Habitat Conservation Plan for Abutilon menziesii

at Kapolei

State of Hawai'i
Department of Transportation

FINAL HCP
March 2004

HABITAT CONSERVATION PLAN FOR ABUTILON MENZIESII AT KAPOLEI

State of Hawaii
Department of Transportation

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

PREFACE

The preparation of the *Habitat Conservation Plan for Abutilon menziesii at Kapolei* ("HCP") was initiated in 1996 with two State sponsored development proposals. The first proposal involved the 1,300-acre East Kapolei Master Plan project proposed by the Housing and Community Development Corporation of Hawaii ("HCDCH") under a right-of-entry agreement with the Department of Land and Natural Resources ("DLNR"). The second proposal by the Department of Transportation ("DOT") involved the North-South Road arterial highway which would bisect the 1,300-acre property. The earlier drafts of the HCP were therefore co-sponsored by DOT and HCDCH.

In actions by the Board of Land and Natural Resources in September 2002, the 1,300 acres of State land have been re-assigned to other State of Hawaii entities. The University of Hawaii has received 500 acres for the development of the University of Hawaii West Oahu campus ("UHWO") and the Department of Hawaiian Home Lands has acquired 200 acres for residential homestead development. The remaining 600 acres are again under the control of the DLNR. Thus, HCDCH no longer holds an interest to these Kapolei lands.

Abutilon menziesii has also been found on adjacent lands owned by the City and County of Honolulu. The City has therefore, requested that its land be included in the subject HCP to allow the construction of a proposed roadway segment and other potential future urban uses. Thus, the Final HCP incorporates an additional 81 acres for a total of 1,381 acres of land.

As described herein, DOT has assumed sole sponsorship of the HCP for the total population of *Abutilon menziesii* at the Kapolei property. DOT has also assumed mitigation responsibility as described in a Memorandum of Agreement ("MOA") with DLNR.

And finally, a request for an Incidental Take License for the Kapolei population will involve coordination and cooperation between DOT and other stakeholder parties through future agreements (i.e., MOA, Certificate of Inclusion) when other properties are ready to be developed.

EXECUTIVE SUMMARY

A population of *Abutilon menziesii* was discovered in late 1996 at Kapolei in the Ewa area, island of Oahu, State of Hawaii, on former sugarcane land. Hence, this population is referred to as the "Kapolei population". *A. menziesii* of the Mallow Family (Malvaceae) is also known by its Hawaiian name Kooloaula and its common name "red ilima". It has been a federally listed endangered species since 1986 and is protected under the provisions of the federal Endangered Species Act of 1973, as amended, and Chapter 195D, *Hawaii Revised Statutes*, as amended. *A. menziesii* is one of nine species included in the *Lanai Plant Cluster Recovery Plan* (US Fish and Wildlife Service, 1994).

This habitat conservation plan is prepared pursuant to Chapter 195D-21, HRS, as amended. Accordingly, the HCP provides a description of the development actions proposed on the 1,300-acre State-owned property and an adjacent 81-acre City and County of Honolulu ("City") property at Kapolei (referred herein as the "Kapolei property"). The HCP describes the impact of development actions on the Kapolei population and proposes a series of mitigative strategies that would provide a net gain of *A. menziesii* to further the recovery of the species.

The preparation of this HCP began in 1997, with drafts prepared in 1997, 1999, 2001, and 2003 and reviewed by the Department of Land and Natural Resources Division of Forestry and Wildlife ("DLNR DOFAW"), the Endangered Species Recovery Committee ("ESRC"), and the US Fish and Wildlife Service ("USFWS"). The present HCP incorporates the actions which have been undertaken as interim mitigation measures and describes the mitigation measures for the Kapolei population that are planned over a period of approximately 20 years.

The sponsor of this HCP is the State Department of Transportation ("DOT"), which will be acquiring a portion (approximately 24.6 acres) of the Kapolei property from DLNR for the proposed North-South Road. The Housing and Community Development Corporation of Hawaii ("HCDCH") had also previously contributed substantially to the development of the HCP and its Interim Management Plan.

The Presence of Abutilon menziesii on the Kapolei Property

For nearly a century, the Kapolei property was cultivated in sugarcane. According to the Oahu Sugar Company, sugarcane was last harvested on the property in 1994, prior to the permanent closure of the company in Spring 1995. Typical of sugarcane grown in Hawaii, the cane was a two-year crop and harvesting practices involved burning to reduce the leaf bulk before the cane stalks were mechanically harvested. Generally, the cane fire in each field lasted 20 to 30 minutes. The now abandoned fields at the Kapolei property were exposed to cane fires every two years during nearly ten decades of cane cultivation.

Botanical surveys of the Kapolei property have been conducted by Kenneth Nagata (1996) and Char & Associates (1996, 1997, 2003, 2004). The survey reports are attached as Appendices A, B, C, D, and E, respectively.

The property is described as a disturbed site characterized by the dominance of alien weed species interspersed with remnant sugar cane. Therefore, the discovery of *A. menziesii* in September 1996 by Nagata approximately two years after the last cane harvest is seen as an enigma (Nagata 1996). Nagata's 1996 reconnaissance survey covered 80 percent of the State property. A subsequent survey by Char in December 1996 following an unusually wet period in November and December 1996 recorded 88 plants. In December 1997 Nagata conducted a second comprehensive survey and recorded 86 plants on-site. One plant was observed off-site to the south of the project site at Renton Road. The December 1997 survey produced taxonomic data and a precise mapping of the plants. A subsequent GPS based map was produced by DLNR. In 2004, Char completed a survey of the City property and discovered an additional 7 plants.

The plants are spatially distributed in five clusters in the central and southern portions occupying approximately 25 percent of the Kapolei property and are described as Clusters A, B, C, D, and E. Through attrition the present number of plants has been reduced to between 30 and 50 (DLNR 2001) but new seedlings have recently been recorded (DLNR 2003); however, this HCP is generally based on the baseline number of 93 plants.

Landownership

The State-owned Kapolei property, consisting of approximately 1,300 acres, was previously leased to Oahu Sugar Company, Limited until 1995; upon its closure, the land was transferred back to the State of Hawaii under the jurisdiction of DLNR Land Division. Through a right-of-entry agreement with HCDCH the property was reclassified in 1998 for urban uses to further the development of Kapolei as the secondary urban center of the City and County of Honolulu and the State of Hawaii. The land tenure however, was changed in late 2002 and 500 acres were transferred to the University of Hawaii for a new West Oahu campus. In addition, 200 acres will be transferred to the Department of Hawaiian Home Lands ("DHHL") for residential development. Both the University of Hawaii and the DHHL have received right-of-entry to their properties and HCDCH's right-of-entry has been revoked. The remaining 600 acres have reverted to DLNR.

A portion of the proposed North-South Road property is owned by DLNR and a portion is owned by the Estate of James Campbell. *A. menziesii* is present only on the State-owned portion. The planned development of the North-South Road will require property conveyance from DLNR and the Estate of James Campbell to DOT. The land conveyance actions are anticipated to be accomplished in 2004 prior to the commencement of construction.

The 81-acre City and County of Honolulu property is comprised of portions of two larger parcels of land which include the adjacent existing Ewa Villages Golf Course to the north. The City's Kapolei Parkway roadway segment and future urban development are anticipated on this vacant land.

The Proposed Developments

Developments proposed by public agencies include the North-South Road, the Kapolei Parkway segment, and the University of Hawaii West Oahu campus. In addition, DHHL will develop residential homesteads for native Hawaiian beneficiaries. Collectively, the HCP refers to these

developments as the "Kapolei projects". The remaining DLNR land area has also been planned for urban uses, however, no specific development proposal is under consideration at this time.

North-South Road

The Department of Transportation is proposing to develop the North-South Road, a federal-aid highway, which would be a principal arterial roadway providing support to the regional network of roadways and to the Interstate Route H-1 ("H-1 Freeway"). The North-South Road would bisect and provide access to the land developments at the Kapolei property and also provide an alternate access roadway for other Kapolei and Ewa communities.

The North-South Road would traverse the Kapolei property between the H-1 Freeway (located to the north) and the City's segment of Kapolei Parkway (located to the south).

Kapolei Parkway Extension

The Kapolei Parkway segment is a 0.7 mile major collector roadway which will link the North-South Road and Renton Road and existing segments of the Kapolei Parkway. The subject roadway project will traverse the City's Ewa Villages property and will provide an alternative regional access to the H-1 Freeway. Regional access to Interstate H-1 is currently limited to Fort Weaver Road. The Kapolei Parkway segment is also a federal-aid highway project.

Department of Hawaiian Home Lands

DHHL is mandated to develop and deliver homesteads to qualified native Hawaiians. The development of 200 acres of DHHL lands would include approximately 1,000 residential homesteads and potentially some commercial and community facility uses to serve its new subdivisions. The first phase is planned for occupancy in 2006 and buildout expected in approximately 8 to 10 years. These uses have been described as part of the East Kapolei Master Plan. The DHHL parcels are to the west of North-South Road, with one parcel to the north of UHWO and the other to the south of UHWO.

A new segment of Kapolei Parkway will bisect the DHHL parcel. This segment will connect to the existing Kapolei Parkway to the west and to the City's proposed Kapolei Parkway segment (described above) and the North South-Road.

University of Hawaii West Oahu

The UH West Oahu campus will be a major educational facility in Kapolei, primarily serving the Leeward and Central Oahu region. The University is currently exploring options for the development of the campus and at present is planning an approximately 100-acre campus which will be developed in phases to an ultimate student population of 7,600. Additionally, about 150 acres of land will be allocated on the property for future campus expansion beyond the 7,600 student population. The University is also considering a number of land use options for the remaining 250 acres of land within the 500-acre property to serve the campus and surrounding region. Construction of the initial phase of the campus could begin in the latter part of 2005, with a completion date of

Fall 2007. The initial phase of campus development would be located in the northeastern portion of the property, in close proximity to Farrington Highway.

Department of Land and Natural Resources

The 600 acres of land under the authority of the DLNR Land Division have been previously planned for residential and school facilities as well as open space areas, which would serve as drainage detention basins as part of the East Kapolei Master Plan. The ultimate specific uses of these lands will be determined in the future.

Habitat Conservation Plan Goals and Objectives

Pursuant to Chapter 195D, the habitat conservation plan shall contain sufficient information for the Board of Land and Natural Resources ("BLNR") to ascertain with reasonable certainty the likely effect of the plan upon any endangered, threatened, proposed, or candidate species in the plan area and throughout its habitat range. Thus, the goal of this HCP is to initiate and sustain a program which would result in an overall net gain in the number of *Abutilon menziesii* on Oahu, thus, contributing towards the recovery of the species as required by HRS Chapter195D-30. HRS Chapter195D-2 defines "Recovery" or "recover" to mean that "the number of individuals of the protected species has increased to the point that the measures provided under this chapter (Chapter 195 HRS) or the Federal Endangered Species Act are no longer needed."

The objectives of the HCP are threefold: (1) describe the existing conditions of the Kapolei population; (2) describe the potential impacts of the Kapolei projects on *Abutilon menziesii*; and (3) describe the strategies and actions to mitigate the impacts. The major strategy designed to mitigate impacts and to benefit the species is the creation of three protected off-site wild populations on Oahu from the single degraded Kapolei population.

To test whether new populations could be established from Kapolei stock of *A. menziesii*, an Interim Management Program was initiated in 1998 and funded by HCDCH. This program has successfully been implemented by DLNR. A complete representation of 630 plant progeny were propagated from the Kapolei population and outplanted at Koko Crater Botanical Gardens, Kaena Point State Park, and Honouliuli Unit of the Pearl Harbor National Wildlife Refuge. The Interim Management Program is described in detail in Strategy (1) of Section 3 and in the DLNR Draft and Final Interim Management Report for *Abutilon menziesii* (2001, 2003), attached as Appendix F and Appendix G.

The HCP is formatted according to the guidelines set forth in HRS Chapter 195D-21. In addition, recommendations received from DLNR, the Endangered Species Recovery Committee, and the US Fish and Wildlife Service have been incorporated.

Impacts and Mitigative Measures

The development of the Kapolei projects is expected to result in incidental take of the entire Kapolei population during an approximately 20-year development period. Therefore, a series of actions are proposed that will produce three new offsite "wild" populations, protect the genetic diversity of the existing population, and protect existing individuals by relocating them to the new population

locations. This HCP also proposes long-term management that would occur concurrently with project development to ensure that benefits are realized for *A. menziesii*.

The duration of the HCP implementation and active management period is approximately 20 years and is tied to the accomplishment of the measurable goals that include the establishment of a minimum of three offsite self-sustaining populations. The successful implementation of the HCP would significantly increase the numbers of new plants on Oahu as well as improve their quality compared to the *in situ* disturbed canefield conditions at the Kapolei property.

Funding and Implementation

The primary funding mechanism is a trust fund for endangered species as promulgated in Chapter 195D-31, HRS. DOT will provide the funding to implement the HCP. The North-South Road, as planned, would affect approximately 25 percent of the population, and the other Kapolei projects would affect the remaining 75 percent. As agreed by DOT and DLNR in a Memorandum of Agreement, DOT on March 14, 2001 made available funds in the amount of $250,000 for the initial five years of HCP implementation. These initial funds are being utilized (since approximately August 2001) by DLNR to manage and implement the HCP strategies. The MOA also stipulates that the subsequent 15 years will also be funded by DOT. An additional $750,000 will also be delegated to DLNR upon the approval of the HCP by the Board of Land and Natural Resources (or the Hawaii Legislature, as appropriate) and the Governor's release of the funds for a total not to exceed $1 million over a maximum period of 20 years.

DOT will also establish a contingency fund and has developed a process for third party developers ("Cooperators") to utilize the Incidental Take License through a Certificate of Inclusion. The Cooperators would pay into a contingency fund for the following purposes: 1) to finance unanticipated costs incurred by DLNR in the implementation of the HCP measures; and 2) to fund the management and monitoring of three "wild" populations beyond 20 years. The total initial amount of the Contingency Fund is $200,000. To ensure this fund DOT will deposit the full $200,000 amount following the approval of the HCP.

SECTION 1

Identify the geographic area encompassed by the plan; the ecosystems, natural communities, or habitat types within the plan area that are the focus of the plan; and the endangered, threatened, proposed, and candidate species known or reasonably expected to be present in those ecosystems, natural communities, or habitat types in the plan area.

(1a) Geographic Area Encompassed by the Plan

The location of the existing plants is at Kapolei, Ewa District, Oahu, Hawaii (Figure 1). The property is bounded on the north by Farrington Highway and H-1 Freeway, to the west by the Villages of Kapolei and Kapolei Golf Course, to the south and southeast by Ewa Villages and Renton Road, and to the east by diversified agricultural fields and fallowed sugarcane land. It encompasses former sugar cane lands from approximately 60 feet above mean sea level ("AMSL") at Renton Road up to 200 feet MSL at the H-1 Freeway. The site also contains an existing Hawaiian Electric Company, Inc. ("HECO") powerline easement. Since 1999, BLNR has leased approximately 550 acres of the property to Aloun Farms, Inc. and A.M. Enterprise, LLC on a month-to-month basis for crop farming. The leased parcels are not known to have any *A. menziesii* on the premises. Kaloi Gulch and the Hunehune tributary, both intermittent ephemeral streams, traverse the property from the north to the southeast boundary. There are no known *A. menziesii* plants in the gulch and tributary.

New offsite populations of *Abutilon menziesii* have been initiated at the City and County of Honolulu Koko Crater Botanical Garden (Outplant Site #1), Kaena Point State Park (Outplant Site #2, Wild Site #1), and Honouliuli National Wildlife Refuge (Outplant Site #3, Wild Site #2). The Koko Crater site is not considered a "wild site"; however, its value is as a protected repository for the full genetic stock of the Kapolei population.

Additional outplant wild sites will be initiated within the region of the Kapolei population as well as other suitable areas on Oahu as described in Section 3, Strategy (4). Candidate sites include Diamond Head State Park, Lualualei Naval Reserve (at the Radio Transmission Facility), Kealia Trail, Kalaeloa Northern Trap and Skeet Range, Kalua Kauila (near Makua Valley), area mauka of Yokohama Beach and Makapuu Head. These sites are also described in Section 3, Strategy (4).

(1b) Ecosystems, Natural Communities, or Habitat Types within the Plan Area

The Ewa Plain experiences light rainfall with a mean annual rainfall of about 20 inches per year, most of which occurs between the months of November and April. Based on more than 50 years of data collected at Oahu Sugar Company (and its predecessor, Ewa Plantation), average annual daily minimum and maximum temperatures in the project area are 65 degrees F and 84 degrees F, respectively. On the arid Ewa plain, the fallow agricultural land and the low levels of evapo-transpiration which occurs from scrub vegetation produces little cooling effect.

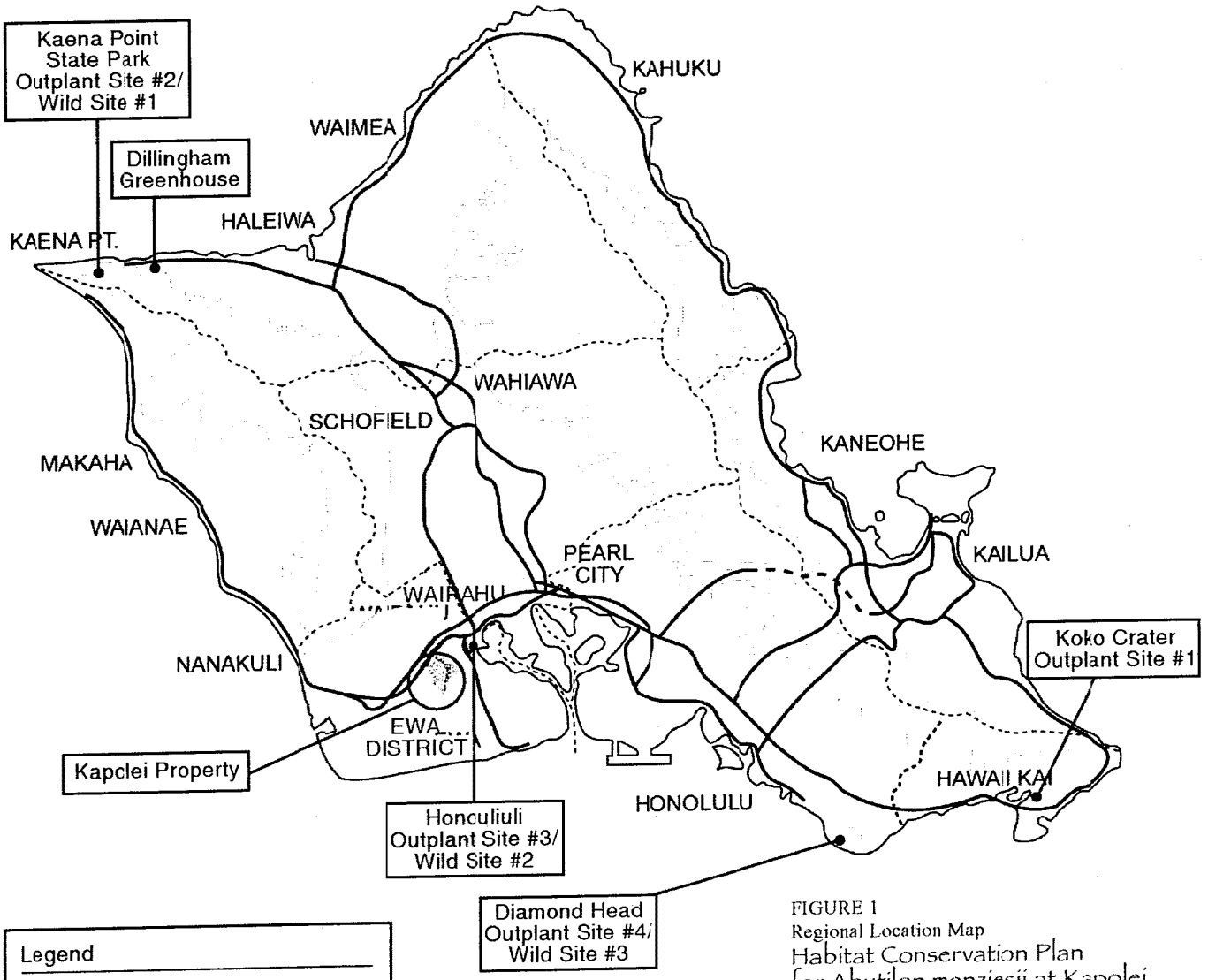

FIGURE 1
Regional Location Map
Habitat Conservation Plan
for Abutilon menziesii at Kapolei

revised by Parsons Brinckerhoff, November 2003.

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The project area was formerly cultivated as sugarcane land and is now characterized as a disturbed coastal dry ecosystem. The vegetation of the region is generally lowland shrub with a coastal fringe of kiawe trees. In the past several years the Kapolei property and surrounding lands have been taken out of sugar cane cultivation and put to other uses (e.g. urbanization, diversified agriculture, fallowed fields).

The vegetation in the region is largely determined by the history of cultivation (or disturbance) on each parcel of land. Nagata (1996) has identified eight plant communities within the State's 1,300-acre project area: 1) Abandoned Cane Fields, 2) Fallowed Fields Mixed Herb Association, 3) Fallowed Fields Grassland Association, 4) Abandoned Fields, 5) Cultivated Fields, 6) Grasslands, 7) Gulch Association, and 8) Roadside Vegetation.

Within the Kapolei Parkway area, Char (2004, Appendix E), documents the dominant vegetation type as koa haole / buffel grass scrub.

Within the Kapolei property there are 80 to 100 plant species common to former sugar cane lands (Appendices A and B). Only two species are indigenous (*Sida fallax* or ilima and Jacquemontia *ovalifolia* or pauohiiaka), two are probably indigenous (*Waltheria indica* or uhaloa and *Abutilon incanum* or hoary abutilon), that is, they are native to the Hawaiian islands and elsewhere; and one, the subject plant, *Abutilon menziesii* or kooloaula is endemic, or native only to the Hawaiian Islands. The vast numbers of plants are non-native.

As previously mentioned, *Abutilon menziesii* is not known to be present on the areas which are in crop cultivation.

The Kaloi Gulch and Hunehune tributary gulch are intermittent and originate north, or mauka, of the H-1 Interstate Freeway. As stated above, past and recent surveys have found no *A. menziesii* within or directly adjacent to the gulches (Nagata 1996 and Char 1997, 1997, 2003, 2004).

(1c) The endangered, threatened, proposed, and candidate species known or reasonably expected to occur in the ecosystems, natural communities, or habitat types in the plan area.

Except as noted above, *A. menziesii* has been found throughout the natural communities and ecosystems of the Kapolei property.

Abutilon menziesii, also known by its Hawaiian name kooloaula, is a shrub in the Mallow Family (Malvaceae) with light green heart-shaped leaves and characteristic small dark red to maroon flowers; hence, the plant is also commonly referred to as the red ilima. Photographs in Figure 2 show *A. menziesii* in the Kapolei habitat.

Abutilon menziesii was federally listed as an endangered species in 1986 and is now protected under the provisions of the federal Endangered Species Act of 1973, as amended, and Chapter 195D, *Hawaii Revised Statutes* ("HRS"), as amended. It is one of nine endangered species included in the *Lanai Plant Cluster Recovery Plan* (US Fish and Wildlife Service, 1994).

A. The general landscape of the Kapolei property in the general area of the *Abutilon menziesii* clusters consist of herbaceous alien weed species and abandoned sugarcane. North-South Road is proposed to the west of the HECO easement (denoted by the utility poles in this 1997 photograph).

B. *A. menziesii* flowers are pendant (hanging) and approximately 3/4 to 1 inch in diameter. They range in color from deep maroon to light red with light green heartshaped leaves which are slightly hairy. This plant is located on the City's property

C. Mature *A. menziesii* is amidst weeds and remnant cane shortly after their discovery and prior to active management. (Photograph taken in 1997).

D. Under the Interim Management Program *A. menziesii* is being monitored by USFWS and DLNR staff. (Photograph taken in May 2003).

FIGURE 2
Photographs: *Abutilon menziesii* at Kapolei Property
Habitat Conservation Plan
for Abutilon menziesii at Kapolei

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March 2004

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Of the nine taxa described in the Lanai Recovery Plan, *A. menziesii* was assigned a high probability of recovery due to its larger population size, its resistance to some of the current threats, and the relative ease of propagation. The Lanai Recovery Plan does not describe the Kapolei population; the populations which are identified are on Lanai, Hawaii, and Maui.

At the time of the Nagata survey in September 1996, 38 individuals were recorded in a reconnaissance survey covering 80 percent of the State property. After the unusually heavy rains of November 1996, Char (1997) in a 100 percent survey of the areas described by Nagata recorded 86 plants at approximately the same locations as Nagata. In December 1997 Nagata performed a detailed survey and count which was followed by precise mapping. The survey and count resulted in 87 plants, 86 on the subject property and one (1) plant at an off-site location on City and County of Honolulu property at Renton Road adjacent to the southern boundary of the State property.[1] Additional plants were identified by Char in 2004 on the City property. The plants are in four clusters (Clusters A, B, C, and E) one additional plant (Cluster D) was also identified (Figure 3). In October 2003, DLNR DOFAW produced an updated map (Figure 3A) depicting the baseline and 16 new plant locations. The new plants occur in close proximity of a mature plant and fall within the known and mapped clusters.

Since the previous baseline year of 1997 the numbers of individuals on the State-owned property have fluctuated with rainfall levels and it is anticipated that the number of individuals will continue to be dynamic. Therefore this HCP covers the entire population of *A. menziesii* within the State and City lands as depicted in Figure 5. To attempt to quantify the development impacts, a baseline population number of 93 (revised in 2004 to include City land) individuals has been assigned. This baseline of 93 individuals is differentiated from the approximate number of 50± currently existing plants. Table 1 describes the baseline distribution of *A. menziesii.*

Table 1. Baseline Population of *Abutilon menziesii* at Kapolei, 1997 (Revised to include Cluster E, 2004)

Cluster	No. of Plants
A	10
B	14
C	61
D	1
E	7
TOTAL	93

Cluster A consists of 10 individuals and is located at the southern end of the State project site. An existing dirt road situated in an east to west direction provides access to this cluster.

[1] The Kapolei population is distributed on State and City lands.

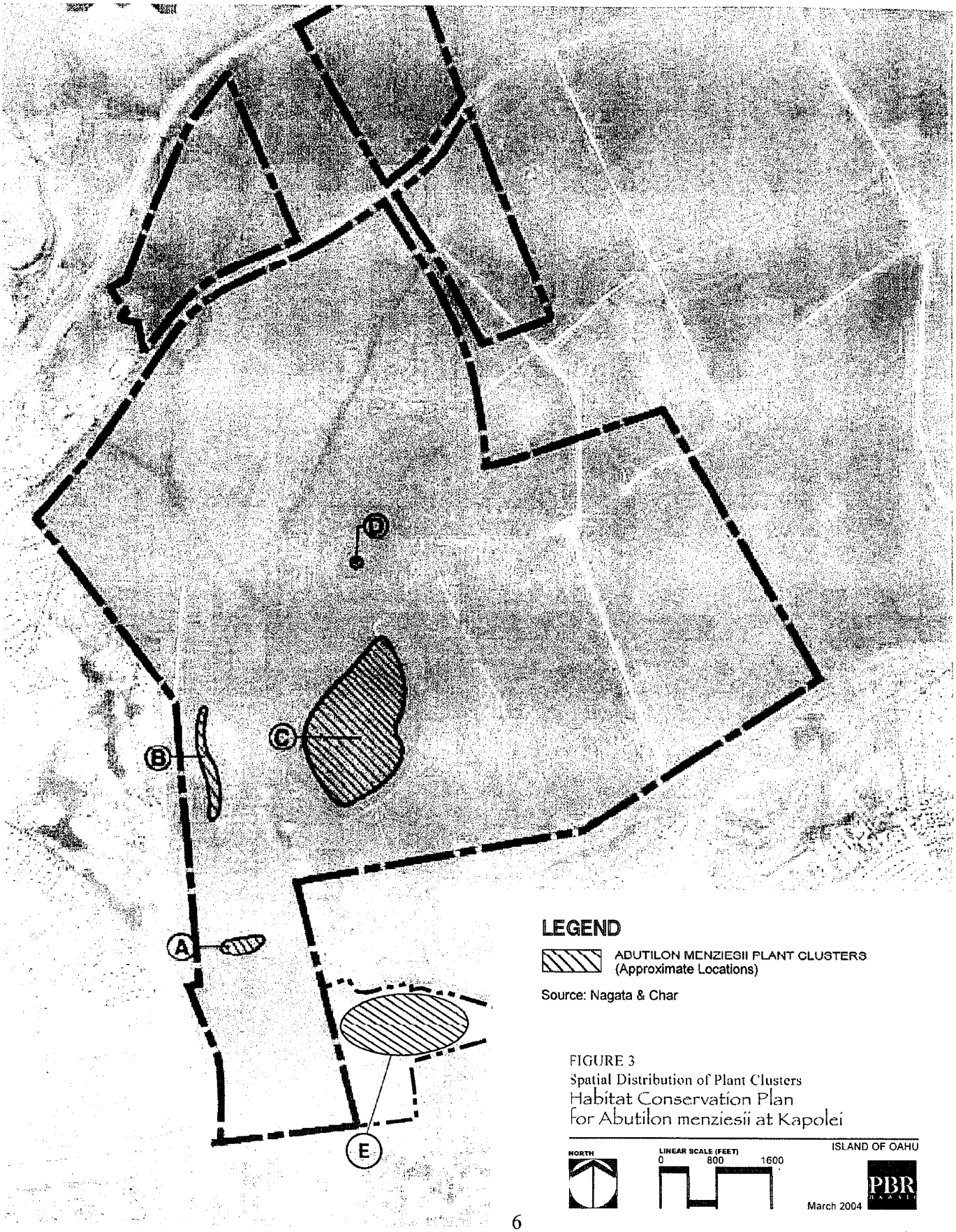

FIGURE 3
Spatial Distribution of Plant Clusters
Habitat Conservation Plan
for Abutilon menziesii at Kapolei

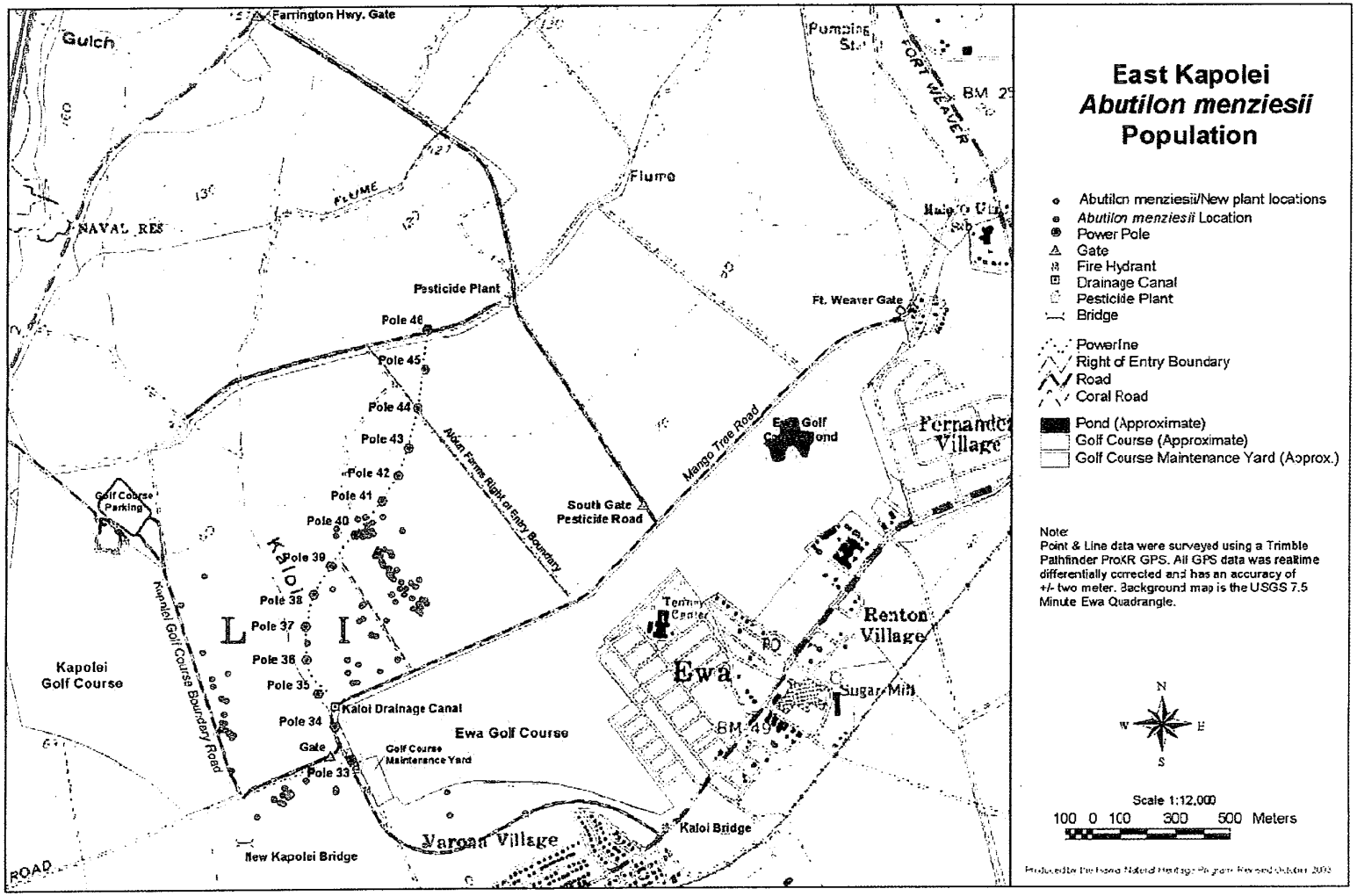

FIGURE 3A
Updated 2003 East Kapolei *Abutilon menziesii* Population

Habitat Conservation Plan
for Abutilon menziesii at Kapolei

revised by Parsons Brinckerhoff,
November 2003.

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November 2003

Cluster B consists of 14 individuals located along the western boundary of the State property which is marked by a chain-link fence. Individuals in this cluster are spread in a north-south direction and are accessed from the dirt road near Cluster A at the southern end of the property.

Cluster C, the largest cluster consisting of 61 plants occurs in the general area of the HECO powerline easement and primarily to the east of the powerline easement. The cluster is accessed from Mango Tree Road which is situated in an east-west direction. Several land uses would affect Cluster C, therefore three sub-areas identified as C-1, C-2 and C-3 have been designated.

Table 2. Cluster C (Sub-Areas)

Sub-Area	No. of Plants	Land Use
C-1	14	North-South Road
C-2	7	Drainage/Open Space Corridor
C-3	40	Residential, other urban uses
TOTAL	61	

Cluster D consisted of a single plant in the central area of the State site; however, this individual has not been seen since the initial recording.

The individuals in Cluster E are spread over an 81-acre area and occur as single plants, except at one location along a fence line at the property boundary and access roadway. At this location, there is a large, multi-stemmed plant, a young single-stemmed plant, and a seedling. Cluster E is accessed from the dirt road which leads to the Ewa Villages Golf Course Maintenance Facility. A segment of Kapolei Parkway and future urban uses are planned at this location.

At the time of the 1997 Nagata survey, plants in the population were 1 to 3.5 feet in height and included juveniles and mature individuals. Approximately 74% of the population were taller than 3 feet, 20% were between 2 to 3 feet, and only 6% were between 1 to 2 feet. No seedlings or small plants were identified. In December 1997, 37% of the plants were flowering and/or fruiting (Nagata 1997).

Present Status. Through natural senescence and accidental take (1997 to 2001), the number of plants has declined to 30 to 50 plants (DLNR 2001): however, in 2003, DLNR recorded 16 new plants in close proximity of existing mature plants (DLNR 2003). The actual number of plants is difficult to determine due to the dry conditions at Kapolei; plants which may appear to be dead may possibly revive during the wet season (DLNR 2001).

Contributing to the decline of the Kapolei population was a January 2000 incident in which approximately four plants were crushed/destroyed (by being plowed) and seedlings were killed (DLNR DOFAW/V. Caraway, personal communication).

SECTION 2

Describe the activities contemplated to be undertaken within the plan area with sufficient detail to allow the department to evaluate the impact of the activities on the particular ecosystems, natural communities, or habitat types within the plan area that are the focus of the plan habitat types in the plan area.

(2a) Description of the activities to be undertaken within the plan area in sufficient detail

The Kapolei projects include North-South Road, a segment of Kapolei Parkway, University of Hawaii West Oahu campus, Department of Hawaiian Home Lands residential homestead development, and unspecified urban uses on the DLNR lands. The projects are shown in a Conceptual Land Use Plan in Figure 4. Land ownership is shown in Figure 5 and described in Table 3.

Table 3. Landownership of the Parcels at the Kapolei Property

Project	TMK Number	Acres*
DOT / North-South Road**	9-1-16: 109 Campbell Estate portion	24.6 39.1
City & County of Honolulu Kapolei Parkway and Urban Uses	9-1-17: por. 069 9-1-17: por. 075	***41.0 / 6.3 ***40.0 / 2.7
DHHL	9-1-16: 108**** 9-1-18: 003	165.466 44.235
UHWO	9-1-16: por. 108 and 9-1-16: 120	500.327
DLNR	9-1-16: 008 9-1-17: 071 9-1-17: 088 9-1-17: 086 9-1-18: 005	31.915 204.254 200.000 40.619 65.999

* Approximate area. (NOTE: Information gathering is still in process due to recent changes in land disposition.)

** North-South Road alignment is under State DLNR and Campbell Estate ownership; to be transferred to DOT in 2004. Legal subdivision is still pending.

*** Approximately 81 acres of the vacant City property was surveyed by Char (2004); however, only approximately 9 acres comprise the Kapolei Parkway segment ROW. The remaining land is anticipated to be urbanized.

**** Parcel 108 includes another future segment of Kapolei Parkway; this roadway segment is to be sub-divided out of Parcel 108. The net area to DHHL will be approximately 200 acres.

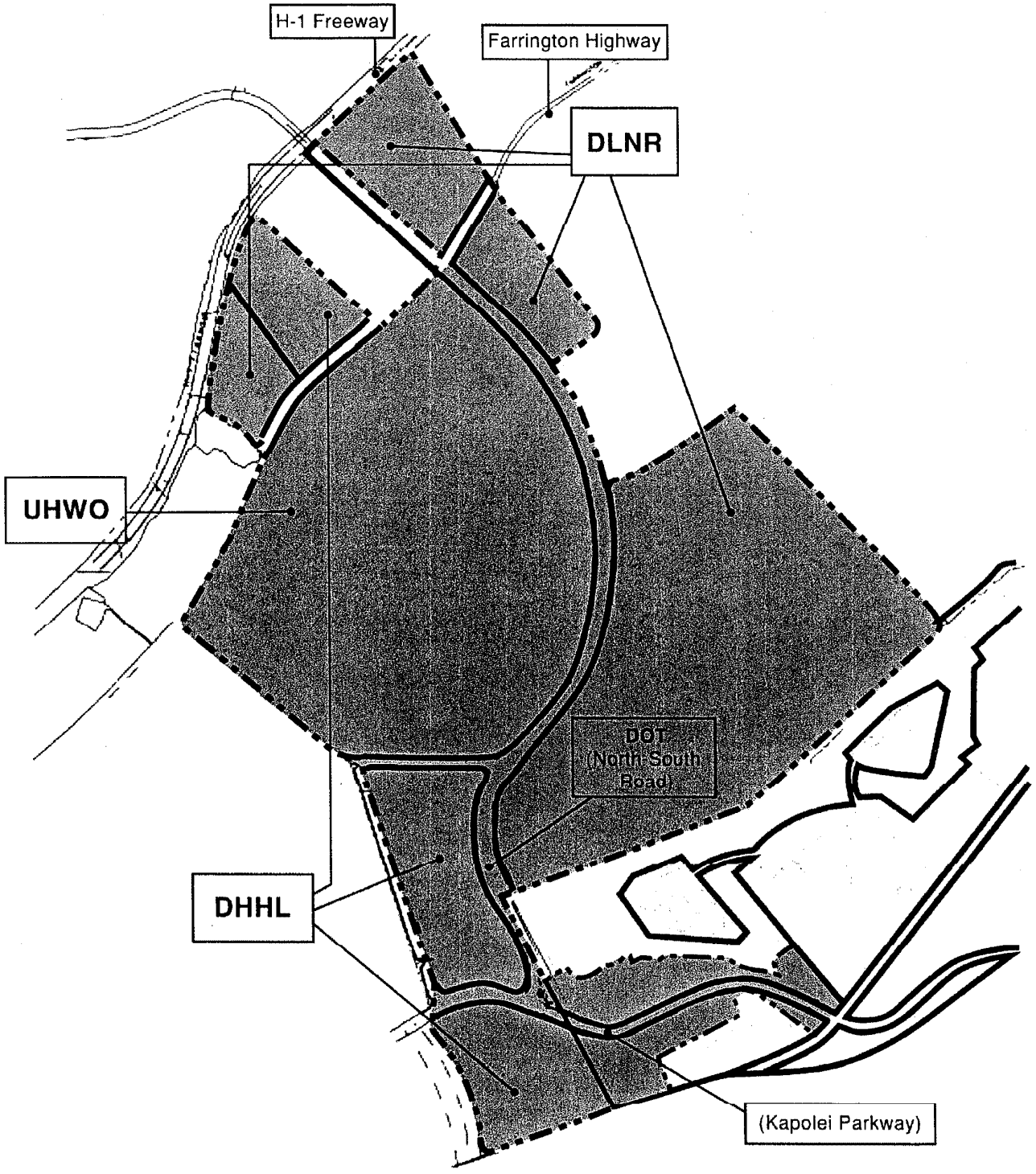

FIGURE 4
Conceptual Land Use Plan
Kapolei Property
Habitat Conservation Plan
for Abutilon menziesii at Kapolei

NORTH
LINEAR SCALE (FEET) 0 800 1600
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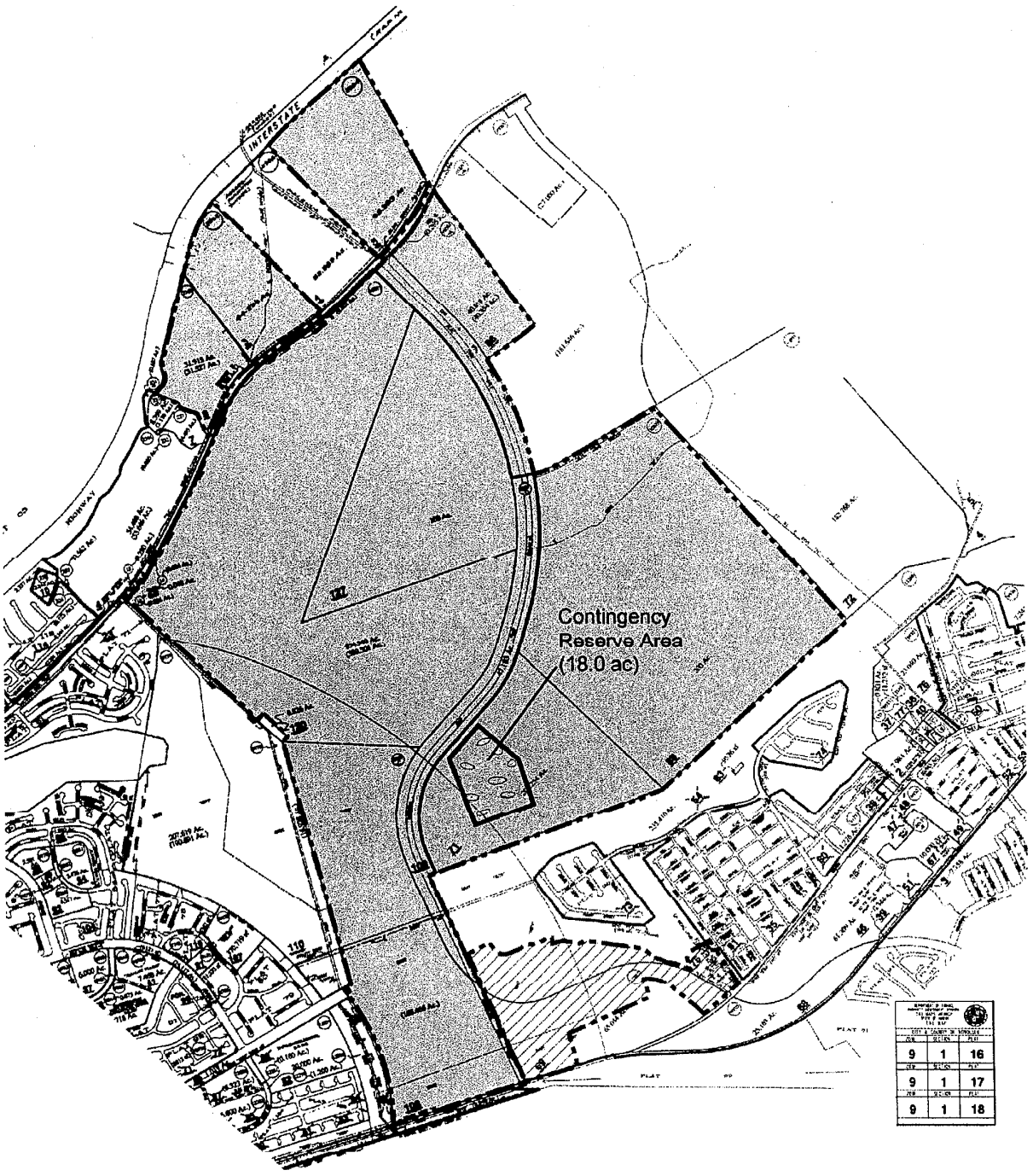


LEGEND

- State Lands
- City Lands
- Contingency Reserve Area

FIGURE 5
Landownership Map
Habitat Conservation Plan
for Abutilon menziesii at Kapolei

NORTH

LINEAR SCALE (FEET)
0 800 1600

ISLAND OF OAHU

MARCH 2004

PBR HAWAII

The distribution of *A. menziesii* on the Kapolei property, and more specifically, within the development parcels, is shown in Figure 6. Surveys conducted since 1996 have not identified A. menziesii in Kaloi and Hunehune Gulches (Nagata 1996, 1997; Char 1997, 2003, 2004 and DLNR 2001, 2003); thus the HCP is not affected by activities proposed at either gulch location.[2] The approximate numbers of individuals are described in Table 4 following the descriptions of the proposed projects.

North-South Road

The North-South Road, a new 6-lane major collector roadway, will traverse the Kapolei property and will provide regional access to the Interstate H-1 Freeway, connecting the Interstate Route H-1 ("H-1 Freeway") (at the north end) to a future segment of Kapolei Parkway (at the south end), a distance of approximately 3.6 km (2.2 miles). Its alignment is adjacent to and toward the west of the corridor delineated by the existing HECO power line electrical easement. The new roadway is designed with three vehicular lanes in each direction, a planting median, and sidewalks on both sides with an overall width of 116 feet.

The overall schedule for the North-South Road began with the initial planning in 1994 and an anticipated completion in 2008:

Planning:	June 1994 to September 2004
Design:	Aug 1997 to Sept 2004
Construction:	Dec 2004 to Dec 2008

The North-South Road construction is planned to be built in two phases:

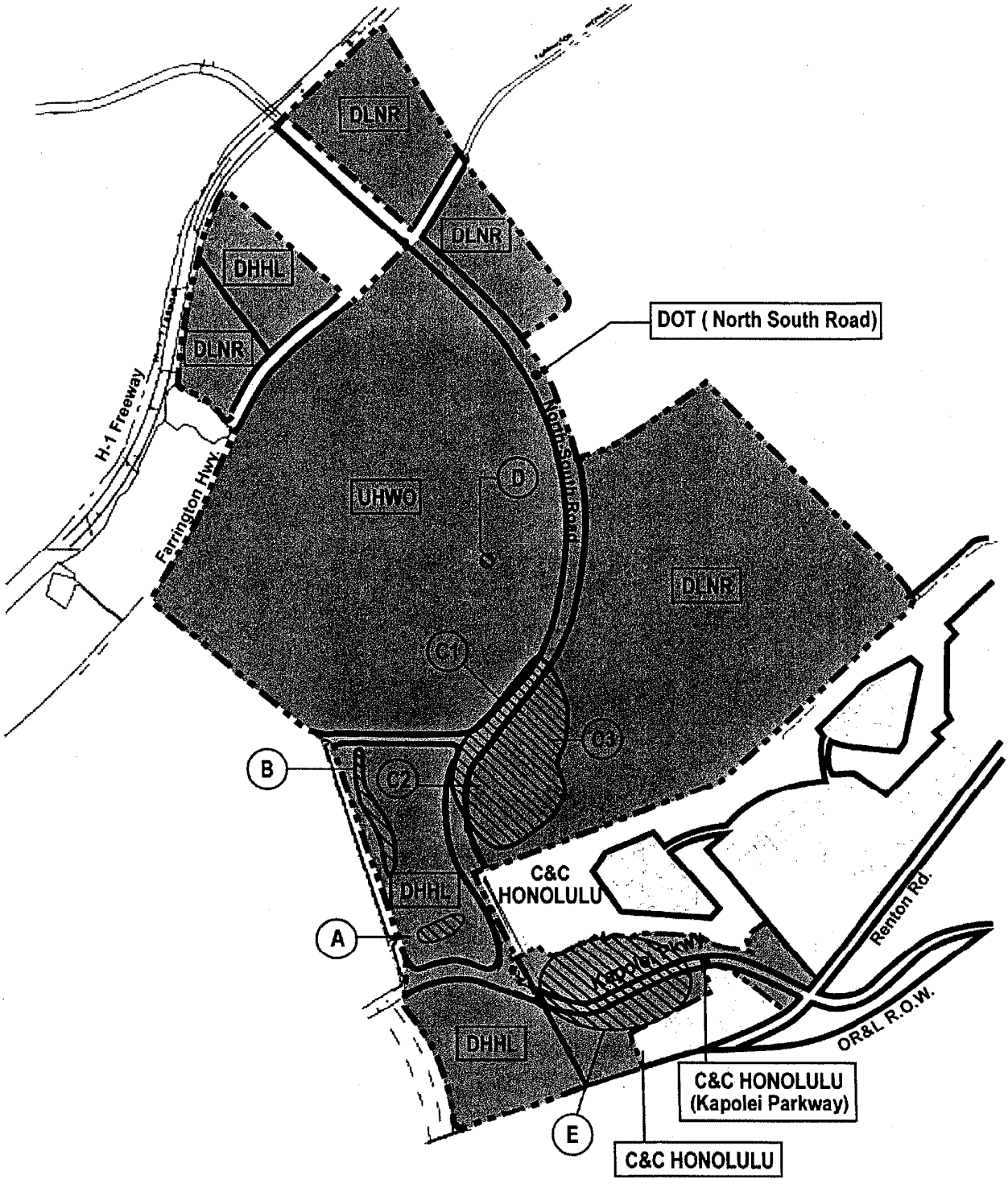
- Phase 1 (late 2004 - 2007) - Mass grading for six (6) lanes and drainage improvements; construction of three (3) highway lanes from Kapolei Parkway to H-1 Freeway.

- Phase 2 (late 2005 - @2008) - Construction of additional three (3) lanes; construction of drainage detention basins, construction of intersections at Kapolei Parkway and Farrington Highway; construction of interchange at H-1 Freeway.

The Phase 1 component includes roadway and drainage grading and the construction of three (of the six) lanes on the Kapolei property. The impact to *A. menziesii* is anticipated in Phase 1.

The Phase 2 components include the construction of the additional three lanes and intersections on the Kapolei property. The off-site construction of the Interchange at the H-1 Freeway will also be completed in Phase 2. The Interchange would provide an access to the Kapolei downtown area and the Ewa plain. There are no known *A. menziesii* within the area of the Interchange, therefore,

[2] DOT will coordinate with the US Department of the Army Corps of Engineers on matters related to Kaloi and Hunehune gulches.



LEGEND

Abutilon Menziesii Plant Clusters

FIGURE 6
Overlay of Plant Clusters
On the Kapolei Projects
Habitat Conservation Plan
for Abutilon menziesii at Kapolei

ISLAND OF OAHU

March 2004

references to the North-South Road development is understood to be the segment through the Kapolei property.

A staging area and construction transit area approximately 50 feet to 75 feet wide along the west boundary of the North-South Road corridor is required; however, no known plants are present along this strip.

As a federal-aid highway, the North-South Road is undergoing a National Environmental Policy Act ("NEPA") review and Endangered Species Act, Section 7 consultation. The subject HCP will be submitted to USFWS as a component of the required biological assessment for the Section 7 process.

Kapolei Parkway Segment

The Kapolei Parkway, a new 6-lane major collector roadway, will traverse the City's Ewa Villages property and will provide alternate regional access to the H-1 Freeway, connecting the North-South Road at the north end to Renton Road at the south end; a distance of approximately 0.7 miles. The new roadway is designed with three vehicular lanes in each direction, a planting median, and sidewalk on one side and a multiuse (pedestrian and bicycle) pathway on the other side with an overall width of 116 feet. The project will include underground utilities (including water, sanitary sewer, electrical, and communication systems), storm drainage system, street lighting system, and landscape irrigation system.

The overall schedule for this segment of Kapolei Parkway began with initial planning in 1994, and the City anticipates completion in 2008:

Planning:	June 1994 to September 2004
Design:	December 2001 to December 2005
Construction:	June 2006 to December 2008

The Kapolei Parkway roadway is planned for construction in two phases:

- Phase 1 (mid 2006 - 2007) - Mass grading for six (6) lanes; construction of three (3) makai travel lanes from North-South Road to Renton Road.

- Phase 2 (late 2007 - 2008) - Construction of additional three (3) mauka lanes. The construction of these lanes is to be coordinated with completion of the North-South Road.

The Phase 1 components include roadway and drainage grading, the construction of three (of the six) lanes, and a portion of the underground utilities, storm drainage system, street lighting system, and landscape irrigation system on the Ewa Villages property. The impact to *A. menziesii* is anticipated in Phase 1.

The Phase 2 components include the construction of the additional three lanes and the balance of the underground utilities, storm drainage system, street lighting system, and landscape irrigation system on the Ewa Villages property.

A staging and construction transit area is required; it will be located where no known plants are present.

As a federal-aid highway, this segment of Kapolei Parkway is undergoing a NEPA review and Endangered Species Act, Section 7 consultation. The subject HCP will be submitted to USFWS as a component of the required biological assessment for the Section 7 process.

The City is planning to schedule construction of an additional three (3) lanes for the Kapolei Parkway segment from the Renton Road intersection (at the north end) to its connection to the existing Kapolei Parkway in the vicinity of the OR&L track right-of-way (at the south end) in coordination with the above Phase 2 segment and North-South Road completion. There are no known *A. menziesii* plants within this area (Char 2004). This latter construction activity will complete this 6-lane major collector roadway segment with the same typical roadway section with an overall width of 116 feet, matching the segment proposed above the Renton Road intersection.

University of Hawaii West Oahu

In September 2002, the BLNR conveyed in fee approximately 500 acres of land to the University of Hawaii for its West Oahu campus. The BLNR also issued to the University a right-of-entry to the property for planning purposes. The UH West Oahu property is bordered by the proposed North-South Road to the east, Farrington Highway to the north, the Kapolei Golf Course and Villages of Kapolei to the west, and DHHL lands to the south. The Kaloi Gulch and Hunehune Gulch traverse this parcel.

At the present time, portions of the UH West Oahu property are being leased for agricultural crop farming under revocable permits. A small portion of the 500-acre property (.826 acres) is also presently encumbered by revocable permit to Kapolei People's Inc. dba Kapolei Golf Course for their parking lot. Approximately two-thirds of the leased area has been cleared and plowed in preparation for planting.

The UH West Oahu will be a major educational facility in Kapolei, primarily serving the Leeward and Central Oahu region. The University is currently exploring options for the development of the campus and at present is planning for an approximately 100-acre campus which will be developed in phases to an ultimate student population of 7,600. Additionally, about 150 acres of land will be allocated on the property for future campus expansion beyond the 7,600 student population. Finally, the University is considering a number of land use options for the remaining 250 acres of lands within the 500-acre property to serve the campus and surrounding region. Construction of the campus could begin in the latter part of 2005, with a completion date of Fall 2007. The initial phase of campus development would be located in the northeastern portion of the property, in close proximity to the Farrington Highway.

There are very few *Abutilon menziesii* on this area of the Kapolei property. A recent survey in June 2003 by Char (Appendix D) confirms that there are two to three individuals from Cluster C at the south boundary and the one individual in Cluster D is no longer alive. However, Char (2003) notes that seeds may be present in the soil.

Department of Hawaiian Home Lands

In November 2002, BLNR granted DHHL a right-of-entry to approximately 200 acres at the Kapolei property and commenced the process to transfer those parcels to DHHL. The two parcels are to the west of the proposed North-South Road and at the northern and southern points of the Kapolei property. The northern property, Parcel 3, is approximately 49 acres and located between Farrington Highway and the H-1 Freeway. Directly to the south is the proposed UHWO property. The southern property, Parcel 108 (portion), is approximately 165 acres and directly adjacent to the UHWO southern boundary. Kapolei Golf Course and the Villages of Kapolei are to the west with the North-South Road to the east and DLNR lands beyond that. A portion of Parcel 108 will require future subdivision for the Kapolei Parkway extension in an east-west orientation. This latter subdivision will bisect the property into two non-contiguous parcels.

The mission of DHHL is to develop and deliver homesteads to qualified native Hawaiians pursuant to the Hawaiian Homes Commission Act. The acquisition of these parcels will allow DHHL to plan and develop approximately 1,000 residential homesteads and potentially some commercial and community facility uses to serve the new subdivision over a 8 to 10 year period from 2006-2016. Conceptually, the first increment is targeted to be completed in 2006. Ownership by DHHL and development of these uses have been described in the EIS for the East Kapolei Master Plan.

Abutilon menziesii is present on DHHL's Parcel 108 (portion) at Clusters A and B. Based on the baseline population, 10 individuals comprise Cluster A and 14 individuals comprise Cluster B. The development sequence will affect Cluster B initially followed by Cluster A.

Department of Land and Natural Resources

The remaining unassigned parcels (formerly part of the East Kapolei Master Plan) total approximately 600 acres in five parcels; the parcels are now under the authority of the DLNR Land Division and are to the east of the proposed North-South Road and the north of Farrington Highway.

The Environmental Impact Statement for the East Kapolei Master Plan designates urban uses including residential, public schools, parks, roadways as well as roadways and open space areas on these parcels which would serve as drainage detention basins. The ultimate uses of these lands will be determined in the future when a development proposal is again proposed by the State or other non-governmental entity.

More than half of the *A. menziesii* in Cluster C occur on the DLNR lands.

Kapolei Projects Conceptual Development Schedule

The commencement of construction for the North-South Road is planned for late 2004 with completion in 2008. The other Kapolei projects are in the early stages of planning and schedules have not yet been determined. Thus, Table 4 below is conceptual and may be changed. The impact to the full population of *A. menziesii* is assumed over 20 years as described in this HCP. However, even if development plans are delayed, the HCP strategies and mitigation measures will be

completed in its entirety. Moreover, in accordance with the expiration date of the incidental take license, any remaining in situ plants after July 31, 2021, will remain within the Kapolei property.

Table 4. Conceptual Development Phasing and Impacts to Plant Clusters

Development Phase* (Conceptual)	**Plant Cluster**	**No. of Plants****	**Land Use** (Conceptual)
2004-2007 North South Road (Phase 1)	C	14+ 7 =21	Roadway (Initial Lanes 1-3, Drainage basins)
2005-2008 North-South Road (Phase 2)		0	Roadway (Lanes 4-6; intersections; interchange); phasing of drainage channel
2006 – 2007 Kapolei Parkway (Phase 1)	E	3	Roadway (Mass grading for 6 lanes; Lanes 1-3)
2007 – 2008 Kapolei Parkway (Phase 2)		0	Roadway (Lanes 4-6)
___ - ___ City Land / Future Urban Uses***	E	4	Future Urban uses
2006-2016 DHHL (Parcel 108 por.)	A B	10 14	Residential Residential
2005 -2007 UHWO (Phase 1) ____ - ___ UHWO (Phase 2)*		0 0	University campus University campus extension
____ -____ UHWO (Future Phase)*	C, D	4	Other related uses (to be determined)
____ -____ DLNR lands*	C****	37	Ultimate Uses*****: Residential, Schools, Parks, Roadways

* Development phases are conceptual and development schedules have yet to be determined at this time.
** The number of plants is estimated and is based on the baseline population of 93 plants.
*** Future urban uses may include residential development by DHHL.
**** Sub-population includes plants within the 18-acre contingency reserve site.
***** Ultimate uses are as proposed by HCDCH for the East Kapolei Master Plan.

(2b) Evaluation of the impact of the activities on the particular ecosystems, natural communities, or habitat types within the plan area

The ultimate development of the Kapolei projects would result in incidental take of all *A. menziesii* plants and the plants are unlikely to survive in their current locations. Much of the non-native plant community on the proposed development sites will also be heavily impacted.

In anticipation of the impacts, an Interim Management Program has been implemented through an agreement between HCDCH and DLNR, and subsequently DOT, as described in Section 3, Strategy (1). Under Strategy (1), the following have been accomplished: 1) DOFAW successfully propagated the genetic representation of the Kapolei population[3], 2) DOFAW initiated outplanting at three sites:

[3] Propagules for genetic representation, including cuttings and seeds, of Kapolei population individuals, were collected from plants mature enough (multi-stemmed of fruiting) or alive at the commencement of collection. Immature individuals and the recently integrated City property individuals are yet to be genetically represented. The genetic resource of expired individuals not yet represented would attempt to be reclaimed through the soil seed bank.

Koko Crater (2000), Kaena Point (2002), and Honouliuli (2002), and 3) monitoring of those sites has been ongoing. The primary purpose of the HCP is the survival of East Kapolei's *Abutilon menziesii* and this will be accomplished through various identified measures including the "relocation" of the basic plan area of this species.

As the agency to implement the HCP, DLNR will pursue use of additional appropriate outplanting sites, and outplanting will occur after all required clearances have been obtained. The selection of appropriate outplanting sites is described in greater detail in Section 3 Strategy (4).

The HCP also establishes an 18-acre contingency reserve site (see Figures 5 and 11) which temporarily protects a colony of Cluster C from development until the short-term success criteria (as described in Section 7) are met at one wild site. Management of this area may include measures such as temporary fencing and firebreaks. If an outplanting site does not meet the short-term success criteria, this reserve site could be considered as a wild site.

SECTION 3

Identify the steps that will be taken to minimize and mitigate all negative impacts, including without limitation the impact of any authorized incidental take, with consideration of the full range of the species on the island so that cumulative impacts associated with the take can be adequately assessed; and the funding that will be available to implement those steps.

Described below are the details of the core elements of this HCP, including the mitigative steps and strategies for the impacts to *Abutilon menziesii* on the Kapolei property.

(3a) Full range of the species

Abutilon menziesii is uncommon and local in dry forests between elevations 200-520 meters on Lanai, East Maui, and Hawaii (Wagner 1999). On Oahu, a collection (Char 81.002, BISH) from an abandoned canefield at Barbers Point, Ewa, was made in 1981 and believed to represent an escapee from cultivation. At that time all cultivated plants on Oahu were descendent from plants derived from individuals propagated on the island of Hawaii. Differences in leaf morphology of progeny from this plant suggest that the Barbers Point plant may represent a distinct population (USFWS 1994). A single individual plant has recently been documented on Navy property at Lualualei (Moribe 1998 and Miyashiro 2001, personal communication). *A. menziesii* is also present in several botanical collections on Oahu including the Waimea Arboretum & Botanical Garden, the Honolulu Botanical Gardens, and Amy B. Greenwell Botanical Garden in Kealakekua in South Kona.

A database search by the Hawaii Natural Heritage Program for *A. menziesii* on Oahu resulted in the subject Kapolei population only.

The relationship of Kapolei plants and island of Hawaii plants is unknown at this time. Prior to the discovery of the Kapolei population, the area was not commonly known as a habitat for *A. menziesii.* Thus, DLNR botanists believe that the abundance and spatial distribution suggest that the Kapolei plants are probably natural remnants of a once more extensive Oahu population (Garnett 2001, personal communication) and not an escapee from cultivation as previously theorized. Moreover, the Kapolei population is the larger of the two known populations and accounts for approximately 99 percent of the known wild plants on Oahu (USFWS, L. Gibson).

(3b) Steps and strategies that will be taken to minimize and mitigate all negative impacts, including, without limitation, the impact of any authorized incidental take.

The strategies under consideration in this Habitat Conservation Plan include off-site and on-site measures which would be implemented, as listed in Table 5:

Table 5. Strategies to Assess and Mitigate the Development Impacts on *Abutilon menziesii* at Kapolei

Strategy	Mitigation Steps and Strategies
1	Interim Management Program (October 1998 to March 2000, extended to October 2001); Establish two test outplant wild population sites
2	Funding for the implementation of the HCP
3	Development schedule and mitigation phasing sequence
4	Establish new populations at three off-site locations
5	Long-term protection and maintenance of permanent *A. menziesii* populations
6	Appropriate research
7	Kapolei population strategies

Strategy (1) Interim Management Program (October 1998 to October 2001)

Through funding provided in 1998 by the Housing and Community Development Corporation of Hawaii ("HCDCH"), HCDCH and DLNR established an agreement to implement a pre-construction period Interim Management Program to test the viability of establishing *Abutilon menziesii* at two offsite locations on Oahu.

On March 14, 2001, DOT delegated the expenditure of $250,000 to DLNR for the implementation of the HCP strategies for Years 1 through 5. Funds became available in August 2001 and are subsequently being used by DLNR to complete Strategy (1) (Interim Management Program) of the HCP and to transition to HCP implementation to accomplish the overall HCP implementation strategies (described below).

The preliminary results of the Interim Program indicate that propagation of the species from cuttings and seed is highly successful in the nursery environment. Outplanting to offsite locations has also been successful in the first year. The *Interim Management Report for Abutilon menziesii* (DLNR 2001) and the *Final Interim Management Report for Abutilon menziesii* (DLNR 2003) are attached as Appendix F and Appendix G.

The Scope of Services of the Interim Management Program include the following tasks:

Task 1: Maintain in-situ population through monitoring, maintenance, and security (fire protection).

Known Kapolei plants have been marked with permanent stakes and mapped to a GIS layer. The existing plants are being maintained by weeding around them, and the application of herbicide, pesticide, and fertilizer, as necessary. A fire management strategy consisting for the following measures is being implemented to ensure that the plants are not accidentally destroyed.

- Identification of fire fighting resources available near the Kapolei population;
- Provide information to fire stations to assist them in protecting *A. menziesii* from fire;
- Identification of water resources near the Kapolei population.

The details of the fire management strategies are described in the Final Interim Management Report for *Abutilon menziesii* (DLNR DOFAW 2003, Appendix G).

Task 2: Propagate a total representation of plants through seeds and cuttings from the Kapolei Abutilon menziesii population. These plants will be used to maintain genetic representation of stock and provide stock for outplanting purposes. Work will be done at the existing State DLNR, Division of Forestry and Wildlife (DOFAW) nurseries.

All the known Kapolei population plants have been propagated through cuttings resulting in 630 first generation progeny from 62 in situ individuals.[4] In addition, 220 seedlings have been produced from seed collected from the first generation nursery plants (grown from cuttings). Additional seeds have been distributed to Lyon Aboretum, the National Seed Storage Laboratory in Fort Collins, Colorado, and the Pahole Rare Plant Facility.

Task 3: Establish two new populations of Abutilon menziesii in appropriate habitat to allow for natural establishment and long term viability. Each outplanting site was planted with a representative sub-sample of the Kapolei population and each individual plant has been tagged with a permanent metal tag.

Three outplant populations of *Abutilon menziesii* have been initiated.

Outplant Site #1: Koko Crater Botanical Garden (Figure 7)

Through an agreement with DLNR DOFAW, the City and County of Honolulu Koko Crater Botanical Garden provided a 100 ft x 100 ft (10,000 sf) site for the initial planting. In November 2000, 140 *Abutilon menziesii* were planted in the 10,000 sf site, representing two complete sets of each of the original Kapolei plants. The *Abutilon* plot is in a public display area supported with drip irrigation. Hence, plants are lush and thriving. Koko Crater Botanical Garden staff will provide the long term care of these plants and will be propagating *Abutilon menziesii* from materials taken from these plants. Although this site is not being considered as a "wild site" its intent is as a living genetic repository of the full Kapolei population. DLNR will continue to coordinate the management regime (e.g. irrigation requirements, etc.) with Koko Crater Botanical Garden.

The outplant site is within a public garden setting and located in close proximity of one individual of another endangered *Abutilon* species (*A. eremitopetalum*) creating concerns about hybridization. Therefore, propagules from the Koko Crater outplanting will be limited to cuttings. Recent observations of this site indicate flowering, fruiting, and setting of seeds (personal communication, N. Sugii). The outplantings will be monitored for seedling recruitment, however due to the potential for hybridization with *A. eremitopetalum*, propagules for outplanting will be limited to cuttings.

[4] The baseline number of in situ plants at the Kapolei population numbered 93 individuals; however, through natural causes, the number had declined to 62 individuals at the time Task 2 was implemented, resulting in a genetic representation of only those existing at that time. Propagation of any subsequent "new" in situ plants (and including the plants on City property) which would constitute parental stock is also being undertaken by DLNR.

A. Propogated from cuttings by DOFAW staff at the DLNR's Mokuleia nursery. 130 progency from the Kapolei population were planted in November 2000 at Koko Crater in the Native Plants section amidst existing kiawe trees (*Prosporis* sp.).

C. Each plant is tagged and numbered for record keeping.

B. Plant growth is vigorous after being in the ground approximately 2 1/2 months. Plants are supported by a drip irrigation system in this dryland ecosystem.

D. Kapolei progency grown from seeds collected and planted in 1997 are flowering and fruiting a short distance from the main outplant site.

FIGURE 7
Photographs: Koko Crater Botanical Gardens (Outplant Site #1)
Habitat Conservation Plan
for Abutilon menziesii at Kapolei

ISLAND OF OAHU

March 2004

Outplant Site #2: Kaena Point State Park (Wild Site #1) (Figure 8)

The Kaena Point outplanting site was started in April 2001. The land is under the jurisdiction of the DLNR, Division of State Parks (TMK: 6-9-01: 4).

The approximately 3-acre outplanting site was established with two distinct planting areas separated by a four-wheel drive road. The site is completely protected from four-wheel drive vehicles by a rock barrier along the dirt road fronting the outplanting site. Site preparation included clearing the non-native brush and grass with weedeaters and with hand tools and treating the area with herbicide to prevent regrowth. A total of 142 *Abutilon menziesii* plants have been planted in the Kaena Point outplanting site. In addition, 20 other native species have been planted to create a coastal strand community.

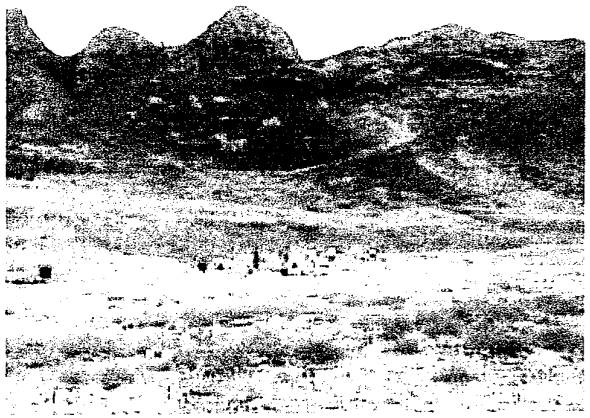
The plants were irrigated at the site to promote their establishment and to encourage the production of a maximum amount of seed to allow the build up of the seed bank and natural establishment of seedlings. The survival rate for plants at this site has been 98%. The 142 plants at this site represent a total of 44 of the original East Kapolei plants. Two *Abutilon* seedlings have grown naturally from seed produced by plants outplanted at this site. These seedlings have grown large enough to be considered part of this population.

The DLNR received permission from the U. S. Air Force to tap into the 4-inch water main that runs adjacent to the outplanting site allowing the construction of a complete irrigation system and including a galvanized steel water tank with a capacity of approximately 3,000 gallons to provide a water reserve for irrigating the plants. This tank is necessary because the 4-inch water main is pressurized only two days a week for 4 hours per day.

The threats to the Kaena Point outplanting site include the rapid growth of weeds and wild fires. This site was established in area with deep soil that was dominated by Guinea grass (*Panicum maximum*) and koa haole (*Leucaena leucocephala*). DLNR staff have had difficulty keeping up with the weed threat presented by these species and others at this outplanting site. To control weeds in the outplanting site, DLNR has used a variety of labor including regular Natural Area Reserves System employees, temporary workers such as the Emergency Environmental Workforce, and volunteers.

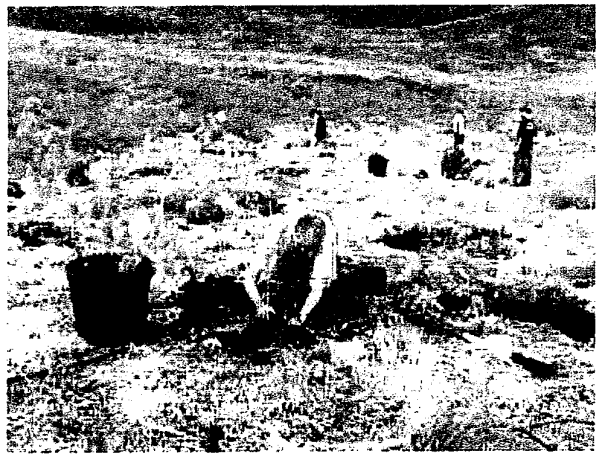
The other major threat to this outplanting site is fire. The fire strategy and fire fighting resources includes the installed water tank, the installed 2-inch outlet to allow fire engine hookup near the road, and the planting of native plants along the perimeter of the outplanting site to serve as a fuel break.

On August 20, 2003, a brush fire started by a vehicle about ¾ mile away burned a total of 160 acres along the coastal flats up to the nearby Kuaokala Game



A. Kaena Point State Park is a remote wild coastline along the northwestern coast flanked by the Waianae Mountain range. The *Abutilon menziesii* outplant site is on 3 acres.

C. Approximately one year in the ground. *A. menziesii* have matured, set flowers and seed (Photograph taken May 2003).



B. In 2002, volunteers planted *Abutilon menziesii*, and other native plants which are adapted to the coastal location.

D. Kaena Point State Park is a popular hiking, biking, fishing, and swimming recreational area along its 2.7 mile length.

FIGURE 8
Photographs: Kaena Point State Park
(Outplant Site #2/Wild Site #1)
Habitat Conservation Plan
for Abutilon menziesii at Kapolei

ISLAND OF OAHU

March 2004 PBR HAWAII

Management Area at about 1,100 feet elevation. This fire started late at night and was fanned by winds of 25 to 35 mph and burned to the edge of the outplanting site and around it. The fire moved so quickly that Honolulu Fire Department engine companies were unable to engage the fire near the ignition point or near the outplanting site resulting in a burn of approximately 30 percent of the 3-acre outplanting site. The effects of the fire on the *Abutilon menziesii* plants at the site are unknown at this time. An assessment will be made when the rainy season commences and there is sufficient moisture for growth.

The plants along the edge were affected by the flames but not completely consumed. It is possible that many of these *Abutilon menziesii* plants will survive. The fire did burn many of the other native species planted in the area to serve as a fuel break along the front of the outplanting site. This fire would have been more damaging if these plants had not been in place. These fuel break plants will need to be replaced. The fire did destroy all irrigation pipes in the area and will need replacement. The lesson learned from this experience is that the fuel break plantings are perhaps, the most useful part of the fire strategy. The fuel break portion of this fire management strategy needs to be replaced and developed further with a wider buffer of fire resistant species established to encompass the entire outplanting site.

Outplant Site #3: Honouliuli Unit of the Pearl Harbor National Wildlife Refuge (Wild Site #2) (Figure 9)

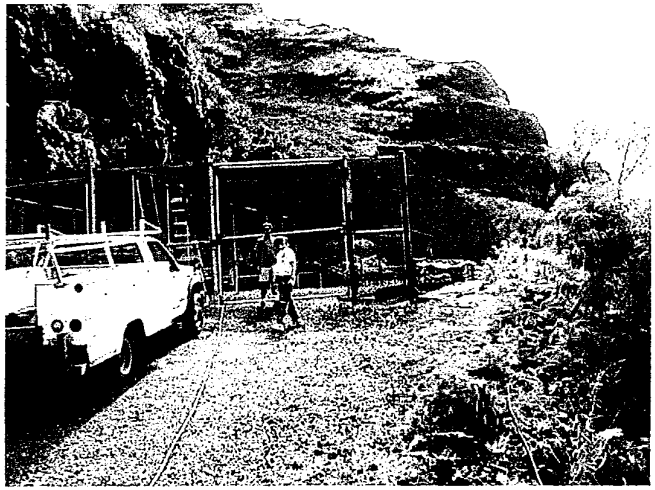
A third outplanting site has been developed at the Honouliuli Unit of the US Fish and Wildlife Service Pearl Harbor National Wildlife Refuge which borders the West Loch of Pearl Harbor (TMK: 9-1-17). USFWS has a cooperative agreement with the Navy to manage the site as a refuge in perpetuity. This 37-acre unit is mostly a fresh water wetland managed for a variety of endangered water birds. The entire Honouliuli Unit is enclosed in an eight-foot chain link fence that provides predator control for the birds and security for the plants. DLNR DOFAW has selected and planted an upland area within this Unit and installed an irrigation system to assist with the initial establishment of plants.

There are two separate areas being used for outplanting within the refuge. The first consists of a narrow strip, approximately 20 by 600 feet, while the second site is approximately 60 by 300 feet. The first planting commenced on March 15, 2002 in the 20 by 600-foot site. Work at the second location began in January of 2003. Both locations are on an irrigation system and are managed entirely by DLNR DOFAW staff.

At this time the planting includes a total of 61 *Abutilon menziesii* plants at the Honouliuli Unit with a survival rate of 96 percent of the outplants. Plants from cuttings from 21 of the original East Kapolei plants are represented here. In addition, 21 seedlings of known parentage and 10 seedlings of unknown parentage that were removed from the East Kapolei population in the spring of 2002 have been planted here.

A. The outplanting at the Honouliuli Unit of the Pearl Harbor National Wildlife Refuge (Outplant Site #3/Wild Site #2) is at 2 locations along the western boundary of the refuge. This 20 ft X 600 ft strip is along the perimeter fenceline.

B. The second Honouliuli Refuge outplanting site (60 ft X 300 ft) overlooks the USFWS managed endangered waterbird refuge. Planting commenced at Honoululi in March 2002.



C. A low-elevation Greenhouse was constructed under the Interim Management Program to acclimatize the plants propagated at the higher elevation Pahole Rare Plant Nursery. The location of the Greenhouse is on State land at Mokuleia in the vicinity of Dillingham Airfield.

FIGURE 9

Photographs: Honouliuli NWR (Outplant Site #3/Wild Site #2) and Dillingham Greenhouse

Habitat Conservation Plan
for Abutilon menziesii at Kapolei

ISLAND OF OAHU

March 2004

PBR HAWAII

A small number of the seedlings produced at the Kapolei population (approximately 10%) during the spring of 2002 were left there and subsequently perished. Three plants produced from seed were also planted at Honouliuli. The amount of area covered by this outplanting site is approximately ½ acre. There is sufficient area to add many more plants to this site.

The fire threat at this site is minimal. The eight-foot chain link fence provides a barrier to most of the possible ignition sources. A buffer of approximately 6 feet of bare ground is in place just inside most of the perimeter fence of this unit to serve as a barrier to predators of the endangered water birds. This buffer strip also serves as a firebreak to the outplanting site. The portion of the fence that doesn't have this buffer has fresh water marsh just inside the fence. The fire management strategy for this site is to ensure that this buffer strip remains in place.

Task 4: Research the biology of the species and determine seed storage requirements, salt and pathogen influence, and the best herbivore control methods.

Granular diazinon has been tested to determine success at controlling ants and azatin and dursban have been tested on a few plants to determine toxicity. Seed have been stored in an appropriate seed bank facility. Additional research is discussed under Strategy (6) below.

Task 5: Provide partial funding for the construction of a low-elevation greenhouse dedicated to growing A. menziesii and other threatened and endangered plant species on Oahu. This greenhouse would serve as a long-term greenhouse, to be owned and operated by the Division of Forestry and Wildlife, for low elevation threatened and endangered plant species on Oahu, including A. menziesii from the Kapolei population for the duration of HCP implementation.

The construction of the Dillingham Greenhouse by DLNR DOFAW has been completed (see Figure 9).

A 6,000 square foot nursery dedicated to the propagation of *Abutilon menziesii* and other threatened and endangered plant species on Oahu is located near the base of the Kealia Trail head, just behind the western end of Dillingham Airstrip in Mokuleia. The land falls under the control of the DLNR Land Division and is in the process of being transferred to DOFAW. The construction included the installation of the water and electrical systems. The greenhouse is 130 feet long by 40 feet wide by 12 feet tall. It is divided into an upper and a lower section along the entire length. All propagation of *A. menziesii* is now at this new facility.

Strategy (2) Funding for the Implementation of the HCP

The HCP's active mitigation effort will span a period of 20 years. The HCP is intended to provide adequate funding for the 20-year period beginning August 1, 2001 to July 31, 2021. Following the completion of 20 years of active mitigation, the HCP will provide additional funds for management of three wild outplanted sites.

The allotment for active mitigation over 20 years is valued at $1,000,000 averaging $250,000 over each five-year increment. This amount is pledged by DOT through funds which have already been delegated ($250,000) and funds which are to be released and delegated upon the approval of the HCP ($750,000).

Additional funds for the 20-year active mitigation period and for the post-Year 20 management period are from two sources: (1) Contingency Fund ($200,000) and (2) Interest earned on monies delegated (preliminary calculation of $440,000). Both of these fund sources are dynamic in nature and subject to change. The Contingency Fund of $200,000 would include an initial deposit of the full amount by DOT in 2005 and then be augmented by Cooperators. Cooperators are defined as other Kapolei property developers who would become sub-permittees of DOT's Incidental Take License through a Certificate of Inclusion. The Interest earned is subject to the prevailing interest rates and actual drawdown of the principle.

The funding sources for the HCP are summarized in Table 6.

Table 6. Funding Sources for the Habitat Conservation Plan (2001 to 2021+)

	HCP Phase / Time Period	Cost (in 2004 Dollars)	Source
(1)	Interim Management Program October 1998 – October 2001	$67,850 ($40,000 only has been remitted)	Special Funds by HCDCH
(2)	HCP Mitigation Period (2001 – 2021) Year 1 to Year 5 August 1, 2001 – July 31, 2006	$50,000/yr for five years. ($250,000 deposited March 14, 2001, with funds available August 1, 2001)	DOT funds
(3)	HCP Mitigation Period (2001 – 2021) Year 6 to Year 20 August 1, 2007 – July 31, 2021	$750,000 for 15 years. (Equivalent of $50,000 average per year for 15 years)	DOT funds (Funds appropriated by State Legislature, pending HCP approval & Governor's release of funds, about June 2004)
(4)	HCP Mitigation Period and Contingency Period (2005 – 2021+) Year 4 to Year 20+	$200,000 (Initial full deposit of $200,000 by DOT in 2005)	Contingency Fund (Fund to be augmented by Cooperators)
(5)	Post Year 20+ Management of Three (3) Wild Outplant Sites August 1, 2021 – Undetermined future	This amount is anticipated to be available from the remaining amount of the Contingency Fund and Interest income.	Remaining Contingency Fund and Interest earned on Items (3) and (4)

Funding for Years 1 – 20 of HCP Implementation

The provision for the establishment of the endangered species trust fund to be administered by DLNR is described in HRS Chapter195D-31. It states "the funds shall be held separate and apart from all other moneys, funds, and accounts in the state treasury, provided the moneys received as deposits or contributions from private sources shall be deposited and accounted for in accordance with the conditions established by the agencies or persons making the contribution. Earnings on the investment of the assets of the fund shall become part of the fund. Any balance in the fund at the end of a fiscal year shall be carried forward to the next fiscal year."

DOT intends to delegate a total of $1,000,000 for implementation of the HCP over a 20-year period from August 1, 2001 to July 31, 2021.

Contingency Fund - Funding After the 20th Year

Funding is provided for unanticipated events and for the management of three wild sites in the years following the 20-year HCP period.

DOT will establish a $200,000 contingency fund for the following purposes: 1) to finance unanticipated costs incurred by DLNR in the implementation of the HCP measures; and 2) to fund the management and monitoring of three "wild" populations beyond 20 years. The initial $200,000 deposit by DOT in 2005 will be augmented by Cooperators in the Incidental Take License, who have filed a certificate of inclusion with DOT.

Certificate of Inclusion

A Certificate of Inclusion would indicate the following:

a. DOT will be the holder of the Incidental Take License ("ITL").
b. Other agencies who propose to develop projects at the Kapolei property may have the protection of the ITL by obtaining a fully-executed Certificate of Inclusion and filing this document with DLNR.
c. The DOT, in consultation with DLNR, may require that other agencies contribute their various resources in order to sustain the mitigation effort of this HCP.

Memorandum of Agreement

DOT and DLNR have prepared a Memorandum of Agreement ("MOA") to implement the HCP. The MOA describes and states the following:

1. On August 1, 2001, DLNR shall implement the tasks set forth in "Exhibit A", attached hereto and incorporated herein. DLNR shall provide reasonable safeguards to secure the existence of at least three (3) "wild" *Abutilon menziesii* populations in appropriate protected habitats.

2. These populations will be maintained and managed beginning on the 1st day of August, 2001, and ending on the 31st day of July, 2021 or until all of the "success criteria" of the HCP has been accomplished.

3. DOT has delegated the expenditure of $250,000 from Act 328, SLH 1997, Item C0135, as amended by Act 116, SLH 1998, North-South Road, Kapolei Parkway to Interstate Route H-1, Oahu, to DLNR for the purpose of implementing mitigative strategies for the endangered *Abutilon menziesii*, thereby insuring funds to finance the HCP mitigative strategies costs for its first five years.

4. DOT shall also delegate to DLNR an additional lump sum amount of $750,000, which is intended to provide adequate funding for a period of fifteen (15) years from August 1, 2006. The precise amount needed to finance the mitigation effort will be estimated by DLNR and approved by DOT. The estimate shall not exceed $250,000 for 5 years, and funding will be used specifically to cover the expenses of DLNR, which relate to the mitigation of impacts to the Kapolei *Abutilon menziesii*. Interest earned on the funding, as delegated to DLNR, shall be retained by DLNR, be reserved to finance any additional mitigation beyond the term of the HCP, and be utilized in accordance with the purposes of the HCP. If a portion of the funding is unexpended due to an early termination of this MOA or the HCP, such funding shall be returned to DOT.

   DOT shall also delegate to DLNR an additional lump sum of $200,000 to serve as a "contingency fund", available over the term of the HCP. The contingency fund shall be used for emergency response, site development costs or other unanticipated expenditures required to fulfill the purposes of the HCP. The contingency fund is subject to legislative appropriation.

   All funding as directly or indirectly transferred by DOT to DLNR, shall be retained by DLNR, for the planned recovery of the *Abutilon menziesii*, until the "success criteria" is fully attained. If it is determined that all of the "success criteria" have been satisfactorily accomplished, the unexpended funds as of the date of the determination, shall be returned to DOT.

   In the event that additional funds for continued implementation of the HCP are needed, the DOT will seek alternative funding sources, including, but not limited to, transfers from the project's construction budget, participation by other State departments, and a separate legislative appropriation.

5. The MOA shall be null and void if the Board of Land and Natural Resources (or the State Legislature, as necessary) does not approve the HCP for the *Abutilon menziesii* in Kapolei.

6. The MOA may be terminated at any time by written consent of the parties of this agreement and any respective remaining funds shall be returned to DOT.

7. The MOA may be amended at any time by written consent of the parties of this agreement.

Strategy (3) Development schedule and mitigation phasing sequence

The period from 1997 to 2004 for the preparation of the HCP was unforseen at the start of the HCP planning period. The delay has been attributed to a number of factors including funding issues, real estate market conditions, analyses of regional drainage issues, and most recently, legislative amendments to the HCP law (Chapter 195D) to enable public agencies / landowners to participate in the HCP process.

This delay has provided an opportunity to test the HCP mitigation measures, specifically, the viability of propagating this species and to initiate outplant populations of *A. menziesii*. A further unanticipated consequence of the prolonged delay is the changes in land uses and ownership of parcels at the Kapolei property.

The decision of the Endangered Species Recovery Committee in the 2002 review established a review period of 15 years with a cap at 20 years for the subject HCP. However, presently, a 20-year implementation and active management time period is anticipated, followed by any necessary management at three wild sites after the conclusion of the 20th year.

A tentative conceptual schedule which represents the best information available at this time is provided in Table 7 to determine the order of impact of development on the Kapolei population. Once construction has commenced the impacts would occur incrementally over approximately 20 years during the Kapolei projects development period. The area of greatest impact is in the south of the property where *A. menziesii* are concentrated.

Table 7. Conceptual Development Phasing and Impacts to Plant Clusters

Development Phase* (Conceptual)	Cluster	No. of Plants	Land Use
2005 to 2008 (North-South Road)	C-1 C-2	14 7	Roadway Drainage basins
2006 to 2008 (Kapolei Parkway Segment) Future Urban Uses (undetermined schedule)	E E	3 4	Roadway Infill Residential Uses (Future)
2005 to 2014 (DHHL Homesteads)	A B	10 14	Residential
200_ to 20__ (UHWO)**	C C, D	0 3	Campus Campus related uses
20-- to 2020 (DLNR other lands)	C-3***	38	Residential, Parks, Schools, etc.,

* Development phases are conceptual and development schedules have yet to be determined at this time.
** UHWO development schedule has not yet been established.
*** Sub-cluster C-3 incorporates the 18-acre contingency reserve which will remain in place until the short-term success criteria are met at one outplant wild population.

The implementation of the mitigation measures described herein and a phasing sequence and conceptual schedule is shown in Table 8. The schedule assumes a favorable approval of the HCP.

Table 8. HCP Implementation Schedule (Conceptual)

Phases	Actions
Interim Management Program 1998 – 2001 (Extended to 2003)	HCDCH funds Interim Management Programs - Implemented by DLNR -Test Outplant Site #1 (Koko Crater) planted (130 plants / November 2000) -Test Outplant Site #2 / Wild Site #1 (Kaena State Park) planted (April 2001) -Test Outplant Site #3 / Wild Site #2 (Honouliuli National Wildlife Refuge) (2002-2003) -Dillingham Greenhouse under construction (2002-2003) DOT deposits initial $250,000 for Years 1-5 (2001 – 2006 – in part, to conclude the interim program and to initiate the first five-year increment of HCP implementation) to DLNR to implement the HCP. [NOTE: Funds were available in August 2001 for Year 1.] -DLNR hires staff to implement the HCP
HCP Review and Approval / Federal Section 7 Consultation 2003-2004	-BLNR review/approval of HCP -DOT/DLNR establish MOA -Approval of Incidental Take License -DOT delegates $750,000 to Years 6-20 funding -Section 7 consultation initiated and concluded with USFWS
HCP Implementation 2001 – 2021	- Establish the 18-acre contingency reserve at the in situ Kapolei population - Initiate and manage additional appropriate outplanting sites - Annual reporting - analyze success criteria, reporting of progress, and applying adaptive management strategies, as appropriate - Implement all other measures identified in the HCP - Annual fiscal reporting to DOT by DLNR - Development of Kapolei projects (Conceptually described in Table 7)
Long-term Management (After 2021)	Appropriately manage 3 established outplant wild sites

The basis for this mitigation phasing sequence, although conceptual, is the result of the initial results of the Interim Program. This is based on the successful nursery propagation and initial outplanting to the three outplanting sites (Koko Crater, Kaena Point State Park, and Honouliuli National Wildlife Refuge).

Strategy (4) Establish new populations at three off-site locations

The HCP outlines a strategy to take cuttings and collect seeds from the existing *Abutilon menziesii* plants at the Kapolei property prior to their removal and to use these materials to: 1) maintain genetic representation of the original population by growing cuttings in nurseries and placing seeds in seed storage facilities; and 2) to establish three new wild populations in protected areas elsewhere on Oahu.

Described below are the following: 1) Criteria for wild site selection, and 2) Candidate sites for outplanting

(4) 1. Criteria for Wild Site Selection

Wild sites for *A. menziesii* re-introduction is generally considered to be an area where the species, after initial planting, with the support of temporary active management measures (e.g. irrigation, control of threats, etc.), will become self-sustaining and will naturally reproduce.

To establish criteria for site selection of appropriate candidate sites on Oahu for *A. menziesii* a brief summary description of the extant populations on Lanai and Maui was made. The physical characteristics, including vegetation type/plant communities, soils, elevation, rainfall, overall site characteristics, and identified threats were analyzed.

These sites are at Kaumalapau and Puu Mahanalua on Lanai and Kalialinui Gulch and Puu o Kali on Maui. Table 9 summarizes the findings and a preliminary analysis of the findings is summarized below.

Table 9. Summary description of extant Lanai and Maui populations of *Abutilon menziesii*

Site (Location)	Site Characteristics	Vegetation type/ Plant communities	Soil type	Elevation & Annual Rainfall	Threats
Kaumalapau (Lanai)	*Abutilon menziesii* occur in scattered colonies numbering approximately 400± in the area north of Kaumalapau Road to Paliamao Gulch. The area is formerly grazed by cattle and makai of overgrown abandoned pineapple fields.	Guinea grass (2 ft. to 3 ft. tall); scattered clumps of koa haole in swales	Molokai silty clay loam (MuC) Well-drained, deep soils on uplands	1,050 ft. to 1,150 ft. amsl 20 - 25 inches between Nov. and April; hot, dry summers	-Weeds -Fire
Puu Mahanalua "Twin Peaks" (Lanai)	*A. menziesii* is found at the base of the most mauka puu along abandoned pineapple field dirt roads. Mature colony of 35± plants (observed in 2001) with plant heights ranging from 4 ft. to 7 ft. Blossoms are unique in color (pale peach) and are upright (not pendant).	Guinea grass (6 ft. to 7 ft. tall)	Uwala silty clay loam (UwC) Well-drained soils on uplands, formed in material derived from basalt. Soil temperature of 70 degrees.	1,200 ft. amsl 15 - 25 inches between Nov. and April; very little rainfall in summer	-Weeds -Fire

Kalialinui Gulch (Central Maui)	Plants occur along the top banks of gulch adjacent to cane haul road. Fields are in active cultivation. Population in 3 colonies. 3 mature colonies of *A. menziesii* with plants reaching heights of 7 ft. to 8 ft. tall	Open scattered koa haole/Guinea grass	Keahua silty clay loam (KnB) Well-drained reddish brown soils on uplands weathered from basic igneous rock; 20 to 40 inches deep	690 ft. to 750 ft. amsl 15 to 25 inches	-Weeds -Grazing -Fire
Puu o Kali (Kihei, Leeward Maui)	Plants occur on shallow pockets of soil on aa lava flow. Generally open with scattered stands of wiliwili (*Erythrina sandwicensis*).	Native Lowland dry shrubland	Very Stony Land (rVS). Young aa lava that has a thin covering of volcanic ash that extends deep into cracks and depressions.	500 ft. to 1,400 ft. amsl 30 to 40 inches	-Weeds -Grazing -Fire -Ungulates A fencing project is underway to control the deer grazing threat.

A preliminary analysis of the extant Lanai and Maui populations is summarized in Table 10.

Table 10. Preliminary analysis of physical characteristics of extant Lanai and Maui populations

Site Characteristics	Vegetation type/ Plant communities	Soil	Elevation & Rainfall
-Leeward or southern location -Located between actively or formerly cultivated fields and scrubland -Threats include weeds, fire, and ungulates. -At Puu o Kali, deer browsing threat to seedlings (being controlled through fencing) -Fire threats, species indicated to be somewhat fire tolerant (i.e. the Kapolei population)	-Presence of and abundance of alien grasses surround stands of *A. menziesii* -Natural recruitment of seedling establishment unknown over time due to alien grass cover	-Well drained deep soils	-Elevation ranges: 500 – 1,400 amsl -Annual rainfall range generally averages 20 inches; -USFWS (1995) notes that all known populations are frequently exposed to severe drought and flooding

In addition, the following set of guidelines for re-introduction is from the World Conservation Union[5]:

Choice of re-introduction site and type

- Site should be within the historic range of the species. For a re-introduction, there should be no remnant population to prevent disease spread, social disruption and introduction of alien

[5]Website: www.iucnsscrsg.org

genes. In some circumstances, a re-introduction may have to be made into an area which is fenced or otherwise delimited, but it should be within the species' former natural habitat and range.

- An introduction outside its historical range should be undertaken only as a last resort when no opportunities for re-introduction into the original site or range exist and only when a significant contribution to the conservation of the species will result.
- The re-introduction area should have assured their long-term protection (whether formal or otherwise).

Evaluation of re-introduction site

- Availability of suitable habitat: re-introductions should only take place where the habitat and landscape requirements of the species are satisfied, and likely to be sustained for the foreseeable future. The possibility of natural habitat change since extirpation must be considered. Likewise, a change in the legal/ political or cultural environment since species extirpation needs to be ascertained and evaluated as a possible constraint. The area should have sufficient carrying capacity to sustain growth of the re-introduced population and support a viable (self-sustaining) population in the long run.
- Identification and elimination, or reduction to a sufficient level, of previous causes of decline: could include disease; over-hunting; over-collection; pollution; poisoning; competition with or predation by introduced species; habitat loss; adverse effects of earlier research or management program; competition with domestic livestock, which may be seasonal. Where the release site has undergone substantial degradation caused by human activity, a habitat restoration program should be initiated before the re-introduction is carried out.

[End: World Conservation Union text]

(4) 2. Candidate Sites

Three new populations of *A. menziesii* have been initiated and are tentatively expected to persist. As evidenced by the successful propagation by DLNR in the Interim Management Program (Strategy (1), plants grown from cuttings and seed from the in situ Kapolei population thrive and produce fruit and viable seed under nursery conditions. The results of the Koko Crater Botanical Garden (Outplant Site #1), Kaena Point State Park (Outplant Site #2 / Wild Site #1), and Honouliuli National Wildlife Refuge (Outplant Site #3 / Wild Site #2) will provide critical information for the selection of additional candidate Wild Sites. It is anticipated a total of three viable wild sites will be determined from planting at several (e.g. more than three) outplant sites to achieve the long-term goal of this HCP, therefore, additional appropriate locations will be pursued and planted while monitoring the sites already planted.

DLNR DOFAW, ESRC, and DOT have had considerable discussion from 1997 to the present (2004) in evaluating potential outplant (or release) sites. Trials at several sites for wild site viability have been initiated and have resulted in outplanting at two sites, Kaena Point State Park and the Honouliuli Unit of the Pearl Harbor National Wildlife Refuge.

These and each future outplanting site will require active management over a 5-year period to before a determination is made on success or failure. Additional sites will continue to be pursued while existing sites are monitored, to yield three successful wild sites.

The discussions for the selection of additional wild sites include the following priority candidate site and other possible sites:

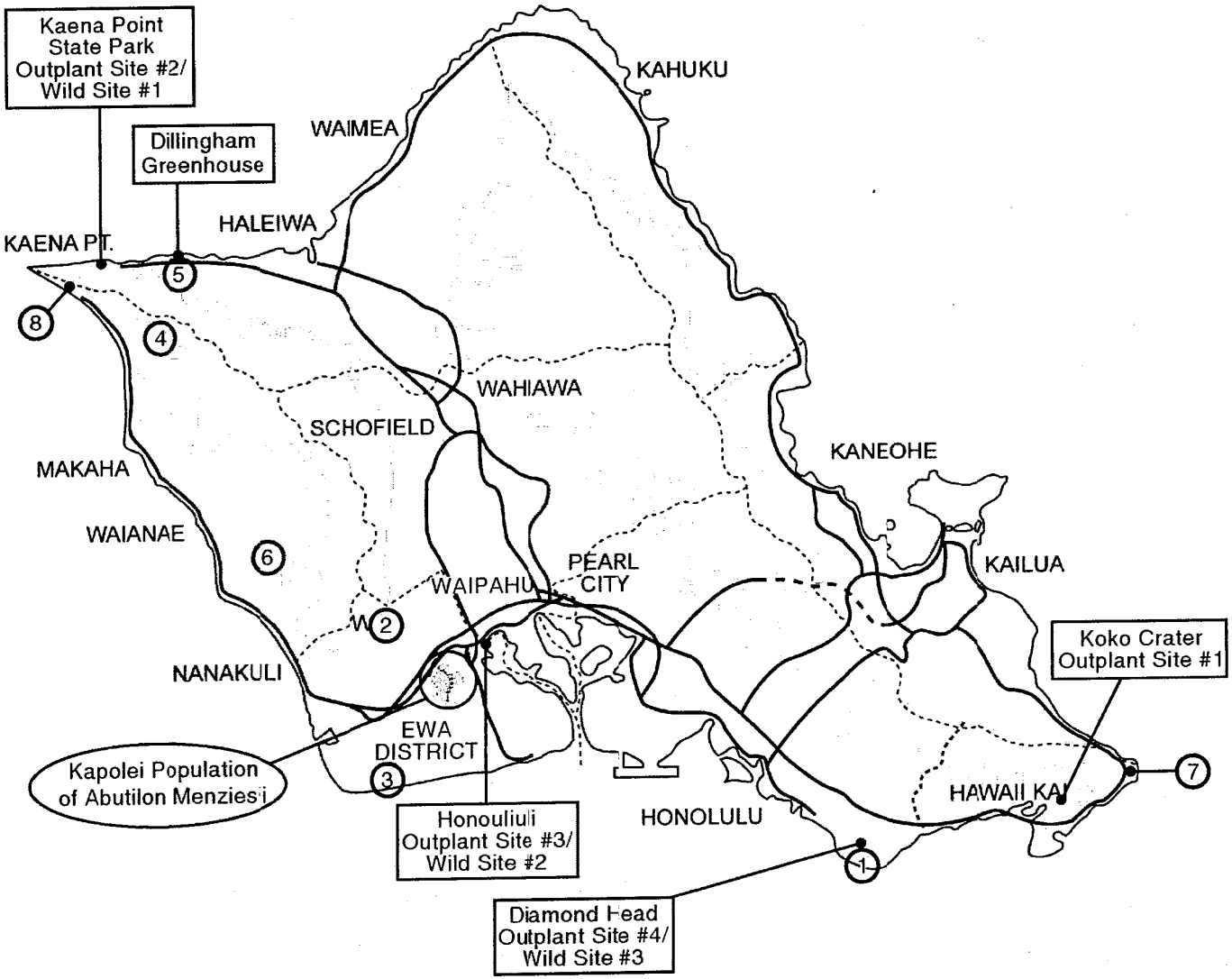
1. Priority Candidate Site

    - Diamond Head State Monument (Approved for outplanting by DLNR Division of State Parks)

2. Other Possible Sites

    - Honouliuli Kaluaa (The Nature Conservancy)
    - Kalaeloa (former Barber's Point Naval Air Station) Northern Trap and Skeet Range
    - Kalua Kauila (near Makua Valley)
    - Kealia Trail area (State DLNR) (Test planted by DOFAW)
    - Lualualei Naval Reserve
    - Makapuu Head
    - Yokohama Beach (mauka area)

The candidate site locations are shown in Figure 10 and Table 11 summarizes the sites which have been considered as candidate outplanting sites. The physical site characteristics, threats such as invasive weeds and the potential for fire, and land ownership and availability have been assessed to determine the suitability of each site as a permanent habitat for *A. menziesii.*



LEGEND

OUTPLANTED SITES

#1 Koko Crater Botanical Garden
#2 Kaena Point State Park
#3 Honouliuli Refuge NWR

CANDIDATE OUTPLANT SITES

(1) Diamond Head State Monument
(2) Honouliuli Kaluaa
(3) Kalaeloa Trap and Skeet Range
(4) Kalua Kauila
(5) Kealia Trail
(6) Lualualei Naval Reserve
(7) Makapuu Head
(8) Yokohama Beach

FIGURE 10
Existing Outplanting Sites and Candidate Sites
Habitat Conservation Plan
for Abutilon menziesii at Kapolei

ISLAND OF OAHU

March 2004

PBR HAWAII

Table 11. Candidate sites for outplanting of *Abutilon menziesii*

Site Name/ Location	Ownership	Size (Outplant Site)	Site Characteristics	Threats / Other Relevant Comments
Diamond Head State Monument Waikiki, East Honolulu	State DLNR Division of State Parks	1 to 2 acres	-Within DLNR control -Convenient site accessibility -Controlled access -State parks master plan designates areas which are not within heavy "public transit areas" -Dry environment -Fairly deep soils -Waterline available in near proximity	-Fire -Weeds -Presently requires MOU between National Guard and DLNR; -National Guard to relocate from Diamond Head @ 2007-2010 -High Priority candidate site to be planted in 2004
Honouliuli Kaluaa Kunia, Waianae Mountains	Campbell Estate (The Nature Conservancy of Hawaii, Le.)	@ 0.5 acre	-Site accessible by rough dirt road and on foot -Not a public access area; however, site is used by hunters, hikers -Dry mesic forest -No waterline available	-Fire -Weeds -Low Priority site due to uncertainty of lease renewal
Kalaeloa Northern Trap and Skeet Range Former Barbers Point Naval Air Station, Ewa	Federal Navy	---	-Convenient site accessibility -Controlled access (to some degree) -Site is scheduled for remediation to remove hazardous materials -Dry coastal lowlands -Presence of Ewa Plains 'Akoko (Chamaesyce skottsbergii, an endangered species -Shallow soil layer on karst substrate (to be exacerbated by remediation) -Unknown Waterline availability	-Fire -Weeds, Buffel grass -Site is planned to be remediated to remove lead shots; top layer of soil to be removed. -Low Priority site
Kalua Kauila Near Makua Valley	Federal Department of the Army	---	-Site access by foot -Controlled site access	-Fire -Weeds - Army is unwilling to allow more T&E species on its lands at this time
Kealia Trail Mokuleia (near Dillingham Nursery)	State DLNR	0.5 to 1.0 acre	-Convenient site accessibility -Public hunting and recreational area -Dry, forested environment -Moderate depth soils	-Fire -Invasive weeds -DOFAW's initial test planting at this site is not

			-No Waterline available	too positive; -2nd site will be test planted in 2004
Lualualei Naval Reserve Waianae	Federal Navy	---	-Convenient site accessibility -Controlled access -Dry environment -Presence of *A. menziesii* (2 known) -Deep soils -Waterline available in proximity	-Fire -Weeds, Guinea grass -Navy is currently unwilling to collaborate and allow additional T&E species on its lands
Makapuu Head	State DLNR Division of State Parks	---	-Relative convenient site accessibility -Public recreational area -Dry coastal environment - Pockets of deep soils -Scattered pockets of native plant communities, including T&E species -Unknown Waterline availability	-Fire threat -Weeds, koa haole scrub, Guinea grass -Limited salt spray -Uncontrolled access (public recreational area)
Yokohama Beach (Within Kaena Point State Park) Leeward Coast (North of Makaha)	State DLNR Division of State Parks	0.5 to 1.0 acres	-Convenient site accessibility -Public recreational area -Dry coastal environment - Deep soils -Unknown Waterline availability	-High fire threat -Weeds, Guinea grass -Uncontrolled access (public recreational area) -Salt spray during kona weather

The priority candidate site, Diamond Head State Monument, is located at Waikiki in East Honolulu and is under DLNR Division of State Parks jurisdiction. The Diamond Head State Monument Master Plan includes areas which will remain as wildlands which may be appropriate for *A. menziesii* introduction. This site has been approved by the Division of State Parks.

From a biological perspective, the Lualualei Naval Reservation environment is a preferred site with appropriate microclimate, soil conditions, and protected status. Moreover, the site is believed to be an historic range of *Abutilon menziesii* with two individuals present at the NCTAMS PAC Radio Transmission Facility and is monitored by Navy staff (R. Miyashiro, personal communication). However, the current position of the Navy precludes the introduction of additional protected species at this location. Follow-up communication with the Navy will resume after the approval of the HCP.

Important considerations in the selection of each site include the following:

- Generally all sites may be exposed to fire threats, therefore, a site specific fire protection plan will be developed for each site – as part of the site assessment /selection process. The fire

plan will include identification of the following: 1) fire fighting resources, 2) response responsibilities, 3) location of water resources, and 4) plans for fire breaks and fuel control.

- All sites that persist are to be considered permanent sites, therefore, future urbanization within and adjacent to the sites must be analyzed and landowner commitments for preservation must be secured.

Strategy (5) Long term protection and maintenance of permanent *Abutilon menziesii* populations

As described in this HCP and in the MOA between DOT and DLNR (Appendix H), the funds for a 20-year period for active management, protection, and maintenance of three permanent outplant sites have been partially delegated by DOT and will be supplemented after the approval of the HCP. Additionally, DOT agrees with the need for management of three wild sites beyond 20 years. Therefore, as described in Strategy (2), the funds for such management will be derived from two sources: 1) Interest earned (estimated at $440,000) on the delegated amounts of $950,000, and 2) Contingency Fund revenues (a portion of $200,000).

A further responsibility for long-term protection and maintenance of the permanent outplant sites after the HCP active management period of 20 years requires the commitment of Landowners of three outplant sites. The property owners will be required to commit to maintaining land uses that are compatible with the protection and management of the *Abutilon menziesii* populations on their property. Thus, the site selection process has analyzed criteria such as landownership status and potential future urbanization pressures on the candidate sites.

The MOA further states, "DLNR has the knowledge, expertise, and permanent presence needed to implement the mitigation of threatened and endangered species and agrees to implement the mitigation of threatened and endangered species and agrees to implement the management of the *A. menziesii* mitigation populations as outlined in the HCP".

Protection and Management of Wild Sites. The protection and management of the of the wild sites 3 will be funded through the monies contributed by DOT and earmarked for *A. menziesii* and as described in the MOA "Exhibit A - Scope of Services" includes the following:

A. Maintain three wild populations. The purpose of the populations is to allow for natural seedling recruitment and establish long-term viability of all three populations.

B. Propagation of a total representation of plants through cuttings from the Kapolei *Abutilon menziesii* population. These plants will be used to maintain genetic representation of stock and provide stock for outplanting purposes.

C. Administration: 1) Prepare biannual reports of progress and findings, and 2) Maintain adaptive management strategy as needed to improve plant recovery and success.

D. At the end of the contract period, DLNR shall prepare a summary final report, providing recommendations for future actions and possible alternatives, if any, based upon documented findings and results.

Strategy (6) Appropriate research

The research component would augment the research and testing measures described in Task 4 of Strategy (1): Interim Management Program which includes biological research, testing, and identification of testing parameters.

Research would focus on the "cultivation methods" of *A. menziesii* to attain the goal of establishing three viable new outplant sites. A review of past research studies would be made and appropriately applied to this project as situations arise at the various outplant site. The need would be determined by DLNR.

Research may include studies of various aspects of life history, habitat, pollinators, reproductive biology, optimum requirements for growth, requirements for population viability, and control of threats to better understand the requirements necessary for perpetuation of these plants. Such additional knowledge would allow more appropriate management and assessment techniques to be developed.

6.1 Collect diagnostic data on crucial associated ecosystem components.

1) Composition of flora and invertebrate, bird, and other fauna populations within the existing clusters to gain an understanding of any relationships between these organisms and *A. menziesii*.

2) Comparison of such information collected over time correlated with data from monitored populations of *A. menziesii* in known locations to provide insight into the required and/or preferred habitat for the species.

6.2 Study various aspects of growth of *A. menziesii*.

1) Growth and mortality of seedlings, cuttings, transplanted parent plants;

2) Growth of mature plants, including seasonal changes, optimum conditions and limiting factors;

3) Seasonal differences in temperature and light needs;

4) Water sources and requirements; and

5) Soil and nutrient requirements.

6.3 Study reproductive viability.

1) Breeding systems including self-compatibility;

2) Pollination vectors; and

3) Preferred conditions for flowering and seed set.

6.4 Determine the degree of threats posed by the nature of interactions with selected diseases/ introduced species.

Determine mechanisms of impact of diseases or pests. If diseases or introduced pests with negative impacts on *A.menziesii* are discovered, effects and mechanisms of each would be

determined. Research into mechanisms of impact of alien species, and any others that may be threats, would be performed as deemed necessary.

6.5 Determine effective control methods to combat insect pests that may adversely affect the species.

6.5.1 *Determine effective control methods for pests.* If the pests are determined to pose a threat to *A. menziesii*, research into effective control methods for these pests would be undertaken, ensuring that the control measures do not adversely affect this species.

6.5.2 *Determine effective control methods for hibiscus scale on Abutilon menziesii.* If the hibiscus scale is determined to pose a threat to *A. menziesii*, research into effective control methods for the hibiscus scale on the appropriate *A. menziesii* species would be undertaken, ensuring that the control measures do not adversely affect this species.

6.6 Other appropriate research to be considered.

Potential research would also be considered for the following:

1) Testing adult plants, seedlings, and seeds for salt tolerance via soil and salt spray; and

2) Conducting studies (or researching) off-island populations of *A. menziesii* to gain an understanding of how these populations function.

The decision to implement any additional research would be subject to other funding availability and a determination that these studies would directly significantly benefit the Kapolei population and the outplant sites as described in this HCP.

6.7 Currently ongoing research.

A research project by the University of Hawaii (Cliff Morden, principal investigator) is currently ongoing as a research component of the HCP. The research is to assess the extent of the genetic variation within the Ewa population of *Abutilon menziesii*. A genetic analysis of all plants from the Ewa population (at the Kapolei site or at outplanting/nursery sites) will be carried out. A limited number of individuals from other populations of *A. menziesii* (Lualualei, Oahu; Lanai, and Hawaii) will be sampled to determine affinities of the Ewa population. This research will address the extent of the genetic variation of the Ewa population, if this population is genetically distinct from other existing populations, and if genetic distance among plants correlate with the physical distance between plants. Random amplified polymorphic DNA (RAPD) markers will be used to assess the genetic diversity among individual plants. All population genetic distances will be statistically evaluated and will be compared to results from similar studies. Assessment of the genetic variation of the Kapolei population of *A. menziesii* will provide information allowing managers to make more informed management decisions concerning selection of source material for outplanting, collection, and storage of propagules to ensure representation of existing genetic material. The final report will include the following items:

1) Collection information for individuals
2) Description of methods
3) Results and discussion of genetic analyses

4) Statement regarding intra-population variation of *Abutilon menziesii* and its genetic relation to other populations

Strategy (7) Kapolei Population strategies

An objective of the HCP over its 20-year program would allow the removal of the Kapolei population and relocating the full genetic resource to three offsite protected locations on Oahu. To assure that the short-term success criteria are met before the full population is removed (as described in Section 7 Table 13) an 18-acre area within the Kapolei population is established as a temporary contingency reserve. This area is shown in Figure 11, as well as on Figure 5.

An additional "Special Condition" to the State Incidental Take License to be issued to accompany the "Habitat Conservation Plan for Abutilon menziesii at Kapolei" would state, "No take or development can occur within the 18-acre area that surrounds the core *Abutilon menziesii* concentration within the area identified as Cluster C3 in the "Habitat Conservation Plan for *Abutilon menziesii* at Kapolei" until such time that one outplanting site has met short-term success criteria described in the HCP."

Management of the 18-acre reserve may include measures such as temporary fencing and firebreaks. If an outplanting site does not meet the short-term success criteria, this could be considered as a wild site.

Incidental Take

DLNR, as the property owner, will be responsible for the Kapolei population until the Kapolei projects are fully entitled and prior to the transfer of land to the Kapolei project developers. A stipulation of the transfer of the property would be the issuance of an Incidental Take Permit by DLNR to enable the removal of the Kapolei population plants to the outplant sites. The cost to remove and upkeep these "original plants" will be from the funds provided by DOT or from contributions to the Endangered Species Trust Fund. The costs associated with the transplanting of original plants would be from the allocations to each of the three wild sites.

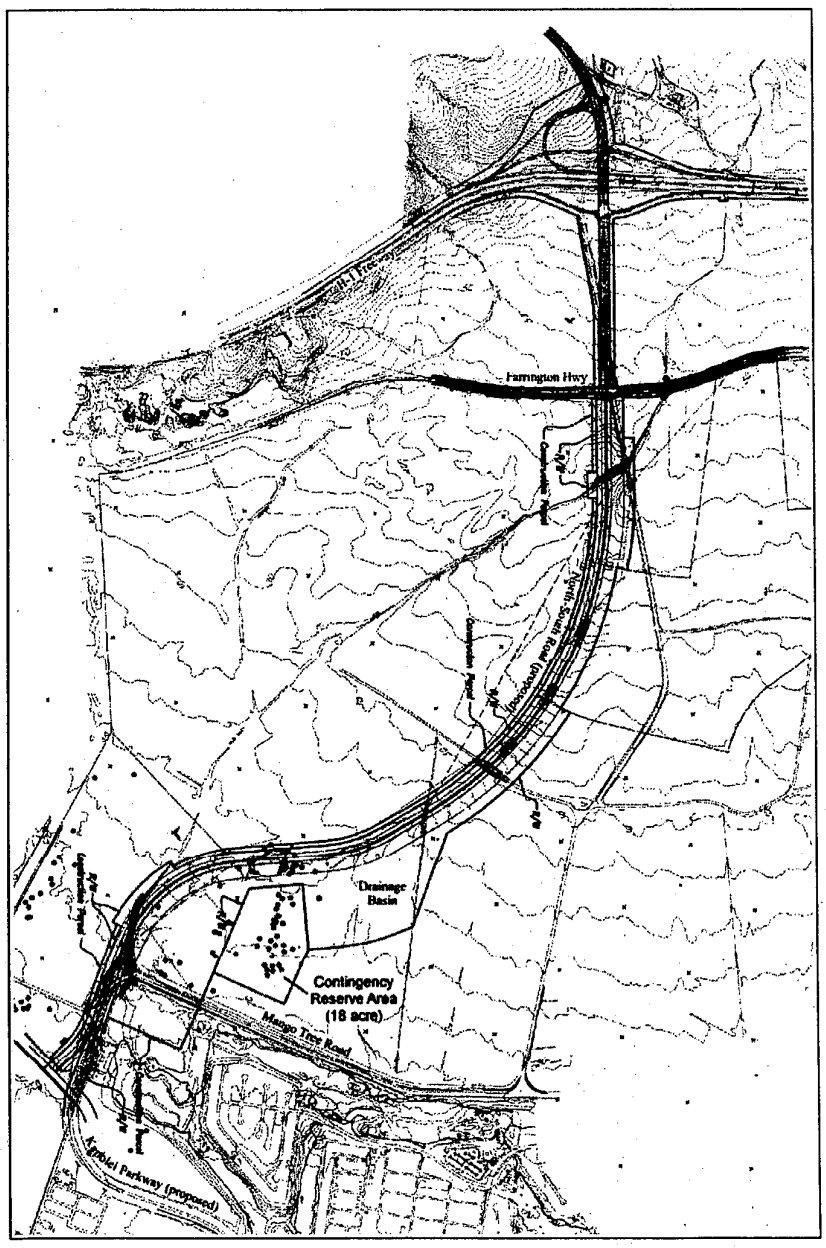
The City and County of Honolulu will issue a right-of-entry permit to DLNR DOFAW to collect propagules and conduct appropriate monitoring of the *A. menziesii* individuals (as described in this HCP) on the City property. However, the City will have overall responsibility for the plants on its property.

Prior to the construction of the North-South Road and removal of *A. menziesii*, DOT personnel will be consulting with DLNR regarding the location and treatment of the endangered plants along the project corridor.

Mitigation of the Seed Bank

To mitigate the seed bank at Kapolei, DOFAW has collected seeds and cuttings from approximately 75±% of all baseline plants. The uncollected 25±% is the due to plants lost through attrition, etc..

Mitigation of the seed bank will focus on seed storage at Lyon Arboretum, vegetative propagation at the new Dillingham Nursery, and the living genetic bank at Koko Crater Botanical Garden. The documentation of the Lyon Arboretum collection is accessed at the following website: http://www.hawaii.edu/scb/docs/science/seed/seedtabl.html



LEGEND

Abutilon menziesii

18-acre contingency reserve

Source: RM Towill Corporation

FIGURE 11
18-Acre Contingency Reserve Area
Habitat Conservation Plan
for Abutilon menziesii at Kapolei

LINEAR SCALE (FEET)
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ISLAND OF OAHU

March 2004

PBR

The requirements of soil collection and storage may not be practical or feasible and collection is unproven as a means to mitigate the seed bank when compared to the successful collection of seeds and vegetative cuttings from the Kapolei population. Therefore, soil collection and banking is left to be exercised at the discretion of DLNR.

SECTION 4

Identify those measures or actions to be undertaken to protect, maintain, restore, or enhance the ecosystems, natural communities, or habitat types within the plan area; a schedule for implementation of the actions or measures, including monitoring, that are to be undertaken in accordance with the schedule.

(4a) Measures or actions to be undertaken to protect, maintain, restore, or enhance the ecosystems, natural communities, or habitat types

Short-term and long-term measures and actions which would affect the existing *Abutilon menziesii* population have been described in detail in Section 3. The strategies outline the measures and actions of the HCP for the existing habitat, the interim management period, and the long-term period at the offsite outplant mitigation populations.

(4b) A schedule for implementation of the proposed measures and actions.

The schedule for implementation of the proposed measures and actions is described in detail in Section 3, Strategy (3).

All of the populations of *A. menziesii* have been and will be periodically monitored throughout each of the phases of the HCP Implementation Schedule. Monitoring of the *in situ* and reintroduction populations will be conducted to determine progress toward attaining taxon stability. Monitoring will also be conducted to assess the status of the management unit relative to control of alien taxa and to habitat restoration. In addition, monitoring is an essential and integral part of adaptive management, which will be undertaken and is more thoroughly described in Section 8.

SECTION 5

Be consistent with the goals and objectives of any approved recovery plan for any endangered species or threatened species known or reasonably expected to occur in the ecosystems, natural communities, or habitat types in the plan area.

The preparation of the subject HCP involved the review of the *Lanai Plant Cluster Recovery Plan* (USFWS 1994) which includes *Abutilon menziesii* as one of nine endangered taxa. Appropriate guidelines are incorporated into the strategies contained herein.

Abutilon menziesii is considered to be a "long-lived" perennial and known or believed to have a life-span greater than 10 years (USFWS 1994, page 69). Conversely, "short-lived" perennials are those known or believed to have life spans greater than 1 year but less than 10 years. There are fewer than 700 *A. menziesii* individuals on Lanai, Maui and Hawaii; Oahu is listed as a possible location (USFWS 1994).

The Lanai Recovery Plan states the most serious threats as browsing and trampling by introduced ungulates, and competition from alien plants. Other threats include fire, seed predation, loss of pollinators and disease. Additional threats noted on Maui and Hawaii include agricultural and urban development.

The presence of the Kapolei population validates that the Leeward Oahu (and possibly Lualualei) and Ewa areas as historic ranges for the species. Threats to the subject population at Kapolei included agricultural cultivation until 1994 and impending urbanization as described herein.

The Lanai Recovery lists five necessary actions: 1) Protect habitat of current populations and manage threats, 2) Conduct research essential to conservation of the species, 3) Expand current populations, 4) Establish new populations as needed to reach recovery objectives, and 5) Validate and revise recovery objectives.

The total estimated cost of recovery for one (of nine) species in the Lanai Recovery Plan is estimated at $3,000,000 over a period of 20 years. The date of recovery (for all nine species) for downlisting to Threatened would be in 2015, if recovery criteria are met (USFWS 1994, page v.).

The Kapolei population is expected to be taken and relocated to the three new outplant sites where threats will be actively managed, research conducted, and populations expanded over the 20 year period. To implement the HCP measures, a funding commitment has been made, as described in the Memorandum of Agreement (Exhibit G) between DOT and DLNR for approximately $50,000 per year for a period of 20 years. Moreover, a commitment to implement the strategies of the HCP has been made by DLNR.

As indicated, there are no other endangered or threatened species in the East Kapolei area. However, remaining, in situ *Abutilon menziesii* will be maintained and protected onsite by DLNR until they are to be taken and relocated to the wild, outplanted sites, as described under Task 1 of Section 3, Strategy (1). In addition, an objective of this plan is the establishment of outplanting sites, which may become "plan areas" which may have other endangered species, and the coordination of these recovery efforts will also be performed by DLNR.

The mitigative measures of this HCP will contribute towards the USFWS Recovery Objective to delist this species. The criteria to meet the Recovery Objective of delisting are summarized below.

Table 12. Recovery Objectives of the Lanai Recovery Plan and HCP Objectives

Objectives	Lanai Recovery Plan	Associated HCP Actions
Interim Objectives	Stabilizing the existing populations: To be considered stable, each taxon must be managed to control threats (e.g. fenced) and be represented in an ex situ collection. In addition, a minimum total of three populations should be documented on Lanai and, if possible, at least one other island where they now occur or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 25 mature individuals per population for long-lived perennials.	HCP goal is to establish 3 new ex situ wild populations on Oahu from the original degraded canefield population at Kapolei. At the new populations, threats from fire, vehicles, insect and weed pests, are to be controlled.
Downlisting	Taxon may be downlisted when a total of five to seven populations are documented on Lanai and at least one other island where it now occurs or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with minimum of 100 mature individuals per population for long-lived perennials. Each of these populations must persist at this level for at least 5 consecutive years before downlisting is considered.	Presently, 830 progeny from cuttings and seeds, representing the full range at Kapolei have been propagated and planted at two outplant sites (Kaena Point and Honouliuli) and at Koko Crater Botanical Garden, which serves as a repository for the full genetic range of the Kapolei population. The next outplant site is anticipated to be on State land at Diamond Head Monument. Additional sites are being evaluated and will be selected for outplanting after all clearances are received. The goal is to achieve at least three sites which meet the success criteria described herein.
Delisting	Taxon may be delisted when a total of 8 to 10 populations are documented on Lanai and at least one other island where it now occurs or historically occurred. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with a minimum of 100 mature individuals per population for long-lived perennials. Each population should persist at this level for at least five consecutive years before delisting is considered.	The funding for the HCP is provided by DOT and implementation of the HCP is by DLNR as described herein.

SECTION 6

Provide reasonable certainty that the ecosystems, natural communities, or habitat types will be maintained in the plan area, throughout the life of the plan, in sufficient quality, distribution, and extent to support within the plan area those species typically associated with the ecosystems, natural communities, or habitat types, including any endangered, threatened, proposed, and candidate species known or reasonably expected to be present in the ecosystems, natural communities, or habitat types within the plan area.

The ecosystems, natural communities or habitat types of the Kapolei property are described in Section 1(b). Studies by Nagata (1996) and Char (1997, 1997, 2003, 2004) indicate that, for the most part, the landscape and ecological conditions are typical of fallowed sugarcane fields at other Oahu locations. It should also be noted that other listed, endangered species have not been discovered in this area, and the interdependency of any organism with *A. menziesii* has not been established at this point.

As described in Section 3, Strategies (1) and (4), the establishment of three new outplant wild populations is a major goal of this HCP, as such, there will ultimately be three "plan areas". Several more potential outplant sites are planned, in order to achieve a minimum of three successful sites.

A primary purpose of the Interim Management Program was to preserve the genetic resource at the Kapolei population and to test the viability of outplanting at appropriate offsite locations. This represents the initial task towards providing a reasonable certainty that the natural Kapolei community of *A. menziesii* will be maintained. The initial results of the Interim Management Program are a positive indication that new plants can successfully be grown from seeds and cuttings and potentially, new populations can be established at appropriate offsite locations to maintain a habitat for this species. At the Kaena Point outplant site, a coastal strand community including approximately 20 native species has been initiated and seedling recruitment has been reported.

The initial results indicate that with continued management there is reasonable certainty that *A. menziesii* from the original Kapolei population could be established as a natural community. However, a final assessment will require continued management over time.

SECTION 7

Contain objective, measurable goals, the achievement of which will contribute significantly to the protection, maintenance, restoration, or enhancement of the ecosystems, natural communities, or habitat types; time frames within which the goals are to be achieved; and provisions for monitoring (such as field sampling techniques) and evaluating progress in achieving the goals quantitatively and qualitatively.

(7a) Objective, measurable goals, the achievement of which will contribute significantly to the protection, maintenance, restoration or enhancement of the ecosystems, natural communities, or habitat types

The primary objective of the HCP is the continued survival of the Kapolei genetic stock of *Abutilon menziesii* through the establishment of three offsite wild populations and one offsite repository site from the degraded canefield population at Kapolei. To achieve this goal, several sites will be outplanted, managed, and monitored for a period of five years before a determination is made whether a site has met the success criteria described herein. The short- and long-term goals are summarized in Table 13:

Table 13. HCP Short-term and Long-term Goals

	Goals
Short-Term Goals	1) Propagate the full complement of lineages of the in situ Kapolei population of *Abutilon menziesii.* 2) Establish a cultivated repository of the full complement of lineages of Kapolei *A. menziesii* at Koko Crater Botanical Garden. 3) Establish two test outplantings of *A. menziesii* at appropriate sites. 4) Represent the full complement of lineages of the in situ Kapolei population at all sites. 5) Establish and maintain an 18-acre contingency reserve area within the Kapolei population until the short-term success criteria are met at one wild outplant site.
Long-Term Goals	1) Maintain three new stable wild populations of *A. menziesii* by out-planting at several (more than three) appropriate sites. 2) For each wild population maintain an effective population of 120 flowering and seed producing plants (minimum of 100 mature individuals) over the term of the HCP. This number will assure an approximate 75 to 100 percent increase of the original population in each location and is five times that recommended by the Hawaii and Pacific Plants Recovery Coordinating Committee (as cited in USFWS 1998). 3) Monitoring of the outplanted populations will be conducted to determine progress toward attaining population stability. 4) The goal for seedling survival rate will be on average in the 10 - 25 percent range over a five year period taking into consideration the many variables related to achieving stability of reintroduced populations. "Survival rate" is defined as survival of individual plants for a minimum of one year. 5) Natural recruitment shall occur in all wild populations not dependent upon artificial management such as irrigation.

(7b) Time frame within which goals are to be achieved

At this time, the goals are anticipated to be achievable within the 20-year timeframe of the HCP. Following the 20-year period of active implementation and management, subsequent monitoring and any necessary management actions would be undertaken through a separate agreement with DLNR (or other qualified organization), for a period of time to be specified by DLNR and the Endangered Species Recovery Committee, until the final determination is made that the three outplant sites are firmly established.

(7c) Provisions for monitoring and evaluating progress in achieving the goals quantitatively and qualitatively

The criteria to measure success of the HCP actions include short-term, long-term, and overall criteria as described in Table 14.

Table 14. Measurable Criteria for Monitoring and Evaluating Progress of Goals

	Success criteria
Measurable Short-Term success criteria	1) At least 25% of the full complement of lineages outplanted in a population must survive for 2 years after irrigation is ceased. 2) During the first 5 years after each wild population is established there must be (a) recruitment of seedlings that survive through the dry season, and (b) seed production by at least 25 % of the full complement of outplanted lineages after irrigation is ceased.
Measurable Long-Term Success Criteria	1) At least 80 reproducing adult plants will be present in each population, averaged over a five-year period after irrigation is ceased. 2) The number of seedlings recruiting into the mature age class must be greater than the mortality rate of existing adult plants, averaged over a five-year period after irrigation is ceased.
Overall Success Criteria	If both Long-Term Success Criteria are met and there are more than 120 reproducing adult plants present at the end of a 5-year period at a site (including at least 40 plants recruited from the seed bank on site) then no additional management action will be required for that site as part of the HCP and only monitoring need continue over the following 5-year period.

Strategies which have been completed or are in progress - including Strategies (1) and (4) - have demonstrated promising initial results of the HCP actions. Approximately 850 plants have been propagated by DLNR and outplanted to three sites. At this time the 1,000 percent increase in total number of Kapolei-derived plants over the original baseline of 93 plants is a positive preliminary indicator of establishing three ex situ wild populations.

An annual reporting process is required by Chapter 195D-21(f), HRS, which states, "Participants in habitat conservation plan shall submit an annual report to the department within 90 days of each fiscal year ending June 30, that includes a description of activities and accomplishments, analysis of the problems and issues encountered in meeting or failing to meet the objectives set forth in the HCP, areas needing technical advice, status of funding, and plans and management objectives for the next fiscal year, including any proposed modifications thereto." In addition, monitoring will occur

throughout the term of the HCP (as described in Section 8 below) and a report will be issued annually with a major assessment at each 5th year increment.

DOT intends to engage the services of DLNR to implement the strategies described in this HCP. DLNR, through the implementation of Strategy (1), has demonstrated the viability of propagating *Abutilon menziesii* and documented this in a progress report (Appendix F) and a final report (Appendix G).

SECTION 8

Provide for an adaptive management strategy that specifies the actions to be taken periodically if the plan is not achieving its goals.

Adaptive management is a strategy that allows for the change of management activities described in the HCP to ensure that the goals and accompanying success criteria of the HCP are achieved. Information from monitoring activities and other sources (e.g., research) will be used to evaluate whether the biological goals and success criteria of the HCP are being achieved and may be used to refine the design, scope, or implementation of the management actions described in the HCP.

Monitoring of the outplanting sites, which are intended to be self-sustaining, wild populations of *Abutilon menziesii*, as well as propagation and outplanting methods, and an examination of threats will be conducted to determine progress toward attaining the short-term and long-term goals and success criteria of the HCP. Monitoring will also be conducted of the Kapolei population of *A. menziesii* to track (e.g., survival, mortality, reproduction) live plants, including new recruits, remaining on site in order to maintain a complete representation of the genetic diversity of this population. Modifications to the management of the Kapolei population and outplanting sites will be made based on the results of the monitoring program and as research results in new information regarding *A. menziesii* (e.g., crucial ecosystem components, growth aspects, reproductive viability, outplanting methods, threat control methods, salt tolerance, genetics, seed bank dynamics).

The monitoring protocols are for various aspects of the HCP, as modified from the Makua Implementation Plan's Appendix E. Each monitoring protocol provides a description of the: 1) monitoring objectives; 2) monitoring methods and data analysis; 3) monitoring activity; and 4) potential management activities to be implemented in response to the information gathered.

Final decisions to change certain management actions will be approved by the DOT and DLNR DOFAW. DLNR DOFAW will determine which actions require additional recommendations by the ESRC.

There are five monitoring protocols which are described below:

- ***MONITORING PROTOCOL 1 – Monitor Individuals of Abutilon menziesii in the Kapolei Population***
- ***MONITORING PROTOCOL 2 – Conduct Phytosanitation Monitoring in Greenhouse Facilities***
- ***MONITORING PROTOCOL 3 – Assess Status and Stability of Outplanted Populations***
- ***MONITORING PROTOCOL 4 – Conduct Phytosanitation Monitoring at Outplanted Populations***
- ***MONITORING PROTOCOL 5 – Monitor Success of Outplanted Individuals***

The monitoring protocols are described in detail below.

MONITORING PROTOCOL 1 – Monitor Individuals of Abutilon menziesii in the Kapolei Population

Type of activity: Monitoring – As a goal of the Habitat Conservation Plan for *Abutilon menziesii* at Kapolei ("HCP") to provide a complete representation of the genetic diversity and survival of the Kapolei population of *A. menziesii*.

Description: Conduct monitoring of the survival of the Kapolei population; to determine phenology; and to collect propagules for storage, propagation, or experimentation.

Applicable for: *Abutilon menziesii* within the Kapolei population.

Management goals: Determine a window when collection of propagules is highly probable. Successfully collect an adequate number of propagules to achieve the goals for the HCP (e.g., complete representation of the genetic diversity of the Kapolei population). Manage to maintain the existence of the Kapolei population (i.e., survival of existing individuals and additional recruits until take occurs).

Preliminary sampling objectives: Be sure that the window for collection will ensure successful seed collection if plants reproduce.

Management response: Adjust schedule according to phenology patterns of *A. menziesii* for seed collection.

Area to monitor: The Kapolei population of *A. menziesii*, with the purpose of locating mature individuals from which propagules will be collected.

Monitoring framework: Conduct a complete survey of all individuals in the Kapolei population to determine if or when they would be flowering or fruiting.

Data to collect: Data will be collected following the Hawaii Rare Plant Restoration Group ("HRPRG") rare plant monitoring format. Record location information (map and/or GPS coordinates) as needed for any new mature individuals of *A. menziesii* found in the Kapolei population.

1. Record reproductive status of all individuals – record presence of fruit (mature or immature), and flower (buds or opened) and numbers of individuals with each.

2. Collection information – Record any collections made, assign numbers to plants sampled, designate purpose for collection before collecting. This information should follow all propagules throughout its life.

Data analysis methods: No statistical analyses are needed for this protocol. All data resulting from the field surveys should be entered into a database and GIS.

Data collection interval: Visit the Kapolei population quarterly to determine phenology or visit at time of year when reproduction expected.

MONITORING PROTOCOL 2 – Conduct Phytosanitation Monitoring in Greenhouse Facilities

Type of activity: Monitoring - A component of the HCP to establish three wild, self-sustaining *A. menziesii* populations on Oahu.

Description: Maintain phytosanitation monitoring at the nursery designated for out-planting to ensure it is not contaminated with new pathogens or other pests of concern (Appendix 2.2 Phytosanitation Standards and Guidelines from the Makua Implementation Plan may be used as a reference).

Applicable for: Plants to be outplanted as part of establishing a wild, self-sustaining population of *A. menziesii* on Oahu.

Management goal: To prevent any introduction of pathogens or other pests of concern from the greenhouse (*ex situ*) environment into the out-planted site.

Preliminary sampling objectives: Be certain that pathogens or other pests of concern do not visibly contaminate the majority of the greenhouse plants proposed for outplanting.

Management response: If pathogens or pests are discovered within the lot of plants designated for outplanting, treat all of the plants with an appropriate pesticide and quarantine for longer period of time; reexamine the plants prior to any future outplanting.

Group to monitor: All of the individual plants proposed for outplanting.

Monitoring framework: Examine all individual plants proposed for outplanting.

Data to collect:

1. Presence or absence of pathogens or pests of concern – Record outbreaks of pathogens or pests of concern.

2. Identify type of pathogen present – Identify type of pathogen present. If pathogen is not controlled, then make a further identification by identifying pathogenic symptoms, document via photo and collect sample for analysis.

Data analysis methods: No statistical analyses are needed for this protocol. However, it is essential that a proper random sample be taken of all of the plants that are in the proposed outplanting lot unless all plants are to be examined.

Data collection interval: Data must be collected during the growing period and prior to outplanting. Monitoring should be conducted during the life of the plant in the propagation growing facility at least bi-weekly. The sampling must be done just before planned outplanting date because any lag

between inspection and planting may allow for new pathogens to become established.

MONITORING PROTOCOL 3 – Assess Status and Stability of Outplanted Populations

Type of activity: Monitoring - A component of the HCP to establish three wild, self-sustaining *A. menziesii* populations on Oahu.

Description: Conduct initial baseline survey and continuing monitoring program for *A. menziesii* within each outplanted population to assess its status relative to the goals and success criteria identified in the HCP. Additionally, determine if the demographic structure of each outplanted population will be able to meet the overall goal and long-term success criteria of the HCP. Data will be collected on the distribution, abundance, status (vigor), population structure, and phenology of plants sampled, as well as evidence of damage by alien animal species (e.g., insects, rats, slugs) within an outplanted population.

Applicable for: Each outplanted population of *A. menziesii* on Oahu intended to be a wild, self-sustaining population.

Management goal: Manage each outplanted population to achieve the specified number of mature, reproducing individuals, and duration as specified in the HCP.

Preliminary sampling objectives:

1. Be certain that the number of mature plants capable of reproduction in each outplanted population is equal to or greater than the minimum number specified in the HCP to achieve the short-term success criteria.
2. Determine if demographic structure of outplanted population appears to be adequate to sustain a viable population of *A. menziesii* over time based on comparison of number of individuals in life-stage classes with predicted model of a stable population for *A. menziesii*.

Management response: If population stability is not achieved, one or more of the following responses are appropriate: 1) continue with the same management program for a longer time, 2) intensify threat control, 3) implement species augmentation, or 4) select another location to establish a wild, self-sustaining population.

Area to monitor: Systematic survey of all of the individuals in each outplanting population. Individuals must be within 500 meters of another plant of the same taxon to be considered to be part of that population.

Pilot studies: It is important to emphasize that the suggestions that follow regarding monitoring framework, data to collect, and data analysis methods are preliminary suggestions that need to be developed following completion of pilot studies in the outplanting populations. Pilot studies will be used to collect data that will be used to refine the protocol relative to variables which will be sampled, plot size and shape, sampling framework, number of samples to be taken, monitoring interval, and data analysis methods to be used.

Sample unit: Outplant population.

Monitoring framework: Either of several survey strategies may be used initially to establish the monitoring framework for this protocol. Continue to use that strategy for subsequent monitoring of the population.

1. Census of plants in the outplanted population. All individuals within an outplanted population will be located and data collected as specified below.

Data to collect: The fields described below are included in the HRPRG's Rare Plant Field Data Form, which may be used for data collection in this monitoring protocol.

1. Location of individuals – this would be quadrat number if sampling conducted along contiguous-plot belt transect, or GPS coordinates (UTM Zone 4, NAD 83 datum base) if using cluster sampling strategy. Some of the individuals in the population may be uniquely identified and tagged to help with collection of propagules or to allow for the collection of data on the progress of individuals through size or stage classes. Where GPS points cannot be used to locate individuals, the position of individuals will be hand-drawn in relationship to local landmarks and topography.

2. Number of individuals - use the following life-stage classes as defined for *A. menziesii*: *seedlings*; *immature individuals*; and *reproductively mature individuals*. Each of these classes must be determined for *A. menziesii*. For most outplanted populations, all of the mature plants will be located and counted.

3. Vigor of all individuals in the following classes: *healthy* – foliage appears green and vigorous, less than 10% dead leaves or defoliation; *moderate* – some chlorosis or deformity (e.g., curled, extremely small, insect damage) may be seen in the leaves, 10-50% dead leaves or defoliation; *poor* – most leaves may be dead or chlorotic or deformed, 50% dead leaves or defoliation; *dead* – no live foliage or woody tissue.

4. Evidence of damage from alien animals: data will also be recorded on the presence or sign of damage on the sampled plants from alien animals, particularly invertebrates, rats, or slugs.

5. Phenological stage: record data on the presence of *buds, flowers, immature fruits, mature fruits,* or *vegetative state* for each plant, or if the plant is *vegetative*, or *dormant*. This information will be summarized for the population as a whole.

Data analysis methods:

1. In many cases all of the individuals within an outplanted population will be enumerated so direct comparisons of the resulting numbers will be made with the specified short-term and long-term goals and success criteria of the HCP.

Data collection interval: Data should be collected on the status of each outplanted population annually. It would be ideal if data collection could coincide with time of fruiting by the plants to

better evaluate seed set and to allow for collection of additional propagules, if needed, at the same time. In any case data should always be collected at the same month of the year for a specific outplanted population.

MONITORING PROTOCOL 4 – Conduct Phytosanitation Monitoring at Outplanted Populations

Type of activity: Monitoring - A component of the HCP to establish three wild, self-sustaining *A. menziesii* populations on Oahu.

Description: Maintain baseline inventory for pathogens at outplanted populations and phytosanitation monitoring on outplanted individuals to determine if they are contaminated by new pathogens or other pest species of concern (Appendix 2.2 Phytosanitation Standards and Guidelines from the Makua Implementation Plan may be used as a reference).

Applicable for: All outplanting sites on Oahu and outplanted individuals of *A. menziesii*.

Management goal: To detect and control any introduction of a pathogen from the greenhouse (*ex situ*) environment into the outplanted site.

Preliminary sampling objectives: Be certain that all outplanted individuals are not visibly contaminated by pathogens or other pest species of concern, and other individuals within the vicinity of the outplanting site are not contaminated above the baseline as a result of the outplanting. Pathogens or pest species of concern must be identified by an expert.

Management response: If pathogens or other pest species of concern are discovered on outplanted individuals, there are options: 1) eliminate the problem with an appropriate control technique and continue to monitor in the field, or 2) remove contaminated plants from reintroduction site and treat the contaminated planting sites with an appropriate pesticide to eliminate the problem in the field. Additionally, if contaminated plants are found in the field, it is necessary to reevaluate the greenhouse phytosanitation monitoring protocol to determine why it failed and to make modifications to that protocol if needed.

Group to monitor: All of the individual plants that were outplanted, as well as a sample of other plant taxa within the outplanting area.

Monitoring framework: 1) Examine all individual plants that were outplanted. 2) Conduct a pilot study to determine the extent and number of plants to be examined for pathogens or other pest species of concern within the study area.

Data to collect:

1. Presence or absence of pathogens or pests of concern – Record outbreaks of pathogens or pests of concern.

2. Identify type of pathogen present – Identify type of pathogen present. If pathogen is not controlled, then make a further identification by identifying pathogenic symptoms, document via photo and collect sample for analysis.

Data analysis methods: No statistical analyses are needed for this protocol.

Data collection interval: Data should be collected on the status of plants at each outplanting site monthly for the first three months and then every three months to complete first year.

MONITORING PROTOCOL 5 – Monitor Success of Outplanted Individuals

Type of activity: Baseline survey and monitoring – A component of the HCP to achieve the short-term and long-term goals and success to achieve three wild, self-sustaining populations *A. menziesii* populations on Oahu.

Description: Monitor germination and/or survival, growth, reproduction, and phenology of all individual plants that have been outplanted or introduced as seeds for *A. menziesii* in an area. The results of this short-term monitoring will be used to develop or refine techniques that maximize the survival of individual plants that are outplanted into the wild. Additionally the information will be the basis for determining how many individuals need to be planted if augmentation of the outplanted population is needed.

Applicable for: Plants or seeds outplanted to sites intended to meet the goal of being a wild and self-sustaining population. Monitoring may be focused on determining germination or survival and growth of all individuals outplanted.

Management goals: 1) Determine germination and/or survival of plants, and 2) document horticultural methods used for propagation and outplanting (i.e., cuttings, mound layering, seeding, size of pot, etc.).

Preliminary sampling objectives: 1) Track lineages of outplanted individuals to aid in determining if complete genetic diversity of the Kapolei population is represented in the outplanted populations. 2) Track survival rate of outplanted individuals.

Management response: 1) The results of monitoring plant growth relative to the different horticultural treatments will be used to help predict or refine the results of the plant survival analysis. The results of the analysis of survival will also be used to determine or refine the projected number of individuals to outplant for *A. menziesii* to achieve a specified number of plants that will become part of the reproductive pool.

Area to monitor: Complete outplanted population.

Monitoring framework: All outplanted individuals will be maintained.

Data to collect:

1. Percent germination of planted seeds: When seeds are planted as a outplanting strategy, the number of individuals that germinate will be counted in a specific seed sowing block within the outplanted site. Percent germination will be calculated by dividing the number of germinants by the total number of seeds planted.

2. Vigor will be recorded for all sampled individuals in the following classes: *healthy* – foliage appears green and vigorous, less than 10% dead leaves or defoliation; *moderate* – some chlorosis or deformity (e.g., curled, extremely small, or insect damage) may be seen in the leaves, 10-50% dead leaves or defoliation; *poor* – most leaves may be dead or chlorotic or deformed, 50% dead leaves or defoliation; *dead* – no live foliage or woody tissue.

3. Phenological stage: Record data if the plant is vegetative, reproductive, or dead.

4. Damage to Plants: Any obvious damage to the plants from ungulates, rodents, or insects will be identified and recorded when each of the sampled plants is examined and measured. This information may be useful in helping to understand reduced vigor or death of some of the plants that have been outplanted.

Data analysis methods:

1. Data collected in general will be used as a measure of the short- and long-term goals and the measurable short- and long-term success criteria, and vigor or survival of individual plants will be analyzed using a **contingency table design.**

Data collection interval: The first data collection time for this protocol will be just prior to moving plants out of the greenhouse and into the outplanting sites. During the first six months, data on germination (if seeds are used for outplanting) and/or survival of the plants will be assessed at least three times during this initial period. The next sampling time will be 12 months after seed sowing or planting, and thereafter the plants will be monitored annually.

Adaptive management options to consider include, but are not limited to:

- increasing or decreasing the number of plants outplanted into a site annually during the initial reintroduction phase
- (re)initiating reintroduction or augmentation efforts for a particular population unit;
- intensifying or changing post-planting care (*e.g.*, watering)
- increasing or decreasing the control of specific threats as indicated by threat monitoring

Final decisions to change management actions must be approved by the DOT and DLNR DOFAW. In addition, detailed adaptive management strategies will continue to be prepared in consultation with DLNR and USFWS.

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Appendix A
Biological Survey
K. Nagata
(September 1996)

EAST KAPOLEI MASTER PLAN

BIOLOGICAL SURVEY

Prepared by: Kenneth M. Nagata
For: PBR Hawaii
17 September 1996

INTRODUCTION

The project site occupies approximately 1300 acres in Honouliuli, Ewa District, Oahu. It encompasses the former sugar cane lands mauka of Varona Village from approximately 60' elevation, up to Farrington Highway. Two sections extend mauka to the H-1 Freeway. The west is bordered by the Kapolei development and the east boundary runs through abandoned sugar cane fields.

Ripperton and Hosaka (1942) classified the vegetation of the region as one of lowland shrub with a coastal fringe of kiawe trees (Prosopis pallida). Because of the arid conditions of the region the vegetation cover is generally sparse. Dominant shrubs include klu (Acacia farnesiana), koa-haole (Leucaena leucocephala) and 'ilima (Sida fallax) and the herb layer generally consists of annual grasses such as bristly foxtail (Setaria verticillata), swollen fingergrass (Chloris barbata) and feather fingergrass (Chloris virgata). In the foothills mauka of the flat lowlands where rainfall is more abundant the vegetation is denser and the herb layer includes Spanish needle (Bidens pilosa), false mallow (Malvastrum coromandelianum), cockelbur (Xanthium strumarium) and pili (Heteropogon contortus) in addition to the annual grasses of the lowlands.

Several recent surveys have been conducted in certain portions of the subject property and in the adjacent lands. In 1990 Funk completed a biological survey of the land immediately east and makai of the project site, including the village of Ewa (Funk 1990). Among the vegetation types recognized were Sugar Cane Fields, Ruderal Fields and Fallow Fields. These communities were characterized by actively cultivated sugar cane fields, abandoned cane fields, common "weedy" introduced plants and lowland wayside species including those mentioned by Ripperton and Hosaka (1942). Similar vegetation was found in the region immediately east of the subject property where common wayside species including koa-haole, Guinea grass (Panicum maximum) and cultivated and abandoned sugar cane fields were found to be prevalent (Funk 1994). Many of these same species were also present in the area between Varona Village and the golf course just makai of the project site (Nagata 1996) and in Kaloi Gulch (Nagata 1994).

METHODS AND MATERIAL

A walk-through survey was conducted in all plant communities between mid-September and early October, 1996 to determine the floristic compostition of the project site. Transects were established throughout the site and all plants observed were recorded and their relative abundance determined. In conjunction

with the plant survey a cursory inventory of animals was also made. All birds and mammals observed along the transects were recorded and listening posts were established at regular intervals. No quantitative analyses was attempted, however, and nests were not investigated.

RESULTS

FLORA

Virtually all of the lowlands and foothills in the Ewa-Honoŭliuli region has been altered by the cultivation of sugar cane. In the past several years certain lands have been taken out of sugar and put to other use, eg. diversified agriculture, urbanization, fallowing. Consequently, the vegetation of these lands are entirely secondary and the vegetation in the region is largely determined by the history of cultivation (or disturbance) on each individual parcel of land, ie. how long the cane field has been abandoned, whether the land was recently tilled, etc. Based mostly on these criteria, eight plant communities were recognized. Although these are drawn with discreet boundaries on the vegetation map it must be remembered that such finite boundaries do not exist in nature. Rather, each community exists as a continuum wth one blending into another. Furthermore, the survey was conducted during the dry season. Species composition and vegetational cover will differ somewhat during the rainy season.

(1) Abandoned Cane Fields (ACF)

This is the largest vegetation type in the project site, representing the most recently abandoned sugar cane fields. Here, sugar cane generally accounts for about 50% of the total vegetational cover. In some areas the cane is 15' tall, robust and still very dense. In most areas, however, the cane is senile, less than 7' tall and accounts for as little as 30% of the total vegetational cover. In fields that have been abandoned for a longer period or where growing conditions were not optimal the clumps of cane are mostly dead or dying. Even in these fields these decrepit clumps are still in distinct rows. The vegetation between clumps usually consist of a mixed herb cover of 'ilima, Guinea grass, radiate fingergrass (Chloris radiata), 'uhaloa (Waltheria indica), hoary abutilon (Abutilon incanum), fuzzy rattlepod (Crotalaria incana), peria (Momordica charantia var. abbreviata) and nut grass (Cyperus rotundus). Total vegetational cover is generally about 75-90%; only where the cane is vigorous and dense is the cover up to 100%.

In some areas such as along the Ewa boundary fence the abundance of cane

is very low and the vegetation approaches that of the Fallow Fields. Here the vegetation is more open with more exposed ground. 'Ilima, 'uhaloa, peria, hoary abutilon and little bell (Ipomoea triloba) are abundant.

Fallowed Fields

The Fallowed Fields are those sugar cane fields which have been abandoned for such a long time that almost no living cane remain. Dead and dying clumps generally constitute less than 5% of the total cover. Dead cane stalks may litter the ground and planting furrows may still be evident but these fields are often difficult to recognize as sugar cane fields without close examination. Two Fallowed Fields subcommunities were recognized depending on the relative abundance of grasses.

(2) Fallowed Fields Mixed Herb Association (Fmh)

Typically the vegetation in this community is less than 4' tall and consists of a mixture of 'uhaloa, radiate fingergrass, 'ilima, hoary abutilon, false mallow, buffelgrass (Cenchrus ciliaris), golden crown-beard (Verbesina encelioides) and coat buttons (Tridax procumbens). Small isolated stands of dying cane occur in certain portions of this community. Small patches of Guinea grass and/or radiate fingergrass can also be found. These grasses along with swollen fingergrass (Chloris barbata), sourgrass (Digitaria insularis) and Natal redtop (Rhynchelytrum repens) are especially common in the mauka portions of this community. Along the road delineating the makai boundary the vegetational cover is only about 50%. Pa'uohi'iaka (Jacquemontia ovalifolia) is common in this open area. Several stands of dead or dying cane also occur here.

(3) Fallowed Fields Grassland Association (Fg)

In certain areas the fallowed cane fields are dominated by Guinea grass and/or radiate fingergrass. Almost no standing cane remain although the furrows are still more or less intact and fallen cane stalks are occasional throughout the community. In most areas the grass cover is 100% but small communities and individuals of 'ilima, hoary abutilon and false mallow are scattered through certain portions and swollen fingergrass and sourgrass are common in other areas.

(4) Abandoned Fields (A)

Several former cane fields in the mauka portion along Palehua Road and between Farrington Highway and the H-1 Freeway have been tilled or graded sometime in the past. The ground is quite level with few stones and although some sugar cane is resprouting the planting furrows are gone. These fields were probably planted in some crop in years past but are now overgrown with mostly 'uhaloa, fuzzy rattlepod,

nut grass and little bell. In one field mauka of Farrington Highway Guinea grass is abundant but in most of the Abandoned Fields this species is not quite so prevalent. Re-sprouting sugar cane is also common in the mauka portion of this field. Golden crown-beard, peria and hoary abutilon are common in some of the fields.

(5) Cultivated Fields (C)

Cultivated Fields are fields which have been recently plowed, actually planted in a crop (other than sugar cane), or which have been put to some urban use. Of the five fields designated as Cultivated Fields, three have been recently plowed. The vegetation in these consist mostly of seedling little bell, peria, fuzzy rattlepod, 'uhaloa, castor bean (Ricinus communis), graceful spurge (Chamaesyce hypericifolia) and re-sprouting nut grass. Vegetational cover is about 25-50%. In two fields watermelons (Citrellus lanatus) have been planted and along the Ewa boundary fence an approximately two-acre site has been graded and turned into a parking lot. Approximately half of this field has been paved with gravel. Most of the vegetation in this portion consist of Amaranthus viridis and nut grass. The vegetation in the ungravelled portion consist of peria, nut grass, 'uhaloa, radiate fingergrass, false mallow and re-sprouting sugar cane.

(6) Grasslands (GR)

Grasslands represent those lands which apparently have not been tilled, graded or planted in any crop including sugar cane. This community exists only on the steepest slopes just makai of the H-1 Freeway and is the smallest of all the vegetation types in the project site. The vegetation is one of Guinea grass 1-2' tall with emergent klu, koa-haole, and kiawe. On eroded slopes, 'ilima, false mallow, 'uhaloa, Beorhavia coccinea, garden spurge (Chamaesyce hirta) and virgate mimosa (Desmanthus virgatus) are found in small numbers.

(7) Gulch Association (GU)

Kaloi Gulch together with its tributary Hunehune Gulch represents the only natural drainage system in the project site. The vegetation in the gulches is characterized by extremely dense stands of Guinea grass 5-10' tall. So dense is this layer that very few other species are present. In the makai portion the predominant arborescent species is castor bean which grows to about 15' height. Koa-haole 20-30' tall replaces castor bean as the dominant overstory in the mauka sections of the gulch system. In the mauka portion of Hunehune Gulch ivy gourd (Coccinea grandis) is abundant, often completely enshrouding the Guinea grass and koa-haole. Paragrass (Brachiaria mutica), wood rose (Merremia tuberosa),

moon flower (Ipomoeaalba) and peria are also found but only in small to moderate numbers.

(8) Roadside Vegetation (R)

Numerous plant species are found along the paved and gravel roads. More species are found in this community than in any other in the project site. Guinea grass and radiate fingergrass are abundant. 'Uhaloa and nut grass are also found in large numbers and many other species including castor bean, fuzzy rattlepod, buffelgrass, graceful spurge, virgate mimosa, peria, lion's ear (Leonotis nepetifolia), Australian saltbush (Atriplex semibaccata), goosegrass (Eleusine indica), Natal redtop (Rhynchelytrum repens) and stinkgrass (Eragrostis cilianensis) are found in smaller numbers. This is not considered a significant plant community and its total area is very small.

Native Plant Communities

As a result of decades of sugar cultivation, virtually all of the vegetation in the project iste is secondary in nature. Of the 99 plant species recorded two are indigenous ('ilima, pa'uohi'iaka), two are probably indigenous ('uhaloa, hoary abutilon) and one is endemic (ko'oloa'ula, Abutilon menziesii). Of these, 'ilima, 'uhaloa and hoary abutilon are dominant or co-dominant in several plant communities and are significant elements in the vegetation in the site as a whole. Pa'uohi'iaka is found in small to moderate numbers in four vegetation types and is common in certain areas in the Fallowed Fields Mixed Herb community. It frequently grows in association with 'ilima, 'uhaloa and hoary abutilon. They do not, however, represent native plant communities. Rather, these native or possibly native species are well adapted to arid lowlands and are able to recolonize disturbed sites.

Except for ko'oloa'ula, all of the native species in the site are common lowland species in Hawaii. Ko'oloa'ula, on the other hand, is a rare and endangered species once endemic to Lanai, Maui, Oahu and Hawaii. It is now extinct on Hawaii.

Endangered Species

At least 38 individuals of the federally listed endangered species ko'oloa'ula were recorded from the site. Most of these (28) were in the Abandoned Cane Fields, six were in the Fallowed Fields Mixed Herb Association and four were in the Fallowed Fields Grassland Association. Approximate locations are indicated on Figure 2. All of these plants were healthy and most were flowering and/or fruiting.

Ko'oloa'ula was first submitted for listing as an endangered species in 1976 (Fed. Reg. 1976). The Endangered Species Act Amendments of 1978 required that the list of candidates for endangered status be withdrawn after two years and in 1979 ko'oloa'ula was withdrawn from consideration (Fed. Reg. 1979). In 1980 it was resubmitted as a top priority Category 1 candidate (Fed. Reg. 1980) and in 1985 the U.S. Fish and Wildlife Service proposed to list it as an endangered species (Fed. Reg. 1985). On Sept. 26, 1986 it was formally listed (Fed. Reg. 1986) and is now protected under the provisions of the Endangered Species Act of 1973, as amended, and the Hawaii State Revised Statutes.

Significant wild populations of ko'oloa'ula are found on Lanai and Maui but its occurrence on Oahu is somewhat of an enigma. It was known from a single plant discovered in an abandoned sugar cane field mauka of Hawaii Raceway Track at Barbers Point in 1981 and more recently from another individual at the Lualualei Naval Magazine (D. Herbst, pers. comm.). Both of these occurrences as well as the current discovery are from highly disturbed environments. The Barbers Point location is approximately four miles from the project site and the Lualualei site is at least 15 miles away. Ko'oloa'ula was not found in any of the prior surveys in the immediate area (Funk 1990, 1994; Nagata 1994, 1996).

FAUNA

Mammals

No mammals were observed in the site. It is probable, however, that field mice (Mus musculus), mongoose (Herpestris auropunctatus) and one or more species of rats (Rattus spp.) are found in the property. In addition, pig trails were observed in several plant communities.

Birds

Seventeen species of birds were observed in the site. To be considered a sighting, the individual must be observed perched or on the ground and not merely flying overhead. In addition, owl pellets were found in the Fallowed Fields Grassland Association community. It is not known, however, whether these are from the barn owl (Tyto alba) or pueo (Asio flammeus). Fifteen species are introduced, one is a common migratory species (Pacific golden-plover) and one is indigenous (Black-crowned night heron).

ARDEIDAE

Cattle egret (Bubulcus ibid)

Eight individuals were observed in the Abandoned Fields mauka of Farrington

Highway. On 4 October the Abandoned Field community immediately makai of the Cultivated Field east of Palehua Road was being plowed. Nearly 100 cattle egrets were seen feeding in the freshly tilled ground.

Black-crowned night heron (Nycticorax nycticorax)

Two young birds were flushed out of Hunehune Gulch near Plantation Road. As there was no water in either Hunehune Gulch or Kaloi Gulch it is not known whether these individuals are residents of the area or whether they are transients. The black-crowned night heron is indigenous to Hawaii.

CHARADRIIDAE

Pacific golden-plover (Pluvialis dominica)

The Pacific golden-plover is a migratory species which commonly spends its winters in Hawaii. Many were observed in the site. Thirty-two were counted in exposed areas in the Abandoned Cane Fields. Most of these were in the open site near the Ewa boundary. Twenty-six were observed in various areas in the Fallowed Fields Mixed Herb Association - six of them from the exposed areas near the makai boundary road. Twenty-six were seen in the Cultivated Areas. Of these, 20 were in the "parking lot" at the Ewa boundary.

COLUMBIDAE

Rock dove (Columba livia)

Three were observed in the exposed sections of the Fallowed Field Mixed Herb Association in the makai portion of the site.

Barred dove (Geopelia striata)

Many were seen in all but two vegetation types. They were most abundant along the paved roads.

Lace-neck dove (Streptopelia chinensis)

This is the most widespread species in the property. It was found in moderate numbers in all vegetation types.

FRINGILLIDAE

Red-crested cardinal (Paroaria coronata)

Three individuals were seen in koa-haole shrubs along Plantation Road.

Kentucky cardinal (Richmondena cardinalis)

One individual was seen in the Fallowed Fields Mixed Herb Association.

PHASIANIDAE

Francolin (Francolinus sp.)

About a dozen were seen in the Abandoned Cane Fields near Kaloi Gulch in the makai portion of the property. These birds ran and hid too quickly for a positive identification to species.

Ring necked pheasant (Phasianus colchicus)

Three pairs were flushed from the Abandoned Cane Fields and one pair was flushed from the Abandoned Fields along Palehua Road.

PLOCEIDAE

House finch (Carpodacus mexicanus)

About 20 were seen in the property, mostly along the roadways.

Orange-cheeked waxbill (Estrilda melpoda)

These were seen in small numbers in the Fallowed Fields Mixed Herb Association, Abandoned Fields and along the roadways.

Black-headed mannikin (Lonchura malacca)

Black-headed mannikins were seen in moderate numbers in the Abandoned Cane Fields, Fallowed Fields communities and along the roadways.

Rice bird (Lonchura punctulata)

Rice birds were seen in moderate to small numbers in all but two plant communities. They were most common along the roadways and in the Fallowed Fields Grassland Association.

PYCNONOTIDAE

Red-vented bulbul (Pycnonotus cafer)

The red-vented bulbul was the second most widespread species in the site. It was found in small to moderate numbers in all vegetation types except the Cultivated Fields.

STURNIDAE

Common mynah (Acridotheres tristis)

Only three were seen in the Abandoned Cane Fields in the makai portion of the property.

ZOSTEROPIDAE

Japanese white-eye (Zosterops japonicus)

Japanese white-eyes were found in small numbers mostly along the roadways.

SUMMARY

The vegetation in the project site consists of sugar cane, lowland shrubs and herbs and grasses. The vast majority of the 99 species recorded from the property is non-native. Only three native species (one endemic, two indigenous) and two possibly indigenous species were encountered but with the exception of the endemic ko'oloa'ula these were present in moderate to large numbers. Native species constitute a rather significant element of the vegetation. However, no native plant communities are present. As a result of decades of sugar cultvation the vegetation is entirely secondary and the native ('ilima, pa'uohi'iaka) or possibly native (hoary abutilon, 'uhaloa) species which are so common in the site are merely recolonizing an already completely altered habitat. According the the U.S. Fish and Wildlife Service the endangered species ko'oloa'ula can also be included as secondary in origin.

The various plant communities in the site serve as an excellent refuge and feeding site for 17 bird species. Fifteen are introduced urban, field or game birds, one is indigenous (black-crowned night heron) and one is a common migratory species (Pacific golden-plover). Many of the birds including the plover are present in moderate to large numbers.

The proposed project will result in the loss of large numbers of 'ilima, pa'uohi'iaka, 'uhaloa and hoary abutilon. These are all common lowland species and theirs is not considered a significant loss to the native flora. The project will also result in the loss of habitat for a large number of Pacific golden-plovers and two black-crowned night herons. At least 38 individuals of the endangered ko'oloa'ula will be affected by the project. The disposition of these will be determined through consultation with the State of Hawaii Division of Forestry and Wildlife as prescribed by the Hawaii Endangered Species Law.

RECOMMENDATIONS

Because of the presence of the federally endangered ko'oloa'ula in the project site, consultation with the Hawaii State Department of Land and Natural Resources Division of Forestry and Wildlife is required under the provisions of the State Endangered Species Law before any grubbing can commence. Similar discussions with the U.S. Fish and Wildlife Service is also recommended. These consultations will essentially determine the fate of the proposed project and what mitigating measures will be required to preserve the ko'oloa'ula.

The plant survey was conducted at 80% coverage and although a more intensive search was conducted in the vicinity of each ko'oloa'ula there is a high probability that more individuals are present in the site. It is therefor recommended that a 100% survey be undertaken in selected areas as indicated in Figure 2.

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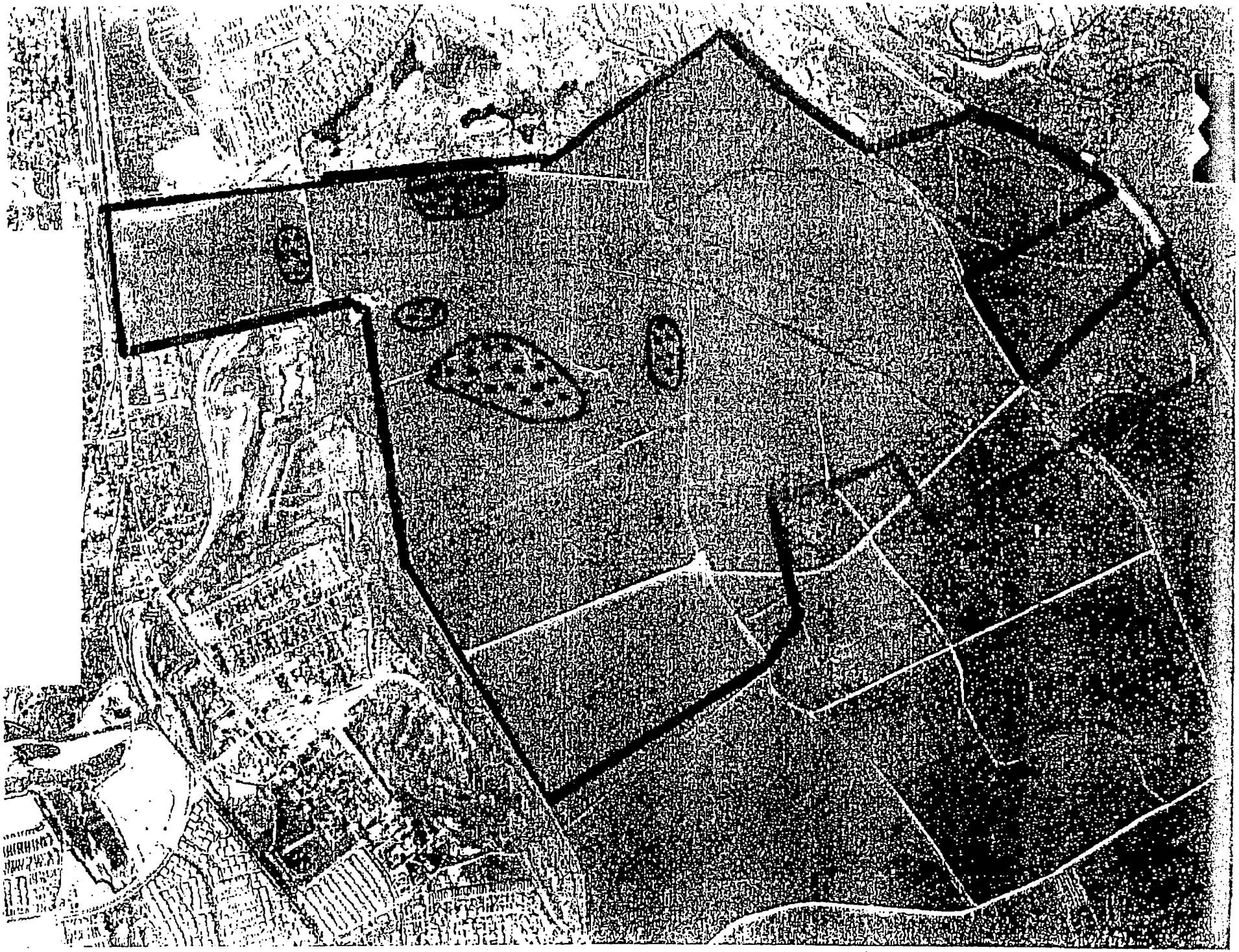

PLANT SPECIES CHECKLIST

Families are arranged alphabetically in two groups: Monocotyledons and Dicotyledons. Genera and species are arranged alphabetically within each family. Taxonomy, common names and status follow those of Neal (1965), St. John (1973) or Wagner et. al. (1990). The abundance determinations are relative and are subject to the judgement of the investigator.

EXPLANATION OF SYMBOLS

Species Status:

- E - Endemic to the Hawaiian Islands, ie. occurring naturally nowhere else in the world.
- I - Indigenous, ie. native to the Hawaiian Islands but also occurring naturally elsewhere.
- X - Exotic (alien), ie. plants introduced after the Western discovery of the islands.
- P - Polynesian introductions, ie. plants introduced before the Western discovery of the islands.

Relative Abundance Ratings:

- A - ABUNDANT, generally the major or dominant species in a given area.
- C - COMMON, generally distributed throughout a given area in large numbers.
- O - OCCASIONAL, generally distributed through a major portion of a given area, but in small numbers.
- U - UNCOMMON, observed uncommonly but more than 10 times in a given area.
- R - RARE, observed 2 to 10 times in a given area.

Vegetation Types:

- ACF - Abandoned Cane Fields
- Fmh - Fallowed Fields Mixed Herb Association
- Fg - Fallowed Fields Grassland Association
- A - Abandoned Fields
- C - Cultivated Fields
- GR - Grasslands
- GU - Gulch Association
- R - Roadside Vegetation

ANIMAL SPECIES CHECKLIST

Families are arranged alphabetically and genera and species are arranged alphabetically within each family. Taxonomy follows that of Berger (1981). Quantitative techniques were not employed and thus only presence is recorded in each vegetation type.

EXPLANATION OF SYMBOLS

Species Status:

- M - Migratory species.
- I - Indigenous, ie. native to the Hawaiian Islands but also occurring naturally elsewhere.
- X - Exotic (alien), ie. animals introduced after the Western discovery of the islands.

Vegetation Types:

- ACF - Abandoned Cane Fields
- Fmh - Fallowed Fields Mixed Herb Association
- Fg - Fallowed Fields Grassland Association
- A - Abandoned Fields
- C - Cultivated Fields
- GR - Grasslands
- GU - Gulch Association
- R - Roadside Vegetation

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	RELATIVE ABUNDANCE							
CHECKLIST OF PLANTS			ACF	FmH	Fg	A	C	GR	GU	R
MONOCOTYLEDONES										
CYPERACEAE										
Cyperus rotundus L.	Nut grass	X	O	C	O	C	C	–	–	C
POACEAE										
Bothriochloa pertusa (L.) A. Camus	Pitted beardgrass	X	U	U	U	–	–	–	–	U
Brachiaria mutica (Forssk.)Stapf	Paragrass	X	U	U	U	R	–	–	O	U
Cenchrus ciliaris L.	Buffelgrass	X	O	C	–	U	R	U	U	U
Chloris barbata (L.) Sw.	Swollen fingergrass	X	O	O	C	U	–	U	–	C
C. radiata (L.) Sw.	Radiate fingergrass	X	C	C	A	U	–	U	–	A
Cynodon dactylon (L.) Pers.	Bermuda grass	X	–	–	–	R	R	–	–	U
Digitaria insularis (L.) Mez ex Ekman	Sourgrass	X	U	O	O	U	–	–	U	R
Echinochloa crus-galli (L.) P. Beauv.	Barnyard grass	X	U	–	–	–	–	–	–	U
Eleusine indica (L.) Gaertn.	Goosegrass	X	U	U	–	U	–	–	–	U
Eragrostis cilianensis (All.) Link	Stinkgrass	X	R	–	–	R	–	–	–	U
E. tenella (L.) P. Beauv. ex Roem. & Schult.	Japanese lovegrass	X	–	–	–	–	–	–	–	U
Leptochloa uninervia (K. Presl) Hitchc.		X	U	–	–	–	–	–	–	–
Panicum maximum Jacq.	Guinea grass	X	C	O	A	C	U	A	A	A
Rhynchelytrum repens (Willd.) Hubb.	Natal redtop	X	O	O	R	R	R	–	R	O
Saccharum officinarum L.	Sugar cane	X	A	U	U	R	–	–	–	R
Setaria verticillata (L.) P. Beauv.	Bristly foxtail	X	–	–	–	R	–	–	R	–
Sorghum halepense (L.) Pers.	Johnson grass	X	–	–	U	U	–	–	–	U
DICOTYLEDONES										
AMARANTHACEAE										
Achyranthes aspera L.										
Alternanthera caracasana Kunth	Mat charf flower	X	U	–	–	–	–	–	–	R
Amaranthus spinosus L.	Spiny amaranth	X	–	R	–	–	–	–	–	U
A. viridis L.		X	U	O	–	U	R	–	–	R
		X	U	U	–	U	O	–	–	O
ANACARDIACEAE										
Mangifera indica L.	Mango	X	–	–	–	–	–	–	–	R
Schinus terebinthifolius Raddi	Christmas berry	X	–	–	–	–	–	–	–	R
ASCLEPIADACEAE										
Calotropis gigantea (L.) W.T. Aiton	Crown flower	X	–	R	R	–	–	–	–	–
ASTERACEAE										
Bidens pilosa L.	Spanish needle	X	U	–	–	U	–	–	–	U
B. pilosa var. minor (Bl.) Sherff		X	U	–	–	–	–	–	–	–
Conyza bonariensis (L.) Cronq.	Hairy horseweed	X	U	–	–	–	–	–	–	–
Emilia fosbergii Nicolson	Flora's paintbrush	X	O	–	–	–	U	–	–	R
Flaveria trinervia (Spreng.) C. Mohr		X	–	–	–	–	–	–	–	R
Lactuca serriola L.	Prickly lettuce	X	U	u	–	R	–	–	–	–
Pluchea indica (L.) Less.	Indian fleabane	X	U	U	U	–	–	–	–	U
P. x fosbergii Cooperr. & Galang		X	–	U	R	–	–	–	–	–
P. symphytifolia (Mill.) Gillis	Sourbush	X	U	U	U	–	–	–	–	U
Sonchus asper (L.) J. Hill	Prickly sow thistle	X	R	–	–	–	–	–	–	–

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	RELATIVE ABUNDANCE							
			ACF	Fmh	Fg	A	C	GR	GU	R
ASTERACEAE										
Sonchus oleraceus L.	Sow thistle	X	R	–	–	–	U	–	–	–
Tridax procumbens L.	Coat buttons	X	U	C	U	U	U	–	–	U
Verbesina encelioides (Cav.) Benth. & Hook.	Golden crown-beard	X	U	C	–	U	R	–	–	U
Xanthium strumarium L.	Cocklebur	X	R	–	–	–	R	–	–	U
BIGNONIACEAE										
Spathodea campanulata Beauv.	African tulip	X	R	R	–	–	–	–	–	–
BORAGINACEAE										
Heliotropium procumbens var. depressum (Cham.) Fosb.		X	–	–	–	–	–	U	–	U
CAPPARADACEAE										
Cleome gynandra L.	Wild spider flower	X	–	–	–	–	R	–	–	–
CHENOPODIACEAE										
Atriplex semibaccata R. Br.	Australian saltbush	X	–	–	–	R	–	–	–	O
A. suberecta Verd.		X	U	U	–	–	–	–	–	O
CONVOLVULACEAE										
Convolvulus arvensis L.	Field bindweed	X	U	U	–	–	U	–	–	O
Ipomoea alba L.	Moon flower	X	–	–	–	–	–	–	U	–
I. cairica (L.) Sweet	Koali	X?	–	R	–	–	–	–	–	–
I. obscura (L.) Ker-Gawl		X	U	U	–	–	–	–	–	O
I. triloba L.	Little bell	X	O	U	U	A	A	–	–	O
Jacquemontia ovalifolia (Choisy) H. Hallier	Pa'uohi'iaka	I	U	O	U	–	–	–	–	U
Merremia aegyptia (L.) Urb.	Hairy merremia	X?	U	O	–	U	U	–	–	–
M. tuberosa (L.) Rendle	Wood rose	X	–	–	–	–	–	–	R	–
CUCURBITACEAE										
Citrellus lanatus (Thunb.) Matsum. & Nakai	Watermelon	X	–	–	–	–	U	–	–	–
Coccinea grandis (L.) Voigt	Ivy gourd	X	O	U	U	U	U	R	A	U
Cucumis dipsaceus Ehrenb. ex Spach	Teasel gourd	X	–	R	–	–	–	–	–	–
Momordica charantia L. var. abbreviata	Peria	X	O	O	U	O	C	–	U	O
EUPHORBIACEAE										
Chamaesyce hirta (L.) Millsp.	Garden spurge	X	–	R	R	–	U	U	–	O
C. hypericifolia (L.) Millsp.	Graceful spurge	X	O	U	U	O	O	–	–	O
C. hyssopifolia (L.) Small		X	–	–	R	R	–	–	–	U
Euphorbia cyathophora J.A. Murray	Mexican fire plant	X	–	–	–	–	–	–	–	R
E. heterophylla L.	Kaliko	X	–	–	–	U	U	–	–	–
Ricinus communis L.	Castor bean	X	U	–	U	U	O	–	C	O
FABACEAE										
Acacia farnesiana (L.) Willd.	Klu	X	–	–	R	R	–	O	R	R
Cassia sp.		X	–	U	–	–	–	–	–	–
Chamaecrista nictitans (L.) Moench	Japanese tea	X	–	–	–	–	R	–	–	R
Crotalaria incana L.	Fuzzy rattlepod	X	O	U	O	C	O	U	–	O
C. pallida Aiton	Smooth rattlepod	X	R	R	U	–	–	–	–	U
Desmanthus virgatus (L.) Willd.	Virgate mimosa	X	U	O	U	U	–	U	–	O

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS		RELATIVE ABUNDANCE							
				ACF	Fmh	Fg	A	C	GR	GU	R
FABACEAE											
Desmodium tortuosum (Sw.) DC.	Florida beggarweed	X		–	–	–	–	–	–	–	U
Erythrina sp.		X		–	–	–	–	–	–	R	R
Indigofera spicata Forssk.	Creeping indigo	X		–	–	–	–	–	–	–	U
I. suffruticosa Mill.	Indigo	X		U	U	U	R	–	–	–	U
Lablab purpureus (L.) Sweet	Hyacinth bean	X		R	R	–	–	–	–	–	U
Leucaena leucocephala (Lam.) de Wit	Koa-haole	X		U	U	U	U	–	O	A	U
Macroptilium lathyroides (L.) Urban	Cow pea	X		U	U	–	–	U	–	–	R
Pithecellobium dulce (Roxb.) Benth.	'Opiuma	X		R	R	–	–	–	–	–	R
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	Kiawe	X		–	R	–	–	–	R	–	U
Senna occidentalis (L.) Link	Coffee senna	X		–	R	–	–	–	–	–	–
Vigna sesquipedalis Wight	Long bean	X		R	–	–	–	–	–	–	–
LAMIACEAE											
Leonotis nepetifolia (L.) R. Br.	Lion's ear	X		O	U	R	U	U	U	–	U
MALVACEAE											
Abutilon grandifolium (Willd.) Sweet	Hairy abutilon	X		–	–	–	–	–	U	–	U
A. incanum (Link) Sweet	Hoary abutilon	I?		C	C	C	O	R	U	–	–
A. menziesii Seem.	Ko'oloa'ula	E	ENDANGERED	U	R	–	–	–	–	–	–
Malvastrum coromandelianum (L.) Garcke	False mallow	X		O	C	O	O	C	U	–	O
Sida ciliaris L.		X		–	–	–	–	–	–	–	U
S. fallax Walp.	'Ilima	I		C	A	C	U	–	U	–	R
S. rhombifolia L.	Cuba jute	X		–	U	–	–	–	–	–	U
S. spinosa L.	Prickly sida	X		–	U	–	R	–	U	–	U
MORACEAE											
Morus sp.		X		R	–	–	–	–	–	–	–
NYCTAGINACEAE											
Boerhavia coccinea Mill.		X		O	O	R	U	U	U	–	U
PASSIFLORACEAE											
Passiflora foetida L.	Love-in-a-mist	X		U	–	U	O	R	U	–	U
PORTULACACEAE											
Portulaca oleracea L.	Pigweed	X		U	U	U	R	U	U	–	–
PRIMULACEAE											
Anagallis arvensis L.	Scarlet pimpernel	X		R	–	–	–	–	–	–	–
SOLANACEAE											
Datura stramonium L.	Jimson weed	X		–	–	–	–	–	–	R	–
Lycopersicon pimpinellifolium Mill.	Currant tomato	X		U	R	–	U	O	–	–	U
Nicotiana glauca R.C. Graham	Tree tobacco	X		U	R	R	–	–	–	–	U
STERCULIACEAE											
Waltheria indica L.	'Uhaloa	I?		C	A	O	C	O	U	–	C

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS			RELATIVE ABUNDANCE								
					ACF	Fmh	Fg	A	C	GR	GU	R	
TILIACEAE													
Triumfetta semitriloba Jacq.	Sacramento bur	X			–	–	–	–	–	–	–	R	
ZYGOPHYLLACEAE													
TRIBULUS TERRESTRIS L.	Puncture vine	X			–	R	–	–	R	–	–	O	

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	RELATIVE ABUNDANCE							
CHECKLIST OF ANIMALS			ACF	Fmh	Fg	A	C	GR	GU	R
ARDEIDAE										
Bubulcus ibid	Cattle egret	Y	–	–	–	X	X	–	–	–
Nycticorax nycticorax	Black-crowned night heron	I	–	–	–	–	–	–	–	X
CHARADRIIDAE										
Pluvialis dominica	Pacific golden-plover	M	X	X	–	–	X	–	–	–
COLUMBIDAE										
Columba livia	Rock dove	X	–	X	–	–	–	–	–	–
Geopelia striata	Barred dove	X	X	X	X	X	X	–	–	X
Streptopelia chinensis	Lace-neck dove	X	X	X	X	X	X	X	X	X
FRINGILLIDAE										
Paroaria coronata	Red-crested cardinal	X	–	–	–	–	–	–	–	X
Richmondena cardinalis	Kentucky cardinal	X	–	X	–	–	–	–	–	–
PHASIANIDAE										
Francolinus sp.	Francolin	Y	Y	–	–	–	–	–	–	–
Phasianus colchicus	Ring-necked pheasant	X	X	–	–	X	–	–	–	–
PLOCEIDAE										
Carpodacus mexicanus	House finch	Y	Y	–	–	–	–	–	–	X
Estrilda melpoda	Orange-cheeked waxbill	X	–	X	–	X	–	–	–	X
Lonchura malacca	Black-headed mannikin	X	X	X	X	–	–	–	–	X
L. punctulata	Rice bird	Y	X	X	X	X	–	X	–	X
PYCNONOTIDAE										
Pycnonotus cafer	Red-vented bulbul	X	Y	Y	Y	Y	–	X	X	X
STURNIDAE										
Acridotheres tristis	Common mynah	Y	X	–	–	–	–	–	–	–
ZOSTEROPIDAE										
Zosterops japonicus	Japanese white-eye	X	Y	Y	–	–	–	–	–	X

Appendix B
Botanical Survey
W. Char
(January 1997)

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January 1997

SUMMARY OF FINDINGS
KO'OLOA'ULA ON EAST KAPOLEI PROJECT SITE
'EWA DISTRICT, ISLAND OF O'AHU

INTRODUCTION

The ko'oloa'ula (Abutilon menziesii), a member of the hibiscus or mallow family (Malvaceae), is a much-branched shrub up to 6 to 9 ft. tall, which is covered by velvety, stellate pubescence. The heart-shaped leaves are silvery-green and the attractive flowers are maroon. It is uncommon and occurs in dryland habitats (Wagner et al. 1990). Today, the largest population is found on Lana'i (about 600 plants) in koa haole scrub. Five small populations occur on Maui on 'a'a lava and also on red soils in a large gulch adjacent to sugar cane fields. One population occurs at Puako on the island of Hawai'i. On O'ahu, a single plant was found in abandoned sugar cane fields near the Campbell Industrial Park. Recently, a single plant was found on the Navy's Lualualei facility in kiawe/Guinea grass scrub.

In 1986, the species was federally listed as endangered. All plants on the federal list are automatically added to the state endangered species list. In its natural habitat the ko'oloa'ula plants are threatened by browsing animals (cattle, goats, axis deer), competition from weedy introduced plants, fires, predation by introduced insects, loss of native pollinators, and development (U.S. Fish and Wildlife Service 1994).

Because the plant is attractive and is easy to cultivate (seeds and cuttings), it was once sold by several plant nurseries as "red 'ilima" prior to its listing.

A new populaion of the ko'oloa'ula was recently discovered by Nagata while conducting a survey of the HFDC's East Kapolei project site in September and October 1996. Nagata recorded at least 38 ko'oloa'ula plants from the southwest corner of the project site (Figure 1). Collections of the plants were deposited by Nagata at the Bishop Museum.

A survey to verify and to more accurately inventory and map the plants found by Nagata was conducted in December 1996. This survey followed an unusually heavy rainfall in November 1996 which lasted for about 10 days.

RESULTS

Three colonies of plants were identified in the field and mapped (Figure 2). We could not locate the northern-most colony mapped by Nagata.

Colony A: This colony consists of 6 large, mature (flowering/budding) plants, 2 to 6 ft. tall, and 2 juvenile (young, immature) plants, 1 to 1.5 ft. tall.

Colony B: This colony is found along the golf course fence. About half (11 plants) are composed of juvenile plants, most of which have probably sprouted and grown since the November rains. The remaining plants (10) are mature individuals.

Colony C: This is the largest colony and is found near the power

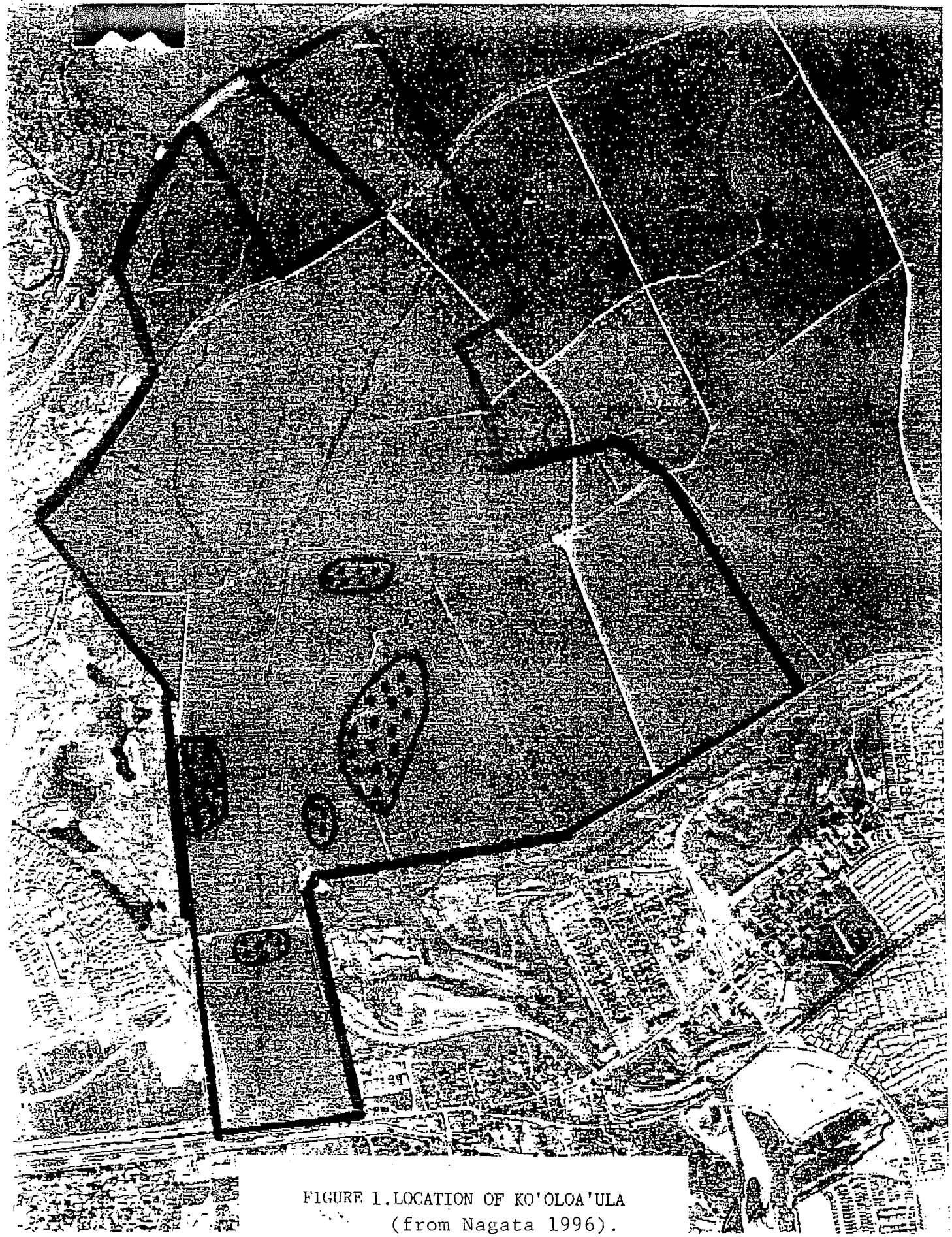

FIGURE 1. LOCATION OF KO'OLOA'ULA (from Nagata 1996).

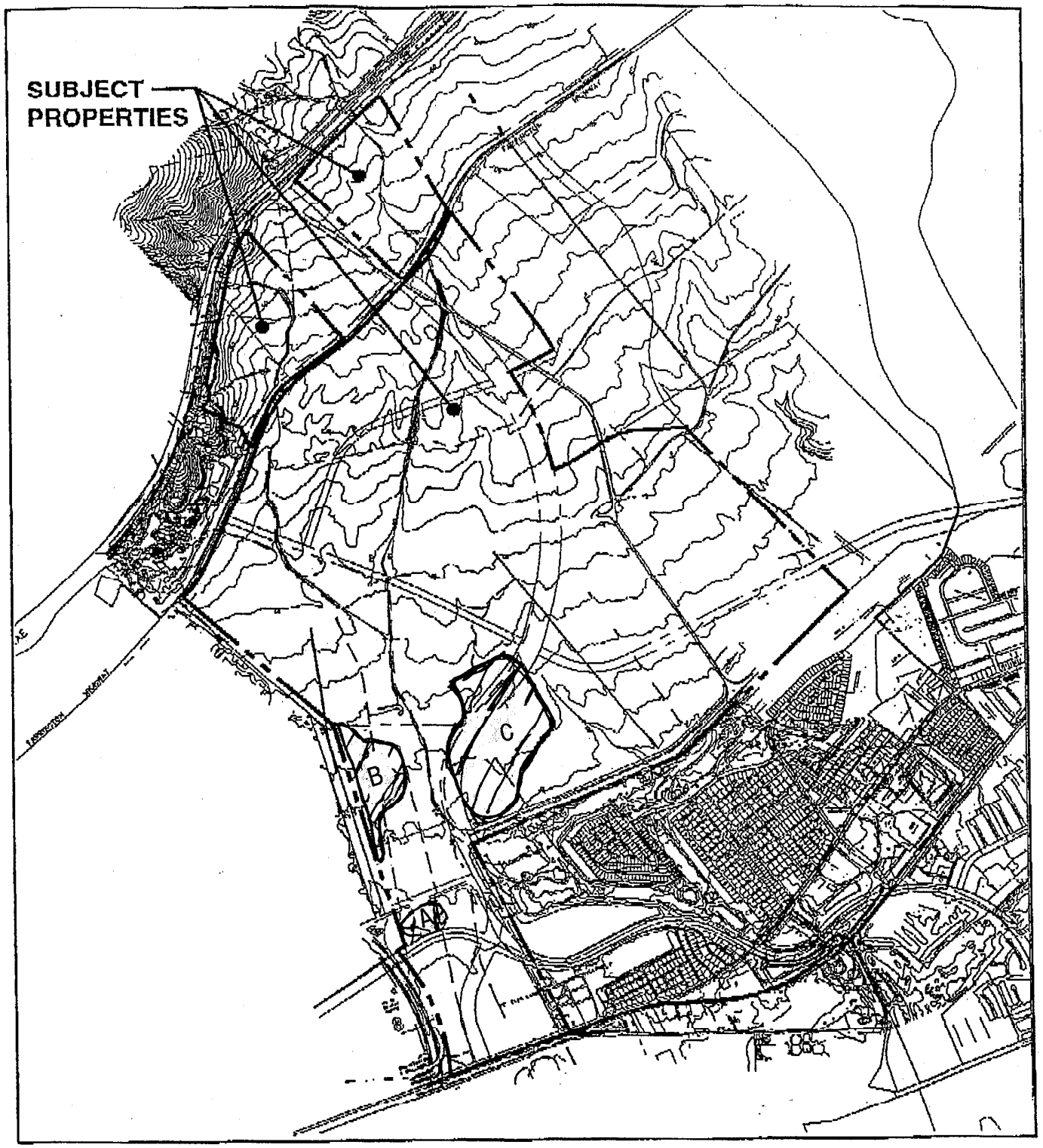

FIGURE 2

LOCATION OF KO'OLOA'ULA DURING THIS SURVEY.

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February, 1997

PBR HAWAII

line. Nagata maps it as two separate colonies. But after the more intensive survey, we located plants between the two colonies and have thus lumped them into one larger colony. The majority of the plants are centered around an overgrown, coral-lined cane haul road. A few plants cross under the power line and extend north of the power line for a short distance. The colony consists of 55 large, mature plants (many of them 4 to 6 ft. tall), and 4 juvenile plants.

DISCUSSION AND RECOMMENDATIONS

A total of 88 ko'oloa'ula plants were found during the recent study to flag and inventory the plants on the East Kapolei site. There are a large number of juvenile plants, most of which sprouted and established themselves since the unusually heavy rainfall in November 1996. The number of plants will most likely increase during this rainy season (November 1996 to about February 1997).

It is recommended that a mitigation plan be initiated as soon as possible as the mature plants will continue to set seeds and the colonies will continue to expand in area.

The larger plants can be easily cultivated from seeds and cuttings while the smaller plants can be dug up and transplanted. It is recommended that an area be set aside for the conservation of these plants. An excellent location would be within the power line corridor. A greenway or belt of vegetation with the ko'oloa-'ula could be established here. A few plants already occur within this corridor.

References

U.S. Fish and Wildlife Service. 1994. Lana'i plant cluster recovery plan: Abutilon eremitopetalum, Abutilon menziesii, Cyanea macrostegia ssp. gibsonii, Cyrtandra munroi, Gahnia lanaiensis, Phyllostegia glabra var. lanaiensis, Santalum freycinetianum var. lanaiensis, Tetramolopium remyii, and Viola lanaiensis. Portland, Or.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1990. Manual of the flowering plants of Hawai'i. 2 vols. University of Hawai'i Press and B.P. Bishop Museum Press, Honolulu. B.P. Bishop Museum Special Publication 83.

Appendix C
Botanical Survey
W. Char
(October 1997)

BOTANICAL RESOURCES STUDY
NORTH-SOUTH ROAD CORRIDOR
(H-1 FREEWAY TO KAPOLEI PARKWAY)
'EWA DISTRICT, ISLAND OF O'AHU

by

Winona P. Char

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Prepared for:

PARSONS BRINCKERHOFF

October 1997

BOTANICAL RESOURCES STUDY
NORTH-SOUTH ROAD CORRIDOR
(H-1 FREEWAY TO KAPOLEI PARKWAY)
'EWA DISTRICT, ISLAND OF O'AHU

INTRODUCTION

The botanical resources found on the North-South road corridor from its proposed interchange with Interstate Route H-1 to its terminus at the proposed Kapolei Parkway is presented in this report. The majority of the alignment crosses sugar cane fields which are no longer in cultivation. Although sugar cane cultivation ceased two to three years ago, there are still a few remnant clumps of sugar cane in the area between Farrington Highway and Waimanalo Road. However, in most places the former fields are now overgrown with Guinea grass or mixed scrub vegetation. A narrow band of koa haole scrub can be found along old irrigation ditches, drainageways, and roadways.

A reconnaissance-level field study was conducted in June 1996, and later in December 1996 during the rainy season. The primary objectives of the field studies were to:

1) provide a description of the vegetation found on the undeveloped portions of the corridor;
2) inventory the flora;
3) search for threatened and endangered plants as well as species of concern; and
4) identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

One Federal and State listed endangered species, the ko'oloa'ula

(Abutilon menziesii), was found during the field studies and is discussed in more detail in the "Endangered Plants" section of the report.

SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. The roadway alignment maps and a recent colored aerial photograph of the study area were examined to determine vegetation cover patterns, terrain characteristics, access, boundaries, and reference points.

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

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

DESCRIPTION OF THE VEGETATION

In the U.S. Fish and Wildlife Service sponsored 'Ewa Plains' Botanical Survey (Char and Balakrishnan 1979), the vegetation along the roadway corridor was mapped as "C", sugar cane fields.

On areas which were not actively cultivated, koa haole shrubland and mixed grass-shrubland were found. Since that survey, O'ahu Sugar Company, Ltd., has ceased cultivating the fields, and much of the 'Ewa Plains has been developed for the second city of Kapolei.

In the discussion below, the vegetation along the proposed North-South road corridor is described from mauka to makai, that is, from its proposed interchange with Interstate Route H-1 to its makai terminus at Kapolei Parkway. Locations are referenced to existing roads and landmarks as the corridor had not been flagged and staked at the time of the field studies. A checklist of all those plants inventoried during the field work is presented at the end of the report.

Vegetation along the corridor

At the interchange with H-1, dense koa haole shrubs (Leucaena leucocephala) border the highway and cover the southwest portion of the interchange. Clumps of Guinea grass (Panicum maximum), 3 to 5 ft. tall, form a thick cover between the shrubs. Scattered through this koa haole/Guinea grass scrub are trees of kiawe (Prosopis pallida) and 'opiuma (Pithecellobium dulce). Along Kalo'i Gulch, there are a few Java plum (Syzygium cumini) and kukui (Aleurites moluccana) trees among the koa haole thickets. Upslope of the highway are former sugar cane fields now overgrown with Guinea grass and buffel grass (Cenchrus ciliaris).

Between Interstate Route H-1 and Farrington Highway, the former sugar cane fields are now overgrown with buffel grass. A few clumps of the taller Guinea grass can be seen scattered here and there. Koa haole shrubs and a few kiawe trees line the edges of the grassy fields. A few of the fields had been planted earlier

with other crops such as watermelons, but in December these fields were overgrown with low mats of pink bindweed (Ipomoea triloba) and clumps of other weedy species such as cocklebur (Xanthium strumarium), apple of Peru (Nicandra physalodes), kaliko (Euphorbia heterophylla), etc.

On the State-owned lands between Farrington Highway and Waimanalo Road, the cane fields were the most recently fallowed and so there are still a few areas with remnant clumps of sugar cane plants (Saccharum officinarum), from 5 to 7 ft. tall. Where the plants collect runoff water in low lying areas, the sugar cane cover is somewhat dense. Where the soil is drier and cracked, there are only dead, dried out clumps of cane. The abandoned fields have been invaded by a mixed scrub composed of swollen fingergrass (Chloris barbata) and a number of other weedy species which include 'uhaloa (Waltheria indica), 'ilima (Sida fallax), hoary abutilon (Abutilon incanum), currant tomato (Lycopersicon pimpinellifolium), Guinea grass, lion's ear (Leonotis nepetifolia), coat buttons (Tridax procumbens), pink bindweed, castor bean (Ricinus communis), etc. In some places, Guinea grass has formed a dense cover, 3 to 6 ft. tall, with only a few other species present. Kalo'i and Makakilo Gulches, now reduced to somewhat narrow drainage channels, support koa haole shrubs and thick tangles of ivy gourd vine (Coccinia grandis).

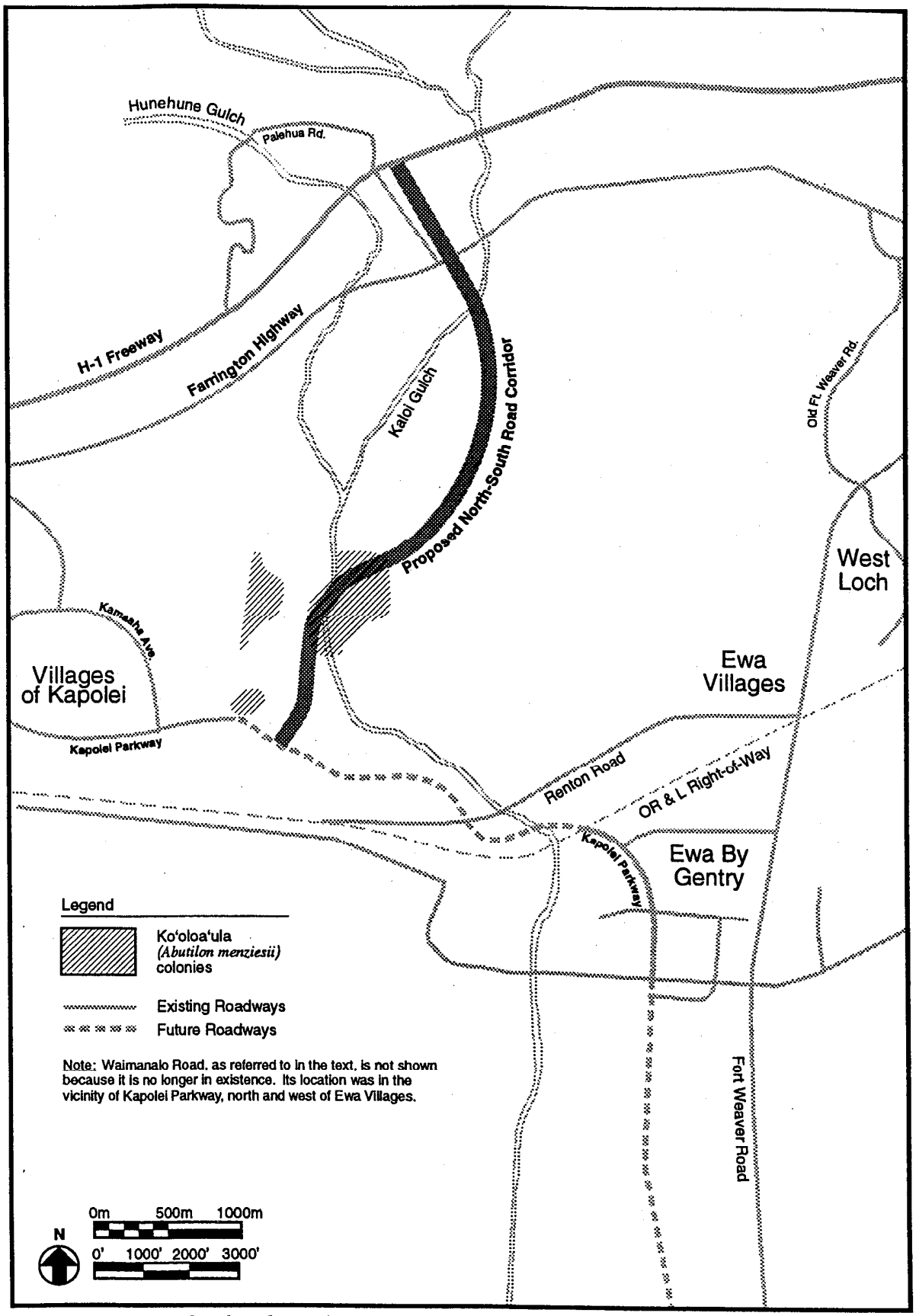
ENDANGERED PLANTS

Because the 'Ewa Plains have been extensively disturbed by agricultural activities for such a long period of time, there are few places which support native plant communities. The few places with native plants tend to be found on areas with karst or limestone topography; since these areas do not have soil they were unsuitable for agriculture. Two listed endangered species which occur today in such habitats are the 'Ewa Plains 'akoko (Chamaesyce

skottsbergii) and Achyranthes rotundata. Both are found only on limestone sites within Campbell Industrial Park and Barbers Point Naval Air Station (Char and Balakrishnan 1979; Traverse Group, Inc., 1988). One plant of the endangered ko'oloa'ula (Abutilon menziesii) was found in an overgrown sugar cane field near Kalaeloa Boulevard in the industrial park (Char and Balakrishnan 1979; Wagner et al. 1990; U.S. Fish and Wildlife Service 1994). There are historical records of two listed endangered species, the 'awiwi (Centaurium sebaeoides) and 'ihi'ihi (Marsilea villosa), and two species of concern, the 'ihi (Portulaca villosa) and pu'uka'a (Torulinium odoratum ssp. auriculatum), in the vicinity of the proposed corridor (B. Harper, USFWS, 01 February 1996 letter).

During the field studies for the State Housing Finance and Development Corporation's (HFDC) East Kapolei project, in September and October 1996, 38 plants of the endangered ko'oloa'ula were found by Ken Nagata, botanist, on the southwest corner of the HFDC project site. The plants occur primarily in mixed scrub and also in areas with remnant clumps of sugar cane. A survey to verify the findings and to more accurately inventory and map the plants was conducted in December 1996 (Char 1997). This December survey followed an unusually heavy period of rainfall in November 1996 in which the 'Ewa area received more than 20 inches of rainfall in about 10 days; average rainfall for the 'Ewa area is 20 inches per year.

A total of 88 ko'oloa'ula plants were flagged and inventoried; the plants occur in three colonies, located fairly close to each other. A large number of juvenile plants which had sprouted after the November rains were found. Some of the ko'oloa'ula plants lie within the proposed North-South road corridor where it follows near the existing HECO powerline (Figure 1).



Distribution of the Endangered Plant Ko'oloa'ula (Abutilon menziesii)
NORTH-SOUTH ROAD CORRIDOR STUDY
Botanical Survey Report
FIGURE 1

DISCUSSION AND RECOMMENDATIONS

The majority of the proposed North-South Road corridor will cross over former sugar cane fields now overgrown with weedy scrub and scattered koa haole thickets. These areas have little of botanical interest as they have been disturbed (under cultivation) for a long period of time and are dominated by introduced or alien plant species. The only area of concern is that portion of the corridor which will cross through the endangered ko'oloa'ula population.

A mitigation plan which would relocate the affected ko'oloa'ula plants is being prepared.

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SPECIES LIST -- North-South Road Corridor (H-1 Freeway to Kapolei Parkway)

The following checklist is an inventory of the plants observed on the undeveloped lands within the proposed roadway corridor. The plants are arranged alphabetically by families within each of two groups: Dicots and Monocots. The taxonomy and nomenclature of the flowering plants follow the most recent treatment of the Hawaiian flora by Wagner et al. (1990) and new additions to the flora in Wagner and Herbst (1995).

The following information is provided for each species:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name(s), when known.
3. Biogeographic status. The following symbols are used:
   - E = endemic = native only to the Hawaiian Islands.
   - I = indigenous = native to the Hawaiian Islands and also elsewhere throughout the Pacific and/or tropics.
   - I? = questionably indigenous = data not clear if introduced or if arrival here by natural means, but weight of evidence suggests probably indigenous.
   - P = Polynesian = plants originally of Polynesian introduction prior to Western contact (Cook's discovery of the islands in 1778).
   - X = introduced or alien = all those plants brought to the islands by humans, intentionally or accidentally, after Western contact (1778).
   - X? = questionably introduced = dates of introduction unclear or very early, may be indigenous or of Polynesian introduction.

Scientific name	Common name	Status
DICOTS		
ACANTHACEAE (Acanthus family)		
Asystasia gangetica (L.) T. Anders.	Chinese violet	X
AIZOACEAE (Fir-marigold family)		
Trianthema portulacastrum L.		X
AMARANTHACEAE (Amaranthus family)		
Achyranthes aspera L.		X
Amaranthus spinosus L.	spiny amaranth, pakai kuku	X
Amaranthus viridis L.	slender amaranth, pakai	X
ANACARDIACEAE (Mango family)		
Schinus terebinthifolius Raddi	Christmas berry	X
ASCLEPIADACEAE (Milkweed family)		
Calotropis procera (Aiton) W.T. Aiton	blue crown flower	X
ASTERACEAE (Daisy family)		
Bidens pilosa L.	Spanish needle, beggars tick, ki	X
Conyza bonariensis (L.) Cronq.	hairy horseweed, 'ilioha	X
Emilia fosbergii Nicolson	Flora's paintbrush, red pualele	X
Pluchea indica (L.) Less.	Indian pluchea	X
Pluchea carolinensis (Jacq.) G. Don	pluchea, sourbush	X
Sonchus oleraceus L.	common sowthistle, pua-lele	X
Tridax procumbens L.	coat buttons	X
Verbesina encelioides (Cav.) Benth. & Hook.	golden crownbeard	X
Vernonia cinerea (L.) Less.	little ironweed	X
Xanthium strumarium var. canadense (Mill.) Torr. & A. Gray	cocklebur, kikania	X
BIGNONIACEAE (Bignonia family)		
Spathodea campanulata P. Beauv.	African tulip tree	X
CHENOPODIACEAE (Goosefoot family)		
Atriplex suberecta Verd.	saltbush	X
Chenopodium murale L.	'aheahea	X

Scientific name	Common name	Status
CONVOLVULACEAE (Morning-glory family)		
Ipomoea obscura (L.) Ker-Gawl.	field bindweed	X
Ipomoea triloba L.	pink bindweed, little bell	X
Merremia aegyptia (L.) Urb.	hairy merremia, koali kua hulu, kuahulu	X?
CUCURBITACEAE (Gourd family)		
Coccinia grandis (L.) Voigt	ivy gourd, scarlet-fruited gourd	X
Momordica charantia L.	wild bittermelon	X
EUPHORBIACEAE (Spurge family)		
Aleurites moluccana (L.) Willd.	kukui, tutui	P
Chamaesyce hirta (L.) Millsp.	hairy spurge	X
Chamaesyce hypericifolia (L.) Millsp.	graceful spurge	X
Chamaesyce prostrata (Ait.) Small	prostrate spurge	X
Euphorbia heterophylla L.	kaliko	X
Phyllanthus debilis Klein ex Willd.	niruri	X
Ricinus communis L.	castor bean, pa'aila, koli	X
FABACEAE (Pea family)		
Crotalaria incana L.	fuzzy rattlepod, kukae-hoki	X
Crotalaria pallida Aiton	smooth rattlepod, pika-kani	X
Desmanthus virgatus (L.) Willd.	slender mimosa	X
Indigofera suffruticosa Mill.	indigo, 'iniko	X
Indigofera spicata Forssk.	creeping indigo	X
Leucaena leucocephala (Lam.) de Wit	koa haole	X
Macroptilium lathyroides (L.) Urb.	wild bean, cow pea	X
Phaseolus sp.		X
Pithecellobium dulce (Roxb.) Benth.	'opiuma	X
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe	X
Senna pendula (Humb. & Bonpl. ex Willd.) H. Irwin & Barneby	senna	X
LAMIACEAE (Mint family)		
Leonotis nepetifolia (L.) R. Br.	lion's ear	X
MALVACEAE (Mallow family)		
Abutilon grandifolium (Willd.) Sweet	hairy abutilon, ma'o	X
Abutilon incanum (Link) Sweet	ma'o, hoary abutilon	I?

Scientific name	Common name	Status
Abutilon menziesii Seem.	ko'oloa'ula	E
Malvastrum coromandelianum (L.) Garcke	false mallow	X
Sida fallax Walp.	'ilima	I
Sida rhombifolia L.		X
MYRTACEAE (Myrtle family)		
Syzygium cumini (L.) Skeels	Java plum	X
NYCTAGINACEAE (Four-o'clock family)		
Boerhavia coccinea Mill.	red-flowered boerhavia	X
PASSIFLORACEAE (Passion flower family)		
Passiflora foetida L.	running pop, pohapoha	X
PORTULACACEAE (Purslane family)		
Portulaca oleracea L.	pigweed, 'akulikuli kula	X
SOLANACEAE (Nightshade family)		
Lycopersicon pimpinellifolium (Jusl.) Mill.	currant tomato	X
Nicandra physalodes (L.) Gaertn.	apple of Peru	X
Nicotiana glauca R.C. Graham	tree tobacco, paka	X
Solanum americanum Mill.	glossy nightshade, popolo, 'olohua	I?
STERCULIACEAE (Cacao family)		
Waltheria indica L.	'uhaloa, hi'aloa, kanakaloa	I?
ZYGOPHYLLACEAE (Creosote bush family)		
Tribulus terrestris L.	puncture vine, goat head	X
MONOCOTS		
COMMELINACEAE (Dayflower family)		
Commelina benghalensis L.	hairy honohono	X
CYPERACEAE (Sedge family)		
Cyperus rotundus L.	nut sedge, nutgrass	X
POACEAE (Grass family)		
Bothriochloa pertusa (L.) A. Camus	pitted beardgrass	X
Brachiaria mutica (Forssk.) Stapf	California grass	X

Scientific name	Common name	Status
Brachiaria subquadriparia (Trin.) Hitchc.		X
Cenchrus ciliaris L.	buffel grass	X
Cenchrus echinatus L.	common sandbur, 'ume'alu, mau'u kuku	X
Chloris barbata (L.) Sw.	swollen fingergrass, mau'u lei	X
Chloris radiata (L.) Sw.	plush grass	X
Cynodon dactylon (L.) Pers.	Bermuda grass, manienie	X
Dactyloctenium aegyptium (L.) Willd.	beach wiregrass	X
Digitaria insularis (L.) Mez. ex Ekman	sourgrass	X
Eleusine indica Gaertn.	goose grass, wire grass	X
Leptochloa uninervia (Presl.) Hitchc. & Chase	leptochloa	X
Melinis repens (Willd.) Zizka	Natal redtop, Natal grass	X
Panicum maximum Jacq.	Guinea grass	X
Panicum maximum var. trichoglume Eyles ex Robyns	green panicgrass	X
Saccharum officinarum L.	sugar cane, ko	X
Setaria verticillata (L.) Beauv.	bristly foxtail	X
Sorghum halepense (L.) Pers.	Johnson grass	X

Appendix D
Botanical Survey
W. Char
(August 2003)

BOTANICAL SURVEY
UNIVERSITY OF HAWAI'I WEST O'AHU
EAST KAPOLEI, 'EWA DISTRICT, O'AHU

by

CHAR & ASSOCIATES
Botanical Consulants
Honolulu, Hawai'i

Prepared for: **PBR HAWAII**

August 2003

BOTANICAL SURVEY
UNIVERSITY OF HAWAI'I WEST O'AHU
EAST KAPOLEI, 'EWA DISTRICT, O'AHU

INTRODUCTION

In mid-September 2002, the University of Hawai'i Board of Regents selected the 500-acre Kapolei Makai site as the permanent site for the University of Hawai'i West O'ahu campus. The 500-acre project site is bounded by Farrington Highway to the north; the proposed North-South Road to the east; overgrown, former sugar cane lands to the south; and the Kapolei residential area and Kapolei Golf Course to the west. A large portion of the 500-acre project site has recently been cleared for vegetatable crops or is already under cultivation by Aloun Farms. The Kalo'i and Hunehune Gulches cross the property. Scrub vegetation is found on the former cane fields on the lower southern portion of the site. A few plants of the endangered ko'oloa'ula (Abutilon menziesii) are associated with the scrub vegetation.

Field studies to assess the botanical resources on the proposed University of Hawai'i West O'ahu campus site were conducted from 17 to 20 June 2003. The primary objectives of the field studies were to:

1) prepare a general description of the vegetation on the site;
2) inventory the flora;
3) search for threatened and endangered species as well as species of concern; and
4) identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Topographic maps and a recent, colored aerial

photograph (1" = 200') were examined to determine vegetation cover patterns, terrain characteristics, access, boundaries, and reference points.

The areas with scrub and gulch vegetation were surveyed more intensively as they were more likely to harbor native plants. A few plants of the endangered ko'oloa'ula (Abutilon menziesii) occur on the project site; larger clusters of plants are found on the adjacent lands. All of the ko'oloa'ula plants, both on and off the project site, have been mapped and/or flagged during earlier studies. The plants are monitered periodically by staff from the State Division of Forestry and Wildlife (DOFAW). Actively cultivated farm lands were not surveyed in detail as rare plants were not likely to occur in such areas.

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

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

DESCRIPTION OF THE VEGETATION

Nagata (1996) conducted a biological survey (flora and fauna) for the approximately 1,300-acre East Kapolei Master Plan project site. This study covered the proposed 500-acre UH West O'ahu property. It was during the field survey in September and October 1996 that Nagata discovered the endangered ko'oloa'ula plants (see "Endangered Species" section in this report for discussion). In the 1996 study, large portions of the East Kapolei site supported abandoned sugar cane fields with sugar cane (Saccharum officinarum) making up 30 to 50% of the total

vegetation cover. In other places, sugar cane made up less than 5% of the cover with mixed herbs and grasses abundant. A botanical survey for the proposed North-South Road (Char 1997) recorded similar vegetation types.

Today, large areas with sugar cane are no longer present on the study site, having been replaced by a scrub vegetation composed primarily of swollen fingergrass (Chloris barbata), mixed herbaceous species, and small shrubs (subshrubs). The lands on the northern portion of the site, adjacent to Farrington Highway, are under cultivation by Aloun Farms.

Three vegetation types are recognized on the UH West O'ahu site in this report. An inventory of all the plant species observed during the field studies is presented at the end of the report.

Agricultural/Farm

Actively cultivated fields make up the agricultural farm lands vegetation type which covers the majority of the 500-acre project site. Most of the large fields bordering Farrington Highway have recently been bulldozed to clear them of woody growth and were being disked during our field survey in June. Short stumps of koa haole shrubs (Leucaena leucocephala) could be observed here and there in these fields. On the planted fields on the eastern portion of the site, hybrid sweet corn (Zea mays) covers large areas. Other crops observed include bell pepper (Capsicum annuum cv. "Grossum"); eggplant (Solanum melongena); a number of different melon cultivars such as watermelon and Thai watermelon (Citrullus lanatus), and canteloupe and honeydew (Cucumis melo); cultivars of Cucurbita pepo -- zucchini, pumpkin, kabocha; and yard-long bean (Vigna unguiculata).

A few weedy species such as swollen fingergrass, field bindweed (Ipomoea obscura), spiny amaranth (Amaranthus spinosus), and pigweed (Portulaca oleracea) can be found growing among the crop plants. Most of the weedy plants, however, occur along the uncultivated areas which border the fields; these weedy patches receive runoff from the cultivated fields so the weeds tend to

be lush and green, and 2 to 4 ft. tall in some places. Weedy species found here include clumps of Guinea grass (Panicum maximum), field bindweed, lion's ear (Leonotis nepetifolia), young koa haole shrubs, graceful spurge (Chamaesyce hypericifolia), Trianthema portulacastrum), milkweed (Sonchus oleraceus), cheese weed (Malva parviflora), etc. The native 'ilima (Sida fallax) is locally common in some places. One new species not recorded from the island of O'ahu, Russian thistle or tumbleweed (Salsola tragus), was collected and deposited at the Bishop Museum herbarium.

Scrub Vegetation

This vegetation type occupies the southern portion of the project site and is usually 1 to 3 ft. tall. Long dead stalks of sugar cane are scattered throughout this vegetation type. At the time of this survey, the project site was very dry with plant cover 50 to 60%. Bare soil areas with large, knee-deep cracks were prominent and made surveying difficult.

Swollen fingergrass is the most abundant species forming fairly large patches. In some places, buffelgrass (Cenchrus ciliaris) becomes locally abundant and forms a thick mat, 2 to 3 ft. tall. Four herbaceous species are abundant to common; these are false mallow (Malvastrum coromandelianum), coat buttons (Tridax procumbens), fuzzy rattlepod (Crotalaria incana), and golden crown-beard (Verbesina encelioides). Small shrubs of hoary abutilon (Abutilon incanum), 'uhaloa (Waltheria indica), and 'ilima are abundant; these small shrubs have fuzzy, gray to bluish-gray leaves, and give a grayish-blue cast to the vegetation where they form extensive patches, 1 to 3 ft. tall.

Scattered through this scrub cover are taller shrubs of koa haole and sourbush (Pluchea carolinensis), 3 to 10 ft. tall. Other woody components found here in small numbers are young kiawe (Prosopis pallida) and 'opiuma (Pithecellobium dulce) trees, 7 to 12 ft. tall. Interestingly, a few species usually used as landscaping material have established themselves within these former cane fields; these are the small crown flower (Calotropis procera), carrion flower (Stapelia

gigantea), and Sebesten plum (Cordia dichotoma).

On the old, crushed coral-covered cane haul roads and along irrigation ditches, the vegetation is somewhat denser. Koa haole shrubs and Guinea grass are common. Other species forming fairly large patches here include saltbush (Atriplex suberecta), 'uhaloa, slender mimosa (Desmanthus pernambucanus), Macroptilium atropurpureum, Natal redtop grass (Melinis repens), 'ilima, and swollen fingergrass.

Along the lower boundary (makai end), especially along the North-South Road corridor, there are a few plants of the endangered ko'oloa'ula within the project site. A more detailed discussion of the ko'oloa'ula plants on the project site is presented in the "Endangered Species" section of the report.

Gulch Vegetation

Kalo'i Gulch and Hunehune Gulch cross the project site. In most places, the gulches are shallow and narrow, however, Kalo'i Gulch becomes 25 to 45 ft. deep and wider along its eastern segment. A large plunge pool with standing water was found during the field studies. The intermittent streams along the bottom of each of the gulches have eroded down to the hardpan parent material.

The vegetation within the gulches (sides and bottom) is characterized by dense, robust clumps of Guinea grass, 5 to 10 ft. tall. The dense Guinea grass cover tends to exclude other species, but a few patches of California grass (Brachiaria mutica), sourbush, castor bean (Ricinus communis), wild bittermelon (Momordica charantia), comby hyptis (Hyptis pectinata), and cocklebur (Xanthium strumarium) are found where the Guinea grass cover is thin and the soil exposed.

Along the top banks of the gulches, buffelgrass forms a thick mat up to 3 ft. tall, but Guinea grass can also be abundant in places. Koa haole shrubs, 10 to 20 ft. high, occur as scattered stands or can sometimes become very dense and form small thickets, especially along the eastern section of Kalo'i Gulch.

Tangled mats of coccinia vine (Coccinia grandis) are frequently observed climbing up and over the koa haole shrubs. A few kiawe trees, 20 to 25 ft. tall, are also found along the top of the gulches.

ENDANGERED SPECIES

The ko'oloa'ula (Abutilon menziesii) is a member of the hibiscus or mallow family (Malvaceae). It is a much-branched shrub covered by velvety, silvery hairs. The heart-shaped leaves are silvery-green and the small 'ilima-like flowers range in color from pale peach to dark red. Abutilon is found in dry, lowland habitats on the islands of O'ahu, Maui, Lana'i, and Hawai'i (Wagner et al. 1990). In 1986, the species was federally listed as endangered and is protected under the provisions of the Endangered Species Act of 1973, as amended, and Chapter 195D, Hawaii Revised Statutes, as amended. In its natural habitat the plants are threatened by browsing animals, competition from weedy introduced species, fires, predation by insects, loss of native pollinators, and development (U.S. Fish and Wildlife Service 1994).

In September 1996, Nagata found 38 Abutilon menziesii plants on the East Kapolei project site; the reconnaissance survey covered roughly 80% of the property. After the unusually heavy rains in November 1996, Char (1997) conducted an intensive inventory of the plants in December and recorded a total of 88 plants. A year later, in December 1997, Nagata performed a detailed survey flagging and attaching numbered tags to the plants; survey engineers then mapped the plants. The 1997 survey recorded 87 plants, 86 from the East Kapolei site and North-South Road corridor and one plant within the fenceline of the adjacent City and County-owned golf course.

In 1998, a Habitat Conservation Plan (HCP) was prepared for the East Kapolei Master Plan; the HCP is an "umbrella plan" that includes the East Kapolei project as well as the North-South Road project. The HCP provides a description of the development actions which would impact the Abutilon plants and proposes a series of mitigative strategies to address the impacts (PBR 1998).

A few of the endangered Abutilon plants occur on the proposed UH West O'ahu site. These represent the most mauka extension of the Cluster C population. One plant remained at the Cluster D site in Nagata's 1997 study, but it has subsequently died (V. Caraway, DOFAW, pers. comm.); there may still be seeds of Abutilon present in the soil around Cluster D. The Abutilon population is periodically monited by the Division of Forestry and Wildlife (G. Mansker, pers. com.).

DISCUSSION AND RECOMMENDATIONS

The proposed 500-acre UH West O'ahu site was under sugar cane cultivation for nearly a century with the last harvest occurring in 1994, prior to permanent closure of Oahu Sugar Company in 1995 (PBR 1998). Today, only dead stalks of sugar cane and faint traces of planting furrows remain. Weedy scrub vegetation consisting of a mixture of swollen fingergrass and buffelgrass, herbaceous species, and small shrubs covers the former cane fields on the southern half of the property, while the northern portion is actively cultivated for various fruit and vegetable crops by Aloun Farms. The gulches which cross the site support dense Guinea grass and stands of koa haole shrubs.

The vegetation on the project site is dominated by introduced or alien species. A total of 95 plant species were observed during this study. Of these 89 (94%) are introduced; introduced species are all those plants which were brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact, that is, Cook's arrival in the islands in 1778. Four species are indigenous or presumably indigenous, that is, they are native to the islands and elsewhere; these are the 'ilima (Sida fallax), hoary abutilon (Abutilon incanum), 'uhaloa (Waltheria indica), and popolo (Solanum americanum). Two species are endemic, that is, they are native only to the Hawaiian Islands; these are the endangered ko'oloa'ula (Abutilon menziesii) and pa'uohi'iaka (Jacquemontia ovalifolia subsp. sandwicensis).

None of the plants found on the project site, with the exception of the

ko'oloa'ula, is a threatened and endangered species or a species of concern (U.S. Fish and Wildlife Service 1999a, 1999b; Wagner et al. 1999). Almost all of the plants can be found in dry, lowland, disturbed habitats throughout the islands. Some of the natives such as the 'ilima, hoary abutilon, and 'uhaloa are common to abundant throughout the scrub vegetation on the project site and elsewhere.

A Habitat Conservation Plan for the endangered ko'oloa'ula plant on the 'Ewa site has already been prepared. Plant material from this population has been propagated and a few outplantings have been made at other locations. The University will need to work closely with the agencies involved in the Habitat Conservation Plan.

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APPENDIX A

PLANT SPECIES LIST -- U.H., West O'ahu

The following checklist is an inventory of all the plants observed on the project site during the field studies. The plants are arranged alphabetically by families into each of two groups: Dicots and Monocots. The taxonomy and nomenclature of the flowering plants, Dicots and Monocots, are in accordance with Wagner et al. (1990) and Wagner and Herbst (1999). The few recent name changes are those reported in the Hawaii Biological Survey series (Evenhuis and Eldredge, editors, 1999-2002).

For each species, the following information is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name(s), when known.
3. Biogeographic status. The following symbols are used:
   - E = endemic = native only to the Hawaiian Islands;
   - I = indigenous = native to the Hawaiian Islands and elsewhere;
   - I? = questionably indigenous = data not clear if dispersal to the islands by natural or human-related mechanisms, but weight of evidence suggests probably natural;
   - X = introduced or alien = all those plants brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact, that is Cook's arrival in the islands in 1778;
   - X? = questionably introduced = dates of introduction are very early/unclear; may be indigenous or of Polynesian introduction.
4. Presence (+) or absence (-) of a particular species within each of three vegetation types recognized on the project site (see text for discussion):
   - a = Agricultural/Farm Lands
   - s = Scrub Vegetation
   - g = Gulch Vegetation

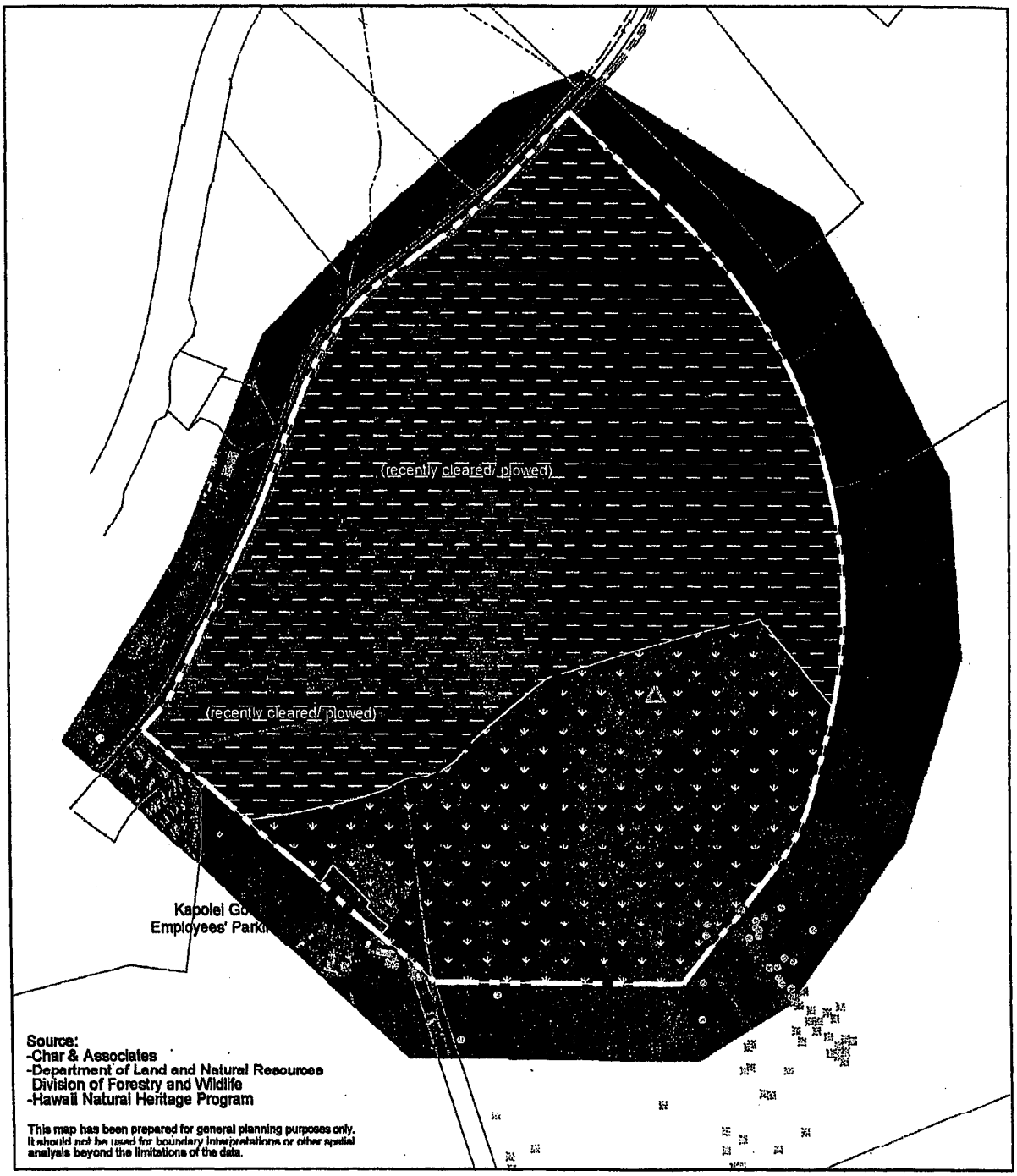
Scientific name	Common name	Status	Vegetation type a	s	g
FLOWERING PLANTS					
DICOTS					
AIZOACEAE (Fir-marigold family)					
Trianthema portulacastrum L.		X	+	+	+
AMARANTHACEAE (Amaranth family)					
Amaranthus spinosus L.	spiny amaranth, pakai kuku	X	+	+	-
Amaranthus viridis L.	slender amaranth, pakai	X	+	+	-
ANACARDIACEAE (Mango family)					
Schinus terebintifolius Raddi	Christmas berry	X	-	+	-
ASCLEPIADACEAE (Milkweed family)					
Calotropis procera (Aiton) W.T. Aiton	small crown flower	X	-	+	-
Stapelia gigantea N.E. Brown	carrion flower, Zulu-giant	X	-	-	+
ASTERACEAE (Daisy family)					
Bidens alba var. radiata (Schultz-Bip.) Ballard ex Melchert		X	+	-	-
Bidens pilosa L.	Spanish needle, ki, ki nehe	X	+	-	+
Emilia fosbergii Nicolson	flora's paintbrush, pualele	X	+	+	-
Pluchea carolinensis (Jacq.) G. Don	sourbush, pluchea	X	+	+	+
Pluchea indica (L.) Less.	Indian fleabane	X	+	+	-
Sonchus oleraceus L.	sowthistle	X	+	+	-
Tridax procumbens L.	coat buttons	X	-	+	+
Verbesina encelioides (Cav.) Benth. & Hook.	golden crown-beard	X	+	+	-
Xanthium strumarium var. canadense (Mill.) Torr. & A. Gray	cocklebur, kikania	X	-	-	+
BIGNONIACEAE (Bignonia family)					
Spathodea campanulata P. Beauv.	African tulip tree	X	-	+	-

Scientific name	Common name	Status	Vegetation type a	s	g
BORAGINACEAE (Borage family)					
Cordia dichotoma Forst. f.	Sebesten plum	X	-	+	-
CAPPARACEAE (Caper family)					
Cleome gynandra L.	wild spider flower, hohohina	X	+	-	-
CHENOPODIACEAE (Goosefoot family)					
Atriplex suberecta Verd.	saltbush	X	+	+	+
Chenopodium murale L.	'aheahea	X	+	+	-
Salsola tragus L.	Russian thistle, thumbleweed	X	+	+	-
CONVOLVULACEAE (Morning glory family)					
Ipomoea cairica (L.) Sweet	koali 'ai, koali	X?	-	-	+
Ipomoea obscura (L.) Ker-Gawl.	field bindweed	X	-	+	+
Ipomoea triloba L.	little bell, pink bindweed	X	+	+	-
Jacquemontia ovalifolia ssp. sandwicensis (A. Gray) K. Robertson	pa'uohi'iaka	E	-	+	-
Merremia aegyptia (L.) Urb.	hairy merremia, koali kua hulu	X?	+	+	-
CUCURBITACEAE (Gourd family)					
Citrullus lanatus (Thunb.) Matsum. & Nakai	watermelon	X	+	-	-
Coccinia grandis (L.) Voigt	coccinia, ivy gourd	X	+	-	+
Cucumis melo L. various cultivars	cantaloupe, honeydew	X	+	-	-
Cucurbita pepo L. various cultivars	zucchini, pumpkin, kabocha	X	+	-	-
Momordica charantia L.	wild bittermelon	X	+	-	+
EUPHORBIACEAE (Spurge family)					
Chamaesyce hirta (L.) Millsp.	hairy spurge, garden spurge	X	-	+	+
Chamaesyce hypericifolia (L.) Millsp.	graceful spurge	X	+	+	+
Chamaesyce hyssopifolia (L.) Sm.		X	+	-	+
Euphorbia heterophylla L.	Mexican fireweed	X	+	-	-
Ricinus communis L.	castor bean, koli	X	+	+	+

Scientific name	Common name	Status	Vegetation type a	s	g
FABACEAE (Pea family)					
Acacia farnesiana (L.) Willd.	klu	X	+	+	-
Cassia sp.		X	-	+	-
Chamaecrista nictitans (L.) Moench	partridge pea, lauki	X	-	+	-
Crotalaria incana L.	fuzzy rattlepod, kukaehoki	X	+	+	-
Crotalaria pallida Aiton	smooth rattlepod, pikakani	X	+	-	-
Desmanthus pernambucanus (L.) Thellung	slender mimosa	X	+	+	+
Indigofera hendecaphylla Jacq.	creeping indigo	X	-	+	-
Indigofera suffruticosa Mill.	indigo, 'iniko	X	+	+	-
Leucaena leucocephala (Lam.) de Wit	koa haole, ekoa	X	+	+	+
Macroptilium atropurpureum (DC) Urb.		X	-	+	-
Macroptilium lathyroides (L.) Urb.	wild bean, cow pea	X	+	-	-
Pithecellobium dulce (Roxb.) Benth.	'opiuma	X	-	+	+
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe	X	+	+	+
Senna occidentalis (L.) Link	coffee senna, 'auko'i	X	+	-	-
Vigna unguiculata ssp. sesquipedalis (L.) Verdc.	yard-long bean	X	+	-	-
LAMIACEAE (Mint family)					
Hyptis pectinata (L.) Poit.	comb hyptis	X	+	-	+
Leonotis nepetifolia (L.) R. Br.	lion's ear	X	+	+	+
MALVACEAE (Mallow family)					
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	X	+	-	-
Abutilon incanum (Link) Sweet	hoary abutilon, ma'o	I?	+	+	+
Abutilon menziesii Seem.	ko'oloa'ula	E	-	+	-
Malva parviflora L.	cheese weed	X	+	-	-
Malvastrum coromandelianum (L.) Garcke	false mallow, hauuoi	X	+	+	-
Sida ciliaris L.		X	+	+	-
Sida fallax Walp.	'ilima	I	+	+	+
Sida spinosa L.	prickly sida	X	+	+	-
MELIACEAE (Mahogany family)					
Melia azedarach L.	Chinaberry, pride of India	X	-	+	-

Scientific name	Common name	Status	Vegetation type a	s	g
NYCTAGINACEAE (Four-o'clock family)					
Boerhavia coccinea Mill.		X	-	+	-
PASSIFLORACEAE (Passion flower family)					
Passiflora foetida L.	running pop, poha poha	X	-	+	-
PORTULACACEAE (Purslane family)					
Portulaca oleracea L.	common purslane, pigweed	X	+	-	-
SOLANACEAE (Nightshade family)					
Capsicum annuum L. cultivar "Grossum"	bell pepper	X	+	-	-
Datura stramonium L.	Jimson weed, la'au hano	X	-	+	-
Nicandra physalodes (L.) Gaertn.	apple of Peru	X	+	-	+
Nicotiana glauca R.C. Graham	tree tobacco	X	-	+	-
Solanum americanum Mill.	popolo, glossy nightshade	I?	+	+	-
Solanum lycopersicon var. cerasiforme (Dunal) Spooner, Anderson & Jansen	currant tomato, wild tomato	X	+	+	-
Solanum melongena L. various cultivars	eggplant, long eggplant	X	+	-	-
STERCULIACEAE (Cacao family)					
Waltheria indica L.	'uhaloa, hi'aloa, kanakaloa	I?	-	+	-
VERBENACEAE (Verbena family)					
Lantana camara L.	lantana, lakana	X	-	+	-
Stachytarpheta cayennensis (Rich.) Vahl	nettle-leaved vervain, owi, oi	X	-	+	-
MONOCOTS					
MUSACEAE (Banana family)					
Musa X paradisiaca L.	banana, mai'a	X	-	-	+
CYPERACEAE (Sedge family)					
Cyperus rotundus L.	nutgrass, nut sedge	X	+	-	-

Scientific name	Common name	Status	Vegetation type a	s	g
POACEAE (Grass family)					
Bothriochloa pertusa (L.) A. Camus	pitted beardgrass	X	-	+	-
Brachiaria mutica (Forssk.) Stapf	California grass	X	-	-	+
Cenchrus ciliaris L.	buffelgrass	X	+	+	+
Cenchrus echinatus L.	common sandbur, 'ume'alu	X	+	-	-
Chloris barbata (L.) Sw.	swollen fingergrass, mau'ulei	X	+	+	+
Cynodon dactylon (L.) Pers.	Bermuda grass, manienie	X	-	+	-
Digitaria insularis (L.) Mez ex Ekman	sourgrass	X	+	-	+
Digitaria sp.	crabgrass	X	-	+	-
Eleusine indica (L.) Gaertn.	wiregrass, goosegrass	X	+	-	-
Eragrostis amabilis Wight & Arnott	lovegrass	X	-	+	-
Eragrostis cilianensis (All.) Link	stinkgrass	X	-	+	-
Melinis repens (Willd.) Zizka	Natal redtop, Natal grass	X	-	+	+
Panicum maximum Jacq.	Guinea grass	X	+	+	+
Panicum maximum var. trichoglume Eyles ex Robyns	green panicgrass	X	-	-	+
Saccharum officinarum L.	sugar cane, ko	X	-	+	-
Setaria verticillata (L.) P. Beauv.	bristly foxtail, mau'u pilipili	X	+	-	+
Sorghum bicolor (L.) Moench	sorghum	X	+	+	-
Zea mays L.	hybrid corn	X	+	-	-



LEGEND

- Project Site Boundary
- Abutilon Menziesii Plant
- Area where Abutilon Menziesii Plants Died-Off but where Seeds Remain
- AG./ Farm
- Scrub
- Gulch

Flora Study

UH WEST O'AHU

EAST KAPOLEI, O'AHU

NORTH

LINEAR SCALE (FEET)

0 500 1,000 1,500

PBR HAWAII

Appendix E
Botanical Survey
W. Char
(March 2004)

BOTANICAL RESOURCES ASSESSMENT STUDY

KAPOLEI PARKWAY EXTENSION FROM NORTH-SOUTH ROAD TO OR&L RIGHT-OF-WAY

KAPOLEI, O'AHU

by

Winona P. Char

CHAR & ASSOCIATES
Botanical Consultants
Honolulu, Hawai'i

Prepared for: PARSONS BRINCKERHOFF

Revised March 2004

BOTANICAL RESOURCES ASSESSMENT STUDY
KAPOLEI PARKWAY EXTENSION FROM NORTH-SOUTH ROAD TO OR&L RIGHT-OF-WAY
KAPOLEI, O'AHU

INTRODUCTION

The proposed Kapolei Parkway Extension will connect the proposed North-South Road with the OR&L right-of-way (ROW) where the existing Kapolei Parkway currently ends. A botanical survey for this extension of the Kapolei Parkway was conducted in two sections (Figure 1).

The first section of Kapolei Parkway is from the proposed intersection with North-South Road to the proposed intersection with Renton Road. The botanical survey area for this section consists of approximately 80 acres of City and County-owned lands located between Varona Village and Kalo'i Gulch/'Ewa Villages Golf Course (Figure 2). For the most part, the proposed parkway follows along or close to an existing paved road which accesses the golf course maintenance facility. In other places, it crosses koa haole/buffel grass scrub vegetation. The endangered Abutilon menziesii, common names ko'oloa'ula and red 'ilima, is known to occur on the adjacent State-owned lands; some Abutilon have also been recorded on the City and County-owned lands (Ohashi and PBR Hawaii 2003).

The second section of Kapolei Parkway is from the proposed intersection with Renton Road to the OR&L right-of-way (ROW). The botanical survey area for this section is an approximately 20-acre area bound by Renton Road to the west, the existing 'Ewa Mahiko Park to the north, the 'Ewa Gentry subdivision and a portion of the OR&L ROW to the east, and Kalo'i Gulch and the OR& L ROW to the south (Figure 3). This property is also owned by the City and County of Honolulu. The proposed parkway follows along an existing paved cane haul road. Except for Kalo'i Gulch, most of the site appears to have been graded in the past.

Field studies to assess the botanical resources on the ±80-acre study site including the proposed Kapolei Parkway corridor from North-South Road to Renton Road were conducted on 09 January 2004 by a team of two botanists. The Renton Road to OR&L ROW section was surveyed on 02 February 2004. The primary objectives of the field survey were to:

1) prepare a general description of the vegetation on the study sites; and
2) search for Abutilon menziesii as well as other threatened and endangered species and species of concern.

SURVEY METHODS

For the North-South Road to Renton Road section of Kapolei Parkway, a colored aerial photograph (roughly 1" = 250') was used, while the design and construction plans were

used for the Renton Road to OR&L ROW section. These were examined prior to the field studies to familiarize the botanists with vegetation cover patterns, terrain characteristics, access, boundaries, and reference points.

The proposed parkway corridor on the ±80-acre site was flagged and staked by the survey engineers before our field survey. Thirty (30)-foot wide transects were made through the koa haole/buffel grass scrub found between the existing paved road and the edge of the golf course. This is identified as "Area E" on Figure 1; plants of Abutilon are known from this portion of the study site. Less intensive transects were conducted for the more recently disturbed area makai of the existing paved road; this is identified as "Varona Village Extension" on Figure 1.

The survey for the proposed parkway corridor on the ±20-acre site between Renton Road to OR&L ROW focused on the less disturbed Kalo'i Gulch area. Notes were made on plant associations and distribution, disturbances, substrate types, topography, exposure, drainage, etc.

DESCRIPTION OF THE VEGETATION

The plant names used in this report follow Wagner et al. (1990) and Wagner and Herbst (1999). The few recent name changes are those reported in the Hawaii Biological Survey series (Evenhuis and Eldredge, eds., 1999-2002). The vegetation is described on each of the two areas within the ±80-acre site (Area E and Varona Village Extension), and on the ±20-acre Renton Road to OR&L ROW section.

Area E

Koa haole (Leucaena leucocephala)/buffel grass (Cenchrus ciliaris) scrub covers the portion of the study site located between the existing paved road and the golf course. Short-statured thickets of koa haole, 3 to 5 ft. tall, are scattered throughout this vegetation type. Buffel grass, 1 to 2 ft. tall, forms dense mats to loose tussocks between the thickets. Locally common are scattered patches of swollen fingergrass (Chloris barbata), stinkgrass (Eragrostis cilianensis), 'ilima (Sida fallax), Guinea grass (Panicum maximum), 'aheahea (Chenopodium murale), and hoary abutilon (Abutilon incanum). A few young trees of kiawe (Prosopis pallida), Chinaberry (Melia azedarch), and monkeypod (Samanea saman) can be observed here and there. Old bulldozer tracks and areas with coralline substrate are occasionally. encountered. Scattered patches of false mallow (Malvastrum coromandelianum), Trianthema portulacastrum, swollen fingergrass, little bell (Ipomoea triloba), spiny amaranth (Amaranthus spinosus), 'aheahea, Macroptilium atropurpureum, and castor bean (Ricinus communis) are common on these more recently disturbed areas.

Along the edge of the golf course (slopes of Kalo'i Gulch), the woody components become very dense. Koa haole thickets are 7 to 12 ft. tall and there are small, scattered stands of emergent kiawe, monkeypod, Eucalyptus, and 'opiuma (Pithecellobium dulce) trees. Shrubs of hairy abutilon (Abutilon grandifolium), klu

(Acacia farnesiana), and sourbush (Pluchea carolinensis) are common. Robust clumps of Guinea grass, 5 to 6 ft. tall, and buffel grass, up to 3 ft. tall, form a dense cover between the woody components.

Four of the Abutilon menziesii locations occur on Area E in open koa haole/ buffel grass scrub (see Rare Plants section of this report).

Varona Village Extension

This portion of the study area located makai of the existing paved road has been bulldozed somewhat recently. Remnants of old house sites, old mango (Mangifera indica) and kalamungai (Moringa oleifera) trees, overgrown garden plots, and rusted parts of refrigerators, stoves, sheet metal, and a Suzuki Samurai vehicle can be found here. The vegetation is composed primarily of weedy, annual plants. Swollen fingergrass is the dominant component. Lion's ear (Leonotis nepetifolia), little bell, field bindweed (Ipomoea obscura), feather fingergrass (Chloris virgata), and saltbush (Atriplex suberecta) are locally abundant. Other weeds observed here include golden crown-beard (Verbesina encelioides), Spanish needle (Bidens pilosa), smooth rattlepod (Crotalaria pallida), 'uhaloa (Waltheria indica), castor bean, and wild tomato (Solanum lycopersicon).

Where the property borders the HECO easement, open, grassy fields of buffel grass are found. The woody components make up less than 5% of the cover; these include short-statured koa haole shrubs and young trees of kiawe and 'opiuma. Three medium-sized kiawe trees line the makai side of the existing paved road near the HECO easement. One plant of Abutilon is found associated with these trees. Also in this area are numerous clumps of Russian thistle or tumbleweed (Salsola tragus).

On the southwest corner of the property, there are large piles of coral rubble and boulders. This was the staging area for a sewer line at one time. The piles of excavated material are covered here and there with patches of tree tobacco shrubs (Nicotiana glauca), mats of Sida ciliaris and saltbush, and shrubs of 'ilima, 'uhaloa, and sourbush.

Renton Road to OR&L ROW Section

The proposed parkway alignment in this section follows along a former cane haul road. It consists of a thin layer of asphalt over crushed coral with patches of asphalt missing in many places. Along the open, grassy field of the park boundary is a narrow band of weedy vegetation with patches of reddish-colored soil. The weedy vegetation consists of a mixture of swollen fingergrass, buffel grass, green panicgrass (Panicum maximum var. trichoglume), and saltbush. A few scattered koa haole shrubs, 3 to 4 ft. tall, occur here. This area appears to have been graded when the parks playing field was installed.

On the makai side of the cane haul road, koa haole scrub borders the roadside and extends down the slopes into Kalo'i Gulch. Along the roadside, the shrubs are 6 to 10 ft. tall, but become somewhat taller, 10 to 15 ft. tall, within the gulch. Scattered through the koa haole scrub are emergent trees of kiawe and 'opiuma, 20 to 25 ft. tall. Other woody

components include sourbush and castor bean. Buffel grass and Guinea grass form-dense clumps up to 3 ft. tall in most places.

On parts of the gulch slope, there are areas with exposed reddish-colored soil; a number of dirt bike trails also are found within the gulch. These open areas support a weedy mixture of plants which include castor bean, cocklebur (Xanthium strumarium), golden crown-beard, hairy merremia (Merremia aegyptia), spiny amaranth, false mallow, and Jimson weed (Datura strumonium). 'Uhaloa is locally abundant on these exposed areas. Other native species observed in the gulch area are 'ilima and hoary abutilon.

Along the gulch bottom, the vegetation is primarily Guinea grass and buffel grass with scattered koa haole shrubs and young kiawe and 'opiuma. In some places, there are small pools of standing muddy water; California grass (Brachiaria mutica) and primrose willow (Ludwigia octovalvis) are associated with these areas. Parts of the gulch adjacent to the bridge are concrete lined.

RARE PLANTS

The approximate locations of Abutilon menziesii are plotted on Figure 2. Only single plants are found at locations 2 to 5. At location 1, there is a large, multi-stemmed plant about 5 ft. tall; a young, single-stemmed plant about 2.5 ft. tall; and a seedling, 4 inches tall. No Abutilon menziesii was found in the Renton Road to OR&L ROW section.

The plants as well as the area around the plants have been flagged with blue and white stripped flagging. G. Mansker, Division of Forestry and Wildlife, will more accurately map the plants using a GPS unit later on.

No other threatened and endangered species or species of concern (U.S. Fish and Wildlife Service 1999; Wagner et al. 1999) were found during the field studies. The other native species which were observed on the study site are common species which can be found throughout the islands. These are the 'ilima (Sida fallax), 'uhaloa (Waltheria indica), hoary abutilon (Abutilon incanum), popolo (Solanum americanum), and pa'uohi'iaka (Jacquemontia ovalifolia ssp. sandwicensis).

DISCUSSION

The vegetation on the City and County-owned lands are dominated by introduced or alien species such as koa haole, buffel grass, kiawe, swollen fingergrass, etc. For the most part, the proposed Kapolei Parkway alignment follows along an existing paved road. None of the plants found on the property, with the exception of the Abutilon menziesii, is a threatened and endangered species or a species of concern.

The City and County will need to work closely with the other agencies involved in the Habitat Conservation Plan which has been prepared for the endangered Abutilon on the Kapolei site. Plant material from the five locations within the study site will need to be collected for propagation and included in future outplantings.

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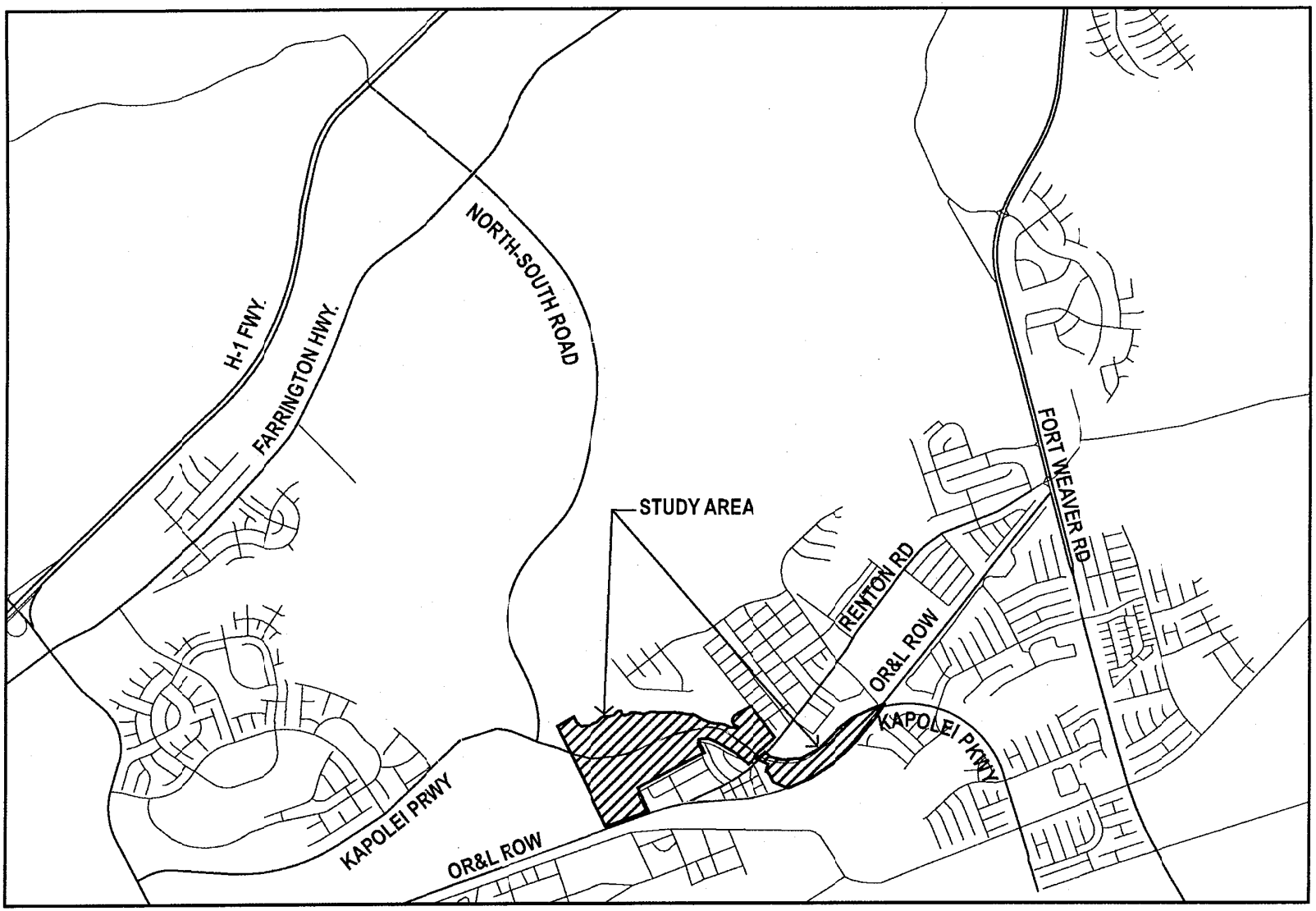


Figure 1
Regional View of Kapolei Parkway Extension Study Area

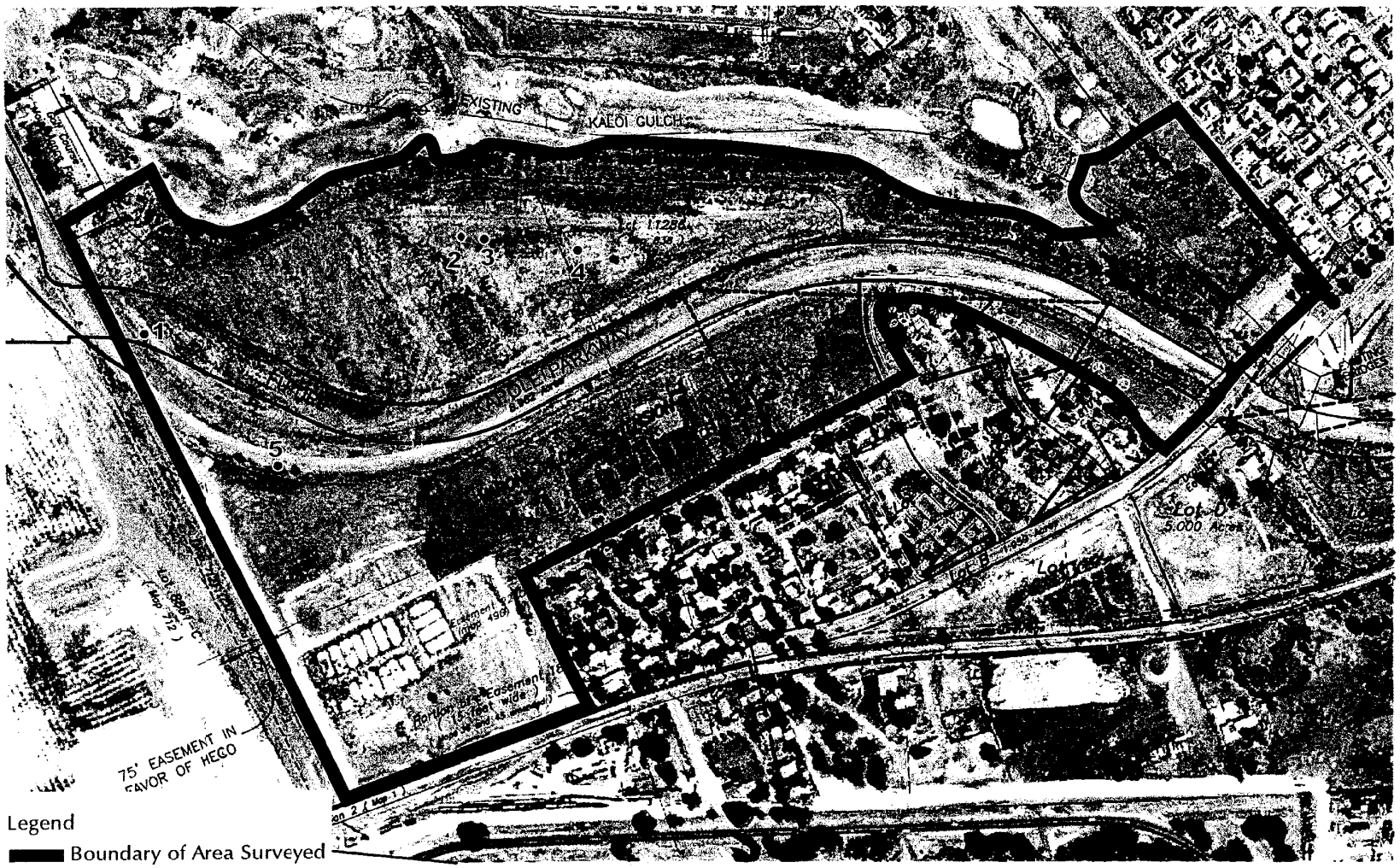


Figure 2
Kapolei Parkway Extension Study Area - North-South Road to Renton Road Section

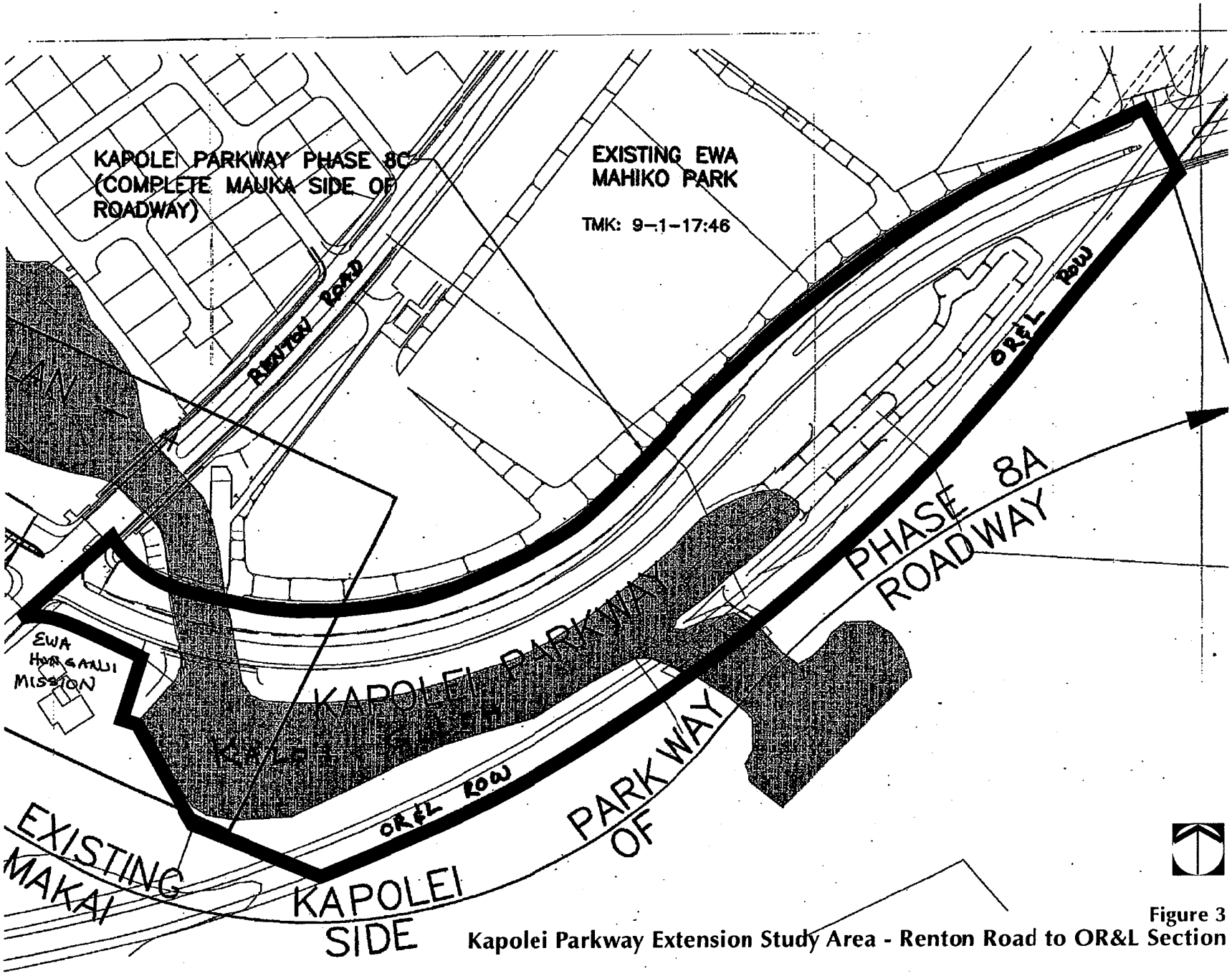


Figure 3
Kapolei Parkway Extension Study Area - Renton Road to OR&L Section

Appendix F

Interim Management Report for Abutilon menziesii (April 24, 2001)

Department of Land and Natural Resources
Division of Forestry and Wildlife
Natural Area Reserve System

Interim Management Report
for
Abutilon menziesii
April 24, 2001

The following is a summary of activities implemented by the Department of Land and Natural Resources (DLNR) under the agreement, East Kapolei –Interim Mitigation Plan for the Endangered species, *Abutilon menziesii,* during the 31-month October 1, 1998 to April 24,2001. This report will summarize the activities completed during each of the 10 quarters during that period. We have not completed all activities set forth in the agreement. The only task that remains is the construction of a greenhouse (Task # 5). This is not a final report. A final report will be submitted when all tasks have been completed.

Task 1: Maintain existing population of Abutilon menziesii on State land at East Kapolei, Oahu, Hawaii. This work will include the following:

1. Monitoring

A total of 76 visits were made to the *Abutilon menziesii* plants at Kapolei between October 1998 and March 2000. Two DLNR staff conducted most of the site visits. The breakdown of the visits per quarter can be found in Table 1 below. Each plant was given a number and a permanent tag. The numbers given to plants followed those assigned during the survey done by Kenneth Nagata in December 1997, where appropriate. New numbers were assigned to plants not located during the Nagata surveys. As part of the monitoring process, four mature plants not found in the original survey were discovered; three are outside the project area near the Ewa golf course maintenance building and one adjacent to population C-1. Therefore the number of original plants in the East Kapolei population was the 86 found during the December 1997 survey by Kenneth Nagata, plus the 4 new plants discovered during the site visits made by DLNR staff during this project, for a grand total of 90 plants. We were successful in propagating clones from 62 of the 90 plants. In the Interim Report of 20 June 2000 we stated that there were 62 remaining plants. Several of these plants have since died due to natural senescence. The number of plants still alive is between 30 and 50. Determining whether an *Abutilon menziesii* is still alive is difficult. The plant may appear to be only dead sticks but a heavy rain will cause the plant to suddenly sprout green leaves. Therefore it is difficult to give a definitive total on the plants still alive in East Kapolei. We have contracted with Hawaii Natural Heritage Program to produce a detailed GIS map of all known *Abutilon menziesii* plants and plant locations. This map will be provided in the final report for this project.

Table 1. Site visits to East Kapolei *Abutilon menziesii* plants

Quarter	Number of Site Visits	Total Person Days
October 1998 - December 1998	13	26
January 1999 - March 1999	6	12
April 1999 - June 1999	7	16
July 1999 - September 1999	8	16
October 1999 – December 1999	7	14
January 2000 March 2000	8	16
April 2000 – June 2000	8	8
July 2000 – September 2000	5	5
October 2000 – December 2000	6	6
January 2001 – March 2001	8	8

2. Maintenance

Plants were watered during each visit and treated six separate times with systemic insecticide to control hibiscus snow scale, ants, and mealy bugs. Vegetation immediately adjacent to each plant was removed during each visit to keep potential fire fuels away from the plant. Plants were not fertilized because of a concern of encouraging soft growth in the wild plants that could not be sustained without the installation of a permanent irrigation system.

3. Security

A fire plan has been implemented for the area that: creates a fire break around the *Abutilon menziesii* populations and individual plants; identifies the fire fighting resources available near the East Kapolei *Abutilon menziesii* population; and provides information to these resources to assist them with protecting these plants from fire. We have contracted the Hawaii Natural Heritage Program to produce a detailed GIS map of all the known *Abutilon menziesii* plants and the key fire resources in the area. This map will be provided to all the Fire Department Stations listed in this fire plan for their reference in case of a fire. This map will be a part of the final report. The TMK for the East Kapolei area where the plants are found is Oahu 9:1:6, parcel 109. The nearest Fire Station to the area is Kapolei Fire Station (Station 40). Station 40 is approximately 2.5 miles from the *Abutilon menziesii* populations.

The potential ignition sources for fires in the East Kapolei area are accidental ignitions from children playing with fire, careless smoking, vehicles in dry flashy fuels, misuse of fireworks, and intentionally set arson fires. Fireworks are prevalent during the New Years and Fourth of July holidays and illegal aerial fireworks are becoming more prevalent during these times. The potential of fireworks as an ignition source in Kapolei is quite high. Illegal motorcycle use of the parcel occurs and is another likely source for fires in the area. To mitigate for the potential for fire we have removed all fuel immediately adjacent to each plant. In late June 2000, we contracted an agricultural disc to create a 30-foot barrier of bare soil around each plant or each cluster of plants. This firebreak is still in place because we have not received any significant rainfall in the area since the establishment of this firebreak.

The fire fighting resources available at Station 40 in Kapolei are an Engine, a Ladder truck, and a Brush Fire truck. A Honolulu Fire Department Battalion Chief is stationed at Station 40. The next closest fire units are at Station 12 in Waipahu. Station 12 has an Engine, a Ladder truck, and a Water Tender. Station 35 in Makakilo is the third closest unit to the area and it has an Engine on site. Station 28 in Makakilo is the fourth closest unit with an Engine and a Water Tender on station. The GIS map we developed shows all the access routes to the main population clusters. This map will be provided the above Fire Stations.

Task 2: Propagate a total representation of plants through seeds and cuttings from the East Kapolei Abutilon menziesii population.

Task 2 of the agreement has been completed. All the known East Kapolei Abutilon menziesii plants have been propagated through cuttings. Figure 1 shows some of the 630 plants we have propagated from cuttings so far. The bullets below detail the propagation work we have done. Table 2 below details the cuttings taken from the East Kapolei *Abutilon menziesii* plants per quarter. Each cutting taken from an East Kapolei plant can be divided into up to six cuttings. We attempt to produce a plant from each cutting but not all are successful. Figure 2 is a photo of many *Abutilon menziesii* plants ready for outplanting.

- A total of 630 plants have been propagated from cuttings of 62 East Kapolei individuals.
- 220 seedlings have been produced from seed. This seed was collected from nursery plants grown from cuttings of the East Kapolei population.
- Research on optimum germination method is ongoing. We are using a heating mat under the seeding tray to speed germination rate. This method has been successful in speeding germination time from 3 to 4 months with regular germination technique to 2 to 3 weeks using this technique.
- We have sent over 800 seeds to Dr. Alvin Yoshinaga at Lyon Arboretum. A percentage of these are sent to the National Seed Storage Lab in Fort Collins, Colorado. These seeds are from nursery plants.
- We have seeds from 39 of the East Kapolei plants in storage at the Pahole Rare plant facility.

Table 2: Cuttings taken of East Kapolei Abutilon menziesii

Quarter	Number of Cuttings Taken
October 1998 - December 1998	120
January 1999 - March 1999	200
April 1999 - June 1999	70
July 1999 - September 1999	30
October 1999 – December 1999	36
January 2000 – March 2000	28
April 2000 – June 2000	40
July 2000 – September 2000	0
October 2000 – December 2000	0
January 2001 – March 2001	70

Figure 1: *Abutilon menziesii* cuttings

Figure 2: Plants grown from cuttings ready for outplanting

Task 3: Establish two wild populations of Abutilon menziesii in appropriate habitat

Two outplanting sites have been identified as the initial sites for the establishment of new wild populations of *Abutilon menziesii*. The first site is on unencumbered State land on the Mokuleia side of Kaena Point and the second is on City and County of Honolulu land in Koko Crater.

The first ouplanting site is located at the Koko Crater Botanical Garden. The Honolulu Botanical Gardens provided a 100 x 100 foot site set aside for the plant for the initial planting. On 16 November 2001, 140 *Abutilon menziesii* were planted at the site provided. These plants represent 2 complete sets of each of the original East Kapolei plants. The planting was accomplished with Honolulu Botanical gardens staff, DLNR staff, and several volunteers. The plants have been irrigated with a drip irrigation system and are thriving. Koko Crater Botanical Gardens staff will provide the long term care of these plants and will be propagating *Abutilon menziesii* from materials taken from these plants.

The Kaena Point outplanting site was initiated in April 2001. The outplanting area is about ¼ mile to the west of the site identified in the June 20, 2000 report. The approximately 3-acre outplanting site was established with two distinct planting areas separated by a four-wheel drive road. The site is completely protected from four-wheel drive vehicles by a rock barrier along the dirt road fronting the outplanting site. We prepared the site by clearing the non-native brush and grass with weedeaters and with hand tools. We treated the area with herbicide to prevent regrowth of these non-natives. A total of 61 *Abutilon menziesii* plants were planted by 6 April 2001. We will be planting more plants in the Kaena Point outplanting site by the end of May 2001. When planting is complete we will have two representatives of each of the 62 East Kapolei plants we have propagated. We also planted over 300 other native coastal plants of 20 different species in this site.

A complete irrigation system was constructed at the Kaena Point outplanting site to provide the initial irrigation for these plants. The DLNR received permission from the U. S. Air Force to tap into the 4-inch water main that runs adjacent to the outplanting site. We contracted a plumber to tap into the line and provide a pressure reducing valve, a backflow preventer, a water meter, and a 1-½ inch stub to attach our irrigation system to. We also installed a valve to supply water for fire suppression in the area. We constructed a corrugated galvanized steel water tank with a capacity of approximately 3,000 gallons to provide a water reserve for irrigating the plants. This tank is necessary because the 4-inch water main is pressurized only two days a week for 4 hours per day. The cost of the irrigation water will be an ongoing expense for this project. We consulted with DLNR Historic Preservation Division and they declared that the construction of the outplanting site would have no effect on significant historical sites. We checked with the City and County about the need for a Special Management Area permit. They confirmed that this site is within the Special Management Area. However, the work of developing the outplanting site did not require a permit because was not considered development.

Each outplanting site was planted with a representative sub-sample of the wild plants from East Kapolei and each individual plant will be tagged with permanent metal tags. Maintenance of these sites will be done during the establishment of these plants via weeding, application of herbicide, pesticide, and fertilizer.

As part of the national program to preserve rare species, replicates of all wild individuals will be planted in the living collections at Waimea Arboretum. It is hoped that this will provide seeds for further out plantings and for distribution. We have not done this yet because of the current staffing levels at the Waimea Arboretum

When the above sites are established we will consider other outplanting sites including:

- U. S. Navy land in Lualualei
- Barbers Point
- Kaena Iki/Yokohama Bay
- Diamond Head Crater
- Makapu'u/Queen's Beach
- A current outplanting site on State land near Kealia Trail

Task 4: Research into the biology of the Abutilon menziesii population.

1. *Document Past Research*

The University of Hawaii has not yet been contracted to document past research on the *Abutilon menziesii* population.

2. *Testing*

a) Test granular diazinon for use in controlling ants.

This was done on all plants and it is a very effective treatment in controlling ants.

b) Test Azatin and encapsulated Dursban on a few plants to determine toxicity.

These pesticides provide good control of scale and mealy bugs with no toxicity to *Abutilon.* The first trial was conducted on 6 plants in October 1998. The treatment was shown to be effective in this trial and about one month later the treatment was done on the remaining East Kapolei plants.

c) Test seed storage in appropriate facilities

Seeds have been collected from 39 individual East Kapolei plants and are being stored at the DLNR rare plant seed storage facility. Approximately 700 seeds have been collected from the East Kapolei plants. We have collected over 1,000 seeds from nursery plants grown from cuttings. We provided over 800 seeds to Dr. Alvin Yoshinaga at Lyon Arboretum for seed storage research. Some of these seeds have been sent to the National Seed Storage Lab in Fort Collins, Colorado for long term storage.

We will continue to work on finding the most effective germination technique for *Abutilon menziesii* seeds.

Task 5: Provide partial funding for the construction of a low-elevation greenhouse dedicated to growing A. menziesii and other threatened and endangered plant species on Oahu.

We have been working on getting a site for a nursery for *Abutilon menziesii* that is near the outplanting site and the DLNR rare plant nursery. The preferred site for the low-elevation nursery facility was identified behind Dillingham airfield. We had discussions with the Department of Transportation over a 6-month period and eventually were told that they were unable to lease any portion of the airfield for a use not associated with aviation.

The second site we identified for the nursery is on a portion of land owned by DLNR and leased by YMCA Camp Erdman. This six-acre site is immediately adjacent to the Camp on the Kaena Point side makai of Farrington Highway. YMCA Camp Erdman indicated keen interest in cooperating in the placement of this nursery here. This site is attractive because it is close to a

water and power source. Camp Erdman offers the benefits of 24-hour security and the potential as an educational outreach site for rare native plants. This site is considered a backup site because of the amount of work involved in removing the many iron wood trees on the site. The other negatives are that because the site is so close to the ocean the nursery would receive heavy salt spray and would be threatened by salt water during periods of high surf.

The primary site identified for the nursery is on land owned by the State of Hawaii, and leased to Mr. Ron Weidenbeck of Fish Farms Hawaii. The parcel is located in Lot 3 of TMK 6: 9: 01. Mr. Weidenbeck has approved DLNR removing a portion of Lot 3 to establish a nursery. The advantages of this site are: within a hundred yards of a water source; within a hundred yards of a power source; within a 8 foot high chain link perimeter fence; located away from the direct influence of the waves and salt spray; and above a planned caretakers cabin which will provide oversight of the area. We are currently working with Ms. Charlene Unoki of the Division of Land Management, DLNR to convert the lease of this parcel to the Division of Forestry and Wildlife from Mr. Weidenbeck. We expect to complete the transfer of this property and begin construction soon. We will submit the final report for the Housing and Community Development Corporation of Hawaii when we have completed the construction of this greenhouse.

Appendix G
Final Interim Management Report
for Abutilon menziesii
(October 31, 2003)

Department of Land and Natural Resources
Division of Forestry and Wildlife
Natural Area Reserves System

Final Interim Management Report
for
Abutilon menziesii
Actions completed by the Division of Forestry and Wildlife
October 31, 2003

The following is a summary of activities implemented by the Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW), for the Endangered species, *Abutilon menziesii,* during the 30-month period from April 24, 2001 to October 31, 2003. This is a final report on the interim management activities completed by DOFAW. The Habitat Conservation Plan (HCP) for *Abutilon menziesii* is nearly complete. The Board of Land and Natural Resources must approve the HCP before the plan is considered complete. All future reporting on the management of *Abutilon menziesii* will be done in relation to the HCP.

Project Background

The East Kapolei *Abutilon menziesii* population was discovered in 1996 by Kenneth Nagata during a biological survey conducted for PBR Hawaii, a consulting firm hired by the State of Hawaii agency then known as the Housing Finance and Development Corporation. This survey was done for the East Kapolei Master Plan project that proposed a mixture of residential and community development projects for the area. The East Kapolei area was in sugar cane cultivation for over a century when agricultural operations ceased in spring 1995. The State of Hawaii, Department of Transportation, and the City and County of Honolulu, Department of Transportation Services commissioned another botanical survey by Char and Associates, Botanical Associates, for a proposed highway. The corridor of this proposed highway, known as the North-South Road, passes directly through a significant portion of the East Kapolei Abutilon *menziesii* population. These surveys are documented in previous versions of the East Kapolei Master Plan Habitat Conservation Plan for *Abutilon menziesii.*

In 1999, the State of Hawaii, Housing Finance and Development Corporation, which had changed its' name to the Housing and Community Development Corporation of Hawaii (HCDCH), entered into an agreement with the DLNR/DOFAW for the interim mitigation of the East Kapolei *Abutilon menziesii* population. This agreement (found in Appendix A), which was signed September 15, 1999, was to cover tasks that DLNR/DOFAW completed from October 1, 1998 to March 31, 2000. This agreement was to provide $67,850.00 to complete 5 main tasks in relation to the protection of the East Kapolei *Abutilon menziesii* population and the conservation of the species. The main tasks were: 1) Maintain existing population of *Abutilon menziesii* on State land at East Kapolei, Oahu, Hawaii; 2) Propagate a total representation of plants through seeds and cuttings from the East Kapolei *Abutilon menziesii* population; 3) Establish two wild populations of *Abutilon menziesii* in appropriate habitat; 4) Research into the biology of the *Abutilon menziesii* population; 5) Provide partial funding for the construction of a low-elevation greenhouse dedicated to growing *Abutilon menziesii* and other threatened and endangered plant species on Oahu. A report entitled, Interim Management Report for *Abutilon menziesii,* dated April 24, 2001 documented the work done by DLNR/DOFAW from October 1, 1998 until the report date. DLNR/DOFAW was paid $40,125 for the work accomplishments documented in that

report. All phases of tasks 1, 2, and 4 were accomplished during that period. We were unable to complete all phases of tasks 3 and 5 of the original agreement. We were unable to complete task 3, the establishment of two wild populations of *Abutilon menziesii,* because we had difficulty finding landowners who had suitable habitat and were willing to allow a new population of endangered plant species to be established on their land. The difficulty we had in completing task 5, the establishment of a low-elevation greenhouse, was finding a suitable parcel of State owned land where building a nursery was feasible with a small budget.

A second agreement between HCDCH and DLNR/DOFAW was signed on January 30, 2001 (see Appendix B). This agreement was signed to complete the actions that were not fully completed in the first agreement. This agreement covered actions to complete the establishment of two wild populations, construction of a greenhouse, and the completion of a final report. In this agreement DLNR/DOFAW was to complete the remaining tasks during the period from November 1, 2000 to October 31, 2001. DLNR/DOFAW continued to work through the problems associated with completion of the tasks identified in the second agreement. However, we were not able to complete them all by October 31, 2001. In October 2001, HCDCH was no longer seeking to complete the East Kapolei Master Plan and the agreement was not extended. DLNR/DOFAW did not receive the $27,725.00 that was set aside to complete the tasks in this second agreement. This report will document the completion of all tasks completed by DLNR/DOFAW since April 24, 2001 that were identified in the original agreement. DLNR/DOFAW staff used a variety of funding sources to complete the second outplanting site and complete the nursery. The HCDCH only paid about 60% of the $67,850.00 they had originally pledged to complete the mitigation measures for the conservation of *Abutilon menziesii.*

The North/South Road project of the State of Hawaii, Department of Transportation (DOT), and the City and County of Honolulu, Department of Transportation Services, has become the lead project in the development of the HCP for the East Kapolei population of *Abutilon menziesii.* The DOT has set aside funds to continue work on the conservation of *Abutilon menziesii* until the HCP is finalized, and beyond. These funds have paid for part of the salary of a Horticulturist working for DLNR/DOFAW to work on the completion of the tasks mentioned above. That Horticulturist was hired in March 2001 and he continues to work on the conservation of *Abutilon menziesii*. The DOT funds have also been used to complete the nursery and support tasks related to the conservation of this species.

ACCOMPLISHMENT OF TASKS

Task 1: Maintain existing population of Abutilon menziesii on State land at East Kapolei, Oahu, Hawaii. This work will include the following:

1.Monitoring

A total of 30 visits were made to the *Abutilon menziesii* plants at Kapolei between April 2001 and October 2003. The Horticulturist DLNR/DOFAW hired to work on *Abutilon menziesii* did all the monitoring. The Horticulturist visited the East Kapolei population once a month, or three times per quarter. Each plant has been given a number and a permanent tag. The numbers given to plants followed those assigned during the survey done by Kenneth Nagata in December 1997, where appropriate. The total number of *Abutilon menziesii* at the time of the last report was 90. The DOFAW Horticulturist has found 16 new *Abutilon menziesii* plants in the East Kapolei area since the last report. New numbers were assigned to plants. We have not taken any cuttings from any of these plants. The plants are still too small to be able to withstand the stress of cuttings being

taken from them. One of the 16 new plants has produced seed. That seed has been collected and stored.

The East Kapolei area has been in drought conditions since April 2001. In the spring of 2002, the area did receive a few significant rains. In surveys done at East Kapolei by DLNR/DOFAW in March through May 2002 many *Abutilon* seedlings were found. The Horticulturist decided that the survival of these seedlings was more likely if they were transplanted when they were still small. A total of 31 seedlings from the East Kapolei population were dug up and transplanted in the nearby outplanting site at the Honouliuli Unit of the Pearl Harbor National Wildlife Refuge. 21 seedlings of known parentage and 10 seedlings of unknown parentage that were removed from the East Kapolei population have been planted there. A small portion of the seedlings produced at the East Kapolei population (approximately 10%) during the spring of 2002 were left at East Kapolei and subsequently perished.

In the time since April 24, 2001, several of the original 86 plants have died due to natural senescence. The number of plants still alive is between 25 and 40. Determining whether an *Abutilon menziesii* is still alive is difficult. The plant may appear to be only dead sticks but a heavy rain will cause the plant to suddenly sprout green leaves. Therefore it is difficult to give a definitive total on the plants still alive in East Kapolei. In Appendix C, we have a map with all the *Abutilon menziesii* plants and plant locations noted in relation to existing infrastructure and boundaries. In Appendix D, we provide a map with all known *Abutilon menziesii* plant locations, existing infrastructure, and boundaries overlaid on an aerial photo from PBR Hawaii that was in HCDCH HCP.

2. Maintenance

Irrigation was provided to the 16 new plants to enhance their establishment. A small amount of fertilizer was given to all the live plants. Weeding was done around the base of all plants, including the plants that have died, to discourage the deposition of weed seeds around the mother plant and to reduce competition from weedy species

3. Security

A fire plan has been implemented for the area that created a fire break around the *Abutilon menziesii* populations and individual plants; identifies the fire fighting resources available near the East Kapolei population; and provides information to these resources to assist them with protecting these plants from fire. We have contracted the Hawaii Natural Heritage Program to produce a detailed GIS map of all the known plants and the key fire resources in the area. This map (in Appendix C) will be provided to all the Fire Department Stations listed below for their reference in case of a fire. The TMK for the East Kapolei area where the plants are found is Oahu 9:1:6, parcel 109.

The potential ignition sources for fires in the East Kapolei area are accidental ignitions from children playing with fire, careless smoking, vehicles in dry flashy fuels, misuse of fireworks, and intentionally set arson fires. Fireworks are prevalent during the New Years and Fourth of July holidays and illegal aerial fireworks are becoming more prevalent during these times. The potential of fireworks as an ignition source in Kapolei is quite high. Illegal motorcycle use of the parcel occurs and is another likely source for fires in the area. In late June 2000, we contracted an agricultural disc to create a 30-foot barrier of bare soil around each plant or each cluster of plants. We have not had any significant heavy rains since then to increase the fuel near the plants. Currently this firebreak is still in place. This method of firebreak creation may be more detrimental

than beneficial to the East Kapolei population. The use of the agricultural disc can disturb seeds in the soil bank around the existing plants, which could be detrimental to their germination.

At this time (October 2003) the fuel in the entire project area is light and discontinuous. It is highly unlikely a brush fire could be sustained in the East Kapolei *Abutilon menziesii* population area at this time. The area should be monitored regularly because an extended period of above average rainfall could increase fuel levels sufficiently to present a fire threat.

The nearest Fire Station to the area is Kapolei Fire Station (Station 40). Station 40 is approximately 2.5 miles from the *Abutilon menziesii* populations. The fire fighting resources available at Station 40 in Kapolei are an Engine, a Ladder truck, and a Brush Fire truck. A Honolulu Fire Department Battalion Chief is stationed at Station 40. The next closest fire units are at Station 12 in Waipahu. Station 12 has an Engine, a Ladder truck, and a Water Tender. Station 35 in Makakilo is the third closest unit to the area and it has an Engine on site. Station 28 in Makakilo is the fourth closest unit with an Engine and a Water Tender on station. The GIS map shown in Appendix C shows all the access routes to the main population clusters. This map will be provided the above Fire Stations.

Task 2:Propagate a total representation of plants through seeds and cuttings from the East Kapolei Abutilon menziesii population.

Task 2 was completed before April 24, 2001. The 16 plants discovered since that time have not been propagated from cuttings. These plants are still to small to sustain cuttings being taken from them.

We have not propagated any new plants from seed since April 24, 2001. We have continued to collect seed from the East Kapolei population. There are 52 plants from the East Kapolei population represented in the seed collection at the Lyon arboretum seed storage facility. This total includes seeds from one of the 16 new plants discovered since April 24, 2003.

Task 3: Establish two wild populations of Abutilon menziesii in appropriate habitat

The Interim management report of April 24, 2001 identified two outplanting sites that were the initial sites for the establishment of new wild populations of *Abutilon menziesii.* The first site is on City and County of Honolulu land in Koko Crater and the second is on State land on the Mokuleia side of Kaena Point. Since that report we have completed a third ouplanting site at the Honoululi Unit of the U. S. Fish and Wildlife Service Pearl Harbor National Wildlife Refuge.

1. Koko Crater

The first ouplanting site is located at the Koko Crater Botanical Garden. The Honolulu Botanical Gardens provided a 100 x 100 foot site set aside for the plant for the initial planting. On 16 November 2001, 140 *Abutilon menziesii* were planted at the site provided. The planting was accomplished with Honolulu Botanical gardens staff, DLNR staff, and several volunteers. The plants have been irrigated with a drip irrigation system since then and are thriving. Koko Crater Botanical Gardens staff will provide the long term care of these plants and will be propagating *Abutilon menziesii* from materials taken from these plants. DLNR has provided support to weed the Koko Crater population on periodic visits to the site. This site met the criteria for the establishment of wild

populations under the first interim mitigation plan agreement between HCDCH and DLNR/DOFAW when it was initially established. However, since the establishment of this site, we have received comments from the Endangered Species Recovery Committee and others. These comments have caused DLNR/DOFAW to reconsider the appropriateness of this population to be considered a wild population. DLNR/DOFAW agrees that since this site is within a public display garden that it should not be considered as a wild population for the purposes of the Habitat Conservation Plan. In addition, the plants at Koko Crater have been on drip irrigation since they were planted. This has caused the plants to grow taller and have more luxuriant growth than they would in a truly wild population. DLNR/DOFAW views this population as a living collection representation of the genetic stock of the East Kapolei *Abutilon menziesii* population. DLNR/DOFAW will work with the staff at Koko Crater Botanical Gardens to coordinate the management of this population.

2. Kaena Point

The Kaena Point outplanting site was started in April 2001. The outplanting area is about ½ the distance between the end of the paved Farrington Highway and the vehicle barrier at the entrance to the Kaena Point Natural Area Reserve. The land is under the jurisdiction of the DLNR, Division of State Parks (TMK 6:9:01, Parcel 4). The DLNR Historic Preservation Division declared that the construction of the outplanting site would have no effect on significant historical sites. The City and County of Honolulu Planning Section confirmed that this site is within the Special Management Area. However, the work of developing the outplanting site did not require a permit because was not considered development.

The approximately 3-acre outplanting site was established with two distinct planting areas separated by a four-wheel drive road. The site is completely protected from four-wheel drive vehicles by a rock barrier along the dirt road fronting the outplanting site. The initial cost of installing this barrier was nearly $4,000. This barrier has been challenged by off-road vehicles occasionally and we have improved the barrier in areas where vehicles have attempted to breech the barrier. We prepared the site by clearing the non-native brush and grass with weedeaters and with hand tools. We treated the area with herbicide to prevent regrowth of these non-natives. A total of 61 *Abutilon menziesii* plants were planted by 6 April 2001. We have planted 81 additional plants since April 2001. A total of 142 *Abutilon menziesii* plants have been planted in the Kaena Point outplanting site. The plants were irrigated at the site to promote their establishment. The approach we plan to take at this site is to irrigate the plants to encourage the production of a maximum amount of seed to allow the build up of the seed bank and natural establishment of seedlings. The survival rate for plants at this site has been 98%. The 142 plants at this site represent a total of 44 of the original East Kapolei plants. Two *Abutilon* seedlings have grown naturally from seed produced by plants outplanted at this site. These seedlings have grown large enough to be considered part of this population.

A complete irrigation system was constructed at the Kaena Point outplanting site to provide the initial irrigation for these plants. The DLNR received permission from the U. S. Air Force to tap into the 4-inch water main that runs adjacent to the outplanting site. We contracted a plumber to tap into the line and provide a pressure reducing valve, a backflow preventer, a water meter, and a 1-½ inch stub to attach our irrigation system to. We also installed a valve to supply water for fire suppression in the area. We constructed a corrugated galvanized steel water tank with a capacity of approximately 3,000 gallons to provide a water reserve for irrigating the plants. This tank is necessary because the 4-

inch water main is pressurized only two days a week for 4 hours per day. The cost of the installation of this irrigation system was nearly $12,000 to complete these tasks.

The Kaena Point outplanting site has been a difficult one to maintain. This site was established in area with deep soil that was dominated by Guinea grass (*Panicum maximum*) and koa haole (*Leucaena leucocephala*). We have had difficulty keeping up with the weed threat presented by these species and others at this outplanting site. DLNR/DOFAW has used a variety of labor including regular Natural Area Reserves System employees; temporary workers such as the Emergency Environmental Workforce; and volunteers to control weeds in the outplanting site. This additional labor has barely allowed us to keep pace with the weed threat at this site. The money provided under the HCDCH agreement was used to establish the irrigation system at this site and pay a portion of the first year of the salary for the Horticulturist assigned to work on all the activities concerning the conservation and recovery of *Abutilon menziesii*. Money provided by the State of Hawaii DOT has continued to support this position since 2001. This Horticulturist position has spent the majority of his time working on construction of the nursery dedicated to growing *Abutilon menziesii*. We would not have been able to keep up with the weed threat at this site without the additional labor supplied by regular DLNR/DOFAW employees. We will not be able to continue to support the weed threat control at this site at this level. This is due to other important projects taking precedence and a hiring freeze that has left the Oahu Branch with three vacant positions. It will be very difficult for the Horticulturist to keep up with the weed threat at this outplanting site.

The other major threat to this outplanting site is fire. The fire plan that has been in place at this site is the installation of the water tank that serves as a resource for fire fighting in addition to being part of the irrigation system, installation of a 2 inch outlet to allow fire engine hookup near the road as another fire fighting resource, and the planting of native plants along the perimeter of the outplanting site to serve as a fuel break. These tasks were accomplished. However, the fuel break portion of this fire plan needs to be developed further with a wider buffer of fire resistant species established.

On August 20, a brush fire started by a vehicle about ¾ mile away burned a total of 160 acres along the coastal flats up to the nearby Kuaokala Game Management Area at about 1,100 feet elevation. This fire started late at night and was fanned by winds of 25 to 35 mph. The fire burned to the edge of the outplanting site and around it. The fire moved so quickly that Honolulu Fire Department engine companies were not able to engage the fire near the ignition point, or near the outplanting site. They did fight the fire to prevent its' spread in the Kuaokala GMA on August 21. The fire burned approximately 30 percent of the 3-acre outplanting site. The effects of the fire on the *Abutilon menziesii* plants at the site are unknown at this time. We will not know how many were killed by the fire until the rainy season commences and there is sufficient moisture for growth. The plants along the edge were affected by the flames but not completely consumed. It is possible that many of these *Abutilon menziesii* plants will survive. The fire did burn many of the other native species planted in the area to serve as a fuel break along the front of the outplanting site. This fire would of caused more damage if these plants had not been in place. These fuel break plants will need to be replaced. The fire did destroy all irrigation pipes in the area. The cost to replace this pipe will be about $3,000. The lesson that DLNR/DOFAW has learned from this experience is that the fuel break plantings are the most useful part of the fire plan. The fuel break at the Kaena Point outplanting site needs to be replaced and improved to encompass the entire outplanting site.

The HCP should set aside enough funds to cover the full costs of developing and maintaining an outplanting site. The money provided under the agreement with HCDCH provided funds to install the vehicle barrier and the irrigation system, and provided some funds towards the first year of the Horticulturists' salary. The total cost to establish this outplanting site was more than $20,000. This does not include the cost of staff time of DLNR/DOFAW employees. The cost would have been significantly higher if the site was further from a water source.

The initial establishment of outplanting sites will be the most expensive phase of the project. Future outplanting sites should be chosen with that in mind. Several important factors need to be considered when developing an outplanting site for wild *Abutilon menziesii* populations: 1) The site should have a water source or irrigation method identified and accounted for in the budget; 2) It is important that the weed threat at the site is manageable with limited staffing or, if that is not possible, the work force and the resources necessary to combat the weed threat should be identified up front; 3) The fire threat to the site should be addressed with fuel break plantings; 4) The site must not be too remote as to require significant travel time and effort to get personnel and tools and equipment there; 5) The protection of the site from human impact needs to be considered and addressed in the establishment of the site. The HCP should front load the first few years of the budget to address the costs associated with initial development of outplanting sites.

3. Honouliuli Unit of Pearl Harbor National Wildlife Refuge

A third outplanting site has been developed at the Honouliuli Unit of the U. S. Fish and Wildlife Service Pearl Harbor National Wildlife Refuge that borders the West Loch of Pearl Harbor (TMK 9:1:17). This 37-acre unit is mostly a fresh water wetland managed for a variety of endangered water birds. The entire Honouliuli Unit is enclosed in an eight-foot chain link fence that provides predator control for the birds and security for the plants. There is an upland area within this Unit that we felt was suitable for planting *Abutilon menziesii*. We installed an irrigation system at the site to assist with the initial establishment of plants there at a cost of approximately $2,500.

We have planted a total of 61 *Abutilon menziesii* plants at the Honouliuli Unit. The survival rate of the plants outplanted there is 96%. Plants from cuttings from 21 of the original East Kapolei plants are planted here. In addition, 21 seedlings of known parentage and 10 seedlings of unknown parentage that were removed from the East Kapolei population in the spring of 2002 have been planted here. A small portion of the seedlings produced at the East Kapolei population (approximately 10%) during the spring of 2002 were left at East Kapolei and subsequently perished. Three plants produced from seed were also planted at Honouliuli. The amount area covered by this outplanting site is approximately ½ an acre. There is sufficient area to add many more plants to this site.

The threat to this outplanting site from fire is minimal. The eight-foot chain link fence provides a barrier to most of the possible ignition sources. A buffer of approximately 6 feet of bare ground is in place just inside most of the perimeter fence of this unit to serve as a barrier to predators of the endangered water birds. This buffer strip also serves as a firebreak to the outplanting site. The portion of the fence that doesn't have this buffer has fresh water marsh just inside the fence. The only fire plan we have for this site is to make sure this buffer strip remains in place.

Task 4: Research into the biology of the Abutilon menziesii population.

No further research activities have been conducted on the biology of the *Abutilon menziesii* population. We have continued to collect seed produced by 52 of the original East Kapolei plants. Over 20,000 seeds have been collected.

Task 5: Provide partial funding for the construction of a low-elevation greenhouse dedicated to growing A. menziesii and other threatened and endangered plant species on Oahu.

We have completed the construction of a 6,000 square foot nursery dedicated to the propagation of *Abutilon menziesii* and other threatened and endangered plant species on Oahu. The nursery is located above the Kaena Point end of Dillingham Air Field on the North Shore of Oahu. The nursery is located is located in Parcel 3 of TMK 6: 9: 01. This parcel is owned by the State of Hawaii, managed by the Land Division of the DLNR, and was leased to Mr. Ron Weidenbeck of Fish Farms Hawaii. We are still in the process of getting the parcel under the jurisdiction of DLNR/DOFAW. There have been issues related to some of the other parcels leased to Mr. Weidenbeck in the area that have slowed this process.

This task has been the most difficult one to complete. The most difficult phase was locating suitable parcel of State owned land where building a nursery was feasible with a small budget. We looked at sites on DOT land closer to the Dillingham Airfield and a parcel near Camp Erdman in addition to others. The selection of a nursery site was not complete until October 2001. The site needed a significant amount of groundwork before it was usable as a nursery. The leveling of the site included hauling 300 tons of rock to the site. We finally completed the groundwork in March 2002. The next difficulty was developing construction specifications and getting bids for the construction of the main part of the nursery. This phase took from April 2002 until June 2002. We completed the construction of the main part of the nursery in the fall of 2002. Once the construction of the nursery was complete we installed the shade cloth with the help of DLNR/DOFAW staff and volunteers. The next to the last phase of the project was the completion of the electrical hook up which included the installation of a new power pole, electrical meter, and safety switch. We also had to wire the pumps for the water system, provide power in the nursery for lights, and outfit the storage containers we had moved to the site with lights and power outlets. The final phase of the nursery project was the installation of a water system. This phase required obtaining permission to tap into a line at a nearby concrete reservoir tank, the installation of a 10,000 gallon storage tank, installation of a 1,000 gallon booster tank, installation of pumps to lift water to the upper storage tank and pressurize the nursery supply lines, and installation of the irrigation system within the nursery. These final two phases were completed by the end of August 2003.

The original agreement with HCDCH set a budget of $10,000 to contribute towards the construction of a nursery dedicated to growing *Abutilon menziesii*. The total cost for completing all phases of this nursery was over $68,000.00. We utilized a variety of funding sources to complete the nursery. We utilized $13,189.53 of the funds set aside by DOT for *Abutilon menziesii* during the nursery construction phase of the project. The nursery alone cost more than the entire amount originally budgeted to complete all tasks in the first Interim Mitigation plan for the Endangered Species, *Abutilon menziesii*, between DLNR/DOFAW and HCDCH. The Horticulturist hired with a majority of his salary coming from DOT funds has spent 80% of his work time since October 2001 working on completion of this nursery. The monetary value of his time is not included in the total listed above.

APPENDIX A

BENJAMIN J. CAYETANO
GOVERNOR

DONALD K.W. LAU
EXECUTIVE DIRECTOR

SHARYN L. MIYASHIRO
EXECUTIVE ASSISTANT

FAX: (808) 587-0600

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT AND TOURISM
HOUSING AND COMMUNITY DEVELOPMENT CORPORATION OF HAWAII
677 QUEEN STREET, SUITE 300
Honolulu, Hawaii 96813

TO: Department of Land and Natural Resources
Division of Forestry and Wildlife
Oahu Branch

DATE: September 16, 1999
ATTENTION: Randy Kennedy

RE: East Kapolei – Interim Mitigation Plan for the Endangered Species, Abutilon Menziesii

WE ARE SENDING YOU X ATTACHED
____ UNDER SEPARATE COVER VIA _____ THE FOLLOWING ITEMS

COPIES	DATE	NO.	DESCRIPTION
1	9/15/99		Executed Agreement for the East Kapolei interim mitigation plan

THESE ARE TRANSMITTED as checked below:

____ For approval
X For your use
____ As requested/required
____ For review and comment
____ FOR BIDS DUE _____ ,

____ Approved as submitted
____ Approved as noted
____ Returned for corrections

____ Resubmit
____ Submit
____ Return

____ copies for approval
____ copies for distribution
____ corrected prints

REMARKS: _____

IF THERE ARE ANY QUESTIONS, PLEASE CONTACT: Leo Domingo TELEPHONE NO. 587-3170

SIGNED: _____
Project Coordinator

COPY TO: _____

IF ENCLOSURES ARE NOT AS NOTED, KINDLY NOTIFY US AT ONCE.

DHS 4308/ (8/87)

AGREEMENT

THIS AGREEMENT is made this 15th day of September, 1999, by and between the HOUSING AND COMMUNITY DEVELOPMENT CORPORATION OF HAWAII ("HCDCH"), a public body and body corporate and politic of the State of Hawaii, whose post office address and principal place of business is 677 Queen Street, Suite 300, Honolulu, Hawaii 96813, and the DEPARTMENT OF LAND AND NATURAL RESOURCES ("DLNR"), State of Hawaii, whose address is 1151 Punchbowl Street, Honolulu, Hawaii 96813, and

WHEREAS, the Department of Land and Natural Resources (DLNR), has title to that certain real property situated at Honouliiuli, Ewa, Oahu, Hawaii, containing an area of 1,300.000 acres, and identified as tax map keys: 9-1-016:008, 9-1-016:108, 9-1-016:109, 9-1-017:086, 9-1-017:071, 9-1-018:003, and 9-1-018:005 (collectively referred to as "East Kapolei State Land Bank,") and

WHEREAS, DLNR is in the process of transferring title of the East Kapolei State Land Bank to HCDCH for development purposes in order to satisfy legislative and administrative goals and objectives, specifically to generate funds for the University of Hawaii West Oahu Campus, to facilitate the development of private sector housing units, and to provide off-site infrastructure for the 200-acre site to be transferred to the Department of Hawaiian Home Lands, and

WHEREAS, HCDCH is the designated master plan developer for the East Kapolei Master Planned Development Project, which encompasses the East Kapolei State Land Bank, and

WHEREAS, HCDCH has filed a Final Environmental Impact Statement (FEIS) for the East Kapolei State Land Bank. The FEIS was accepted by the Governor of the State of Hawaii on September 23, 1998, conditioned upon satisfying the requirements of Chapter 343, Hawaii Revised Statutes, and specifically to implement the Habitat Conservation Plan for the endangered abutilon menziesii in accordance with the requirements of the U.S. Fish and Wildlife Service and the State Department of Land and Natural Resources;

WHEREAS, DLNR has the capability of performing the plant mitigation and has the knowledge and expertise to administer the mitigation of the endangered Abutilon Menziesii, and is willing to provide services for the interim mitigation of the endangered Abutilon Menziesii,

NOW THEREFORE, in consideration of the premises above, the parties mutually agree as follows:

1. DLNR shall perform the tasks set forth in "Exhibit A", attached hereto and incorporated herein. DLNR shall provide reasonable safeguards to secure the existence of the endangered Abutilon Menziesii, to maintain the existing plant population, to establish a new "wild" population, and to perform research into the biology of the endangered Abutilon Menziesii.

2. HCDCH will pay to DLNR the total sum of $67,860.00 as set forth in "Exhibit B", attached hereto and incorporated herein. Quarterly payments will be made upon submission of written quarterly reports of progress to HCDCH.

3. DLNR will perform the tasks during an 18-month period, beginning from October 1, 1998 and ending on March 31, 2000.

4. This Agreement shall be null and void if the Habitat Conservation Plan is not approved by DLNR.

5. This Agreement may be terminated at any time by written consent of both parties.

IN WITNESS WHEREOF, the undersigned have executed these presents as of the day and year first written above.

APPROVED AS TO FORM:

Deputy Attorney General

HOUSING AND COMMUNITY DEVELOPMENT CORPORATION OF HAWAII

Donald K. W. Lau
Its Executive Director

DEPARTMENT OF LAND AND NATURAL RESOURCES

Timothy E. Johns, Chairperson
Board of Land and Natural Resources

Exhibit "A"

SCOPE OF SERVICES

A. Task 1

Maintain existing population of Abutilon Menziesii on State lands at East Kapolei, Oahu, Hawaii. This work will include the following:

1. Monitoring

   a. Place permanent stakes for sequence shots.
   b. Record GPS data in notebook and on video soundtrack.
   c. Create a new map with GPS points using GIS.

2. Maintenance

   Maintain existing population by weeding, and applying herbicide, pesticide and fertilizer.

3. Security

   Develop and implement a fire protection plan for the population.

B. Task 2

Propagate a total representation of plants through seeds and cuttings from the Abutilon Menziesii population. These plants will be used to maintain genetic representation of stock and provide stock for outplanting purposes. Work will be done at the existing State DLNR, Division of Forestry and Wildlife (DOFAW) nurseries or at appropriate co-operating nurseries.

C. Task 3

Establish two wild populations of Abutilon Menziesii in appropriate habitat to allow for natural establishment and long term viability. Prepare and implement fire protection plan for the population. Secure wild population from off-road vehicles using boulder barriers.

D. Task 4

Research into the biology of the Abutilon Menziesii population.

1. Contract the University of Hawaii to document past research on the Abutilon Menziesii population.

2. Perform testing and identify testing parameters as follows:

   a. test granular diazinon for use in controlling ants;
   b. test Azatin and encapsulated Dursban on a few plants to determine toxicity;
   c. test seed storage in appropriate facilities in the event of problems with wild populations;
   d. establish testing parameters for outplanting site selection to include, but not limited to, salt influence, occasional storm wave wash influence, associated soil organisms, and accompanying pests.

E. Task 5

Construct a greenhouse dedicated to growing Abutilon Menziesii endangered plant species. The greenhouse would serve as a long-term greenhouse for threatened and endangered plant species on Oahu. Task 5 includes the following scope:

1. Site Preparation

   a. clear and grade the greenhouse site, having approximately 0.5 acres in size; and
   b. construct an eight-foot high chain link fence.

2. Water Supply

   a. develop a permanent water source for greenhouse irrigation;
   b. purchase and construct a 5,000 gallon tank for emergency backup water supply; and
   c. provide irrigation system for greenhouse.

3. Greenhouse Construction

   a. construct a greenhouse using a prefabricated greenhouse kit;
   b. construct two shade structures for preparing nursery stock for outplanting; and
   c. purchase benches, pots, and equipment necessary to operate the greenhouse.

F. Administration

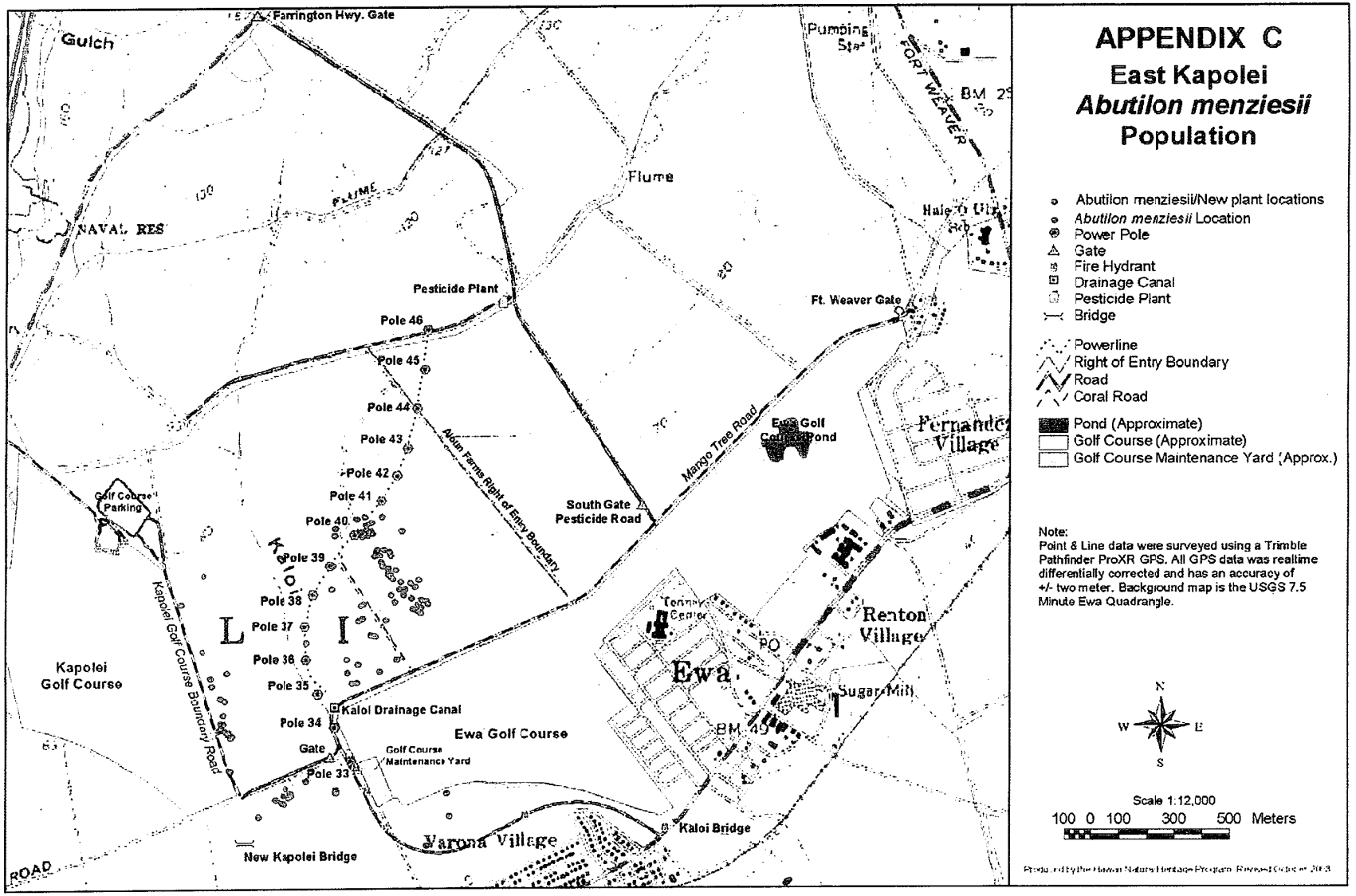
Document findings and prepare quarterly reports of progress. At the end of the contract period, prepare a summary final report which provides a recommendation of action and possible alternatives, if any, based upon documented findings and results.

Exhibit "B"

COMPENSATION

Payment will be made upon DLNR's submission of quarterly reports to HCDCH. Final payment will be made upon DLNR's submission of a final report to HCDCH. Compensation is based upon the following cost breakdown:

Task 1	in the amount of	$18,300.00
Task 2	in the amount of	$10,950.00
Task 3	in the amount of	$16,600.00
Task 4	in the amount of	$ 7,500.00
Task 5	in the amount of	$10,000.00
Administration	in the amount of	$ 4,500.00
	TOTAL COMPENSATION	$67,850.00



APPENDIX C

East Kapolei *Abutilon menziesii* Population

- Abutilon menziesii/New plant locations
- *Abutilon menziesii* Location
- Power Pole
- Gate
- Fire Hydrant
- Drainage Canal
- Pesticide Plant
- Bridge
- Powerline
- Right of Entry Boundary
- Road
- Coral Road
- Pond (Approximate)
- Golf Course (Approximate)
- Golf Course Maintenance Yard (Approx.)

Note:
Point & Line data were surveyed using a Trimble Pathfinder ProXR GPS. All GPS data was realtime differentially corrected and has an accuracy of +/- two meter. Background map is the USGS 7.5 Minute Ewa Quadrangle.

N
W E
S

Scale 1:12,000
100 0 100 300 500 Meters

Produced by the Hawaii Natural Heritage Program, Revised October 2013