, the cultural and natural history of Hawai'i, and other related topics.
5. To use the Garden Area to gain more support for the NTBG in the form of members, volunteers and financial supporters, and to generate revenue that will help support Limahuli Gardens and the NTBG.



LEGEND

 EXISTING GARDEN AREA

**EXHIBIT 3
TOPOGRAPHY AND OUTLINE
MAP OF EXISTING GARDEN AREA**

LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN

HAENA, KAUAI



MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

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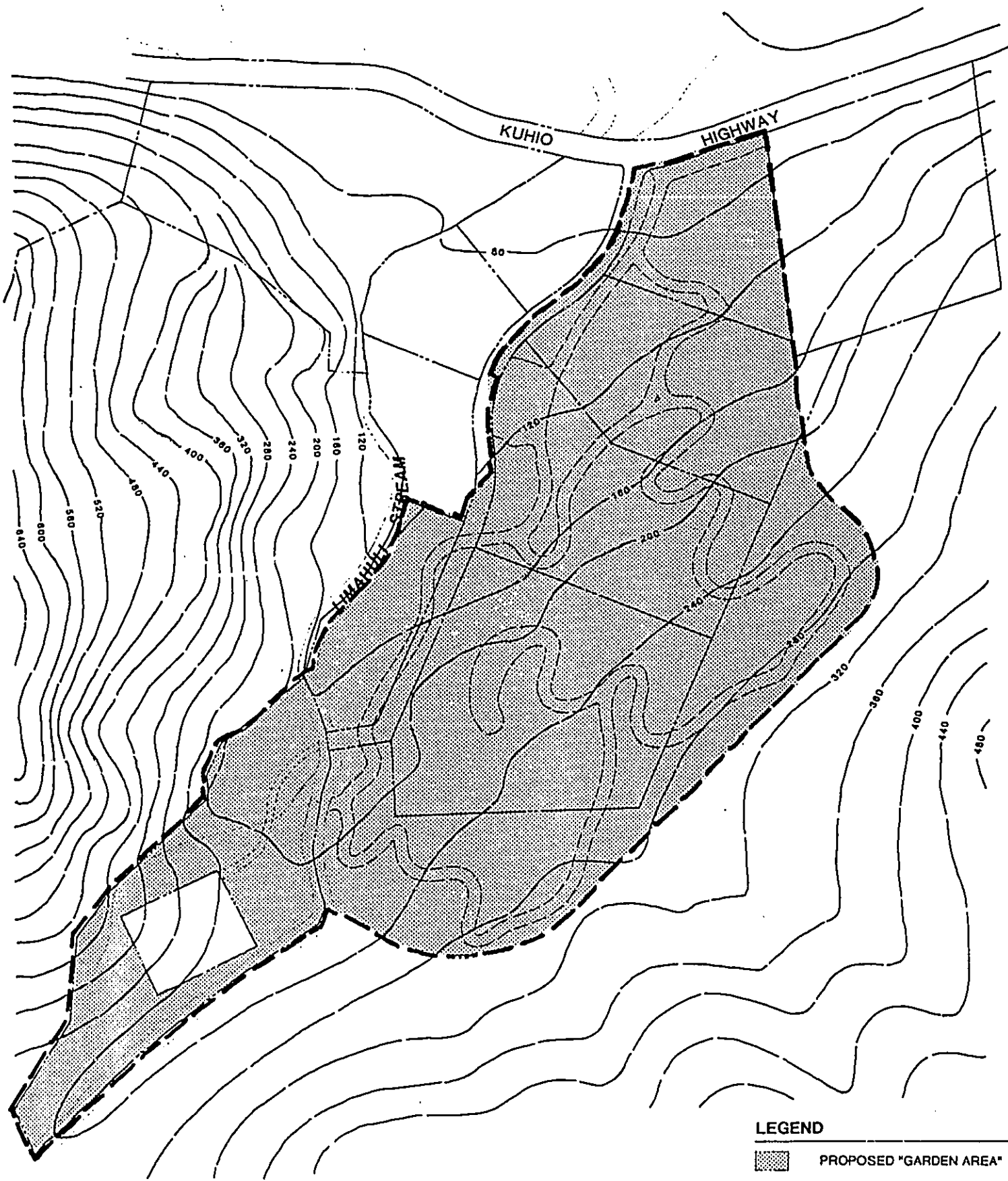


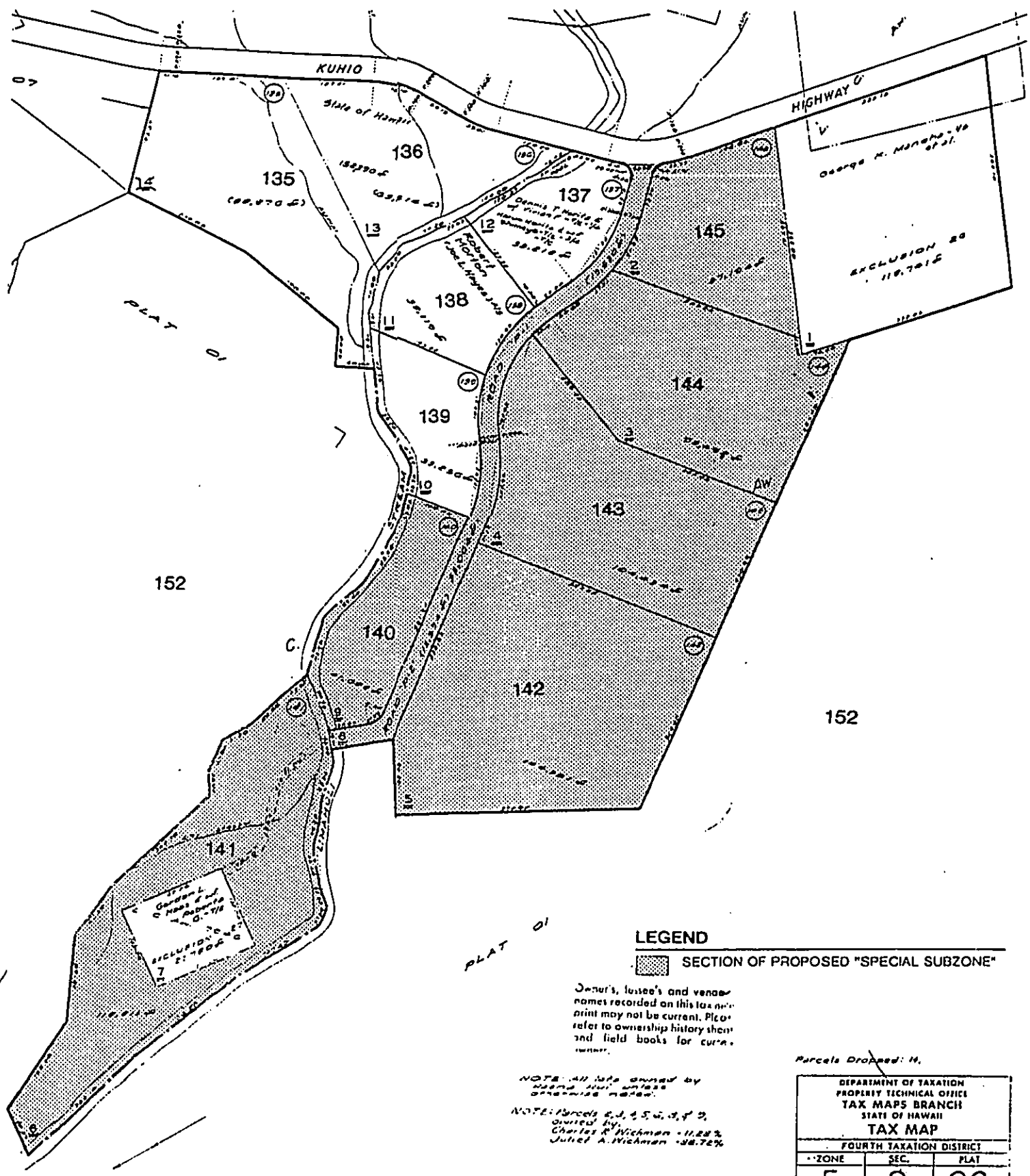
EXHIBIT 4
 TOPOGRAPHY AND OUTLINE OF PROPOSED GARDEN AREA

HAENA, KAUAI

LIMAHULI VALLEY
 NATIONAL TROPICAL BOTANICAL GARDENS



MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT



**EXHIBIT 5
TAX MAP KEY**

**LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN**

HAENA, KAUAI



MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

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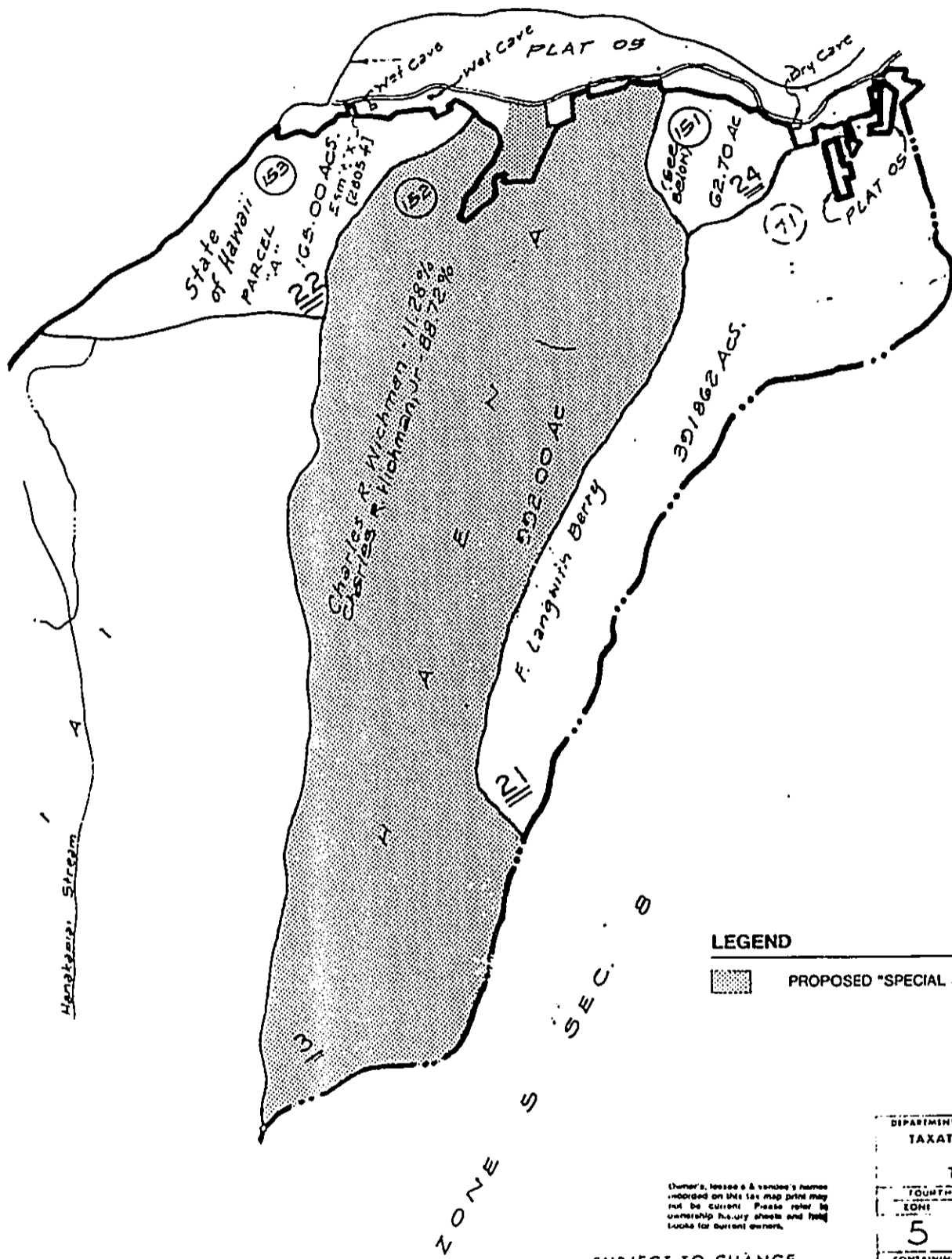
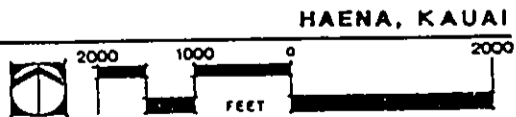


EXHIBIT 6
 TAX MAP KEY

LIMAHULI VALLEY
 NATIONAL TROPICAL BOTANICAL GARDEN



MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

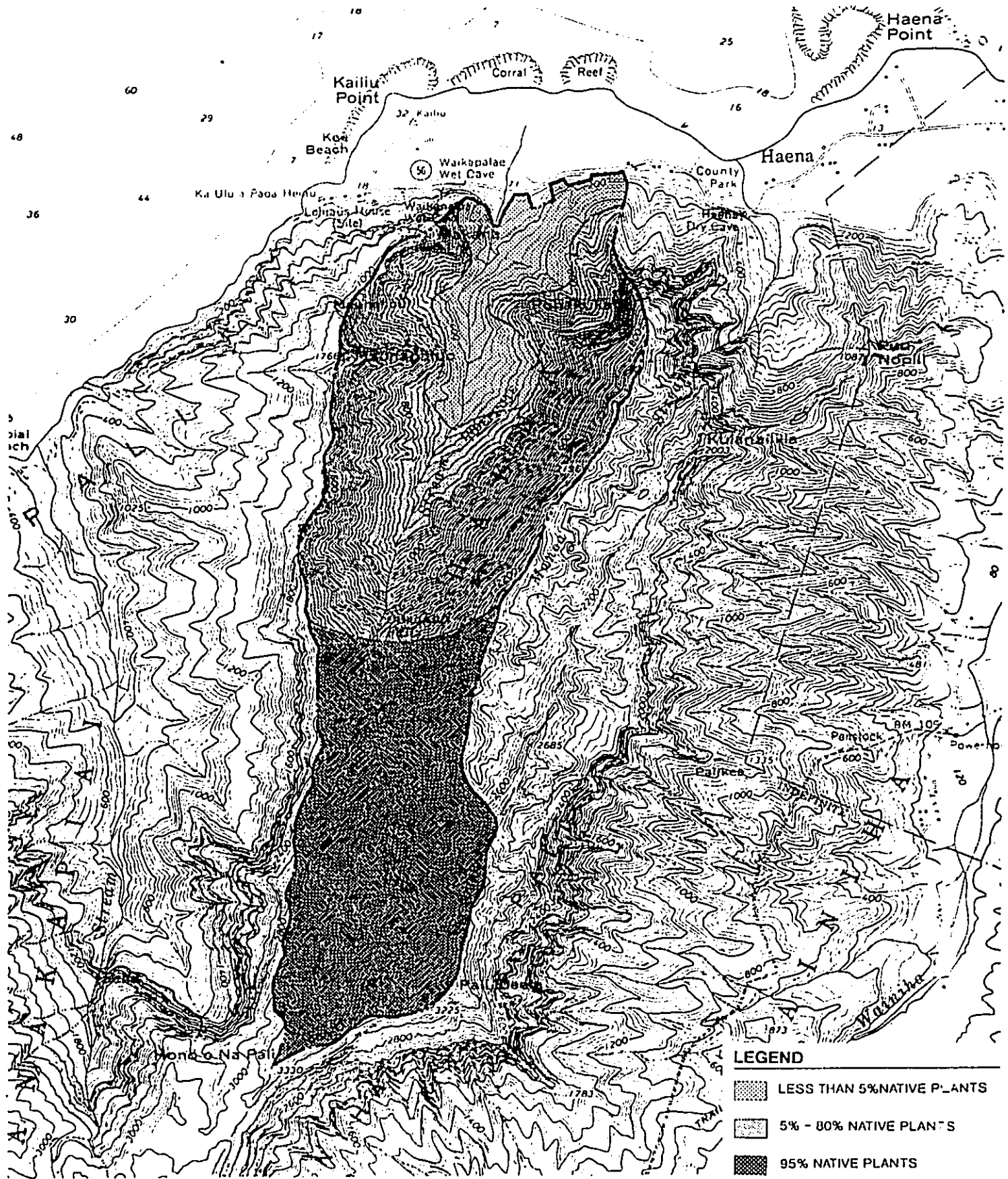
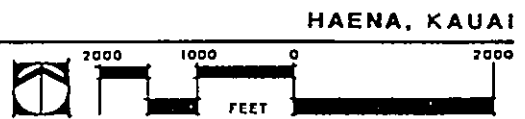


EXHIBIT 7
EXISTING VEGETATION MAP

LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN



MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

CHAPTER II
MASTER PLAN FOR LIMAHULI GARDENS

Management Guidelines

The following Management Guidelines are recommended to assist the NTBG in the judicious implementation of its programs and improvements in Limahuli Gardens.

1. Habitat improvements in the Garden Area must be performed in a manner that will not adversely impact Limahuli Valley's terrestrial or aquatic environments, its scenic value, or its archaeological sites.
2. The implementation of the NTBG's programs (i.e., planting, education, research, etc.) in the Garden Area must be done in a manner that will not adversely impact Limahuli Valley's terrestrial or aquatic environments, its scenic value, or its archaeological sites.
3. Maintenance of the Garden Area must be performed in a manner that will not adversely impact Limahuli Valley's terrestrial or aquatic environments, its scenic value, or its archaeological sites.
4. All organic litter generated in the Garden Area should be recycled through a composting program.
5. The construction of all physical facilities in the Garden Area must be performed in a manner that will not adversely impact Limahuli Valley's terrestrial or aquatic environments, its scenic value, or its archaeological sites.

THE NTBG'S PROGRAMS

The Environmental Assessment Program

It is the original intent of the NTBG and the Wichman family that the Limahuli Gardens and Preserve be used as an educational, recreational, and research resource that does not negatively impact upon the natural or cultural resources of Limahuli Valley.

During the early review of this Master Plan (October 1990 to April 1991), members of the community expressed concern that the future focus of the Gardens and Preserve could change to that of a tourist attraction. Although this type of change would require prior approval of the Board of Land and Natural Resources and would allow for public review at that time, the idea continued to be a concern among the reviewers. All of the reviewers agreed that controlled public access to Limahuli, as proposed in this Master Plan, would be beneficial to the public and the NTBG, but that a larger scale program could have severe negative implications.

The NTBG shares this very serious concern, and in order to prevent the focus of the Gardens and Preserve from changing without the consent of the community and/or the Wichman family, it will establish a committee that will assess, on an annual basis, the environmental impacts, both positive and negative, of the NTBG's operations in Limahuli Valley. Members of this committee will equally represent the community, the Wichman family, and the NTBG. The committee will be chaired by the Director of the NTBG, and will issue an annual report to the NTBG's Board of Trustees stating their findings and recommendations. The public will be encouraged to submit written or oral testimony to the committee for their evaluation, and copies of the annual reports will be made available to the public upon request.

CHAPTER II
MASTER PLAN FOR LIMAHULI GARDENS

Although the recommendations of this committee will not be binding on the NTBG, it will allow for an official annual review process that is sensitive to the concerns of the community, the Wichman family, and the NTBG. In essence, it will become a planning tool that will assist the NTBG in the judicious management of the valuable natural and cultural resources located in Limahuli Valley.

The Habitat Improvement Program

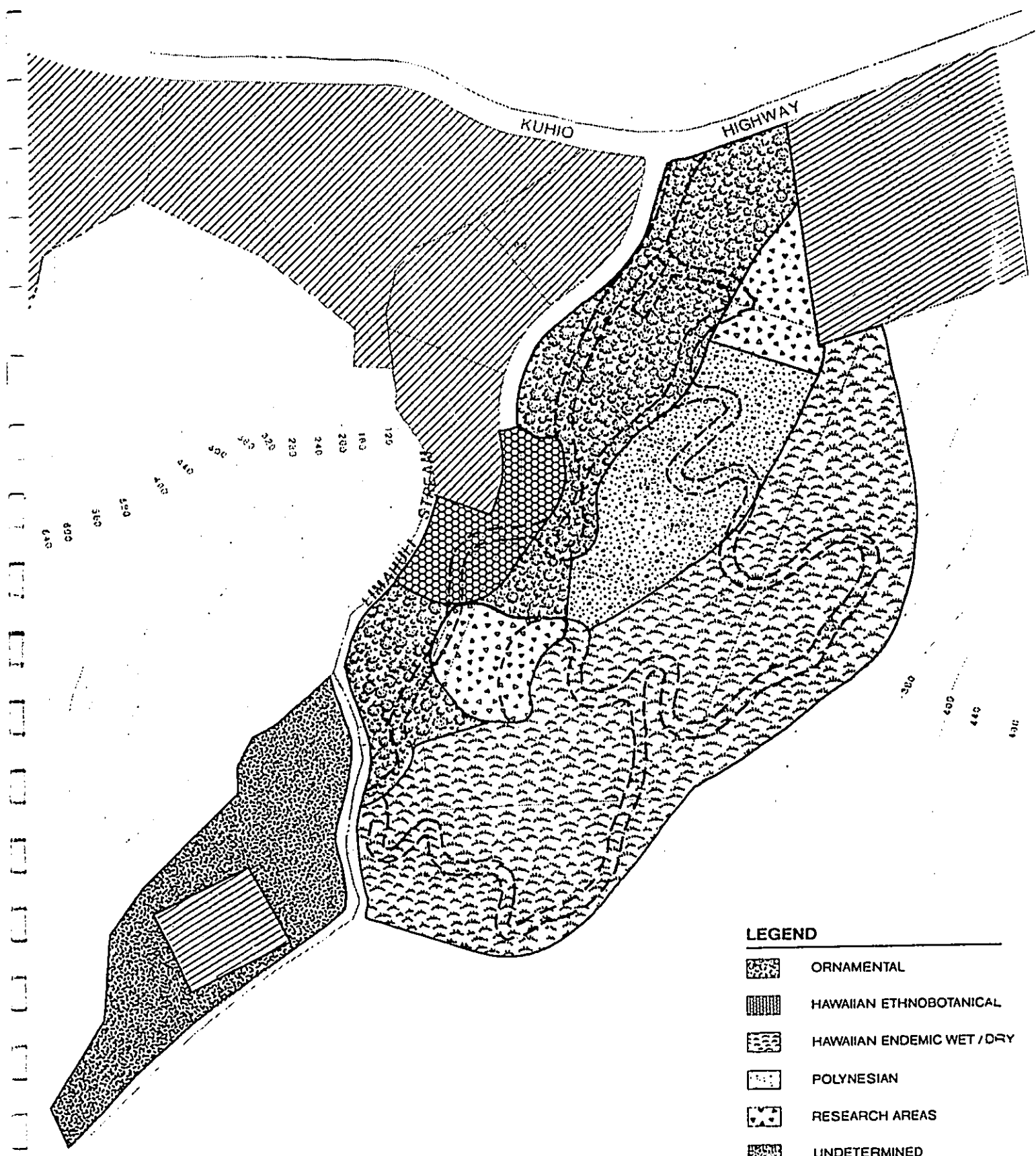
The Habitat Improvement Program for Limahuli Gardens will seek to fulfill Management Objective (1) described above, by making the Garden Area more hospitable to the NTBG's Living Collections. Currently, this area is dominated by aggressive alien plant species, many of which have simultaneously employed several reproduction strategies to invade and dominate the area. These alien plants will have to be physically removed before the Garden Area can be successfully planted by the NTBG.

Because this area will function as a garden, it will employ the extensive use of lawns, at least initially, to reduce soil erosion. Nearly half of the functional Garden Area² will be devoted to endemic Hawaiian plant species (Exhibit 8), while the rest of the Garden Area will be planted with ornamental, specimen, and ethnobotanical plants of the early Hawaiians. The following methodology will be used to improve the habitat of this area from one that is dominated by aggressive alien trees to one more hospitable to the NTBG's Living Collections:

1. The Garden Area will be cleared of undesirable alien trees and shrubs. This will be done a small section at a time, and will primarily be accomplished through the use of chain saws, and if necessary, the use of a translocated herbicide that will be painted on freshly cut stumps.³
2. Grass will be established in this area as quickly as possible to hold the soil in place.
3. Utilizing the criteria outlined in the following Planting Program for Limahuli Gardens, the Garden Area will be replanted generally following Exhibit 8, the Proposed Landscape Plan. (The Proposed Landscape Plan is simply a general guide to the planting of the Garden Area. Plants will, of course, need to go into an area most ecologically suited for them and thus their final planting spot may differ from what is shown on Exhibit 8.)
4. Eventually, as the specimen trees become mature, the understory plants can be planted to make the improved habitat more complete.
5. Feral chickens will be trapped and removed from the Garden Area.

² The functional Garden Area does not contain Lot 141, which will not be improved or planted on the same schedule as the rest of the Garden Area. By leaving this lot in a natural state, the existing alien vegetation will act as a buffer to mitigate the impact on Exclusion 27 (not owned by the NTBG).

³ The National Parks have been doing extensive testing on the use of herbicides in their habitat improvement projects and have proven that herbicides can be used safely and efficiently to prevent the regrowth of alien plant species (Santos et al. 1986).










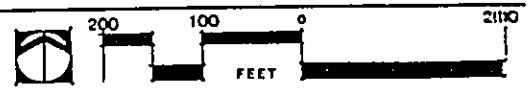
- LEGEND**
-  ORNAMENTAL
 -  HAWAIIAN ETHNOBOTANICAL
 -  HAWAIIAN ENDEMIC WET / DRY
 -  POLYNESIAN
 -  RESEARCH AREAS
 -  UNDETERMINED
 -  OTHER OWNERS

EXHIBIT 8
PROPOSED LANDSCAPING PLAN
LIMAHULI VALLEY
 NATIONAL TROPICAL BOTANICAL GARDEN

HAENA, KAUAI



MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

CHAPTER II
MASTER PLAN FOR LIMAHULI GARDENS

The Planting Program

As defined in the first section of the NTBG's Statement of Purposes for Limahuli Gardens and Preserve, the Planting Program will be devoted to:

.... the cultivation of plants native to the Hawaiian Lowland Rain and Mesophytic Forests, especially rare and endangered species; varieties of Hawaiian ethnobotanical plants (such as taro, bananas, olona, etc.) and other plants capable of growing in this Gardens' environment;

Since the focus of this program will be the cultivation of native plant species, it will become a destination for many of the native species distributed by the Hawai'i Plant Conservation Center (HPCC).

The HPCC was established by the NTBG in 1989 with a grant from the John D. and Catherine T. MacArthur Foundation to become a resource and information center dedicated to the collection, propagation, cultivation, and distribution of native Hawaiian plants. The HPCC has also developed a partnership with the State's Department of Forestry and Wildlife (DOFAW) and has become a major component in the State's efforts to preserve Hawai'i's rare and endangered species.

The ecological zones available for planting in Limahuli Valley make it a natural choice for many of the plants that will be propagated by the HPCC and will allow the NTBG, the HPCC, and the DOFAW to realize many of their goals.

There are however, certain criteria that should be used to screen all candidate plants--both native and alien species--that will be grown in Limahuli Gardens and Preserve. These are:

1. **To prevent the introduction of any new alien plants pests, all candidate plants should be researched to determine if they have a history of becoming naturalized and thus possibly invading the native ecosystems.**

This will prevent the unintentional establishment of alien plant species (ornamental, research or Hawaiian ethnobotanical) that might escape into the wild and pose a new threat to the existing native species. Historically, the relatively small percentage of introduced species that have done so in the past are perhaps the major single factor endangering Hawaiian plants (Smith 1985).

The responsibility of this research should be shared by the NTBG's Planting Committee, botanical staff, and the Limahuli Gardens' horticulturist. Additionally, any plant introduced into the Gardens that shows the potential of becoming a weed will be immediately destroyed.

2. **To prevent the unintentional alteration of the existing native plant gene pools, all candidate plants should be researched to determine the chances of their being able to interbreed with the existing populations of native species existing in Limahuli Valley and surrounding areas.**

This is an important consideration if the NTBG is to preserve, intact, the existing gene pools that have taken thousands or millions of years to evolve in Limahuli and the surrounding area. Again, the NTBG Planting Committee, botanical staff, and the

CHAPTER II
MASTER PLAN FOR LIMAHULI GARDENS

Limahuli Gardens' horticulturist should be responsible for the required research.

Unfortunately, it is difficult to establish any firm guidelines in this regard, as our knowledge of existing gene pools and their genetic variability (diversity) is very limited.

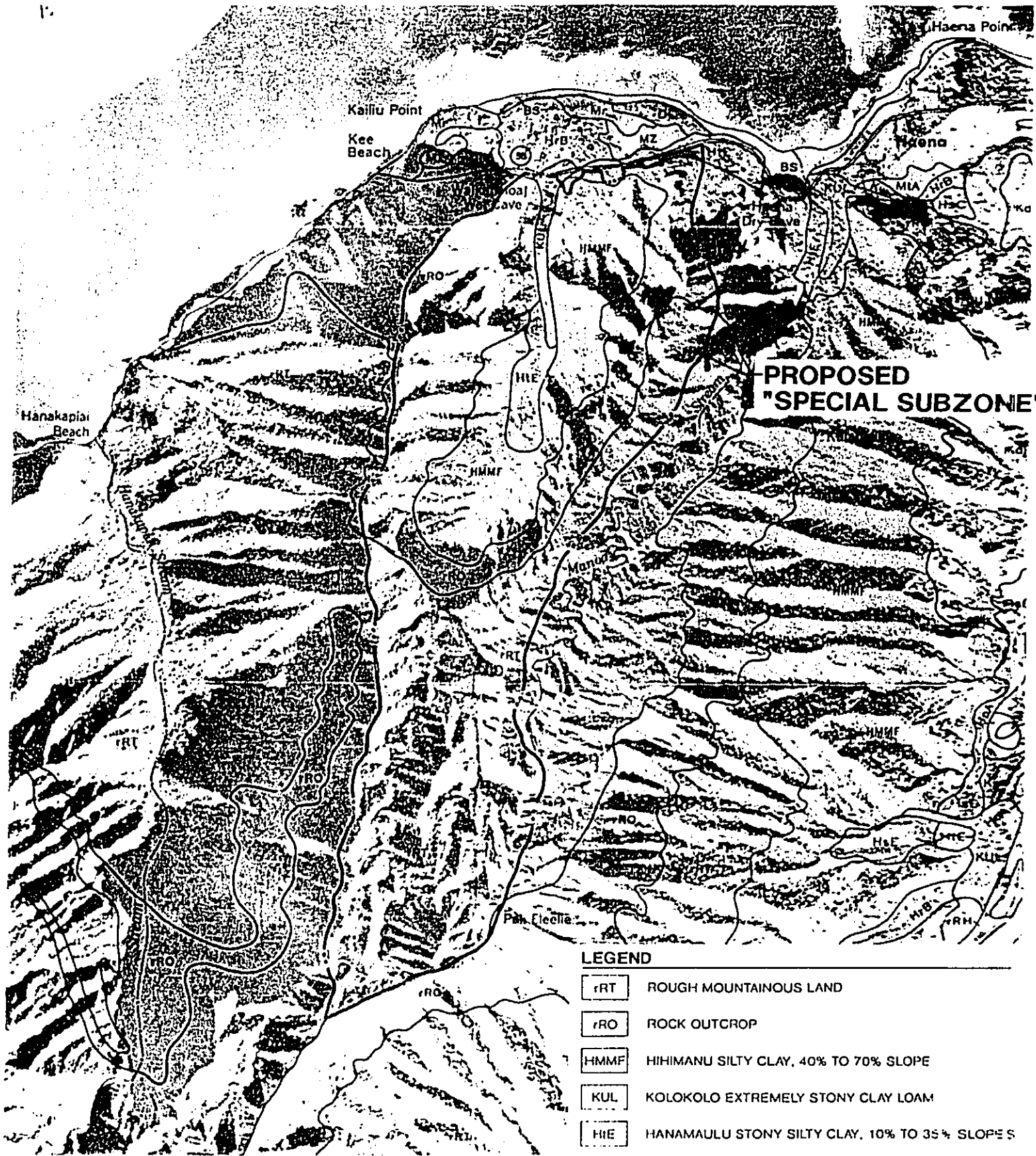
Many Hawaiian species have become so depleted in numbers that these remnant populations may no longer contain a true representation of the genetic variability of a given species. It is not known if these depleted populations are undergoing genetic drift, that is, the random loss of low-frequency genes in depleted populations. In such cases, a remnant population of rare species might benefit from an infusion of new genes from a geographically different population. These genes could invigorate the depleted population and save it from extinction (Schonewald-Cox 1985, Carson 1989).

Until the NTBG has the knowledge to address these problems, the following basic guidelines are suggested to help screen the native candidate plant species:

1. If botanical surveys indicate that a gene pool for a particular species does exist in Limahuli (i.e., *Pittosporum kauaiensis*), then consideration should be given towards only reintroducing plants that have been grown from seeds or cuttings collected from populations (of that particular species) that currently exist in Limahuli. If a large number of plants are to be reintroduced into the valley, as many different individuals as possible should be used for the propagative material, to insure the perpetuation of as much of the genetic variability of that population as possible.
2. If a severely depleted population of a particular species does exist in Limahuli, then consideration should be given towards introducing genes from a population that is as similar as possible to the one existing in Limahuli. An example of this is the remnant population of *Pteralyxia kauaiensis* that exists in Limahuli. The addition of genes from the *Pteralyxia kauaiensis* growing on the Napali coast could help invigorate the Limahuli population.
3. If botanical surveys indicate that a gene pool for a particular species does not exist in Limahuli but does exist in nearby areas (i.e., Wainiha and Hanakapiai), then consideration should be given towards using propagative material only from these locations for those particular species. An example of this is *Strongylodon ruber*, which has not been found in Limahuli although it has been collected in Wainiha valley (K. Robinson pers. comm.).
4. If botanical surveys indicate that a gene pool for a particular species does not exist in Limahuli or nearby areas (i.e., *Hibiscadelphus distans*), then propagative material from other locations can safely be used.

The Composting Program

The Composting Program for Limahuli Gardens will seek to recycle all of the organic litter and alien vegetation removed in this area into compost. The compost will then be used as mulch and soil amendments throughout the grounds. This program will directly and indirectly benefit the plants grown in Limahuli Valley and the terrestrial and aquatic environments located there.



LEGEND

rRT	ROUGH MOUNTAINOUS LAND
rRO	ROCK OUTCROP
HMMF	HIHIMANU SILTY CLAY, 40% TO 70% SLOPE
KUL	KOLOKOLO EXTREMELY STONY CLAY LOAM
HIE	HANAMAULU STONY SILTY CLAY, 10% TO 35% SLOPE S

SOURCE: SOIL SURVEY OF THE ISLANDS OF KAUAI, OAHU, MAUI, MOLOKAI, AND LANAI, STATE OF HAWAII, U.S. DEPT. OF AGRICULTURE SOIL CONSERVATION SERVICE, AUG. 1972

**EXHIBIT 9
SOILS MAP**

**LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN**

HAENA, KAUAI



MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

SOIL NAME	GENERAL DESCRIPTION	PARENT MATERIAL	ELEV. (FT.)	RAIN* (IN.)	P-Permeability R-Runoff** E-Erosion***	REPRESENTATIVE PROFILE	SOIL PH	EXISTING USES	POTENTIAL USES	NATURAL VEGETATION
(HIE) HANAMAULU STONY SILTY CLAY 10 TO 35 % SLOPES	Well-drained soils on stream terraces and steep terrace breaks, occurring on moderate to strongly sloping areas. Root penetration to a depth of 5 ft. or more. Stones interfere with operation of farm machinery.	Developed from alluvium washed from upland soils.	200 to 700	60 to 100	P- N/A R- Medium to rapid E- Moderate to severe	<u>Surface:</u> 11 inches thick; brown, very dark grayish brown, and dark reddish brown stony silty clay. <u>Subsoil:</u> 60 inches thick; dark brown and reddish brown subangular blocky silty clay over silty clay loam. <u>Substratum:</u> Slightly to strongly weathered pebbles, stones and boulders.	The surface soil is extremely acid. The subsoil is very strongly acid.	Pasture, Woodland, Wildlife habitat, and Water supply.	Good source of roadfill. Fair source of topsoil w/ low fertility.	Guava, Hala, Glenwood grass, Rice grass, Hau, and Mango.
(HMMF) HIHIMANU SILTY CLAY LOAM 40 TO 70 % SLOPES	Well-drained soils occurring on very steep upland slopes. Root penetration to a depth of 5 ft. or more.	Developed in material weathered from basic igneous rock and colluvium at the base of slopes.	100 to 2000	70 to 120	P- Moderately rapid R- Medium E- Moderate	<u>Surface:</u> 15" thick; dark brown silty clay loam and silty clay. <u>Subsoil:</u> 24" to 57" thick; brown, dark brown and reddish brown silty clay subangular blocky structure soft, weathered rock. <u>Substratum:</u> Soft, weathered rock.	The surface and subsurface soils are very strongly acid.	Pasture, Woodland, Wildlife habitat, and Water supply.	Fair source of topsoil and roadfill.	Guava, Hala, Ohia, Koa, Melastoma, Lantana, False staghornfern, Yellow foxtail, and Paspalum.
(KUL) KOLOKOLO EXTREMELY STONY CLAY LOAM 0 TO 12 % SLOPES	Well-drained, extremely strong clay loam soils occurring on level to gently sloping bottom lands.	Developed in alluvium washed from upland soils.	50 to 500	60 to 150	P- Moderate R- Slight E- Slight	<u>Surface:</u> To about 19" thick; very dark brown stony clay loam. <u>Subsoil:</u> 41" or more thick; dark brown, very dark grayish brown, brown loam to stony silty clay loam. <u>Substratum:</u> Stratified alluvium.	The soils are neutral throughout each layer.	Pasture and Wildlife habitat.	Good source of roadfill. Fair source of topsoil w/ low fertility.	Guava, Hala, Hau, Mango, Grasses: Pangola Kukuju Para Glenwood Rice

* ANNUAL RAINFALL ** RUNOFF POTENTIAL *** EROSION POTENTIAL

SOURCE: SOIL SURVEY OF THE ISLANDS OF KAUAI, OAHU, MAUI, MOLOKAI, AND LANAI, STATE OF HAWAII U.S. DEPT. OF AGRICULTURE SOIL CONSERVATION SERVICE, AUG. 1972

EXHIBIT 10
LIMAHULI VALLEY SOILS CLASSIFICATIONS AND USES
LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN

HAENA, KAUAI

MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

CHAPTER II
MASTER PLAN FOR LIMAHULI GARDENS

The nature of nutrient cycling in tropical climates and soils is such that nutrients are heavily tied up in the living biomass and not stored in the soil. Organic litter is decomposed and nutrients are quickly taken up by the plants. This can pose a problem in a botanical garden where most of the organic litter (leaves, broken limbs, cut grass, etc.), is removed from the grounds for aesthetic reasons. The removal of this organic matter prohibits nutrient cycling, and it often leads to the application of chemical fertilizers to increase soil fertility and support plant growth. Although chemical fertilizers work well at increasing the nutrition available to the plants, they are relatively expensive and can pose a threat to the aquatic environment in Limahuli Stream if incorrectly applied (A. Timbol pers. comm.). By using all of the organic litter generated in the improvement and maintenance of the Gardens to make compost, which can then be applied as a surface mulch, the normal nutrient cycle can be maintained.

Compost generated in this program will also become a valuable soil amendment. The soil texture⁴ of the Hihimanu silty clay loam found in the Garden Area has a surface layer consisting of both silty clay loam and silty clay (Exhibit 9 & 10). Soils with these textures tend to have a compact structure⁵ that inhibits root development and the availability of nutrients, air and water to the roots (James-Palmer 1989). The Hihimanu silty clay loam soil will benefit greatly from amendments that increase the percentage of organic matter and humus⁶ in them. The addition of compost to the soil at the time of planting out will improve the soil structure and nutrient content of the soil, and also increase the cation exchange capacity of the soil (the ability to hold nutrients). Thus, the use of compost will provide the NTBG's specimen plants with a much improved soil, both nutritionally and structurally.

Another benefit that will result from the periodic use of compost as a mulch is a reduced chance of damage to specimen plants due to the normal maintenance practices of weed whacking or the spraying of herbicide. Periodic mulching will also reduce the need to weed around the plants as well as reduce water loss from the soil and thus help to reduce the man hours spent on watering new plantings. These are important considerations that will help to cut down the man-hours spent on maintenance of the plantings.

⁴ Soil texture refers to the relative size of the soil particles, and more specifically to the relative proportions of sand, silt and clay.

⁵ Soil structure is the arrangement of the soil particles in a soil profile. Soil structure modifies the influence of soil texture in regard to moisture and air relationships, availability of plant nutrients, action of microorganisms, and root growth.

⁶ Humus is defined as the more or less stable fraction of the soil's organic matter remaining after the major portion of added plant and animal residues have decomposed. Usually it is dark colored and is one of the very best soil conditioners, since it tends to make clay soils loose and crumbly. Most plants will thrive under these conditions, since air, water and nutrients are readily available to their roots.

CHAPTER II
MASTER PLAN FOR LIMAHULI GARDENS

The Archaeological Preservation Program

This program will seek to identify, stabilize, preserve and protect the archaeological features, which are part of site 50-30-02-1005, located within Limahuli Gardens (Exhibit 11). This program will be conducted by the NTBG's staff following the recommendations of a qualified archaeologist. The actual study and research of these sites will fall under the archaeological research program for this area (page 39), and also under the long term research program described in Chapter V (page 95).

The Educational Programs

The Educational Programs in Limahuli Gardens will become a valuable resource for public education. The concept of a Living Classroom (already implemented to a limited degree) in the Gardens also has proven successful in several places throughout the State.⁷ The expansion of the Garden Area and the implementation of the Visitors Program for Limahuli Gardens (described on pages 40-41) will greatly enhance the value of the NTBG's Educational Programs.

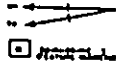
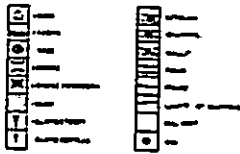
Educating the public on the importance and fragility of our natural resources is the single most important means of preserving our native species (Stone and Scott 1985). Only if the public is made aware of the potential loss will they make a stand and voice their concerns. There can never be too many educational opportunities in this regard. These opportunities are the key to public awareness and must not be restricted. Instead, they must be available to everyone, especially to our children. If we can instill the ethics of preservation in Hawai'i's children and adults, the idea that our natural resources are limited and not limitless, our society will overcome the largest hurdle in the path of protecting and preserving Hawai'i for future generations. *Ua mau ke ea o ka 'aina i na opio*, the land is preserved in our children! We must educate them with the concept of *malama 'aina*, loving and caring for our land.

The physical setting in Limahuli Gardens enhances people's ability to grasp the concepts emphasized in the NTBG's programs. General concepts normally discussed include: 1) the environment, 2) the natural history of Hawai'i, 3) the cultural history of Hawai'i, and 4) the importance of plants in our society. Specific topics discussed, depending upon the interest of the group, include: 1) the impact modern man has on the environment through the pollution and depletion of the earth's natural resources, 2) the geological formation of the Hawaiian Islands, 3) the slow geologic erosion the islands are undergoing, 4) how plants were able to disperse themselves over thousands of miles of ocean, 5) how evolution works through adaptive radiation and isolation, 6) how the balance of nature in Hawai'i was upset by man and his introduction of plants and animals, 7) how invasive alien plants take hold and can eventually smother an ecosystem, 8) how the Hawaiians lived with the concept of *malama 'aina*, 9) plant propagation and pollination, 10) genetic variations in Hawai'i's endemic flora, and 11) the use of native plants by our modern society.

⁷ Other places that have been utilized as a "living classroom" are, the NTBG's Lawa'i (Kaua'i) and Kahanu (Maui) sites, Ho'omaluhia park (Oahu), the Honolulu Zoo (Oahu), the campus of the University of Hawai'i at Manoa (Oahu), Foster Botanical Gardens (Oahu), Polynesian Cultural Center (Oahu), and the Ho'onaunau City of Refuge (Hawai'i). This is not a comprehensive list. There are many more Living Classrooms that can be found throughout Hawai'i.

DENSE VEGETATION

LIMIAHULI GARDENS
ARCHAEOLOGICAL COMPLEX
HAENA, KAUAI, PROJECT #17
30-64-05-18



DRAWN BY CHARLES W. WILSON
BIO-PHILIP MUSEUM
FIELD RESEARCH MAP

NOTE: THIS EXHIBIT IS BASED UPON A REDUCTION OF THE ORIGINAL MAP WHICH IS
40 x 75 INCHES AND IS AVAILABLE FOR INSPECTION BY CONTACTING NTBG

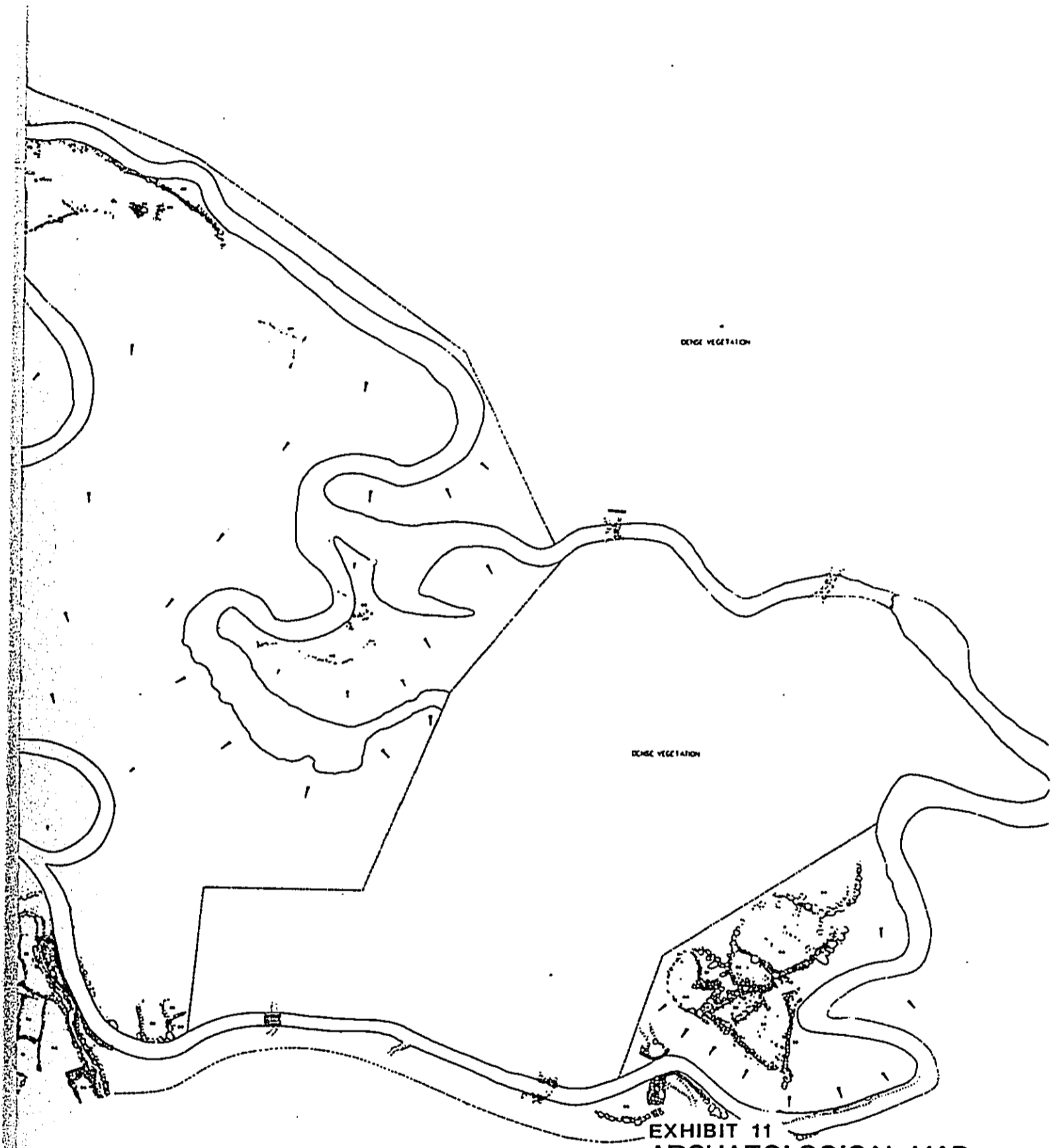
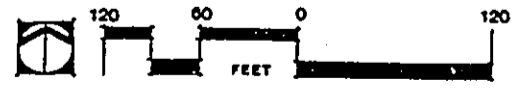


EXHIBIT 11
ARCHAEOLOGICAL MAP
LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN



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MASTER PLAN FOR LIMAHULI GARDENS

An essential aspect of the NTBG's Educational Programs is the people. The Visitors Program for this area will expose the public (on a controlled basis) to the educational opportunities available in the Limahuli Gardens. All of the Educational Programs will be implemented so as to accommodate both the guided and self-guided visitors that will come to the Gardens. To achieve this goal, rain shelters (gazebos) will be strategically placed throughout the grounds (Exhibits 14 & 19). Here visitors can rest and shelter themselves from the sun and/or rain and view educational displays that will be presented inside the shelters. Limahuli Gardens also plans to use educational labels on many of its plants which will give visitors information about the plant's scientific name, common name, origin, and possible uses.

These educational aids combined with trained docent guides and the Living Classroom of Limahuli Gardens will help visitors grasp the concepts discussed above. To a limited degree, the Living Classroom in Limahuli Gardens already has proven itself very effective with groups ranging from primary school students to *kupuna* (senior citizens), and it will continue to be the key to the following programs:

1. **The School Resource Program** is the only Educational Program currently operational. It has expanded with the help of the DOE, which has brought teachers to Limahuli Gardens to learn first-hand what educational opportunities are available to them and their students.

School groups participating in this program learn about Hawai'i's natural history, environmental awareness, the Hawaiian culture and its impact on the natural history of Hawai'i, and the severe impact of continental man and the other immigrant groups over the past 200 years. In addition to these general subjects, special topics are addressed depending upon the curriculum taught in the class before the field trip (e.g., plant propagation, asexual and sexual plant reproduction, plant pollinators, etc.). Essentially, the School Resource Program combines all of the NTBG's programs for the benefit of a particular school group and its current field of studies.

2. **The Environmental Awareness Program** is currently a part of the School Resource Program. In the future it will evolve into an independent program that specifically instructs the visitors to the Garden about the fragility of our environment. Emphasis will be placed on the Hawaiian environment, but global environmental issues also will be presented. Major assets to this program are the dense wall of alien vegetation surrounding the Garden Area, the view of the "sea" of alien vegetation along the coast, the remnant sections of native forest in the Lower Limahuli Preserve, the nearly pristine Limahuli Stream, and the many archaeological sites located within the valley. Future information gained from studying the archaeological sites will allow the NTBG to show how densely populated the valley once was and how, through their awareness of the environment, the Hawaiians were able to live for hundreds of years in a limited area without depleting or polluting their essential natural resources. A key part of this program will be educational displays in strategically placed rain shelters, and the use of trained docents knowledgeable about our environment and the ancient Hawaiian culture.
3. **The Hawaiian Cultural Awareness Program** is also currently a part of the School

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

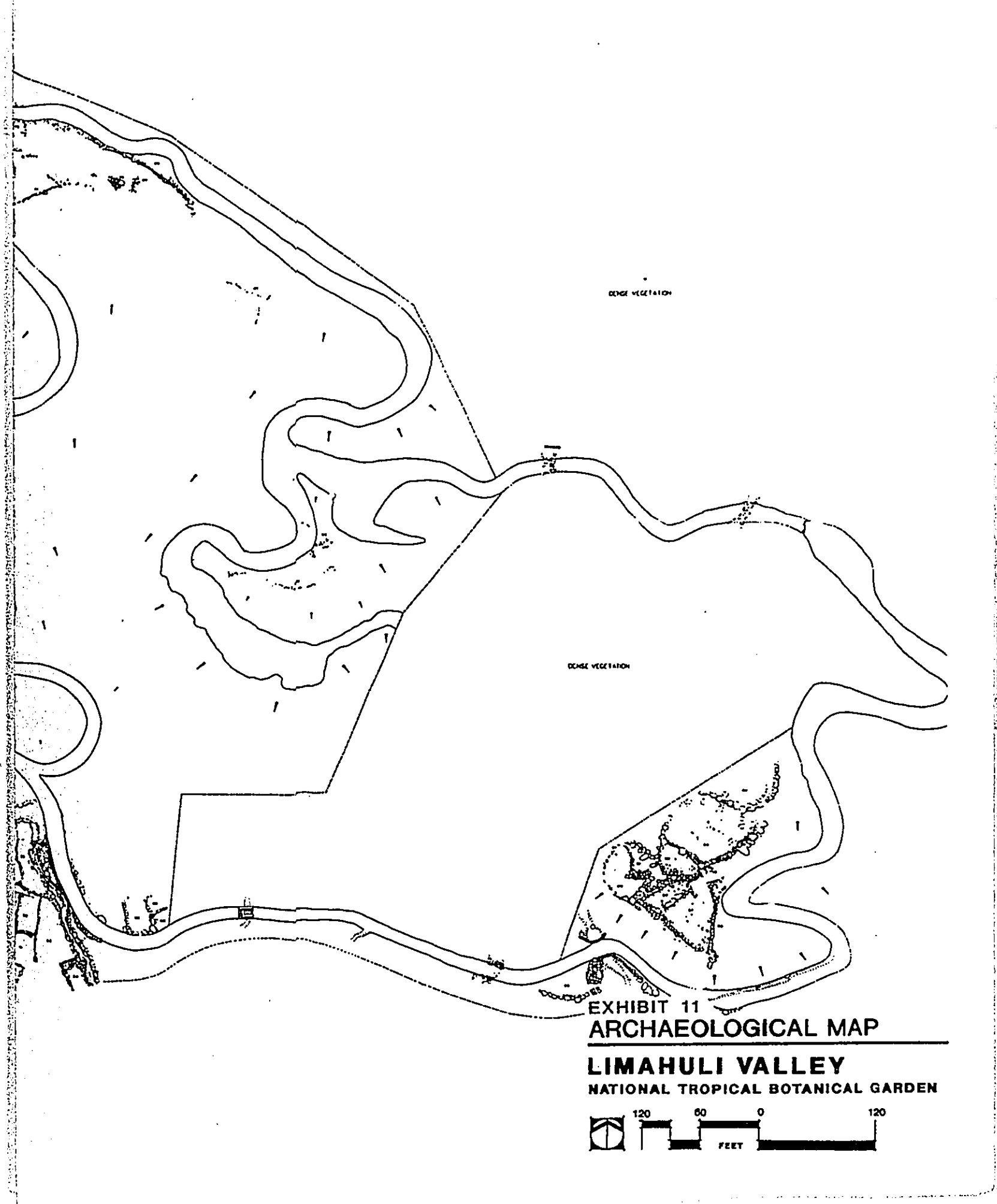
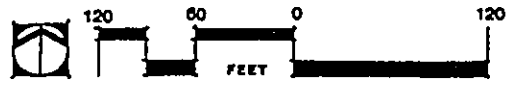


EXHIBIT 11
ARCHAEOLOGICAL MAP
LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN



MASTER PLAN FOR LIMAHLI GARDENS AND PRESERVE
EXHIBIT

CHAPTER II
MASTER PLAN FOR LIMAHULI GARDENS

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Resource Program. It also will evolve into an independent program that instructs the Gardens' visitors about the ancient Hawaiian culture that once thrived in Limahuli Valley. The archaeological features (part of site 50-30-02-1005) located on the valley floor (Exhibit 11, Appendix IV) includes a functioning *lo'i kalo* system (taro terraces) and offers an ideal spot to recreate an ancient Hawaiian *hale* (dwelling) surrounded by the plants that the Hawaiians used. This area will eventually grow into a Hawaiian ethnobotanical area shown on Exhibit 8. This program will become more refined and informative as the use of educational displays, trained docents, and the archaeological sites located within the Lower Limahuli Preserve become available to visitors.

This program will also benefit from the information gained through the future study of the other archaeological sites located in Limahuli Valley and the surrounding Ha'ena area, as proposed in Chapter V, Management Plan for Limahuli Valley Archaeological Sites (page 95). The adjacent Ha'ena State Park--which includes *Makana* mountain, the *Kauhale* of the *All'i Lohi'au*, *Ka Ulu Paoa halau*, *Ka Ulu O Laka hula halau*, *Waikanaloa* and *Waikapala'e* (the two "wet" caves), and a possible fish pond and many unstudied agricultural terraces--is also a tremendous resource for this program. The cultural history of this area is so rich and interesting that this may become one of our most popular programs.

The Native Plant Giveaway Program

The Native Plant Giveaway Program is fully operational and administered by the NTBG's Hawai'i Plant Conservation Center located at its Lawai headquarters. The goals of this program are to promote greater awareness and use of native Hawaiian and Polynesian introduced plants and to increase knowledge of the horticultural and environmental requirements of these plants. To achieve these goals, the HPCC periodically gives selected plant species away to the public free of charge. Recipients are given information on the plants' requirements (i.e., soil type, light, fertilization, pests, etc.) and later, they are sent questionnaires asking how their plants have responded to different horticultural and environmental conditions since being taken home.

Limahuli Gardens has been an active participant in the Plant of the Month Program since February 1990, by acting as a second distribution site (the main distribution site is in Lawai). The community response has been outstanding thus far, and should increase as more people become aware of this program.

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The Research Programs

The NTBG is continually working on a number of research programs directed by the research staff at the headquarters in Lawai. The research programs at Limahuli will be a coordinated part of the NTBG's research, although in some cases they may be conducted and funded by independent researchers in cooperation with the NTBG. Limahuli Gardens' programs will include, but are not limited to, the following:

1. Two horticultural research programs, that will yield valuable information for the continued expansion and maintenance of the NTBG's Living Collections, are planned for this area. They are both important to the success of the NTBG's efforts to grow native plants whose requirements are not well-known or documented.

- a. **Evaluation of native plant species.** This program seeks to evaluate existing native plant species and native plant species that will be reintroduced to Limahuli to determine their potential uses in the horticultural trade.

Candidate plants may be released to the public through the Plant of the Month Program. Many native plant species have been found to be attractive ornamentals which provide good ground cover, attractive shrubs, and handsome shade trees. Utilizing these native species in the Plant of the Month Program will increase the public's awareness and use of native plants as well as their interest in conserving and protecting our native flora.

- b. **Horticultural requirements of native plant species.** This program seeks to determine the horticultural and environmental conditions necessary and/or ideal for the growth of the native plants.

There is a current shortage of data on the requirements of many native species. This program will increase our knowledge in this area. To achieve this goal, Limahuli Gardens will use a computerized database to compile information on the native plant species grown in the Garden Area and the Lower Limahuli Preserve. Data recorded will include: light and nutritional requirements, soil pH requirements and preference, salt tolerance, wind tolerance, insect pests and successful methods of their control, and other significant factors contributing to the health of native plants. Eventually, this data can be used to publish a manual concerning the horticultural requirements of native plant species.

An additional part of this program will be the inclusion and analysis of data obtained from the surveys sent out to Plant of the Month recipients. These periodic surveys request information on how well that particular species is doing and the conditions under which it is being grown. This information will then supplement the NTBG's own research on the horticultural and environmental requirements of that particular species.

2. An archaeological research program that will seek to determine and document the ages and uses of selected archaeological features that are part of site 50-30-02-1005 located in the Garden Area (Exhibit 11). Information gained from this program will be very useful in the public interpretation of these features, educational and planting programs, and in locating future physical facilities (i.e., visitors center, office, etc.).

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The Visitors Program

This program is essential for the fulfillment of many of the points set forth as the Foundations of this Master Plan (Chapter I), yet it presents a special challenge to the NTBG. Public use of a sensitive area like Limahuli Valley presents a potential conflict between high visitation and the fragile surrounding environment. The challenge is for the NTBG to develop a creative, site-specific program that effectively controls visitor impacts, while enhancing visitor enjoyment and education.

The NTBG believes that the following program meets this challenge and will allow the public, on a controlled basis, access to the educational, instructional, and recreational opportunities available in Limahuli Gardens.

After approval of the NTBG's Conservation District Use Application (CDUA) for Limahuli Valley (see Chapter VII), visitors will be able to make reservations for a self-guided tour. Reservations will be scheduled to separate tour groups so that they will not impact upon each other. This scheduling will give visitors time to spread out over the grounds and not interfere with one another. Visitors will drive in and park on one of the two parking terraces and then report to the visitors center (Exhibit 18). Until funding for a full-scale visitors center is available, a small temporary structure could be built to house the receptionist and/or Visitors Program Coordinator. At the center, visitors will pay their admission fee and obtain information about the Gardens, including where they are allowed to go and when they should return. They will be given a map of the grounds and a guide book to direct them through the grounds and inform them about the Gardens' plants, programs and future improvements. [The NTBG anticipates that visitors on self-guided tours will have trouble conforming to a set schedule (i.e., what time to return by) and will probably need to adjust the reservations schedule to allow for slow-moving visitors. Undoubtedly, several months of actual operations will be required to work all the bugs out of this aspect of the program.]

Once a core of trained docents (guides) are available to take visitors around, guided tours will be scheduled and become the primary method for visitors to tour the grounds. Self-guided tours will still be offered if there is a continued demand by garden visitors. Many repeat visitors and local residents may prefer self-guided tours after their initial exposure to Limahuli through a docent-guided tour.

The NTBG can draw upon its many years of experience with the Lawai garden's Visitors Program to operate Limahuli's program in an efficient and controlled manner. The plan to have trained volunteer docents available to guide tours, as has been possible at Lawai, depends upon volunteers coming forth from the community. The North Shore has a large pool of potential volunteers, but their actual volunteering will depend on Limahuli's Visitors Program making their training and work experience interesting and personally fulfilling.

As soon as it is feasible, a four-wheel drive vehicle will be obtained for visitors who are physically unable to walk the grounds. Many individuals with a strong and sincere interest in the Gardens are unable to walk its steep terrain because of their age or health, and will require a vehicle tour to experience the educational opportunities available at this site. The use of this vehicle should be limited during very wet conditions to prevent damage to the Gardens dirt and gravel roads, and even under dry conditions this vehicle must stay only on the designated vehical roads. Once the roads are cemented, this vehicle will be able to provide all-weather access to the grounds for physically challenged individuals.

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School groups and other educational groups will be allowed to tour the Gardens free of charge and several of the limitations can be waived to accommodate these groups, depending upon their size and nature.

Another important aspect of the Limahuli Gardens Visitors Program is its **Community Day**. At least once a month Limahuli Gardens will be open free of charge to residents of Kaua'i. They still will have to make reservations and follow the normal tour rules and regulations, but they will not have to pay an admission fee. This will encourage the community to utilize the NTBG's facilities, to learn more about its organization, its programs, and policies for Limahuli Valley. This aspect of the program is important since the NTBG wishes to attract volunteers from the community to help in the operation of the Gardens and its programs. We want the community to feel welcome to participate in our programs and development, and not feel alienated because of the entrance fee. Depending upon the community response, Community Day can be held as often as is deemed appropriate by the NTBG.

In the past members of the NTBG have been allowed to be married in Limahuli Gardens. After approval of this Master Plan by the DLNR, this privilege can be extended to the Gardens' visitors, with the understanding that they must continue to abide by all of the limitations listed below.

Limitations

The following limitations are recommended as measures to effectively control visitor impacts. They are untested and the NTBG must remain flexible and willing to change some aspects of them should the situation warrant it.

It should also be noted that these limitations have been used to calculate the impact that this program will have on the environment, adjacent property owners, the economy, and the society of Kaua'i.

1. A daily limit of 120 visitors is suggested for Limahuli Gardens.
2. No more than 30 visitors should be in the Garden Area at one time. Exceptions will be allowed for school groups.
3. All visitors should make advance reservations to visit the Gardens.
4. A minimum entrance fee should be established. Exceptions will be allowed for school groups.
5. Visitation hours should remain flexible, but should not exceed 8 hours a day, five days a week.
6. Guided tour groups should be limited to 10-15 visitors or less, per group. Exceptions will be allowed for school groups.
7. All visitors will be restricted to designated roads or trails while in the Garden Area.
8. Parking for garden visitors must be provided on the NTBG's property.
9. All ingress and egress roads off of Kuhio Highway must be designed and maintained to prevent traffic congestion at the entrance of Limahuli Gardens.

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PHYSICAL FACILITIES

The Garden Area will be the most improved and utilized section of Limahuli Valley. The following is a list of physical facilities for which an actual or potential need is envisioned. For the purpose of this Master Plan, the term "physical facilities" includes: All buildings or structures, utility transmission systems, wastewater systems, irrigation and potable water systems, roads, drainage systems, and parking areas. These facilities will enhance the efficient operation and maintenance of Limahuli Gardens and Preserve.

Basic Infrastructure

This is a very broad-based improvement that will affect the utilities, roads, and wastewater disposal systems used in this area. It is the basis for the development of a botanical garden in this area. The components of this improvement are listed below:

1. An improved entrance/exit off of Kuhio Highway that will utilize the existing private access road and allow all garden traffic to be contained on the NTBG's property (Exhibit 12). The design of this facility should be coordinated with that of the adjacent Ha'ena State Park.
2. An underground utility transmission system that will service the visitors center, office, the tool house/nursery complex, and a live-in caretaker's cottage (Exhibit 13).
3. County water meters that will supply potable water to the visitors center, office, toolhouse/nursery complex, and the caretaker's cottage (Exhibit 13). The County water system will be completely independent of the NTBG's existing irrigation systems (Exhibit 14). Water from the County water system will not be used for irrigation purposes.
4. Wastewater disposal systems that meet the requirements of the Department of Health (Chapter 11-62, Wastewater Systems). These wastewater systems will service the visitors center, office, toolhouse/nursery complex, and caretaker's cottage. (Detailed plans specifying the type and locations of these systems will be completed in the future by a certified sanitary/environmental engineer.)
5. Paving the entire system of roads with concrete (Exhibit 14). Although this is a very expensive proposal, it can be done in sections. Improved in this way, the roads will prevent soil erosion and help to channel run-off from heavy rains.
6. Improvement of the existing rain water drainage systems. These improvements will consist of concrete gutters, culverts, waterbars, and swales intimately tied into the system of concrete roads that allow run-off from heavy rains to follow its natural course of flow down to Limahuli Stream without causing severe soil erosion. (The USDA Soil Conservation Service has been asked to assist in the design of this system.)

Infrastructure Associated with the Administration of the Garden Area and Preserve

This will consist of an office building from which all operations in the Gardens and preserve can be administered. This facility will also include electrical, telephone, and County water utilities, as well as a toilet facility, and a parking area for the administrative staff (Exhibits 14 & 15; estimated size 900 sq.ft.).

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Infrastructure Associated with the Maintenance of the Garden Area

This improvement will greatly enhance the NTB's maintenance operations in this area. There are three basic aspects to this improvement:

1. A toolhouse/maintenance complex that will combine areas for tool and equipment storage, propagation activities, an adjacent outdoor nursery, staff restroom, and a large room for educational lectures and staff meetings. This facility will also include parking for maintenance staff (Exhibits 14 & 16; estimated to include 1,200 sq.ft. of covered area).
2. A 256 square foot toolhouse facility located on the upper grounds that will provide the staff working in that area with toilet, tool storage facilities, and parking. This facility was approved by DLNR in 1989 (CDUA KA-2277, Exhibits 14 & 17).
3. Improvements to the existing irrigation systems, including an 144 square foot wooden enclosure for the water tank located on the upper grounds.

Infrastructure Associated with the Visitors Program

The following facilities will greatly enhance its operation and value to the visitors:

1. A visitors center with a reception area, and restrooms. This facility will include electrical, telephone, and County water utilities, and enable the NTB to run their Visitors Programs as described above (Exhibits 13 & 18; estimated size 1,000 sq.ft.).
2. A parking area for visitors center staff and garden visitors (Exhibits 14 & 17). Two terraces adjacent to the visitors center will provide ample on-site parking.
3. Rain shelters (gazebos) strategically placed throughout the grounds where visitors can rest, relax, shelter themselves from the sun and/or rain, and inside which educational displays can be presented (Exhibits 14 and 19; estimated size 350 sq.ft.).
4. A replica of an ancient Hawaiian *hale* made out of traditional materials. Most likely this display will be located in the ethnobotanical area, and will be a valuable educational resource.
5. The purchase of a four-wheel drive vehicle or vehicles to be used for special tours. These will allow handicapped people, the elderly, and those unable to walk around the Gardens access to the grounds.

Infrastructure Associated with the Security of the Garden Area and Preserve

This improvement includes two facilities:

1. The replacement of the existing boundary fence, and the construction of gates at the entrance to the Gardens off of Kuhio Highway. Both of these will be tastefully designed to enhance the appearance of the Gardens.
2. A small 2-bedroom cottage and parking area for a live-in caretaker providing 24 hour-a-day security for the grounds. This facility will also include electrical, telephone, gas, and County water utilities (Exhibit 20; estimated size 1,500 sq.ft.).

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THE INCREMENTAL USE AND IMPROVEMENT OF LIMAHULI GARDENS

The arrangement of the programs and construction of the future physical facilities into the following phases has been prepared to provide a series of goals that NTBG can use in its effort to raise the needed capital. When these phases are actually implemented they may be different from what is outlined below, depending upon Limahuli Gardens' greatest need at the time the money becomes available.

Phase One. Limahuli Gardens' highest priority is implementing its programs. Initially, most of the programs won't require any major capital improvements, but will be supported by an increase in the Limahuli Gardens' fiscal budget.

This phase will thus fund an expansion of the Gardens' staff to at least five full-time grounds maintenance employees, a horticulturist, and an administrative head. With the increased staff, the horticulturist and administrative head for Limahuli Gardens will be able to oversee the implementation of all of the programs for this area except the visitors program and the archaeological research program. Although it is envisioned that volunteers will help conduct many of these programs, additional employees will eventually be needed to oversee the educational programs.

This phase will also fund the commencement of the archaeological research program (page 39) for this area. This program will initially focus on subsurface testing that seeks to identify the ages and uses of the archaeological features located near Limahuli Gardens' future physical facilities (i.e., visitors center, office, etc.).

Phase Two will make the implementation of Limahuli Gardens' Visitors Program possible by funding the infrastructure and staff associated with the Visitors Program. The Visitors Program is one of the most important programs for the Gardens, since it will fulfill many of the NTBG's Master Plan Objectives.

An important part of this Phase is the visitors center. A temporary low-cost alternative to the permanent visitors center would be a gazebo. This could be used until funds can be raised to construct the permanent visitors center, at which time the gazebo could be moved and used as a rain shelter on the grounds. This option will allow the Visitors Program to become functional as rapidly as possible.

Phase Three of the improvements to Limahuli Gardens will see the continued support of the Visitors Program and general Gardens' operations by funding the basic infrastructure within the Garden Area. This infrastructure is necessary for the Visitors Program, administration, and maintenance of the Gardens. If at all possible, this phase should be combined with Phase Two so that the Visitors Program will have the use of electrical, telephone, and toilet facilities from its inception.

Phase Four of the improvements to Limahuli Gardens will see the funding of the administrative office building. This improvement will enhance the efficient administration of the Gardens.

Phase Five of the improvements to Limahuli Gardens would see the funding of the maintenance-toolhouse complex. This improvement will allow the Gardens to be run much more efficiently by providing a facility for the repair of machines, storage, parking, a staff toilet, a nursery area, etc.

The upper grounds toolhouse and staff toilet (Exhibit 17) have already been approved and are currently under construction.

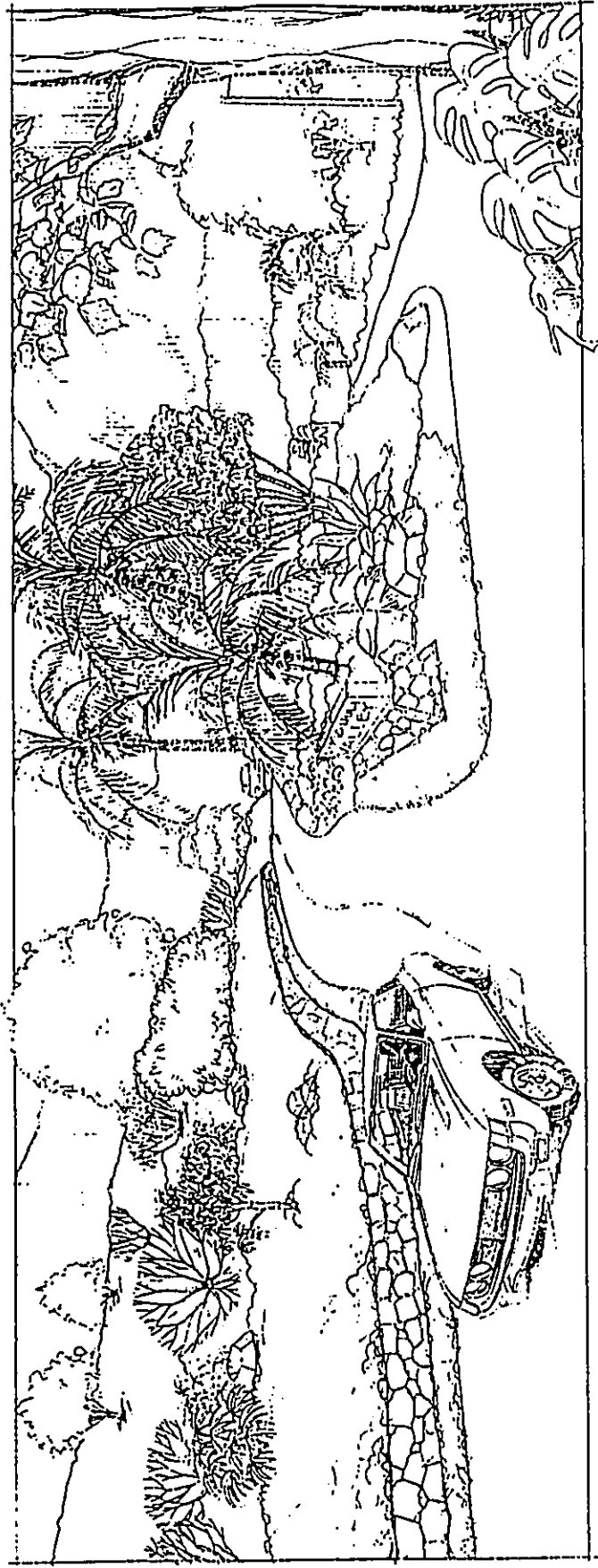


EXHIBIT 12
ENTRY FEATURE
LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN

MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

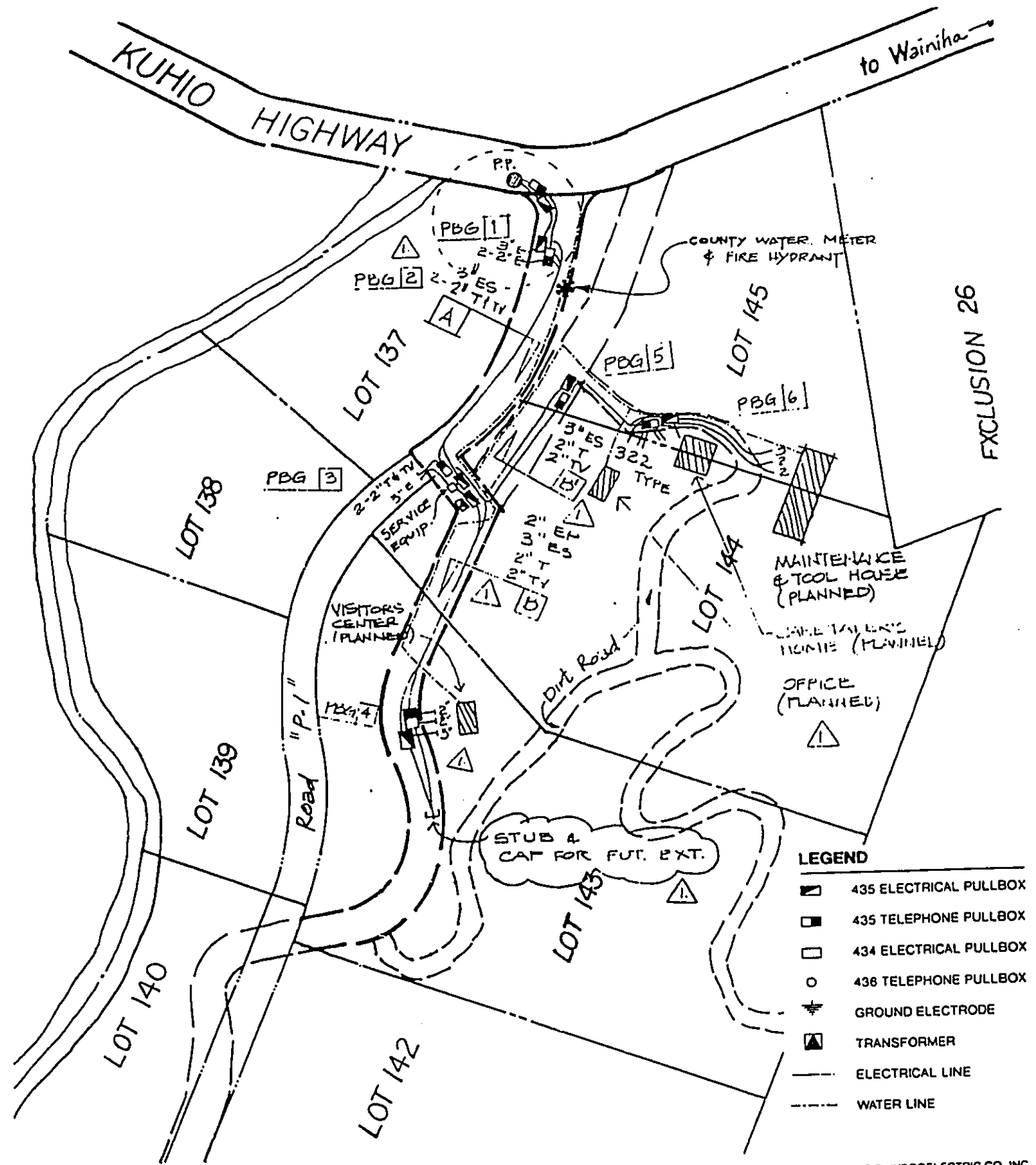
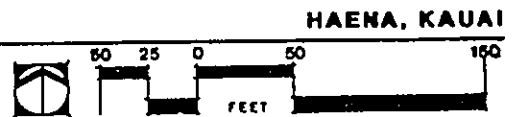


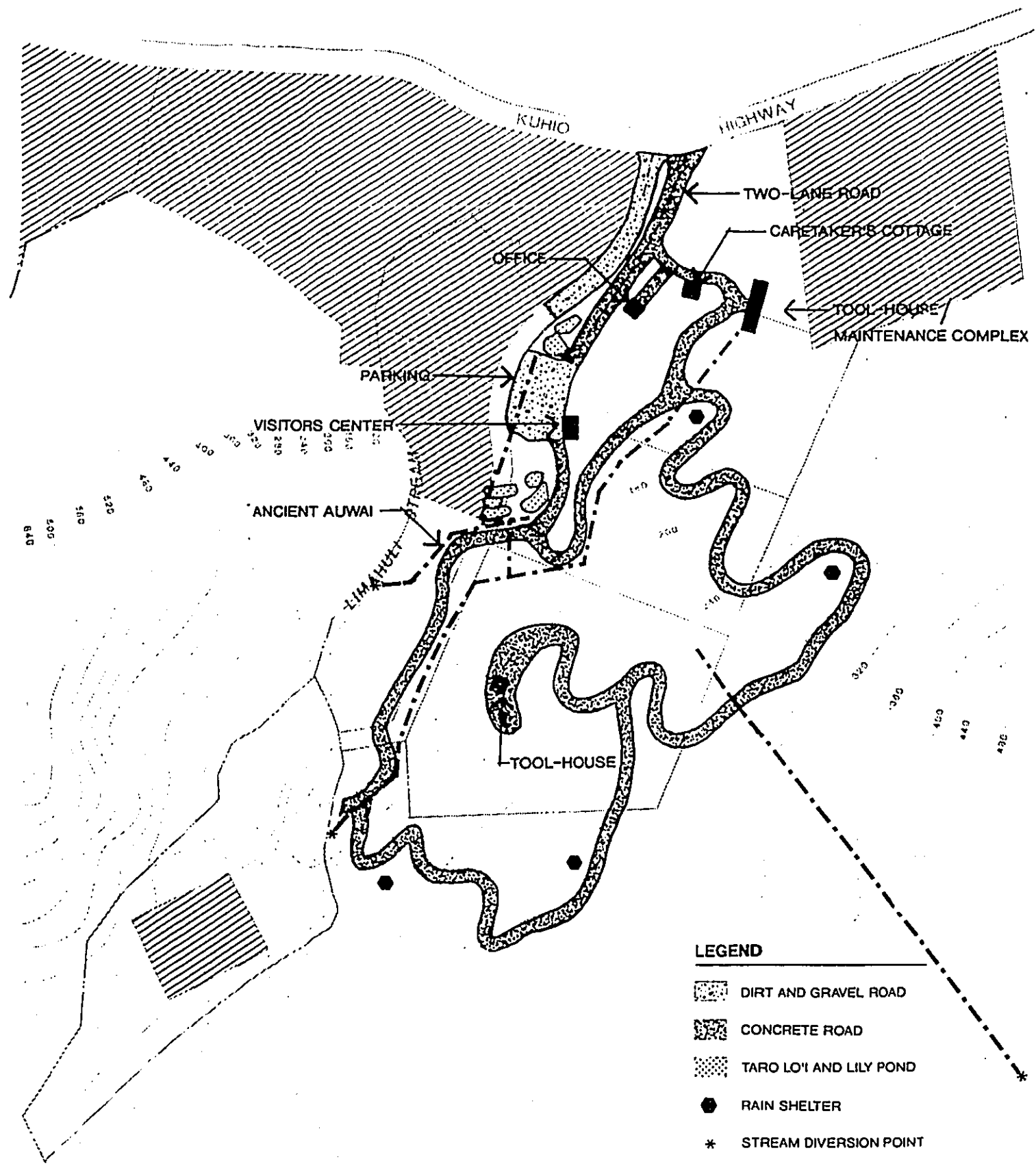
EXHIBIT 13
PROPOSED UTILITIES

LIMAHULI VALLEY
 NATIONAL TROPICAL BOTANICAL GARDEN

SOURCE: ELECTRIC & TELEPHONE FACILITIES, PACIFIC HYDROELECTRIC CO. INC.,
 JAN. 5, 1989



MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT



**EXHIBIT 14
PROPOSED INFRASTRUCTURE**

**LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN**

HAENA, KAUAI



MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

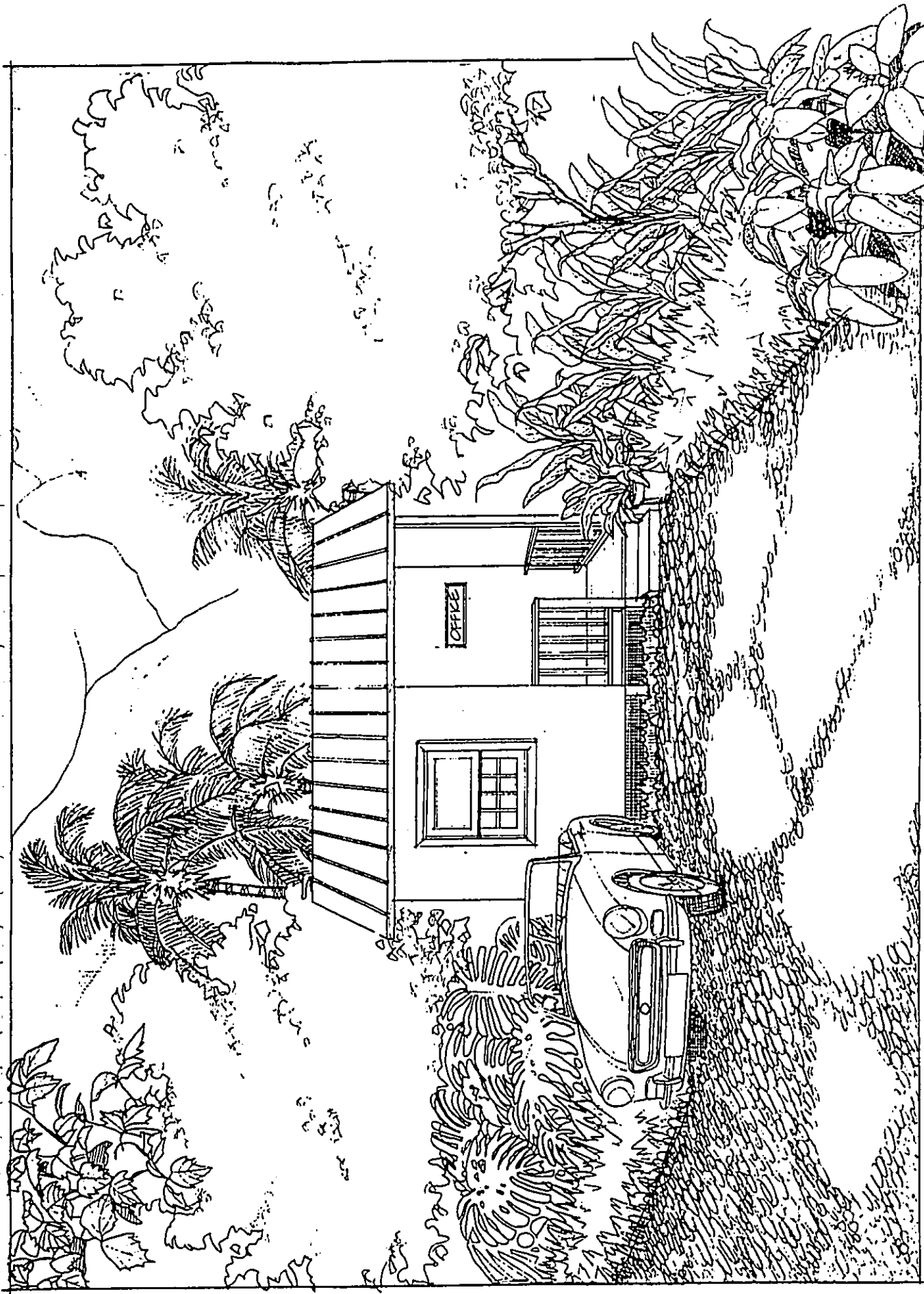


EXHIBIT 15
OFFICE
LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN

MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

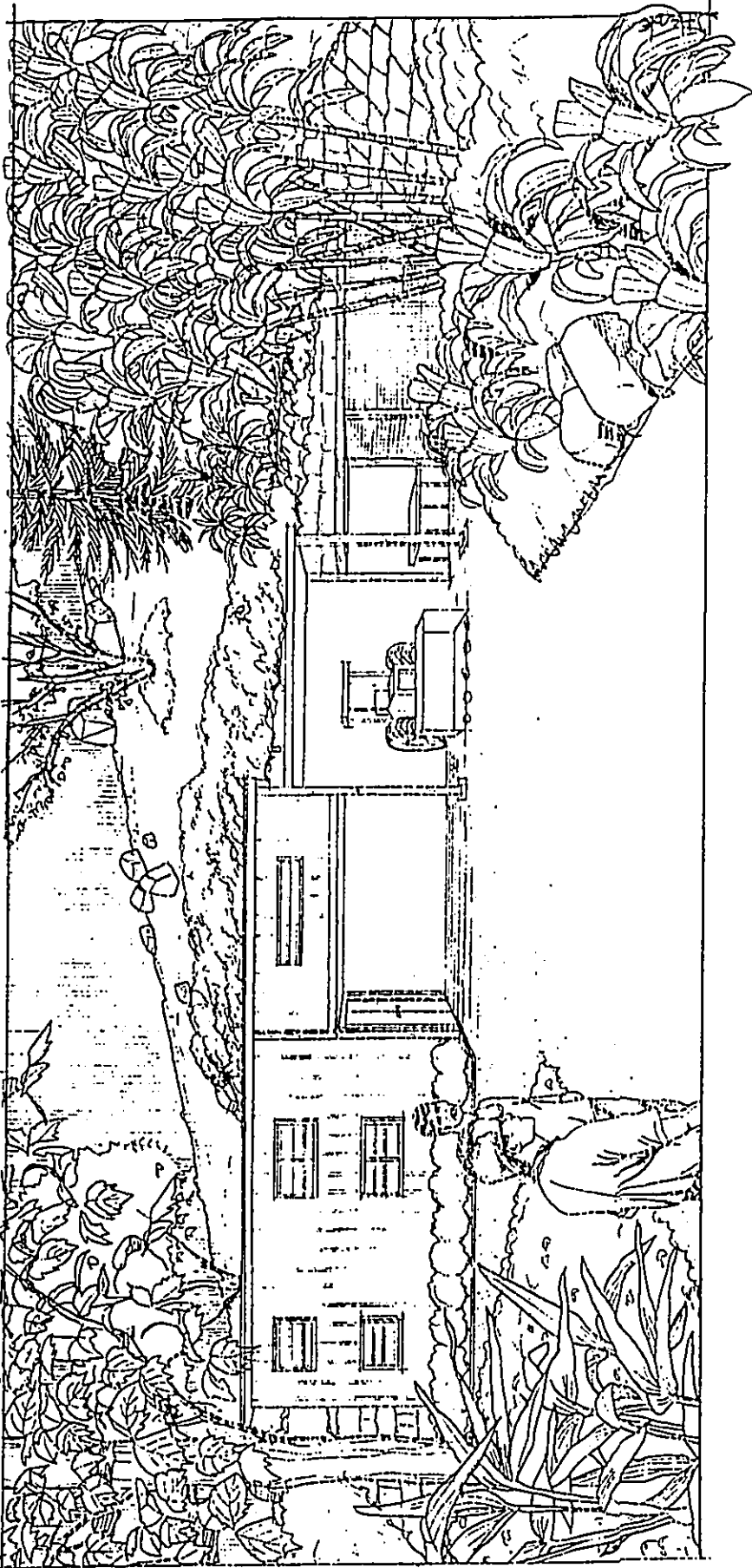


EXHIBIT 16
MAINTENANCE BUILDING
LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN

MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

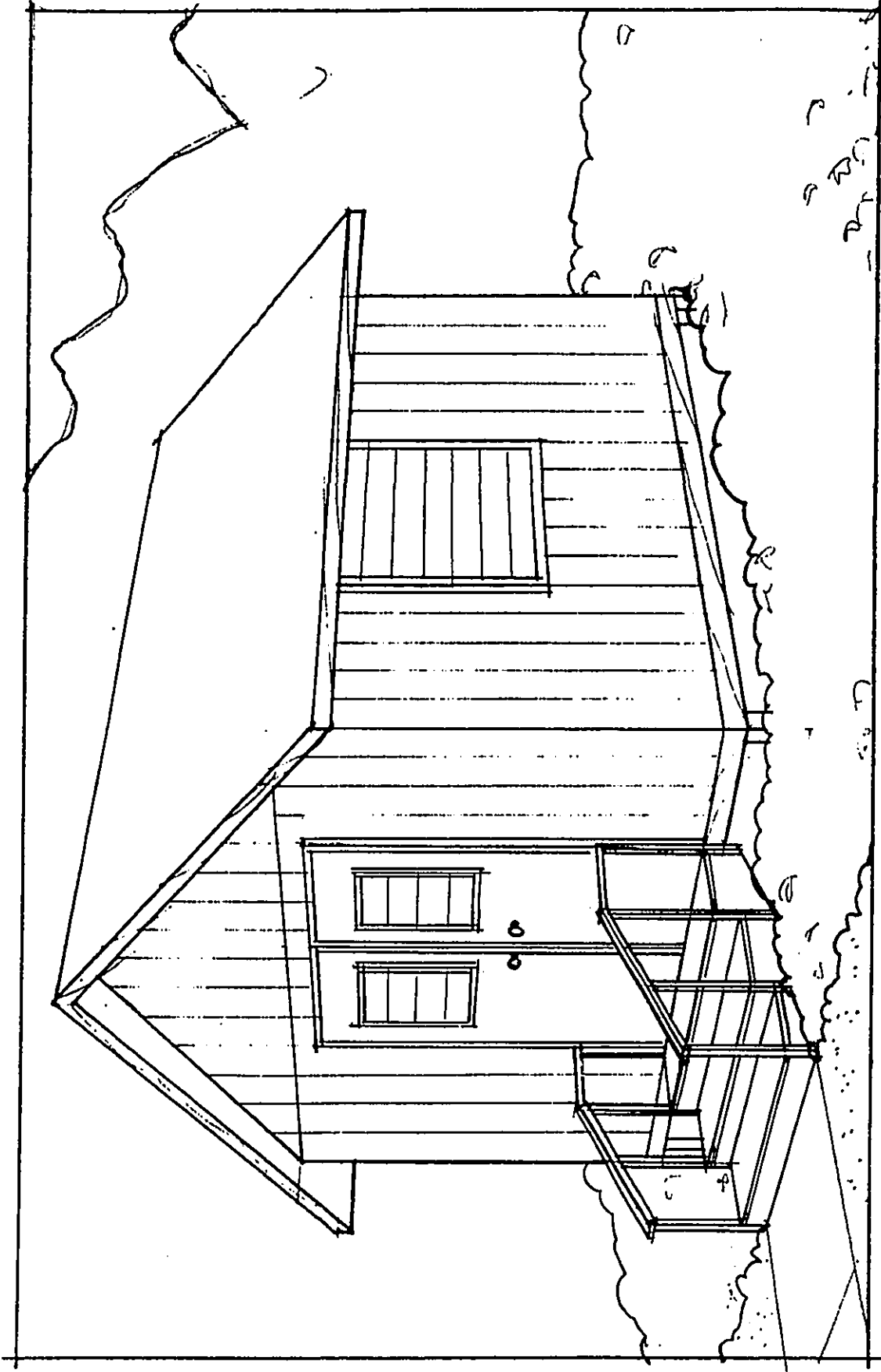
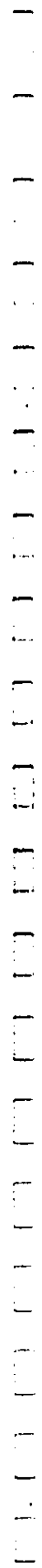


EXHIBIT 17
TOOL HOUSE
LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN

MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT



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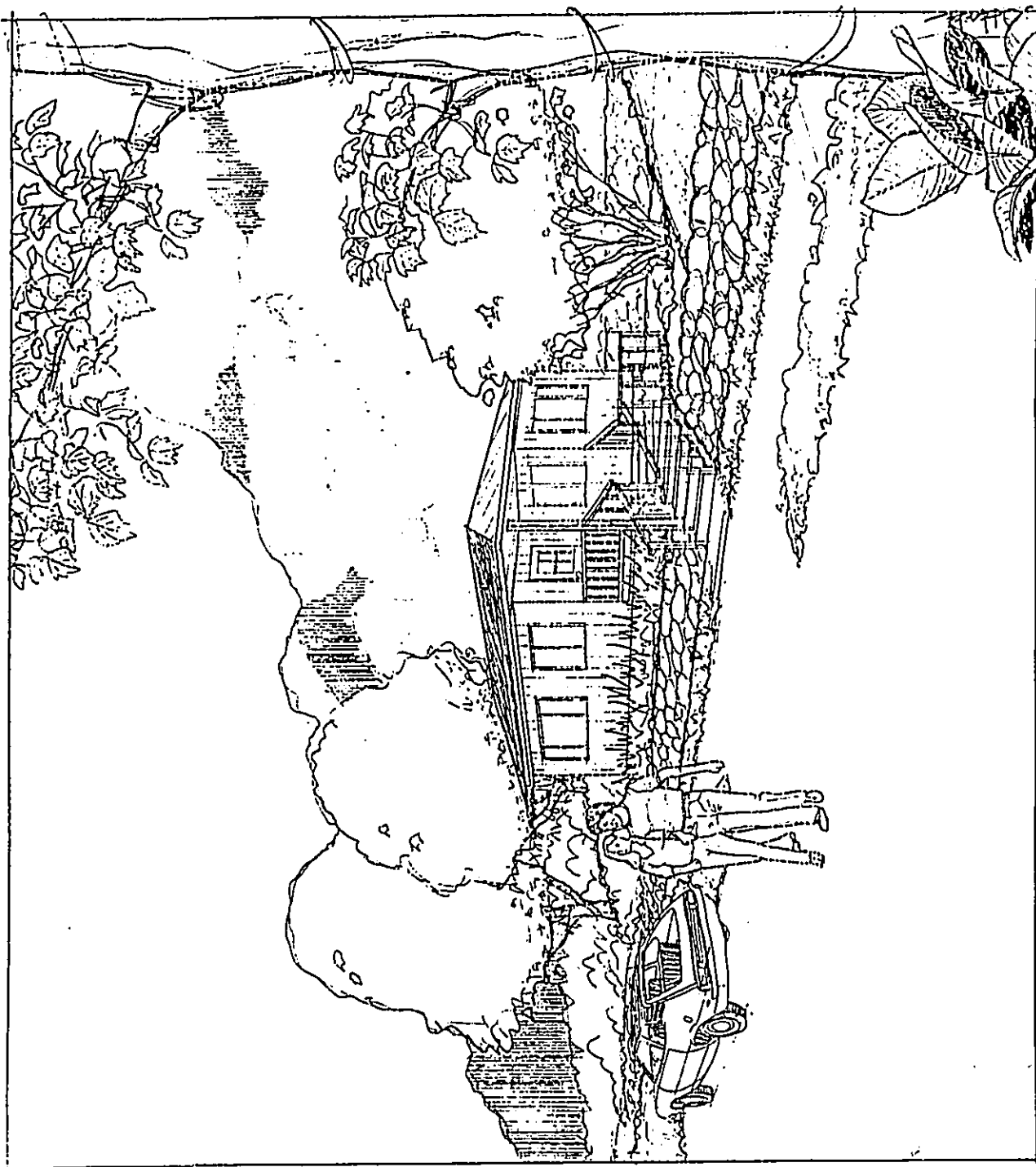


EXHIBIT 18
VISITOR CENTER
LIMAHULI VALLEY
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MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

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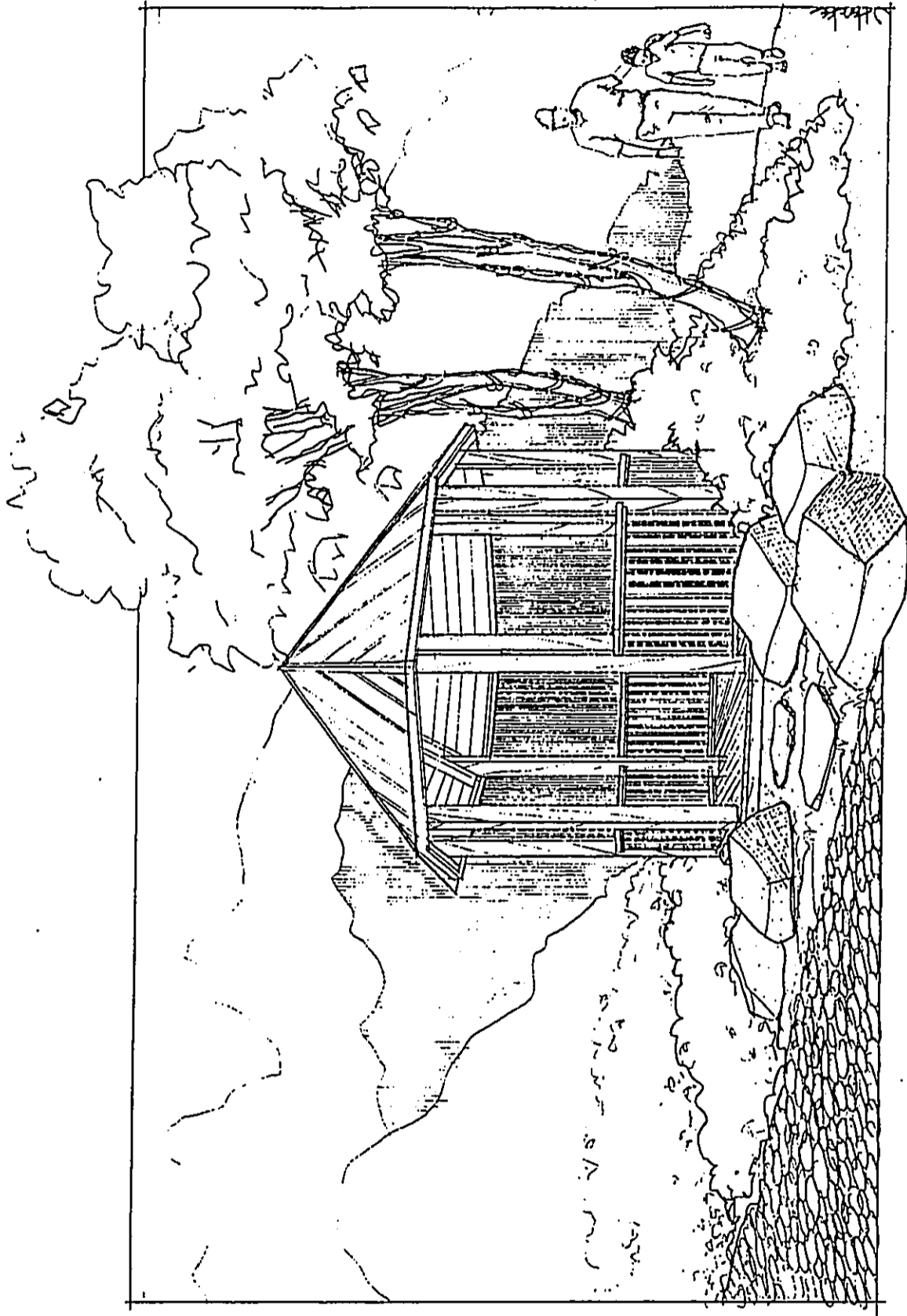


EXHIBIT 19
RAIN SHELTER
LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN

MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

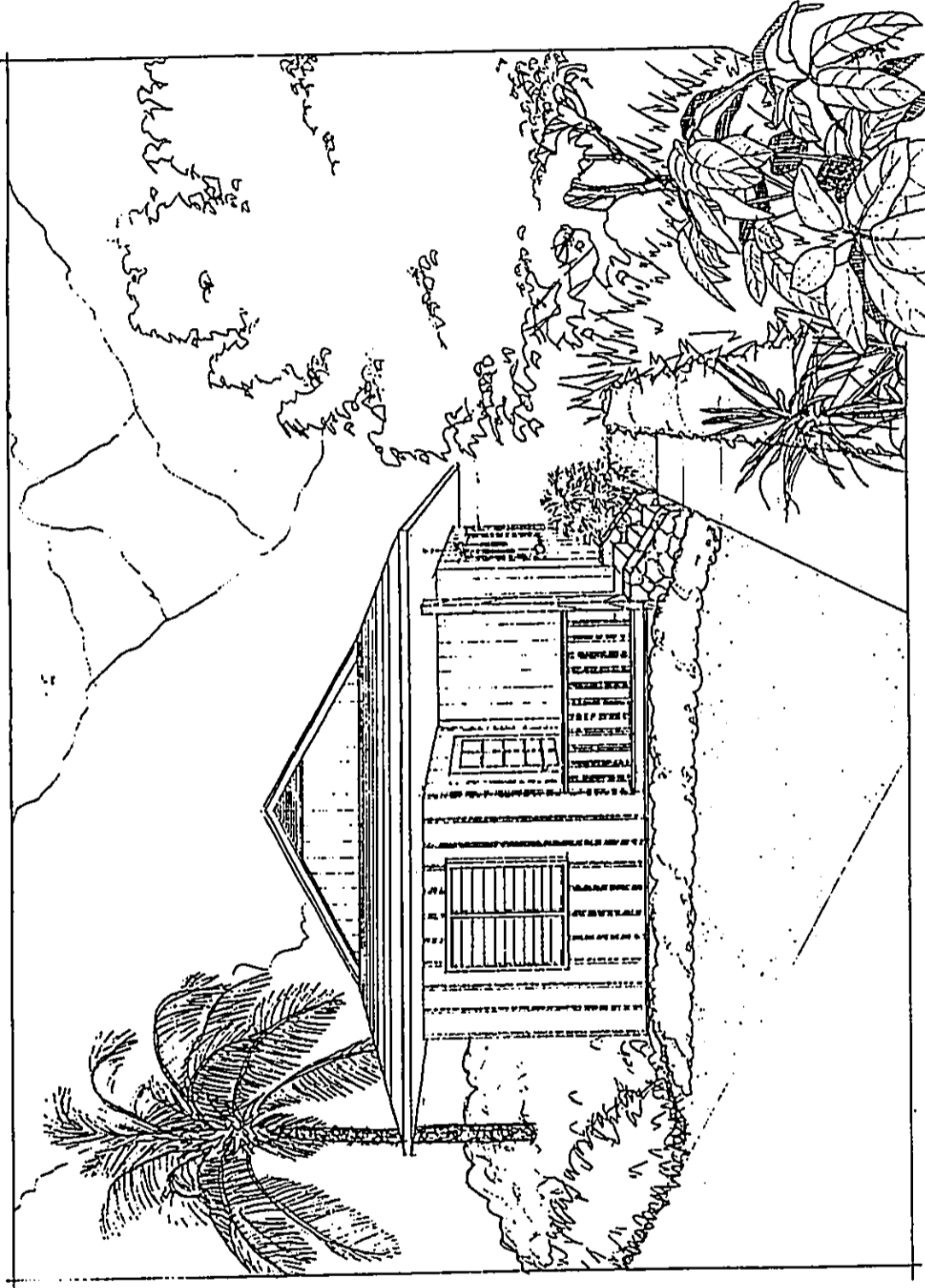


EXHIBIT 20
CARETAKER'S HOUSE
LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN

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Phase Six will see the funding of the infrastructure associated with the security of the Gardens and Preserve. This will add to the security of the Gardens and Preserve by replacing the existing (very rusty) fence, adding an entrance gate instead of a chain, and building a live-in caretaker's home.

It should be noted that the NTBG views the construction of a live-in caretaker's home as an option that may not prove necessary. Only if the future situation indicates an increased need for security will this option be exercised.

ENVIRONMENTAL ASSESSMENT OF THE POTENTIAL IMPACTS AND MITIGATIVE MEASURES ASSOCIATED WITH THE IMPLEMENTATION OF THIS MASTER PLAN IN LIMAHULI GARDENS

The commencement of the NTBG's programs and the construction of the physical facilities (improvements) in the Garden Area will allow the Limahuli Valley to reach its potential as an educational resource and native plant refuge.

The implementation of the programs and improvements will result in three general classes of action: Habitat Improvement; Construction of Physical Facilities; and Public Use of the Area.

The following sections will describe all of the potential impacts associated with these three general classes of action in Limahuli Gardens. Following each impact will be a short discussion on how they can be avoided if so desired, and/or how they can be mitigated if they cannot be avoided.

Habitat Improvement

The improvement of the habitat in the Garden Area, will follow the Management Guidelines for Limahuli Gardens and could result in the following impacts:

1. **The removal of the existing alien vegetation.** This is a positive impact that will allow the area to be used as a botanical garden.
2. **A reduced amount of alien allelopathic vegetation.** This is another positive impact that will result from the Habitat Improvement Program for this area. Many of the aggressive alien trees are allelopathic (e.g., they suppress the growth of other plant species by releasing of toxic substances) and thus well adapted to crowding out native species. The *Waiawi*, or yellow strawberry guava, has been suspected of producing such toxic agents. This may be the reason large groves of these trees can be found with virtually nothing else growing among them. Such trees are literally poisoning our native species, and their removal will definitely have a very positive impact on the habitat (Smith 1989).
3. **A reduction in the number of feral chickens.** This positive impact will also result from the Habitat Improvement Program for this area. Because these wild chickens are not native to Hawai'i, they are placing additional pressures on the native flora and fauna. Their foraging habits primarily include disturbing the top organic layer of the soil looking for insects and seeds. Damage to native plants in the Garden Area has been noticed as a result of their pecking at insects on the plants' stems. Undoubtedly, these animals consume viable seeds--some of which are native species that could otherwise grow. On several occasions they have disturbed new plantings with their foraging habits. The control of the wild fowl with a humane trapping program will have a very positive impact on the environment in this area.

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4. **Increased stabilization of the archaeological sites.** This is an entirely positive impact that is a direct result of the Habitat Improvement Program for this area and the Archaeological Preservation Program. Currently, several significant archaeological features are located in the section of the Garden Area that is still partially covered by alien vegetation. These features were identified as numbers 57 to 64 by the archaeologists from Bishop Museum who performed a surface survey and mapping of the archaeological sites in this area (Patolo and Cleghorn 1990). They (the archaeologists) have recommended that the removal of the alien vegetation currently growing on, over, and in these archaeological sites will help to stabilize them and prevent further disturbance (A. Sinoto pers. comm.). Any negative impact that could result from the removal of the alien vegetation will be avoided by having the alien vegetation removed by hand. This process will include, when necessary, the use of ropes to lower limbs as they are removed from large alien trees.
5. **An increased scenic value.** This positive impact will also be a direct result of the Habitat Improvement Program for this area. Over the past 14 years, the NTBG has found that the most common statement made by people who see Limahuli Gardens is, "It's so beautiful, I can't believe it. The views are incredible" (Limahuli Gardens staff pers. comm.). Clearly, the future removal of the alien vegetation from the rest of the Garden Area, and the scenic view planes that will be opened up as a result, will have a significantly positive impact on the scenic value of Limahuli Valley.
6. **Soil erosion.** Removal of the existing alien vegetation could cause soil erosion. Because most of the affected area is sloping, the potential of this negative impact is increased and could have the following effects:
 - a. A denuded slope could suffer from gully and sheet erosion. Gully erosion could make the area difficult or impossible to maintain as future lawns. Sheet erosion could result in the loss of top soil. Soil surveys (Exhibit 10) indicate that most of the nutrient capabilities are located in this important soil horizon, and that the loss of this layer could have detrimental effects on all replacement vegetation.
 - b. Eroded soil could wash down into the stream and adversely effect the balance of the aquatic ecosystem.

In order to avoid these potential negative impacts, the NTBG's staff will establish a ground cover of grass immediately after clearing an area. Grass "plugs" will be used to quickly establish lawns. If necessary, a steep slope could be planted with grass using the "hydro-mulching" technology. A grass plug consists of pre-established grass plants, usually grown in small 2" containers, that are planted in an area to quickly establish a lawn. Hydro-mulching is where grass seeds or cuttings are sprayed from a special machine over an area to quickly establish grass ground cover. Meticulous management of Limahuli Gardens in the past has indicated that slopes of the type located in the affected area can be cleared and grassed without suffering soil erosion. During the past 12 months, (6/89 -6/90) Limahuli Valley has been subjected to numerous torrential rainstorms. The effectiveness of grass as a ground cover was made apparent when large amounts of topsoil were deposited in several places on the lawns from forested areas above the Gardens. No soil erosion was noticed within the Garden Area except on the existing dirt and gravel roads (Limahuli Gardens staff pers. comm.).

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7. **Translocated herbicide.** Translocated herbicides are those herbicides that are absorbed into a plant's vascular system and translocated throughout the plant, literally killing it from the inside out. Depending upon the formulation and active ingredients contained in the herbicide, it has the potential to severely damage or kill plants to which it is accidentally applied. It also has the potential to adversely effect beneficial soil organisms and, in severe cases, act as a soil sterilant. In order to avoid an adverse impact from the use of translocated herbicides, they will be brushed on freshly cut stumps. This method will prevent them from contacting the soil and/or adjacent plant species. Applied in this manner translocated herbicides will not adversely effect beneficial soil organisms, adjacent plants, or be washed into Limahuli Stream.
8. **Heavy equipment.** Use of heavy equipment to remove alien vegetation could irreversibly compact and change the structure of the soil, as well as damage remnant native plant species. In order to avoid this potential impact, the NTBG will not use any heavy equipment to remove alien vegetation. All vegetation removal will be done by hand, thus eliminating the impact of heavy equipment on the soil structure and accidental damage to remnant native vegetation.
9. **Accidental injury to native vegetation.** Remnant native plant species could suffer accidental injury in two general ways:
 - a. As the surrounding alien trees are cut down, they could injure adjacent native plant species. In order to avoid this potential impact, the NTBG will use ropes, when necessary, to pull or lower limbs as they are cut from large alien trees so that they won't damage native species as they fall.
 - b. As the alien canopy is removed, native plant species growing in the understory could be exposed to high levels of sunlight. In order to avoid this potential impact, some alien vegetation will be left immediately surrounding the native species and later removed when the natives plants have adjusted to the higher light levels.

By instituting these practices, the accidental injury to native species can be almost completely avoided and should not pose a significant negative impact.

10. **Displaced organisms.** Birds, insects, and other organisms will be displaced from their homes. Although this impact cannot be avoided, it will be mitigated by clearing only small amounts of alien vegetation at any one time. Thus, this action is not expected to have a significant negative impact since the birds, insects, and other organisms that will be displaced by the removal of the alien vegetation will not have to go far to relocate in a similar habitat.
11. **Limahuli Stream.** The NTBG recognizes that the improvement of the existing habitat could affect the present pristine condition of Limahuli Stream. Potential impacts that could result are:
 - a. Soil erosion resulting from the removal of the alien vegetation could adversely affect the aquatic environment of Limahuli Stream. This anticipated impact and its associated mitigative measures have been discussed above.
 - b. The removal of alien riparian (stream side) vegetation could result in elevated water temperatures, excessive evaporation, and ultimately decreased water flow. In order to avoid this impact and thus safeguard the existing pristine

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nature of Limahuli Stream, alien riparian vegetation will only be removed when necessary. When the removal of riparian vegetation is required, the impact on the stream will be mitigated by removing only small sections of riparian vegetation at one time and immediately establishing the desired replacement native vegetation. By removing alien riparian vegetation and replacing it with native plant species in this manner, the canopy, which is crucial for the continued balanced state of the stream, will be replaced without significant impact to the stream.

An additional mitigative measure that will be employed by the NTBG is that the Limahuli Stream will be periodically monitored by aquatic biologists so that the NTBG can determine the effects, if any, of its actions, or the actions of others, on the quality of the stream. As a result of these studies, the NTBG will implement further mitigative measures to maintain the quality of the Limahuli Stream.

12. **Noise.** The increased use of maintenance vehicles, chainsaws, and maintenance equipment will generate an increase in noise. This impact cannot be avoided although it can be mitigated. This impact will be mitigated naturally by the location of the area targeted for an improved habitat and by the normal wind direction and speed.

The expansion of the Garden Area will occur primarily on Lots 140, 142 and 152 (compare Exhibits 3,4 & 5). The parts of these lots (140, 142 and 152) that will be improved are south (down wind; see discussion on Air Quality below), and substantially separated from Lots 137-139 and Exclusion 26. The distance and normal wind direction will act to buffer (mitigate) the increased noise level. As mentioned earlier, Exclusion 27 is buffered by Lot 141 from the increased noise level.

Thus, because of the location of the targeted area and the normal wind direction, the increased noise levels associated with the improvement of the habitat in the Garden Area should not significantly impact Lots 136-138, Exclusion 26 and/or Exclusion 27.

Additional mitigation will result from efforts by the NTBG to consolidate and schedule the days and times designated for use of noise producing equipment so that these activities won't have a negative impact on the visitors to Limahuli Gardens. Since the Gardens won't be open to visitors every day, the NTBG will attempt to complete most of this type of work (weather permitting) on those days that visitors are not present.

13. **Air Quality.** The NTBG recognizes the importance of maintaining good air quality in the Limahuli area. Currently, the existing air-quality conditions in Limahuli Valley are now of a nearly pristine nature due to the strong trade winds here on the windward side of Kaua'i. The prevailing northeast trades blow about 80% of the time, and with no source of pollution up wind for thousands of miles the air quality is nearly ideal.

The primary sources of natural air contaminants are attributed to, *ehukai* (salt spray occurring during times of high surf), and "vog", or volcanic haze. (Vog results from particulates in the air emitted during volcanic eruptions on the island of Hawai'i, and can cover the entire chain of Hawaiian Islands when the trade winds break down). Occasionally, *kona* (southerly) winds pass over the islands and disrupt the normal tradewind pattern. These kona winds, generated by large

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storms to the south of the islands, are often accompanied by heavy rains and humid weather. Often air quality will decrease during the break down in the trades as particulates from the sea spray and vog increase in concentration.

Potential negative impacts on air quality that could result from the NTBG's improvement of the existing habitat are:

- a. Suspended particulates or carbon dioxide buildup which could result from a increased use of maintenance vehicles and equipment. Although the NTBG cannot stop the emission of particulates or carbon dioxide, this impact will be naturally mitigated by the existing wind conditions, the expected low number of maintenance vehicles and equipment, their location, and amount of daily use.
- b. The release of smoke into the air as a result of clearing and burning of organic matter. The Composting Program will reduce the need to burn organic matter, and thus avoid this potential impact.
- c. The spraying of pesticides in the Garden Area. The NTBG anticipates that it will need to spray pesticides occasionally in the Garden Area. The impact of this action will be mitigated by reducing the need to spray pesticides or herbicides (i.e., the frequency that they are applied) through the skillful use of composting, mulching, and especially weed whacking practices. When it is deemed necessary to spray, pesticides will be administered judiciously by a licensed pesticide applicator, and only under the optimum weather conditions (i.e., on sunny days when no rain is expected and when wind will not be a factor) and when the Gardens' grounds are closed to visitors. Efforts will be made to use alternative methods to spraying in all cases. Under these circumstances the spraying of pesticides is expected to have only a very localized short-term impact and will not effect the overall air quality.

14. **Compatibility with the surrounding environment.** The NTBG anticipates that any impact on the compatibility with the surrounding environment as a result of the improvement of the existing habitat will be avoided by the nature of the improvements. With the exceptions of the residences currently under construction on Lot 137 and Exclusion 27, the surrounding environment is in a natural state. A well-maintained botanical garden will be a perfect complement to this situation. In fact, the improvement of the existing habitat is much more compatibility than the numerous residential dwellings that could otherwise have been built if the Garden had not been established in the front of Limahuli Valley.

15. **Public services, economy and demography.** The NTBG anticipates that the improvement of existing habitat will have no significant impact upon public services (provided by the State and County governments), the economy, or demography of Kaua'i.

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Construction of physical facilities

The construction of physical facilities within the Garden Area could result in the following possible impacts:

1. **An increase in educational opportunities for the public.** This is an entirely positive impact that will result from the construction of the physical facilities in the Garden Area that will support the Visitors Program, Educational Programs, and Research Programs.
2. **A more efficient administration and maintenance of the Garden Area and Preserve.** This positive impact will result from the construction of the physical facilities in the Garden Area that will support the administration and maintenance of the Gardens and Preserve.
3. **An increase in the security of the Gardens and Preserve.** This is also a positive impact that will result from the construction of the physical facilities in the Garden Area that will increase the security of the Gardens and Preserve.
4. **Soil erosion.** Soil erosion can occur in the following ways:
 - a. After removal of the vegetation during preparation of the foundation site. This impact will be avoided in the same way that was discussed above under the Habitat Improvement impacts.
 - b. After the grading or leveling of topsoil during the preparation of the foundation site. This impact will be avoided by the use of structures that utilize footing blocks and posts, rather than concrete slabs for foundations. This means that almost no grading or leveling will be required to prepare the site for construction.
 - c. Soil could erode from trenches dug for the underground utility transmission systems (Exhibit 13). The NTBG should be able to avoid this impact by backfilling and compacting all of the trenches that must be dug for the transmission of utility systems as quickly as possible. Nearly all of the necessary trenching will occur on the lower section our current system of dirt and gravel roads. With the exception of the road going up to the Maintenance/toolhouse, all of the trenches will be dug on nearly level roads that are not prone to erosion. None of the trenching areas are in close proximity to the stream, and thus there is not expected to be any significant impact even if some of the soil were to erode during the course of the trenching operations.
 - d. Roads graded and prepared for cementing could contribute to the soil erosion impact. Because most of the soil erosion taking place in the Garden Area is occurring on the existing system of dirt and gravel roads, the NTBG plans to cement all the roads in the Garden Area. The preparation of the existing roads will require grading prior to the erection of a form and the pouring of the cement. It is at this stage that the newly "prepped" road is susceptible to erosion from torrential rains. To help avoid this impact, the NTBG will not schedule road improvements during anticipated rainy periods and will only grade new sections when they are ready to be cemented.

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5. **Heavy equipment.** The use of a backhoe and small bulldozer will be required to dig the trenches for the utilities as well as grade and prepare the roads for cementing. They will also be required for the construction of the septic tank systems and associated leach fields. These machines have the potential to create a negative impact in the following ways:
 - a. The use of heavy equipment will result in soil compaction and an accompanying irreversible change in the structure of the soil. As severe as this anticipated impacts sounds, this actually is a beneficial impact if used in the appropriate place. Since these machines will be used exclusively on the existing system of roads, the resulting compaction of the soil will help to prevent it from eroding. Additionally, these machines can be used to compact the soil in the trenches after the utilities are in place and the trench has been backfilled.
 - b. Indiscriminate use of these machines could result in the destruction of, or damage to, subsurface archaeological features. The NTBГ recognizes the potential damage that these machines could do and will carefully control their use. To avoid this impact, the NTBГ will have an archaeologist perform subsurface testing as required by the State's Historic Preservation Program. Additionally, work will stop at the first indication of any buried archaeological features, and a qualified archaeologist will be called in to investigate.
 - c. The use of these machines will cause an increase in the noise level of the area. This is an unavoidable impact. Fortunately, it is a short-term impact and not a perpetual one. One mitigative measure that will help to lessen the impact of the noise generated by these machines is that their use will be restricted to normal working hours from 8:00 a.m. to 5 p.m.

6. **Limahuli Stream.** The NTBГ recognizes that there are several aspects of the construction of physical facilities that could impact the aquatic environment of Limahuli Stream. These are:
 - a. Creating maintenance roads and hiking trails adjacent to the stream could result in erosion and siltation in the stream bed. To avoid this impact, no new roads will be constructed, and all trails will be routed away from areas that are subject to erosion. The NTBГ currently recognizes that 90% of the erosion in the existing garden area is occurring on its dirt and gravel roads. Because of this, they plan to cement all of their roads and make them an integral part of the drainage system. Although it is very costly, this plan will mitigate a perpetual problem with soil eroding from the existing dirt and gravel roads.
 - b. Soil could erode from the construction sites into the stream. This anticipated impact has already been discussed above.

7. **Archaeological sites.** The NTBГ recognizes that there could be potential negative impacts to selected archaeological features because of the construction of the physical facilities. These impacts are:
 - a. Unintentional damage to subsurface archaeological features. This potential impact and its associated avoidance measures has been previously discussed above.

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- b. Intentional damage to features deemed "insignificant". The NTBG will be able to avoid this impact because of its conviction that all of the ancient Hawaiian archaeological features in Limahuli Valley are "significant" and worth preserving. The preservation of an authentic archaeological feature will override the need to place a facility in that location, or if no alternative location can be found, the facility must be constructed without damaging the feature.

An example of this is the location of the future visitors center (Exhibits 14 & 18). Currently, the NTBG is planning to locate this facility on top of an existing retaining rock wall. This rock wall was identified in the archaeological surface survey and mapping as feature # 11 (Patolo and Cleghorn 1990). Local informants have indicated that the wall was constructed in the 1960s as part of the original road through this area. Prior to construction of the visitors center, the age and original use of this wall will need to be verified by an archaeologist. If it proves to be an ancient wall the future visitors center will have to be relocated or constructed in a manner that will not damage feature # 11.

The implementation of these measures will assure that there is no negative impact to the archaeological sites during the construction of the future physical facilities in Limahuli Gardens.

8. **Noise.** The NTBG recognized that the construction of physical facilities will generate a temporary increase in noise. The noise will come from general construction activities like hammering, sawing and the use of heavy equipment for trenching and grading. This is an unavoidable impact. One mitigative measure that will help to lessen the impact of the noise generated by these activities and machines, is that their use will be restricted to normal working hours from 8:00 a.m. to 5 p.m.
9. **Air quality.** The NTBG does not anticipate any significant long-term change in air quality due to the construction of physical facilities. A short-term change in air quality could come from:
- a. Dust generated from construction activities. The NTBG will use dust control measures as deemed necessary to prevent dust from contaminating the air quality during construction of its physical facilities, and thus mitigate this impact.
- b. The temporary use of construction machinery and construction vehicles are anticipated to produce a small amount of suspended particulates or carbon dioxide. This is an unavoidable impact that will be naturally mitigated by the normal wind pattern and air speed. (See Air Quality on pages 66-67.)
10. **Compatibility with the surrounding environment.** The NTBG recognizes that the construction of physical facilities could be incompatible with the surrounding environment. This could occur in several ways:
- a. The NTBG anticipates that the actual construction activity will not be compatible with the surrounding environment. This is an unavoidable impact. Fortunately this will be a short-term impact and not a perpetual one. Having experienced the effects of the construction activities on Lot 137 for the last 12 months (10/89 to 10/90), and on Exclusion 27 for the last 21 years (1969 to 1990), the NTBG is very aware of the incompatibility of construction activity. To mitigate this

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impact, the construction of specific individual facilities will not commence until the funds necessary to complete it are raised. This will allow the construction to proceed as quickly as possible.

- b. The construction of structures that don't harmonize with their surroundings. To avoid this impact the NTBG has put much thought into the architectural design and placement of the facilities at Limahuli Gardens. The NTBG will construct structures which are designed to blend into the environment and which imitate the local vernacular dwellings that have developed since the late 19th century on the North Shore in response to the climate and agricultural way of life. These structures will be small, built out of wood, painted green, and situated so that they are landscaped out of the picture. They will be located so that they will not be visible from Kuhio Highway or obstruct the view planes from anywhere in the Gardens.
- c. The paving of all of the existing dirt and gravel roads with concrete could possibly be visually incompatible. This is an unavoidable impact. To mitigate the visual impact of the concrete, it could be dyed or painted green, brown or camouflage so as to blend in with the surrounding environment. This has been done at the Kilauea Point Wildlife Sanctuary with impressive results.
- d. Aerial transmission systems for the electrical, telephone, and cable utilities. To avoid this impact, the NTBG has elected to bring in all utilities underground. Although much more expensive, this will avoid the visual impact of transmission poles and wires running through several view planes in the Garden Area.

11. **Public services, economy and demography.** The NTBG does not anticipate that the construction of physical facilities will have any significant impact upon the public services provided by the State and County governments, or the economy or demography of Kaua'i. The only public service that could feel any real impact from the construction of the physical facilities is the County's once weekly collection of refuse. In order to avoid any impact on that service, the NTBG will hire a private refuse collection firm to handle all of its non-recyclable solid waste.

Although there will be a few short-term employment opportunities for construction workers, these opportunities are not expected to have a noticeable positive impact on the economy or demography.

Public use of the area

The NTBG realizes that it is important to keep a balance between the positive aspects of the public's use of this area and the potential negative impacts that could occur through its overuse. The Limitations that the NTBG has worked out for the Visitors Program for the Garden Area will allow the NTBG to avoid most of these negative impacts.

The following section discusses the possible impacts that could result from the public's use of this area.

1. **Increased educational, instructional, recreational, and research opportunities for the public and interested scientists.** This is an entirely positive impact that will result from the public's use of the area and exposure to the Gardens' programs.

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2. **Soil erosion.** Soil erosion has the potential to occur as a result of the public's use of the Garden Area. To help avoid this impact, visitors will have access only to designated trails and roads throughout the Garden Area. To mitigate the impact of any soil erosion that does occur, the NTBG will locate the trails only in areas which are not prone to heavy soil erosion.
3. **The use of vehicles for special tours.** The use of four-wheel drive vehicles for special tours is not anticipated to cause a negative impact. In fact, they will allow handicapped people the chance to make use of the Gardens' unique educational and instructional opportunities.
4. **Limahuli Stream.** The use of the Garden Area by the public is not anticipated to have any significant impact on the Limahuli Stream. Potential negative impacts that will be avoided, could have occurred from soil erosion as discussed above, and from the disposal of wastewater generated by the visitors. According to informal discussions with the Department of Health inspector for the North Shore of Kaua'i, Dean Jamieson, a properly designed and constructed septic tank system will adequately handle the needs of our Visitors Program and Garden staff. The key to this of course is to have the system designed by a certified sanitary engineer, licensed by the State of Hawai'i, and properly installed and constructed with an adequate leachfield. Properly constructed, this system will safeguard the quality of Limahuli Stream.
5. **Archaeological sites.** The use of the Garden Area by the public is not anticipated to have any significant impact on the archaeological sites located within it. Any impact that could have occurred will be avoided by keeping visitors on designated roads and trails during their tour. Thus, visitors will not be allowed to disturb the archaeological sites located in the Garden Area.
6. **Noise.** The use of the Garden Area by the public is anticipated to have only a minor impact on the noise level in this area. There will be a small increase in noise level generated by the arrival and departure of visitors' vehicles from the parking area. This is an unavoidable impact that will be mitigated by scheduling tours so that large groups of cars don't arrive or leave at one time.

There should be no noticeable increase in noise attributed to the tours themselves. Groups will be limited to 10 people so that the docent won't have to talk in a loud voice and all the visitors can hear what is being said.
7. **Air quality.** The use of the Garden Area by the public is anticipated to have only a short-term minor impact on the air quality. The arrival and departure of visitors' cars will cause a small amount of suspended particulates or carbon dioxide to be release into the air. This is an unavoidable impact that will be naturally mitigated by the normal wind pattern and speed. (See Air Quality on pages 66-67.)
8. **Compatibility with the surrounding environment.** The use of the Garden Area by the public is not anticipated to have any significant impact on the compatibility of the surrounding environment. Since Limahuli Valley is adjacent to the Ha'ena State Park, which attracts many hundreds of visitors daily (possibly even thousands during peak days), the limited use of Limahuli Gardens for a educational, instructional, and recreational purposes is totally compatible. In fact, the programs offered at Limahuli Gardens will complement and enhance the attractions in the State Park.

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9. **Public services.** The use of the Garden Area by the public is not anticipated to have any significant impact on any public services provided by the State or County governments. Potential impacts that will be avoided or mitigated are:
- a. Traffic congestion on Kuhio Highway. By providing a safe entrance and exit from the Gardens, as well as on-site parking, the NTBG will avoid having any impact on the traffic using Kuhio Highway. In addition, it should be noted that the maximum number of visitors allowed per day (120) at the Gardens will in no way overburden the capacity of Kuhio Highway, especially when the visitor's reservations are spread out over the whole day.
 - b. Overburdening the weekly County refuse collection. By utilizing a private refuse collection firm for all non-recyclable solid wastes, the NTBG will avoid having any impact on this public service.
 - c. Overburdening the County Fire Department and/or Police Department. The County currently has a Fire Station and Police Substation located at Princeville in Hanalei, approximately 9.5 miles from Limahuli Gardens. By training its employees in first aid and CPR, the NTBG can avoid using these public services for anything except true emergencies. The NTBG also has tentative plans to build a caretaker's house (Exhibit 20) to provide the grounds with the security of a live-in caretaker. This should help prevent vandalism and petty damage to the NTBG's facilities by idle youths or opportunistic thieves.
 - d. Overburdening the County water system. The primary use of water in Limahuli Gardens will be for irrigation purposes. Because the NTBG has three separate irrigation systems that it can use to irrigate its plants (Exhibit 14), it will be able to avoid an adverse impact on the County's water system. The use of these independent irrigation systems will allow the NTBG to use the County water only as a source of potable water for its visitors and staff, thus reducing the amount of County water it will need to consume in its overall operations. In order to prevent contamination of the County water system with water from the NTBG's irrigation systems, all potable water piping will be clearly labeled when it is installed, and backflow preventers will be installed on the NTBG's side of the County water meters.

The NTBG has estimated that after all its facilities are fully functional and with its visitors program running at maximum capacity, it will use about 1105 gallons of County water per day.⁸ If homes had been developed on the 6 lots (140 to 145; Exhibit 5) owned by the NTBG, the average daily use could have been over 2,400 gallons (based upon family of four using 400 gallons per day). Thus, the NTBG's projected water use should not overburden the County water system, which is designed to service the residents living at this end of the island.

⁸ Based upon the following daily estimates supplied by Dept. of Health: Visitors Center (120 visitor/day) 600 gallons; Toolhouse/maintenance complex (5 full-time employees) 75 gallons; Caretakers home (family of 4) 400 gallons; Office (2 employees) 30 gallons (Dept. of Health 1988).

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- e. **Overburdening the Electric, Telephone, Cable, and Gas companies.** Although these four utilities are owned privately, they are considered a public service for the purpose of this Master Plan. The use of the Garden Area by the public is not anticipated to have any significant impact on any of these utilities. This is due primarily to the nature of the NTBG's operations. Limahuli Gardens will require only the minimum basic services from all of these companies.

- 10. **Economy of Kaua'i and Hawai'i.** The use of the Garden Area by the public is anticipated to have a small positive impact on the economy of Kaua'i and Hawai'i. The natural beauty of Limahuli Gardens, combined with the unique educational and research opportunities that will become available, will act to draw an increased number of visitors and scientists to Kaua'i from around the world. Although the numbers of visitors drawn to Hawai'i as a result of Limahuli Gardens will be relatively small compared to the millions of visitors that visit the State for other reasons, they will nonetheless have a positive impact on Hawai'i's tourist based economy.

- 11. **Demography of Kaua'i.** The use of Lots 140 to 145 as a botanical garden will remove six potential house lots from the market. This will effect the demography of this area by reducing the number of residential dwellings that could otherwise have been located here. Although there currently is a real need for affordable housing on Kaua'i, the recent speculation in this area has priced land well beyond what is considered affordable for middle income residents. (Recent sales have seen undeveloped lots in this area sell for well over \$200,000 apiece.) Thus, removing these six lots from the real estate market will not effect the availability of affordable housing on Kaua'i and will help to preserve the natural beauty of the area.

CHAPTER III

**MASTER PLAN FOR THE
LOWER LIMAHULI PRESERVE**

OVERVIEW AND DESCRIPTION

This vast area contains approximately 600 acres of land and the only existing access is via a hiking trail that begins in the Garden Area and proceeds south up the valley to Limahuli Falls (Exhibit 21). Due to the limited accessibility and size of this area, it will be managed differently than Limahuli Gardens.

The Lower Limahuli Preserve encompasses the land around the Garden Area in the north end of the valley and extends southward to Limahuli Falls. The valley bowl encompasses the majority of this section and is surrounded on three sides (east, south, and west) by precipitous cliffs rising to approximately 2,000 feet elevation.

Because the ancient Hawaiians fully utilized this area prior to 1778, and because the cattle were allowed to roam here after their introduction to the area in the early 1800s, we find that it has suffered from the same environmental pressures as the Garden Area, but to a lesser degree as one proceeds south (inland) into the valley. The remnant native vegetation tends to follow the same pattern as it does in the Garden Area. That is, the Mixed Mesophytic vegetation dominates the steep, well-drained slopes exposed to the trade winds, and the Lowland Rain Forest vegetation dominates the valley floor. Generally, as one proceeds southward, the rainfall pattern increases and the Lowland Rain Forest type vegetation becomes more dominant.

Because the cattle tended to stay away from the rocky tributaries and steep sections, there are still pockets of remnant native forest. Where the cattle did roam, however, the area is almost completely dominated by alien plant species. Botanical surveys into this area have shown that the dominant tree species on the floor of the Lower Limahuli Preserve is the common guava (Flynn 1990, Theobald 1987). These surveys have also documented the existence of naturalized fruit trees like the pomelo, lemon, mango, and avocado, as well as the kudzu vine and coffee plants that indicate that this area could have been inhabited in the early 19th century (Flynn 1990, Wichman 1978). These inhabitants were probably the immigrant Chinese laborers who planted rice and possibly coffee in the North Shore area around the turn of the century. (Hume 1986; The Hanalei Project 1988; J. Wichman pers. comm.).

Because of the original pressures exerted by man, and more recently by the cattle, and especially the invasive alien plant species that have become naturalized in this area, we now find that the vegetation in the Lower Limahuli Preserve ranges from 5 percent native species in the most disturbed areas to 80 percent native species in areas that were difficult for the cattle to reach (Exhibit 7).

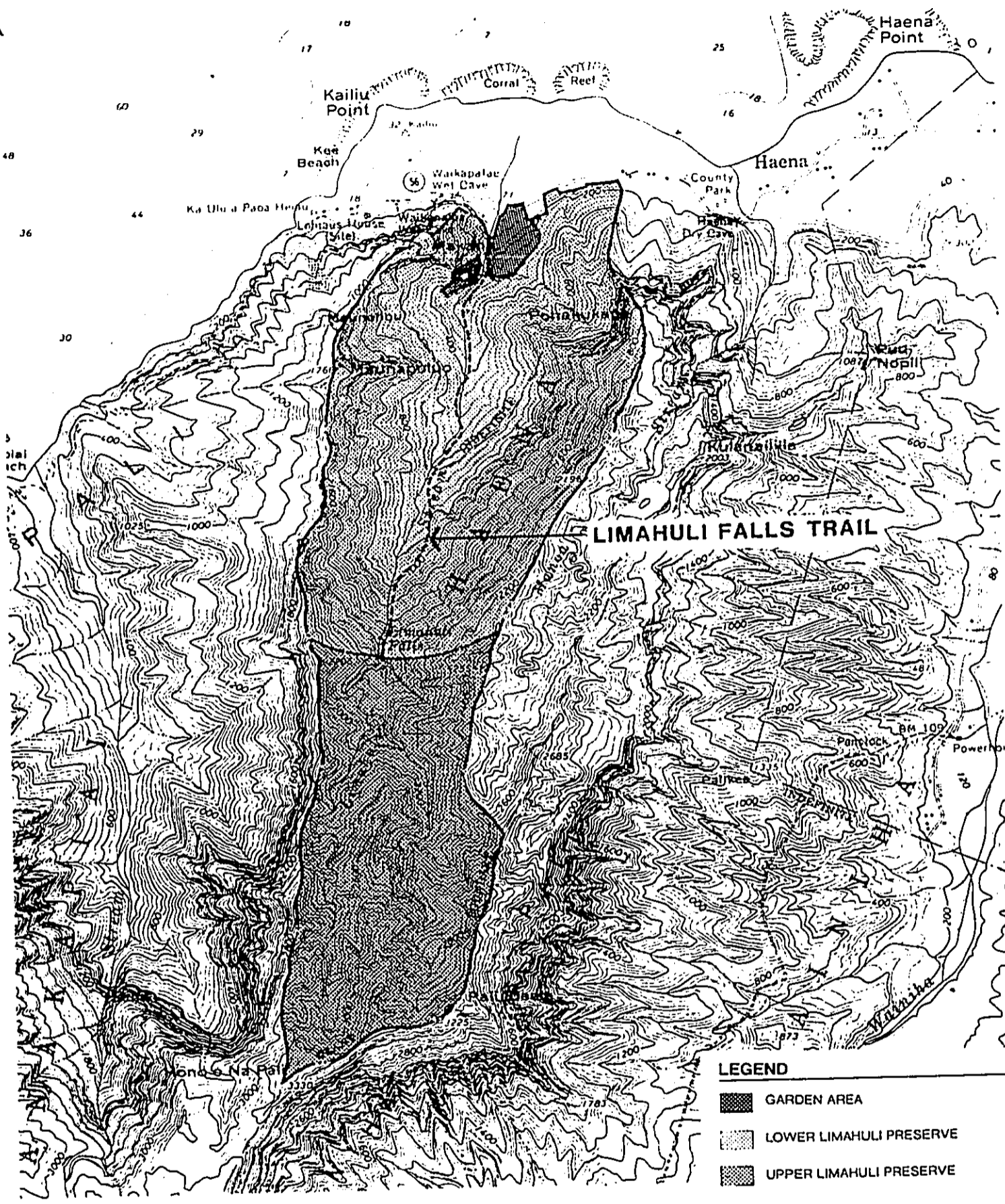
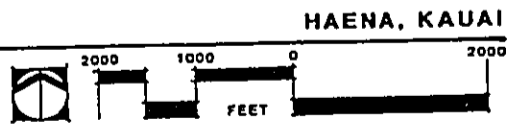


EXHIBIT 21
 PROPOSED TRAIL TO LIMAHULI FALLS

LIMAHULI VALLEY
 NATIONAL TROPICAL BOTANICAL GARDEN



MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT

CHAPTER III
MASTER PLAN FOR THE LOWER LIMAHULI PRESERVE

MANAGEMENT PLAN

The NTBG is proposing an action-based management plan for the Lower Limahuli Preserve. It seeks not only to preserve and protect the area but also to improve its existing state.

The existing situation in Limahuli Valley demands action by the land manager. For hundreds of years Limahuli Valley has suffered the onslaught of one alien organism after another. The remnant forest in the front of the valley has undergone a rapid decline in the last 20 years with the spread of *Schefflera actinophylla*. In 1967, there were only a few scattered trees growing in the front of the valley (T. Hashimoto pers. comm.). Today, *Schefflera* is the dominant tree surrounding the Garden Area. It grows so densely and quickly that it is smothering the remnant native species of *Metrosideros*, *Pisonia*, *Psychotria*, *Hibiscus*, *Rauvolfia*, *Ochrosia*, *Pteralyxia*, *Santalum*, *Bohea*, *Pittosporum*, *Charpentiera*, *Canthium*, *Eugenia* and numerous others.

Time is running out for the native plants that are being crowded out by this alien species. With few exceptions, the native species are not reproducing well. They can not compete successfully for light and nutrients against this rapid growing and aggressive alien *Schefflera*. Another 20 years of inaction will bring about the extinction of a large number of the native species currently growing throughout the front of the valley.

Today, the NTBG has the ability however to change the situation. Through the action based management plan proposed below it can try to change the balance back in favor of the native plants. If the worst of the alien plant pests are removed and native species propagated and replanted in the area, native plants may once again dominate the forests of Limahuli. Over 50 to 100 years, this type of management could have a significant impact on the overall character of the ecosystems.

The basic methodology employed by this management plan in regard to the improvement of the habitat was highlighted at a symposium on the preservation and management of Hawai'i's ecosystems held on June 5th and 6th, 1984. At that meeting, many land managers in the State of Hawai'i gathered to share their ideas and research on the preservation and management of Hawai'i's terrestrial ecosystems. These men and women were from both the private and public sectors and they brought with them the most up-to-date knowledge and research results available in Hawai'i. What was presented often was the result of years or lifetimes of involvement and management of terrestrial ecosystems. The proceedings were later published in, *Hawai'i's Terrestrial Ecosystems: Preservation and Management* (Stone and Scott 1985). The recurring theme of the symposium was the need to control alien species in native ecosystems. A summary address, given by Sheila Conant (1985), recommended the following:

Alien herbivores and aggressive plants should be removed and kept out of ecosystems we are attempting to restore.

Replanting and restocking should be carried out with genetically similar forms or species.

To the extent possible, detrimental changes should be anticipated and stopped or arrested before, during, and after programs for ecosystems restoration are conducted.

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She concluded by urging Hawai'i's land managers not to give up, but to continue to strive to be the leader in the field of ecosystem restoration. Her encouraging words were:

Although conservation problems in Hawai'i are considerable, a number of positive factors exist. There are many individuals and institutions sincerely committed to conservation.... Our scientific data base, though not complete, is of high quality.... The control of alien plants and animals must be a part of any successful preserve program. In this regard Hawai'i should be a leader in the area of ecosystem restoration because we do not have the choice of simply leaving things alone and hoping they will recover without any efforts to remove the initial cause of disturbance.

Function

The primary function of Limahuli Preserve is set forth in section B) of the NTBG's Statement of Purposes for Limahuli Gardens and Preserve.

- B) to maintain for purposes of research and education a natural area of approximately 985 acres for the preservation of the flora and fauna native to the area;

Management Objectives

1. To improve and maintain the habitat of the Lower Limahuli Preserve in a manner that will be beneficial for the native flora and fauna of that area through the control and eradication (if possible) of the most noxious of the alien plants and herbivores now present in this area, and the reintroduction of plant species native to this area. This should be geared toward reestablishing the original plant communities as much as possible.
2. To use the Lower Limahuli Preserve to provide both visitors and scientists with a better understanding of the fragile endemic Hawaiian flora and the need to protect it, as well as the ancient Hawaiian culture and the impact that it had upon the flora and fauna of Hawai'i.
3. To stabilize, preserve, protect and study the archaeological sites within the Lower Limahuli Preserve.
4. To use the Lower Limahuli Preserve to provide a hiking trail that has great scenic beauty and unique educational opportunities.

Management Guidelines

The following Management Guidelines are recommended for the Lower Limahuli Preserve. They provide the NTBG with a general guide for the use and improvement of this area.

1. Habitat improvements in the Lower Limahuli Preserve must be performed in a manner that will not adversely impact Limahuli Valley's terrestrial or aquatic environments, its scenic value, or its archaeological sites.
2. Maintenance of Lower Limahuli Preserve, including its associated trail to Limahuli Falls and archaeological sites, must be performed in a manner that will not adversely impact Limahuli Valley's terrestrial or aquatic environments, its scenic value, or its archaeological sites.

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3. All organic litter generated in the maintenance of the Lower Limahuli Preserve as well as the alien vegetation removed to improve the habitat should be recycled through a composting program.
4. The NTBGS Programs that will use the Lower Limahuli Preserve must be implemented in a manner that will not adversely impact Limahuli Valley's terrestrial or aquatic environments, its scenic value, or its archaeological sites.
5. The construction of any physical facility in the Lower Limahuli Preserve must be performed in a manner that will not adversely impact Limahuli Valley's terrestrial or aquatic environments, its scenic value, or its archaeological sites.

THE NTBGS PROGRAMS

The Habitat Improvement Program

This program seeks to fulfill Management Objective (1) outlined above. Because this area will be used as a preserve and not as a garden, the habitat improvement methodology and type of plantings will differ from that of the Garden Area. The Planting Program for this area (page 82) calls for the reintroduction of native Hawaiian flora as well as plants once cultivated by the ancient Hawaiians. Since this area is not a garden, it will not employ the extensive use of lawns to prevent soil erosion, rather the following methodology will be employed to improve the habitat:

1. Alien trees and shrubs will be selectively removed from strategic locations within the Lower Limahuli Preserve. The basic methodology for this will be the use of a chain saw and/or the use of translocated herbicide that is either painted on the stump, or injected into the trees or shrubs. This will primarily accomplish two things:
 - a. Existing native vegetation will be encouraged to grow and flourish.
 - b. A break in the alien canopy will allow newly planted native species a chance to compete with the existing alien vegetation and become established as the replacement vegetation for that specific site.
2. Utilizing the criteria outlined in the Planting Program for Limahuli Gardens, replacement vegetation will be planted to supplement the existing remnant native species. This will happen in two phases:
 - a. Plantings will initially be located in openings created through the selective removal of alien trees and shrubs.
 - b. As the newly planted trees become established, more of the existing alien species can be selectively removed and additional native species planted.
 - c. Once the native species have become the dominant components of the canopy, the understory elements of the ecosystems can be replanted.
3. Once the native plants have become dominant factors in the ecosystems, the other components such as birds, insects, fungi, etc. should naturally return or, if necessary, the NTBGS can attempt to restock them.
4. The maintenance of the Lower Limahuli Preserve will undoubtedly require the continual removal of young alien trees before they reach a mature size. This

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should become less of a problem as more and more seed-producing alien trees are removed over the years. Although there are not any herbivores currently present in this area, it must be monitored to prevent their future establishment.

By following the above scenario, there should not be any increase in soil erosion because large areas will not be cleared, and relatively few organisms will be displaced. The change that will occur will be a gradual shift towards a native dominant ecosystem. Because of the sheer size of this area (approximately 600 acres) and the aggressive nature of many alien plant species, this program may never be completed.

The Planting Program

The Planting Program for the Lower Limahuli Preserve will be an essential component of the Habitat Improvement for this area. It will oversee the selection of the replacement vegetation used in this area. Plants reintroduced into this area must be either native species or ones that were once cultivated by the ancient Hawaiians. Since this area is totally surrounded by native forests it is critical that all candidate plant species be screened by the same criteria and guidelines set forth in the Planting Program for Limahuli Gardens (pages 27-29).

The Composting Program

The Composting Program for the Lower Limahuli Preserve will also be an important aspect of the Habitat Improvement Program for this area. Although the methodology used to improve the habitat in this area should not disrupt the normal cycling of nutrients, organic litter and alien vegetation removed by the NTBG's staff will be recycled through a composting program. As mentioned earlier in Chapter II, the compost generated will have many beneficial uses especially as soil amendments at the time of planting and as top dressings around desirable native vegetation.

The Archaeological Preservation Program

This program will seek to identify, stabilize, preserve and protect the archaeological sites located within the Lower Limahuli Preserve. This program will be conducted by the NTBG's staff with the recommendations of a qualified archaeologist, and will include the removal of alien vegetation growing on the sites if it poses a threat to their stability. The actual study and research of these sites will fall under the Archaeological Research Program for this area (page 83), and in Chapter V (page 95).

The Educational Programs

Due to the remoteness and limited accessibility of this area, the Lower Limahuli Preserve will not be a primary resource in the NTBG's educational programs. This area will, however, provide several unique educational opportunities to those visitors who tour this area. These educational opportunities will be described briefly in the following section about the visitors program (page 83-84).

The Research Programs

Two horticultural research programs could be implemented in this area. They will have the same objectives as the horticultural research programs outlined previously for Limahuli Gardens (page 39).

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Botanical survey. Although three botanical surveys have already been conducted in this area (Wichman 1978, Theobald 1987, Flynn 1990), there are still many unexplored sections. This program will be run by the NTBG's botanical staff and will seek to determine what species of plants currently exist and could previously have existed in this area. It will provide essential information and propagative material for the Habitat Improvement and Planting Programs, as well as supplying the HPC and the NTBG with material to expand their Living Collections and meet their research needs.

Ornithological survey. This program will seek to determine what species of birds inhabit this vast area, and the impact of the alien bird species. This program will probably not be run by the NTBG's staff but will be conducted by independent researchers in cooperation with the NTBG.

Invertebrate survey. This program will seek to determine the other components of the existing ecosystems and the impact of the non-native organisms upon the native species. The scope of this program will probably require it to be long term, undertaken by other organizations in cooperation with the NTBG.

Archaeological research in this area will seek to determine and document the locations, the ages and uses of the archaeological sites in the Lower Limahuli Preserve. Information about the colonization and growth of the ancient Hawaiian community in Ha'ena, how Limahuli Valley was used by the community, as well as the impact of the community on the native flora and fauna of the area will also be a part of this program. This will also be a long term program that is undertaken by other organizations in cooperation with the NTBG.

Aquatic research in this area will seek to periodically measure and monitor the aquatic environment and macrofauna in the Limahuli Stream. Over a long period of time, this program will yield valuable information on the natural population cycling of stream organisms. In order to be comprehensive, this program will also include the study of sections of the stream that are not directly located in this area, (i.e., the estuary located north of Kuhio Highway) but play a vital role in the overall quality of the aquatic environment. Knowledge gained from this program will add significantly to the baseline data on the stream and help the NTBG to evaluate the impact of its use of this area, in order to maintain the pristine nature of the stream in the future. This is an important program that will be conducted by independent aquatic biologists.

The Visitors Program

The Visitors Program for the Lower Limahuli Preserve seeks to fulfill many of the points set forth as the Foundations of this Master Plan (Chapter I), by providing controlled public access into this area. It will be run independently of the Visitors Program for Limahuli Gardens, (with the exception of the use of the visitors center, the office staff, parking areas, and ingress and egress roads) and will consist of a guided hike up the valley to Limahuli Falls.

Educational opportunities that will be available on this hike are: (1) experiencing the isolation that the plants underwent living within the steep valley walls of Limahuli, (2) seeing the impact that the cattle and alien plants have had on this area, (3) seeing remnants of the native forest that once existed here, (4) seeing the NTBG's efforts to improve the habitat for the remnant plant species of this area, (5) seeing many of the ancient Hawaiian archaeological sites located in this area, and (6) experiencing the

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beauty and tranquility of this area. Hopefully, this will spark an awareness and concern for the native Hawaiian plant species and the fragility of the valley and its native ecosystems.

There will be only one hike per day lasting probably between four and five hours. The ideal group size would be 10 people, to allow ample opportunity for discussion between visitors and docents. Exceptions to the group size will depend upon the nature of the group (e.g., school groups), but the number should not exceed a maximum of 20 visitors.

Limitations

In order to prevent this program from over using this area and/or having a negative impact on the surrounding environment the following limitations are recommended.

1. All visitors should be required to make advance reservations.
2. A minimum entrance fee should be established (at the NTBG's discretion, this limitation can be waived for educational groups).
3. Visitation hours should remain flexible, but should not exceed eight hours a day, three days a week.
4. All tours must be guided by trained docents.
5. Group size should be limited to 10 people.
6. Visitors should stay only on the defined trail.
7. Ideally, two docents should guide tours, one to lead the group and the other to bring up the rear. This will help keep the group together and on the trail. For small groups this may not be necessary.
8. No removal of plant materials by the visitors will be allowed. Docents may collect materials for the visitors at their discretion.
9. All litter must be carried out of the valley by each respective tour.
10. Tours will not be allowed under adverse weather conditions.

PHYSICAL FACILITIES

Two physical facilities are needed to support the NTBG's programs in this area.

1. The establishment of a well-maintained trail to Limahuli Falls that will primarily follow the old horse/cow trail that goes up the valley (Exhibit 21). The trail will allow access to the Lower Limahuli Preserve by NTBG staff, scientists, and for guided tours.
2. Small toolstorage structures (approximately 8x8 feet) for the NTBG's staff and/or research scientists. Strategically placed, these toolsheds will allow ready access to necessary research and/or maintenance equipment and protect such equipment from weather or theft. The exact size and location of these facilities will be determined when the NTBG is prepared to construct them.

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THE INCREMENTAL USE OF LOWER LIMAHULI PRESERVE

The arrangement of the programs and the construction of the physical facilities into the following phases has been prepared to provide a series of goals that the NTBG can use in its quest to raise the capital needed to implement its programs and construct the physical facilities planned for this area. The actual implementation of phases may be different from what is outlined below, depending upon the Lower Limahuli Preserve's greatest need at the time the financial support becomes available.

Phase One will fund the restoration of the existing trail to Limahuli Falls and the commencement of the aquatic research program. The completion of a well-maintained trail to Limahuli Falls will make the implementation of the NTBG's programs possible in this area.

Phase Two will begin funding the Habitat Improvement Program and the Archaeological Preservation Program for this area. Initially, all that will be needed is funding for additional staff to work in this area. Eventually, these program will grow to the point that they will require the physical facilities that are part of Phase Three.

Phase Three will fund the construction of small tool storage structures in this area. These structures will support the NTBG's staff and associated scientists in their efforts to implement all of the NTBG's programs for this area.

ENVIRONMENTAL ASSESSMENT OF THE POTENTIAL IMPACTS AND MITIGATIVE MEASURES ASSOCIATED WITH THE IMPLEMENTATION OF THIS MASTER PLAN IN THE LOWER LIMAHULI PRESERVE

The implementation of the NTBG's programs and the construction of the physical facilities in the Lower Limahuli Preserve could result in several possible impacts. These potential impacts are associated with the following three general classes of action: Habitat Improvement; Construction of Physical Facilities; and Public Use of the Area.

Impacts Associated with the Habitat Improvement

The improvement of the habitat in the Lower Limahuli Preserve as described in the Habitat Improvement Program for the Lower Limahuli Preserve could result in the following impacts.

1. **An increased percentage of native vegetation.** This is an entirely positive impact that will result from the removal of the alien plant species. A reduction in the number of alien species and a corresponding increase in the number of native species will result in a habitat that is more characteristic of the probable original ecosystems. It is an illusion to think that at this point in time a highly-degraded ecosystem can be completely restored to its original pre-contact condition, but any effect that will change the balance back in favor of the native species can be considered a beneficial one. Eventually, a high percentage of native plant species will create a more desirable habitat for other native organisms such as native birds and insects. These native organisms have often developed mutually beneficial pollinator/food source relationships with the native plant species over thousands

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- or millions of years, and thus they will directly benefit from an increase in native plant species.
2. **A reduced amount of alien allelopathic vegetation.** This is an entirely positive impact that will be a direct result of the Habitat Improvement Program for this area. Details of this positive impact have been discussed in Chapter II (page 63).
 3. **A reduced production of alien seeds.** This positive impact will be a direct result of the removal of the naturalized alien species growing in this area. Every alien plant that is removed from this area will reduce the number of potential alien progeny which that particular species could otherwise produce. Although the area will undoubtedly continue to experience a "rain" of alien seeds from plants located in surrounding areas, over time, the reduction in the number of alien seeds produced within this area could have a noticeable effect on the maintenance of the Lower Limahuli Preserve, as well as adding a layer of protection to the Upper Limahuli Preserve.
 4. **Increased stabilization of the archaeological sites.** This is an entirely positive impact that is a direct result of the Habitat Improvement Program and the Archaeological Preservation Program for this area. Details of this positive impact have been discussed in Chapter II (page 64).
 5. **Soil erosion.** Removal of the existing alien vegetation could cause soil erosion. The NTBG will be able to avoid this impact because only selected alien vegetation will be removed and large areas will not be cleared. The NTBG does not anticipate an increase in the amount of soil erosion over what is already occurring in this area.
 6. **Translocated herbicide.** The use of translocated herbicides could have an adverse effect on the environment. By applying translocated herbicide only with a brush on freshly cut stumps, or by injecting it into living trees, the NTBG will be able to avoid this impact (see page 65).
 7. **Accidental injury to native vegetation.** Although this is a concern it will be avoided by the methods described in Chapter II (page 65).
 8. **Displaced organisms.** Birds, insects and other organisms will be displaced from their homes. This impact will be avoided by the methodology used in the Habitat Improvement Program for Lower Limahuli Preserve (pages 81-82).
 9. **Limahuli Stream.** The NTBG recognizes that the improvement of the existing habitat could affect the present pristine condition of Limahuli Stream. All potential impacts will be avoided or mitigated as described in Chapter II (page 65-66).
 10. **Noise.** The increased use of chainsaws and maintenance equipment will generate an increase in noise. This impact will be naturally mitigated by the remote nature of this area. Thus, the NTBG does not anticipate any negative impact to result from the increased use of chain saws and maintenance equipment.
 11. **Air quality.** The NTBG does not anticipate any significant long-term change in air quality due to the modification of the existing habitat. The reasons for this are described in Chapter II (pages 66-67).
 12. **Compatibility with the surrounding environment.** The NTBG does not foresee any incompatibility with the surrounding environment as a result of the Habitat Improvement in this area.

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Impacts Associated with the Construction of physical facilities

The construction of physical facilities within the Lower Limahuli Preserve will consist of two basic types of facilities. These are: (1) the establishment of a well-maintained trail to Limahuli Falls, and (2) tool-storage structures for use by the NTBG staff and research scientists. The NTBG anticipates that the construction of these facilities could result in the following possible impacts.

1. **An increase in educational, recreational, and research opportunities for the public and scientific community.** This is an entirely positive impact that will result from the construction of the physical facilities in the Lower Limahuli Preserve that will support the NTBG's Programs planned for this area.
2. **More efficient Habitat Improvement and Research Programs in the Lower Limahuli Preserve.** This is an entirely positive impact that will result from the construction of the physical facilities in the Lower Limahuli Preserve that will support the NTBG's staff and scientists as well as the affiliated scientists (i.e., archaeologists, ornithologists, etc.) who will work in this area.
3. **Soil erosion.** Areas used for the construction of physical facilities could contribute to the erosion of soil. Due to the nature of the physical facilities that will be constructed in this area (a trail and small toolsheds built off the ground with footing blocks for a foundation), the NTBG will be able to avoid this impact by locating and constructing the facilities in accordance with the Management Guidelines set forth in the Management Plan for Limahuli Stream, Chapter VI (pages 98-99).
4. **Limahuli Stream.** The NTBG does not anticipate any significant impact to result from the construction of the physical facilities, as long as the location and construction of the facilities follows the Management Guidelines set forth in the Management Plan for Limahuli Stream, Chapter VI (pages 98-99).
5. **Archaeological sites.** The NTBG recognizes that there could be potential negative impacts on selected archaeological sites because of the construction of the physical facilities. To avoid this impact all physical facilities will be strategically placed so as not to impact the archaeological sites in any way.
6. **Noise.** The NTBG recognizes that the construction of physical facilities will generate an increase in noise, but the remote nature of the area will naturally mitigate this impact.
7. **Air quality.** The NTBG does not anticipate any significant change in air quality due to the construction of physical facilities.
8. **Compatibility with the surrounding environment.** To avoid this impact the NTBG will strategically locate these facilities. Because of their nature and use, the NTBG anticipates that they will be completely compatible with the surrounding environment, as long as they are constructed according to the Management Guidelines set forth in the Management Plan for Limahuli Stream, Chapter VI (pages 98-99).

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Impacts Associated with the Public use of the Area

The NTBG realizes that it is important to keep a balance between the positive aspects of the public use of this area, and the potential negative impacts that could occur through its overuse. The Limitations that the NTBG has worked out for the Visitors Program for the Lower Limahuli Preserve will allow the NTBG to avoid most of the possible negative impacts associated with the public use of this area. The possible impacts that could result from the public use of this area are listed below with their avoidance or mitigative measures.

1. **Increased educational, recreational, instructional, and research opportunities for the public and scientists.** This is an entirely positive impact that will result from the public's use of the area and their exposure to the NTBG's programs.
2. **Soil erosion.** Soil erosion has the potential to occur as a result of the public using the designated trail. This may be an unavoidable impact. To mitigate it, the NTBG must locate the trail away from areas likely to erode into the stream. If the trail is properly located the erosion resulting from the public use of it is not expected to be significant.
3. **Limahuli Stream.** The public use of this area is not anticipated to have any significant impact on the Limahuli Stream as long as the designated trail is properly located.
4. **Archaeological sites.** The public use of this area is not anticipated to have any significant impact on the archaeological sites located within it. Any impact that could occur will be avoided by keeping visitors on the designated trail during the tour. By doing this visitors will not disturb the archaeological sites located in this area.
5. **Noise.** The public use of this area is not anticipated to have any significant impact on the noise level.
6. **Air quality.** The public use of this area is not anticipated to have any significant impact on the air quality.
7. **Compatibility with the surrounding environment.** The public use of this area is anticipated to be completely compatible with the surrounding environment.
8. **Public services.** The public use of this area is not anticipated to have any significant impact on any public services provided by the State or County governments. Potential impacts that will be avoided or mitigated are:
 - a. **Traffic congestion on Kuhio Highway.** By providing a safe entrance and exit from the Gardens, as well as on-site parking, the NTBG will avoid having any impact on the traffic using Kuhio Highway.
 - b. **Overburdening the weekly County refuse collection.** By utilizing a private refuse collection firm for all non-recyclable solid wastes, the NTBG will be able to avoid having any impact on this public service.
 - c. **Overburdening the County Fire Department and/or Police Department.** By training its employees in first-aid and CPR, the NTBG can avoid using these public services for anything except true emergencies.

CHAPTER IV

MASTER PLAN FOR UPPER LIMAHULI PRESERVE

OVERVIEW AND DESCRIPTION

The Upper Limahuli Preserve encompasses approximately 400 acres of land above Limahuli Falls and extends from about 1,600 feet elevation at the top of the Falls to 3,330 feet elevation at the summit of "Hono O Napali" (Exhibit 2). This upper preserve is wedge shaped with "Hono O Napali" being at the apex. At upper elevations, the vegetation is characteristic of the Montane Rain Forest, while at lower elevations it is characteristic of the Lowland Rain Forest.

The Upper Limahuli Preserve is a very remote area. Although it is possible to climb the sheer valley walls to gain access into this area, it is also very dangerous. As a result, a helicopter is normally required to gain access to this area. Due to its remoteness and pristine character as described below, this area will rarely be used by the NTBG, but will instead be managed as a natural area for the preservation of the native flora and fauna.

Historically, this area has suffered from different environmental pressures than those exerted on the lower Limahuli Valley. Limited surveys have indicated that it was probably not cultivated by the ancient Hawaiians; rather it is thought that they used it primarily for its natural resources. They may have occasionally climbed up here to gather upland plants and/or feathers from the endemic birds. The colorful bird feathers were used to make the famous Hawaiian feather cloaks, helmets and leis and were often difficult to come by. Remnant plantings of two Polynesian introductions, banana and taro, still exist along the stream and in natural drainages and were probably used as a source of food for extended expeditions into this remote area.

The greatest environmental pressure has come from feral pigs introduced to Hawai'i by the early Polynesian colonists. In the last 200 years, damage from the pigs has slowly resulted in opening up niches enabling invasive alien weeds to get established. In addition to disturbing the environment, the pigs also are transporters of alien weed seeds. Other pressures have come from severe storms and aerial-borne alien weed seeds. A good example of these last two pressures working together was the situation that occurred after Hurricane Iwa in 1982. High winds associated with Iwa resulted in the destruction of many trees and opened up areas in which aerial-born weed seeds subsequently became established.

As a result of these three pressures, the area above Limahuli Falls has fallen from forest with an estimated 99 percent native plant species in 1978 to about 95 percent native species in 1990 (Exhibit 7). Despite this reduction in native plant species, the Upper Limahuli Preserve is still considered nearly pristine and will be managed with the utmost awareness in order to preserve and protect its native flora and fauna.

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MANAGEMENT PLAN

Function

The primary function of Upper Limahuli Preserve will be as a natural area for the preservation of the flora and fauna native to the area and on a limited basis for scientific research.

Management Objectives

Because this area is remote and has never been directly modified by man, it contains mostly pristine native vegetation. Therefore the NTBG does not plan to use this area as an educational, recreational or cultural resource. Thus, this area has very different Management Objectives from the Lower Limahuli Preserve. These are:

1. To maintain the Upper Limahuli Preserve in a manner that will preserve the flora and fauna native to the area and, if possible, by providing an improved habitat for the flora and fauna, through the control and eradication of the alien plants and alien mammals now present in this area. [Due to factors that are slowly but continually degrading the native habitat (i.e., feral pigs and rats; severe storms; and invasive alien plants) removal of the alien species from this area is an important long-range objective.]
2. To establish limited Research/Survey Programs in the Upper Limahuli Preserve that will document and record the numerous plant and animal species that exist in this area.

Management Guidelines

The following Management Guidelines are recommended for the Upper Limahuli Preserve. They provide the NTBG with a general guide for the use and possible future improvement of this area.

1. The implementation of any Research/Survey Program in the Upper Limahuli Preserve must be done in a manner that will not adversely impact the terrestrial or aquatic environments and/or scenic value of Limahuli Valley.
2. Habitat Improvements in the Upper Limahuli Preserve should be attempted only when advances in technology (primarily biological control) present new methods of controlling the alien plant and animal species now present in this area, or if a drastic change in the pristine nature of the area mandates the use of conventional methods.

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THE NTBG'S PROGRAMS

The following are possible programs that could be implemented in this area:

Research Programs

Botanical survey. This program will seek to determine which species of plants exist in this isolated area. Since this area is relatively pristine and unexplored, many interesting and valuable plants are likely to exist here. Their documentation and classification will add to our still growing knowledge of Hawai'i's unique flora.

Ornithological survey. This program will seek to determine which species of birds inhabit the upper reaches of Limahuli Valley. Due to the remote nature of the area, many native bird species probably still exist in this area and their documentation and study could prove valuable. This may prove to be a program undertaken by an independent organization or researcher in cooperation with the NTBG.

Invertebrate survey. This program will seek to determine the other components of the existing ecosystems. The scope of this program will necessitate the NTBG's collaboration with experts in other fields (e.g., entomology, mycology, etc.). This program is a natural choice for doctoral candidates and other scholars looking for an environmental location to study. It may thus prove to be a program undertaken by an independent organization or researcher in cooperation with the NTBG.

The Habitat Improvement Program

Due to the remote and inaccessible nature of this area, this program will not emphasize the reintroduction of native species, rather, it will concentrate on the control and eradication of alien plant and animal species, while letting the native species reestablish themselves naturally.

Methodology used in this area will be quite different than that used in the Lower Limahuli Preserve. Ideally, alien species will be controlled and eradicated with methods that don't require the direct presence of man. Biological control (the use of an organism's natural enemies such as predators, parasites and diseases) will probably be the method of choice for this remote area. Future technology may also provide land managers with ways to break the reproductive cycles of the most noxious alien organisms and thus control them. Unfortunately, both of these methods are currently very costly and must be well researched prior to their implementation to avoid damage to native species that are similar to the target organism.

Although an improved habitat in this area is a very desirable goal, this program will probably not be implemented unless future technology make it more feasible.

PHYSICAL FACILITIES

The NTBG does not plan any physical facilities for this area.

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MASTER PLAN FOR UPPER LIMAHULI PRESERVE

IMPLEMENTATION OF PROGRAMS

The implementation of the research programs for this area will depend upon the interest shown by researchers. Interested parties will be asked to submit a research proposal to be reviewed by the NTBG. If approved, the research could begin as soon as the funding is secured.

Implementation of the Habitat Improvement Program will depend upon future advances in biological control or if drastic changes in the nature of the vegetation demand immediate action to prevent a rapid degradation of the existing habitat.

ENVIRONMENTAL ASSESSMENT OF THE POTENTIAL IMPACTS AND MITIGATIVE MEASURES ASSOCIATED WITH THE IMPLEMENTATION OF THIS MASTER PLAN IN THE UPPER LIMAHULI PRESERVE

Because the Management Plan for Upper Limahuli Preserve strictly controls the use and improvement of this area, the NTBG does not anticipate any negative impacts to be associated with its management as long as the Management Guidelines for this area are followed.

Although the limited use of the Upper Limahuli Preserve for research purposes will require the use of a helicopter, this is not anticipated to cause any negative impact. In the past, researchers have been dropped off on high ridges where, in areas with low-growing vegetation, the helicopter is able to hover with its skids just off the ground. This practice reduces the need to clear a landing site and minimizes the environmental impact. It is suggested that any future plan to clear either a permanent or temporary landing site in this remote area be approached with great care. Any clearing should be immediately replanted with native species to prevent the future spread of alien seeds carried by both the wind and birds. Because this area is so remote the audio or visual impact of having a helicopter in this area is negligible.

A positive impact that could result from the limited scientific use of this area is the identification of rare or endangered populations of native Hawaiian organisms. Knowledge of the population size and range of these rare and endangered species is essential for their management and the formulation of effective recovery plans as mandated by the federal Government (Public Law 100-478).

CHAPTER V

MANAGEMENT PLAN FOR LIMAHULI VALLEY ARCHAEOLOGICAL SITES

OVERVIEW

The ancient Hawaiians recognized Limahuli Valley as an ideal agricultural site. The stream and year-round rainfall provided the Hawaiians with an abundant source of irrigation water. The valley floor and sloping sides provided land that was terraced and used for their crops and habitation. Evidence of these ancient terraces are found throughout Limahuli Gardens and the Lower Limahuli Preserve. These terraces, and the archaeological features associated with them, are all that remain of the ancient Hawaiian culture that thrived in Limahuli Valley for centuries.

The Ha'ena area is rich in ancient Hawaiian history and has a concentration of significant archaeological sites and associated *mo'olelo* (stories and legends), *oli* (chants) and *hula* (ancient dances) that rivals those found anywhere in the Hawaiian archipelago. Because the Hawaiians had no written language, their genealogies, history, and culture were perpetuated through their legends, chants, and dances. These sites thus demand more than just preservation. They represent tremendous educational tools that could benefit modern Hawaiians wishing to learn more about their forefathers' culture, scientists studying the impact these ancient people had on the pre-contact ecosystems in Hawai'i, and visitors who are curious about the culture and history of the Hawaiian people.

Currently, most of the archaeological work done in Hawai'i is "contract archaeology"⁹, and only scattered consideration has been given to the larger issues of Hawaiian archaeology. These issues address: (1) when and where the original colonists came from (legends of Limahuli being one of the valleys that the *menehune* lived in indicated that more than one race of Polynesian people may have colonized this area); (2) how the colonists gradually exploited more and more of the natural resources available to them in a large area (like the *ahupua'a* of Ha'ena and especially Limahuli Valley); and (3) how an original colony could evolve from a lone unit concentrating on its subsistence to a stratified unit within a larger politically stratified society (Dye 1989).

⁹ Contract archaeology is a term that refers to archaeological work whose goal is to produce studies that satisfy technical laws governing the protection of ancient sites in areas proposed for development (Rosendahl 1976).

CHAPTER V
MANAGEMENT PLAN LIMAHULI VALLEY ARCHAEOLOGICAL SITES

Literature searches show that there has never been any archaeological work on the 1005 acres that comprise Limahuli Gardens and Preserve prior to the surface survey and mapping done by the Bishop Museum at the NTBG's request (Patolo and Cleghorn 1989). Limited archaeological work carried out in the surrounding area indicates that the Hawaiians may have colonized the coastal dunes of Ha'ena as early as A.D. 400 (N. McMahon HPP, pers. comm.). The Limahuli/Ha'ena area is in need of a thorough archaeological study that will attempt to determine the approximate colonization dates for the coastal areas, as well as the mauka (inland) areas, the uses of these areas, and the impact that the Hawaiian culture had on the pre-contact ecosystems.

The importance of this research and the scope of the project demand that only a top-quality archaeologist or team of archaeologists oversee this project. This will undoubtedly be a long-term and very costly project. The NTBG therefore should search for (and assist where possible) a qualified individual or organization able and willing to take on the project, which will include the establishment of a long-term research program as described in Objective (9) below.

Because the scope of this Management Plan is long-term and quite broad, the NTBG has developed a range of objectives, some of which already have been achieved or can be achieved in the near future, while others will not be achieved for many years to come. These objectives seek to not only preserve and protect but to study these ancient sites and utilize them as educational tools.

With this in mind, the following are the NTBG's Management Objectives for the archaeological sites that exist in Limahuli Valley.

MANAGEMENT OBJECTIVES

1. To stabilize, preserve, and protect archaeological site 50-30-02-1005 located within the Garden Area of Limahuli Valley for future generations.
2. To perform a surface survey and instrument-aided mapping of all of the archaeological features located within the Garden Area. (Most of these features have been mapped (Exhibit 11), although additional features may need to be added to the map once the dense alien vegetation is completely removed from the Garden Area.)
3. To gain more understanding about the age and various uses of archaeological site 50-30-02-1005 through subsurface testing of selected features within the Garden Area, and to develop preservation plans in conjunction with the State's Historic Preservation Program that produce an accurate interpretation of these features.
4. To stabilize, preserve, and protect the archaeological sites located within the Lower Limahuli Preserve.
5. To perform a surface survey and instrument-aided mapping (where possible) of the archaeological sites located within the Lower Limahuli Preserve.
6. To gain more understanding about the ages and various uses of the archaeological sites located within the Lower Limahuli Preserve through the subsurface testing of selected features, and to develop adequate preservation plans for these sites.
7. To utilize the archaeological sites within Limahuli Valley as a resource for the NTBG's Educational Programs.
8. To protect, through educational means, those sites and features that are not located on property controlled by the NTBG.

CHAPTER V
MANAGEMENT PLAN LIMAHULI VALLEY ARCHAEOLOGICAL SITES

9. To promote (and assist where possible) an independent archaeologist who will coordinate an indepth Archaeological Research Program that will include but not be limited to:
 - a. Formalizing a research proposal.
 - b. Raising the necessary funding through grants or other means. (This may be one aspect of the Program that the NTBG can substantially help with.)
 - c. Coordinating all aspects of the program with adjacent property owners, especially the State of Hawai'i (owners of the adjacent Ha'ena State park, which contains numerous significant sites).
 - d. An exhaustive literature search.
 - e. Field work which will include, surface surveying and mapping, subsurface testing, and the recording of data.
 - f. The synthesis and interpretation of all the data and research into a report (or series of reports) that attempts to elucidate the relationship of Limahuli Valley to the overall ancient Hawaiian community of Ha'ena, its original colonization date(s), its expansion from a coastal community to one occupying the inner reaches of Limahuli Valley, the size of the population this community contained at its zenith, the internal stratification of this community and its role in a larger politically stratified society, and the probable impact of this ancient community on the original ecosystems (pre-Polynesian contact).

MANAGEMENT GUIDELINES

The task of accomplishing the aforementioned Management Objectives for the archaeological sites within Limahuli Valley will require a significant amount of human activity. Five Management Guidelines are recommended to help guide the NTBG and the other professionals involved in the long-term management of these sites in upholding not only the Management Objectives outlined above, but also the Foundations of this Master Plan (Chapter I).

1. The stabilization, preservation, protection, and maintenance of all the archaeological sites in Limahuli Valley must be done in a manner that will not adversely impact the terrestrial or aquatic environments and/or scenic value of Limahuli Valley.
2. The construction of any physical facilities in Limahuli Valley must be done in a manner that will not adversely impact the archaeological sites, the terrestrial or aquatic environments and/or scenic value of Limahuli Valley.
3. All archaeological work performed in Limahuli Valley must be done by a well-respected, professional archaeologist with an ability to work with the State's Historic Sites Preservation Program as well as with adjacent property owners.
4. All artifacts recovered must not be sold or traded, but should be permanently preserved as displays for educational purposes and scientific study in Limahuli Valley, although they can be loaned to reputable museums for display and study there.
5. All ancient human remains must be left undisturbed in their original location in Limahuli Valley.

CHAPTER VI

MANAGEMENT PLAN FOR LIMAHULI STREAM

OVERVIEW

The Limahuli Stream is a nearly pristine Hawaiian stream. It has never been highly modified by man, although the ancient Hawaiians and possibly the Chinese immigrants in the late 19th century did use its waters to irrigate some of their crops. Today, its waters are not diverted to irrigate sugarcane, nor are they polluted with runoff from subdivisions, agricultural fields, or cattle pastures.

The pristine nature of Limahuli Stream makes it an irreplaceable resource. Aquatic Biologist, Dr. Amadeo Timbol, studied Limahuli Stream and documented the high quality of the aquatic environment and macrofauna living in it. In his written report (Appendix II) he concluded that, "*Needless to say, the endemic fish and crustaceans now found in Limahuli Valley are priceless*" (Timbol 1990). The NTBG realizes its importance and value and will strive to maintain Limahuli Stream in its pristine condition. As such, its Management Objectives for Limahuli Stream are as follows:

MANAGEMENT OBJECTIVES

1. To preserve and protect Limahuli Stream in its existing nearly pristine state for future generations to use and appreciate.
2. To periodically study and document the aquatic organisms living in Limahuli Stream and the quality of the aquatic environment so that the NTBG can determine the effects, if any, of improvements or changes made in Limahuli Valley¹⁰ upon the stream's quality.
3. To improve the quality and nature of the Limahuli Stream through the removal of alien organisms, should future technology make this feasible.
4. To use Limahuli Stream as part of the NTBG's Programs and to educate the public about the fragile balance that exists in a pristine Hawaiian stream.
5. To protect, through educational means, the parts of Limahuli Stream that are not located on property controlled by the NTBG.

¹⁰ The fulfillment of this objective will allow NTBG to have an early warning of any decrease in stream quality and a chance to mitigate any negative impacts before irreversible damage is done to the aquatic environment of the stream.

CHAPTER VI
MANAGEMENT PLAN FOR LIMAHULI STREAM

MANAGEMENT GUIDELINES

To safeguard the nearly pristine nature of the stream and the aquatic environment of which it is a part, and to accomplish all of the Limahuli Stream Management Objectives as well as the General Master Plan Objectives, the following Management Guidelines are recommended.¹¹ The guidelines are meant to assist the NTBG and the private staff associated with research work in Limahuli Valley in maintaining or improving (if possible) the quality of Limahuli Stream.

1. The improvements of terrestrial habitats must be performed in a manner that will not adversely effect the aquatic environment of Limahuli Stream. To achieve this the following measures and practices are suggested:
 - a. All newly cleared areas must be immediately replanted with a ground cover to prevent soil erosion into the stream.
 - b. If all riparian¹² vegetation must be removed, only small sections of riparian vegetation should be removed at any one time. Additionally, new replacement native vegetation should be immediately planted so that a new canopy is quickly established.
 - c. When the application of pesticides or fertilizers is necessary they must be applied in a manner that will not allow them to enter and contaminate the stream.
2. The stabilization, preservation, protection, and study of the archaeological sites within Limahuli Valley must be performed in a manner that will not adversely effect the aquatic environment of Limahuli Stream.
3. The construction and use of all physical facilities within Limahuli Gardens and Preserve must be performed in a manner that will not adversely effect the aquatic environment of Limahuli Stream. To achieve this the following are suggested:
 - a. Keep all maintenance roads, hiking trails and structures away from the stream as much as possible. This will help to prevent any soil eroded from these facilities from washing into the stream and increasing the turbidity of the water.
 - b. All clearing and trenching associated with the construction of physical facilities should be immediately replanted to prevent eroded soil from these areas from washing into the stream and increasing the turbidity of the water.
 - c. Only wastewater disposal systems that will not adversely effect the aquatic environment of Limahuli Stream shall be used in Limahuli Valley.

¹¹ NTBG is grateful to Dr. Amadeo Timbol for initially presenting many of these guidelines in Sections 5.1 to 5.5 of his unpublished report entitled: "A Descriptive Study of Selected Biological and Physicochemical Characteristics of Limahuli Stream, Kaua'i" (Timbol 1989).

¹²Riparian vegetation is the vegetation growing on the bank of a stream or river. In the case of Limahuli Stream, this riparian vegetation produces shade which helps maintain a cool water temperature.

CHAPTER VI
MANAGEMENT PLAN FOR LIMAHULI STREAM

4. Every effort should be made to keep the fish population in Limahuli Stream native. To achieve this the following are suggested:
 - a. Limahuli Stream must not be stocked with poeciliids¹³ to control mosquitoes. Visitors to the valley who are allergic to mosquito bites should be provided with repellent.
 - b. The stream should not be stocked with alien fish species for the benefit of freshwater fishing enthusiasts (e.g., small mouth bass, large mouth bass, trout, etc.).
 - c. Unauthorized introductions of alien species seems to be a problem on Kaua'i and the NTBG should make every effort to prevent this from occurring in Limahuli Stream by educating the public about the consequences of such unauthorized introductions.
5. The NTBG should take advantage of any future technology to enable it to remove alien organisms (like the Tahitian prawn) now present in Limahuli Stream, and thus improve the habitat for the native organisms, without adversely effecting the aquatic environment of Limahuli Stream or any of the native organism already living there. No attempt to improve the habitat of Limahuli Stream should be undertaken without prior consent of the State's Division of Aquatic Resources.
6. The NTBG should not allow any major water diversions and/or channel alterations to be made in Limahuli Stream. Either of these could have drastic consequences on the aquatic environment of the stream by decreasing the flow and character of the stream.

¹³Poeciliids are any fish belonging to the family Poeciliidae. Many fish in this family like mosquitofish, swordtails, and the Mexican molly are commonly used to eat the mosquito larva living in the waters of a stream.

CHAPTER VII

LIMITING FACTORS GOVERNING THE IMPLEMENTATION OF THIS MASTER PLAN

LIMITING FACTORS

The implementation of NTBG's Master Plan for Limahuli Gardens and Preserve are restricted primarily by two factors: necessary permits and capital.

Necessary Permits

The NTBG must acquire several necessary permits, or declarations of non-applicability, prior to the implementation of this Master Plan. The following are the most vital of these permits:

1. **Conservation District Use (CDU) Permit.** Because Limahuli Valley is located within the Conservation District (Exhibit 22), this is the first permit that must be obtained by NTBG. It is issued by the State of Hawai'i's Department of Land and Natural Resources (DLNR) in response to the filing of a Conservation District Use Application (CDUA). The Board of Land and Natural Resources (BLNR) is responsible for the final decision on all CDUAs.
After reviewing its options, the NTBG plans to submit a CDUA in late April 1991 asking the BLNR to establish a "Special Subzone" (Exhibits 5 & 6) within the Conservation District that will allow the NTBG to manage this area according to this Master Plan.
2. **Special Management Area (SMA) Permit or Determination that the applicants' property is outside of the SMA.** This permit or determination must be obtained by NTBG as part of the CDUA process. It is issued by the County of Kaua'i. Since NTBG's property is outside of the SMA (Exhibit 23), the Kaua'i County Planning Department can make a determination exempting NTBG from having to obtain a SMA permit.
3. **Kaua'i County Building, Electrical, Gas and Plumbing Permits.** The County of Kaua'i does not zone land that falls within the State's Conservation District. This allows the State (DLNR) to maintain sole jurisdiction over development within the Conservation District (A. Fukushima-Kaua'i County Department of Planning pers. comm). However, the County does require that all developments within the Conservation District meet with the local building codes. Thus, the NTBG must apply for County permits to install the infrastructure needed in Limahuli Gardens after receiving a CDU permit from the BLNR.

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Obtaining County permits involves the submittal of detailed building and construction plans to the County Planning Department for review. If the plans have not been previously stamped with approval by the DLNR, the County will not accept them.

If the building and construction plans meet the local building codes then the County will issue the applicable permits (i.e., Building, Electrical, Gas, and Plumbing). After receiving these permits, the NTBG is free to start construction but must conform to the requirements of each permit. One of the normal requirements is that work must be commenced within 120 days and never be abandoned for more than 120 days or the permits will become null and void. Thus the NTBG must be ready to commence construction once the County permits are issued.

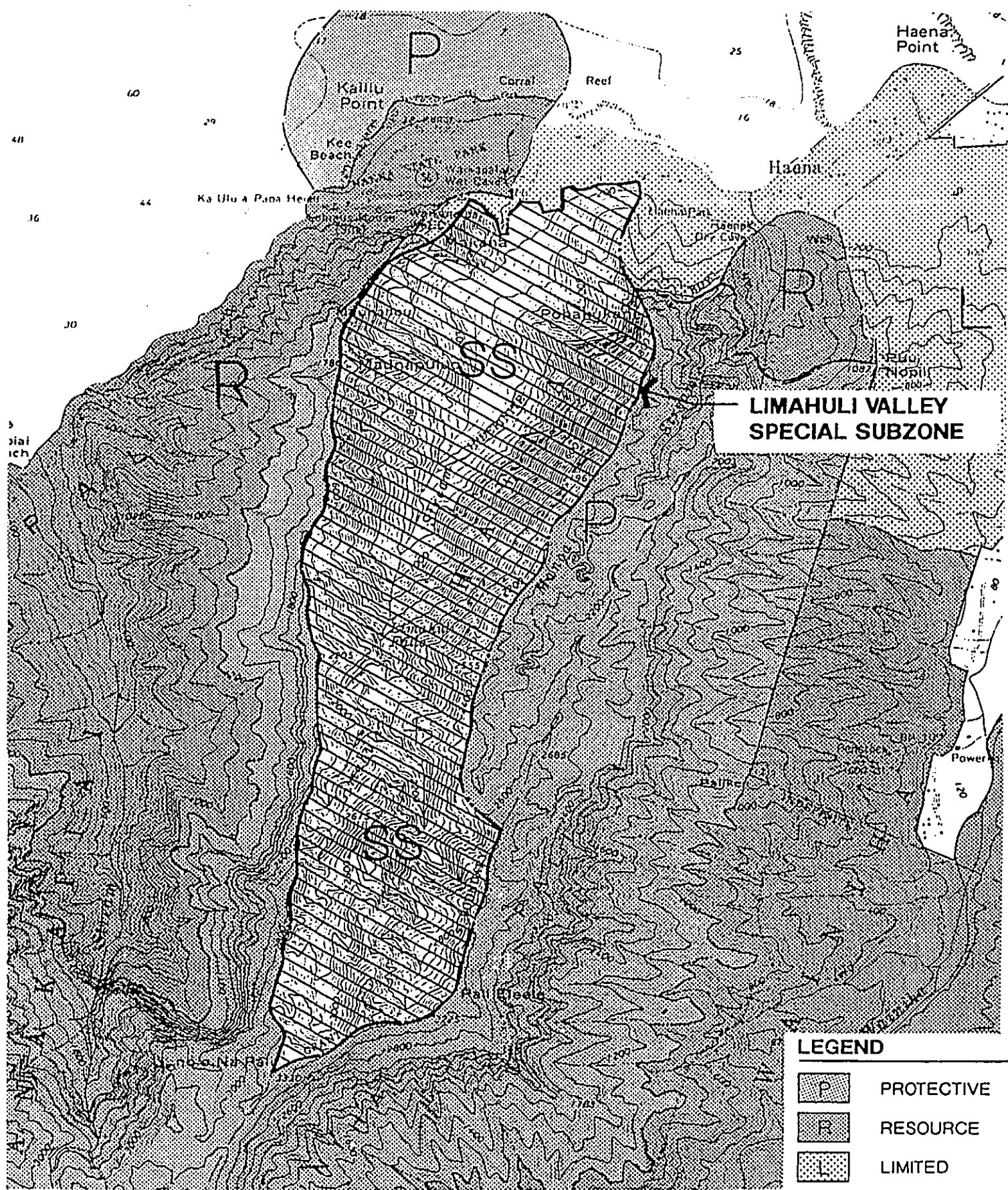
Capital

The second limiting factor for the implementation of the NTBG's Programs and Improvement Plans is funding. Because the NTBG is a non-profit organization run primarily on donations and grants, it must raise the money needed to implement its programs and construct its physical facilities. Money for capital improvements does not normally come from the fiscal operating budget.

The first priority of the NTBG is the maintenance of its Living Collections and the grounds. Currently, about two-thirds of its fiscal operating budget goes to payroll, the expenses of insurance, and utilities. This leaves about one-third for research projects, educational programs, and their associated costs. (Most research funds come from grants for specific projects from foundations, government agencies, corporations, etc.) There is little room in the annual budget for capital improvements and/or expensive research projects. Fortunately, most donors prefer to give money for specific projects whose results they can see in short order.

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These considerations require that the time element in this Master Plan be almost the exact opposite of the plan for a commercial development. In a commercial plan, a rigid schedule is essential to demonstrate to the prospective lenders that if they lend the capital, the project will be completed and generate revenues fast enough to pay back the loan plus interest on time. With a non-profit project like Limahull, what is needed is not a rigid schedule but **flexibility**, so that programs can be initiated early in a small way, and then be expanded as capital is received. Limahull Gardens and Preserve is not something that will be built and then rented out or sold to pay off a loan. Rather, it will be a long-term project whose success will be measured not by the revenue it generates but by the plants and programs that it nurtures.



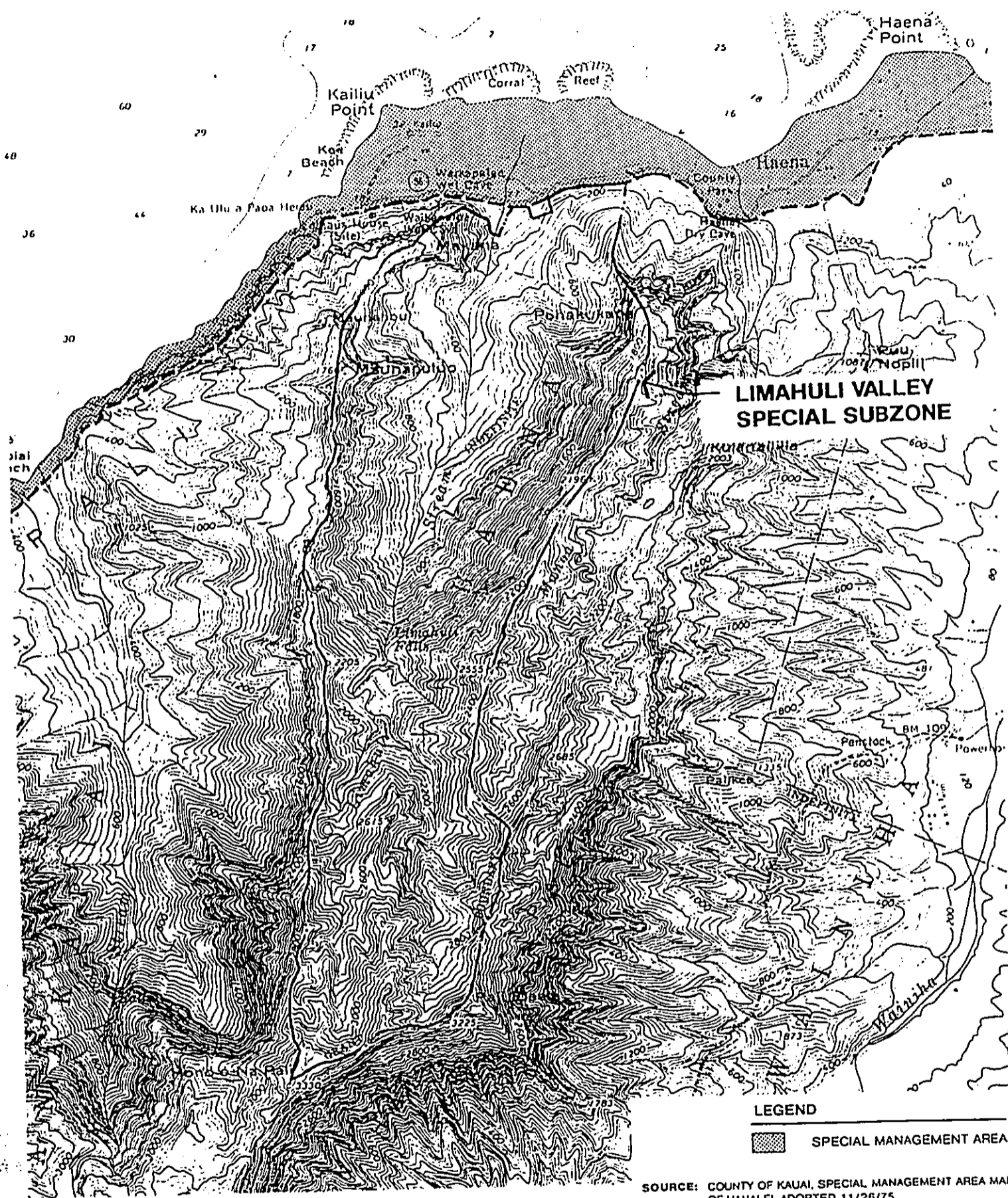
SOURCE: DEPARTMENT OF LAND AND NATURAL RESOURCES, QUAD K-3, 1983

EXHIBIT 22
CONSERVATION DISTRICT SUBZONES

LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN

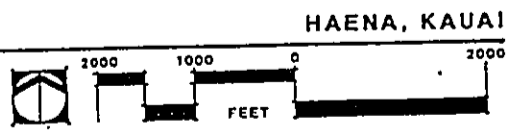
HAENA, KAUAI





SOURCE: COUNTY OF KAUAI, SPECIAL MANAGEMENT AREA MAP OF HANAIEI, ADOPTED 11/26/75

EXHIBIT 23
 KAUAI COUNTY SPECIAL MANAGEMENT AREA
LIMAHULI VALLEY
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HAENA, KAUAI

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CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

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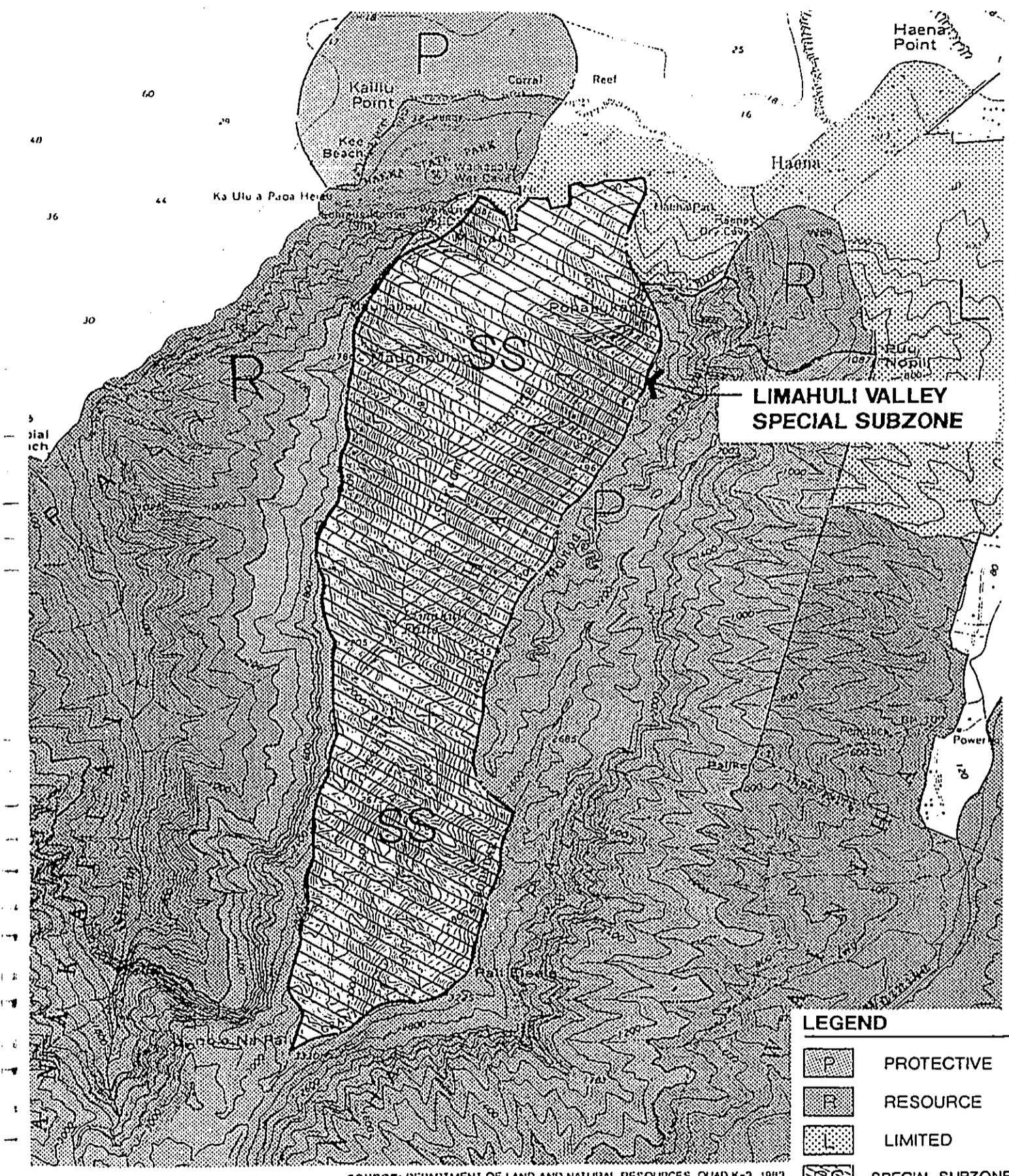
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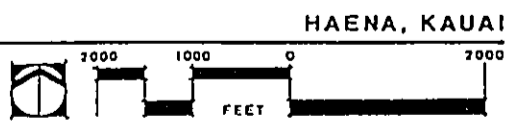
SOURCE: DEPARTMENT OF LAND AND NATURAL RESOURCES. QUAD K-3. 1983

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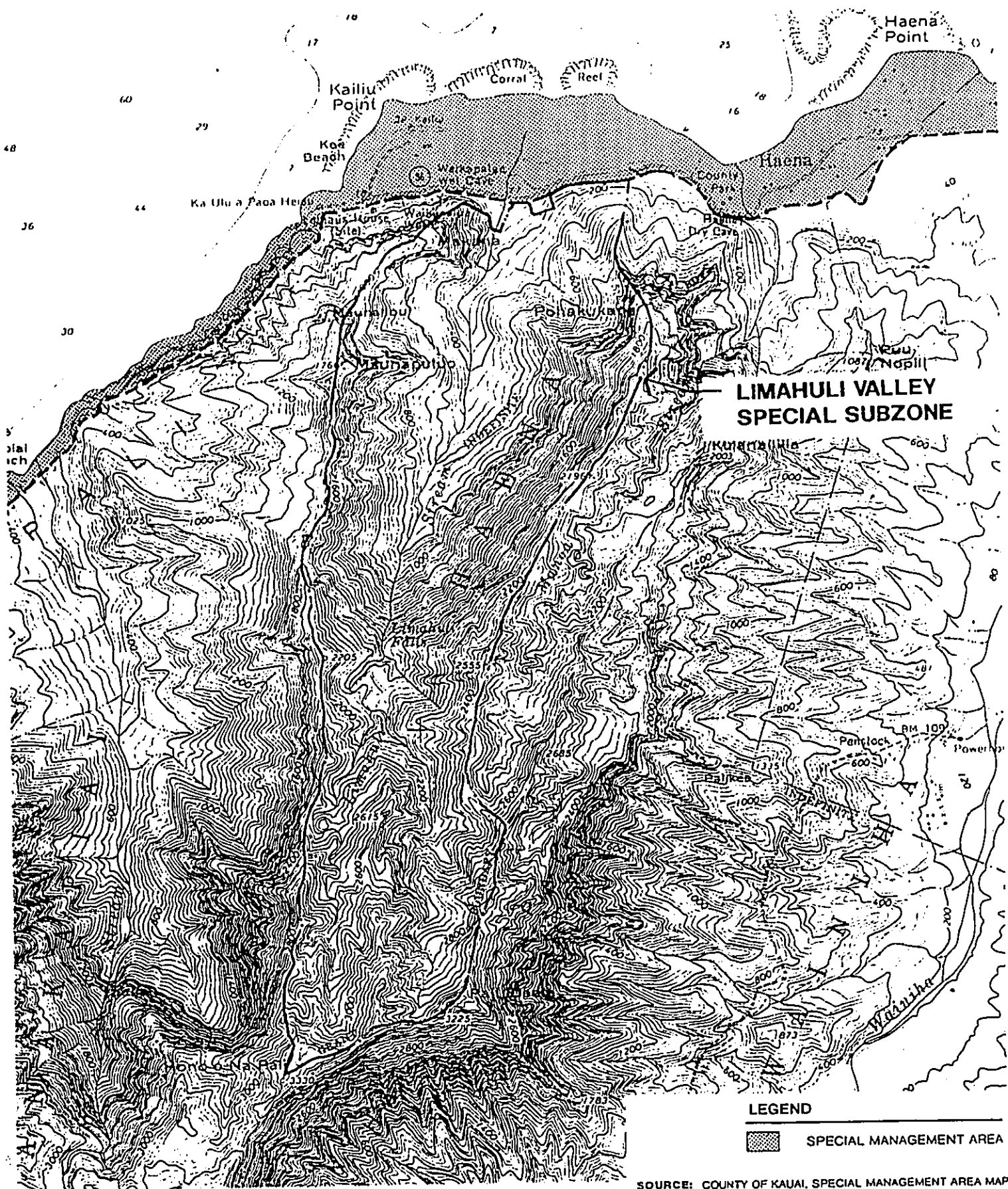
LIMAHULI VALLEY
NATIONAL TROPICAL BOTANICAL GARDEN

LEGEND

	PROTECTIVE
	RESOURCE
	LIMITED
	SPECIAL SUBZONE



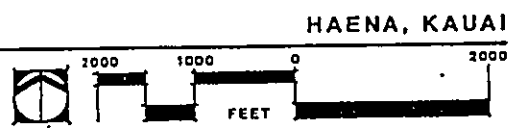
MASTER PLAN FOR LIMAHULI GARDENS AND PRESERVE
EXHIBIT



LEGEND
 SPECIAL MANAGEMENT AREA

SOURCE: COUNTY OF KAUAI, SPECIAL MANAGEMENT AREA MAP OF HANAIEI, ADOPTED 11/26/75

EXHIBIT 23
 KAUAI COUNTY SPECIAL MANAGEMENT AREA
LIMAHULI VALLEY
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- Carson, H.L. 1985. Gene pool conservation: *in* Stone, C.P. and D. B. Stone (eds.), Conservation biology in Hawai'i. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, pp. 118-124.
- Conant, S. 1985. Ecosystem monitoring, restoration, and management in Hawai'i: a summary: *in* Stone, C.P. and J.M. Scott (eds.), Hawai'i's terrestrial ecosystems: preservation and management. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, pp. 475-480.
- Dept. of Health. 1988. Wastewater systems. Administrative rules of the Department of Health, State of Hawaii, providing prohibitions and general requirements for wastewater treatment systems. Title 11, Chapter 62, Honolulu, Hawaii.
- Dept. of Land and Natural Resources. 1985. Administrative rules of the Department of Land and Natural Resources, State of Hawaii, providing for land use within the Conservation District, providing for subzones, uses, appeals, enforcement and penalty, pursuant to Chapter 183-41, as amended. Hawaii Revised Statutes. Title 13, Chapter 2, Honolulu, Hawaii.
- Dye, T. 1989. Tales of two cultures: traditional historical and archaeological interpretations of Hawaiian prehistory. Bishop Museum Occasional Papers, 29:3-22.
- Flynn, T.W. 1990. Botanical survey Limahuli Valley conservation district use application, Halelea district Island of Kauai. (unpublished).
- Hanalei Project, The. 1988. Hanalei cultural resources management plan. 1000 Friends of Kauai, Hawaii, p. 58.
- Hume, L.M. 1986. Some plants of Hanalei. The Bulletin. Pacific Tropical Botanical Garden, 16: 37-48.
- James-Palmer, R.M. 1989. Hawaiian organic growing guide. Oasis, Maui, Inc., Bookcrafters, Chelsea, Michigan, pp. 21-34.
- National Tropical Botanical Garden. 1989. Statement of purposes for Limahuli gardens and preserve. Adopted by the Board of Trustees of the National Tropical Botanical Garden, 9/20/89. (unpublished).
- Pacific Tropical Botanical Garden. 1987. Limahuli Valley conservation district use application, KA-2065. (unpublished).
- Patolo, T. and P.L. Cleghorn, 1990. Archaeological mapping and reconnaissance survey in lower Limahuli valley, Ha'ena, Kaua'i. Public Archaeology Section, Applied Research Group, Bishop Museum, Honolulu. (unpublished).

ACKNOWLEDGEMENTS AND REFERENCES

- Rosendahl, P.H. 1976. Contract archaeology in Hawaii. *New Zealand Archaeology Association Newsletter*, 19(3): 142-50.
- Santos, G.L., D. Kageler, D.E. Gardner, and C.P. Stone. 1986. Herbicidal control of selected alien plant species in Hawaii volcanoes national park. Cooperative National Park Resources Studies Unit Technical Report 60, Botany Dept., University of Hawaii, Honolulu.
- Schonewald-Cox, C. 1985. Genetics, minimum population size, and the island preserve: *in* Stone, C.P. and J.M. Scott (eds.), *Hawai'i's terrestrial ecosystems: preservation and management*. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, pp. 432-433.
- Smith, C.W. 1985. Impact on alien plants on Hawaii's native biota: *in* Stone, C.P. and J.M. Scott (eds.), *Hawai'i's terrestrial ecosystems: preservation and management*. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, pp.180-250.
- Stone, C.P. 1985. Alien animals in Hawaii's native ecosystems: towards controlling the adverse effects of introduced vertebrates: *in* Stone, C.P. and J.M. Scott (eds.), *Hawai'i's terrestrial ecosystems: preservation and management*. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, pp. 251-288.
- Stone, C.P. and J.M. Scott. 1985. Hawai'i's native ecosystems: importance, conflicts, and suggestions for the future: *in* Stone, C.P. and J.M. Scott (eds.), *Hawai'i's terrestrial ecosystems: preservation and management*. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, pp. 495-534.
- Theobald, W.L. 1987. Final performance report, IMS Grant No. IC-50023-85. (unpublished).
- Timbol, A.S. 1989. A descriptive study of selected biological and physicochemical characteristics of Limahuli stream, Kauai, Hawaii. (unpublished).
- Wagner, W.L., D.R. Herbst, and R.S.N. Yee. 1985. Status of the native flowering plants of the Hawaiian Islands: *in* Stone, C.P. and J.M. Scott (eds.), *Hawai'i's terrestrial ecosystems: preservation and management*. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, pp. 23-64.
- Wichman, C.R. 1978. Limahuli Valley botanical survey. *The Bulletin. Pacific Tropical Botanical Garden*, 8(1): 1-8.
- United States of America Public Law 88-449; 78 Stat. 496. 1964. An Act to charter by Act of Congress the Pacific Tropical Botanical Garden. U.S. Statutes at Large. Approved August 19, 1964 by Lyndon B. Johnson.

ACKNOWLEDGEMENTS AND REFERENCES

United States of America Public Law 100-478; 102 Stat. 2306. 1988. An act to authorize appropriations to carry out the Endangered Species Act of 1973 during fiscal years 1988, 1989, 1990, 1991, and 1992, and for other purposes. U.S. Statutes at Large. Approved October 7, 1988 by George Bush.

United States of America Public Law 100-539; 102 Stat. 2718. 1988. An Act to change the name of the Pacific Tropical Botanical Garden, a federally chartered organization, to the National Tropical Botanical Garden, and for other purposes. U.S. Statutes at Large. Approved October 28, 1988 by George Bush.

SUGGESTED ADDITIONAL READINGS

Anonymous. 1968. Best ways to improve your soil. Organic gardening and farming staff, Rodale Press, Inc. Emmaus, PA.

Anonymous. 1980. Endangered and threatened wildlife and plants: review of plant taxa for listing as endangered or threatened species. Dept. of Interior, U.S. Fish and Wildlife Service, Washington D.C., Federal register 45(242):82480-82569.

Carlquist, S. 1970. Hawaii, a natural history. Geology, climate, native flora and fauna above the shoreline. The Natural History Press, Garden City, N.Y.

Carson, H.L. 1972. Chromosome tracers of the origin of species. *Science*: 168: 1414-1418. (Reprinted in Kay, E.A. (ed.), *A natural history of the Hawaiian Islands*. University of Hawaii Press, Honolulu, Hawaii, pp. 546-554.)

Daws, G. 1968. Shoal of time: a history of the Hawaiian Islands. University Press of Hawaii, Honolulu, Hawaii.

Emerson, N.B. 1965. Unwritten literature of Hawaii: the sacred songs of the hula. Charles E. Tuttle Co., Inc., Tokyo, Japan.

Fosberg, F.R. 1972. Derivation of the flora of the Hawaiian Islands: *in* Kay, E.A. (ed.), *A natural history of the Hawaiian Islands*. University of Hawaii Press, Honolulu, Hawaii.

Fosberg, F.R. and D.R. Herbst. 1975. Rare and endangered species of Hawaiian vascular plants. *Allertonia*, 1(1): 1-72.

Gagne, W.C. and C.C. Christensen. 1985. Conservation status of native terrestrial invertebrates in Hawaii: *in* Stone, C.P. and J.M. Scott (eds.), *Hawaii's terrestrial ecosystems: preservation and management*. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, pp.105-121.

Gosline, W.A. 1972. Considerations regarding the evolution of Hawaiian animals: *in* Kay, E.A. (ed.), *A natural history of the Hawaiian Islands*. University of Hawaii Press, Honolulu, Hawaii, pp. 499-505.

ACKNOWLEDGEMENTS AND REFERENCES

- Kepler, C.B. 1985. Current and future roles of agencies, conservation groups, legislature, and the public in preserving and managing Hawaiian ecosystems: a summary: *in* Stone, C.P. and J.M. Scott (eds.), *Hawai'i's terrestrial ecosystems: preservation and management*. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, pp. 483-492.
- Kirch, P.V. 1985. *Feathered gods and fishhooks: an introduction to Hawaiian archaeology and prehistory*. University Hawaii Press, Honolulu, Hawaii.
- Lamoureux, C.H. 1985. Restoration of native ecosystems: *in* Stone, C.P. and J.M. Scott (eds.), *Hawai'i's terrestrial ecosystems: preservation and management*. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, pp. 422-429.
- Sherman, G.D. 1972. Tropical soils of the Hawaiian islands: *in* Kay, E.A. (ed.), *A natural history of the Hawaiian islands*. University of Hawaii Press, Honolulu, Hawaii, pp. 205-252.
- Stone, C.P. and D.B. Stone. 1989. *Conservation biology in Hawai'i*. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu.

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APPENDIX I

BACKGROUND INFORMATION ON THE DEVELOPMENT OF THE NTBG'S MASTER PLAN FOR LIMAHULI VALLEY

BY

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THE GENESIS OF THIS MASTER PLAN FOR LIMAHULI VALLEY

The NTBG's Master Plan for Limahuli Gardens and Preserve has developed out of a series of "needs" that are very diverse in nature. They range from a broad global need for the conservation of tropical plant life to Hawai'i's unique environmental needs, and specifically the needs of the National Tropical Botanical Garden (NTBG), as an organization, and Limahuli Valley, as a place in need of judicious management. This Appendix will describe these needs and show how they have all led to the development of the NTBG's Master Plan for Limahuli Gardens and Preserve.

Demography, the statistical study of human populations, shows an alarming trend in the growth of the world population since 1650 A.D. Prior to 1650, the world population doubled approximately every 1,500 years. Then between 1650 and 1850 it doubled in only 200 years, and by 1930 the world population had again doubled in a mere 80 years. This rapid decrease in doubling time continued and by the mid-1970s (in only 40 years), the population had doubled again to an estimated 4 billion people (Wallace et. al. 1981).

This explosive increase in world population has necessitated a corresponding increase in the exploitation of the planet's natural resources by man. In the last 60 years, as man's technology has become more sophisticated, we have begun to realize that there is a definite limit to the environmental damage this planet will tolerate while still being able to support man's existence. *"Population biologists, notably Paul Ehrlich and Garrett Hardin, were among the first to sound warnings about the ultimate consequences of unbridled population growth. Simple arithmetic showed that the growth rate of the 1950s would outstrip the world of resources and space"* (Wallace et. al. 1981).

The tropical rain forests of the world are one of the natural resources that have been severely depleted in the last 50 years. As ever-increasing sections of these forests are cut down, untold plant and animal species are lost to extinction, and the global environmental picture has slowly and irreversibly changed. Today, ecologists and meteorologists are linking the destruction of millions of acres of tropical rain forests to a trend in global warming that is predicted to effect most of the world (Myers 1984).

Nowhere is the concept of "limited natural resources" and the environmental damage resulting from their over-exploitation by man more apparent than on small oceanic islands. Islands have a clear, definable limit to their natural resources.

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Because of this, the conservation and judicious management of the natural resources on oceanic islands is not a luxury, but a necessity. Human populations that have lived and evolved as part of an island's ecosystems (an ecosystem embodies all of the plant and animal life forms in a given ecological zone, as well as their interaction with the non-living portions of that area) have been compelled to become more environmentally aware. This has resulted primarily because environmental issues are magnified when viewed from within an island's ecosystem, of which man is a part (Newman 1972).

The Hawaiian archipelago is unique in that it is the most isolated chain of oceanic islands in the world. This isolation has resulted in the development of a unique flora and fauna which are considered the world's best example of endemism¹. The millions of years of isolation that helped create this endemic flora and fauna have also made it very sensitive to the impact of man. When the first Polynesian colonizers arrived in Hawai'i about the fourth or fifth century A.D. (Kirch 1985), they brought with them alien² animals and plants, which began to slowly exert pressure on the existing ecosystems. Since then, the environmental pressure has increased, slowly at first then more and more quickly, with the arrival of continental men and their concomitant alien plants and animals (Gagne and Cuddihy 1990).

Today, the environmental pressures on Hawai'i's unique native ecology demand the implementation of comprehensive management plans that actively mitigate man's damage to the native environment. Many alien plants and animals have firmly established themselves in most of the terrestrial ecosystems and are continually expanding their dominance and control. Management plans that protect areas through passive techniques like zoning and restrictive covenants are no longer adequate forms of protection for many areas (Franklin 1985).

Currently, over 40 percent of Hawai'i's approximately 1,000 native plant species are considered threatened (Wagner et al. 1985). Furthermore, although Hawai'i comprises only a tiny portion of the total land area of the United States, more than 25 percent of the country's listed endangered species and 72 percent of recorded extinctions involve species endemic to Hawai'i (U.S. Fish and Wildlife Service 1980). The time has come for man to accept the responsibility for his past actions, and begin to take an active role in trying to reverse or at least slow the continual degradation of Hawai'i's unique native habitats before more species are lost to extinction. Land managers throughout the State need to begin implementing "action based" management plans that have the potential to provide locally improved habitats for Hawai'i's remnant native flora and fauna.

¹ "... the percentage of endemism at both the species and genus level is higher (in Hawai'i) than for any other area in the world, a measure of isolation in time and space primarily, but also of the ecological richness which spurs change in immigrant stocks" (Carlquist 1970).

² Six terms are commonly used to describe species not native (endemic or indigenous) to an area. These are adventive, alien, exotic, introduced, naturalized and weed. Today, in many parts of the world, "alien" is the preferred word and is entirely appropriate because its meaning is direct and it also has the strong and desirable connotation of "not belonging" (Smith 1985).

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THE UNITED STATES CONGRESS RECOGNIZES A NEED

In 1964, the 88th Congress of the United States recognized the need to conserve and protect the tropical plant resources of the world, especially the threatened and endangered species. To help meet this goal, the 88th Congress passed Public Law 88-449 which established the National Tropical Botanical Garden (formerly the Pacific Tropical Botanical Garden) as a non-profit organization (Master Plan Chapter I).

As the years went by, the United States Government further realized the urgent need to protect not only rare and endangered species in botanical gardens and zoos, but also their natural habitats. Thus, in 1973, the 93rd Congress of the United States passed the Federal Endangered Species Act, which protected endangered plant species and their critical habitats. With time, the government realized that the scope of the existing law needed to be expanded further. Recovery plans were needed for many of the depleted populations of endangered species. Thus, Public Law 100-478 (passed in 1988) amended the Endangered Species Act to include the development of "recovery plans" that will actively promote the conservation and survival of endangered species.

THE NTBГ RECOGNIZES ITS NEED

After receiving its Congressional Charter in 1964, the NTBГ faced its first major need. This was to find a suitable site--a site that would allow it to become a national resource in tropical botany and horticulture.

Although deciding upon a "suitable" site was a very difficult process involving many factors (i.e., the number and type of ecosystems contained by the site, current land zoning, accessibility, existing use of the site, existing infrastructure, availability of utilities and, of course, the cost of acquiring the site) a decision was finally made. In January 1970, ground was broken for the headquarters of the NTBГ at *Kumuokalani* in the Lawai Valley on the Hawaiian island of Kaua'i (Stewart 1971).

The NTBГ's Need for Additional Sites

The following excerpt from the dedication address³ given at the NTBГ's ground breaking in Lawai describes the Lawai garden's role in the future chain of gardens that would someday make up the NTBГ. *"It (the Lawai site) is the perfect "mother garden" to the satellite gardens which will be needed in time, to fully use the great diversity of tropical climate which Hawaii offers"* (Lennox 1971). As the Lawai garden and its living collections of plants grew, the need for additional sites grew with it, sites that would provide a variety of ecosystems.

Tropical flora the world over exists in many different ecosystems. In Hawaii, 14 ecological zones have been identified, and 38 principal plant communities have developed within them (Wagner et al 1985, Gagne and Cuddihy 1990). The

³ The dedication address was given on January 30, 1970, by Colin G. Lennox a member of NTBГ's original Scientific Advisory Committee.

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headquarters site in Lawai, including Lawai Kai (the Allerton estate at the mouth of the valley, which contains a sandy beach and sections of rocky shoreline), encompasses basically two ecological zones: the Leeward Coastal and Leeward Lowland zones. These two zones are not capable of supporting all of the 38 different plant communities found in Hawai'i. The NTBG's experience in growing plants in Lawai has shown that this site clearly has ecological limitations that horticulturists have difficulty trying to overcome. These ecological limitations thus led to the NTBG's need to increase the diversity of the ecosystems in its organization.

The NTBG Acquires New Sites

Over the years, the NTBG's need for more diverse ecosystems led to the acquisition of two satellite gardens in Hawai'i. These are Kahanu Gardens on Maui, and the Limahuli Gardens on Kaua'i. (The NTBG also has a satellite garden in Florida called the Kampong, which is the former home of the world famous horticulturist David Fairchild.) The two Hawaiian satellite sites have added several different ecosystems which will allow the NTBG to grow a wide range of tropical plants. Even with the addition of these satellite gardens, however, the NTBG's Scientific Advisory Committee for Living Collections⁴ recommended the continued acquisition of additional sites (ecosystems) that would allow the NTBG to grow an even more diverse collection of tropical plants. Because of the vast number of ecological zones in Hawai'i, and around the world, this will undoubtedly be a continuing goal for the NTBG.

Although the NTBG had little in the way of funds to purchase these three gardens, it became the beneficiary of several generous patrons. In 1972, the Kahanu-Matsuda family and the Hana Ranch, Inc. generously gave 60 acres of land in Hana, Maui, to the NTBG. (An additional 60 acres has just recently been added to this site.) This gift became the second link in what would someday be a chain of gardens and was named the "Kahanu Gardens", after the Kahanu-Matsuda family (Bulletin 1972). The Kahanu Gardens, located at Kalahu point on the wet, windward coast of Maui, added the Wet Coastal ecosystem to the NTBG's portfolio.

In 1976, through the generosity of Mrs. Juliet Rice Wichman and her son, Charles Rice Wichman, six lots totaling 12.89 acres in Limahuli Valley, Ha'ena, Kaua'i, were given to the NTBG. This area contains two ecosystems: the Lowland Rainforest and the Mixed Mesophytic Forest. It also contained the basic infrastructure of a garden started nine years earlier and was a valuable addition to the NTBG.

The Wichman family continues to own 992 additional acres of land in Limahuli Valley and intends to donate this vast area to the NTBG. The terms of this gift are the subject of current negotiations that will allow for the use of this exceptional area as part of the Limahuli Gardens and Preserve as they have been presented in this Master Plan.

LIMAHULI'S NEED FOR JUDICIOUS MANAGEMENT

⁴ NTBG has three Scientific Advisory Committees (Education; Research and Publications; and Living Collections) made up of well-respected world leaders in tropical horticulture and botany.

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Beginning with the arrival of the Hawaiians and the impact of people on the native ecosystems in Limahuli, the area has been in need of judicious management. The ancient Hawaiian culture that utilized Limahuli Valley managed it primarily to provide food for their society. The need to feed a growing population forced them to cultivate and terrace hundreds of acres of land. Unfortunately this process was the first step in the destruction of the flora and fauna native to Limahuli Valley. In spite of the injury they inflicted on the original ecosystems, the ancient Hawaiians were actually very aware of their surrounding environment. They practiced the concept of *malama 'aina*, caring for the land as if it were their child, and because of this, they were able to live in the Limahuli area for hundreds of years without depleting and polluting their essential natural resources.

The need for judicious management of the Limahuli area increased dramatically with the beginning of Hawai'i's modern history in 1778. Continental men brought alien plants, animals, and diseases which devastated the Hawaiian ecosystems and the Hawaiians themselves. Within 100 years, epidemics of new diseases like tuberculosis, small pox, leprosy, typhoid fever, influenza, and venereal diseases had decimated most of the Hawaiian population (Joesting 1984), and alien plants and animals (primarily the herbivores) had firmly established themselves in Hawai'i and were overrunning the native ecosystems.

Limahuli was not spared the devastating impacts of this era. Little is written or known about exactly what happened to the Hawaiians living here between 1778 and 1848. Apparently, the local population nearly disappeared and feral cattle were introduced to the area (J. Wichman pers. comm.). The year 1848 was a major turning point in Hawaiian history, marking the beginning of fee-simple ownership of land in Hawai'i. This change, known as the Great Mahele (distribution), was a complicated process that gave native Hawaiians the right to make claims to land and to own it in fee simple. During the Mahele, the *ahupua'a* of Ha'ena (an ancient Hawaiian division of land that included all the resources from the mountains to the off-shore fishing rights) became the property of Abner Paki, an absentee landlord from Oahu who had no real connection to Kaua'i or, in particular, Limahuli Valley. He therefore exerted little control over the management of the area. In 1875, the *ahupua'a* of Ha'ena was sold to a *hui* (partnership) of 38 local residents. Their official name was the *Hui Kual 'Aina o Ha'ena* (the partnership that purchased the land of Ha'ena), although they soon became known as the "Ha'ena Hui". For 80 years, the "Ha'ena Hui" used Limahuli Valley primarily to pasture their feral cattle, although naturalized alien vegetation in the back of the Limahuli Valley indicates that the area could have been inhabited during this time (Flynn 1990).

In 1955, at the request of the Ha'ena Hui, the Fifth Circuit Court began partition proceedings on the Hui's lands. By this time, there were 98 claimants for the original 38 shares. Thus the partition was a difficult process and took 12 years, or until 1967, to complete (Ching 1967, O'Neil 1967, The Garden Island 1968).

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The period of time that began with the disappearance of the ancient Hawaiians in the early 19th century and ended with the partition of the Ha'ena Hui by the Fifth Circuit Court of Hawai'i in 1967, was a very destructive time for Limahuli. Not only were the native ecosystems greatly diminished, but also a vast number of archaeological sites were severely damaged by the cattle that were allowed to roam unfettered. This period in Limahuli's history is characterized by the absence of a long-range management plan. The area was managed for the immediate needs of the landowners with no real thought of the impact of the cattle on the existing ecosystems. Fortunately, this was destined to change with the partition of the Hui lands.

Mrs. Juliet Rice Wichman, a *kama'aina* (native born), moved to Ha'ena in 1946 and immediately recognized the need to preserve and protect Limahuli Valley. During the partition proceedings of 1955 to 1967, the court and the plaintiffs recognized the desire of Mrs. Wichman to preserve the area and assigned her 1,005 acres of Limahuli Valley. In 1967, when the court partition proceedings were completed, the cattle were removed from the valley, it was fenced in, and Limahuli Gardens then moved into its new location. (The concept of Limahuli Gardens originated in the early 1950s, but it was not until 1964 that ground was broken on the west side of Limahuli Stream on a Ha'ena Hui allotment owned by Dora Jane Cole, cousin to Mrs. Wichman. In 1967, the Gardens' location was moved across the stream to Mrs. Wichman's property so that it could expand and realize its potential.)

After suffering nearly 150 years of little or no management, Limahuli Valley once again had a dedicated and caring land manager. In 1976, in an effort to assist the NTBG and at the same time prevent the six house lots (Lots 140 to 145) that made up the majority of Limahuli Gardens from ever being developed as residences,⁵ Mrs. Wichman and her son, Charles Rice Wichman, gave the six house lots to the NTBG.

Because of the NTBG's non-profit status and its commitment to existing projects, Limahuli Gardens was not immediately destined to change after being donated in 1976. The NTBG continued to maintain what was given to them but did not immediately formulate a master plan that addressed the future use, or improvement of, Limahuli Gardens. Instead, the Gardens continued to be guided unofficially by the dream of preservation originally conceived over 40 years earlier by Mrs. Wichman. Her dream was to see Limahuli Valley preserved and used for educational purposes by developing a garden and preserve in this unique and majestic setting.

In 1986, the NTBG and Mrs. Wichman began to work on formalizing her dream of Limahuli Gardens and Preserve. In June 1987, the NTBG filed a Conservation District Use Application (CDUA) with the State of Hawai'i's Department of Land and Natural Resources (DLNR) that contained a Master Plan for the Limahuli Valley (CDUA KA-2065). Because the entire *ahupua'a* of Ha'ena is part of the State's Conservation

⁵ Because these lots were designated and held for "residential use" prior to 1957, (the partition proceedings began in 1955) they carried the "grandfather" right to be developed as residences, even though they were designated as part of the Conservation District under the provisions of Act 187, SLH 1961, and Act 205, SLH 1963 (DLNR Title 13, Chapter 2).

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District (Master Plan Chapter VII), filing a CDUA was a required first step in the implementation of the NTBG's Master Plan. Any improvements or changes in the Conservation District must first be approved by the DLNR. The NTBG's CDUA asked the DLNR to establish the 1005 acres of Limahuli Gardens and Preserve into a "Special Subzone" within the Conservation District. The establishment of the Limahuli Valley Special Subzone would then allow the NTBG to develop the Gardens and Preserve according to their Master Plan, and it would also add another layer of protection to this valuable resource⁶.

On November 5, 1987, Mrs. Wichman passed away at her home in Ha'ena at the age of 86. She had lived a full and happy life trying to help others understand the importance of our natural and cultural Hawaiian heritage. She left two perpetual monuments on her native island of Kaua'i that are dedicated to fulfilling her goals. These are the Kaua'i Museum in Lihue and Limahuli Gardens and Preserve in Ha'ena.

The need for an Environmental Assessment of the NTBG's Master Plan

On October 23, 1987, just before the death of Mrs. Wichman, the NTBG received a notice from the DLNR. The notice stated that after reviewing CDUA KA-2065 the DLNR had determined that an Environmental Impact Statement (EIS) would be required to satisfy the concerns of the DLNR's Office of Environmental Quality Control (OEQC). Two months later, on December 29, 1987, the NTBG withdrew its CDUA in order to raise the funding necessary to prepare an (EIS) that would address the NTBG's Master Plan for Limahuli Valley.

The original Master Plan filed with the DLNR in 1987 (CDUA KA-2065) briefly described the habitat improvements, visitors programs, and physical facilities that the NTBG wanted to implement in Limahuli Valley. The NTBG assumed that the implied and described merits of the project, and the NTBG's role as a leading institution in the field of horticulture, botany, and conservation would be enough to allow the DLNR to approve the NTBG's application as originally presented. The requirements of the OEQC changed the NTBG's approach, and thus, the NTBG set out to raise the funding needed to complete an indepth environmental study.

The Need for an Action-based Management Plan for Limahuli Valley

The revision of the Master Plan for Limahuli Gardens and Preserve to include all of the environmental concerns of the OEQC has been an enlightening process for the NTBG. It has clearly documented and reinforced Mrs. Wichman's and the NTBG's original feelings that there was and is a real need for an action-based management plan for Limahuli Valley.

Under the existing conditions, simply leaving the area untouched would contribute to the rapid and complete degradation of the remnant ecosystems located within the Garden Area and the Lower Limahuli Preserve. Invasive alien plants like

⁶ By placing this land within a Special Subzone designated for the purposes of the NTBG's Master Plan, it can not be developed as residential lots in the future without having it rezoned (J. Lembeck pers. comm.).

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Schefflera actinophylla, *Psidium* spp., *Schinus terebinthifolius*, *Syzygium cummini*, *Clusia rosea*, *Aleurites moluccana*, *Elephantopus mollis*, *Pluchea carolinensis*, *Pueraria lobata*, and *Clidemia hirta* clearly have gained the upper hand and, if allowed to grow unchecked, they will eventually smother the existing native species (Wichman 1978; Flynn 1990).

The NTBG, now more than ever, fully realizes that only through the implementation of a series of comprehensive management plans that demand action can the relentless destruction to the natural and cultural resources in Limahuli Valley be mitigated.

CONCLUSION

From 1987 until today, the NTBG's Master Plan for Limahuli Gardens and Preserve has undergone numerous revisions and changes, but throughout its evolution it has continued to reflect all of the original aspirations Mrs. Wichman had for the area, as well as the needs and goals of the NTBG. Its successful future implementation will not only fulfill these goals, it will set an example of land stewardship for future organizations and land managers to follow.

It has thus become more than a Master Plan. It has become an endeavor that demonstrates that through the dedicated efforts, sacrifices, and cooperation of the Federal, State and County governments, private institutions, private landowners, and concerned individuals, a project of this magnitude can be accomplished for the benefit of future generations.

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REFERENCES CITED

- Anonymous. 1968. Haena hui final division approved. *The Garden Island*, 2/7/68.
- Anonymous. 1972. Maui gift of land to the Pacific Garden is announced. *The Bulletin, Pacific Tropical Botanical Garden*, 2(4): 61-62.
- Anonymous. 1980. Endangered and threatened wildlife and plants: review of plant taxa for listing as endangered or threatened species. Dept. of Interior, U.S. Fish and Wildlife Service, Washington D.C., Federal register 45(242):82480-82569.
- Carlquist, S. 1970. Hawaii, a natural history. Geology, climate, native flora and fauna above the shoreline. The Natural History Press, Garden City, N.Y., p. 176.
- Ching, H. 1967. Kauai partitioning ends Isle's old hui. *Honolulu Star-Bulletin, Honolulu, Hawaii*, 6/20/67:A-15.
- Dept. of Land and Natural Resources. 1978. Administrative rules of the Department of Land and Natural Resources, State of Hawaii, providing for land use within the Conservation District, providing for subzones, uses, appeals, enforcement and penalty, pursuant to Chapter 183-41, as amended. Hawaii Revised Statutes. Title 13, Chapter 2, Honolulu, Hawaii.
- Flynn, T.W. 1990. Botanical survey Limahuli Valley conservation district use application, Halelea district, Island of Kauai. (unpublished).
- Franklin, J. F. 1985. Design of natural area preserves in Hawai'i: *in* Stone, C.P. and J.M. Scott, (eds.), *Hawai'i's terrestrial ecosystems: preservation and management*. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, pp. 459-474.
- Gagne, W. C. and L. W. Cuddihy. 1990. *Vegetation: in* Wagner, W.L., D.R. Herbst, and S.H. Sohmer, (eds.), *Manual of the flowering plants of Hawai'i*. University of Hawai'i Press and Bishop Museum Press, Hawaii, Vols. I and II, pp. 45-114.
- Joesting, E. 1984. Kauai: a separate kingdom. University of Hawaii Press, Honolulu, Hawaii, pp. 112-113, 158-159.
- Kirch, P.V. 1985. Feathered gods and fishhooks: an introduction to Hawaiian archaeology and prehistory. University Hawaii Press, Honolulu, Hawaii, 349 pp.
- Lennox, C.G. 1971. Dedication address. *The Bulletin, Pacific Tropical Botanical Garden*, 1(2): 2-5.
- Myers, N. 1984. *The primary source*. W. W. Norton & Company, Inc., New York, NY, pp. 5-17.

APPENDIX I
BACKGROUND INFORMATION

- Newman, T.S. 1972. Man in the prehistoric Hawaiian ecosystem: *in* Kay, E.A. (ed.), A natural history of the Hawaiian islands. University of Hawaii Press, Honolulu, Hawaii, pp. 519-607.
- O'Neil, S. 1967. 100-year land dispute may end. Honolulu Advertiser, 5/25/67:C-14.
- Pacific Tropical Botanical Garden. 1987. Limahuli Valley conservation district use application, KA-2065. (unpublished).
- Smith, C.W. 1985. Impact of alien plants on Hawaii's native biota: *in* Stone, C.P. and J.M. Scott, (eds.), Hawaii's terrestrial ecosystems: preservation and management. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu. p. 182.
- Stewart, W.S. 1971. Putting down roots. The Bulletin, Pacific Tropical Botanical Garden, 1(1): 1-3.
- Stone, C.P. and J.M. Scott. 1985. Hawaii's native ecosystems: importance, conflicts, and suggestions for the future: *in* Stone, C.P. and J.M. Scott, (eds.), Hawaii's terrestrial ecosystems: preservation and management. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, pp. 495-534.
- United States of America Public Law 88-449; 78 Stat. 496. 1964. An Act to charter by Act of Congress the Pacific Tropical Botanical Garden. U.S. Statutes at Large. Approved August 19, 1964 by Lyndon B. Johnson.
- United States of America Public Law 100-478; 102 Stat. 2306. 1988. An act to authorize appropriations to carry out the Endangered Species Act of 1973 during fiscal years 1988, 1989, 1990, 1991, and 1992, and for other purposes. U.S. Statutes at Large. Approved October 7, 1988 by George Bush.
- Wagner, W.L., D.R. Herbst, and R.S.N. Yee. 1985. Status of the native flowering plants of the Hawaiian islands: *in* Stone, C.P. and J.M. Scott (eds.), Hawaii's terrestrial ecosystems: preservation and management. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu, pp. 23-45.
- Wallace, R.A., J.L. King, and G.P. Sanders. 1981. Biology: the science of life. Scott Foresman and Co., Glenview, Illinois, pp. 1051-1056.
- Wichman, C.R. 1978. Limahuli Valley botanical survey. The Bulletin, Pacific Tropical Botanical Garden, 8(1): 1-8.

APPENDIX I
BACKGROUND INFORMATION

SUGGESTED ADDITIONAL READINGS

- Daws, G. 1968. Shoal of time: a history of the Hawaiian islands. University Press of Hawaii, Honolulu, Hawaii.
- Emerson, N.B. 1965. Unwritten literature of Hawaii: the sacred songs of the hula. Charles E. Tuttle Co., Inc., Tokyo, Japan.
- Fosberg, F.R. 1972. Derivation of the flora of the Hawaiian islands: *in* Kay, E.A. (ed.), A natural history of the Hawaiian islands. University of Hawaii Press, Honolulu, Hawaii, pp. 396-408.
- Fuchs, L.H. 1961. Hawaii pono: a social history. Harcourt, Brace & World, Inc., New York.
- Kay, E.A. 1972. A natural history of the Hawaiian islands, University Press of Hawaii, Honolulu.
- , 1972. Hawaiian natural history: 1778-1900: *in* Kay, E.A. (ed.), A natural history of the Hawaiian islands, University of Hawaii Press, Honolulu, Hawaii, pp. 604-642.
- Stone, C.P. 1985. Alien animals in Hawai'i's native ecosystems: towards controlling the adverse effects of introduced vertebrates: *in* Stone, C.P. and J.M. Scott, (eds.), Hawai'i's terrestrial ecosystems: preservation and management. Cooperative National Park Resources Studies Unit, University of Hawaii, Honolulu.
- United States of America Public Law 100-539; 102 Stat. 2718. 1988. An Act to change the name of the Pacific Tropical Botanical Garden, a federally chartered organization, to the National Tropical Botanical Garden, and for other purposes. U.S. Statutes at Large. Approved October 28, 1988 by George Bush.
- Zimmerman, E.C. 1972. Adaptive radiation in Hawaii with special reference to insects: *in* Kay, E.A. (ed.), A natural history of the Hawaiian islands. University of Hawaii Press, Honolulu, pp. 528-534.

APPENDIX II

A DESCRIPTIVE STUDY OF THE SELECTED BIOLOGICAL AND PHYSICOCHEMICAL CHARACTERISTICS OF LIMAHULI STREAM, KAUA'I

BY

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A DESCRIPTIVE STUDY OF SELECTED BIOLOGICAL AND
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1. INTRODUCTION

Limahuli Stream on the north shore of Kauai drains about 1.6 square miles (4.1 square kilometers) of Limahuli valley. Its headwaters come from nearly 3,000-foot elevation, flows 8.5 miles (13.7 km) before reaching the ocean at 22 13'41" latitude North, 159 34'37" longitude West.

Physically, Limahuli valley may be divided into two parts: lower Limahuli and upper Limahuli. The lower Limahuli consists of the drainage area up to the waterfalls (1560 feet elevation) and all land above the waterfall comprises upper Limahuli. At present, a portion of lower Limahuli is utilized as a "Garden Area" by the National Tropical Botanical Garden.

This study involves that portion of the stream that flows through lower Limahuli. The location of the stream, its drainage basin are shown in Appendix I.

1.1 Study Personnel and Acknowledgement

The principal investigator in this study is Dr. Amadeo S. Timbol. He was assisted by Mr. Michael Kido, M. S. who analyzed the substrate and identified and analyzed the riparian vegetation. Mr. Todd Mayer assisted in the field work. We are indebted to Mr. Charles R. Wichman Jr., Superintendent-Horticulturist for the Limahuli Gardens for the identification of the endemic Gahnia kauaiensis.

1.2 Scope of Report

This report covers two field work days: July 29 and September 2, 1989.

1.3 Objectives of the Study

The main purpose of this study is to compile a short-term baseline description of that part of Limahuli stream situated in lower Limahuli. The specific objectives are to:

1. Compile an aquatic macrofauna list consisting of both scientific and local or common names.
2. Make a semi-quantitative estimate of fish, decapod crustaceans and stream macrobenthos.
3. Describe the stream's physicochemical characteristics, i.e. dissolved oxygen, water temperature, pH, and conductance.

4. Describe the stream using the designated sampling stations as representative stream channel. This involves width, depth, flow velocity and stream substrate.

5. Identify riparian vegetation on both banks of the sampling stations and estimate the vegetative canopy covering stream channel.

2. MATERIALS AND METHODS

2.1 Sampling Stations

Four sampling stations were studied. Their approximate locations are shown in Appendix I. In this report, station I is sometimes (i.e. section on riparian vegetation) referred to as "Limahuli falls", station II as "Stream crossing", station III as "Road crossing," and station IV as "Above estuary."

2.2 Biological Features

2.2.1 Fish and crustaceans. Fish and crustaceans were obtained with the use of a Coffelt BP-6 gas electroshocker. In electroshocking a 3-ft scissor net was set downstream to collect those missed by the electroshocker operator. All specimens were collected from an estimated area of 20 x 1 m whenever possible. On the occasions where this was not possible, the biological count was extrapolated accordingly. Generally, electroshocking was continued beyond the 20 m zone to determine if additional species were present. If new species were found, they were added to the species list. Animals collected were identified, counted, and released live in the same general area.

2.2.2 Aquatic macrobenthic animals. The benthic population was obtained with a WIDCO Surber Stream Bottom Sampler which had a frame of 30 cm x 30 cm (12" x 12") and a net mesh size of 728 microns. The procedure required the seating of the lower frame of the sampler, stirring the bottom and gently wiping the pebbles and stones within the frame so that any animal life will float up and drift to the net. All the contents of the net were placed in plastic whirl-paks, preserved in 70 per cent denatured ethyl alcohol and brought to the laboratory where they were sorted, identified, and counted.

Samples were taken in riffles with gravel bottoms at between 30 and 60 cm (12" and 24") water depth.

2.2.3 Riparian vegetation. For the purposes of this study, an estimate of relative cover and abundance for each species was adapted from Elliot and Hall (1977) as shown in Table 1. Most scientific names are from Wagner, Herbst, and Sohmer (1990), and Neal (1965).

Table 1. Vegetative coding system used in categorizing riparian vegetation (from Elliot and Hall 1977).

COVER	ABUNDANCE
< 5% = 1	rare (1 - 4 plants) = R
5% - 25% = 2	occasional (5 - 14 plants) = O
26% - 50% = 3	frequent (15 - 29 plants) = F
51% - 75% = 4	abundant (30 - 99 plants) = A
76% - 100% = 5	very abundant (> 100 plants) = V

The area sampled was confined horizontally (i.e. across the stream) to within 3 meters of the waters edge and vertically (i.e. upstream - downstream) to within 10 meters on either side of the center of the sample station. Vegetation beyond this area was noted only if: 1) the canopy of the stream was involved and 2) if interesting native plants were observed.

As significant physical differences may exist between the right and left banks of a stream, each was treated separately (note: left and right was always determined looking upstream). A riparian vegetation list was therefore compiled separately for each bank and generally plants are listed beginning with plants closest to the waters' edge. An asterik (*) after a species indicates a tree species involved in creating the canopy over the stream channel.

The vegetative cover of the stream (canopy) affects the amount of sunlight reaching its surface. This may be another important factor in the overall energy production of the ecosystem. The canopy was estimated as % shaded. A 100% shaded condition indicates that the canopy completely covered the stream channel, 50% shaded indicates that the canopy covered half the stream channel, and so on.

2.3 Physicochemical Features

2.3.1 Channel width, depth, and flow velocity. Channel width was obtained by stretching a 100-ft tape across the channel. Depth was measured from one bank to the other at foot intervals at the upper two stations and at three-foot intervals at the lower two stations using the calibrated Swoffer flow meter model 2100 rod. Flow velocity was measured with the Swoffer flow meter for depth. Flow values

obtained are from 0.6 of depth. The flow meter is accurate to within 1% and precision is a standard deviation of plus or minus 0.01 ft/s.

2.3.2 Substrate. The substrate of each of the sampling station was determined by above water visual examination. The substrate was sketched, photographed and quantified using a modified system adapted from the Wentworth classification of particle size (table 2). The plant cover of exposed and submerged substrate was also estimated as it may be an important habitat component affecting species composition and abundance.

Table 2. Substrate coding system (modified Wentworth: Bovee and Cochnauer 1977) used in characterizing the substrate.

Substrate	Particle size, range (mm)
1. Bedrock	solid, lava slab
2. Exposed boulder	250 - 4,000 mm (10 in.-13 ft)
3. Submerged boulder	same as above
4. Cobble	65 - 250 mm (2.6 in.-10 in.)
5. Gravel	5 - 65 mm (0.2 in.-2.6 in.)
6. Sand	1 - 5 mm (0.04 - 0.2 in.)
7. Silt	1 mm (0.04 in.)
8. Plant detritus/ organic material	established percentage covering sampling area

2.3.3 Water temperature. An alcohol thermometer was used for these data. Water temperature was cross checked with the oxygen meter and conductivity meter. These meters are also equipped to measure water temperature.

2.3.4 Conductance. Water conductivity was measured with a YSI model 33 meter at subsurface in the same place where dissolved oxygen was measured. The meter has an accuracy of plus or minus 2.5% maximum error. Conductivity is expressed in micromhos/centimeter ($\mu\text{mhos/cm}$).

2.3.5 Dissolved oxygen. This was measured with a YSI 57 dissolved oxygen meter at subsurface from an area

representative of the sampling station. The meter measured oxygen in mg/L. The data were converted to per cent saturation. The meter accuracy is given at 0.1 mg/L.

2.3.6 pH. This feature was measured with a Digisense pH meter model 5994 (Cole-Parmer Instrument Co.) at subsurface level at the same place where dissolved oxygen and conductance were measured. The accuracy for this meter is 0.01 pH unit. The meter was calibrated at each sampling site in accordance with the procedure manual.

3. RESULTS AND DISCUSSION

3.1 Biological Features

3.1.1 Aquatic macrofauna. Table 3 lists the macrofauna in Limahuli stream. It includes their common and/or local names, origin, and listing in scientific and/or official register.

Table 3. List of macrofauna in Limahuli stream, Kauai (July - September 1989).

Scientific Names	Common Names	Origin	Listing
Insects			
Diptera:			
Chironomidae	midge larvae		
1. <u>Orthocladus grimshawi</u>		alien	none
2. <u>Culex hawaiiensis</u>		endemic	none
Ephydriidae	brinefly larvae	endemic	none
Tipulidae	crane-fly larvae	endemic	none
Trichoptera	caddisfly larvae		
1. <u>Cheumatopsyche analis</u>	caddisfly	alien	none
2. <u>Oxyethira maya</u>	microcaddisfly	alien	none
Coleoptera			
Psephenidae	waterpennies	unknown	none
Odonata: Zygoptera			
<u>Megalagrion sp.</u>	damsel fly naiad	endemic	none
Ephemeroptera	mayfly nymph	unknown	none
Orthoptera			
Tridactylidae	pygmy mole cricket	unknown	none

Crustacea

Amphipoda

<u>Gammarus sp.</u>	sideswimmers	unknown	none
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Decapoda

1. <u>Atyoida bisulcata</u>	'opae-kala'ole (mountain shrimp)	endemic	none
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2. <u>Macrobrachium grandimanus</u>	'opae-oeha'a	endemic	none
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3. <u>Macrobrachium lar</u>	tahitian prawn	alien	none
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Fishes

1. <u>Awaous stamineus</u>	'o'opu-nakea	endemic	special concern (Deacon et al. 1979) depleted (Miller 1972)
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2. <u>Eleotris sandwicensis</u>	'o'opu-okuhe	endemic	none
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3. <u>Kuhlia sandwicensis</u>	aholehole	endemic	none
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4. <u>Sicyopterus stimpsoni</u>	'o'opu-nopili	endemic	special concern (Deacon, et al. 1979)
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5. <u>Stenogobius genivittatus</u>	'o'opu-naniha	indigenous	none
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Terms used:

endemic = occurring naturally in Hawaii only;

indigenous = occurring in Hawaii and also elsewhere;

native = both endemic and indigenous;

alien = brought to Hawaii either intentionally or accidentally by man.

Listing (Miller 1972 definitions):

Threatened = facing extinction, needs special protective measures.

Depleted = still occurs in numbers adequate for survival but heavily depleted and continues to decline at a rate substantially greater than can be sustained.

Nineteen species were found in Limahuli stream. They include 10 insects, 4 crustaceans and 5 fishes. Of the 19, 11 species are native to Hawaii. Ten of the 11 are endemic. Three of these endemic ('opae-kala'ole, 'o'opu-nakea, aholehole) are of some economic importance. Two endemic species are listed in scientific publications as THREATENED. The goby fish ('o'opu-nakea) is listed OF SPECIAL CONCERN by Deacon, et al. (1979) and depleted by Miller (1972) but has no legal protection (Johnson 1987). The second second, also a goby fish ('o'opu-nopili) is listed OF SPECIAL CONCERN by Deacon, et al. (1979) but like the preceding species, has no legal protection (Johnson 1987). (For definition of DEPLETED, see footnote in table 3, above. Miller's DEPLETED is about equivalent to Deacon, et al.'s OF SPECIAL CONCERN.) Of the alien species, the tahitian prawn is also harvested for food.

The endemic goby nakea (and probably all the gobies in the species inventory) is diadromous, a designation for species which are migratory between fresh and salt water. The life history of this species can be generalized as follows: spawning may occur over a period of months (July-December), in the lower reaches of the streams. Hatchlings are carried to the sea by stream flow where they grow and develop over a period of between four and seven months as plankton ("as long as 160 days" according to Radtke, Kinzie, and Folsom 1988). The larvae then metamorphose into post-larvae known as hinana near the mouths of streams, settle on appropriate substrata, and migrate upstream to their places of permanent residence. This life style requires an unimpeded passageway from the stream mouth to the upper elevations.

3.1.2 Distribution and relative abundances. The occurrence and relative abundances of the fishes, and large crustaceans (9 species) are shown in Table 4.

Table 4. Distribution and relative abundances of crustaceans and fishes in Limahuli stream, Kauai (July - September 1989).

Scientific Name (Common Name)	Sampling Station			
	I	II	III	IV
A. Crustacea				
<u>Atyoida bisulcata</u> (mountain 'opae)	++++	++++	++++	+
<u>Macrobrachium grandimanus</u> ('opae-o'eha'a)	0	0	0	+
<u>Macrobrachium lar</u> (tahitian prawn)	0	0	++++	+++
B. Fishes				
<u>Awaous stamineus</u> ('o'opu-nakea)	0	0	++++	++
<u>Eleotris sandwicensis</u> ('o'opu-okuhe)	0	0	0	++
<u>Kuhlia sandwicensis</u> (aholehole)	0	0	0	++++
<u>Sicyopterus stimpsoni</u> ('o'opu-nopili)	0	++++	++++	++
<u>Stenogobius genivittatus</u> ('o'opu-naniha)	0	0	0	+

Legend: +++++ = very abundant (11 or more)
 +++ = abundant (6 - 10)
 ++ = common (2 - 5)
 + = uncommon (1)
 0 = not collected or seen,
 possibly absent.

3.1.3.1 Large crustaceans. The mountain 'opae, Atyoida bisulcata, is both ubiquitous and very abundant in the stream, except at the lowest elevation sampling station. All of the mountain 'opae collected in the upper elevation (Stn I and Stn II) are adults while those from the lower elevation (Stn III) were mostly juveniles and postlarvae while those from the lowest elevation (Stn IV) were postlarvae, barely a centimeter long. At the highest elevation station (Stn I), only the mountain 'opae (all adults) was present in very large quantities. For example, we obtained 379 adults in four square meters (= 1895

individuals in 20/meter square).

The alien crustacean Macrobrachium lar (tahitian prawn) is common in the lower stations III and IV while the endemic crustacean M. grandimanus was collected only in the lowest elevation (Stn IV).

3.1.3.2 Fishes. Five fish species were collected. All are native to Hawaii. Four of these are endemic (found only in Hawaii and nowhere else) and three are true gobies (with fused pelvic discs. The fourth, 'o'opu-okuhe, does not have this fused pelvic discs. Table 4 shows their origin and listing in scientific publications. The significant species in this list are two endemic gobies: the Awaous stamineus which known as 'o'opu-nakea and Sicyopterus stimpsoni or 'o'opu-nopili. They were found in stations II, III, and IV. There are slightly more nopili than nakea in the stream.

The nakea supports a small commercial and recreational fishery on Kauai with Hanalei and Wainiha rivers as the prime fishing areas. The last time it was sold in the markets, two years ago, it was \$10.00 a pound. This is the largest of the endemic gobies, reaching a minimum of over 30 cm standard length in Kauai streams. It is well known for its downstream migrations usually in association with freshets or flash floods. Spawning occurs near the mouth of rivers and streams. The best published information on this goby is Ego (1956) but there are extensive on-going studies on the nakea by University of Hawaii (Robert Kinzie), Kauai Community College (Mike Kido) and Department of Land and Natural Resources (Don Heacock) scientists.

The nopili has no commercial value at present although in the olden days it was "relished as food, and also a favorite fish with the priests" (Titcomb 1972, p. 128). It is also considered to bring good luck. According to Titcomb (1972) the largest nopili (up to 18 cm standard length) were found in Kauai streams, particularly in Wainiha, Hanalei and Makaweli. During this survey, the largest we caught was 10 cm standard length. This species has been recommended by Timbol and Maciolek (1978) as an indicator species. Its decline in population density, or in extreme case, its disappearance in a stream is a good indication of serious degradation. Extensive information on the biology of the nopili is available in Tomihama (1972) and Yuen (1986).

The other two fish species are Stenogobius genivittatus called 'o'opu-naniha and Kuhlia sandvicensis, known as aholehole. The first is indigenous and the second is endemic. The naniha is a small (10 cm SL maximum) goby that lives in and around stream and river mouths. The aholehole is a marine visitor and is found in the freshwater only when young. At maturity, it lives in marine environment.

3.1.3.3 Aquatic macrobenthic animals. Twelve species of macrobenthos were found living in or around the stream substrate (table 4). Their distribution and relative abundances are in table 5. Eleven of these are aquatic insects or insects which spend part of their lives in water as nymphs, naiads or larvae. The twelfth is an amphipod. The most important components are the chironomids and caddisflies larvae. These form the major food source of the fish and large crustacean population in the stream.

Table 5. Distribution and relative abundances of aquatic macrobenthic animals in Limahuli stream, Kauai (July - September 1989).

Scientific Name (Common Name)	Sampling Station			
	I	II	III	IV
A. INSECTS				
I. Diptera (Flies)				
1. <u>Orthocladus</u> <u>grimshawi</u> (midge larva)	0	++++	0	0
2. <u>Culepsectra</u> <u>hawaiiensis</u> (midge larva)	0	+++	0	0
Ephydriidae (brinefly larva)	+	0	0	0
Tipulidae (crane fly larva)	0	+++	0	0
II. Trichoptera (caddisflies)				
1. <u>Cheumatopsyche</u> <u>analis</u> (caddisfly larva)	+	+	+++	++++
2. <u>Oxyethira</u> <u>maya</u> (microcaddisfly larva)	+	+	+	++
III. Coleoptera (beetles)				
Psephenidae (water pennies)	+++	++++	0	+

IV. Odonata				
	Zygoptera (Damselfly)			
	<u>Megalagrion sp.</u>	+	++	+ +
	(damselfly naiad)			
V. Ephemeroptera				
	(mayfly nymph)	0	+	0 0
VI. Orthoptera				
	Tridactylidae	0	+	0 0
	(pygmy mole cricket)			
B. Crustacea				
I. Amphipoda				
	<u>Gammarus sp.</u>	0	+	0 0
	(sideswimmers)			

Legend: ++++ = very abundant (11 and more)
 +++ = abundant (6-10)
 ++ = common (2-5)
 + = uncommon (1)
 0 = not collected, possibly absent

The unique feature of the macrobenthos is the presence of the water pennies (Coleoptera: Psephenidae) in the basalt bottom and fast flowing sampling stations I and II (upper elevations). A single specimen was collected in Station IV in July which was just after a big freshet. The specimen was not collected in September in that same station. It may have been washed down on the earlier date by the freshet. According to White, Brigham and Doyen (1984) the life history of these insects have not been well studied. What is known is that they lay their eggs in masses of several thousands on submerged objects in the swifter parts of riffles. They hatch into larvae and the larvae leave the water to construct pupal chambers in moist soil after which they hatch into adults. The adult stage is very short with little or no feeding.

Three insect species are found in all four stations: the Cheumatopsyche analis (caddisfly larva), Oxyethira maya (microcaddisfly), and the Megalagrion sp. (damselfly naiad). On the basis of abundance the caddisflies are more numerous in the lower stations while the waterpennies are more abundant in the upper stations.

Station II harbors the most species of insect, nine out of 10. The pygmy mole cricket listed in that station was collected incidentally by electroshocking, not by surber net. The damselfly naiad was also found among the electroshocking collection but they did not figure in the numbers shown in the tabulation.

3.1.3 Riparian vegetation

Riparian vegetation (i.e. vegetation alongside a stream or river) may be an important source of energy input for lotic (flowing-water) ecosystems. Allochthonous material has been shown to play a significant role in energy input for woodland streams in temperate climate (Minshall 1967, Fisher and Likens 1973). However, whether or not this is also true for Hawaiian streams has yet to be studied.

The stream channel appears to be highly colonized by non-native plants as evidenced by the common presence of yellow guava (Psidium quajava) and weedy species like honohono (Commelina diffusa). The Clidemia hirta, considered an obnoxious weed by many, was found at station II and also elsewhere in isolated pockets.

The common presence of taro (Colocasia esculenta) along the water's edge indicates its cultivation in previous times. Significant remains of walled terraces (lo'i) alongside the stream may indicate the use of the stream by organized agricultural communities in ancient times.

Perhaps the most significant impact of alien plants on the stream itself is in the extensive canopy created by tree species. The channel is shaded throughout most of its length significantly reducing sunlight reaching the water's surface. Yellow guava (Psidium quajava) is the most common component of the riparian canopy although the octopus tree (Schefflera actinophylla) and the autograph tree (Clusia rosea) also contribute to the canopy in lower portions of the stream.

In one fairly long section of stream above station II, the hau (Hibiscus tiliaceus) has completely overgrown the channel making passage very difficult. The dense root mats in the stream created by such a condition may block the upstream migration of diadromous species like the goby fishes ('o'opu). A large, very dense stand of another introduced species, wild bamboo (Schizostachyum glaucifolium), located on high ground above station II also contribute to the considerable shading of a significant portion of the stream channel.

Despite the common presence of introduced plants, significant patches of native vegetation still exist. The common native streamside plant mamaki (Pipturus albidus) for example, was found at station I however in a less dominant

condition than observed elsewhere. Also at station I on the walls of the canyon were a few individuals of the endemic Gahnia kauaiensis. The native fiber plant olona (Touchardia latifolia) was observed on the trail as was the Kauai endemic white hibiscus (Hibiscus waimeae subsp. hannerae).

It should be mentioned that streamside vegetation is highly susceptible to high water during flood. It is not uncommon therefore to see the vegetation laid down and strands of loose vegetation hanging incredibly high on the banks. Riparian vegetation is therefore constantly in a state of flux and only very hardy species can survive for any length of time alongside the stream. This may be one factor which clears the way for hardy species like yellow quava (Psidium quajava) and other introduced tree-like plants which now dominate the water's edge.

The riparian vegetation and vegetative canopy over stream channel is summarized in the following table 6.

Table 6. Riparian vegetation in sampling stations at Limahuli stream, Kauai (July-September 1989).

STATION I: Limahuli Falls

Canopy - 90% shaded

	Coverage	Abundance
left bank		
taro (<u>Colocasia esculenta</u>)	1	R
small club moss (<u>Selaginella arbuscula</u>)	2	A
'ama'u fern (<u>Sadleria sp.</u>)	4	A
mamaki (<u>Pipturus albidus</u>)	4	A
yellow quava * (<u>Psidium quajava</u>)	4	A
right bank		
maidenhair fern (<u>Adiantum radianum</u>)	2	O
juvenile 'ama'u fern (<u>Sadleria sp.</u>)	5	V
kamole (<u>Polygonum glabrum</u>)	5	V
<u>Cyperus odoratus</u>	2	R
yellow quava * (<u>Psidium quajava</u>)	5	V

ti leaf (<u>Cordyline fruticosa</u>)	2	O
'ie'ie (<u>Freycinetia arborea</u>)	1	R
<u>Gahnia kauaiensis</u>	1	R

STATION II: Stream crossing

Canopy - 60% shaded

	Coverage	Abundance
left bank		
laua'e fern (<u>Phymatosorus scolopendria</u>)	4	V
kamole (<u>Polygonum glabrum</u>)	5	V
honohono (<u>Commelina diffusa</u>)	5	V
air plant (<u>Bryophyllum pinnatum</u>)	1	R
wild ginger (<u>Zingiber zerumbet</u>)	5	V
<u>Clidemia hirta</u>	1	R
ti (<u>Cordyline fruticosa</u>)	2	O
yellow guava * (<u>Psidium guajava</u>)	5	F
octopus tree (<u>Schefflera actinophylla</u>)	2	R
right bank		
<u>Cyperus odoratus</u>	4	O
Jamaica vervain (<u>Stachytarpheta jamaicensis</u>)	1	R
wild ginger (<u>Zingiber zerumbet</u>)	2	F
yellow guava * (<u>Psidium guajava</u>)	5	F
kukui * (<u>Aleurites moluccana</u>)	3	O
octopus tree (<u>Schefflera actinophylla</u>)	1	R
'ohi'a-lehua (<u>Metrosideros polymorpha</u>)	1	R

STATION III: Road crossing

Canopy - 100% shaded

	Coverage	Abundance
left bank		
<u>Cyperus odoratus</u>	2	0
honohono (<u>Commelina diffusa</u>)	3	F
<u>Wedelia trilobata</u>	5	V
hala (<u>Pandanus tectorius</u>)	3	F
yellow guava * (<u>Psidium guajava</u>)	3	F
autograph tree * (<u>Clusia rosea</u>)	3	F
Java plum * (<u>Syzygium cumini</u>)	3	0
right bank		
<u>Wedelia trilobata</u>	4	V
laua'e fern (<u>Phymatosorus scolopendria</u>)	4	V
Hilo grass (<u>Paspalum conjugatum</u>)	3	V
yellow ginger (<u>Hedychium flavescens</u>)	4	V
taro (<u>Colocasia esculenta</u>)	3	0
yellow guava * (<u>Psidium guajava</u>)	3	F
Christmas-berry * (<u>Schinus terebinthifolius</u>)	3	0
octopus tree * (<u>Schefflera actinophylla</u>)	3	0
Java plum * (<u>Syzygium cumini</u>)	3	0

STATION 4: Above estuary

Canopy - 100% shaded

	Coverage	Abundance
left bank		
laua'e fern (<u>Phymatosorus scolopendria</u>)	5	A
yellow ginger (<u>Hedychium flavescens</u>)	5	F
autograph tree * (<u>Clusia rosea</u>)	5	0

mango * (<u>Mangifera indica</u>)	5	O
Java plum * (<u>Syzygium cumini</u>)	5	O
right bank		
laua'e fern (<u>Phymatosorus scolopendria</u>)	3	F
yellow ginger (<u>Hedychium flavescens</u>)	5	A
haole-koa (<u>Leucaena leucocephala</u>)	5	F
autograph tree * (<u>Clusia rosea</u>)	5	O
yellow guava * (<u>Psidium guajava</u>)	5	V
octopus tree * (<u>Schefflera actinophylla</u>)	4	O

Legend: R = rare A = abundant
 O = occasional V = very abundant
 F = frequent

3.2 Physicochemical

3.2.1 Channel width, depth, and flow velocity.

Limahuli stream is characterized by narrow stream channels in the upper elevations, from 5 to 10 feet width, widens at mid elevations (15 feet) and is widest at the lowest elevation. It is shallow, only 0.4 ft at the upper elevations, becoming a foot deep at mid elevations and a little bit more than two feet at the lowest elevation. Its flow velocity is faster at the upper elevation (1.8 ft/s), slowing to a third of its original velocity at mid elevations down to one-sixth at the lowest elevation.

The data obtained is summarized in the table that follows (table 7).

Table 7. Width, depth and flow velocity in Limahuli stream, Kauai. (July-September 1989)

Parameters			
Stations	Width (ft)	Depth (ft)	Flow Velocity (ft/s)
I	5	0.4	1.8
II	10	1.1	0.8
III	15	1.5	0.8
IV	30	2.2	0.3

3.2.2 Substratum.

The substratum is an important physical parameter of lotic ecosystems. In Hawaii, the substrate is characterized by solid lava bedrock, varying sizes of exposed or submerged weathered basalt particles, plant detritus, organic material, and varying degrees of vegetation covering the substratum. Substrate composition has important biological implications because it determines available aquatic habitat and affects physicochemical parameters such as dissolved oxygen.

Slope is an important determinant of substrate type as affects the velocities of stream flows and the resultant scarification of the streambed. Limahuli descends from an elevation of approximately 1590 feet at the falls to sea level in less than 2.5 miles. High velocities are evidenced at higher elevations in the narrowness of the channel and the predominance of bedrock. High channel velocities may also be a factor in the low abundance of algae observed on the substrate throughout the stream system.

As in any lotic system in Hawaii it should be noted that substrate parameters especially in the lower portions of the stream where velocities are amplified, are highly variable and subject to drastic change during periods of flood.

Table 8. Substrate in the four sampling stations at Limahuli stream, Kauai (Wentworth scale: Bovee and Cochnauer 1977).

Station I: Limahuli Falls

Substrate	% Coverage	Estimated Plant Cover (%)
1. bedrock	80	3
2. exposed boulder	10	3
3. submerged boulder	5	3
4. cobble	3	<1
5. gravel	<1	-
6. sand	<1	-
7. silt	<1	-
8. organics/detritus	not estimated	-

Station II: Stream crossing

1. bedrock	40	5
2. exposed boulder	10	5
3. submerged boulder	25	5
4. cobble	15	2
5. gravel	5	<1
6. sand	4	-
7. silt	1	-
8. organics/detritus	not estimated	-

Station III: Road crossing

1. bedrock	5	<1
2. exposed boulder	5	5
3. submerged boulder	25	5
4. cobble	30	5
5. gravel	20	<1
6. sand	10	<1

7. silt	5	-
8. organics/detritus	not estimated	-
<u>Station IV: Above estuary</u>		
1. bedrock	1	-
2. exposed boulder	35	<5
3. submerged boulder	30	<5
4. cobble	25	<2
5. gravel	5	-
6. sand	2	-
7. silt	2	-
8. organics/detritus	not estimated	-

Limahuli stream, using the sampling stations as representative of the entire stream, shows a substrate gradient of bedrock and boulder on the higher elevations, becoming bedrock, boulder and cobble at mid elevations, and boulder, cobble, gravel with some silt at the lower elevations. That the mean particle size decreases in a downstream direction is normal for streams (Hynes 1970).

3.2.3 Temperature, conductance, dissolved oxygen, pH.

These short-term data reflect only the conditions at the time of sampling. They may be useful for comparative purposes only. On the other hand, Limahuli stream has not been studied before as far as the above parameters are concerned. These, therefore, could be part of the pre-construction data if the proposed project is realized. These data are summarized in table 9.

Subsurface water temperature is between 18 and 19 degrees Celsius with the uppermost station I (Limahuli falls) only one degree cooler than the lower stations. This range is well within the range of unaltered stream in Hawaii (Timbol and Maciolek 1978) and within the living (tolerance) limit of native gobies (Hathaway 1978).

Conductance indicates total dissolved solids in water (Cole 1979). Results show a very low conductance, ranging from a low 59 microhms/cm (umhos) at the upper station I,

gradually decreasing with decreasing elevation: to 61 at station II, 68 at station III to 71 at the lowest station IV. These values are much lower than those for Kauai streams which have farms within their drainage areas (ave. 131 umhos, Timbol and Maciolek 1978). On the other hand, conductance for Limahuli stream compares favorably with those obtained at Wainiha River, a nearby but larger stream (53 through 83 umhos, Timbol 1986).

The pH is from slightly acidic at the upper stations to slightly basic at the lowest station. This is well within the range of neutral to slightly alkaline water for normal Hawaiian streams. This condition (acidic at the upper elevations, basic at the lower elevations) comes from organic acids from decomposing plant materials in the watershed which tend to make stream water acidic but is neutralized as the water flows over volcanic rock.

Dissolved oxygen was measured as mg/L and converted to per cent saturation. Limahuli stream water is oxygen saturated, from the upper elevations down to the lowest elevation. Considering the low water temperature, the oxygen available for the aquatic animals is considerable, from 9.26 to 9.45 mg/L (actual values obtained). These indicate clean, high velocity, bubbling waters.

Table 9. Summary of water temperature, conductance, dissolved oxygen, and pH obtained in Limahuli stream, Kauai (July-September 1989).

Physicochemical Parameters	Sampling Stations			
	I	II	III	IV
Water temperature (degree Celsius)	18	19	19	19
Conductance (umhos/cm)	59	61	68	71
pH	6.20	6.63	6.77	7.44
Dissolved oxygen (per cent saturation)	99	102	104	102

4. SUMMARY

Limahuli Stream on the northshore of Kauai is small if compared with nearby Wainiha or Hanailei rivers. Its substrate consists of lava bedrock and large boulders at high elevations and boulder, cobble, and gravel at low elevations. Its water is cold, has low conductance, slightly acidic to slightly basic, and oxygen saturated.

Limahuli Stream has five fish species; all native to Hawaii. Four of these are (endemic); found only in Hawaii. Of the four species, two (S. stimpsoni, A. stamineus) are the more abundant with the former more abundant than the later. Both of these species are listed as NEEDING PROTECTION but have no legal protection. The A. stamineus ('o'opunakea) supports a small ethnic fishery on Kauai.

There are three decapod crustaceans, two of which are endemic to Hawaii. One endemic (A. bisulcata) and the alien species (M. lar) are harvested for home consumption. The other endemic (M. grandimanus) has limited use as fish bait.

The macrobenthic residents consist of at least 12 species, four of these are endemic, three are alien and the rest are of unknown origin. The caddisflies larvae are found in all four stations sampled. They are more abundant in the lower stations. The upper stations are characterized by an abundance of the coleopteran waterpennies, and the caddisflies larvae. The waterpennies have yet to be recorded in any other streams on Kauai.

The riparian vegetation is dominantly alien contributing significantly to the vegetative canopy over the stream channel. These are the ubiquitous yellow guava, and in lower elevations, the octopus and autograph trees mingle with the dominant guava. At upper elevations, the bamboo and the hau contributed significantly to the streamside vegetative canopy.

In spite of the dominance of alien species there are several patches of native plants thriving stream-side. The most significant are the mamaki (Pipturus albidus), Gahnia kauaiensis, olana (Touchardia latifolia), and the white hibiscus (Hibiscus waimeae subsp. hanneriae).

5. SUGGESTIONS TO MINIMIZE IMPACT OF DEVELOPMENT

5.1 Keep the fish population native.

The fish population in the stream is entirely native and serious consideration should be made in maintaining the same species composition. The urge to stock the stream with poeciliids (i.e. mosquitofish, swordtail, mexican molly) to control mosquitos should be resisted strongly. These alien species compete with the native 'o'opus for food and living space and they are the more hardy, meaning, they will have a detrimental impact. The Hawaii Cooperative Fishery Research Unit has published information on this subject (Hathaway 1980, Norton, et al. 1978).

Visitors in the valley who are allergic to mosquito bites may be provided with mosquito repellent sprays. The introduction of these poeciliids to control the mosquitos as intended has not worked.

Based on casual conversations with freshwater fishing enthusiasts, it appears that the spread of the smallmouth bass (Micropterus dolomieu) and the largemouth bass (Micropterus salmoides) on Kauai's streams and reservoirs is due to unauthorized stocking. These fish are good "fighters" and provide the excitement all light tackle fishermen seek. The (unauthorized) introduction of these predators will mean disaster to the endemic fish and crustacean populations in the stream. I have no suggestion on how to control unauthorized introductions. Intentional stocking of alien fish is subject to government regulation. The Department of Land and Natural Resources, Aquatic Resources Division can provide the specifics on this regulation.

5.2 Avoid major water diversion and channel alteration.

Due to the migratory behavior of Hawaiian stream fauna, diversion is particularly detrimental to the native stream fauna which requires access to the ocean as well as migratory pathways to habitat above the diversion. There are several examples in Hawaii demonstrating the adverse effects of such disruptions to migratory fauna. In West Maui, Honokowai, Kahoma, and Waikapu streams do not have any native fishes and crustaceans above their diversions (Timbol and Maciolek 1978). Lau (1977) attributed lower Lentipes concolor abundance in Piinau stream on East Maui to a partial diversion of stream flow.

Total diversion may result in the destruction of the stream ecosystem below the diversion and can render the portion above it inaccessible to migratory fauna, as mentioned above. Partial diversion always results in

simultaneous modification of environmental conditions. For example, modification of flow rate may result in changes to the streambed, scouring power of the stream, oxygen-carrying capacity of the water, water temperature and other parameters.

5.2.1 Decrease in stream flow.

Hawaiian endemic fish and crustacean species evolved in fast flowing water conditions, a characteristic of pristine streams. A decrease in stream flow may cause the disappearance of the endemic goby Sicyopterus stimpsoni ('o'opu-nopili). An example of this was reported by Timbol (1979) in Kawa stream, a tributary of Kahana stream on windward Oahu. It is known that less oxygen (even in saturated conditions) is available to organisms when velocities are reduced. The fact that 'o'opu-nopili is found only in strong flowing, high-quality streams (Timbol and Maciolek 1978, Tomihama 1972) suggests that it requires high oxygen concentrations.

A decrease in flow velocity may also lead to a decrease in the insect larvae population. Insect larvae are the food resource for fish. According to Ruttner (1963) velocities below 20 cm/s will form a streambed of mineral organic mud and large quantities of organic detritus; velocities between 20 and 40 cm/s will form a substrate of small, medium, to fist-size gravel. Velocities above 120 cm/s will produce a bottom composed of large stones to boulders. The optimum velocities for invertebrate productivity, according to Ruttner (1963) are velocities between 20 and 60 cm/s. Measured velocities for Limahuli are between 3 and 55 cm/s.

5.3 Minimize removal of riparian vegetation

Avoid the removal of streamside vegetation and if a considerable stretch of the stream bank must be cleared, it should be replanted as soon as possible. Riparian clearing may cause high insolation resulting in elevated water temperatures and excessive evaporation. Excessive evaporation could lead to reduced stream flow. Reduced stream flow means HIGHER WATER TEMPERATURES. Work done by Timbol and Maciolek (1978) show that stream channels without riparian vegetative canopy have higher water temperatures than stream with such canopy.

The effects of elevated temperatures can be divided into three categories: lethal, metabolic, and behavioral. Lethal temperatures make up the range within which the animal will die. Metabolic effects are "delayed effects" as in growth acceleration resulting in the inability to reach and/or pass a critical point in the animal's life cycle (Andrewartha and Birch 1954). Behavioral effects are the organism's responses to the environment.

5.3.1. Lethal temperatures. Laboratory studies done by Hathaway (1979) showed that the lethal temperature for adult Awaous stamineus ('o'opu-nakea) is between (first death to final death) 37.2 and 38.8 degrees centigrade with 50% (LT50) of the fish dying at 38.1 degrees centigrade. The post-larvae (hinana) are slightly more tolerant with range for mortality between 39.0 and 39.3 degrees centigrade with LT50 at 39.3 degrees centigrade. However, little is known about the effect of elevated temperature on the vitality of the postlarvae.

5.3.2. Behavioral effects. A motile animal will leave an area when conditions become unfavorable and will not voluntarily remain in the area until conditions become lethal. Thus, there will be a decrease in numbers as those that can leave will do so. Timbol and Maciolek (1978) found that altered (channelized) streams have higher water temperatures than unaltered ones. In the unaltered streams, native species were dominant in both number of species and biomass. Alien species were dominant in altered streams.

5.4 Keep maintenance roads and hiking trails away from the stream.

The impact of maintenance roads and hiking trails comes from the resulting erosion and siltation in the streambed. Water turbidity and excessive sedimentation will alter the character of the stream. Burns (1972) reported turbidities greater than 3,000 ppm resulting from such constructions. Excessive sedimentation may alter the biological character of the stream. Fine particulate matter will become suspended in the water increasing turbidity and decreasing light penetration resulting in reduced primary productivity. Fine particles also have the effect of clogging the gills of fish which could cause suffocation. Settling of particles in rapids and riffles will reduce the natural habitats of the economically and biologically valuable endemic residents of Limahuli stream.

5.5 Limahuli valley and stream a nature park?

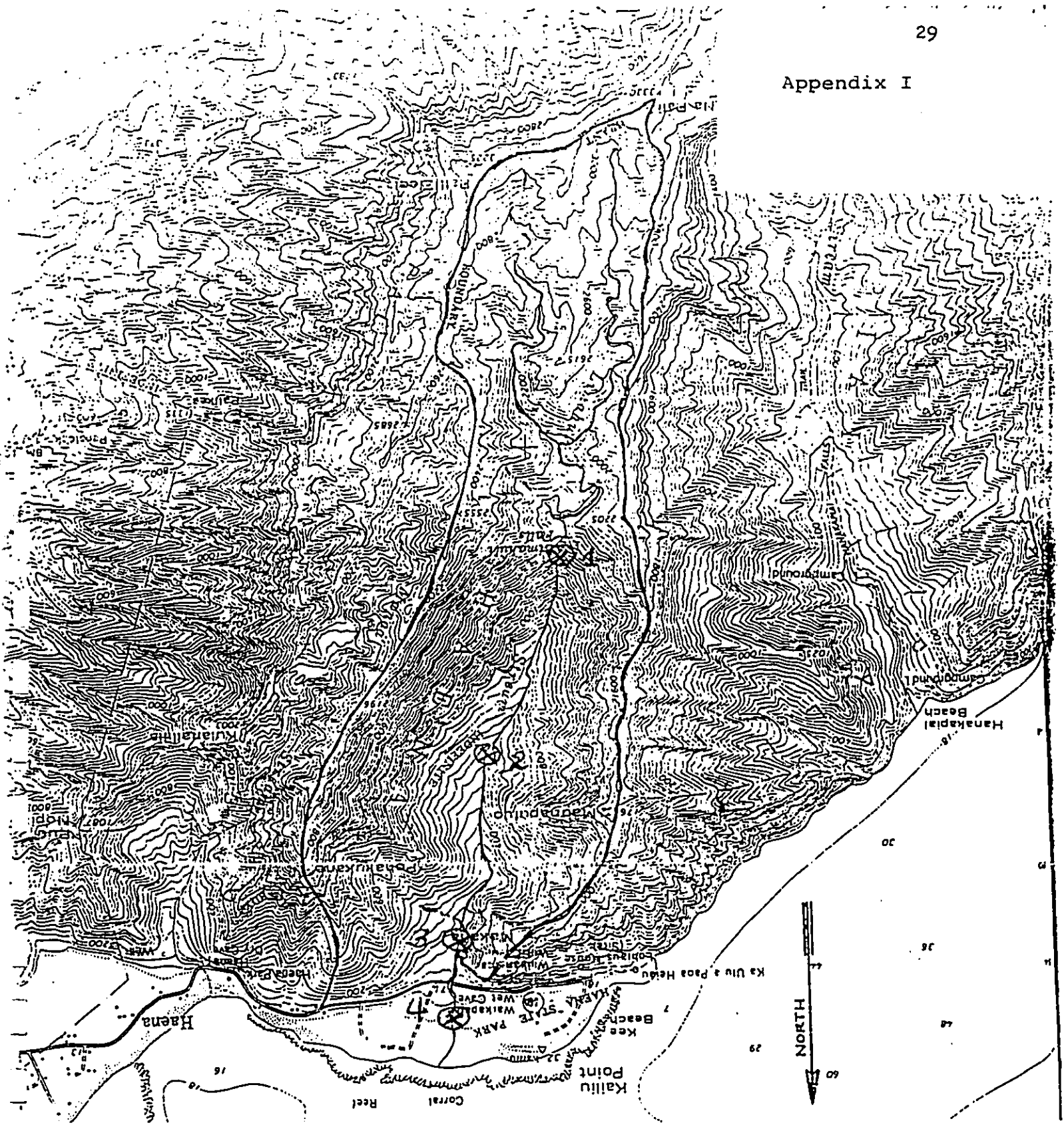
It is rare that an almost pristine stream is located in a valley owned by a single entity (almost anyway). Consideration should be made in maintaining the valley for both its botanical and aquatic animal resources. Needless to say, the endemic fish and crustaceans now found in Limahuli valley are priceless.

6. LITERATURE CITED

- Andrewartha, H. G. and L. C. Birch. 1954. The Distribution and Abundance of Animals. Univ. of Chicago Press, Chicago.
- Bovee, K. D. and T. Cochnauer. 1977. Development and evaluation weighted criteria probability of use curves for instream flow assessment: Fisheries. FWS/OBS-77/66. USFWS Cooperative Flow Service Group. Fort Collins, Colorado.
- Burns, J. W. 1972. Some effects of logging and associated road construction on northern Colorado streams. Trans. Am. Fish. Soc. 101:1-17.
- Deacon, J. E., G. Kobetich, J. D. Williams, S. Contreras, and others. 1979. Fishes of North America: Endangered, Threatened, or Of Special Concern. Trans. Am. Fish. Soc. 101:239-252.
- Elliot, M. E. and E. M. Hall. 1977. Wetlands and Wetland Vegetation. Prepared for the U. S. Army Corps of Engineers, Pacific Ocean Division. Fort Shafter, Honolulu. Contract No. DAC W -84-77-C-0014.
- Fisher, S. G. and G. E. Likens. 1973. Energy flow in Bear Brook, New Hampshire: An integrative approach to stream ecosystem metabolism. Ecol. Monogr. 41: 421-439.
- Hathaway, C. B. Jr. 1978. Stream channel modification in Hawaii. Part C: Tolerance of Native Stream Species to Observed Levels of Environmental Variability. FWS/OBS - 78/18. U.S. Fish and Wildlife Service National Stream Alteration Team, Columbia, Missouri.
- Hynes, H. B. N. 1970. The Ecology of Running Waters. University of Toronto, Toronto.
- Johnson, J. E. 1987. Protected fishes of the United States and Canada. American Fisheries Society, Bethesda, Maryland. 42 p.
- Lau, E. Y. K. 1973. Dimorphism and speciation in the Hawaiian freshwater goby genus Lentipes. B. A. Honors thesis, Biology Department, University of Hawaii at Manoa, Honolulu, Hawaii. 83 p.
- Miller, R. 1972. Threatened freshwater fishes of the United States. Trans. Am. Fish. Soc. 101:239-252.
- Minshall, G. W. 1967. Role of allochthonous detritus in the trophic structure of a woodland spring brook community. Ecology 48: 139-144.

- Neal, M. C. 1984. In Gardens of Hawaii. Bernice P. Bishop Museum Special Publication 50. Bishop Museum Press, Honolulu.
- Norton, S. E., A. S. Timbol, and J. D. Parrish. 1978. Stream channel modification in Hawaii. Part B: Effects of channelization on the distribution and abundance of fauna in selected streams. FWS/OBS -78/17. USFWS National Stream Alteration Team, Columbia, Missouri.
- Radtke, R. L., R. A. Kinzie, III, and S. D. Folsom. 1988. Age at recruitment of Hawaiian freshwater gobies. Environmental Biology of Fishes 23: 205-213.
- Ruttner, F. 1963. Fundamentals of Limnology. 3rd edition. University of Toronto Press, Toronto.
- Timbol, A. S. and J. A. Maciolek. 1978. Stream Channel Modification in Hawaii. Part A: Statewide inventory of streams; habitat factors and associated biota. FWS/OBS - 78/16. USFWS National Stream Alteration Team, Columbia, Missouri.
- Timbol, A. S. 1979. Limnological Survey of Kahana Stream, Oahu. Report prepared for Science Applications and the U. S. Army Corps of Engineers, Pacific Ocean Division, Fort Shafter, Hawaii. Contract No. DACWB4-79-C-0021.
- Titcomb, M. 1972. Native use of fish in Hawaii. University of Hawaii Press. Honolulu.
- Tomihama, M. 1972. The life history of Sicydium stimpsoni, a freshwater goby endemic to Hawaii. Honors Division B. S. Thesis. Univ. of Hawaii, Honolulu.
- Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1990. Manual of the Flowering Plants of Hawaii. Bishop Museum Spl. Publ. 83. University of Hawaii Press, Honolulu. vols. I and II.
- White, D. S., W. U. Brigham, and J. T. Doyen. 1984. "Aquatic Coleoptera" In R. W. Merritt and K. W. Cummins, eds. An Introduction to the Aquatic Insects. 2nd ed. Kendall/Hunt Publishing Company. Dubuque, Iowa. pp. 361 - 437.
- Yuen, A. R. 1986. Social and territorial behavior of the endemic freshwater goby Sicyopterus stimpsoni. M. S. Thesis, Zoology Department, University of Hawaii at Manoa, Honolulu, Hawaii. 51 pp.

Appendix I



Limahuli Stream and its drainage basin. Approximate locations of sampling stations are shown and numbered accordingly.

Neal, M. C. 1984. In Gardens of Hawaii. Bernice P. Bishop Museum Special Publication 50. Bishop Museum Press, Honolulu.

Norton, E. E., A. S. Timbol, and J. D. Parrish. 1978. Stream channel modification in Hawaii. Part B: Effects of channelization on the distribution and abundance of fauna in selected streams. FWS/OBS -78/17. USFWS National Stream Alteration Team, Columbia, Missouri.

Radtke, R. L., R. A. Kinzie, III, and S. D. Folsom. 1988. Age at recruitment of Hawaiian freshwater gobies. Environmental Biology of Fishes 23: 205-213.

Ruttner, F. 1963. Fundamentals of Limnology. 3rd edition. University of Toronto Press, Toronto.

Timbol, A. S. and J. A. Maciolek. 1978. Stream Channel Modification in Hawaii. Part A: Statewide inventory of streams: habitat factors and associated biota. FWS/OBS - 78/16. USFWS National Stream Alteration Team, Columbia, Missouri.

Timbol, A. S. 1979. Limnological Survey of Kahana Stream, Oahu. Report prepared for Science Applications and the U. S. Army Corps of Engineers, Pacific Ocean Division, Fort Shafter, Hawaii. Contract No. DACW84-79-C-0021.

Titcomb, M. 1972. Native use of fish in Hawaii. University of Hawaii Press. Honolulu.

Tomihama, M. 1972. The life history of Sicydium stimpsoni, a freshwater goby endemic to Hawaii. Honors Division B. S. Thesis. Univ. of Hawaii, Honolulu.

White, D. S., W. U. Bigham, and J. T. Doyen. 1984. "Aquatic Coleoptera" In R. W. Merritt and K. W. Cummins, eds. An Introduction to the Aquatic Insects. 2nd ed. Kendall/Hunt Publishing Company. Dubuque, Iowa. pp. 361 - 437.

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APPENDIX III

ARCHAEOLOGICAL MAPPING AND RECONNAISSANCE SURVEY IN LOWER LIMAHULI VALLEY, HA'ENA, KAUA'I

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ARCHAEOLOGICAL MAPPING AND SURVEY
IN LOWER LIMAULI VALLEY,
HĀ'ENA, KAUA'I
(TMK 5-9-06:2, 3, 4, 5, 6 [por.], 8, 9;
and portions of 5-9-01:3)

by

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INTRODUCTION

This report and the accompanying large scale map presents the findings of the archaeological mapping and surface survey conducted within the approximately 13 acres that make up the proposed Limahuli Valley Botanical Garden, in lower Limahuli Valley, Hā`ena, Kaua`i (TMK 5-9-06:2, 3, 4, 5, 6 [por.], 8, and 9; and portions of 5-9-1:3) (Fig. 1). Fieldwork for this project was carried out between 19 September and 9 October 1989 by Bishop Museum Applied Research Group archaeologists Hemanta Jayatilake and Tomasi Patolo. A field inspection of the project was conducted on 8 October 1989 by Aki Sinoto and Scott Williams of the Applied Research Group. This work was done under contract with the National Tropical Botanical Garden.

This property was originally Royal Patent 3596; LCA 10613, Apana 6 to Abner Paki. In 1967, it was conveyed to Charles R. Wichman and Juliet A. Wichman. In 1976 and 1977, the Wichmans deeded TMK 5-9-6:2, 3, 4, 5, 6, and 9 to the Pacific Tropical Botanical Garden (now the National Tropical Botanical Garden).

Currently, much of the area has been previously cleared, landscaped, and planted as a private botanical garden. Several clusters of archaeological surface structures were identified prior to commencement of the project, as were small unimproved areas requiring reconnaissance survey.

SCOPE OF WORK

The Scope of Work for this project included the following tasks:

- 1) Brief pre-field literature search
- 2) Walk-through, surface survey

The objectives of this task are as follows: (a) locate and identify archaeological sites and features within designated portions of the area; and (b) determine the horizontal extent of

ISLAND OF KAUAI

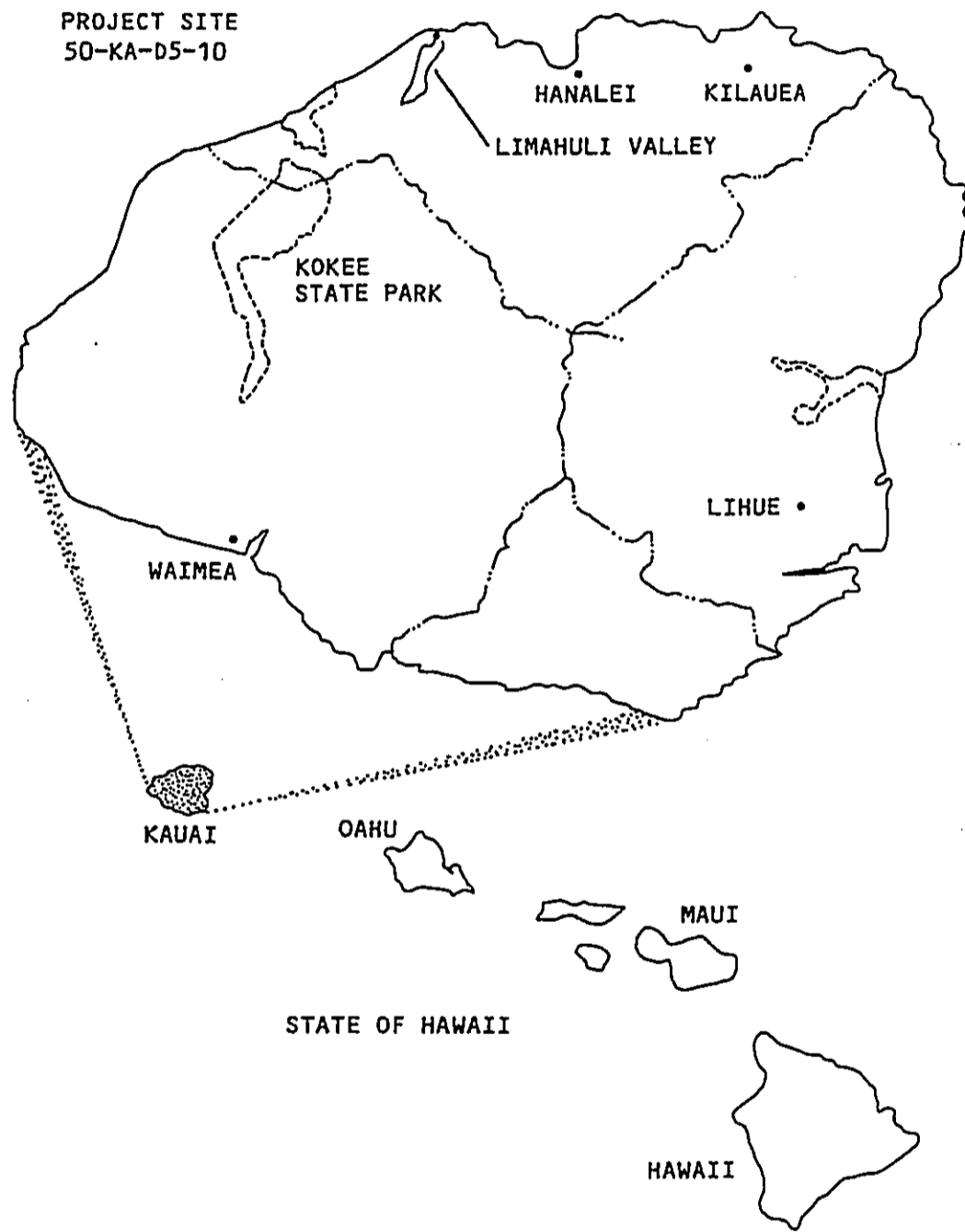


Fig. 1. LOCATION OF PROJECT AREA.

sites and associated cultural deposits as possible. No subsurface testing was undertaken during this level of research because of restricted fund availability on the part of the client.

3) Instrument-aided mapping of surface structures

Since some of the existing features were stabilized as well as modified previously, detailed mapping of structural features, including those portions that continue into neighboring properties, may aid in determining their original configuration. An accurate location map of archaeological sites is also necessary for incorporating the sites into a public interpretation plan in the proposed botanical garden.

METHODS

The reconnaissance survey was accomplished by walking sweeps across the project area. This was a simple task since most of the area is landscaped or mowed grass. While the heavily overgrown southern end of the project area was more difficult to survey, it was completely covered by pedestrian survey. One site was found at the extreme southern edge of the project area; alien vegetation in this area was cut to facilitate mapping.

A large-scale plan view map of the archaeological features present in the project area was made using theodolite, stadia rod, and measuring tapes. Written notes were taken on the size, complexity, and condition of the archaeological features. Finally, selected photographs were taken in both black-and-white and color.

All field notes, maps and records are stored in the Department of Anthropology, Bishop Museum.

ENVIRONMENTAL SETTING

The project area is an approximately 13-acre parcel located in Limahuli Valley, Hā'ena ahupua'a, Halele'a District, Kaua'i Island. The project area

is located c. 500 m inland of the coast, directly south of Kūhiō Highway. It is bounded by Makana and Pōhakukāne mountains and roughly 70 percent of the project area is situated on steep slopes. The boundaries of the project area are clearly defined: the north boundary is Kūhiō Highway; the south boundary is an existing access road; the west side is a property fenceline; the remaining boundaries are marked by the limits of extensive vegetation clearing.

Limahuli Valley is located in the wet windward north shore of Kaua'i. Rainfall near the mouth of the valley is about 1,700 mm and increases to more than 10,000 mm at the back of the valley (Earl 1978).

The soils in Limahuli Valley are classified as belonging to two different series: Hihimanu Series and Hanalei Series. Approximately two-thirds of the soils in the valley belong to the Hihimanu Series, which consist of well-drained silty clay loam developed from igneous rocks and colluvium at the base of the slopes. These soils are found primarily in areas with 40 - 70 percent slope (Foote et al. 1972:40). Soils in the remaining one-third of the project area belong to the Hanalei Series, which consist of silty clays and a deep water table. The soils are found in areas with a 0 - 6 percent slope (Foote et al. 1972:38).

Most of the alien vegetation in the project area has been removed in the past and, as a result, approximately 80 percent of the project area is now maintained as mowed lawns. The area not cleared is densely vegetated with primarily alien vegetation. Native vegetation noted in the project area include *lama* (*Diospyros* sp.), *pāpala-kēpau* (*Pisonia* sp.), *kōpiko* (*Psychotria* sp.), *ākia* (*Wikstroemia* sp.), and *ōhi'a* (*Metrosideros collina*). Polynesian introductions noted include *hala* (*Pandanus* spp.), *hau* (*Hibiscus tiliaceus*), and wild ginger (*Zingiber zerumbet*)

PREVIOUS ARCHAEOLOGICAL RESEARCH

No archaeological work has been conducted within the current project area, though previous work has been conducted in adjacent areas. Wendell

Bennett (1931) who conducted the only island-wide archaeological survey does not record any sites within the project area.

Timothy Earl conducted extensive research into the irrigated agricultural systems of Halele'a District in the early 1970's. As part of this research, he mapped and described the irrigated systems located to the north of Kūhiō Highway (1972:79-96). He did not work on the sites within the current project area; however, he does state that the head dam for the systems he was studying was located in the ornamental garden above the road (1972:91). Earl also states that the systems were abandoned at the time of his research and much of the systems were destroyed by road construction. It appears that the irrigated terraces within the current project area were a continuation of the systems that Earl studied.

A combined University of Hawaii and University of Illinois archaeological fieldschool was conducted at the state park at Kē'e Beach, located to the northwest of the project area. Evidence of occupation was found in the area for both prehistoric and historic periods (Riley and Clark 1979).

In 1979, the Archaeological Research Center of Hawaii conducted ethno-historical and archaeological investigations on Mr. Chu's property, north of the current project area. These investigations revealed considerable disturbance to the archaeological features from road construction and recent bulldozing (Hammatt and Meeker 1979).

Other limited archaeological investigations in the area were conducted by Kennedy in 1987 and 1988.

RESULTS

A total of 88 archaeological features were recorded within the project area (see enclosed map). These features are considered components of a single large site complex and are subsumed under one site number: 50-Ka-D5-11 (in the Bishop Museum site numbering system 50 = State of Hawai'i; Ka = Kaua'i Island; D = Hanalei District; 5 = Hā'ena *ahupua'a*; and 11 = specific

site number). State number 50-30-02-1005 is also assigned to this complex of features.

The following notes are provided to generally describe the features that were recorded. Table 1 (at the end of this report) presents descriptive details on individual features.

- FEATURE 1 Concentration of large boulders, possibly associated with highway construction.
- FEATURES 2 - 28 Irrigated terraces that have been historically modified, as evidenced by curvilinear walls and the incorporation of saphoritic rock in the retaining wall construction. Only the eastern sections (east of the fenceline) of Features 22, 23, and 25 were modified; the western sections appear to be unaltered. Features 13 - 15 were used as lily ponds in the past, and Features 23, 24, 25, and 28 currently have irrigated taro growing in them (see Figs. 2 and 3).
- FEATURES 29 - 55 These features are part of an extensive irrigated terrace complex incorporation Features 2 - 28. These features, 88, 89, however, have not been modified and are in relatively good condition. The length of these terraces range from approximately 7.0 - 28.0 m (\bar{X} = c. 10.0 m), in width from 1.5 - 25.0 m (\bar{X} = c. 6.0 m) and height from 0.5 - 2.0 m. Feature 55 has been artificially separated from the rest of the complex because of road construction (see Fig. 4).
- FEATURE 56 A small flat area with a retaining wall along the edge of the stream. The feature was probably built during road construction and may also be associated with the construction of the culvert to the south. A large pile of recently transported boulders and cobbles is located at the south end of the feature.



Fig. 2. OVERVIEW OF PHOTOGRAPH OF HISTORICALLY-MODIFIED
AGRICULTURAL TERRACES (Features 2 - 28).
BPBM Neg. No. Ka(a)25-1.



Fig. 3. DETAILED PHOTOGRAPH OF HISTORICALLY-MODIFIED
AGRICULTURAL TERRACES (Features 23 and 25).
BPBM Neg. No. Ka(a)26-1.



Fig. 4. PHOTOGRAPH OF IRRIGATED AGRICULTURAL
TERRACES (Feature 33). BPBM Neg. No.
Ka(a)26-3.

- FEATURES 57 - 64 A cluster of terraces and walls that may have functioned for habitation during the historic period, based on the massive nature of construction and the presence of historic artifacts on the surface. Feature 58 is a free-standing wall (c. 10.0 m long and 0.5 - 2.1 m high) that forms the southern boundary of the feature cluster (see Fig. 5).
- FEATURES 65, 66 Two rock alignments that are not spatially associated with any other features. Their function is unknown.
- FEATURE 67 Possible terrace remnants located on a steep slope.
- FEATURE 68 A linear boulder mound (27.5 by 1.0 m).
- FEATURES 69, 70 Rock mounds, consisting of cobbles and pebbles, with diameters of c. 2.0 m. Probably clearing mounds.
- FEATURE 76 A U-shaped rock alignment measuring c. 5.0 by 5.0 by 0.3 m high, which is probably the remains of a more substantial walled structure that may have functioned as the foundation of a habitation perishable superstructure (see Fig. 6).
- FEATURES 77, 78 Possible terrace remnants.
- FEATURE 79 A terrace constructed of large boulders.
- FEATURE 80 A U-shaped rock alignment measuring c. 6.0 by 6.0 by 0.6 m maximum height. This structure may have served as the foundation of a habitation perishable superstructure.
- FEATURE 81 - 86 Terrace remnants of unknown function.



Fig. 5. PHOTOGRAPH OF FEATURE 63. BPBM Neg.
No. Ka(a)25-3.



Fig. 6. PHOTOGRAPH OF FEATURE 76 (Feature 74 in foreground).
BPBM Neg. No. Ka(a)26-13.

FEATURE 87 A large boulder alignment recently built around a mango tree.

FEATURES 88 - 89 Part of the extensive irrigated terrace system (Features 2 - 28, 29-55). They, along with Feature 55, have been artificially separated from the complex because of road construction. They currently support small plots of sugar cane.

SIGNIFICANCE EVALUATION

Site 50-Ka-D5-11 appears to be significant according to Criterion D of the National Park Service. This site has the potential to yield information that is important to the history and prehistory of both the region as well as the State of Hawai'i.

DISCUSSION

The 88 features that make up Site 50-Ka-D5-11 are part of a large, complex agricultural system that undoubtedly extends beyond the confines of the project area. The agricultural system incorporated both irrigated and dry land cultivation techniques. The irrigated terraces, located along the valley bottom, were fed by irrigation ditches that diverted water from Limahuli Stream. The dry land terraces are located up on the valley slopes and were dependent on rainfall.

At least two of the features (71 and 80) probably functioned as Pre-Contact (before A.D. 1778) foundations for perishable habitation structures. One cluster of features (57 to 64) probably functioned as part of an historic habitation area in the valley. All of these habitation type features indicate that the valley has probably had a long and possibly continuous occupation, spanning both pre-Contact and historic eras.

The archaeological resources in Limahuli have tremendous potential to add to our knowledge about the settlement and adaptation to this region of Kaua'i. More intensive investigations can produce information to address basic research questions such as:

- 1) How do the features present in lower Limahuli Valley relate to the overall settlement pattern of Halele'a District?
- 2) What was the nature of the habitations in this lower portion of the valley--was it of a short-term, temporary nature, or was it permanent?
- 3) What activities took place at the various features? Were any of these features of a specialized nature?
- 4) What were the temporal origins of the features? Are all of the features contemporaneous? How were the features spatially, temporally, and functionally associated with one another?
- 5) What were the impacts of the historic uses in the valley?
- 6) What exploitive strategies were employed by the inhabitants of lower Limahuli Valley and what micro-environments were being exploited?

RECOMMENDATIONS

With the completion of a detailed map of the archaeological features present in the project area, development plans for the botanical garden can commence. It is recommended that the archaeological features that are present in the project area be preserved and incorporated into the long-range development plans.

Some of the features along the alluvial flat that have been modified in recent times should be restored, as possible, to their original configuration and construction. All plans for modification of surface archaeological features should be reviewed by the State Historic Preservation Program.

If any ground-altering activities, such as grubbing, grading, or excavation are conducted, archaeological testing should be undertaken first to determine if any potentially significant subsurface archaeological deposits

are present. Contingent on the results of the testing, a data recovery program should be prepared and be reviewed by the State Historic Preservation Program.

TABLE 1.
DESCRIPTIVE DATA FROM RECORDED FEATURES

Fe. No.	Size (m)	Fe. Type	Construction	Probable Age	Probable Function
1	6.5 x 6.0	Terrace	Stacked boulders	Historic	Associated with highway construction
2	9.0 x 6.0	Alignment	Irregularly-aligned cobbles	Historic	From access road drainage
3	8.0 x 9.0	Terrace	Stone-faced	Unknown	Agricultural
4	7.0 x 12.5	Terrace	Stone-faced	Unknown	Agricultural
5	20.0 x 1.0	Terrace	Stone-faced	Unknown	Probably access road retainment
6	11.5 x 5.0	Alignment	Aligned cobbles/ boulders	Probably historic	From access road construction
7	54.0 x 4.0	Terrace	Stacked, stone-faced	Unknown	Agricultural
8	26.0 x 7.0	Terrace	Stacked, stone-faced	Unknown	Agricultural
9	9.0 x 2.0	Terrace	Stacked, stone-faced	Unknown	Agricultural
10	67.0 x 5.0	Terrace	Stacked, stone-faced	Unknown	Agricultural/slope retention
11	40.0 x 4.0	Terrace	Stacked, stone-faced	Probably pre-historic	Portion of an old trail
12	7.0 x 10.0	Alignment	Aligned cobbles/ boulders	Unknown	Unknown
13	7.5 x 3.0	Linear concentration	One rock high and several wide (boulders and cobbles)	Prehistoric/historic	Prehistoric but historically used as lily pond
14	10.0 x 4.5	Linear concentration	One rock high and several wide (boulders and cobbles)	Prehistoric/historic	Prehistoric but historically used as lily pond.
15	10.0 x 7.5	Linear concentration	One rock high but several rocks wide (boulders)	Prehistoric/historic	Prehistoric but historically used as lily pond.
16	9.0 x 2.0	Alignment	Aligned boulders	Prehistoric/historic	Agricultural (irrigated)

TABLE 1 (cont.)

Fe. No.	Size (m)	Fe. Type	Construction	Probable Age	Probable Function
17	19.3 x 14.0	Terrace	Stone-faced	Prehistoric/ historic	Agricultural (irrigated)
18	22.0 x 29.0	Terrace	Stone-faced	Prehistoric/ historic	Agricultural (irrigated)
19	7.8 x 2.4	Terrace	Stone-faced	Prehistoric/ historic	Agricultural (irrigated)
20	15.5 x 2.0	Terrace	Stone-faced	Prehistoric/ historic	Agricultural (irrigated)
21	20.0 x 5.4	Terrace	Stone-faced	Prehistoric/ historic	Agricultural (irrigated)
22	7.0 x 6.4	Terrace	Stone-faced	Prehistoric/ historic	Agricultural (irrigated)
23	23.7 x 5.6	Terrace	Stone-faced	Prehistoric/ historic	Agricultural (irrigated)
24	22.2 x 11.00	Terrace	Stone-faced	Prehistoric/ historic	Agricultural (irrigated)
25	27.8 x 8.4	Terrace	Stone-faced	Prehistoric/ historic	Agricultural (irrigated)
26	14.0 x 7.0	Terrace	Stone-faced	Prehistoric/ historic	Agricultural (irrigated)
27	11.0 x 4.0	Terrace	Stacked, stone-faced	Prehistoric/ historic	Prehistoric irrigated agriculture with historic modifications
28	13.6 x 4.2	Terrace	Stacked, stone-faced	Prehistoric/ historic	Prehistoric irrigated agriculture with historic modifications
29	12.8 x 3.7	Terrace	Stacked/tumbled cobbles/ boulders	Prehistoric	Irrigated agriculture with no apparent historic modifications
30	15.0 x 3.0	Concentration	Concentration of large boulders and cobbles	Prehistoric	Irrigated agriculture with no apparent historic modifications
31	9.0 x 4.0	Terrace	Tumbled boulder/cobble	Prehistoric	Irrigated agriculture with no apparent historic modifications
32	11.6 x 1.2	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
33	20.5 x 5.0	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications

TABLE 1 (cont.)					
Fe. No.	Size (m)	Fe. Type	Construction	Probable Age	Probable Function
34	5.0 x 1.8	Terrace	Boulder/cobble concentration	Prehistoric	Irrigated agriculture with no apparent historic modifications
35	NO FEATURE RECORDED				
36	8.0 x 2.5	Linear concentration	One to two rocks high	Prehistoric	Irrigated agriculture with no apparent historic modifications
37	8.4 x 4.2	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
38	19.0 x 5.0	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
39	9.5 x 3.0	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with apparent historic modifications
40	14.6 x 8.0	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
41	18.2 x 7.4	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
42	6.0 x 2.5	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
43	23.0 x 7.0	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
44	8.0 x 3.0	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
45	13.5 x 7.0	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
46	11.0 x 1.0	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
47	14.0 x 10.0	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
48	22.5 x 7.0	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
49	17.5 x 1.7	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
50	7.0 x 7.5	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
51	8.7 x 5.0	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no

TABLE 1 (cont.)					
Fe. No.	Size (m)	Fe. Type	Construction	Probable Age	Probable Function
52	10.5 x 4.2	Terrace	Stacked, stone-faced	Prehistoric	Irrigated agriculture with no apparent historic modifications
53	16.0 x 7.5	Terrace	Stone-faced	Prehistoric/historic	Irrigated agriculture with historic modifications
54	7.7 x 2.7	Terrace	Stone-faced	Prehistoric/historic	Irrigated agriculture with historic modifications
55	8.0 x 4.0	Terrace	Stone-faced	Prehistoric/historic	Probably prehistoric with historic modifications. Currently has sugar cane on it
56	12.5 x 4.8	Terrace	Boulder-faced	Historic	Associated with access road construction
57	16.0 x 10.0	Terrace	Boulder/cobble-faced	Possibly historic	Associated with habitation terrace
58	20.0 x 6.0	Wall	Stone-faced wall	Possibly historic	Associated with habitation terrace
59	8.9 x 3.0	Terrace	Boulder-faced	Possibly historic	Associated with habitation terrace
60	12.0 x 6.0	Alignment	Boulder/cobble	Possibly historic	Associated with habitation terrace
61	9.2 x 4.0	Terrace	Stacked, stone-faced	Possibly historic	Habitation Terrace
62	11.5 x 5.0	Terrace	Stacked, stone-faced	Possibly historic	Habitation Terrace
63	18.0 x 13.5	Terrace	Stacked, stone-faced	Possibly historic	Habitation Terrace
64	12.5 x 9.8	Terrace	Irregular stone-faced	Possibly historic	Habitation Terrace
65	20.0 x 5.0	Linear cobble concentration	No apparent construction	Unknown	Possible agricultural terrace remnant
66	3.0 x 0.5	Alignment	Aligned boulders	Unknown	Unknown
67	9.5 x 0.3	Alignment	Aligned boulders	Unknown	Unknown
68	27.0 x 1.0	Linear boulder concentration	No apparent construction	Historic	Probably piled during the access road construction
69	3.7 x 2.0	Linear rock mound	Piled cobbles and pebbles	Unknown	Clearing mound
70	4.0 x 2.0	Rock mound	Piled cobbles and pebbles	Unknown	Clearing mound
71	13.5 x 0.5	Linear concentration of cobbles and pebbles	No apparent construction	Unknown	Unknown but probably a wall remnant

TABLE 1 (cont.)					
Fe. No.	Size (m)	Fe. Type	Construction	Probable Age	Probable Function
72	4.0 x 2.0	Rock pile	Piled rocks	Unknown but probably historic	Probably from recent bulldozing in the area
73	7.5 x 2.5	Alignment	Aligned boulders/cobbles	Most probably historic	Associated with access road construction
74	6.5 x 2.0	Linear rock concentration	Probably faced but not distinct	Probably prehistoric with historic modifications	Probably habitation
75	3.2 x 1.0	Rock concentration	No apparent construction	Unknown	Unknown
76	8.4 x 4.0	Terrace	Rock-faced	Probably prehistoric	Probably a habitation feature but currently used as a tool storage area
77	9.5 x 0.7	Linear rock concentration	No apparent construction	Unknown	Probably a clearing mound
78	7.8 x 1.5	Linear rock concentration	No apparent construction	Unknown	Probably a clearing mound
79	11.0 x 1.0	Alignment	Aligned boulders	Historic	Unknown
80	8.0 x 4.0	Terrace	Boulder-and-cobble-faced	Probably prehistoric	Probable habitation site
81	20.0 x 0.8	Linear rock concentration	No apparent construction	Unknown	Unknown
82	9.0 x 0.4	Rock concentration	No apparent construction	Unknown	Unknown
83	3.7 x 0.5	Rock concentration	No apparent construction	Unknown	Unknown
84	19.5 x 0.5	Alignment	Aligned boulders	Probably historic	Unknown
85	11.4 x 0.5	Partially rock-aligned earthen terrace	No apparent construction	Probably historic	Unknown
86	7.5 x 0.7	Terrace	One or two rocks high (stacked)	Historic	Unknown
87	10.4 x 10.0	Terrace	Stacked boulders and cobbles	Historic	Unknown

TABLE 1 (cont.)

Fe. No.	Size (m)	Fe. Type	Construction	Probable Age	Probable Function
88	4.0 x 3.5	Terrace	Rock-faced (boulders and cobbles)	Probably prehistoric with historic modifications	Unknown. Currently has sugar cane on it
89	4.0 x 3.0	Terrace	Rock-faced (boulders and cobbles)	Probably prehistoric with historic modifications	Unknown. Currently has sugar cane on it

REFERENCES

- Bennett, W. C.
1931 *The Archaeology of Kaua`i*. B. P. Bishop Mus. Bull. 80.
Honolulu: Bishop Mus. Press.
- Earl, Timothy
1978 "Economic and Social Organization of a Complex Chiefdom:
The Halelea District, Kaua`i, Hawai`i." Anthropological
Papers, No. 63. Ann Arbor. University of Michigan.
- Foote, D. E., E. L. Hill, S. Nakamura, F. Stephens
1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai,
and Lanai, State of Hawaii*. Washington D.C.: United States
Department of Agriculture and Soil Conservation Service.
- Kennedy, Joseph
1987 "Archaeological Investigations at Limahuli, Island of Kaua`i
(TMK 5-9-03:8)." On file at the State Historic Preservation
Program Office, Honolulu.
- 1988 "Report Concerning Archaeological Survey and Testing at
Limahuli, Kaua`i." On file in the State Historic
Preservation Program Office, Honolulu.
- Hammatt, H. H., and V. Meeker
1979 "Archaeological and Ethnohistorical Investigation at Hā`ena,
Halele`a, Kaua`i Island. Lāwa`i. Archaeological Research
Center of Hawaii.
- Riley, T. J., and J. Clark
1979 "Archaeological Testing and Excavation at Hā`ena, Kaua`i."
On file in the State Historic Preservation Program Office,
Honolulu.

APPENDIX IV

BOTANICAL SURVEY

LIMAHULI VALLEY CONSERVATION DISTRICT USE

APPLICATION

HALELEA DISTRICT, ISLAND OF KAUA'I

BY

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Botanical Survey
Limahuli Valley Conservation District Use Application
Halelea District, Island of Kauai

by
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Botanical Survey
Limahuli Valley Conservation District Use Application
Halelea District, Island of Kauai

Introduction

The National Tropical Botanical Garden and the Charles Rice Wichman family are planning to file a conservation district use application requesting the subsequent establishment of a special subzone in Limahuli Valley. Two developments of the proposed action are addressed in this report:

- (1) the proposed clearing of the Garden Area of all undesirable weed species.
- (2) the restoration of all or part of an existing trail up Limahuli Valley to the base of Limahuli Falls.

A botanical survey of the project area was conducted in order to describe the vegetation of the areas to be impacted; search for rare, threatened or endangered species; and to identify areas of potential problems or concerns.

Survey Methods

The results of this study are based on five walk-through surveys (between 1989 and 1990) of the impacted areas as well as on extensive collections made by the investigator during a survey of Limahuli Valley over a three year period, from 1985-1987. Relative abundance of the species is based on visual estimates. Almost all of the species listed are documented by voucher specimens housed in the herbarium of the National Tropical Botanical Garden (PTBG).

The survey site can be divided into two areas: Lots 140-145, which are bounded by the roads P-1 and P-2 and are largely developed as a garde area with a rather small portion that is proposed to be cleared and added to the garden; and a trail through Lot 152 from the southern end of Lot 142 along the Limahuli stream to the base of the Limahuli Falls.

Limahuli Valley lies along the north shore of Kauai in the district of Halelea. It has an elevation of approximately 3330 feet at the peak of Hono O Na Pali. Bordered on the east by Wainiha Valley and on the west by Hanakapiai Valley, Limahuli Valley encompasses some 1005 acres of land (Wichman, 1978). The valley can be divided into an upper and lower valley by Limahuli Falls. The upper valley is largely undisturbed, low elevation rain forest and relatively inaccessible (Theobald, 1987). The vegetation of the lower valley has undergone extensive modification and degradation. The area was under cultivation by the early Hawaiians, who grew such crops as taro, bananas, sugar cane, and awa (Handy and Handy, 1972). This is evidenced by the taro lo'i found near the mouth of the valley as well as by remnants of these crops still found along many of the water ways and old agricultural terraces in the lower Limahuli Valley.

Between 1840 and 1856, coffee was planted in many of Kauai's north shore valleys (Hume, 1986). While there seems to be no record of coffee cultivation in Limahuli, the

large amount of coffee found growing in the valley today certainly seems to suggest that it was once cultivated here.

From the late 1800 's until 1967, the lower valley was used to pasture cattle. Development of the existing garden area was begun in 1967 by Juliet Rice Wichman (Wichman, 1978) and has continued off and on since that time.

Vegetation

The vegetation of the lower valley floor is dominated by alien species, although there are remnant individuals of various native species. The maintained garden area is dominated by an open canopied forest of *Psidium cattleianum* (strawberry guava, waiawi) and *Pandanus tectorius* (hala) over a mown lawn of introduced grasses and herbs.

Scattered individuals of the native species *Metrosideros polymorpha* var. *glaberrima* ('ohia) and *Wikstroemia oahuensis* var. *palustris* (akia) are found in parts of the garden area. There are also a number of cultivated plants scattered throughout the area, but they are not listed here. The undeveloped, forested portion of the survey site is much more diverse, but again the majority of the plants are introduced species. The canopy is quite dense and is dominated by the introduced species *Aleurites moluccana* (kukui), *Schefflera actinophylla* (octopus tree), *Syzygium cumini* (java plum), *Schinus terebinthifolius* (christmas berry), and *Clusea rosea* (autograph tree). A number of other introduced tree species are also found but do not constitute a major element of the forest. They include *Psidium guajava* (common guava), *Psidium cattleianum* (strawberry guava) *Mangifera indica* (mango), *Spathodea campanulata* (African tulip tree), *Ficus microcarpa* (Chinese banyan), and *Cestrum diurnum* (day cestrum). Four native tree species were found in this area, but only *Pandanus tectorius* (hala) could be considered common. Three additional native tree species were found: a single individual of *Diospyros sandwicensis* (lama); two individuals of *Pisonia wagneriana*; and two individuals of *Psychotria kaduana* (kopiko kea).

The understory is heavily shaded; consequently the species composition is relatively depauperate, especially when compared to the forest edge bordering the road. The shrub layer consists entirely of scattered individuals of the polynesian introduction *Cordyline fruticosa* (ti, ki).

The groundcover consists of a mixture of *Oplismenus hirtellus* (basketgrass), *Elephantopus mollis*, *Kalanchoe pinnata* (air plant), and *Phymatosorus scolopendria* (lauae fern). In some places the polynesian introductions *Zingiber zerumbet* ('awapuhi, shampoo ginger) and *Dioscorea bulbifera* (pi'ia) are locally dominant. But, because both species are winter dormant, they may not always be apparent as components of the vegetation. Less frequently, the ferns *Phlebodium aureum* and *Christella dentata* are encountered. Three species are occasionally found as epiphytes on exposed rock: *Peperomia sandwicensis*, *Peperomia tetraphylla*, and *Pleopeltis thunbergiana*.

Along the margins of the forest that border the dirt and gravel road the vegetation is dominated by weedy, herbaceous species. A mixture of *Wedelia trilobata*, *Stachytarpheta jamaicensis*, *Nephrolepis multiflora*, *Rubus rosifolius*, *Pluchea carolinensis*, *Spathoglottis plicata*

(philippine ground orchid), *Christella dentata*, *Zingiber zerumbet* ('awapuhi), and *Commelina diffusa* (honohono) dominates these open roadsides. Single individuals of *Psilotum nudum* (moa) and *Canavalia cathartica* (mauna loa) were also noted. Near the upper lookout *Bidens forbesii* subsp. *forbesii*, *Wikstroemia oahuensis* var. *palustris*, and *Sphenomeris chinensis* were also found. A colony of *Syzygium malaccense* (mountain apple) occupies a small area along the outer edge of the road and has shaded out most of the ground cover under it.

The proposed trail to the base of Limahuli Falls would follow an existing trail that begins near the south corner of Lot 142 and follows Limahuli stream through Lot 152 to the base of Limahuli Falls. The trail runs along the eastern side of Limahuli Stream through forest dominated by the introduced species *Psidium guajava*. *Aleurites moluccana* is commonly mixed with the guava and in some cases may be locally dominant. Large stands of *Coffea arabica* are frequent and in some areas may form a monospecific subcanopy. Approximately half-way up the valley the trail passes through an area of rock walls and terraces. Here the *Psidium* briefly gives way to an extensive clone of *Phyllostachys nigra* (black bamboo). Along the southern boundary of the bamboo grove one encounters massive trees of *Mangifera indica*. Adjacent to the bamboo and obscuring the stream is an equally extensive clone of *Hibiscus tiliaceus* (hau). The bamboo shortly gives way to the *Psidium guajava* forest, and in this area one finds a large population of the introduced vine *Pueraria lobata* (kudzu vine).

Psidium continues to be the dominant species along the remainder of the trail to the base of the falls. But as one proceeds up the valley the numbers and diversity of native species increases dramatically. *Metrosideros polymorpha* var. *glaberrima*, *Pisonia wagneriana*, and *Hedyotis acuminata* (au, pilo) are most commonly encountered, though usually as scattered individuals. Less frequently seen are *Charpentiera elliptica* x *Charpentiera densiflora*, *Hibiscus waimeae* subsp. *hannerae* (koki'o ke'oke'o), *Pittosporum glabrum* (ho'awa), *Psychotria mariniana*, and *Psychotria greenwelliae*. A number of other native species are usually found along the many small watercourses and drainages that intersect the trail. These include *Cyrtandra wainihaensis*, *Cyrtandra confertiflora* var. *confertiflora*, *Boehmeria grandis* (akolea), *Urera glabra* (opuhe, hopue, hona), *Touchardia latifolia* (olona), *Selaginella arbuscula* (lepelepe-a-moa), *Cyanea hardyi*, and *Cyanea sylvestris*. Polynesian introductions are also found along these waterways. They include *Colocasia esculenta* (taro), *Musa xparadisiaca* (mai'a), and *Piper methysticum* (awa). Along the trail itself, the ground cover is composed almost exclusively of introduced species. They include *Sacciolepis indica*, *Drymaria cordata*, *Elephantopus mollis*, *Zingiber zerumbet*, *Oplismenus hirtellus*, *Christella parasitica*, *Christella dentata*, *Nephrolepis multiflora*, *Blechnum occidentale*, and *Kyllinga brevifolia*. Two native species are common where the trail crosses waterlogged ground. They are *Cyclosorus interruptus* (neke) and *Adenostemma lavenia* (kamanamana). Both species are widespread in the Pacific (Wagner et al., 1990; Holttum, 1977). Just off the trail, one often encounters the native fern species *Athyrium macraei*, *Diplazium sandwichianum* (ho'i'o), and *Sphenomeris chinensis* (pala'a).

A number of species are found only as epiphytes on rocks and tree trunks. These include five species of *Peperomia* (ala'ala wai nui): *Peperomia tetraphylla*, *Peperomia leptostachys*, *Peperomia sandwicensis*, *Peperomia oahuensis*, and *Peperomia latifolia*. Three

ferns are also commonly seen: the filmy ferns *Gonocormus minutus* and *Vandenboschia draytoniana* (kilau), which often form thick mats mixed with mosses and liverworts that almost completely clothe large boulders; and *Pleopeltis thunbergiana* (pakahakaha).

Unfortunately, the introduced and extremely noxious species *Clidemia hirta* ("Koster's curse") and *Pueraria lobata* ("kudzu") were also encountered along the trail. Both species have the potential of completely dominating the vegetation of the lower valley. It appears to be spreading quite rapidly, no doubt due to the spread of seeds by foraging birds attracted to the fruit. The kudzu occupies an extensive area south of the bamboo grove and south and east of the hau thicket; it does not appear to be expanding into new areas.

Threatened or Endangered Species

The survey did not find any plant species that are Federally listed as either Threatened or Endangered or any plant species that are candidates for listing as Threatened or Endangered.

Discussion and Recommendations

The vegetation of the lower Limahuli Valley reflects hundreds of years of modification and degradation. It is dominated by introduced, aggressive species that have for the most part replaced the native species. The native species that do remain often exist as remnant individuals, or they occupy a niche that has not yet been filled by weedy species. This is best illustrated by the high percentage of epiphytic plants that are native. The proposed project is not expected to have a significant impact on the remaining native vegetation. Removal of weedy plant species from the Garden Area may in fact encourage regrowth of certain native species such as *Metrosideros polymorpha* var. *glaberrima*, *Bidens forbesii* subsp. *forbesii*, and *Wikstroemia oahuensis* var. *palustris*. This should be done gradually, allowing ground covers to fill in, to reduce the chance of erosion during periods of heavy rain. Freshly cleared areas might be sown with seed from adjacent native species, further enhancing the possibility of their regeneration. A special effort should be made to control the invasive species *Clidemia hirta* and *Pueraria lobata*. It will be difficult to remove both these species but, if allowed to go unchecked, they could eventually spread throughout the entire valley.

Reopening the trail up the valley to the base of Limahuli Falls should not adversely effect the native plant species. But care should be taken to reroute the trail away from areas subject to erosion, such as that found near the beginning of the trail where it passes just above the stream. There is also the remote possibility that hikers could introduce new weed species from seed carried on their boots. Outweighing those negative possibilities are the opportunities that such a trail could offer. With a knowledgeable guide, users would be given the chance to see a fair number of native species in their natural habitat. Many would also see just how much of the modern Hawaiian 'plantscape' is dominated by introduced, weedy species. Hopefully this would spark an awareness of and concern for the native Hawaiian plant species.

References

- Handy, E. S. C. and E. G. Handy. 1972. "Native plants in old Hawaii. Their life, lore, and environment". Bernice P. Bishop Mus. Bull. 233: 1-641.
- Holtum, R. E. 1977. "The Family Thelypteridaceae in the Pacific and Australasia". *Allertonia* 1(3): 169-234.
- Hume, L. M. 1986. "Some Plants of Hanalei". Bull. Pacific Trop. Bot. Gard. 16: 37-48.
- Khan, R. and C. E. Jarvis. 1989. "The Correct Name for the Plant known as *Pluchea symphytifolia* Gills (Asteraceae)". *Taxon* 38: 659-662.
- Lamoureux, C. H. 1988. Draft Checklist of Hawaiian Pteridophytes. (unpublished).
- Porter, J. R. 1972. "Hawaiian Names for Vascular Plants". Hawaii Agric. Exp. Sta. Univ. Hawaii Dept. Pap 1: 1-64.
- Theobald, W. L. 1987. Final Performance Report, IMS Grant No. IC-50023-85. (unpublished).
- Wagner, W. H. Jr., and F. S. Wagner. 1987. Revised Checklist of Hawaiian Pteridophytes. (unpublished).
- Wagner, W. L., D. R. Herbst, and S. H. Sohmer, 1990. *Manual of the Flowering Plants of Hawaii*. University of Hawaii Press, Honolulu, 1853 pp.
- Wichman, C., Jr. 1978. *Limahuli Valley botanical survey*. Bull. Pacific Trop. Bot. Gard. 8: 1-8.

Appendix 1. Plant Species List

The following list records the vascular plant species seen on the survey. The species are listed alphabetically within the family. The families are placed within one of three groups: Pteridophytes, Monocotyledons, and Dicotyledons. The names of the pteridophytes (ferns and fern allies) follow Lamoureux (1988) and Wagner and Wagner (1987). Distributions of the pteridophytes follow Lamoureux (1988) and Holttum (1977). The names and distributions of the monocots and dicots follows Wagner et al., 1990).

The distributions are designated with the following symbols:

- E - endemic; species native only to the Hawaiian Islands.
- I - indigenous; species native to the Hawaiian Islands but also native elsewhere.
- P - polynesian; species introduced into the Hawaiian Islands by the Polynesians.
- X - exotic; weedy species that have become established and are reproducing without human interference.

Note: This is not a comprehensive list of plant species found in Limahuli Valley but rather a list of those species found along the route of the proposed trail and that might possibly be impacted by said trail.

	Limahuli	
	Pteridophytes	
	Adiantaceae	
<i>Adiantum raddianum</i> Presl.		X
	Athyriaceae	
<i>Athyrium macraei</i> (Hook & Grev.) Copel.		E
<i>Diplazium sandwichianum</i> (Presl.) Diels		E
	Blechnaceae	
<i>Blechnum occidentale</i> L.		N
	Hymenophyllaceae	
<i>Gonocormus minutus</i> (Blume) v.d. Bosch		I
<i>Vandenboschia draytoniana</i> Brack.) Copel.		E
	Lindsaeaceae	
<i>Sphenomeris chinensis</i> L. Maxon		I
	Nephrolepidaceae	
<i>Nephrolepis multiflora</i> (Roxb.) Jarrett ex Morton		X
	Polypodiaceae	
<i>Phlebodium aureum</i> (L.) J. Sm.		X
<i>Phymatosorus scolopendria</i> (Burm.) Pic.-Ser.		P
<i>Pleopeltis thunbergiana</i> Kaulf.		I
	Psilotaceae	
<i>Psilotum nudum</i> (L.) Beauv.		
	Thelypteridaceae	
<i>Christella dentata</i> (Forsk.) Brownsey & Jermy		X
<i>Christella parasitica</i> (L.) Levl.		X
<i>Cyclosorus interruptus</i> (Willd.) H. Ito		I
	Selaginellaceae	
<i>Selaginella arbuscula</i> (Kaulf.) Spring		E
	Monocotyledons	
	Agavaceae	
<i>Cordyline fruticosa</i> (L.) A. Cheu.		P

	Araceae	
<i>Colocasia esculenta</i> (L.) Schott		P
	Commelinaceae	
<i>Commelina diffusa</i> N. L. Burm.		X
	Cyperaceae	
<i>Kyllinga brevifolia</i> Rottb.		X
	Dioscoreaceae	
<i>Dioscorea bulbifera</i> L.		P
	Gramineae	
<i>Oplismenus hirtellus</i> (L.) Beauv.		X
<i>Phyllostachys nigra</i> (Lodd.) Munro		X
<i>Sacciolepis indica</i> (L.) Chase		X
	Musaceae	
<i>Musa xparadisiaca</i> L.		P
	Orchidaceae	
<i>Spathoglottis plicata</i> Blume		X
	Pandanaceae	
<i>Pandanus tectorius</i> Parkinson ex. Z.		I
	Zingiberaceae	
<i>Zingiber zerumbet</i> (L.) Roscoe in Sm.		P
	Dicotyledons	
	Amaranthaceae	
<i>Charpentiera elliptica</i> (Hillebr.) A. Heller x <i>C. densiflora</i> Sohmer		E
	Anacardiaceae	
<i>Mangifera indica</i> L.		X
<i>Schinus terebinthifolius</i> Raddi		X
	Araliaceae	
<i>Schefflera actinophylla</i> (Endl.) Harms		N

Asteraceae	
<i>Adenostemma lavenia</i> (L.) Kuntze	I
<i>Bidens forbesii</i> Sherff subsp. <i>forbesii</i>	E
<i>Elephantopus mollis</i> H.B.K.	X
<i>Pluchea carolinensis</i> (Jacq.) G. Don in Sweet	X
<i>Wedelia trilobata</i> (L.) Hitchc.	X
<i>Youngia japonica</i> (L.) DC.	X
Bignoniaceae	
<i>Spathodea campanulata</i> Beauv.	X
Capanulaceae	
<i>Cyanea hardyi</i> Rock	E
<i>Cyanea sylvestris</i> A. Heller	E
Caryophyllaceae	
<i>Drymaria cordata</i> (L.) Willd. ex Roem. & Schult. var. <i>pacifica</i> Mizushima	X
Clusiaceae	
<i>Clusia rosea</i> Jacq.	X
Crassulaceae	
<i>Kalanchoë pinnata</i> (Lam.) Pers	X
Ebenaceae	
<i>Diospyros sandwicensis</i> (A.DC.) Fosb.	E
Euphorbiaceae	
<i>Aleurites moluccana</i> (L.) Willd.	P
Fabaceae	
<i>Canavalia cathartica</i> Thouars	X
<i>Pueraria lobata</i> (Willd.) Ohwi	X
Gesneriaceae	
<i>Cyrtandra confertiflora</i> (Wawra) C. B. Clarke var. <i>confertiflora</i>	E
<i>Cyrtandra wainihaensis</i> St. John	E
Malvaceae	
<i>Hibiscus tiliaceus</i> L.	I
<i>Hibiscus waimeae</i> A. Heller subsp. <i>hanneriae</i> (Deg. & Deg.) D. Bates	E

	Moraceae	
<i>Ficus microcarpa</i> L. fil.		X
	Myrtaceae	
<i>Metrosideros polymorpha</i> Gaud. var. <i>glaberrima</i> (H. Lev.) St. John		E
<i>Psidium cattleianum</i> Sabine		X
<i>Psidium guajava</i> L.		X
<i>Syzygium cumini</i> (L.) Skeels		X
<i>Syzygium malaccense</i> (L.) Merr. & Perry		P
	Nyctaginaceae	
<i>Pisonia wagneriana</i> Fosb.		E
	Piperaceae	
<i>Peperomia latifolia</i> Miq.		E
<i>Peperomia leptostachys</i> Hook. & Arnott		I
<i>Peperomia oahuensis</i> C. DC.		E
<i>Peperomia sandwicensis</i> Miq.		E
<i>Peperomia tetraphylla</i> (G. Forster) Hook. & Arnott		I
<i>Piper methysticum</i> G. Forster		P
	Pittosporaceae	
<i>Pittosporum glabrum</i> Hook. & Arnott		E
	Rosaceae	
<i>Rubus rosifolius</i> Sm.		X
	Rubiaceae	
<i>Coffea arabica</i> L.		X
<i>Hedyotis acuminata</i> (Cham. & Schlect.) Steud.		E
<i>Psychotria kaduana</i> (Cham. & Schlechtend.) Fosb.		E
<i>Psychotria mariniana</i> (Cham. & Schlect.) Fosb.		E
<i>Psychotria greenwelliae</i> Fosb.		E
	Solanaceae	
<i>Cestrum diurnum</i> L.		X
	Thymelaeaceae	
<i>Wikstroemia oahuensis</i> (A. Gray) Rock var. <i>palustris</i> (Hochr.) B. Peterson		E

Urticaceae

Boehmeria grandis (Hook. & Arnott) A. Heller

Pilea peploides (Gaud.) Hook. & Arnott

Touchardia latifolia Gaud.

Urera glabra (Hook. & Arnott) Weddell

E
I
E
E

Verbenaceae

Stachytarpheta jamaicensis (L.) Vahl

X