A97-722 - MAUI ELECTRIC CO., LTD.
(Waena Generating Sta.)

(EXHIBITS)

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PETITIONER'S EXS. #1
A97-722

Maui Electric Company, Limited's
Proposed Waena Generating Station

Land Use Commission Petition
Docket A 97-722
Petition, Exhibits 1-5

October 1997

ORIGINAL

PETITION FOR DISTRICT BOUNDARY AMENDMENT FROM AGRICULTURAL TO URBAN

MAUI ELECTRIC COMPANY, LIMITED WAENA GENERATING STATION

In The Matter Of The Petition Of
Maui Electric Company, Limited
To Amend The District Boundary Of Certain Lands
Situated At Wailuku And Makawao Districts, Maui, Hawaii

ORIGINAL

LAND USE COMMISSION
STATE OF HAWAII
1997 OCT 24 P 1:46

DOCKET NO. A 97-722
Maui Electric Company, Limited

PETITION FOR DISTRICT BOUNDARY AMENDMENT
FROM AGRICULTURAL TO URBAN

MAUI ELECTRIC COMPANY, LIMITED
WAENA GENERATING STATION

LAND USE COMMISSION
STATE OF HAWAII
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TABLE OF CONTENTS

BOUNDARY AMENDMENT PETITION

EXHIBIT 1
PROJECT MAPS

EXHIBIT 2
LAND OWNERSHIP DOCUMENTATION

EXHIBIT 3
LETTER OF AUTHORIZATION

EXHIBIT 4
ENVIRONMENTAL IMPACT STATEMENT

EXHIBIT 5
FINANCIAL STATEMENT OF MAUI ELECTRIC COMPANY, LIMITED

EXHIBIT 6
SITING STUDIES

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LAND USE COMMISSION
STATE OF HAWAII
1997 OCT 24 P 2:17

BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAII

In the Matter of the Petition of MAUI ELECTRIC COMPANY, LIMITED To Amend the Land Use District Boundary of Certain Lands Situated at Wailuku and Makawao Districts, Island of Maui, State of Hawaii, Consisting of 65.7 Acres from the Agriculture to the Urban District	DOCKET NO. A 97-722 MAUI ELECTRIC COMPANY, LIMITED

ORIGINAL

PETITION FOR LAND USE DISTRICT BOUNDARY AMENDMENT,

VERIFICATION, CERTIFICATE OF SERVICE,

EXHIBITS 1 - 6, INCLUSIVE

BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAII

In the Matter of the Petition of MAUI ELECTRIC COMPANY, LTD. To Amend the Land Use District Boundary of Certain Lands Situated at Wailuku and Makawao Districts, Island of Maui, State of Hawaii, Consisting of 65.7 Acres from the Agriculture to the Urban District	DOCKET NO.A 97-722 MAUI ELECTRIC COMPANY, LIMITED

PETITION FOR LAND USE DISTRICT BOUNDARY AMENDMENT

COMES NOW, MAUI ELECTRIC COMPANY, LIMITED (hereinafter "Petitioner"), a Hawaii corporation, whose business and mailing address is P.O. Box 398, Kahului, Maui, Hawaii, 96733-6898, and respectfully requests this Honorable State of Hawaii Land Use Commission (hereinafter the "Commission") to amend the land use district classification of certain lands, hereinafter described, consisting of 65.7 acres, from the Agricultural to the Urban District, and in support thereof, Petitioner respectfully alleges and presents the following:

I

STANDING

Petitioner alleges standing to file this Petition for Land Use District Boundary Amendment pursuant to Section 205-4, Hawaii Revised Statutes (H.R.S.), and Hawaii Land Use Commission Rules ("LUC Rules"), §15-15-46 (3).

II

AUTHORIZED REPRESENTATIVES

Mr. B. Martin Luna and the law firm of CARLSMITH, BALL, WICHMAN, CASE & ICHIKI have been appointed and are hereby authorized to represent Petitioner in its Petition for Land Use District Boundary Amendment and the proceedings thereon pursuant to LUC Rules §15-15-35 (b). Pursuant to LUC Rules, §15-15-50 (c) (2) all correspondence and communications in regard to this Petition shall be addressed to:

1. B. Martin Luna, Esq.
CARLSMITH BALL WICHMAN CASE & ICHIKI
One Main Plaza, Suite 400
2200 Main Street
Wailuku, Hawaii 96793
Telephone No. (808) 242-4535

III

AUTHORITY FOR RELIEF SOUGHT

This petition is filed pursuant to H.R.S. §205-4, as amended, and LUC Rules, §15-15-46 et seq. The Commission is authorized to grant the relief sought herein pursuant to the provisions of H.R.S. Chapter 205, as amended, and all applicable statutes and rules promulgated and governing the Land Use Commission, State of Hawaii.

IV

SERVICE OF PROCESS

All papers, notices and pleadings required to be served upon Petitioner in this proceeding hereon shall be addressed to and served upon Petitioner and Messengers Martin B. Luna of CARLSMITH BALL WICHMAN CASE & ICHIKI, as Petitioner's representatives.

V

DESCRIPTION OF THE SUBJECT PROPERTY

The land affected by this petition is situated in Wailuku and Makawao Districts, north of Waiko Road at its intersection with Pulehu Road, Island of Maui, County of Maui, State of Hawaii as shown on the maps attached hereto and incorporated herein as Exhibit 1 ("Property").

The Property is owned in fee by Maui Electric Company, Limited, as described in the land ownership documentation attached hereto and incorporated herein as Exhibit 2. The property is identified by Tax Map Key Second Division, lots 3-8-03:23 and 3-8-03:24 consisting of 65.7 acres, inclusive of all existing easements identified as Easements 1-11 described within Exhibit 2. The Petitioner, as owner of the Property, agrees with and has consented to the submission of this Petition, as evidenced by Exhibit 3 (Letter of Authorization).

VI

EXISTING USE OF PROPERTY

The Property is currently leased to Hawaiian Commercial & Sugar Company ("HC&S") for sugarcane cultivation. The lease is on a month-to-month basis for the project site until the area is required for development by MECO for utility purposes or December 31, 2004, whichever comes first, or if cultivation of crops on the premises is no longer permissible by law. HC&S must use the premises solely for the purpose of crop cultivation and

ancillary agricultural activities. Uses on the property for the past two (2) years have consisted of sugarcane cultivation. HC&S also holds easements within the property for maintenance and use of its irrigation ditch, identified as easements 1-4 within Exhibit 2. Easements 5-11 described within Exhibit 2 were previously granted to MECO for transmission line use.

Lands immediately surrounding the site are owned by Alexander & Baldwin-Hawaii and are used for sugarcane cultivation. Across Pulehu Road from the site are a sanitary landfill, owned and operated by the County of Maui, and a quarry, operated by Ameron HC&D. Both the landfill and the quarry have proposed expansion, as granted by the LUC Special Permits.

VII

RECLASSIFICATION SOUGHT AND PROPOSED USE

Petitioner respectfully requests that the Commission amend the present classification of the Property from Agricultural to Urban district use.

The Petitioner proposes to design, construct, and operate a 232-megawatt (MW) electrical generating station on 65.7 acres of land located along Pulehu and Waiko Roads in Central Maui. Related 69-kilovolt (kV) transmission lines from the site to substations at the Paia Sugar Mill and Puunene Sugar Mill are also proposed as a part of this project. Distribution lines (12 kV) may also lead from the proposed generating station to Puunene. In addition, the Petitioner may relocate its existing transmission and distribution base yard and related support facilities from its location in Kahului to the new facility.

The Waena Generating Station will consist of four 58-MW dual-train, combined-cycle combustion turbines (DTCC). Engineering for the first component of generating capacity will begin in the year 2000, with the first 20-MW combustion turbine scheduled for operation by the year 2004. Completion of the first 58-MW DTCC unit is planned for 2006. The entire 65.7-acre

site will be developed for the installation of the first unit of generation by the year 2006, in accordance with HAR 15-15-50(19). This will include full grading of the site and the installation of necessary infrastructure, such as drainage improvements, supply and injection wells, domestic wastewater systems, and roads required to support all four DTCC generating units. As the need for additional generation capacity occurs, the subsequent DTCC units will be placed upon the already improved site. Electrical generating activities, Hawaiian Commercial & Sugar Company easements, transmission line corridors, leach fields, and other supporting urban uses will maximize the amount of usable area available on the Property.

The estimated costs for construction of the initial DTCC are approximately $105.4 million. Cost of construction of the entire Waena Generation Station project, excluding land purchase costs, is estimated at approximately $415.7 million.

Project Cost and Schedule (1997 dollars)

Project Component	Acreage	Cost	Operation Date
DTCC 1	65.7	$105,370,000	2006
DTCC 2	0	$96,857,000	2010
Transmission Lines	n/a	$10,419,000	2006-2020
Transmission & Distribution Facility	0	$5,900,000	2016
DTCC 3	0	$100,318,000	2016
DTCC 4	0	$96,848,000	2020
Total Project Cost		**$415,712,000**	

Further detail and description of the Waena Generating Station are contained in the Environmental Impact Statement attached hereto and incorporated herein as Exhibit 4.

VIII

PETITIONER'S PROPRIETARY INTEREST IN SUBJECT PROPERTY

Maui Electric Company, Limited, is the owner of the Property and will develop the Property.

IX

PETITIONER'S FINANCIAL CONDITION

Evidence of Petitioner's financial condition in the form of the last available monthly financial report is attached hereto and incorporated herein as Exhibit 5. As is shown on page 1 of the report, MECO's net income for the month of August 1997 was $1,525,414, with an accumulated year to date net income of $9,213,872. MECO's accumulated net income for the 12 months from August 1996 to August 1997 was $15,016,036 as shown on page 2 of the statement.

MECO is a subsidiary of Hawaiian Electric Company, Inc.(HECO), which in turn is a wholly owned subsidiary of Hawaiian Electric Industries (HEI), a holding company with publicly traded stock. MECO is regulated by the Public Utilities Commission (PUC). MECO has concluded that the proposed project meets internal economic feasibility criteria. As a subsidiary of a publicly traded company, MECO has access to sufficient economic resources required to develop the project. MECO can request the authority from the PUC to make expenditures for construction of the proposed facility and recapture costs through the electricity rates paid by the Petitioner's customers. In addition, HECO is also able to issue bonds and stock to finance the project. The proposed Waena Generating Station project will be funded through the Petitioner's customer base and will not require expenditures by either the State of Hawaii or the County of Maui.

X

REQUIRED FACTS, DATA AND INFORMATION

Pursuant to the requirements of the LUC Rules, §15-15-50, Petitioner submits the facts, data and other information required therein and as set forth in this Petition and Exhibits 1 to 6 inclusive, attached hereto and made a part hereof, in addition to any evidence and testimony submitted by Petitioner in the proceedings herein.

XI

STANDARDS FOR DETERMINING THE
BOUNDARIES OF AN "URBAN" DISTRICT

The following examines the Petition Area pursuant to the LUC Rules, §15-15-18, which establishes standards for determining the boundaries of an "Urban" district:

(1) It shall include lands characterized by "city-like" concentrations of people, structures, streets, urban level of services and other related and land uses;

(2) It shall take into consideration the following specific factors:

(A) Proximity to center of trading and employment except where the development would generate new centers of trading and employment;

(B) Availability of basic services such schools, parks, wastewater systems, solid waste disposal, drainage, water, transportation systems, public utilities, and police and fire protection; and

(C) Sufficient reserve areas for foreseeable urban growth;

(3) It shall include lands with satisfactory topography, drainage, and reasonably free from the danger of any flood, tsunami, unstable soil condition, and other adverse environmental effects;

(4) Land contiguous with existing urban areas shall be given more consideration than non-contiguous land, and particularly when indicated for future urban use on state or county general plans;

(5) It shall include lands in appropriate locations for new urban concentrations and shall give consideration to areas of urban growth as shown on the state and county general plans;

(6) It may include lands which do not conform to the standard in paragraphs (1) to (5):

(A) When surrounded by or adjacent to existing urban development; and

(B) Only when those lands represent a minor portion of this district.

(7) It shall not include lands, the urbanization of which will contribute toward scattered spot urban development, necessitating unreasonable investment in public infrastructure or support services; and

(8) It may include lands with a general slope of twenty percent or more if the commission finds that those lands are desirable and suitable for urban purposes and that the design and construction controls, as adopted by any federal, state, or county agency, are adequate to protect the public health, welfare and safety, and the public's interests in the aesthetic quality of the landscape.

The proposed project will be a heavy industrial use and will be located in close proximity to two other heavy industrial uses, the Central Maui Landfill and the Ameron HC&D quarry. The site is also adjacent to other Agricultural District lands that will remain in sugar cultivation. The proposed project will be compatible with these uses.

The subject property was selected through several siting studies, the most relevant of which are attached hereto and incorporated herein as Exhibit 6. As a part of the site selection process, existing sugar mill sites on Maui and the industrial area near Kahului Hobron Harbor were analyzed and considered. However, existing industrial areas within the Central Maui urban areas were eliminated from site consideration due to constrained lands, air quality concerns, or incompatible adjacent land uses.

The Waena site is approximately 3 miles from Puunene (the nearest urban center), and, by contrast, the site is not adversely affected by constrained lands, air quality concerns, or incompatible adjacent land uses. In addition, siting the generating station adjacent to existing urban areas would be inappropriate, as the facility would represent an incompatible land use to adjacent urban commercial and residential areas.

Factors considered in the site selection for the proposed Waena Generating Station included: the compatibility of using the site for generation with the nearby quarry and landfill and the surrounding agricultural uses, the site's separation from more sensitive urban uses, and the site's centralized location within the Maui Electric Company, Limited system. The centralized location will allow the station to provide reliable power and transmission of electricity to the Island of Maui and will allow for additional growth within the appropriate boundaries.

Slopes on the project site are minimal (approximately one degree). A topographic map is included in Exhibit 1. According to the federal Emergency Management Agency's Flood Insurance Rate Map, the project site is located in Zone C, areas experiencing minimal flooding. According to the National Flood Insurance Program, Zone C areas are not considered to be flood plain areas. The site does not lie in a tsunami zone. Soil conditions at the site consist of the Waiakoa series, a generally stony soil grading to hard bedrock within a depth of approximately 5 feet or

so. Drainage containment will be designed in accordance with applicable County of Maui Standards and approved by the County of Maui Department of Public Works.

The site is listed as "Prime Agricultural Land" according to the Agricultural Lands of Importance to the State of Hawaii (ALISH) map. The University of Hawaii Land Study Bureau's Detailed Classification designates the land as "A." This classification system rates lands on a scale of "A" to "E," reflecting land productivity characteristics. Lands designated "A" are considered to be of highest productivity, with "E" rated lands ranked the lowest. The proposed use of the site does not significantly diminish the available supply of land used for agricultural activities, nor will it have any adverse impact on the remaining adjacent agricultural uses.

The location of the project site does not represent a significant adverse impact to scenic views or vistas, nor does it cause a significant adverse impact on the aesthetic quality of the landscape. Visual impacts can be mitigated through landscaping and choices of paint colors appropriate to the area. The construction and operation of the facility will adhere to existing regulations governing the public health, welfare, and safety.

The proposed project will not require extension of existing County or State infrastructure to the site, and the project is not expected to have any direct impact that will require the expenditure of public funds for infrastructure. Potable water will be delivered by truck and sanitary wastewater facilities will be constructed on-site. Development of the site is expected to have a minimal impact on any requirement for police and fire protection. The project will have no significant adverse impact on regional traffic which will require mitigation.

The project will not directly cause additional population growth on the Island of Maui and; therefore, the project will not adversely impact existing housing supplies. The project will not

directly result in any increase in school population and; therefore, will have no adverse impact on area school capacities. The project will; however, indirectly support additional population and economic growth through the provision of adequate and reliable electricity.

Future additional urban uses in the area must receive applicable land use, community plan, and zoning re-designations or special use permits. Because of this, policy and decision makers will be able to determine the extent and nature, if any, of future development around the proposed project site.

Development of the Waena site does not adversely impact the provision of sufficient service areas for other urban growth requirements. Granting of the Petition would be consistent with the Land Use Commission's approval of Special Permits for the adjoining quarry and landfill. Urbanization of the site does not contribute to scattered spot urban development, as it is in close proximity to an existing landfill and quarry, both being uses permitted by the State Land Use Commission. The Petitioner's proposed project will be compatible with these uses, as well as adjacent agricultural uses.

While the area is not adjacent to existing Urban district lands, the establishment of the nearby landfill and quarry have created an area of "city-like" heavy industrial use near the proposed Waena Generating Station site which are located away from sensitive residential, commercial, and public areas. The quarry, landfill, and electrical generating station are all uses that are necessary to support urban uses and growth.

Based upon the facts, data and information submitted herein and contained in this Petition and Exhibits 1 to 6, inclusive, and by the evidence and testimony to be submitted by Petitioner in the proceedings herein, the Petition Area meets each and every standard for determining an Urban district boundary for the subject property pursuant to the LUC Rules, §15-15-18 (1) to (8),

inclusive, as the same or so much thereof as may be applicable to the Property.

XII

CONFORMANCE WITH THE HAWAII STATE PLAN

The Hawaii State Plan, Chapter 226, "Hawaii Revised Statutes, 1996," is a guide for future long-range development. It identifies the goals, objectives, policies, and priorities for the State; allocates limited resources; improves coordination among federal, state, and county agencies; and establishes a system for integrating all major state and county activities.

Section 226-14 of the State Plan, Objectives and Policies for Facility Systems applies, in general, to the proposed project and states the following:

a. *Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy systems that support statewide social, economic, and physical objectives.*

b. *To achieve the general facility system objective, it shall be the policy of this State to:*

   1. *Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans*
   2. *Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities*
   3. *Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user*

4. *Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.*

The proposed Waena Generating Station is designed to meet the increasing demand for electricity on the Island of Maui and to improve system reliability. As a result of its planned addition of generation capacity over the next 20-30 years, the Waena Generating Station can accommodate changing public demands and allow for the flexibility of future designs and technologies. Currently, a 58-MW, dual-train, combined-cycle unit is the least cost option in terms of both initial and long-term costs.

Section 226-18 of the Hawaii State Plan, "Objectives and Policies for Facility Systems - Energy," applies specifically to the project and states the following:

a. *Planning for the State's facility systems with regard to energy shall be directed towards the achievement of the following objectives:*
   1. *Dependable, efficient, and economical statewide energy systems capable of supporting the needs of the people;*
   2. *Increased self-sufficiency where the ratio of indigenous to imported energy use is increased; and*
   3. *Greater energy security in the face of threat to Hawaii's energy supplies and systems.*

b. *To achieve the energy objectives, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable energy services to accommodate demand.*

c. *To further achieve the energy objectives, it shall be the policy of this State to:*

1. *Support research and development as well as promote the use of renewable energy sources;*
2. *Ensure that the combination of energy supplies and energy-saving systems are sufficient to support the demands of growth;*
3. *Base decisions of least-cost supply-side and demand side energy resource options on a comparison of their total costs and benefits when a least-cost is determined by a reasonably comprehensive, quantitative, and qualitative accounting of their long-term, direct and indirect economic, environmental, social, cultural, and public health costs and benefits;*
4. *Promote all cost-effective conservation of power and fuel supplies through measures including:*
   A. *Development of cost-effective demand-side management programs;*
   B. *Education; and*
   C. *Adoption of energy-efficient practices and technologies; and*
5. *Ensure to the extent that the new supply-side resources are needed, the development or expansion of energy systems utilizes the least-cost energy supply option and maximizes efficient technologies;*
6. *Support research, development, and demonstration of energy efficiency, load management, and other demand-side management programs, practices, and technologies; and*
7. *Promote alternate fuels and energy efficiency by encouraging diversification of transportation modes and infrastructure.*

The proposed project, in the context of the Petitioner's integrated approach to energy production and conservation,

conforms with these objectives and policies. The purpose of the proposed Waena Generating Station is to provide a system that meets the projected electrical demand, increases system reliability, and provides dependable electrical service to its customers.

Resource limitations and environmental, public health, and safety concerns were considered in selecting the site and appropriate technology for the generating facility. During the development of the Petitioner's Integrated Resource Plan, a comparison of costs and benefits for both alternative fuels and alternative technologies was performed. At this time, alternative fuels and technologies do not represent the least-cost energy supply option or the maximum efficient technology. The use of diesel-fueled dual-train, combined-cycle units currently are justified while other renewable energy projects are being developed.

The Petitioner is actively participating in education and research programs to further develop alternative fuels and technologies in Hawaii, as is evident through their cooperation with the Pacific International Center for High Technology Research, the County of Maui, and the State of Hawaii in examining biomass to electricity applications for Hawaii and through the Petitioner's continued installation of small photovoltaic systems on public schools through the Petitioner's "Sun Power for Schools" project.

XIII

CONFORMANCE WITH CHAPTER 205A, COASTAL ZONE MANAGEMENT, HAWAII REVISED STATUTES

Hawaii's Coastal Zone Management Program has established objectives and policies as identified in Chapter 205A, HRS. Those objectives and policies are primarily focused on development activities and the effects on the Coastal Zone resources and are outlined below:

1. *RECREATIONAL RESOURCES*

Objectives: *Provide coastal recreational resources accessible to the public.*

Policies:

a. *Improve coordination and funding of coastal recreation planning and management; and*

b. *Provide adequate, accessible and diverse recreational opportunities in the coastal zone management area by:*

   1. *Protecting coastal resources uniquely suited for recreation activities that cannot be provided in other areas;*
   2. *Requiring replacement of coastal resources having significant recreational value, including, but not limited to, surfing sites and sandy beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;*
   3. *Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;*
   4. *Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;*
   5. *Encouraging expanding public recreational use of county, state and federally owned or controlled shoreline lands and waters having recreational value;*
   6. *Adopting water quality standards and regulating point and non-point sources of pollution to protect and, where feasible, restore the recreational value of coastal waters; and*

7. *Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits, and crediting such dedication against the requirements of Section 46-6 of the Hawaii Revised Statutes.*

2. *HISTORICAL/CULTURAL RESOURCES*

Objectives: *Protect, preserve and where desirable, restore those natural and man-made historic and prehistoric resources in the coastal zone management areas that are significant in Hawaiian and American history and culture.*

Policies:

a. *Identify and analyze significant archaeological resources;*

b. *Maximize information retention through preservation of remains and artifacts or salvage operation; and*

c. *Support state goals for protection, restoration, interpretation and display of historic resources.*

3. *SCENIC AND OPEN SPACE RESOURCES*

Objectives: *Protect, preserve and, where desirable, restore or improve the quality of the coastal scenic and open space resources.*

Policies:

a. *Identify valued scenic resources in the coastal zone management area;*

b. *Insure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of the natural land forms and existing public views to and along the shoreline;*

c. *Preserve, maintain and, where desirable, improve and restore shoreline open space and scenic resources; and*

d. *Encourage those developments which are not coastal dependent to locate in inland areas.*

4. *COASTAL ECOSYSTEMS*

Objectives: *Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems.*

Policies:

a. *Improve the technical basis for mature resource management;*

b. *Preserve valuable coastal ecosystems of significant biological or economic importance;*

c. *Minimize disruption and degradation of coastal water ecosystems by effective regulation of stream diversions, channelization and similar land and water uses, recognizing competing water needs; and*

d. *Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land water uses which violate state water quality standards.*

5. *ECONOMIC USES*

Objectives: *Provide public or private facilities and improvements important to the State's economy in suitable locations.*

Policies:

a. *Concentration in appropriate areas the location of coastal dependent development necessary to the state's economy;*

b. *Insure that coastal dependent development such as harbors and ports, visitor facilities, and energy-generating facilities are located, designed, and constructed to minimize adverse social, visual and environmental impacts in the coastal zone management areas; and*

c. *Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term*

growth at such areas, and permit coastal dependent development outside of presently designated areas when:

1. *Utilization of presently designated locations is not feasible,*
2. *Adverse environmental effects are minimized, and*
3. *The development is important to the State's economy.*

6. *COASTAL HAZARDS*

Objectives: *Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion and subsidence.*

Policies:

a. *Develop and communicate adequate information on storm wave, tsunami, flood, erosion and subsidence hazard;*
b. *Control development in areas subject to storm wave, tsunami, flood, erosion and subsidence hazard;*
c. *Ensure that development comply with requirements of the Federal Flood Insurance Program; and*
d. *Prevent coastal flooding from inland projects.*

7. *MANAGING DEVELOPMENT*

Objectives: *Improve the development review process, communication, and public participation in the management of coastal resources and hazard.*

Policies:

a. *Effectively utilize and implement existing law to the maximum extent possible in managing present and future coastal zone development;*
b. *Facilitate timely processing of the application for development permits and resolve overlapping of conflicting permit requirements; and*
c. *Communicate the potential short- and long-term impacts of proposed significant coastal developments early in their life-cycle and in terms understandable to the*

general public to facilitate public participation in the planning and review process.

8. PUBLIC PARTICIPATION

Objective: Stimulate public awareness, education and participation in coastal management.

Policies:

a. Maintain a public advisory body to identify coastal management problems and to provide policy advice and assistance to the coastal zone management program;

b. Disseminate information on coastal management issues by means of educational materials, published reports, staff contact and public workshops for persons and organizations concerned with coastal related issues, development, and government activities; and

c. Organize workshops, policy dialogues, and site specific mediations to respond to coastal issues and conflict.

9. BEACH PROTECTION

Objectives: Protect beaches for public use and recreation.

Policies:

a. Locate new structures inland from the shoreline setback to conserve open space and to minimize loss of improvements due to erosion;

b. Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

c. Minimize the construction of public erosion-protection structures seaward of the shoreline.

10. MARINE RESOURCES

Objective: Implement the State's ocean resource management plan.

Policies:

a. *Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;*
b. *Assure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;*
c. *Coordinate the management of marine and coastal resources and activities management to improve effectiveness and efficiency;*
d. *Assert and articulate the interest of the state as a partner with federal agencies in the sound management of the ocean resources within the United States exclusive economic zone;*
e. *Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon the ocean and coastal resources; and*
f. *Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.*

The subject property is located approximately 4 miles inland. The proposed project will have no impact on the public's access and use of the shoreline area, and there will be no adverse impact to nearshore waters from point and non-point sources of pollution. Because of its location and lack of coastal impacts, the project will conform with the objectives related to recreational resources, coastal ecosystems, beach protection, and marine resources.

There are no known traditional gathering activities and/or cultural practices affecting the subject property. The site and surrounding area have been utilized for sugarcane cultivation for

over 100 years, and no significant archaeological resources were discovered during surveys of the site. Therefore, it is anticipated that the subject property will not have an adverse impact upon any significant archaeological or historical resources.

The location of the project site does not represent a significant adverse impact to scenic views or vistas related to coastal areas. Visual impacts will be mitigated through landscaping and choices of paint colors appropriate to the area. Therefore, the project will have no negative impact on the visual character of its immediate environs within the Central Maui region.

The project complies with the economic uses objective by providing a necessary facility located away from coastal areas which will meet and support continued economic growth on the Island of Maui.

According to the federal Emergency Management Agency's Flood Insurance Rate Map, the project site is located in Zone C, areas experiencing minimal flooding. According to the National Flood Insurance Program, Zone C areas are not considered to be flood plain areas. The site does not lie in a tsunami zone. The subject property has no involvement with construction of any structures within the shoreline area and will not have an impact upon any public beaches.

The project has produced an environmental impact statement which has gone through public review and comment. In addition, several public meetings were held during both the facility siting and environmental assessment phases of the project. The requirement of the project to follow the Maui County Community Plan amendment and County rezoning processes, as well as the state Land Use Boundary redesignation process, ensures that the development of the project will be managed with a high level of public input and participation.

XIV

COMPLIANCE WITH REQUIREMENTS

FOR BOUNDARY AMENDMENTS

In addition to the foregoing standards for the Urban District set forth in HAR 15-15-18, the LUC considers specific criteria in making their decision as outlined in HAR 15-15-77. Those decision-making criteria for boundary amendments and the relationship of the proposed project to them are outlined below.

1. *The extent to which the proposed reclassification conforms to the goals, objectives, and policies of the Hawaii State Plan and relates to the applicable priority guidelines of the Hawaii State Plan and the adopted functional plans.*
2. *The extent to which the proposed reclassification conforms to the applicable district standards.*
3. *The impact of the proposed reclassification on the following areas of state concern:*
   - A. *Preservation or maintenance of important natural systems or habitats*
   - B. *Maintenance of valued cultural, historical, or natural resources*
   - C. *Maintenance of other natural resources relevant to Hawaii's economy including, but not limited to agricultural resources*
   - D. *Commitment of state funds and resources*
   - E. *Provision for employment opportunities and economic development*
   - F. *Provision for housing opportunities for all income groups, particularly the low, low-moderate, and gap groups*
4. *In establishing the boundaries of the districts in each county, the commission shall give consideration to the*

general plan of the county in which the land is located.

5. *The representations and commitments made by the petitioner in securing a boundary change, including a finding that the petitioner has the necessary economic ability to carry out the representations and commitments relating to the proposed use or development; and*
6. *Land in intensive agricultural use for two years prior to date of filing of a petition or lands with a high capacity for intensive agricultural use shall not be taken out of the agricultural district unless the commission finds either that the action:*
   (A) Will not substantially impair actual or potential agricultural production in the vicinity of the subject property or in the county or State; or
   (B) Is reasonably necessary for urban growth.

The Hawaii State Plan is a guide for future long-range development. It identifies the goals, objectives, policies, and priorities for the State; allocates limited resources; improves coordination among federal, state, and county agencies; and establishes a system for integrating all major state and county activities. The extent to which the project conforms with the Hawaii State Plan and the applicable district standards is discussed within this Petition. The extent to which the project conforms with the provisions of the Maui County General Plan and the Wailuku-Kahului Community Plan is discussed in Section 5.7 and Section 5.8 of the Draft Environmental Impact Statement, incorporated herein as Exhibit 4. Pursuant to HAR 15-15-24, the power generation on the site is a use permitted by the County of Maui on lands zoned "Heavy Industrial." MECO is pursuing the necessary County approvals to rezone the site to the "Heavy Industrial" zoning classification. The County's decision for a

zoning reclassification cannot occur until after the State Land Use Commission has approved a re-designation of the site from the State's Agricultural to the Urban district.

Site investigations and reconnaissance revealed no significant or valued cultural, historic, or natural resources or natural systems or habitats at the project site. The site has been under continuous active sugarcane cultivation for over 100 years, and there are no known traditional gathering activities and/or cultural practices as identified by Article XII, Section 7 of the Hawaii State Constitution affecting the subject property. Construction or operation of the proposed generating station will not have a significant adverse impact on any environmental resources, nor will the project require a commitment of State funds and resources.

The operation of the proposed 232-MW facility will create approximately 46 new jobs directly. The project will require between 80 to 100 construction workers during the initial installation. Indirectly, the electricity provided by the proposed facility will support the continued economic expansion of the Island of Maui and provide the necessary energy to support affordable housing programs as they are developed.

Maui Electric Company, Limited (MECO), is a subsidiary of Hawaiian Electric Company, Inc.(HECO), which in turn is a wholly owned subsidiary of Hawaiian Electric Industries (HEI), a holding company with publicly traded stock. MECO is regulated by the Public Utilities Commission (PUC). MECO has concluded that the proposed project meets internal economic feasibility criteria. As a subsidiary of a publicly traded company, MECO has access to sufficient economic resources required to develop the project. MECO can request the authority from the PUC to make expenditures for construction of the proposed facility and recapture costs through the electricity rates paid by the Petitioner's customers. In addition, HECO is also able to issue bonds and stock to finance the project.

The change in land use from agricultural to urban/heavy industrial will remove 65.7 acres from active sugarcane cultivation. Impacts to agricultural lands from land use changes can take three forms:

- Impacts from the new land use on existing agricultural operations;
- Impacts from agricultural operations on the new land use; and
- Indirect impact of the new land use on agricultural potential

Impacts on Existing Agricultural Operations. Construction and operation of the proposed Waena Generating Station will be a compatible land use to the existing and planned land uses in the vicinity of the project site. Existing easements with HC&S will be maintained throughout the development of the proposed project. Site access will occur from Pulehu Road and will not conflict with cane hauling operations along plantation roads. Activities associated with the proposed generating station will not negatively impact cultivation activities of surrounding properties.

Agricultural Impacts on Proposed Project. In some instances, the continued agricultural operations adjacent to a new land use will impact that new use. When this occurs, it is sometimes necessary for the agricultural uses to be modified. In the case of the proposed Waena Generating Station, MECO and HC&S have developed a cooperative relationship to ensure compatibility of agricultural and generating station operations.

As demonstrated at MECO's Maalaea facility, little impact to generating facilities occurs from adjoining cane cultivation. Prior to cane burning or harvesting activities, HC&S notifies MECO. MECO safety personnel keep an active watch during actual burning and facility employees are advised to have breathing aides and other protective devices immediately available in case of shifts in wind. HC&S operates under established field burning

protocols to keep cane fires away from adjoining property boundaries. In addition, a 15-foot landscaped perimeter will be planted around the proposed generating station, further removing it from the adjoining cane fields. Because of the long-standing relationship between HC&S and MECO, as well as the established protocols, continued agricultural operations should not need to be modified to accommodate the proposed generating station.

Impacts on Agricultural Lands. According to the Maui County Data Book (County of Maui, 1996), approximately 360,000 acres of land in Maui County is classified as "farmland." Of this acreage, approximately 89,000 acres are considered cropland, 36,500 of which are cultivated by HC&S and 11,000 of which are cultivated by Maui Land & Pine Co., Ltd. (ML&P). The subject parcel represents approximately 0.02 percent of Maui County's total farmland, 0.07 percent of Maui County's total cropland, and only 0.18 percent of HC&S total acreage. In comparison to the approximately 1.7 million acres of total farmland listed within the entire State of Hawaii, the 65.7 acre site represents the removal of an even more insignificant 0.004 percent.

Currently, HC&S is in the process of expanding their current acreage under active cultivation by 280 acres near Kuihelani Highway as part of a strategy to reuse ML&P's cannery effluent. In addition, HC&S is working towards adding another 1,100 acres of land formerly cultivated by Wailuku Agribusiness.

The change in land use from agricultural to urban/heavy industrial will remove 65.7 acres of "prime agricultural land," as defined by the Agricultural Lands of Importance to the State of Hawaii (ALISH) map, from active cultivation. However, this represents an insignificant amount of HC&S's total acreage under cultivation and an even more insignificant amount of Maui County's and the State of Hawaii's total farmland. In addition, HC&S is undergoing expansion plans which will more than replace these 65.7 acres of cropland. Removal of such an insignificant amount of farmland from active production will have no adverse

impact upon either the County's or the State's overall agricultural production capabilities.

The removal of prime agricultural lands from production also must be weighed against the public use and public good derived from any proposed land use change. The proposed Waena Generating Station is planned to provide the necessary energy to both meet and allow the expanding energy needs of the Island of Maui's residents and economy and is reasonably necessary for urban growth. The additional energy will also allow for continued and expanded agricultural operations by ensuring reliable power for irrigation uses and processing operations.

Because the amount of prime agricultural land being removed is small, and HC&S will more than replace the loss, the proposed project is not considered to have a significant adverse impact on overall prime agricultural land production. The proposed project will have a beneficial impact by providing reliable power to support continued and expanded agricultural operations and is reasonably necessary for urban growth on the Island of Maui.

CONCLUSION

To summarize, the proposed project site is a heavy industrial use considered reasonably necessary for urban growth which will be located at an appropriate distance from incompatible land uses, such as residential or commercial developments. In addition, the site of the proposed project is near existing industrial land uses in the form of the Central Maui Landfill and the Ameron HC&D quarry. The location of the site at least 3 miles away from existing urban uses will result in the proposed project having no significant adverse impact on these sensitive uses.

The 65.7-acre site represents only a small portion of the available land within the Central Maui area. In accordance with the LUC Rules, §15-15-77 and H.R.S., §205-4(h) and based upon the foregoing facts, data and information submitted herein and contained in this Petition and Exhibits 1 to 6, inclusive, and by the evidence and testimony to be submitted by Petitioner in the proceedings herein, the district boundary amendment requested by this Petition is reasonable, does not violate provisions of H.R.S. §205-2, as amended, and is consistent with the provisions of §205-16, §205-17, and Chapter 226, H.R.S., as amended.

SERVICE OF PETITION

Pursuant to §15-15-48, copies of this petition must be served upon the County of Maui Planning Department and Planning Commission, the State of Hawaii Office of Planning, and all persons with a property interest in the subject property as recorded in the County's real property tax records at the time the Petition is filed. Persons with a property interest in the subject property at this time are Alexander & Baldwin-Hawaii through their agent, Hawaiian Commercial & Sugar Company.

Copies of this petition will be served upon the above named parties. An affidavit of compliance with §15-15-48 will be

ORIGINAL

submitted following service of this petition. In accordance with §15-15-48(b), copies of this petition will also be served upon potential intervenors upon receipt of a notice of intent to intervene pursuant to §15-15-52(b).

Dated: Wailuku, Hawaii, November 6, 1997.

B. Martin Luna
Attorney for Petitioner

LAND USE COMMISSION
STATE OF HAWAII
1997 NOV -7 P 4:19

VERIFICATION

William A. Bonnet being duly sworn on oath deposes and says that he is the President of Maui Electric Company, Limited, a Hawaii corporation, and as such is authorized to make this verification on behalf of the Corporation, that he has read the foregoing Petition and has full knowledge of the contents thereof, and that the same are true to the best of his knowledge, information and belief.

William A. Bonnet

State of Hawaii)
) SS.
County of Maui)

On this 20th day of October, 1997, before me appeared William A. Bonnet, to me personally known, who being by me duly sworn, did say that he is the President of Maui Electric Company, Limited, a Hawaii corporation, and that the seal affixed to the foregoing instrument is the corporate seal of said corporation and that said instrument was signed and sealed in behalf of said corporation by authority of its board of directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

Notary Public, State of Hawaii
My Commission expires: 8-15-01

NOTARIZED AFFIDAVIT OF MAILING

STATE OF HAWAII)
) SS
CITY AND COUNTY OF HONOLULU)

Mark Richard Willey, CH2M HILL, BEING FIRST DULY SWORN ON OATH, DEPOSES AND SAYS THAT:

1. Affiant is a representative for Maui Electric Company, Limited, Applicant for a State of Hawaii Land Use District Boundary Amendment, identified as Docket No.: A 97-722, for land situated at the Wailuku Ahupua'a, Wailuku District, Maui, and identified as TMK parcels: 3-8-03:23 and 3-8-03:24.

2. Affiant did on October 24, 1997, deposit in the United States mail, post paid, by first class mail and delivery to addressee, a copy of the Notification of Petition Filing for the aforementioned property pursuant to §15-15-50(c)(22), a copy of which is attached hereto as "Exhibit A" and made a part hereof, addressed to each of the persons identified on "Exhibit B," attached hereto and made a part hereof.

3. This affidavit is provided for compliance with §15-15-50(d)(10).

Further Affiant sayeth not:

Signed: October 24, 1997
Mark R. Willey, Project Manager
CH2M HILL
Honolulu, Hawaii

Subscribed and sworn to before me this
24th day of October, 1997

Lynette P.M. Choy
Notary Public, State of Hawaii

My commission expires: 9/23/2001

LYNETTE P.M. CHOY NOTARY PUBLIC STATE OF HAWAII

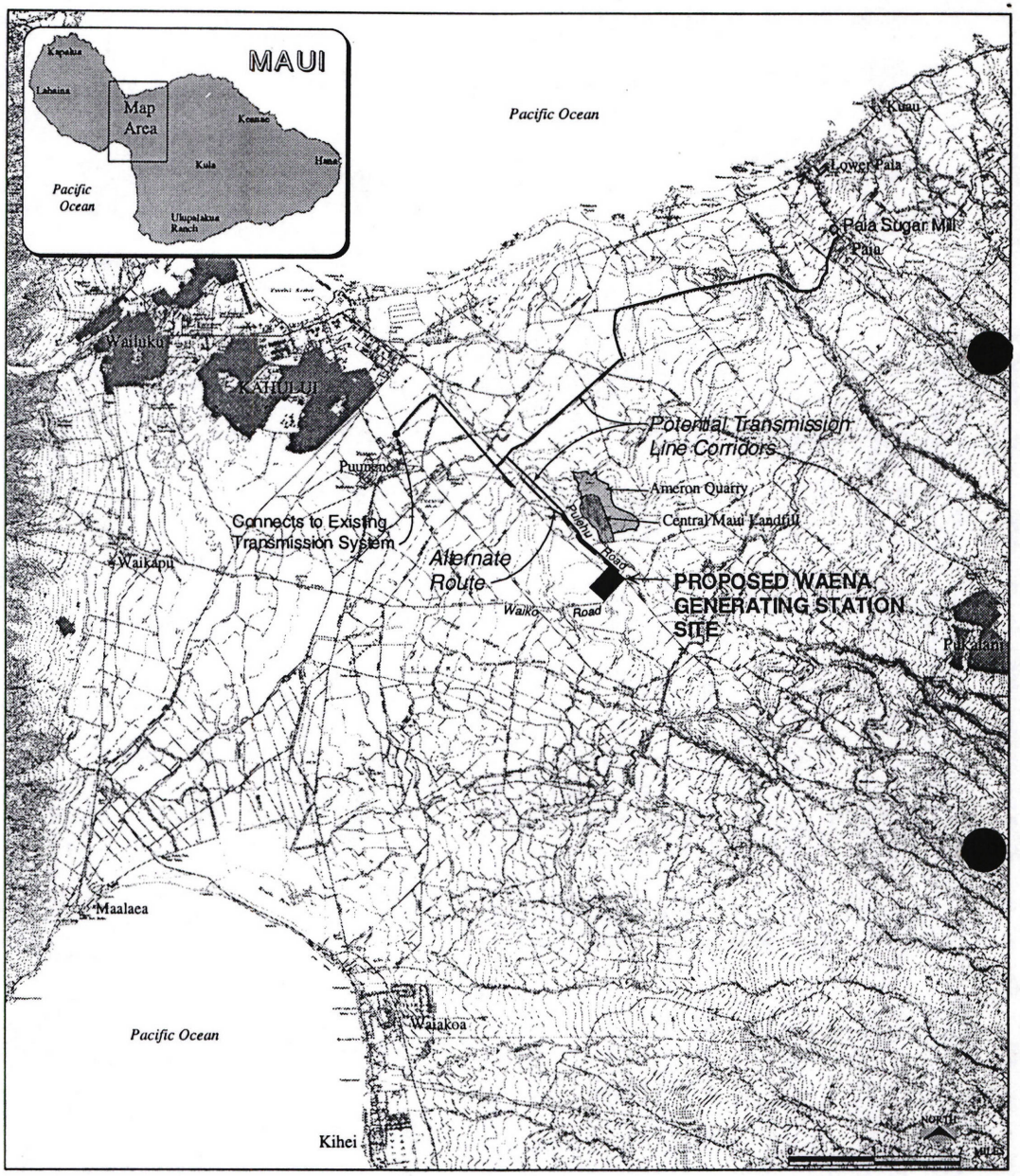
EXHIBIT A

Date of Submission to Commission: October 24, 1997

NOTIFICATION OF PETITION FILING

This is to advise you that a petition to amend the State Land Use District Boundaries with the following general information has been submitted to the State Land Use Commission:

Docket No:	**A97-722**
Petitioner/Address	Maui Electric Company, Limited Mr. William A. Bonnet, President PO Box 398 Kahului, Maui, Hawaii 96733-6898
Landowner:	Maui Electric Company, Limited
Tax Map Key	Second Division: 3-8-03:23 and 3-8-03:24
Location:	Wailuku ahupua'a, Wailuku District, Maui
Requested Reclassification:	Agriculture to Urban
Acreage:	65.7
Proposed Use:	232-MW Electric Generating Station
Date Submitted:	October 24, 1997



You may review detailed information regarding the petition at the Land Use Commission office or the County of Maui Planning Department

The Land Use Commission Office is located at 235 S. Beretania Street, Room 406, Honolulu, Hawaii. Office hours are from 7:45 a.m. to 4:30 p.m., Mondays through Fridays.

A hearing on this petition will be scheduled at a future date. If you are interested in participating in the hearing as a public witness, please write or call the Commission office at P.O. Box 2359, Honolulu, Hawaii 96804-2359; Phone: 587-3822.

If you intend to participate in the hearing as an intervenor, pursuant to §15-15-52, Hawaii Administrative Rules, you should file a Notice of Intent to Intervene with the Commission within 30 days of the date of this notice. Please contact the Commission office for further information.

CERTIFICATE OF SERVICE

I hereby certify that due service of a copy of the within document, identified as Land Use Commission Petition Docket No. A97-722, was made by depositing the same with the U.S. mail, postage prepaid, on October 24, 1997, in accordance with §15-15-48(a), addressed to:

RICK EGGED, Director — BY MAIL
ABE MITSUDA, Administrator
Office of Planning
State of Hawaii
P.O. Box 2359
Honolulu, Hawaii 96804

DAVID W. BLANE, Director — BY MAIL
Planning Department
County of Maui
250 South High Street
Wailuku, Maui, Hawaii 96793

PLANNING COMMISSION — BY MAIL
County of Maui
250 South High Street
Wailuku, Maui, Hawaii 96793

G. STEPHAN HOLADAY — BY MAIL
Hawaiian Commercial & Sugar Company
P.O. Box 266
Puunene, Hawaii 96784

Any potential intervenor shall be served a copy of this petition upon receipt of a notice of intent to intervene pursuant to Section 15-15-52(b).

Dated: Honolulu, Hawaii, October 24, 1997

Mark Richard Willey
Project Manager, CH2M HILL, INC.

Subscribed and sworn to before me this
24th day of October, 1997

Lynette P.M. Choy
Notary Public, State of Hawaii

My commission expires: 9/23/2001

LYNETTE P.M. CHOY NOTARY PUBLIC STATE OF HAWAII

ORIGINAL

Of Counsel:
CARLSMITH BALL WICHMAN
CASE & ICHIKI

B. MARTIN LUNA 865
2200 Main Street, Suite 400
Wailuku, Maui, Hawaii 96793
(808) 242-4535

Attorney for Petitioner Maui Electric
Company, Limited

LAND USE COMMISSION
STATE OF HAWAII
1997 NOV -7 P 4:20

BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAII

In the Matter of the Petition of MAUI ELECTRIC COMPANY, LIMITED To Amend the Land Use District Boundary of Certain Lands Situated at Wailuku and Makawao Districts, Island of Maui, State of Hawaii, Consisting of 65.7 Acres from the Agriculture to the Urban District	DOCKET NO. A97-722 MAUI ELECTRIC COMPANY, LIMITED

AFFIDAVIT OF SERVICE OF PETITION
FOR LAND USE DISTRICT BOUNDARY AMENDMENT

and

CERTIFICATE OF SERVICE

BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAII

In the Matter of the Petition of	)	DOCKET NO. A97-722
	)	
MAUI ELECTRIC COMPANY, LIMITED	)	MAUI ELECTRIC
	)	COMPANY, LIMITED
To Amend the Land Use	)	
District Boundary of Certain	)	
Lands Situated at Wailuku and	)	
Makawao Districts, Island of	)	
Maui, State of Hawaii,	)	
Consisting of 65.7 Acres from	)	
the Agriculture to the Urban	)	
District	)	
	)	

AFFIDAVIT OF SERVICE OF PETITION
FOR LAND USE DISTRICT BOUNDARY AMENDMENT

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

MARK R. WILLEY, being first duly sworn on oath, deposes and says:

1. Affiant is the Project Manager for CH2M HILL, a representative for Maui Electric Company, Limited, the Petitioner for a State of Hawaii Land Use District Boundary Amendment from Agricultural to Urban, identified as Docket No. A97-722, for land situated at the Wailuku Ahupua'a, Wailuku District, Maui, and identified as TMK parcels: 3-8-03:23 and 3-8-03:24.

2. In compliance with §15-15-48(a), Hawaii Administrative Rules, Affiant did on October 24, 1997, deposit in the United States mail, post paid, by first class mail, a copy of the Petition for District Boundary Amendment from Agricultural to Urban filed on October 24, 1997, to the following:

RICK EGGED, Director
ABE MITSUDA, Administrator
Office of Planning
State of Hawaii
P. O. Box 2359
Honolulu, Hawaii 96804

DAVID W. BLANE, Director
Planning Department
County of Maui
250 South High Street
Wailuku, Maui, Hawaii 96793

PLANNING COMMISSION
County of Maui
250 South High Street
Wailuku, Maui, Hawaii 96793

G. STEPHAN HOLADAY
Hawaiian Commercial & Sugar Company
P. O. Box 266
Puunene, Hawaii 96784

3. This Affidavit is provided in compliance with §15-15-50(c)(5)(C), HAR.

That further Affiant sayeth not.

Dated: Honolulu, Hawaii, November 6, 1997.

Mark R. Willey
Project Manager, CH2M HILL, INC.

Subscribed and sworn to before me
this 6 day of November , 1997.

LYNETTE P.M. CHOY NOTARY PUBLIC STATE OF HAWAII

Notary Public, State of Hawaii

My Commission expires: September 23, 2001

CERTIFICATE OF SERVICE

I hereby certify that due service of a copy of the within document was made by depositing the same with the U.S. mail, postage prepaid, on November 6, 1997, addressed to:

RICK EGGED, Director
ABE MITSUDA, Administrator
Office of Planning
State of Hawaii
P. O. Box 2359
Honolulu, Hawaii 96804

DAVID W. BLANE, Director
Planning Department
County of Maui
250 South High Street
Wailuku, Maui, Hawaii 96793

PLANNING COMMISSION
County of Maui
250 South High Street
Wailuku, Maui, Hawaii 96793

G. STEPHAN HOLADAY
Hawaiian Commercial & Sugar Company
P. O. Box 266
Puunene, Hawaii 96784

Dated: Honolulu, Hawaii, November 6,1997.

Mark R. Willey
Project Manager, CH2M HILL, INC.

Subscribed and sworn to before me
this 6 day of November , 1997.

LYNETTE P.M. CHOY NOTARY PUBLIC STATE OF HAWAII

Notary Public, State of Hawaii

My Commission expires: September 23, 2001

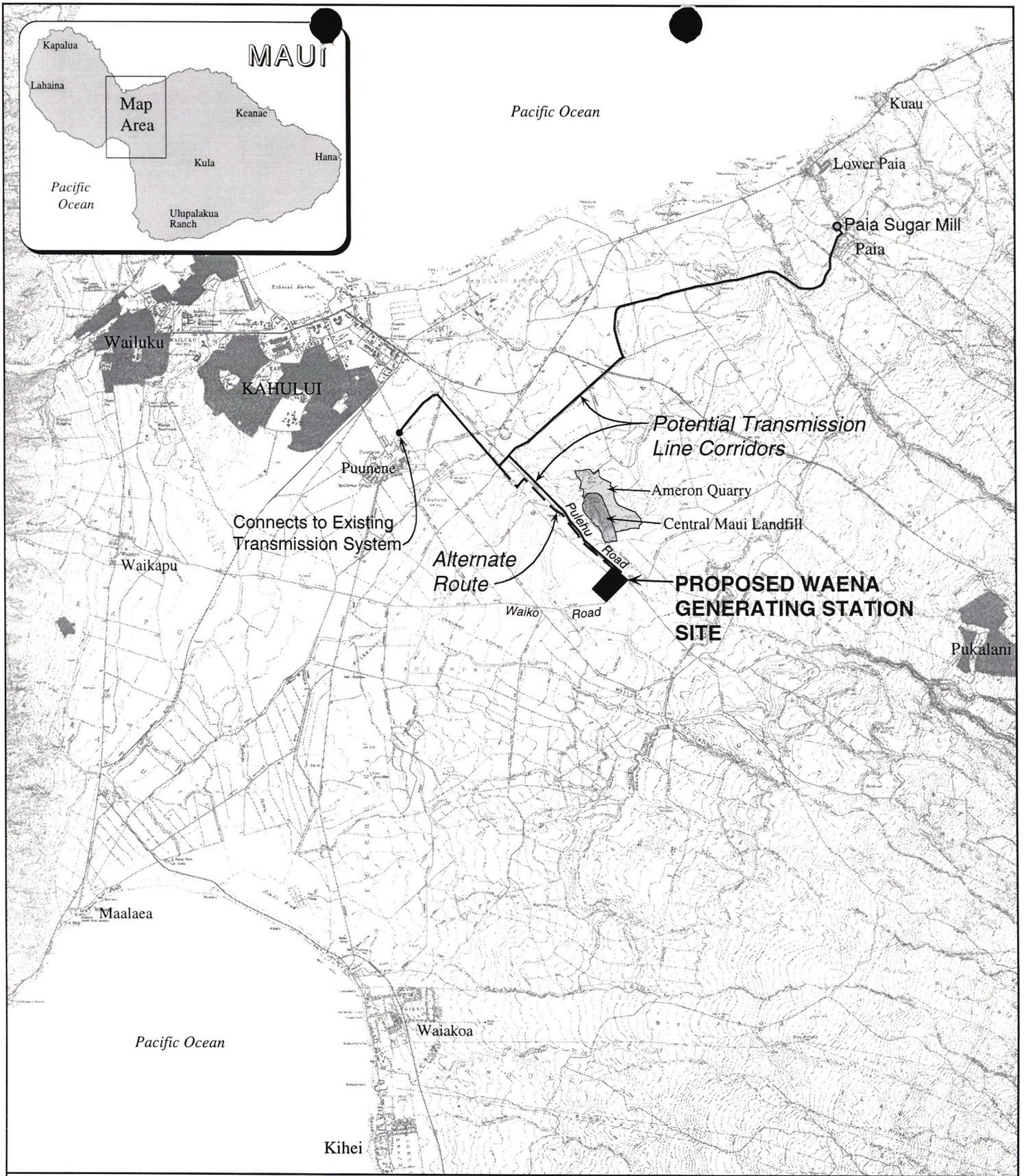
PETITION FOR DISTRICT BOUNDARY AMENDMENT
FROM AGRICULTURAL TO URBAN

MAUI ELECTRIC COMPANY, LIMITED
WAENA GENERATING STATION

LAND USE COMMISSION
STATE OF HAWAII
1997 OCT 24 P 2:18

EXHIBIT 1

PROJECT MAPS



Land Use District Boundary Amendment
Proposed Waena Generating Station
Maui Electric Company, Limited

FIGURE

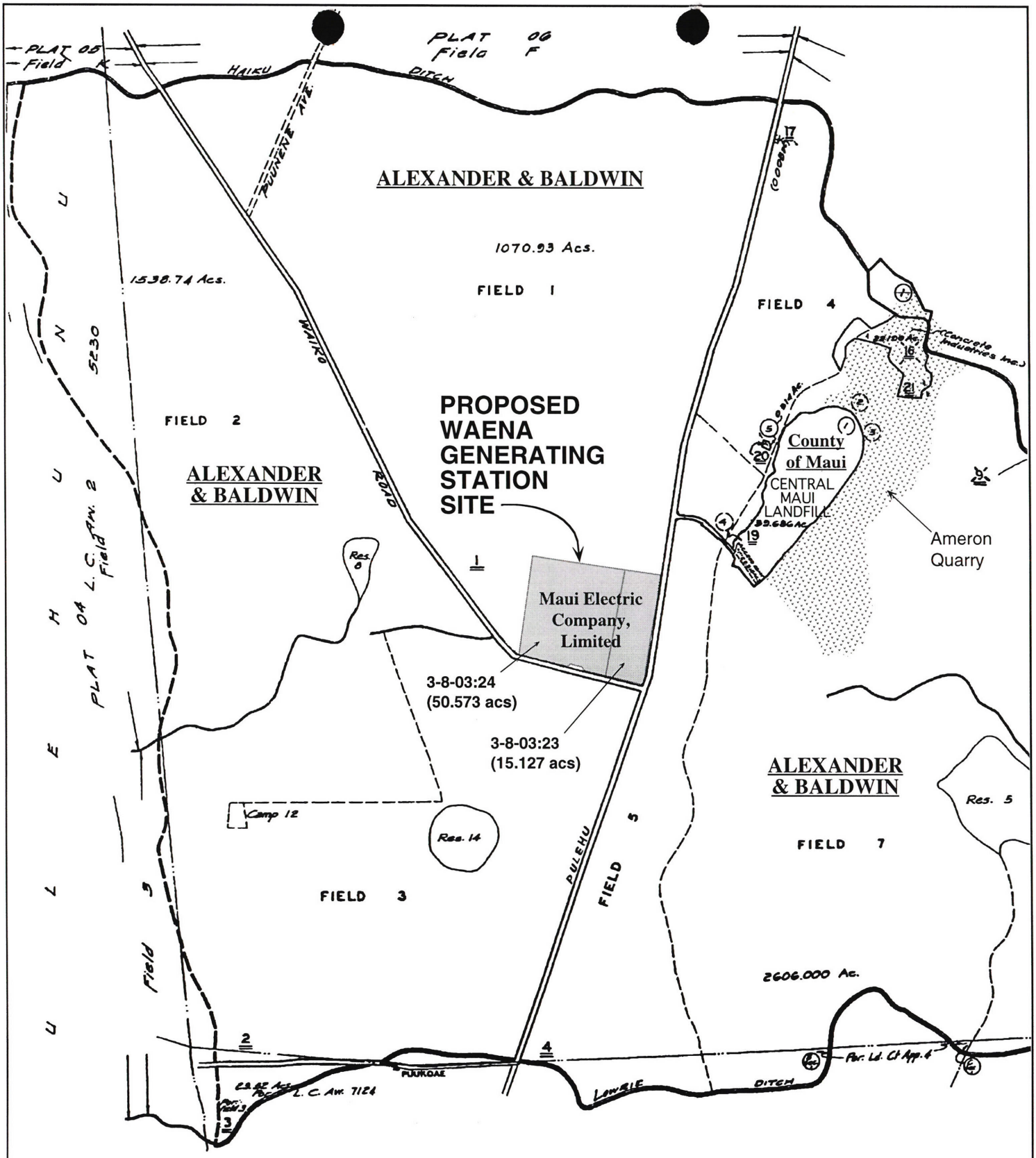
PROPOSED WAENA GENERATING STATION SITE LOCATION

NORTH

0 1 2 3 4 MILES

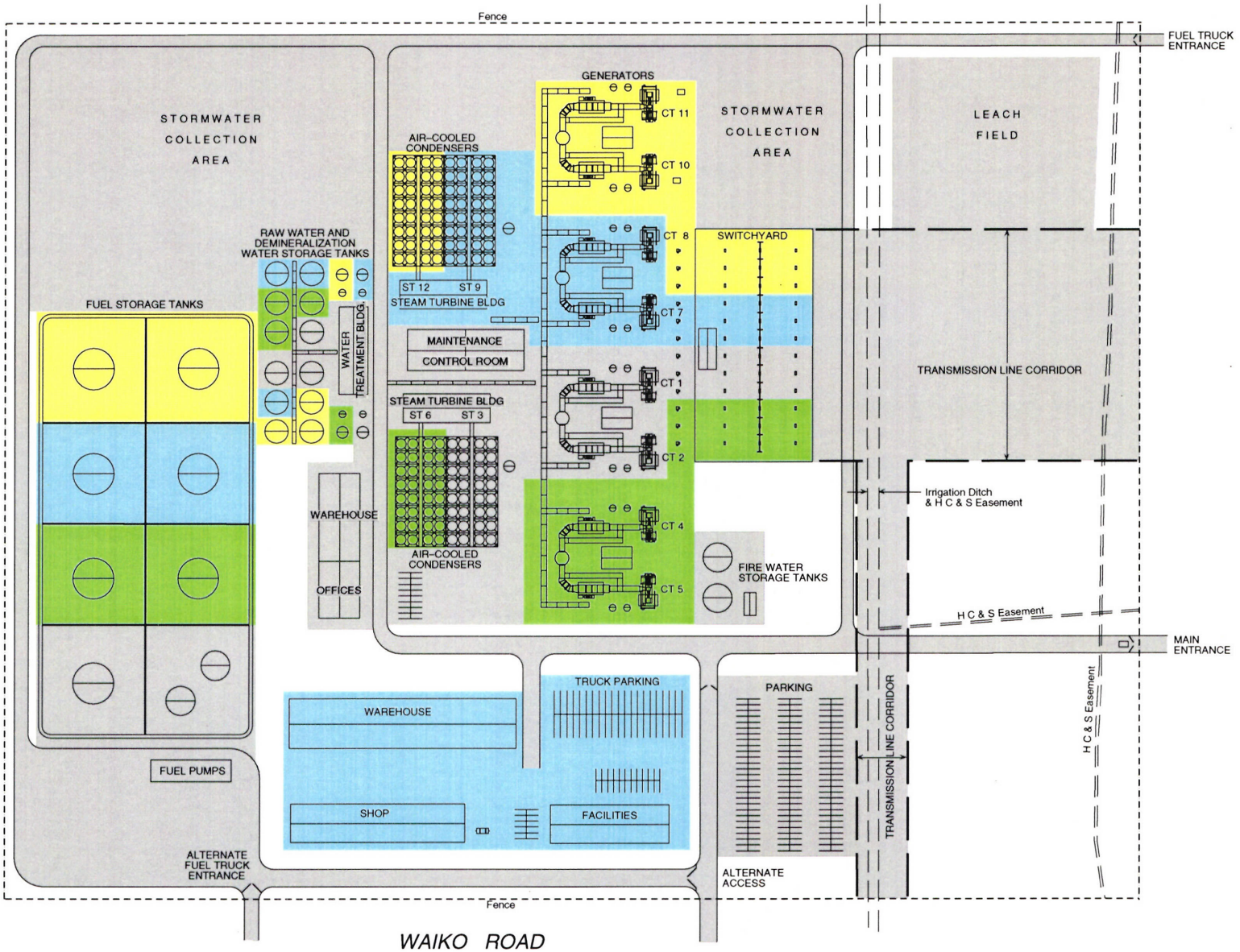
Source: Maui Electric Company, Limited

CH2M HILL



	Land Use District Boundary Amendment *Proposed Waena Generating Station* Maui Electric Company, Limited	FIGURE
	PROPOSED PROJECT LOCATION AND SURROUNDING LAND OWNERSHIP	
Source: Tax Map Key 3-8-03: portion of 01	NORTH 0 2000 4000 FEET	

CH2M HILL



PROJECT SCHEDULE (YEAR)

- DTCC 1/Site Development (2006)
- DTCC 2 (2010)
- DTCC 3/Transmission and Distribution Facilities (2016)
- DTCC 4 (2020)

Note: DTCC = Dual-Train Combined-Cycle Combustion Turbine
Source: Maui Electric Company, Limited, 1997

Land Use District Boundary Amendment
Proposed Waena Generating Station
Maui Electric Company, Limited

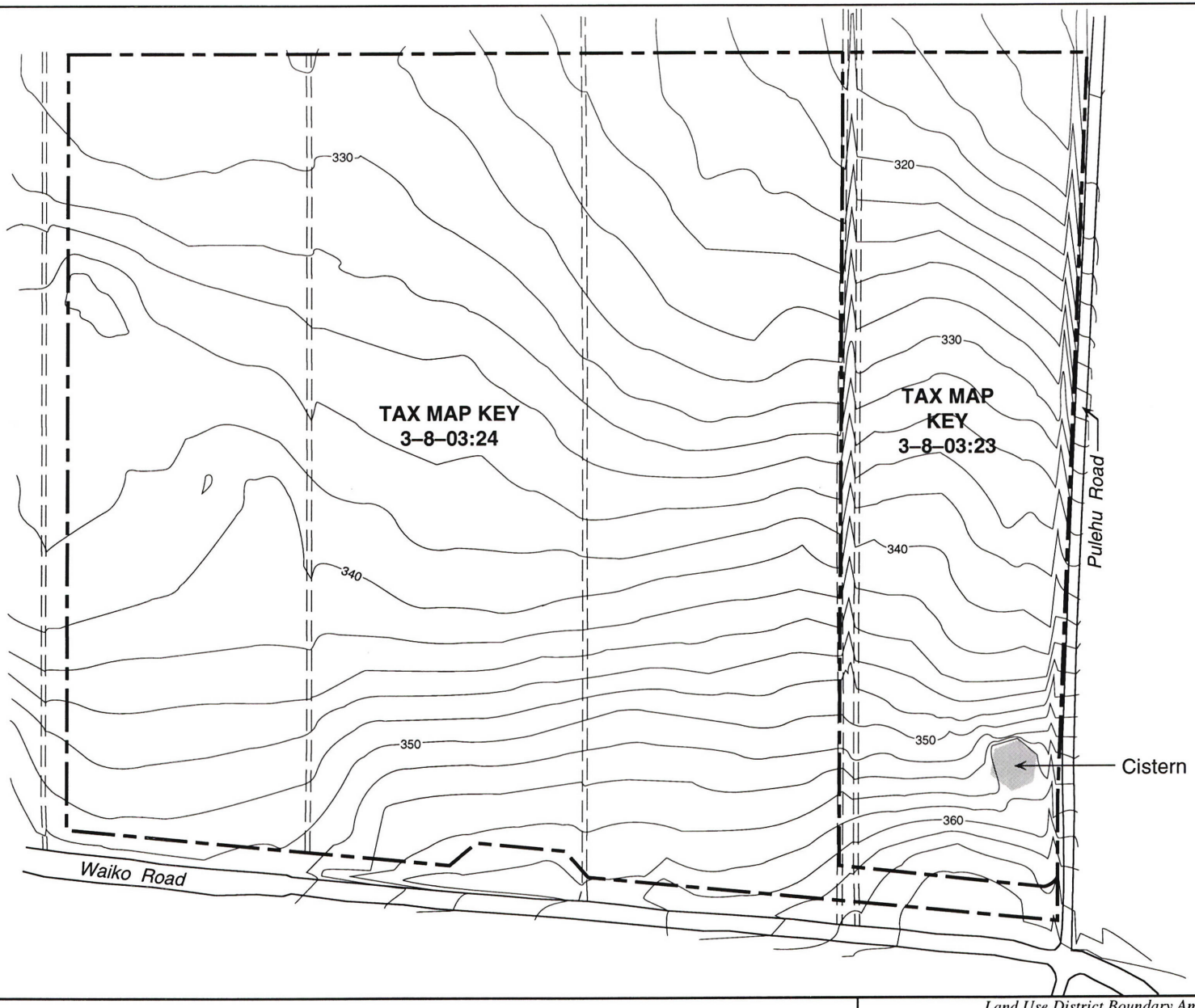
FIGURE

CONCEPTUAL SITE LAYOUT

NORTH

NOT TO SCALE

CH2M HILL



LEGEND

640 Contour (feet)

Dirt Road

Property Boundary

Note: Contour interval at 2 feet
Source: Maui Electric Company, Limited

Land Use District Boundary Amendment
Proposed Waena Generating Station
Maui Electric Company, Limited

FIGURE

TOPOGRAPHY

NORTH 0 200 400 600 FEET

CH2M HILL

3 8 03

PLAT 05
Field K

PLAT 06
Field F

HAIKU DITCH

PUUNENE AVE.

TRUE NORTH
1" = 1000'

Field D

PLAT 01

U

1538.74 Acs.

FIELD 1

FIELD 4

98.100 Ac.

Concrete Industries Inc.

16

21

17

(0.008 Ac.)

FIELD 2

1005.23 Ac.

3.934 Ac.

County of Maui

20

18

19

55.686 Ac.

HAIKU ROAD

Res. 8

Maui Electric Co., Ltd.

50.673 Ac.

24

23

18.187 Ac.

1

FIELD 6

3343

Por. 15

(1.458 Ac.)

(1.382 Ac.)

F.A.P. No. F-037-1(10)

Por. Par. 1

Field C

HAIKU DITCH

Field A

GRANT

FIELD 8

1088.220 Ac
(1043.455 Ac.)

FIELD 10

Res. 5

Camp 10

11

12

FIELD 7

FIELD 12

Camp 11

13

14

(9362.73 Ft. S, 3,267.08 Ft. E. PUUNENE Δ)

2934 Ac.

10

State of Hawaii
(Dept. of Transportation)
FOR: KAHULUI AIRPORT
Exec. Ord. No. 2827
PARCEL B
"WATER PURIFICATION PLANT SITE"

Camp 12

Res. 14

FIELD 3

FIELD 5

FIELD 9

Rem. R.P. 50.885 Ac. or 1.128 Ac.

See Below 22

(82,125 Sq. Ft. or 1.885 Ac.)

Por. Par. 1

HANA HWY.

FIELD 11

5 Por.

324.26 Ac.

ZONE 2 SEC. 5

2606.000 Ac.

2

4

PUUKOAE

23.52 Ac.
Por. R.P. 3
L. C. Aw. 7124

3

Por. Ld. Ct. App. 4

LOWRIE DITCH

4

7

35G.5

Res. 1

8 15

LOWRIE DITCH

6

5.51 Ac.s.

G R A N T

ZONE 2 SEC. 5

22 State of Hawaii
(Alexander & Baldwin, Inc.)
Rev. Prmt. 5-5485

Note: All parcels owned by A&B Hawaii, Inc. unless otherwise noted.

NOV 4 1997

Dropped parcels: 13, 14, 11, 12, 8, 15, 17, 16,

NOTICE: Owner's, lessee's and vendee's names recorded on this tax map print may not be current.

SUBJECT TO CHANGE

TAXATION MAPS BUREAU
TERRITORY OF HAWAII
TAX MAP

SECOND DIVISION		
ZONE	SEC.	PLAT
3	8	03

CONTAINING PARCELS

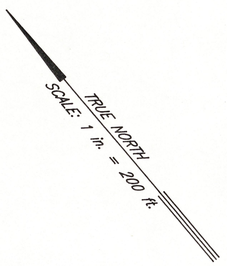
SCALE: 1in.=1000 ft.

POR. WAILUKU MAUI

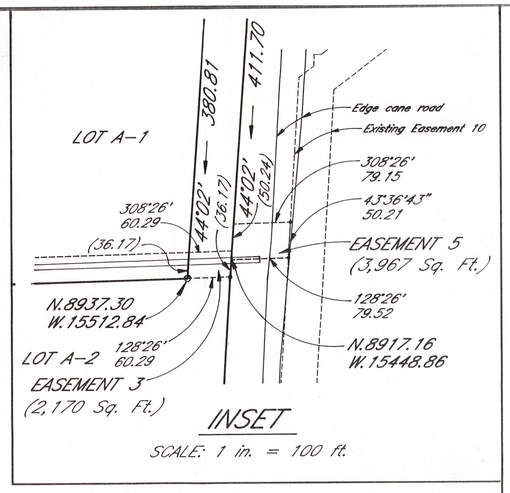
Dwg. No. 3430
Source: H.C.T.S. Cadastral Sys. Plat Map)
By: D.S.C. & H.N. June 1998

RECEIVED
1997 NOV -7 P 4:21
LAND USE COMMISSION
STATE OF HAWAII

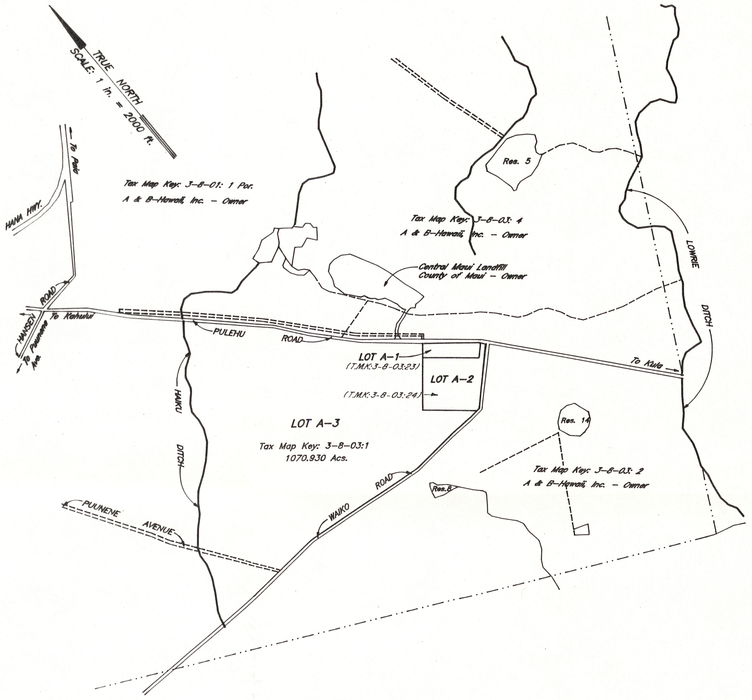
0018



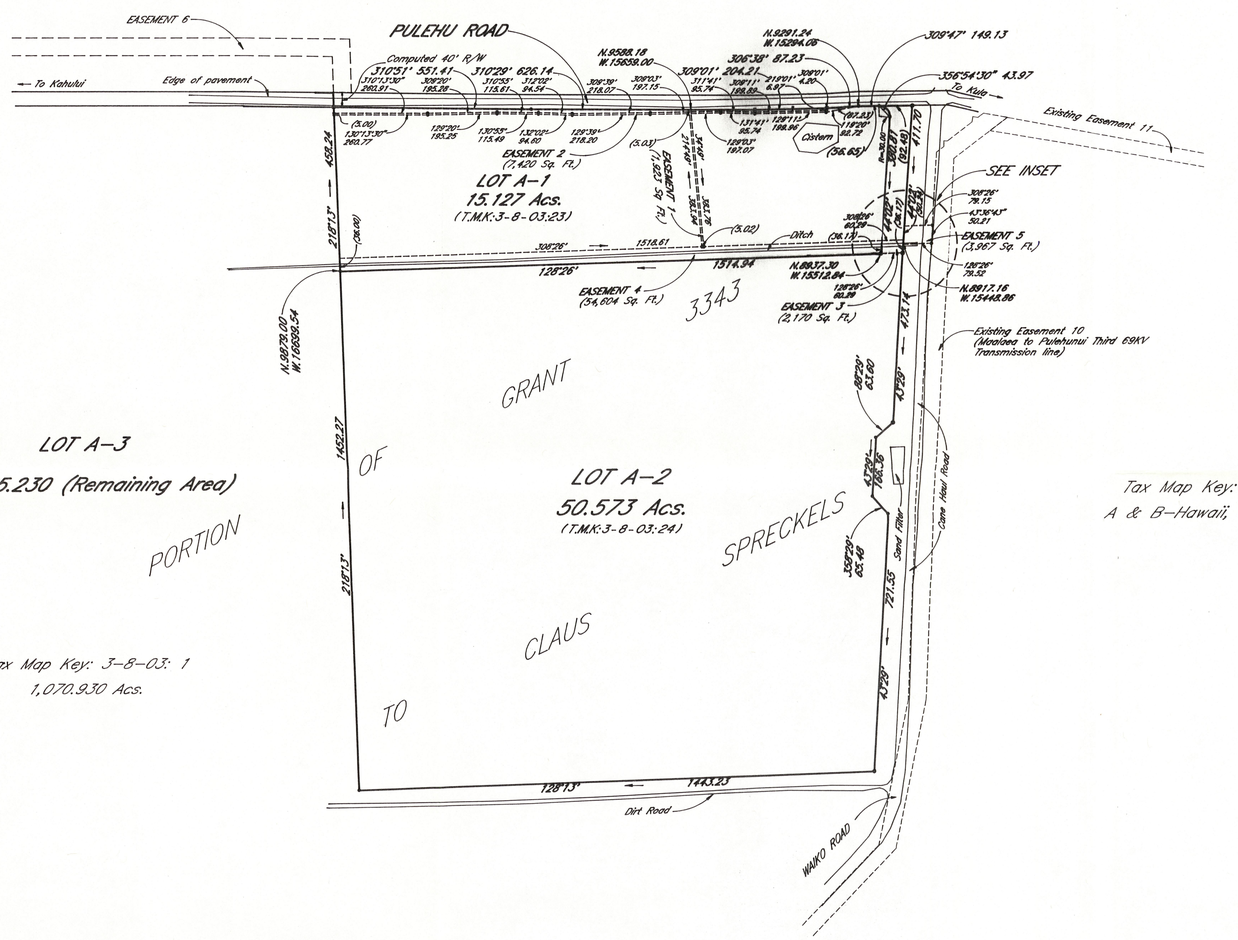
Tax Map Key: 3-8-03: 4
A & B-Hawaii, Inc. - Owner



INSET
SCALE: 1 in. = 100 ft.



LOCATION MAP
Scale: 1 in. = 2000 ft.



Tax Map Key: 3-8-03: 1
1,070.930 Acs.

Tax Map Key: 3-8-03: 2
A & B-Hawaii, Inc. - Owner

NEW CENTRAL MAUI GENERATION SITE SUBDIVISION

SUBDIVISION OF PARCEL 1 OF TAX MAP KEY: (2) 3-8-03 INTO LOTS A-1, A-2, AND A-3 AND DESIGNATION OF EASEMENTS 1 TO 5, INCLUSIVE

Being a portion of Grant 3343 to Claus Spreckels

WAILUKU, MAUI, HAWAII

OWNER: A & B-Hawaii, Inc.

SCALE: 1 in. = 200 ft.

DATE: March 26, 1996
REVISED: August 6, 1996
REVISED: September 11, 1996

Prepared for: Maui Electric Company, Limited

Prepared by: A & B Properties, Inc.
Kahului, Hawaii

KEN T. NOMURA
LICENSED PROFESSIONAL LAND SURVEYOR
No. LS-7633
HAWAII, U.S.A.

This work was prepared by me or under my supervision

Ken T. Nomura
Registered Professional Land Surveyor No. LS-7633

NOTES:
1. Azimuths and coordinates referred to Government Survey Triangulation Station "PUU O KOHA".
2. Origin of actual field survey from Government Survey Triangulation Station "FILTRATION".
3. Owners of adjoining parcels taken from Tax Map Records.
4. Boundary corners marked with 1/2 inch pipe unless noted otherwise.
5. Easements 1 and 2 are for waterline purposes in favor of Hawaiian Commercial and Sugar Company.
6. Easements 3 and 4 are for access and waterline purposes in favor of Hawaiian Commercial and Sugar Company.
7. Right-of-Way for Pulehu Road based on field location of existing centerline pavement and to be used only for this survey.
8. Easement 5 is for electrical transmission line purposes in favor of Maui Electric Company, Limited.

Tax Map Key: (2) 3-8-03: 1, 23 & 24

PETITION FOR DISTRICT BOUNDARY AMENDMENT
FROM AGRICULTURAL TO URBAN

MAUI ELECTRIC COMPANY, LIMITED
WAENA GENERATING STATION

LAND USE COMMISSION
STATE OF HAWAII
1991 OCT 24 P 2:18

EXHIBIT 2

LAND OWNERSHIP DOCUMENTATION

THE ORIGINAL OF THE DOCUMENT
RECORDED AS FOLLOWS:
STATE OF HAWAII

BUREAU OF CONVEYANCES
DATE: DEC 2 1996 9:00
DOCUMENT NO. 96-170191

After recording return by mail to:

Langa Breen & Associates
Wailuku Executive Center
24 North Church Street, #308
Wailuku Maui Hawaii 96793

Property description:

TMK: 3-8-3-1

Central Maui Power Plant Site

FINAL ORDER OF CONDEMNATION

Maui Electric Company, Ltd. vs. A & B-Hawaii, Inc., et al.

Civil No. 96-0929(3)

Second Circuit Court

RECEIVED
DEC 09 1996
MAUI ELECTRIC CO., LTD.
ENGINEERING DEPT.

COPY

Sanford J. Langa 808
John J. Breen 5022
R. Michael O'Donnell 5930
Michael G. Smith 6561
Langa Breen & Associates
24 North Church Street, #308
Wailuku Maui Hawaii 96793
242-7222 (voice)
242-9657 (fax)
Attorneys for Plaintiff

2ND CIRCUIT COURT
STATE OF HAWAII
FILED

96 NOV 26 AM 8:45

I. ARAKAKI
CLERK

IN THE CIRCUIT COURT OF THE SECOND CIRCUIT
STATE OF HAWAII

MAUI ELECTRIC COMPANY, LIMITED, a Hawaii Corporation Plaintiff vs. A&B-HAWAII, INC., a Hawaii Corporation; and ALEXANDER & BALDWIN, INC., a Hawaii Corporation Defendants	Civil Case No. 96-0929 (3) (Condemnation) Final Order Of Condemnation; Exhibit "A"; Exhibit "B"; Exhibit "C"; Exhibit "D"

I hereby certify that this is a full, true and correct copy of the Original.
Clerk, Circuit Court, Second Circuit

r:\litigation p\meco v a&b\finalord.doc

FINAL ORDER OF CONDEMNATION

Pursuant to the Stipulated Judgment As To All Parties And All Claims And Order For Withdrawal Of Funds And For Entry Of Final Order Of Condemnation filed herein on NOV 26 1996**, which has been fully satisfied,**

IT IS HEREBY ORDERED, ADJUDGED, AND DECREED:

1. Lot A-1 and Lot A-2 of the Central Maui Power Plant Site, being a portion of Grant 3343 to Claus Spreckels, and more particularly described in Exhibit "A" annexed hereto, including any and all improvements thereon, appurtenances thereunto belonging and access rights, and

2. Easements 5, 6, 7, 8, 9, 10, and 11 for electrical transmission purposes over, under, across and through said Grant 3343, and more particularly described in Exhibit "B" annexed hereto,

3. are hereby condemned for the construction of a power generation facility and related power transmission lines, and title thereto is hereby vested in Maui Electric Company, Limited, in fee simple absolute as to the property described in Exhibit "A", and absolutely and perpetually as to the easements described in Exhibit "B", subject to Easements 1, 2, 3 and 4, as described in said Exhibit "A", and subject to Letter Agreement — Central Maui Power Plant Site and Easements annexed hereto as Exhibit "C", and the Letter Agreement — Relocation of Central Maui Power Plant Easements annexed hereto as Exhibit "D".

DATED: Wailuku, Hawaii, NOV 25 1996.

/s/ Boyd P Mossman (Seal)

Judge of The Above Entitled Court

APPROVED AS TO FORM:

Attorney for the Plaintiff

Attorney for Defendants

EXHIBIT A

DESCRIPTION

LOT A-1
NEW CENTRAL MAUI GENERATION SITE SUBDIVISION
(Tax Map Key:(2)3-8-03:23)

All of that certain parcel of land, being a portion of Grant 3343 to Claus Spreckels situated at Wailuku, Island and County of Maui, State of Hawaii.

Beginning at a 1/2-inch pipe at the southwesterly corner of this lot, said pipe being also the northerly corner of Lot A-2 of the New Central Maui Generation Site Subdivision, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 9,879.00 feet North and 16,699.54 feet West and running by azimuths measured clockwise from True South:

1.	218° 13'	458.24	feet along Lot A-3 of the New Central Maui Generation Site Subdivision, being also the remainder of Grant 3343 to Claus Spreckels to a pipe;
2.	310° 51'	551.41	feet along the southwesterly side of Pulehu Road to a pipe;
3.	310° 29'	626.14	feet along same to a pipe;
4.	309° 01'	204.21	feet along same to a pipe;
5.	306° 38'	87.23	feet along same to a pipe;
6.	309° 47'	56.65	feet along same to a pipe;
7.	Thence along Lot A-2 of the New Central Maui Generation Site Subdivision, being also the remainder of Grant 3343 to Claus Spreckels on a curve to the right with a radius of 30.00 feet, the chord azimuth and distance being: 356° 54' 30" 43.97 feet to a pipe;		

8.	44° 02'	380.81	feet along same to a pipe;
9.	128° 26'	1,514.94	feet along same to the point of beginning and containing an Area of 15.127 Acres.

SUBJECT, HOWEVER to the following easements:

A) EASEMENT 1

Being an easement for waterline purposes over, under and across a portion of Lot A-1 of the New Central Maui Generation Site Subdivision, being also a portion of Grant 3343 to Claus Spreckels and being more particularly described as follows:

Beginning at a point at the northeasterly corner of this easement, on the southwesterly side of Pulehu Road, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 9,588.18 feet North and 15,659.00 feet West and running by azimuths measured clockwise from True South:

1.	34° 49'	383.76	feet over and across Lot A-1 of the New Central Maui Generation Site Subdivision to a point;
2.	128° 26'	5.02	feet over and across same to a point;
3.	214° 49'	383.94	feet over and across same to a point;
4.	310° 29'	5.03	feet along the southwesterly side of Pulehu Road to the point of beginning and containing an Area of 1,923 Square Feet.

B) EASEMENT 2

Being an easement for waterline purposes over, under and across Lot A-1 of the New Central Maui Generation Site Subdivision, being also a portion of Grant 3343 to Claus Spreckels and being more particularly described as follows:

Beginning at a pipe at the southeasterly corner of this easement, on the southwesterly side of Pulehu Road, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 9,291.24 feet North and 15,294.06 feet West and running by azimuths measured clockwise from True South:

1.	119° 20'	92.72	feet over and across Lot A-1 of the New Central Maui Generation Site Subdivision to a point;
2.	129° 11'	199.96	feet over and across same to a point;
3.	131° 41'	95.74	feet over and across same to a point;
4.	129° 03'	197.07	feet over and across same to a point;
5.	129° 39'	218.20	feet over and across same to a point;
6.	132° 02'	94.60	feet over and across same to a point;
7.	130° 55'	115.49	feet over and across same to a point;
8.	129° 20'	195.25	feet over and across same to a point;
9.	130° 13' 30"	260.77	feet over and across same to a point;
10.	218° 13'	5.00	feet along Lot A-3 of the New Central Maui Generation Site Subdivision to a point;
11.	310° 13' 30"	260.91	feet over and across Lot A-1 of the New Central Maui Generation Site Subdivision to a point;
12.	309° 20'	195.28	feet over and across same to a point;

13.	310° 55'	115.61	feet over and across same to a point;
14.	312° 02'	94.54	feet over and across same to a point;
15.	309° 39'	218.07	feet over and across same to a point;
16.	309° 03'	197.15	feet over and across same to a point;
17.	311° 41'	95.74	feet over and across same to a point;
18.	309° 11'	199.89	feet over and across same to a point;
19.	219° 01'	6.97	feet over and across same to a point;
20.	309° 01'	4.20	feet along the southwesterly side of Pulehu Road to a pipe;
21.	306° 38'	87.23	feet along same to the point of beginning and containing an Area of 7,420 Square Feet.

C) EASEMENT 4

Being an easement for access and waterline purposes over, under and across Lot A-1 of the New Central Maui Generation Site Subdivision, being also a portion of Grant 3343 to Claus Spreckels and being more particularly described as follows:

Beginning at a pipe at the southeasterly corner of this easement, said pipe being also the southeasterly corner of Lot A-1 of the New Central Maui Generation Site Subdivision, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 8,937.30 feet North and 15,512.84 feet West and running by azimuths measured clockwise from True South:

1.	128° 26'	1,514.94	feet along Lot A-2 of the New Central Maui Generation Site Subdivision to a pipe;

2.	218° 13'	36.00	feet along Lot A-3 of the New Central Maui Generation Site Subdivision to a point;
3.	308° 26'	1,518.61	feet over and across Lot A-1 of the New Central Maui Generation Site Subdivision to a point;
4.	44° 02"	36.17	feet along Lot A-2 of the New Central Maui Generation Site Subdivision to the point of beginning and containing an Area of 54,604 Square Feet.

Prepared by A&B Properties, Inc. September 11, 1996
Kahului, Maui, Hawaii

This work was prepared by me or under my supervision.

KEN T. NOMURA
LICENSED PROFESSIONAL LAND SURVEYOR
No. LS-7633
HAWAII, U.S.A.

Ken T. Nomura

Registered Professional Land Surveyor No. LS-7633

ME
43/6-t

DESCRIPTION

LOT A-2
NEW CENTRAL MAUI GENERATION SITE SUBDIVISION
(Tax Map Key:(2)3-8-03:24)

All of that certain parcel of land, being a portion of Grant 3343 to Claus Spreckels situated at Wailuku, Island and County of Maui, State of Hawaii.

Beginning at a 1/2-inch pipe at the northerly corner of this lot, said pipe being also the southwesterly corner of Lot A-1 of the New Central Maui Generation Site Subdivision, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 9,879.00 feet North and 16,699.54 feet West and running by azimuths measured clockwise from True South:

1.	308° 26'	1,514.94	feet along Lot A-1 of the New Central Maui Generation Site Subdivision, being also the remainder of Grant 3343 to Claus Spreckels to a pipe;
2.	224° 02'	380.81	feet along same to a pipe;
3.	Thence along same on a curve		to the left with a radius of 30.00 feet, the chord azimuth and distance being: 176° 54' 30" 43.97 feet to a pipe;
4.	309° 47'	92.48	feet along the southwesterly side of Pulehu Road to a pipe;
5.	44° 02'	411.70	feet along Lot A-3 of the New Central Maui Generation Site Subdivision, being also the remainder of Grant 3343 to Claus Spreckels to a pipe;
6.	43° 29'	473.14	feet along same to a pipe;
7.	88° 29'	63.60	feet along same to a pipe;

8.	43° 29'	166.36	feet along same to a pipe;
9.	358° 29'	65.48	feet along same to a pipe;
10.	43° 29'	721.55	feet along same to a pipe;
11.	128° 13'	1,443.23	feet along same to a pipe;
12.	218° 13'	1,452.27	feet along same to the point of beginning and containing an Area of 50.573 Acres.

SUBJECT, HOWEVER to Easement 3 for access and waterline purposes over, under and across a Portion of Lot A-2 of the New Central Maui Generation Site Subdivision, being also a portion of Grant 3343 to Claus Spreckels and being more particularly described as follows:

Beginning at a pipe at the northwesterly corner of this easement, said pipe being also the southeasterly corner of Lot A-1 of the New Central Maui Generation Site Subdivision, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 8,937.30 feet North and 15,512.84 feet West and running by azimuths measured clockwise from True South:

1.	224° 02'	36.17	feet along Lot A-1 of the New Central Maui Generation Site Subdivision to a point;
2.	308° 26'	60.29	feet over and across Lot A-2 of the New Central Maui Generation Site Subdivision to a point;
3.	44° 02'	36.17	feet along Lot A-3 of the New Central Maui Generation Site Subdivision to a point;
4,	128° 26'	60.29	feet over and across Lot A-2 of the New Central Maui Generation Site Subdivision to the point of beginning and containing an Area of 2,170 Square Feet.

Prepared by A&B Properties, Inc. August 6, 1996
Kahului, Maui, Hawaii

This work was prepared by me or under my supervision.



Ken T. Nomura

Registered Professional Land Surveyor No. LS-7633

ME
43/6-u

EXHIBIT B

DESCRIPTION

EASEMENT 5
NEW CENTRAL MAUI GENERATION SITE SUBDIVISION
Affecting Lot A-3
(TMK: (2)3-8-03:Por. 1)

All of that certain parcel of land, being an easement for electrical transmission line purposes over and across a portion of Grant 3343 to Claus Spreckels situated at Wailuku, Island and County of Maui, State of Hawaii.

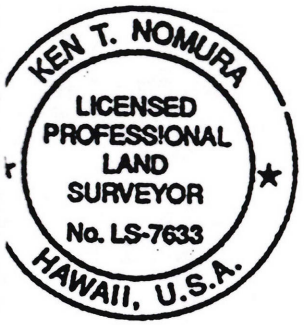
Beginning at a point at the northwesterly corner of this easement, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 8,917.16 feet North and 15,448.86 feet West and running by azimuths measured clockwise from True South:

1.	224° 02'	50.24	feet along Lot A-2 of the New Central Maui Generation Site Subdivision to a point;
2.	308° 26'	79.15	feet over and across Grant 3343 to Claus Spreckels to a point;
3.	43° 36' 43"	50.21	feet over and across same to a point;
4.	128° 26'	79.52	feet over and across same to the point of beginning and containing an Area of 3,967 Square Feet.

Prepared by A&B Properties, Inc.
Kahului, Maui, Hawaii

September 11, 1996

This work was prepared by me or under my supervision.



Registered Professional Land Surveyor No. LS-7633

ME
43/6-x

DESCRIPTION

EASEMENT 6
NEW CENTRAL MAUI GENERATION SITE SUBDIVISION
(Affecting TMK: (2)3-8-03:4)

All of that certain parcel of land, being an easement for electrical transmission line purposes over and across a portion of Grant 3343 to Claus Spreckels situated at Wailuku, Island and County of Maui, State of Hawaii.

Beginning at a point at the southwesterly corner of this easement, on the northeasterly side of Pulehu Road, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" BEING 10,270.48 feet North and 16,391.29 feet West and running by azimuths measured clockwise from True South:

1.	218° 13'	100.11	feet over and across Grant 3343 to Claus Spreckels to a point;
2.	130° 51'	244.42	feet over and across same to a point;
3.	130° 15'	647.51	feet over and across same to a point;
4.	129° 45'	168.86	feet over and across same to a point;
5.	219° 45' 35"	50.00	feet along Lot 1 of the Central Maui Sanitary Landfill Subdivision to a point;
6.	309° 45'	169.07	feet over and across Grant 3343 to Claus Spreckels to a point;
7.	310° 15'	647.99	feet over and across same to a point;
8.	310° 51'	292.43	feet over and across same to a point;

9.	38° 13'	150.16	feet over and across same to a point;
10.	130° 51'	50.05	feet along the northeasterly side of Pulehu Road to the point of beginning and containing an Area of 60,513 Square Feet or 1.389 Acres.

Prepared by A&B Properties, Inc.
Kahului, Maui, Hawaii

April 17, 1996

This work was prepared by me or under my supervision.



Ken T. Nomura

Registered Professional Land Surveyor No. LS-7633

ME
43/6-w

DESCRIPTION

EASEMENT 7
NEW CENTRAL MAUI GENERATION SITE SUBDIVISION
(Affecting TMK: (2)3-8-01:1, (2)3-8-03:4)

All of that certain parcel of land, being an easement for electrical transmission line purposes over and across a portion of Grant 3343 to Claus Spreckels situated at Wailuku, Island and County of Maui, State of Hawaii.

Beginning at a point at the southeasterly corner of this easement, being also on the northerly boundary of Lot 1 of the Central Maui Sanitary Landfill Subdivision, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 11,063.49 feet North and 17,172.10 feet West and running by azimuths measured clockwise from True South:

1. 129° 45' 323.10 feet over and across Grant 3343 to Claus Spreckels to a point;

2. 129° 00' 258.93 feet over and across same to a point;

3. Thence over and across same on a curve to the right with a radius of 1,455.00 feet, the chord azimuth and distance being:
134° 52' 30" 297.86 feet to a point;

4. 140° 45' 437.04 feet over and across same to a point;

5. 139° 26' 990.32 feet over and across same to a point;

6. 140° 06' 736.46 feet over and across same to a point;

7. 139° 40' 303.36 feet over and across same to a point;

8.	136° 15'	202.49	feet over and across same to a point;
9.	135° 20'	413.47	feet over and across same to a point;
10.	136° 06'	503.37	feet over and across same to a point;
11.	135° 26'	1,143.38	feet over and across same to a point;
12.	133° 29'	656.53	feet over and across same to a point;
13.	132° 55'	786.55	feet over and across same to a point;
14.	133° 20'	499.08	feet over and across same to a point;
15.	223° 05'	50.00	feet over and across same to a point;
16.	313° 20'	499.12	feet over and across same to a point;
17.	312° 55'	786.62	feet over and across same to a point;
18.	313° 29'	657.63	feet over and across same to a point;
19.	315° 26'	1,144.52	feet over and across same to a point;
20.	316° 06'	503.33	feet over and across same to a point;
21.	315° 20'	413.53	feet over and across same to a point;
22.	316° 15'	204.38	feet over and across same to a point;
23.	319° 40'	305.04	feet over and across same to a point;
24.	320° 06'	736.36	feet over and across same to a point;

25. 319° 26' 990.61 feet over and across same to a point;

26. 320° 45' 437.61 feet over and across same to a point;

27. Thence over and across same on a curve to the left with a radius of 1,405.00 feet, the chord azimuth and distance being:
314° 52' 30" 287.63 feet to a point;

28. 309° 00' 259.25 feet over and across same to a point;

29. 309° 45' 323.44 feet over and across same to a point;

30. 39° 45' 35" 50.00 feet along Lot 1 of the Central Maui Sanitary Landfill Subdivision to the point of beginning and containing an Area of 377,550 Square Feet or 8.667 Acres.

Prepared by A&B Properties, Inc. September 11, 1996
Kahului, Maui, Hawaii

This work was prepared by me or under my supervision.



Ken T. Nomura

Registered Professional Land Surveyor No. LS-7633

ME
43/6-y

DESCRIPTION

EASEMENT 8
NEW CENTRAL MAUI GENERATION SITE SUBDIVISION
(Affecting TMK: (2)3-8-01:1)

All of that certain parcel of land, being an easement for electrical transmission line purposes over and across a portion of Grant 3343 to Claus Spreckels situated at Wailuku, Island and County of Maui, State of Hawaii.

Beginning at a point at the northwesterly corner of this easement, on the northeasterly side of Pulehu Road, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 16,442.27 feet North and 22,521.18 feet West and running by azimuths measured clockwise from True South:

1.	223° 05'	879.66	feet over and across Grant 3343 to Claus Spreckels to a point;
2.	242° 30'	757.56	feet over and across same to a point;
3.	234° 27'	277.87	feet over and across same to a point;
4.	230° 44'	202.33	feet over and across same to a point;
5.	228° 58'	2,708.29	feet over and across same to a point;
6.	229° 05'	3,278.67	feet over and across same to a point;
7.	227° 52'	84.52	feet over and across same to a point;
8.	291° 03' 05"	29.29	feet along the southerly side of Haleakala Road [Federal Aid Project No. F-037-1(6)] to a point;

9. Thence along same on a curve to the left with a radius of 7,689.44 feet, the chord azimuth and distance being: 290° 57' 06" 26.77 feet to a point;

10. 47° 52' 110.38 feet over and across Grant 3343 to Claus Spreckels to a point;

11. 49° 05' 3,279.15 feet over and across same to a point;

12. 48° 58' 2,709.01 feet over and across same to a point;

13. 50° 44' 204.72 feet over and across same to a point;

14. 54° 27' 283.02 feet over and across same to a point;

15. 62° 30' 752.52 feet over and across same to a point;

16. 43° 05' 873.05 feet over and across same to a point;

17. 135° 19' 50.04 feet along the northeasterly side of Pulehu Road to the point of beginning and containing an Area of 410,080 Square Feet or 9.414 Acres.

Prepared by A&B Properties, Inc. August 7, 1996
Kahului, Maui, Hawaii

This work was prepared by me or under my supervision.

KEN T. NOMURA
LICENSED PROFESSIONAL LAND SURVEYOR
No. LS-7633
HAWAII, U.S.A.

Ken T. Nomura

Registered Professional Land Surveyor No. LS-7633

ME
43/7-a

DESCRIPTION

EASEMENT 9
NEW CENTRAL MAUI GENERATION SITE SUBDIVISION
(Affecting TMK: (2)3-8-01:6,7 & 14 and (2)2-5-05:19)

All of that certain parcel of land, being an easement for electrical transmission line purposes over and across portions of Grant 3343 to Claus Spreckels, Royal Patent 7512, Land Commission Award 11216, Apana 27 to M. Kekauonohi and the land deeded by the Board of Education to the Trustees of the Oahu College dated: January 30, 1860 situated at Wailuku, Haliimaile and Hamakuapoko, Island and County of Maui, State of Hawaii.

Beginning at a point at the southwesterly corner of this easement, on the northeasterly side of Haleakala Highway [Federal Aid Project No. F-037-1 (6)], the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUUNENE 2" being 5,762.22 feet South and 6,826.22 feet West and running by azimuths measured clockwise from True South:

1.	227° 51' 25"	26.37	feet over and across Grant 3343 to Claus Spreckels to a point;
2.	229° 08'	847.98	feet over and across same to a point;
3.	227° 05'	180.87	feet over and across same to a point;
4.	200° 55'	177.19	feet over and across same to a point;
5.	161° 27'	1,245.48	feet over and across same to a point;
6.	168° 30'	252.63	feet over and across same to a point;
7.	173° 10'	255.68	feet over and across same to a point;
8.	176° 43'	251.90	feet over and across same to a point;

9.	183° 56'	255.54	feet over and across same to a point;
10.	187° 58'	257.78	feet over and across same to a point;
11.	196° 49'	262.06	feet over and across same to a point;
12.	218° 12'	268.35	feet over and across same to a point;
13.	238° 44'	263.99	feet over and across same to a point;
14.	255° 58'	437.29	feet over and across same to a point;
15.	256° 43'	216.39	feet over and across same to a point;
16.	251° 38'	441.36	feet over and across same to a point;
17.	261° 22'	289.78	feet over and across same to a point;
18.	262° 47'	550.70	feet over and across same to a point;
19.	255° 02'	824.84	feet over and across same to a point;
20.	257° 00'	262.03	feet over and across same to a point;
21.	258° 45'	263.73	feet over and across same to a point;
22.	254° 54'	263.09	feet over and across same to a point;
23.	256° 55'	1,102.51	feet over and across same to a point;
24.	261° 56'	738.92	feet over and across same to a point;
25.	257° 01'	936.10	feet over and across same to a point;

26.	263° 52'	501.34	feet over and across same to a point;
27.	258° 41'	574.72	feet over and across same to a point;
28.	256° 36'	250.74	feet over and across same to a point;
29.	254° 03'	497.69	feet over and across same to a point;
30.	250° 00'	256.06	feet over and across same to a point;
31.	248° 24'	237.99	feet over and across same to a point;
32.	251° 31'	260.07	feet over and across same to a point;
33.	264° 09'	234.37	feet over and across same to a point;
34.	288° 30'	230.82	feet over and across same to a point;
35.	292° 52'	220.33	feet over and across same to a point;
36.	301° 50'	229.63	feet over and across same to a point;
37.	306° 38'	782.18	feet over and across same to a point;
38.	296° 45'	466.32	feet over and across same and R. P. 7512, L. C. Aw. 11216, Apana 27 to M. Kekauonohi to a point;
39.	287° 52'	230.55	feet over and across R. P. 7512, L. C. Aw. 112166, Apana 27 to M. Kekauonohi to a point;
40.	279° 01'	213.15	feet over and across same to a point;
41.	272° 31'	258.81	feet over and across same to a point;

42.	260° 44'	415.45	feet over and across same to a point;
43.	247° 14'	221.75	feet over and across same to a point;
44.	239° 21'	196.60	feet over and across same to a point;
45.	220° 43'	190.74	feet over and across same to a point;
46.	202° 01'	420.32	feet over and across same to a point;
47.	202° 58'	220.56	feet over and across same to a point;
48.	199° 33'	215.71	feet over and across same to a point;
49.	181° 55'	495.66	feet over and across same to a point;
50.	187° 27'	744.37	feet over and across same and the land deeded by the Board of Education to the Trustees of the Oahu College dated: January 30, 1860 to a point;
51.	184° 03'	242.09	feet over and across the land deeded by the Board of Education to the Trustees of the Oahu College dated: January 30, 1860 to a point;
52.	189° 33'	229.49	feet over and across same to a point;
53.	349° 50' 20"	148.25	feet along Ld. Ct. App. 110 to a point;
54.	9° 33'	87.52	feet over and across the land deeded by the Board of Education to the Trustees of the Oahu College dated: January 30, 1860 to a point;
55.	4° 03'	241.18	feet over and across same to a point;

56.	7° 27'	743.43	feet over and across same and R. P. 7512, L.C. Aw. 11216, Apana 27 to M. Kekauonohi to a point;
57.	1° 55'	501.00	feet over and across R. P. 7512, L. C. Aw. 11216, Apana 27 to M. Kekauonohi to a point;
58.	19° 33'	224.96	feet over and across same to a point;
59.	22° 58'	221.63	feet over and across same to a point;
60.	22° 01'	428.14	feet over and across same to a point;
61.	40° 43'	207.18	feet over and across same to a point;
62.	59° 21'	208.24	feet over and across same to a point;
63.	67° 14'	231.12	feet over and across same to a point;
64.	80° 44'	426.53	feet over and across same to a point;
65.	92° 31'	266.81	feet over and across same to a point;
66.	99° 01'	219.85	feet over and across same to a point;
67.	107° 52'	238.30	feet over and across same to a point;
68.	116° 45'	474.53	feet over and across same and Grant 3343 to Claus Spreckels to a point;
69.	126° 38'	784.41	feet over and across Grant 3343 to Claus Spreckels to a point;
70.	121° 50'	223.61	feet over and across same to a point;

71.	112° 52'	214.51	feet over and across same to a point;
72.	108° 30'	218.13	feet over and across same to a point;
73.	84° 09'	218.05	feet over and across same to a point;
74.	71° 31'	253.17	feet over and across same to a point;
75.	68° 24'	237.32	feet over and across same to a point;
76.	70° 00'	258.53	feet over and across same to a point;
77.	74° 03'	500.58	feet over and across same to a point;
78.	76° 36'	252.76	feet over and across same to a point;
79.	78° 41'	577.89	feet over and across same to a point;
80.	83° 52'	500.61	feet over and across same to a point;
81.	77° 01'	935.25	feet over and across same to a point;
82.	81° 56'	738.88	feet over and across same to a point;
83.	76° 55'	1,099.44	feet over and across same to a point;
84.	74° 54'	263.89	feet over and across same to a point;
85.	78° 45'	264.65	feet over and across same to a point;
86.	77° 00'	260.41	feet over and across same to a point;
87.	75° 02'	827.37	feet over and across same to a point;

88.	82° 47'	553.47	feet over and across same to a point;
89.	81° 22'	284.90	feet over and across same to a point;
90.	71° 38'	439.32	feet over and across same to a point;
91.	76° 43'	218.29	feet over and across same to a point;
92.	75° 58'	429.38	feet over and across same to a point;
93.	58° 44'	247.36	feet over and across same to a point;
94.	38° 12'	249.85	feet over and across same to a point;
95.	16° 49'	248.75	feet over and across same to a point;
96.	7° 58'	252.16	feet over and across same to a point;
97.	3° 56'	250.62	feet over and across same to a point;
98.	356° 43'	247.20	feet over and across same to a point;
99.	353° 10'	252.09	feet over and across same to a point;
100.	348° 30'	247.52	feet over and across same to a point;
101.	341° 27'	1,260.35	feet over and across same to a point;
102.	20° 55'	206.74	feet over and across same to a point;
103.	47° 05'	193.39	feet over and across same to a point;
104.	49° 08'	848.35	feet over and across same to a point;

105. Thence along the northeasterly side of Haleakala Highway [Federal Aid Project No. F-037-1 (6)] on a curve to the right with a radius of 7,569.44 feet, the chord azimuth and distance being: 110° 35' 27.5" 56.26 feet to the point of beginning and containing an Area of 992,181 Square Feet or 22.777 Acres.

Prepared by A&B Properties, Inc.
Kahului, Maui, Hawaii

April 17, 1996

This work was prepared by me or under my supervision.



Registered Professional Land Surveyor No. LS-7633

ME
43/6-z

DESCRIPTION

EASEMENT 10
NEW CENTRAL MAUI GENERATION SITE SUBDIVISION
(Affecting TMK: (2)3-8-06:1)

All of that certain parcel of land, being an easement for electrical transmission line purposes over and across a portion of Grant 3343 to Claus Spreckels situated at Wailuku, Island and County of Maui, State of Hawaii.

Beginning at a point at the southeasterly corner of this easement, on the southwesterly side of Pulehu Road, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU O KOHA" being 16,377.46 feet North and 22,513.33 feet West and running by azimuths measured clockwise from True South:

1.	43° 05'	509.01	feet over and across Grant 3343 to Claus Spreckels to a point;
2.	118° 36'	120.57	feet over and across same to a point;
3.	139° 10'	900.30	feet over and across same to a point;
4.	110° 58'	98.18	feet over and across same to a point;
5.	151° 12'	227.43	feet over and across same to a point;
6.	139° 13'	1,261.33	feet over and across same to a point;
7.	247° 02' 45"	52.52	feet along the southeasterly side of Hansen Road to a point;
8.	319° 13'	1,250.49	feet over and across Grant 3343 to Claus Spreckels to a point;

9.	331° 12'	214.36	feet over and across same to a point;
10.	290° 58'	92.42	feet over and across same to a point;
11.	319° 10'	903.79	feet over and across same to a point;
12.	298° 36'	72.78	feet over and across same to a point;
13.	223° 05'	472.23	feet over and across same to a point;
14.	315° 19'	50.04	feet along the southwesterly side of Pulehu Road to the point of beginning and containing an Area of 153,068 Square Feet or 3.514 Acres.

Prepared by A&B Properties, Inc. August 8, 1996
Kahului, Maui, Hawaii

This work was prepared by me or under my supervision.



Ken T. Nomura

Registered Professional Land Surveyor No. LS-7633

ME
43/7-b

DESCRIPTION

EASEMENT 11
NEW CENTRAL MAUI GENERATION SITE SUBDIVISION
(Affecting TMK: (2)3-8-06:4)

All of that certain parcel of land, being an easement for electrical transmission line purposes over and across a portion of Grant 3343 to Claus Spreckels situated at Wailuku, Island and County of Maui, State of Hawaii.

Beginning at a point at the southeasterly corner of this easement, on the northwesterly side of Hansen Road, the coordinates of said point of beginning referred to Government Survey Triangulation Station "LUKE" being 2,925.58 feet South and 18,994.36 feet East and running by azimuths measured clockwise from True South:

1.	67° 00'	52.52	feet along the northwesterly side of Hansen Road to a point;
2.	139° 10' 15"	2,584.51	feet over and across Grant 3343 to Claus Spreckels to a point
3.	138° 53'	217.55	feet over and across same to a point;
4.	128° 12'	229.79	feet over and across same to a point;
5.	136° 42'	132.45	feet over and across same to a point;
6.	48° 43'	320.83	feet over and across same to a point;
7.	53° 50'	327.42	feet over and across same to a point;
8.	56° 19'	201.64	feet over and across same to a point;

9.	46° 50'	248.69	feet over and across same to a point;
10.	40° 00'	286.39	feet over and across same to a point;
11.	39° 55'	1,572.12	feet over and across same to a point;
12.	39° 39'	721.26	feet over and across same to a point;
13.	206° 50'	216.74	feet over and across same to a point;
14.	286° 10'	29.50	feet over and across same to a point;
15.	196° 10'	5.00	feet over and across same to a point;
16.	106° 10'	29.42	feet over and across same to a point;
17.	219° 39'	505.41	feet over and across same to a point;
18.	219° 55'	1,572.28	feet over and across same to a point;
19.	220° 00'	289.41	feet over and across same to a point;
20.	226° 50'	255.82	feet over and across same to a point;
21.	236° 19'	204.71	feet over and across same to a point;
22.	233° 50'	324.10	feet over and across same to a point;
23.	228° 43'	366.87	feet over and across same to a point;
24.	316° 42'	177.00	feet over and across same to a point;
25.	308° 12'	230.75	feet over and across same to a point;

26. 318° 53' 222.26 feet over and across same to a point;

27. 319° 10' 15" 2,600.81 feet over and across same to the point of beginning and containing an Area of 339,564 Square Feet or 7.795 Acres.

Prepared by A&B Properties, Inc. August 8, 1996
Kahului, Maui, Hawaii

This work was prepared by me or under my supervision.



Registered Professional Land Surveyor No. LS-7633

ME
11/42-L

EXHIBIT C

Thomas J. Jezierny
President

January 31, 1996

Mr. Stanley M. Kuriyama, Esq.
Vice President
A&B-Hawaii, Inc.
822 Bishop Street
Honolulu, Hawaii 96813

Letter Agreement--Central Maui Power Plant Site and Easements

Dear Mr. Kuriyama:

As a result of recent discussions and understandings reached on the above referenced subject, Maui Electric Company, Limited ("MECO") believes it would be appropriate to enter into a letter agreement with A&B-Hawaii, Inc. ("ABHI") regarding MECO's acquisition from ABHI of site A-2 of approximately 50 acres, a 17-acre remnant parcel (collectively the "Property") and related transmission line easements for the Central Maui Power Plant project.

Power Plant Site A-2 and Remnant Parcel: ABHI agrees to convey to MECO the Property for purposes of constructing the proposed Central Maui Power Plant. The Property is a portion of TMK 2-3-8-003-001, generally located as shown on the attached Exhibit I.

Option to Repurchase the Remnant Parcel: ABHI is requesting that MECO grant ABHI an option to repurchase the 17-acre remnant parcel in the event MECO has no utility need for the remnant and decides to dispose of it. MECO agrees to take title to the remnant subject to an option to ABHI to purchase it back at the same price MECO paid for it ($25,000 per acre), adjusted by the increase in the Honolulu Consumer Price Index from the date MECO acquires the remnant to the date ABHI exercises the option to repurchase. The option to repurchase shall remain effective for the benefit of ABHI, its successors and assigns for a period of 25 years from the date MECO acquires title.

Agricultural Maintenance License and Irrigation Ditch/Pipeline Easement: MECO understands that Hawaiian Commercial & Sugar Company ("HC&S") cultivates sugar cane on the Property. After MECO acquires title, MECO agrees to license the Property to HC&S for crop cultivation on a month-to-month basis at no rent until the area is

required for development by MECO for utility purposes or December 31, 2004, whichever comes first, or if cultivation of crops on the Property is no longer permissible by law. HC&S will pay any agricultural property taxes assessed against the Property during the term of the license arrangement. In consideration, HC&S will manage the Property for MECO during the tenure of the license under terms set forth in a license agreement that will be drawn up between the parties without undue delay after an Order of Possession is issued by the Second Circuit Court.

MECO also agrees to take title to the Property subject to easements in favor of HC&S for the existing irrigation and mountain water ditch, pipelines and access road through the remnant parcel. ABHI agrees to cause the surrender and cancellation of the easements if they are no longer required for farming operations. Such ditch, pipelines and access road may be relocated by MECO outside of the Property at MECO's expense, subject to ABHI's approval of the new location and the proposed substitute facilities. The existing irrigation pipeline(s) through site A-2 will be tenured under the above-described license agreement until it is relocated by MECO to a mutually agreeable location outside the Property at MECO's expense.

Transmission Easements: ABHI agrees to convey to MECO perpetual transmission line easements for the Central Maui Power Plant project, consisting of approximately 39 acres. A routing for such easements is generally shown on the attached Exhibit II. However, upon the issuance of a Final Order of Condemnation for the easements, the location of Easements 3 through 8 may be relocated to mutually agreeable, substitute alignments at no further cost to MECO.

Compensation: MECO and ABHI agree that the total compensation payable to ABHI for site A-2, the remnant parcel and the transmission easements is $1,831,421. MECO and ABHI further agree that the above compensation will be adjusted for changes in the acreage of site A-2, the remnant parcel and the easements resulting from a formal survey. The unit land values to be used for adjusting A-2 and the remnant are $23,000 per acre and $25,000 per acre respectively. The unit land values and disutility factors to be used to adjust easement values will be those of the Medusky & Co. appraisal. The compensation recited herein is for the unencumbered fee title of site A-2 and the remnant parcel, subject to the easements and option to repurchase cited above. ABHI warrants that to its knowledge it has good title to the property and that no other person or entity has any lawful claim to site A-2, the remnant parcel and the transmission easement areas.

Closing Deadline: Both MECO and ABHI will make every effort to close the transaction by November 30, 1996, but no later than December 30, 1996. To achieve this closing deadline, MECO shall commence a condemnation action to convey title to the Property and related easements. MECO will file with the PUC an Application requesting authority

to expend the compensation above and to condemn the Property and related easements. Upon receipt of PUC approval, MECO will file a complaint for condemnation in Second Circuit Court and deposit with the Court the above compensation, as adjusted for acreage changes. ABHI will be able to withdraw the compensation from Circuit Court whenever it is available. The prices set forth in "Compensation" above shall be effective and binding only if payment is made in 1996. If this transaction fails to close by the December 30, 1996, the prices shall be subject to further negotiation and shall be binding only upon the mutual agreement of the parties. If the prices have to be further negotiated, the parties agree that the highest and best use of the Property and the land underlying the easements is agriculture with long-term urban potential, as currently concluded in the Medusky appraisal. If the parties fail to reach agreement on mutually acceptable prices by April 1, 1997, the provisions of this agreement do not apply.

Cooperation: ABHI and MECO pledge to mutually cooperate in the review, drafting and execution of whatever documents, authorizations, stipulations and agreements are needed to close the transaction by the end of 1996.

On behalf of MECO and Hawaiian Electric Company, I thank you for the superb cooperation and professionalism demonstrated by the representatives of ABHI and HC&S in the last four years of discussions concerning the Central Maui Power Plant project.

Sincerely yours,

Thomas Jezierny

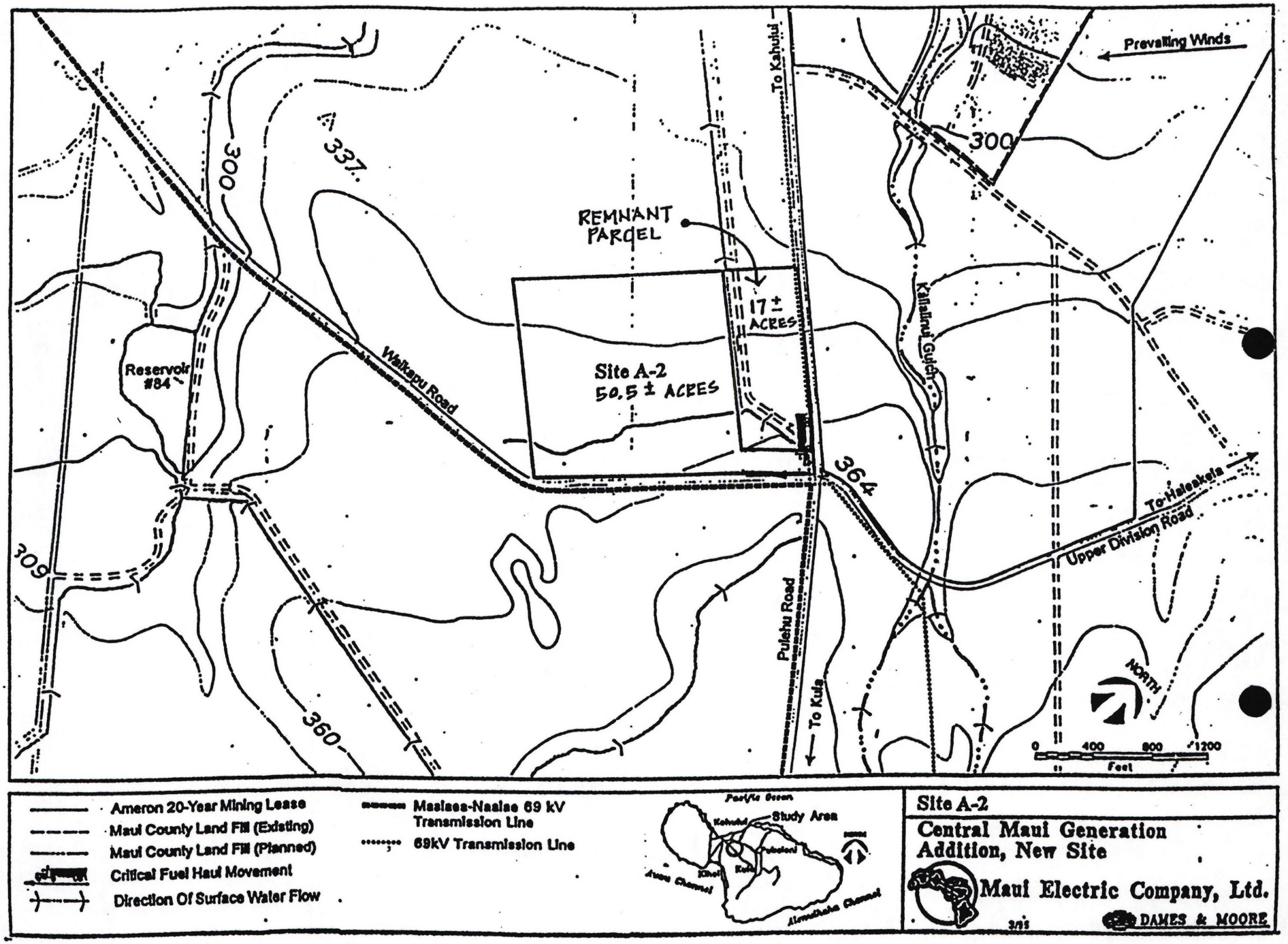
Attachments

AGREED AND ACCEPTED
THIS 2nd DAY OF February, 1996

A&B-HAWAII, INC.

By Stanley M. Kuriyama
Its Vice President

bc: J. Fernie
P. Wong
K. Kusaka
G. Hashiro
E. Reinhardt (MECO)
N. Shinyama (MECO)
T. Jezierny (MECO)
Central Maui Power Plant Site


Prevailing Winds
To Kahului
300
337
REMNANT PARCEL
17 ± ACRES
Site A-2
50.5 ± ACRES
Reservoir #84
Waikapu Road
Kalialinui Gulch
364
To Haleakala
Upper Division Road
309
Pulehu Road
To Kula
360
NORTH
0 400 800 1200
Feet
Ameron 20-Year Mining Lease
Maui County Land Fill (Existing)
Maui County Land Fill (Planned)
Critical Fuel Haul Movement
Direction Of Surface Water Flow
Maalaea-Naalae 69 kV Transmission Line
69kV Transmission Line
Pacific Ocean
Study Area
Kahului
Kihei
Alenuihaha Channel
Site A-2
Central Maui Generation Addition, New Site
Maui Electric Company, Ltd.
DAMES & MOORE

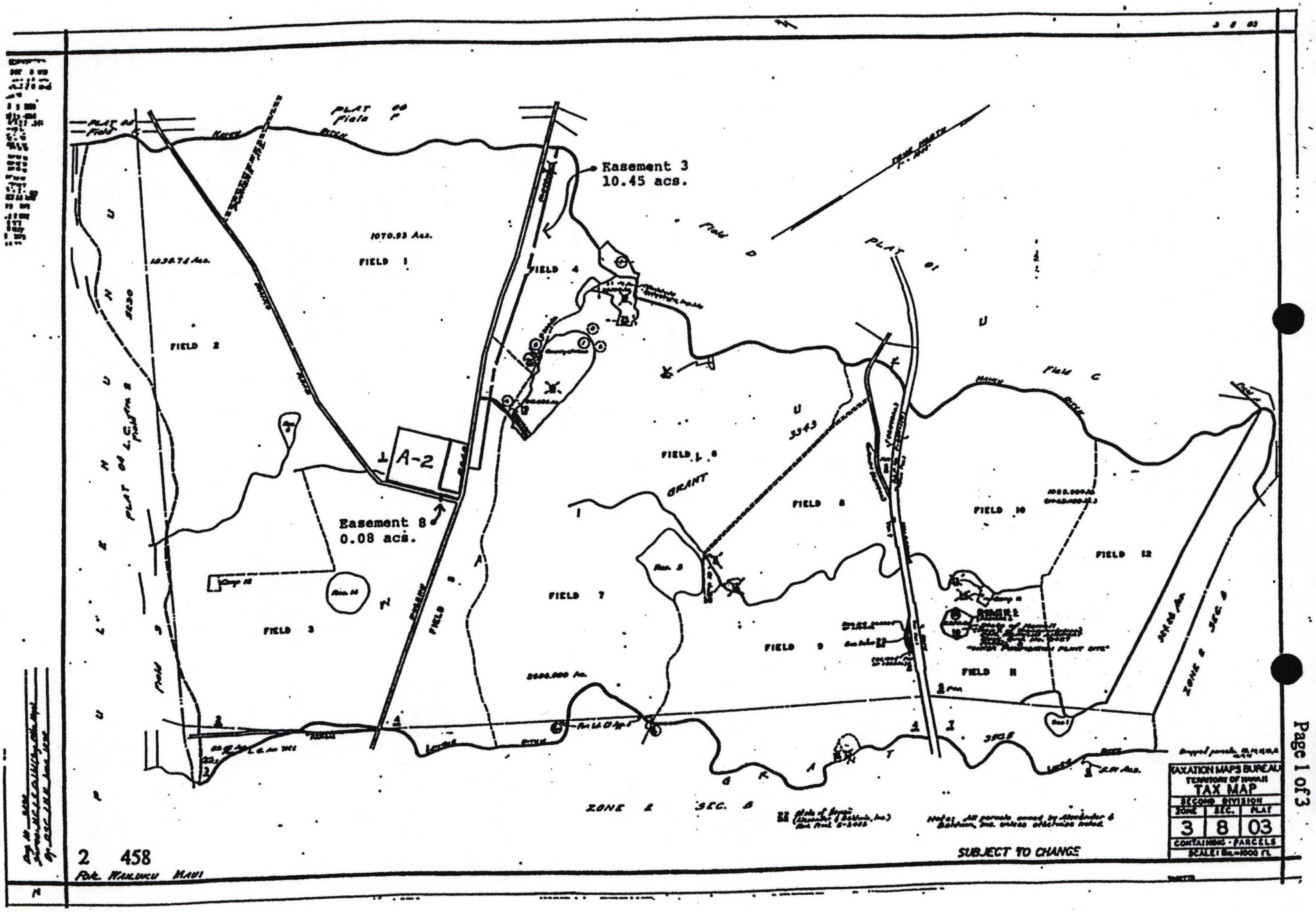


EXHIBIT II
Page 1 of 3

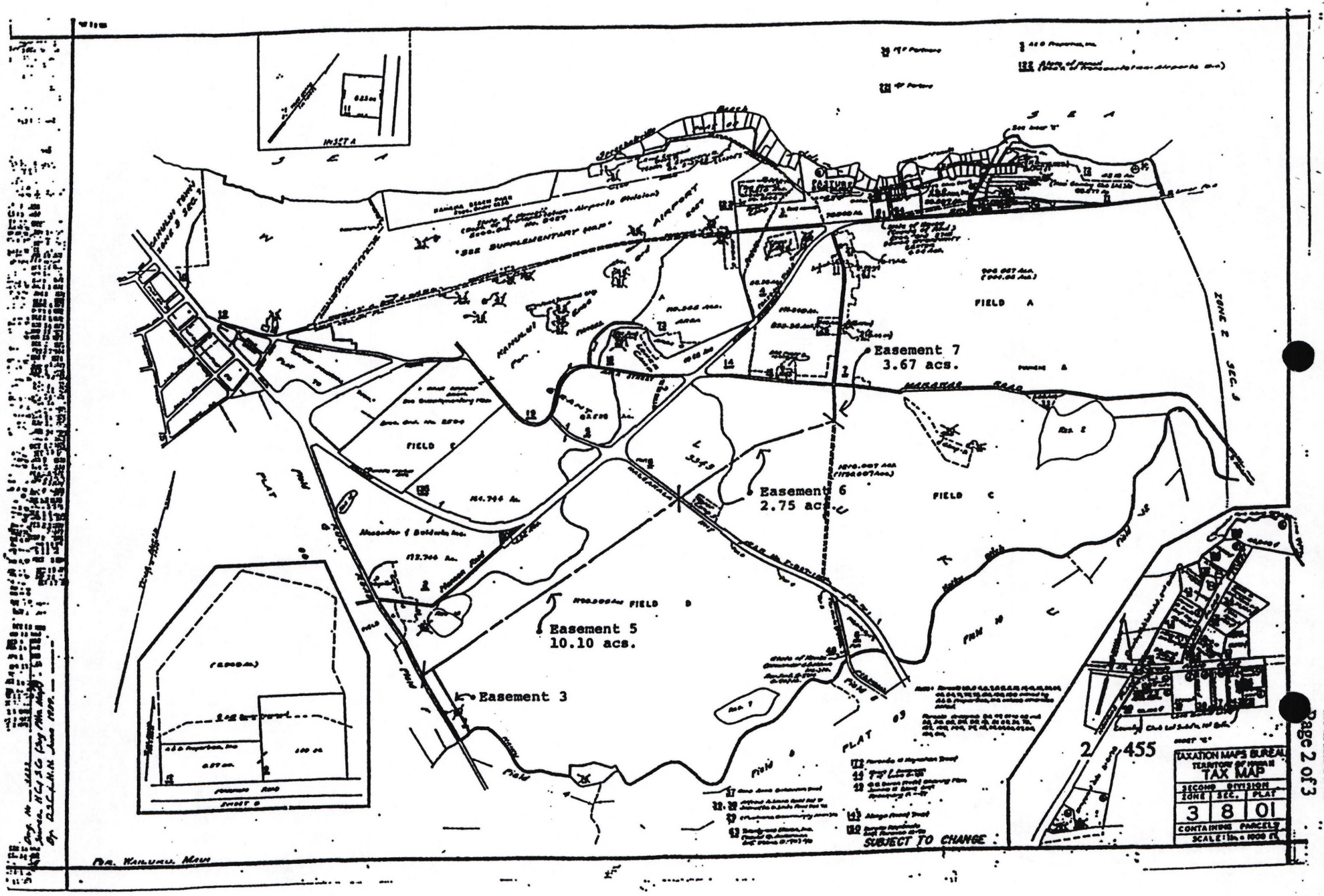


EXHIBIT II
Page 2 of 3

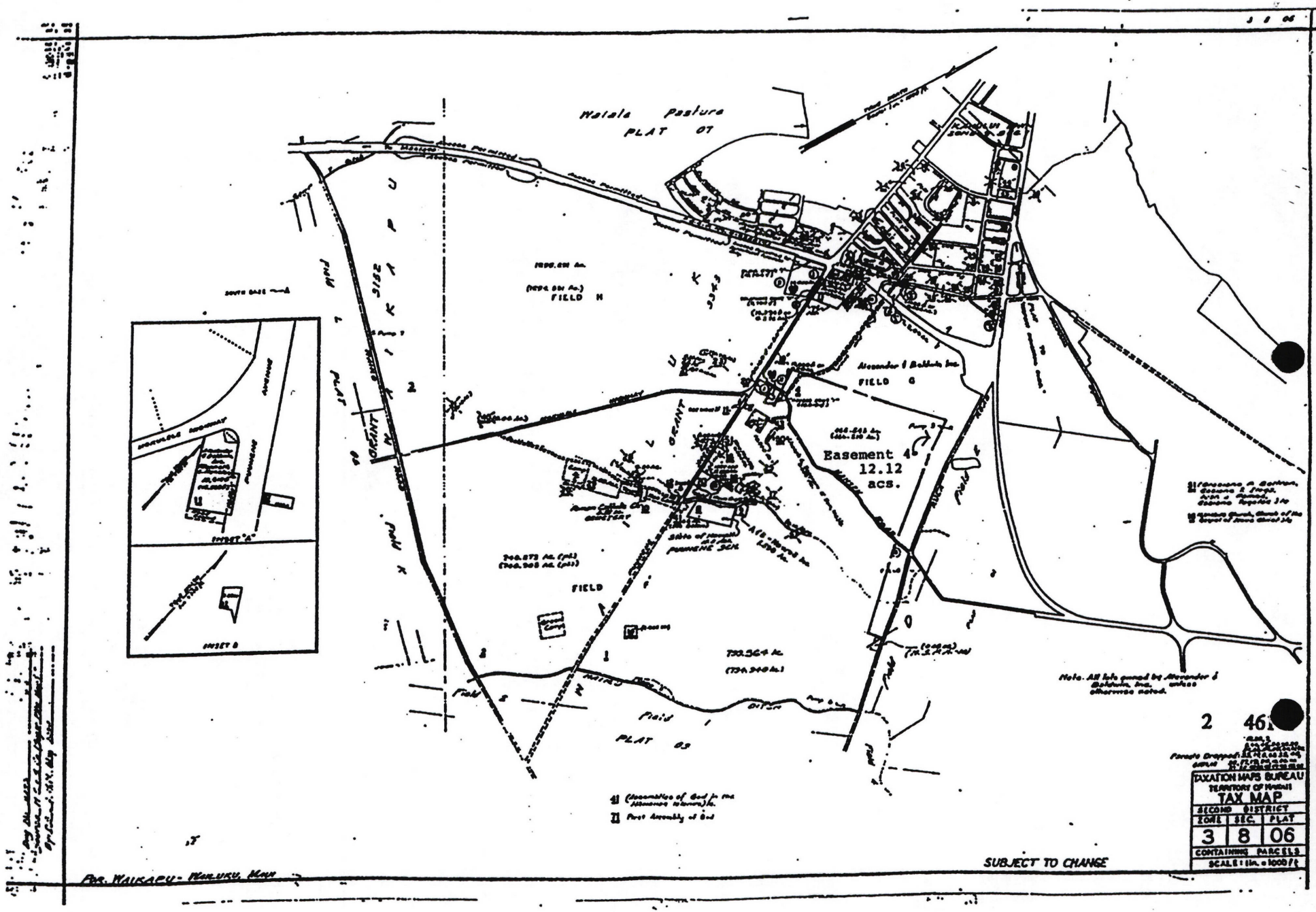

Waiala Pasture
PLAT 07
FIELD H
FIELD G
Easement 4
12.12
acs.
FIELD
PLAT 03
Note: All lots owned by Alexander & Baldwin, Inc., unless otherwise noted.
TAXATION MAPS BUREAU
TERRITORY OF HAWAII
TAX MAP
SECOND DISTRICT
ZONE 3 | SEC. 8 | PLAT 06
CONTAINING PARCELS
SCALE: 1 in. = 1000 ft
SUBJECT TO CHANGE
PAR. WAIKAPU-WAILUKU, MAUI

EXHIBIT D

Maui Electric Company, Ltd. • 210 West Kamehameha Avenue • PO Box 398 • Kahului, Maui, HI 96732-0398 • (808) 871-8461

William A. Bonnet, P.E.
President

October 24, 1996

Mr. Stanley M. Kuriyama, Esq.
Vice President
A&B-Hawaii, Inc.
822 Bishop Street
Honolulu, Hawaii 96813

Letter Agreement--Relocation of Central Maui Power Plant Easements

Dear Mr. Kuriyama:

In recent discussions, A&B-Hawaii, Inc. ("ABHI") and Hawaiian Commercial & Sugar Company ("HC&S") (ABHI and HC&S being herein collectively referred to as "A&B") have requested clarification and expansion of the provision in the Central Maui Power Plant letter agreement dated January 31, 1996 ("letter agreement") between ABHI and Maui Electric Company, Limited ("MECO") regarding the relocation of Easements 3 through 8. A&B and MECO believe it would be prudent to clarify the parties' intentions regarding this matter prior to the closing of the transaction.

The letter agreement states: "...upon the issuance of a Final Order of Condemnation for the easements, the location of Easements 3 through 8 may be relocated to mutually agreeable, substitute alignments at no further cost to MECO." Easements 3 through 8 are identified in Exhibit II of the letter agreement, and connect the Central Maui Power Plant site with the existing Maalaea-Kealahou 69kV line and the Puunene and Paia Mills. Since the execution of the letter agreement, Easements 3 through 8 have been formally surveyed by Ken Nomura, and have been renumbered as Easements 5 through 11 inclusive, as shown on the New Central Maui Generation Site Subdivision maps dated March 26, 1996, revised August 6, 1996 and September 11, 1996.

Although the above easements have been identified for acquisition by MECO (such easements being herein referred to as the "MECO Easements"), this does not mean that they constitute the preferred transmission alignments for A&B. In fact, A&B's current preference is that certain easements be relocated to the locations shown on the Attached Exhibits A-1, A-2 and A-3. However, A&B had agreed to the present location in order to facilitate an agreement that would enable MECO to obtain PUC approval in a timely manner and based on the letter agreement's provision addressing the substitution of easement locations.

At the same time, both parties recognize that these easements are not likely to be utilized for a number of years, and that in the interim site conditions could materially change. Therefore, rather than attempt at this time to agree upon a final and alternate locations for the easements, the parties agree that a final decision on the easement locations shall be deferred and agreed upon as follows:

1. A&B will be given an opportunity before the design of transmission lines for the Central Maui Power Plant to propose alternative transmission alignments that would better serve the interests of A&B (such alternate easement alignments being herein referred to as the "A&B Easements"). A&B will be given no less than sixty (60) days advance written notice of MECO's intent to commence the design of the transmission lines, during which period the parties will seek to identify mutually agreeable, substitute easement alignments. Both parties shall at all times act and negotiate reasonably and in good faith. MECO shall not be required to pay any additional compensation to A&B for any substitute easements that may be agreed upon. If the parties agree to substitute easements and A&B thereafter makes a second request to relocate, A&B shall bear the full cost of any such subsequent relocation of the easements.

2. If the parties have complied with the foregoing provisions, and are unable to reach mutual agreement by the date MECO intends to commence the design of the transmission lines, then MECO shall have the right to proceed with its engineering and design and to construct the transmission lines within the MECO Easements, provided MECO's decision is based upon verifiable engineering or permitting reasons favoring the MECO Easements. Before commencing its design of the transmission lines, MECO shall provide A&B with such engineering or permitting reasons and such back-up data and information as A&B may reasonably request.

3. The foregoing agreements shall be binding upon and inure to the benefit of MECO and A&B, and their respective successors and assigns. The foregoing agreements shall survive the entry of the Final Order of Condemnation and shall not be deemed superseded, amended or affected by the provisions of the Final Order of Condemnation or any other documents that may be stipulated to or approved by the parties in connection with such condemnation.

All other terms and conditions of the letter agreement remain in full force and effect. Furthermore, A&B and MECO confirm that they will make every effort to close the Central Maui Power Plant site and easements transaction by November 30, 1996, but no later than December 30, 1996.

We appreciate your cooperation in this matter.

Sincerely yours,

AGREED AND ACCEPTED
THIS 19th DAY OF November, 1996

A&B-HAWAII, INC.

By _____
Its Vice President

EXHIBIT "A-1"

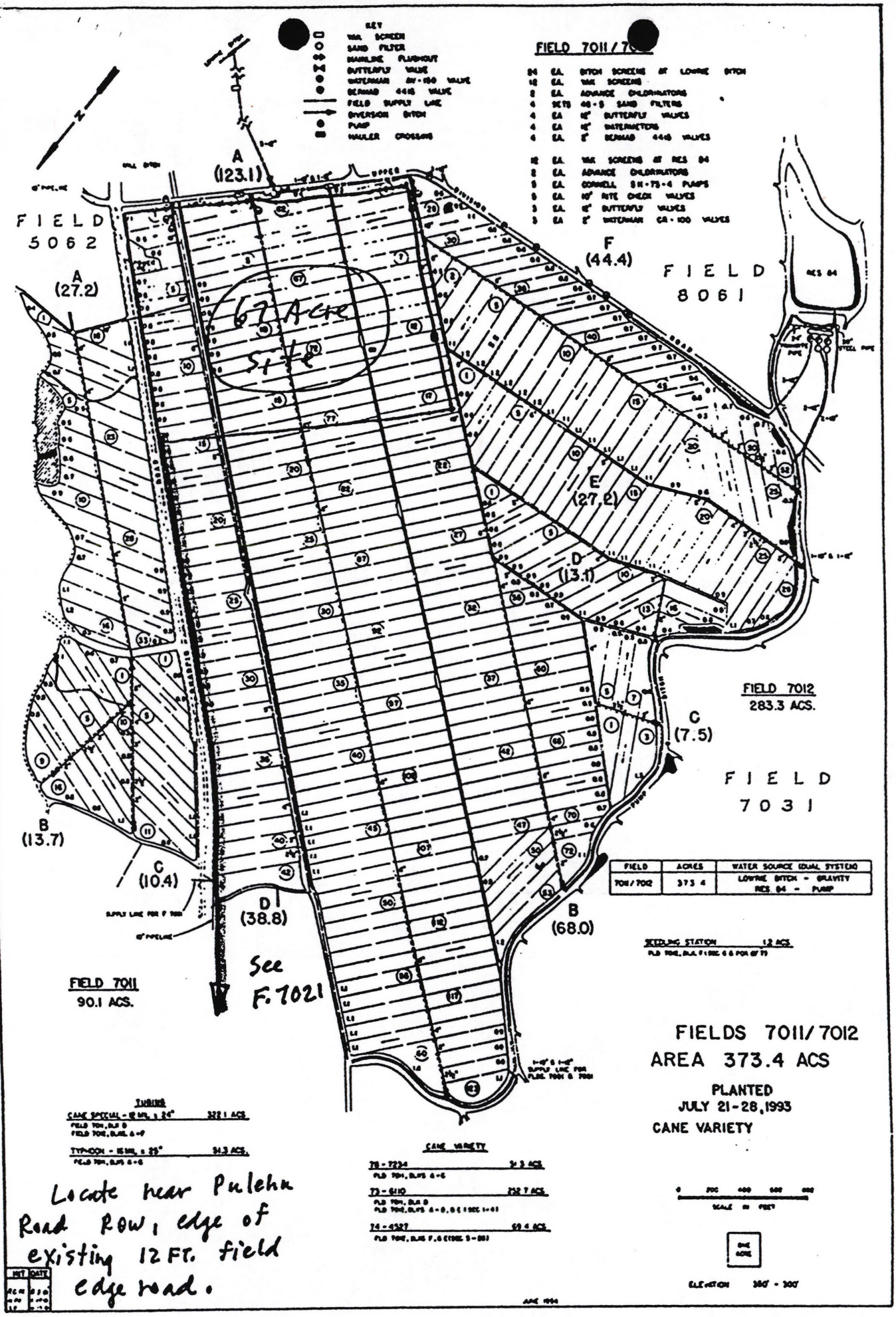
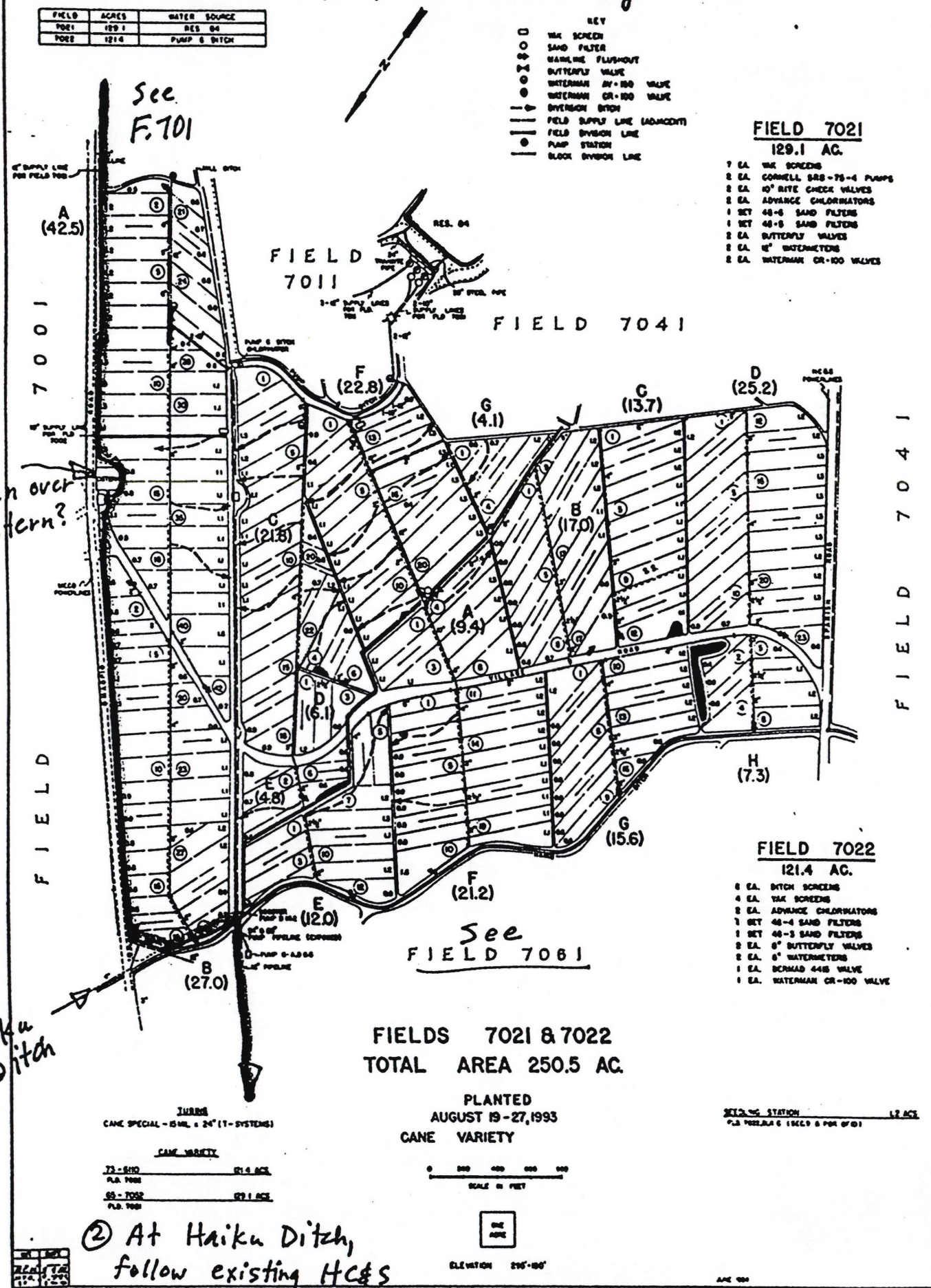

FIELD 7011 / 7012
FIELD 5062
FIELD 8061
FIELD 7012
283.3 ACS.
FIELD 7031
FIELD 7011
90.1 ACS.
A (123.1)
A (27.2)
B (13.7)
C (10.4)
D (38.8)
E (27.2)
F (44.4)
D (13.1)
C (7.5)
B (68.0)
67 Acre Site
See F. 7021
FIELD | ACRES | WATER SOURCE (DUAL SYSTEM)
70H / 7012 | 373.4 | LOWRIE DITCH - GRAVITY; RES 84 - PUMP
FIELDS 7011/7012
AREA 373.4 ACS
PLANTED
JULY 21-28, 1993
CANE VARIETY
Locate near Pulehu Road ROW, edge of existing 12 Ft. field edge road.

EXHIBIT "A-2"

① Locate near Pulehu Road ROW, edge of 12 FT. wide field edge road.



pan over cistern?

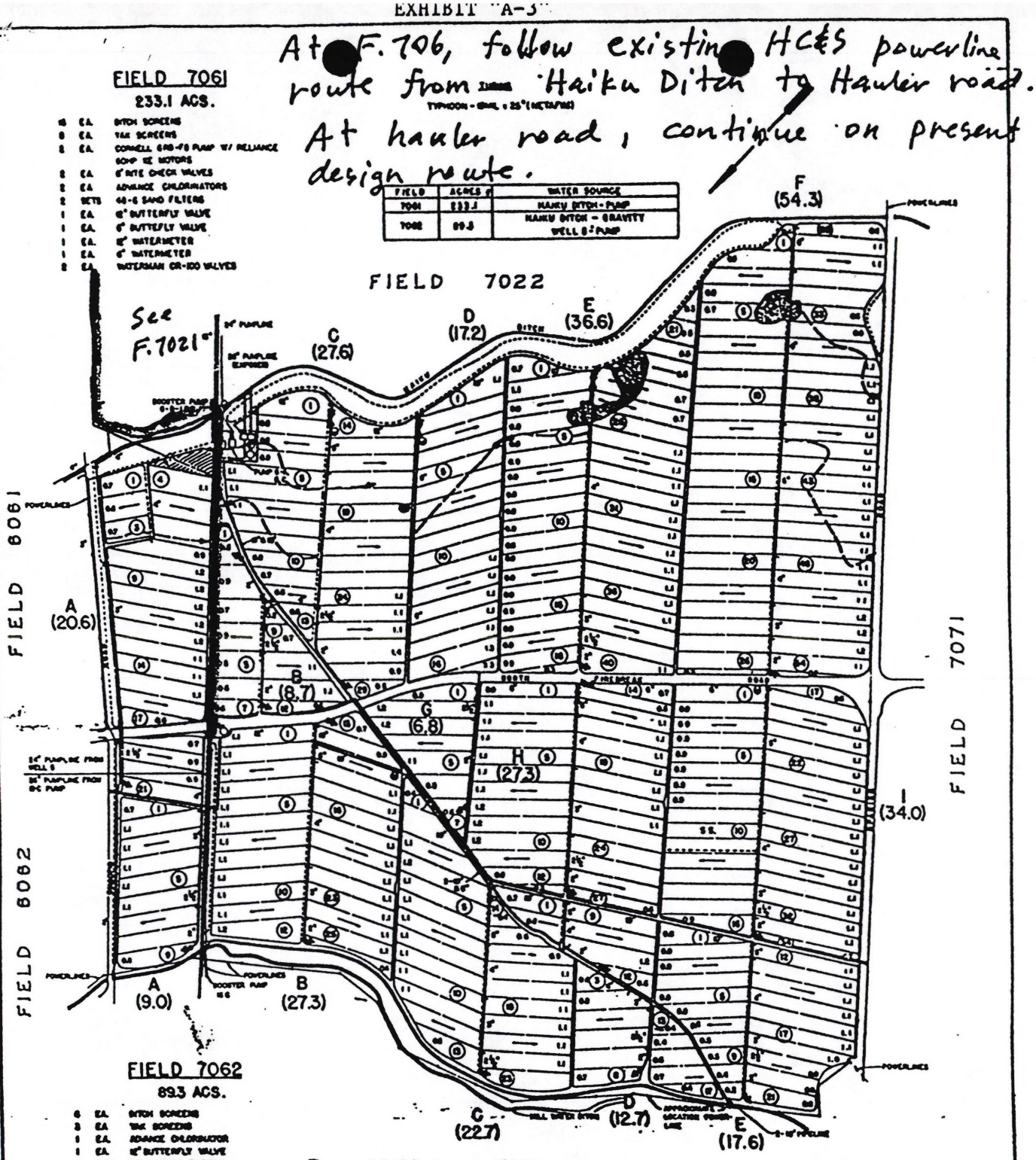
Haiku Ditch

② At Haiku Ditch, follow existing HC&S power line route.

EXHIBIT "A-3"

At F. 706, follow existing HC&S powerline route from Haiku Ditch to Hauler road.

At hauler road, continue on present design route.



Present design route.

PETITION FOR DISTRICT BOUNDARY AMENDMENT
FROM AGRICULTURAL TO URBAN

MAUI ELECTRIC COMPANY, LIMITED
WAENA GENERATING STATION

LAND USE COMMISSION
STATE OF HAWAII
1997 OCT 24 P 2:18

EXHIBIT 3

LETTER OF AUTHORIZATION

Maui Electric Company, Ltd. • 210 West Kamehameha Avenue • PO Box 398 • Kahului, Maui, HI 96732-0398 • (808) 871-8461

William A. Bonnet, P.E.
President

October 20, 1997

AUTHORIZATION

TO WHOM IT MAY CONCERN:

This will certify that MAUI ELECTRIC COMPANY, LIMITED, a Hawaii corporation, is the owner of certain real property situate at Waiko Road and Pulehu Road, Wailuku, Maui, State of Hawaii, more particularly described hereinbelow.

MAUI ELECTRIC COMPANY, LIMITED hereby authorizes B. MARTIN LUNA and CARLSMITH BALL WICHMAN CASE & ICHIKI, its attorneys, and/or their respective designated representatives, to apply for all necessary permits and approvals relative to the development of the Waena Generating Station on said real property, including but not limited to applying for a Land Use Boundary Amendment on said property.

Dated: OCTOBER 20, 1997.

MAUI ELECTRIC COMPAY, LIMITED

By _____

Print Name WILLIAM A. BONNET

Its PRESIDENT

TMK: (2) 3-8-03:23
(2) 3-8-03:24

STATE OF HAWAII)
) SS
COUNTY OF MAUI)

On this 20th day of October, 1997, before me appeared *William A. Bonnet*, to me personally known, who being by me duly sworn, did say that he is the President, of MAUI ELECTRIC COMPANY, LIMITED, a Hawaii corporation, and that the seal affixed to the foregoing instrument is the corporate seal of said corporation and that said instrument was signed and sealed in behalf of said corporation by authority of its board of directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

LS

Brenda A. Otake
Notary Public, State of Hawaii
My commission expires: August 15, 2001

Exhibit 4

FOR DRAFT EIS, SEE SEPARATE BOUND MATERIAL.

PETITION FOR DISTRICT BOUNDARY AMENDMENT
FROM AGRICULTURAL TO URBAN

MAUI ELECTRIC COMPANY, LIMITED
WAENA GENERATING STATION

LAND USE COMMISSION
STATE OF HAWAII
1991 OCT 24 P 2:20

EXHIBIT 5

FINANCIAL STATEMENT OF
MAUI ELECTRIC COMPANY, LIMITED

MONTHLY FINANCIAL REPORT OF
MAUI ELECTRIC COMPANY, LTD.
AUGUST 1997

TO THE PUBLIC UTILITIES COMMISSION OF THE STATE OF HAWAII
COMPARATIVE ANALYSIS OF INCOME AND RETAINED EARNINGS

Acct. No.	ACCOUNT TITLE	Totals for This Month	ACCUMULATED TOTALS TO DATE This Year	Last Year	Increase-Decrease Accumulated Totals
	UTILITY OPERATING INCOME				
400.	Operating Revenues (See Page 3 for 3 Islands)	13,470,670	102,824,863	94,672,781	8,152,082
	Operating Expenses (See Page 3 for 3 Islands)				
401.402	Operation & Maint. Expenses	8,183,299	65,559,351	59,961,697	5,597,654
403	Depreciation Expense	1,268,535	10,145,772	8,470,822	1,674,951
	Amort. of Utility Plant	-	-	-	-
	Amort. of Utility Plant Acq. Adj.	-	-	-	-
	Amort. of Property Leases	-	-	-	-
408.1	Taxes Other Than Income Taxes	1,253,081	9,804,701	9,029,396	775,306
409.	Income Taxes	281,753	4,383,233	5,284,035	(900,802)
410.	Prov. for Def. Income Taxes	618,109	1,065,033	275,578	789,455
412.	Prov. for Def. Invest. Tax Cr	153,923	1,231,401	630,953	600,448
411.	Income Taxes Def. in Prior Yrs.-Cr.	(87,295)	(760,008)	326,110	(1,086,118)
412.	Amort. of Def. Invest. Tax Cr.-Cr.	(19,254)	(154,030)	(118,810)	(35,220)
	TOTAL OPERATING EXPENSES	11,652,150	91,275,454	83,859,780	7,415,674
	OPERATING INCOME	1,818,520	11,549,409	10,813,001	736,408
	Income from Utility Plant Leased to Others	-	-	-	-
	TOTAL OPERATING INCOME	1,818,520	11,549,409	10,813,001	736,408
	OTHER INCOME				
	Income from Mdse.,Jobbing & Contract Work (Net)	-	-	-	-
	Income from Non-utility Operations	(6,772)	(51,032)	(52,877)	1,845
418	Non-operating Rental Income	3,065	27,162	28,147	(984)
419	Interest & Dividend Income	18	1,427	1,584	(157)
420	Allowance for Funds Used During Construction	426,500	3,315,356	3,364,773	(49,416)
414-422	Miscellaneous Non-operating Income	10,627	6,077	(8,437)	14,514
420.1	AFUDC Tax Adjustment	174,052	1,361,935	1,438,021	(76,086)
	TOTAL OTHER INCOME	607,490	4,660,927	4,771,210	(110,283)
	OTHER INCOME DEDUCTIONS				
425	Miscellaneous Amortization	6,745	50,661	45,252	5,409
426	Miscellaneous Income Deductions	600	9,151	9,223	(72)
	TOTAL OTHER INCOME DEDUCTIONS	7,345	59,812	54,476	5,336
	INTEREST CHARGES				
427	Interest on Long-Term Debt	747,904	5,912,195	4,332,138	1,580,057
428	Amort. of Debt Discount & Expense	22,440	176,072	158,403	17,669
429	Amort. of Premium on Debt-Cr.	-	-	-	-
430	Other Interest Expense	122,907	848,385	936,102	(87,717)
	TOTAL INTEREST CHARGES	893,250	6,936,651	5,426,643	1,510,009
	INCOME BEFORE EXTRAORDINARY ITEMS	1,525,414	9,213,872	10,103,093	(889,221)
	Extraordinary Income (Net)	-	-	-	-
	NET INCOME	1,525,414	9,213,872	10,103,093	(889,221)
216.1	RETAINED EARNINGS (Beginning of Period)	60,404,915	58,798,325	54,698,095	4,100,230
433	Balance Transferred from Income	1,525,414	9,213,872	10,103,093	(889,221)
	Credits	-	-	-	-
	Debits	-	-	-	-
437	Dividends Declared-Preferred Stock	93,553	748,420	866,400	(117,980)
	Dividends Declared-Common Stock	-	5,427,000	4,917,000	510,000
	RETAINED EARNINGS (End of Period)	61,836,777	61,836,777	59,017,787	2,818,990

MAUI ELECTRIC COMPANY, LTD.
AUGUST 1997

COMPARATIVE ANALYSIS OF INCOME AND RETAINED EARNINGS (CONTINUED)

Acct. No.	ACCOUNT TITLE	ACCUMULATED TOTALS 12 MONTHS This Year	Last Year	Incr.-Decr. Amount	Percent
	UTILITY OPERATING INCOME				
400.	Operating Revenues (See Page 3 for 3 Islands)	153,927,908	138,906,137	15,021,771	10.8
	Operating Expenses (See Page 3 for 3 Islands)				
401.402	Operation & Maint. Expenses	97,422,753	87,688,305	9,734,448	11.1
403	Depreciation Expense	14,375,885	12,226,414	2,149,471	17.6
	Amort. of Utility Plant	-	-	-	-
	Amort. of Utility Plant Acq. Adj.	-	-	-	-
	Amort. of Property Leases	-	-	-	-
408.1	Taxes Other Than Income Taxes	14,762,232	13,381,338	1,380,893	10.3
409.	Income Taxes	4,956,430	8,445,071	(3,488,641)	(41.3)
410.	Prov. for Def. Income Taxes	3,449,908	255,001	3,194,908	1,252.9
412.	Prov. for Def. Invest. Tax Cr	2,186,871	336,563	1,850,308	549.8
411.	Income Taxes Def. in Prior Yrs.-Cr.	(873,277)	474,596	(1,347,873)	(284.0)
412.	Amort. of Def. Invest. Tax Cr.-Cr.	(213,434)	(176,754)	(36,680)	(20.8)
	TOTAL OPERATING EXPENSES	136,067,367	122,630,535	13,436,833	11.0
	OPERATING INCOME	17,860,541	16,275,603	1,584,938	9.7
	Income from Utility Plant Leased to Others	-	-	-	-
	TOTAL OPERATING INCOME	17,860,541	16,275,603	1,584,938	9.7
	OTHER INCOME				
	Income from Mdse.,Jobbing & Contract Work (Net)	-	-	-	-
	Income from Non-utility Operations	(77,142)	(94,405)	17,262	18.3
418	Non-operating Rental Income	40,765	49,348	(8,583)	(17.4)
419	Interest & Dividend Income	2,330	6,022	(3,692)	(61.3)
420	Allowance for Funds Used During Construction	5,389,452	4,642,071	747,381	16.1
414-422	Miscellaneous Non-operating Income	6,528	(11,200)	17,728	158.3
420.1	AFUDC Tax Adjustment	2,248,352	1,998,551	249,802	12.5
	TOTAL OTHER INCOME	7,610,285	6,590,388	1,019,898	15.5
	OTHER INCOME DEDUCTIONS				
425	Miscellaneous Amortization	73,287	72,126	1,161	1.6
426	Miscellaneous Income Deductions	12,391	13,057	(665)	(5.1)
	TOTAL OTHER INCOME DEDUCTIONS	85,678	85,182	496	.6
	INTEREST CHARGES				
427	Interest on Long-Term Debt	8,344,410	6,366,402	1,978,008	31.1
428	Amort. of Debt Discount & Expense	266,022	232,501	33,520	14.4
429	Amort. of Premium on Debt-Cr.	-	-	-	-
430	Other Interest Expense	1,758,681	1,438,368	320,313	22.3
	TOTAL INTEREST CHARGES	10,369,112	8,037,271	2,331,842	29.0
	INCOME BEFORE EXTRAORDINARY ITEMS	15,016,036	14,743,538	272,498	1.8
	Extraordinary Income (Net)	-	-	-	-
	NET INCOME	15,016,036	14,743,538	272,498	1.8
437	Dividends Declared-Preferred Stock	1,043,046	1,272,804	(229,758)	(18.1)
	BALANCE FOR COMMON	13,972,990	13,470,733	502,256	3.7
	Dividends Declared-Common Stock	11,154,000	7,977,000	3,177,000	39.8
	CHANGE IN RETAINED EARNINGS	2,818,990	5,493,733	(2,674,744)	(48.7)

COMPARATIVE ANALYSIS OF INCOME
MAUI ELECTRIC COMPANY, LTD. - Maui System

Acct. No.	ACCOUNT TITLE	Totals for This Month	ACCUMULATED TOTALS TO DATE This Year	Last Year	Increase-Decrease Accumulated Totals
	UTILITY OPERATING INCOME				
400.	Operating Revenues (Page 3 - Maui)	12,462,829	94,884,930	87,202,774	7,682,156
	Operating Expenses (Page 3 - Maui)				
401.402	Operation & Maint. Expenses	7,605,201	60,712,264	54,848,361	5,863,903
403	Depreciation Expense	1,094,449	8,753,090	7,970,104	782,987
	Amort. of Utility Plant	-	-	-	-
	Amort. of Utility Plant Acq. Adj.	-	-	-	-
	Amort. of Property Leases	-	-	-	-
408.1	Taxes Other Than Income Taxes	1,156,446	9,027,540	8,303,126	724,415
409.	Income Taxes	151,990	3,538,505	4,880,427	(1,341,922)
410.	Prov. for Def. Income Taxes	605,294	962,513	173,058	789,455
412.	Prov. for Def. Invest. Tax Cr	153,923	1,231,401	630,953	600,448
411.	Income Taxes Def. in Prior Yrs.-Cr.	(87,295)	(760,008)	326,110	(1,086,118)
412.	Amort. of Def. Invest. Tax Cr.-Cr.	(19,254)	(154,030)	(118,810)	(35,220)
	TOTAL OPERATING EXPENSES	10,660,753	83,311,276	77,013,328	6,297,948
	OPERATING INCOME	1,802,076	11,573,654	10,189,446	1,384,208

ANALYSIS OF GROSS OPERATING REVENUES - Maui System

Acct. No.	ACCOUNT TITLE	Totals for the Same Month This Year	Totals for the Same Month Last Year	ACCUMULATED TOTALS TO DATE This Year	ACCUMULATED TOTALS TO DATE Last Year	Increase-Decrease Accum. Totals
	OPERATING REVENUES					
	Residential Sales	4,379,246	4,207,218	33,833,013	31,330,621	2,502,393
	Commercial & Industrial	7,890,299	7,711,324	59,565,681	54,466,542	5,099,139
	Public St. & Highway Light'g.	49,805	54,149	419,024	399,272	19,752
	Industrial Contract Sales	-	-	-	-	-
	Electric Sales to Employees	27,144	27,436	223,600	200,691	22,909
	Sub-total	12,346,494	12,000,127	94,041,318	86,397,125	7,644,193
	OTHER OPERATING REVENUES					
	Miscellaneous Service Revenues	51,286	21,596	242,616	191,329	51,287
	Rent from Property	53,419	52,013	424,023	414,769	9,254
	Interdepartmental Rents	-	-	-	-	-
	Other Revenues	11,630	25,337	176,974	199,551	(22,577)
	Sub-total	116,335	98,946	843,613	805,650	37,964
	TOTAL OPERATING REVENUES	12,462,829	12,099,074	94,884,932	87,202,775	7,682,157

ANALYSIS OF OPERATING EXPENSES - Maui System

Acct. No.	ACCOUNT TITLE	Totals for the Same Month This Year	Totals for the Same Month Last Year	ACCUMULATED TOTALS TO DATE This Year	ACCUMULATED TOTALS TO DATE Last Year	Increase-Decrease Accum. Totals
	PRODUCTION EXPENSES					
	Steam Power Generation					
	Operation	1,075,383	963,508	7,937,446	7,595,044	342,402
	Maintenance	68,490	83,882	855,934	783,597	72,336
	Other Power/Fuel Generation					
	Operation	3,563,913	3,758,146	29,085,092	25,739,363	3,345,728
	Maintenance	676,511	609,469	4,547,315	4,912,212	(364,897)
	Other Power Supply Expenses					
	Operation	655,301	668,071	4,901,646	4,863,336	38,310
	TRANSMISSION EXPENSES					
	Operation	60,671	51,479	477,554	443,980	33,574
	Maintenance	12,451	50,291	146,939	311,052	(164,113)
	DISTRIBUTION EXPENSES					
	Operation	175,150	187,105	1,561,013	1,600,862	(39,849)
	Maintenance	106,272	120,254	946,371	763,029	183,343
	CUSTOMER ACCOUNTS EXPENSES					
	Operation	140,702	166,398	1,347,124	1,385,748	(38,624)
	CUSTOMER SERVICE EXPENSES					
	Operation	259,376	142,750	2,514,671	426,459	2,088,212
	SALES PROMOTION EXPENSES					
	Operation	-	-	-	-	-
	ADMINISTRATIVE & GENERAL					
	Operation	808,980	780,447	6,370,703	6,008,281	362,422
	Maintenance	2,002	3,173	20,457	15,397	5,059
	TOTAL OPERATING EXPENSES	7,605,202	7,584,973	60,712,265	54,848,361	5,863,904
	Total Operation Expenses	6,739,475	6,717,904	54,195,248	48,063,073	6,132,175
	Total Maintenance Expenses	865,726	867,069	6,517,016	6,785,288	(268,271)

MONTHLY STATISTICAL INFORMATION - Maui System 0897

CLASSIFICATION OF RATES	(1)	TOTAL CONSUMERS At Close of This Month (2)	TOTAL CONSUMERS At Close of Same Month Last Year(3)	TOTAL METERS At Close of This Month(4)	TOTAL METERS At Close of Same Month Last Year(5)	TOTAL K.W.H. SOLD This Month(6)	TOTAL K.W.H. SOLD Accumulated Total for This Year
Res'l Comb. Light'g, Heat'g & Sm. Pow.	" R "	42,593	41,600	-	-	28,824,542	216,855,943
General Lighting Service	" G "	6,634	6,481	-	-	24,875,542	181,327,849
Heating, Cooking, Refrigeration, etc.	" H "	286	285	-	-	2,526,492	17,525,404
Combined Power & Incidental Lighting	" "	-	-	-	-	-	-
General Power	" "	-	-	-	-	-	-
Large General Service	" P "	107	104	-	-	32,377,499	222,616,091
Optional Power	" "	-	-	-	-	-	-
Industrial Contract	" "	-	-	-	-	-	-
Governmental St., Hwy. & Park Lighting	" F "	131	123	-	-	389,145	3,163,205
Governmental Contract	" "	-	-	-	-	-	-
Interdepartmental	" "	-	-	-	-	-	-
Electric Service to Employees	" R "	352	351	-	-	253,957	2,040,441

NOTE:
Where the same customers are served under more than one rate schedule, the entries in columns (2) and (3), "Total Consumers" should denote the duplication in number of reported consumers.

TOTALS	50,103	48,944	-	-	89,247,177	643,528,933

			KW (Max)*	KW (Max)		
KW Hrs. Used-N/C	x x x x x	x x x x x	x x x x x	x x x x x	151,773	1,111,966
KW Hrs. Lost-Unaccounted	x x x x x	x x x x x	x x x x x	x x x x x	4,678,810	43,430,168
KW Hrs. Net to System	x x x x x	x x x x x	x x x x x	x x x x x	94,077,760	688,071,067
KW Hrs. Station Use	x x x x x	x x x x x	x x x x x	x x x x x	3,256,580	22,464,010
KW Hrs. and KW (Max.) Generated-Steam	x x x x x	x x x x x	33,900	32,500	21,936,200	149,084,100
" " " " -Diesel	x x x x x	x x x x x	129,400	124,000	67,345,320	506,604,360
" " " " -Other	x x x x x	x x x x x	-	-	-	-
Total KW Hrs. and KW (Max.) Generated	x x x x x	x x x x x	163,300	156,500	89,281,520	655,688,460
Total KW Hrs. and KW (Max.) Purchased	x x x x x	x x x x x	8,100	12,800	8,052,820	54,846,617
Percentage of KW Hrs. Used-N/C (%)	x x x x x	x x x x x	x x x x x	x x x x x	.2	.2
Percentage of KW Hrs. Loss-Unaccounted (%)	x x x x x	x x x x x	x x x x x	x x x x x	5.0	6.3
	x x x x x	x x x x x	x x x x x	x x x x x	x x x x x x	x x x x x x
Average Cost per KWHr. Sold	x x x x x	x x x x x	x x x x x	x x x x x	x x x x x x	x x x x x x
Average Net Income per KWHr. Sold	x x x x x	x x x x x	x x x x x	x x x x x	x x x x x x	x x x x x x
Purchased Power-HC&S					7,657,200	56,016,000
Power Interchange-Pioneer Mill Co. Ltd.						
Deliveries to					-80,327	-2,789,810
Receipts from					438,987	1,577,707
Total Power Interchange					358,660	-1,212,103
Purchased Power-Alternate Energy Sources					-	-
Standby Power-Pioneer Mill Co. Ltd.					36,960	42,720
Total Purchased Power					8,052,820	54,846,617

*(1) KW (Max.) is the recorded 15 minute period peak KW generated or purchased applicable to electric utilities only.

MONTHLY STATISTICAL INFORMATION - Maui System 0897

NET REVENUE RECEIVED		AVERAGE K.W.H. SOLD PER CONSUMER		AVERAGE NET REVENUE PER K.W.H SOLD*		AVG. NET REVENUE PER CONSUMER		% OF TOTAL REVENUE RECVD.	
This Month (8)	Same Month Last Year (9)	This Month (10)	Same Month Last Year(11)	This Month (12)	Same Month Last Year(13)	This Month(14)	Same Month Last Year(15)	This Month(16)	Same Month Last Year(17)
4,379,244	4,207,219	677	680	15.193	14.874	103	101	35.5	35.1
3,725,177	3,711,587	3,750	3,796	14.975	15.088	562	573	30.2	30.9
350,037	347,957	8,834	8,736	13.855	13.976	1,224	1,221	2.8	2.9
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
3,815,085	3,651,780	302,593	297,880	11.783	11.788	35,655	35,113	30.9	30.4
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
49,806	54,149	2,971	3,430	12.799	12.836	380	440	.4	.5
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
27,145	27,436	721	730	10.689	10.714	77	78	.2	.2
12,346,493	12,000,128	1,781	1,778	13.834	13.788	246	245	100.0	100.0
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		x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x	x x x x x x		
x x x x x x	x x x x x x	x x x x x x	x x x x x x	11.945	12.416	x x x x x	x x x x x x		
x x x x x x	x x x x x x	x x x x x x	x x x x x x	1.889	1.372	x x x x x	x x x x x x		

GENERATING STATION STATISTICS	Totals for This Month		Accumulated Totals - This Year	
	Fuel Oil	Diesel Oil	Fuel Oil	Diesel Oil
Maui System				
Barrels of Oil Consumed	45,919.16	106,799.16	313,706.40	776,226.12
Average Cost per Barrel of Oil Consumed	19.6060	30.1395	20.6257	33.9840
Total Cost of Oil Consumed	900,290.18	3,218,873.28	6,470,400.18	26,379,280.53
Cost of Oil per KWH Generated	.041041	.047797	.043401	.052071
Posted Month End Price per Barrel of Oil *	19.4412	28.9106	19.4412	28.9106
Lanai System				
Barrels of Oil Consumed	-	4,208.81	-	31,780.70
Average Cost per Barrel of Oil Consumed	-	46.0900	-	48.4959
Total Cost of Oil Consumed	-	193,983.89	-	1,541,232.87
Cost of Oil per KWH Generated	-	.073718	-	.080701
Posted Month End Price per Barrel of Oil *		46.1885		46.1885
Molokai System				
Barrels of Oil Consumed	-	5,470.74	-	39,551.98
Average Cost per Barrel of Oil Consumed	-	32.7418	-	36.5482
Total Cost of Oil Consumed	-	179,121.67	-	1,445,553.89
Cost of Oil per KWH Generated	-	.051770	-	.057361
Posted Month End Price per Barrel of Oil *		31.0166		31.0166

* Including all expenses for taxes, transportation and handling charges delivered in utility's tanks.

EMPLOYEES AND PAYROLL DATA	For This Month			Year To Date
	Non Bargaining	Bargaining	Total	
Total Number of Employees	83	225	308	x x x x x x x
Total Payroll			1,464,076.49	12,324,669.10
Amount Charged To Plant			318,067.60	2,745,048.95
Amount Charged to Plant Removal			10,215.86	115,294.88
Amount Charged to Operating Expenses			1,135,793.03	9,464,325.27

MAUI SYSTEM TRANSMISSION AND DISTRIBUTION LINE STATISTICS		For This Month: Higher than 6.6 K.V.	For This Month: 6.6 K.V. and Lower	Same Period Last Year: Higher than 6.6 K.V.	Same Period Last Year: 6.6 K.V. and Lower
Transmission System					
Line Length-Number of Miles	22,900 V	114.72		114.72	
	69,000 v	128.48		113.28	
Distribution System					
Line length-Number of Miles	12,470 / 7,200 V	614.46		607.59	
	6,900 V	15.49		15.49	
	4,164 V	140.99		140.99	
	2,400 V	100.25		99.58	
	Secondaries	479.16		469.24	

LANAI SYSTEM TRANSMISSION AND DISTRIBUTION LINE STATISTICS		For This Month: Higher than 6.6 K.V.	For This Month: 6.6 K.V. and Lower	Same Period Last Year: Higher than 6.6 K.V.	Same Period Last Year: 6.6 K.V. and Lower
Transmission System					
Line Length-Number of Miles	22,900 V				
	69,000 v				
Distribution System					
Line length-Number of Miles	12,470 / 7,200 V	34.92		34.70	
	6,900 V				
	4,164 V				
	2,400 V	.04		.04	
	Secondaries	.60		.57	

MOLOKAI SYSTEM TRANSMISSION AND DISTRIBUTION LINE STATISTICS		For This Month: Higher than 6.6 K.V.	For This Month: 6.6 K.V. and Lower	Same Period Last Year: Higher than 6.6 K.V.	Same Period Last Year: 6.6 K.V. and Lower
Transmission System					
Line Length-Number of Miles	34,500 V	10.00		10.00	
Distribution System					
Line length-Number of Miles	12,470 / 7,200 V	81.99		80.63	
	6,900 V				
	2,400 / 4,164 V		12.00		12.00
	Secondaries	2.60		2.11	

COMPARATIVE BALANCE SHEET
ASSETS AND OTHER DEBITS

Acct. No.	ACCOUNT TITLE	Balance at Close of Last Year	ACCRUED BALANCES at Close of This Month	Last Year	Increase-Decrease During the Year
	UTILITY PLANT				
101	Utility Plant in Service	410,868,873	424,238,395	375,267,764	13,369,522
108	Accum. Provision for Deprec. and Amort.	122,998,299	133,605,731	118,651,852	10,607,432
	Utility Plant Less Reserves	287,870,574	290,632,664	256,615,912	2,762,090
107	Construction Work in Progress	56,734,060	58,280,021	66,240,766	1,545,961
114	Utility Plant Acquisition Adjustments	1,785,138	1,785,138	1,785,138	-
115	Accum. Prov. for Amort. of Util. Pt. Acq. Adj.	(1,170,573)	(1,205,334)	(1,153,192)	(34,761)
	Retirement Work in Progress	54,874	153,057	35,048	98,183
105	Property Held for Future Use	1,942,188	1,927,553	24,206	(14,635)
	TOTAL UTILITY PLANT LESS RESERVES	347,216,263	351,573,099	323,547,878	4,356,837
	Other Property and Investments				
121.122	Non-Utility Property Less Reserves	1,234,038	1,183,514	1,259,300	(50,524)
	Investment in Associated Companies	-	-	-	-
	Other Investments	-	-	-	-
	Special Funds	-	-	-	-
	TOTAL OTHER PROPERTY & INVESTMENTS	1,234,038	1,183,514	1,259,300	(50,524)
	Current and Accrued Assets				
131	Cash	54,281	1,598,338	489,998	1,544,056
	Special Deposits	-	-	-	-
135	Working Funds	3,025	3,075	3,025	50
136	Temporary Cash Investments	-	-	-	-
145	Notes Receivable	-	-	-	-
142.1	Customer Accounts Receivable	16,861,068	16,663,688	16,310,893	(197,380)
142.2	Other Accounts Receivable	142,207	280,488	121,362	138,281
144	Accum. Prov. for Uncollectible Accts-Cr.	(103,864)	(181,467)	(139,202)	(77,603)
146	Receivables from Associated Companies	22,075	-	7,777	(22,075)
151	Fuel Oil Stock	5,919,677	3,690,104	4,367,582	(2,229,573)
	Residuals	-	-	-	-
154	Materials and Supplies-Utility	6,955,342	7,780,718	7,924,189	825,376
	Materials and Supplies-Merchandise	-	-	-	-
163	Stores Expense	92,215	562,638	80,918	470,423
166	Prepayments	304,563	204,653	153,402	(99,910)
171	Interest and Dividends Receivable	451,462	251,000	50,756	(200,463)
	Accrued Utility Reserves	-	-	-	-
	Miscellaneous Current and Accrued Assets	-	-	-	-
	TOTAL CURRENT AND ACCRUED ASSETS	30,702,051	30,853,233	29,370,700	151,182
	Deferred Debits				
181.1	Unamortized Debt Discount and Expense	5,279,965	4,934,285	4,636,143	(345,680)
183	Preliminary Survey and Invest'n Charges	147,755	147,314	188,930	(441)
184	Clearing Accounts	1,265,121	2,164,018	2,688,779	898,897
185	Temporary Facilities	(33,913)	(2,554)	32,211	31,359
186	Miscellaneous Deferred Debits	5,409,010	4,501,140	5,358,845	(907,869)
186.52	Regulatory Commission Expenses	382,851	192,086	363,593	(190,765)
186.70 *	Regulatory Assets, net	6,742,655	8,741,511	6,234,639	1,998,856
	Less: Provision for Uncertain Recovery of Regulatory Assets				-
	TOTAL DEFERRED DEBITS	19,193,443	20,677,800	19,503,139	1,484,357
	TOTAL ASSETS AND OTHER DEBITS	398,345,795	404,287,647	373,681,017	5,941,851

*See footnote on Page 7a.

The "Regulatory Assets, Net" amount of $8,741,511 includes $3,434,608 for OPEB Costs, $1,016,566 for Vacation Earned but not yet taken, and $66,994 for SFAS No. 112 - Employers' Accounting for Postemployment Benefits. The remaining amount of $4,223,343 relates to Regulatory Assets and Liabilities established under SFAS No. 109 - Accounting for Income Taxes.

COMPARATIVE BALANCE SHEET
LIABILITIES AND OTHER CREDITS

Acct. No.	ACCOUNT TITLE	Balance at Close of Last Year	ACCRUED BALANCES at Close of This Month	ACCRUED BALANCES at Close of Last Year	Increase-Decrease During the Year
	Proprietary Capital				
201	Common Stock Issued	15,229,660	15,229,660	13,502,900	-
204	Preferred Stock Issued	13,960,000	13,670,000	13,960,000	(290,000)
207	Premium on Capital Stock	73,841,470	73,841,470	58,568,230	-
	Other Paid-in Capital	-	-	-	-
	Discount on Capital Stock	-	-	-	-
214	Capital Stock Expense	(296,450)	(683,679)	(301,531)	(387,229)
	Appropriated Retained Earnings	-	-	-	-
216.1	Unappropriated Retained Earnings	58,798,325	61,836,777	59,017,787	3,038,452
	Reacquired Capital Stock	-	-	-	-
	TOTAL PROPRIETARY CAPITAL	161,533,005	163,894,228	144,747,386	2,361,223
	Long-Term Debt				
221	Bonds	7,000,000	7,000,000	7,000,000	-
223	Advances from Associated Companies	-	10,000,000	-	10,000,000
224	Other Long-Term Debt	132,335,100	132,335,100	97,345,300	-
	TOTAL LONG-TERM DEBT	139,335,100	149,335,100	104,345,300	10,000,000
	Current and Accrued Liabilities				
231	S/T Notes Payable				
233	S/T Notes Payable to Assoc. Co.	13,623,900	10,500,000	34,000,000	(3,123,900)
232	Accounts Payable	13,126,809	5,961,363	11,386,994	(7,165,446)
234	Payables to Associated Companies	(1,221,074)	(522,366)	(398,368)	698,708
235	Customer Deposits	966,458	1,838,885	914,445	872,427
236	Taxes Accrued	10,177,007	10,409,891	10,884,501	232,885
237	Interest Accrued	2,069,237	3,224,783	2,819,905	1,155,546
238	Dividends Declared	140,469	136,201	230,280	(4,268)
239	Matured Long-Term Debt	-	-	10,000,000	-
241	Tax Collections Payable	102,579	91,736	53,057	(10,844)
242	Preferred Stock Sinking Fund	195,000	95,000	195,000	(100,000)
242	Misc. Current and Accrued Liabilities	2,519,825	1,658,112	1,690,570	(861,713)
	TOTAL CURRENT AND ACCRUED LIABILITIES	41,700,210	33,393,605	71,776,384	(8,306,605)
	Deferred Credits				
251	Unamortized Premiums on Debt	-	-	-	-
252	Customer Advances for Construction	7,114,402	7,437,304	7,209,324	322,903
253	Other Deferred Credits	4,265,698	4,531,411	4,166,252	265,712
255	Accumulated Deferred Investment Tax Cr.	9,916,868	10,818,443	9,108,700	901,576
	TOTAL DEFERRED CREDITS	21,296,967	22,787,158	20,484,276	1,490,191
	Operating Reserves				
	Property Insurance Reserve	-	-	-	-
	Injuries and Damages Reserve	-	-	-	-
	Pensions and Benefits Reserve	-	-	-	-
265	Miscellaneous Operating Reserves	-	-	-	-
	TOTAL OPERATING RESERVES	-	-	-	-
271	CONTRIBUTIONS IN AID OF CONSTRUCTION	23,099,961	23,191,599	23,174,750	91,638
	Accumulated Deferred Income Taxes-				
282	Liberalized Depreciation	15,981,159	16,455,713	15,409,733	474,554
283	Accumulated Deferred Income Taxes-Other	(4,600,606)	(4,769,756)	(6,256,812)	(169,150)
	TOTAL ACCUM. DEF. INCOME TAXES	11,380,552	11,685,957	9,152,921	305,404
	TOTAL LIABILITIES AND OTHER CREDITS	398,345,795	404,287,647	373,681,017	5,941,851

Acct. No.	ACCOUNT TITLE	Balance at Close of Last Year	ACCRUED BALANCES at Close of This Month	Last Year	Increase-Decrease During the Year
	UTILITY PLANT IN SERVICE				
	Intangible Plant Franchise - Maui	750	750	750	-
	- Molokai	1,000	1,000	1,000	-
	Land Production - Steam	123,655	123,655	123,655	-
	- Other	400,533	404,473	400,533	3,939
	- Lanai	220,385	220,385	220,385	-
	- Molokai	235,006	235,006	235,006	-
	Land Transmission - Maui	237,783	299,355	204,963	61,572
	Land Distribution - Maui	221,342	221,342	221,342	-
	Land General Plant - Maui	58,557	58,557	58,557	-
	- Lanai	23,125	23,125	23,125	-
	Steam Production - Maui	47,259,461	47,524,542	47,062,773	265,081
	Other Production - Maui	108,489,556	108,906,681	108,268,093	417,125
	- Lanai	15,657,554	16,514,880	4,317,823	857,326
	- Molokai	19,100,773	19,613,953	18,436,702	513,179
	Transmission Plant - Maui	56,543,022	59,424,114	38,754,765	2,881,092
	- Molokai	707,444	717,004	702,675	9,560
	Distribution Plant - Maui	131,693,161	136,673,507	127,831,750	4,980,345
	- Lanai	5,680,494	6,467,437	5,128,408	786,944
	- Molokai	6,693,459	7,466,411	6,573,080	772,952
	General Plant - Maui	16,074,103	17,800,839	15,085,364	1,726,736
	- Lanai	387,884	479,723	397,698	91,839
	- Molokai	1,059,824	1,061,656	1,219,317	1,832
	Total Utility Plant in Service	410,868,873	424,238,395	375,267,764	13,369,522
	Accum Prov Amort Util Plt Adj	(1,170,573)	(1,205,334)	(1,153,192)	(34,761)
	Utility Plant Acquisition Adjustment	1,785,138	1,785,138	1,785,138	-
	Other Utility Plant Adjustment				
	Construction Work in Progress	56,734,060	58,280,021	66,240,766	1,545,961
	Property Held for Future Use	1,942,188	1,927,553	24,206	(14,635)
	TOTAL UTILITY PLANT	470,159,686	485,025,773	442,164,682	14,866,087

Acct. No.	ACCOUNT TITLE	Balance at Close of Last Year	ACCRUED BALANCES at Close of This Month	ACCRUED BALANCES at Close of Last Year	Increase-Decrease During the Year
	RESERVES				
	Intangible Plant				
	Production Plant				
	Steam	15,126,337	15,977,712	14,702,726	851,375
	Other	40,218,943	43,348,878	38,670,776	3,129,935
	Lanai	1,501,222	1,973,266	1,429,965	472,044
	Molokai	(876,112)	(284,546)	(916,797)	591,566
	Transmission Plant				
	Maui	11,744,141	12,853,285	11,423,109	1,109,144
	Molokai	(25,094)	(9,389)	(27,270)	15,705
	Distribution Plant				
	Maui	44,458,451	47,803,059	42,982,100	3,344,608
	Lanai	1,436,206	1,612,961	1,356,118	176,755
	Molokai	2,413,192	2,566,482	2,339,259	153,290
	General Plant				
	Maui	6,207,820	6,881,365	5,923,388	673,545
	Lanai	100,071	118,705	92,662	18,634
	Molokai	693,122	763,953	675,814	70,831
	Total Reserve for Depreciation & Amortization	122,998,299	133,605,731	118,651,852	10,607,432
	Accumulated Provision for Amortization of Utility Plant Acquisition Adjustment				
	Retirement Work in Progress	(54,874)	(153,057)	(35,048)	(98,183)
	TOTAL RESERVES	122,943,425	133,452,674	118,616,804	10,509,249

Maui Electric Company, Limited
Name of Company


Signature of Officer

Duane Hayashi, Assistant Treasurer
Name, Title of Officer

9/26/97
Date

LANAI SYSTEM -- AUGUST 1997

ANALYSIS OF OPERATING REVENUES

Acct. No.	ACCOUNT TITLE	Totals for the Same Month This Year	Totals for the Same Month Last Year	ACCUMULATED TOTALS TO DATE This Year	ACCUMULATED TOTALS TO DATE Last Year	Increase-Decrease Accum. Totals
	OPERATING REVENUES					
	Residential Sales	101,590	96,662	838,840	763,084	75,756
	Commercial & Industrial	338,752	351,194	2,579,668	2,436,007	143,661
	Public St. & Highway Light'g.	1,489	1,085	13,919	12,260	1,659
	Electric Sales to Employees	695	495	5,530	4,001	1,529
	Sub-total	442,526	449,436	3,437,957	3,215,352	222,605
	Rent From Property	1,540	1,243	12,320	11,979	341
	Other Operating Revenues	894	838	7,634	8,461	(827)
	TOTAL OPERATING REVENUES	444,960	451,517	3,457,911	3,235,792	222,119

ANALYSIS OF OPERATING EXPENSES

Acct. No.	ACCOUNT TITLE	Totals for the Same Month This Year	Totals for the Same Month Last Year	ACCUMULATED TOTALS TO DATE This Year	ACCUMULATED TOTALS TO DATE Last Year	Increase-Decrease Accum. Totals
	PRODUCTION EXPENSES					
	Other Power/Fuel Generation					
	Operation	233,942	312,228	1,915,220	2,222,075	(306,855)
	Maintenance	13,165	11,351	130,925	170,141	(39,216)
	Other Power Supply Expenses					
	Operation	-	-	-	-	-
	DISTRIBUTION EXPENSES					
	Operation	1,762	4,788	22,679	20,787	1,892
	Maintenance	11,450	11,035	80,349	54,806	25,543
	CUSTOMER ACCOUNTS EXPENSES					
	Operation	8,164	5,100	66,149	45,710	20,439
	CUSTOMER SERVICE EXPENSES					
	Operation	2,215	-	38,392	-	38,392
	ADMINISTRATIVE & GENERAL					
	Operation	7,411	5,577	59,451	44,531	14,920
	Maintenance	42	27	3,094	246	2,848
	TOTAL OPER. & MAINT. EXPENSES	278,151	350,106	2,316,259	2,558,296	(242,037)
	Depreciation Expense	78,718	35,512	629,743	284,095	345,648
	Taxes Other Than Income Taxes	42,541	44,708	336,808	323,496	13,312
	Income Taxes	48,353	8,631	288,245	23,037	265,208
	Prov. for Def. Income Taxes	5,700	5,700	45,600	45,600	-
	TOTAL OPERATING EXPENSES	453,463	444,657	3,616,655	3,234,524	382,131
	OPERATING INCOME	(8,503)	6,860	(158,744)	1,268	(160,012)
	Total Operation Expenses	253,494	327,693	2,101,891	2,333,103	(231,212)
	Total Maintenance Expenses	24,657	22,413	214,368	225,193	(10,825)

MONTHLY STATISTICAL INFORMATION - Lanai System 0897

CLASSIFICATION OF RATES (1)	TOTAL CONSUMERS At Close of This Month (2)	TOTAL CONSUMERS At Close of Same Month Last Year(3)	TOTAL METERS At Close of This Month(4)	TOTAL METERS At Close of Same Month Last Year(5)	TOTAL K.W.H. SOLD This Month(6)	TOTAL K.W.H. SOLD Accumulated Total for This Year
Res'l Comb. Light'g, Heat'g & Sm. Pow. " R "	1,151	1,162	-	-	532,430	4,271,620
General Lighting Service " G "	164	153	-	-	632,901	4,608,134
Heating, Cooking, Refrigeration, etc. " H "	5	5	-	-	50,919	365,500
Combined Power & Incidental Lighting " "	-	-	-	-	-	-
General Power " "	-	-	-	-	-	-
Large General Service " P "	3	3	-	-	1,121,413	7,992,633
Optional Power " "	-	-	-	-	-	-
Industrial Contract " "	-	-	-	-	-	-
Governmental St., Hwy. & Park Lighting " F "	4	4	-	-	8,598	77,308
Governmental Contract " "	-	-	-	-	-	-
Interdepartmental " "	-	-	-	-	-	-
Electric Service to Employees " R "	10	9	-	-	5,366	42,499

NOTE:
Where the same customers are served under more than one rate schedule, the entries in columns (2) and (3), "Total Consumers" should denote the duplication in number of reported consumers.

TOTALS	1,337	1,336	-	-	2,351,627	17,357,694
			KW (Max)*	KW (Max)		
KW Hrs. Used-N/C	x x x x x	x x x x x	x x x x x	x x x x x	2,472	21,046
KW Hrs. Lost-Unaccounted	x x x x x	x x x x x	x x x x x	x x x x x	207,232	1,219,613
KW Hrs. Net to System	x x x x x	x x x x x	x x x x x	x x x x x	2,561,331	18,598,353
KW Hrs. Station Use	x x x x x	x x x x x	x x x x x	x x x x x	70,109	499,797
KW Hrs. and KW (Max.) Generated-Steam	x x x x x	x x x x x	-	-	-	-
" " " " -Diesel	x x x x x	x x x x x	4,750	4,950	2,631,440	19,098,150
" " " " -Other	x x x x x	x x x x x	-	-	-	-
Total KW Hrs. and KW (Max.) Generated	x x x x x	x x x x x	4,750	4,950	2,631,440	19,098,150
Total KW Hrs. and KW (Max.) Purchased	x x x x x	x x x x x	-	-	-	-
Percentage of KW Hrs. Used-N/C (%)	x x x x x	x x x x x	x x x x x	x x x x x	.1	.1
Percentage of KW Hrs. Loss-Unaccounted (%)	x x x x x	x x x x x	x x x x x	x x x x x	8.1	6.6
	x x x x x	x x x x x	x x x x x	x x x x x	x x x x x x	x x x x x x
Average Cost per KWHr. Sold	x x x x x	x x x x x	x x x x x	x x x x x	x x x x x x	x x x x x x
Average Net Income per KWHr. Sold	x x x x x	x x x x x	x x x x x	x x x x x	x x x x x x	x x x x x x

*(1) KW (Max.) is the recorded 15 minute period peak KW generated or purchased applicable to electric utilities only.

MONTHLY STATISTICAL INFORMATION - Lanai System 0897

NET REVENUE RECEIVED		AVERAGE K.W.H. SOLD PER CONSUMER		AVERAGE NET REVENUE PER K.W.H SOLD*		AVG. NET REVENUE PER CONSUMER		% OF TOTAL REVENUE RECVD.	
This Month (8)	Same Month Last Year (9)	This Month (10)	Same Month Last Year(11)	This Month (12)	Same Month Last Year(13)	This Month(14)	Same Month Last Year(15)	This Month(16)	Same Month Last Year(17)
101,591	96,661	463	436	19.081	19.071	88	83	23.0	21.5
134,805	132,508	3,859	4,012	21.300	21.585	822	866	30.5	29.5
9,129	8,654	10,184	9,548	17.928	18.127	1,826	1,731	2.1	1.9
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
194,818	210,032	373,804	401,027	17.373	17.458	64,939	70,011	44.0	46.7
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
1,489	1,085	2,150	1,539	17.314	17.625	372	271	.3	.2
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
695	495	537	439	12.950	12.544	69	55	.2	.1
442,526	449,435	1,759	1,783	18.818	18.871	331	336	100.0	100.0
x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x	x x x x x x		
x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x	x x x x x x		
x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x	x x x x x x		
x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x	x x x x x x		
x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x	x x x x x x		
x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x	x x x x x x		
x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x	x x x x x x		
x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x	x x x x x x		
x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x	x x x x x x		
x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x	x x x x x x		
		x x x x x x	x x x x x x	x x x x x x	x x x x x x	x x x x x	x x x x x x		
x x x x x x	x x x x x x	x x x x x x	x x x x x x	19.283	18.670	x x x x x	x x x x x x		
x x x x x x	x x x x x x	x x x x x x	x x x x x x	-.465	.201	x x x x x	x x x x x x		

MOLOKAI SYSTEM -- AUGUST 1997

ANALYSIS OF OPERATING REVENUES

Acct. No.	ACCOUNT TITLE	Totals for the Same Month This Year	Totals for the Same Month Last Year	ACCUMULATED TOTALS TO DATE This Year	ACCUMULATED TOTALS TO DATE Last Year	Increase-Decrease Accum. Totals
	OPERATING REVENUES					
	Residential Sales	199,287	216,915	1,686,631	1,602,444	84,187
	Commercial & Industrial	345,316	359,622	2,647,207	2,487,555	159,652
	Public St. & Highway Light'g.	6,011	7,205	57,282	55,773	1,509
	Electric Sales to Employees	2,982	3,178	24,770	23,105	1,665
	Sub-total	553,596	586,920	4,415,890	4,168,877	247,013
	Rent From Property	5,038	4,642	38,368	36,883	1,485
	Other Operating Revenues	4,247	3,197	27,764	28,455	(691)
	TOTAL OPERATING REVENUES	562,881	594,759	4,482,022	4,234,215	247,807

ANALYSIS OF OPERATING EXPENSES

Acct. No.	ACCOUNT TITLE	Totals for the Same Month This Year	Totals for the Same Month Last Year	ACCUMULATED TOTALS TO DATE This Year	ACCUMULATED TOTALS TO DATE Last Year	Increase-Decrease Accum. Totals
	PRODUCTION EXPENSES					
	Other Power/Fuel Generation					
	Operation	241,758	246,696	1,944,940	1,849,318	95,622
	Maintenance	4,048	11,130	51,048	225,178	(174,130)
	Other Power Supply Expenses					
	Operation	-	-	-	-	-
	TRANSMISSION EXPENSES					
	Operation	148	7,551	2,892	58,430	(55,538)
	Maintenance	-	-	-	160	(160)
	DISTRIBUTION EXPENSES					
	Operation	2,297	3,126	30,626	39,613	(8,987)
	Maintenance	7,125	6,614	118,347	74,388	43,959
	CUSTOMER ACCOUNTS EXPENSES					
	Operation	15,528	16,527	131,025	124,890	6,135
	CUSTOMER SERVICE EXPENSES					
	Operation	4,554	241	47,246	241	47,005
	ADMINISTRATIVE & GENERAL					
	Operation	23,783	21,913	196,329	176,577	19,752
	Maintenance	706	651	8,375	6,245	2,130
	TOTAL OPER. & MAINT. EXPENSES	299,947	314,449	2,530,828	2,555,040	(24,212)
	Depreciation Expense	95,368	26,143	762,939	216,623	546,316
	Taxes Other Than Income Taxes	54,094	43,485	440,353	402,774	37,579
	Income Taxes	81,410	86,078	556,483	380,571	175,912
	Prov. for Def. Income Taxes	7,115	7,115	56,920	56,920	-
	Amort. of Def. Invest. Tax Cr.	-	-	-	-	-
	TOTAL OPERATING EXPENSES	537,934	477,270	4,347,523	3,611,928	735,595
	OPERATING INCOME	24,947	117,489	134,499	622,287	(487,788)
	Total Operation Expenses	288,068	296,054	2,353,058	2,249,069	103,989
	Total Maintenance Expenses	11,879	18,395	177,770	305,971	(128,201)

MONTHLY STATISTICAL INFORMATION - Molokai System 0897

CLASSIFICATION OF RATES (1)		TOTAL CONSUMERS At Close of This Month (2)	TOTAL CONSUMERS At Close of Same Month Last Year(3)	TOTAL METERS At Close of This Month(4)	TOTAL METERS At Close of Same Month Last Year(5)	TOTAL K.W.H. SOLD This Month(6)	TOTAL K.W.H. SOLD Accumulated Total for This Year
Res'l Comb. Light'g, Heat'g & Sm. Pow.	" R "	2,325	2,310	-	-	1,019,257	8,314,160
General Lighting Service	" G "	453	439	-	-	1,078,268	7,880,674
Heating, Cooking, Refrigeration, etc.	" H "	31	29	-	-	209,765	1,386,324
Combined Power & Incidental Lighting	" "	-	-	-	-	-	-
General Power	" "	-	-	-	-	-	-
Large General Service	" P "	12	12	-	-	643,744	3,955,226
Optional Power	" "	-	-	-	-	-	-
Industrial Contract	" "	-	-	-	-	-	-
Governmental St., Hwy. & Park Lighting	" F "	10	10	-	-	32,493	297,311
Governmental Contract	" "	-	-	-	-	-	-
Interdepartmental	" "	-	-	-	-	-	-
Electric Service to Employees	" R "	29	28	-	-	22,124	176,708

NOTE:
Where the same customers are served under more than one rate schedule, the entries in columns (2) and (3), "Total Consumers" should denote the duplication in number of reported consumers.

TOTALS	2,860	2,828	-	-	3,005,651	22,010,403
			KW (Max)*	KW (Max)		
KW Hrs. Used-N/C	x x x x x	x x x x x	x x x x x	x x x x x	12,351	90,743
KW Hrs. Lost-Unaccounted	x x x x x	x x x x x	x x x x x	x x x x x	327,077	2,224,137
KW Hrs. Net to System	x x x x x	x x x x x	x x x x x	x x x x x	3,345,079	24,325,283
KW Hrs. Station Use	x x x x x	x x x x x	x x x x x	x x x x x	114,841	875,557
KW Hrs. and KW (Max.) Generated-Steam	x x x x x	x x x x x	-	-	-	-
" " " " -Diesel	x x x x x	x x x x x	6,200	6,400	3,459,920	25,200,840
" " " " -Other	x x x x x	x x x x x	-	-	-	-
Total KW Hrs. and KW (Max.) Generated	x x x x x	x x x x x	6,200	6,400	3,459,920	25,200,840
Total KW Hrs. and KW (Max.) Purchased	x x x x x	x x x x x	-	-	-	-
Percentage of KW Hrs. Used-N/C (%)	x x x x x	x x x x x	x x x x x	x x x x x	.4	.4
Percentage of KW Hrs. Loss-Unaccounted (%)	x x x x x	x x x x x	x x x x x	x x x x x	9.8	9.1
	x x x x x	x x x x x	x x x x x	x x x x x	x x x x x x	x x x x x x
Average Cost per KWHr. Sold	x x x x x	x x x x x	x x x x x	x x x x x	x x x x x x	x x x x x x
Average Net Income per KWHr. Sold	x x x x x	x x x x x	x x x x x	x x x x x	x x x x x x	x x x x x x

Purchased Power - Onsite	-	-
- Cummins	-	-
- Zond	-	-
Total Purchased Power	-	-

*(1) KW (Max.) is the recorded 15 minute period peak KW generated or purchased applicable to electric utilities only.

NET REVENUE RECEIVED		AVERAGE K.W.H. SOLD PER CONSUMER		AVERAGE NET REVENUE PER K.W.H SOLD*		AVG. NET REVENUE PER CONSUMER		% OF TOTAL REVENUE RECVD.	
This Month (8)	Same Month Last Year (9)	This Month (10)	Same Month Last Year(11)	This Month (12)	Same Month Last Year(13)	This Month(14)	Same Month Last Year(15)	This Month(16)	Same Month Last Year(17)
199,288	216,916	438	470	19.552	19.968	86	94	36.0	37.0
223,663	225,413	2,380	2,380	20.743	21.573	494	513	40.4	38.4
34,440	32,494	6,767	6,573	16.419	17.047	1,111	1,120	6.2	5.5
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
87,212	101,716	53,645	54,596	13.548	15.526	7,268	8,476	15.8	17.3
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
6,011	7,205	3,249	3,815	18.500	18.886	601	720	1.1	1.2
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
2,981	3,178	763	821	13.476	13.824	103	113	.5	.5
553,596	586,920	1,051	1,074	18.418	19.319	194	208	100.0	100.0
xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxx	xxxxxx		
xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxx	xxxxxx		
xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxx	xxxxxx		
xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxx	xxxxxx		
xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxx	xxxxxx		
xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxx	xxxxxx		
xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxx	xxxxxx		
xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxx	xxxxxx		
xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxx	xxxxxx		
xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxx	xxxxxx		
xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxx	xxxxxx		
		xxxxxx	xxxxxx	xxxxxx	xxxxxx	xxxxx	xxxxxx		
xxxxxx	xxxxxx	xxxxxx	xxxxxx	17.897	12.423	xxxxx	xxxxxx		
xxxxxx	xxxxxx	xxxxxx	xxxxxx	.521	6.896	xxxxx	xxxxxx		

Maui Electric Company, Limited's
Proposed Waena Generating Station

Land Use Commission Petition
Docket A 97-722
ORIGINAL **Exhibit 6**

October 1997

Exhibit 6

PETITION FOR DISTRICT BOUNDARY AMENDMENT
FROM AGRICULTURAL TO URBAN

MAUI ELECTRIC COMPANY, LIMITED
WAENA GENERATING STATION

LAND USE COMMISSION
STATE OF HAWAII
1991 OCT 24 P 1:47

EXHIBIT 6

SITING STUDIES

MECO Central Maui Siting Study

Belt Collins Hawaii
June 1994

TABLE OF CONTENTS

Page

1.0 INTRODUCTION

1.1 BACKGROUND 1-1
1.1.1 TYPE AND CAPACITY OF PLANNED GENERATING FACILITIES 1-1
1.1.2 PREVIOUS SITING EFFORTS AND STUDIES 1-1
1.1.3 CENTRAL MAUI SITING STUDY AIR QUALITY ANALYSIS 1-3
1.1.4 STUDY PURPOSE 1-5

1.2 STUDY WORK FLOW 1-5

1.3 REPORT ORGANIZATION 1-7

2.0 SITE EVALUATION METHODOLOGY

2.1 INTRODUCTION 2-1

2.2 SCREENING FACTORS AND EVALUATION CRITERIA 2-1
2.2.1 AIR QUALITY 2-1
2.2.2 LAND OWNERSHIP, EXISTING USE, AND LAND USE CONTROLS 2-2
2.2.2.1 Land Ownership 2-2
2.2.2.2 Existing Use 2-3
2.2.2.3 State Land Use District Designation 2-4
2.2.2.4 Community Plan Designation 2-4
2.2.2.5 County Zoning 2-5
2.2.2.6 Special Management Area 2-6
2.2.3 TOPOGRAPHY 2-6
2.2.4 SOILS 2-7
2.2.5 GROUNDWATER 2-7
2.2.5.1 Groundwater Availability 2-8
2.2.5.2 Wastewater Disposal 2-9
2.2.6 DRAINAGE/FLOOD ZONES 2-10
2.2.7 NOISE 2-10
2.2.8 FLORA AND FAUNA 2-10
2.2.9 AESTHETIC (VISUAL) CONSIDERATIONS 2-11

2.2.10 TECHNICAL/ENGINEERING FACTORS 2-11
2.2.10.1 Subsurface Conditions 2-12
2.2.10.2 Transmission System Improvement Costs 2-12
2.2.10.3 Fuel Delivery 2-13

2.3 DELINEATION AND EVALUATION OF SPECIFIC SITES 2-13
2.3.1 INITIAL SCREENING 2-13
2.3.2 IDENTIFICATION OF SPECIFIC SITES 2-13

2.4 SITE RANKING 2-14

3.0 STUDY AREA CHARACTERISTICS

3.1 INTRODUCTION 3-1

3.2 LAND OWNERSHIP, USE, AND CONTROLS 3-1
3.2.1 LAND OWNERSHIP 3-1
3.2.1.1 Data Sources and Limitations 3-1
3.2.1.2 Regional Patterns 3-1
3.2.2 EXISTING USE 3-1
3.2.2.1 Data Sources and Limitations 3-1
3.2.2.2 Regional Patterns 3-2
3.2.3 STATE LAND USE DISTRICT DESIGNATION 3-2
3.2.3.1 Data Sources and Limitations 3-2
3.2.3.2 Regional Patterns 3-2
3.2.4 COMMUNITY PLAN DESIGNATION 3-3
3.2.4.1 Data Sources and Limitations 3-3
3.2.4.2 Regional Patterns 3-3
3.2.5 ZONING DESIGNATION 3-3
3.2.5.1 Data Sources and Limitations 3-3
3.2.5.2 Regional Patterns 3-3
3.2.6 SPECIAL MANAGEMENT AREA 3-4
3.2.6.1 Data Sources and Limitations 3-4
3.2.6.2 Regional Patterns 3-4

3.3 NATURAL FACTORS 3-4
3.3.1 AIR QUALITY 3-4
3.3.1.1 Data Sources and Limitations 3-4
3.3.1.2 Regional Patterns 3-5
3.3.2 TOPOGRAPHY 3-5
3.3.2.1 Data Sources and Limitations 3-5
3.3.2.2 Regional Patterns 3-5
3.3.3 SOILS 3-5
3.3.3.1 Data Sources and Limitations 3-5
3.3.3.2 Regional Patterns 3-6

3.3.4 GROUNDWATER 3-6
3.3.4.1 Data Sources and Limitations 3-6
3.3.4.2 Regional Patterns 3-7
3.3.5 DRAINAGE/FLOOD ZONES 3-7
3.3.5.1 Data Sources and Limitations 3-7
3.3.5.2 Regional Patterns 3-7
3.3.6 NOISE 3-7
3.3.6.1 Data Sources and Limitations 3-7
3.3.6.2 Regional Patterns 3-8
3.3.7 FLORA AND FAUNA 3-8
3.3.7.1 Data Sources and Limitations 3-8
3.3.7.2 Regional Patterns 3-8
3.3.8 AESTHETIC CHARACTER 3-9
3.3.8.1 Data Sources and Limitations 3-9
3.3.8.2 Regional Patterns 3-9
3.3.9 TECHNICAL/ENGINEERING FACTORS 3-9
3.3.9.1 Data Sources and Limitations 3-9
3.3.9.2 Regional Patterns 3-10

4.0 IDENTIFICATION AND RANKING OF SPECIFIC SITES

4.1 OVERALL APPROACH 4-1
4.1.1 INITIAL SCREENING 4-1
4.1.2 IDENTIFICATION OF SPECIFIC SITES 4-1
4.1.3 SITES INCLUDED IN THE FINAL PHASE OF ANALYSIS 4-4

4.2 SITE RANKINGS 4-6
4.2.1 INTRODUCTION 4-6
4.2.2 SCORING 4-6
4.2.2.1 Air Quality 4-9
4.2.2.2 Land Ownership 4-9
4.2.2.3 Existing Uses 4-10
4.2.2.4 Land Use Controls/Adjacent Uses 4-10
4.2.2.5 Topography 4-11
4.2.2.6 Soils 4-11
4.2.2.7 Groundwater Availability and Quality 4-11
4.2.2.8 Wastewater Disposal 4-12
4.2.2.9 Flooding/Drainage Issues 4-12
4.2.2.10 Noise 4-12
4.2.2.11 Flora and Fauna 4-13
4.2.2.12 Aesthetic Considerations 4-13
4.2.2.13 Subsurface Conditions 4-13
4.2.2.14 Transmission System Improvement Costs 4-13
4.2.2.15 Fuel Delivery Distance 4-14
4.2.2.16 Road Improvement Costs 4-14

4.2.3 SUMMARY OF SITE SCORING 4-14
4.2.4 SENSITIVITY ANALYSIS OF SCORING 4-15

5.0 RECOMMENDATIONS

5.1 COORDINATION AND REVIEW 5-1

5.2 SITE SELECTION 5-1

5.3 FOLLOW-UP INVESTIGATIONS 5-2

Figures

ES-1 Finalist Sites ES-2
1-1 Black & Veatch Sites 1-2
1-2 Difficulty of Air Quality Permitting 1-4
1-3 Study Flow Diagram 1-6
4-1 Initial Screening: Favorable Zones 4-2
4-2 Initial Screening: Sites 4-3
4-3 Finalist Sites 4-5
4-4 Screening Process Diagram 4-7

Tables

4-1 Scores 4-8
4-2 Sensitivity Analysis Scores 4-16

Appendices

Appendix A Parameter Overlays A-1
Appendix B CADD View Analysis B-1
Appendix C Slope Analysis C-1
Appendix D Letter Report - Engineering Evaluation D-1
Appendix E Letter Report - Tom Nance Water Resource Engineering (5-21-1993) E-1
Appendix F Letter Report - Tom Nance Water Resource Engineering (1-19-1993) F-1

Executive Summary

EXECUTIVE SUMMARY

The Maui Electric Company (MECO) must install additional generating units over the coming decades to meet the forecast demand for electrical power. Space limitations and other factors prevent MECO from accomplishing this by simply expanding its existing power plants. Consequently, the company is searching for a new site at which it can install up to 232 megawatts (MW) of additional generating capacity. For the purposes of this analysis it is assumed that the additional capacity will be in the form of four oil-fired, dual train combined-cycle generating units as called for in MECO's approved generation expansion plan.

Air quality issues constitute a major area of environmental concern for power plant development; they also strongly influence the design, construction, and operating costs of power plants. Because of this, MECO commissioned Trinity Consultants, Incorporated, to identify the areas in Central Maui which possess the most favorable conditions for complying with State and Federal air quality regulations. (Central Maui was specified because a previous study indicated it was the most appropriate location.) It identified a broad area along the lower slopes of Haleakala as most promising from an air quality viewpoint.

This report is intended as a companion to Trinity Consultants' analysis. It:

- identifies numerous non-air quality factors relevant to the siting of a new generating facility within the zones deemed favorable from an air quality viewpoint;
- combines general information on these factors with the results of air quality analyses to identify possible sites;
- evaluates the identified sites using specific environmental and engineering suitability criteria; and
- integrates the results of these evaluations with other information to identify the sites which are most promising for construction of a new power plant.

Factors considered in the evaluation include air quality, land ownership, existing land use, land use controls and adjacent uses, topography, soils, groundwater availability, wastewater disposal, flooding and drainage characteristics, noise, flora and fauna, aesthetics, subsurface conditions, transmission system requirements, fuel delivery distance, and road improvement costs. Data relating to each of these factors were collected and mapped. This information was used in conjunction with explicit site selection criteria to identify zones which are most favorable for power plant development.

Ten 50-acre sites (the minimum area needed for a 232 MW facility) were identified within these zones. These sites represented the full range of conditions present. After additional screening, six of the ten were selected as "finalist" sites and were analyzed further. The other four sites were eliminated from consideration because they were either so similar to one of the six chosen as finalists that separate analyses would not have been meaningful or were clearly inferior to those six. The locations of the finalist sites are shown on Figure ES-1.

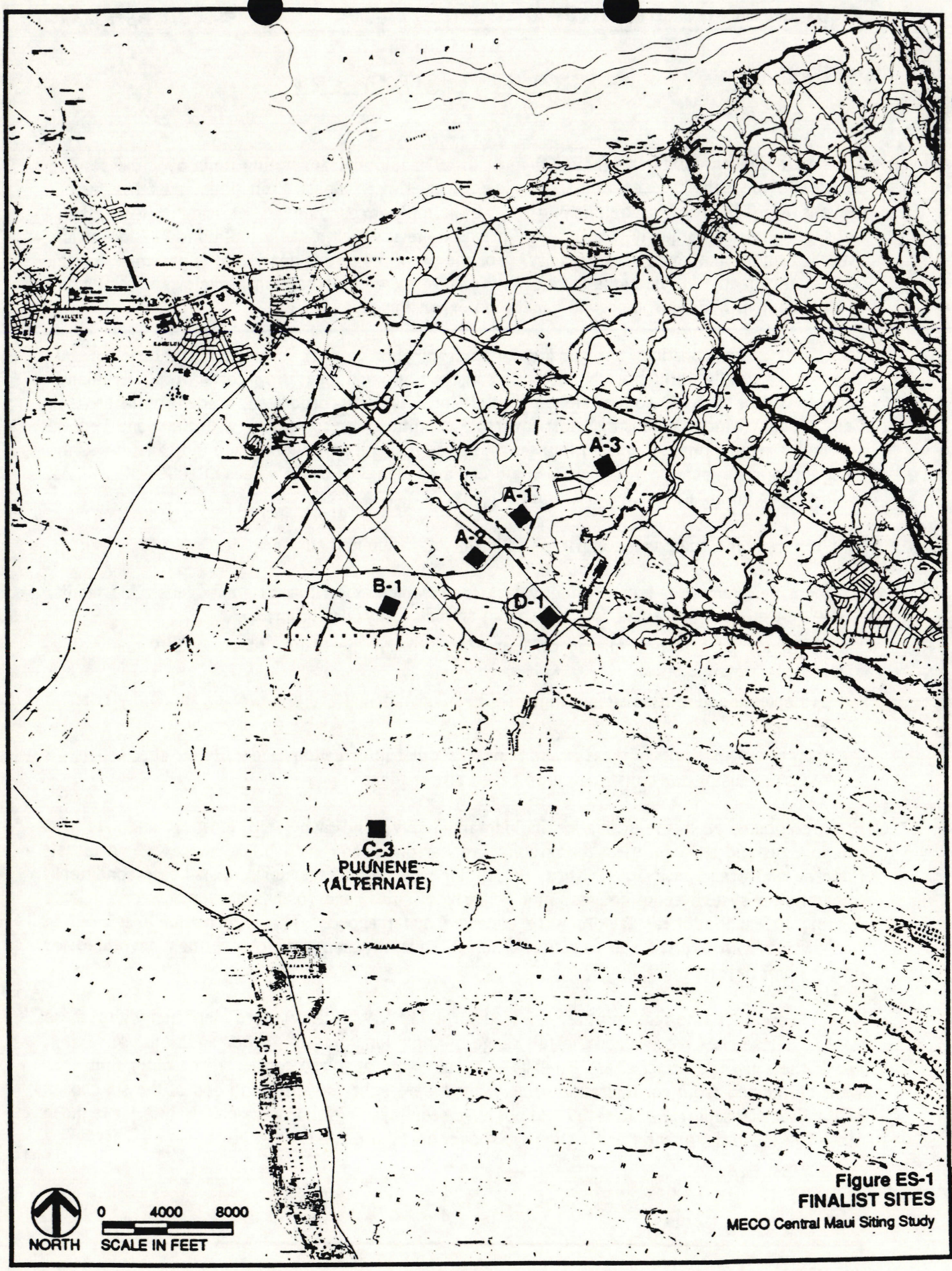


Figure ES-1
FINALIST SITES
MECO Central Maui Siting Study

The suitability of each of the six finalist sites for power plant development was then evaluated. The rating involved two components. The first is a score for each of the sixteen factors listed above. The second component of the rating system represents the importance (or weight) attached to each factor. This reflects the fact that some parameters (such as air quality) are inherently more important than others (e.g., electrical power transmission system improvement costs) in making power plant siting judgements.

Results of the analysis showed that Site A-1, which is located on the northeast side of Kalialinui Gulch near the County Landfill) is the most favorable site for power plant development. Site A-2, which is located about 0.4 mile southwest of Site A-1, and Site D-1, which is situated along Pulehu Road approximately one mile to the south, scored nearly as well. They received 94.7% and 93.0% of A-1's score, respectively. The closeness of the scores among the top three sites suggests that the proposed generating facilities might reasonably be developed on any one of them.

Sites B-1 and C-3, which both received 74.9% of A-1's score, are the best of the three lower-rated sites. Air quality is by far their most significant deficiency; if this problem could be eliminated through appropriate mitigation, their scores would be much closer to those of the higer-rated three top-rated sites. Site A-3 scored 67.4%; it appears to be far less suitable for power plant development than the top-rated sites. A low air quality score plays a significant role in this, but it is relatively low-rated in other factors as well.

Both the weights attributed to each parameter and the scores assigned that parameter involved numerous qualitative judgements. Because of this, alternative weighting schemes were tested to determine the extent to which using them instead of the primary weighting scheme (which was based on the best judgements of the authors of this report) might alter the site rankings. The results of this sensitivity analysis showed that the site rankings are relatively insensitive to changes in the weights that are assigned the various parameters. This tends to confirm the reasonableness of the ranking described above.

Based on the results of the study and discussions with the State Department of Health, MECO identified the region around Sites A-1/A-2/D-1 as its primary area of interest. In the fall of 1993 A&B-Hawaii gave MECO permission to erect a meteorological monitoring tower on Site D-1, and a monitoring station was put into operation at that location in January 1994. The data from it will be used to model the air quality impacts of power plant development at all three sites in this region. While Site C-3 had a relatively low air quality rating in the initial screening, it is the only site which is not presently being used for sugarcane cultivation. Because of this and the landowner's interest in making this site available to MECO, a meteorological monitoring station was established at it as well; it will provide the data needed for more detailed analyses of the ability of a facility at this location to obtain the needed air permits. However, even if it does prove suitable from an air quality standpoint, Site C-3's rating on other factors means that it would probably not be MECO's first choice for the planned generation facilities.

Once a full year of meteorological data is available from the two monitoring stations, the air quality effects of the proposed facilities will be modeled. The results of this modeling will be used to further evaluate the feasibility of power plant construction in the A-1/A-2/D-1 region and at C-3. This final analysis will address the ambient concentrations that can be anticipated, the

relationship of these to applicable ambient air quality standards, and the implications that this has for permitting difficulty and the cost of the required pollution control measures.

Several activities that will need to be undertaken in conjunction with the meteorological data collection to assist MECO in making a final site selection. Subjects to be explored include the possible integration with the existing irrigation system (A&B Hawaii); the appropriateness of making minor adjustments in the site boundaries to increase their compatibility with existing land uses on and around the sites (A&B Hawaii); the best access road design and right-of-way (A&B Hawaii/HC&S, Maui County, and the Highways Division of the State Department of Transportation); the best transmission system alignments (MECO); and the timing and scope of walk-through surveys of the most promising sites by qualified biologists and archaeologists to confirm that no unanticipated resources are present.

Chapter 1
Introduction

CHAPTER 1.0 INTRODUCTION

1.1 BACKGROUND

1.1.1 TYPE AND CAPACITY OF PLANNED GENERATING FACILITIES

In order to meet forecast long-term increases in the demand for electrical power and to accommodate the retirement of older generating units, the Maui Electric Company (MECO) must install additional generating capacity over the coming decades. Limited space, environmental constraints, and socioeconomic factors severely limit MECO's ability to develop the facilities needed to meet this demand on its existing power plant sites at Kahului and Mā'alaea. Consequently, the company is searching for an entirely new site on which to construct up to 232 megawatts (MW) of additional generating capacity.

1.1.2 PREVIOUS SITING EFFORTS AND STUDIES

The *Preferred and Alternate Site/Technology Report* prepared for the Maui Electric Company as part of Black & Veatch's (1991) *Generating Facility Siting Study* identified Central Maui as the best location for new generating units. It also identified "preferred" and "alternate" sites for the development of these facilities. The preferred site identified in the report is located near the existing Ameron HC&D quarry; the alternate site named in the report is located on land near the old Puunene Airport (see Figure 1-1). Both sites are currently owned by Alexander & Baldwin-Hawaii, Incorporated (A&B-Hawaii).

Following completion of the Black & Veatch study, MECO and A&B-Hawaii/Hawaiian & Commercial Sugar Company (HC&S) representatives formed a working group to discuss MECO's possible use of the preferred and alternate sites. Due to MECO's concerns regarding dust from nearby quarries and HC&S's concerns regarding loss of cane land, both parties eventually shifted their attention to another location. This 50-acre site is situated within Field 823, a non-crop field located two miles southeast of the Puunene Airport "alternate" site identified in Black & Veatch. This report refers to the Field 823 location as "Site C-3."

Because it appeared that the Field 823 site might meet both MECO's and HC&S' needs, MECO agreed to consider that location pending the outcome of environmental and engineering studies intended to confirm its suitability for the proposed use. An analysis of environmental factors (other than air quality) affecting the site's suitability for the proposed facilities (Belt Collins & Associates, December 23, 1992) indicated it was generally adequate. However, when MECO and A&B-Hawaii were unable to agree on the value of the land and other related issues in a timely fashion, MECO was forced to suspend its negotiations with A&B-Hawaii and turn its immediate attention to development of 58 megawatts of additional capacity on the last of its vacant land at the Mā'alaea power plant. MECO's decision to meet its immediate need for additional capacity by constructing new units at Mā'alaea gave it an opportunity to examine the Field 823 site from

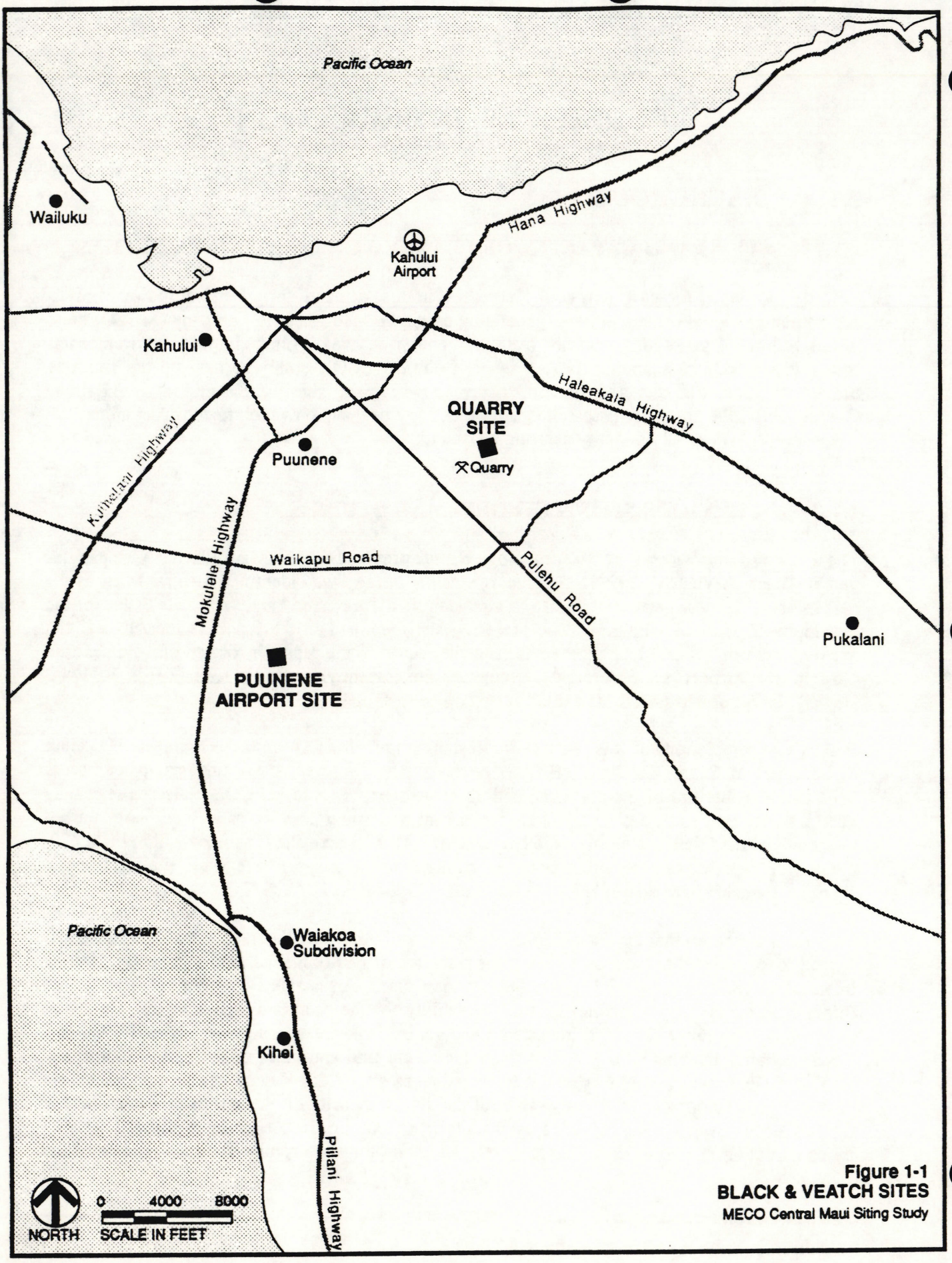


Figure 1-1
BLACK & VEATCH SITES
MECO Central Maui Siting Study

an air quality perspective, a factor which was not included in the scope of work for the 1992 study.

1.1.3 CENTRAL MAUI SITING STUDY AIR QUALITY ANALYSIS

Air quality issues constitute a major area of environmental concern for power plant development. Moreover, their effect on the need for pollution control devices and fuel choices strongly influence generating facility construction and operating costs. Because of this, MECO retained the services of Trinity Consultants, Incorporated (subsequently referred to as "Trinity Consultants"), to identify the areas in Central Maui which possess the most favorable conditions for complying with state and federal air quality regulations.[1] Trinity Consultants' study (*Central Maui Siting Study Air Quality Analysis*, April 1993) focused on nitrogen oxides, sulfur dioxide, and particulate matter. This was because emissions of each of these would exceed 250 tons per year, thereby triggering a requirement for a Prevention of Significant Deterioration (PSD) review, as mandated by the Clean Air Act. The area included in the air quality analysis is depicted in Figure 1-2.

In order to demonstrate that a facility of the type envisioned would be able to comply with national and state Ambient Air Quality Standards and the allowable PSD increment, emissions from the proposed facility were modeled in conjunction with emissions from other permitted sources. Emission data and stack parameters were obtained by Trinity Consultants from the files of the State Department of Health. The study (which entailed more than 500 separate computer runs) modeled the air quality effects of developing the proposed generating facilities at each of nearly 200 potential locations. In addition to the anticipated emissions from MECO's proposed new generating facilities, the model accounts for all other permitted air pollutant sources, meteorological conditions (e.g., wind speed and direction, inversions, etc.), and topography. Results of the modeling provide a much better indication of the area that is suitable for additional generating capacity from an air quality standpoint than has heretofore been available.[2]

Figure 1-2 presents the results of Trinity Consultants' study in the form of contours showing the relative difficulty of air quality permitting for the hypothetical additional generating capacity. For display purposes, the zones have been labeled "moderate difficulty", "higher difficulty", and "highest difficulty." No "low difficulty" areas are present in the study area. In general, the best areas from an air permitting viewpoint are expected to be in the center of the "moderate difficulty" zone in the eastern portion of the study area. Permitting is expected to be more

[1]The study focused on Central Maui because Black & Veatch's previous work had indicated it was the preferred siting area.

[2]The study cites a number of analytical limitations that must be considered in applying its results. These include: (1) lack of site-specific meteorological data; (2) use of a relatively coarse receptor spacing for the air quality grid to cover the large study area; (3) uncertainty regarding the future emissions inventory for Maui at the time the air permits for the future generating units are sought; (4) uncertainty as to the exact stack parameters of the new source; and (5) uncertainty regarding the specific air quality regulations and regulatory guidelines for air quality modeling that will be applicable at the time permits for additional units are sought.

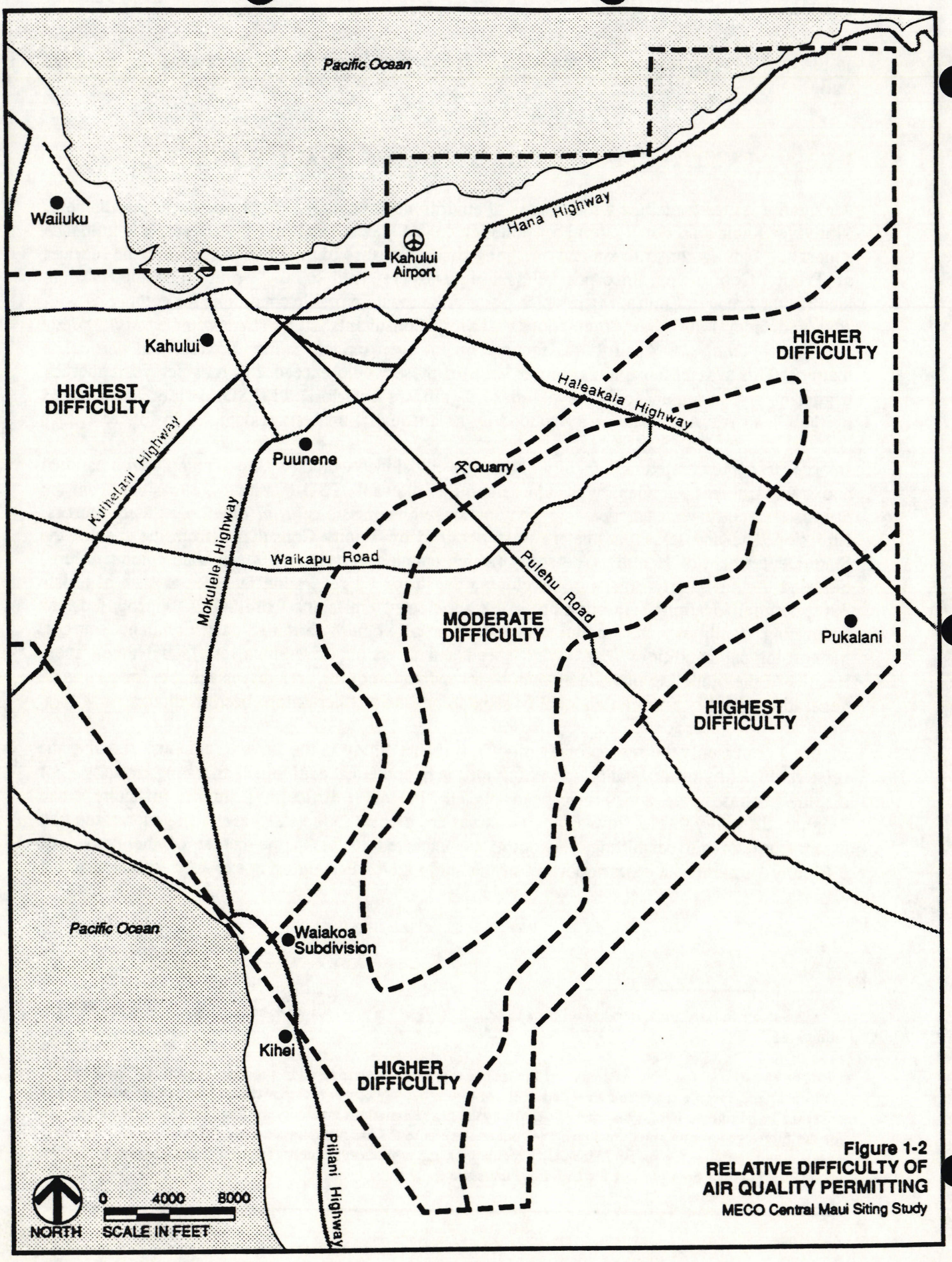


Figure 1-2
RELATIVE DIFFICULTY OF AIR QUALITY PERMITTING
MECO Central Maui Siting Study

difficult in the "higher" and "highest" difficulty zones. Trinity Consultants' report stresses that no location within the study area should be ruled out solely on the basis of its air quality rating.[3]

1.1.4 STUDY PURPOSE

The purpose of the study described in this report was:

- to identify the numerous non-air quality factors relevant to the siting of a new generating facility;
- to combine general information on these factors with the results of air quality analyses to identify zones most suitable for power plant development and possible sites within those zones; and
- to integrate the results of these evaluations with other information from MECO's contacts with the State Department of Health, the owners of potential sites, and public officials, so that MECO could identify locations that are most suitable for development of the additional generating capacity it will need.

For the purposes of this analysis, it was assumed that the additional capacity will be in the form of four 58-megawatt capacity, oil-fired, dual-train combined cycle (DTCC) generating systems. Each DTCC system would consist of two 20-MW combustion turbines, each paired with a heat recovery steam generator, and an 18-megawatt capacity steam turbine. Hence, the total capacity planned at the new site is 232 megawatts. Because implementation costs and other factors may depend upon site-specific conditions (such as the presence of subsurface archaeological remains) which cannot be readily identified by the kind of screening-level analysis conducted for this study, additional work (e.g., archaeological inventory survey, botanical survey, etc.) may need to be conducted on the top-rated sites before making a final selection.

1.2 STUDY WORK FLOW

The flow diagram in Figure 1-3 shows the study's major work elements and their relationship to associated activities. The diagram emphasizes that the study was incremental and interactive. Findings from the early phases were used together with information from other sources to guide the work that was subsequently undertaken. Three working drafts of the report were circulated to increasingly larger audiences in order to insure that the analytical techniques that were used were adequate, the data sources complete, and the assumptions appropriate. The close integration of data collection and decision-making made it possible to eliminate unnecessary data collection, focusing, instead, only on those issues which were most pertinent to the site selection process.

[3]Trinity Consultants' report stresses that no location within the study area should be ruled out solely on the basis of its air quality rating, advising: *"...if there is a compelling reason to consider a high difficulty site because of non-air quality related issues, a more detailed, site specific study, possibly including more refined power plant parameters, may indicate a more favorable outcome for that site."* The present study was conducted on the premise that a site could be found in one of the less restrictive air quality zones.

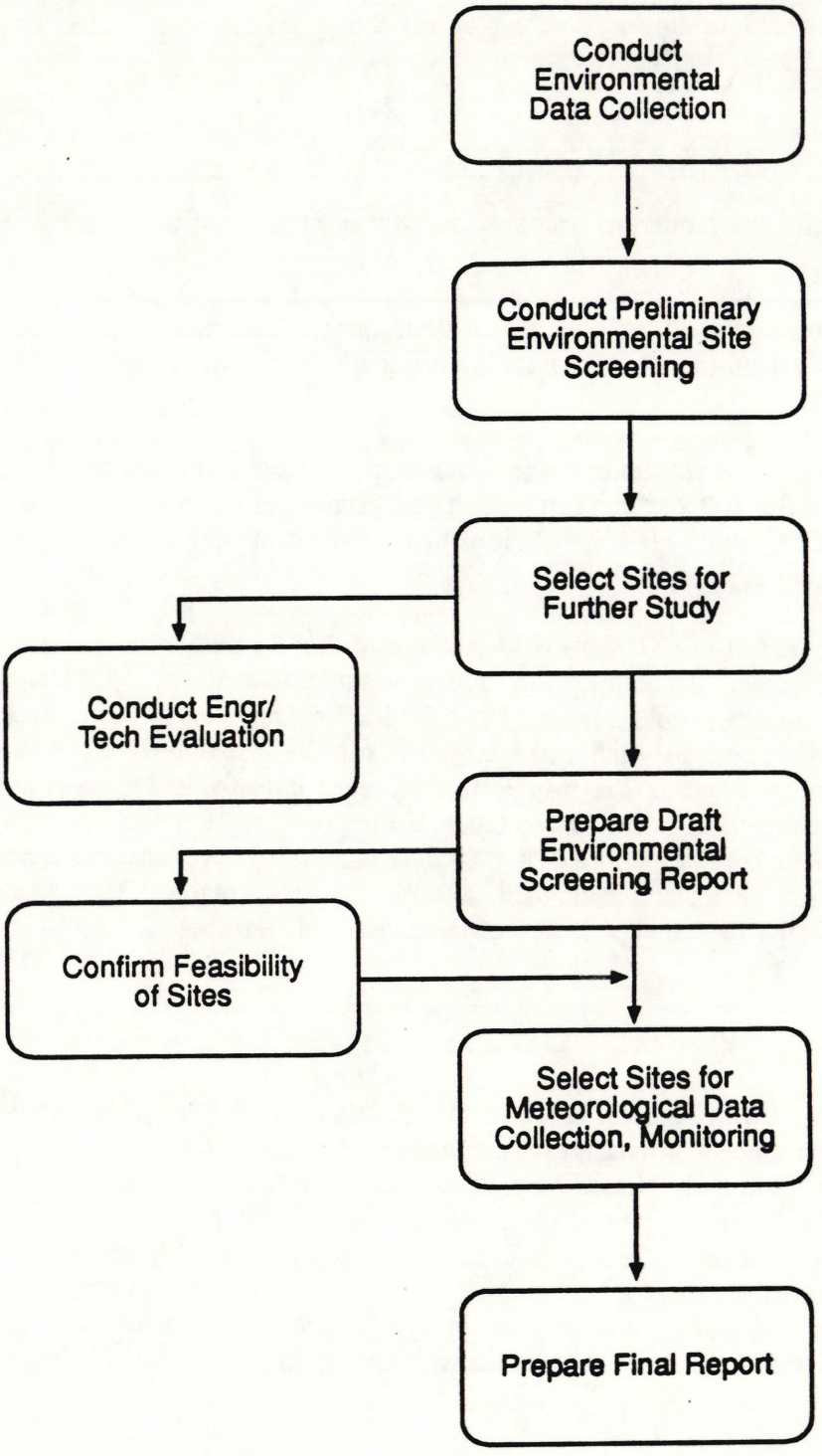


Figure 1-3
STUDY FLOW DIAGRAM
MECO Central Maui Siting Study

This would not have been possible without the cooperation of the many individuals at MECO, HECO, Stone & Webster Engineering Corporation, BEE Consulting Services, A&B-Hawaii, HC&S, and the Maui County Government who contributed information and provided feedback on the qualitative judgements that were made.

1.3 REPORT ORGANIZATION

The remainder of the report is divided into four parts:

- **Chapter 2 — Site Evaluation Methodology.** This chapter describes the factors considered important in selecting a site for the generating facility; it also lists the criteria that were used to determine suitability for that use.

- **Chapter 3 — Study Area Characteristics.** This chapter describes the characteristics of the study area that relate to the evaluation parameters and selection criteria developed in Chapter 2.

- **Chapter 4 — Identification and Ranking of Specific Sites.** This chapter describes the process by which potential siting areas were identified and specific sites were selected for further analysis and comparison. It also compares the data presented in Chapter 3 with the selection criteria described in Chapter 2 in order to determine the selected sites' suitability for the proposed power generating facilities.

- **Chapter 5 — Recommendations.** This chapter briefly describes the review of the working drafts of the report, identifies the sites that appear to be most suitable for a new power plant, and lists several follow-up investigations that may be appropriate before a site is acquired.

Chapter 2
Site Evaluation Methodology

CHAPTER 2.0 SITE EVALUATION METHODOLOGY

2.1 INTRODUCTION

As previously noted, this screening analysis began with the premise that suitable sites were likely to be present within the area which Trinity Consultants' April 1993 report had classified as "moderate" or "higher" air quality permitting difficulty. The portion of the island within these two zones constitutes the "Study Area" for the purposes of this report.

Once the study area boundaries had been established, information was collected on a wide variety of factors with the potential to affect an area's suitability for the proposed project. These factors, and the related criteria against which a potential site's suitability can be measured, are discussed in Section 2.2. Section 2.3 summarizes the way in which the data and the criteria were combined to arrive at a finite number of potential power plant sites; it also explains why several additional sites were included in the final analysis described in Chapter 4. Finally, Section 2.4 presents an overview of the methodology that was used to rank the sites; additional details on the ranking methodology and the sensitivity analysis that was performed in conjunction with it are contained in Chapter 4.

2.2 SCREENING FACTORS AND EVALUATION CRITERIA

This section lists the factors that were considered in evaluating sites' suitability for the proposed generating facilities. The criteria used in rating the sites for each factor are briefly described. In most cases, the criteria are presented sequentially, beginning with the ones that define the conditions that are most favorable to power plant development and ending with conditions that are least favorable.

Two points should be kept in mind in considering the discussion of the evaluation factors and criteria. First, the criteria are area-specific because local conditions were considered in their formulation. Second, the criteria are semi-quantitative and are intended as guides to decision-making rather than exact formulas.

2.2.1 AIR QUALITY

The importance of air quality considerations in selecting a location for a new power plant is discussed in Section 1.1.3. This study considered only those areas which Trinity Consultants'

April 1993 report categorized as "Moderate Difficulty" and "Higher Difficulty."[1] The following criteria were used in scoring potential power plant locations with respect to this factor.

- The most favorable rating was reserved for sites which Trinity Consultants' April 1993 analysis indicated would result in concentrations for the most critical pollutant/averaging period that are between 50% and 60% of those allowed by the AAQS/PSD increment.

- Sites whose development would result in modeled concentrations between 60 and 65% of the allowed level for the most critical pollutant/averaging period were considered next most favorable with respect to this factor.

- Sites whose development would result in modeled concentrations between 65 and 70% of the allowed level for the most critical pollutant/averaging period were considered next most favorable with respect to this factor.

- Sites whose development would result in modeled concentrations between 70% and 75% of the allowed level for the most critical pollutant and averaging period were considered next most favorable with respect to this factor.

- Power plant sites whose development would result in modeled concentrations of between 75% and 100% of the allowed level for the most critical pollutant/averaging period were considered least favorable with respect to this factor.

The specific concentrations modeled at each of the locations were used rather than the summary categories shown on the map since they made it possible to draw finer distinctions than were possible using the summary categories.

2.2.2 LAND OWNERSHIP, EXISTING USE, AND LAND USE CONTROLS

2.2.2.1 Land Ownership

The existing ownership affects each site's suitability for power plant development insofar as it influences the complexity and/or cost of acquisition. MECO's power to condemn land that is needed for utility purposes limits the importance of this factor, but it remains a consideration. The following categories of ownership were used for this evaluation:

- MECO already owns all or part of the site. Areas already owned by MECO (in whole or in part) are the best with respect to this factor.

[1]The "moderate difficulty" areas are those which are expected to have pollutant concentrations no greater than 75% of the State/National Ambient Air Quality Standards (SAAQS/NAAQS) or the available Prevention of Significant Deterioration (PSD) increment following build-out of the proposed project. The "higher difficulty" areas are those which are expected to have pollutant concentrations or PSD increment consumption of between 75% and 100% of the allowable limit following build-out of the proposed project. Note that the analysis assumed the use of four 56 MW combined cycle units giving a total capacity of 224 MW instead of the nominal 240 MW cited previously. This difference has no substantial bearing on the analysis.

- Areas of at least 50 acres which are controlled by a single owner are considered the second most favorable with respect to this factor. This acreage is the amount needed for the proposed power plant, and single-ownership would simplify negotiations between the utility and the landowner.

- Areas of at least 50 acres owned by between two and ten owners are considered the next most suitable with respect to this factor. The larger number of owners complicates purchase negotiations and decreases the probability that acquisition can be completed without condemnation.

- Areas of at least 50 acres where ownership is split among more than ten owners (i.e., where the average number of owners per 50-acre area exceeds 10) are the least favorable with respect to this factor. This is because the large number of owners complicates the acquisition process.

2.2.2.2 Existing Use

The existing uses of prospective sites affects the ease and cost of acquisition. It was presumed that sites which could be developed without displacing existing uses are preferable to sites already in productive use. Areas already being used were rated according to the relative cost of relocating those uses. The following criteria were used for this evaluation:

- Vacant land on existing power plant sites is considered most favorable with respect to this factor. This is because its development would not preclude any other desired use.

- Vacant land that is not being used for any purpose, including agriculture is considered the second most favorable with respect to this factor. Power plant development on it would not displace any existing use.

- Land currently used for ranching or other low-density agricultural uses (or which is temporarily fallow) is considered the next most favorable with respect to this factor. Development of a power plant on it would have a limited effect on existing economic uses.

- Land that is presently being cultivated is considered the next most favorable for power plant development with respect to this factor. In this regard, lands that are irrigated and/or are part of a larger integrated operation (such as sugar cane cultivation) are less suitable than isolated farm parcels. This is because the relocation costs and economic impact on ongoing operations are likely to be higher for irrigated/integrated operations.

- Areas already developed for urban uses other than industrial are considered generally unsuitable for power plant development. This is a function both of the cost of relocating the existing uses and the likelihood that power plant operations would prove to be incompatible with adjacent uses.

2.2.2.3 State Land Use District Designation

The existing State Land Use District designation of a potential site affects the ease and cost of obtaining approval for power plant development. The following criteria were used in rating potential power plant sites for this factor:

- **Urban District:** Areas already in the Urban District are considered most suitable for power plant development. This District is intended for uses which involve "city-like" concentrations of people, structures, streets, and land uses. Power plants are clearly urban uses and are most appropriately developed within it. In practice, however, Urban classified land must also be zoned by the County for heavy industrial use, which is needed for power plant development.

- **Agricultural District:** Lands within the Agricultural District (the next most suitable designation for power plant development) are subdivided into two categories depending on the master productivity rating assigned to them by the Land Study Bureau.[2] The first category is comprised of A- and B-rated land; the second consists of soils that are rated C, D, or E. Power plants are not specifically identified as permissible uses in lands rated A or B. Non-agricultural uses are permissible on lower-rated land so long as they are compatible with the principal agricultural uses as defined by the Land Use Law. The Land Use Commission has traditionally been more reluctant to urbanize areas with soils having master productivity ratings of A or B than it has been to urbanize areas having lower-rated soils. Thus, areas within the Agricultural District having soils that are rated C, D, or E are considered more suitable than areas with A- and B-rated soils.

- **Agricultural District:** Public, quasi-public, and public utility facilities are permissible uses in the Rural District. However, the Maui County zoning needed for power plant development (Heavy Industrial) would not normally be allowed in the Rural District. Consequently, it is unlikely that a power plant could be developed on a site that is currently in the Rural District without the property first being redesignated "Urban." It should also be noted that the Rural areas within the study area have low-density residential uses on them, another factor that makes land in the Rural District less suitable for power plant development than land in the Agricultural and Urban Districts.

- **Conservation District:** Uses in the Conservation District are regulated by the State Department of Land and Natural Resources. There are five subzones in the Conservation District, and power generation is an allowable use only in the Geothermal Resource Subzone. Since none of the land within the study area is in the Geothermal Resource Subzone, Conservation District areas were judged least suitable for the proposed project.

2.2.2.4 Community Plan Designation

Maui County's Community Plans establish the character of the development the County desires in each of the island's planning districts. These plans implement the planning objectives stated

[2]The Land Study Bureau productivity rating is discussed in more detail in Section 2.2.4.

in the Maui County General Plan by establishing region-specific goals and objectives and providing maps showing allowable land uses. Suitability with respect to this factor was evaluated as follows:

- **Heavy Industrial:** Areas designated Heavy Industrial on the Community Plan are considered most suitable for power plant development. This designation is reserved for major industrial operations whose effects are potentially noxious due to noise, airborne emissions, or liquid discharges. The kinds of effects (e.g., noise, traffic, appearance, etc.) that might result from heavy industrial development in such areas is considered in the Community Plan process. Hence, there is likely to be relatively little public objection to power plant development in areas already classified as Heavy Industrial.

- **Agricultural:** Locations in the midst of extensive areas designated Agricultural on the Community Plan are considered the second most suitable for power plant development because the proposed facilities are unlikely to adversely affect nearby agricultural activities. Locations on the fringe of the Agricultural District are less suitable if they are adjacent to residential or other incompatible uses.

- **Light Industrial:** Areas designated Light Industrial on the Community Plans are considered the third most suitable for power plant development. While it may be possible to develop a power plant in such areas, it would require amending the Community Plan. Such an amendment would be difficult to obtain, especially if opposed by neighboring property owners.

- **Other Land Use Designations:** Areas with other designations on the Community Plan (e.g., Residential and some public and/or quasi-public uses such as hospitals, recreational areas, etc.) are considered least suitable for power plant development. The primary uses of these areas are generally incompatible with power plant operations.

2.2.2.5 County Zoning

The County of Maui Zoning Ordinance regulates the timing of land development and establishes specific design criteria. The ordinance lists public utilities as a permitted use in most zoning districts, but does not specifically mention power plants as either a permitted or special use in any zoning district. MECO's two existing power plants (Mā'alaea and Kahului) are in the M-2 Heavy Industrial Zoning District, and the Maui County Planning Commission has confirmed that M-2 is the most appropriate designation for power plants. The following criteria are used in evaluating the suitability of areas for power plant development:

- **M-2 Heavy Industrial:** The M-2 Heavy Industrial designation is considered the most appropriate for power plant development.

- **Areas Suitable for M-2 Zoning:** The second most suitable areas with respect to this factor are areas that are not yet zoned for heavy industrial use, but which have characteristics that make them suitable for that use (and, therefore, are likely to receive the necessary zone change from the County Council). These include areas which are adjacent to existing M-2

zones or which are removed from existing and future uses (such as residential) that are incompatible with the kinds of activities that can be anticipated at the power plant site.

- **Areas Unsuitable for M-2 Zoning:** The areas least suitable with respect to this factor are those close to residential and other uses typically sensitive to the noise, traffic, and other factors generally resulting from power plant operations.

2.2.2.6 Special Management Area

Development within the Special Management Area (SMA) is subject to additional regulation designed to protect coastal resources. Since it was considered preferable to avoid the additional regulatory processing and potential effects associated with development within the coastal zone, areas outside the SMA were rated superior to locations within the SMA for the purpose of this study.

2.2.3 TOPOGRAPHY

Topography affects the difficulty (and, therefore, the expense) of developing generating facilities. It also influences the potential for soil erosion. In general, sites which have moderate topographic relief are preferable to areas with steeper terrain or which are too flat to provide good site drainage. The evaluation used the following criteria for this factor:

- **2-4% Slopes:** Sites with average slopes of between 2% and 4% are considered most favorable for power plant development. Slopes in this range provide positive drainage without requiring special engineering measures or requiring excessive cut volumes or cost.

- **0-2% and 4-8% Slopes:** Sites with average slopes of less than 2 or between 4% and 8% and which do not include substantial amounts of steeper terrain are considered second most suitable. Both require some special engineering (either to insure adequate drainage or to provide suitable building space), but the additional cost of the special provisions is moderate. Significant erosion hazards and other adverse environmental effects can usually be avoided using standard construction techniques.

- **8-16% Slopes:** Sites with average slopes of 8 to 16 percent and sites with lower average slopes which have substantial amounts of steeper terrain, are considered third most suitable for the proposed project. The limitations of the relatively steep terrain can be overcome with appropriate engineering measures, but development costs are higher and the potential for adverse environmental effects (e.g., erosion during construction, unsightly cut slopes, etc.) is greater than for sites with lesser slopes.

- **Greater Than 16% Slopes:** Areas with average slopes in excess of 16 percent are generally considered unsuitable for power plant development because of the additional costs required to provide stable foundations and avoid excessive erosion. Consequently, they were given the lowest suitability rating with respect to this factor.

2.2.4 SOILS

Two soil characteristics were considered in this study. The first is potential agricultural productivity (specifically its "master productivity rating") as determined by the University of Hawaii Land Study Bureau (1967). The second characteristic is the engineering suitability as determined by the U.S. Soil Conservation Service. The soil engineering properties were evaluated only for the six specific sites identified as having the greatest potential for power plant development (see Chapter 4).

The University of Hawaii Land Study Bureau (1967) classified soils from "A" (highest productivity) to "E" (lowest productivity). This rating system indicates the relative importance of preserving soils for agricultural use; it is significant because the system is directly linked to the State Land Use District controls discussed in Section 2.2.2.3. Two soil-related criteria were used for this analysis:

- Soils rated "C", "D", "E" and areas already in urban use (i.e., areas designated "U" on the land classification maps) are considered preferable to "A-" or "B-" rated soils because using them will have less effect on potential agricultural output than using soils rated "A" or "B."

- Soils rated "A" or "B" are considered less suitable for power plant development than lower-rated soils because their use will have a greater effect on the potential agricultural productivity of Maui County.

2.2.5 GROUNDWATER

Two groundwater-related factors were considered in the evaluation of sites for power plant development. The first is the availability of on-site water suitable (with respect to both quantity and quality) for use in the facility. The second criteria is the ability to dispose of wastewater using injection wells. The third criteria is the extent to which the withdrawal of water from an aquifer at a particular site is likely to interfere with other water sources. To understand the implications of these factors it is necessary to understand the general nature of the facilities' water supply and wastewater disposal requirements.

Supply Requirements. Each of the four DTCC systems will require a feedwater supply of 114 GPM. This assumes the water is supplied by onsite brackish wells, has salinity similar to that at Mā'alaea, is demineralized by reverse osmosis, and that 10 GPM of feedwater is required to produce potable-quality water for miscellaneous washdown uses, showers, sinks, and toilets.[3])

[3]The combined-cycle units that are planned for the new site are expected to have water requirements and disposal needs (see Section 2.2.5.2) similar to the combined cycle system recently installed at the Mā'alaea power plant (i.e., Units 14, 15, and 16). The exception is that all of the water at the new site might have to come from on-site sources, whereas drinking water at the Mā'alaea Power Plant is obtained from the Maui County Department of Water Supply (DWS) system. Depending upon the site that is selected and the needs of HC&S, it may be possible to utilize water from the plantation's system for a portion of the power plant's needs. However, for the purpose of this study it was assumed that all water would need to be obtained from independent sources. This estimate is based on feedwater of the same salinity as that used at Mā'alaea. The salinity of the feedwater at most sites within the study area is likely to be somewhat lower than this, slightly reducing the feedwater requirement. The higher figure has been used for this study, however, to insure that adequate provisions are made for water supply.

Full build-out of the facility (i.e., 4 times 58 MW, or 232 MW) would require four times this amount.

Disposal Requirements. Combined cycle power plants of the type envisioned generate several wastewater streams. These include "brine" from the reverse osmosis water treatment process; wastewater from equipment drains, the heat recovery steam generator and inside service water (i.e., water which would enter the disposal system); and sanitary waste from showers, sinks, and toilets. It is estimated that the volume of wastewater requiring disposal will average just under 60 GPM per DTCC system (240 GPM for the four units that are proposed). Three possible disposal methods are:

- surface disposal using a natural drainageway;
- subsurface disposal in a leaching field; and
- deep disposal in a drilled injection well.

If surface disposal is pursued, the small amount of sanitary wastewater generated would have to be disposed of separately in a leaching field. There are natural drainageways and HC&S irrigation ditches in the study area that might be suitable for disposal of some waste streams. However, this could require additional NPDES permitting and raise potentially controversial environmental issues; consequently, it was not considered a viable option for this screening evaluation.

The second option, a shallow leaching field, would require an extensive area and would not offer an easy opportunity for remedial maintenance when and if it is needed. In comparison, disposal in deep wells would provide far greater capacity and easy methods of remediation (e.g., back-flushing, acid treatment, etc.). One well could easily handle the entire disposal requirement, but construction of a second, backup well would be prudent and also likely to be required by regulatory authorities.

2.2.5.1 Groundwater Availability

Evaluation Criteria. Potential power plant locations were ranked according to the following criteria (note that the criteria are arranged in subgroups dealing with slightly different aspects of the issue):

Availability On Site:

- Areas which have a high likelihood of providing all of the water needed for the proposed facilities using on-site wells pumping from depths of less than 300 feet are considered most suitable for power plant development.
- Areas which have a high likelihood of providing all of the water needed for the proposed facilities using on-site wells pumping from depths of between 300 to 500 feet are considered next most suitable for power plant development.

- Areas which have a high likelihood of providing all of the water needed for the proposed facilities but which would require pumping water from depths of more than 500 feet are considered less suitable for the proposed facilities.

- Areas where on-site wells are unlikely to provide all of the water needed for the proposed facilities are considered unsuitable.

Interference with Other Sources:

- Areas where the required pumping is unlikely to interfere significantly with pumping from existing wells are considered preferable to locations where some well interaction might occur.

Groundwater Quality:

- Locations where wells are likely to provide water of lower salinity are considered generally superior to locations where the groundwater has a higher salinity (because treatment would be less costly). However, areas with potable quality groundwater are considered less desirable than areas where the chlorides exceed drinking water standard of 250 milligrams per liter (mg/l); this is because permitting industrial supply wells in areas that are potential sources of drinking water has the potential to be more problematic.

2.2.5.2 Wastewater Disposal

Evaluation Criteria. Potential locations were rated for this sub-factor using the following criteria:

- Locations where subsurface conditions allow ready injection of wastewater, which are removed from existing water supply wells, and which are below the State Department of Health's Undergound Injection Control (UIC) line are considered most suitable for the proposed project.[4]

- Locations where one of the following conditions is true are considered less favorable for the proposed project:

  — subsurface conditions make reinjection of wastewater more difficult,
  — are closer to existing water supply wells, or
  — are above the State Department of Health's UIC line.

- Locations where more than one of the limitations listed above are true are the least favorable with respect to this sub-factor.

[4]Note that administration of the UIC program is in flux. The move to joint review by the State Department of Health and the U.S. Environmental Protection Agency could make it more difficult to obtain approval of the kinds of injection wells that are discussed here.

2.2.6 DRAINAGE/FLOOD ZONES

Areas that are subject to repeated flooding (whether from surface runoff, storm waves, or tsunami) are considered unsuited for power plants. At the very least, such locations require engineering protection that increases overall costs and/or subjects the facilities to potential hazards. Similarly, areas with inadequate drainage are less well suited for power plants. Potential power plant sites were ranked for this factor using the following criteria:

- Areas that are situated outside any of the flood zones identified on the Flood Insurance Rate Maps are considered most suitable for power plant development.

- Areas whose flood hazards have not been precisely defined on the Flood Insurance Rate Maps but which have topography indicating they are likely to be outside of drainageways are rated just below those in the first category.

- Areas whose flood hazards have not been precisely defined on the Flood Insurance Rate Maps but which have topography indicating they might be affected by flooding from known drainageways are rated the next most suitable for power plant development.

- Areas within wetlands or in flood zones identified on the Flood Insurance Rate Maps are considered unsuited for power plant development.

2.2.7 NOISE

Power plants of the type that are envisioned have the potential to produce noise levels that are incompatible with some noise-sensitive uses (e.g., residences, hospitals, schools, etc.). The noise-related criteria used for this study are as follows:

- Areas that are at least three miles from the nearest noise-sensitive use and would not require fuel trucks to pass through residential neighborhoods are highest-rated with respect to this factor.

- Areas that are at least 1.5 miles from the nearest noise-sensitive use and would not require fuel trucks to pass through residential neighborhoods are considered the next most favorable.

- Areas that are less than 1.5 miles from the nearest noise-sensitive use and/or that would require fuel trucks to pass through residential neighborhoods are considered the least favorable with respect to this factor. Noise impacts from facilities located in such areas can be mitigated, but the effort is likely to increase overall construction and/or operating costs.

2.2.8 FLORA AND FAUNA

Power plant development typically results in a complete change in the biota present on the project site. The following criteria were used for in this analysis:

- Areas which are currently intensively cultivated are considered most suitable because they are the most disturbed and are the least likely to contain critical habitat or species.

- Areas which are not presently cultivated but which have been previously disturbed are considered next most suitable because they typically contain common exotic species and do not have critical habitat or species.

- Areas which contain undisturbed natural vegetation are considered the least suitable for power plant development since the probability that they contain critical habitat or species is greatest. Areas which are known to be suitable habitat for threatened or endangered species are considered unsuitable.

2.2.9 AESTHETIC (VISUAL) CONSIDERATIONS

When fully developed, the proposed facilities will constitute a relatively large industrial complex. The structures housing the generating machinery, support equipment, and offices will be between 15 and 70 feet high and will cover more than 50 to 60 percent of the 50 acre site. The height and diameter of the stacks that will be needed is not known for certain at the present time, but could reach over 200 feet and 25 feet, respectively. When these features are considered together with the electrical transmission lines, fuel storage tanks, and on-site roadways and storage areas, the overall effect will be decidedly industrial. In open terrain, the complex will be visible from a considerable distance.

Because site suitability from a visual standpoint involves the interaction of many factors, it was not possible to identify a list of discrete, semi-quantitative criteria such as those used in evaluating other suitability factors. Instead, locations were assessed qualitatively.

Other things being equal, areas that are least visible from residential areas, from scenic points, and from major roadways are the most suitable for power plant development. In practice, this involves consideration of a number of factors, including distance from important viewpoints, presence or absence of intervening terrain features (i.e., whether or not a site is partially or completely hidden by hills, trees, or other structures), and the ease with which screening (e.g., landscaping, earthen berms, special paint schemes, etc.) can be provided to soften the visual impact. It also involves a consideration of the extent to which generation facilities might be highlighted against the skyline when seen from important viewpoints (less is better). Finally, the analysis also considers the visual implications of the additional electrical power transmission lines that would be needed at each location (fewer new lines is considered better).

2.2.10 TECHNICAL/ENGINEERING FACTORS

While engineers are able to design generation facilities for practically any situation, certain combinations of factors simplify the design effort and reduce construction and/or operating costs. Many of these factors overlap, or are directly related to, factors already discussed (e.g., reasonable topography, the presence of suitable groundwater, etc.). This section addresses three factors that are particularly important from an engineering and/or technical viewpoint but which

are not specifically discussed elsewhere. These are subsurface conditions (which affect site preparation costs), the improvements needed to integrate the new facility into the power transmission grid, and fuel delivery costs.

2.2.10.1 Subsurface Conditions

Subsurface conditions dictate the type of foundation needed. They also determine the ease of excavating and grading the site. In extreme cases, the costs of correcting for poor foundation conditions can make a project infeasible on a particular site. For the purpose of this analysis, subsurface conditions were rated as follows:

- Areas where the foundations and site preparation work necessitated by subsurface conditions would increase total project construction costs by less than 1 percent over the costs that would be incurred under ideal conditions were considered most favorable.

- Areas where the foundations and site preparation work required because of less-than-optimal subsurface conditions would increase total project costs by more than 1 percent over the costs that would be incurred under ideal conditions were considered less favorable.

2.2.10.2 Transmission System Improvement Costs

The transmission criterion is based primarily on the costs of connecting a proposed generation site to MECO's power grid. In general, this was quantified by determining the distance to an existing transmission line or substation and evaluating the difficulty of modifying existing facilities to accommodate the additional power provided by the proposed generating units. Sites were rated for this factor using the following criteria.

- Locations that are adjacent to existing transmission lines having sufficient excess capacity to accommodate the proposed new facilities were rated highest.

- Locations that are not adjacent to, but are within 1 mile of, existing transmission lines and where necessary additions could be constructed along existing transmission corridors were rated next highest.

- Locations which would require construction of between 1 and 5 miles of new transmission line through non-urban areas were rated next highest.

- Locations which would require construction of more than 5 miles of transmission line through non-urban areas or which would require construction of transmission lines through urban areas were judged least suitable.

2.2.10.3 Fuel Delivery

At least initially, fuel delivery will be via tanker trucks from Kahului Harbor to the site. No pipelines presently exist and, because of their high initial cost and the limited amount of fuel that would be needed for the first phases of the project, none are likely to be constructed for many years. Thus, the most important siting issues from this perspective are proximity to the harbor and the presence of suitable roadways. The following specific criteria were used for the evaluation:

- Locations close to the harbor that are served by existing highways having sufficient load bearing capacity to accommodate fully-loaded fuel trucks and low existing traffic volumes are the best with respect to this factor. (Desirability decreases with increasing distance and/or increasing traffic.)

- Sites that can be accessed entirely on public roads and highways, but which will require structural improvement in order to accommodate fuel trucks moving to and from the site, are considered next most suitable.

- Locations that will require right-of-way acquisition and substantial new road construction are considered least desirable with respect to this criteria, with the locations needing greater construction considered less desirable than those requiring only limited amounts of right-of-way acquisition or road construction.

2.3 DELINEATION AND EVALUATION OF SPECIFIC SITES

2.3.1 INITIAL SCREENING

When the selection criteria were applied, several facts became apparent that were not evident at the outset of the study. First, fairly broad zones, rather than just a few discrete sites, were judged to be relatively well-suited for development of the kinds of the proposed power generating facilities. Their locations are discussed in Section 4.1.1.

2.3.2 IDENTIFICATION OF SPECIFIC SITES

To facilitate analysis of factors that could best be evaluated on a site-specific basis, a finite number of locations within these broader zones were selected. In delineating these specific sites, an effort was made to include alternatives which differed substantially from one another with respect to factors judged most likely to be important (e.g., distance from residential areas, visibility from public viewpoints, and location on soils classified as "A" or "B" by the University of Hawaii Land Study Bureau). Initially, we considered only the air quality categories Trinity Consultants assigned to the sites (e.g., "Moderate Difficulty", "Higher Difficulty") rather than their specific air quality scores.

After analyzing the regional data that were collected in the first round of the study, five sites (designated A-1 through A-5) were identified that appeared to have the highest likelihood of meeting the greatest number of screening criteria. Upon further analysis, limitations were

identified which made it unlikely that two of these (A-4 and A-5) would prove to be superior to other sites being considered; these were eliminated from further consideration (see Section 4.1.3).

Three other potential locations were also included in the site-specific analysis, despite their not scoring in the top tier in the initial phase of the screening analysis. One of these (Site D-1) was selected because it represented the best location within the "Moderate Difficulty" zone defined by Trinity Consultants' April 1993 air quality analysis. The second (Site B-1) was included in the final phase of the analysis because it was well hidden from important public viewpoints. Finally, the area (Site C-3) at the far southwestern edge of the study area that MECO had investigated earlier (see Section 1.1.2) was also included, principally as a means of determining how it compared with other sites that the air quality study had determined to be superior. Thus, a total of six sites were ranked.

2.4 SITE RANKING

Once the specific sites had been identified, numerical scores were developed for each location using the criteria described above. In developing the scores, each of the factors was weighted to reflect its relative importance to the overall site selection process. In addition to the primary weighting scheme (which was based on the best judgements of the authors of this report), alternative weighting schemes were also tested to determine the likelihood that differences would alter the rankings. The ranking process is described in detail in Section 4.2.

Chapter 3
Study Area Characteristics

CHAPTER 3.0 STUDY AREA CHARACTERISTICS

3.1 INTRODUCTION

This section identifies the data sources that were used to characterize the study area with respect to each of the suitability factors discussed in Chapter 2. It also summarizes the regional patterns for each factor. The data were entered into a computerized system that facilitated analyses. Copies of the individual drawings are included in Appendix A.

3.2 LAND OWNERSHIP, USE, AND CONTROLS

3.2.1 LAND OWNERSHIP

3.2.1.1 Data Sources and Limitations

For the initial phase of the study, information on land ownership was obtained from the *Atlas of Hawaii, 2nd Edition, 1983*. Once specific sites had been identified, information for them was verified using current tax maps.

3.2.1.2 Regional Patterns

With the exception of small parcels occupied by existing substations, MECO does not presently own or lease any land within the study area. Most of the land in the study area consists of large parcels owned by A&B-Hawaii, but a few large parcels are owned and/or leased by Maui County, the State of Hawaii, and others. Virtually none of the land in the study area is broken up into small parcels, the exception being the Waiakoa Subdivision at its southwestern corner.

3.2.2 EXISTING USE

3.2.2.1 Data Sources and Limitations

A composite aerial photograph of the study area provided current land use information for the study area. The composite photograph was prepared from false-infrared images taken by Air Survey Hawaii on May 29 and 30, 1990, October 27, 1990, and January 12, 1991. The photos used were contact prints at a scale of approximately 1-inch equals 1,000 feet. Additional land use information was collected during a May 1993 ground reconnaissance survey of the six specific sites discussed in Chapter 4. Information from the ground survey was used to confirm and supplement the photographic information.

The aerial photographs that were used are of excellent quality, and their scale is sufficiently large to permit accurate identification of existing land use and other relevant information, such as irrigation facilities, recent construction, and cane haul roads. Although the oldest of the photographs are more than two years old, due to the relatively slow pace of land development and the continuation of ongoing agricultural operations, the aerial photographs provide reasonably current information.

3.2.2.2 Regional Patterns

None of the vacant land in the study area is designated for heavy industrial use, the category considered most favorable for power plant development. A few pockets of unused land are scattered through the northern part of the study area, but they are too small and/or otherwise unsuited for power plant development. The southern half of the area contains substantially more vacant land and is, therefore, more suitable with respect to this factor. Most of the land in the study area is currently used for agriculture, primarily sugarcane cultivation; power plant development would displace this activity.

3.2.3 STATE LAND USE DISTRICT DESIGNATION

3.2.3.1 Data Sources and Limitations

The existing State Land Use District classifications of land within the study area were obtained from copies of the official maps prepared by the State Land Use Commission. The names of the four quadrangle maps that were used and the dates of the most recent changes to them are as follows: M-5/Wailuku, May 17, 1990; M-6/Mā'alaea, March 2, 1989; M-7/Paia, May 17, 1990; and M-8/Pu'u O Kali, February 28, 1989). The absence of State Land Use District boundary changes that would affect the suitability ratings developed for the purpose of this study were confirmed in early June 1993. There are no significant limitations on the usefulness of this information for the purposes of this study.

3.2.3.2 Regional Patterns

The great majority of the land in the study area is in the State Agricultural District. Only a small part is in the State Urban District, the classification considered most favorable for power plant development. The Urban-classified land that is present is concentrated in residential areas such as Hali'imaile, lower Pukalani, and Waiakoa, all of which are situated on the fringes of the study area. Because these Urban-designated areas are already in residential use, they are unsuited for the proposed facilities. Only a small amount of the study area (e.g., portions of Pukalani) is designated "Rural"; none is designated "Conservation".

3.2.4 COMMUNITY PLAN DESIGNATION

3.2.4.1 Data Sources and Limitations

Information on the existing Community Plan designation for land within the study area was obtained from Community Plan land use maps prepared by the Maui County Planning Department and text contained in the Maui Community Plan for Makawao, Pukalani, and Kula. The Maui County Planning Department was contacted by telephone to confirm that no amendments to the Community Plan had been made since these maps were prepared that would significantly alter the conclusions of this report. Although Maui County is currently updating its Community Plans, the Maui County Planning Department staff indicated that the changes they anticipated are on adjacent to existing development on the fringes of the study area. Because the changes are still speculative and are unlikely to affect the conclusions of this screening, they were not taken into account during this study.

3.2.4.2 Regional Patterns

The Community Plan land use map designations generally follow the same pattern as the State Land Use District designations. No vacant land designated for Heavy Industrial use on the Community Plans (the category judged most suitable for power plant development) is present within the study area. Most of the study area consists of land that is planned for agricultural use, the category deemed second-most suitable for power plant development. Areas with residential and public of quasi-public designations on the community plans are situated at the fringes of the study area.

3.2.5 ZONING DESIGNATION

3.2.5.1 Data Sources and Limitations

Information on this factor was obtained from zoning maps provided by the Maui County Planning Department. These maps were current as of May 1993. It should be noted that County Zoning maps exist for only small portions of the study area (principally within existing urban centers at Hali'imaile, lower Pukalani, and Waiakoa). The zoning of the remainder is established by the State Land Use District designation. The information is current, and there are no significant limitations with respect to its use in the present study.

3.2.5.2 Regional Patterns

The County Zoning shows the same pattern as the Community Plans. There is no vacant land with the zoning most favorable for power plant development (M-2, Heavy Industry) within the study area. However, a large amount of land with the second most favorable zoning designation (Agriculture) is present. Land with the least suitable zoning is limited to Hali'imaile, lower Pukalani, and Waiakoa, all of which are on the fringes of the study area.

3.2.6 SPECIAL MANAGEMENT AREA

3.2.6.1 Data Sources and Limitations

The location of the Special Management Area was obtained from maps provided by the Maui County Planning Department. The information is current as of May 1993.

3.2.6.2 Regional Patterns

None of the study area is within the Special Management Area.

3.3 NATURAL FACTORS

3.3.1 AIR QUALITY

3.3.1.1 Data Sources and Limitations

Trinity Consultants, Inc.'s (April 1993) analysis of Central Maui locations most suitable for power plant development from the perspective of air quality provided the information for this extremely important factor. The report defines areas of lesser and greater air quality permitting difficulty and estimates concentrations of key pollutants for each critical averaging period at approximately 200 possible power plant sites within the study area.

The report cites several limitations to the analysis, including: (*i*) lack of site-specific meteorological data, (*ii*) use of a receptor grid[1] having relatively wide (1 kilometer) spacing, (*iii*) uncertainty regarding other emissions sources in the airshed at the time the air permits for the future generating units are sought, (*iv*) uncertainty as to the exact stack parameters (e.g., height and diameter, exhaust temperature and velocity, etc.) associated with the proposed power plant, and (*v*) uncertainty regarding the specific air quality regulations and regulatory guidelines for air quality modeling that will be applicable at the time permits for the latter generating units are sought. Because of this, the report cautions that further modeling should be undertaken once additional, site-specific meteorological data has been collected and the design of the proposed facilities has been refined. The report notes that areas considered to be most difficult to permit from an air quality standpoint should not be eliminated if there are other compelling reasons to consider them.

The zones of difficulty identified in the air quality study were considered generally adequate for the purpose of this screening study. However, because of the uncertainties associated with Trinity Consultants' estimates, it was judged prudent to include the location which the study found most favorable from an air quality standpoint in the final group of sites (see Section 4.1.3).

[1] A "receptor grid" defines the locations ("receptors") for which a computerized air quality model estimates air quality.

3.3.1.2 Regional Patterns

According to Trinity Consultants' April 1993 analysis, the zone that is considered most favorable from an air quality permitting standpoint forms an elongated shape through the center of the region ("Moderate Difficulty" on Figure 1-2). The second most-favorable zone (which they term "Higher Difficulty") consists of a band around the Moderate Difficulty Zone. The least favorable zone ("Highest Difficulty" on the figure) consists of a band along the southeastern (up-slope) side of the region and the entire western side of Maui's central valley.

3.3.2 TOPOGRAPHY

3.3.2.1 Data Sources and Limitations

Information on the topography of the study area was obtained from the U.S. Geological Survey (USGS). Printed versions of the Wailuku, Mā'alaea, Paia, and Pu'u O Kali 7.5-minute quadrangle maps were used. In addition, digital topographic data based on the USGS quadrangle sheet contour data and TIGER (Topologically Integrated Geographic Encoding and Referencing System) data was acquired for portions of Central Maui. The TIGER data (which includes roads, hydrography, place names, and political and/or municipal boundaries) is current as of the late 1980s.

The topographic data consisted of 40-foot contour intervals in most areas; these are adequate for the purposes of the present study. Field inspection suggests that there have been no significant topographic changes in the study area since the maps were prepared that would impact this screening. However, more detailed topographic information may be needed for site-specific engineering. This will be particularly true if the facility is sited in the immediate vicinity of the two quarries or the Maui County landfill because of the changes which quarrying and landfilling continue to have on topography.

3.3.2.2 Regional Patterns

The great majority of the study area has slopes of less than 8 percent, with much of the area having slopes of between 2 and 4 percent, the range considered most favorable for power plant development. Nearly all of the remaining area has a slope of between 8 and 16 percent, the range that is considered to impose significant limitations and/or additional costs on power plant development. Only small areas, most of them in gullies cut by drainageways, have slopes in excess of 16 percent that make them unsuitable for a power plant.

3.3.3 SOILS

3.3.3.1 Data Sources and Limitations

Data on the location, physical characteristics, and agricultural suitability of the soils were obtained from the University of Hawaii Land Study Bureau's *Detailed Land Classification - Island of Maui*

(May 1967) and from the U.S. Soil Conservation Service's Soil Survey. This information is adequate for the purpose of this study. However, additional site-specific information concerning subsurface conditions will be needed for foundation design. The more detailed information might reveal differences in conditions that affect the relative cost of construction at different each site.

3.3.3.2 Regional Patterns

Most of the soils in the northern part of the study area have an "A" or "B" rating from the Land Study Bureau; the soils in that area are generally much better suited to agricultural production than are the soils in the southern part of the study area. Only a few limited areas in the northern zone have soils suitable for power plant development that are not also "A"- or "B"-rated, while extensive areas in the southern part of the study area have "C," "D," and "E" rated soils.

3.3.4 GROUNDWATER

3.3.4.1 Data Sources and Limitations

Information on groundwater availability and quality, as well as the practicality of disposing of wastewater through injection wells was obtained from several sources:

- *Aquifer Classification Map*, Water Resources Research Center, University of Hawaii (Revised 1990);
- Letter Report from Tom Nance Water Resource Engineering (January 19, 1993), *Permitting Issues for Water Supply and Wastewater Disposal for Maui Electric Company's Proposed Combustion Turbine Power Plant at the Lower Puunene Airport Site in Kihei, Maui*; (see Appendix E)
- Letter Report from Tom Nance Water Resource Engineering (May 21, 1993), *Alternative MECO Power Plant Sites in Central Maui*; (see Appendix E) and
- Black & Veatch (December 31, 1991), *Maui Electric Company, Limited, Generating Facility Siting Study: Preferred and Alternate Site/Technology Report.*

The information is current and is adequate for the present analysis. However, the level of detail is limited because the study had to be conducted using readily available data. Additional information on quality and well characteristics will be needed to complete the design and obtain required governmental permits and land use approvals. Moreover, the possibility of reaching an agreement with HC&S allowing part or all of the facility's water requirements or disposal needs to be met using the plantation's system is yet to be explored with HC&S.

3.3.4.2 Regional Patterns

Sufficient groundwater is available from the island's basal lens to meet the estimated needs of the proposed facilities is available throughout the study area. Water beneath the western half of the study area south of Haleakala Highway can generally be found at depths of less than 500 feet. Supply wells could be installed at most locations without interfering significantly with pumping from existing wells. Wells in the eastern half of the study area will probably provide water with lower salinity than wells in the western half, leading to lower treatment costs. However, the differences do not appear to be significant from either a technical or cost standpoint.

Most locations within the study area appear to have the subsurface conditions and distance from potable water wells needed to make wastewater disposal through injection wells a technically feasible alternative. The existing UIC (above which disposal of wastewater from a power plant may be more difficult to permit) runs generally northeast to southwest in the study area. Consequently, it will be easier to obtain permits for disposal wells in the western third of the study area (i.e., below the UIC line) than it will be to permit wells further east.

3.3.5 DRAINAGE/FLOOD ZONES

3.3.5.1 Data Sources and Limitations

Drainage patterns were determined using topographic and other hydrologic information contained on the USGS maps of the study area. This was supplemented, for selected areas, with information from aerial photographs and a field reconnaissance. The Flood Insurance Rate Maps were reviewed for information on flood zones. Although drainage features below the level of detail evaluated in this screening analysis could affect the development costs of specific sites, they are not likely to significantly alter the desirability of an area for power plant development.

3.3.5.2 Regional Patterns

The Flood Insurance Rate Maps showed that essentially all of the study area is in Zone C, "Areas of minimal flooding." Drainageways throughout the study area appear as relatively narrow gullies marked by sharp topographic relief. Although extensive overland flow is likely to occur during periods of intense rainfall, it is impossible to make meaningful distinctions between different portions of the study area with respect to this factor. Runoff is present in drainageways during storm events, but it appears that significant inundation is limited to topographic low points and gullies that appear on the topographic maps.

3.3.6 NOISE

3.3.6.1 Data Sources and Limitations

Estimates of the noise that will be generated by the proposed facilities and by the vehicles carrying fuel to and from them were obtained from *Maui Electric Company 1995 Unit Addition Project:*

Alternate Pu'unene Airport Site/Environmental Screening Report (Belt Collins & Associates, December 23, 1992). Relative estimates of the significance of these noise emissions were based on the land use data discussed elsewhere in this report. In conducting the analysis, fuel delivery was assumed to be via the most direct route along public highways.

Estimates of plant and truck noise emissions were based on standard industry data. These data are accurate enough for this screening-level analysis. However, it must be noted that noise emissions may vary significantly between different manufacturers of the same type of equipment (i.e., a cooling fan from one manufacturer may have a noise profile that is significantly different from that of a fan produced by another manufacturer). Consequently, further analysis will be needed once a specific site/equipment combination has been selected.

3.3.6.2 Regional Patterns

The majority of the study area, and virtually all of the area within the most favorable air quality zone, is in the zone that is considered most favorable for power plants from a noise standpoint. Some fringe areas, e.g., those near Hali'imaile, lower Pukalani, and Waiakoa, are less favorable from a noise standpoint. Locations at the extreme southern and extreme northeastern ends of the study area are considered least favorable with respect to noise.

3.3.7 FLORA AND FAUNA

3.3.7.1 Data Sources and Limitations

The previously cited false-infrared aerial photographs taken by Air Survey Hawaii were used to determine the distribution of major plant communities throughout the study area using the categorization system described in Section 2. Faunal assemblages were assumed to correlate with the vegetation. The information was necessarily at a very general level. It was assumed that additional information will be needed if areas containing undisturbed vegetation communities are selected for further study. Such vegetation and faunal surveys would be designed to confirm the conclusions drawn from the aerial photograph and to insure that no threatened or endangered species are present on or dependent upon the site.

3.3.7.2 Regional Patterns

Sugarcane is cultivated on most of the land north of Waiakoa Gulch, which runs longitudinally across the study area near the southern end of the "Moderate Difficulty" air quality zone. Exceptions include the old Pu'unene Airport site (which is mostly scrub vegetation), drainageways, and areas used for quarries, landfills, and other human purposes.

3.3.8 AESTHETIC CHARACTER

3.3.8.1 Data Sources and Limitations

Aerial photographs, USGS maps, and site visits were used to identify significant viewpoints (i.e., locations from which substantial numbers of people might be able to see potential sites). Observations made during field inspection, together with terrain modeling using the digital terrain model (DTM) data, were used in making judgements about the visibility of power generation facilities at the selected sites.

Some of the evaluation involved a computer-aided analyses of sites which passed the initial screening (see Appendix C). The DTM data used for these analyses was in the form of 40-foot contour intervals transformed into 400 foot grid points. Because of the relative coarseness of this grid, small variations in terrain, which could affect the exact siting and layout of power generation facilities, may have been overlooked. The transformation of the data (which was necessitated by limitations in the computer system) did not substantially affect the conclusions of the analysis.

3.3.8.2 Regional Patterns

The gently sloping terrain, the absence of significant topographic barriers that limit the extent of views, the high volume of traffic on Haleakala Highway, and the presence of view-sensitive residential and recreational areas in Hali'imaile and lower Pukalani would make a power plant in the far northern part of the study area highly visible. The southern portion of the study area (approximately from Waiakoa Gulch southward) is not as visible from heavily travelled roadways, but it is closer to residential areas (approximately 2 miles at the present time, and likely to become less as Kihei expands inland). The central portion of the study area (from Pulehu or Spanish Roads south to Keahuaiwi Gulch) is farthest and least visible from heavily travelled roads, residential areas, and scenic/recreational points.

3.3.9 TECHNICAL/ENGINEERING FACTORS

3.3.9.1 Data Sources and Limitations

Technical and engineering issues relating to power plant development include the ease with which generation facilities can be developed on a particular site, the additional transmission facilities that would be required to service a large generating complex, and the ease with which fuel could be delivered to a particular site. Because of the difficulty of evaluating these factors on a regional (i.e., non-site-specific) basis, this portion of the analysis focused on the sites that initial screening indicated were most promising. The analysis was performed by Stone & Webster Engineering Corporation and by MECO personnel.

The data available for these factors were obtained through brief field visits and general familiarity with the study area. Detailed, site-specific analyses of each of the sites have not been conducted. However, the information that is available is considered sufficient to reach general conclusions about the feasibility of the various sites. Variations between sites will affect the ultimate

development costs and will be taken into consideration before selecting the site for power plant construction.

3.3.9.2 Regional Patterns

Subsurface conditions, slopes, and other physical factors affecting site development costs vary moderately through the study area. All factors can be dealt with through appropriate foundation design and infrastructure development, and the costs of undertaking these mitigating measures are modest in the context of the overall facility development costs. Sites near Pulehu Road are close to several existing and planned transmission lines; however, because of the relatively undeveloped nature of the study area, adequate transmission facilities could be installed to almost any area. Fuel delivery is expected to be via barge to Kahului Harbor, with truck transport beyond that point; consequently, sites in the northern part of the study area are slightly favored over those sites further to the south. Because of its public ownership, modest existing traffic volumes, and location away from noise-sensitive uses, Pulehu Road appears to offer the best access route for fuel trucks.

Chapter 4

Identification and Ranking of Specific Sites

CHAPTER 4.0 IDENTIFICATION AND RANKING OF SPECIFIC SITES

4.1 OVERALL APPROACH

This chapter describes the steps that were taken to identify and rank potential power plant sites. It begins with a discussion of the initial screening that delineated the most promising siting zones within the study area. This is followed by a description of the potential sites that were identified within this zone. These sites are then evaluated using the suitability criteria and data presented in Chapters 2 and 3. The chapter concludes with a brief site-by-site discussion of the ratings; the latter includes a brief sensitivity analysis aimed at determining if errors in the rating or weighting of the various factors that were used are likely to have significantly affected the ratings.

4.1.1 INITIAL SCREENING

Figure 4-1 delineates the zones that our initial screening, using the criteria from Chapter 2 and the data described in Chapter 3, indicates are most suitable for the proposed facilities. The factors that were most influential in delineating the zones shown on that figure were favorable air quality rating by Trinity Consultants' (i.e., Moderate Difficulty or Higher Difficulty), State Land Use District designation of "Agriculture", and location below (i.e., down-gradient of) the State Department of Health's Underground Injection Control (UIC) line (see Figure 4-1). Ownership and distance from existing and proposed residential areas also played a role in delineating the zone boundaries in the southern part of the study area. Site-specific technical and engineering factors were not considered in the initial screening. Every effort was made to be explicit and objective throughout the initial screening process, but the level of information available meant that the analysis was inherently qualitative.

4.1.2 IDENTIFICATION OF SPECIFIC SITES

To facilitate analysis of factors that could only be evaluated on a site-specific basis, a number of discrete 50-acre areas within the favorable zones were identified as "potential sites". Figure 4-2 shows the locations of these sites; it also shows several other sites identified in previous studies. In delineating these 50-acre sites, an effort was made to include areas which differed substantially from one another with respect to one or more factors important in the site selection process (e.g., distance from residential areas, visibility from public viewpoints, location on soils classified as "A" or "B" by the University of Hawaii Land Study Bureau). Equivalent sites within the favorable zones may be present, and this should be considered in the final selection process. Readers should also note that it is anticipated that the exact site boundaries may be adjusted during the design process in order to optimize them for localized conditions that could not be accounted for while working at this regional scale.

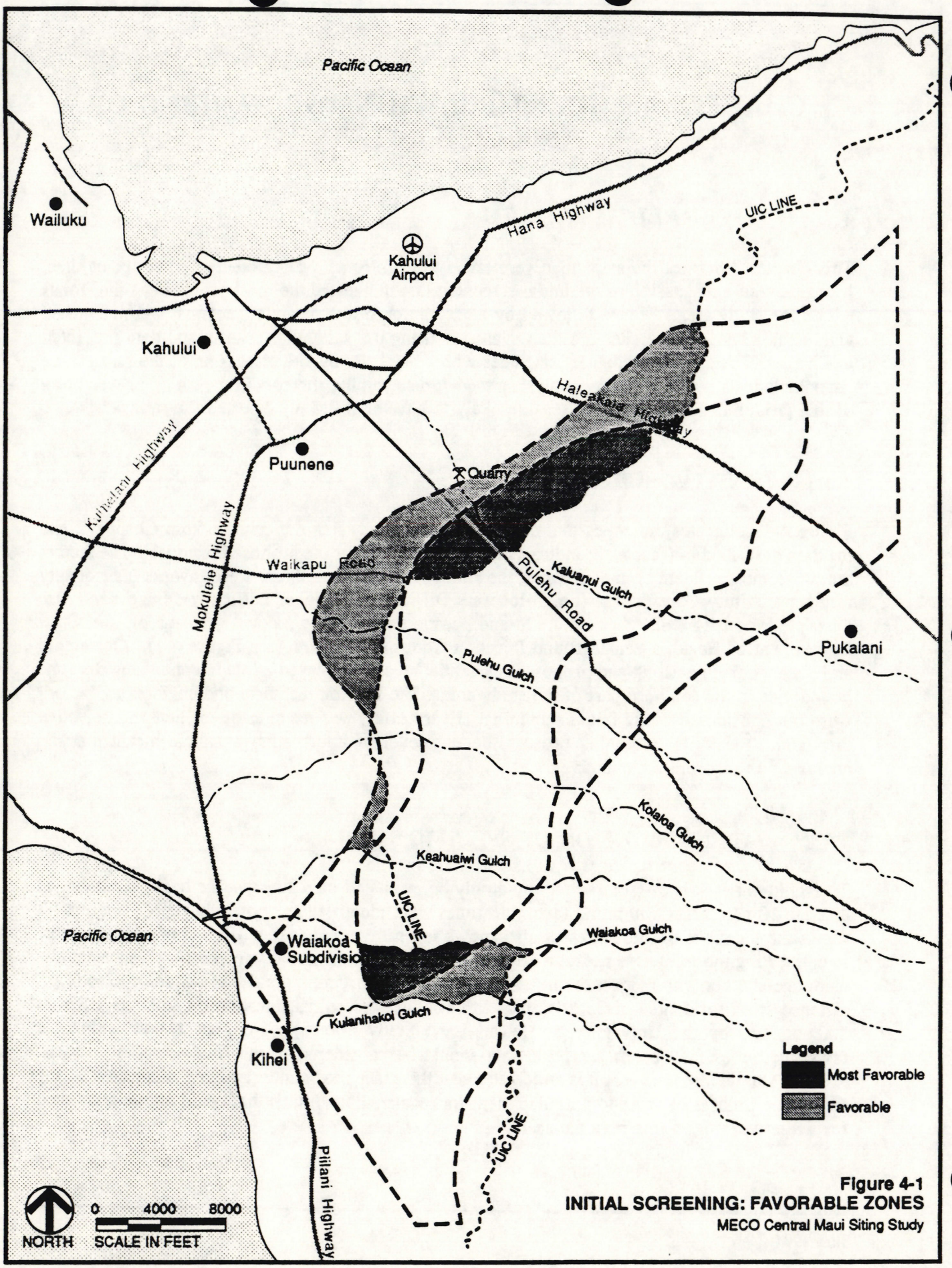


Figure 4-1
INITIAL SCREENING: FAVORABLE ZONES
MECO Central Maui Siting Study

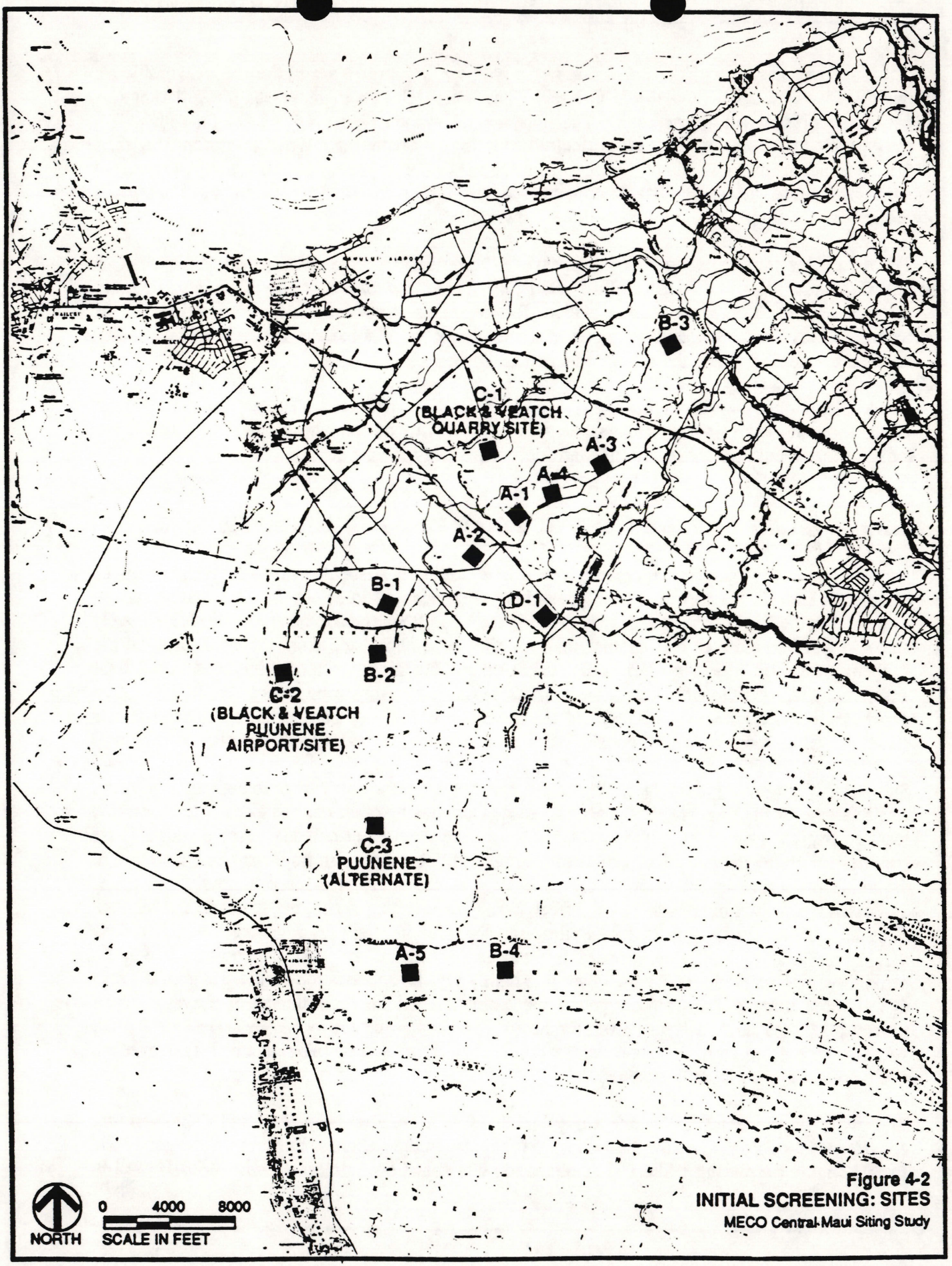


Figure 4-2
INITIAL SCREENING: SITES
MECO Central Maui Siting Study

The five sites shown on Figure 4-2 that begin with an "A" prefix are in the most favorable air quality zone and are below the UIC line. They were selected to represent the full range of variability present within the zone. The four sites shown on Figure 4-2 that begin with a "B" prefix are situated in the "Higher Difficulty" zone for air permitting. While less promising than the "A" sites from an air quality viewpoint, these sites offered potentially off-setting advantages, such as reduced fuel-haul distances, decreased visibility from significant vantage points, and reduced water supply pumping costs due to lower elevation.

The three sites shown on Figure 4-2 that have "C" prefixes are from previous studies. Sites C-1 and C-2 were identified in Black & Veatch's *Preferred and Alternate Site Technology Report* (December 31, 1991) and are included for reference purposes only. As explained in Section 1.1.2, Site C-3 was investigated as a potential power plant site in 1992. It is the location favored by A&B-Hawaii, the region's largest landowner.

The last location shown on Figure 4-2 (D-1) represents the location that Trinity Consultants' April 1993 air quality analysis indicated has the highest probability of obtaining air permits. This is the location that would be chosen if one were optimizing only for air quality.

4.1.3 SITES INCLUDED IN THE FINAL PHASE OF ANALYSIS

At this point in the analysis, representatives of Belt Collins & Associates met with representatives of MECO and HECO to discuss the preliminary findings and to select the sites that would be evaluated in the final phase of the study (see Figure 4-3). It was decided that Sites A-1, A-2, A-3, and A-4 were so close to one another that one should be eliminated from the final phase of the analysis. Because Site A-4 offered the fewest unique qualities, it was not included in the final analysis. Site A-5, the fifth site in the most favorable air quality zone, was judged too close to expanding residential areas in Kihei and too distant from existing transportation facilities (roads and harbors) to warrant further consideration; consequently, it was also eliminated.

Site B-1, which emerged as the highest-rated site in the second most favorable air quality zone, was retained for the final stage of analysis. Aside from having other desirable characteristics, this location is among the least visible and is well-removed from other existing development. These qualities minimize the probability of strong community objections, an important consideration in the siting process. Its inclusion in the final stage of the study also made it possible to better understand what advantages there might be (if any) in selecting a site that is not in the highest-rated air quality zone. Site B-2 was eliminated because it offers no advantages over its close neighbor, Site B-1, and is less desirable from an operational and cost standpoint. Site B-3's proximity to Hana Highway (from which it is highly visible) and location on the fringe of the area that is most suitable from an air quality viewpoint left it with little chance of prevailing over nearby "A" sites, and so it was also eliminated. Site B-4, which is owned by Haleakala Ranch, was also eliminated from further consideration because it offered no inherent advantages over the other potential sites identified above.

The two sites the Black & Veatch study identified as most promising (C-1 and C-2) were not considered in this phase of the study because they are in the "Highest Difficulty" category zone for air quality permitting. Site C-3 (the location which had been discussed with A&B-Hawaii in

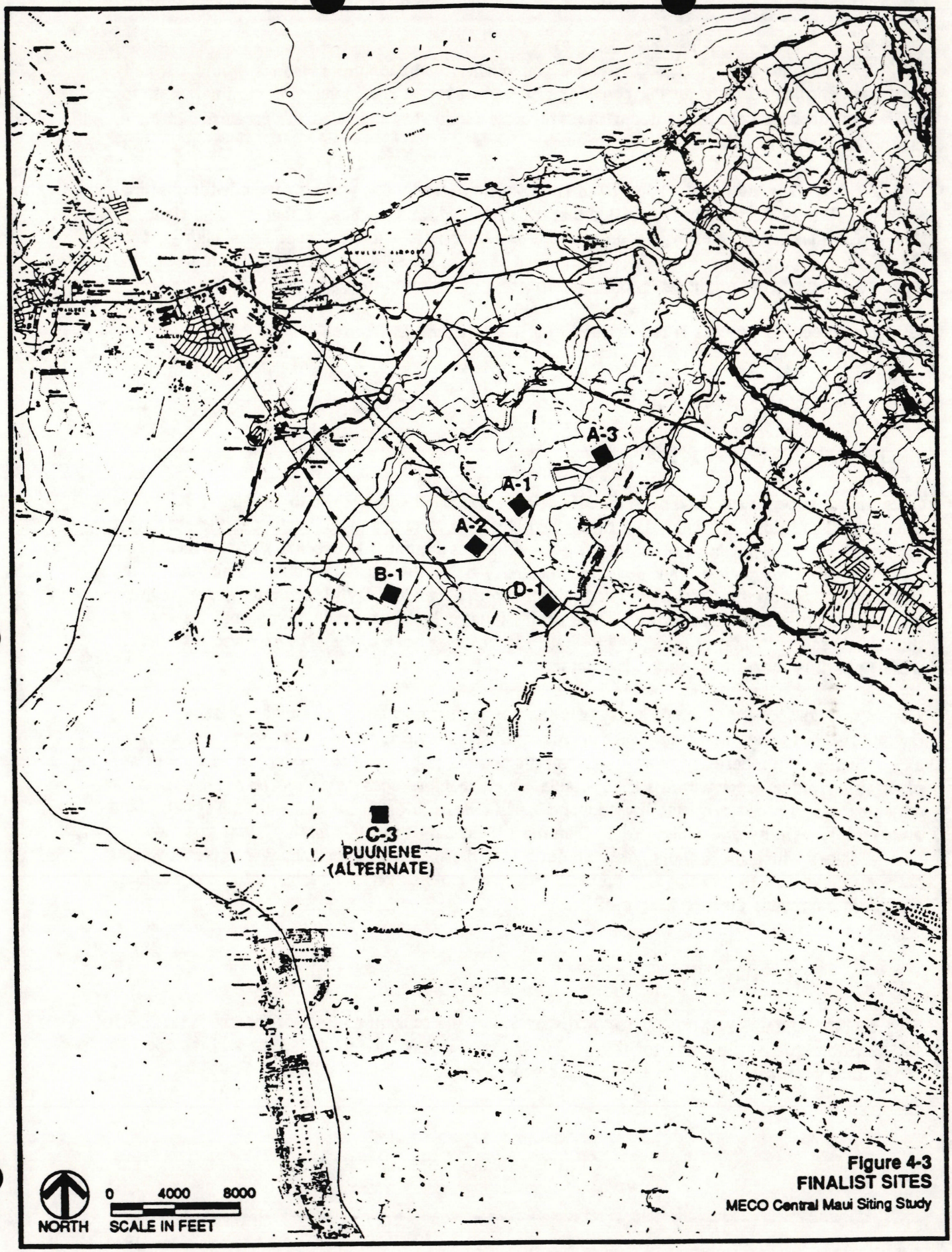


Figure 4-3
FINALIST SITES
MECO Central Maui Siting Study

1992, extends into the "Highest Difficulty" air quality zone; for this reason it would normally have been eliminated from further consideration. However, it was included in the final phase for reference purposes because it is the site which the landowner indicated the greatest interest in making available to MECO.

Site D-1, which is the best location from an air quality standpoint, was also included in the final analysis. Trinity Consultants suggested that it be retained, and we believe that the importance of this factor make this appropriate despite the fact that it is outside the potential siting zones identified in Figure 4-1. Its inclusion in the final phase of the study made it possible to determine what other objectives might have to be sacrificed in order to optimize for air quality concerns.

This site screening process is represented in a flow diagram in Figure 4-4.

4.2 SITE RANKINGS

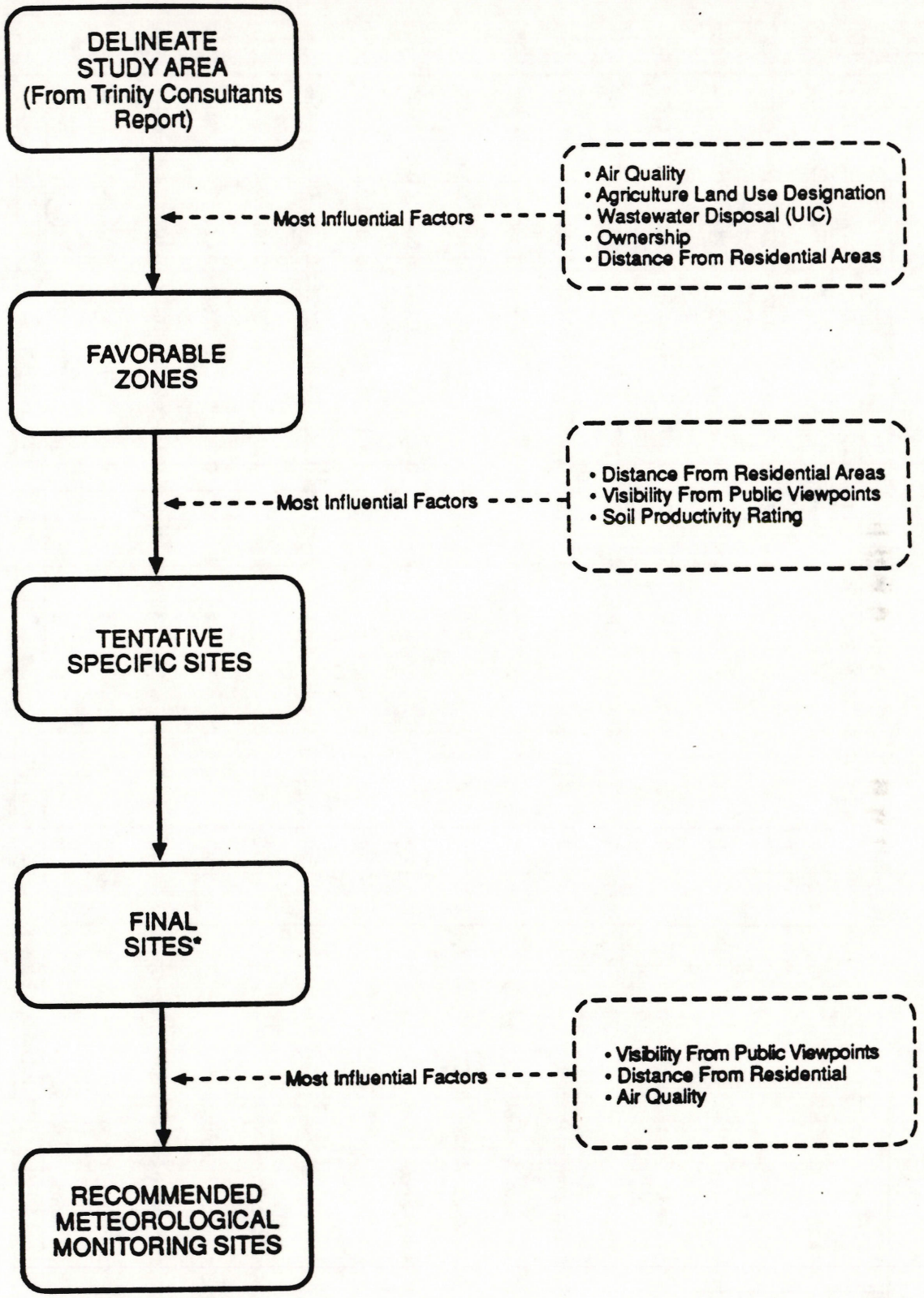
4.2.1 INTRODUCTION

Once the six specific sites had been identified, each was rated with respect to its relative suitability for power plant development. The rating involves two components. The first is the score that was given each site for each suitability factor. This was a number between 1 and 5, with 1 being most favorable for power plant development and 5 being the least favorable. This part of the rating was based on the suitability criteria described in Chapter 2. While the criteria are, in many instances, semi-quantitative, considerable professional judgement was involved, and the analysis should be read with that in mind. Note that in some cases none of the sites received the best (or worst) possible score for a particular factor.

The second component of the rating system represents the importance (or weight) attached to each factor relative to the others that were considered. This reflects the fact that some factors (such as air quality) are inherently more important than others (e.g., land ownership) in making power plant siting judgements within the favorable zone. Factors considered the least important, or which exhibited minimal variability on a site-specific basis (e.g., noise, transmission system, land ownership), were given a weight of 1. The most important factor (air quality), was given weight of 5. Factors which the authors considered to be of intermediate importance were given a weight between these two extremes (e.g, fuel delivery distance was given a weight of 2 and aesthetic considerations were given a weight of 3).

4.2.2 SCORING

This section contains a factor-by-factor discussion of the scoring of each of the six sites. Each sub-section explains the basis for the weighting that was assigned to the factor and the specific scores that were assigned to each site. The scores are summarized in Table 4-1.



* Sites C-3 and D-1 remained in consideration because of favorable land acquisition and air quality conderations, respectively.

Figure 4-4
SCREENING PROCESS DIAGRAM
MECO Central Maui Siting Study

Table 4-1 Site Scoring

FACTOR	WEIGHT	SITES' RAW SCORES (1)						SITES' WEIGHTED SCORES					
		A-1	A-2	A-3	B-1	C-3	D-1	A-1	A-2	A-3	B-1	C-3	D-1
Air Quality	5	2	2	3	5	5	1	0.357	0.357	0.536	0.893	0.893	0.179
Land Ownership	1	2	2	2	2	1	2	0.071	0.071	0.071	0.071	0.036	0.071
Existing Uses	2	3	3	3	3	1	3	0.214	0.214	0.214	0.214	0.071	0.214
Land Use Controls/Adjacent Uses	3	1	1	3	2	3	2	0.107	0.107	0.321	0.214	0.321	0.214
Topography	1	3	2	3	3	2	2	0.107	0.071	0.107	0.107	0.071	0.071
Soils (Agricultural Productivity)	2	2	5	5	5	1	5	0.143	0.357	0.357	0.357	0.071	0.357
Groundwater Availability	1	2	2	2	1	1	3	0.071	0.071	0.071	0.036	0.036	0.107
Groundwater Quality (UIC)	3	2	2	2	1	1	3	0.214	0.214	0.214	0.107	0.107	0.321
Flood/Drainage Issues	1	1	1	1	1	1	1	0.036	0.036	0.036	0.036	0.036	0.036
Noise	1	2	2	2	1	2	2	0.071	0.071	0.071	0.036	0.071	0.071
Flora & Fauna	1	1	1	1	1	2	1	0.036	0.036	0.036	0.036	0.071	0.036
Aesthetic Considerations	3	2	2	4	1	2	1	0.214	0.214	0.429	0.107	0.214	0.107
Subsurface Conditions	1	2	2	2	2	2	2	0.071	0.071	0.071	0.071	0.071	0.071
Transmission System Improvement Costs	1	2	1	3	3	5	2	0.071	0.036	0.107	0.107	0.179	0.071
Fuel Delivery Distance	1	2	2	3	1	4	3	0.071	0.071	0.107	0.036	0.143	0.107
Road Improvement Costs	1	2	1	3	4	5	1	0.071	0.036	0.107	0.143	0.179	0.036
TOTAL (Lower is better)								1.925	2.033	2.85	2.57	2.57	2.06
Date: 7-16-1993		Total Normalized Scores (2) [higher is better]						100.0%	94.7%	67.4%	74.9%	74.9%	93.0%

(1) On a scale of 1 to 5, with 1 being the best and 5 being the worst.

(2) Normalized score is calculated by dividing the best site's score (i.e. the site having the lowest weighted score) by the site's score

4.2.2.1 Air Quality

Weight. Air quality issues are the single most important consideration in power plant siting. Air emissions have the potential to affect wide areas and substantial populations, and the permitting process is comprehensive, lengthy, and somewhat uncertain. Consequently, this factor was given a weight of 5.

Scoring. The air quality scores were based on the estimates provided in Trinity Consultants' April 1993 report.[1] Site D-1, which is forecast to result in pollutant concentrations that are no more than about 52% of the standard, is the most favorable site from the perspective of air quality. It was rated a 1 for this factor. Sites A-1 and A-2 are the next most favorable with respect to this factor, with the model forecasting approximately 63 percent and 70 percent for them, respectively. If these concentrations are confirmed by models using site-specific meteorological data, it is likely that the proposed facilities could be developed on either of these two sites.

On the basis of Trinity Consultants' April 1993 estimate for the controlling pollutant and averaging period (approximately 79% of the PSD increment), Site A-3 is rated a 3 for this factor. While at least a portion of the proposed generating capacity can probably be constructed at this location, more mitigation measures may be needed than would be required at the higher-rated sites. Moreover, there is a greater chance that further modeling could identify difficulties meeting air quality standards for specific pollutants/averaging periods.

Generation facilities on Sites B-1 and C-3 are likely to find it difficult to meet all ambient air quality standards and/or meet the PSD increment limitation if a full 232 megawatts of generating capacity is developed. Since this may make it impossible to develop all of the capacity that is presently planned and/or necessitate additional mitigation measures, these sites have been rated 5 for this factor.[2]

4.2.2.2 Land Ownership

Weight. Since utility companies have the ability to condemn land, ownership issues are not of the same importance that they would be if the facilities were being developed by a private party. Nonetheless, purchasing is simplified if the area being acquired is owned by a few parties and if the owner(s) is (are) inclined to negotiate an agreement, rather than to be forced into condemnation. All things considered, this factor was assigned a weight of 1.

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[1]Estimates (expressed as the percent of the allowable limit that would be reached for the most critical parameter and averaging period) were used for this rating. It should be noted that these estimates are from Trinity Consultants' regional screening model. They provide a reasonably accurate basis for comparing sites. However, the more refined models that are needed to more accurately establish the absolute magnitude of the air pollutant concentrations resulting from the proposed project can only be run after additional (site-specific) meteorological data is collected and processed.

[2]Site C-3 is located on the edge of the favorable air quality zone. Shifting it slightly up-slope to another portion of the uncultivated area on which it is located may improve its rating slightly, but this analysis assumes the location originally identified.

Scoring. Site C-3 was given a score of 1 for this factor because it is the site that A&B-Hawaii had recommended to MECO. All of the other sites are under also under single-ownership (also A&B Hawaii). While their use for the proposed power plant would remove 50 acres from sugarcane cultivation, this is a modest amount relative to the amounts that A&B-Hawaii has withdrawn in recent years for other urban uses. Further, it does not appear that the withdrawal would seriously affect ongoing sugarcane cultivation on adjacent areas. Consequently, the other sites were given a score of 2 for this factor. This rating assumes that the final site boundaries will be defined in cooperation with the landowner in such a way as to minimize unnecessary interference with sugarcane production.

4.2.2.3 Existing Uses

Weight. This factor influences the difficulty and cost of relocating existing uses. In heavily developed areas this can be one of the most important factors in power plant siting decisions. In the present instance, however, the largely agricultural nature of the study areas moderates it importance. Consequently, this factor was assigned a weight of 2.

Scoring. Site C-3 is located within a relatively large parcel of vacant land. Because construction of a power plant on it would not displace any uses from the site or from immediately adjacent areas, this factor was given a score of 1 for this factor.

The other sites are part of HC&S' sugar plantation, and power plant development would remove the plant site from cultivation. The area (50 acres) is small enough that this would not have a significant secondary effect on the plantation's operations (i.e., it would not reduce the area under cultivation to the point where mill operation is uneconomic). Consequently, the other sites were given a score of 3 for this factor.

4.2.2.4 Land Use Controls/Adjacent Uses

Weight. It is important that the power plant site have the appropriate existing land use designation or that its circumstances are such that the necessary State and County land use approvals and permits can be obtained. Similarly, it is important for the site to be adjacent to compatible land uses. Therefore, this factor was assigned a weight of 3.

Scoring. None of the sites have the most desirable land use designations (Heavy Industrial designation on the Community Plan and M-2 Zoning). All are planned and zoned for agriculture by the State and the County. However, Sites A-1 and A-2 are near existing industrial-type activities (a quarry and the County landfill) and are well away from residential areas, recreational areas, major roadways, and other uses that would be compromised if a power plant were developed on them. Because of this, these sites were rated 1 for this factor. Sites B-1 and D-1 are located well away from any existing industrial-type uses, eliminating the precedent for converting agricultural land to urban purposes. Because of this, they were rated 2 for this factor. Site A-3 was scored a 3 for this factor, largely because it is more visible from Haleakala Highway. Site C-3 was also given a 3 because its distance from existing development was

partially offset by the fact that residential development is likely to spread inland toward it from Waiakoa Homesteads and Kihei.

4.2.2.5 Topography

Weight. The average slope is relatively unimportant for the range of conditions on the sites under consideration (mostly 0 to 8 percent slope, with small areas in the 8 to 16 percent range). This is because slopes in this range do not create potential problems with respect to slope stability or soil erosion. Consequently, this factor was given a weight of 1.

Scoring. The greater parts of all of the sites have topography that is reasonably suitable for power plant development. Consequently, normal construction techniques can be used without creating a potential for significant environmental harm. Sites A-2, C-3, and D-1 are slightly superior to the others in this respect, however, and were rated 2 for this factor. The other sites were given a score of 3.

4.2.2.6 Soils

Weight. Agriculture is a major part of the Maui economy, and both the State and County governments are dedicated to maintaining viable agricultural sectors. Because of this, it was considered moderately important to try to avoid sites having agriculturally productive soils (i.e., Land Study Bureau ratings of A or B). Consequently, this factor was given a weight of 2.

Scoring. Site C-3 is the only site that is not currently used for agriculture. This, and the fact that the University of Hawaii Land Study Bureau's master productivity rating for the soils on this site are low, led it to be rated a 1. A goodly part of Site A-1 is on soils which the Land Study Bureau rates as "C" (the remainder is on "B"-rated soil); for this reason it was rated a 2. All other sites are on soils rated "A" or "B". These agriculturally productive soils were rated 5.

4.2.2.7 Groundwater Availability and Quality

Weight. It is important that the power plant site be over or near an aquifer from which sufficient quantities of groundwater can be withdrawn for power plant use. At the same time, the planned use of desalination techniques gives MECO considerable latitude on water quality. Because of this, this factor was given a weight of 1.

Scoring. Sufficient groundwater is present beneath all of the sites to meet the projected demand. However, the fact that Sites B-1 and C-3 overlie portions of the basal lens having higher salinity levels may make it slightly easier to obtain the necessary water appropriations and wastewater discharge permits at these two locations. Consequently, they were given scores of 1 for this factor. Sites A-1, A-2, and A-3 are located slightly closer to the portion of the aquifer containing water of potable quality; because of this, they were given scores of 2 for this factor. Site D-1 overlies a portion of the aquifer having higher water quality, but the pumping costs would be

greater due to the higher site elevation and it could be more difficult to permit for industrial use. Consequently, it was assigned a score of 3.

4.2.2.8 Wastewater Disposal

Weight. The ability to inject wastewater from the proposed facility without adversely affecting the quality of significant groundwater resources is an important consideration in the site selection process. Problems associated with underground injection could affect surrounding land uses that rely on groundwater for irrigation and other uses; they could also lead to regulatory action by the State Department of Health. Because of this, this factor is considered moderately important and was given a weight of 3.

Scoring. Sites C-3 and B-1 are below the UIC line and overlie a relatively brackish portion of the Central Maui aquifer. As a result, they are the most favorable with respect to this factor and were rated a 1. Sites A-1, A-2, and A-3 are also below the UIC line, but groundwater salinity at these sites is probably somewhat lower than that at the first two sites. Because it was felt that this might make them slightly more difficult to permit, they were given a score of 2. Site D-1 is above the UIC line. Disposal of wastewater from a facility located on this site through underground injection is more likely to raise concerns during the permitting process than will injection at the other locations. While the nature of the effluent and the character of the aquifer at this location are such that these concerns can probably be overcome, the uncertainty involved led to a 4 rating for this site.

4.2.2.9 Flooding/Drainage Issues

Weight. Previous stages in the screening process had already eliminated locations likely to be subject to flooding or from which storm runoff was likely to be difficult to accommodate. Consequently, this factor was given a weight of 1 for the final analysis.

Scoring. All six sites are in areas that can be readily drained and that are outside of flood-prone areas. Consequently, all were rated 1 for this factor.

4.2.2.10 Noise

Weight. None of the sites being considered is close to noise-sensitive areas. Moreover, relatively inexpensive mitigation measures are available that can be used to reduce adverse noise impacts. Consequently, this factor was considered relatively unimportant and was given a weight of 1.

Scoring. Site B-1 is considered the most favorable site with respect to this factor due to its location far from noise-sensitive uses and the fact that all of the fuel delivery route is along heavily-travelled existing roadways. The "A" sites, Site C-3, and Site D-1 score just behind Sites B-1 for this factor; they were given a score of 2.

4.2.2.11 Flora and Fauna

Weight. Because all six sites are either in sugarcane cultivation or have typical introduced scrub vegetation, flora and fauna were given a relatively low weight of 1.

Scoring. All of the sites except C-3 were given a 1 for this factor. Site C-3 was given a score of 2, principally because it is a "natural" ecosystem and has a slightly higher (but still small) possibility of being found to contain important biota.

4.2.2.12 Aesthetic Considerations

Weight. Power plants are inherently industrial in nature, and their bulk and height (particularly their stacks) tend to make them highly visible from surrounding areas. Their appearance is generally considered undesirable, even to passers-by. Because of this, this factor is considered moderately important and was given a weight of 3.

Scoring. Sites B-1 and D-1 were judged the best with respect to this factor; they were given scores of 1. The high rating stems primarily from their distance from residential areas, heavily travelled roadways, and public viewpoints. Sites A-1, A-2, and C-3 were judged next best and were given a score of 2; while not as visually isolated as the two best sites, their distance from heavily travelled roadways, residential areas, and other scenic viewpoints still makes them highly suitable for power plant development. Because of its proximity to Haleakala Highway, Site A-3 is considered the least suitable for power plant development; it was awarded a 4.

4.2.2.13 Subsurface Conditions

Weight. While subsurface conditions affect construction costs and the specific erosion control and stabilization techniques that are required, they neither constitute a high percentage of project costs nor involve adverse effects that are particularly difficult to mitigate for the range of conditions present on the sites under consideration. Hence, this factor was given a weight of 1.

Scoring. Based on engineering reviews of these sites, all were given a score of 2.

4.2.2.14 Transmission System Improvement Costs

Weight. Transmission costs can represent a substantial portion of total system costs; transmission lines can also generate substantial public opposition. However, since none of the transmission interconnections needed to serve the six sites under consideration involved particularly difficult conditions, this factor was assigned a weight of 1.

Scoring. Site A-2, which is immediately adjacent to a major transmission corridor, was given a score of 1 for this factor. Site A-1 and Site D-1 are close to the same corridor and were rated a 2. Site A-3 would require a greater length of new transmission line and would entail overhead lines across relatively open areas visible from Haleakala Highway and Pukalani; consequently, it

was given a score of 3. Site B-1, which would require somewhat more new transmission line but which is more isolated, was also given a 3. Site C-3 would require the greatest amount of new transmission line; it was given a score of 5.

4.2.2.15 Fuel Delivery Distance

Weight. Fuel delivery costs can form a substantial part of the on-going operational costs of an oil-fired facility such as is proposed. However, this factor's importance as a distinguishing factor is diminished by the fact that all of the sites are in the same zone used by trucking firms to establish charges. Because of this, fuel delivery distance was given a weight of 1.

Scoring. Site B-1, which involves the shortest fuel-haul distance and the least elevation gain, was scored a 1 for this factor. Sites A-1 and A-2 involve slightly greater haul distances and elevation gain and were given scores of 2. The score of 3 given to Sites A-3 and D-1 was due to their somewhat greater haul distance. Finally, Site C-3 was given a score of 5 because it involves by far the longest fuel haul route.

4.2.2.16 Road Improvement Costs

Weight. Road improvement costs contribute to total project costs, particularly if they involve right-of-way acquisition as well as actual construction. In most instances these represent a reasonably small part of the total cost, and this factor was given a weight of 1.

Scoring. Sites A-2 and D-1 are immediately adjacent to existing public highways capable of supporting fuel haul trucks; hence, they were given a score of 1. Site A-1 will require some additional new road construction; it was given a score of 2. The longer access road needed for Site A-3 will add substantially to its cost, resulting in a score of 3. Site B-1 will involve a longer access road, but there is an opportunity to take advantage of an existing dirt road for most of the route; because of this, it was given a score of 4. Site C-3 involves the greatest new road construction cost and was given a score of 5.

4.2.3 SUMMARY OF SITE SCORING

The results of this analysis are summarized in the last two lines of Table 4-1. In the first of these lines, a lower score is better than a higher score. A site which received a perfect score for each of the 16 factors (e.g., air quality, soils, topography, etc.) would have a total raw score of 16 (i.e., 16 times 1). Since all of its scores would be 1, a perfect site's "weighted score" would be 1 as well. Conversely, a site which received the poorest possible score for each factor would have a score of 80 (16 times 5) under "Sites' Scores" and a score of 5 under "Sites' Weighted Scores."

To simplify comparisons between sites, the "Sites' Weighted Scores" are also represented as percentages. These are reported as "Total Normalized Scores" on the last line of Table 4-1. These scores were calculated by awarding the top-rated site, Site A-1, 100%, and representing the other sites with a number calculated by dividing their scores into the "best" score.

The percentages in Table 4-1 show that Site A-1 (at 100%), Site A-2 (at 94.7%), and Site D-1 (at 93%) are the most suitable for the proposed project. The closeness of the scores earned by the top three sites suggests that the proposed project might reasonably be developed on any one of them.

Sites B-1 and C-3 both scored just under 75%. Air quality was by far the most significant deficiency of these sites; they would score considerably better if this problem could be eliminated.

Site A-3's score of 67% indicates that it is far less suitable for power plant development than the other sites. Low air quality scores play a significant role in this, but it is relatively poorly rated in other factors as well.

4.2.4 SENSITIVITY ANALYSIS OF SCORING

As stressed throughout this report, both the weights attributed to each factor and the scores assigned that factor involved considerable professional judgement. Because of this, in addition to the primary weighting scheme, alternative weighting schemes were used to test the extent to which different weights might alter the site rankings. This sensitivity analysis was performed by increasing the weight assigned to a factor by an order of magnitude (ten times) and examining the results to determine if the increased importance attributed to that factor altered the conclusions. For example, the "air quality" weighting was increased from "5" to "50" and the ranking was reviewed to determine the extent to which such a change would alter the relative score and rankings of the six sites.

The results of this sensitivity analysis are summarized in Table 4-2. The numbers in the top portion of the table represent the "Total Normalized Score" that the site would receive with the alternate weighting. The bottom of the table lists the number times each site ranked in the top two and the bottom two when the weight of individual factors was increased by an order-of-magnitude.

Sites A-1 and A-2 continue to emerge as the most suitable under the majority of the alternative factor weights that were tested (24 out of 32). Site D-1 is rated best when the weight of air quality or of aesthetics is increased by a factor of ten, and it is nearly at the top when topography and aesthetics are emphasized.

Site C-3 rises to the top when existing use or groundwater quality are emphasized. It is second-best if the agricultural productivity of the soil is made extremely important. Site B-1 is second-best when the weights assigned to fuel delivery distance or the UIC line are exaggerated. Site A-3 never reaches the top two spots; equally telling is the fact that it ranks in the bottom two places 14 out of 16 possible times.

Table 4-2 Sensitivity Analysis Summary

PARAMETERS	TOTAL NORMALIZED SCORE IF INDIVIDUAL PARAMETER WEIGHT IS INCREASED BY A FACTOR OF TEN (*)					
	A-1	A-2	A-3	B-1	C-3	D-1
Air Quality	71.5	70.0	47.9	34.6	34.7	100.0
Land Ownership	100.0	96.0	73.5	80.0	88.9	94.7
Existing Uses	83.4	81.2	67.2	71.4	100.0	80.4
Land Use Controls/Adjacent Uses	100.0	96.5	50.2	64.1	52.9	72.2
Topography	92.6	100.0	70.1	75.7	83.3	98.7
Soils	100.0	61.2	52.9	55.5	99.8	60.7
Groundwater Availability	100.0	96.0	73.5	88.9	88.9	84.7
Groundwater Quality (UIC)	91.6	89.2	73.8	99.9	100.0	71.2
Flood/Drainage Issues	100.0	95.5	70.8	77.7	77.7	94.0
Noise	100.0	96.0	73.5	88.9	80.0	94.7
Flora & Fauna	100.0	95.5	70.8	77.7	69.9	94.0
Aesthetic Considerations	78.7	76.6	45.2	85.8	67.4	100.0
Subsurface Conditions	100.0	96.0	73.5	80.0	80.0	94.7
Transmission System Improvement Costs	91.6	100.0	61.7	66.6	56.4	86.8
Fuel Delivery Distance	100.0	96.0	67.3	88.9	66.7	84.7
Road Improvement Costs	91.6	100.0	61.7	61.1	56.4	98.5
NUMBER OF TIMES SITE RANKED FIRST	9	3	0	0	2	2
NUMBER OF TIMES SITE RANKED SECOND	4	8	0	2	1	1
NUMBER OF TIMES SITE RANKED NEXT-TO-LAST	0	0	4	6	6	1
NUMBER OF TIMES SITE RANKED LAST	0	0	10	1	3	1
FOR COMPARISON PURPOSES: TOTAL NORMALIZED SCORES (From Table 4-1)	100	94.7	67.4	74.9	74.9	93.0

(*) Scores are normalized for each parameter so that the highest rated site receives a "100". These scores represent the "Total Normalized Score" the site would have received with the alternate weights. They can be compared to the scores listed below.

In summary, the sensitivity analysis shows that the sites that score best using the weights incorporated in Table 4-1 also tend to have the best scores even when extremely high weights are assigned to one factor. This provides some assurance that the scores presented in Table 4-1 are really indicative of the sites' relative suitability for the proposed project.

Chapter 5
Recommendations

CHAPTER 5.0 RECOMMENDATIONS

5.1 COORDINATION AND REVIEW

Working drafts of this report were circulated to selected State and County agencies and to A&B-Hawaii (the owner of all of the top-rated sites) for review and comment. Suggestions and corrections from these reviewers made it possible to improve the accuracy of the data and to refine the criteria that were used to rank the sites. These improvements were incorporated in the third working draft of the document.

The tentative findings of the study, as described in the third working draft, were presented to the Maui County Council Planning Committee on August 3, 1993. The presentation had two fundamental purposes. The first was to apprise the County Council of the status of MECO's analysis. The second was to solicit the Council's guidance with respect to land use policy issues that it believed should be taken into consideration in the siting decision. The Council indicated that it appreciated MECO's efforts to keep it informed. However, it stated it would not be appropriate to comment until after the Council had the opportunity to review the updated Community Plans for the planning areas in which the potential sites are located. At the conclusion of the meeting, the Council Planning Committee chairman suggested that MECO proceed with the selection process, returning to the Council after a preferred site had been identified.

5.2 SITE SELECTION

Site A-1 emerged as the top-rated site; Sites A-2 and D-1 were close behind. All three sites scored substantially better than the other potential power plant sites that were identified. Because of the uncertainties that are involved, MECO concluded that it was important to collect the meteorological data needed to prepare air permit application-level air quality analyses for all three. This approach was chosen because it improved the likelihood that MECO would be able to move forward with its plans even if unanticipated problems were encountered with the site receiving the highest score in this rating.

In response to MECO's request, the State Department of Health agreed to allow a single set of meteorological data collected on Site D-1 to be used to model the effects of air emissions associated with power plant development at any location within the area encompassing Sites A-1, A-2, and D-1. A&B-Hawaii subsequently granted MECO an easement for the tower, and it was erected in January 1994.

Site C-3 (which was the subject of previous discussions between MECO and A&B-Hawaii), scored substantially lower than the first three sites. Its marginal air quality rating is of particular concern because it could make it impossible to obtain the air permits needed to develop the desired power generation facilities on it. However, because A&B-Hawaii strongly favors this site over the others (all of which are on its land) and because most of the factors which contributed to Site C-3's lower score could be dealt with at the design stage (albeit at a cost premium to the utility) MECO agreed

to continue to consider Site C-3. In accordance with this agreement, MECO erected a meteorological monitoring station on Site C-3 and began collecting data at it at the same time that it began monitoring on Site D-1.

Site C-3 had a relatively low air quality rating in the initial screening. Unless the detailed air quality analysis that will be done once meteorological data from this monitoring station are available is more favorable than the results of the initial screening, it would probably be impractical to develop and operate the proposed facilities at this location. Even if it does prove suitable from an air quality standpoint, Site C-3's rating on other factors means that it would probably not be MECO's first choice for the planned generation facilities.

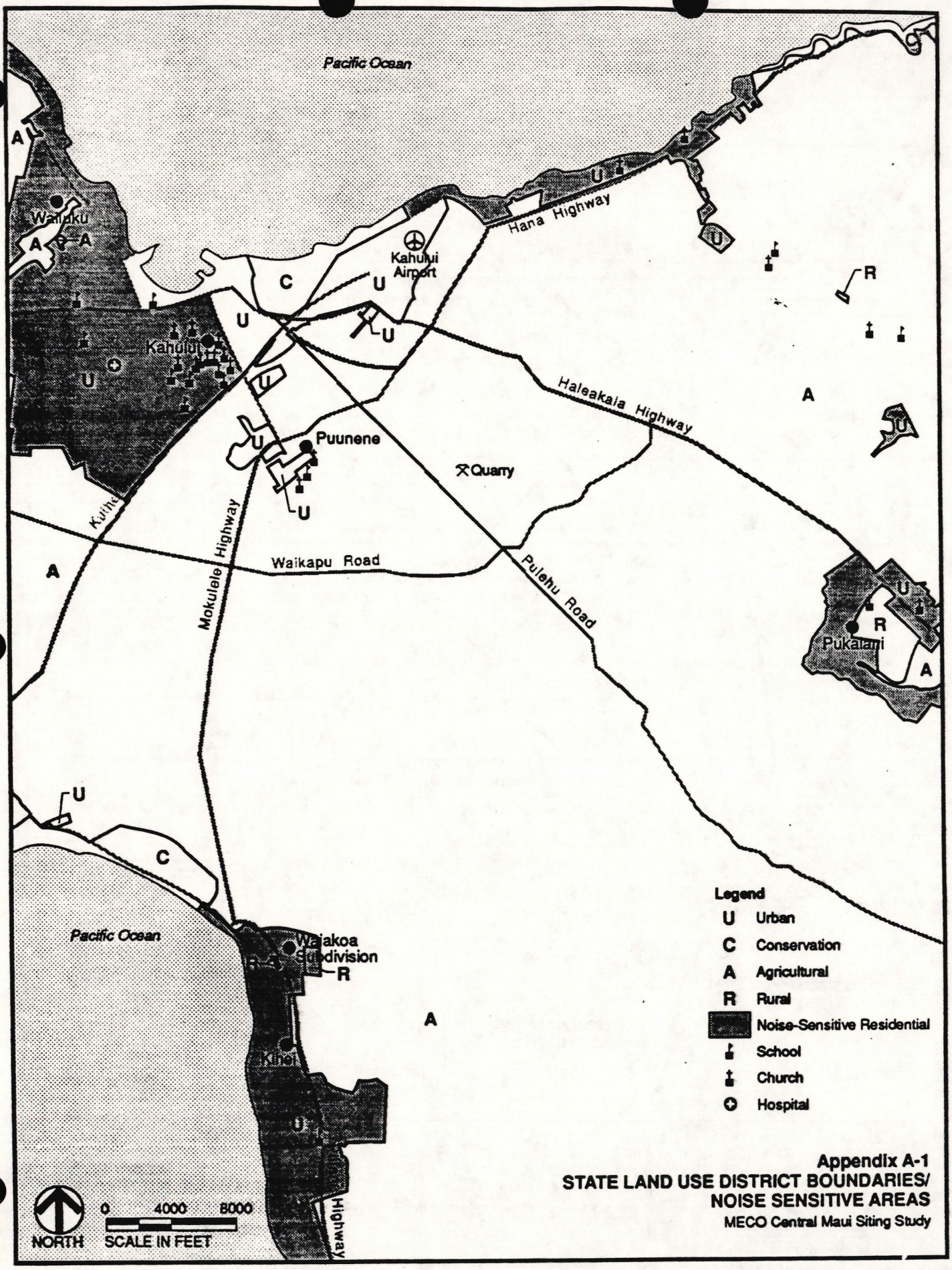
As soon as a full year of meteorological data is available from the two monitoring stations, the air quality effects of the proposed facilities will be modeled. The results of this modeling will be used to evaluate the feasibility of power plant construction at the various sites. This analysis should address the ambient concentrations that can be anticipated, the relationship of these to applicable ambient air quality standards, and the implications that this has for permitting difficulty and the cost of the required pollution control measures.

5.3 FOLLOW-UP INVESTIGATIONS

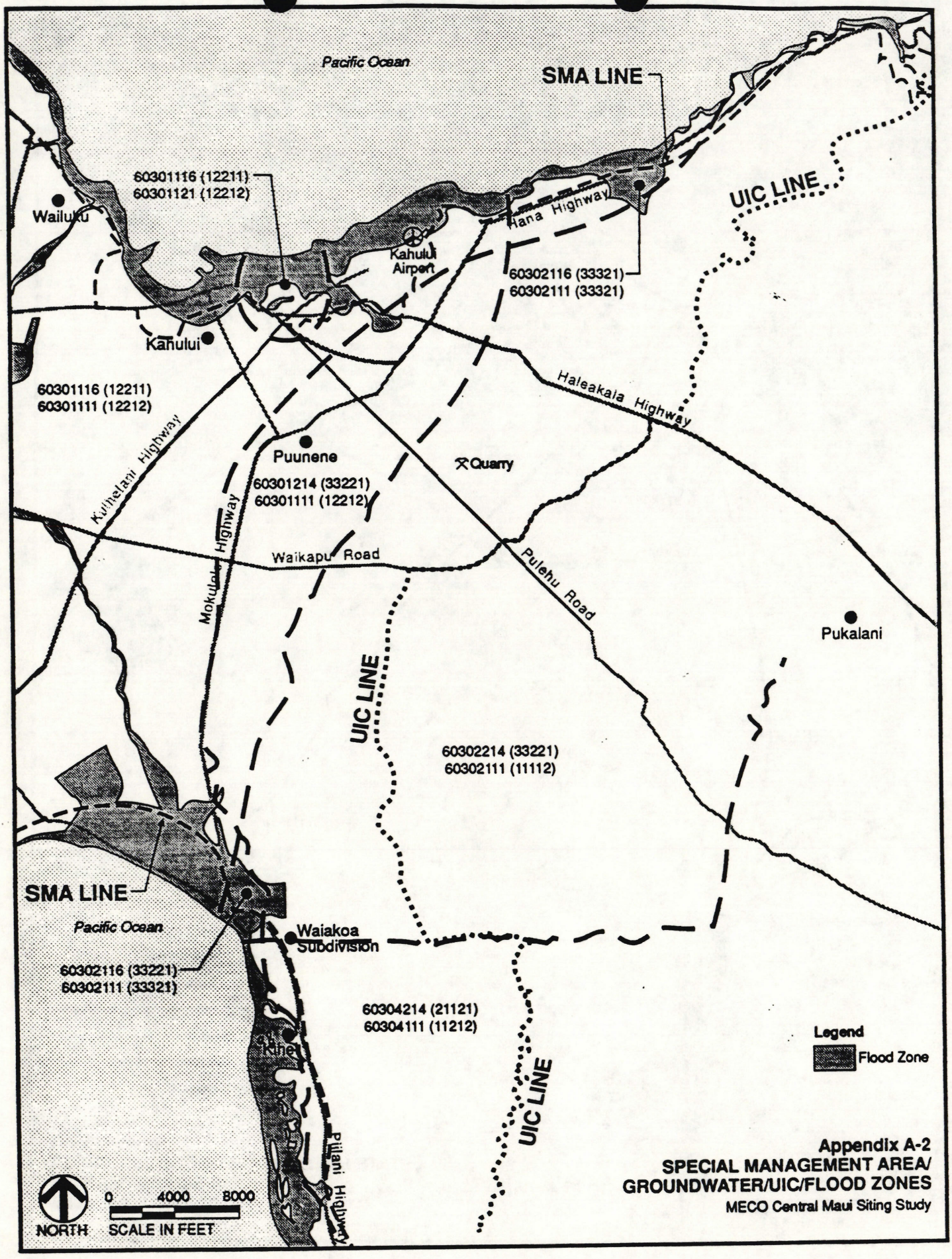
Some additional investigations should be conducted once the results of further air modeling are available. These investigations, which are listed below, would provide more detailed, site-specific information that would confirm the results of this regional analysis and allow MECO to make a final choice of sites.

- Investigate possible integration of the facility with A&B-Hawaii/HC&S' existing irrigation system.
- Hold discussions with A&B-Hawaii/HC&S concerning minor adjustments in the site location that could substantially increase the power plant's compatibility with surrounding sugarcane cultivation.
- Meet with A&B-Hawaii/HC&S, Maui County, and the Highways Division of the State Department of Transportation to discuss specific access road design options/requirements for the most promising sites, including the road rights-of-way that would be required.
- Conduct more detailed investigation of the transmission requirements of the most promising sites, including additional rights-of-way and improvements that would be required.
- Complete walk-through surveys of the most promising sites to confirm that no unanticipated biological or archaeological resources are present.
- Determine how recent changes in the administration of the Underground Injection Control regulations might affect the power plant siting decision.

Appendix A
Parameter Overlays



Appendix A-1
STATE LAND USE DISTRICT BOUNDARIES/ NOISE SENSITIVE AREAS
MECO Central Maui Siting Study



Appendix A-2
SPECIAL MANAGEMENT AREA/ GROUNDWATER/UIC/FLOOD ZONES
MECO Central Maui Siting Study

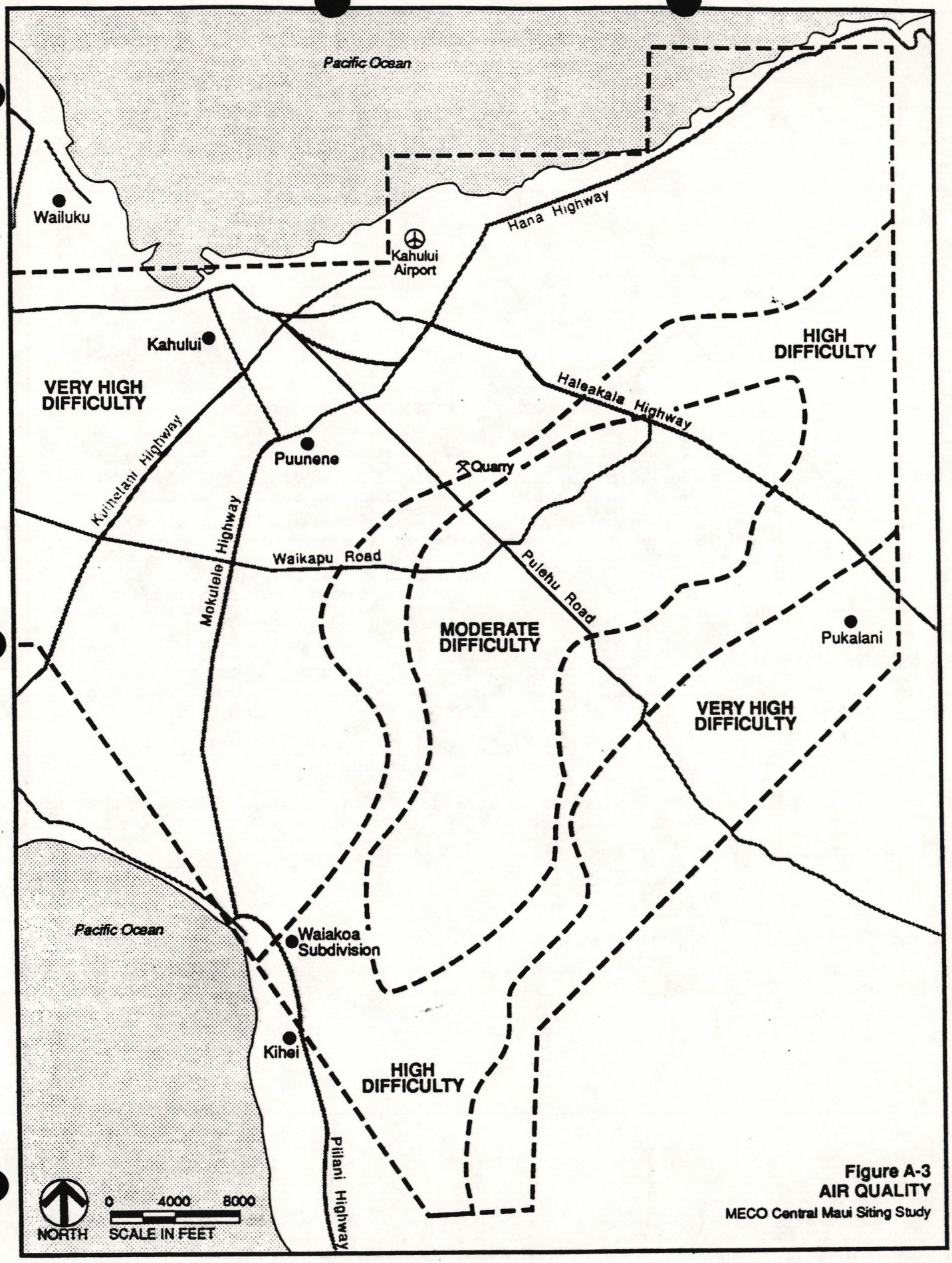


Figure A-3
AIR QUALITY
MECO Central Maui Siting Study

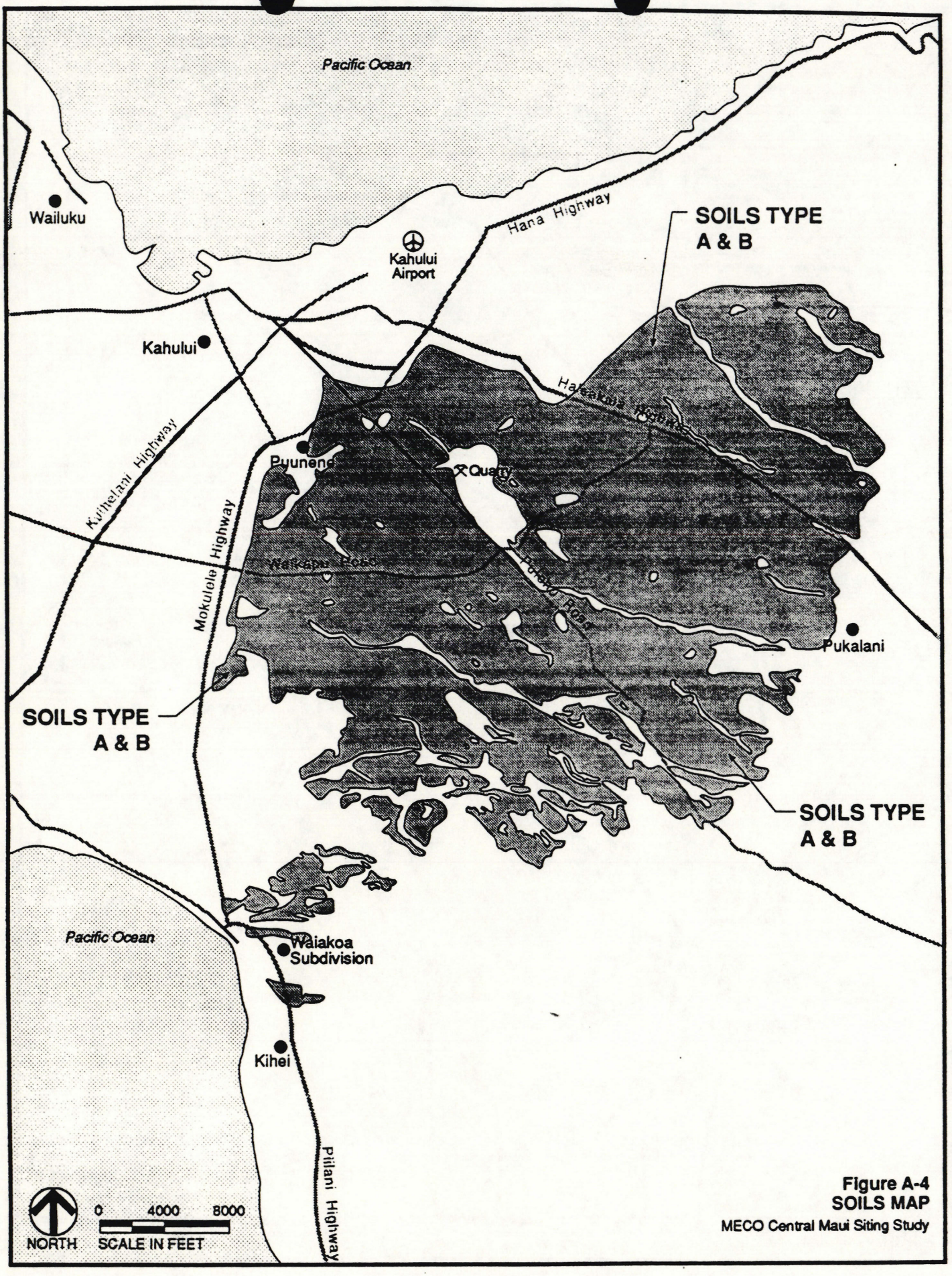
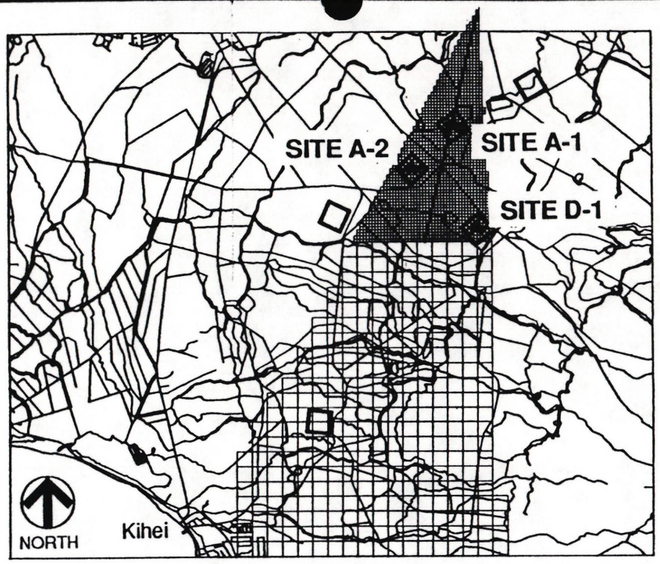
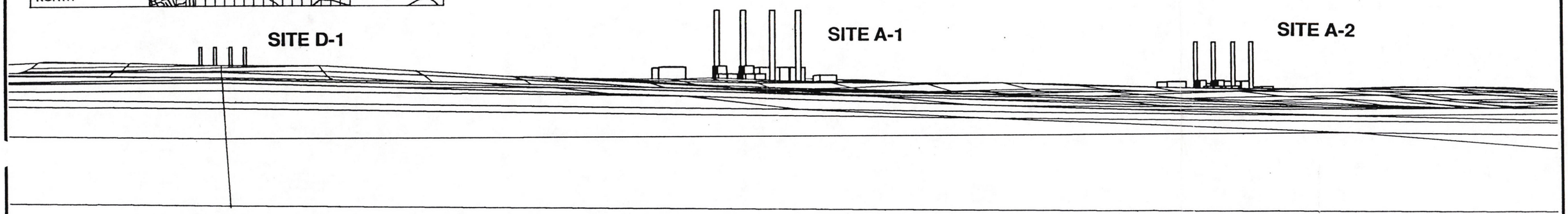


Figure A-4
SOILS MAP
MECO Central Maui Siting Study

Appendix B

CADD View Analysis





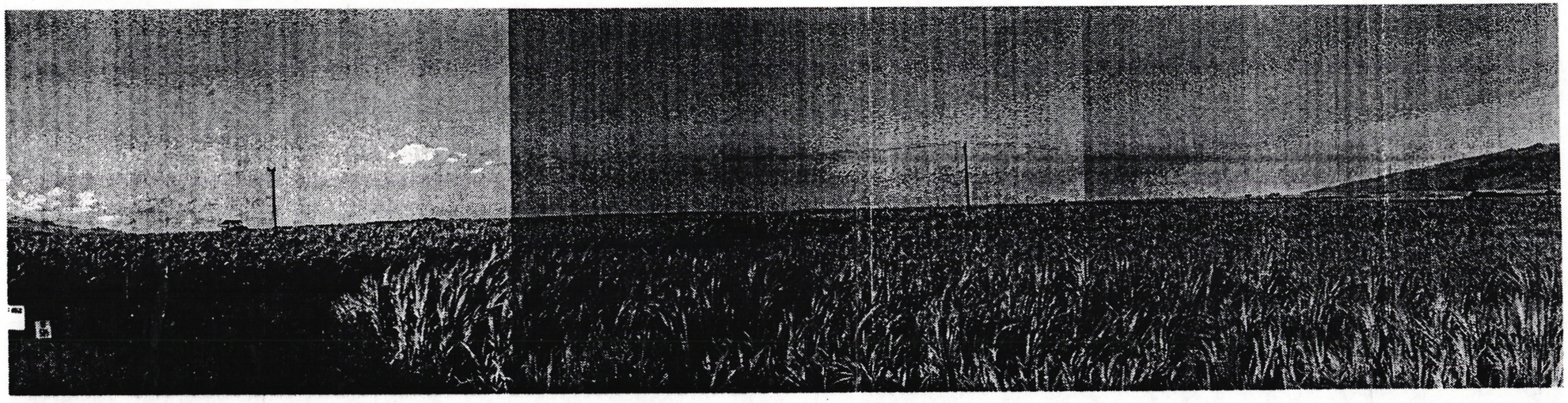


Figure B-1
CADD VIEW ANALYSIS

MECO Central Maui Siting Study
July 1993

Appendix C
Slope Analyses

Required Permits

All aspects of obtaining approval for the supply wells come under the regulatory authority of the State Commission on Water Resource Management (CWRM). Since this aquifer is not a designated Water Management Area, a relatively low level of management authority is exercised by the CWRM. Before drilling can begin, well drilling permits will be required. Normal processing time is 2 to 3 months, ending with a decision by the Commission at one of its regulatory scheduled meetings. Pump installation permits from the CWRM will also be necessary. These are applied for after drilling and pump testing is completed. Processing and approval are similar to the drilling permit. Both permits are likely to be obtained without difficulty.

Permits for the disposal wells are issued under the authority of the Underground Injection Control (UIC) program administered by the State Department of Health (DOH). It's a two-step, permit process. In the initial application, details of the disposal are presented, including prospective quantities and qualities, proposed well design, expected well performance, and provisions for back-up disposal capacity. Processing of this first stage typically takes DOH three to four months. When approval is received, the applicant can proceed with drilling and testing the wells. Upon completion, details of the wells' construction and test results are submitted to DOH for approval. DOH's processing of this second stage can be very lengthy, typically from 6 months to one year. The project site is makai of the UIC line and similar disposal wells for power plants located elsewhere on Maui and in the State have been approved. Consequently, ultimate approval with the issuance of an operating permit is expectable.

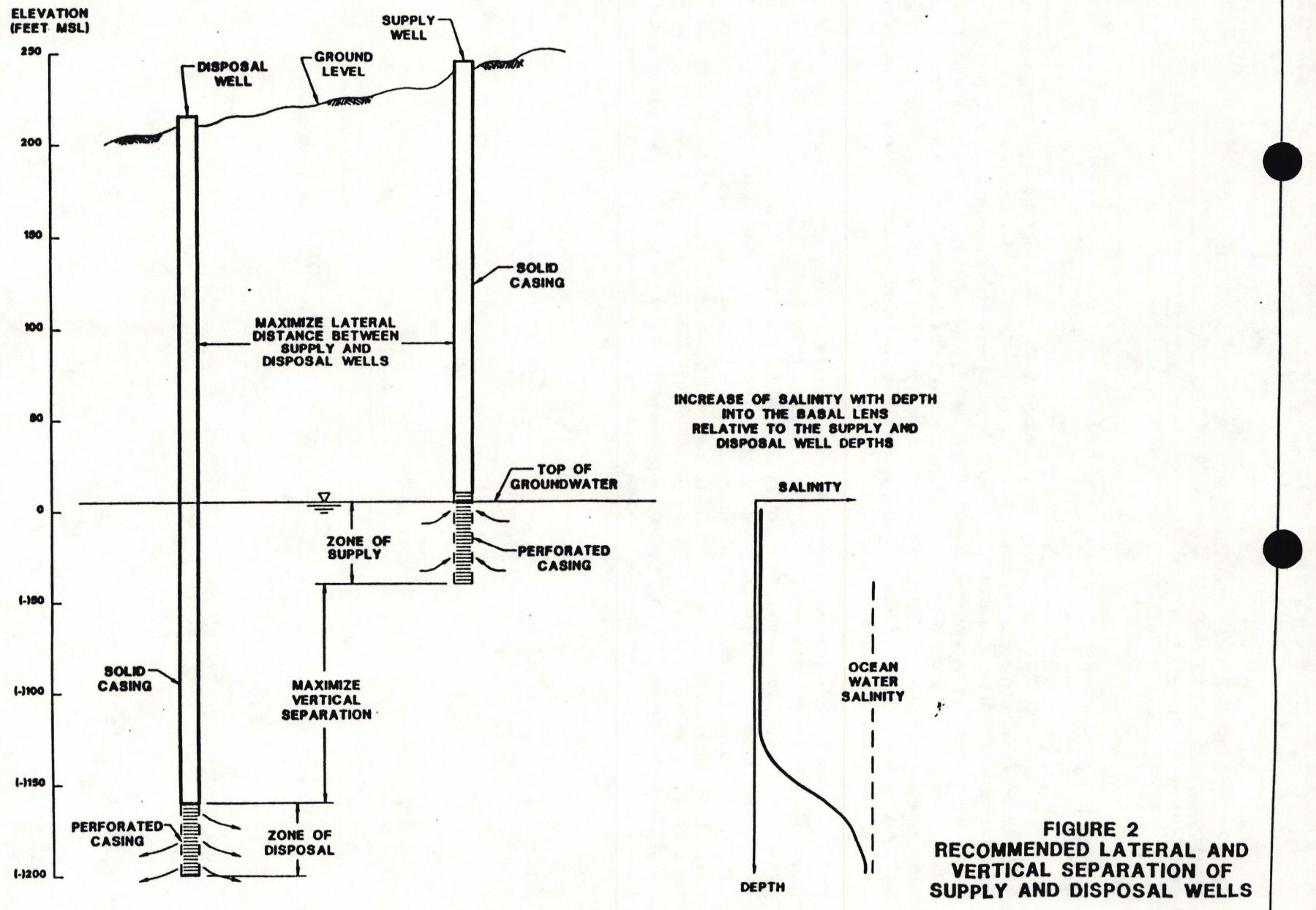


FIGURE 2
RECOMMENDED LATERAL AND VERTICAL SEPARATION OF SUPPLY AND DISPOSAL WELLS

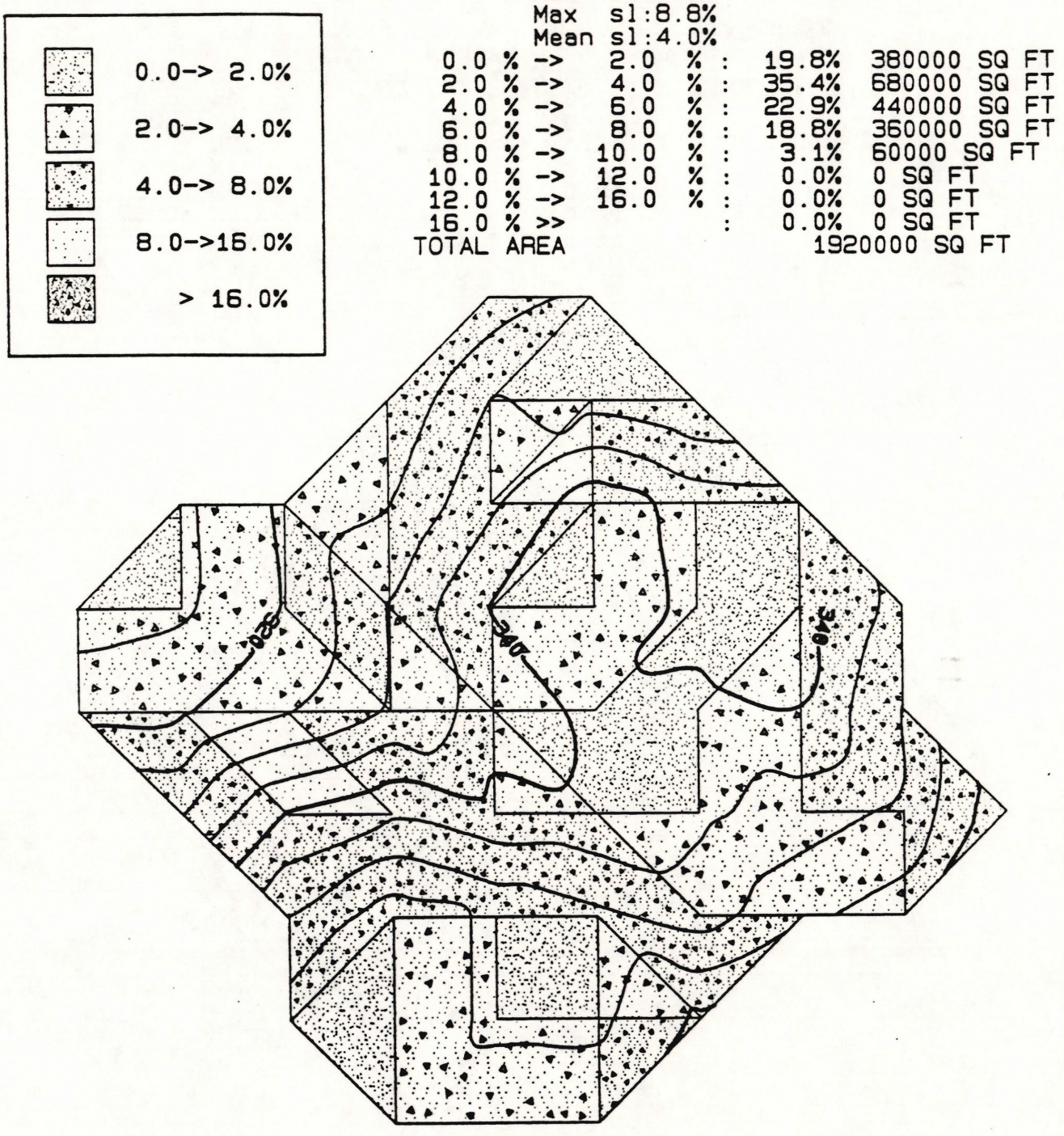
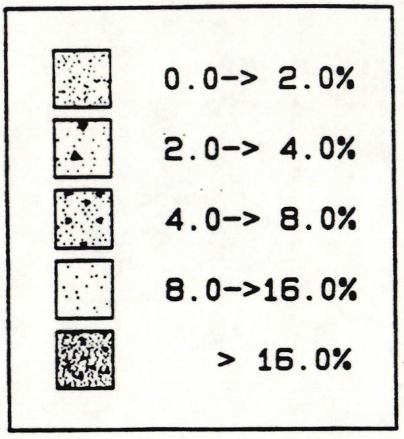
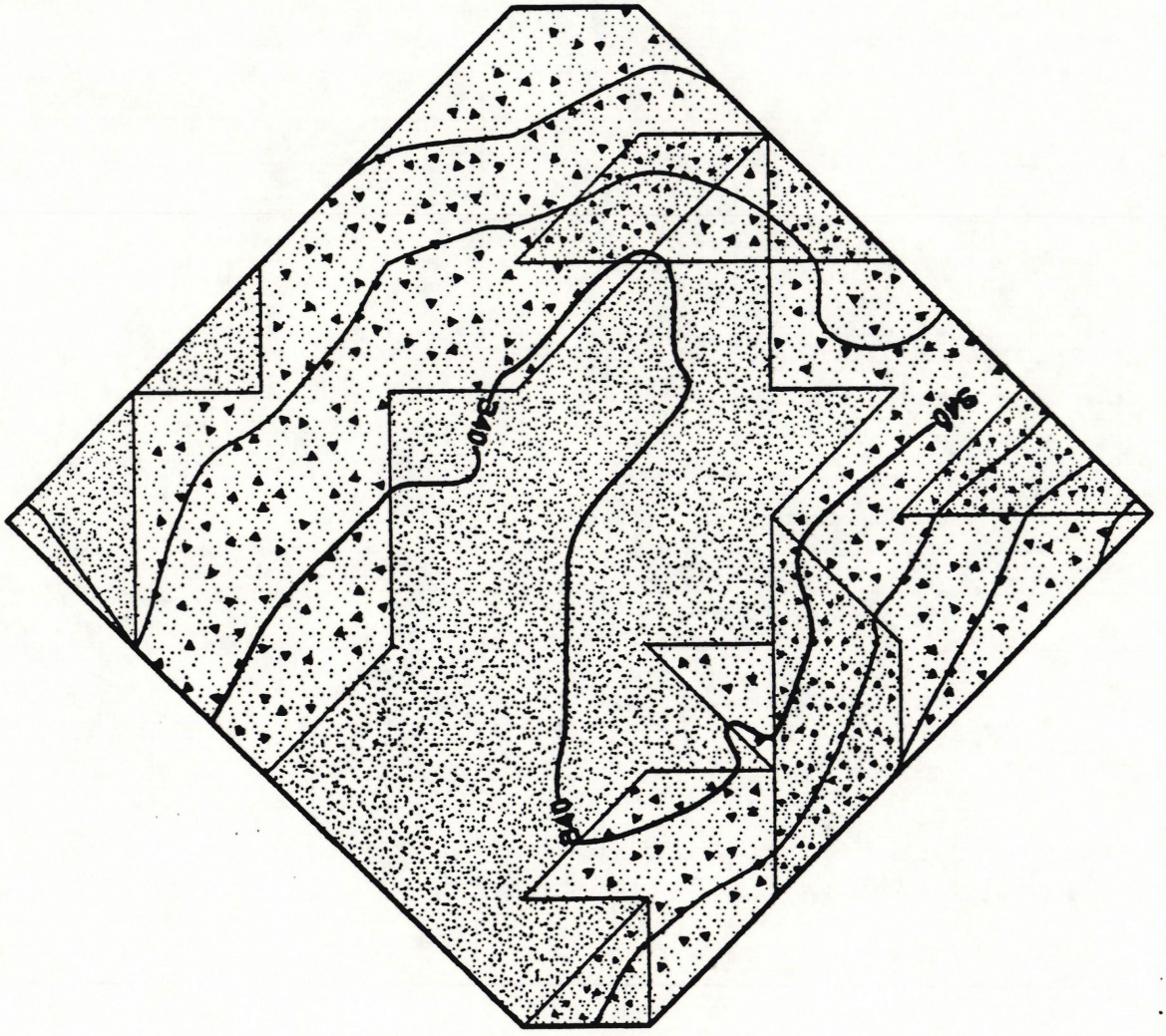


Figure C-1
SLOPE ANALYSIS—SITE A-1
MECO Central Maui Siting Study



SLOPE ANALYSIS
Min sl:0.2%
Max sl:5.5%
Mean sl:2.5%

0.0 %	->	2.0 %	:	39.6%	720000 SQ FT
2.0 %	->	4.0 %	:	48.4%	880000 SQ FT
4.0 %	->	6.0 %	:	12.1%	220000 SQ FT
6.0 %	->	8.0 %	:	0.0%	0 SQ FT
8.0 %	->	10.0 %	:	0.0%	0 SQ FT
10.0 %	->	12.0 %	:	0.0%	0 SQ FT
12.0 %	->	16.0 %	:	0.0%	0 SQ FT
16.0 %	>>		:	0.0%	0 SQ FT
TOTAL AREA					1820000 SQ FT



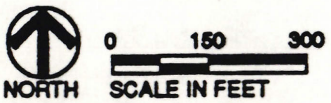
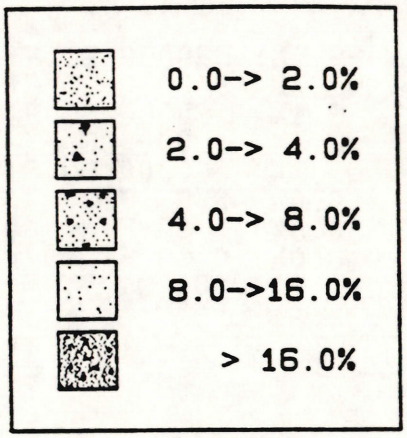


Figure C-2
SLOPE ANALYSIS—SITE A-2
MECO Central Maui Siting Study



SLOPE ANALYSIS
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Max sl:11.8%
Mean sl:4.2%

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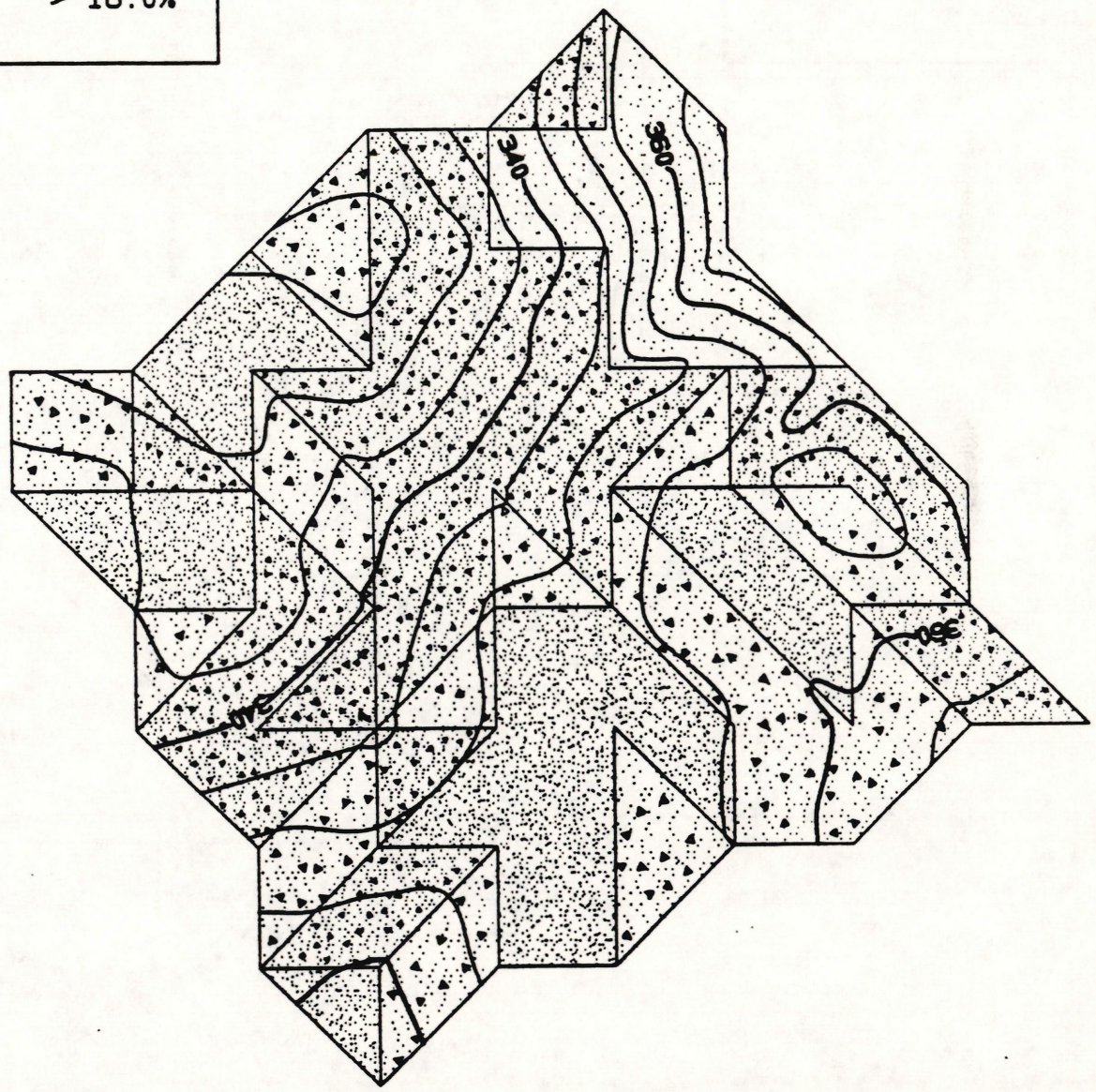
2.0 %	->	4.0 %	:	29.9%	580000 SQ FT
4.0 %	->	6.0 %	:	28.9%	560000 SQ FT
6.0 %	->	8.0 %	:	9.3%	180000 SQ FT
8.0 %	->	10.0 %	:	5.2%	100000 SQ FT
10.0 %	->	12.0 %	:	3.1%	60000 SQ FT
12.0 %	->	16.0 %	:	0.0%	0 SQ FT
16.0 %	>>		:	0.0%	0 SQ FT
TOTAL AREA					1940000 SQ FT



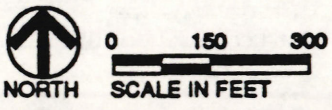


Figure C-3
SLOPE ANALYSIS—SITE A-3
MECO Central Maui Siting Study

SLOPE ANALYSIS
Min sl:0.1%
Max sl:8.5%
Mean sl:2.9%

0.0 %	->	2.0 %	:	29.5%	520000 SQ FT
2.0 %	->	4.0 %	:	53.4%	940000 SQ FT
4.0 %	->	6.0 %	:	9.1%	160000 SQ FT
6.0 %	->	8.0 %	:	2.3%	40000 SQ FT
8.0 %	->	10.0 %	:	5.7%	100000 SQ FT
10.0 %	->	12.0 %	:	0.0%	0 SQ FT
12.0 %	->	16.0 %	:	0.0%	0 SQ FT
16.0 %	>>		:	0.0%	0 SQ FT
TOTAL AREA					1760000 SQ FT

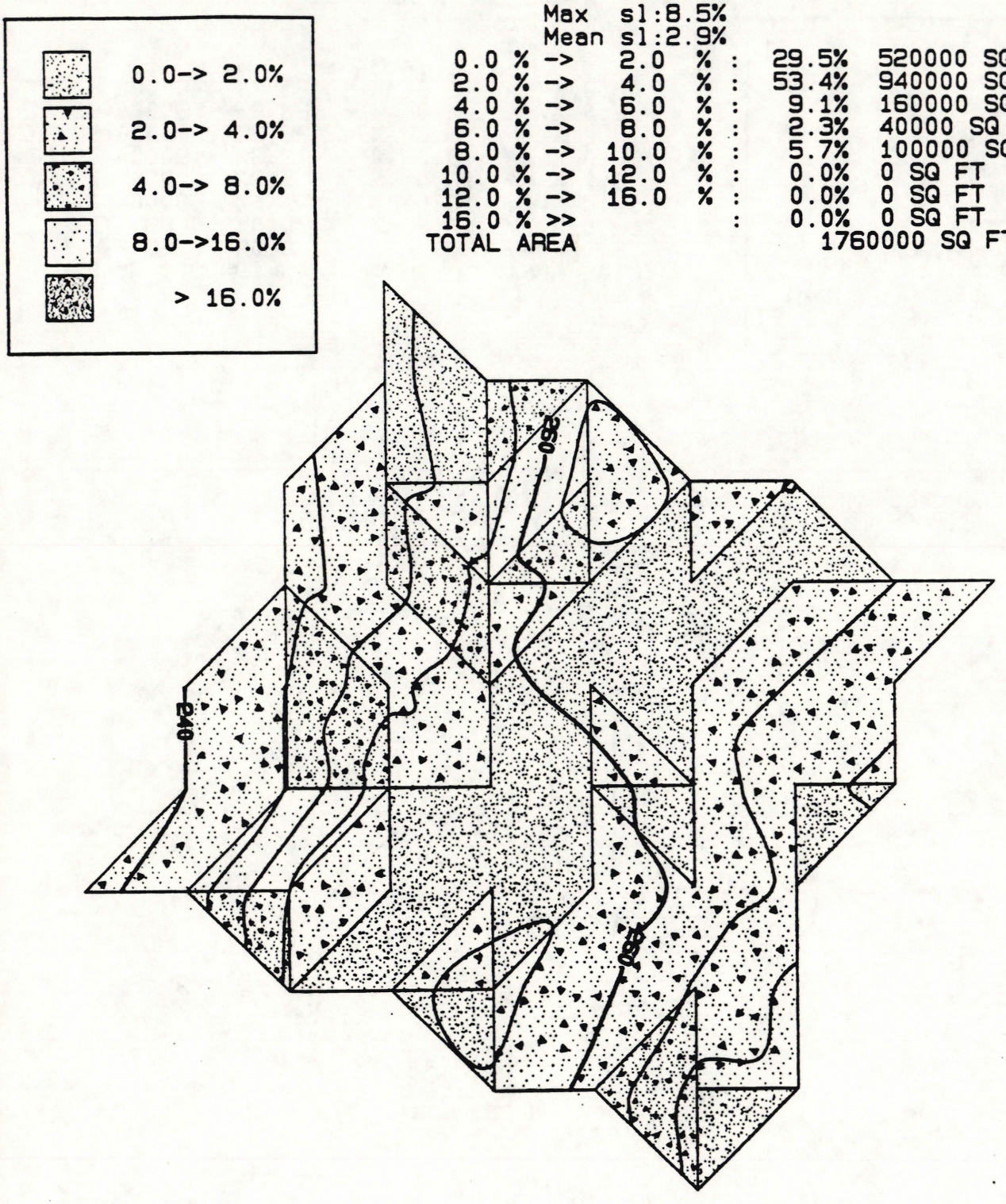
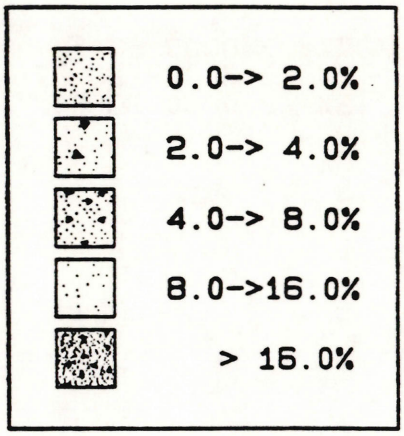


Figure C-4
SLOPE ANALYSIS—SITE B-1
MECO Central Maui Siting Study



SLOPE ANALYSIS
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Mean sl:3.0%

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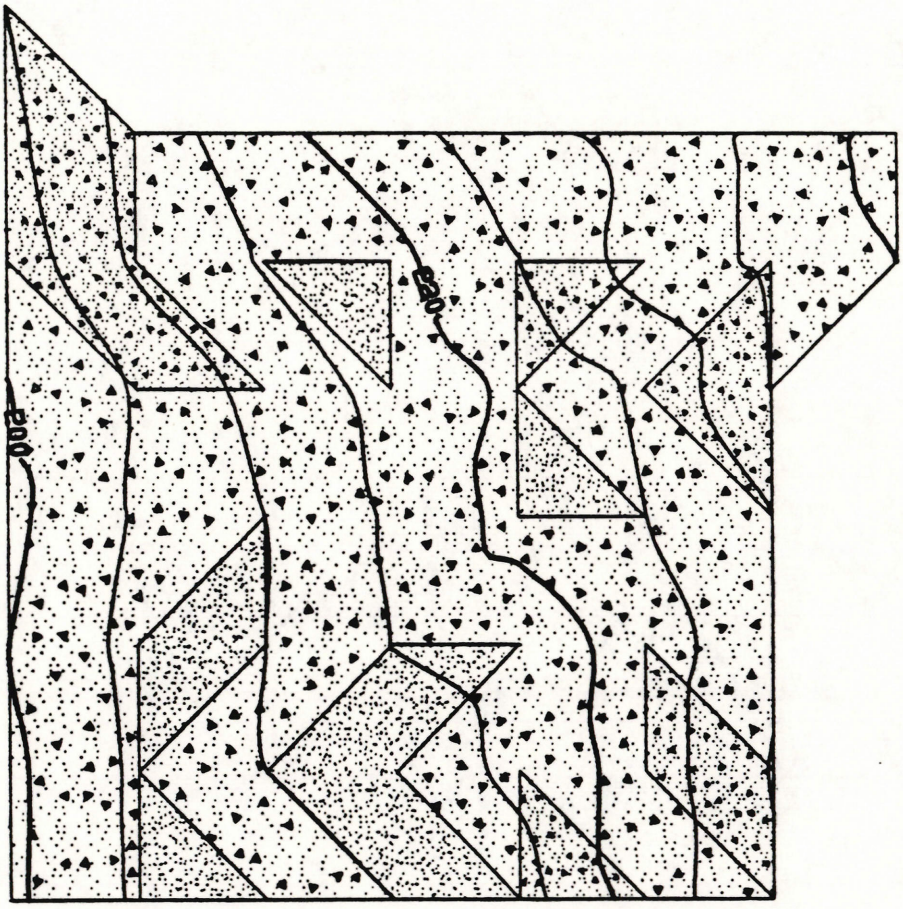
2.0 %	->	4.0 %	:	74.0%	1198947.4 SQ FT
4.0 %	->	6.0 %	:	14.8%	240000 SQ FT
6.0 %	->	8.0 %	:	0.0%	0 SQ FT
8.0 %	->	10.0 %	:	0.0%	0 SQ FT
10.0 %	->	12.0 %	:	0.0%	0 SQ FT
12.0 %	->	16.0 %	:	0.0%	0 SQ FT
16.0 %	>>		:	0.0%	0 SQ FT
TOTAL AREA					1620000 SQ FT



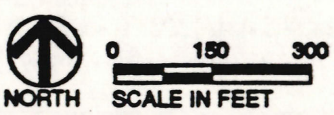
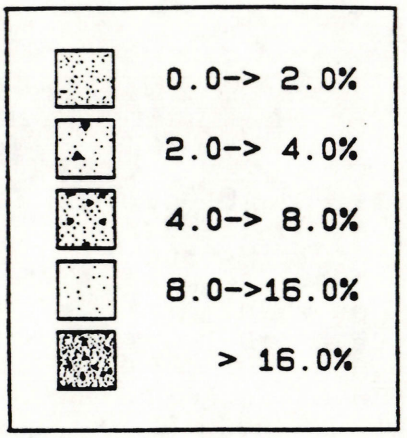


Figure C-5
SLOPE ANALYSIS—SITE C-3
MECO Central Maui Siting Study



SLOPE ANALYSIS
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Max sl:5.7%
Mean sl:2.5%

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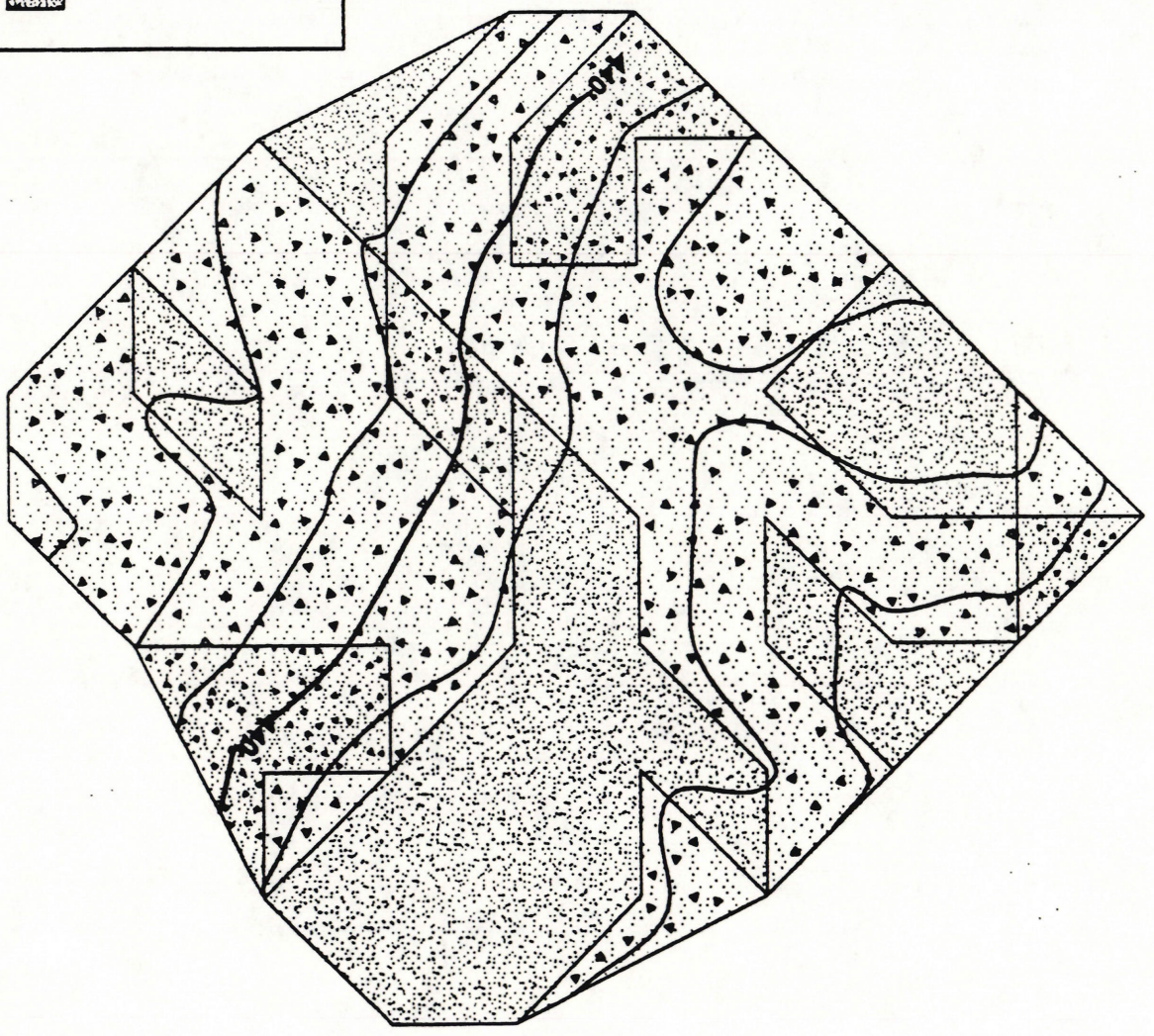
2.0 %	->	4.0 %	:	53.5%	1080000 SQ FT
4.0 %	->	6.0 %	:	11.9%	240000 SQ FT
6.0 %	->	8.0 %	:	0.0%	0 SQ FT
8.0 %	->	10.0 %	:	0.0%	0 SQ FT
10.0 %	->	12.0 %	:	0.0%	0 SQ FT
12.0 %	->	16.0 %	:	0.0%	0 SQ FT
16.0 %	>>		:	0.0%	0 SQ FT
TOTAL AREA					2020000 SQ FT



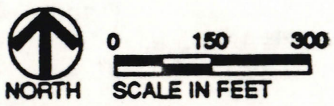


Figure C-6
SLOPE ANALYSIS—SITE D-1
MECO Central Maui Siting Study

Appendix D

Letter Report—Engineering Division

STONE & WEBSTER ENGINEERING CORPORATION

7677 EAST BERRY AVENUE
ENGLEWOOD, COLORADO 80111-2137

ADDRESS ALL CORRESPONDENCE TO P.O. BOX 5406, DENVER, COLORADO 80217-5406

W.U. TWX: 910 935-0105
W.U. TELEX: 45-4401
TELEPHONE: 303 741-7700
RCA TELEX: 289231
FAX: 303-741-7670
303-741-7671

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TAMPA, FL
WASHINGTON, D.C.

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To ROSS SAKUDA	From BOB CHRISTIANSEN
Co.	Co.
Dept.	Phone #
Fax #	Fax #

Letter No. MN-36

May 6, 1993

Mr. Ross Sakuda
Project Engineer
Hawaiian Electric Company, Inc.
820 Ward Avenue
Honolulu, Hawaii 96814

J.O. No. 03366.01

GENPP 1-2

Dear Mr. Sakuda:

1999 GENERATION ADDITION
MAUI ELECTRIC COMPANY, LTD.

In evaluating the five sites that are being considered for the 1999 Generation Addition, SWEC has ranked the sites technically in the following order:

1. Site A-2 — This site is rated the highest to the relative flatness of the site and its location to existing transmission lines and public access roads.

2. Site A-1 — This site generally has the same characteristics as site A-2, however the access road to the plant would have to cross a gulch and the topography is a little more severe than the previous site.

3. Site B-1 — This site is relatively flat, however access to the site would have to be by roads that are currently private. The distance to the existing transmission lines is approximately one mile longer than site A-2.

4. Site A-3 — This site has generally the same characteristics as site B-1, however the topography of the site is more severe.

Letter No. MN-36
Mr. Ross Sakuda
Page 2

May 6, 1993

5. Site C-3 This site is relatively flat, however the distance to existing transmission lines and public roads is over twice as far as the other sites. The distance for fuel delivery is also approximately twice as far as the other four plants.

If you have any questions concerning SWEC's rating of the sites, please call.

R.C. Christianson
Project Engineer

RCC:LVM:RAK

Copy to:
RJung-MECO-3
NShinyama-MECO-4

1.61

HAWAIIAN ELECTRIC COMPANY, INC. PO BOX 2750 HONOLULU, HAWAII 96840

MECO N1
GENPP 1

TELECOPIER COVER LETTER

DATE: May 7, 1993

TO: [redacted]

COMPANY: Belt Collins Associates

CITY & STATE: Honolulu, Hawaii

TELECOPIER NUMBER: 538-7819

CONFIRMING NUMBER:

FROM: Ross Sakuda RHS

CHARGE: YJ-W1126191-510
RA JOB NO. COST TYPE

TOTAL NUMBER OF PAGES, INCLUDING COVER LETTER: 7

Subject: MECO New Site Screening

Attached are correspondences from Stone & Webster and MECO providing the ranking of the five candidate sites based on engineering considerations.

Please pardon the informal format.

We are transmitting from a Rapicom 205 - FAX NO. (808) 543-7519
If you do not receive all the pages, please call (808) 543-7926

ACCESS ROADS

Access roads of this nature generally will cost between $500,000 to $1,000,000 per mile depending upon topography.

SITE A-1 AND A-2

These two sites will be accessed from Pulehu Road (currently a two lane county road) to some point where access can be made from Pulehu Road to the site. Pulehu Road may require improvements in order to deliver fuel to the site. Site A-1 would require crossing Kaliailinui Gulch which may require culverts or a small bridge to complete the crossing. Both access roads would be relatively short with the A-1 site approximately 5/8 mile and the A-2 site approximately 1/4 mile.

SITE A-3

This site will most likely be accessed from Haleakala Highway by means of an access road which would be approximately 1 mile from highway. The access road could follow Upper Division Road which is currently a private road.

SITE B-1

The only access to the B-1 site is by means of private roads. Either Spanish Road or Waikapu Road are the two adjacent roads to the site and would have to be condemned to provide access.

SITE C-3

Access to the C-3 site would be from Mokulele Highway by an approximately two mile access road. Currently there are no access roads to the site either public or private.

FUEL DELIVERY

Fuel delivery will initially be transported to the site via fuel trucks. Once access roads are developed, the only variable cost will be the distance from Kahului Harbor to the sites.

Site	Distance to Kahului Harbor
A-1	5.0 Miles
A-2	4.7 Miles
A-3	6.1 Miles
B-1	4.1 Miles
C-3	10.5 Miles

There is no significant difference in cost of fuel delivery for the first four sites with the cost of fuel delivery to site C-3 being approximately twice as much as the other sites based strictly on mileage.

WATER AVAILABILITY

Based upon Black & Veatch's site study, all sites would be located over aquifers with sufficient capacity to allow groundwater withdrawal, although the quality of the water will differ in the amount of its brackishness, with chloride counts ranging from 200 - 1600 ppm. The groundwater in the area of the Quarry site near the A-1 and A-2 sites is brackish with chloride counts between 200 to 300 ppm. The water quality at site C-3 would most likely have higher chloride counts than the other sites.

GEOTECHNICAL

Very little soils information is available at this time to make a recommendation concerning a particular site over other sites. If the assumption is made that piles are required for any particular site, then a cost of approximately $500,000 can be added to the cost of the facility. The magnitude of other cost factors associated with the plant will far outweigh the impacts from a geotechnical standpoint.

VISIBILITY

Most of the potential sites are located in the island's Central Valley. The surrounding areas are largely agricultural land. If a 65 meter stack is assumed for the facility, a visual impact will be present at any of the sites. The C-3 site is close to the Waiakoa Homesteads and the visual impact may pose public opposition. The remaining sites will be visible from the Puunene and Kahului area however they are further removed from the populated areas.

TRANSMISSION

The A-1 and A-2 sites are near the 69 kV line that runs parallel to Pulehu Road. Sites A-3 and B-1 could also be served by the same 69 kV line, however each would require an addition one mile of transmission line to reach the existing line. SWEC currently does not know the ability of the existing line to carry additional load and a new transmission line may be required for any of the sites. The transmission corridor from the existing lines may have room for any new transmission lines.

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To ROSS SAKUDA	From R. CHRISTIANSON
Co.	Co.
Dept.	Phone #
Fax # 808-543-7519	Fax #

Appendix E

Letter Report—Tom Nance Water Resource Engineering (5-21-1993)

TOM NANCE WATER
RESOURCE ENGINEERING

May 21, 1993
93TN-098 (254-49)

MEMORANDUM

TO: Belt Collins

ATTENTION: Perry White

FROM: Tom Nance

SUBJECT: Alternative MECO Power Plant Sites in Central Maui

This memo briefly discusses groundwater conditions and water supply and disposal prospects for five alternate power plant sites in Central Maui which have been designated A-1, A-2, A-3, B-1, and D-1. The alternate sites are upslope (southeast) of the HC&S mill in Puunene. My earlier (January 19, 1993) memo provided a similar discussion for Site C-3 near Kihei. As I understand it, the power plant's supply and disposal requirements at the alternate sites would be identical to Site C-3. Required supply from onsite wells would be approximately 115 GPM in the initial phase and 460 GPM at full build-out. The disposal rate would be about 60 GPM initially and 240 GPM at full build-out.

Hydrologic conditions and supply and disposal prospects at the alternate sites are similar to Site C-3. In general, points made in my January 19th memo are also appropriate for the alternate sites if they considered with the following site specific information:

1. All sites, including the original Site C-3, are in a broad basal lens covering an area of over 200 square miles. The State classifies this aquifer as the Central Sector comprised of four aquifer systems (Kahului, Paia, Makawao, and Kamaole) with a combined sustainable yield of 27 MGD. However, HC&S pumps about 260 MGD seasonally and approximately 200 MGD as a year-round average. The State's sustainable yield figure ignores the 200 MGD imported by the East Maui Irrigation Ditch and irrigation return flow from sugarcane fields which recirculates the water. These aquifers are not in a groundwater management area. Permits for supply wells at any of these sites can be obtained.

2. Groundwater stands about 4.5 feet above sea level at Site A-1, A-2, A-3, and B-1 and closer to 5 feet above sea level at Site D-1. The lateral and vertical separation of onsite supply and disposal wells depicted on Figure 2 of the January 19th memo is appropriate for the alternate sites.

3. The UIC line runs along Upper Kihei Road. Four of the alternate sites, A-1, A-2, A-3, and B-1, are below the UIC line; Site D-1 is above it. Since Site C-3 was below the UIC line, the discussion on wastewater disposal options in the January 19th memo is appropriate for four of the five alternate sites.

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4. Wastewater disposal for Site D-1 located above the UIC line would be somewhat different. By present UIC regulations, a Class V, Subclass B cooling water disposal well would be allowed, but injected fluids would be limited to cooling water. "Brine" wastewater from a reverse osmosis plant, washdown wastewater, and sewage effluent would have to be disposed in a different manner. After proper treatment, a disposal pit or shallow leaching field would have to be used for these components of the plant's wastewater. EPA is in the process of revising the UIC regulations with a target date of 1995 for implementation. This change may allow all of the plant's wastewater except sewage effluent to be disposed in an onsite well.

5. Although there are no wells in the near vicinity of any of the alternate sites, it can be reasonably anticipated that water quality from onsite supply wells will be somewhat better than at Site C-3. The last column of Table 2 on the January 19th memo listed expected chemical constituents of well water quality at Site C-3. Modifications of these expected constituent levels for the alternate sites are as follows:

   a. Silica (SiO_2) and pH are likely to be similar to C-3 for all five alternate sites.

   b. Nitrate (NO_3) is likely to be lower, perhaps 10 MGL at Sites A-1, A-2, A-3, and B-1 and lower than this at D-1.

   c. Total dissolved solids (TDS), chlorides (Cl), and all other major constituents will be less at the alternate sites. Chlorides and TDS may be on the order of 250 and 700 MGL, respectively, at Sites A-1, A-2, A-3, and B-1. At Site D-1, chlorides of 150 MGL and TDS of 450 MGL are expectable. At this site, the water quality may meet EPA and State DOH standards for drinking water.

6. HC&S irrigation ditches and feeder flumes and pipelines are in reasonable proximity to all five alternate sites. The Lowrie Ditch runs from northeast to southwest upslope of all of the sites and passes directly adjacent to Site D-1. Depending on MECO's inclinations and HC&S' receptiveness, these ditches might provide supply and/or disposal alternatives to onsite supply and disposal wells.

Appendix F

Letter Report—Tom Nance Water Resource Engineering (1-19-1993)

TOM NANCE
WATER RESOURCES ENGINEERING

January 19, 1993
93TN-003 (254-49)

MEMORANDUM

TO: Belt Collins & Associates
Attention: Perry White

FROM: Tom Nance

SUBJECT: Permitting Issues for Water Supply and Wastewater Disposal for Maui Electric Company's Proposed Combustion Turbine Power Plant at the Lower Puunene Airport Site in Kihei, Maui

This memo addresses the issues involved in obtaining process and potable water for and disposing of wastewater from a proposed 224 MW power generation facility to be located on a 50-acre site (portion of TMK 3-8-04:02) in Kihei, Maui. The site is bounded by upper Kihei Road on its eastern side and by HC&S cane fields on all other sides. Figure 1 shows the site in relation to existing wells other features discussed in this memo.

Supply and Disposal Requirements of the Power Plant

To quantify the supply and disposal requirements of the Kihei plant, flowrates of Units 14, 15, and 16 at the Maalaea power plant, as detailed in a water balance by Stone and Webster Engineering (Drawing No. 88804), have been used. These three units at Maalaea form one 56 megawatt (MW) combined cycle power plant. This combination is essentially identical to the first phase of the proposed Kihei plant. Full build-out at Kihei would consist of four such combined cycle units for a total of 224 MW. At Maalaea, process water is supplied by a reverse osmosis plant which uses onsite brackish well water as the feedwater supply. Drinking water uses are supplied by the County Department of Water Supply (DWS) system. In Kihei, the brackish feedwater is likely to be somewhat better quality than at Maalaea, but drinking water may not be available from the DWS system. On Table 1, prospective supply requirements at Kihei with and without drinking water from the DWS system are summarized.

For the 56 MW first phase, 60 gallons per minute (GPM) of process water is required, 54 GPM for the combustion turbine and 6 GPM for the heat recovery turbine. Assuming this is supplied by onsite brackish wells and demineralized by reverse osmosis, the required feedwater supply rate would be 104 GPM. The reverse osmosis process would produce 44 GPM of "brine" wastewater for disposal. Regarding the process water, the 6 GPM through the heat recovery generator would be collected for disposal and the 54 GPM through the combustion turbine would be lost to atmosphere. Another 5.5 GPM supply is required for miscellaneous washdown uses, showers, sinks, and toilets. If the RO plant also provides this supply rather than the DWS system, the brackish feedwater would be increased by 9.5 GPM. At full build-out of the Kihei plant, all of these rates would be four times greater.

If an allocation for the various washdown uses was available from DWS, it would be necessary to extend a 7000-foot long connecting pipeline across HC&S property and to boost the pressure in this line to achieve a satisfactory service pressure at the power plant site. It is undoubtedly more practical to simply provide the drinking water supply with the RO plant. The discussion that follows assumes that this is the choice.

Table 1

Water Supply and Wastewater Disposal Quantities
for the Proposed Lower Puunene Combined Cycle Power Plant

Parameter	Initial Phase - 56 MW		Full Build-Out - 224 MW	
	All Supply From Onsite Wells (GPM)	Supply by Onsite Wells and County DWS (GPM)	All Supply From Onsite Wells (GPM)	Supply by Onsite Wells and County DWS (GPM)
Supply by County DWS	0	5.5	0	22
Onsite Well Supply	113.5	104	454	416
Loss to Atmosphere	54	54	216	216
Wastewater Streams for Injection Disposal				
- Reverse Osmosis "Brine"	48	44	192	176
- Equipment Drains	1.0	1.0	4.0	4.0
- Inside Service Water	2.5	2.5	10.0	10.0
- Showers, Sinks, & Toilets	1.0	1.0	4.0	4.0
- Heat Recovery Steam Generator	6.0	6.0	24.0	24.0
Total for Injection Disposal	58.5	54.5	234	218
Outside Service Water	1.0	1.0	4.0	4.0

Notes:

1. Assumes sanitary wastewater will be treated by septic tank and sand filtration prior to injection disposal.
2. Outside service water would be disposed of in the stormwater disposal system.
3. The quantities above do not include landscape irrigation since no information on the extent of landscaping was available. The quality of water from onsite brackish wells is adequate for direct irrigation use if salt-tolerant plants are selected.

Table 2

Water Quality at Nearby Wells and Prospective Quality From Wells Onsite

Constituent	Unit	HC&S Pump No. 3 (Shaft 15; State Well No. 4825-01)							HC&S Pump No. 1 (Shaft 14, State Well No. 4727-01)				Prospective Onsite Well Water Quality
		6-18-68	1-20-69	4-8-69	8-7-69	10-30-69	1-13-70	4-14-72	6-18-68	4-8-69	8-7-69	1-13-70	
SiO_2	MGL	52	62	66	33	59	54	58	45	48	29	50	60
Ca	MGL	20	19	20	22	21	24	21	36	21	40	46	22
Mg	MGL	37	34	41	34	41	43	35	39	37	45	52	40
Na	MGL	260	208	250	260	260	205	275	343	260	384	300	270
K	MGL	20	15	20	21	8.6	19	19	20	18	10	20	20
HCO_3	MGL	305	300	312	316	320	300	333	452	288	440	360	320
SO_4	MGL	58	42	50	64	55	34	53	75	50	72	44	60
Cl	MGL	335	262	315	328	340	273	335	460	340	483	455	335
F	MGL	1.7	0.7	0.9	0.6	2.2	2.8	0.8	2.8	0.9	0.6	3.3	1.5
NO_3	MGL	23	16	17	17	14	13	18	21	16	18	15	17
TDS	MGL	976	815	937	955	961	818	978	1290	934	1310	1170	975
Carbonate Hardness	MGL	203	168	220	194	220	230	197	250	204	284	328	220
pH	pH Units	7.2	7.7	7.7	7.7	7.5	7.5	8.0	7.0	8.1	7.5	7.5	7.7
Temperature	°C	23.5	24.0	24.0	23.5	23.5	23.0	--	25.0	24.0	24.5	24.3	24.0
Laboratory	UH	UH	UH	UH	UH	UH	UH	USGS	UH	UH	UH	UH	--

Sources: Tenorio, P.A., R.N.F. Young, N.C. Burbank, and L.S. Lau. 1970. Identification of Irrigation Return Water in the Subsurface. Technical Report 44, Water Resources Research Center, University of Hawaii.

Swain, L.A. 1973. Chemical Quality of Ground Water in Hawaii. Report R48, Division of Water and Land Development, Department of Land and Natural Resources, State of Hawaii.

Prospects for Onsite Well Development

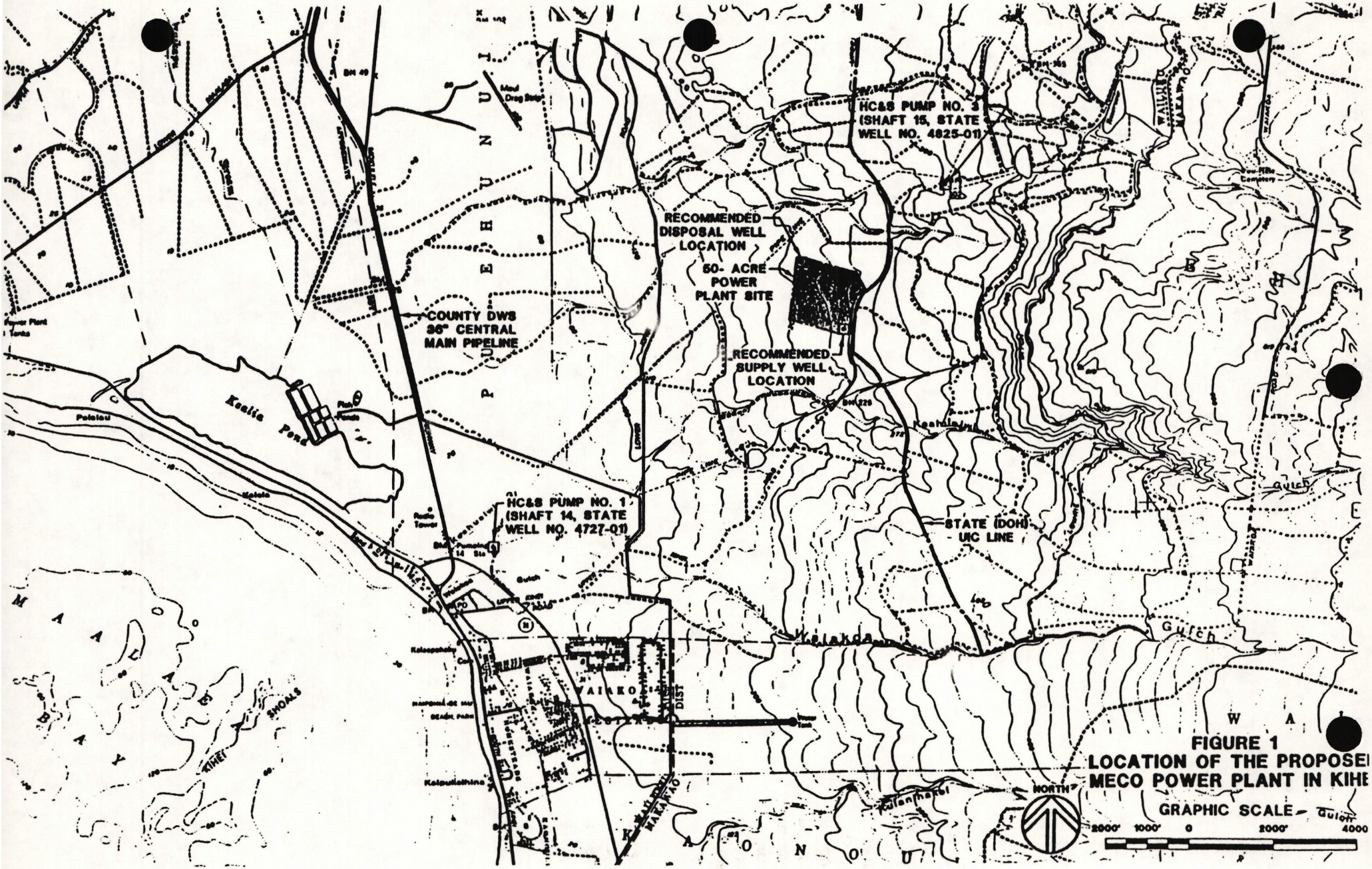
HC&S has two major groundwater pumping facilities in the general vicinity of the power plant site. The water these produce provide the best indication of the prospective quality from onsite wells (Figure 1 locates these wells). HC&S' Pump 3, also known as Shaft 15 and State well no. of 4825-01, is 3000 feet northwest of the power plant site. It can produce up to 20 million gallons per day (MGD) and typically averages 14 to 15 MGD year-round. The well is actually a network of skimming tunnels and drilled wells which feed by gravity into two pump sumps. HC&S' Pump 1, also known as Shaft 14 and State Well No. 4727-01, is located further from the project site and is relatively close to the shoreline. It also is a system of skimming tunnels and drilled wells which deliver water to pump sumps, but at a far less rate of about 3 MGD.

Available water quality analyses of these wells are compiled on Table 2. Although all of these are more than 20 years old, they are believed to still be representative of present conditions. Based on this information and considering the configurations of these pumping facilities, the anticipated quality of water from wells developed on the power plant site is shown in the last column of the table. At the prospective supply requirements of about 115 GPM for the first phase and 455 GPM at full build-out, all supply could be provided by one well. However, it would be prudent to develop a second well to provide back-up capacity. At this location, groundwater exists as a basal lens with a water level standing about four feet above sea level. If each well is drilled 25 to 40 feet below sea level, the desired yield should be obtainable with minimal drawdown and consistent water quality.

Wastewater Disposal Options

There are three basic disposal options to consider: surface disposal using a natural drainageway; subsurface disposal in a leaching field; or deep disposal in a drilled well. If surface disposal is pursued, the small amount of sanitary wastewater would have to be disposed of separately in a leaching field. All the natural drainageways within and adjacent to the power plant site flow naturally into Kealia Pond which is home to a number of endangered species. Overflow from the pond into coastal waters occurs during large runoff events. A number of potentially controversial environmental issues would be raised for disposal into Kealia Pond and the possible overflow into coastal waters is likely to trigger an NPDES permit. Department of Health staff were questioned regarding this, but they were unwilling to make a commitment about an NPDES without additional information. Since less controversial and more efficient disposal options do exist, I would avoid pursuing this one.

A shallow leaching field to ultimately dispose up to 220 GPM would require an extensive area and would not offer an easy opportunity for remedial maintenance when and if it is needed. In comparison, disposal in deep wells would provide far greater capacity and easy methods of remediation. One well could easily handle the entire disposal requirement, but construction of a second, backup well would be prudent and also likely to be required by regulatory authorities. If disposal wells are used, it will be important to minimize, if not avoid entirely, recirculating wastewater back to the supply wells. This can be accomplished by creating as much lateral and vertical separation as practical. Recommended well locations on Figure 1 would provide the lateral separation. Vertical separation should be accomplished with the respective well depths shown schematically on Figure 2. Supply wells should draw from the uppermost part of the lens and the disposal wells should be extended into the transition or saline zone of the lens. The horizontal-to-vertical permeability contrasts typical of Hawaiian lava flows will help in avoiding recirculation.


HC&S PUMP NO. 3
(SHAFT 15, STATE
WELL NO. 4825-01)
RECOMMENDED
DISPOSAL WELL
LOCATION
50- ACRE
POWER
PLANT SITE
COUNTY DWS
36" CENTRAL
MAIN PIPELINE
RECOMMENDED
SUPPLY WELL
LOCATION
HC&S PUMP NO. 1
(SHAFT 14, STATE
WELL NO. 4727-01)
STATE (DOH)
- UIC LINE
Keelia Pond
Paloiau
Kealia
Kihei
Waiakoa
Waiakoa
Gulch
Waiakoa
Gulch
Kalepaloa
Kalepaloalihina
Kaukahi
Kaukahi
Kaukahi

FINAL

ENVIRONMENTAL SCREENING AND SITING REPORT

for the

CENTRAL MAUI GENERATION PROJECT

prepared for

MAUI ELECTRIC COMPANY, LIMITED

prepared by

DAMES & MOORE

April 8, 1995

PREFACE

This document is an Environmental Screening/Siting Report (ESSR) prepared to assist Maui Electric Company, Limited, (MECO) to select a preferred site for a proposed nominal 232 megawatt (MW) electrical power generation facility. This ESSR is intended as an "in-house" tool to assist MECO during site selection and landowner consultation. It is one element of a body of studies and reports that have provided input to the site selection process.

An ESSR is an informational document, a source that MECO can turn to for input regarding the history of the site selection process, sites previously evaluated and carried forward or eliminated from further evaluation, as well as initially identified environmental, cost, and regulatory issues associated with each candidate site currently under consideration. The information provided in this document represents a level of detail sufficient to distinguish identified candidate sites from one another, to the extent meaningful differences between sites exist. The information contained in this report is not exhaustive, nor is it unnecessarily detailed. The ESSR will provide MECO the most currently-available relevant information and conclusions regarding candidate sites.

The ESSR is one element of the site selection process, which is in turn a component of the more comprehensive project development process. Once the preferred site is selected and terms negotiated with the landowner, MECO will proceed with project planning, environmental review, permitting, design, construction, and operation of the proposed generation facility.

In order to serve as an effective decision-making tool, this ESSR contains the following:

- A Table of Contents.
- An Executive Summary to serve as either an alternative to reading the entire document, or to familiarize the reader with the contents of the full ESSR prior to reading.
- An introduction which describes the purpose of the current environmental screening/siting study (ESSS), the proposed action and facilities requirements, a description of candidate sites, and a brief history of the site selection process to date.
- A description of the methods and approach employed for the ESSS.
- A detailed description of factors used in the current study to evaluate candidate sites.
- A discussion of candidate site evaluation and results.
- Recommendations for site selection, as well as for further study, analysis, and consultation.
- A list of persons and materials referenced for this study.

The text of this document is followed by, in order, tables, figures, and appendices.

TABLE OF CONTENTS

EXECUTIVE SUMMARY **ES-1**

1.0 INTRODUCTION **Page-1**
1.1 PURPOSE OF THE ENVIRONMENTAL SCREENING/SITING STUDY (ESSS) Page-1
1.2 PROJECT DESCRIPTION Page-1
1.3 DESCRIPTION OF CANDIDATE SITES Page-2
1.4 BACKGROUND OF PROJECT SITING EFFORTS Page-3

2.0 METHODS OF THE CURRENT STUDY **Page-6**
2.1 CONCEPTUAL BOUNDARIES Page-6
2.2 ENVIRONMENTAL ISSUE AREAS, DATA FACTORS, AND EVALUATION CRITERIA Page-6
2.3 DATA REVIEW Page-7
2.4 BASELINE INVENTORIES/DISCIPLINE REPORTS Page-8
2.5 ENVIRONMENTAL SCREENING/SITING ANALYSIS Page-8

3.0 DESCRIPTION OF DATA FACTORS **Page-10**
3.1 LAND OWNERSHIP, REGULATION, AND USE Page-10
3.2 AIR QUALITY Page-11
3.3 SOILS Page-11
3.4 GROUNDWATER Page-12
3.5 SURFACE WATER Page-13
3.6 NOISE Page-13
3.7 AESTHETICS Page-14
3.8 BIOLOGY Page-14
3.9 CULTURAL RESOURCES Page-14
3.10 TOPOGRAPHY Page-15
3.11 NATURAL HAZARDS Page-15
3.12 HAZARDOUS WASTE/MATERIALS Page-15
3.13 ENGINEERING CONSIDERATIONS Page-16
3.14 TRAFFIC/TRANSPORTATION Page-16

TABLE OF CONTENTS
(CONTINUED)

4.0 EVALUATION OF CANDIDATE SITES Page-18
4.1 FATAL FLAW EVALUATION Page-18
4.2 COMPARATIVE SITE EVALUATION: SITE SCORES Page-18
4.2.1 Land Ownership, Regulation, and Use Page-19
4.2.2 Air Quality Page-21
4.2.3 Soils Page-21
4.2.4 Groundwater Page-21
4.2.5 Surface Water Page-23
4.2.6 Noise Page-23
4.2.7 Aesthetics Page-24
4.2.8 Biology Page-24
4.2.9 Cultural Resources Page-25
4.2.10 Topography Page-25
4.2.11 Natural Hazards Page-25
4.2.12 Hazardous Waste/Materials Page-26
4.2.13 Engineering Considerations Page-26
4.2.14 Traffic/Transportation Page-27
4.3 COMPARATIVE SITE EVALUATION: OVERALL SITE RANKS, NORMALIZED SCORES, AND SENSITIVITY ANALYSIS Page-28
4.3.1 Overall Site Ranks Page-28
4.3.2 Normalized Site Scores Page-28
4.3.3 Sensitivity Analysis Page-28

5.0 RECOMMENDATIONS Page-30
5.1 RECOMMENDATIONS FOR CANDIDATE SITES Page-30
5.2 RECOMMENDATIONS FOR FURTHER STUDY, ANALYSIS, CONSULTATION Page-30

6.0 REFERENCES Page-33

TABLE OF CONTENTS
(CONTINUED)

TABLES

2-1 Environmental Issue Areas, Data Factors, Weights
4-1 Analysis of Candidate Sites
4-2 Sensitivity Analysis

FIGURES

1-1 Vicinity Map, Project Study Area
1-2 Location Map, Candidate Sites
4-1 Site A1
4-2 Site A2
4-3 Site D1
4-4 Ameron Mining Areas

APPENDICES

A Groundwater
B Surface Water
C Noise
D Botany
E Wildlife
F Archaeology and History
G Natural Hazards
H Environmental Site Assessment (Phase I PSA)
I Traffic/Transportation

EXECUTIVE SUMMARY

Maui Electric Company, Limited (MECO) proposes to design, construct, and operate a nominal 232 megawatt (MW) electrical generation facility. A series of siting studies have been conducted which served to identify the most suitable areas of Maui for such a facility. Results of these studies indicate the Central Maui region has most desirable combination of characteristics for a new generation plant. Previous studies have narrowed the range of acceptable candidate sites to four: A1, A2, D1, and C3. One site, C3, already underwent an environmental screening evaluation. The current Environmental Screening and Siting Study (ESSS) evaluates the remaining three candidate sites.

The current study evaluates Sites A1, A2, and D1 for the following for nine environmental issue areas, identified by MECO as important to their site selection process, and also generally regarded as critical issues to be evaluated in the siting of industrial facilities:

- groundwater
- surface water
- plants
- wildlife
- archaeology
- traffic
- hazardous materials/waste
- natural hazards
- noise

Air quality is an important environmental issue which will influence the site selection process. The results of current air modelling efforts, not available for inclusion to this study, will be incorporated into the site selection process as these results are available.

The nine appendices to this document are memo reports, one for each environmental issue area, which characterize each candidate site, and comparatively evaluate the three sites relative to environmental issue areas. In addition, this study investigates issues related to adjacent land uses which could affect the siting process. Finally, in order to provide a comprehensive and intelligible document with which to evaluate the three candidate sites, and in order to leverage existing studies to the extent possible, the current study incorporates, as appropriate, relevant findings of the most recent past siting evaluation. The current study first evaluates candidate sites for fatal flaws, then comparatively evaluates viable candidate sites (i.e., those not fatally flawed) on the basis of environmental issues.

Results indicate that none of the three candidate sites is fatally flawed. Of the three viable candidate sites evaluated during the current study, Site A2 is the least environmentally constrained and the most preferred location for the proposed project, followed by Site A1, then Site D1.

A comparative evaluation of all four remaining candidate sites including Site C3, or alternatively of Site A2 and Site C3, has not been conducted to date, and is recommended. It is also recommended the most current air quality information be incorporated into future comparative evaluations as that information is made available.

1.0 INTRODUCTION

This introduction provides information regarding the purpose of the current ESSS, a description of the proposed action and facilities requirements, a description of candidate sites evaluated during the current study, and a brief history of the site selection process to date.

1.1 PURPOSE OF THE ENVIRONMENTAL SCREENING/SITING STUDY (ESSS)

The primary purpose of this ESSS is to assist Maui Electric Company, Limited (MECO) to select a preferred site for a proposed nominal 232 MW electrical power generation facility. More specifically, this exercise provides a comparative analysis of three candidate sites relative to environmental issue areas identified as important to MECO's site selection decision-making process. Candidate sites assessed in this study are A1, A2, and D1; the general project area as well as the location of each project site are shown on Figures 1-1 and 1-2, following the text and tables of this report. After the most preferred of the three candidate sites is identified, an additional comparative analysis will be conducted between that site and a candidate site located near Kihei, Site C3. The results of that comparative assessment will identify the final preferred site.

In order to achieve the intended purpose of this study, results of the current analysis should be synthesized with results of ongoing air quality studies to provide adequate information for all environmental site selection factors.

1.2 PROJECT DESCRIPTION

Maui Electric Company, Limited proposes to design, construct, and operate a nominal 232 MW electrical generation facility. The need for this proposed project is established by the *MECO Generating Unit Type and Size Study* (Hawaiian Electric Company, Inc. (HECO), 1990). In addition, MECO intends to relocate its transmission and distribution (T&D) base yard from its current location in Kahului to the selected site. Therefore, the project will comprise both production and T&D facilities. Initial planning indicates a site requirement of approximately 50 acres for the proposed facility.

Major elements of the proposed project include the following:

Generation/transmission

- four diesel oil-fired nominal 58 MW dual-train combined cycle units, exhausted to two Good Engineering Practice (GEP) four-flue stacks
- four steam turbines
- four air-cooled condensers

- four control houses
- a control room, including control equipment, offices, file room, kitchen, rest rooms, showers, lockers, and meeting room
- supply wells
- water treatment facility
- wastewater treatment facility
- evaporation ponds, approximately four acres
- injection wells
- water and air laboratory
- maintenance shop, including offices, showers, lockers, rest rooms, 10-ton overhead crane, compressor, welding area, machinist area, automotive/electric cart area, steam clean area, sand blasting shed, lunch room, parts storage area, and electronic maintenance room
- warehouse, including offices, rest room, storage room, racks, bins, and one elevated loading dock
- relay building
- switch yard, approximately 350 by 200 feet

Fuel

- 8.63 million gallons (MG) of fuel storage in seven 70-foot diameter by 40-foot high and two 50-foot by 40-foot tanks
- fuel unloading area

Administration

- one building, including offices, conference/training room, computer room, lunch room, rest rooms, file rooms, and lobby/reception area

T&D

- warehouse, including offices, training/conference room, lunch room, file room, staging assembly area, parts storage, shop, truck wash area, showers, lockers, rest rooms
- approximately five acres of outdoor storage
- 80 parking stalls for company vehicles
- gasoline storage area

1.3 DESCRIPTION OF CANDIDATE SITES

The current study evaluates three candidate sites, which were identified in prior studies as worthy of additional evaluation. These sites are portrayed on Figure 1-2, following the text and tables of this document.

Site A1 is generally located north of Upper Division Road, approximately 2000 feet east of Pulehu Road, and east of Kalialinui Gulch. Site A1 is approximately 2000 feet southeast of the Central Maui Landfill. Site A1 is a portion of TMK 3-8-03:4, a 2606-acre parcel owned by Alexander and Baldwin,

Inc. (A&B-Hawaii), with a leasehold interest by Ameron Honolulu Construction & Dray (HC&D). Ameron operates a quarry on a portion of the parcel, and A&B's subsidiary, HC&S, cultivates sugar cane on the remainder. An "out parcel," formerly the original Ameron quarry site, is now the Central Maui Landfill, operated by the County of Maui; the County is currently proceeding with development of Phases 4, 5, and 6 of the landfill which will be located between Pulehu Road and Kalialinui Gulch. In addition, a waste incinerator is currently being evaluated for the site.

Site A2 is generally located north of Waikapu Road, approximately 1500 feet west of Pulehu Road, and 0.4 mile southwest of Site A1. Site A2 is a portion of TMK 3-8-03:1, a 1071-acre parcel owned by A&B. The site is currently cultivated in sugarcane by HC&S.

Site D1 is located at the northwest quadrant of Pulehu Road and Lowrie Ditch Road, and 1.0 mile south of Site A1. Site D1 is a portion of TMK 3-8-03:2, a 1539-acre parcel owned by A&B. A meteorological station is located on this site, which is accumulating data representative of the three candidate sites. The site is currently cultivated in sugarcane by HC&S.

1.4 BACKGROUND OF PROJECT SITING EFFORTS

The current study builds upon and is the latest addition to a body of work intended to assist development of the proposed project. In addition, ongoing air analyses will add to the existing knowledge base utilized for site selection.

Several siting studies and site assessments have been accomplished to date, each adding an additional level of information to the site selection process, and each affecting the range of candidate sites under consideration. In addition, landowner preferences have resulted in revision of the range of candidate sites under consideration.

1989

An island-wide site selection study was conducted by Stone & Webster in February, 1989. This study assessed ten candidate sites. Of these, three were identified as viable candidate sites for accommodating new generation units: Kahului Power Plant, Puunene HC&S Mill, and Maalaea Power Plant.

1991

A generating facility siting study conducted by Black & Veatch in 1991 identified central Maui as the most appropriate location for a new, stand-alone (not a unit addition to an existing production unit) electrical generation facility. The *Candidate Sites Report and Preferred and Alternate Site/Technology Report* (Black & Veatch, 1991a, b) identified the preferred site as the "Quarry Site," in the general vicinity of Site A1 of the current study, and the alternate site as the "Puunene Airport Site," not assessed in the current study.

1992

Further evaluation of the preferred Quarry and alternate Puunene Airport sites by MECO as well as by the landowner and its subsidiary, A&B-Hawaii and HC&S, respectively, resulted in identification of concerns regarding both sites. In light of these concerns, A&B-Hawaii offered a new land parcel for evaluation and possible purchase by MECO, Site C3. Site C3 is located approximately two miles southeast of the alternate Puunene Airport Site identified in the 1991 Black & Veatch study.

In December, 1992 Belt Collins & Associates conducted an environmental screening of Site C3, comprising four investigations: botany, wildlife, acoustics, and archaeology. The purpose of the environmental screening was to identify potential environmental "fatal flaws" of the site. None were identified, and Site C3 remained a viable candidate site for consideration, and for further environmental evaluation.

1993

Further site evaluations were accomplished in 1993. Belt Collins Hawaii conducted a Phase I Preliminary Site Assessment (PSA, also known as a Phase I Environmental Site Assessment, or ESA) of Site C3, which concluded that no observable evidence exists to indicate the presence of hazardous substances in site soil or groundwater. (Belt Collins, 1993)

Tom Nance Water Resources Engineering assessed groundwater supply and disposal issues for Site C3. This assessment did not identify any substantial groundwater concerns associated with Site C3. (Tom Nance, 1993)

Trinity Consultants, Inc. utilized estimated project emission data in conjunction with known permitted uses to assess effects and permitting issues associated with siting the proposed project within the Central Maui region. This analysis identified areas of moderate, higher, and highest difficulty of air permitting for the proposed project. No areas within Central Maui were found to have a low level of permitting difficulty. (Trinity Consultants, 1993)

1994

Information from previous studies was used by Belt Collins Hawaii to identify ten candidate sites within the Central Maui region potentially suitable for evaluation. Of the ten candidate sites, six were determined to be viable, and were evaluated for a variety of environmental factors. The 1994 *MECO Central Maui Siting Study* identified Sites A1, A2, and D1, in rank order, as most preferred. At 74.9 percent, the normalized score of Site C3 placed it substantially below that of Site A1 (normalized score of 100). (Belt Collins Hawaii, 1994)

Also during 1994, meteorological towers were placed at two locations to collect ambient data. One station is located on Site C3; another is located on Site D1 at the northwest quadrant of Lowrie Ditch and Pulehu Road, and is representative of Sites A1, A2, and D1.

1995

The current study was initiated in January, 1995. The intent of the study is to evaluate the three preferred sites identified in the 1994 *MECO Central Maui Siting Study*–A1, A2, and D1–for environmental factors important to MECO, and to evaluate the sites to a level of detail similar to the evaluation of Site C3 by Belt Collins and their subconsultants in 1992 and 1993. The current study incorporates findings of the 1994 *Central Maui Siting Study* without change, as appropriate, or refines and incorporates findings of that study as appropriate.

The study team for this ESSS effort includes the following firms and subconsultants:

- Dames & Moore
- Char & Associates
- Dr. A. Chiu, et al.
- Cultural Surveys Hawaii
- T.J. Ohashi

2.0 METHODS OF THE CURRENT STUDY

This section described steps taken and methods used in the current study to evaluate and comparatively rank candidate sites A1, A2, and D1. General study steps taken in approximate chronological order are as follows:

- Develop conceptual boundaries
- Develop data factors and evaluation criteria
- Obtain and review existing information
- Conduct baseline inventories and develop discipline reports
- Rank sites/develop screening report

2.1 CONCEPTUAL BOUNDARIES

Hawaiian Electric Company, Inc. (HECO) Engineers developed a conceptual layout for a nominal 232 MW generation facility, which will fit within a typical, generally square, 50-acre site. After reviewing the area of the Central Maui region in the vicinity of Sites A1, A2, and D1, HECO and Dames & Moore personnel identified three 50-acre sites which could be appropriate for development of the proposed project. The three candidate sites are either coterminous with or near the original location of the three candidate sites as described in the 1994 *Central Maui Siting Study*. Major factors considered in the development of these conceptual boundaries included proximity to previous boundaries for the three sites, proximity to existing roadways, and minimizing effects to agricultural operations. These three sites are shown on Figure 1-2.

2.2 ENVIRONMENTAL ISSUE AREAS, DATA FACTORS, AND EVALUATION CRITERIA

For purposes of this ESSS, the following definitions are utilized:

- ***Environmental issue areas*** are broad areas of concern or interest in the siting of a proposed facility (e.g., groundwater).
- ***Data factors*** are subsets of environmental issue areas that represent specific interest areas related to the more broad issue areas. For example, for the issue area of groundwater, supply availability and disposal options would be two of several data factors. If no subset of an environmental issue area exists, the issue area itself is considered a data factor.
- ***Evaluation criteria*** are those specific elements used to measure the suitability of a candidate site in relation to any data factor. For example, groundwater supply availability at a specific candidate site can be measured as a function of depth to groundwater, cost to construct supply wells, well capacity/yield, etc.

A summary of environmental issue areas, data factors, assigned weights, and evaluation criteria is presented in Table 2-1, following the text of this document; detailed descriptions of all data factors and weights are provided in Section 3.

Maui Electric Company, Limited recommended nine general environmental issue areas be investigated for each candidate under the current ESSS. Candidate sites were either not evaluated for these issue areas during previous studies, or are subject to more in-depth investigation of these issue areas under the current ESSS. The nine environmental issue areas are as follows:

- groundwater
- surface water
- plants
- wildlife
- archaeology
- traffic
- hazardous materials/waste
- natural hazards
- noise

In addition, Dames & Moore felt a review of certain land use issues related to adjacent sites and proposed regional projects would assist the site selection process, and added that issue to the original list of nine.

Specific data factors were identified by Dames & Moore. The data factors were assigned weights indicative of the importance of a particular data factor to the site selection process, with one being least and five most important. These data factors and their weights were reviewed and accepted by MECO as the basis for the current study.

2.3 DATA REVIEW

Project team members identified existing published data, documents, mapping, aerial photographs, and regulations which could provide key information regarding existing and reasonably expected future conditions of the three candidate sites or their surrounding areas which could affect any site's suitability for the proposed generation facility. Existing information was obtained from a wide variety of sources; MECO-supplied information included a long-range generation study, siting studies, site evaluations, project description information, and conceptual mapping. The reference section of this document contains a complete listing of materials reviewed for the current ESSS.

Each Dames & Moore team member reviewed information appropriate for the environmental issue area (or "environmental discipline") they were assigned, and identified additional informational requirements necessary to the thorough characterization of candidate sites and their surrounding setting.

2.4 BASELINE INVENTORIES/DISCIPLINE REPORTS

A baseline inventory includes collection of information regarding existing and, in some cases, reasonably expected future conditions of a specific area, as well as the presentation of that information in written, and if appropriate, graphical format. Each Dames & Moore project team member determined if a field reconnaissance or survey would be required to develop primary or verify existing information regarding data factors for their environmental issue area/discipline.

For their environmental issue area/discipline, each key team member developed a memo-format discipline report which describes results of their baseline inventory, and which characterizes existing and reasonably anticipated conditions of Sites A1, A2, and D1. These discipline reports follow the text, tables, and figures of this report, and generally contain the following information, as appropriate:

- relevant regulations and jurisdictional agencies
- data and methods (e.g., map/aerial/list review, site reconnaissance, etc.)
- existing conditions
- assessment of relevant data factors (presence, extent, proximity, etc.)
- unresolved uncertainties
- recommendations for further study/work
- references

2.5 ENVIRONMENTAL SCREENING/SITING ANALYSIS

Based on contents of environmental issue area/discipline studies and reports, as well as initial agency consultation, Dames & Moore conducted an initial screening to identify any as-yet unidentified environmental "fatal flaws." Following that exercise a spreadsheet-based analysis of the relative merit of each viable candidate site was conducted, in order to rank candidate sites in order of preference. The steps taken in the site ranking exercise are as follows:

1) Based on the results of their analyses, key members of the current study team assigned simple ranks[1] to each candidate site for each data factor evaluated during their environmental issue/discipline analysis. Depending on the data factor, these analyses were semi-quantitative or qualitative in nature, and assignment of ranks was based on the professional judgement of key team members. For those data factors evaluated in the 1994 *Central Maui Siting Study* and included in this analysis, the "raw scores" for each site for each data factor (presented

[1] Simple ranks are ideally first, second or third (but "draws" occur when two or more sites rank the same); the lower the rank, the less constrained and more preferred the candidate site relative to a specific data factor.

in Table 4-1 and discussed in Chapter 4 of that document) were utilized to assign simple ranks.

2) For each site, the simple rank was multiplied by the weight assigned the relevant data factor in order to obtain a weighted site score for that factor.

3) For each site, weighted site scores were summed. These sums were normalized relative to the sum of the mst preferred site in order to provide a measure of how closely site score sums were "clustered."

4) The rank order of the sums calculated in step 3) were considered the overall rank for each candidate site; the lower the overall rank, the more preferred a candidate site is relative to the other two sites.

3.0 DESCRIPTION OF DATA FACTORS

This section provides a detailed description of the weighted data factors used in both the current study and the 1994 *Central Maui Siting Study*. The 1994 *Central Maui Siting Study* utilized an array of data factors, some which supplement the current analysis, and some which are being studied to a more in-depth level of detail by the current study. In order that a full array of important issues be included in the current assessment, Dames & Moore incorporated the actual data factors, weights, and results of the 1994 study or a modification of them, where appropriate. In essence, the 1994 study supplements the current study: where methods, findings, or focus of the 1994 study deviate from the current study, the latter prevails.

The following discussion describes the data factors utilized. Environmental issue areas, data factors, and weights utilized in the current study are also presented in summary format in Table 2-1, following the text of this document.

3.1 LAND OWNERSHIP, REGULATION, AND USE

Existing and planned land uses can result in conflicts or create synergies related to the location or operation of a proposed facility.

1994 Study

The *Central Maui Siting Study* assessed the following land ownership, use, and regulation data factors as they relate to candidate sites; the weight assigned each data factor in the 1994 study appears in parentheses immediately after the factor:

- number of owners of the site (1)
- existing use (2)
- location relative to Special Management Area (3)
- State Land Use designation (3)
- Community Plan designation (3)
- zoning (3)

Current Study

The current study incorporates the above criteria without change, and additionally assesses candidate sites for the following land use data factors:

- **Existing and planned land uses of adjacent properties**
  Uses of properties near the proposed project were classified, in order of most to least preferred, as follows: undeveloped; range or fallow; cultivated; or other development. The weight assigned this data factors is 2.

- **Existing and planned regional-level land uses**
  Uses of large blocks of land or development of projects with widespread influence were identified and evaluated for their potential to affect or be affected by the proposed project. The weight assigned this data factor is 3.

3.2 AIR QUALITY

Time and cost associated with air quality permitting, the cost of pollution control devices, and potential restrictions on operation of electrical generation facilities can fluctuate, depending on location.

1994 Study

The *Central Maui Siting Study* evaluated candidate sites by determining if they were located within areas having "moderate" or "higher" degrees of air permitting difficulty. The "moderate" and "higher" designations were determined via modelling of criteria pollutant concentrations by Trinity Consultants, in a separate air quality study. (Trinity Consultants, 1993) The weight assigned this data factor was 5.

Current Study

Air quality and meteorological ambient data are currently being accumulated for candidate sites; information more current than that used in the 1994 study is currently not available for use under this ESSS. Therefore, methods and results of the 1994 study are incorporated into this analysis without change.

3.3 SOILS

The agricultural productivity of the County of Maui and State of Hawaii would be reduced by removal of agriculturally productive land for uses other than agriculture, such as the proposed project.

1994 Study

The *Central Maui Siting Study* utilized the State Land Bureau rating system to determine the agricultural potential of each candidate site. Sites with less agriculturally productive soils—those rated "C," "D," or "E"—were preferred for siting an industrial facility relative to those sites with more agriculturally productive soils rated "A" or "B." The weight assigned this data factor was 2.

Current Study

The current study incorporates methods and results of the 1994 study, without change.

3.4 GROUNDWATER

The availability of groundwater supply for operations as well as the range and difficulty of available disposal options for industrial wastewater can influence the attractiveness of a candidate site.

1994 Study

The *Central Maui Siting Study* utilized several groundwater data factors to evaluate candidate sites:

- **Groundwater availability**
  The study assessed on-site availability, potential interference with other pumping operations, and groundwater quality. The weight assigned this data factor was 1.
- **Groundwater disposal**
  The study assessed subsurface conditions, candidate site proximity to supply wells, and site location relative to the UIC line. The weight assigned this data factor was 3.

Current Study

The current study builds on the information developed during the 1994 study, and places a slightly different emphasis on groundwater supply and disposal issues than does the 1994 study. The following data factors are used in the current study:

- **Groundwater supply, availability**
  Since, from previous studies, all sites are known to have groundwater available, this study focusses on the cost of supply wells, well capacity/yield, and whether optional off-site sources are available. The weight assigned this data factor is 5.
- **Groundwater supply, interference with existing uses**
  The study identifies existing source wells nearest the candidate sites. The weight assigned this data factor is 3.
- **Groundwater supply, quality**
  The current study evaluates relative permitting and treatment costs associated with obtaining sufficient amounts of groundwater. The weight assigned this data factor is 2.
- **Groundwater disposal, proximity to supply wells**
  In order to assess potential to contaminate groundwater supply, distance to nearest supply wells is evaluated. The weight assigned this data factor is 3.
- **Groundwater disposal, regulation**
  The relative ease of on-site UIC permitting, as well as the ease of permitting alternative disposal options are evaluated. The weight assigned this data factor is 4.

3.5 SURFACE WATER

The range and difficulty of available disposal options for storm water runoff can influence the attractiveness of a candidate site.

1994 Study

The *Central Maui Siting Study* did not evaluate candidate sites for disposal issues related to surface (storm) water runoff.

Current Study

For the current study, the following surface water data factors were assessed:

- **Surface water, quality**
  The current study evaluates the receiving waters for off-site surface water disposal, including the quality, proximity to, and sensitive uses between the source and receiving waters. The weight assigned this data factor is 3.
- **Surface water disposal, options**
  The type and feasibility of surface water disposal options for each candidate site are evaluated. The weight assigned this data factor is 2.
- **Surface water disposal, regulation**
  This study evaluates whether an NPDES permit is required for a candidate site, and if so, the relative ease of acquiring such a permit. The weight assigned this data factor is 3.

3.6 NOISE

The noise generated by industrial facilities and associated activities can create a nuisance for sensitive receptors, and can result in community opposition to and rejection of facilities such as the proposed project.

1994 Study

The *Central Maui Siting Study* evaluated candidate sites and associated fuel haul routes by identifying sensitive noise receptors such as schools, hospitals, and residences within specific radii (1.5 and 3.0 miles) of candidate sites, as well as identifying haul routes that traverse residential communities or pass near to other sensitive receptors. The weight assigned this factor was 1.

Current Study

The current study does not incorporate methods or results of the 1994 study. Rather, it focuses on the literal distance to the nearest sensitive receptor to haul routes or candidate sites, as well as the relative potential for the proposed project to generate noise complaints. The current study assumes that a sound level of 70 db(A) will be achieved at the property line, as is required by State Department of Health regulations for the City and County of Honolulu, and which MECO has adopted as a standard for the proposed project. Nuisance generation as a result of actual or perceived

noise related to generation facility or fuel haul receptors evaluated in the current study. The weight assigned this data factor is 3.

3.7 AESTHETICS

The extent to which industrial facilities are visible from sensitive receptors (i.e., important viewpoints) will affect community acceptance of such facilities.

1994 Study

The *Central Maui Siting Study* evaluated candidate sites for aesthetics by considering candidate site distance from important viewpoints, site exposure from important viewpoints, and potential opportunities for effective screening associated with each candidate site. The weight assigned this data factor was 3.

Current Study

The current study incorporates results and methods of the 1994 study without change.

3.8 BIOLOGY

The presence of threatened or endangered species on or in proximity to a candidate site could trigger costly and time-consuming regulatory processes.

1994 Study

The *Central Maui Siting Study* evaluated candidate sites for their potential to contain critical habitat or species based primarily on current land use.

Current Study

The current study does not incorporate methods or results of the 1994 study. Rather, individual site reconnaissances were conducted to determine the actual on-site presence of threatened, endangered, or sensitive plant or wildlife species or habitats. In addition, a qualitative assessment was conducted regarding the likelihood that such species or habitats could be located within 0.25 mile of a candidate site. The weight assigned this data factor is 3.

3.9 CULTURAL RESOURCES

The presence of known or suspected significant State or Federal historic or archaeological resources could trigger costly and time-consuming regulatory processes.

1994 Study

The *Central Maui Siting Study* did not evaluate candidate sites for the presence of historic or archaeological sites.

Current Study

For the current study, individual site reconnaissances were conducted to determine the actual on-site presence of historic structures or archaeological resources. The weight assigned this data factor is 3.

3.10 TOPOGRAPHY

The slope of a site can affect full land utilization, or can create design opportunities or difficulties.

1994 Study

The *Central Maui Siting Study* first established an order of preference for ranges of percent slope for candidate sites as follows in rank order, most to least preferred: 2 to 4 percent; 0 to 2 and 4 to 8 percent; 8 to 16 percent; and greater than 16 percent. The study then determined the slope of each candidate site, and ranked it according to the established preferences. The weight assigned this data factor was 1.

Current Study

The current study incorporates methods and results of the 1994 study, without change.

3.11 NATURAL HAZARDS

Exposure to natural hazards such as floods, tsunami, storm waves, hurricanes, or earthquakes could significantly affect the structural or operational integrity of the proposed project, or could limit full utility of a candidate site.

1994 Study

The *Central Maui Siting Study* evaluated candidate sites for their potential exposure to flooding (no matter the source), via review of Flood Insurance Rate Maps. The weight assigned the natural hazards data factor was 1.

Current Study

The current study incorporates results of the 1994 study, with supplemental information obtained regarding the issue of flooding. The weight assigned this data factor in the current study is 3, increased from 1 in the 1994 study. In addition, the current study assesses candidate sites for their potential exposure to extreme winds (such as those generated by strong trade winds or hurricane conditions) and seismic hazards (earthquake).

3.12 HAZARDOUS WASTE/MATERIALS

The impairment of a candidate site by hazardous materials or wastes can present a costly and time-consuming high-risk issue, and may limit full utility of land.

1994 Study

The *Central Maui Siting Study* did not evaluate candidate sites for the presence of hazardous materials or wastes.

Current Study

For the current study, an environmental site assessment (ESA) was conducted for each candidate site, including data and file searches, literature review, aerial photograph and map review, as well as a site reconnaissance, the latter to the extent current agricultural activities allow. The weight assigned this data factor is 5.

3.13 ENGINEERING CONSIDERATIONS

Technical and engineering factors can affect design/construction/operation effort and cost.

1994 Study

The *Central Maui Siting Study* evaluated candidate sites for the following technical and/or engineering data factors:

- **Geotechnical**
  Subsurface conditions, and their potential to increase construction costs were evaluated.
- **Transmission facilities**
  Candidate site proximity to existing transmission facilities and the need to construct additional transmission lines through residential uses were assessed.
- **Fuel delivery**
  Candidate site proximity to Kahului Harbor, adequacy of existing roadways, and the length of new road construction required were evaluation criteria used to assess sites.

The weight assigned each of these data factors was 1.

Current Study

The current study incorporates methods and results of the 1994 study without change.

3.14 TRAFFIC/TRANSPORTATION

The effect of increased project-related traffic on area roadways, as well as the range of fuel transportation options can influence the relative attractiveness of a candidate site.

1994 Study

As part of the assessment of technical/engineering issues, the *Central Maui Siting Study* evaluated candidate sites for the following traffic/transportation issues:

- **Fuel delivery**

  Candidate site proximity to Kahului Harbor, adequacy of existing roadways, and the length of new road construction required were evaluation criteria used to assess sites. The weight assigned this data factor was 1.

Current Study

The current study incorporates methods and results of the fuel haul distance and road construction assessment components of the technical/engineering evaluation of the 1994 study, without change. The current study also evaluates candidate sites for the following data factors, with respect to delivery of fuel to the proposed project:

- **Traffic**

  The current study evaluates the potential effects of fuel haul on existing traffic patterns, the adequacy of the existing roadway configuration for fuel haul, and the adequacy of existing roadbed integrity for fuel haul trucks. The weight assigned this data factor is 3.

- **Transportation**

  The availability of fuel delivery via pipeline is evaluated. The weight assigned this data factor is 1.

4.0 EVALUATION OF CANDIDATE SITES

This section describes existing and reasonably anticipated conditions of candidate sites and as appropriate their surrounding areas, and presents a comparative evaluation of candidate sites relative to the data factors presented in the previous section. First, an evaluation is made of any fatal flaws that might remove a candidate site from further consideration. This evaluation is followed by a comparative assessment of viable candidate sites relative to data factors. Site scores[2] as well as overall site ranks[3] are determined and discussed. The analysis presented in this section is summarized in Table 4-1. Figures 4-1, 4-2, and 4-3 present mappable information regarding Sites A1, A2, and D1, respectively. An analysis was conducted to test the sensitivity of each candidate site relative to the weight assigned each data factor. The results of the sensitivity analysis are presented at the end of this section and in Table 4-2.

4.1 FATAL FLAW EVALUATION

"Fatal flaws" are those characteristics of a candidate site or its immediately surrounding area that would constrain development of the proposed project to an unacceptable degree. An example of such a fatal flaw would be extensive contamination of a site by hazardous materials or wastes. Presence of a fatal flaw would eliminate a candidate site from further consideration on its face. Review of past siting studies, as well as results of the current ESSS indicate no candidate site is fatally flawed. Therefore, Sites A1, A2, and D1 are carried forward for further investigation and comparative evaluation.

4.2 COMPARATIVE SITE EVALUATION: SITE SCORES

A site score indicates the degree of opportunity or constraint associated with a candidate site relative to a specific data factor; the lower the site score, the less constrained (and more preferred) a candidate site is relative to that data factor. The bases of the following evaluation are discipline reports developed for the current ESSS (and incorporated into this document as appendices), as well as portions of the 1994 *Central Maui Siting Study*. The basis of each individual site score is indicated: the reader is referred to the appendices of this report as well as the *Central Maui Siting Study*, as appropriate, for more detailed information.

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[2] Site scores are the product of a candidate site's simple rank for a given data factor times the weight assigned that data factor.

[3] Overall site ranks are the sum of all weighted site scores, in rank order.

4.2.1 LAND OWNERSHIP, REGULATION, AND USE

Candidate sites were evaluated in the 1994 *Central Maui Siting Study* as follows:

Land Ownership

All three candidate sites are privately held by a single owner. Therefore, no distinguishable difference exists between sites on the basis of land ownership; all are assigned a simple rank of 1. Given the assigned weight of 1 for this data factor, the site score related to land ownership for all candidate sites is 1.

Existing Candidate Site Land Use

All three candidate sites are in sugarcane cultivation, and no distinguishable difference exists between sites on the basis of existing site land use; all are assigned a simple rank of 1. Given the assigned weight of 2 for this data factor, the site score related to existing candidate site land use for all candidate sites is 2.

State Land Use Designation

All three candidate sites are designated Agricultural. Therefore, no distinguishable difference exists between sites on the basis of State land use designations; all are assigned a simple rank of 1. Given the assigned weight of 3 for this data factor, the site score related to State land use designation for all candidate sites is 3.

Community Plan Designation

All three candidate sites are designated Agricultural in the Wailuku-Kahului Community Plan. Therefore, no distinguishable difference exists between sites on the basis of Community Plan designation; all are assigned a simple rank of 1. Given the assigned weight of 3 for this data factor, the site score related to Community Plan land use designation for all candidate sites is 3.

Zoning Designation

All candidate sites are zoned Agricultural District. Therefore, no distinguishable difference exists between sites on the basis of county zoning; all are assigned a simple rank of 1. Given the assigned weight of 3 for this data factor, the site score related to zoning for all candidate sites is 3.

Special Management Area

None of the candidate sites is within the SMA. Therefore, no distinguishable difference exists between sites on the basis of the SMA; all are assigned a simple rank of 1. Given the assigned weight of 3 for this data factor, the site score related to Community Plan land use designation for all candidate sites is 3.

In addition to incorporating the above from the 1994 study, the current study further evaluates candidate sites for the following:

Existing and Planned Land Uses of Adjacent Properties

As shown on Figure 1-2, the Maui County Landfill is currently located approximately 1,000 feet northwest of Site A1, and 2,000 feet northeast of Site A2. The landfill, which follows mining activities of Ameron Quarry, is currently filling in a quarried area, and plans to vertically expand its current fill area until a height of 40 feet above grade is reached. Ameron has a 20-year mining agreement with A&B-Hawaii, and plans expansion of its mining activities as shown on Figure 4-4. (Ameron, 1995) The County plans to continue its practice of horizontal and vertical expansion via landfilling mined areas until a height of 40 feet above grade is reached. As the figure indicates, Site A1 is located within the area of Ameron's 20-year mining plan. This would represent a significant land use conflict for Site A1; resolution of this conflict would require extensive renegotiation on the part of Ameron and A&B.

In addition, current conditions at and near the landfill indicate litter control is an unresolved issue, with wind-blown litter evident along Pulehu Road and clinging to vegetation within Kalialinui Gulch. Without much more effective measures in place, blown litter can be expected to continue to accumulate, as the elevation of the waste lift reaches 40 feet above grade. Site A2 is directly and Site A1 is generally downwind of the landfill under prevailing wind conditions. Blown litter as well as dust from mining activities could impose design or even operating restrictions to either of these sites.

The existing and known planned land uses in the vicinity of Site D1 are agricultural. When adjacent sugarcane fields are being plowed or burned, operating restrictions may occur. This would also be true for Sites A1 and A2.

Based on the above, the descending rank order of site preference for this data factor is D1, A2, A1. Given the assigned weight of 2 for this data factor, site scores related to adjacent land use are 2 for Site D1, 4 for Site A2, and 6 for Site A1.

Existing and Planned Regional Land Uses

Other than the existing Maui County landfill and its planned expansions[4], other potentially relevant existing and planned regional land uses include Haleakela National Park, observatories on Haleakela, and the Kahului Airport. Consultation with the National Park Service (NPS) indicates Haleakela National Park is classified as Class I under the Clean Air Act; Denver headquarters of the NPS would review all pertinent air quality information regarding the project in order to determine its potential

[4] While the expansion of the County landfill would be a potentially conflicting existing and planned regional land use, its effect on the suitability of candidate sites was captured in the previous discussion.

impact on park activities and resources. Initial consultation indicates the NPS does not anticipate impacts to the park, nor that distinguishable differences between candidate sites exist relative to potential park impacts; however, a final determination would pend the provision and NPS review of air quality information. (NPS, 1995) Consultation with the University of Hawaii (UH) Institute for Astronomy as well as the United States Air Force (USAF) Space Command, Maui Space Surveillance Site indicates no project-related effects to operations of observatories are anticipated. (UH, 1994; USAF, 1995) Review of the *1982 Kahului Airport Master Plan Report* indicates that Sites A1 and A2 are within planned conical surfaces (or aircraft holding patterns). Consultation with the Federal Aviation Administration (FAA) on this matter indicates the proposed project could be developed on these sites, however modification of flight plans at Kahului Airport would be required, and special lighting could be required. (FAA, 1995)

For this reason, the descending rank order of site preference for this data factor is Site D1, followed equally by Sites A1 and A2. Given the assigned weight of 3 for this data factor, site scores related to regional land use are 3 for Site D1, and 6 for Sites A1 and A2.

4.2.2 AIR QUALITY

Candidate sites were evaluated in the 1994 *Central Maui Siting Study* fundamentally for their "permitability." In that evaluation, the descending rank order of preference for this data factor was Site D1, followed equally by Sites A1 and A2. Given the assigned weight of 5 for this data factor, site scores related to air quality are 5 for Site D1, and 10 for Sites A1 and A2.

4.2.3 SOILS

Candidate sites were evaluated in the 1994 *Central Maui Siting Study* for the agricultural productivity of their soils, with the least productive soils the most preferred. In that evaluation, the descending rank order of site preference for this data factor was Site A1, followed equally by Sites A2 and D1. Given the assigned weight of 2 for this data factor, site scores related to soils are 2 for Site A1, and 4 for Sites A2 and D1.

4.2.4 GROUNDWATER

A memo report discussing groundwater issues is attached to this document as Appendix A.

Groundwater Supply, Availability

The depth to groundwater would affect the cost of supply wells. Sites A1 and A2, approximately 100 feet nearer the basal groundwater table than Site D1 would likely incur lower costs for well development than D1. All sites would be approximately equally, and reasonably, located relative to the existing HC&S irrigation water system. Therefore, should HC&S be inclined to make that water

supply source available, the candidate sites would not be distinguishable from one another on this basis. The descending rank order of site preference for this data factor is Sites A1 and A2 (equally), followed by Site D1. Given the assigned weight of 5 for this data factor, site scores related to groundwater supply availability are 5 for Sites A1 and A2, and 10 for Site D1.

Groundwater Supply, Interference with Existing Uses

All three sites are located more than 6,000 linear feet from the nearest supply well, and are therefore not likely to interfere with these wells. Therefore, no distinguishable difference exists between sites on the basis of interference with existing uses; all are assigned a simple rank of 1. Given the assigned weight of 3 for this data factor, the site score related to groundwater supply and interference with existing groundwater uses for all candidate sites is 3.

Groundwater Supply, Quality

The quality of water underlying all three candidate sites is similar, however differences do exist which can be used to distinguish between the sites. The quality of water underlying Site D1 is considered to be potable by regulatory definition, while that underlying Sites A1 and A2 is considered non-potable (brackish). Therefore, the effort to permit wells for industrial purposes could be greater for Site D1 than for Sites A1 and A2. Although these waters differ in quality by definition, the actual difference to treat them to a level necessary for industrial use is minimal, and no distinguishable difference exists between sites in the basis of treatment costs. The descending rank order of site preference for this data factor is Sites A1 and A2 (equally), followed by Site D1. Given the assigned weight of 2 for this data factor, site scores related to groundwater supply quality are 2 for Sites A1 and A2, and 4 for Site D1.

Groundwater Disposal, Proximity to Supply Wells

Due to their distance from other supply wells, the likelihood of contamination of existing wells for all three sites is negligible. Therefore, no distinguishable difference exists between sites on the basis of groundwater contamination of existing wells; all are assigned a simple rank of 1. Given the assigned weight of 3 for this data factor, the site score related to groundwater disposal proximity to other users for all candidate sites is 3.

Groundwater Disposal, Regulation

Both Sites A1 and A2 could be permitted for UIC disposal of all industrial wastewater in the standard manner. Site D1 would be normally permitted only to dispose of non-contact cooling water in this manner; additional and possibly costly permitting efforts would be required to dispose of the remaining industrial wastewater. The descending rank order of site preference for this data factor is Sites A1 and A2 (equally), followed by Site D1. Given the assigned weight of 4 for this data factor, site scores related to groundwater disposal regulation are 4 for Sites A1 and A2, and 8 for Site D1.

4.2.5 SURFACE WATER

A memo report discussing surface water issues is attached to this document as Appendix B. The current study evaluates candidate sites for the following:

Surface Water, Quality

Should surface water runoff be disposed of offsite, the quality of receiving waters could be important to permitting efforts, as well as to the maintenance of Maui water resources. Surface waters near candidate sites include Kalialinui Gulch for Site A1 and irrigation ditches for Sites A2 and D1. Since natural waterways discharging to the ocean are considered more valuable than irrigation ditches, and impacts to valuable water resources are not desirable, the descending rank order of site preference for this data factor is Sites A2 and D1 (equally), followed by Site A1. Given the assigned weight of 3 for this data factor, site scores related to surface water quality are 3 for Sites A2 and D1, and 6 for Site A1.

Surface Water Disposal, Options

The range of surface water disposal options could affect the relative attractiveness of candidate sites. In general, the range of options for surface water disposal investigated for the current study include off-site direct discharge to recieving waters, off-site discharge to a municipal disposal syatem, onsite impoundment, and onsite discharge via underground injection wells. The descending rank order of site preference for this data factor is Site A2, the most flexible site in terms of feasible disposal options, followed equally by Sites A1 and D1. Given the assigned weight of 2 for this data factor, site scores related to surface water disposal options are 2 for Site A2, and 4 for Sites A1 and D1.

Surface Water Disposal, Regulation

Should surface water be disposed of via injection or offsite discharge, a UIC or NPDES permit would be required, respectively. The "permitability" of candidate sites was assessed, encompassing the ability to permit a site, as well as the anticipated degree of difficulty of such permitting. Site D1 would be more difficult to permit from a UIC Standpoint then Sites A1 or A2; Site A1 would be more difficult to permit from an NPDES standpoint than Sites A2 and D1. Therefore, the descending rank order of preference for this data factor would be Site A2, followed equally by Sites D1 and A1. Given the assigned weight of 3 for this data factor, site scores related to surface water disposal regulation are 3 for Site A2, and 6 for Sites A1 and D1.

4.2.6 NOISE

A memo report discussing noise issues is attached to this document as Appendix C.

The noise analysis evaluated sites based on their distance to existing and planned sensitive uses, surrounding topography, wind direction, and the existing noise environment (i.e., levels of noise). Site

A1 is the most distant from sensitive land uses, especially downwind uses, and is subject to noise generated by plane approaching the Kahului Airport as well as that generated by the landfill and quarry. Site A2 is nearer Puunene and other downwind receptors, and is exposed to the same ambient noise as A1. Site D1 is the nearest to potentially sensitive receptors, and to receptors that may be sensitive to a perceived, if not actual, noise nuisance. Based on the noise evaluation, the descending rank order of preference for this data factor would be Site A1, A2, and D1. Given the assigned weight of 3 for this data factor, site scores related to noise are 3 for Site A1, 6 for Site A2, and 9 for Site D1.

4.2.7 AESTHETICS

Candidate sites were evaluated in the 1994 *Central Maui Siting Study* for their visibility and potential to impair important views. In that evaluation, the descending order of site preference for this data factor was Site D1, followed equally by Sites A1 and A2. Given the assigned weight of 3 for this data factor, site scores related to aesthetics are 3 for Site D1, and 6 for Sites A1 and A2.

4.2.8 BIOLOGY

Two memo reports, one discussing plant (botanical) and the other wildlife resources issues, are attached to this document as Appendices D and E, respectively. The current study evaluates candidate sites for the actual on-site presence of threatened, endangered, or sensitive plant or wildlife species or habitats, and for the likelihood that such species or habitats could be located within 0.25 mile of a candidate site.

The botanical survey of the three candidate sites did not identify any listed or sensitive species. All sites are in sugarcane cultivation, with introduced and native ruderal vegetation along some cane haul roads and on adjacent properties. None of the species identified are listed, and none are otherwise considered sensitive. Therefore, no distinguishable difference between candidate sites exists on the basis of plants.

Because birds are the most abundant wildlife type in the area, the wildlife survey focussed on avifauna. The evaluation of candidate sites focussed on their suitability as habitat for a broad array of bird species, based on observations made in the field. The "richness" of a site indicates the number of species associated with that site; the richer the site, the more species it could support, and the less suitable it would be for development. Based on this evaluation, the descending rank order of site preference for this data factor would be Site A1, the least rich and the most preferred for development, Site A2, and finally Site D1, the most rich. Given the assigned weight of 3 for this data factor, site scores related to biology are 3 for Site A1, 6 for Site A2, and 9 for Site D1.

4.2.9 CULTURAL RESOURCES

A memo report discussing archaeological and historic resources issues is attached to this document as Appendix F.

The archaeological and historic assessment of the three candidate sites did not identify any known or suspected significant sites or resources. All sites are in sugarcane cultivation, and any resources within the plow zone have likely been compromised. Therefore, no distinguishable difference between candidate sites exists on the basis of archaeological and historic resources; all are assigned a simple rank of 1. Given the assigned weight of 3 for this data factor, the site score related to cultural resources for all candidate sites is 3.

4.2.10 TOPOGRAPHY

The slope of candidate sites was evaluated in the 1994 *Central Maui Siting Study* because of topography's role as an indicator of slope stability, erosion potential, and constructability. In that evaluation, the descending rank order of site preference for this data factor would be Site D1 and A2 (equally), followed by Site A1. Given the assigned weight of 1 for this data factor, site scores related to topography are 1 for Site D1 and A2, and 2 for Site A1.

4.2.11 NATURAL HAZARDS

The current study evaluates the natural hazard issue of flooding (based on information which supplements the 1994 study), earthquake, and extreme winds. A memo report discussing extreme wind and seismic hazards issues is attached to this document as Appendix G.

The natural hazards and surface water studies conducted for the current ESSS, concluded the following:

- The Lowrie Ditch is known to overflow its banks during heavy rains (i.e., the 25-year event), resulting in run-on to Site D1; therefore, while Site D1 is not prone to flooding from natural sources, it is known to flood from the irrigation system. (HC&S, 1995) Avoidance of this flooding would likely require additional design and construction effort, and may affect full utility of Site D1.
- Candidate sites are in relative proximity to one another, and the natural hazards study did not distinguish between the three sites on the basis of exposure to seismic hazards.
- The three candidate sites are all located within the central valley area of Maui, and all would be exposed to extreme wind speeds. Wind speeds in the valley increase as they are channeled between Haleakela and the West Maui Mountains, and as they climb in elevation from the

shoreline to the central valley region. The three candidate sites are located near enough to one another that they are not distinguishable on the basis of exposure to extreme wind hazards.

The descending rank order of site preference for this data factor is Sites A1 and A2 (equally), followed by Site D1. Given the assigned weight of 3 for this data factor, site scores related to natural hazards are 3 for Sites A1 and A2, and 6 for Site D1.

4.2.12 HAZARDOUS WASTE/MATERIALS

An environmental site assessment (ESA) report discussing hazardous waste/materials and site contamination issues is attached to this document as Appendix H. This ESA focussed on the extent of potential site contamination as well as potential restrictions on site use due to contamination.

The ESA and its associated site and information investigation did not identify potential site contamination that would distinguish one site from another. Given the assigned weight of 5 for this data factor, the site score related to hazardous waste/materials is 5 for all candidate sites.

4.2.13 ENGINEERING CONSIDERATIONS

Candidate sites were evaluated in the 1994 *Central Maui Siting Study* as follows:

Geotechnical

Candidate sites were not considered distinguishable from one another on the basis of subsurface conditions; all are assigned a simple rank of 1. Given the assigned weight of 1 for this data factor, the site score related to geotechnical conditions is 1 for all candidate sites.

Transmission Facilities

Candidate sites were evaluated for their proximity to existing transmission facilities; the closer the site, the less cost to construct connecting transmission facilities. In the current evaluation, the descending rank order of site preference for this data factor is Site A2 and D1 (equally), followed by Site A1. This takes into account the Maalaea-Lahaina 69 kV transmission line, completed and energized in January, 1995. In the vicinity of candidate sites this line is located along Upper Division Road adjacent to Site A2; the power line then trends southeasterly along Pulehu Road and at one point is located adjacent to Site D1. Given the assigned weight of 1 for this data factor, site scores related to transmission facilities are 1 for Site A2 and D1, and 2 for Site A1.

Fuel Delivery

Candidate sites were evaluated in the 1994 *Central Maui Siting Study* for their proximity to Kahului Harbor as an indicator of fuel delivery cost. In that evaluation, the descending order of site preference for this data factor was Sites A1 and A2 (equally), followed by Site D1. Given the assigned weight

of 1 for this data factor, site scores related to fuel delivery are 1 for Sites A1 and A2, and 2 for Site D1.

Road Improvement Costs

Candidate sites were evaluated in the 1994 *Central Maui Siting Study* for the length of new road construction required to serve each as an indicator of road construction cost. In addition, the current ESSS includes the number of structures required to be built by MECO, which would substantially affect road construction costs. In the 1994 and current evaluations, the descending order of site preference for this data factor is Sites A2 and D1 (equally), located on or near Pulehu Road, followed by Site A1, which requires substantially more privately-constructed access road, as well as construction of a bridge to span Kalialinui Gulch. Given the assigned weight of 1 for this data factor, site scores related to road improvement costs are 1 for Sites A2 and D1, and 2 for Site A1.

4.2.14 TRAFFIC/TRANSPORTATION

A memo report discussing traffic and transportation issues is attached to this document as Appendix I.

Traffic

The evaluation criteria for traffic included roadway configuration and integrity, and traffic operations. The traffic study concluded the following:

- Given recent and reasonably expected planned improvements to Pulehu Road, there is no distinguishable difference between candidate sites on the basis of roadway integrity.
- Given Site A1 would require three bridge crossings, while Sites A2 and D1 would require two, on the basis of roadway configuration, the descending order of site preference for this evaluation criteria is Sites A2 and D1 (equally), followed by Site A1.
- No distinguishable difference exists between candidate sites on the basis of impacts to existing traffic operations.
- Given that required movements for loaded fuel trucks are with-traffic (preferred) to access sites A2 and D1, and are cross-traffic (not preferred) to access Site A1, the descending order of site preference for this evaluation criteria is Sites A2 and D1 (equally), followed by Site A1.

The descending rank order of site preference for this data factor is Sites A2 and D1 (equally), followed by Site A1. Given the assigned weight of 3 for this data factor, site scores related to traffic are 3 for Sites A2 and D1, and 6 for Site A1.

Transportation

Any of the three candidate sites could be served by a fuel pipeline from the Chevron Kahului Harbor bulk terminal facility, and the sites are not distinguishable from each other on the basis of their ability to be served by such a facility. Assuming all three candidate sites can be served from the same pipeline route, and using site distance from the bulk terminal as an indicator of pipeline cost, the descending rank order of site preference for this data factor is Sites A1 and A2 (equally), followed by Site D1. Given the assigned weight of 1 for this data factor, site scores related to transportation are 1 for Sites A1 and A2, and 2 for Site D1.

4.3 COMPARATIVE SITE EVALUATION: OVERALL SITE RANKS, NORMALIZED SCORES, AND SENSITIVITY ANALYSIS

4.3.1 OVERALL SITE RANKS

As Table 4-1 indicates, the sum of site scores[5] for the three candidate sites are 110 for Site A1, 102 for Site A2, and 116 for Site D1; overall site ranks[6] are 2 for Site A1, 1 for Site A2, and 3 for Site D1. Therefore, based on this evaluation, the descending rank order of site preference is Site A2, A1, and D1.

4.3.2 NORMALIZED SITE SCORES

In order to obtain an understanding of how tightly results of the numeric analysis are clustered, results can be evaluated relative to a known result of that analysis. This process is known as "normalizing." The current study normalizes sums of sites scores relative to the score of the least constrained site, A2. The normalized sum for Site A2 is 100, and the normalized sums for A1 and D1, 92.73 and 87.93 respectively, are ratios relative to the normalized sum of A2. This represents a fairly tight cluster, with results of analysis for all sites falling within a range of 12.1 percent. Therefore, while Site A2 is the least constrained and most preferred, neither Site A1 or D1 is substantially inferior in terms of suitability for the proposed project. This result substantiates the results of the 1994 study.

4.3.3 SENSITIVITY ANALYSIS

In order to test the validity of the data factor weighting scheme utilized in this analysis, a sensitivity analysis was conducted. This analysis in essence systematically (i.e., one data factor at a time) distorts or exaggerates the weights utilized in the analysis, in this case by a factor of 10. The corresponding overall site ranks are then reviewed to determine if a different result arises (that is, is

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[5] With the lowest score being the least constrained and the most preferred.

[6] With the lowest overall site rank being the most preferred.

the descending order of site preference, A2, A1, D1, altered) with the use of the distorted weight for a particular data factor. This process is repeated 31 times, once for each data factor, with the original weights maintained for all but one factor at a time.

Results of the sensitivity analysis are presented in Table 4-2. In general, the overall order of site preference remains the same as in the original analysis, with Site A2 remaining the most preferred in 24 of 31, or 77.4 percent, of the cases.

When issues regarding soils (agricultural productivity), noise, or biology are emphasized, Site A1 is the most preferred (3 out of 31, or 9.7 percent, of the cases). When issues regarding existing or planned adjacent property or regional land uses, air quality, or aesthetics are emphasized, Site D1 is the most preferred (4 out of 31, or 12.9 percent, of the cases).

In summary, all three candidate sites show a strong tendency to remain in their original overall rank order, even when subjected to substantial distortion of the weighting system utilized in the sensitivity analysis. This result indicates the relative order of site preference resulting from this ESSS–A2, A1, D1–is stable and fairly represents the appropriate order of preference, given the weighting system and data factors utilized.

5.0 RECOMMENDATIONS

This section presents recommendations regarding the most preferred candidate site, based on the evaluation conducted for this study. In addition, this section provides recommendations for further study, analysis, or consultation.

5.1 RECOMMENDATIONS FOR CANDIDATE SITES

Site A2 is identified as most preferred of the three candidate sites evaluated in this study. It is recommended the results of this study be combined with additional information for both Site A2 and C3 regarding air quality, site cost, and community reaction to guide final site selection and landowner negotiations.

5.2 RECOMMENDATIONS FOR FURTHER STUDY, ANALYSIS, CONSULTATION

This section presents recommendations made by the project team members for further study, analysis, or agency consultation. Each heading is followed by a bullet list of summary recommendations.

Land Ownership, Regulation, and Use

- Further investigate the status of Ameron's 20-year mining agreement with A&B-Hawaii.
- Upon selection of the preferred site, notify Mr. Eric Yoshizawa of Ameron (requested by Mr. Yoshizawa).
- Periodically consult with Ameron to obtain status of mining activities.
- Periodically consult with County of Maui Public Works Department to obtain status of landfill expansion plans.
- Complete FAA form 7460-1 for each candidate site and submit to FAA; once determination granted by FAA, request extension for preferred site every 18 months, let other sites lapse.
- Initiate discussions with County of Maui Planning Department regarding re-zone procedures and processes for the proposed project.

Air Quality

- Complete tabulation and organization of meteorological and air quality data.
- Conduct air quality analysis.
- Incorporate findings of air quality analysis into site selection process.
- Provide air quality analysis to the National Park Service Headquarters in Denver for evaluation.

Soils

No recommendations.

Groundwater

- Should Site A1 be selected, periodically consult with County of Maui Public Works Department regarding status of their landfill groundwater monitoring program.
- Investigate further the possibility of obtaining an easement from A&B-Hawaii to allow for offsite UIC injection disposal of industrial wastewater from Site D1.
- Continue to monitor anticipated changes in the administration of UIC regulations between DOA and the U.S. EPA, and determine how these changes might affect site selection.

Surface Water

- Continue consultation with Hawaii State Department of Health regarding potential NPDES and storm water UIC discharge issues.

Noise

- Following site selection, and as part of design, conduct a site-specific noise analysis to develop design-oriented mitigation.
- Continue to monitor the status of DOH noise regulations as they apply to Maui.

Aesthetics

- Develop realistic photosimulations of the proposed project from sensitive viewpoints, as part of the final site selection process.
- Once the preferred site is selected, develop additional visual simulations as part of the community involvement program, including simulations of the proposed generation facility as well as additional required transmission facilities.

Biology

- Conduct survey for Hawaiian hoary bat during months of activity, August through December.
- Evaluate flyways of endangered waterbirds within the area of the candidate sites.

Cultural Resources

No recommendations.

Topography

No recommendations.

Natural Hazards

- Conduct analysis of wind speed data currently being compiled from the meteorological tower located on Site D1.
- Conduct a wind tunnel test, once a preferred site is selected.
- Keep abreast of current recommendations for revision of Maui's seismic zonation.
- Should Site A1 be selected, conduct a surface hydrology investigation (due to its proximity to the gulch)

Hazardous Waste/materials

- Conduct additional research regarding airstrips in the vicinity of candidate sites.
- Review additional information as it becomes available regarding six recorded incidents in the Puunene area.

Engineering Considerations

- Conduct a comprehensive soils and subsurface investigation for the proposed project and access roads after preferred site is selected.

Traffic/Transportation

- Video-document condition of Pulehu Road; possibly conduct deflection testing.
- Periodically consult with County of Maui DOT regarding recommendation of Pulehu Road to Hana Highway after the Airport Access Road/Hana Highway interchange is complete.
- Conduct comprehensive traffic analysis once preferred site is selected and traffic generation information completely developed.
- Continue consultation with Chevron as well as other potential users regarding viability of pipeline development.

6.0 REFERENCES

Detailed references are provided in each technical discipline memo report, included in this document as Appendices A through I.

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United States Air Force (USAF) Space Command, Maui Space Surveillance Site, 1995. Personal communication, Major Clutcher.

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TABLES

TABLE 2-1
ENVIRONMENTAL ISSUE AREAS, DATA FACTORS, WEIGHTS

Environmental Issue Area	Data Factor [1]	Weight	Evaluation Criteria [1], [2]
Land Ownership, Regulation, and Use	Land Ownership	1	MECO-owned land
			Private land, 1 owner
			Private land, 2-10 owners
			Private land, >10 owners
			State/County land
			Hawaiian Homelands
			Federal land
	Existing candidate site land use	2	Power generation
			Undeveloped
			Range or fallow
			Cultivation
			Other developed
	State Land Use Districts	3	Urban
			Agriculture
			Rural
			Conservation
	Community Plan designation	3	Heavy Industry
			Agriculture
			Light Industry
			Other designation
	Zoning designation	3	M-2, Heavy Industry
			Suitable for M-2
			Unsuitable for M-2
	Special Management Area (SMA)	3	Not within
			Within
	Existing or planned adjacent land use	2	Undeveloped
			Range or fallow
			Cultivation
			Other
	Existing or planned regional uses	3	Uses that would facilitate power plant development
			Uses that would limit power plant development
			Uses that would prohibit power plant development

(1) Shaded data factors or evaluation criteria were previously assessed in the 1994 *MECO Central Maui Siting Study.*
(2) Within each data factor, listed most to least desirable

Environmental Issue Area	Data Factor [1]	Weight	Evaluation Criteria [1], [2]
Air Quality	Modelled pollutant concentration in areas identified as having "moderately" or "higher" degrees of air permitting difficulty	5	50 to 60 percent of allowable by AAQS/PSD increment
			60 to 65 percent of allowable by AAQS/PSD increment
			65 to 70 percent of allowable by AAQS/PSD increment
			70 to 75 percent of allowable by AAQS/PSD increment
			75 to 100 percent of allowable by AAQS/PSD increment
Soils		2	C, D, or E rated soils
			A or B rated soils
Groundwater	Supply, availability	5	On-site-quantity sufficient, depth <300'
			On-site quantity sufficient, depth >300, <500
			On-site quantity sufficient, depth >500
			On-site quantity not sufficient
			Cost of water supply wells
			Well capacity/yield
			Off-site source available
			Off-site source not available
	Supply, interference with existing source wells	3	>500' from existing supply wells
			<500' from existing supply wells
	Supply, quality	2	Chloride >250 mg/l
			Chloride <250 mg/l
			Relative permitting costs
			Relative treatment costs
	Disposal, proximity to supply wells	3	Potential for contamination of existing supply wells
	Disposal, regulation	4	Makai of UIC line
			Mauka of UIC line
			Relative ease of UIC permitting
			Ease of permitting alternative method

(1) Shaded data factors or evaluation criteria were previously assessed in the 1994 *MECO Central Maui Siting Study.*
(2) Within each data factor, listed most to least desirable

Environmental Issue Area	Data Factor [1]	Weight	Evaluation Criteria [1], [2]
Surface Water (stormwater runoff)	Quality	3	Quality of receiving water
			Proximity of site to receiving water
			Sensitive uses between site and receiving water
	Disposal Options	2	On-site
			Off-site
			Municipal system
	Regulation	3	Does not require permit
			Requires NPDES permit
			Relative ease NPDES permitting
Noise (assume 70 db(A) achieved at property line)		3	>3 miles from sensitive receptor, no residential haul routes
			>1.5 miles from sensitive receptors, no residential haul routes
			<1.5 miles from sensitive receptor and/or residential haul routes
			Distance to nearest existing or planned sensitive receptor
			Potential for noise complaints
Aesthetics	Impairment of scenic views	3	Visibility from sensitive receptors
Biology		3	Under current intense cultivation
			Currently fallow, previously under cultivation
			Natural or native vegetation with potential to provide habitat
			Not known to support or be in within .25 mile of threatened, endangered, or sensitive species or habitats
			Not likely to support or be near threatened, endangered, or sensitive species
			Likely to support or be near threatened, endangered, or sensitive species
			Known to support or be near threatened, endangered, or sensitive species or habitats
Cultural Resources		3	Known significant State or Federal cultural sites
			Known burials and their immediate vicinity
			High potential for discovery of significant cultural resources

(1) Shaded data factors or evaluation criteria were previously assessed in the 1994 *MECO Central Maui Siting Study.*
(2) Within each data factor, listed most to least desirable

Environmental Issue Area	Data Factor [1]	Weight	Evaluation Criteria [1], [2]
Topography		1	2-4% slope
			0-2% and 4-8% slope
			8-16% slope
			>16% slope
Natural Hazards		3	Tsunami inundation zone
			Flood prone area (100-year)
			Susceptibility to extreme winds
			Susceptibility to seismic hazards
Hazardous Waste/materials		5	Ability to utilize property as planned
			Relative impairment of site
Engineering Considerations	Geotechnical	1	No increased cost associated with conditions
			Increase construction cost by <1%
			Increase construction cost by >1%
	Transmission system	1	Adjacent to existing transmission lines with sufficient capacity
			Within 1 mile of existing transmission facilities/sufficient capacity can be achieved
			Requires construction of 1 to 5 miles of transmission line through non-urban
			Requires construction of >5 miles of transmission or requires construction of transmission through urbanized areas
	Fuel delivery	1	Proximity to Kahului harbor
			Use of existing, adequate roadways
			Use of existing roadways requiring structural improvement to accommodate project
			Construction of new roads
Traffic/Transportation	Traffic	3	Effects on existing traffic patterns and LOS
			Length of new roadway construction
			Adequacy of existing roadway configuration
			Adequacy of existing roadbed integrity
	Transportation	1	Availability of alternative fuel delivery systems (i.e., pipelines)

(1) Shaded data factors or evaluation criteria were previously assessed in the 1994 *MECO Central Maui Siting Study.*
(2) Within each data factor, listed most to least desirable

TABLE 4-1
ANALYSIS OF CANDIDATE SITES

Environmental Issue Area/ Data Factor	Weight	Site Score (1) A1	A2	D1
Land Ownership, Regulation, Use				
Land Ownership	1	1	1	1
Existing candidate site land use	2	2	2	2
State Land Use designation	3	3	3	3
Community Plan designation	3	3	3	3
Zoning designation	3	3	3	3
Special Management Area (SMA)	3	3	3	3
Existing/planned adjacent land use	2	6	4	2
Existing/planned regional uses	3	6	6	3
Air Quality	5	10	10	5
Soils	2	2	4	4
Groundwater				
Supply, availability	5	5	5	10
Supply, interference with existing source wells	3	3	3	3
Supply, quality	2	2	2	4
Disposal, proximity to supply wells	3	3	3	3
Disposal, regulation	4	4	4	8
Surface Water (stormwater disposal)				
Quality	3	6	3	3
Disposal options	2	4	2	4
Regulation	3	6	3	6
Noise	3	3	6	9
Aesthetics				
Impairment of scenic views	3	6	6	3
Biology	3	3	6	9
Cultural Resources	3	3	3	3
Topography	1	2	1	1
Natural Hazards	3	3	3	6
Hazardous Waste/materials	5	5	5	5
Engineering Considerations				
Geotechnical	1	1	1	1
Transmission system	1	2	1	1
Fuel delivery	1	1	1	2
Road improvement costs	1	2	1	1
Traffic/Transportation				
Traffic	3	6	3	3
Transportation	1	1	1	2
Sum of Site Scores (lowest is least constrained, most preferred)		**110**	**102**	**116**
Normalized Sums (100 is least constrained)		**92.73**	**100.00**	**87.93**
Overall Site Rank (2) (lowest is least constrained)		**2**	**1**	**3**

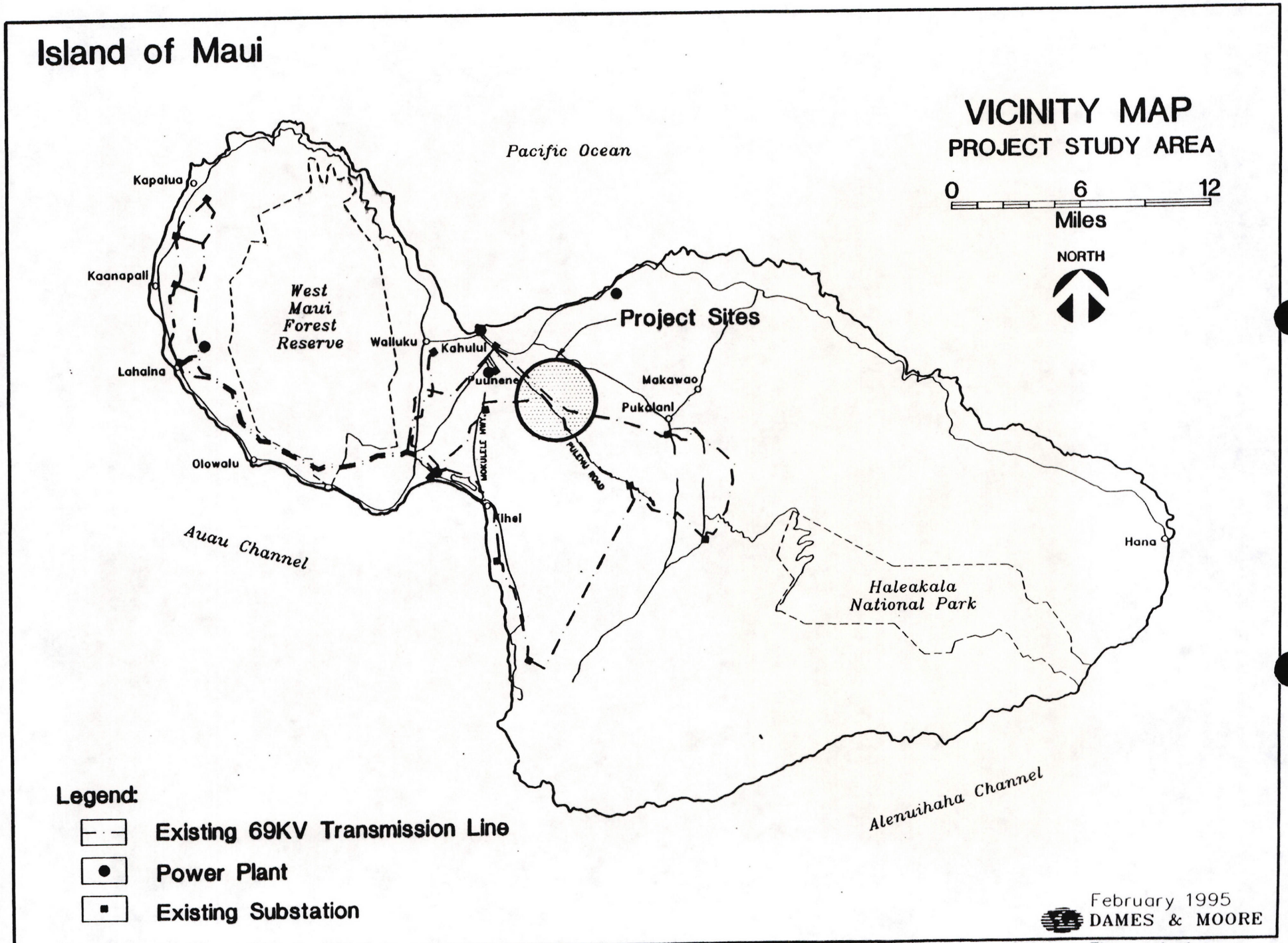
Notes:
(1) Site score is the product of a site's rank for a specific data factor times the assigned weight of the factor.
(2) Overall site rank is the rank order of the summed weighted ranks.

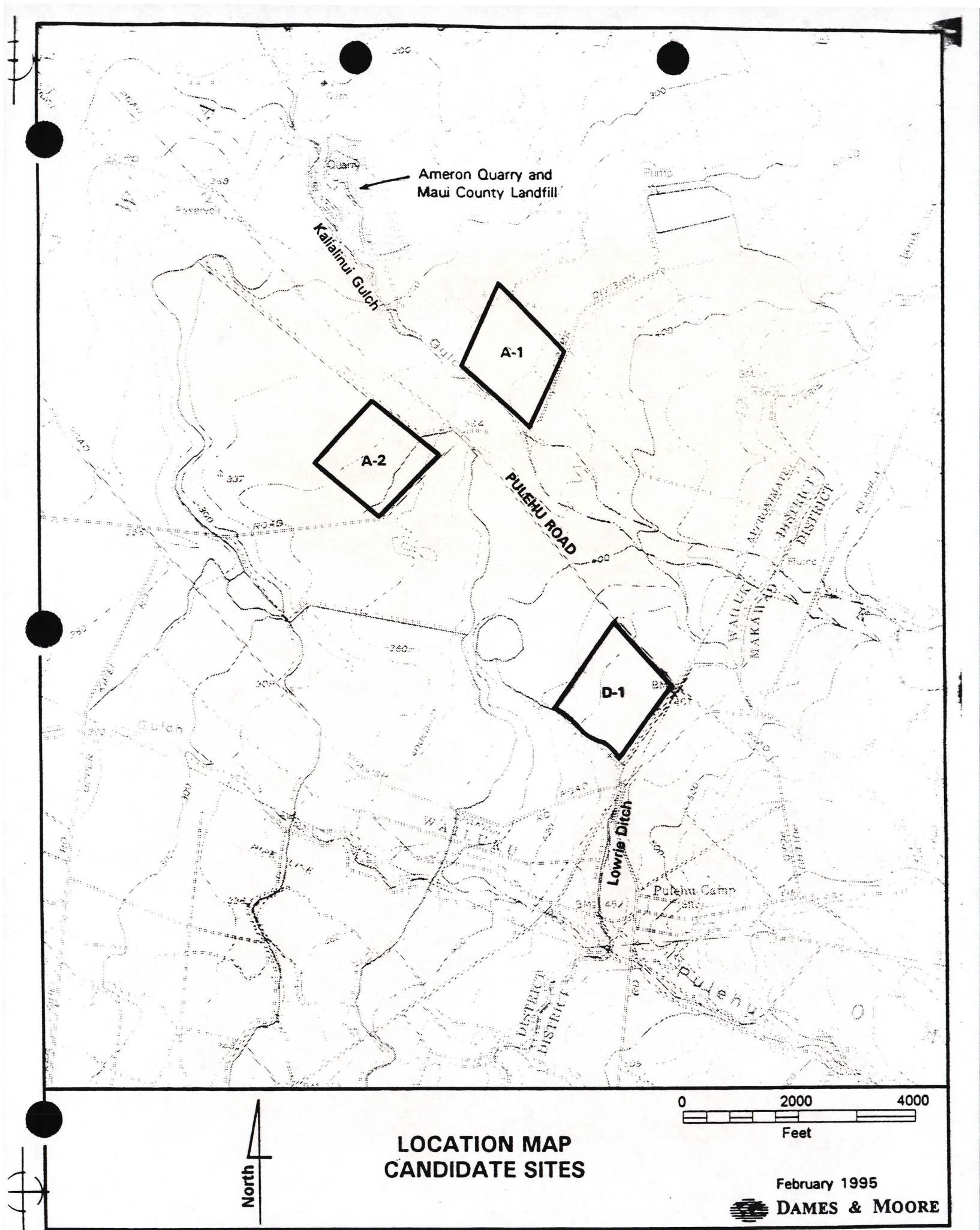
TABLE 4-2
SENSITIVITY ANALYSIS

Environmental Issue Area/ Data Factor	Overall Site Rank w/ Assigned Weight X 10 A1	A2	D1	
Land Ownership, Regulation, Use				
Land Ownership	2	1	3	
Existing candidate site land use	2	1	3	
State Land Use designation	2	1	3	
Community Plan designation	2	1	3	
Zoning designation	2	1	3	
Special Management Area (SMA)	2	1	3	
Existing/planned adjacent land use	***3***	***2***	***1***	
Existing/planned regional uses	***3***	***2***	***1***	
Air Quality	***3***	***2***	***1***	
Soils	***1***	***2***	3	
Groundwater				
Supply, availability	2	1	3	
Supply, interference with existing source wells	2	1	3	
Supply, quality	2	1	3	
Disposal, proximity to supply wells	2	1	3	
Disposal, regulation	2	1	3	
Surface Water (stormwater runoff)				
Quality	***3***	1	***2***	
Disposal options	2	1	3	
Regulation	2	1	3	
Noise	***1***	***2***	3	
Aesthetics				
Impairment of scenic views	***3***	***2***	***1***	
Biology	***1***	***2***	3	
Cultural Resources	2	1	3	
Topography	***3***	1	***2***	
Natural Hazards	2	1	3	
Hazardous Waste/materials	2	1	3	
Engineering Considerations				
Geotechnical	2	1	3	
Transmission system	2	1	3	
Fuel delivery	2	1	3	
Road improvement costs	***3***	1	***2***	
Traffic/Transportation				
Traffic	***3***	1	***2***	
Transportation	2	1	3	
Number of Times Site Ranks #1	**3**	**24**	**4**	(n=31)
Percent of Times Site Ranks #1	9.68	77.42	12.90	
Number of Times Site Ranks #2	**20**	**7**	**4**	(n=31)
Percent of Times Site Ranks #2	64.52	22.58	12.90	
Number of Times Site Ranks #3	**8**	**0**	**23**	(n=31)
Percent of Times Site Ranks #3	25.81	0.00	74.19	
Original Overall Site Ranks	**2**	**1**	**3**	

Overall site ranks that deviate from their original overall ranks are in italic boldface.

FIGURES


Island of Maui
VICINITY MAP
PROJECT STUDY AREA
0 6 12
Miles
NORTH
Pacific Ocean
Kapalua
Kaanapali
Lahaina
Olowalu
West Maui Forest Reserve
Wailuku
Kahului
Puunene
Project Sites
Makawao
Pukalani
MOKULELE HWY.
PULEHU ROAD
Kihei
Auau Channel
Hana
Haleakala National Park
Alenuihaha Channel
Legend:
Existing 69KV Transmission Line
Power Plant
Existing Substation
February 1995
DAMES & MOORE
Figure 1-1
MECO GENERATION: 22941007(VICINITY.DWG) PLOT SCALE 1=2

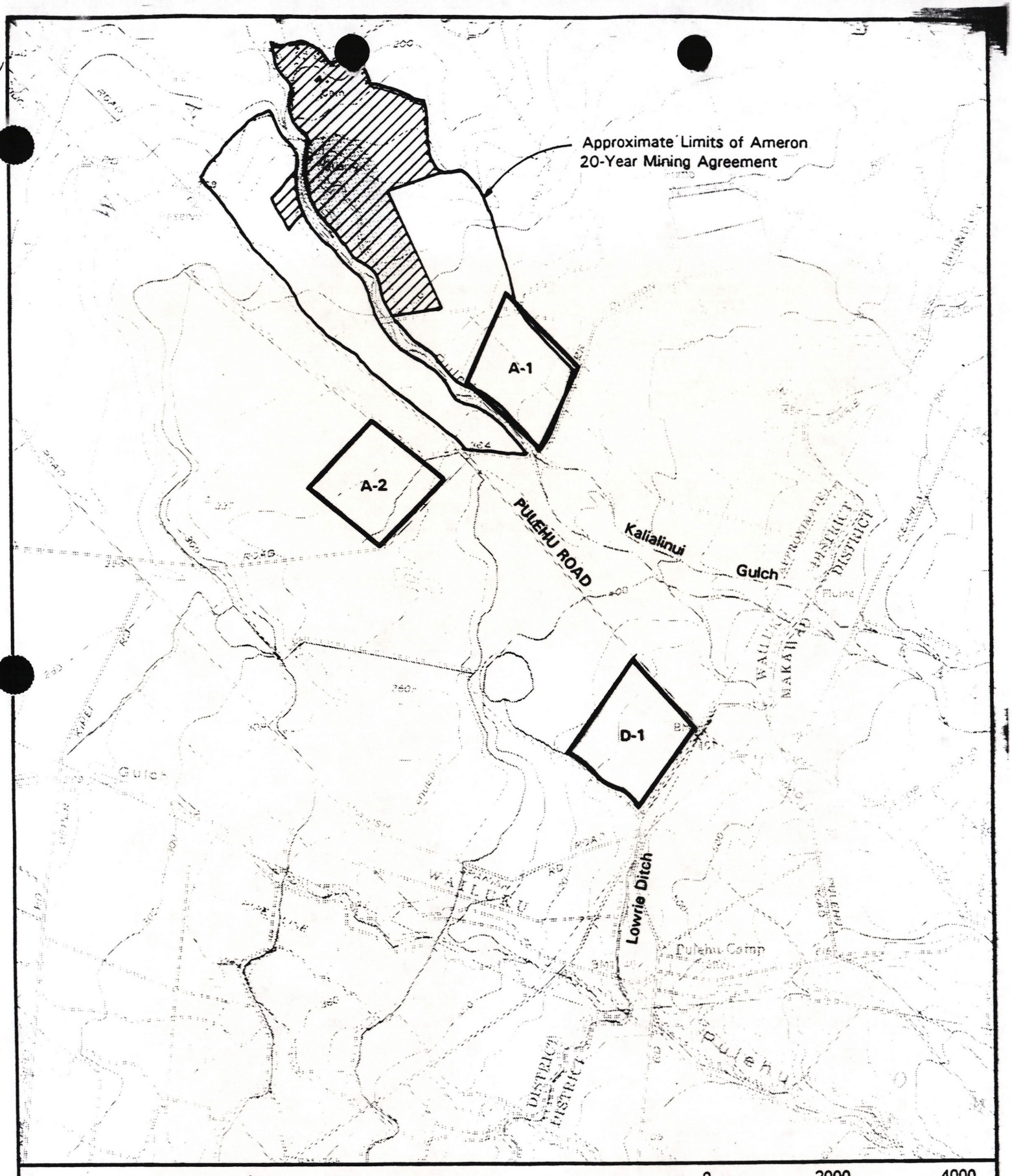


LOCATION MAP
CANDIDATE SITES

February 1995

DAMES & MOORE

Figure 1-2

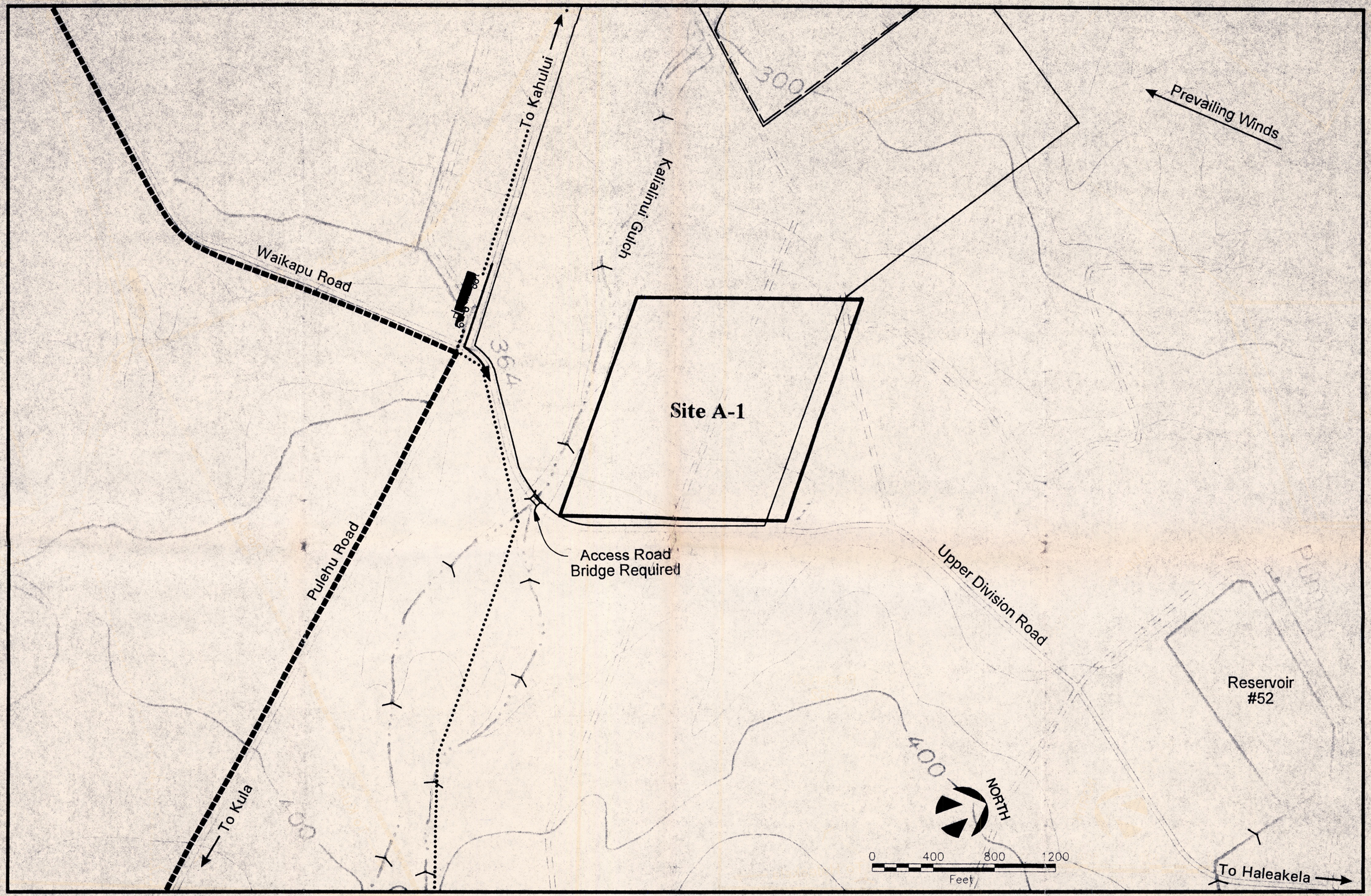


AMERON MINING AREAS

February 22, 1995

DAMES & MOORE

Figure 4-4



Ameron 20-Year Mining Lease

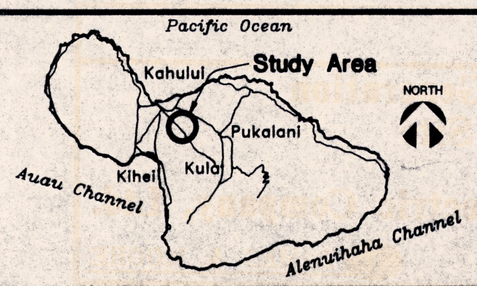
Maui County Land Fill

Critical Fuel Haul Movement

Direction Of Surface Water Flow

Maalaea-Naalae 69 kV Transmission Line

69kV Transmission Line



Site A-1

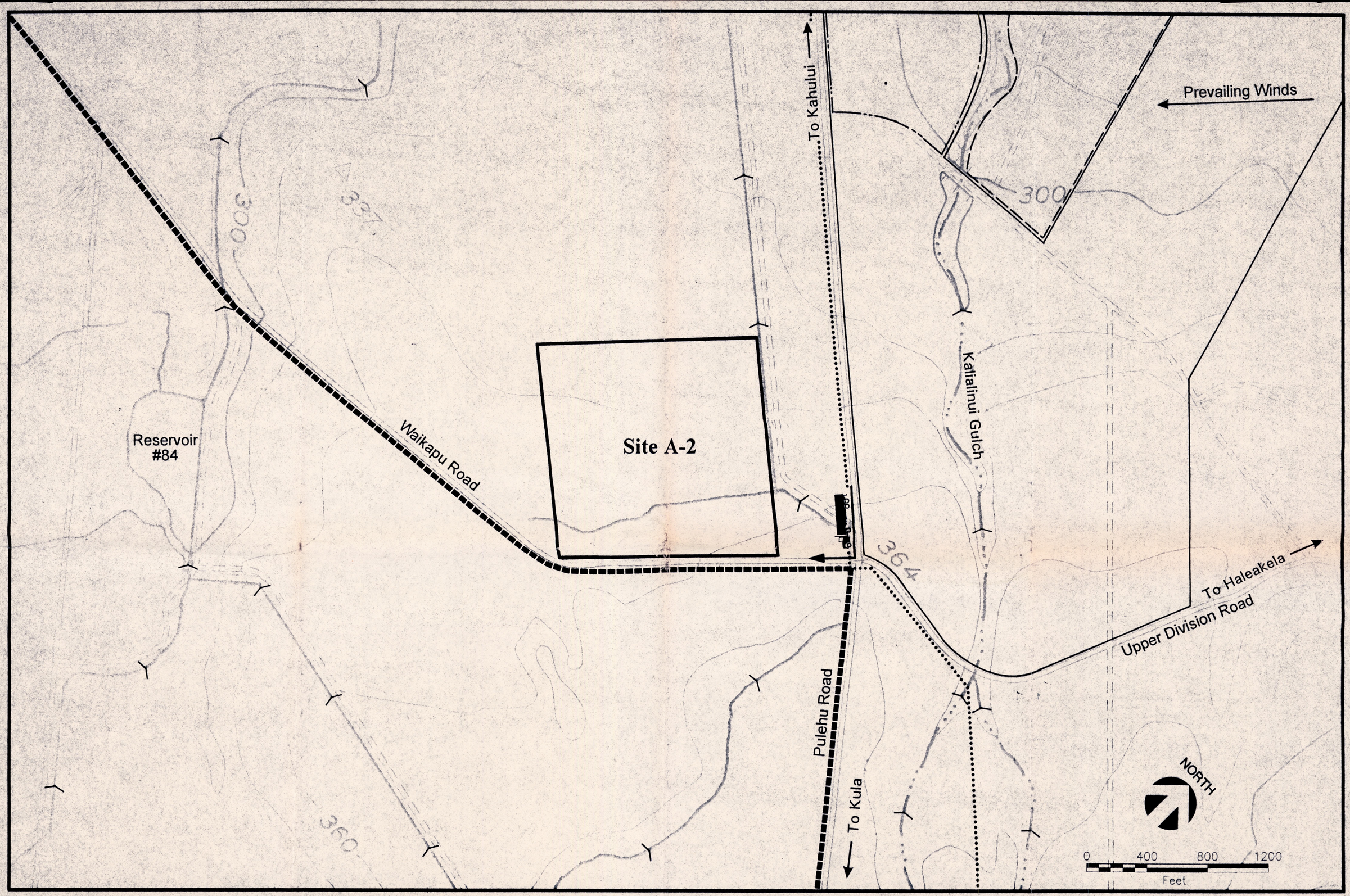
Central Maui Generation Addition, New Site

Maui Electric Company, Ltd.

3/95

DAMES & MOORE

0020



Ameron 20-Year Mining Lease

Maui County Land Fill (Existing)

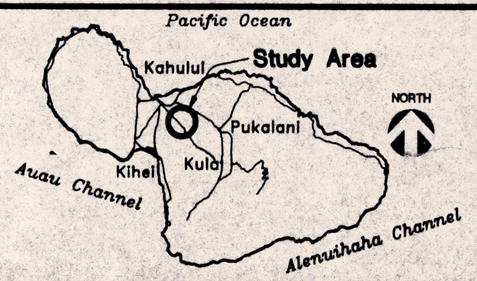
Maui County Land Fill (Planned)

Critical Fuel Haul Movement

Direction Of Surface Water Flow

Maalaea-Naalae 69 kV Transmission Line

69kV Transmission Line



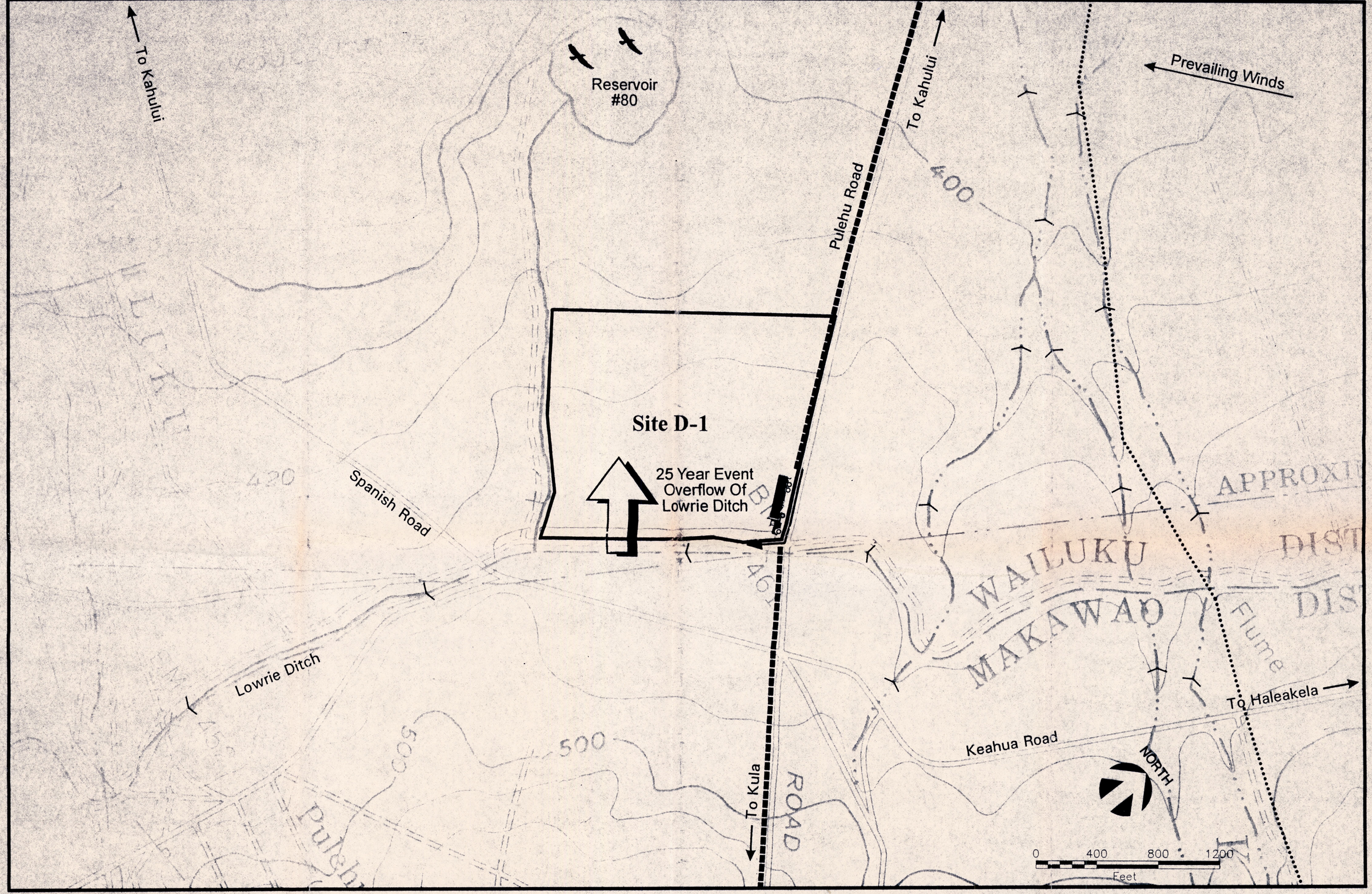
Site A-2

Central Maui Generation Addition, New Site

Maui Electric Company, Ltd.

DAMES & MOORE

3/95



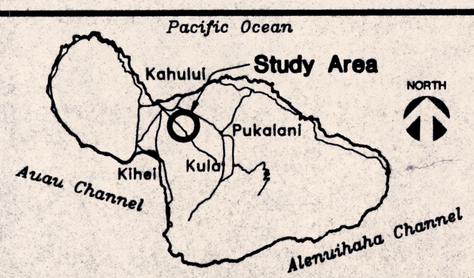
Sighting Of Endangered Species

Critical Fuel Haul Movement

Direction Of Surface Water Flow

Maalaea-Naalae 69 kV Transmission Line

69kV Transmission Line



Site D-1

Central Maui Generation Addition, New Site

Maui Electric Company, Ltd.

3/95

DAMES & MOORE

0022

APPENDIX A

Groundwater

DAMES & MOORE MEMO

• HONOLULU •

ACTION		INFO	FILE	
To:	Gayle Borchard		Job No.:	22941-007
			Date:	February 23, 1995
From:	Garry Lay			
Subject:	Central Maui Generation Facility Environmental Screening/Siting Study Groundwater			

This memo report regarding groundwater issues for the subject project follows this format:

- introduction
- scope of work and siting methodology
- existing conditions
- site evaluation and screening
- recommendations
- references

1.0 INTRODUCTION

This portion of the report presents the results of our screening of the three candidate sites (A-1, A-2 and D-1) with regards to groundwater. The site locations are shown on Vicinity Map, Figure 1. The factors that were considered in evaluating sites' suitability with regard to groundwater included groundwater supply and potential impact on groundwater when using injection wells to dispose of wastewater. These factors are as follows:

SUPPLY

- Groundwater availability.
- Potential interference with nearby existing wells.
- Groundwater quality.

DISPOSAL

- Onsite wastewater disposal and regulations.
- Potential contamination of existing supply wells.

Each candidate site was evaluated and ranked relative to each other according to its suitability for a power generating station based on these groundwater issues. The evaluation and screening process were formulated strictly based on readily available public information on each candidate site, site reconnaissance, interview with HC&S and State and County agency personnel. No field testing was conducted by Dames & Moore.

2.0 SCOPE OF WORK AND SITING METHODOLOGY

2.1 SCOPE OF WORK

In order to assess the factors related to groundwater issues listed above, Dames & Moore performed the following:

- Reviewed available pertinent geotechnical reports, hydrogeologic documents, and geologic maps pertaining to subsurface conditions, drilling conditions, depth to groundwater, and characterization of hydrogeologic conditions.

- Conducted site reconnaissance.

- Reviewed available data from nearby water supply wells, including any available water quality data.

- Consulted with the DOH (Uehara and Hew, 1995), Safe Drinking Water Branch, regarding compliance with Hawaii Administrative Rule Title 11, Chapter 23, Underground Injection Control (HAR, 1992).

2.2 SITING METHODOLOGY

After completion of relative evaluation of each candidate site with respect to the aforementioned groundwater issues, the sites were then ranked on each of these issues on a basis of a numerical scale of 1 to 3 with 1 = most suitable, 2 = suitable and 3 = least suitable. These groundwater ranks will serve in part as the basis of an overall environmental screening of the three candidate sites for the proposed new power generating station.

3.0 EXISTING CONDITIONS

3.1 REGIONAL GEOLOGIC SETTING

The Hawaiian Archipelago, which makes up the Hawaii Region, is a group of shoals, reefs, and islands trending northwest to southeast more than 1,500 miles across the Pacific Ocean. The Hawaiian Islands, which lie at the southeastern end of the archipelago, constitute more than 99 percent of the region's total land area. The Hawaiian Islands are the tops of shield volcanoes rising from the ocean floor, the oldest is Kauai in the northwest part, and the youngest, the island of Hawaii in the southeast part. Each of the islands consists of one to five volcanic domes, the bulk of which is composed of thousands of basaltic lava flows. The lavas issued in repeated outpourings from narrow zones of fissures associated with each volcano, first below sea level, then above it, to form huge mountain masses. The basaltic lavas that were extruded above sea level are generally thin-bedded, highly clinkery, and highly permeable. In contrast, the lavas extruded in water were quickly

chilled, are less clinkery, more massive, and are likely to be less permeable. All of the islands have sunk, to some extent, to adjust isostatically for their great weight on the earth's crust. Consequently, the highly permeable lava flows, which were originally extruded above sea level, now extend some distance below it. This rock assemblage of highly permeable basaltic lava flows, intruded in part by dikes in the zones of fissure and free of dikes outside of them, makes up the principal reservoirs for groundwater in the Hawaiian Islands.

3.2 HYDROGEOLOGICAL CONDITIONS

3.2.1 General

Groundwater in the area of the candidate sites occurs as a basal lens in the Honomanu volcanic series and to a lesser extent, the Kula volcanic series. The aquifer is comprised of lava and associated extrusive volcanic rocks. They are highly permeable and readily yield water to pumping. The State divided Maui into six aquifer sectors and the candidate sites lie within the Central Sector which comprised of four aquifer systems (Kahului, Paia, Makawao and Kamoole). More specifically, the candidate sites all lie within the Paia system (DLNR, 1992). The direction of groundwater flow in the area of the candidate sites is toward the coastal reach from higher ground elevation.

The groundwater originates chiefly from surplus irrigation of sugar cane with water diverted from Northeast Maui by a complex of ditches as well as groundwater locally pumped from wells and skimming tunnels. The regional groundwater is essentially the product of plantation activities and reflects quality and quantity features resulting from irrigation, fertilization and pesticide application practices.

3.2.2 Groundwater Table

Groundwater table of the basal lens is at approximately 4.5 feet (Mink and Yuen, 1994) above Mean Sea Level (MSL) at candidate Sites A-1 and A-2 (approximately 330 to 360 feet below existing ground surface) and up to 5 feet above MSL at candidate Site D-1 (approximately 430 to 460 feet below existing ground surface).

3.2.3 Groundwater Quality

The groundwater in the Paia aquifer system is a mixture of brackish and potable water. The estimated sustainable yield of the Paia aquifer system is 8 million gallons per day (DLNR, 1992) and of which approximately one-half may be potable quality water. Available information (DLNR, 1992) indicates water contains approximately 300 mg/L chloride for Sites A-1 and A-2 and 250 mg/L for Site D-1 while nitrate concentration is 23 mg/L for all three candidate sites. The silica concentration in water which could adversely affects reverse osmosis process varies between 50 to 70 mg/L for all three candidate sites. Total dissolved solids is estimated to be about 700 mg/L for Sites A-1 and A-2 and 450 mg/L for Site D-1.

3.2.4 Existing Water Supply

Our site reconnaissance indicated that HC&S irrigation reservoirs, ditches, feeder flumes and pipelines are in equal and reasonable distance to all three candidate sites. The Lowrie Ditch runs from northeast to southwest mauka of all three sites and actually borders the southeastern boundary of Site D-1.

3.2.5 Underground Injection Control Line

Sites A-1 and A-2 are both makai (below) the State Department of Health's Underground Injection Control (UIC) line and site D-1 is mauka (above) the UIC line (see Vicinity Map, Figure 1).

4.0 SITE EVALUATION AND SCREENING

Each candidate site was evaluated and ranked relative to each other according to its suitability based on the following factors. Table 1 summarizes the scoring of each site.

4.1 GROUNDWATER AVAILABILITY

All three candidate sizes are over the same aquifer from which sufficient quantities of groundwater can be withdrawn for power plant use.

Depth of basal groundwater table is similar for Sites A-1 and A-2 but about 100 feet deeper for Site D-1. The water supply well construction costs would be higher for Site D-1 due to the greater depth to groundwater table.

All three sites are in equal and reasonable distance to existing HC&S irrigation water supply system. If MECO intends to keep start-up costs to a minimum and is willing to balance cost with risk by depending on others to supply all of or part of the needed water to operate the power generation station, HC&S could be contacted for negotiation to allow part or all of the facility water requirements to be met by using the existing plantation's system.

Due to the higher costs to construct water supply wells on Site D-1, it was assigned a ranking of 2. Sites A-1 and A-2 were assigned a ranking of 1.

4.2 POTENTIAL INTERFERENCE WITH NEARBY EXISTING WATER SUPPLY WELLS

All three sites are located more than 6,000 feet from any water supply wells (see Vicinity Map, Figure 1) and therefore are unlikely to interfere significantly with pumping from these wells. All three sites were ranked 1 for this factor.

4.3 GROUNDWATER QUALITY

The groundwater quality (DLNR, 1992) near Sites A-1 and A-2 is similar but slightly lower in overall quality as compared to Site D-1 where the groundwater quality is close to potable water standards (approximate chloride concentrations of 300 mg/L for sites A-1 and A-2 versus 250 mg/L for site D-1). Our discussions with several local water treatment/purification companies indicate there should be no significant difference in reverse osmosis water treatment costs to reduce chlorides between Sites A-1/A-2 and D-1. The permitting for industrial water supply wells would be easier for Sites A-1 and A-2 as compared to Site D-1 because the Board of Water Supply may object the use of potable quality water for any purposes other than drinking and domestic use only (Ice, 1995). A rank of 1 was assigned to Sites A-1 and A-2 and a 2 was assigned to Site D-1 for this factor.

4.4 ONSITE WASTEWATER DISPOSAL AND REGULATIONS

Sites A-1 and A-2 are located makai of (below) the UIC line and therefore are allowed use of Class V, Subclass AB, B and E type injection wells for disposal of typical wastewater generated from the operation of a power station and other related sanitary sewage wastes provided the sanitary waste disposal system is equipped with septic tanks or equivalent aerobic units for pre-treatment of sewage effluent. Site D-1, however, is located mauka of (above) the UIC line and disposal of industrial wastewater onsite will be severely constrained as compared to Sites A-1 and A-2 because the use of injection wells mauka of the UIC line is discouraged by State DOH regulations (HAR, 1992). For Site D-1, only disposal of non-contact cooling water via Class V, Subclass B type injection wells are permitted. An alternative for wastewater disposal for Site D-1 could include obtaining an easement from A&B and piping industrial wastewater to injection wells makai of the UIC line. The sanitary sewage waste generated on Site D-1 (pre-treated by septic tanks or equivalent aerobic units) also has to be disposed of separately in a shallow leaching field which could require an extensive area. Since Sites A-1 and A-2 are more favorable with respect to onsite wastewater disposal, they were both ranked 1. Site D-1 receives a ranking of 2 for its anticipated difficulty and higher costs relating to wastewater disposal.

4.5 POTENTIAL CONTAMINATION OF EXISTING SUPPLY WELLS

Potential contamination of groundwater in nearby wells from onsite wastewater disposal is low since all three sites are more than one mile from any water supply wells (see Vicinity Map, Figure 1) and therefore all three sites were given a ranking of 1.

4.6 RESULTS OF SITE RANKING

Based on Table 1 - Site Ranking Based on Groundwater Factors, Sites A-1 and A-2 both have identical ranks and are more suitable for the proposed project than Site D-1.

5.0 RECOMMENDATIONS

With respect to the water supply and wastewater disposal issues relating to the final selection among the three candidate sites, we recommend the following:

- Contact HC&S to explore the possibility of integrating the selected facility site with the existing plantation irrigation system for water supply.

- Contact A&B/HC&S for the possibility of obtaining an easement to allow construction of pipelines from Site D-1 to a designated location makai of the UIC line for disposal of wastewater via injection wells at that designated location.

- Determine how potential changes in the near future regarding the administration of UIC regulations between the State DOH and the U.S. EPA might affect the final site selection process.

REFERENCES

Belt Collins Hawaii, 1994. MECO Central Maui Siting Study.

Black & Veatch, 1991. Maui Electric Company, Limited Generating Facility Siting Study, Candidate Sites Report.

DLNR (State of Hawaii, Department of Land and Natural Resources) 1992. Draft Maui County Water Use and Development Plan.

EPA (Environmental Protection Agency) 1977, Manual of Water Well Construction Practices. Prepared by Office of Water Supply, EPA-570/9-75-001.

HAR (Hawaii Administrative Rules), 1992. Title 11, Chapter 23 Underground Injection Control.

Ice, C., DLNR, telephone conversation, February 22, 1995.

Mink and Yuen, Inc., 1994. Conceptual Groundwater Monitoring Plan for Central Maui Landfill.

Takasaki K.J., 1978. Summary Appraisals of the Nation's Ground-Water Resources - Hawaii Region, USGS Professional Paper 813-M.

Takasaki, K.J., 1957. Hawaii Chapter of Water Levels and Artisan Pressures in Observation Wells in the United States, 1955, USGS Water-Supply Paper 1409.

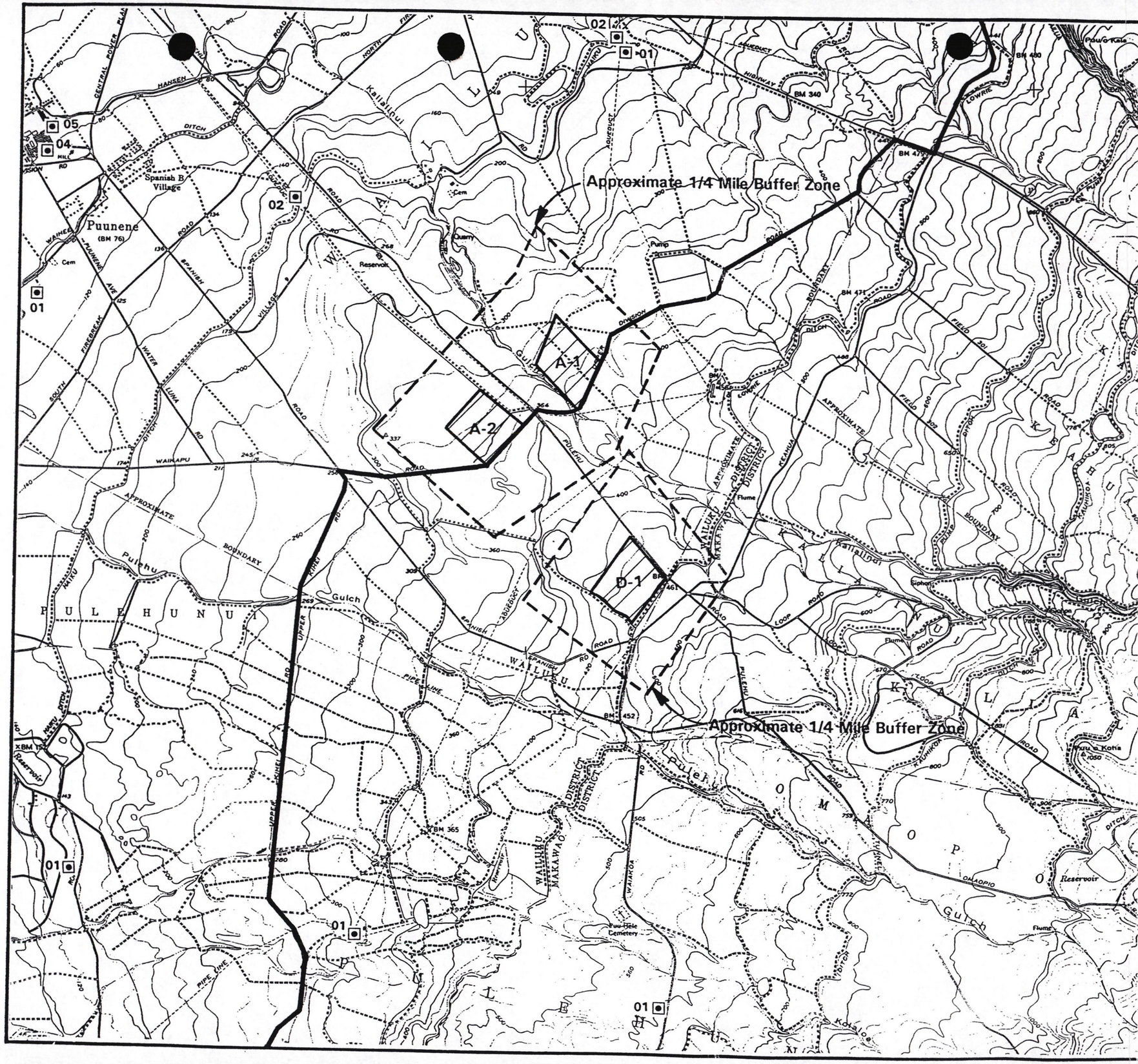
Takasaki, K.J., 1977. Elements Needed in Design of a Ground-Water Quality Monitoring Network in the Hawaiian Islands, USGS Water-Supply Paper 2041.

Uehara, N. and Hew, C., Geologists, Department of Health, Safe Drinking Water Branch, State of Hawaii. Meeting on January 26, 1995.

TABLE 1 - SITE RANKING BASED ON GROUNDWATER FACTORS

FACTOR	SITE		
	A-1	A-2	D-1
Groundwater Availability	1	1	2
Potential Interference on Nearby Wells	1	1	1
Groundwater Quality	1	1	2
Onsite Wastewater Disposal	1	1	2
Potential Contamination of Existing Supply Wells	1	1	1
Total (lower is more favorable)	5	5	8

Note : 1 = **Most suitable**
2 = **Suitable**
3 = **Least suitable**



Legend:

Underground Injection Control Line

Irrigation Well

North

Approximate Scale

0 2500 5000

Feet

VICINITY MAP

ENVIRONMENTAL SCREENING
CANDIDATE SITES A-1, A-2 AND D-1
PULEHU ROAD
PUUNENE, MAUI, HAWAII

Reference:
U.S.G.S. Topographic Map
Paia and Puu O Kali Quadrangle
Paia, Maui, Hawaii

Dames & Moore

Figure 1

REVISIONS
BY _____ DATE _____
BY _____ DATE _____
PLATE _____ OF _____

FILE 22941-007-001 6060
BY _____ DATE _____
CHECKED BY _____ DATE _____

APPENDIX B

Surface Water

DAMES & MOORE MEMO

• HONOLULU •

ACTION		INFO	FILE	
To:	Gayle Borchard		Job No.:	22941-007-001
			Date:	April 5, 1995

From: Faith Caplan

Subject: SURFACE WATER RESOURCE ASSESSMENT: Environmental Screening of Three Candidate Sites: A-1, A-2, and D-1 for a MECO Power Generating Facility
Wailuku District, Maui, Hawaii.

1.0 INTRODUCTION

This memo report addresses surface water resource issues pertaining to the proposed siting of a Maui Electric Company, Limited (MECO) power generation facility at one of three 50-acre candidate sites (A-1, A-2, D-1) in Central Maui (Figure 1). The primary focus of the following discussion is the potential for storm water runoff from the candidate sites to affect the quality of surface water adjacent or down gradient of the candidate sites, the range of available disposal options, and the surface water regulatory environment. Integral to this discussion are federal, State, and County permitting requirements related to discharge of construction or operations phase storm water runoff into surface waters. Inland surface waters are protected by all three levels of government not only to preserve them as natural resources and wildlife habitats, but to protect the quality of the ultimate surface receiving water, which in Hawaii is the Pacific Ocean.

2.0 METHODS

Information necessary to conduct this study was obtained through site reconnaissance; interviews with HC&S and State and County agency personnel; literature review, including prior siting studies evaluating the three candidate sites; map review; and review of federal, State and County regulations.

The following were data factors utilized to relatively evaluate the three candidate sites with respect to storm water disposal:

- The potential effect to the quality of receiving waters
- The range of disposal options available for each site
- The "permitability", or degree of permitting difficulty, associated with each site relative to stormwater disposal

Professional judgement was used to comparatively assess the candidate sites relative to these data factors.

The comparative evaluation of candidate sites site evaluation was in part based on the following assumptions:

- All operations phase wastewater, excluding stormwater but including non-contact cooling water and hydrotesting water, will be contained onsite through the use of one or more of the following: surface impoundments, septic systems, injection wells.
- At least five acres of earth will be disturbed during construction of the facility.
- Construction-phase storm water and industrial storm water will be discharged offsite.
- Due to their relative proximity to one another and similar topography, it is assumed rainfall does not vary appreciably among the sites (USGS, 1983).

- Based on the "generic" project schematic currently pertaining to all candidate sites, the quantity of impervious cover is assumed the same for all three sites. In addition, the slope of all three sites is similar (between 2.5 and 4.0 percent) (Belt Collins Hawaii, 1994). Therefore, the volume of runoff is assumed essentially the same for all sites.
- The amount of earth moved during construction is an indicator of the quality of construction-phase storm water discharge. Because all three candidate sites are relatively flat, the amount of grading required during construction among the three sites is assumed, within the confines of a surface water discussion, to be comparable.

3.0 RELEVANT REGULATIONS AND JURISDICTIONAL AGENCIES

3.1 Offsite Stormwater Disposal: Direct Discharge to Receiving Waters

The National Pollutant Discharge Elimination System (NPDES), mandated by the Clean Water Act, regulates activities which have the potential to impact the quality of surface waters. The State of Hawaii Department of Health (DOH), Clean Water Branch is responsible for administering the federal regulations and has developed an anti-degradation policy. Water (e.g., storm water runoff, wastewater, non-process cooling) entering surface water must be at least equal in quality to receiving waters (HAR, 1990). All NPDES permit applications are reviewed by DOH (Shinmoto, 1995).

The surface water bodies within the study area include streams associated with Kalialinui and Pulehu Gulches, irrigation reservoirs, and irrigation ditches. Although the reservoirs and ditches are manmade and owned by HC&S, and the water contained therein is used solely for irrigation, discharge into these waters is not necessarily exempt from the NPDES permitting process, because theoretically water from these sources could flow into gulches and ultimately into the Pacific Ocean (Wong, 1995). Drip irrigation is utilized by HC&S, who has tight control over the flow in the irrigation ditches, into the fields, and into the reservoirs; they do not have an NPDES permit (Moore, 1995; O'Keefe, 1995; Chin, 1995). Use of study area irrigation ditches for any project-related discharge would require prior permission from HC&S. Both HC&S and DOH will expect assurance that project-related storm water discharge would not degrade irrigation water quality, nor would it overburden irrigation infrastructure during a storm event in such a manner that overflow into study area streams would occur. In the event an inadvertent overflow did occur, MECO could be held accountable for the degradation of surface water quality (Sumida, 1995).

The flow of water in the streams of Kalialinui and Pulehu Gulches is intermittent; however, this does not diminish its value as a natural resource (Wong, 1995). The state classification for these inland surface water resources is Class 2 (HAR, 1990). The Hawaii Administrative Rules state, "These waters (Class 2) shall not act as receiving water for any discharge *which has not received the best degree of treatment* ..." (1990) (Emphasis added.)

The State of Hawaii holds six General Permits (GPs) granted by EPA; four of which may be relevant to the proposed power generation facility:

1) construction phase storm water discharge permit (triggered if more than five acres are graded)
2) industrial (operating phase) storm water discharge permit
3) industrial wastewater permit
4) non-contact once through cooling water (less than 1 MGD) discharge permit [1]
5) hydrotest water discharge permit.

Items 1) and 2), above are relevant to the disposal of stormwater from the candidate sites.

---

[1] Note that if non-contact cooling water is to be disposed of onsite at a quantity greater than 1 MGD, then an individual permit would be required. The principal disadvantages of applying for an individual permit through EPA is a prolonged review process and the requirement for a public hearing. An advantage to the individual permit is that it would cover all onsite discharges (including operation phase storm water), with the exception of the construction phase stormwater discharge (Sumida, 1995).

3.2 Offsite Storm Water Disposal: Municipal Disposal System

Discharge of storm water into either a municipal storm water or wastewater system is under the jurisdiction of the DOH Department of Wastewater and the County of Maui Department of Public Works, Division of Wastewater. The discharge of storm water into a municipal system requires a permit.

3.3 Onsite Storm Water Disposal: Impoundment

There are no regulations or agencies with jurisdiction over containment of storm water onsite in evaporation ponds or other surface impoundment.

3.4 Onsite Storm Water Disposal: Underground Injection

Disposal of stormwater into injection wells is regulated by the Department of Health, Safe Drinking Water Branch, Underground Injection Control (UIC) Division. Storm water runoff injection wells are classified as Class 5, Subclass C and are not permitted above (mauka of) the State designated Underground Injection Control line (HAR, 1992). Installation and use of a Subclass C well requires a UIC permit. The primary consideration in review of the permit application is proximity to drinking water wells and the quality of the discharge.

Disposal of storm water mixed with facility wastewater into an injection well is allowable. In the event of combined waste water and storm water disposal, the injection well is classified according to the most hazardous wastewater stream (Uehara, 1995).

4.0 EXISTING CONDITIONS

4.1 Sources of Study Area Receiving Waters

Surface water in the area of the candidate sites comprises natural streams within Kalialinui and Pulehu Gulches, three reservoirs, designated by HC&S as 80, 84 and 52, and cement-lined irrigation ditches (Figure 1). The reservoirs and ditches are owned and were created by HC&S specifically and solely for the impoundment and transport of irrigation water (Moore, 1995). Irrigation reservoirs and ditches are technically surface waters, but since the water is presumably contained within the irrigation system and does not ultimately flow into the ocean HC&S does not have a NPDES permit (O'Keefe, 1995) and does not need one (Wong, 1995; Uehara, 1995).

The reservoirs in addition to being integral to sugarcane production also serve as wildlife habitats. Two Hawaiian stilts were observed during a site reconnaissance at reservoir 80 (Caplan, 1995; Ohashi, 1995).

A recent site reconnaissance of the streambeds of both Kalialinui and Pulehu Gulches, conducted for this study, revealed them to be dry and heavily vegetated (Caplan, 1995). It is possible that a storm event could cause water to flow in the streambed; hence, the streams' designation of "intermittent" (USGS, 1983). The Central Maui Landfill, an unlined municipal solid waste facility, is located adjacent to Kalialinui Gulch immediately downstream of Site A-1. Access to this portion of Kalialinui Gulch was blocked by a fence, but visual inspection of the gulch from the vantage point of the fence showed the streambed covered with litter, primarily plastic bags, presumably from the landfill. Should a storm event result in a flow of water in the Kalialinui streambed there would be a few concerns: 1) the stream would carry the litter downstream; 2) the litter in the stream could create a weir effect, and potentially result in upstream flooding.

4.2 Characteristics of Study Area Receiving Waters

There are three sources for the HC&S irrigation water flowing through the agricultural ditches and reservoirs: approximately 189 MGD from the East and West Maui Ditch System, and 158 MGD are pumped from groundwater wells (DLNR, 1992). No water quality data was available from HC&S for the irrigation water. The groundwater may be brackish but is diluted with fresh water supplies and the

sugarcane is very salt tolerant (Takahata, 1995). The water quality of reservoirs is apparently adequate to support endangered species (Caplan, 1995; Ohashi, 1995).

Water quality data were not available for the Kalialinui or Pulehu Gulches because the stream flow is intermittent. Based on the site reconnaissance conducted for this study, the water quality of the stream within the Kalialinui Gulch would be compromised downstream of the candidate sites by the abundance of litter in the streambed; in addition, downstream contamination related to the generation of leachate from the unlined Central Maui Landfill is a possibility. Contamination by stormwater runoff from the landfill is another potential concern.

4.3 Candidate Site Proximity to Receiving Waters

To minimize the impact on surface water due to storm water generated during construction and operation of the facility it is desirable that the distance between the site and the surface receiving water be large, theoretically allowing an opportunity for rainwater infiltration. Surface water upgradient of the site is unlikely to be impacted by the MECO facility.

The western border of Site A-1 (Figures 1 and 2) is within 50 feet of Kalialinui Gulch, and the site slopes toward the gulch. There are no irrigation ditches within or bordering the site, nor are there any reservoirs down gradient of the site.

Site A-2 (Figures 1 and 3) is approximately 1,000 feet from Kalialinui Gulch (with Pulehu Road intervening), and 5,000 feet from Pulehu Gulch. The flow from the site is directed to the northwest, away from both gulches. Reservoir 84, approximately 2,000 feet from the site, is too far away to be of concern. There is an irrigation ditch bordering the site to the northeast, which, if preserved by HC&S, would be susceptible to storm water impact from the site, especially during the construction phase.

Site D-1 is located approximately 2,000 feet from Kalialinui Gulch (with Pulehu Road intervening), and 3,000 feet from Pulehu Gulch. The flow from the site is directed to the northwest, away from both gulches. Site D-1 is located immediately northwest and down gradient of Lowrie Ditch (Figures 1 and 4). Storm water flow from the site is unlikely to impact Lowrie Ditch water; however, Lowrie Ditch has overflowed onto Site D-1 during heavy rainfall (25-year event) (Moore, 1995; Chin, 1995). Another irrigation ditch is located adjacent to and down gradient of the southwest border of Site D-1, and is vulnerable to storm water flows from the site. Surface water flows from the Lowrie Ditch through the western-boundary irrigation ditch and ultimately into Reservoir 80, which is less than 100 feet down gradient of Site D-1.

4.4 Study Area Land Use

The predominant land use in the vicinity of all three candidate sites is sugarcane cultivation, including land between the sites and study area receiving waters. The Central Maui Landfill is within a quarter mile downstream of Site A-1. Ameron Quarry operates immediately adjacent to and north of the landfill, and is currently mining an area adjacent to Kalialinui Gulch.

4.5 Municipal Disposal System

The existing municipal storm and waste water systems currently do not extend beyond the urbanized areas of Kahului and Kihei. There are presently no plans to extend these systems to the study area (Miyasato, 1995).

5.0 RESULTS

This section provides information regarding a comparative evaluation of the three candidate sites relative to the three data factors utilized: water quality, disposal options, and regulation.

5.1 Surface Water Quality

All surface water is not equal and the natural streams, even though they are intermittent and may be negatively impacted by nearby downstream land uses, are valued as a natural resource. Even in the absence of water quality data, waters of Kalialinui Gulch are considered a more valued resource than irrigation water. Site A-1 is more constrained than the other sites by virtue of its proximity to a valued natural water resource and its drainage pattern relative to that resource. Due to their distance from natural surface waters coupled with their drainage patterns, Sites A-2 and D-1 can be considered equal relative to potential effects to study area surface water quality; both are considered less constrained than Site A-1.

5.2 Disposal Options

Table 1 summarizes the relative constraint presented by each candidate site relative to the range of disposal options available to that site.

5.2.1 Offsite Storm Water Disposal: Direct Discharge to Receiving Waters

With HC&S permission, it is possible storm water could be discharged into irrigation surface water. Based on proximity to ditches and reservoirs storm water disposal from Sites A-2 and D-1 would be more convenient than from Site A-1, which is not adjacent to an irrigation ditch or reservoir.

It is also possible to direct discharge to Kalialinui Gulch. Based on convenience, a function of proximity to study area gulches, Site A-1 is the least constrained.

5.2.2 Offsite Storm Water Disposal: Municipal Disposal System

Based on agency consultation conducted for this investigation, it is unlikely this option will be available to any of the candidate sites in the foreseeable future. Therefore, all sites are equal.

5.2.3 Onsite Storm Water Disposal: Impoundment

This options is available to all three sites. However, if there is an inadvertent overflow from the storm water surface impoundment, adjacent surface water could be vulnerable to degradation. Therefore, it is likely there would be design or locational restrictions on the impoundment for Site A-1 that would not apply to the other two candidate sites not in proximity to study area gulches. Inadvertent storm water runoff from impoundments on Sites A-2 and D-1 is likely, based on existing drainage patterns, to enter the HC&S irrigation system, or to run on to adjacent cane fields.

Based on the above, Site A-1 is the most constrained candidate site if surface impoundment is the preferred disposal option.

5.2.4 Onsite Disposal: Underground Injection

Onsite injection well disposal is a viable option for Site A-1 and A-2. Site D-1 is located approximately 3/4 mile above the UIC line, and would require the attainment of an easement to a location below the UIC line, drilling of an injection well, and installation of a pipeline to that well to implement this option. Therefore, Site D-1 is more constrained than the other two candidate sites for onsite disposal to injection wells.

5.2.5 Disposal Summary

Based on the above, Site A-2 would be preferred to Sites A-1 and D-1, which are equal, relative to the range and feasibility of available disposal options.

Table 1: Summary of Storm Water Disposal Options and Relative Value of Each Site

Disposal Option	Relative Value	Comments
Offsite Storm Water Disposal		
Direct Discharge	A-1 = A-2 = D-1	All sites constrained by potential environmental liability
Municipal System	A-1 = A-2 = D-1	Municipal system not available in foreseeable future
Onsite Storm Water Disposal		
Surface Impoundment	A-1 < [A-2 = D-1]	A-1 constrained by design and/or locational restrictions
Underground Injection	[A-1 = A-2] > D-1	D-1 constrained by location relative to UIC line

5.3 Regulation

5.3.1 NPDES

Storm water disposal into study area reservoirs or ditches may require NPDES permitting for Sites A-2 and D-1; the ease of permitting is anticipated to be equal for both sites. Because irrigation waters are not considered "natural", it is anticipated that NPDES permitting would not be unduly difficult.

Since the waters of Kalialinui Gulch are considered a more valued resource than irrigation waters, the NPDES permitting effort required for direct discharge from Site A-1 to the gulch could be logically anticipated to be relatively more difficult. Therefore, Site A-1 is more constrained than the other candidate sites.

5.3.2 UIC

Any disposal into an injection well will require UIC permitting. While injection well disposal of storm water is an option for Site D-1 (Wong, 1995), the relative degree of permitting difficulty can logically be expected to be somewhat higher for this "non-standard" arrangement than for the other two candidate sites.

5.3.3 Regulation Summary

Based on the above, Site A-2 is the least constrained relative to surface water regulation.

5.4 Summary

Table 2 summarizes the findings of this evaluation. On the basis of water quality, Sites A-2 and D-1 are equally preferred over Site A-1. On the basis of disposal options, Site A-2 is the least constrained and, A-1 and D-1 are equally constrained. On the basis of regulation Site A-2 is preferred.

Table 2: Relative Value of Each Site with Respect to Surface Water

Data Factor	Relative Value	Comments
Quality	A-1 < [A-2 = D-1]	A-1 constrained by proximity to natural surface water
Disposal Options	A-2 > [A-1 = D-1]	
Regulation	A-2 > [A-1 = D-1]	A-1 constrained by degree of potential NPDES permitting difficulty D-1 constrained by potential UIC permitting difficulty

6.0 SUMMARY AND RECOMMENDATIONS

None of the sites can be excluded based on surface water resources alone. All disposal options are viable for all sites. Based on the relative values of the three sites within the data factors as summarized in Table 2, Site A-2 is the least constrained.

The choice of stormwater disposal option is dependent upon a number of factors. If the option is based on permitting alone then the preferred option would be offsite surface disposal and Site A-1 would be slightly more constrained than the other two.

All offsite disposal into surface waters would potentially require NPDES permitting. It is possible that a convincing argument could be made to DOH that storm water from the site will be contained in the HC&S irrigation system and the quantity discharged would not result in irrigation water overflow into any natural streams. If the argument were acceptable to DOH, assuming HC&S granted permission to use their infrastructure, an NPDES permit may not be required for the disposal of storm water from the site into irrigation waters. Disposal into Kalialinui Stream will require NPDES permitting.

Dependence on HC&S infrastructure and easements has at least a few disadvantages: 1) potential liability should the surface water quality be degraded, 2) dependence on the integrity of the HC&S system.

Should Site A-1 and disposal into the Gulch be preferred, evaluation of the Central Maui Landfill's impact on the stream is recommended.

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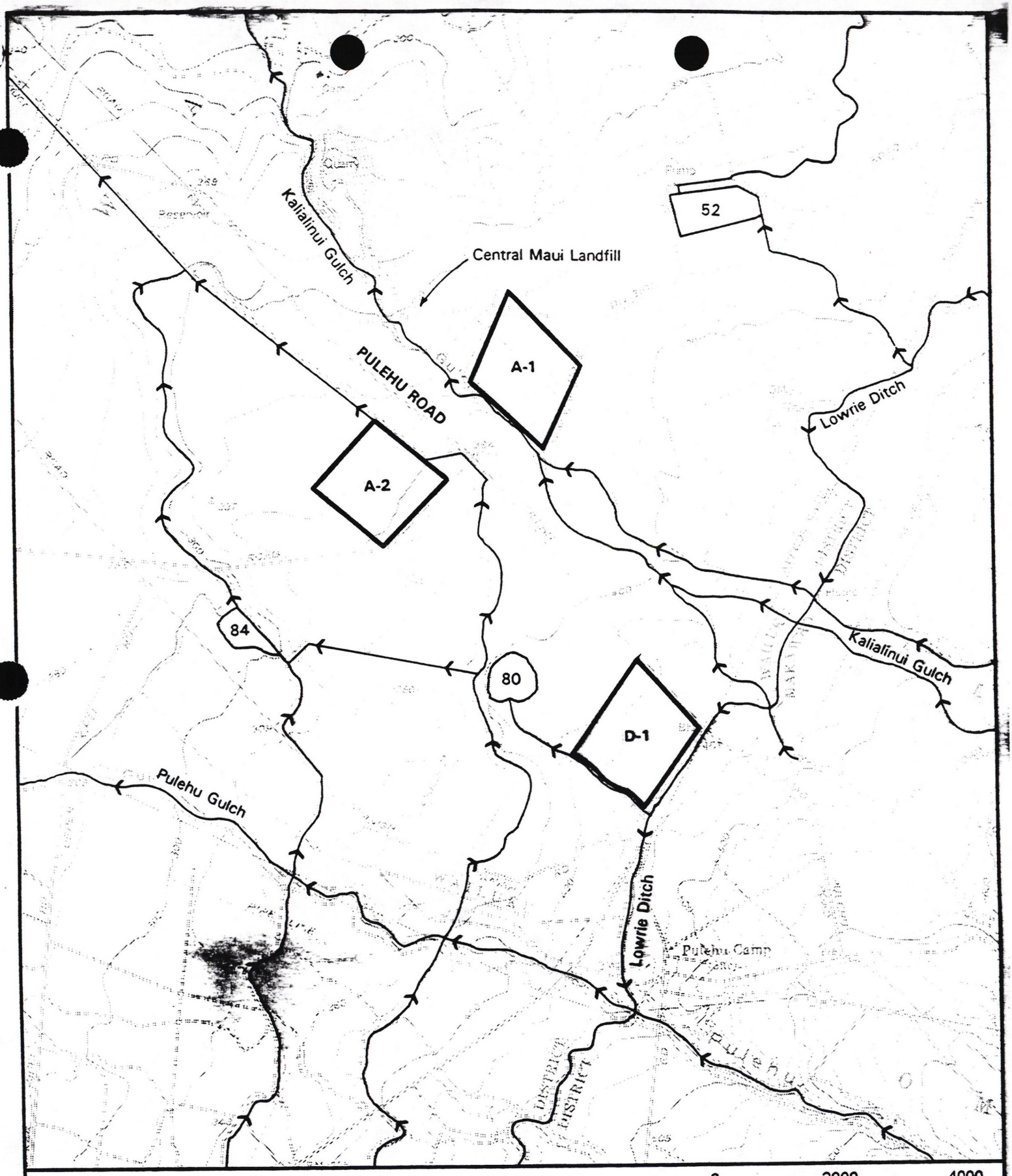
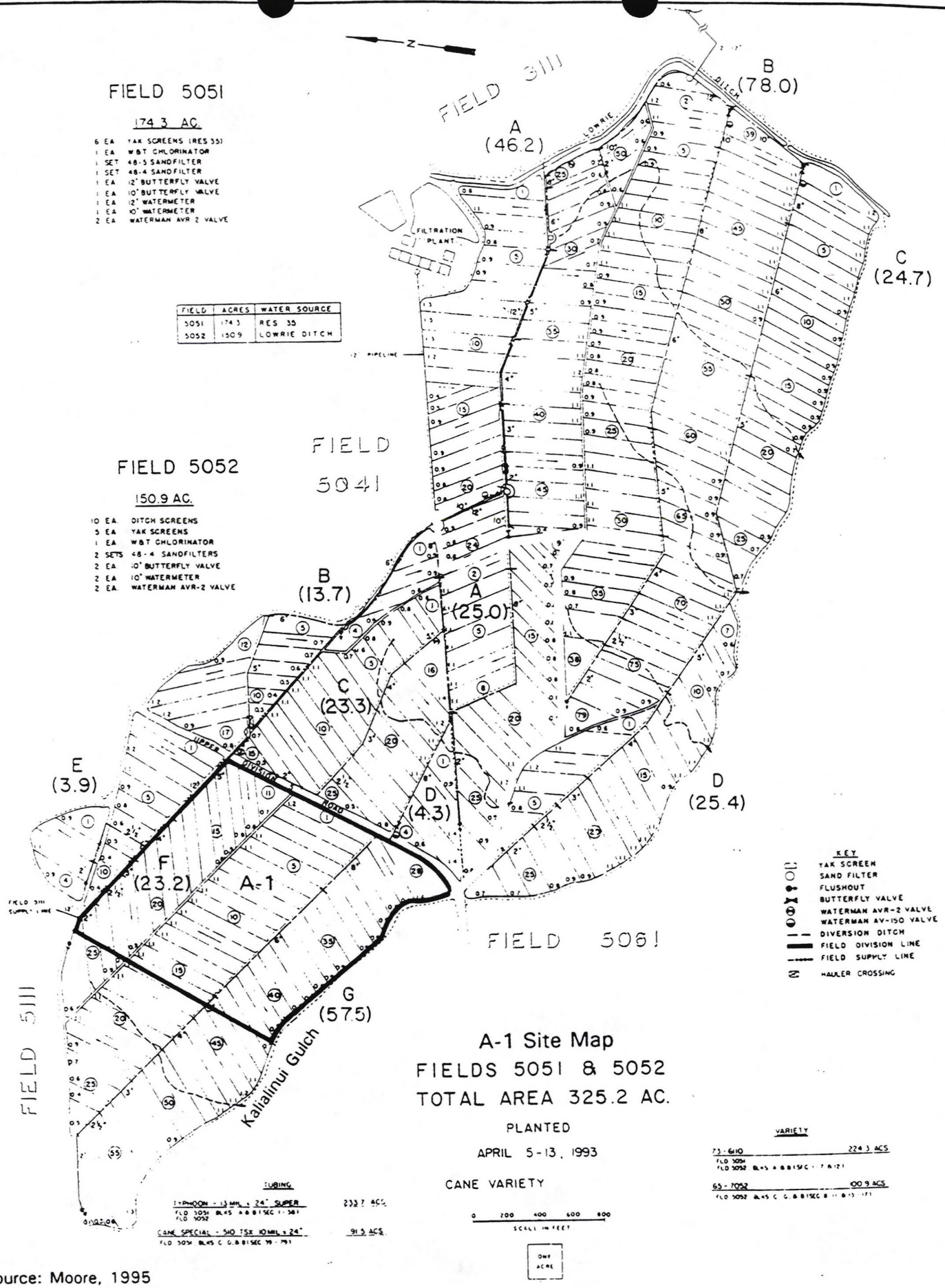


SITE LOCATIONS AND DIRECTIONAL FLOW OF SURFACE WATER

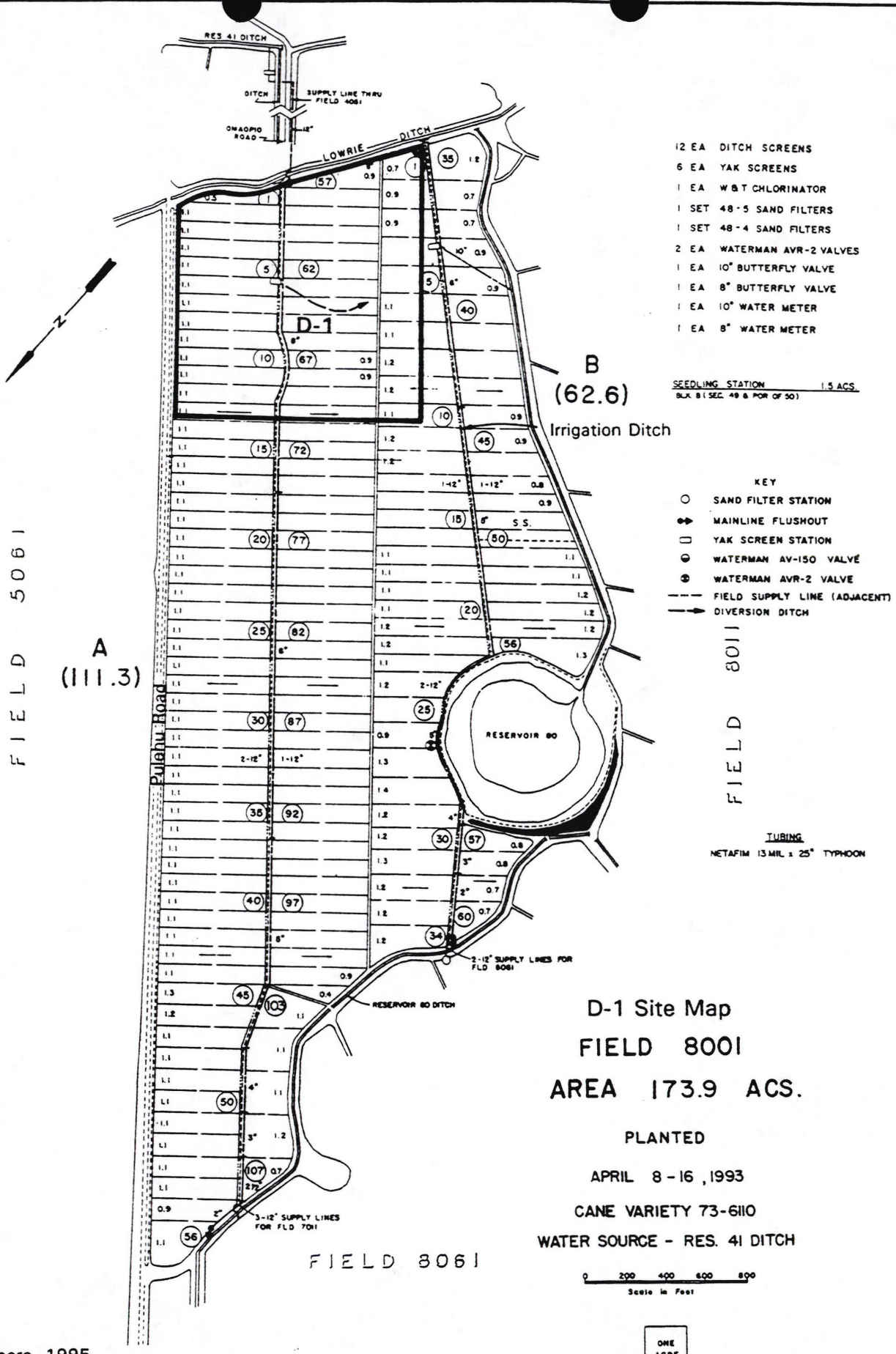
Figure 1



Source: Moore, 1995
Modified By Dames & Moore
February 1995

Dames & Moore

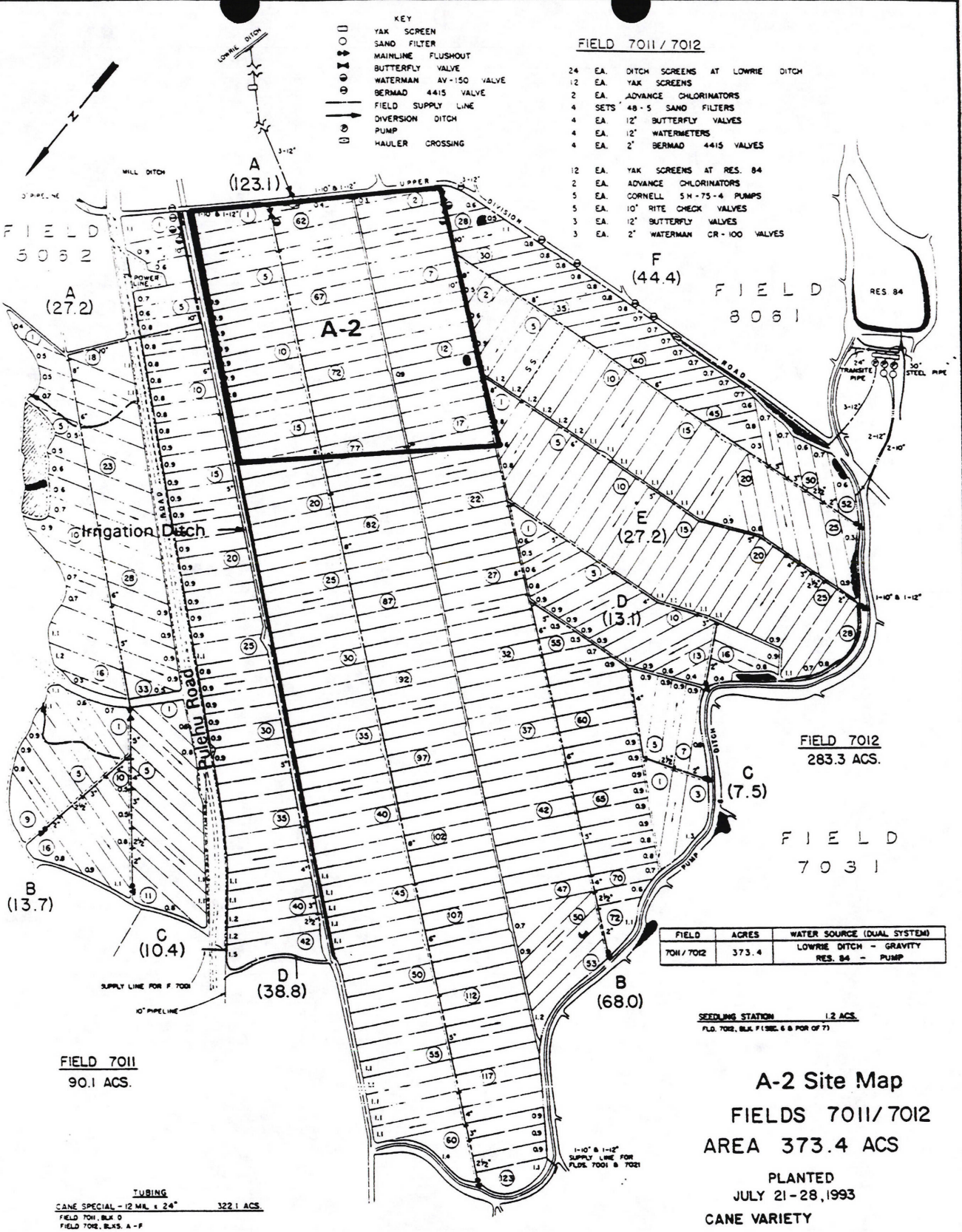
Figure 2



Source: Moore, 1995
Modified By Dames & Moore
February 1995

Dames & Moore

Figure 4



FIELD	ACRES	WATER SOURCE (DUAL SYSTEM)
7011 / 7012	373.4	LOWRIE DITCH - GRAVITY RES. 84 - PUMP

TUBING

CANE SPECIAL - 12 MIL x 24"	322.1 ACS.
FIELD 7011, BLK D FIELD 7012, BLKS. A-F	
TYPHOON - 16 MIL x 25"	51.3 ACS.
FIELD 7011, BLKS A-C	

CANE VARIETY

78-7234	51.3 ACS
FLD. 7011, BLKS. A-C	
73-6110	252.7 ACS.
FLD. 7011, BLK. D FLD. 7012, BLKS. A-D, & E (SEC. 1-4)	
74-4527	69.4 ACS.
FLD. 7012, BLKS. F, & E (SEC. 5-28)	

Source: Moore, 1995
Modified By Dames & Moore
February 1995

Figure 3

APPENDIX C

Noise

DAMES & MOORE MEMO

• HONOLULU •

ACTION		INFO	FILE	
To:	Gayle Borchard		Job No.	22941-007-001
			Date:	February 27, 1995
From:	Alison Signorotti			
Subject:	**Proposed MECO Power Plant: Noise Evaluation of Three Candidate Sites**			

1.0 INTRODUCTION

The following describes potential noise constraints and opportunities associated with each of three sites identified as candidate sites for an electrical generation facility. The three sites are within a 1.5 mile area with a generally uniform noise environment; because of this, many noise constraints affecting one site apply to all three candidate sites.

For the purposes of this analysis, the following noise-related factors were considered in order to identify a preferred site:

- Local noise regulations or requirements affecting activities at the project site.
- The site's proximity to existing or planned noise-sensitive land uses, such as residences or schools.
- The relation of the site to existing or planned major noise sources, including industrial operations, airports, or major highways.
- The site's physical / acoustic environment, including predominant wind directions, or topographical features that may affect sound propagation.
- Existing sound levels in the vicinity of the site.

2.0 RELEVANT REGULATIONS AND JURISDICTIONAL AGENCIES

The Hawaii Department of Health is the jurisdictional agency responsible for establishing and enforcing noise regulations in the state. Currently the Department has no noise regulations applicable to the Island of Maui. The Department is, however, in the process of developing a community noise regulation that would be applicable throughout the state; this noise regulation would be similar to the current Oahu noise regulations described in Title 11, Chapter 43.[1]

Chapter 43 defines allowable community noise levels, or maximum permissible noise levels for various land uses. Table 2-1 summarizes the Chapter 43 noise regulations. The following applications of these maximum allowable sound

[1] The Department also regulates automobile and truck noise through Title 11, Chapter 42. These vehicular noise regulations apply only to the Island of Oahu, and the Department does not plan to extend vehicular noise regulation to the other Islands.

levels are particularly relevant to this s:

- Where the allowable sound levels between two adjacent zoning districts differ, the lower sound level is the maximum allowable; for instance, the allowable sound level for a residential district applies at the property line between residential and commercial districts.

- The specified maximum allowable sound levels apply subject to the order of precedence in which land uses were initiated. For example, if industrial operations are conducted next to a residential land use, the industrial noise limit would apply at the property line if the residential building permit was obtained after the industrial operations had been initiated. Residential limits would apply if the residential building permit was obtained prior to the initiation of industrial operations.

- If a particular land use is located in an area zoned for a different use, the maximum allowable sound levels applicable to the zoned land use would apply. For instance, if a residence or a commercial building is located in an area zoned for industrial or agricultural land uses, the maximum allowable sound levels for the industrial / agricultural land uses would apply (Eckerd, 1995).

TABLE 2-1
Allowable Property Line Sound Levels (dBA)[1]

Zoning District	Maximum Allowable Sound Level[2]	
	Daytime (7:00 a.m. - 10:00 p.m.)	Nighttime (10:00 p.m. - 7:00 a.m.)
Residential, Preservation	55	45
Apartment, Hotel, Commercial	60	50
Agricultural, Industrial	70	70

1. Section 11-43-3, Department of Health Administrative Rules.
2. Maximum Allowable Sound Levels are not to be exceeded for more than ten percent of the time during any twenty-minute period. The sound level exceeded ten percent of the time, referred to as L_{10}, and usually exceeds the average sound level over that period by several decibels.

3.0 METHODS

The noise screening study was conducted through a review of USGS, aerial, and land use/zoning maps; review of a noise study conducted in the vicinity of the candidate sites; a review of available wind data for Maui; and site-reconnaissance and ambient sound level monitoring.

USGS and aerial maps were reviewed to identify existing structures within a several mile circumference of the candidate sites, to establish the proximity of candidate sites to probable noise sources (e.g., major highways, industrial operations) and to noise-sensitive receptors (e.g., residences, schools), and to assess local topographical features that may affect noise propagation. Land use/zoning maps were reviewed to determine current land use designations for properties surrounding the candidate sites.

Dames & Moore reviewed a background noise study conducted for a project several kilometers south of the three candidate sites to gather available information on ambient sound levels in the project vicinity (Ebisu, 1992). Historical

wind direction data was collected fr[illegible]n-house sources and used to determi[illegible]ypical wind conditions near the candidate sites.

A site reconnaissance was performed to verify the presence or absence of sensitive receptors identified through map review, and to characterize the noise environment through short-term sound level measurements.

4.0 EXISTING CONDITIONS

Surrounding Land Uses and Sensitive Receptors

A review of the Wailuku-Kahului and Kihei-Makena community plans and zoning maps for the Pukalani area indicates that all three candidate sites are surrounded by designated agricultural zones, with the exception of the Ameron Quarry/Maui County Landfill site, which is zoned "Public/Quasi Public" in the Wailuku-Kahului community plan. Because the Hawaii Department of Health Maximum Allowable Noise Levels do not address public/quasi public land uses, the allowable noise levels for the quarry/landfill area were assumed to be the same as agricultural/industrial area noise limits.

Site A-1 is contained entirely within the Wailuku District, located immediately southeast of the Maui County Landfill and parallel to Pulehu Road. The Ameron buildings north of the quarry (about 0.5 mile from the Site A-1 boundary[2]) represent the nearest commercial land use, although they are located in an agriculturally zoned area. A day-care facility and several social services buildings are located in Puunene, approximately 2.0 miles northwest of the Site A-1 boundary. These buildings are located in an area designated for public/quasi public land uses, and are surrounded by heavy industrial land use designations. The nearest existing or proposed residentially zoned area is in Kahului, about 3.25 miles northwest of the Site A-1 boundary. Residentially designated land uses also lie about 4.0 miles east of the [illegible]ite A-1 boundary, in the Pukalani area.

Site A-2 is also contained entirely within the Wailuku District. The Ameron buildings are about 0.5 mile from the Site A-2 boundary, and the day-care facility and several social services buildings in Puunene are located approximately two miles from the site boundary. Residentially zoned land uses in Kahului are 3.25 miles from the nearest Site A-2 boundary. Residentially zoned areas in Pukalani are about 4.25 miles from the nearest Site A-2 boundary.

Site D-1 is also surrounding by agricultural land use designations. Site D-1 is southeast of Sites A-1 and A-2, and therefore is about 3.5 miles from residentially zoned areas of Pukalani, and is within 2.5 miles of scattered residences at Omaopio Homesteads; the Omaopio Homesteads area is zoned for agricultural uses. Site D-1 is located about 4.25 miles from the residentially zoned areas of Kahului.

Physical Environment

The area surrounding the candidate sites is generally flat, sloping gently upward east and southeast of the sites, and downward northwest toward Kahului. Areas with noise sensitive receptors in Puunene and Kahului, and more distant residential areas in Kihei-Makena (Waiakoa Homesteads) and Lower Paia, are at about the same elevation as the three candidate sites. Residential areas in Pukalani and the Omaopio Homesteads are uphill of the three candidate sites, over 600 feet higher in elevation.

Wind directions and speeds in are monitored at the Kahului Airport, several miles northwest of the site locations.

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[2] The "site boundary" refers to outer, or buffer area boundary.

Historical data indicate that winds in K[redacted]ui are predominantly from the northeas[redacted]roughout most of the year (Gale, 1985).

Current Noise Environment

Sound level monitoring data collected by Y. Ebisu & Associates and Dames & Moore indicate that ambient sound levels in the project area are generally low, and are strongly affected by the area's proximity to local roadways and by the presence of air traffic. Data collected by Y. Ebisu & Associates indicated that sound levels in areas unaffected by air or vehicular traffic noise ranged from about 35 to 45 dBA. Sound levels near residential portions of Kahului, however, were dominated by local traffic noise, and ranged from about 55 to 70 dBA (Ebisu, 1992).

Short-term daytime sound levels recorded by Dames & Moore in Puunene were dominated by aircraft noise, and generally exceeded 55 dBA. Monitored short-term sound levels in the vicinity of the three candidate sites were between 55 and 60 dBA, and were highly dependent on local vehicular traffic and air traffic. The noise level monitoring locations are shown on Figure 1. Table 4-1 summarizes the noise levels used in the preparation of this report.

TABLE 4-1
Noise Readings (dBA) and Monitoring Location Observations

Monitoring Location	Ln_{10}[a]	Ln_{90}[b]	L_{ev}[c]	Observations
1	57	50	54.5	Ambient community noise: light traffic
2	62	50	58.7	Ambient site noise: intermittent dump truck activity, breezes through sugarcane, distant helicopter
3	62	48	60.2	Strong wind through sugarcane, no air traffic
4	63	45	58.6	Local traffic noise
5	53	49	51.4	Ambient community noise: occassional car, no air traffic, breezes through sugarcane

[a] Ln_{10} values represent sound levels exceeded during 10% of monitoring period.
[b] Ln_{90} values represent sound levels exceeded during 90% of monitoring period.
[c] L_{ev} values represent the time averaged sound levels during the monitoring interval.

5.0 FINDINGS

Because of the proximity of the three candidate sites, most noise constraints and opportunities affect all three sites similarly. While no candidate site was substantially superior or inferior with respect to noise issues, slight differences among the three site locations allowed for a clear determination of site preference.

5.1 Noise Factors Considered in Candidate Site Ranking

Ranking of the three sites was based primarily on their distance from residentially zoned land uses. Physical constraints played a role in the site ranking to a limited extent: the uphill location of Pukalani with respect to the candidate sites could result in both a greater perceived effect, because of an unbroken line of sight with the facility, and a greater actual effect, as the unbroken line of sight would minimize potential noise attenuation from ground absorption. Also, because predominant wind directions in the area are toward the southwest (where the residentially-zoned community of Waiakoa is located), the location of the site with respect to downwind noise receptors was considered in the site ranking.

Another physical characteristic of the candidate sites would affect project-generated noise, but was not incorporated into the site ranking: agricultural lands surrounding the three candidate sites are used primarily for sugar cane cultivation; because mature sugar cane can reach 10-15 feet in height, cane fields in the vicinity could have the effect of attenuating noise produced by a ground level noise source. Studies have shown that the excess attenuation (i.e., the sound level reduction in addition to that caused by atmospheric spreading) for sound propagation through dense shrubbery can reach 20 or more decibels over several hundred feet[3] (Beranek, 1988). While the existence of cane cultivation in the vicinity of the candidate sites would be likely to reduce potential project-generated noise, no associated attenuation can be assumed in the noise analysis, as there is no guarantee that surrounding fields will remain continuously in sugarcane cultivation.

The existing noise environment played a limited role in the site ranking. Dames & Moore's site reconnaissance and noise monitoring data review indicate that noise from Kahului Airport air traffic has a major effect on the Kahului area noise environment, and that ambient sound levels in the Kahului-Wailuku area are likely higher than ambient sound levels in the Pukalani area, because of the absence of major noise sources in the Pukalani area. Accordingly, a site's distance from the Pukalani area was again given priority, as project-generated noise would potentially be more noticeable in an area with low ambient sound levels.

5.2 Candidate Site Rankings

Site A-1 was identified as the most preferable site, primarily because of its intermediate distance from Pukalani and Kahului, and in part because of its location with respect to existing noise sources, such as Pulehu Road, Kahului Airport, and the Ameron Quarry/Maui County Landfill, and in part because of its relatively greater upwind distance from the Waiakoa community.

Site A-2 was ranked second with respect to noise issues; while Sites A-1 and A-2 are about equidistant from Pukalani, Site A-2 is somewhat closer than Site A-1 to Kahului and Puunene and is slightly closer to the downwind community of Waiakoa.

Site D-1 was identified as the least preferable site, due to its comparative proximity to residentially zoned land uses (approximately 3.5 miles from Pukalani), and because Site D-1 is the closest candidate site to the uphill residential community of Pukalani.

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[3] The actual noise reduction from excess attenuation would depend on the character of the noise produced and site-specific parameters.

5.3 Other Considerations

Truck noise associated with the project would not be likely to present an environmental constraint for any of three reasons:

- Vehicular noise is not regulated on Maui, and the State Department of Health does not intend to transfer existing Oahu traffic noise regulations to the other islands;
- Based on current estimates of project truck traffic, truck noise generated by anticipated project-generated traffic would not substantially affect the time averaged sound levels in the affected area; and,
- Roads serving each of the three candidate sites do not pass through noise-sensitive areas.

6.0 UNRESOLVED UNCERTAINTIES

Dames & Moore has identified three unresolved uncertainties associated with noise:

- Property-line sound levels: MECO has indicated that it intends to comply with a 70-dBA limit at the property boundary, and Dames & Moore has assumed that required sound level reductions can be attained. Actual property-line sound levels will depend on the project-specific equipment characteristics.
- A facility could generate substantial nighttime noise, and this noise could be magnified by stable nighttime atmospheric conditions, the absence of air traffic, and the added sensitivity of residential receptors to nighttime noise.
- While conversations with Hawaii Department of Health staff have indicated that future Maui noise regulations would be similar to those contained in Title 11, Chapter 43, no draft rules applicable to Maui are available for review.

7.0 RECOMMENDATIONS FOR FURTHER STUDY

To address the unresolved uncertainties described in Section 6.0, Dames & Moore recommends that the following be considered:

- Following site selection and preliminary project design, a site specific noise analysis should estimate property line sound levels and project-generated sound levels at affected residentially zoned areas for both daytime and nighttime operating conditions. The acoustical analysis should also identify feasible noise mitigation, as necessary, to reduce plant noise.
- The State Department of Health's progress on Maui Noise Regulation development should be monitored.

8.0 REFERENCES

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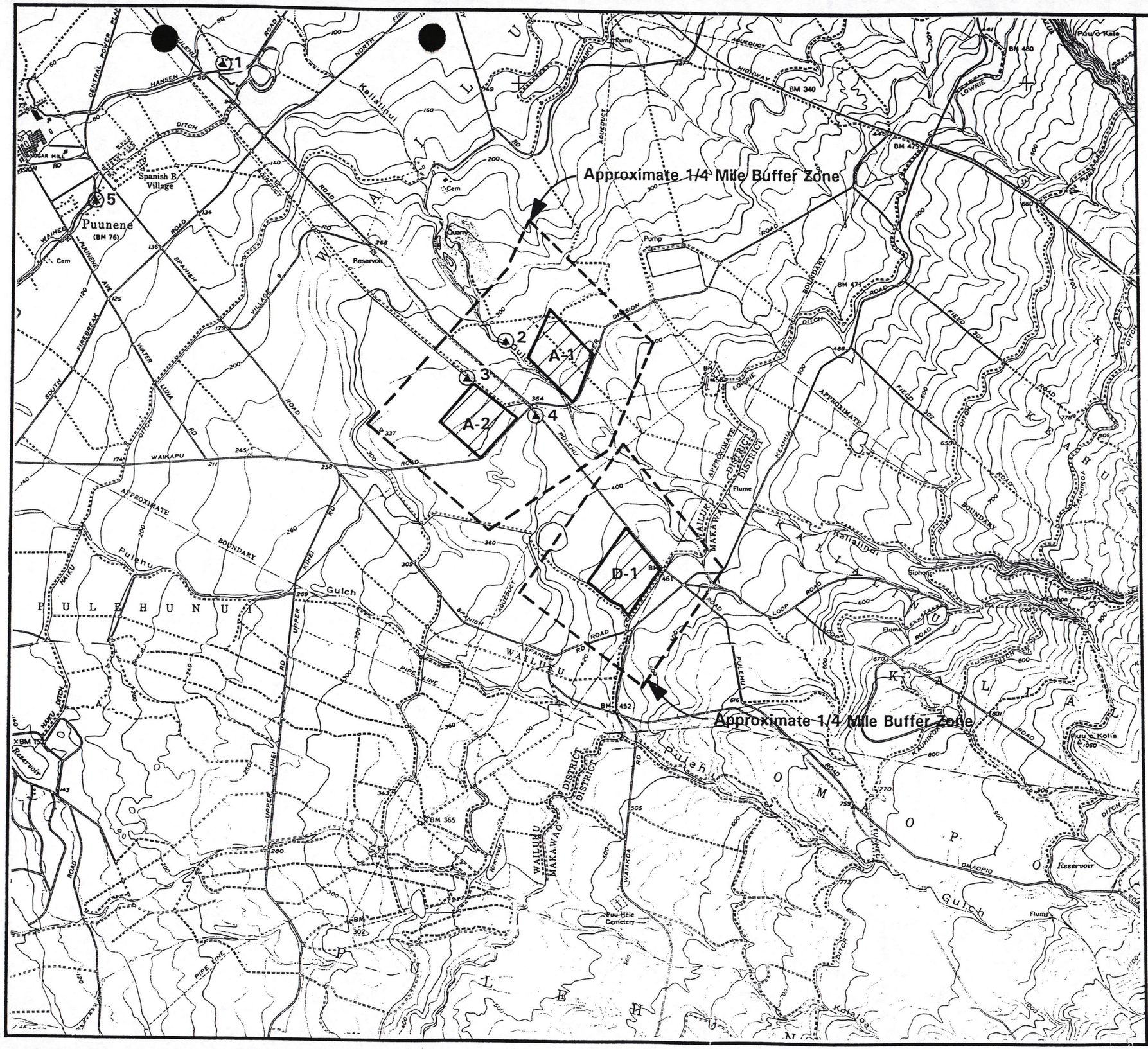
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Approximate 1/4 Mile Buffer Zone
A-1
A-2
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1
2
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Puunene
(BM 76)
Spanish B
Village
Reservoir
Quarry
Pump
Flume
Siphon
Gulch
Cem
Reservoir
Puu-Hele
Cemetery
Puu o Kolia
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Kolaloa
Kalialinui
Pulehu
Waiakoa
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Wailuhu
Makawao
Keahua
Kaonoulu
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APPENDIX D

Botany

BOTANICAL ASSESSMENT STUDIES

MECO NOMINAL 232 MW GENERATING STATION

WAILUKU DISTRICT, ISLAND OF MAUI

by

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Prepared for: DAMES & MOORE

February 1995

BOTANICAL ASSESSMENT STUDIES
MECO NOMINAL 232 MW GENERATING STATION
WAILUKU DISTRICT, ISLAND OF MAUI

SECTION 1.0 INTRODUCTION

Three viable candidate sites—Al, A2, and Dl—are currently being screened in order to identify environmental constraints or opportunities associated with each candidate site. Baseline information gathered during the environmental screening will be used to rank the sites in order to identify a preferred site. The three candidate sites are located in central Maui, approximately 4.0 to 4.5 miles southeast of Kahului. All three sites are located relatively near each other, all are owned by A&B–Hawaii (Alexander and Baldwin, Inc.), and all are presently in sugar cane cultivation.

Field studies to assess the botanical resources found on each of the three candidate sites were conducted on 01 February 1995. The primary objectives of the survey were to provide a description of the vegetation, search for threatened and endangered species as well as rare and vulnerable plants, and identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

SECTION 2.0 RELEVANT REGULATIONS AND JURISDICTIONAL AGENCIES

Currently, 199 plant species are recognized as threatened and endangered species in Hawai'i by the U.S. Fish and Wildlife Service (1994b). Plants listed by the Service are automatically added to the State's threatened and endangered species list. Federally listed species are protected under the Endangered Species Act of 1973, as amended. Hawai'i State Law (H.R.S. 195-D) protects all Federal and State listed plants on all lands within the State. Any projects or actions that may adversely affect these plants would need to coordinated with the Department of Land and Natural Resources (DLNR).

SECTION 3.0 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 very recent black and white aerial photographs (1" = 2000') were examined to determine vegetation cover patterns, terrain characteristics, access, boundaries, and reference points. Access onto all the sites was provided by Pulehu Road, a paved County road.

The uncultivated areas, such as around drainageways and reservoirs and along the margins of fields, were more intensively surveyed as these areas were more likely to harbor native plant communities and, perhaps, rare plants. The actively cultivated sugar cane fields were not surveyed in detail as sensitive native plants were not likely to occur in such habitats.

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

SECTION 4.0 EXISTING CONDITIONS

In the following discussion, the plant names used for the flowering plants are in accordance with the most recent treatment of the Hawaiian flora by Wagner *et al.* (1990). Fern names follow Lamoureux (1988).

4.1 Site A1

Site A1 is located north of Upper Division Road, approximately 2000 feet east of Pulehu Road, and east of Kalialinui Gulch. The site is located approximately 2000 feet southeast of the Central Maui Landfill.

The majority of the proposed 50-acre A1 site and the surrounding buffer area is actively cultivated sugar cane *(Saccharum officinarum)* fields. The dense fields of fast-growing sugar cane tend to exclude other species so most of the weedy plants are found along the margins of the fields. On this site, swollen fingergrass *(Chloris barbata)* is the most frequently encountered species. Other species observed occasionally along the edges of fields include fir-leaved celery *(Ciclospermum leptophyllum)*, *Crassocephalum crepidioides*, fleabane *(Conyza bonariensis)*, 'uhaloa *(Waltheria indica)*, fuzzy rattlepod *(Crotalaria incana)*, and cheese weed *(Malva parviflora)*.

Where the site abuts Kalialinui Gulch, the vegetation consists of 3 to 8 feet tall koa-haole shrubs *(Leucaena leucocephala)* and dense patches of Guinea grass *(Panicum maximum)* and California grass *(Brachiaria mutica)*. Scattered through this shallow gulch area are a few trees of kiawe *(Prosopis pallida)* and Chinaberry *(Melia azedarach)*. Besides the weedy, herbaceous species common to the cane fields, other plants found here include smaller shrubs and vines such as castor bean *(Ricinus communis)*, hairy abutilon *(Abutilon grandifolium)*, hairy merremia *(Merremia aegyptia)*, wild bittermelon *(Momordica charantia)*, Mauritius hemp *(Furcraea foetida)*, and lion's-ear *(Leonotis nepetifolia)*. Besides 'uhaloa, the other native species found here are 'ilima *(Sida fallax)*, 'anunu *(Sicyos hispidus)*, and koali *(Ipomoea indica)*.

4.2 Site A2

Site A2 is located north of Waikapu Road, approximately 1500 feet west of Pulehu Road, and 0.4 miles southwest of Site A1.

This site is somewhat weedier than Site A1 with plants of spiny amaranth *(Amaranthus spinosus)*, puncture vine *(Tribulus terrestris)*, Mexican poppy *(Argemone mexicana)*, and cheese weed locally abundant in places alongside the cane haul roads. Along the Pulehu Road boundary, there is an abandoned, partially collapsed, below ground water storage tank. A few clumps of hairy sword fern *(Nephrolepis multiflora)* are found in this slightly damper area. Also found around the old water tank are a few trees of kiawe and Java plum *(Syzygium cumini)*, 30 to 50 feet tall.

4.3 Site D1

Site D1 is located at the northwest quadrant of Pulehu Road and Lowrie Ditch Road, and 1.0 mile south of Site A1. A meteorological station is located on this site.

The weedy vegetation along portions of the roadsides and ditch were recently treated with herbicide and so most plants were dried and brown, but species observed on this site were similar to those found on the other two candidate sites. The ditch did support a few plants which prefer a moisture environment; these were false daisy *(Eclipta alba),* hairy sword fern, and *Leptochloa uninervia.*

SECTION 5.0 FINDINGS

All three candidate sites are dominated by introduced or alien plant species. The vegetation consists of sugar cane fields and the weedy species commonly associated with such agricultural lands. The uncultivated gulch areas support koa-haole shrubs, various grasses, a mixed assortment of weedy herbaceous species and vines, and a few kiawe and Chinaberry trees. Four native species were found on the candidate sites, most of them in the shallow gulch area on Site A1. Three of these natives are indigenous, that is, they are native to the Hawaiian Islands and elsewhere; these plants are 'ilima *(Sida fallax),* 'uhaloa *(Waltheria indica),* and koali *(Ipomoea indica).* One species, the 'anunu *(Sicyos hispidus),* is endemic, that is, it is native only to the Hawaiian Islands. The 'anunu is a climbing annual vine which occurs in dry forest or alien vegetation, such as koa-haole scrub, from sea level up to 2400 feet elevation on Moloka'i, Lana'i, Maui in the valley area from Kahului to Kihei, and Hawai'i in the North Kona area (Wagner *et al.* 1990).

None of the plants found during the survey is a listed, proposed or candidate threatened and endangered species (U.S. Fish and Wildlife Service 1994a, 1994b); nor is any plant considered rare and vulnerable (Wagner *et al.* 1990). The three candidate sites and the adjacent lands have been extensively disturbed and cultivated for a long period of time, and there is little, if any, native vegetation remaining today (Cuddihy and Stone 1990). No sensitive native plant-

dominated communities (Hawai'i Heritage Data Program 1994) exist on the three sites today. A botanical study of a site located near the old Pu'unene airport and considered at one time for a power plant site recorded similar results.

Given the findings above, the proposed project should not have a significant negative impact on the botanical resources of all three candidate sites. All three sites are given a low weight ranking of 1.

SECTION 6.0 UNRESOLVED UNCERTAINTIES

There are no unresolved uncertainties for the botanical resources found on each of the three candidate sites. There are no botanical reasons to impose any restrictions, conditions, or impediments to the use of the sites for a proposed generating station.

SECTION 7.0 RECOMMENDATIONS FOR FURTHER STUDY

No recommendations are proposed for further botanical studies at this time.

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APPENDIX E

Wildlife

SURVEY OF WILDLIFE RESOURCES
MECO NOMINAL 232 MW GENERATION FACILITY SITE ASSESSMENT
PUUNENE, ISLAND OF MAUI

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TABLE OF CONTENTS

1.0	Introduction	1
2.0	Relevant Regulations and Jurisdictional Agenices	1
3.0	Methods.	2
4.0	Existing Conditions.	3
5.0	Findings	3
	5.1 Birds Recorded on Point Count Stations.	3
	5.2 Bird Counts at Reservoirs.	5
	5.3 Birds Expected but Not Recorded.	6
	5.4 Mammals.	6
	5.5 Conclusions.	6
6.0	Unresolved Uncertainties.	7
7.0	Recommendations for Further Study.	7
8.0	Literature Cited.	8

LIST OF TABLES AND FIGURES

Table

1 IPA (index of abundance) for birds in each alternative site for the MECO Nominal 232 MW Generation Facility, Pu'unene, Maui. February 6 to 7, 1995

2 Counts of waterbirds at reservoirs in the vicinity of the alternative sites for the MECO Nominal 232 MW Generation Facility, Pu'unene, Maui. February 6, 1995.

Figure

1 Map of Survey Area

Photograph

1 Site A-2, Point Count Station 2. Interior cane road with well developed wayside vegetation.

2 Site A-2, Point Count Station 1. Wide irrigation ditch running along a contour.

3 Site A-1, Point Count Station 3. Kalialinui Gulch.

4 Site A-1, Point Count Station 6. Interior cane road with undeveloped wayside vegetation.

5 Site D-1, Point Count Station 9. Reservoir 50 and inflow ditch.

6 Site D-1, Point Count Station 12. Roadside vegetation along Pulehu Road (not visible).

1.0 INTRODUCTION

Field surveys were made from February 5 to 7, 1995 to assess the wildlife resources on three alternative sites for the proposed MECO Nominal 232 MW Generation Facility. The three alternative 50 acre facility sites and their buffer zones are located on the isthmus of the island of Maui, in close proximity to each other (Fig. 1). Bird censuses were designed to provide a clear ranking of the birds within each alternative site and the buffer zones around each site. Cursory inpections were made to assess other wildlife components, and important wildlife habitat in close proximity to each site. The objectives of this work are:

- To provide a description of the wildlife and habitat components within, and in the vicintiy of each 50 acre alternative site and its respective buffer zone.

- To describe observations or historical records of indigenous wildlife species and those currently listed by the U.S. Fish and Wildlife Service or the State of Hawaii as Threatened or Endangered, and thereby, subject to protection and special consideration by project planners.

- To provide a clear ranking of the wildlife resources of the three alternative sites and buffer zones, which will serve in part as the basis for an environmental screening process.

2.0 RELEVANT REGULATIONS AND JURISDICTIONAL AGENCIES

The Endangered Species Act of 1973 (Public Law 93-205) was enacted by Congress to conserve threatened and endangered species and their physical environments. The act defines conservation as "the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to [this act] are no longer necessary." (GAO 1988)

The Fish and Wildlife Service (FWS) of the Department of the Interior is charged with the responsibility for implementing the act. Prior to a November 1987 reorganization, the Office of Endangered Species within FWS was the principal office responsible for implementing the act and overseeing the seven regional offices and numerous field stations where most of the work was performed. The reorganization abolished the Office of Endangered Species, transferred its responsibilities to several headquarters units, and granted greater authority to the regions. (GAO 1988). To perform the work in Hawaii, the FWS maintains an Ecoregion Unit which is headquartered in Honolulu, and administered out of the Portland, Oregon Regional Office.

Local jurisdiction over managing and protecting endangered species falls within the purview of the State of Hawaii's Department of Land and Natural Resources which is

authorized under Title 12, Chapter 195D, Section 195 D-5 of the Hawaii Revised Statutes. Endangered species management activities are directed from Honolulu, through the non-game coordinator of the Division of Forestry and Wildlife (DOFAW). Implementation of the state's endangered species program on Maui is out of a district office of DOFAW in Wailuku.

Within the general area being considered for the siting of the MECO Nominal 232 MW Generation Facility, there can occur four federally listed endangered species: the Hawaiian duck or koloa (*Anas wyvilliana*), Hawaiian coot or alae keo keo (*Fulica alai*), Hawaiian stilt or aeo (*Himantopus mexicanus knudseni*) and Hawaiian hoary bat *(Lasiurus cinereus semotus)*. The waterbirds use and travel between the reservoirs that occur throughout the area. The bat is most probably transient. Unless the proposed development project entails a direct taking of an endangered species, a loss of habitat determined by the FWS to be "critical" to the species survival, involves an area zoned for conservation or results in a loss of wetlands, there is unlikely to be any jurisdictional concern by either the FWS or DOFAW with regard to the siting of the proposed facility in the area.

3.0 METHODS

The initial survey design specified the use of transects to census birds, however, the design was replaced by a modified point count method (Blondel et. al. 1981), to adequately sample the patches of bird habitat within relatively sterile monotypic stands of sugarcane. The method allows quantitative results in a short period of time and permits counting birds within the same period of the day in several different sites.

The point count method gives the number of species and quantitative information in the form of an index of abundance (IPA). Objective comparisons of a species' abundance can be made between the IPA of two or more sites or habitats, because the data are samples which provide a measure of dispersion about a mean value, and the results can be compared by statistical tests if required (Blondel et. al. 1981).

The list of species obtained during the point counts allows us to assess the number of species (species richness) in the habitat or site. Two parameters of richness are measured. The average number of species per point count station is the *mean richness*. The *total richness* is a cummulative parameter representing the total number of species sampled in the habitat or site. The values for mean richness and total number of species for each site are used to rank the alternative sites for their wildlife value. The IPA's are used to describe the relative abundance of a particular species between the sites.

Four count stations were selected from each of three study areas. For the purpose of this report each alternative 50 acre site and its quarter mile buffer zone will be refered to as a study area, and referenced by the alpha-numeric designations A-1, A-2 and D-1. Three count stations were located within each 50 acre alternative site, with one of them near the center of the site. The location of the fourth count station was based on subjective determination of the best bird habitat within the study area. Bird habitat in

sugarcane fields is generally along roadways, rock piles, at reservoirs, gulches and wayside areas.

Point counts, lasting 20 minutes, were made in the morning, beginning at dawn. During each point count all birds that were seen and heard were recorded. An 8x24 pair of binoculars was used to assist in bird identification. Six point counts were made each morning. The sequence that each count station was visited was determined randomly for the two count days.

In the afternoon of February 6, 1995, four reservoirs in the vicinity of the alternative sites were surveyed for waterbirds. Direct counts were made with the use of a 8x24 pair of binoculars.

No small mammal trapping was made for the survey. Reliance was placed on careful searches for scats and tracks. These signs are realiable indicators of the presence of the small Indian mongoose (*Herpestes auropunctatus*), feral cats (*Felis catus*) and feral dogs (*Canis familiaris*).

Additionally, interviews were made with natural resource managers and naturalists residing on Maui who were familiar with the wildlife in the general area.

4.0 EXISTING CONDITIONS

The three study areas are under sugarcane cultivation. The current crop is mature. The sites are located in close proximity to each other and generally located about 2.5 miles east southeast of Puunene, on gently sloping terrain.

Site A-1 is east of Kalialinui Gulch and a quarter mile upslope from the Central Maui Landfill. Site A-2 is on the south side of Kalialinui Gulch from Site A-1. Both sites have as the upslope boundary, the Upper Division Road, which is a paved road used by HC&S to haul sugarcane. A large portion of the buffer zone between Sites A-2 and A-1 is common to both and includes Pulehu Road. Reservoir 64 is to the west of A-2, but about a quarter mile outside the buffer zone or study area, and Reservoir 52 is to the east of A-1, also about a quarter mile outside the buffer zone.

Site D-1 is south of the other two sites and has as its eastern boundary Pulehu Road. Reservoir 50 is located immediately north of the site, partially within the study area. Study area D-1 is between Pulehu Gulch and Kalialinui Gulch. All three study areas include Pulehu Road and to a lesser degree Kalialinui Gulch.

More detailed descriptions of each site are found in the next section of this report.

5.0 FINDINGS

5.1 Birds Recorded on Point Count Stations

Conditions for the 20 minute point counts on both February 6 and 7, were marginal due to moderate winds of between 15 to 30 mph. Windy conditions made bird calls difficult to hear over the rustling sugarcane. Visual identification was also

challenging as small birds flew by with a 30 mph tail wind and appeared for only one or two seconds. These conditions, however, did not affect the determination of a species' presence in the area, since birds were recorded throughout the entire 3-day survey period.

Sunrise was at 7:01 a.m. on February 6 and 7, 1995 The first of six point counts began at 7:00 a.m. and the count at the sixth station ended at 9:50 a.m. Ten minutes was reserved to get from one station to the next. The days were sunny with less than 30 percent cloud cover.

Results for Site A-2 (Point Count Stations 1 to 4)

The study area that included alternative Site A-2 is characterized by mature sugarcane with a well developed complement of wayside grasses and forbs along the roads and ditch embankments (Photo 1). Swollen fingergrass (*Chloris inflata*) and Floras paintbrush (*Emilia sonshifolia*) were the two most dominant grass and forb species found in these situations. A small clump of Java plum (*Eugenia cuminii*), silk oak (*Grevillea robusta*), and kiawe (*Prosopis pallida*) trees was present along Pulehu Road within the study area. A good number of common mynas (*Acridotheres tristis*), zebra doves *(Geopelia striata)*, house finches *(Carpodacus mexicanus*) and northern cardianals (*Cardinalis cardinalis*) used this clump of trees as a daytime roost.

Irrigation ditches ran on two sides of the study area and were typical of the ditches throughout the area. At Point Count Station (PCS) 4, the ditch was two feet across, steep sided and lined with Gunite. The water flowed fast and did not appear to be readily available to birds. The ditch at PCS 1 (Photo 2), was about six feet across and its water flowed slowly along a contour, however, its bank was also steep and lined with Gunite, and may not have been available to birds except ducks and herons.

A total of 12 bird species were recorded from PCS 1 to 4 within study area A-2 (Table 1). The mean richness for study area A-2 was 7.0. Cattle egrets (*Bubulcus ibis*) had the highest index of abundance (IPA = indice ponctuel d'abondance) of 16.25, followed by nutmeg mannikins (*Lonchura punctulata*) with an IPA of 10.25 and other seedeating birds such as house finches (*Carpodocus mexicanus*) with an IPA of 5.25 and zebra doves with 4.25. Study area A-2 was along the flight path of cattle egrets as they flew from their Kealia Pond roost to the Central Maui Landfill.

The only sensitive species present was one individual Pacific golden plover (*Pluvialis fulva*) that had established a territory on Upper Division Road near PCS 4. This migratory shorebird is a winter resident and will probably maintain this territory throughout its life.

Results for Site A-1 (Point Count Stations 5 to 8)

Site A-1 is located next to Kalialinui Gulch and is upslope to the Central Maui Landfill. The gulch is a natural drainage channel for the area and is an intermittent stream bed. The gulch at PCS 5 was recently burned (Photo 3). Kiawe trees were dead but farther up or down the gulch, large live kiawe trees were present. Cattle egrets (*Bubulcus ibis*), common mynas (*Acridotheres tristis*) and English sparrows (*Passer domesticus*)

that feed among the refuse at the landfill were found roosting in these large kiawe trees during the midday, outside the point count period. Sisal (*Agave sisalana*) was present, and haole koa (*Leuceana leucocephala*) occured throughout the gulch in small patches. A *Panicum* sp. grass covered the gulch bottom and was showing a flush of new growth. The gulch was rocky, with large boulders piled in some areas, probably as a result of clearing the sugarcane field. At PCS 8, a rock pile supported a stand of haole koa and grasses. There was also a narrow band of haole koa and phragmites separating two parallel dirt roads that provided additional wildlife habitat. There were no irrigation ditches in the immediate vicinity of the study area. Maps indicate that there was once an aquaduct running through PCS 7, but it appears that it was replaced by a buried irrigation pipe. The wayside vegetation along the sides of the dirt roads through the center of the site were less well developed than they were in Site A-2 (Photo 4).

A total of 13 species were present in the study area A-1. The mean richness was 6.0. The species with highest abundance was the nutmeg mannikin, with an IPA of 44.75, which were particularly numerous in the gulch. All other speices were in relatively low abundance.

Results for Site D-1 (Point Count Stations 9 to 12)

The study area of Site D-1 includes Reservoir 50 which contained water and had exposed mudflats (Photo 5). The endangered Hawaiian Stilt (*Himantopus mexicanus knudseni*) was present during the count of PCS 9, and on the previous day a Hawaiian coot (*Fulica americana alai*) was observed (Table 2). Both gray francolin (*Francolinus pondicerianus*) and black francolin (*Francolinus francolinus*) were observed in the site during the survey period but were not detected during the point counts. The study area is bordered on two sides by irrigation ditches. Black crowned night herons (*Nycticorax nycticorax hoactli*) fished along side the wider contour irrigation ditch. Pacific golden plovers were present on the cane haul roads. Point Count Station 12 sampled roadside vegetation along Pulehu Road (Photo 6). Without the birds associated with the reservoir the mean richness for the study area would have been comparable to study area A-1. When the waterbirds are added to the analyses, the mean richness is 7.5, which is the highest out of the three alternative sites. Nutmeg mannikins were again the species with the highest IPA and comparable to Site A-2.

5.2 Bird Counts at Reservoirs

Reservoirs 35, 50, 52, 64 were in the vicinity of the alternative sites. Only Reservoir 50 fell within a study area and therefore subject to a point count. The other reservoirs were visited but were not used in the analyses to rank the three alternative sites. Reservoir 50 was the only reservoir having endangered waterbirds during the survey period. On August 26, 1993, records show only one Pacific golden plover at Reservoir 50 (DOFAW 1993). A survey on January 18-19, 1994, recorded only four black-crowned night herons at Reservior 50 (DOFAW 1994). No endangered species were recorded on

these two DOFAW surveys for Reservoirs 35 and 52. No DOFAW surveys were made for Reservoir 64.

5.3 Birds Expected but Not Recorded

The Hawaiian Owl *(Asio flammeus sandwichensis)* or Pueo is an endemic race of the Short-Eared Owl (*Asio flammeus*). They are most active at dawn and dusk but can be seen in the middle of the day, foraging for insects and rodents in pastures and agricultural areas. The Hawaiian owl has been collected from Pulehu Road but generally occurs at elevations that are above the three alternative sites (Duvall pers. comm.). The common barn owl (*Tyto alba*) is more likely to occur at the elevation of the alternative sites (Duvall pers. comm.). The common barn owl was introduced to Hawai'i in 1958 (Hawai'i Audubon Society 1989). It is primarily nocturnal in its activities, prefering the same habitats, open forests, grasslands, and pastures, that are used by the endemic Hawaiian owl. Both owls feed on insects and rodents.

Bruner (1992), recorded the orange-cheeked waxbill (*Estrilda melpoda*), in Pu'unene, but this species was not encountered over the three day survey period covered by this report.

5.4 Mammals

No Hawaiian hoary bats (*Lasiurus cinereus semotus*) were seen in any of the sites. In general bat records are usually from higher elevations, however, they have been recorded down to an elevation of 400 feet, sometimes in gulches (Duvall 1991) and often over water (Kepler and Scott 1990). The bats are most conspicuous from August to December, when they are usually seen in the early evening, in sometimes larger aggregations than other at times or seasons (Kepler and Scott 1990).

Records of introduced mammals were made opportunistically during the three day survey period, but were not used in the ranking of alternative sites. A feral cat *(Felis catus)* was observed on the berm road of Reservoir 50 at night, near PCS 9 in Study Area D-1. A small Indian mongoose *(Herpestes auropunctatus)* was seen running along an irrigation ditch at PCS 9. A rat (*Rattus* sp.) was seen running across Pulehu Road within Study Areas A-1 and A-2 and dog (*Canis familiaris*) tracks were present in Site A-1.

5.5 Conclusions

The ranking of sites based on the number of species and the mean richness of a site is a valid method for determining the relative quality of the site for birds. The three alternative sites were ranked from lowest to highest quality in Table 1, based on the mean richness parameter. While A-1 includes Kalialinui Gulch, and numerically had the highest number of birds, the absence of wetland features lowered its overall richness in species. Both A-2 and D-1 were characterized by irrigation ditches that ran on two sides of the site. Site D-1 included Reservoir 50 which supported two species of endangered waterbirds.

6.0 UNRESOLVED UNCERTAINTIES

The reservoirs that occur throughout the Pu'unene sugarcane fields are important waterbird habitat. The extent and routes which endangered waterbirds such as stilts and coots move between these reservoirs may be affected by development projects.

The Hawaiian hoary bat is more readily observable from August through December. It is suspected that they may hibernate during the winter months. Bat sightings are relatively rare. The timing of this survey is outside the period when most bats have been recorded.

7.0 RECOMMENDATIONS FOR FURTHER STUDY

The Hawaiian hoary bat is not readily observable during months outside August to December. Additional observations during this period at reservoirs and gulches may give a better indication of the presence of bats in the survey area. Mere presence would not necessarily affect the project's fate, unless a more significant discovery such as a roost is located nearby.

Endangered waterbirds that use the reservoirs travel between these bodies of water on routes that may be predictable. Discernment of these routes would give planners a better handle on where to site the project without impacting the endangered waterbird movement patterns.

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Table 1. IPA (index of abundance) for birds in each alternative site for the MECO Nominal 232 MW Generation Facility, Pu'unene, Maui. February 6 to 7, 1995.

SPECIES		SITE A-1	A-2	D-1
Zebra Dove	*Geopelia striata*	2.00	4.25	5.50
Spotted Dove	*Streptopelia chinensis*	0.50	1.50	0.50
Chestnut Mannikin	*Lonchura malacca*		1.25	0.75
Japanese White-eye	*Zosterops japonicus*	1.75	0.75	2.75
Nutmeg Mannikin	*Lonchura punctulata*	44.75	10.25	15.25
House Finch	*Carpodacus mexicanus*	0.25	5.25	0.75
Cattle Egret	*Bulbulcus ibis*	0.50	16.25	4.75
Black Francolin	*Francolinus francolinus*	1.50	0.75	
Gray Francolin	*Francolinus pondicerianus*	0.50	0.25	
Common Myna	*Acridotheres tristis*	2.00	2.00	1.75
Northern Cardinal	*Cardinalis cardinalis*	0.25	1.00	0.50
Pacific Golden Plover	*Pluvialis fulva*	0.25	0.25	2.25
European Skylark	*Alauda arvensis*	0.75		0.50
Warbling Silverbill	*Lonchura malabarica*	0.25		0.25
Hawaiian Stilt	*Himantopus mexicanus knudseni*			0.50
Black Crowned Night Heron	*Nycticorax nycticorax hoactli*			1.25
Mallard	*Anas platyrhyncos*			0.50
Wandering Tattler	*Heteroscelus incanus*			0.25
Ruddy Turnstone	*Arenaria interpres*			0.25
Total Number of Species		13	12	17
Mean Richness		6	7	7.5

Table 2. Counts of waterbirds at reservoirs in the vicinity of the alternative sites for the MECO Nominal 232 MW Generation Facility, Pu'unene, Maui. February 6, 1995.

SPECIES		RESERVOIR 35	50	52	64
Cattle Egret	*Bulbulcus ibis*				2
Pacific Golden Plover	*Pluvialis fulva*	1	1	3	
Hawaiian Stilt	*Himantopus mexicanus knudseni*		1		
Hawaiian Coot	*Fulica americana alai*		1		
Black Crowned Night Heron	*Nycticorax nycticorax hoactli*		5	2	8
Mallard	*Anas platyrhyncos*			2	
Wandering Tattler	*Heteroscelus incanus*		1		
Ruddy Turnstone	*Arenaria interpres*		2	1	
Total Number of Species		1	6	4	2

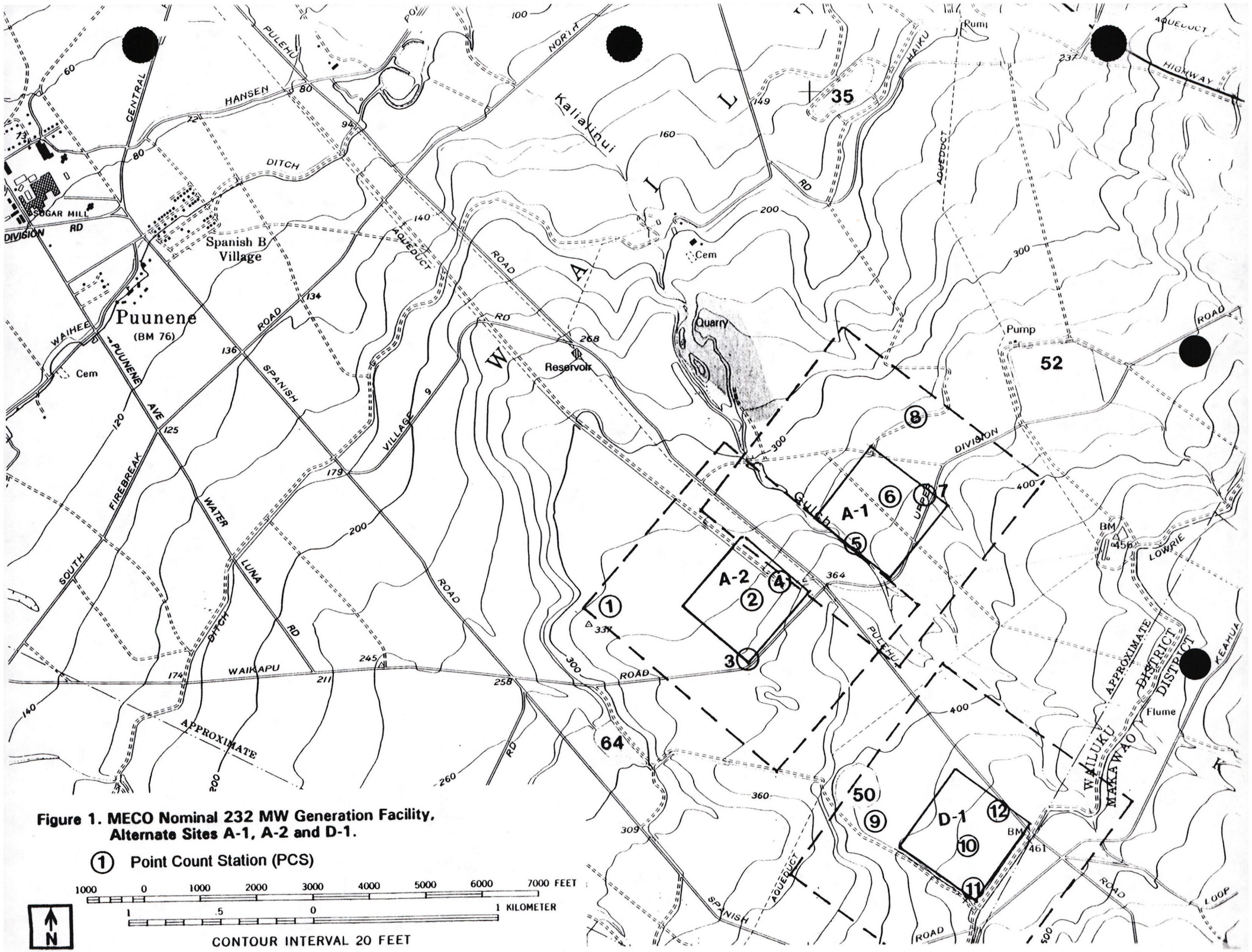
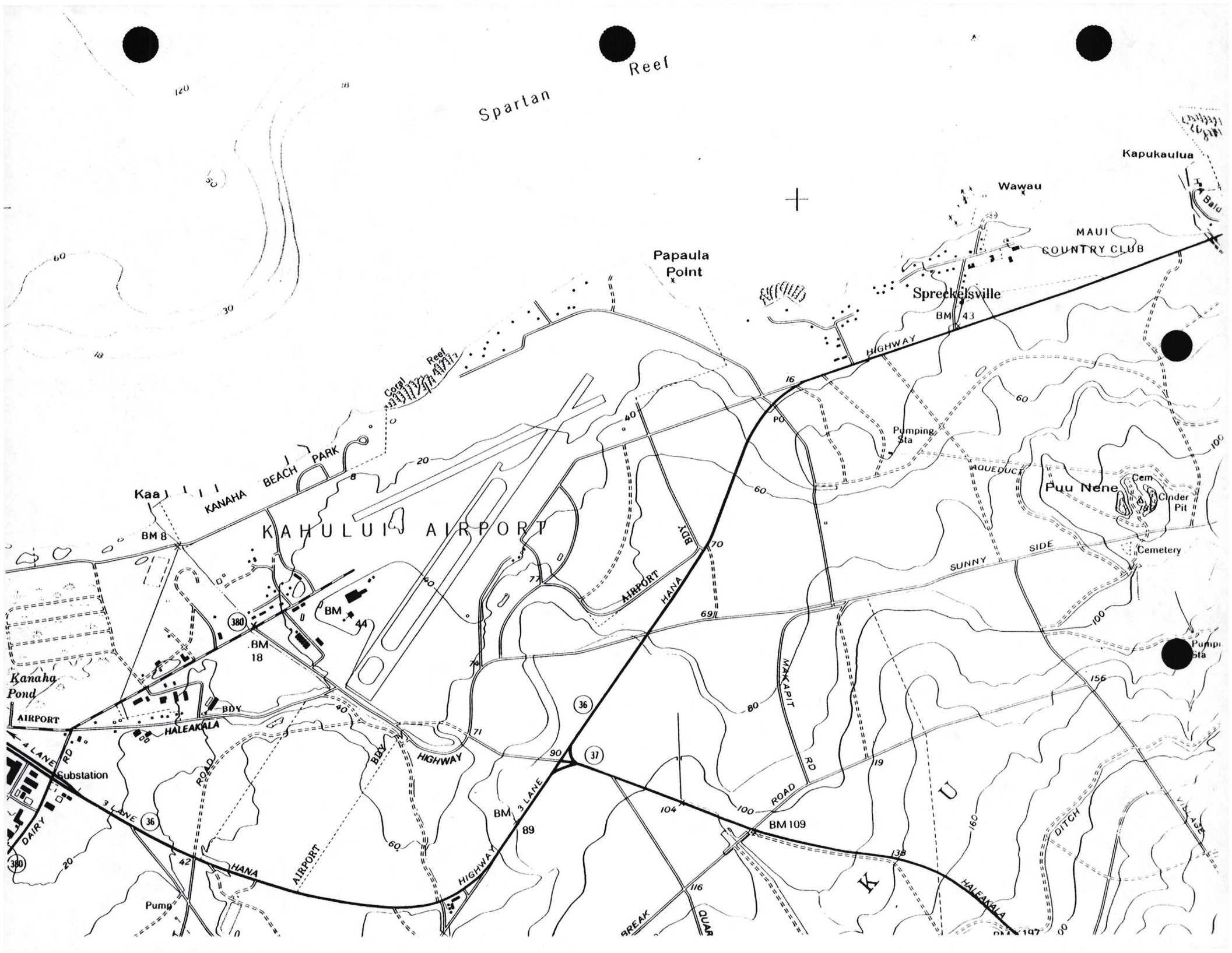


Figure 1. MECO Nominal 232 MW Generation Facility, Alternate Sites A-1, A-2 and D-1.

(1) Point Count Station (PCS)



Spartan Reef
Kapukaulua
Wawau
MAUI COUNTRY CLUB
Papaula Point
Spreckelsville
BM 43
HIGHWAY
Coral Reef
KANAHA BEACH PARK
Kaa
BM 8
KAHULUI AIRPORT
Pumping Sta
AQUEDUCT
Puu Nene
Cem
Cinder Pit
Cemetery
SUNNY SIDE
AIRPORT
HANA
BDY
BM 44
BM 18
380
Kanaha Pond
AIRPORT
HALEAKALA
BDY
4 LANE
RD
Substation
DAIRY
3 LANE
ROAD
HIGHWAY
36
37
BM 89
MAKAPIT RD
ROAD
BM 109
DITCH
VILLAGE
HALEAKALA
Pump
BREAK
QUAR



Photograph 1. Site A-2, Point Count Station 2. Interior cane road with well developed wayside vegetation.



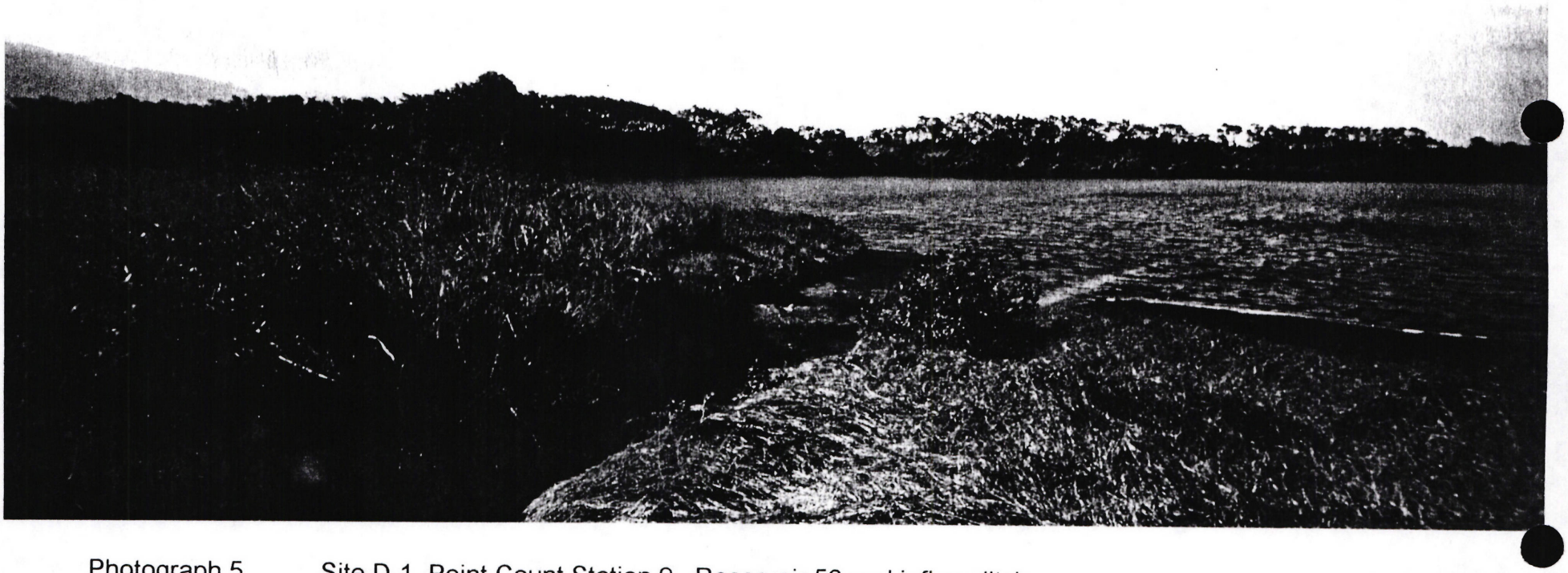
Photograph 2. Site A-2, Point Count Station 1. Wide irrigation ditch running along a contour.



Photograph 3. Site A-1, Point Count Station 3. Kalialinui Gulch



Photograph 4. Site A-1, Point Count Station 6. Interior cane road with undeveloped wayside vegetation.



Photograph 5. Site D-1, Point Count Station 9. Reservoir 50 and inflow ditch.



Photograph 6. Site D-1, Point Count Station 12. Roadside vegetation along Pulehu Road (not visible).

APPENDIX F

Archaeology & History

Archaeological Assessment of Three 50-Acre Sites for A Proposed Power Plant Project in Wailuku, Maui (TMK 3-8-03:1, 2, & 4)

by

Hallett H. Hammatt Ph.D.

prepared for

Dames & Moore
(Job No. 22941-007-001)
Honolulu

Cultural Surveys Hawaii
February 1995

INTRODUCTION

At the request of Dames & Moore, Cultural Surveys Hawaii conducted a preliminary investigation aimed at identifying known archaeological sites and areas of potential archaeological concern in a study area within the Wailuku District on the island of Maui (Fig. 1) and in the *ahupua'a* of Wailuku. The study area consists of three approximately 50-Acre sites (Sites A1, A2, and D1) of proposed lands under consideration for a new Power Plant (Fig. 2) by Maui Electric Co., Ltd (MECO). These three sites are located approximately 4.0 to 4.5 miles southeast of Kahului. All of the sites are owned by A&B, and have historically been used for sugar cane cultivation.

Members of Dames and Moore and Cultural Surveys Hawaii went to the potential project site to investigate conditions of the sites on Jan. 30, 1995.

This report presents the results of Cultural Surveys Hawaii's investigations. It is designed to assist MECO and Dames & Moore in identifying any potential impact on cultural resources of the potential alternatives for the Central Maui Generation Project.

SCOPE OF WORK

The scope of work as contained in a letter of Oct. 16, 1994 includes the following:

1. A brief historical review of the three areas involving identification of known archaeological sites in and around each of these areas and review historic literature which would be relevant to identifying any concerns of an archaeological or historic nature.

2. A field visit to each of the 3 sites to confirm present use and to assess these areas for potential archaeological value.

3. Preparation of a report on the results of the historical review and the field investigations. If there are archaeological or historical concerns or potential for the occurrence of archaeological sites on each of these project areas, these will be described. Recommendations will be presented which can be used in planning and site selection.

A copy of the report containing the findings should be submitted to DLNR/SHPD for their information.

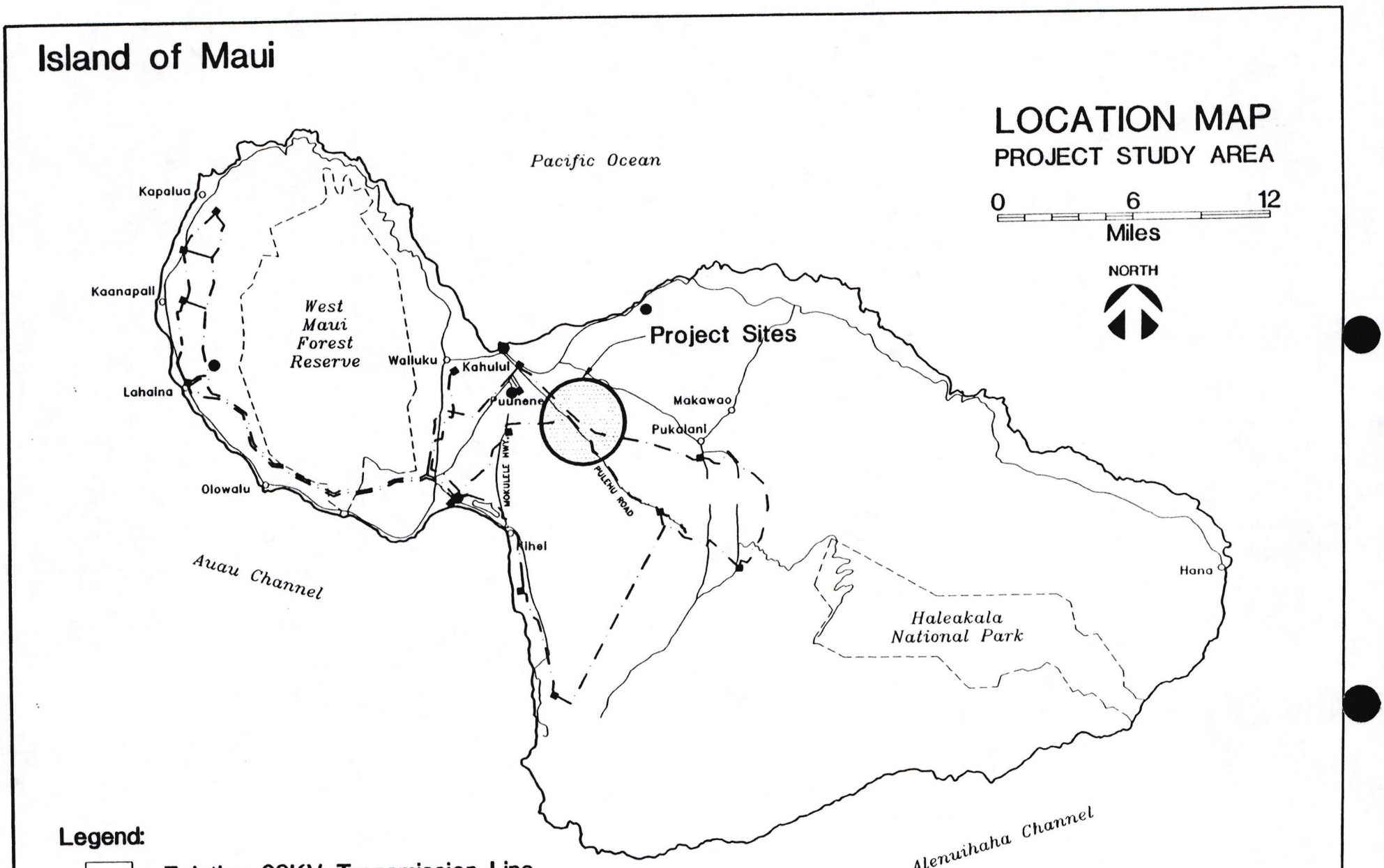
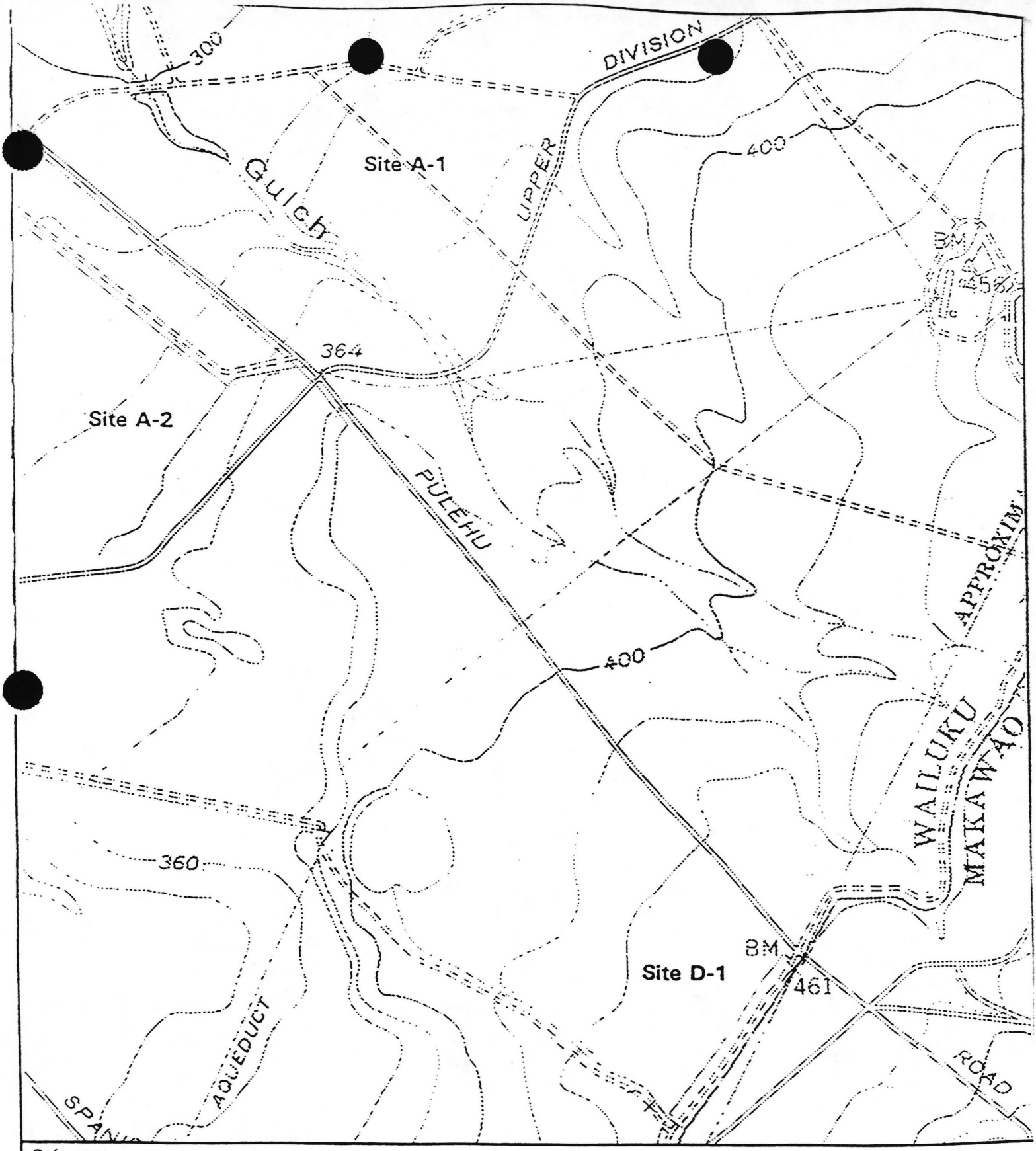


Figure 1 Island of Maui Showing Project Area

MECO GENERATION: 22941007(LOCATION.DWG) PLOT SCALE 1=2



Reference:
U.S.G.S. Topographic Map (1983)
Paia Quadrangle
Paia, Maui, Hawaii

0 1000 2000
Feet

North

Figure 2 Portion of USGS 7.5 Minute Series Topographic Maps (Paia Quad) Showing Project Areas

METHODS

Two archaeologists from Cultural Surveys Hawaii, Inc. who accompanied the Dames & Moores representatives, inspected the three project areas on January 30, 1995. All of these areas are presently under cane cultivation with the exception of a few field corners, and uncultivated areas where rocks are piled from the cane fields. In all cases the periphery of the sites were traversed and all non-cane cultivated areas were examined within and adjacent to the three project areas. No attempt was made to systematically survey the cane fields because of the difficulty in penetrating into the cane itself. The historical study that accompanied the fieldwork was concentrated on documenting land use and known sites which may have existed in this area. One of the major sources for this information was the examination of various historic maps, including maps of sugar companies dating from 1873 onward. Special attention was given to the possibility of finding former plantation camps in or adjacent to these three areas. No camps were identified close to the three project areas.

NATURAL SETTING

Project Area Description

The Maui isthmus, on which the three potential locations for the generator plant are found, was created when Haleakalā volcano banked its ashes against the already-existing slope of the West Maui mountains to form the broad, gently sloping plain (Macdonald et al. 1978). The soil on the Maui peninsula are of the Pulehu-Ewa-Jaucas association which are deep, nearly level to moderately sloping, well-drained and excessively drained soils that have a moderately fine textured to coarse-textured subsoil or underlying material. This soil is found on alluvial fans and in basins. The specific soil in all three of these areas is Waiakoa silty clay loam (WeB) (Foote et al. 1972; Fig. 3). Site Areas A1 and A2 are between 300-400 ft. elevation (A.M.S.L.) and Site Area D2 is between 400-500 ft. elevation.

The mean annual rainfall in this area is between 15-20 inches (Armstrong, ed. 1973) or 400-500 cm. per year (Giambelluca et al., 1986). The wind is often turbulent as it is funneled between the two volcanic ranges from ENE to the WSW over the isthmus and it is only calm 5.3% of the time (Armstrong, ed. 1973).

HISTORY AND LAND USE

In an archaeological literature search the only previous investigations relevant to the present project areas were studies by Walter and Demaris Fredericksen (1988, 1989) and Christopher Stevenson (n.d.) of a 232-acre parcel bordering the south side of Dairy Road, the east side of Puunene Avenue and the east and west sides of Hana Highway. Discovered were scatters of possible volcanic glass within cane fields. The glass-like material was later determined to be an industrial by-product of cane processing (cane slag). This was an area under cane cultivation. No archaeological or historic sites were found.

The study area lies within an area that was traditionally reported to have been very dry prior to the introduction of irrigation to the area by the Hawaiian Commercial & Sugar Company. The project area falls within their property. A 1910 plantation map surveyed and drawn by

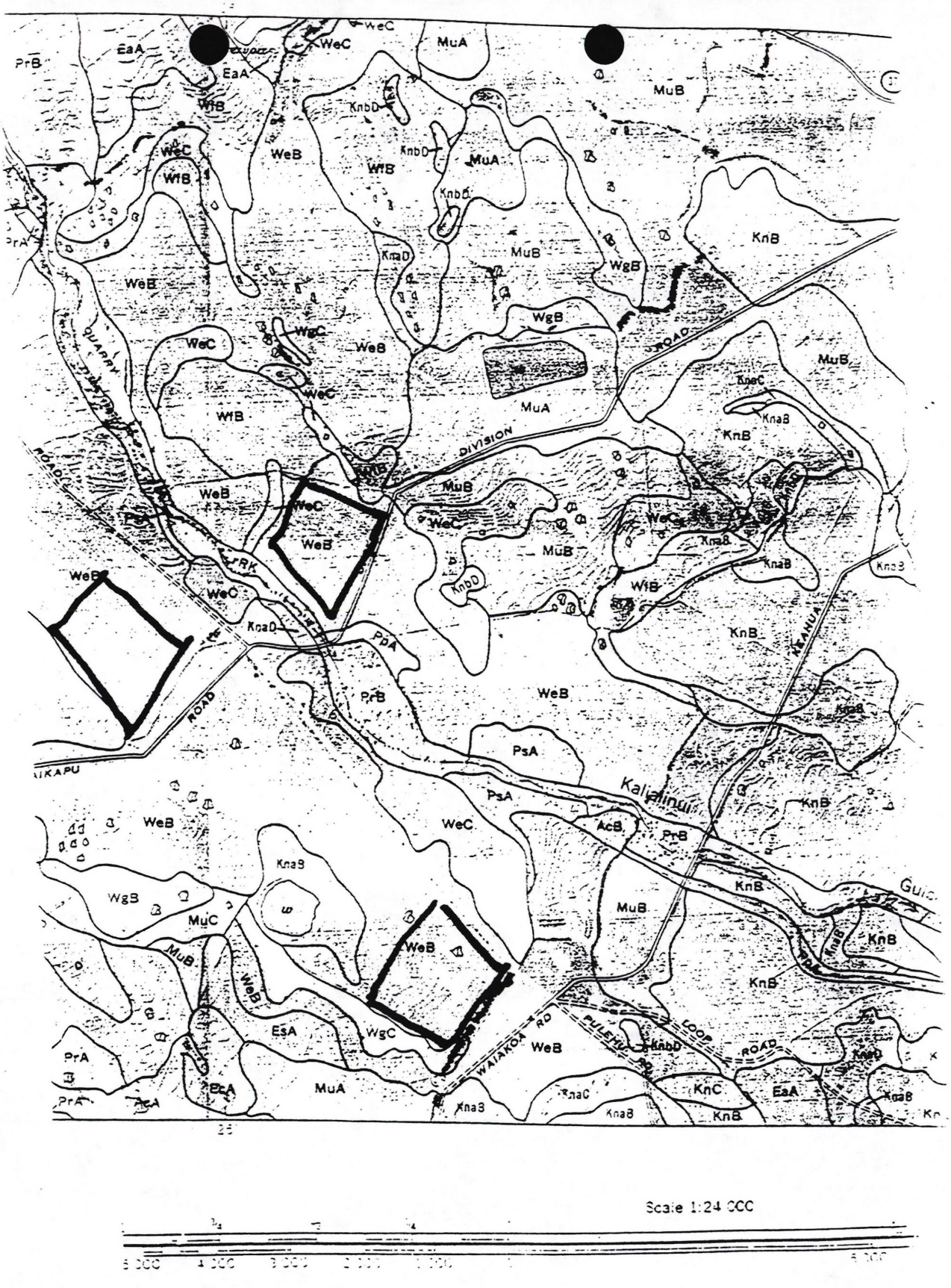


Figure 3 Foote et al. 1972 Soil Survey map #105 showing Waiakoa silty clay loam WeB designation in three project areas

H.S. Shoemaker (Fig. 4) shows the Hawaiian Commercial and Sugar Company's lands. This company was incorporated in 1878 by Claus Spreckles and his associates (Condé and Best, 1973). In 1898, The Hawaiian Commercial and Sugar Company came under the control of Alexander & Baldwin Inc. Alexander and Baldwin who has held the land since that time remains today one of the largest and most productive sugar producers in Hawaii.

Two field railroads are shown on the Shoemaker map, one through Site A1 and one to the east of the Site A2. The railroads laid and picked up depending on the need for hauling of harvested cane. It is assumed that they would leave no remnants.

All man-made improvements and structures such as ditches, cement culverts, sluice gates, pipelines, and roads are related to the cane fields and are modern in age. The three potential project areas are all existing, as well as former cane fields. Cane cultivation can generate plow zones of up to four feet in depth, which means that if there were ever any archaeological sites in these areas, they have probably been destroyed. It is further observed that site density within this portion of the Maui isthmus was probably fairly sparse considering the dry windy environment.

FINDINGS

Site A1

Site A1 is generally located north of Upper Division Road, approximately 2000 feet east of Pulehu Road and east of Kalialinui Gulch. Site A1 is approximately 2000 feet southeast of the Central Maui Landfill. Site A1 is a portion of TMK 3-8-03:4. The natural gully (Kalialinui Gulch) extends along the SW side of Area A1, but outside the area proposed for the power plant. This gulch (Fig. 5) was inspected as a possible location for archaeological sites which might have survived the impact of the surrounding cane cultivation. Special attention was paid to the possibility of petroglyphs on large boulders within the gulch. Most of these boulders appeared to have been pushed into the gulch from surrounding cane fields. No petroglyphs were found. Kalialinui Gulch is an intermittent flood drainage and contains various debris from the surrounding fields. The lot is on a level plateau with a few cane roads running through it NW/SE. A high mounded rock pile (Fig. 6) was observed to the SE of the A1 area, it was examined and determined to be a pile of large boulders removed from the adjacent cane fields by heavy equipment. Another smaller rock pile adjacent to the east side of the A1 project area was determined to be of the same origin.

Site A2

A2 is generally located north of Waikapu Rd. approximately 1500 feet west of Pulehu Road, and 0.4 mile southwest of Site A1. Site A2 is a portion of TMK 3-8-03:1, a 1071-acre parcel owned by A&B. It is marked by a sign labelled Field 407. A concrete ditch running NW/SE lies to the NE of A2. Modern structures existing on Site A2 are irrigation tanks near the center of the lot along the Waikapu Rd. side. Two cane roads bisect A2 NW/SE. The curve in Waikapu Rd marks the SW corner of Area A2. Archaeological sites are absent from this area.

Site D1

D1 is located at the northwest quadrant of Pulehu Road and Lowrie Ditch Road, and 1.0 mile south of Site A1. The Lowrie MET station (Meteorological) is situated in the NE corner of Site D1. Irrigation tanks lie adjacent to the road and a major ditch (Lowrie Ditch) runs along



Figure 4 Portion of 1910 H.I. Shoemaker Map of Sugar Plantation at Puunene, Maui, T.H. owned by Hawaiian Commercial & Sugar Co. Showing Three Project Areas



Figure 5 Kaliaiinui Gulch, view to southeast with Power Plant Site Alternative A1 to the left



Figure 6 Cane Field Rock Pile SE of Power Plant Alternative Site A1, view to NE

D1's SW boundary and along the SE side of the road opposite the project area. The Wailuku and Makawao District boundaries lie on Lowrie Rd and Ditch, with D1 being in Wailuku. A well-traveled cane road bounds the NE boundary of the lot. Archaeological sites are absent from this area.

SUMMARY AND RECOMMENDATIONS

The literature search which involved researching previous archaeological investigations in the area as well as historic maps, show no evidence of previously existing or present archeological or historic sites. The field investigation confirmed these findings. Further archaeological investigation is not recommended for any of the three potential sites for the Power Plant. All of these sites have been part of active cane production during all of this century. Cane cultivation can be confirmed in this area by historic maps at least as early as 1898. There is no archaeological justification for preferring one potential power plant site over the others as they are all equally free of potential impact to cultural resources.

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APPENDIX G

Natural Hazards

REPORT ON

MECO NOMINAL 232 MW GENERATION FACILITY ENVIRONMENTAL SCREENING (NATURAL HAZARDS)

submitted by

Edmond D. H. Cheng, Ph.D.

Arthur N. L. Chiu, Ph.D., P.E.

Thomas A. Schroeder, Ph.D.

to

Dames & Moore

Honolulu, Hawaii

February 21, 1995

REPORT ON
MECO NOMINAL 232 MW GENERATION FACILITY ENVIRONMENTAL SCREENING
(NATURAL HAZARDS)

submitted by
Edmond D. H. Cheng, Ph.D.
Arthur N. L. Chiu, Ph.D., P.E.
Thomas A. Schroeder, Ph.D.
to
Dames & Moore
Honolulu, Hawaii
February 21, 1995

1. OVERVIEW

1.1 Introduction

This report assesses the potential natural hazards that may impact the three sites A-1, A-2, and D-1 on Maui. Overview comments presented below are followed by more details in the subsequent sections of this report. The following general observations are applicable to all three sites:

a) earthquakes and extreme winds constitute the major natural hazards;

b) extreme wind speeds are escalated by the channeling effect by the mountainous terrains of east and west Maui as well as the sloping terrain; and,

c) the earthquake hazard should be adequately addressed because of the proximity of Maui to the island of Hawaii which frequently experiences earthquakes.

1.2 Site Environments

We visited the three sites on Maui (Cheng and Chiu on February 7, 1995 and Schroeder on February 16, 1995) to obtain first-hand information regarding the terrain surrounding the sites. All three sites are situated in similar environments: rolling terrain in the sugar-cane fields of central Maui. Sites A-1 and A-2 are adjacent to each other, and site D-1 is relatively close but southward of the other two. Hence, it is expected that the three sites could experience the same levels of exposure to potential natural hazards.

1.3 Potential Natural Hazards

The main natural hazards to be encountered at the three sites are earthquakes and extreme winds. The sites are at higher elevations (about 400 - 450 ft contours) and are too far from the shoreline to be subjected to tsunami inundation. Additionally, they are on sloping terrains so that flooding also will not be an expected hazard.

1.4 Extreme Winds Hazard

The mountainous topography of both east Maui (Haleakala) and west Maui will tend to channel the winds through the central valley area. This will apply equally well to winds blowing from the general northeasterly or southwesterly directions, associated with trade winds or Kona storms, respectively. In addition to the channeling effects, the sloping terrain from the shoreline to higher elevations at the three sites will also tend to escalate the wind speeds.

A separate study was performed by Cheng, Chiu and Schroeder [1994] for the Maui Electric Company, Limited (MECO), concerning extreme winds at Maalaea. The results from that study serve as additional information for assessing the extreme winds hazard at the three sites.

1.5 Earthquake Hazard

The occurrence frequency and magnitudes of earthquakes on the island of Hawaii (Big Island) have been reported in many publications [Wyss and Koyanagi, 1992; Furumoto et al., 1973]. The island of Maui, on the other hand, had only two reported significant earthquakes: in 1871 and 1938. With only these two significant local events, it becomes a formidable task to make estimates of the level of the earthquake hazard confronting the three sites. However, the proximity of Maui to the Big Island should be of enough concern to warrant a detailed study of the possible seismic effects on Maui caused by the earthquakes on the Big Island.

1.6 Relevant Regulations

The Uniform Building Code (UBC) is the accepted document in Maui for the structural design of buildings and structures to resist wind and earthquake forces. The County of Maui is currently (February 1995) still operating under the provisions of the 1988 edition of the UBC. More detailed guidelines for designing for resisting wind effects are given in the ASCE-7 Standard published by the American Society of Civil Engineers [1993]. This document is being used more widely now by the design professionals.

1.7 Recommendations for Further Study

The findings from the Maalaea project [Cheng, Chiu and Schroeder, 1994] has provided valuable insight for assessing the extreme wind hazard at the candidate sites. It will be very useful to analyze the wind speed data gathered by MECO, from the meteorological tower at site D-1, for corroborating the estimates of extreme wind speeds (see section on Extreme Winds).

A wind tunnel test may be advisable for determining the escalation of the wind speeds caused by the channeling effect of the mountains on east and west Maui.

The study could also provide more definitive answers on the escalation effect (compounded with the channeling effect) on the wind speeds because of the higher elevations at the sites.

A study similar to the one performed by Cox [1985b, 1986a, 1986b] and the Structural Engineers Association of Hawaii [1990] will more adequately define the seismic zonation to which Maui should be assigned. Additionally, a study of the soil conditions surrounding the sites will be advisable to assess the possibility of liquefaction.

2. EXTREME WINDS

2.1. Historical Cases of Extreme Winds

The official designation "hurricane" was first applied to an Hawaiian storm in 1950 when Hurricane "Hiki" passed north of Oahu and Kauai. Since 1950, the major events have been:

a. Nina (1957): A late season storm Nina formed near the Line Islands and approached the Hawaiian islands from the south veering to the west before reaching Kauai. Strong northeasterlies blew over Oahu and Kauai.

b. Dot (1959): An August storm which in its decaying stages crossed Kauai.

c. Iwa (1982): A weak November storm which brushed Kauai. Winds and water caused $239 million in damage on Kauai and Oahu.

d. Iniki (1992): A severe hurricane which hit Kauai directly.

None of the above storms impacted Maui other than some surf damage.

Comprehensive accounts of historic Hawaiian storms appear in Shaw [1982] and Schroeder [1993]. The most recent documented tropical cyclone (intensity unknown) to strike Maui occurred in 1871. This storm, named by Shaw as the "Kohala Cyclone," struck the northern portion of the Big Island then recurved over Maui striking Lahaina. The storm probably struck Molokai as well.

2.2 Winter Storms

In an earlier study [Cheng, Chiu and Schroeder, 1994], we evaluated scenarios for tropical cyclone strikes on Maui. The worst case identified produces winds in central Maui similar to those associated with a winter "Kona" storm. Strong southerlies are channeled through the central valley much as trades are [Daniels and Schroeder, 1978]. The most recent example of a strong Kona storm occurred on 8 January 1980 when peak wind gusts of 58 mph were recorded at Kahului in the evening [Haraguchi, 1980].

2.3 Characterization of Sites

All three sites lie in gently rolling slopes. Each site will experience enhanced trades as well as Kona winds. The two major damaging wind sources will be hurricane winds and Kona storms and the most likely direction will be southerly. A useful approach to evaluating wind hazard at the collective three sites is to contrast with the results of an earlier study [Cheng, Chiu and Schroeder, 1994] for Maalaea. In contrast to Maalaea sites A-1, A-2 and D- are:

a. inland. Friction reduces the coastal winds.

b. in a channel. Convergence enhances the winds.

c. elevated from sea level. Winds are stronger aloft.

The net of three factors suggest that all sites could be likened in magnitude of the wind hazard at Maalaea. Of the three, D-1 at the highest elevation will be windier than the other two (A-1 and A-2) which are situated at lower elevations. The worst-case scenario Iniki-class hurricane should cause winds of 114 mph with gusts to 148 mph. This is an extremely rare event but may serve as a useful upper limit on severe conditions.

2.4. Data Survey

In an earlier study [Cheng, Chiu and Schroeder, 1994], several sources of wind data in central Maui were identified. As indicated in Fig. 1, the National Weather Services (NWS) had digitized hourly weather observations at the old Puunene Airport (1949 to 1958, WBAN # 22516) and at the Kahului Airport (1958 to 1982, WBAN # 22525). In addition, at Kahului Airport the annual fastest-mile wind speeds were collected from 1963 to 1987. This may be the only historical annual series of extreme winds recorded on Maui.

Maui Electric Company, Limited (MECO) has collected one year hourly average wind speed and direction data at Maalaea (March 1993 - February 1994) and the D-1 site (January 1994 - January 1995). At these two MECO meteorological monitoring stations (Fig. 1), hourly average wind speed (an average of 600 readings per hour) and direction data are available at 10-meter, 37-meter, and 64-meter levels.

Maalaea -MECO station was dismantled recently. Data at D-1 site made available to us very recently are not used for analysis in this study. Since July 1988, Hawaiian Commercial and Sugar Company (HC&S) in Puunene, Maui has been monitoring and collecting hourly wind speed (an average of 360 readings per hour) and direction data at 11 locations in central Maui. These data were used for their sugar cane field burning operation.

2.5 Simulated Extreme Winds

In an earlier study [Cheng, Chiu and Schroeder, 1994], the Rayleigh Simulation Model [Cheng and Chiu, 1995] was employed to estimate the 25-year, 50-year and 100-year one minute fastest-mile wind speeds at Kahului Airport, Puunene-NWS and Maalaea-MECO. In addition, on the basis of the one-year hourly data at Maalaea-MECO, 100-year hourly wind data were generated by means of a stochastic hourly simulation (SHS) technique developed by Cheng and Chiu [1985 and 1994]. Results of the Rayleigh Simulation Model (RSM) and SHS indicated that the extreme winds at Kahului Airport, Puunene-NWS and Maalaea-MECO are Type I in nature. The estimated 25-year, 50-year and 100-year one-minute averaged fastest-mile wind speeds at these three stations are summarized in Table 1.

2.6 Regionalization of Extreme Winds

2.6.1 Strategy

To estimate the extreme winds at the proposed A-1, A-2, and D-1 sites in central Maui, a regional analysis technique for extreme winds is utilized [Cheng and Chiu, 1993 and 1995]. Since Type I distributions are realized at Kahului Airport, Puunene-NWS and Maalaea-MECO for their extreme winds, similar slopes may be observed from these Gumbel lines. If the extreme wind speeds at these stations are reduced to dimensionless Gumbel lines, then these lines may be expected to be nearly coincident. This composite Gumbel line is then applicable throughout the entire region. The basic strategy of regional analysis of extreme winds in an area is to obtain a composite dimensionless extreme wind-

frequency curve. The extreme wind speed for a specific recurrence interval can then be obtained from multiplying the value from this curve by a mean annual extreme wind speed at a potential project site.

2.6.2 Homogeneity test

Prior to a composite dimensionless extreme wind-frequency curve that can be developed, a homogeneity test of the stations involved has to be performed. For the problem on hand, permissible ranges of variation are determined by electing $\pm$ 2.0 standard deviation of the Type I distribution. The Type I distribution in reduced variate w may be expressed as

$$\text{CDF: } G(w) = \exp[-\exp(-w)] \tag{1}$$

and

$$w = -\ln \ln \, (1/G\,(w)\,) = -\ln \ln \, T/(T-1) \tag{2}$$

The standard deviation of the reduced variate of Type I distribution, S_w, is

$$S_w = (\exp\,(w)\,/n^{1/2})[(1-G(w))\,/\,G(w)]^{1/2} \tag{3}$$

where G(w) = cumulative distribution function (CDF) of Type I distribution defined in Eq. (1) and n = sample size of historical data. Further,

$$G_l(w) = \exp[-\exp(-(w-2s_w))] \tag{4}$$

$$G_u(w) = \exp[-\exp(-(w+2s_w))] \tag{5}$$

and

$$T_l = [\,1-\,G_l(w)]^{-1} \tag{6}$$

$$T_u = [\,1-\,G_u(w)]^{-1} \tag{7}$$

where G_l (w) and G_u (w) are lower and upper limiting CDFs, respectively.
T_l and T_u are lower and upper limits of recurrence intervals, respectively, in years and used in the homogeneity test.

In order to identify the inherent tendency of regionalization, a homogeneity test was performed. In this study, a 15-year data period was selected for calculating the values of the permissible range of variation in the homogeneity test. This was achieved by using Eqs. (1) through (7) to compute the upper and lower limits, T_l, and T_u for $\pm 2.0\ s_w$, and the results are shown in Table 2. T_l and T_u (Columns (5) and (7) of Table 2) were plotted in Fig. 2. As indicated in Fig. 2 and Table 3, all three stations were subjected to the homogeneity test and passed, which implies that central Maui may be considered as a homogeneous region.

2.7 Estimated Extreme Winds

To construct the dimensionless regional frequency curve for central Maui, ratios of the fastest-mile speeds to the mean annual fastest-mile wind speeds at recurrence intervals 1.1, 1.5, 5, 15, 25, 50, and 100 years were calculated. For Type I distributions, it can be shown that the mean annual fastest-mile wind speeds are fastest-mile wind speeds with 2.33 years of recurrence interval (Table 4 and Fig.3).

Adjusting for the enhancements due to the elevation differences and topographic channeling, it is estimated that the mean annual fastest-mile wind speed in the proposed A-1, A-2 and D-1 area is about 25 m/s. Consequently, the 25-year, 50-year and 100-year fastest-mile wind speeds, as obtained from Fig. 3, are 28.3 m/s (63.2 mph), 29.3 m/s (65.5 mph) and 30.0 m/s (67.1 mph), respectively, in the proposed A-1, A-2 and D-1 sites.

3. EARTHQUAKE HAZARD

3.1 Historical Severe Earthquakes

The Hawaii Volcano Observatory, the Hawaii Institute of Geophysics at the University of Hawaii at Manoa, and the U.S. Geological Survey are possibly the best sources of data on earthquakes that have affected the Hawaiian islands. Table 5, adapted from the U.S. Geological Bulletin 2006 [Wyss and Koyanagi, 1992], lists the moderate to large earthquakes in Hawaii with felt reports. The island of Hawaii, as expected, has been subjected to the most severe earthquakes. However, only two recorded earthquakes of significance had impacted the island of Maui, to date. These occurred in 1871 and 1938 [Wyss and Koyanagi 1992; Cox 1985a; Furumoto et al., 1973].

The 1871 earthquake occurred at 2205 hours on February 19, with maximum intensity VIII, magnitude 6.8 and was located at latitude 21.0, longitude 156.2, on the southern coast of Lanai. West Maui was more severely affected than east Maui by this earthquake [Cox 1985a; Furumoto et al., 1973].

The 1938 earthquake, maximum intensity VIII, magnitude 6-3/4, occurred north of Maui at 2203 hours on January 22 at latitude 21.2, longitude 156.1. This earthquake was strong enough to break water pipes [Furumoto et al., 1973].

3.2 Epicenters and Fault Zones

Figure 4 shows the epicenters of some of the larger earthquakes in the Hawaiian islands. The Big Island (Hawaii), with its ongoing volcanic eruptions, is subjected to many more earthquakes than the other islands. The southern part of the Big Island shows a concentration of the larger earthquakes.

The faults or fracture zones that cut across the Hawaiian islands are shown in Fig. 5. These faults were found by Malahoff and Woollard [1968] using aeromagnetic

surveys. Furumoto [1973] plotted the recorded 1963 earthquakes on the same figure to show that earthquakes in Hawaii are also associated with fault zones.

3.3 Design Zonation for Earthquake Hazard

Although Maui has had only two recent significant earthquakes, the island's proximity to the Big Island should be of concern to warrant a more conservative approach to this natural hazard.

The design seismic zonation for Maui was raised from 2 to 2B in the 1991 edition of the Uniform Building Code (UBC). By comparison, Oahu's seismic zonation was changed from 1 to 2A in the same edition of the UBC. A detailed study of the seismic events affecting Oahu had been performed by Cox [1985b, 1986a, 1986b] as well as by the Structural Engineers Association of Hawaii . Based on the results from the study, the requested change was then submitted to and subsequently approved by the International Conference of Building Officials for the 1991 edition of the UBC. Zone 2B, for Maui, has a higher seismic loading requirement than zone 2A.

4. CLOSURE

Earthquakes and extreme winds consitute the potential major natural hazards that could impact the three sites, A-1, A-2 and D-1. Because of the proximity of these sites to each other, they could be equally subjected at the same level of exposure to both hazards.

A previous study for the MECO Maalaea project has provided an estimate of the extreme wind speeds that can be experienced at the sites. An analysis of the wind-speed data gathered by MECO, at site D-1, will reinforce the findings in this report.

For a more definitive assessment of increased wind speeds caused by channeling through the central valley and the sloping terrain, a wind-tunnel study should be considered.

The earthquake hazard could be mistakenly underestimated because only two significant local events have impacted Maui. The proximity of Maui to the Big Island should be taken into account in assessing the possible effects from the earthquakes on the Big Island. A detailed study of such effects, based on historical data, will be desirable. It may be prudent to recommend an increase of the current seismic zonation assigned to Maui in the current UBC.

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Table 1 Estimated one minute averaged fastest-mile wind speeds at Kahului Airport, Puunene-NWS and Maalaea-MECO in central Maui at 10-meter above ground level.

Station (1)	Recurrence interval (in years) (2)	V_f (m/s) (3)	V_f (mph) (4)
Kahului Airport	25	21.7	48.5
	50	22.7	50.8
	100	23.7	53.0
Puunene - NWS	25	19.4	43.4
	50	19.8	44.3
	100	20.1	45.0
Maalaea - MECO	25	24.5	54.8
	50	25.3	56.6
	100	25.9	57.9

V_f = estimated one-minute averaged fastest-miles wind speed.

Table 2 Values of permissible range of variation in homogeneity test.

n (in years) (1)	w (2)	$2s_w$ (3)	$w-2s_w$ (4)	T_l (years) (5)	$w+2s_w$ (6)	T_u (years) (7)
10	2.674	2.450	0.224	1.8	5.124	169
15	2.674	2.000	0.674	2.5	4.674	108
20	2.674	1.732	0.942	3.1	4.406	82
30	2.674	1.415	1.259	4.0	4.089	60
40	2.674	1.225	1.449	4.8	3.899	50
50	2.674	1.096	1.578	5.4	3.770	44
100	2.674	0.776	1.898	7.2	3.450	32

(2) Obtained from Eq. (2) for T = 15 years
(3) Obtained from Eq. (3)
(5) and (7) Obtained from Eqs (6) and (7), respectively.
T_l and T_u are lower and upper limits, respectively, in years for homogeneity test.

Table 3 Data for homogeneity test.

Station	$V_{2.33}$ (m/s)	V_{15} (m/s)	$V_{15}/V_{2.33}$	Mean ($V_{2.33}$)	Recurrence interval (years)
(1)	(2)	(3)	(4)	(5)	(6)
Kahului Airport	18.1	21.0	1.160	20.0	7.6
Puunene - NWS	18.0	19.1	1.067	19.8	55.6
Maalaea - MECO	22.0	24.0	1.091	24.3	19.3
Mean			1.106		

Table 4 Dimensionless one minute averaged fastest - mile wind speed regional frequency curve for central Maui.

Station	$V_{2.33}$	$\frac{V_{1.1}}{V_{2.33}}$	$\frac{V_{1.5}}{V_{2.33}}$	$\frac{V_{5}}{V_{2.33}}$	$\frac{V_{15}}{V_{2.33}}$	$\frac{V_{25}}{V_{2.33}}$	$\frac{V_{50}}{V_{2.33}}$	$\frac{V_{100}}{V_{2.33}}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Kahului Airport	18.1	0.89	0.95	1.07	1.16	1.19	1.25	1.31
Puunene - NWS	18.0	0.96	0.98	1.03	1.06	1.08	1.10	1.12
Maalaea - MECO	22.0	0.94	0.97	1.04	1.09	1.11	1.15	1.18
Mean		0.93	0.97	1.05	1.10	1.13	1.17	1.20

Table 5 Moderate to large earthquakes in Hawaii with felt reports [Date is month and day. Time is local Hawaiian Standard Times. Latitude in degrees north; longitude in degrees west; where blank not known. Intensity refers to Modified Mercalli Intensity Scale]

Year	Date	Time	Location	Latitude	Longitude	Maximum intensity
1823	06 ??	2200	Kaimu			IX
1834	02 19	1800	Hawaii			VI
1838	12 12	1300	Hawaii			VI
1841	04 07	2345	Hawaii			VII
1868	03 28	1328	Kau	19.1	155.65	IX
1868	04 02	1540	Kau	19.2	155.5	XII
1868	04 04	0029	Hawaii			VII
1868	04 30	0615	Hawaii			VI
1870	08 07	0413	Near Molokai			VI
1871	02 19	2205	Off Maui	21.0	156.2	VIII
1872	04 22	1630	Eastern or southern Hawaii			VI
1874	12 29	0430	Offshore north of Hawaii			V
1877	05 31	0420	Offshore north of Hawaii			VI
1881	09 30	0453	Maui			VI
1885	01 13	0630	Offshore north of Hawaii			IV
1887	01 13	0500	Oahu			V
1887	01 17	Several	Mauna Loa			VI
1887	01 23	2330	Kau			VIII
1888	08 20	0735	Eastern or southern Hawaii			V
1890	08 06	2310	Hawaii (possibly Kona)			VI
1896	09 13	0559	Hawaii deep or off Maui			VI
1900	06 27	0530	Kau			V
1905	05 03	1520	Southern or eastern Hawaii			V
1908	09 20	2015	Kilauea			VI
1918	11 02	2333	Kaoiki	19.4	155.45	VII
1919	09 14	1720	Hilea	19.2	155.55	VII
1924	08 20	0620	Hilea	19.25	155.55	V
1926	03 19	2230	Northwest off Hawaii			V
1927	03 20	0452	Northeast off Hawaii, deep			V
1929	09 25	1820	Hualalai	19.7	155.9	VIII
1929	10 05	2122	Hualalai	19.7	155.9	VIII
1930	05 25	2017	Kaoiki or Kilauea	19.4	155.4	V
1935	01 02	0647	Kilauea	19.43	155.28	VI
1935	06 28	0900	Mtn. View	19.6	155.2	VI
1935	11 21	0141	Mauna Loa	19.5	155.5	VI
1938	01 22	2203	North of Maui	21.2	156.1	VIII
1939	05 23	1414	Mauna Loa	19.46	155.37	VI
1939	07 14	0351	Kalapana	19.32	155.11	V
1940	06 16	2357	Off northern Hawaii, off eastern Maui	21.0	155.3	VI
1941	09 25	0718	Kaoiki	19.35	155.45	VII
1948	06 28	0141	Oahu	21.2	157.9	VI
1950	05 29	1516	Kona	19.5	156	VII
1951	04 22	1452	Glenwood	19.4	155.25	VII
1951	08 21	0057	Kona	19.50	155.95	VIII
1952	05 23	1213	Kona	19.48	155.98	VI
1954	03 30	0841	Kalapana	19.35	155	VII
1955	08 14	0228	Kilauea	19.31	155.29	VI
1957	08 18	0042	East of Maui	23.8	155.47	V
1962	06 27	1827	Kaoiki	19.40	155.45	VI
1963	01 08	0939	Kilauea	19.39	155.22	V
1973	04 26	1026	Honomu	19.87	155.15	VIII
1974	11 30	0354	Kaoiki	19.44	155.42	IV
1975	11 29	0447	Kalapana	19.34	155.04	VIII
1979	09 21	2159	Kalapana	19.35	155.07	VII
1982	01 21	1152	Hilea	19.23	155.59	VI
1983	11 16	0613	Kaoiki	19.43	155.45	IX
1989	06 25	1727	Kalapana	19.36	155.03	VII

[After Wyss and Koyanagi, 1992]

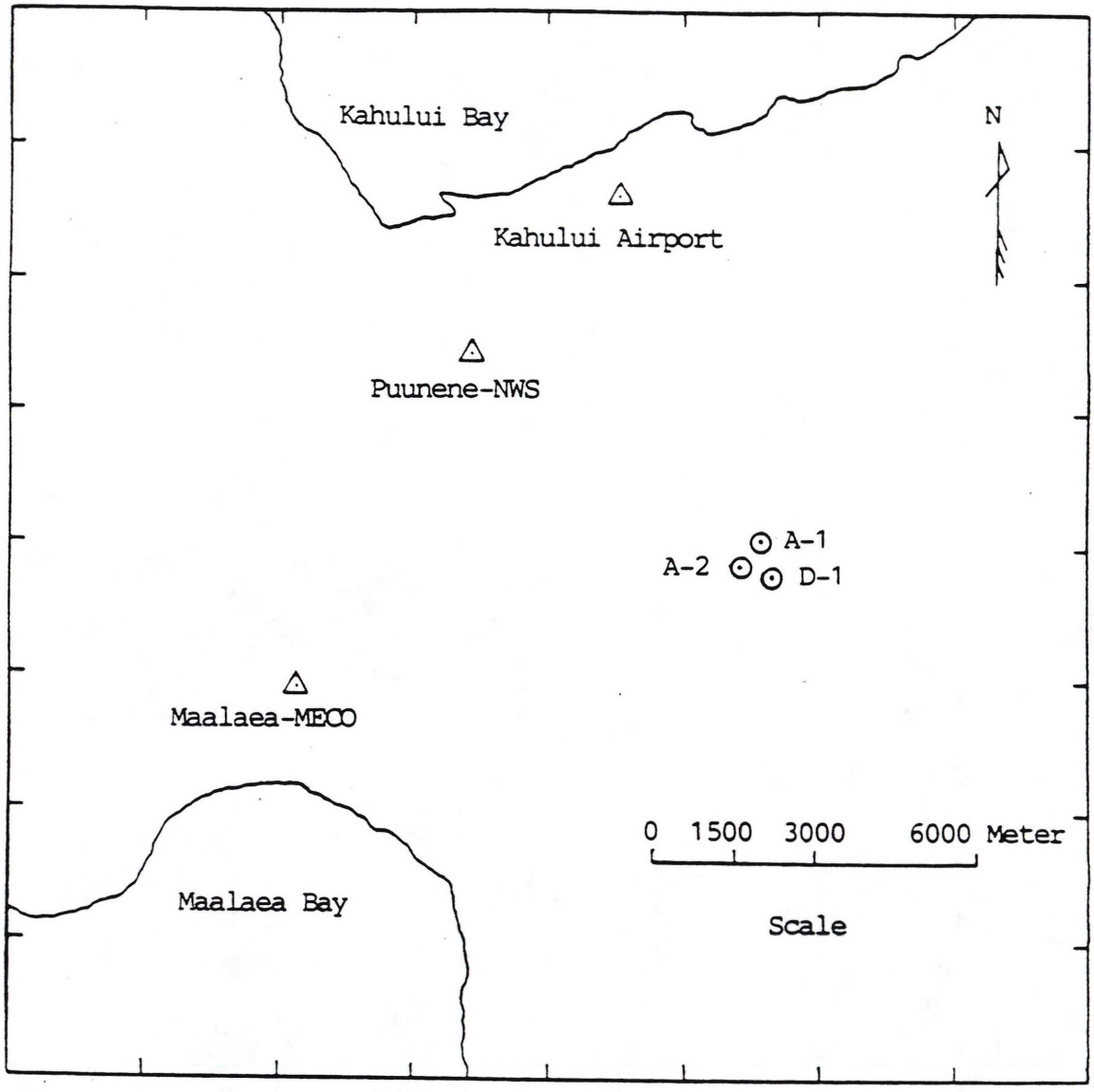

Fig. 1 Locations of wind stations used and A-1, A-2 and D-1 sites in central Maui.

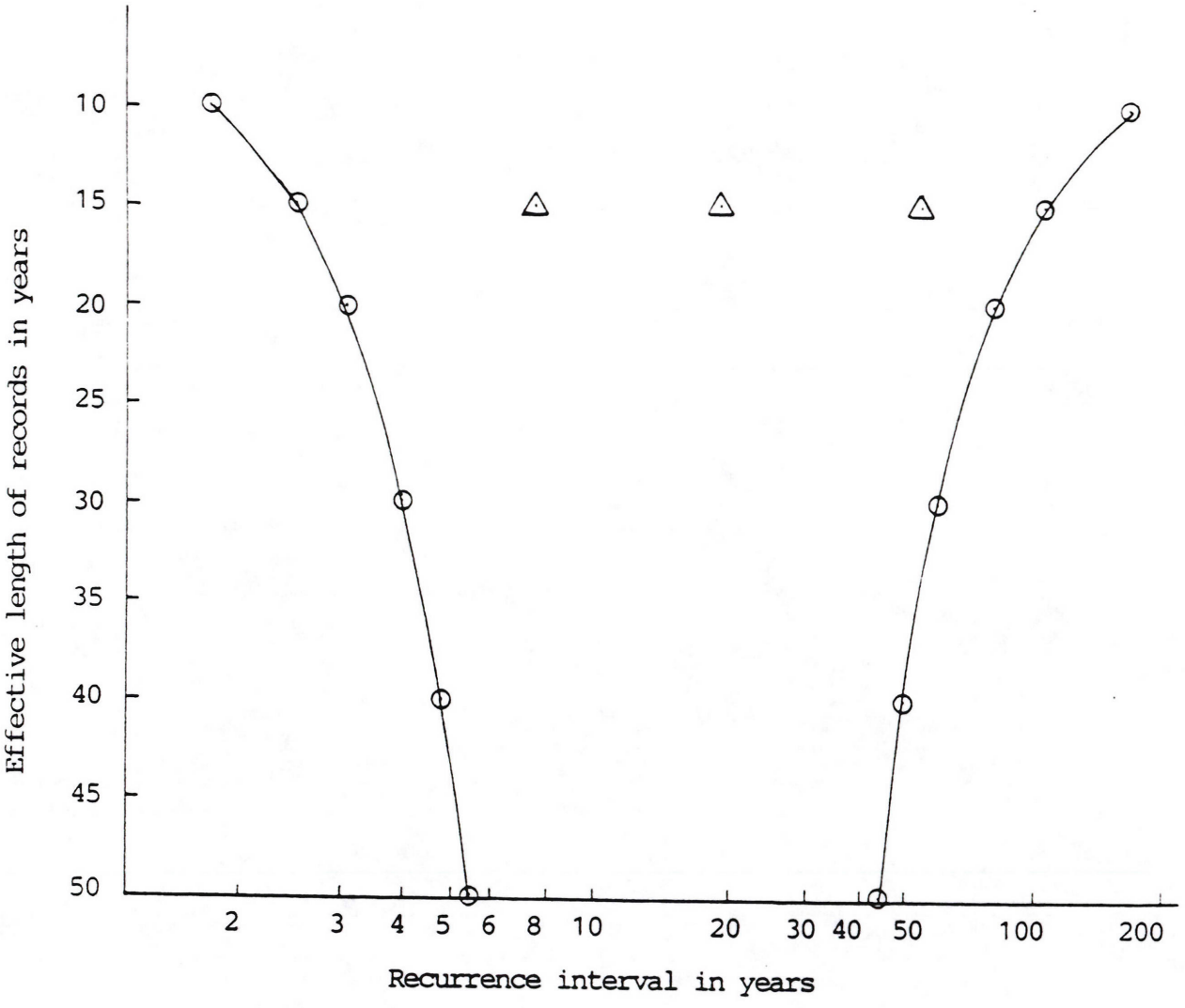

Fig. 2 Homogeneity test.

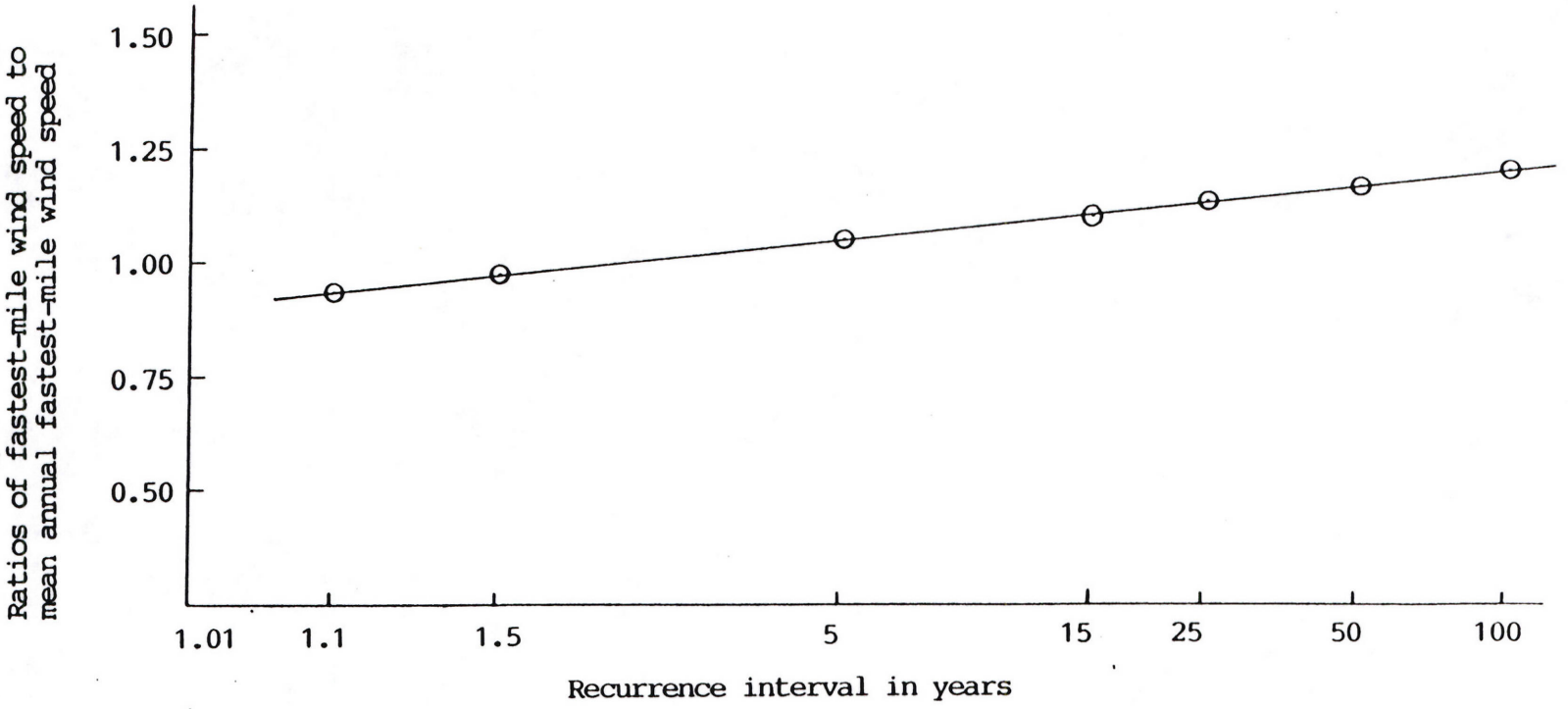

Fig. 3 Type I distribution of regional one-minute averaged fastest-mile wind speed frequency curve at 10-meter above ground level.

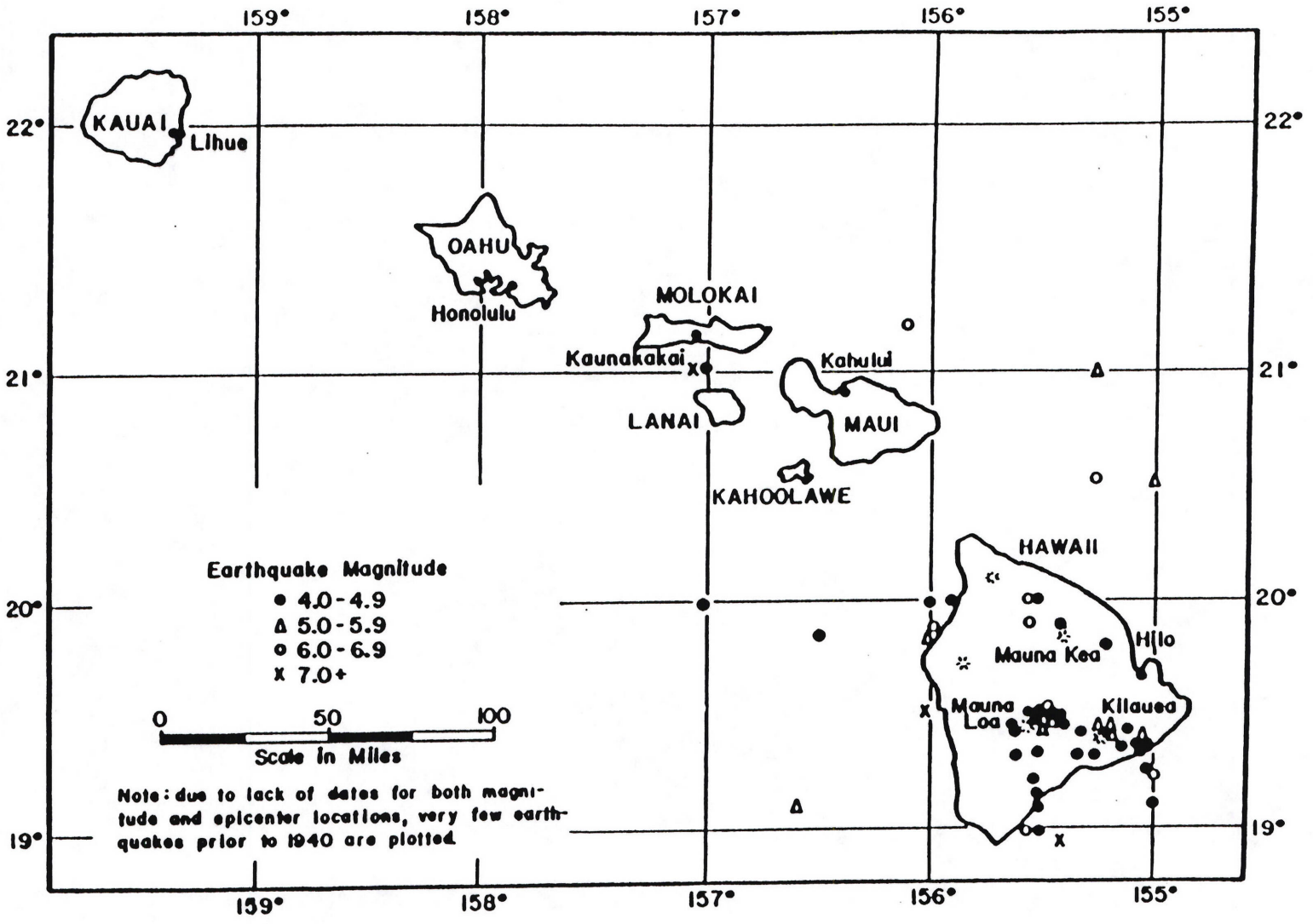

Fig. 4 Epicenters of the larger earthquakes [After: Furumoto et al., 1973].

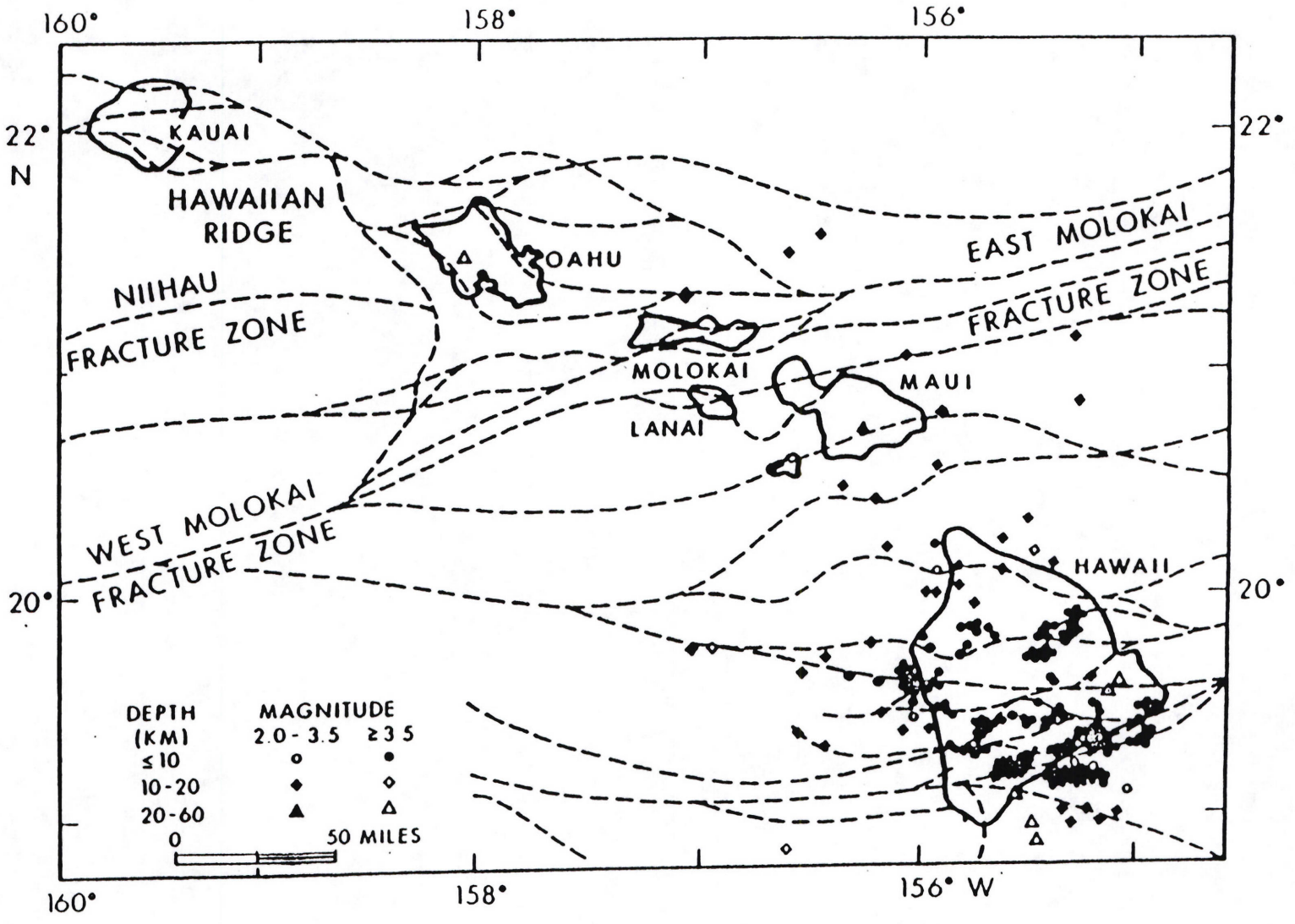

Fig. 5 Recorded earthquakes of 1963 and faults [After: Furumoto et al., 1973].

APPENDIX H

Environmental Site Assessment (Phase I PSA)

REPORT
PHASE I ENVIRONMENTAL SITE ASSESSMENT
THREE HC&S PROPERTIES
TMK 03-08-03: 1,2, AND 4
PUUNENE, WAILUKU DISTRICT, MAUI, HAWAII
FOR MAUI ELECTRIC COMPANY
Job No. 22941-007-001
March 16, 1995

TABLE OF CONTENTS

Section		Page
1.0	INTRODUCTION	1
2.0	PURPOSE AND SCOPE OF SERVICES	1
3.0	PHYSICAL SETTING	4
	3.1 PHYSIOGRAPHY	4
	3.2 GEOLOGY	5
	3.3 HYDROGEOLOGY	6
4.0	PRESENT SITE CONDITIONS	7
	4.1 SITE RECONNAISSANCE	7
	4.1.1 Site A-1	8
	4.1.2 Site A-2	8
	4.1.3 Site D-1	9
	4.2 VICINITY SURVEY	10
	4.3 ELECTRICAL TRANSFORMERS	11
5.0	HISTORICAL LAND USE	11
	5.1 AERIAL PHOTOGRAPH REVIEW AND HISTORIC SITE MAP REVIEW	11
	5.2 BUILDING PERMIT REVIEW	13
6.0	AGENCY LISTS REVIEW	13
	6.1 INTERPRETATION OF VISTA REPORTS	14
	6.2 MANUAL LIST SEARCH	14
7.0	AGENCY CONTACTS	15
8.0	CONCLUSIONS, RANKING, AND RECOMMENDATIONS	16
9.0	LIMITATIONS	17
10.0	REFERENCES	19

TABLES

TABLE 1 SUMMARY OF HERBICIDES USED ONSITE
TABLE 2 SUMMARY OF HEER LIST SEARCH

FIGURES

FIGURE 1 VICINITY MAP
FIGURE 2 FIELD LOCATION MAP
FIGURE 3 SITE PLAN
FIGURE 4 HISTORIC SITE PLAN

APPENDIX

VISTA REPORTS:
- Site A-1
- Site A-2
- Site D-1

REPORT
PHASE I ENVIRONMENTAL SITE ASSESSMENT
THREE HC&S PROPERTIES
TAX MAP KEY 03-08-03:1, 2, and 4
PUUNENE, WAILUKU DISTRICT, HAWAII

1.0 INTRODUCTION

Presented in this report are the results of Dames & Moore's Phase I Environmental Site Assessment (ESA) conducted at three sugar cane properties located on Pulehu Road in Puunene, Wailuku District, Maui, Hawaii (Sites) (Figure 1). The Sites are located on portions of the properties identified as Tax Map Keys (TMKs) 3-08-03:1, 2, and 4. The Sites currently consist of three sugar cane agricultural properties, designated A-1, A-2, and D-1, covering an area of approximately 50 acres each. It is Dames & Moore's understanding that the three Sites are currently owned by Alexander and Baldwin - Hawaii, Inc. (A&B), and operated by Hawaiian Commercial Sugar Company (HC&S), an A&B subsidiary. The scope of services of this ESA is presented below.

2.0 PURPOSE AND SCOPE OF SERVICES

The purpose of this ESA was to review past and present land use practices, site operations and conditions, and nearby off-site land uses to evaluate the potential presence of hazardous substances, and soil and/or groundwater contamination at each of the three Sites. Each of the three Sites were then compared to each other based on the findings of this ESA and the relative impairment of each site. The collection of soil or groundwater samples or performance of analytical laboratory testing for the presence of contaminants was not included. This ESA was accomplished by, and limited to, the following specific tasks:

- Reviewed pertinent, available documents and maps regarding local physiographic and hydrogeologic conditions in the Site vicinity (studies to specifically identify landslides or other geologic hazards in the Site vicinity were not included);

- Reviewed and interpreted available historical aerial photographs of the site and vicinity from the years 1950 and 1975. Flight and frame numbers and the approximate scale for each photograph reviewed are listed in the References section of this report. The review of aerial photographs consisted of an examination of available photographs for evidence of previous Site activities and development to evaluate the potential that storage and/or disposal of hazardous substances at or adjacent to the three sites may have occurred in the past;

- Reviewed and interpreted Dames & Moore's available archival U.S. Geological Survey (USGS) topographic map of the Paia Quadrangle from the year 1954;

- Reviewed and interpreted historic site maps provided by HC&S from the years 1910 and 1949;

- Contacted Sanborn Mapping and Geographic Information Service in New York, New York, for information regarding historic fire insurance maps. These maps often contain information regarding historical land use potentially involving the manufacture, generation, use, storage, and/or disposal of hazardous substances on properties. Sanborn maps were not available for the three site areas;

- Contacted the Maui County Building Department for information from building permits issued for the three Sites which may indicate previous and/or current use, storage, and/or disposal of hazardous materials at the three Sites;

- Performed a reconnaissance survey of the Sites to make visual observations of existing Site conditions and activities. Performed a drive-by survey of the area within a 0.25-mile radius of the Sites to observe types of general land use within the search area;

- Conducted interviews with HC&S employees: Mr. Randall Moore, Vice President of Field Operations; Mr. Rodney Chin, Irrigation Superintendent; and Mr. Sean O'Keefe, Environmental Manager, to evaluate Site history, and operation and maintenance procedures;

- Evaluated the Sites for the presence of electrical transformers or hydraulic equipment which have the potential to contain polychlorinated biphenyl-type (PCB-type) cooling oils;

- Reviewed the federal, state, and local database list search generated by VISTA Environmental Information, Inc. of San Diego, California. This list search consisted of known or potential hazardous waste sites or landfills, and properties currently under investigation for environmental violations in the vicinity of the three Sites. The list search conducted by VISTA included the following:

  - United States Environmental Protection Agency (U.S. EPA), Resource Conservation and Recovery Act (RCRA), Treatment, Storage, and Disposal Facilities (RCRA TSD) Database (June 1994) (1.25-mile search radius);
  - U.S. EPA, National Priorities Listing ("Federal Superfund") for Region IX (August 1994) (1.25-mile search radius);
  - U.S. EPA, Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) list for Region IX (September 1994) (0.75-mile search radius);
  - Emergency Response Notification System (ERNS) Database (September 1994) (0.375-mile search radius);
  - RCRA Facilities Database, Small and Large Generators List (June 1994) (0.375-mile search radius);
  - State of Hawaii, Department of Health (DOH), Permitted Landfills, Transfer Stations and Incinerator Facilities (December 1993) (0.75-mile search radius);
  - State of Hawaii, DOH, Active Leaking Underground Storage Tank List (July 1994) (0.75-mile search radius); and
  - State of Hawaii, DOH, Registered Underground Storage Tank List (May 1993) (0.75-mile search radius).

  The following lists, not included in the VISTA database search, were reviewed by Dames & Moore:

- DOH Hazard Evaluation and Emergency Response (HEER) Section Incidents Response List (see References Section at the end of this report) (0.25-mile search radius); and
- Maui County Fire Department Incident Listings (see References Section at the end of this report) (0.25-mile search radius).

- Conducted inquiries in writing to the State of Hawaii, DOH for information regarding environmental permits, violations or incidents, and/or the status of enforcement actions at the Sites; and

- Prepared this report describing the research performed and presenting Dames & Moore's findings and professional opinions regarding the potential for environmental contamination at the three Sites.

Based on the scope of services outlined herein, this ESA specifically did not include an evaluation for the presence of asbestos, radon gas, lead-based paint, lead in drinking water, geologic hazards and/or geotechnical constraints.

3.0 PHYSICAL SETTING

Dames & Moore reviewed pertinent maps and readily available literature for information on the physiography and hydrogeology of the site. A summary of this information is presented in the following subsections.

3.1 PHYSIOGRAPHY

The Sites are located at the foot of Haleakala Mountain, between eastern and western Maui in an area known as the Isthmus. The Sites are southeast of Kahului Bay, at approximately 20 degrees 50 minutes North latitude and 156 degrees 25 minutes West longitude (USGS, 1983).

The elevations (in feet above mean sea level (MSL)), topographic gradients (in feet per mile), and the Sites' geographic relationship to the Underground Injection Control (UIC) line (DOH, 1984) are summarized as follows:

Site	Elevation (feet MSL)	Topographic Gradient	Relationship to UIC Line
A-1	350	106 NW	below
A-2	320	70 NW	below
D-1	440	150 NW	above

Rainfall in the area averages approximately 5 inches per year (State of Hawaii, Department of Land and Natural Resources (DLNR), 1986). Three reservoirs are located near the three Sites: one is located approximately 2,300 feet northeast of the Site A-1 (Reservoir 52); the second is located 2,200 feet southwest of the Site A-2 (Reservoir 84); and the third is located 1,000 feet northwest of the Site D-1 (Reservoir 80) (Figure 3). In addition, an aqueduct is located at the northeast portion of the Site A-2, and Lowrie Ditch is located at the southeast boundary of the Site D-1. Both the aqueduct and the Lowrie Ditch are concrete-lined. The reservoirs, the aqueduct, and Lowrie Ditch are used for agricultural purposes.

3.2 GEOLOGY

The stratigraphy of the Maui Isthmus consists of a basal shield of Tertiary volcanic flows that originated from the West Maui Volcanoes. These lava flows are overlain by alluvial fan deposits measuring in thickness up to 1,000 feet. During the Pleistocene, Haleakala Volcano emerged and lava of the Kula Volcanic Series flowed westward covering the alluvium at the Isthmus.

The surface deposits of the Isthmus consists of Pleistocene eolian and recent alluvial sediments. The east portion of the Maui Isthmus is underlain by eolian deposits in the form of partially lithified (solidified) sand dunes. The west portion of the Maui Isthmus is underlain by alluvium deposits consisting of poorly sorted gavels, sands and silts (Macdonald and Abbot, 1979).

The surface soils at the Sites are classified as Waiakoa association, and consist primarily of a surface layer of reddish-brown silty clay ranging in thickness from approximately a few feet to a few tens of feet thick (United States Department of Agriculture, 1972). Beneath the silty clay are Kula lavas which are underlain by Homomanu lavas (USGS, 1977).

3.3 HYDROGEOLOGY

There are three groundwater types on the island of Maui: high level dike-impounded groundwater bodies of the East Maui Mountains; basal groundwater in the highly permeable fresh basalt of the Kula Volcanic Series; and perched groundwater contained by impermeable layers of the alluvium deposits.

The basal groundwater is tapped by numerous wells and shafts for domestic and irrigation use. The elevation of the basal groundwater level in the area of the Isthmus ranges from three feet to thirty feet above MSL. Groundwater beneath the site is reportedly basal groundwater and occurs approximately at 6 to 10 feet above MSL (Macdonald and Abbott, 1979). The direction of the basal groundwater flow beneath the site is interpreted to be northwest toward the ocean. The basal groundwater in the area is recharged by precipitations, and dike-impounded water (Macdonald and Abbott, 1979).

No drinking water wells or irrigation wells were identified on the Sites or within a 0.25-mile radius. Information obtained from several nearby groundwater wells (DLNR, 1993) is summarized as follows:

Well No.	Distance to the Site (mile/direction)	Water Level (feet above MSL)	Chloride (milligrams/liter)	Status
5127-01	2.1/NW	5	NA	OTH
5224-01	1.5/NE	5	NA	UNU
5224-02	1.5/NE	5	275-425	IRR
5226-02	1.5/NW	4	330-490	IRR
5227-04	2.3/NW	NA	430-685	UNK
5227-05	2.3/NW	NA	484-686	UNK
4824-01	2.0/SE	2.8	69-74	UNU
4825-01	2.3/SW	3.6	280-491	UNK
4927-01	3.0/SW	NA	NA	OTH

NA - Not available
OTH - Other
UNU - Not in use
IRR - Irrigation
UNK - Unknown

Two of the above-listed wells (Well 4824-01 and 4825-01) are located topographically above the UIC line. The other wells are located below the UIC line (Figure 1). According to the chloride concentrations in groundwater obtained from the above-listed wells, the groundwater beneath the site appears to be fresh to brackish water.

Irrigation water for the three Sites is supplied by East Maui Irrigation, a subsidiary of A&B (O'Keefe, 1995). When surface reservoirs are low, water is pumped out of irrigation wells located northwest to northeast of the three Sites (Moore, 1995). The locations of these irrigation wells are shown on Figure 2.

4.0 PRESENT SITE CONDITIONS

4.1 SITE RECONNAISSANCE

Dames & Moore personnel conducted a reconnaissance of the Sites on January 30, 1995. The reconnaissance consisted of the observation and documentation of the present condition of the Sites and neighboring properties. In addition, interviews were conducted for information regarding the history of the Sites and the use and handling of potentially hazardous substances on-site.

The Sites are located approximately three miles southeast of the city of Kahului, and approximately two and a half miles southeast of Puunene, the town where HC&S operates its sugar mill. Each site consists of approximately 50 acres of land and is currently being used for the cultivation of sugar cane. At the time of the site visits, the crop of each cane field was over six feet in height. No evidence of cane burning was observed within each Site area, or adjacent fields.

Mr. Randall Moore estimated that sugar cane had been cultivated in the areas of the three Sites for the past 100 years (Moore, 1995). Mr. Moore was not aware of other crops cultivated commercially in the area of the three Sites in the past. The area of the Sites was reportedly undeveloped prior to sugar cane cultivation. Mr. Moore also stated that no vehicle storage or maintenance was conducted in the area of the three Sites. According to Mr. Sean O'Keefe, the HC&S vehicle maintenance and storage facilities are located at the Sugar Mill in Puunene. Mr.O'Keefe also provided a list of herbicides currently being used in the fields (O'Keefe, 1995). These herbicides are listed in Table 1. Mr. O'Keefe indicated that the herbicide Dalapon had

been used in the past at the Sites, but is not currently being used at the Sites. Details regarding the strength of the herbicide solutions used or frequency of use was not available. Mr. O'Keefe did mention that the same chemicals were used at all three Site fields. Mr. O'Keefe was not aware of any chemical releases or spills in the areas of the three Sites.

4.1.1 Site A-1

Site A-1 is located approximately 1000 feet to the northeast of Pulehu Road (an asphalt-paved road), within Field #505 (Figure 3) (HC&S, 1994 and USGS, 1983). The Site is bordered on the southeast by Upper Division Road (a dirt road) and on the southwest by a dirt road and the Kalialinui Gulch. Cane fields which are part of Field 505 border the site to the northeast and northwest (HC&S, 1994).

The Site consisted of cane fields separated by three dirt roads oriented northwest to southeast. The dirt roads were muddy and several large puddles were observed on the roads. Evidence of environmental hazards were not observed along these roads. Perimeter access was available on only the dirt roads along the southeast and southwest boundaries of the Site. The northeast and northwest boundaries of the Site were within the cane fields and not accessible. The cane stalks were over six feet high, which hindered views across the Site. Three rock piles were observed to the northeast and southeast of the Site. The closest rock pile was approximately 200 feet northeast of the Site. According to Mr. Hallett Hammatt, Archaeologist with Cultural Surveys Hawaii, the rock piles were probably formed by the accumulation of boulders dug out from the fields during initial grading activities (Hammatt, 1995).

Field 505 was planted in April 1994 (O'Keefe, 1995). The irrigation water source for Site A-1 is Lowrie Ditch, located approximately one mile to the southeast of the Site (HC&S, 1994, and USGS, 1983). No surface irrigation ditches were observed within or adjacent to the Site.

4.1.2 Site A-2

Site A-2 is located approximately 300 feet to the northwest of Pulehu Road, within Field #701 (Figure 3) (HC&S, 1994 and USGS, 1983). The Site is bordered on the northeast by a dirt road, an irrigation ditch, and additional cane of Field #701, and on the southeast by Waikapu Road (a dirt road). Cane fields which are part of Field #701 border the site to the northwest and southwest (HC&S, 1994).

The Site consisted of cane fields separated by three dirt roads oriented northwest to southeast. The dirt roads were muddy and several large puddles were observed on the roads. Evidence of environmental hazards were not observed along these roads. Perimeter access was available on only the dirt roads along the northeastern and southeastern boundaries of the Site. The northwestern and southwestern boundaries of the Site were within the cane fields and not accessible.

Field #701 was planted in July 1993 (HC&S, 1994). The irrigation water source for Site A-2 is both Lowrie Ditch, located approximately one mile southeast of the site, and Reservoir #84, located approximately one-half mile to the southwest of the Site (HC&S, 1994, and USGS, 1983). One concrete-lined surface irrigation ditch was observed adjacent to the northeastern boundary of the Site.

A sand washer, part of the irrigation water filtration system, was observed on the southeastern boundary of the Site, along Waikapu Road (Figure 3). The system consisted of approximately 20 cylindrical-shaped washers connected with polyvinyl chloride (pvc) piping. According to Mr. Rodney Chin, pre-filtered irrigation water (water sent through a screen filter) is "sand washed" prior to release into the fields, to remove any remaining fine particles which would plug the drip irrigation lines (Chin, 1995).

4.1.3 Site D-1

Site D-1 is located approximately 3/4-mile south of Site A-2, adjacent to the west side of Pulehu Road, within Field #800 (Figure 3) (HC&S, 1994 and USGS, 1983). The Site is bordered on the northeast by Pulehu Road, on the southeast by a dirt road and Lowrie Ditch, on the northwest by cane of Field #800, and on the southwest by a dirt road and cane of Field #801.

Field 800 was planted in April 1993 (HC&S, 1994). The irrigation water source for Site D-1 is Reservoir #41, located approximately one and one-half miles southeast of the Site (HC&S, 1994 and USGS, 1983). Lowrie Ditch is located along the southeastern boundary of the Site, on the opposite side of the dirt road. A meteorological station is located at the easternmost corner of the site.

One set of sand washers (as previously described for Site A-2) was observed on the southeastern boundary of the Site along the dirt road. In addition, two aboveground storage tanks (ASTs)

were observed on the southeastern and southwestern boundaries of the Site, labelled 43-21 and 43-4, respectively (Figure 3). The ASTs appeared to be approximately 1000 gallon capacity, constructed of metal, and mounted on concrete pads. The ASTs were not labelled as to their contents. No evidence of spills or leaks were observed. According to Mr. Chin, the ASTs contained various types of fertilizers (potassium, phosphorus or nitrogen). The fertilizers are not mixed into the ditch water, but are added to the filtered, sand-washed irrigation water through piping (Chin, 1995). The various fertilizers are added once or twice at critical growth stages when the crops are first planted. According to Mr. Sean O'Keefe, the ASTs are used to store urea (carbamide - a type of fertilizer) and are only full when they are used. Mr. O'Keefe did not recall any incidents involving chemical leaks or spills in the fields in the past.

Part of the filtering system for the irrigation water was observed on the southernmost corner of the Site. Several large-screened filters were observed adjacent to the Lowrie Ditch. The filters resembled surface-skimming clarifiers, where floating debris was caught in the large (approximately 1-inch) screens. Water was diverted from the Lowrie Ditch through these filters and flowed northwest in a single concrete-lined ditch along the southwestern boundary of the Site. Some of the water from this ditch was diverted to a second clarifier that appeared to hook up to underground piping which fed a fine-screen clarifier, approximately 100 feet northwest of the dirt road. The filtered water again appeared to flow underground into Field #801, southwest of the Site.

A locked, green wooden shed, labelled "poison gas" (approximately 2 feet by 7 feet) was observed approximately 100 feet south of the southeastern boundary (Figure 3). According to Mr. Chin, the shed is used to store chlorine gas which is added to the filtered irrigation water to reduce the algae growth. No other details were available regarding the use of chlorine on the Site.

4.2 VICINITY SURVEY

Land use immediately adjacent to each of the three Sites in all four compass directions consisted of agricultural land used to cultivate sugar cane. No businesses were identified in the vicinity of the Sites, except for the Ameron Quarry and the Maui County Department of Public Works (DPW) Central Maui Landfill, located within Kalialinui Gulch approximately 0.25-mile northwest of Site A-1 and 0.25-mile north of Site A-2. Ameron quarries material alongside the Kalialinui Gulch for road aggregate and cement. The unlined landfill is currently filling a

previously quarried area, and is located south of the active portion of the quarry. According to Ms. Elaine Baker, Civil Engineer at DPW, Solid Waste Branch, the landfill has been in operation since approximately 1987, and is a permitted Class 3 landfill which accepts municipal wastes (Baker, 1995). Currently, there are plans to expand the landfill to a vertical height of 40 feet above grade (Yoshizawa, 1995). Further details regarding the landfill expansion are discussed in Section 4.2.1 - Landownership, Regulation and Use, in Dames & Moore's report entitled Environmental Screening and Siting Report for the Central Maui Generation Project, dated March 15, 1995.

4.3 ELECTRICAL TRANSFORMERS

Electrical transformers which may contain polychlorinated biphenyl-type (PCB-type) cooling oils were not observed at any of the sites included in this investigation.

5.0 HISTORICAL LAND USE

5.1 AERIAL PHOTOGRAPH REVIEW AND HISTORIC SITE MAP REVIEW

Dames & Moore reviewed available historical aerial photographs, archival topographic and orthophoto maps, and historic site maps for information regarding past land use of the Site and surrounding area, as detailed in Section 2.0. Historic features located at each site are shown on Figure 4. An interpretation of the Site and vicinity history from these references is presented below:

A-1

In the 1910 site map, Site A-1 appeared to cover field areas then numbered as Fields 6 and 7. A railroad track (labelled "Field 9 track") appeared to transverse the northern-most corner of the Site, oriented east to west. These tracks continued beyond the Site to the east and west. At the westernmost corner of the Site, adjacent to the Kalialinui Gulch, was a Station "C" marker. The map did not describe what the station was, but it appeared to resemble an elevation benchmark. In the 1949 site map, the track was still present, but unlabelled. The Station "C" marker was present, but unlabelled. In the 1950 aerial photograph, what appeared to be a landing strip was observed on the northeastern side of Pulehu Road, southwest of the Kalialinui Gulch, adjacent to the northwest side of Upper Division Road. The 1954 topographic map indicated no landing strip on the topographic map. The area of the former landing strip

appeared cultivated in the 1975 aerial photograph. No other features were observed on or near Site A-1 in the historic maps and photographs that were reviewed.

A-2

In the 1910 site map, Site A-2 was part of Field 1. A railroad track (labelled "Field 1 track") appeared to originate at the southeast end of the Site, and transverse the center of the Site, oriented south-southeast to north-northwest. These tracks continued beyond the Site to the northwest. A pipeline was labelled along the northeast boundary of the site (where the irrigation ditch is currently). A ditch labelled "No.6 Pump Ditch" transversed the southeast section of the Site, oriented north-northeast to south-southwest. In the 1949 site map, the track was still present, but unlabelled. The field was labelled "Field 1B." In the 1950 aerial photograph, a hexagonal-shaped feature was observed northwest of the Waikapu/Pulehu Road intersection, along the southwest side of Pulehu Road. It was unclear from the aerial photograph if the feature was a clearing or a structure. An irrigation ditch appeared to almost parallel Waikapu Road on the southeast portion of the Site. The 1954 topographic map indicated that a pipeline ran along the northeast boundary of the Site. The irrigation ditch observed in the 1950 photograph was not present. No other features were observed on or near Site A-2 in the historic maps and photographs that were reviewed.

D-1

In the 1910 site map, Site D-1 was part of Field 3. In the 1949 site map, the field was labelled "3-A." In the 1950 aerial photograph, a knoll was observed in the center of the Site. A landing strip was observed on the northeastern side of Pulehu Road, southwest of the Kalialinui Gulch. The 1954 topographic map indicated that a landing strip was present in that area. The 1975 aerial photograph indicated that the former landing strip area had been cultivated. No other features were observed on or near Site D-1 in the historic maps and photographs that were reviewed.

Vicinity

In the 1910 site map, the southernmost extent of the HC&S property appeared to terminate at the Lowrie Ditch. Pulehu Road was present but labelled as "Kula Road." Waikapu Road was present and labelled as such; however, Upper Division Road was not yet constructed. The four

closest reservoirs to the Sites were present, but had different numbers. Reservoirs currently known as 52, 61, 80, and 84 were labelled 5, 7, 14, and 8. Kalialinui Gulch was labelled "Camp A Gulch." In the 1949 site map, Upper Division Road was present, but unnamed. The only changes observed in the 1954 topographic map was that Waikapu Road and Upper Division Road are paved. In the 1977 orthophotoquad, quarry activities were observed approximately 1/2-mile northwest of Site A-1. No other features were observed on or near the vicinity of the three Sites in the historic maps and photographs that were reviewed.

5.2 BUILDING PERMIT REVIEW

Dames & Moore contacted the Maui County Department of Public Works, Building Permit Department, for information regarding building permits issued for the sites. According to Ms. Sharon Norrod, Building Permit Clerk Supervisor, the Building Permit Department maintains computer files for building permits issued from 1979 to the present (personal communication, 1995). Historic Building Permit files (pre-1979) are maintained by Building Permit number.

Ms. Norrod checked the computer files and found no listings for Tax Map Key (TMK) 03-08-03:1 (Site A-2). A temporary building permit was filed for the meteorological station at TMK 03-08-03:2 (Site D-1). A building permit existed for a weigh station within TMK 03-08-03:4 (Site A-1); however, the exact location of the weigh station was not available from the Building Department. Mr. O'Keefe was not aware of any weigh station in or near Site A-1 at this time, and was not able to provide any additional information regarding the location of the weigh station. The Maui County Landfill located north of Site A-1, is also located on the same TMK parcel, and operates a weigh station. The permit found for TMK 03-08-03:4, may refer to the County Landfill's weigh station. None of the permits issued for the sites indicated any storage and/or disposal of hazardous materials for the three parcels.

6.0 AGENCY LISTS REVIEW

During the last fifteen years, federal and state governments have developed legislation relating to environmental concerns. As a result of this legislation, laws and regulations which govern hazardous and/or toxic wastes and materials, and the manufacture, generation, use, storage, release, and/or disposal of such materials have been promulgated. As a consequence of these laws and regulations, numerous agencies collect and disseminate information for use in evaluating potential environmental problems.

As part of the assessment of the potential for soil and groundwater contamination at the Site or on nearby properties, Dames & Moore reviewed documents provided by a variety of federal, state, and local regulatory agencies. Section 2.0 presents a descriptive list of the agency documents reviewed for this investigation.

6.1 INTERPRETATION OF VISTA REPORTS

The VISTA Reports were conducted separately for each of the three sites, and consisted of a database review of the agency listings as described in Section 2. A copy of the VISTA Reports for each site is included in the Appendix attached at the end of this report.

No properties were identified on the NPL, RCRA-TSD or small/large generators, CERCLIS, ERNS, DOH LUST, UST, or Landfill listings within the specified search radii of each of the three Sites.

6.2 MANUAL LIST SEARCH

The following lists, as described in Section 2.0, were manually reviewed by Dames & Moore:

State of Hawaii, Department of Health (DOH) Hazard Evaluation and Emergency Response (HEER) Section Incidents Response Lists

The DOH HEER Section Incidents Response Lists for the years covering 1980 through 1994 were reviewed. Six incidents were identified on the lists and are summarized in Table 2. The location of case number 940908 has been estimated to be one mile southeast of Site D-1, which is beyond our search radius. The exact location of the remaining five sites is unknown. A written request has been made to HEER for more information regarding these sites. No response has been received to date. Dames & Moore will transmit outstanding environmental information, if any, obtained from these agencies when it becomes available.

City & County of Honolulu Fire Department (HFD) Incidents List

The Maui County Fire Department (Kahului Fire Station) maintains an Incidents Lists report of all fire department responses, including information regarding spills and chemical emergencies. According to Deputy Fire Chief Henry Lindo (interview, January 30, 1995), the Kahului Fire

Station maintains only recent Incident Listings on their computer files, from the year 1993 to the present. Mr. Lindo recommended that the Honolulu Fire Department (HFD) be contacted for information prior to 1993, when HFD maintained the Incident Lists for all islands. Prior to the Kahului Fire Department's database of Incident Listings, their files were organized chronologically.

Mr. Lindo checked the Kahului database and found one listing in the general area of the site which occurred in 1994. According to this incident report (#713), five 55-gallon drums were discovered in May 1994, in a gulch located adjacent to Field #413. The location of Field #413 was not described in the incident report. According to the report, some unidentified product, possibly waste paint or resin which had hardened, had leaked out of the drums. The drums were removed from the site and consisted of 4 full drums, 3 partially-filled drums, and 8 empty drums. All necessary agencies were reportedly contacted regarding this incident. No other information regarding this incident was described in the fire department incident report.

According to Mr. Randall Moore of HC&S (Interview, 1995), the incident referred to by Mr. Lindo involved a cane field located over one and a half miles southeast of Site D-1. According to a site map showing the field locations provided by Mr. Moore, the gulches adjacent to Field # 413 would not pass along any of the three Sites. The drums were reportedly removed at the time of the incident. No other information regarding this incident was available from Mr. Moore.

Mr. Ed Yee, Administrative Officer for Honolulu Fire Department (personal communication, July 5, 1994), was contacted regarding information on the Incident Lists reports prior to 1993. According to Mr. Yee, their records contained information from 1984 to 1993. Mr. Yee checked the lists and found no incidents listed for the sites or vicinity.

7.0 AGENCY CONTACTS

Dames & Moore has contacted the State of Hawaii, Department of Health to obtain information on the environmental condition of the Site. Requests for information from this agency have not been acknowledged as of the date of this report. It should be noted that this inquiry was conducted as a routine part of completing a Phase I ESA. Dames & Moore will transmit outstanding environmental information, if any, obtained from these agencies when it becomes available.

8.0 CONCLUSIONS, RANKING, AND RECOMMENDATIONS

Dames & Moore has completed an ESA of the three HC&S properties located in Puunene, Wailuku District, Maui, Hawaii. The findings are summarized as follows:

Site A-1

- A railroad track was located at the northernmost section of the Site. No information regarding this railroad was found during this investigation. It appears that the railroad track was used to move cane from the fields to Puunene (sugar mill). There have been no indications that any environmental impacts occurred to the Site due to the operation of this railroad.
- A landing strip was located between Kalialinui Gulch and Pulehu Road, southeast of the Site. No information regarding this landing strip was found during this investigation. The potential impacts to the landing strip and adjacent areas are unknown at this time.
- A feature labelled as Station C was located on the southwest boundary of the Site. It appeared to be a type of benchmark. There have been no indications that any environmental impacts occurred to the Site due to this feature.
- Based on the other activities conducted during this investigation, releases to the Site have not been identified at this time.

Site A-2

- A railroad track was located through the center of the Site. No information regarding this railroad was found during this investigation. It appears that the railroad track was used to move cane from the fields to Puunene (sugar mill). There have been no indications that any environmental impacts occurred to the Site due to the operation of this railroad.
- Based on the other activities conducted during this investigation, releases to the Site have not been identified at this time.

Site D-1

- A landing strip was located northeast of Pulehu Road, northeast of the Site. No information regarding this landing strip was found during this investigation. The potential impacts to the landing strip and adjacent areas are unknown at this time.
- Based on the other activities conducted during this investigation, releases to the Site have not been identified at this time.

Based on these findings, Dames & Moore recommends that additional research into the historic activities involving the airstrips be made to evaluate the potential environmental impact to soil, surface water, or groundwater from these areas. Based on the site visit, no releases to the three Sites have been observed. The exact locations of the incidents reported by the HEER listings have not been resolved at this time. Dames & Moore will transmit outstanding environmental information, if any, obtained from these agencies when it becomes available. At this time, the three Sites can be ranked equally in regard to environmental impairment as no releases to the three Sites have been identified at this time.

9.0 LIMITATIONS

The conclusions presented in this report are professional opinions based solely upon indicated data described in this report, visual observations of the Site and vicinity, and our interpretation of the available historical information and documents reviewed, as described in this report. They are intended exclusively for the purpose outlined herein and the Site locations and project indicated. This report is intended for the sole use of Maui Electric Company. The scope of services performed in execution of this investigation may not be appropriate to satisfy the needs of other users, and any use or reuse of this document or the findings, conclusions, or recommendations presented herein is at the sole risk of said user without the express written consent of Dames & Moore.

It should be recognized that this study was not intended to be a definitive investigation of contamination at the subject property and the recommendations provided are not necessarily inclusive of all the possible conditions. Given that the scope of services for this investigation was limited and that exploratory borings, soil and/or groundwater sampling or analytical testing were not undertaken, it is possible that currently unrecognized subsurface contamination may exist at the Site.

Services performed by Dames & Moore were conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the same profession currently practicing in the same locality under similar conditions. It is important to recognize that even the most comprehensive scope of services may fail to detect the environmental liabilities on a particular Site. Therefore, Dames & Moore cannot act as insurers and cannot "certify" that a Site is free of environmental contamination. No expressed or implied representation of warranty is included or intended in our reports, except that our services were performed, within the limits prescribed by our client, with the customary thoroughness and competence of our profession.

Opinions and recommendations presented herein apply to the Site conditions existing at the time of our investigation and cannot necessarily apply to Site changes of which Dames & Moore is not aware and has not had the opportunity to evaluate. Changes in the conditions of this property may occur with time due to natural processes or the works of man on the subject Site or adjacent properties. Changes in applicable standards may also occur as a result of legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated, wholly or in part, by changes beyond our control.

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10.0 REFERENCES

Aerial Photographs reviewed at R.M. Towill Corporation:

Date	Flight Number	Frame Number	Approximate Scale
09/30/50	417	7,8,9	1" = 5,200'
04/02/75	6607	2,3	1" = 2,000'

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USGS, 1977. Water Supply Paper 2041.

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VISTA, 1995. Site Assessment Report, A-2, Pulehu Road, Puunene, Maui, Hawaii.

VISTA, 1995. Site Assessment Report, D-1, Pulehu Road, Puunene, Maui, Hawaii.

Yee, Ed, Administrative Officer, 1995, City & County of Honolulu, Fire Department, personal communication, February 1.

Yoshizawa, Erik, 1995. HC&D Ameron, personal communication, January.

TABLE 1
SUMMARY OF HERBICIDE CHEMICALS USED ONSITE[1]

HERBICIDES CURRENTLY USED	HERBICIDES NO LONGER USED
Atrazine (Aatrex Nine-O)	Dalapon
Banvel	
Divron	
Evik (ametryn)	
Polado (aerial spraying for ripening)	
Prowl	
Round-Up	
Tilt (propiconazole - fungicide)	
Trifluralin	
Velpar	
Weedar (2,4-D)	

Note:

1 = Provided by Mr. Sean O'Keefe, HC&S

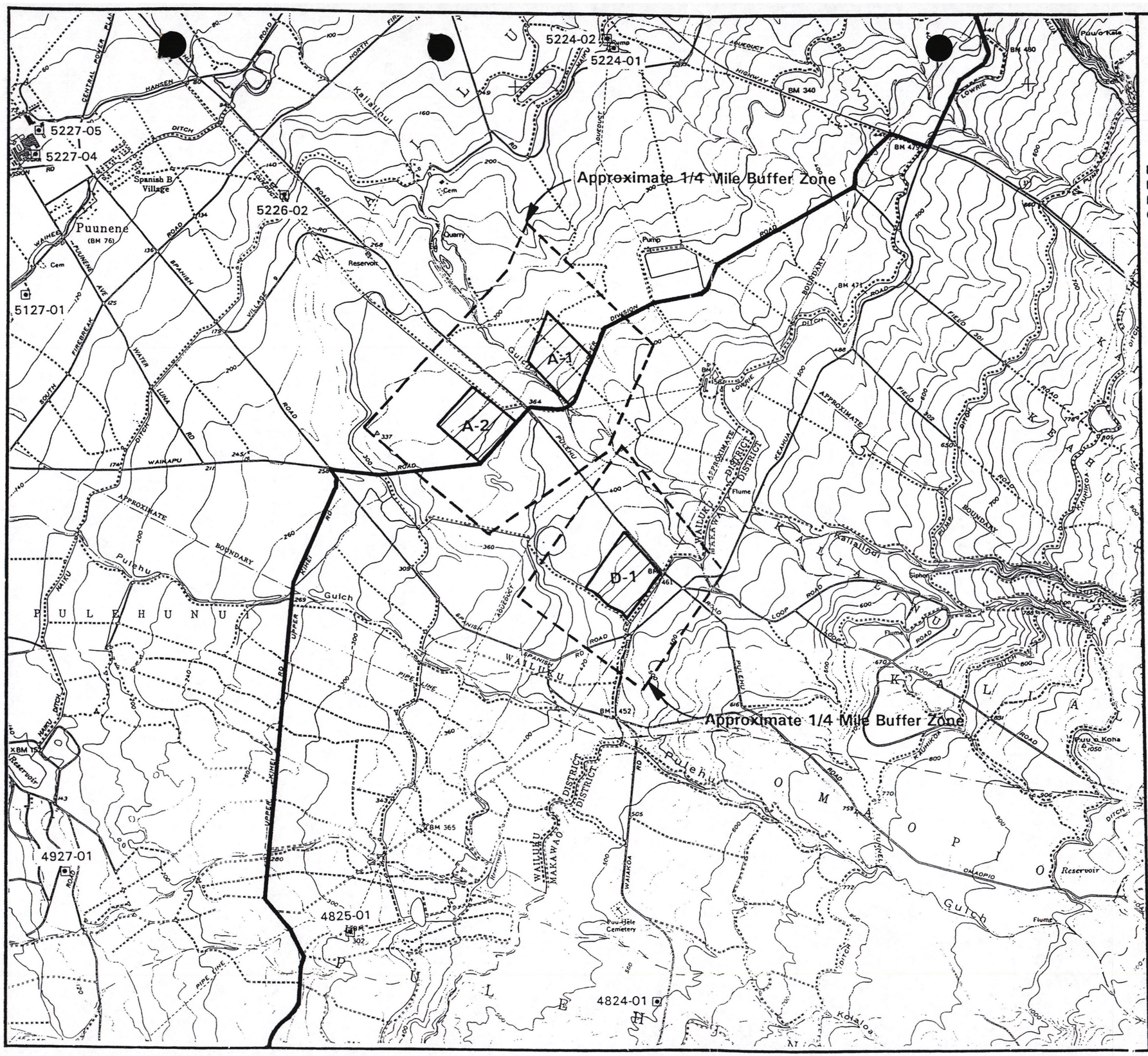
TABLE 2
SUMMARY OF HEER LIST SEARCH

DATE	ADDRESS	CASE NUMBER	APPROXIMATE DISTANCE/DIRECTION FROM SITE	COMMENTS
August 1, 1989	Puunene	890801	Unknown	Photochemical vapors - indoors, Lab ventilation improved.
September 18, 1992	Puunene	091892	Unknown	Chemical spill, approx. 120 lb. of Chloride, USCG investigated and reported that the case was closed to file.
January 20, 1993	Puunene	012093	Unknown	Chlorine gas was released from 150 lb. cylinder. The corroded valve could not be repaired at the scene. A kit was on the cylinder but there was no spare cylinder. The release was controlled in the Puunene cane fields. The winds were blowing around 15 MPH. A total of 8 lb. was released.
January 24, 1994	Puunene	940124-4	Unknown	Dumping of six (6) drums, unknown contents. HC&S removed and cleaned up the site.
May 10, 1994	Puunene	940511	Unknown	Occurred in dry gulch next to pineapple field. Unknown cause of release. 15 drums (55 gal), paint waste, 3 partial, 8 residue, 10 five (5) gallon pails of latex, soil was impacted. No final resolution recorded.
August 08,1994	1 mile past Pulehu and Omaopio Rd	940908	1 mile/East	Found 5 X 55 gallon drums; 2 lacquer thinner, 1 waste oil, 1 racing oil, 1 motor oil, small area stained and slow leaking observed. Fugitive dumping. Lacquer thinner, Racing fuel, waste oil, soil impacted. HC&S disposed of drums as hazardous waste.

REVISIONS
BY _____ DATE _____
BY _____ DATE _____
PLATE _____ OF _____

FILE 24941-007-001 / 0063
MECO GENERATION
BY JJS DATE 3/15
CHECKED BY _____ DATE _____

(11-8")



Legend:

Underground Injection Control (UIC) Line

5227-05 Other Well

Note: UIC Line and Well Locations from the State of Hawaii DOH UIC Program 7.5 Minute Topographic Maps
Maui, Hawaii, 1984.
Quadrangles: Paia and Puu O Kali

Approximate Scale

0 2500 5000
Feet

VICINITY MAP

ENVIRONMENTAL SITE ASSESSMENT
THREE HC & S PROPERTIES
PULEHU ROAD
PUUNENE, MAUI, HAWAII

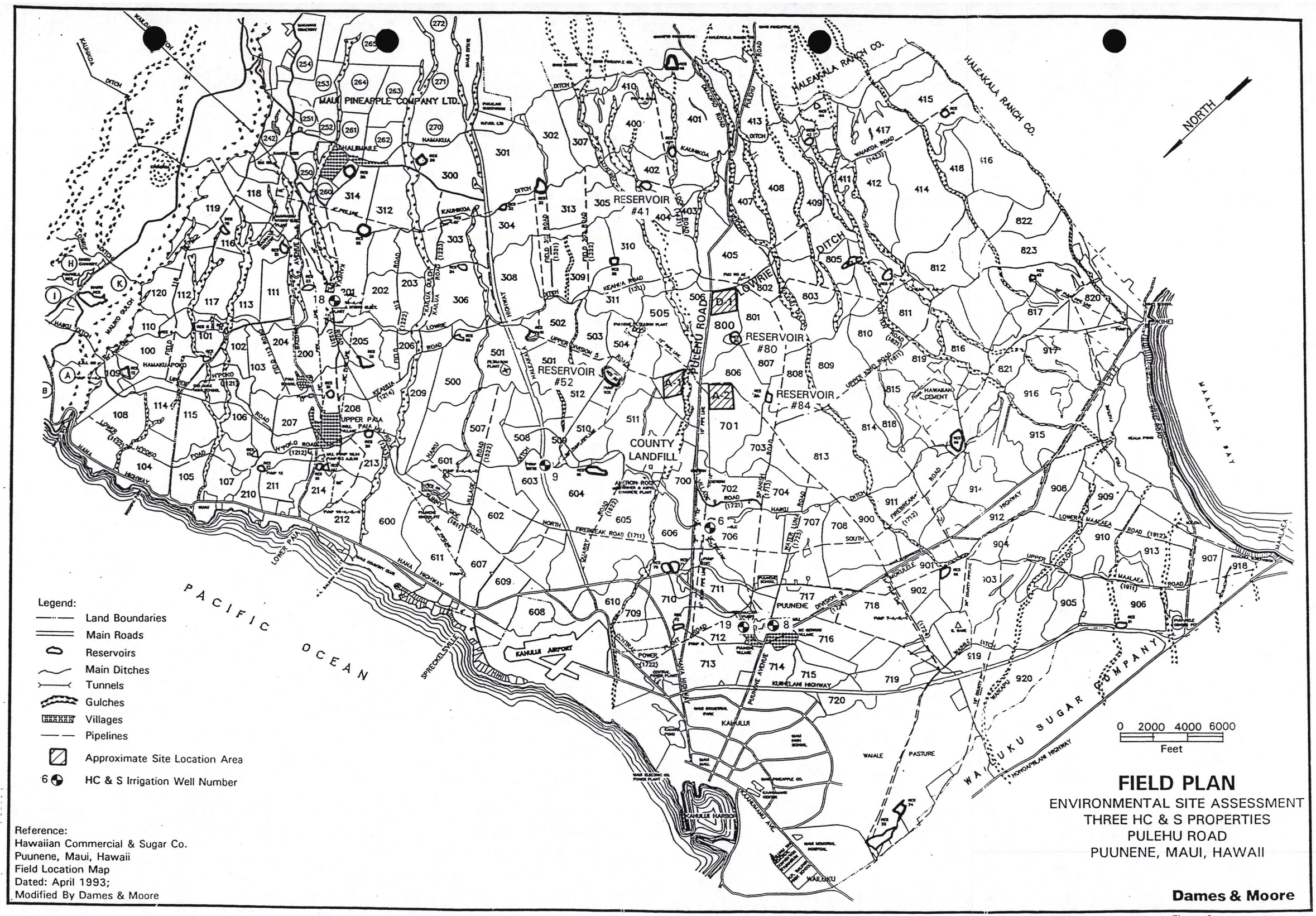
Reference:
U.S.G.S. Topographic Map
Paia and Puu O Kali Quadrangle
Paia, Maui, Hawaii

Dames & Moore

Figure 1

REVISIONS
BY _____ DATE _____
BY _____ DATE _____
PLATE _____ OF _____

FILE _____
BY _____ DATE _____
CHECKED BY _____ DATE _____



Legend:
- Land Boundaries
- Main Roads
- Reservoirs
- Main Ditches
- Tunnels
- Gulches
- Villages
- Pipelines
- Approximate Site Location Area
- 6 HC & S Irrigation Well Number

Reference:
Hawaiian Commercial & Sugar Co.
Puunene, Maui, Hawaii
Field Location Map
Dated: April 1993;
Modified By Dames & Moore

FIELD PLAN

ENVIRONMENTAL SITE ASSESSMENT
THREE HC & S PROPERTIES
PULEHU ROAD
PUUNENE, MAUI, HAWAII

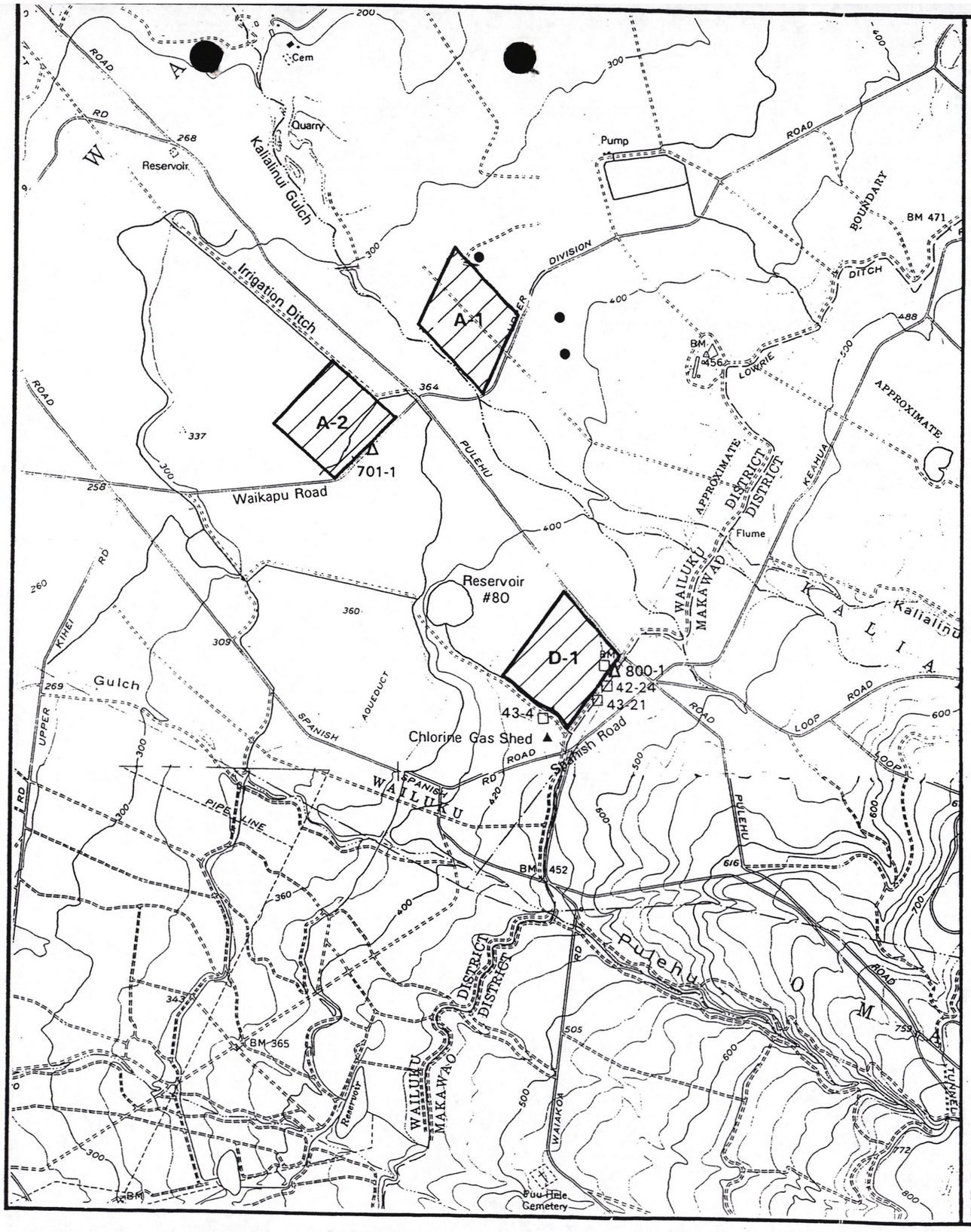
Dames & Moore

Figure 2

46612 (11-89)

REVISIONS
BY _____ DATE _____
BY _____ DATE _____
PLATE _____ OF _____

FILE _____
BY _____ DATE _____
CHECKED BY _____ DATE _____



Legend:

- Approximate Location of Site Area
- Approximate Location of Rock Pile
- 700-1 Δ Sand Filter System
- 43-4 □ Numbered Above Ground Storage Tank
- ▲ Chlorine Gas Shed

SITE PLAN

ENVIRONMENTAL SITE ASSESSMENT
THREE HC & S PROPERTIES
PULEHU ROAD
PUUNENE, MAUI, HAWAII

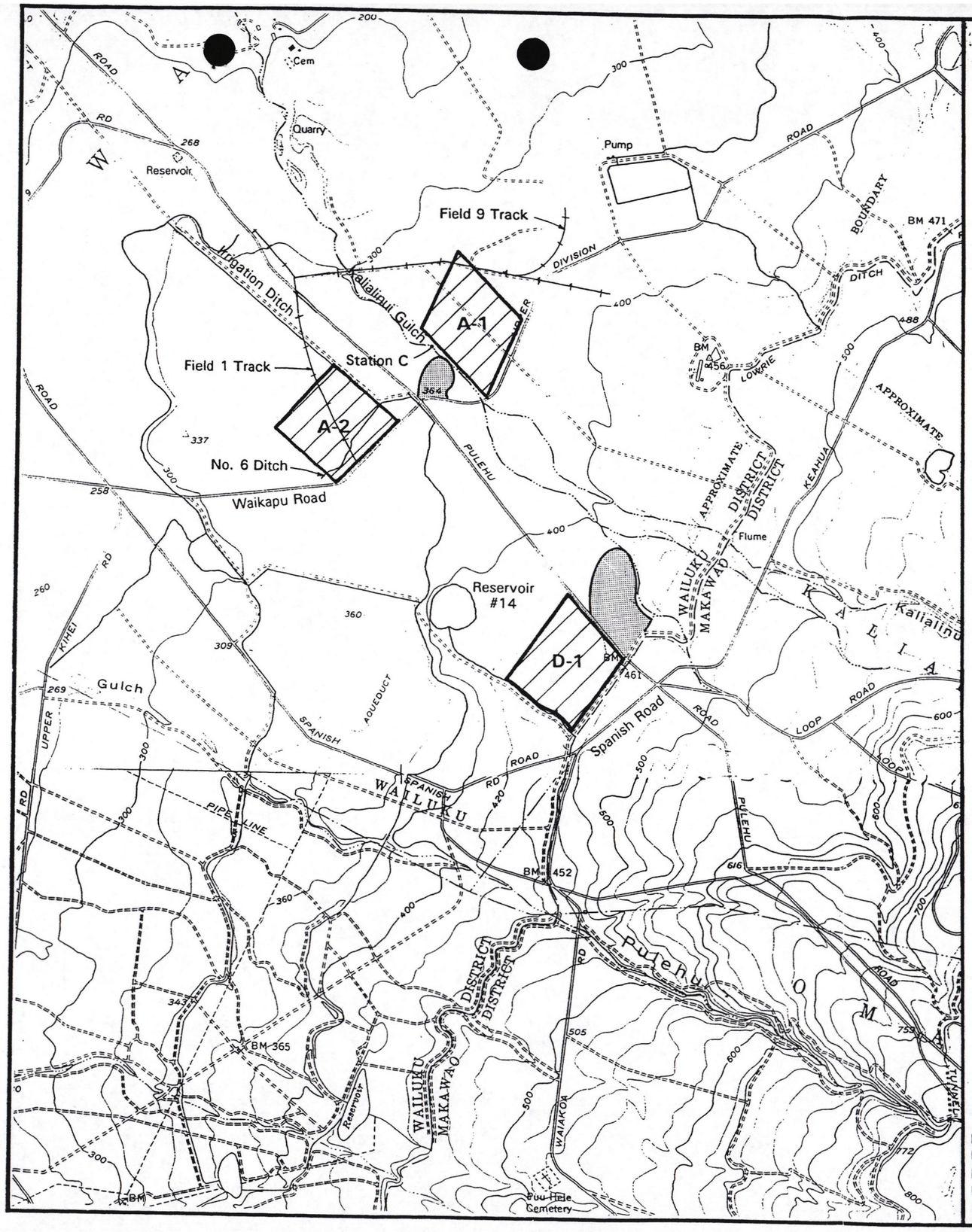
Reference:
U.S.G.S. Topographic Map (1983)
Paia and Puu O Kali Quadrangle
Paia, Maui, Hawaii

Dames & Moore

Figure 3

REVISIONS
BY _____ DATE _____
BY _____ DATE _____
PLATE _____ OF _____

FILE _____
BY _____ DATE _____
CHECKED BY _____ DATE _____



Legend:

- Approximate Location of Site Area
- Approximate Location of Former Airstrip Identified from Aerial Photograph and/or Topographic Map
- Approximate Location of Historic Railroad Tracks*

*Note: Only a portion of the train track system which was located on or near the sites are shown.

+ Features shown are compiled from various sources, as described in the text of this report.

North

0 2000 4000
Feet

HISTORIC SITE PLAN+

ENVIRONMENTAL SITE ASSESSMENT
THREE HC & S PROPERTIES
PULEHU ROAD
PUUNENE, MAUI, HAWAII

Base Map Reference:
U.S.G.S. Topographic Map (1983)
Paia and Puu O Kali Quadrangle
Paia, Maui, Hawaii; Modified By
Dames & Moore, March 1995

Dames & Moore

Figure 4

APPENDIX

VISTA REPORTS

Site A-1
Site A-2
Site D-1

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SITE ASSESSMENT REPORT (EXTENDED BY 1/4 MILE)

PROPERTY INFORMATION	CLIENT INFORMATION
Project Name/Ref #: Not Provided A-1 PULEHU RD PUUNENE MAUI, HI 96784 Cross Street: WAIKAPU RD Latitude/Longitude: (20.855065, 156.412519)	CAROL MITSUYASU DAMES MOORE - HONOLULU 1050 QUEEN ST STE 204 HONOLULU, HI 96814

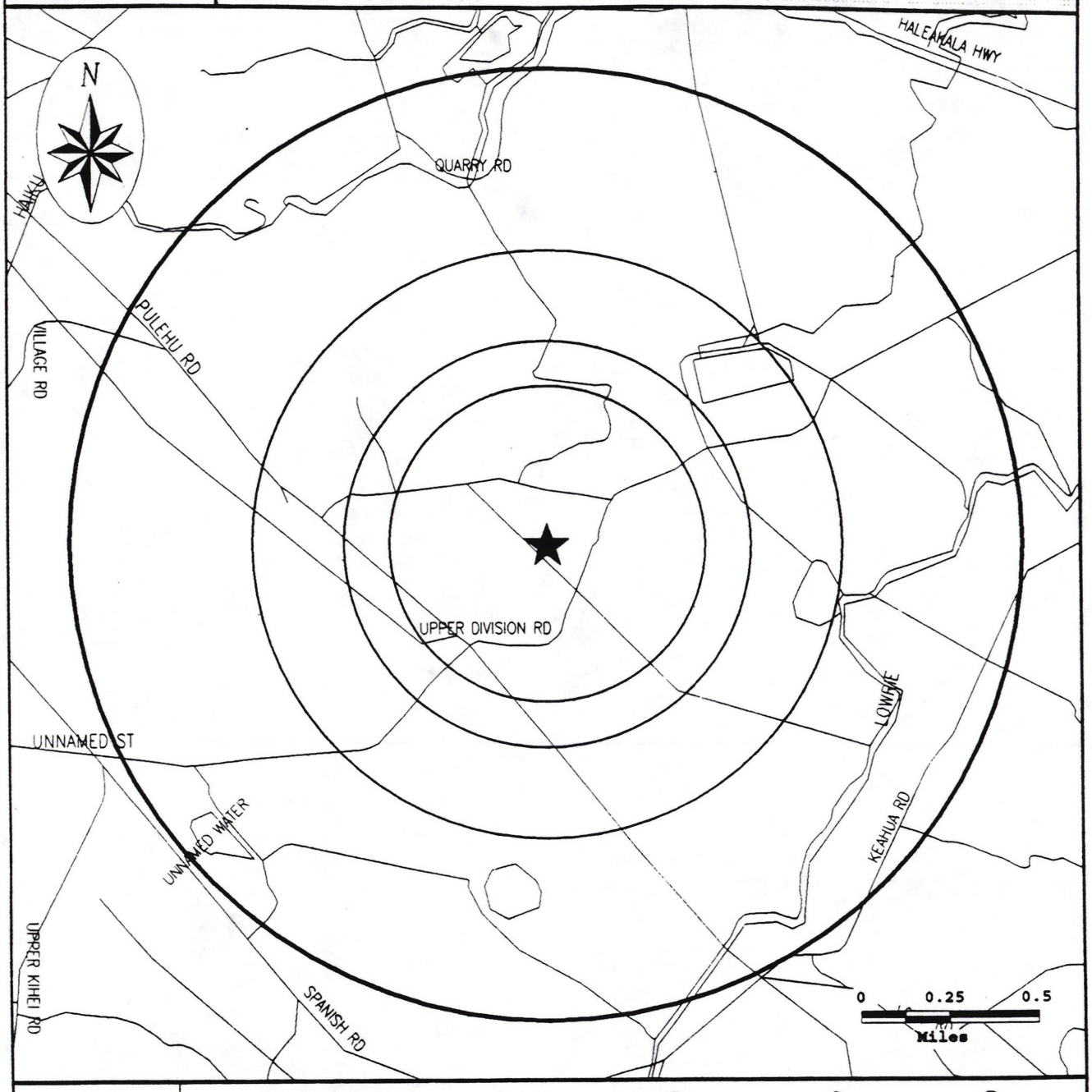
Site Distribution Summary Agency / Database - Type of Records			within 3/8 mile	3/8 to 1/2 mile	1/2 to 3/4 mile	3/4 to 1 1/4 miles
A) Databases searched to 1 1/4 miles:						
US EPA	NPL	National Priority List	0	0	0	0
US EPA	TSD	RCRA permitted treatment, storage, disposal facilities	0	0	0	0
B) Databases searched to 3/4 mile:						
US EPA	CERCLIS	Sites under review by US EPA	0	0	0	-
STATE	LUST	Leaking Underground Storage Tanks	0	0	0	-
STATE	SWLF	Permitted as solid waste landfills, incinerators, or transfer stations	0	0	0	-
C) Databases searched to 1/2 mile:						
STATE	UST	Registered underground storage tanks	0	0	-	-
D) Databases searched to 3/8 mile:						
US EPA	ERNS	Emergency Response Notification System of spills	0	-	-	-
US EPA	LG GEN	RCRA registered large generators of hazardous waste	0	-	-	-
US EPA	SM GEN	RCRA registered small generators of hazardous waste	0	-	-	-

This geographic database search meets the American Society for Testing Materials (ASTM) standards for a government records review. A (-) indicates the search distance exceeds ASTM search parameters.

LIMITATION OF LIABILITY
Customer proceeds at its own risk in choosing to rely on VISTA services, in whole or in part, prior to proceeding with any transaction. VISTA cannot be an insurer of the accuracy of the information, errors occurring in conversion of data, or for customer's use of data. VISTA and its affiliated companies, officers, agents, employees and independent contractors cannot be held liable for accuracy, storage, delivery, loss or expense suffered by customer resulting directly or indirectly from any information provided by VISTA.

SITE ASSESSMENT REPORT (EXTENDED BY 1/4 MILE)

Map of Sites within One and One-Quarter Miles



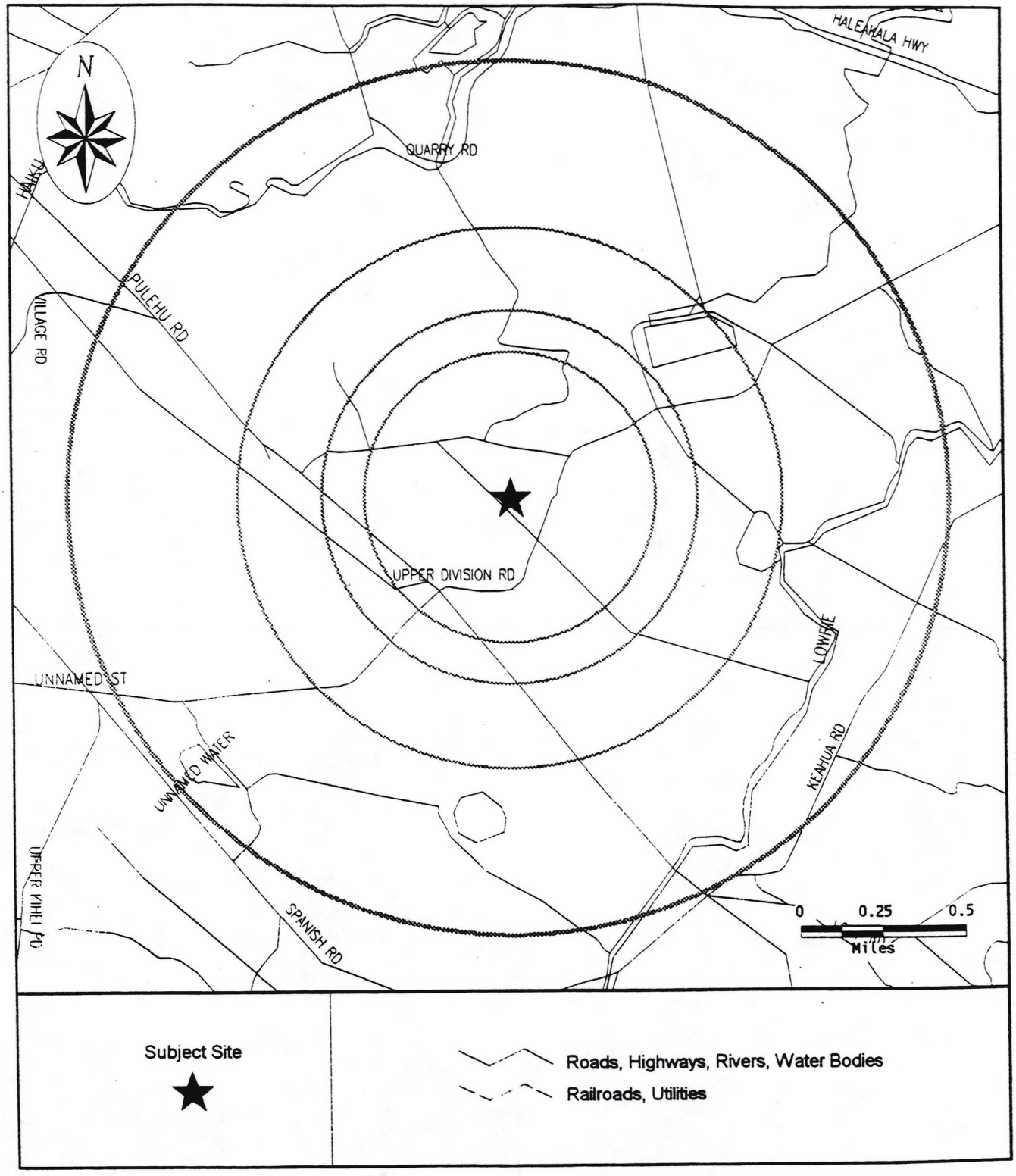
Subject Site	Category:	A	B	C	D
★	Databases Searched to:	1 1/4 mi.	3/4 mi.	1/2 mi.	3/8 mi.
	Single Sites	◆	■	△	○
	Multiple Sites	◆	■	△	○
		NPL, SPL, SCL, TSD	CERCLIS, LUST, SWLF	UST	ERNS, GENERATORS

Roads
Highways
Railroads
Rivers or Water Bodies
Utilities

If additional databases are listed in the cover page of the report they are also displayed on this map. The map symbol used corresponds to the database category letter A,B,C,D.

SITE ASSESSMENT REPORT (EXTENDED BY 1/4 MILE)

Street Map



SITE ASSESSMENT REPORT
(EXTENDED BY 1/4 MILE)

SITE INVENTORY

MAP ID	PROPERTY AND THE ADJACENT AREA (within 3/8 mile)	A		B			C	D			VISTA ID DISTANCE DIRECTION
		NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
No Records Found											

MAP ID	SITES IN THE SURROUNDING AREA (within 3/8 - 1/2 mile)	A		B			C	D			VISTA ID DISTANCE DIRECTION
		NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
No Records Found											

MAP ID	SITES IN THE SURROUNDING AREA (within 1/2 - 3/4 mile)	A		B			C	D			VISTA ID DISTANCE DIRECTION
		NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
No Records Found											

MAP ID	SITES IN THE SURROUNDING AREA (within 3/4 - 1 1/4 miles)	A		B			C	D			VISTA ID DISTANCE DIRECTION
		NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
No Records Found											

UNMAPPED SITES	A		B			C	D			VISTA ID
	NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
KIHEI CHEVRON P.O. BOX 1688 KIHEI, HI 96753						X				3164483
MAKAWAO HIGHWAYS DIVISION BASEYA TMK 2-4-17:41 MAKAWAO, HI 96768						X				4050335

SITE ASSESSMENT REPORT
(EXTENDED BY 1/4 MILE)

DETAILS

PROPERTY AND THE ADJACENT AREA (within 3/8 mile)

No Records Found

SITES IN THE SURROUNDING AREA (within 3/8 - 1/2 mile)

No Records Found

SITES IN THE SURROUNDING AREA (within 1/2 - 3/4 mile)

No Records Found

SITES IN THE SURROUNDING AREA (within 3/4 - 1 1/4 miles)

No Records Found

UNMAPPED SITES

Records Found, No Details Displayed

SITE ASSESSMENT REPORT
(EXTENDED BY 1/4 MILE)

DESCRIPTION OF DATABASES SEARCHED

A) DATABASES SEARCHED TO 1 1/4 MILES

NPL
SRC#: 1948

VISTA conducts a database search to identify all sites within 1.25 mile of your property.
The agency release date for NPL was August, 1994.

The National Priorities List (NPL) is the EPA's database of uncontrolled or abandoned hazardous waste sites identified for priority remedial actions under the Superfund program. A site must meet or surpass a predetermined hazard ranking system score, be chosen as a state's top priority site, or meet three specific criteria set jointly by the US Dept of Health and Human Services and the US EPA in order to become an NPL site.

RCRA-TSD
SRC#: 1832

VISTA conducts a database search to identify all sites within 1.25 mile of your property.
The agency release date for RCRIS was June, 1994.

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities which report generation, storage, transportation, treatment or disposal of hazardous waste. RCRA TSDs are facilities which treat, store and/or dispose of hazardous waste.

B) DATABASES SEARCHED TO 3/4 MILE

CERCLIS
SRC#: 1955

VISTA conducts a database search to identify all sites within 3/4 mile of your property.
The agency release date for CERCLIS was September, 1994.

The CERCLIS List is a compilation by the EPA of the sites which the EPA has investigated or is currently investigating for a release or threatened release of hazardous substances pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (Superfund Act).

SWLF
SRC#: 1682

VISTA conducts a database search to identify all sites within 3/4 mile of your property.
The agency release date for Permitted Landfills, Transfer Station Incinerator Facilities Database was December, 1993.

This database is provided by the Department of Health, Solid Hazardous Waste Branch.

LUST
SRC#: 1943

VISTA conducts a database search to identify all sites within 3/4 mile of your property.
The agency release date for Active Leaking Underground Storage Tank List was July, 1994.

This database is provided by the Department of Health, Solid Hazardous Waste Branch.

C) DATABASES SEARCHED TO 1/2 MILE

UST's
SRC#: 1351

VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for UST Section Database was May, 1993.

This database is provided by the Department of Health, Solid Hazardous Waste Branch.

D) DATABASES SEARCHED TO 3/8 MILE

ERNS
SRC#: 1951

VISTA conducts a database search to identify all sites within .375 mile of your property.
The agency release date for ERNS was September, 1994.

The Emergency Response Notification System (ERNS) is a national database used to collect information on reported releases of oil and hazardous substances. The database contains information from spill reports made to federal authorities including the EPA, the US Coast Guard, the National Response Center and the Department of transportation. A search of the database records for the period October 1986 through September 1993 revealed the following information regarding reported spills of oil or hazardous substances in the stated area.

RCRA-LgGen
SRC#: 1832

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RCRA-SmGen
SRC#: 1832

VISTA conducts a database search to identify all sites within .375 mile of your property.
The agency release date for RCRIS was June, 1994.

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities which report generation, storage, transportation, treatment or disposal of hazardous waste. RCRA Small and Very Small generators are facilities which generate less than 1000 kg./month of non-acutely hazardous waste.

End of Report

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SITE ASSESSMENT REPORT (EXTENDED BY 1/4 MILE)

PROPERTY INFORMATION	CLIENT INFORMATION
Project Name/Ref #: Not Provided A-2 PULEHU RD PUUNENE MAUI, HI 96784 Cross Street: WAIKAPU RD Latitude/Longitude: (20.850322, 156.420170)	CAROL MITSUYASU DAMES MOORE - HONOLULU 1050 QUEEN ST STE 204 HONOLULU, HI 96814

Site Distribution Summary Agency / Database - Type of Records			within 3/8 mile	3/8 to 1/2 mile	1/2 to 3/4 mile	3/4 to 1 1/4 miles
A) Databases searched to 1 1/4 miles:						
US EPA	NPL	National Priority List	0	0	0	0
US EPA	TSD	RCRA permitted treatment, storage, disposal facilities	0	0	0	0
B) Databases searched to 3/4 mile:						
US EPA	CERCLIS	Sites under review by US EPA	0	0	0	-
STATE	LUST	Leaking Underground Storage Tanks	0	0	0	-
STATE	SWLF	Permitted as solid waste landfills, incinerators, or transfer stations	0	0	0	-
C) Databases searched to 1/2 mile:						
STATE	UST	Registered underground storage tanks	0	0	-	-
D) Databases searched to 3/8 mile:						
US EPA	ERNS	Emergency Response Notification System of spills	0	-	-	-
US EPA	LG GEN	RCRA registered large generators of hazardous waste	0	-	-	-
US EPA	SM GEN	RCRA registered small generators of hazardous waste	0	-	-	-

This geographic database search meets the American Society for Testing Materials (ASTM) standards for a government records review. A (-) indicates the search distance exceeds ASTM search parameters.

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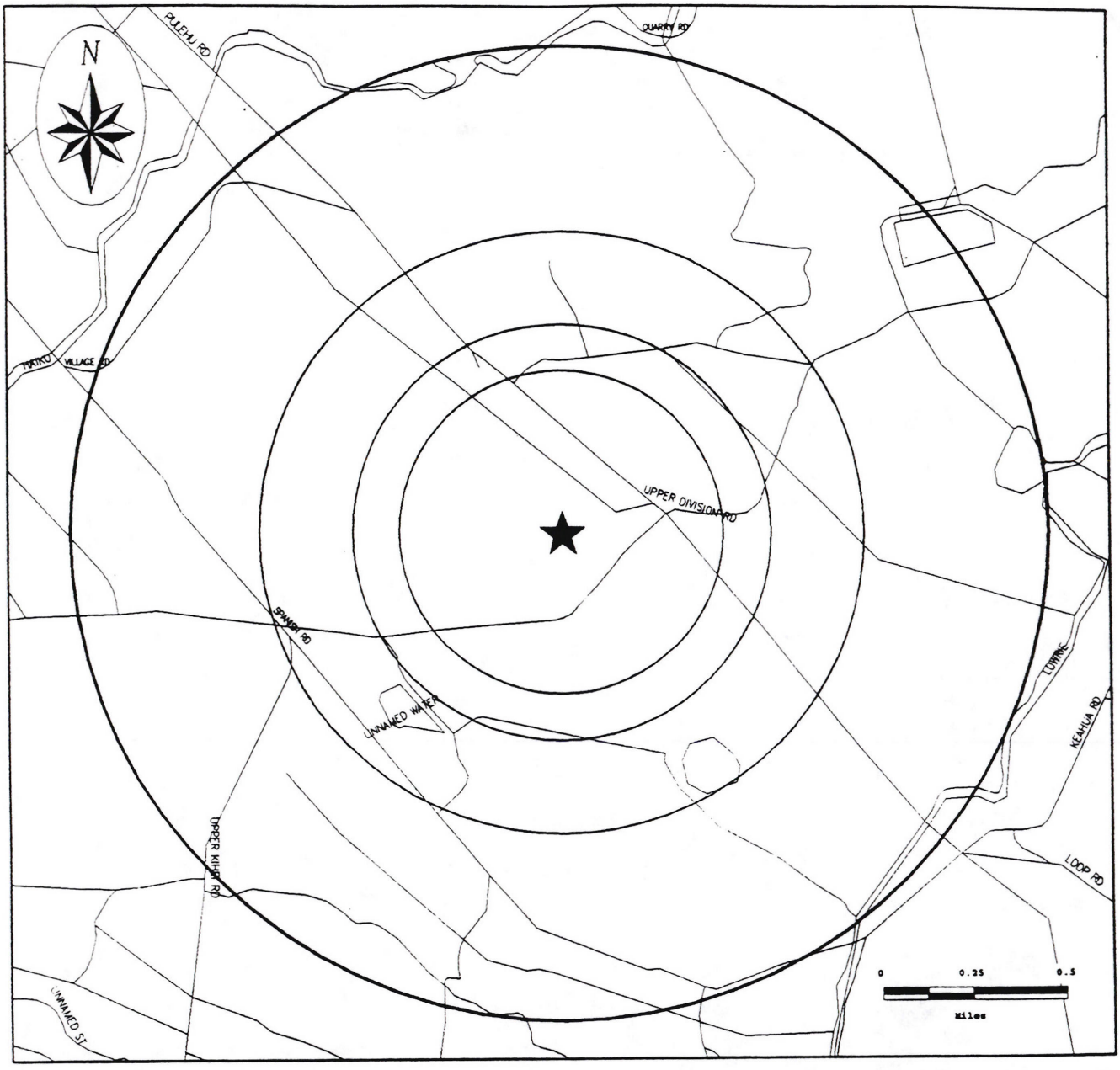
SITE ASSESSMENT REPORT (EXTENDED BY 1/4 MILE)

Map of Sites within One and One-Quarter Miles



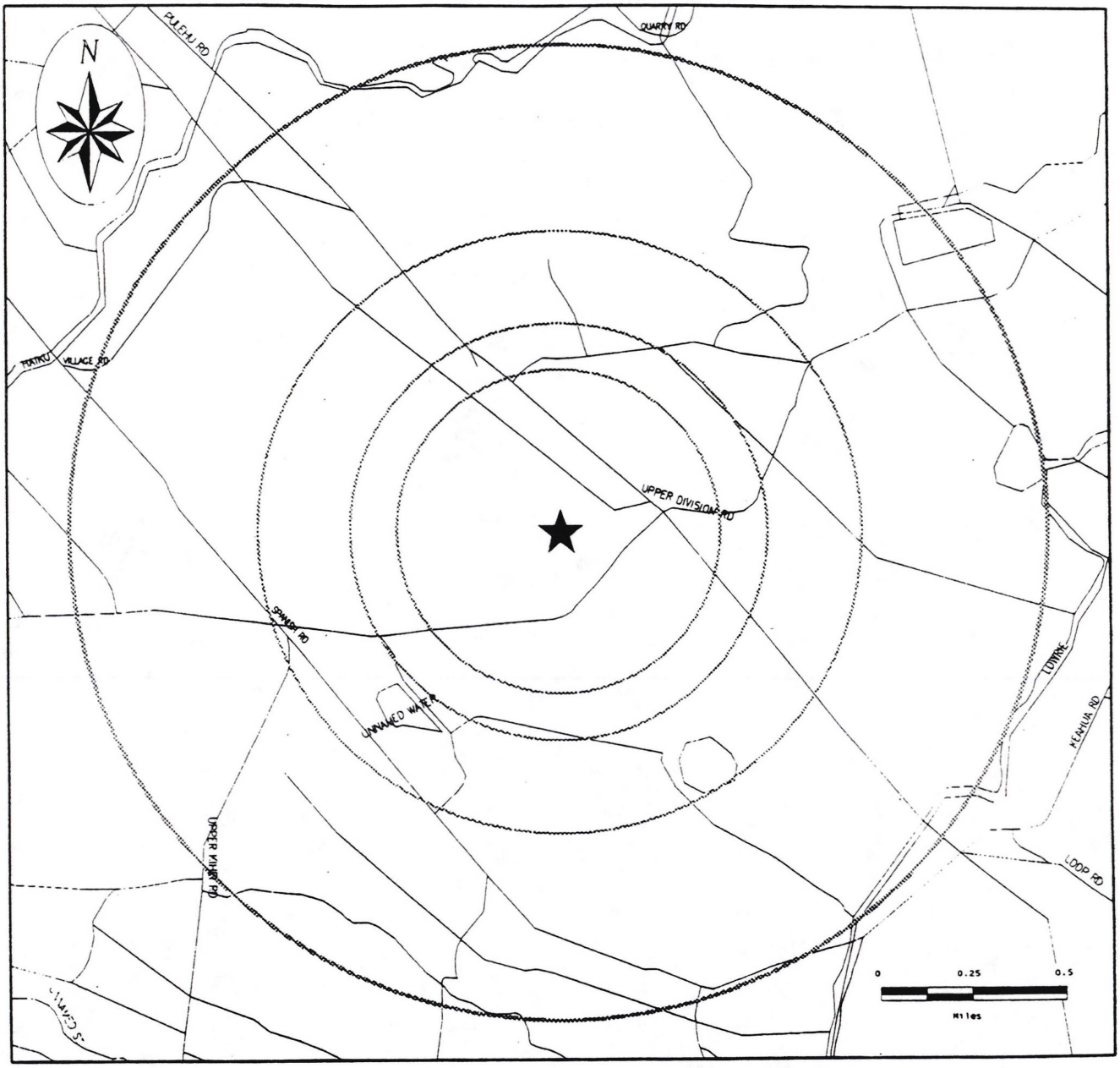
	Category:	A	B	C	D
Subject Site ★	Databases Searched to:	1 1/4 mi.	3/4 mi.	1/2 mi.	3/8 mi.
	Single Sites	◆	■	△	○
	Multiple Sites	◆	■	△	○
		NPL, SPL, SCL, TSD	CERCLIS, LUST, SWLF	UST	ERNS, GENERATORS

Roads
Highways
Railroads
Rivers or Water Bodies
Utilities

If additional databases are listed in the cover page of the report they are also displayed on this map. The map symbol used corresponds to the database category letter A,B,C,D.

SITE ASSESSMENT REPORT (EXTENDED BY 1/4 MILE)

Street Map



Subject Site ★

Roads, Highways, Rivers, Water Bodies

Railroads, Utilities

SITE ASSESSMENT REPORT
(EXTENDED BY 1/4 MILE)

SITE INVENTORY

MAP ID	PROPERTY AND THE ADJACENT AREA (within 3/8 mile)	A		B			C	D			VISTA ID DISTANCE DIRECTION
		NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
No Records Found											

MAP ID	SITES IN THE SURROUNDING AREA (within 3/8 - 1/2 mile)	A		B			C	D			VISTA ID DISTANCE DIRECTION
		NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
No Records Found											

MAP ID	SITES IN THE SURROUNDING AREA (within 1/2 - 3/4 mile)	A		B			C	D			VISTA ID DISTANCE DIRECTION
		NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
No Records Found											

MAP ID	SITES IN THE SURROUNDING AREA (within 3/4 - 1 1/4 miles)	A		B			C	D			VISTA ID DISTANCE DIRECTION
		NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
No Records Found											

UNMAPPED SITES	A		B			C	D			VISTA ID
	NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
KIHEI CHEVRON P.O. BOX 1688 KIHEI, HI 96753						X				3164483

SITE ASSESSMENT REPORT
(EXTENDED BY 1/4 MILE)

DETAILS

PROPERTY AND THE ADJACENT AREA (within 3/8 mile)
No Records Found

SITES IN THE SURROUNDING AREA (within 3/8 - 1/2 mile)
No Records Found

SITES IN THE SURROUNDING AREA (within 1/2 - 3/4 mile)
No Records Found

SITES IN THE SURROUNDING AREA (within 3/4 - 1 1/4 miles)
No Records Found

UNMAPPED SITES

Records Found, No Details Displayed

SITE ASSESSMENT REPORT
(EXTENDED BY 1/4 MILE)

DESCRIPTION OF DATABASES SEARCHED

A) DATABASES SEARCHED TO 1 1/4 MILES

NPL
SRC#: 1948

VISTA conducts a database search to identify all sites within 1.25 mile of your property.
The agency release date for NPL was August, 1994.

The National Priorities List (NPL) is the EPA's database of uncontrolled or abandoned hazardous waste sites identified for priority remedial actions under the Superfund program. A site must meet or surpass a predetermined hazard ranking system score, be chosen as a state's top priority site, or meet three specific criteria set jointly by the US Dept of Health and Human Services and the US EPA in order to become an NPL site.

RCRA-TSD
SRC#: 1832

VISTA conducts a database search to identify all sites within 1.25 mile of your property.
The agency release date for RCRIS was June, 1994.

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities which report generation, storage, transportation, treatment or disposal of hazardous waste. RCRA TSDs are facilities which treat, store and/or dispose of hazardous waste.

B) DATABASES SEARCHED TO 3/4 MILE

CERCLIS
SRC#: 1955

VISTA conducts a database search to identify all sites within 3/4 mile of your property.
The agency release date for CERCLIS was September, 1994.

The CERCLIS List is a compilation by the EPA of the sites which the EPA has investigated or is currently investigating for a release or threatened release of hazardous substances pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (Superfund Act).

SWLF
SRC#: 1682

VISTA conducts a database search to identify all sites within 3/4 mile of your property.
The agency release date for Permitted Landfills, Transfer Station Incinerator Facilities Database was December, 1993.

This database is provided by the Department of Health, Solid Hazardous Waste Branch.

LUST
SRC#: 1943

VISTA conducts a database search to identify all sites within 3/4 mile of your property.
The agency release date for Active Leaking Underground Storage Tank List was July, 1994.

This database is provided by the Department of Health, Solid Hazardous Waste Branch.

C) DATABASES SEARCHED TO 1/2 MILE

UST's
SRC#: 1351

VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for UST Section Database was May, 1993.

This database is provided by the Department of Health, Solid Hazardous Waste Branch.

D) DATABASES SEARCHED TO 3/8 MILE

ERNS
SRC#: 1951

VISTA conducts a database search to identify all sites within .375 mile of your property.
The agency release date for ERNS was September, 1994.

The Emergency Response Notification System (ERNS) is a national database used to collect information on reported releases of oil and hazardous substances. The database contains information from spill reports made to federal authorities including the EPA, the US Coast Guard, the National Response Center and the Department of transportation. A search of the database records for the period October 1986 through September 1993 revealed the following information regarding reported spills of oil or hazardous substances in the stated area.

RCRA-LgGen
SRC#: 1832

VISTA conducts a database search to identify all sites within .375 mile of your property.
The agency release date for RCRIS was June, 1994.

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities which report generation, storage, transportation, treatment or disposal of hazardous waste. RCRA Large Generators are facilities which generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).

RCRA-SmGen
SRC#: 1832

VISTA conducts a database search to identify all sites within .375 mile of your property.
The agency release date for RCRIS was June, 1994.

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities which report generation, storage, transportation, treatment or disposal of hazardous waste. RCRA Small and Very Small generators are facilities which generate less than 1000 kg./month of non-acutely hazardous waste.

End of Report

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SITE ASSESSMENT REPORT (EXTENDED BY 1/4 MILE)

PROPERTY INFORMATION	CLIENT INFORMATION
Project Name/Ref #: Not Provided D-1 PULEHU RD PUUNENE MAUI, HI 96784 Latitude/Longitude: (20.838920, 156.407803)	CAROL MITSUYASU DAMES MOORE - HONOLULU 1050 QUEEN ST STE 204 HONOLULU, HI 96814

Site Distribution Summary Agency / Database - Type of Records			within 3/8 mile	3/8 to 1/2 mile	1/2 to 3/4 mile	3/4 to 1 1/4 miles
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US EPA	TSD	RCRA permitted treatment, storage, disposal facilities	0	0	0	0
B) Databases searched to 3/4 mile:						
US EPA	CERCLIS	Sites under review by US EPA	0	0	0	-
STATE	LUST	Leaking Underground Storage Tanks	0	0	0	-
STATE	SWLF	Permitted as solid waste landfills, incinerators, or transfer stations	0	0	0	-
C) Databases searched to 1/2 mile:						
STATE	UST	Registered underground storage tanks	0	0	-	-
D) Databases searched to 3/8 mile:						
US EPA	ERNS	Emergency Response Notification System of spills	0	-	-	-
US EPA	LG GEN	RCRA registered large generators of hazardous waste	0	-	-	-
US EPA	SM GEN	RCRA registered small generators of hazardous waste	0	-	-	-

This geographic database search meets the American Society for Testing Materials (ASTM) standards for a government records review. A (-) indicates the search distance exceeds ASTM search parameters.

LIMITATION OF LIABILITY
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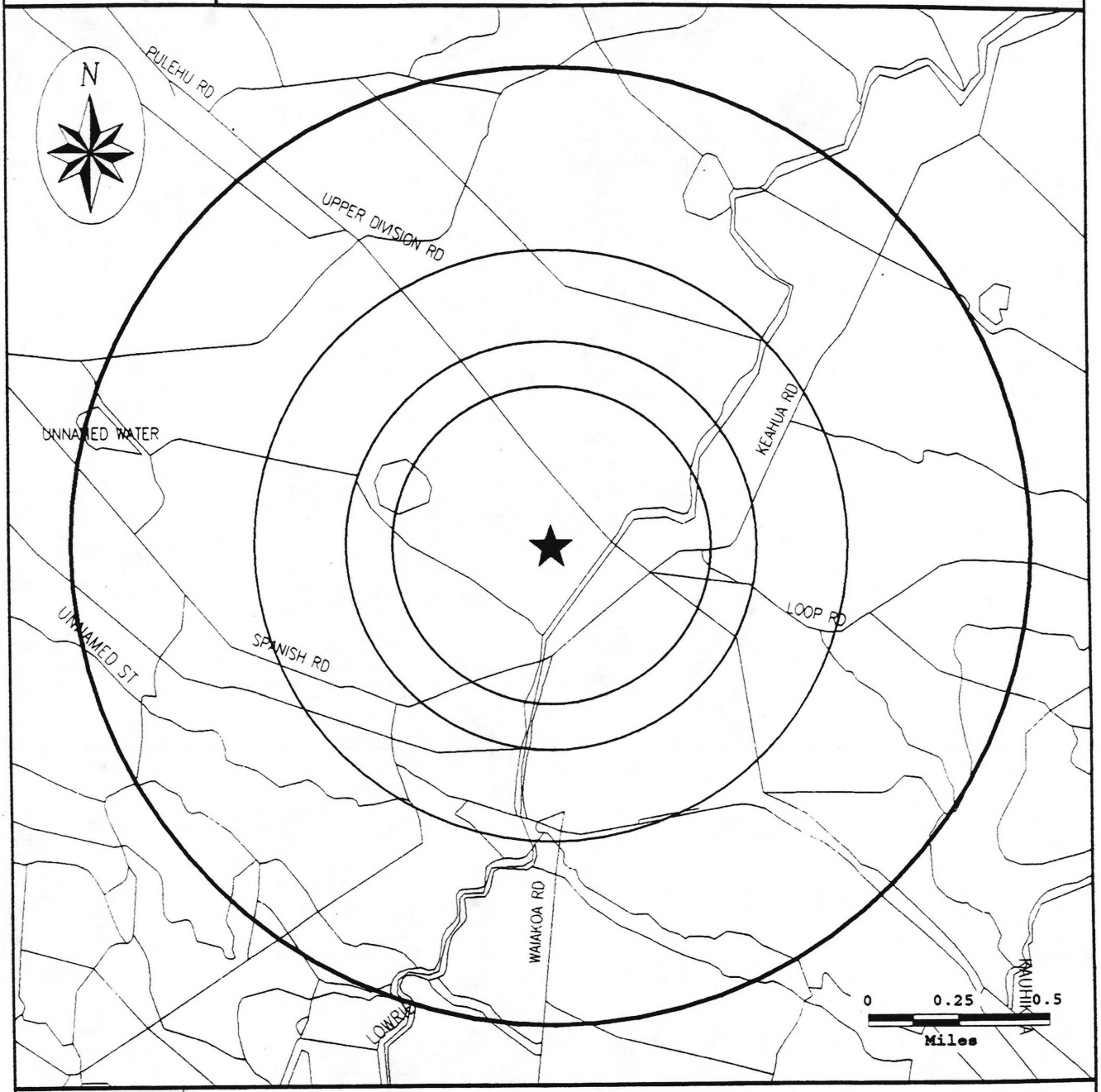
SITE ASSESSMENT REPORT (EXTENDED BY 1/4 MILE)

VISTA

Map of Sites within One and One-Quarter Miles



Category:	A	B	C	D
Databases Searched to:	1 1/4 mi.	3/4 mi.	1/2 mi.	3/8 mi.
Single Sites	◆	■	△	○
Multiple Sites	◆	■	△	○
	NPL, SPL, SCL, TSD	CERCLIS, LUST, SWLF	UST	ERNS, GENERATORS

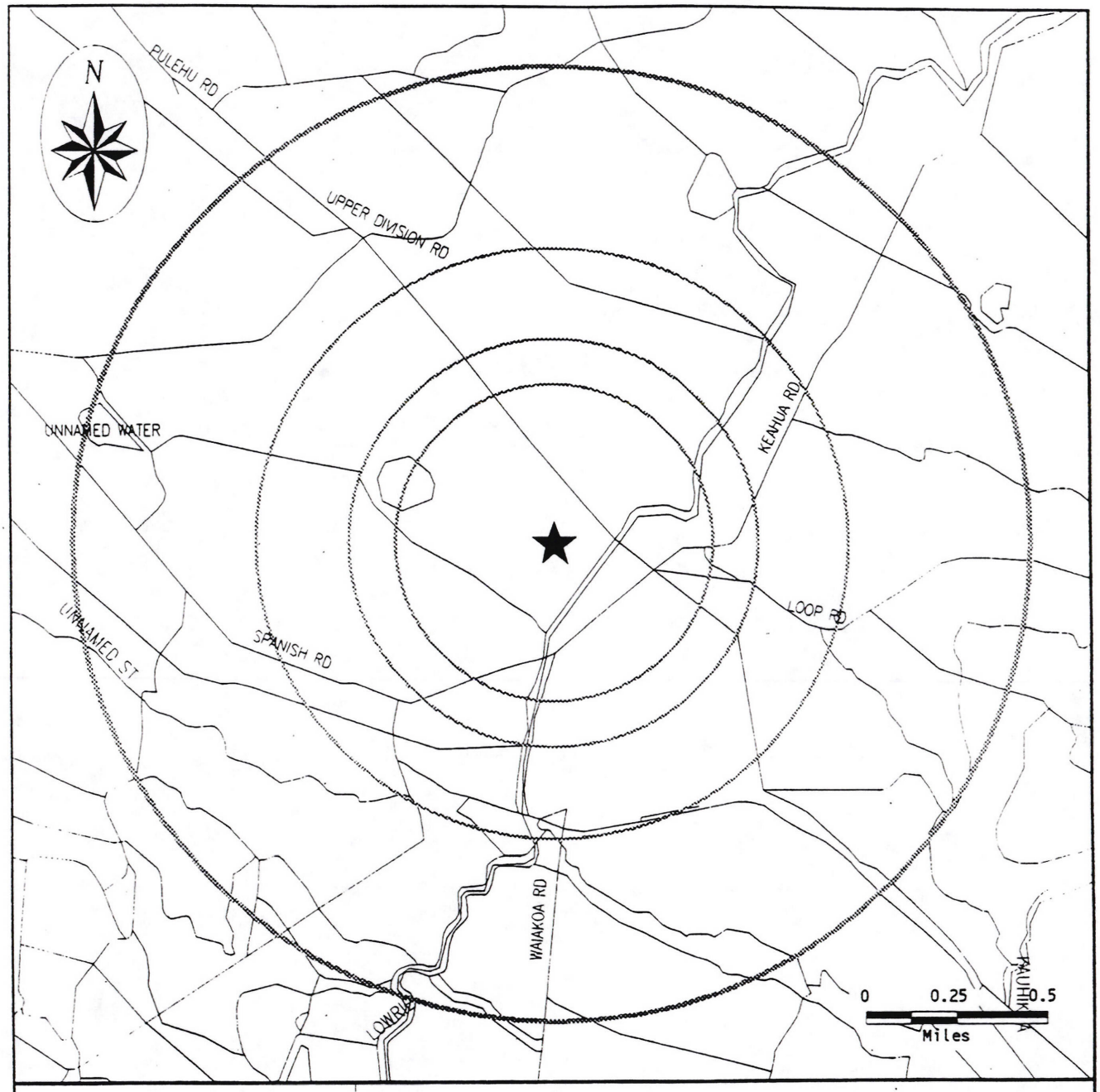
Subject Site ★

Roads
Highways
Railroads
Rivers or Water Bodies
Utilities

If additional databases are listed in the cover page of the report they are also displayed on this map. The map symbol used corresponds to the database category letter A,B,C,D.

SITE ASSESSMENT REPORT (EXTENDED BY 1/4 MILE)

Street Map



SITE ASSESSMENT REPORT
(EXTENDED BY 1/4 MILE)

SITE INVENTORY

MAP ID	PROPERTY AND THE ADJACENT AREA (within 3/8 mile)	A		B			C	D			VISTA ID DISTANCE DIRECTION
		NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
No Records Found											

MAP ID	SITES IN THE SURROUNDING AREA (within 3/8 - 1/2 mile)	A		B			C	D			VISTA ID DISTANCE DIRECTION
		NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
No Records Found											

MAP ID	SITES IN THE SURROUNDING AREA (within 1/2 - 3/4 mile)	A		B			C	D			VISTA ID DISTANCE DIRECTION
		NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
No Records Found											

MAP ID	SITES IN THE SURROUNDING AREA (within 3/4 - 1 1/4 miles)	A		B			C	D			VISTA ID DISTANCE DIRECTION
		NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
No Records Found											

UNMAPPED SITES	A		B			C	D			VISTA ID
	NPL	TSD	CERCLIS	LUST	SWLF	UST	ERNS	LG GEN	SM GEN	
KIHEI CHEVRON P O. BOX 1688 KIHEI, HI 96753						X				3164483
MAKAWAO HIGHWAYS DIVISION BASEYA TMK 2-4-17:41 MAKAWAO, HI 96768						X				4050335

SITE ASSESSMENT REPORT
(EXTENDED BY 1/4 MILE)

DETAILS

PROPERTY AND THE ADJACENT AREA (within 3/8 mile)

No Records Found

SITES IN THE SURROUNDING AREA (within 3/8 - 1/2 mile)

No Records Found

SITES IN THE SURROUNDING AREA (within 1/2 - 3/4 mile)

No Records Found

SITES IN THE SURROUNDING AREA (within 3/4 - 1 1/4 miles)

No Records Found

UNMAPPED SITES

Records Found, No Details Displayed

SITE ASSESSMENT REPORT
(EXTENDED BY 1/4 MILE)

DESCRIPTION OF DATABASES SEARCHED

A) DATABASES SEARCHED TO 1 1/4 MILES

NPL
SRC#: 1948

VISTA conducts a database search to identify all sites within 1.25 mile of your property.
The agency release date for NPL was August, 1994.

The National Priorities List (NPL) is the EPA's database of uncontrolled or abandoned hazardous waste sites identified for priority remedial actions under the Superfund program. A site must meet or surpass a predetermined hazard ranking system score, be chosen as a state's top priority site, or meet three specific criteria set jointly by the US Dept of Health and Human Services and the US EPA in order to become an NPL site.

RCRA-TSD
SRC#: 1832

VISTA conducts a database search to identify all sites within 1.25 mile of your property.
The agency release date for RCRIS was June, 1994.

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities which report generation, storage, transportation, treatment or disposal of hazardous waste. RCRA TSDs are facilities which treat, store and/or dispose of hazardous waste.

B) DATABASES SEARCHED TO 3/4 MILE

CERCLIS
SRC#: 1955

VISTA conducts a database search to identify all sites within 3/4 mile of your property.
The agency release date for CERCLIS was September, 1994.

The CERCLIS List is a compilation by the EPA of the sites which the EPA has investigated or is currently investigating for a release or threatened release of hazardous substances pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (Superfund Act).

SWLF
SRC#: 1682

VISTA conducts a database search to identify all sites within 3/4 mile of your property.
The agency release date for Permitted Landfills, Transfer Station Incinerator Facilities Database was December, 1993.

This database is provided by the Department of Health, Solid Hazardous Waste Branch.

LUST
SRC#: 1943

VISTA conducts a database search to identify all sites within 3/4 mile of your property.
The agency release date for Active Leaking Underground Storage Tank List was July, 1994.

This database is provided by the Department of Health, Solid Hazardous Waste Branch.

C) DATABASES SEARCHED TO 1/2 MILE

UST's
SRC#: 1351

VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for UST Section Database was May, 1993.

This database is provided by the Department of Health, Solid Hazardous Waste Branch.

D) DATABASES SEARCHED TO 3/8 MILE

ERNS
SRC#: 1951

VISTA conducts a database search to identify all sites within .375 mile of your property.
The agency release date for ERNS was September, 1994.

The Emergency Response Notification System (ERNS) is a national database used to collect information on reported releases of oil and hazardous substances. The database contains information from spill reports made to federal authorities including the EPA, the US Coast Guard, the National Response Center and the Department of transportation. A search of the database records for the period October 1986 through September 1993 revealed the following information regarding reported spills of oil or hazardous substances in the stated area.

RCRA-LgGen
SRC#: 1832

VISTA conducts a database search to identify all sites within .375 mile of your property.
The agency release date for RCRIS was June, 1994.

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities which report generation, storage, transportation, treatment or disposal of hazardous waste. RCRA Large Generators are facilities which generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).

RCRA-SmGen
SRC#: 1832

VISTA conducts a database search to identify all sites within .375 mile of your property.
The agency release date for RCRIS was June, 1994.

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities which report generation, storage, transportation, treatment or disposal of hazardous waste. RCRA Small and Very Small generators are facilities which generate less than 1000 kg./month of non-acutely hazardous waste.

End of Report

APPENDIX I

Traffic/Transportation

DAMES & MOORE MEMO

• HONOLULU •

	ACTION	INFO	FILE
To:	Maui Electric Company, Limited	File	**Job. No.:** 22941-007 **Date:** March 24, 1995

From: Gayle Borchard

Subject: **Central Maui Generation Facility Environmental Screening/Siting Study Traffic/Transportation**

This memo report regarding traffic and transportation issues for the subject project follows this format:

- introduction
- relevant agencies
- data and methods
- existing conditions
- assessment of relevant data factors
- unresolved uncertainties
- recommendations for further study/work
- references

INTRODUCTION

Maui Electric Company, Limited (MECO), proposes to construct and operate a nominal 232 MW electrical generation facility. The purpose of this analysis is to describe existing traffic and transportation conditions, and to determine of three candidate sites—A1, A2, and D1—can be distinguished from one another on the basis of traffic or transportation factors. It should be understood this analysis is conducted at a level of detail required for a siting effort, and is generally a qualitative assessment; a comprehensive quantitative traffic analysis should be conducted as part of the environmental review for the proposed project.

The three candidate sites, A1, A2, and D1, are located in the Central Maui region. Site A1 is located on Waikapu/Upper Division Road, approximately 0.5 mile south of the Maui County landfill access road, and 1,000 feet east of Pulehu Road. Division Road makes an at-grade crossing of Kalialinui Gulch between Pulehu Road and Site A1. Site A2 is also located on Waikapu/Upper Division Road approximately 0.5 mile south of the landfill access road, and is 400 feet west of Pulehu Road. Site D1 is located at the northwest quadrant of Pulehu Road and the Lowrie Ditch, approximately 1.0 mile south of the Pulehu Road/Waikapu/Upper Division Road intersection.

The primary emphasis of this analysis is vehicular traffic. The traffic evaluation focusses on the movement of goods and people to and from a candidate site via vehicle, particularly the configuration and integrity of the roadway system, the possible effects of project-related traffic on roadway operations, and the operational requirements associated with access to a given site. Issues associated with fuel haul trucks are emphasized for the following reasons:

- the efficient and effective transport of fuel to a candidate site is critical to the operation of the proposed project
- due to their size, weight, and turning radius requirements, roadway configuration and integrity as well as operational characteristics are more critical to fuel haul vehicles than other project-related vehicles
- project fuel haul routes and trip generation are relatively well known, as opposed to other project-related traffic (such as employee commute, service, and T&D vehicles)

In addition to the traffic assessment, an evaluation of the transportation of fuel to the proposed project by alternative means (i.e., pipeline) is briefly evaluated and discussed.

Fuel Truck and Haul Route Characteristics

Of the daily trips generated by the proposed project, 125 round trips would be trucks, and of those, 40 round trips would be multi-axle fuel haul trucks. Fuel haul trucks would have the following approximate physical characteristics:

Length:	65 feet
Width:	12 feet (total, including protrusions such as mirrors)
Height:	13 feet
Weight:	29,600 pounds, unloaded
	89,200 pound, loaded

Fuel trucks require a minimum 150-foot turning radius. (Maui Electric Company, Limited (MECO), 1995)

The fuel haul route would be from the Chevron bulk terminal at Kahului Harbor on Hobron Avenue to Hana Highway, Hana Highway to Pulehu Road, and Pulehu Road to the proposed project on Pulehu Road. Intersections relevant to project fuel haul are presented in Table 1, following the text of this report.

1.0 RELEVANT AGENCIES

Both Hobron Avenue and Hana Highway under the control of the State of Hawaii Department of Transportation (DOT), Maui District. Contact personnel for that agency are Mr. Robert Siarot, Maui District, and Ms. Gail Okaneku, Oahu District.

Pulehu Road is under the control of the County of Maui Public Works Department (PWD). The contact person for that agency is Ms. Charlene Shiboya.

2.0 DATA AND METHODS

Relevant intersections were identified via review of street and USGS quadrangle maps as well as review of aerial photographs. Information regarding road configuration and integrity was obtained via windshield survey, review of aerial photographs, and contact with the County of Maui PWD representative.

Traffic counts along Hana Highway were obtained from the DOT, which obtained counts in 1993 at the Hana Highway/Hobron Avenue, Hana Highway/Hanakai Street, and Hana Highway/Dairy Road intersections. These traffic counts were taken during the summer of 1993, and were used without modification as an indicator of current traffic volumes. In addition, these counts were used to estimate what percentage of overall volume project-related truck traffic might represent in the current year at key relevant intersections. Level of Service (LOS) designations or intersection capacity information for these intersections were not available from the DOT. Relatively current traffic counts or LOS information do not exist for Pulehu Road.

Information regarding alternative transportation options was obtained from Chevron and from a map review.

3.0 EXISTING CONDITIONS/PLANNED IMPROVEMENTS

This section describes existing roadway configurations and conditions along haul routes, as well as planned improvements that could affect haul routes. In addition, the section briefly describes existing or planned alternative fuel transportation facilities.

Roadway Configuration and Integrity of Truck Haul Routes

Hobron Avenue is a two-lane paved roadway with 12-foot lanes, and improved shoulders of variable width. The juncture of Hobron Avenue and Hana Highway is a modified T intersection, controlled by stop sign on Hobron, the cross street. The integrity of the roadbed of Hobron Avenue is good. Hobron Avenue currently serves fuel haul and other large truck traffic, and its existing configuration will accommodate fuel haul requirements of the proposed project without modification.

Hana Highway is a four-lane divided highway with improved shoulders. The primary Hana Highway intersection along the fuel haul route is with Dairy Road; this intersection is controlled by actuated signal. All other relevant intersections are controlled by stop or yield sign on the cross streets. The integrity of the roadbed of Hana Highway is excellent. The existing configuration of Hana Highway can accommodate fuel haul requirements of the proposed project without modification. In order to improve access to the Kahului Airport, a new access road to that facility is planned. As part of that improvement, a modified cloverleaf grade-separated interchange is proposed at the existing Hana Highway/Pulehu Road intersection; the future connection of Pulehu Road to Hana Highway is not currently planned. (County of Maui, 1995)

Pulehu Road is under the jurisdiction of the County of Maui PWD. It is a two-lane rural road, with paved 12-foot lanes and narrow paved shoulders. The intersection of Pulehu Road and Hana Highway is a modified T. The Pulehu Road/Hansen Road intersection is controlled by a four-way stop sign; all other relevant crossings are uncontrolled. The integrity of the roadbed from Hana Highway to the landfill access road is excellent; the integrity of the roadbed from the landfill access road to Omaopio Road is good to fair. In the area of concern, Pulehu Road spans two irrigation ditches, Waihee (or Millwater) Ditch and Haiku Ditch. The bridges associated with these ditches are box culverts. In the mid-1980s, the County widened the bridges associated with these ditches; however, paving of the entire widened structure over Haiku Ditch is not anticipated until Fiscal Year (FY) 1995/96. The County has recently resurfaced that portion of Pulehu Road from Hana Highway to the Maui County landfill access road. The County plans to resurface Pulehu Road from the landfill access road

to Omaopio Road in FY 1995/96, and to widen the bridge crossing of Lowrie Ditch in FY 1998/99 or 1999/2000. The County has not rated the ditch crossings for allowable live loading.

Traffic Operations

Relatively current traffic counts are available for the Hana Highway portion of the fuel haul route (including the Hana Highway/Hobron Avenue intersection). Information regarding intersection LOS is not available for any roadway along the fuel haul route. Year 1993 peak period DOT traffic counts for relevant key intersections along Hana Highway are illustrated in Figure 1, following the text and tables of this report.

Peak periods for relevant intersections along the haul routes spans the hours of 7:00 a.m. to 9:00 a.m. (a.m. peak) and 3:00 p.m. to 5:30 p.m. (p.m. peak). In the a.m. peak, traffic is predominantly in the direction away from the proposed project (i.e. in a northwesterly direction), and in the evening peak traffic is predominantly in the direction toward the project (in a southeasterly direction). In 1993, intersection total volumes (vehicles per hour, or vph) in the a.m. peak for key relevant intersections along Hana Highway were as follows:

Kamehameha Avenue/Hobron Avenue:	36,167
Hanakai Street/Haleakela Highway:	40,645
Dairy Road:	52,717

Visual observation of the signalized Hana Highway/Dairy Road intersection indicates that during the a.m. peak period, operations are functioning at LOS B or C.

Alternative Fuel Transportation Facilities

An alternative to truck transport of fuel would be transport by pipeline. Currently, MECO obtains generation facility fuel from the Chevron bulk terminal facility at Kahului Harbor. The only known existing fuel transport pipelines are from the harbor to the bulk terminal facility: no trans-Maui pipelines exist, and none are currently planned. (Chevron, 1995)

4.0 ASSESSMENT

This section presents an evaluation of traffic and transportation issues as they related to the three candidate sites. The issues evaluated include roadway configuration and integrity, traffic operations, and alternative fuel transportation options.

Roadway Configuration and Integrity

The current roadway configuration of Hobron Avenue, Hana Highway, and Pulehu Road will support fuel haul and other project vehicular requirements, no matter the candidate site. However, in order to achieve adequate access to Site A1, necessary improvements to Upper Division Road would include construction of a bridge spanning Kalialinui Gulch. Therefore, Site A2 and D1 would be equally preferred over Site A1 on the basis of roadway configuration.

Given recent roadway improvements on Pulehu Road from Hana Highway to the landfill access road (i.e., bridge widening, resurfacing), as well as funded and reasonably expected future improvements to Pulehu Road from the landfill access road to Omaopio Road, the candidate sites cannot currently be distinguished from one another on the basis of roadway integrity.

It should be noted that additional information is needed regarding the future connection of Pulehu Road to Hana Highway once the Airport Access Road and its associated Hana Highway interchange are complete. If an alternative fuel haul route is utilized in the future, differentiation between candidate sites on the basis of roadway configuration or integrity may be possible.

Traffic Operations

As presented in Table 2, the proposed project is anticipated to generate 206 a.m. peak period one-way trips, and 140 p.m. peak period one-way trips. Of these, fuel haul truck account for eight and ten one-way trips, respectively, in the a.m. and p.m. peak. In the a.m. peak, project-related fuel haul traffic represents a maximum of 0.8 percent of the total directional traffic associated with key relevant intersections. In the p.m. peak, project fuel haul traffic represents a maximum of 0.9 percent of total directional traffic associated with key relevant intersections. Therefore, if the project were operational today, significantly add to the volume of traffic along haul routes; moreover, as volumes increase with anticipated growth, the project contribution to area traffic would decrease. This is true for all three candidate sites. No distinguishable difference exists between candidate sites on the basis of effects to existing traffic operations.

Access to Site A1 will require a left-hand turn across Pulehu Road traffic for loaded fuel trucks, and a right-hand turn with Pulehu Road traffic for unloaded fuel trucks; Sites A2 and D1 will require a right hand turn with Pulehu Road traffic for loaded fuel trucks and a left hand turn across Pulehu Road traffic for unloaded fuel trucks. Assuming that an adequate 150-foot turning radius can be accomplished for all candidate sites, Sites A2 and D1 would be equally preferred over Site A1 on the basis of traffic operations.

Alternative Fuel Transportation Options

The alternative to truck transport would be fuel transport via pipeline. While no trans-Maui fuel pipelines are known to currently exist, discussions with Chevron indicate that development of such a pipeline would be considered by Chevron to be a general improvement over truck transport. This option would be available to all three candidate sites. Based strictly on proximity to the bulk terminal area of Kahului, and assuming the most direct pipeline route would be the most cost effective and could be accomplished, Sites A1 and A2 would be equally preferred over Site D1 on the basis of alternative fuel transportation.

5.0 UNRESOLVED UNCERTAINTIES

The following uncertainties related to traffic and transportation remain:

- The location and configuration of the Pulehu Road/Hana Highway connection after Kahului Airport Access Road improvements are complete
- The peak period direction and volume of project-related non-fuel haul traffic
- Predicted vehicle volumes and LOS during project construction and build-out years
- The effect of all project-related traffic on area traffic operations for construction and build-out
- The live load capacity of existing crossings of Waihee and Haiku Ditches
- The willingness of Chevron to participate in the development of a fuel transport pipeline, which could serve the proposed project, and the project development issues associated with such a pipeline

6.0 RECOMMENDATIONS FOR FURTHER STUDY/WORK

Dames & Moore recommends the following be undertaken, once a preferred candidate site is selected:

- Conduct a comprehensive traffic study during the environmental review phase of project development.
- Continue to consult with the PWD and DOT to remain abreast of plans for Pulehu Road and Hana Highway in the future.
- Consult with PWD regarding acceptable live loading of existing bridges, and conduct structural analysis if warranted
- Video-document existing conditions of Pulehu Road; alternatively or additionally, conduct deflection testing to establish baseline conditions
- Continue to consult with Chevron regarding the possibility of developing a fuel transport pipeline that could serve, in part, the proposed project. Consult with other potential pipeline users, such as the HC&S Puunene Mill, Ameron, County of Maui, etc. to identify potential partnering opportunities.

7.0 REFERENCES

Barton-Aschman Associates, Inc., 1994. *Traffic Impact Analysis: Maalaea Generating Station, Maui Electric Company, Ltd., Maui, Hawaii.*

Chevron Corporation. Personal communication, Michael Higgins, Engineer. February 21, 1995.

County of Maui Public Works Department. Personal communication, Charlene Shiboya. February 7, 1995.

Hawaii Department of Transportation. *24-Hour Traffic Station Summaries for Hana Highway at Kamehameha Avenue and Hobron Street, Hana Highway at Haleakela Highway and Hanakai Street, and Hana Highway at Dairy Road.* Intersection traffic counts for various years, from 1978 through 1993.

Maui Electric Company, Limited. Personal communication, Richard Cugal. January 26, 1995.

_____. Personal communication, Rodney Jung. January 26, 1995.

_____. Personal communication, Neal Shinyama. January 26, 1995.

TABLE 1: RELEVANT FUEL HAUL INTERSECTIONS

Travelled Road	Relevant Crossing	Relevant to fuel haul		Comments
		Toward Project (loaded)	Away From Project (unloaded)	
Hobron Avenue (FAP 32A) Two-lane roadway, improved shoulders	Kaahumanu Avenue/Hana Highway	X	X	controlled T intersection full access all directions
Hana Highway (FAP 36) Four-lane divided highway, wide improved shoulders	East Kamehameha Avenue	X	X	controlled T intersection full access to Kamehameha southbound access only to Hana
	Wakea Avenue	X	X	controlled T intersection full access all directions
	Hanamau Street	X		controlled T intersection access to and from southbound Hana only
	Haleakela Highway	X	X	northbound access only to Hana southbound access only to Haleakala
	Hanakai Street	X	X	controlled T intersection full access all directions
	Papa Place	X		controlled T intersection access to and from southbound Hana only
	Dairy Road	X	X	four-way, actuated signalized intersection
Pulehu Road Two-lane roadway, dirt shoulders	Central Power Plant Road	X	X	uncontrolled four-way intersection
	Hansen Road	X	X	uncontrolled four-way intersection
	Waihee Ditch	X	X	
	Firebreak Road	X	X	uncontrolled four-way intersection
	Haiku Ditch	X	X	
	Village Road	X	X	uncontrolled four-way intersection
	Landfill access road	X	X	uncontrolled T intersection
	Waikapu/Upper Division Road	X	X	uncontrolled four-way intersection access to sites A1 and A2
	Lowrie Ditch Road	X	X	four-way intersection dirt road access to site D1

TABLE 2: TRIP GENERATION

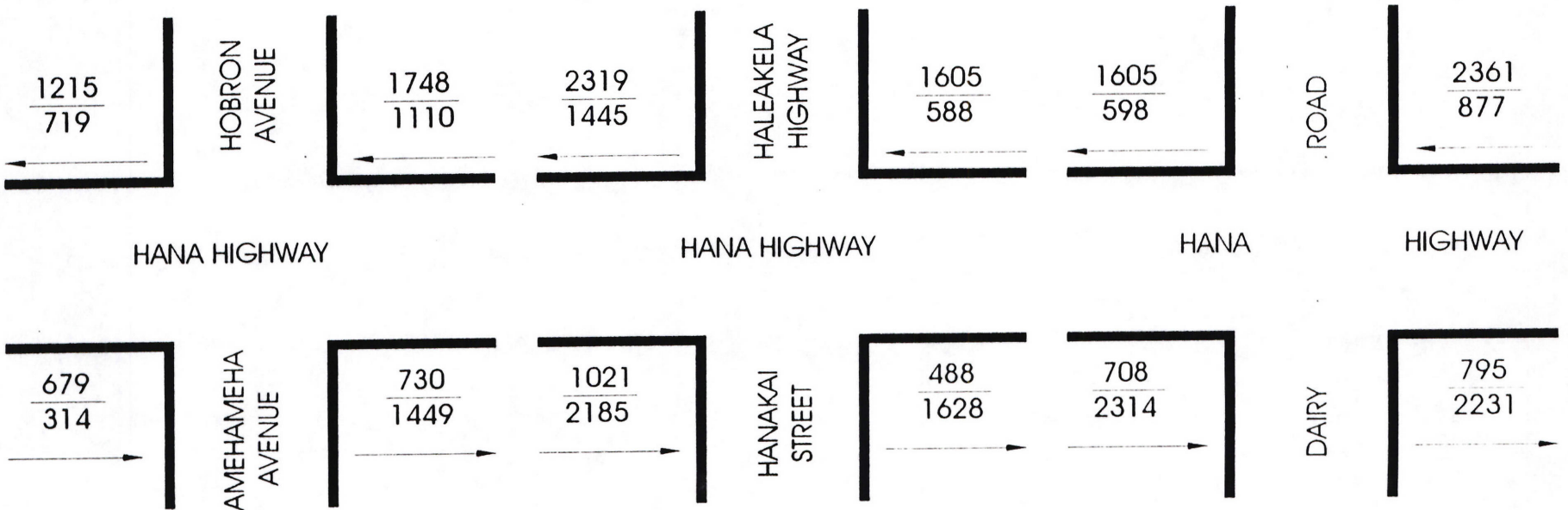
Trip Source	Total Trips 24-hour Period		During A.M. Peak (7-9)		During P.M. Peak (3-5:30)	
	Round	One-way	In	Out	In	Out
Generation production employees	20	40	0	0	0	0
Generation non-production employees	26	52	26	0	0	26
T&D employees	110	220	104	0	0	104
T&D work-related	85	170	0	50	0	0
Fuel haul [1]	40	80	4	4	5	5
Service and delivery	40	80	9	9	0	0
TOTAL	**321**	**642**	**143**	**63**	**5**	**135**

[1] The number of peak period fuel haul trips is calculated as follows:

trips per day/hours per day*hours in peak period, rounded to next highest whole number, or

A.M. Peak: 40/24*2, rounded up
P.M. Peak: 40/24*2.5, rounded up

Information for production and non-production generation employee vehicle trips provided by R. Jung
Information for T&D employees and work vehicle trips provided by N. Shinyama
Information for fuel haul trips estimated from the Maalaea Traffic Study, and assumes straight line extrapolation
Information for service and delivery trips estimated from the Maalaea Traffic Study, with additional input from N. Shinyama



LEGEND:

AM PEAK HOUR
PM PEAK HOUR

NOT TO SCALE

SOURCE: HAWAII STATE DOT, HIGHWAYS DIVISION
24-HOUR TRAFFIC COUNT-STATION SUMMARIES

1993 TRAFFIC VOLUMES
MAIN RELEVANT HAUL ROUTE INTERSECTIONS

CARLSMITH BALL WICHMAN
CASE & ICHIKI

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Attorneys for Applicant
MAUI ELECTRIC COMPANY,
LIMITED

ORIGINAL

LAND USE COMMISSION
STATE OF HAWAII
1998 FEB 17 P 3:40

BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAII

In the Matter of the Petition of	)	DOCKET NO. A97-722
	)	
MAUI ELECTRIC COMPANY, LIMITED	)	
	)	
To Amend the Land Use	)	
District Boundary of Certain	)	
Lands Situated at Wailuku and	)	
Makawao Districts, Island of	)	
Maui, State of Hawaii,	)	
Consisting of 65.7 Acres from	)	
the Agriculture to the Urban	)	
District	)	
	)	

FINAL LIST OF WITNESSES (February 18, 1998)

FINAL LIST OF EXHIBITS (February 18, 1998)

EXHIBITS C-117 and C-118

CERTIFICATE OF SERVICE

LAND USE COMMISSION
STATE OF HAWAII

1998 FEB 17 P 3:42

ORIGINAL

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing document was duly served upon the following parties by either U.S. Certified Mail, postage prepaid, or by hand-delivery on the date stated below:

ESTHER UEDA, Executive Director Land Use Commission State of Hawaii P.O. Box 2359 Honolulu, HI 96804-2539	Delivery
RICHARD EGGED, JR., Director ABE MITSUDA, Administrator Office of Planning State of Hawaii P. O. Box 2359 Honolulu, HI 96804-2359	Cert. Mail
ANN OGATA-DEAL, Esq. Deputy Attorney General Hale Auhau, Third Floor 425 Queen Street Honolulu, HI 96813	Cert. Mail
DAVID W. BLANE, Planning Director Planning Department County of Maui 250 South High Street Wailuku, HI 96793	Cert. Mail
PLANNING COMMISSION County of Maui 250 South High Street Wailuku, HI 96793	Cert. Mail
JEFFREY SCHMIDT, Esq. Corporation Counsel County of Maui 200 South High Street Wailuku, HI 96793	Cert. Mail

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Cert. Mail

DATED: Honolulu, Hawaii, February 17, 1998.

Mark R. Willey
CH2M HILL, INC.

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Attorneys for Applicant
MAUI ELECTRIC COMPANY,
LIMITED

ORIGINAL

LAND USE COMMISSION
STATE OF HAWAII
1998 FEB 11 P 12:46

BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAII

In the Matter of the Petition of	)	DOCKET NO. A97-722
	)	
MAUI ELECTRIC COMPANY, LIMITED	)	
	)	
To Amend the Land Use	)	
District Boundary of Certain	)	
Lands Situated at Wailuku and	)	
Makawao Districts, Island of	)	
Maui, State of Hawaii,	)	
Consisting of 65.7 Acres from	)	
the Agriculture to the Urban	)	
District	)	
	)	

REVISED LIST OF WITNESSES (February 11, 1998)

REVISED LIST OF EXHIBITS (February 11, 1998)

EXHIBITS C-115 and C-116

CERTIFICATE OF SERVICE

LAND USE COMMISSION
STATE OF HAWAII
1998 FEB 11 P 12:48

ORIGINAL

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing document was duly served upon the following parties by either U.S. Certified Mail, postage prepaid, or by hand-delivery on the date stated below:

ESTHER UEDA, Executive Director Land Use Commission State of Hawaii P.O. Box 2359 Honolulu, HI 96804-2539	Delivery
RICHARD EGGED, JR., Director ABE MITSUDA, Administrator Office of Planning State of Hawaii P. O. Box 2359 Honolulu, HI 96804-2359	Cert. Mail
ANN OGATA-DEAL, Esq. Deputy Attorney General Hale Auhau, Third Floor 425 Queen Street Honolulu, HI 96813	Cert. Mail
DAVID W. BLANE, Planning Director Planning Department County of Maui 250 South High Street Wailuku, HI 96793	Cert. Mail
PLANNING COMMISSION County of Maui 250 South High Street Wailuku, HI 96793	Cert. Mail
JEFFREY SCHMIDT, Esq. Corporation Counsel County of Maui 200 South High Street Wailuku, HI 96793	Cert. Mail

G. STEPHAN HOLADAY
Hawaiian Commercial & Sugar Company
P. O. Box 266
Puunene, Hawaii 96784

Cert. Mail

MARK SHEEHAN
MAUI TOMORROW
P.O. Box 429
Makawao, HI 96768

Cert. Mail

DATED: Honolulu, Hawaii, February 11, 1998.

Mark R. Willey
CH2M HILL, INC.

CARLSMITH BALL WICHMAN
CASE & ICHIKI

B. MARTIN LUNA 865
CRAIG G. NAKAMURA 2062
RANDALL H. ENDO 6567
One Main Plaza, Suite 400
2200 Main Street
Wailuku, Maui, Hawaii 96793-1086
Tel. No. (808) 242-4535

Attorneys for Applicant
MAUI ELECTRIC COMPANY,
LIMITED

ORIGINAL

BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAII

In the Matter of the Petition of	)	DOCKET NO. A97-722
	)	
MAUI ELECTRIC COMPANY, LIMITED	)	
	)	
To Amend the Land Use	)	
District Boundary of Certain	)	
Lands Situated at Wailuku and	)	
Makawao Districts, Island of	)	
Maui, State of Hawaii,	)	
Consisting of 65.7 Acres from	)	
the Agriculture to the Urban	)	
District	)	
	)	

LAND USE COMMISSION
STATE OF HAWAII
1998 FEB 10 P 1:44

REVISED LIST OF WITNESSES

REVISED LIST OF EXHIBITS

SUMMARY TESTIMONY OF WITNESSES (EXHIBITS D-1 TO D-22)

EXHIBITS B-25, C-112 TO C-114

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LAND USE COMMISSION
STATE OF HAWAII
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G. STEPHAN HOLADAY
Hawaiian Commercial & Sugar Company
P. O. Box 266
Puunene, Hawaii 96784

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MAUI TOMORROW
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LAND USE COMMISSION
STATE OF HAWAII
1998 JAN 27 P 3:36

LIST OF WITNESSES

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RESUMES OF WITNESSES

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RICHARD EGGED, JR., Director — Delivery
ABE MITSUDA, Administrator
Office of Planning
State of Hawaii
P. O. Box 2359
Honolulu, HI 96804-2359

ANN OGATA-DEAL, Esq. — Delivery
Deputy Attorney General
Hale Auhau, Third Floor
425 Queen Street
Honolulu, HI 96813

DAVID W. BLANE, Planning Director — Delivery
Planning Department
County of Maui
250 South High Street
Wailuku, HI 96793

PLANNING COMMISSION — Delivery
County of Maui
250 South High Street
Wailuku, HI 96793

JEFFREY SCHMIDT, Esq. — Delivery
Corporation Counsel
County of Maui
200 South High Street
Wailuku, HI 96793

G. STEPHAN HOLADAY — Delivery
Hawaiian Commercial & Sugar Company
P. O. Box 266
Puunene, Hawaii 96784

MARK SHEEHAN
MAUI TOMORROW
P.O. Box 429
Makawao, HI 96768

Delivery

DATED: Honolulu, Hawaii, January 27, 1998.

Mark R. Willey
CH2M HILL, INC.

STATE OF HAWAII LAND USE COMMISSION

PUBLIC HEARING

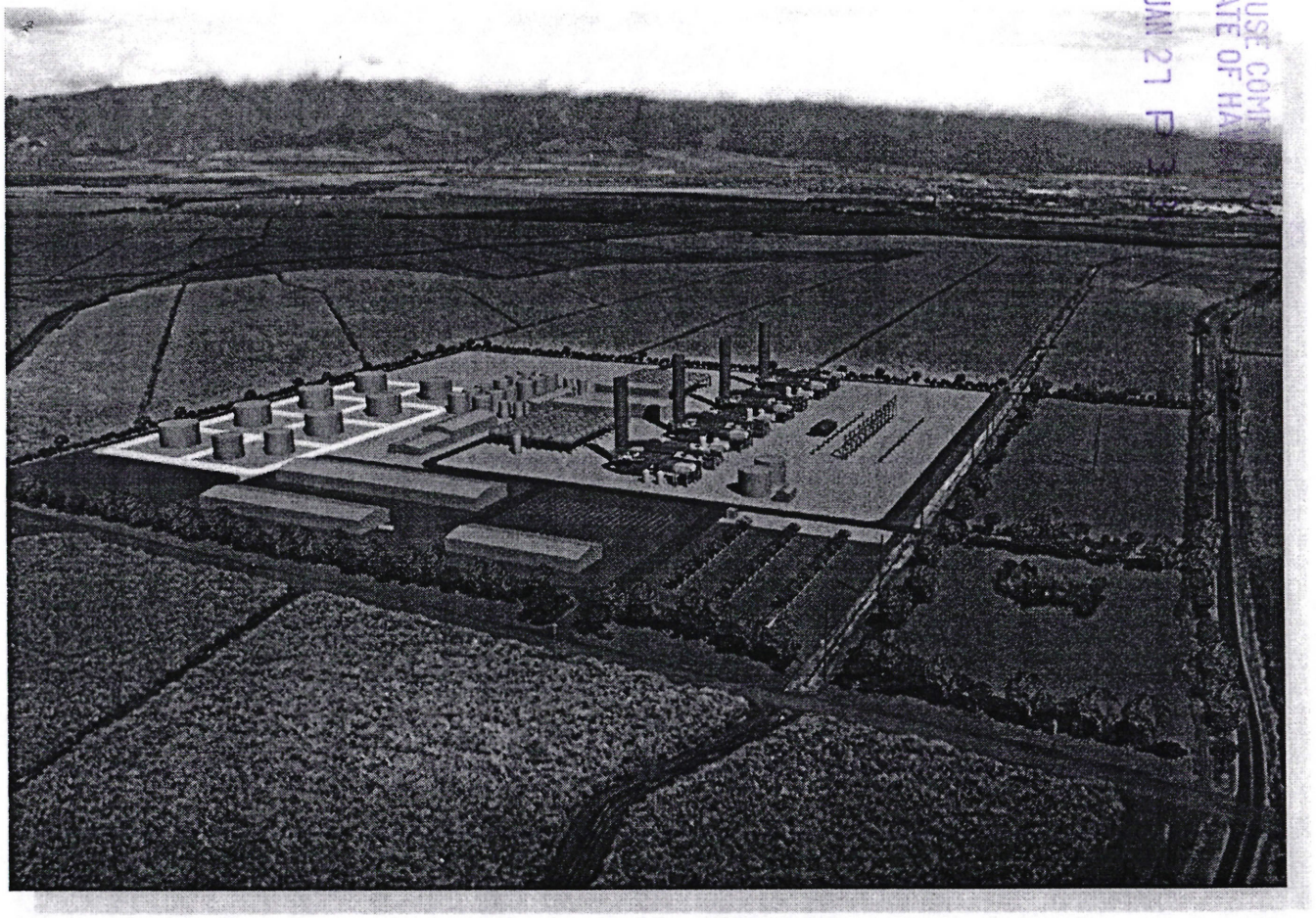
LIST OF WITNESSES AND EXHIBITS

MAUI ELECTRIC COMPANY, LIMITED'S

WAENA GENERATING STATION

WAILUKU AND MAKAWAO DISTRICTS – ISLAND OF MAUI

LAND USE COMM
STATE OF HA
1998 JAN 27 P



MAUI ELECTRIC COMPANY, LIMITED

JANUARY 27, 1998

LAND USE COMMISSION
STATE OF HAWAII
1998 FEB 17 P 3:41

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

FINAL LIST OF WITNESSES (**FEBRUARY 18, 1998**)

NAME/ORGANIZATION/POSITION (List in Order of Appearance)	**TO BE QUALIFIED AS AN EXPERT IN:**	**SUBJECT MATTER**	**WRITTEN TESTIMONY** (Yes or No)	**EXHIBIT NUMBER(S)**	**LENGTH OF DIRECT**
Edward L. Reinhardt Manager of Engineering Maui Electric Company, Limited	MECO Operations	Project Description Siting Community Involvement	Yes	B-1 A-6 C-2 to C-11, C-115	30 min.
Leslie V. Mathine, PE Senior Principal Structural Engineer Stone & Webster Engineering Company	Power Plant Operations and Design	Siting Fuel Transport Conceptual Design Station Infrastructure	Yes	B-2 A-4, Appendix A A-6 C-4, C-12, C-56, C-57	30 min.
Earle H. Ifuku Manager, Customer Service Department Maui Electric Company, Limited	Integrated Resource Planning Power Supply Planning	Integrated Resource Planning Forecasting Demand-Side Management Energy Conservation Programs	Yes	B-3 C-13 to C-19 C-115, C-116	30 min.
Arthur S. Seki Energy Specialist, Engineering Department Hawaiian Electric Company, Inc.	Alternative and Renewable Energy Resource Power Supply Planning	Supply-Side Resource Planning Alternative Energy Resources Renewable Energy Resources	Yes	B-4 C-20 to C-26 C-117, C-118	30 min.
Stanley Kiyonaga Manager, Production Department Maui Electric Company, Limited	MECO Power Plant Operations and Procedures Generation Operations and Maintenance	Handling of Hazardous Materials Emergency Response Plans Equipment Retirements	Yes	B-17 C-17	30 min.

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

FINAL LIST OF WITNESSES (**FEBRUARY 18, 1998**)

NAME/ORGANIZATION/POSITION (List in Order of Appearance)	**TO BE QUALIFIED AS AN EXPERT IN:**	**SUBJECT MATTER**	**WRITTEN TESTIMONY (Yes or No)**	**EXHIBIT NUMBER(S)**	**LENGTH OF DIRECT**
Scott W.H. Seu, PE Principal Environmental Scientist Hawaiian Electric Company, Inc.	Air Quality Permitting Air Quality Standards	Air Quality Permitting Process	Yes	B-5 A-4, Appendix C C-27 to C-37, C-112	30 min.
Thomas A. Schroeder, Ph.D. Acting Director Joint institute for Marine and Atmospheric Research, University of Hawaii	Meteorology Maui Vortex	Formation and Characteristics of Maui Vortex	Yes	B-7 A-4, Appendix C C-46 to C-54	20 min.
James C. Clary, Jr., CCM President Jim Clary & Associates	Air Quality Modeling Meteorology	Air Quality Modeling Results Impacts on Class I areas Emission interactions with ambient sources	Yes	B-6 A-4, Appendix C C-38 to C-45 C-113	30 min.
Robert E. Paull, Ph.D. Professor, Dept. of Plant Molecular Physiology College of Tropical Agriculture and Human Resources, University of Hawaii	Plant Toxicology	Impacts of emissions on agricultural crops	Yes	B-8 A-4, Appendix C	20 min.
Michael K.Y. Yuen, PE Lead Mechanical Engineer, Planning and Engineering Department Hawaiian Electric Company, Inc.	Power Plant Planning and Operations	Selective Catalytic Reduction Demonstration Project	Yes	B-9 C-55	15 min.
Tom Simmons Manager, Power supply Services Department Hawaiian Electric Company, Inc.	Fuel Production and Handling	Fuel Availability	No	B-25	15 min.

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

FINAL LIST OF WITNESSES (**FEBRUARY 18, 1998**)

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Glen Y.F. Lau, PE President Pacific Geotechnical Engineers, Inc.	Geotechnical Engineering	Geotechnical Resources Seismic Hazards	Yes	B-11 A-4, Appendix D C-3, C-58	15 min.
Ted S. Kawahigashi, PE President Austin, Tsutsumi & Associates, Inc.	Traffic Engineering and Traffic Impact Analysis	Traffic Impacts	Yes	B-12 A-4, Appendix I C-59, C-60, C-12, C-4, C-61	20 min.
Amy E. Dunn Co-Director, Maui Office Scientific Consultant Services, Inc.	Archeology	Impacts to Archeological and Cultural Resources	Yes	B-13 A-4, Appendix G C-62	10 min.
Evangeline J. Funk, Ph.D. President Botanical Consultants	Biological Science	Impacts to Biological Resources	Yes	B-14 A-4, Appendix F	10 min.
Daniel Lum, R.G. President Water Resource Associates	Hydrology	Impacts to Groundwater Resources	Yes	B-15 A-4, Appendix E C-63	20 min.
Yoichi Ebisu, PE Principal and Owner Y. Ebisu & Associates	Acoustical Engineering	Impacts from Noise	Yes	B-16 A-4, Appendix H C-64 to C-66	15 min.
James Michael Silva, PE President ENERTECH Consultants	Electrical Engineering Electric and Magnetic Field Modeling	Impacts from Electric and Magnetic Fields	Yes	B-18 A-4, Appendix J C-67 to C-82	15 min.

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

FINAL LIST OF WITNESSES (**FEBRUARY 18, 1998**)

NAME/ORGANIZATION/POSITION (List in Order of Appearance)	**TO BE QUALIFIED AS AN EXPERT IN:**	**SUBJECT MATTER**	**WRITTEN TESTIMONY (Yes or No)**	**EXHIBIT NUMBER(S)**	**LENGTH OF DIRECT**
Albert Lono Lyman Senior Project Manager/Economist CH2M HILL, Inc.	Economics	Socioeconomic Impacts	Yes	B-19 A-4	20 min.
Christopher L. Hart, LLA, Senior Partner (or) Rory M. Frampton, Planner Chris Hart & Partners	Landscape Architecture Agricultural Land Use on Maui	Landscape Plan Impacts to Prime Agricultural Lands	Yes	B-20/B-21 C-83 to C-85	20 min.
Mark R. Willey, AICP Project Manager, Environmental Planner CH2M HILL, Inc.	Visual Resource Analysis Land Use Planning, Policies, and Permitting Environmental Impact Statement Process Public Involvement Programs	Visual impacts Relationship of Project to Applicable Plans, Policies, and guidelines EIS Process Public Involvement Project Permitting	Undetermined	B-22 A A-4 C-86 to C-109 C-114	45 min.
Jan R. Medusky, MAI President Medusky & Company, Inc.	Property Value Impact Analysis	Impact on Property Values	Yes	B-23 C-110, C-111	20 min.
William A. Bonnet, PE President Maui Electric Company, Limited	MECO Policy Utility Environmental Issues	MECO's policy on project Project need Site Selection Process Public Involvement MECO's commitments for the future	No.	B-24 A, A1-A-6	30 min.
Any witnesses listed by all other parties to these proceedings	To be determined	To be determined	No	All exhibits submitted by other parties to these proceedings	

LAND USE COMMISSION
STATE OF HAWAII
1998 FEB 11 P 12:47

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

REVISED LIST OF WITNESSES (FEBRUARY 11, 1998)

NAME/ORGANIZATION/POSITION (List in Order of Appearance)	TO BE QUALIFIED AS AN EXPERT IN:	SUBJECT MATTER	WRITTEN TESTIMONY (Yes or No)	EXHIBIT NUMBER(S)	LENGTH OF DIRECT
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Leslie V. Mathine, PE Senior Principal Structural Engineer Stone & Webster Engineering Company	Power Plant Operations and Design	Siting Fuel Transport Conceptual Design Station Infrastructure	Yes	B-2 A-4, Appendix A A-6 C-4, C-12, C-56, C-57	30 min.
Earle H. Ifuku Manager, Customer Service Department Maui Electric Company, Limited	Integrated Resource Planning Power Supply Planning	Integrated Resource Planning Forecasting Demand-Side Management Energy Conservation Programs	Yes	B-3 C-13 to C-19 C-115, C-116	30 min.
Arthur S. Seki Energy Specialist, Engineering Department Hawaiian Electric Company, Inc.	Alternative and Renewable Energy Resource Power Supply Planning	Supply-Side Resource Planning Alternative Energy Resources Renewable Energy Resources	Yes	B-4 C-20 to C-26	30 min.
Stanley Kiyonaga Manager, Production Department Maui Electric Company, Limited	MECO Power Plant Operations and Procedures Generation Operations and Maintenance	Handling of Hazardous Materials Emergency Response Plans Equipment Retirements	Yes	B-17 C-17	30 min.

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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REVISED LIST OF WITNESSES (**FEBRUARY 11, 1998**)

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James C. Clary, Jr., CCM President Jim Clary & Associates	Air Quality Modeling Meteorology	Air Quality Modeling Results Impacts on Class I areas Emission interactions with ambient sources	Yes	B-6 A-4, Appendix C C-38 to C-45 C-113	30 min.
Robert E. Paull, Ph.D. Professor, Dept. of Plant Molecular Physiology College of Tropical Agriculture and Human Resources, University of Hawaii	Plant Toxicology	Impacts of emissions on agricultural crops	Yes	B-8 A-4, Appendix C	20 min.
Michael K.Y. Yuen, PE Lead Mechanical Engineer, Planning and Engineering Department Hawaiian Electric Company, Inc.	Power Plant Planning and Operations	Selective Catalytic Reduction Demonstration Project	Yes	B-9 C-55	15 min.
Tom Simmons Manager, Power supply Services Department Hawaiian Electric Company, Inc.	Fuel Production and Handling	Fuel Availability	No	B-25	15 min.

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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PARTY: MAUI ELECTRIC COMPANY, LIMITED

LAND USE COMMISSION
STATE OF HAWAII
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Jan R. Medusky, MAI President Medusky & Company, Inc.	Property Value Impact Analysis	Impact on Property Values	Yes	B-23 C-110, C-111	20 min.
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Any witnesses listed by all other parties to these proceedings	To be determined	To be determined	No	All exhibits submitted by other parties to these proceedings	

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PARTY: MAUI ELECTRIC COMPANY, LIMITED

LAND USE COMMISSION
STATE OF HAWAII
1998 JAN 27 P 3:

LIST OF WITNESSES

NAME/ORGANIZATION/POSITION (List in Order of Appearance)	TO BE QUALIFIED AS AN EXPERT IN:	SUBJECT MATTER	WRITTEN TESTIMONY (Yes or No)	EXHIBIT NUMBER(S)	LENGTH OF DIRECT
Edward L. Reinhardt Manager of Engineering Maui Electric Company, Limited	MECO Operations	Project Description Siting Community Involvement	Undetermined	B-1 A-6 C-2 to C-11	45 min.
Leslie V. Mathine, PE Senior Principal Structural Engineer Stone & Webster Engineering Company	Power Plant Operations and Design	Siting Fuel Transport	Undetermined	B-2 A-4, Appendix A A-6 C-4, C-12	45 min.
Earle H. Ifuku Manager, Customer Service Department Maui Electric Company, Limited	Integrated Resource Planning Power Supply Planning	Integrated Resource Planning Forecasting Demand-Side Management Energy Conservation Programs	Undetermined	B-3 C-13 to C-19	45 min.
Arthur S. Seki Energy Specialist, Engineering Department Hawaiian Electric Company, Inc.	Alternative and Renewable Energy Resource Power Supply Planning	Supply-Side Resource Planning Alternative Energy Resources Renewable Energy Resources	Undetermined	B-4 C-20 to C-26	45 min.
Scott W.H. Seu, PE Principal Environmental Scientist Hawaiian Electric Company, Inc.	Air Quality Permitting Air Quality Standards	Air Quality Permitting Process	Undetermined	B-5 A-4, Appendix C C-27 to C-37	45 min.

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

LIST OF WITNESSES

NAME/ORGANIZATION/POSITION (List in Order of Appearance)	TO BE QUALIFIED AS AN EXPERT IN:	SUBJECT MATTER	WRITTEN TESTIMONY (Yes or No)	EXHIBIT NUMBER(S)	LENGTH OF DIRECT
James C. Clary, Jr., CCM President Jim Clary & Associates	Air Quality Modeling Meteorology	Air Quality Modeling Results Impacts on Class I areas Emission interactions with ambient sources	Undetermined	B-6 A-4, Appendix C C-38 to C-45	45 min.
Thomas A. Schroeder, Ph.D. Acting Director Joint institute for Marine and Atmospheric Research, University of Hawaii	Meteorology Maui Vortex	Formation and Characteristics of Maui Vortex	Yes	B-7 A-4, Appendix C C-46 to C-54	30 min.
Robert E. Paull, Ph.D. Professor, Dept. of Plant Molecular Physiology College of Tropical Agriculture and Human Resources, University of Hawaii	Plant Toxicology	Impacts of emissions on agricultural crops	Yes	B-8 A-4, Appendix C	30 min.
Michael K.Y. Yuen, PE Lead Mechanical Engineer, Planning and Engineering Department Hawaiian Electric Company, Inc.	Power Plant Planning and Operations	Static Catalytic Reduction Demonstration Project	Undetermined	B-9 C-55 to C-57	30 min.
Rick Roberts Refinery Manager Chevron USA Products Company	Fuel Production and Handling	Fuel Availability	Undetermined	B-10	15 min.
Glen Y.F. Lau, PE President Pacific Geotechnical Engineers, Inc.	Geotechnical Engineering	Geotechnical Resources Seismic Hazards	Yes	B-11 A-4, Appendix D C-3, C-58	30 min.

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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Ted. S. Kawahigashi, PE President Austin, Tsutsumi & Associates, Inc.	Traffic Engineering and Traffic Impact Analysis	Traffic Impacts	Yes	B-12 A-4, Appendix I C-59, C-60, C-12, C-4, C-61	30 min.
Amy E. Dunn Co-Director, Maui Office Scientific Consultant Services, Inc.	Archeology	Impacts to Archeological and Cultural Resources	Yes	B-13 A-4, Appendix G C-62	15 min.
Evangeline J. Funk, Ph.D. President Botanical Consultants	Biological Science	Impacts to Biological Resources	Yes	B-14 A-4, Appendix F	15 min.
Daniel Lum, R.G. President Water Resource Associates	Hydrology	Impacts to Groundwater Resources	Yes	B-15 A-4, Appendix E C-63	30 min.
Yoichi Ebisu, PE Principal and Owner Y. Ebisu & Associates	Acoustical Engineering	Impacts from Noise	Yes	B-16 A-4, Appendix H C-64 to C-66	15 min.
Stanley Kiyonaga Manager, Production Department Maui Electric Company, Limited	MECO Power Plant Operations and Procedures	Handling of Hazardous Materials Emergency Response Plans Equipment Retirements	Undetermined	B-17 C-17	45 min.
James Michael Silva, PE President ENERTECH Consultants	Electrical Engineering Electric and Magnetic Field Modeling	Impacts from Electric and Magnetic Fields	Yes	B-18 A-4, Appendix J C-67 to C-82	15 min.

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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Albert Lono Lyman Senior Project Manager/Economist CH2M HILL, Inc.	Economics	Socioeconomic Impacts	Undetermined	B-19 A-4	15 min.
Christopher L. Hart, LLA, Senior Partner (or) Rory M. Frampton, Planner Chris Hart & Partners	Landscape Architecture Agricultural Land Use on Maui	Landscape Plan Impacts to Prime Agricultural Lands	Yes	B-20/B-21 C-83 to C-85	30 min.
Mark R. Willey, AICP Project Manager, Environmental Planner CH2M HILL, Inc.	Visual Resource Analysis Land Use Planning, Policies, and Permitting Environmental Impact Statement Process Public Involvement Programs	Visual impacts Relationship of Project to Applicable Plans, Policies, and guidelines EIS Process Public Involvement Project Permitting	Undetermined	B-22 A A-4 C-86 to C-109	1 hour
Jan R. Medusky, MAI President Medusky & Company, Inc.	Property Value Impact Analysis	Impact on Property Values	Yes	B-23 C-110, C-111	30 min.
William A. Bonnet, PE President Maui Electric Company, Limited	MECO Policy Utility Environmental Issues	MECO's policy on project Project need Site Selection Process Public Involvement MECO's commitments for the future	Undetermined	B-24 A, A1-A-6	45 min.
Any witnesses listed by all other parties to these proceedings	To be determined	To be determined	No	All exhibits submitted by other parties to these proceedings	

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

FINAL LIST OF EXHIBITS **(FEBRUARY 18, 1998)**

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
A	Waena Generating Station Land Use Commission Petition		
A-1	Waena Generating Station LUC Petition Exhibit 1, Project Maps		
A-2	Waena Generating Station LUC Petition Exhibit 2, Land Ownership Documentation		
A-3	Waena Generating Station LUC Petition Exhibit 3, Letter of Authorization		
A-4	Waena Generating Station LUC Petition Exhibit 4, Environmental Impact Statement		
A-5	Waena Generating Station LUC Petition Exhibit 5, Financial Statement		
A-6	Waena Generating Station LUC Petition Exhibit 6, Siting Studies		
B-1	Resume for Edward L. Reinhardt		
B-2	Resume for Leslie V. Mathine		
B-3	Resume for Earle H. Ifuku		
B-4	Resume for Arthur S. Seki		
B-5	Resume for Scott W.H. Seu		
B-6	Resume for James C. Clary, Jr.		
B-7	Resume for Dr. Thomas A. Schroeder		
B-8	Resume for Dr. Robert E. Paull		
B-9	Resume for Michael K. Y. Yuen		
~~B-10~~	~~Resume for Rick Roberts~~		
B-11	Resume for Glen Y.F. Lau		
B-12	Resume for Ted S. Kawahigashi		

LAND USE COMMISSION STATE OF HAWAII 1998 FEB 17 P 3:41

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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B-14	Resume for Dr. Evangeline J. Funk		
B-15	Resume for Daniel Lum		
B-16	Resume for Yoichi Ebisu		
B-17	Resume for Stanley Kiyonaga		
B-18	Resume for James Michael Silva		
B-19	Resume for Albert Lono Lyman		
B-20	Resume for Christopher L. Hart		
B-21	Resume for Rory M. Frampton		
B-22	Resume for Mark R. Willey		
B-23	Resume for Jan R. Medusky		
B-24	Resume for William A. Bonnet		
B-25	Resume for Tom Simmons		
C-1	List of Common Acronyms		
C-2	Exhibit A-4, Figure 2-1, Existing Generating Stations and 69-kV and 23-kV Electrical System on the Island of Maui		
C-3	Exhibit A-4, Figure 3-1, Proposed Waena Generating Station Site and Potential Transmission Line Corridors		
C-4	Conceptual Site Layout Figure		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-5	Waena Generating Station Computerized Photo Simulation		
C-6	Exhibit A-4, Figure 3-3, Conceptual Site Layout showing time of equipment installment		
C-7	Exhibit A-4, Figure 3-4, Turbine Configurations		
C-8	Project Cost and Schedule (1997 Dollars) Table		
C-9	Exhibit A-4, Figure 3-5, Alternative Generating Station Sites Considered 1989-1996		
C-10	MECO Siting Study Chronology Table		
C-11	Kihei Community Association Letter and Petition		
C-12	Exhibit A-4, Figure 4-21, Fuel Haul Route		
C-13	Maui Electric Company, Limited Integrated Resource Planning 1994-2013, Chapters 1-10		
C-14	Overview of IRP Process Flow Chart		
C-15	Maui Electric Company, Limited, Summary of Sales and Peak Forecasting Methodology		
C-16	Exhibit A-4, Figure 2-2, Actual and Projected Peak Electrical Demand for Maui, 1985-2016		
C-17	Exhibit A-4, Table 2-2, MECO Resource Plan: Power Facility Additions and Retirements for the Island of Maui		
C-18	MECO Peak Forecast Comparison Graph		
C-19	Comparison of Long Range Forecasts Table		
C-20	Integrated Resource Plan, Supply-Side Resources Report, Chapter 2		
C-21	Supply-Side Resource Options Process Flow Chart		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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FINAL LIST OF EXHIBITS **(FEBRUARY 18, 1998)**

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-22	Stage of Technical Development or Maturity Graph		
C-23	Type of Energy Baseload or As-Available Graph		
C-24	Comparable Electrical Generation Cost Ranges for Energy Sources in Hawaii Table		
C-25	Land Requirements for Various Electrical Generating Systems Tables		
C-26	Solar Electric Generating System Assessment for Hawaii		
C-27	Applicable Air Regulations (Overview)		
C-28	Ambient Air Quality Standard (Overview)		
C-29	Attainment Area (Overview)		
C-30	Air Permitting - Key Steps (Overview)		
C-31	PSD/CSP Permit Review Process Chart		
C-32	Best Available Control Technology (Overview)		
C-33	Key Steps in "Top-Down" BACT Process (Overview)		
C-34	Permit Conditions (Overview)		
C-35	Opacity Chart (Overview)		
C-36	Permitting of Generation Increments (Overview)		
C-37	Farm Bureau Meeting Summary		
C-38	Exhibit A-4, Figure 4-1, Wind Rose		
C-39	Exhibit A-4, Table 4-2, Summary of State of Hawaii and Federal Ambient Air Quality Standards		
C-40	Exhibit A-4, Table 4-3, Summary of Impact Levels, Monitoring Levels, and PSD Increment		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

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EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-41	Exhibit A-4, Table 4-5, Comparison of Project Impacts with Significant Impact Levels (SIL)		
C-42	Exhibit A-4, Table 4-6, Comparison of Maximum Predicted Sulfur Dioxide, Nitrogen Dioxide, and PM/PM10 Concentrations with Class II PSD Increments		
C-43	Exhibit 4, Table 4-7, Comparison of Maximum Predicted Sulfur Dioxide, Nitrogen Dioxide, and PM/PM10 Concentrations with Class I PSD Increments		
C-44	Exhibit A-4, Table 4-9, Worst-Case Concentrations within the Maui Vortex as a Function of the Number of 58-MW DTCC Units		
C-45	Comparison of Maximum Project Impacts with Ambient Standards Chart		
C-46	Exhibit A-4, Appendix C-3, Figure 3.1, Leopold's Vortex		
C-47	Exhibit A-4, Appendix C-3, Figure 3.2, NWS Vortex Model - Daylight Hours		
C-48	Exhibit A-4, Appendix C-3, Figure 3.3, NWS Vortex Model - Night Hours		
C-49	Exhibit A-4, Appendix C-3, Figure 4.1, Ueyoshi et al Model for 0200 July 1988		
C-50	Exhibit A-4, Appendix C-3, Figure 5.1, July 0200 Wind Roses from Tower 251		
C-51	Exhibit A-4, Appendix C-3, Figure 5.2, Resultant 0200 Wind Vector from Tower 251 at 37 m Level		
C-52	Exhibit A-4, Appendix C-3, Figure 5.3, Temperature Profiles for 0100, 0400 & 0700 LST		
C-53	Exhibit A-4, Appendix C-3, Figure 6.1, Plume Centerline Path and 2.7 Sigmas		
C-54	Exhibit A-4, Appendix C-3, Table 6.1, Worst-Case SO2, NO2 and PM10 Concentrations		
C-55	MECO/HELCO Combustion Turbine SCR Demonstration Program Results Final Report, Summary of Results and Conclusions		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

FINAL LIST OF EXHIBITS (**FEBRUARY 18, 1998**)

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-56	Exhibit A-4, Table 4-10, Existing Groundwater Quality and Estimated Effluent Quality, Waena Generating Station		
C-57	Nature & Sources of Injected Fluids (Estimated Percent of Wastewater Flow) Chart		
C-58	Exhibit A-4, Figure 4-2, Topography		
C-59	Exhibit A-4, Figure 4-19, Existing Road Network and Study Intersections		
C-60	Exhibit A-4, Figure 4-20, Future Road Network and Study Intersections		
C-61	State of Hawaii Department of Transportation, Letter to Mr. David Blane re Comments on the Draft Environmental Impact Statement, September 12, 1997		
C-62	State of Hawaii Department of Land and Natural Resources, State Historic Preservation Division, Letter to Mr. David Blane re Chapter 6E-42 Historic Preservation Review of Archaeological Inventory Survey, August 29, 1997		
C-63	Exhibit A-4, Figure 4-3, Water Resources Near the Project Site		
C-64	Exhibit A-4, Figure 4-12, Noise Measurement Sites around proposed Waena Generating Station		
C-65	Exhibit A-4, Figure 4-13, Hourly Equivalent Noise Contours for the Proposed Waena Generating Station Phase I		
C-66	Exhibit A-4, Figure 4-14, Hourly Equivalent Noise Contours for the Proposed Waena Generating Station, Full Build		
C-67	Exhibit A-4, Appendix J, Figure 1, Diagram of Transmission Line Configurations		
C-68	Exhibit A-4, Appendix J, Figure 2, Computer Site Model of proposed Waena Generating Station		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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FINAL LIST OF EXHIBITS **(FEBRUARY 18, 1998)**

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-69	Exhibit A-4, Appendix J, Figure 3, Calculated Magnetic Field Contour Map of Proposed Waena Generating Station		
C-70	Exhibit A-4, Appendix J, Figure A-1, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Kanaha - Pukalani 69 kV Chart		
C-71	Exhibit A-4, Appendix J, Figure A-2, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Maalaea - Kealahou 69 kV Chart		
C-72	Exhibit A-4, Appendix J, Figure A-3, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Proposed Pulehu Road - Firebreak Road 69/12 kV Chart		
C-73	Exhibit A-4, Appendix J, Figure A-4, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Proposed Firebreak Road - Paia 69/12 kV Chart		
C-74	Exhibit A-4, Appendix J, Figure A-5, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Proposed Firebreak Road - Puunene 69/12 kV Chart		
C-75	Exhibit A-4, Appendix J, Figure A-6, Proposed Waena Generating Station Powerline Electric Field Calculations, Magnetic Field Kanaha - Pukalani 69 kV Chart		
C-76	Exhibit A-4, Appendix J, Figure A-7, Proposed Waena Generating Station Powerline Electric Field Calculations, Magnetic Field Maalaea - Kealahou 69 kV Chart		
C-77	Exhibit A-4, Appendix J, Figure A-8, Proposed Waena Generating Station Powerline Electric Field Calculations, Magnetic Field Proposed Pulehu Road - Firebreak Road 69/12 kV Chart		
C-78	Exhibit A-4, Appendix J, Figure A-9, Proposed Waena Generating Station Powerline Electric Field Calculations, Magnetic Field Proposed Firebreak Road - Paia 69 kV Chart		
C-79	Exhibit A-4, Appendix J, Figure A-10, Proposed Waena Generating Station Powerline Electric Field Calculations, Magnetic Field Proposed Firebreak Road - Puunene 69/12 kV Chart		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-80	Exhibit A-4, Appendix J, Table 1, Summary of Transmission /Distribution Line Configurations		
C-81	Exhibit A-4, Appendix J, Table 2, Summary of Transmission/Distribution line Project 2020 Loading Conditions		
C-82	Exhibit A-4, Appendix J, Table 6, Summary of Transmission Line Magnetic Field Calculations		
C-83	Exhibit A-4, Figure 4-10, Conceptual Landscape Plan		
C-84	Exhibit A-4, Figure 4-11, Conceptual Landscape Sections		
C-85	Letter from Department of Agriculture re Comments on the Land Use Petition, Nov. 28, 1997		
C-86	Exhibit A-4, Figure 4-4, View Locations		
C-87	Exhibit A-4, Figure 4-5, Effect of Distance on Apparent Facility Size		
C-88	Exhibit A-4, Figure 4-6, Key View 1, Elevated View of Project Site from Pulehu Road, Existing Condition and Project Simulation		
C-89	Exhibit A-4, Figure 4-7, Key View 2, View of Project Site from Haleakala Highway, Existing Condition and Project Simulation		
C-90	Exhibit A-4, Figure 4-8, Key View 3, View of Project Site from Pukalani Community Center, Existing Condition and Project Simulation		
C-91	Exhibit A-4, Figure 4-9, Key View 4, View of Project Site from Honoapiilani Highway near Wailuku, Existing Condition and Project Simulation		
C-92	Exhibit A-4, Figure 4-15, Proposed Land Use Changes		
C-93	Exhibit A-4, Figure 4-16, State Land Use Districts		
C-94	Exhibit A-4, Figure 4-17, Wailuku-Kahului Community Plan		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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FINAL LIST OF EXHIBITS (**FEBRUARY 18, 1998**)

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-95	Exhibit A-4, Figure 4-18, County of Maui Zoning		
C-96	OEQC *Environmental Notice*, Environmental Impact Statement Preparation Notice, March 8, 1997		
C-97	Maui News, Notice of Public Scoping Meetings, March 13, 15, 1997		
C-98	Haleakala Times, Notice of Public Scoping Meetings, March 19, 1997		
C-99	OEQC *Environmental Notice*, Draft Environmental Impact Statement Availability Notice, August 8, 1997		
C-100	Maui News, Notice of Public DEIS Comment Meetings, August 22, 1997		
C-101	Haleakala Times, Notice of Public DEIS Comment Meetings, August 22, 1997		
C-102	OEQC *Environmental Notice*, Final EIS Submittal Notice, November 23, 1997		
C-103	Maui Planning Department Final EIS Acceptance Letter, November 24, 1997		
C-104	OEQC *Environmental Notice*, Final EIS Acceptance Notice, December 8, 1997		
C-105	Letter from Scott Crawford Maui Tomorrow to Mark Willey, CH2M HILL, re Comments on the Draft Environmental Impact Statement, September 22, 1997		
C-106	Letter from Mark Willey (w/o attachments), CH2M HILL, to Scott Crawford, Maui Tomorrow re Response to Draft EIS Comment Letter, November 3, 1997		
C-107	Exhibit A-4, Table ES-2, List of Potential Permits and Approvals for the Proposed Waena Generating Station and Transmission Lines		
C-108	Summary of Project's Relationship with Urban District Criteria		
C-109	Summary of Project's Relationship with Decision-Making Criteria		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-110	Exhibit A-4, Figure 3-2, Surrounding Land Ownership		
C-111	Consulting Report Regarding Effect on Property Values of Proposed Waena Generating Station		
C-112	PSD Increment (Overview)		
C-113	Excerpt from Department of Health Response to Public Comments to HELCO's Draft Air Permit for the Keahole Generating Station pertaining to VOG		
C-114	Exhibit A-4, Table ES-1, Summary of Potential Impacts		
C-115	Public Utilities Commission Decision & Order No. 14674		
C-116	Public Utilities Commission Decision & Order No. 14707		
C-117	Comparable Electrical Generation Cost Ranges for Energy Sources for Maui		
C-118	Maui Land Requirements for Various Electrical Generating Systems		
D-1	Summary Testimony for Edward L. Reinhardt		
D-2	Summary Testimony for Leslie V. Mathine		
D-3	Summary Testimony for Earle H. Ifuku		
D-4	Summary Testimony for Arthur S. Seki		
D-5	Summary Testimony for Stanley Kiyonaga		
D-6	Summary Testimony for Scott W.H. Seu		
D-7	Summary Testimony for Dr. Thomas A. Schroeder		
D-8	Summary Testimony for James C. Clary, Jr.		
D-9	Summary Testimony for Dr. Robert E. Paull		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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FINAL LIST OF EXHIBITS (**FEBRUARY 18, 1998**)

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
D-10	Summary Testimony for Michael K.Y. Yuen		
D-11	Summary Testimony for Glen Y.F. Lau		
D-12	Summary Testimony for Ted S. Kawahigashi		
D-13	Summary Testimony for Amy E. Dunn		
D-14	Summary Testimony for Dr. Evangeline J. Funk		
D-15	Summary Testimony for Daniel Lum		
D-16	Summary Testimony for Yoichi Ebisu		
D-17	Summary Testimony for J. Michael Silva		
D-18	Summary Testimony for Albert Lono Lyman		
D-19	Summary Testimony for Christopher L. Hart		
D-20	Summary Testimony for Mark R. Willey		
D-21	Summary Testimony for Jan R. Medusky		
E	All Exhibits submitted by other parties to these proceedings		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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REVISED LIST OF EXHIBITS (FEBRUARY 11, 1998)

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B-5	Resume for Scott W.H. Seu		
B-6	Resume for James C. Clary, Jr.		
B-7	Resume for Dr. Thomas A. Schroeder		
B-8	Resume for Dr. Robert E. Paull		
B-9	Resume for Michael K. Y. Yuen		
~~B-10~~	~~Resume for Rick Roberts~~		
B-11	Resume for Glen Y.F. Lau		
B-12	Resume for Ted S. Kawahigashi		

LAND USE COMMISSION
STATE OF HAWAII

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B-15	Resume for Daniel Lum		
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B-17	Resume for Stanley Kiyonaga		
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B-25	Resume for Tom Simmons		
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C-2	Exhibit A-4, Figure 2-1, Existing Generating Stations and 69-kV and 23-kV Electrical System on the Island of Maui		
C-3	Exhibit A-4, Figure 3-1, Proposed Waena Generating Station Site and Potential Transmission Line Corridors		
C-4	Conceptual Site Layout Figure		

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EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-5	Waena Generating Station Computerized Photo Simulation		
C-6	Exhibit A-4, Figure 3-3, Conceptual Site Layout showing time of equipment installment		
C-7	Exhibit A-4, Figure 3-4, Turbine Configurations		
C-8	Project Cost and Schedule (1997 Dollars) Table		
C-9	Exhibit A-4, Figure 3-5, Alternative Generating Station Sites Considered 1989-1996		
C-10	MECO Siting Study Chronology Table		
C-11	Kihei Community Association Letter and Petition		
C-12	Exhibit A-4, Figure 4-21, Fuel Haul Route		
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C-16	Exhibit A-4, Figure 2-2, Actual and Projected Peak Electrical Demand for Maui, 1985-2016		
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C-20	Integrated Resource Plan, Supply-Side Resources Report, Chapter 2		
C-21	Supply-Side Resource Options Process Flow Chart		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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C-23	Type of Energy Baseload or As-Available Graph		
C-24	Comparable Electrical Generation Cost Ranges for Energy Sources in Hawaii Table		
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C-28	Ambient Air Quality Standard (Overview)		
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C-31	PSD/CSP Permit Review Process Chart		
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C-33	Key Steps in "Top-Down" BACT Process (Overview)		
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C-35	Opacity Chart (Overview)		
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C-37	Farm Bureau Meeting Summary		
C-38	Exhibit A-4, Figure 4-1, Wind Rose		
C-39	Exhibit A-4, Table 4-2, Summary of State of Hawaii and Federal Ambient Air Quality Standards		
C-40	Exhibit A-4, Table 4-3, Summary of Impact Levels, Monitoring Levels, and PSD Increment		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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C-43	Exhibit 4, Table 4-7, Comparison of Maximum Predicted Sulfur Dioxide, Nitrogen Dioxide, and PM/PM10 Concentrations with Class I PSD Increments		
C-44	Exhibit A-4, Table 4-9, Worst-Case Concentrations within the Maui Vortex as a Function of the Number of 58-MW DTCC Units		
C-45	Comparison of Maximum Project Impacts with Ambient Standards Chart		
C-46	Exhibit A-4, Appendix C-3, Figure 3.1, Leopold's Vortex		
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C-54	Exhibit A-4, Appendix C-3, Table 6.1, Worst-Case SO2, NO2 and PM10 Concentrations		
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C-64	Exhibit A-4, Figure 4-12, Noise Measurement Sites around proposed Waena Generating Station		
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C-66	Exhibit A-4, Figure 4-14, Hourly Equivalent Noise Contours for the Proposed Waena Generating Station, Full Build		
C-67	Exhibit A-4, Appendix J, Figure 1, Diagram of Transmission Line Configurations		
C-68	Exhibit A-4, Appendix J, Figure 2, Computer Site Model of proposed Waena Generating Station		

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EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
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C-70	Exhibit A-4, Appendix J, Figure A-1, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Kanaha - Pukalani 69 kV Chart		
C-71	Exhibit A-4, Appendix J, Figure A-2, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Maalaea - Kealahou 69 kV Chart		
C-72	Exhibit A-4, Appendix J, Figure A-3, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Proposed Pulehu Road - Firebreak Road 69/12 kV Chart		
C-73	Exhibit A-4, Appendix J, Figure A-4, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Proposed Firebreak Road - Paia 69/12 kV Chart		
C-74	Exhibit A-4, Appendix J, Figure A-5, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Proposed Firebreak Road - Puunene 69/12 kV Chart		
C-75	Exhibit A-4, Appendix J, Figure A-6, Proposed Waena Generating Station Powerline Electric Field Calculations, Magnetic Field Kanaha - Pukalani 69 kV Chart		
C-76	Exhibit A-4, Appendix J, Figure A-7, Proposed Waena Generating Station Powerline Electric Field Calculations, Magnetic Field Maalaea - Kealahou 69 kV Chart		
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C-81	Exhibit A-4, Appendix J, Table 2, Summary of Transmission/Distribution line Project 2020 Loading Conditions		
C-82	Exhibit A-4, Appendix J, Table 6, Summary of Transmission Line Magnetic Field Calculations		
C-83	Exhibit A-4, Figure 4-10, Conceptual Landscape Plan		
C-84	Exhibit A-4, Figure 4-11, Conceptual Landscape Sections		
C-85	Letter from Department of Agriculture re Comments on the Land Use Petition, Nov. 28, 1997		
C-86	Exhibit A-4, Figure 4-4, View Locations		
C-87	Exhibit A-4, Figure 4-5, Effect of Distance on Apparent Facility Size		
C-88	Exhibit A-4, Figure 4-6, Key View 1, Elevated View of Project Site from Pulehu Road, Existing Condition and Project Simulation		
C-89	Exhibit A-4, Figure 4-7, Key View 2, View of Project Site from Haleakala Highway, Existing Condition and Project Simulation		
C-90	Exhibit A-4, Figure 4-8, Key View 3, View of Project Site from Pukalani Community Center, Existing Condition and Project Simulation		
C-91	Exhibit A-4, Figure 4-9, Key View 4, View of Project Site from Honoapiilani Highway near Wailuku, Existing Condition and Project Simulation		
C-92	Exhibit A-4, Figure 4-15, Proposed Land Use Changes		
C-93	Exhibit A-4, Figure 4-16, State Land Use Districts		
C-94	Exhibit A-4, Figure 4-17, Wailuku-Kahului Community Plan		

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C-104	OEQC *Environmental Notice*, Final EIS Acceptance Notice, December 8, 1997		
C-105	Letter from Scott Crawford Maui Tomorrow to Mark Willey, CH2M HILL, re Comments on the Draft Environmental Impact Statement, September 22, 1997		
C-106	Letter from Mark Willey (w/o attachments), CH2M HILL, to Scott Crawford, Maui Tomorrow re Response to Draft EIS Comment Letter, November 3, 1997		
C-107	Exhibit A-4, Table ES-2, List of Potential Permits and Approvals for the Proposed Waena Generating Station and Transmission Lines		
C-108	Summary of Project's Relationship with Urban District Criteria		
C-109	Summary of Project's Relationship with Decision-Making Criteria		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

REVISED LIST OF EXHIBITS **(FEBRUARY 11, 1998)**

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-110	Exhibit A-4, Figure 3-2, Surrounding Land Ownership		
C-111	Consulting Report Regarding Effect on Property Values of Proposed Waena Generating Station		
C-112	PSD Increment (Overview)		
C-113	Excerpt from Department of Health Response to Public Comments to HELCO's Draft Air Permit for the Keahole Generating Station pertaining to VOG		
C-114	Exhibit A-4, Table ES-1, Summary of Potential Impacts		
C-115	Public Utilities Commission Decision & Order No. 14674		
C-116	Public Utilities Commission Decision & Order No. 14707		
D-1	Summary Testimony for Edward L. Reinhardt		
D-2	Summary Testimony for Leslie V. Mathine		
D-3	Summary Testimony for Earle H. Ifuku		
D-4	Summary Testimony for Arthur S. Seki		
D-5	Summary Testimony for Stanley Kiyonaga		
D-6	Summary Testimony for Scott W.H. Seu		
D-7	Summary Testimony for Dr. Thomas A. Schroeder		
D-8	Summary Testimony for James C. Clary, Jr.		
D-9	Summary Testimony for Dr. Robert E. Paull		
D-10	Summary Testimony for Michael K.Y. Yuen		
D-11	Summary Testimony for Glen Y.F. Lau		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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REVISED LIST OF EXHIBITS (**FEBRUARY 11, 1998**)

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
D-12	Summary Testimony for Ted S. Kawahigashi		
D-13	Summary Testimony for Amy E. Dunn		
D-14	Summary Testimony for Dr. Evangeline J. Funk		
D-15	Summary Testimony for Daniel Lum		
D-16	Summary Testimony for Yoichi Ebisu		
D-17	Summary Testimony for J. Michael Silva		
D-18	Summary Testimony for Albert Lono Lyman		
D-19	Summary Testimony for Christopher L. Hart		
D-20	Summary Testimony for Mark R. Willey		
D-21	Summary Testimony for Jan R. Medusky		
E	All Exhibits submitted by other parties to these proceedings		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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REVISED LIST OF EXHIBITS

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
A	Waena Generating Station Land Use Commission Petition		
A-1	Waena Generating Station LUC Petition Exhibit 1, Project Maps		
A-2	Waena Generating Station LUC Petition Exhibit 2, Land Ownership Documentation		
A-3	Waena Generating Station LUC Petition Exhibit 3, Letter of Authorization		
A-4	Waena Generating Station LUC Petition Exhibit 4, Environmental Impact Statement		
A-5	Waena Generating Station LUC Petition Exhibit 5, Financial Statement		
A-6	Waena Generating Station LUC Petition Exhibit 6, Siting Studies		
B-1	Resume for Edward L. Reinhardt		
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~~B-10~~	~~Resume for Rick Roberts~~		
B-11	Resume for Glen Y.F. Lau		
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LAND USE COMMISSION
STATE OF HAWAII

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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B-23	Resume for Jan R. Medusky		
B-24	Resume for William A. Bonnet		
B-25	Resume for Tom Simmons		
C-1	List of Common Acronyms		
C-2	Exhibit A-4, Figure 2-1, Existing Generating Stations and 69-kV and 23-kV Electrical System on the Island of Maui		
C-3	Exhibit A-4, Figure 3-1, Proposed Waena Generating Station Site and Potential Transmission Line Corridors		
C-4	Conceptual Site Layout Figure		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

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C-5	Waena Generating Station Computerized Photo Simulation		
C-6	Exhibit A-4, Figure 3-3, Conceptual Site Layout showing time of equipment installment		
C-7	Exhibit A-4, Figure 3-4, Turbine Configurations		
C-8	Project Cost and Schedule (1997 Dollars) Table		
C-9	Exhibit A-4, Figure 3-5, Alternative Generating Station Sites Considered 1989-1996		
C-10	MECO Siting Study Chronology Table		
C-11	Kihei Community Association Letter and Petition		
C-12	Exhibit A-4, Figure 4-21, Fuel Haul Route		
C-13	Maui Electric Company, Limited Integrated Resource Planning 1994-2013, Chapters 1-10		
C-14	Overview of IRP Process Flow Chart		
C-15	Maui Electric Company, Limited, Summary of Sales and Peak Forecasting Methodology		
C-16	Exhibit A-4, Figure 2-2, Actual and Projected Peak Electrical Demand for Maui, 1985-2016		
C-17	Exhibit A-4, Table 2-2, MECO Resource Plan: Power Facility Additions and Retirements for the Island of Maui		
C-18	MECO Peak Forecast Comparison Graph		
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C-106	Letter from Mark Willey (w/o attachments), CH2M HILL, to Scott Crawford, Maui Tomorrow re Response to Draft EIS Comment Letter, November 3, 1997		
C-107	Exhibit A-4, Table ES-2, List of Potential Permits and Approvals for the Proposed Waena Generating Station and Transmission Lines		
C-108	Summary of Project's Relationship with Urban District Criteria		
C-109	Summary of Project's Relationship with Decision-Making Criteria		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

REVISED LIST OF EXHIBITS

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-110	Exhibit A-4, Figure 3-2, Surrounding Land Ownership		
C-111	Consulting Report Regarding Effect on Property Values of Proposed Waena Generating Station		
C-112	PSD Increment (Overview)		
C-113	Excerpt from Department of Health Response to Public Comments to HELCO's Draft Air Permit for the Keahole Generating Station pertaining to VOG		
C-114	Exhibit A-4, Table ES-1, Summary of Potential Impacts		
D-1	Summary Testimony for Edward L. Reinhardt		
D-2	Summary Testimony for Leslie V. Mathine		
D-3	Summary Testimony for Earle H. Ifuku		
D-4	Summary Testimony for Arthur S. Seki		
D-5	Summary Testimony for Stanley Kiyonaga		
D-6	Summary Testimony for Scott W.H. Seu		
D-7	Summary Testimony for Dr. Thomas A. Schroeder		
D-8	Summary Testimony for James C. Clary, Jr.		
D-9	Summary Testimony for Dr. Robert E. Paull		
D-10	Summary Testimony for Michael K.Y. Yuen		
D-11	Summary Testimony for Glen Y.F. Lau		
D-12	Summary Testimony for Ted S. Kawahigashi		
D-13	Summary Testimony for Amy E. Dunn		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

REVISED LIST OF EXHIBITS

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
D-14	Summary Testimony for Dr. Evangeline J. Funk		
D-15	Summary Testimony for Daniel Lum		
D-16	Summary Testimony for Yoichi Ebisu		
D-17	Summary Testimony for J. Michael Silva		
D-18	Summary Testimony for Albert Lono Lyman		
D-19	Summary Testimony for Christopher L. Hart		
D-20	Summary Testimony for Mark R. Willey		
D-21	Summary Testimony for Jan R. Medusky		
E	All Exhibits submitted by other parties to these proceedings		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

LIST OF EXHIBITS

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
A	Waena Generating Station Land Use Commission Petition		
A-1	Waena Generating Station LUC Petition Exhibit 1, Project Maps		
A-2	Waena Generating Station LUC Petition Exhibit 2, Land Ownership Documentation		
A-3	Waena Generating Station LUC Petition Exhibit 3, Letter of Authorization		
A-4	Waena Generating Station LUC Petition Exhibit 4, Environmental Impact Statement		
A-5	Waena Generating Station LUC Petition Exhibit 5, Financial Statement		
A-6	Waena Generating Station LUC Petition Exhibit 6, Siting Studies		
B-1	Resume for Edward L. Reinhardt		
B-2	Resume for Leslie V. Mathine		
B-3	Resume for Earle H. Ifuku		
B-4	Resume for Arthur S. Seki		
B-5	Resume for Scott W.H. Seu		
B-6	Resume for James C. Clary, Jr.		
B-7	Resume for Dr. Thomas A. Schroeder		
B-8	Resume for Dr. Robert E. Paull		
B-9	Resume for Michael K. Y. Yuen		
B-10	Resume for Rick Roberts		
B-11	Resume for Glen Y.F. Lau		
B-12	Resume for Ted S. Kawahigashi		

LAND USE COMMISSION
STATE OF HAWAII
1998 JAN 27 P 3:36

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

LIST OF EXHIBITS

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
B-13	Resume for Amy E. Dunn		
B-14	Resume for Dr. Evangeline J. Funk		
B-15	Resume for Daniel Lum		
B-16	Resume for Yoichi Ebisu		
B-17	Resume for Stanley Kiyonaga		
B-18	Resume for James Michael Silva		
B-19	Resume for Albert Lono Lyman		
B-20	Resume for Christopher L. Hart		
B-21	Resume for Rory M. Frampton		
B-22	Resume for Mark R. Willey		
B-23	Resume for Jan R. Medusky		
B-24	Resume for William A. Bonnet		
C-1	List of Common Acronyms		
C-2	Exhibit A-4, Figure 2-1, Existing Generating Stations and 69-kV and 23-kV Electrical System on the Island of Maui		
C-3	Exhibit A-4, Figure 3-1, Proposed Waena Generating Station Site and Potential Transmission Line Corridors		
C-4	Conceptual Site Layout Figure		
C-5	Waena Generating Station Computerized Photo Simulation		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

LIST OF EXHIBITS

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-6	Exhibit A-4, Figure 3-3, Conceptual Site Layout showing time of equipment installment		
C-7	Exhibit A-4, Figure 3-4, Turbine Configurations		
C-8	Project Cost and Schedule (1997 Dollars) Table		
C-9	Exhibit A-4, Figure 3-5, Alternative Generating Station Sites Considered 1989-1996		
C-10	MECO Siting Study Chronology Table		
C-11	Kihei Community Association Letter and Petition		
C-12	Exhibit A-4, Figure 4-21, Fuel Haul Route		
C-13	Maui Electric Company, Limited Integrated Resource Planning 1994-2013, Chapters 1-10		
C-14	Overview of IRP Process Flow Chart		
C-15	Maui Electric Company, Limited, Summary of Sales and Peak Forecasting Methodology		
C-16	Exhibit A-4, Figure 2-2, Actual and Projected Peak Electrical Demand for Maui, 1985-2016		
C-17	Exhibit A-4, Table 2-2, MECO Resource Plan: Power Facility Additions and Retirements for the Island of Maui		
C-18	MECO Peak Forecast Comparison Graph		
C-19	Comparison of Long Range Forecasts Table		
C-20	Integrated Resource Plan, Supply-Side Resources Report, Chapter 2		
C-21	Supply-Side Resource Options Process Flow Chart		
C-22	Stage of Technical Development or Maturity Graph		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

LIST OF EXHIBITS

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-23	Type of Energy Baseload or As-Available Graph		
C-24	Comparable Electrical Generation Cost Ranges for Energy Sources in Hawaii Table		
C-25	Land Requirements for Various Electrical Generating Systems Tables		
C-26	Solar Electric Generating System Assessment for Hawaii		
C-27	Applicable Air Regulations (Overview)		
C-28	Ambient Air Quality Standard (Overview)		
C-29	Attainment Area (Overview)		
C-30	Air Permitting - Key Steps (Overview)		
C-31	PSD/CSP Permit Review Process Chart		
C-32	Best Available Control Technology (Overview)		
C-33	Key Steps in "Top-Down" BACT Process (Overview)		
C-34	Permit Conditions (Overview)		
C-35	Opacity Chart (Overview)		
C-36	Permitting of Generation Increments (Overview)		
C-37	Farm Bureau Meeting Summary		
C-38	Exhibit A-4, Figure 4-1, Wind Rose		
C-39	Exhibit A-4, Table 4-2, Summary of State of Hawaii and Federal Ambient Air Quality Standards		
C-40	Exhibit A-4, Table 4-3, Summary of Impact Levels, Monitoring Levels, and PSD Increment		
C-41	Exhibit A-4, Table 4-5, Comparison of Project Impacts with Significant Impact Levels (SIL)		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

LIST OF EXHIBITS

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-42	Exhibit A-4, Table 4-6, Comparison of Maximum Predicted Sulfur Dioxide, Nitrogen Dioxide, and PM/PM10 Concentrations with Class II PSD Increments		
C-43	Exhibit 4, Table 4-7, Comparison of Maximum Predicted Sulfur Dioxide, Nitrogen Dioxide, and PM/PM10 Concentrations with Class I PSD Increments		
C-44	Exhibit A-4, Table 4-9, Worst-Case Concentrations within the Maui Vortex as a Function of the Number of 58-MW DTCC Units		
C-45	Comparison of Maximum Project Impacts with Ambient Standards Chart		
C-46	Exhibit A-4, Appendix C-3, Figure 3.1, Leopold's Vortex		
C-47	Exhibit A-4, Appendix C-3, Figure 3.2, NWS Vortex Model - Daylight Hours		
C-48	Exhibit A-4, Appendix C-3, Figure 3.3, NWS Vortex Model - Night Hours		
C-49	Exhibit A-4, Appendix C-3, Figure 4.1, Ueyoshi et al Model for 0200 July 1988		
C-50	Exhibit A-4, Appendix C-3, Figure 5.1, July 0200 Wind Roses from Tower 251		
C-51	Exhibit A-4, Appendix C-3, Figure 5.2, Resultant 0200 Wind Vector from Tower 251 at 37 m Level		
C-52	Exhibit A-4, Appendix C-3, Figure 5.3, Temperature Profiles for 0100, 0400 & 0700 LST		
C-53	Exhibit A-4, Appendix C-3, Figure 6.1, Plume Centerline Path and 2.7 Sigmas		
C-54	Exhibit A-4, Appendix C-3, Table 6.1, Worst-Case SO2, NO2 and PM10 Concentrations		
C-55	MECO/HELCO Combustion Turbine SCR Demonstration Program Results Final Report, Summary of Results and Conclusions		
C-56	Exhibit A-4, Table 4-10, Existing Groundwater Quality and Estimated Effluent Quality, Waena Generating Station		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

LIST OF EXHIBITS

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-57	Nature & Sources of Injected Fluids (Estimated Percent of Wastewater Flow) Chart		
C-58	Exhibit A-4, Figure 4-2, Topography		
C-59	Exhibit A-4, Figure 4-19, Existing Road Network and Study Intersections		
C-60	Exhibit A-4, Figure 4-20, Future Road Network and Study Intersections		
C-61	State of Hawaii Department of Transportation, Letter to Mr. David Blane re Comments on the Draft Environmental Impact Statement, September 12, 1997		
C-62	State of Hawaii Department of Land and Natural Resources, State Historic Preservation Division, Letter to Mr. David Blane re Chapter 6E-42 Historic Preservation Review of Archaeological Inventory Survey, August 29, 1997		
C-63	Exhibit A-4, Figure 4-3, Water Resources Near the Project Site		
C-64	Exhibit A-4, Figure 4-12, Noise Measurement Sites around proposed Waena Generating Station		
C-65	Exhibit A-4, Figure 4-13, Hourly Equivalent Noise Contours for the Proposed Waena Generating Station Phase I		
C-66	Exhibit A-4, Figure 4-14, Hourly Equivalent Noise Contours for the Proposed Waena Generating Station, Full Build		
C-67	Exhibit A-4, Appendix J, Figure 1, Diagram of Transmission Line Configurations		
C-68	Exhibit A-4, Appendix J, Figure 2, Computer Site Model of proposed Waena Generating Station		
C-69	Exhibit A-4, Appendix J, Figure 3, Calculated Magnetic Field Contour Map of Proposed Waena Generating Station		
C-70	Exhibit A-4, Appendix J, Figure A-1, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Kanaha - Pukalani 69 kV Chart		

C-66
Should it be 4 Figs. 4-14

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

LIST OF EXHIBITS

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-71	Exhibit A-4, Appendix J, Figure A-2, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Maalaea - Kealahou 69 kV Chart		
C-72	Exhibit A-4, Appendix J, Figure A-3, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Proposed Pulehu Road - Firebreak Road 69/12 kV Chart		
C-73	Exhibit A-4, Appendix J, Figure A-4, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Proposed Firebreak Road - Paia 69/12 kV Chart		
C-74	Exhibit A-4, Appendix J, Figure A-5, Proposed Waena Generating Station Powerline Electric Field Calculations, Electric Field Proposed Firebreak Road - Puunene 69/12 kV Chart		
C-75	Exhibit A-4, Appendix J, Figure A-6, Proposed Waena Generating Station Powerline Electric Field Calculations, Magnetic Field Kanaha - Pukalani 69 kV Chart		
C-76	Exhibit A-4, Appendix J, Figure A-7, Proposed Waena Generating Station Powerline Electric Field Calculations, Magnetic Field Maalaea - Kealahou 69 kV Chart		
C-77	Exhibit A-4, Appendix J, Figure A-8, Proposed Waena Generating Station Powerline Electric Field Calculations, Magnetic Field Proposed Pulehu Road - Firebreak Road 69/12 kV Chart		
C-78	Exhibit A-4, Appendix J, Figure A-9, Proposed Waena Generating Station Powerline Electric Field Calculations, Magnetic Field Proposed Firebreak Road - Paia 69 kV Chart		
C-79	Exhibit A-4, Appendix J, Figure A-10, Proposed Waena Generating Station Powerline Electric Field Calculations, Magnetic Field Proposed Firebreak Road - Puunene 69/12 kV Chart		
C-80	Exhibit A-4, Appendix J, Table 1, Summary of Transmission /Distribution Line Configurations		
C-81	Exhibit A-4, Appendix J, Table 2, Summary of Transmission/Distribution line Project 2020 Loading Conditions		
C-82	Exhibit A-4, Appendix J, Table 6, Summary of Transmission Line Magnetic Field Calculations		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

LIST OF EXHIBITS

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-83	Exhibit A-4, Figure 4-10, Conceptual Landscape Plan		
C-84	Exhibit A-4, Figure 4-11, Conceptual Landscape Sections		
C-85	Letter from Department of Agriculture re Comments on the Land Use Petition, Nov. 28, 1997		
C-86	Exhibit A-4, Figure 4-4, View Locations		
C-87	Exhibit A-4, Figure 4-5, Effect of Distance on Apparent Facility Size		
C-88	Exhibit A-4, Figure 4-6, Key View 1, Elevated View of Project Site from Pulehu Road, Existing Condition and Project Simulation		
C-89	Exhibit A-4, Figure 4-7, Key View 2, View of Project Site from Haleakala Highway, Existing Condition and Project Simulation		
C-90	Exhibit A-4, Figure 4-8, Key View 3, View of Project Site from Pukalani Community Center, Existing Condition and Project Simulation		
C-91	Exhibit A-4, Figure 4-9, Key View 4, View of Project Site from Honoapiilani Highway near Wailuku, Existing Condition and Project Simulation		
C-92	Exhibit A-4, Figure 4-15, Proposed Land Use Changes		
C-93	Exhibit A-4, Figure 4-16, State Land Use Districts		
C-94	Exhibit A-4, Figure 4-17, Wailuku-Kahului Community Plan		
C-95	Exhibit A-4, Figure 4-18, County of Maui Zoning		
C-96	OEQC *Environmental Notice*, Environmental Impact Statement Preparation Notice, March 8, 1997		
C-97	Maui News, Notice of Public Scoping Meetings, March 13, 15, 1997		

DOCKET NO./PETITIONER: A97-722 - MAUI ELECTRIC COMPANY, LIMITED

PARTY: MAUI ELECTRIC COMPANY, LIMITED

LIST OF EXHIBITS

EXHIBIT NUMBER	DESCRIBTION	PARTY: OBJECTIONS	ADMIT
C-98	Haleakala Times, Notice of Public Scoping Meetings, March 19, 1997		
C-99	OEQC *Environmental Notice*, Draft Environmental Impact Statement Availability Notice, August 8, 1997		
C-100	Maui News, Notice of Public DEIS Comment Meetings, August 22, 1997		
C-101	Haleakala Times, Notice of Public DEIS Comment Meetings, August 22, 1997		
C-102	OEQC *Environmental Notice*, Final EIS Submittal Notice, November 23, 1997		
C-103	Maui Planning Department Final EIS Acceptance Letter, November 24, 1997		
C-104	OEQC *Environmental Notice*, Final EIS Acceptance Notice, December 8, 1997		
C-105	Letter from Scott Crawford Maui Tomorrow to Mark Willey, CH2M HILL, re Comments on the Draft Environmental Impact Statement, September 22, 1997		
C-106	Letter from Mark Willey (w/o attachments), CH2M HILL, to Scott Crawford, Maui Tomorrow re Response to Draft EIS Comment Letter, November 3, 1997		
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C-109	Summary of Project's Relationship with Decision-Making Criteria		
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C-111	Consulting Report Regarding Effect on Property Values of Proposed Waena Generating Station		
D	All Exhibits submitted by other parties to these proceedings		

A

EXHIBIT A
BOUNDARY AMENDMENT PETITION

This Exhibit is contained in the original petition previously submitted to all parties.

EXHIBIT A-1
PROJECT MAPS

This Exhibit is contained in the original petition previously submitted to all parties.

EXHIBIT A-2
LAND OWNERSHIP DOCUMENTATION

This Exhibit is contained in the original petition previously submitted to all parties.

EXHIBIT A-3
LETTER OF AUTHORIZATION

This Exhibit is contained in the original petition previously submitted to all parties.

EXHIBIT A-4
ENVIRONMENTAL IMPACT STATEMENT

This Exhibit is contained in the original petition previously submitted to all parties.

EXHIBIT A-5
FINANCIAL STATEMENT OF MAUI ELECTRIC COMPANY, LIMITED

This Exhibit is contained in the original petition previously submitted to all parties.

EXHIBIT A-6
SITING STUDIES

This Exhibit is contained in the original petition previously submitted to all parties.

LAND USE COMMISSION
STATE OF HAWAII
1998 JAN 27 P 3:37