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GOVERNOR OF HAWAII

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

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

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WATER AND LAND DEVELOPMENT

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OFC. OF ENVIRONMENTAL QUALITY

File No.: MA-2653

Maui Electric Company, Ltd.
P.O. Box 398
Kahului, Hawaii 96732-0398
Attn: David Park

MAY 6 1994

Dear Mr. Park,

Subject: Final Environmental Impact Statement for Maalaea-Lahaina Third 69 KV Transmission Line Project

I am pleased to inform you that your Final Environmental Impact Statement for Maalaea-Lahaina Third 69 Kilovolt Transmission Line Project is acceptable as defined by Chapter 200, Title 11, Hawaii Administrative Rules. The document will now be used to determine whether a Conservation District Use Permit may be granted for the proposal.

Please note that acceptance of the statement does not imply any endorsement of the project. Acceptance merely means that the statement fulfills the content requirements of an environemtnal impact statement, adequately describes identifiable environmental impacts, and satisfactorily responds to substantive comments received during review of the statement as prescribed under Chapter 343, Hawaii Revised Statutes.

The Board of Land and Natural resources will consider the environmental impacts disclosed in the statement in their deliberation of your Conservation District Use Application (CDUA). The affect of these impacts on the purpose and intent of the Conservation District and on the objectives of the subzone will be the major consideration for approval or disapproval of your CDUA.

Your application will be placed on the Board's meeting agenda as soon as the SMA permit for the project has been granted. Please advise us of that event.

Very truly yours,

Keith W. Ahue

Keith W. Ahue, Chairperson
Board of Land and Natural Resources

c: Dames & Moore

Post-it™ Fax Note 7671	Date 6/1/94	# of pages ▶ 1
To Nyan	From Faith Caplan	
Co./Dept. OEQC	Co. Dames & Moore	
Phone # 586-4185	Phone # 593-1116	
Fax # 586-4157	Fax # 593-1198	

FINAL

Volume 1

Maalaea - Lahaina Third 69KV Transmission Line Project Maui, Hawaii

Environmental Impact Statement

Maui Electric Company, Ltd.

March 1994

Prepared by DAMES & MOORE

FINAL

ENVIRONMENTAL IMPACT STATEMENT

MAALAEA-LAHAINA THIRD 69KV

TRANSMISSION LINE PROJECT

MAUI ELECTRIC COMPANY, LTD.

DAMES & MOORE
MARCH 1994

PREFACE

This document is a Final Environmental Impact Statement (EIS) prepared to meet federal and state environmental requirements. In the State of Hawaii, preparation of an EIS to standards of the National Environmental Policy Act (NEPA) is required for projects that would use State Conservation District Lands, as is the case with this project.

An EIS serves as an informational document, a source that citizens and decision-makers can turn to for information regarding the proposed project and each alternative under consideration regarding possible impacts to natural, social, and economic environments. All feasible or reasonable alternatives are required to be investigated and described, including the option of not implementing *any* alternative. In this manner, technically accurate information describing an array of alternatives and their consequences is available to serve as the foundation of the decision-making process for selecting the most appropriate course of action.

The EIS is one element of the public/agency involvement process, which is in turn a step in the larger environmental decision-making process. The intent of the public/agency involvement process—which includes meetings, hearings, and coordination with technical specialists—is to establish a flow of knowledge between the project applicant, citizens of the community, and agencies at the federal, state, and local levels. This process draws on the knowledge and expertise of these groups to develop and analyze project alternatives. Thus, agencies and citizens assist in development of portions of the EIS and then use the document in its entirety as a decision-making tool.

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

- A detailed Table of Contents, and a listing of acronyms used in this document.
- An introduction and summary to serve as either an alternative to reading the entire document, or to familiarize the reader with the contents of the full EIS prior to reading.
- A description of the project, including discussion of the purpose of the project and the needs the project proposes to address.

- Descriptions of alternatives considered to the proposed project, including the alternative to not undertake the proposed project or any alternative projects (the "No Action" Alternative); in addition, justification for rejecting alternatives from further consideration is provided.
- A description of the current natural, social, an economic environment in the study area that could be affected by the proposed project.
- Discussion of environmental consequences—potential beneficial and adverse natural, social, and economic impacts—associated with each alternative under consideration. Also included is a discussion of how to mitigate, or reduce the effect of, negative impacts.
- An assessment of how the proposed project relates to land use plans, policies, and controls.
- A discussion of topical issues, including unresolved issues.
- A description of public, land owner, and agency consultation.
- A section added since development of the Draft EIS which identifies the parties who received either a copy of the Draft EIS for review or were notified in writing the Draft EIS was available for review. This new section also includes all substantive written comments received during the Draft EIS review period as well as written responses to those comments.
- References, and a listing of individuals who contributed to the EIS.

The Final EIS comprises the Draft EIS in its entirety, plus comments received during the public review period, as well as responses to these comments; revisions based on review comments are incorporated into the text of the EIS, as appropriate. The Draft EIS distributed for public review was a two-volume set. Volume II contains detailed technical appendices and information which are summarized in several technical discussions found in Volume I. Based on comments received on the Draft EIS, revision of Volume II is limited to Appendix G, *An Archaeological Inventory Survey of an Approximately 14.7 mile proposed Transmission line, from Ma'alaea to Lahaina, Maui, Hawai'i.* Other regional resources discussed in Volume II include: geological, hydrological, botanical, biological, cultural, and historical. In addition, Volume II contains reports on corridor evaluation and alignment, proposed project profiles, electric and magnetic fields, and a viewshed analysis of Lahaina Pali Trail.

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APPENDICES
(Volume 2)

ACRONYMS

ACRONYMS

4WD	four-wheel drive
°F	degrees fahrenheit
AAAC	all-aluminum alloy conductor
AAC	all-aluminum conductor
AASHTO	American Association of Standards for Highway and Transportation Officers
ac	alternating current
ACOE	U.S. Army Corps of Engineers
AMHERST	aluminum industry standard code for the shield wire and size of strands
amps	amperes
Bishop Estate	Bernice Pauahi Bishop Estate
BLNR	Board of Land and Natural Resources
CDUA	Conservation District Use Application
CFR	Code of Federal Regulations
Co.	Company
CO	carbon monoxide
db	decibel(s)
dBA	A-weighted decibel(s)
DBEDT	Department of Business, Economic Development and Tourism
dBμV/m	decibels above a one μV/m reference value
dc	direct current
DEIS	Draft Environmental Impact Statement
DLNR	Department of Land and Natural Resources
DOFAW	Division of Forestry and Wildlife
DOH	Department of Health
EA	Environmental Assessment
e.g.	for example
EIS	Environmental Impact Statement
EISPN	Environmental Impact Statement Preparation Notice
ELGIN	aluminum industry standard code from the conductor and size of strands
EMF	electric and magnetic fields
EPA	U.S. Environmental Protection Agency
ETS	listed, or under consideration for listing, as endangered, threatened or sensitive by the Federal or State governments
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
GPS	Global Positioning System
HC&S	Hawaii Commercial and Sugar Company

HECO	Hawaiian Electric Company, Inc.
HFDC	Housing Finance and Development Corporation
H-P	Honoapiilani
HRHP	Hawaii Register of Historic Places
HRS	Hawaii Revised Statutes
Hz	hertz
i.e.	that is
IRP	integrated resource planning
IRPA	International Radiation Protection Association
KCM	thousands of circular mils (cross-sectional measure of conductor area)
kcmil	thousands of circular mils (cross-sectional measure of conductor area)
KV	kilovolts
KV/m	kilovolts per meter
LCA	land commission award
LPFF	low pressure, fluid filled
LUD	Land Use District
MECO	Maui Electric Company, Ltd.
mG	milligauss
mph	miles per hour
mtns.	mountains
MVA	megavolt-ampere (practical unit of apparent power)
MW	megawatts
N.	north
NMFS	National Marine Fisheries Service
No.	number or north
NO_2	nitrogen dioxide
NRHP	National Register of Historic Places
O_3	ozone
OCEA	Office of Conservation and Environmental Affairs
OEQC	Office of Environmental Quality Control
Pioneer Mill	Pioneer Mill Company
PM_{10}	fine particulates (less than 10 microns in diameter)
ppb	parts per billion
PUC	Hawaii Public Utilities Commission
PVC	polyvinyl chloride
Rd.	road
S.B.	senate bill
SDOT	State of Hawaii Department of Transportation
SHPD	State of Hawaii Historic Preservation Division

s.f.	square feet
sq.	square
SMA	Special Management Area
SO_2	sulfur dioxide
TMK	tax map key
TSP	total suspended particulates
TV	television
U.S.	United States
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
V/m	volts per meter
XLPE	cross-linked polyethylene
μV/m	microvolts per meter

SECTION 1
INTRODUCTION AND SUMMARY

1.0 INTRODUCTION AND SUMMARY

1.1 PURPOSE AND CONTENT OF THIS ENVIRONMENTAL IMPACT STATEMENT

Maui Electric Company, Ltd. (MECO) proposes to construct the Maalaea-Lahaina Third 69 kilovolt (KV) Transmission Line Project, to deliver power from the Maalaea Power Plant to West Maui. The proposed project consists of: (1) a new 15.2-mile 69KV transmission line between the Maalaea Power Plant and Lahainaluna Switching Station; and (2) a new Lahainaluna Switching Station located off of Lahainaluna Road to distribute electrical power from the new line to the existing transmission system.

Tax Map Keys (TMK) for the proposed project are:

<u>Transmission Line</u> (Single Circuit)

3-8-05:02	State Department of Transportation,
	Alexander & Baldwin Hawaii, Inc.
3-8-05:25	MECO
	Alexander & Baldwin Hawaii, Inc.
3-6-01:18	Wailuku Agribusiness
3-6-01:14	State of Hawaii (Perreira Ranch Company)
4-8-01:1,2	State of Hawaii (Perreira Ranch Company)
4-8-02:2,8	State of Hawaii (Pioneer Mill Company)
4-8-02:9	Pioneer Mill Company
4-8-03:8,40	State of Hawaii (Pioneer Mill Company)
4-8-03:10	Pioneer Mill Company
4-7-01:2	Pioneer Mill Company
4-7-05:1	Pioneer Mill Company
4-6-21:1,3	Pioneer Mill Company, State of Hawaii (Parcel 3)
4-6-20:2,5	Pioneer Mill Company, State of Hawaii (Parcel 2)
4-6-18:1	Pioneer Mill Company
4-6-18:3	Bishop Estate (Pioneer Mill Company)

Switching Station

4-6-18:3	Bishop Estate (Pioneer Mill Company)

Transmission Line (Double Circuit)

4-6-18:3	Bishop Estate (Pioneer Mill Company)

This Environmental Impact Statement (EIS) is prepared to support the application for a Conservation District Use Permit and a Use of State Lands Approval from the Department of Land and Natural Resources (DLNR). In addition, improvements at the Maalaea Power Plant would be located within the Special Management Area (SMA); an SMA Permit from the Maui County Planning Department would also be required.

This EIS was prepared in accordance with Chapter 343, Hawaii Revised Statutes (HRS); Chapter 200 of Title 11, Department of Health (DOH) Administrative Rules; Act 241, Session Laws of Hawaii, 1992; Chapter 2, Title 13 of the Department of Land and Natural Resources Administrative Rules; and Article II, *Special Management Area Rules and Regulations of the County of Maui.*

1.2 PROPOSED ACTION AND ALTERNATIVES

MECO proposes to construct and operate a new third West Maui 69KV single-circuit transmission line from the Maalaea Power Plant to a new switching station near Lahaina. The proposed Lahainaluna Switching Station would be located approximately one mile mauka of the Pioneer Mill factory off of Lahainaluna Road. The switching station is needed to terminate the line and deliver power to the West Maui power system. In addition, a new 1,000-foot-long double-circuit 69KV transmission line would connect the new Lahainaluna Switching Station to the existing Puukolii and Lahaina 69KV lines. The total length of the proposed transmission line will be about 15.2 miles and will cross approximately 9.6 miles of State-owned land of which 4.5 miles is within the Conservation District.

MECO conducted system planning studies to determine West Maui transmission system needs over a five-year period (1990 to 1995). The studies identified transmission line and substation additions necessary to correct existing and future system limitations in West Maui. The Maalaea-Lahaina

Third 69KV Transmission Line Project was identified as a critical system addition needed to maintain reliable electric service to West Maui.

The Maalaea-Lahaina Third 69KV Transmission Line Project is needed to:

- **Maintain reliable electric service to West Maui in the event that one or both existing 69KV lines from the Maalaea Power Plant to the region is out of service.**
  At present, two 69KV lines carry electricity to West Maui. If one of the lines is out of service, the remaining line could be overloaded, potentially resulting in a blackout of West Maui. Addition of a third 69KV line and a new switching station would enable West Maui to be served by two lines if one is out of service.The existing two lines share a common power corridor. Because the lines are close to one another, an event such as high winds could result in a broken conductor on one line being thrown onto the adjacent line causing a blackout of West Maui. A second, physically separate power corridor, which would be provided by the new Maalaea-Lahaina Third 69KV Transmission Line Project, would provide an alternate path for power flow to West Maui in the event that one of the two existing lines is out of service.
- **Provide additional transmission capacity to serve load growth in West Maui.**
  The new line will meet the demand for power in West Maui resulting from existing and planned resort, commercial and residential developments.

A range of alternatives was evaluated, including short-term, non-transmission alternatives involving the installation of series capacitors, as well as a "no action" alternative. System planning studies concluded that an outage of either of the two existing 69KV lines in 1995 could result in excessive power flow through the remaining in-service line beyond its conductor rating. The resulting overload could lead to loss of both transmission lines to West Maui resulting in a potential blackout of the area. The Maalaea-Lahaina Third 69KV Transmission Line Project emerged as the preferred long-term solution to this problem. Once the need for the new transmission line was determined, alternative transmission technologies were analyzed including conventional overhead lines, underground cable and submarine cable. Conventional overhead line construction with steel poles was chosen by MECO as the most cost-effective, reliable, and easily-repaired technology.

A detailed routing study was conducted to evaluate opportunities and constraints of alternative transmission line locations. The routing study evaluated patterns of land use, ownership and regulation as well as biological, archaeological, earth and water resources. Other factors considered included: landowner, agency, and public comments and concerns; MECO's existing transmission system; construction and operating costs; and potential environmental impacts.

The route selection process began with a large study area that was narrowed down to alternative corridors approximately 1/4 to 3/4 mile wide. After screening the alternative corridors and consultation with landowners, agencies and the public, a preferred corridor, and then alternative alignments within the preferred corridor, were selected. Field engineering survey and staking of a proposed alignment was conducted, based primarily on terrain and engineering design factors. Then, this proposed alignment was carefully evaluated for cultural, biological and visual resources and the final alignment was selected to avoid impacts to identified resources. Landowners and agency consultation continued throughout the alignment selection process, to determine their concerns and preferences.

From the Maalaea Power Plant the preferred alignment proceeds along North Kihei Road to Honoapiilani Highway. After crossing the highway, the line would proceed up Kealaloloa Ridge across State-owned Conservation District land used for grazing, crossing three major gulches before proceeding makai to the base of Papalaua Gulch near Ukumehame. From this point, the alignment proceeds west towards Lahaina through kiawe-scrub to Puu Hipa, where the alignment crosses to the mauka side of the existing 69KV lines to avoid cane fields in the vicinity of Launiupoko. The segment of the alignment crossing the existing 69KV lines would be placed underground to assure that reliability would not be compromised by having the lines come in contact with one another. From Puu Hipa, the alignment continues west and mauka of cane fields to Piilani Ditch Road, where it crosses Bishop Estate property leased by Pioneer Mill Company (Pioneer Mill) for sugarcane cultivation for one mile to a new three-acre switching station site off of Lahainaluna Road. From the switching station, the preferred alignment would proceed makai along the edge of cane fields to the existing Lahaina and Puukolii 69KV lines.

1.3 IMPACTS AND MITIGATION

Impacts and mitigation are described in detail in Section 4.0. The proposed transmission line and switching station would not result in any unavoidable significant adverse impacts; all impacts would be beneficial, negligible, or non-significant after mitigation.

1.3.1 Types of Impacts and Levels of Significance

The significance of impacts was evaluated in relationship to both context and intensity. Examining context reflects the fact that significance varies with the setting of the action. For example, impacts may be significant in the immediate surroundings of the action, but non-significant within the context of the island as a whole. Intensity refers to the severity of the impact.

The significance of impacts was measured using guidelines established in Section 12, Chapter 200, Title 11 State Department of Health, Administrative Rules as authorized by Chapter 343, Hawaii Revised Statutes (HRS). The rules state that an action, "in most instances," would be determined to have a significant effect on the environment if it:

(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;

(2) Curtails the range of beneficial uses of the environment;

(3) Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions or executive orders;

(4) Substantially affects the economic or social welfare of the community or State;

(5) Substantially affects public health;

(6) Involves substantial secondary impact, such as population changes or effects on public facilities;

(7) Involves a substantial degradation of environmental quality;

(8) Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;

(9) Substantially affects a rare, threatened or endangered species or its habitat;

(10) Detrimentally affects air or water quality or ambient noise levels; or

(11) Affects an environmentally sensitive area such as a floodplain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

With these criteria in mind, four levels of potential impacts were defined for each resource:

- **Beneficial effect** - A beneficial effect on the environment.
- **No or Negligible impact** - No perceptible impact or change predicted.
- **Non-significant impact** - A perceptible impact or change predicted, but the impact does not meet defined standards of significance.
- **Significant adverse impact** - A perceptible impact or change that meets the standard of significance defined for the specific resource.

Table 1.3-1 summarizes potential impacts of the proposed project station, mitigation measures to avoid or reduce adverse impacts, and significance of impacts before and after mitigation.

1.4 UNRESOLVED ISSUES

One unresolved issue regarding the project remains: the issue of potential public health effects from magnetic fields of the proposed transmission lines and switching station.

Scientists do not yet know if magnetic fields could produce adverse public health effects. The simple assumption that "more is worse" may not be true and a simple standard for a maximum limit to magnetic fields cannot be adequately supported by the available knowledge. One cannot categorically assert that there are no risks nor can one assert that there is a significant risk (Carnegie Mellon University, 1989).

Considering the question of public health policy and what should be done given our present knowledge, there appear to be three possible courses of action:

- **Do Nothing.** Conclude that there is not yet enough evidence to warrant any action.
- **Prudent Avoidance.** Adopt strategies that limit field exposures with small investments of money and effort. Do nothing drastic or expensive until research provides a clear picture of whether there is any risk at all.
- **Aggressive Regulation.** Conclude that there is a problem and spend some serious time and money on an aggressive program to limit field exposure, while recognizing that we may eventually learn that some or all of this effort and money has been wasted.

Table 1.3-1
IMPACT SUMMARY TABLE

POTENTIAL IMPACTS	SIGNIFICANCE BEFORE MITIGATION	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
4.2 (1) LAND OWNERSHIP AND REGULATION			
Transmission Line 4.58 miles of Conservation District lands crossed: 2.4 miles General Subzone; 1.9~~2.2~~ miles Resource; and 0.2 mile Limited. Conservation District Use Application required.	Non-significant	None needed	Non-significant
9.6 miles of State-owned land crossed. Use of State Lands Approval required.	Non-significant	None needed	Non-significant
1,000 feet within Special Management Area. Special Management Area Permit required.	Non-significant	None needed	Non-significant
Switching Station No impact	No impact	None needed	No impact
4.3 EXISTING AND PROPOSED LAND USE			
Transmission Line Total easement area of 137.7 acres required: approximately 73.8 acres remote, undeveloped land; 36.8 acres grazing; 16.2 acres sugar cane; 1.4 acres pineapple field; 9.5 acres roadway rights-of-way.	Non-significant	Compensation at fair market value for value of easement and effects on property.	Non-significant
Potential interference with sugar cane field operations during planting and harvesting activities and aerial spraying.	Non-significant	Locate poles five feet or more from cane haul roadway edge; earthen berms around poles to protect from cane hauler vehicles; minimize use of guy wires and locate them as close to poles as possible; marker poles at far end of guy wires and install reflective tape on poles and guy wires for visibility to agricultural equipment operators; and maintain 35-foot minimum conductor-to-ground clearance.	Non-significant
Potential interference with pineapple field operations.	Non-significant	Maintain 40-foot minimum conductor-to-ground clearance to prevent hazards from night harvesting	Non-significant
Switching Station Conversion of 3.0 acres of sugar cane field for the switching station site.	Non-significant	Compensation at fair market value for acquisition of property.	Non-significant

Table 1.3-1
IMPACT SUMMARY TABLE (continued)

POTENTIAL IMPACTS	SIGNIFICANCE BEFORE MITIGATION	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
4.4 EARTH AND WATER RESOURCES			
Transmission Line Potential landslides and slope movements on steep slopes, and potential slope instability in area north of Manawaipueo Gulch and northwest of Launiupoko Stream.	Non-significant	Site specific geotechnical investigations during selection of final pole and spur road locations and pole foundation design.	Non-significant
Potential erosion due to vegetation removal and disturbance, particularly in high erosion potential area at Puu Hipa and Puu Manalua Nui, due to:		Erosion control plan implemented to address clearing practices, spur road construction, drainage and restoration of disturbed areas.	
• Pole installation	Non-significant		Non-significant
• Undergrounding	Non-significant	Punch/straw and/or jute netting would be placed on disturbed areas.	Non-significant
• New spur roads	Potentially significant	Water bars, cross ditches, diversion ditches, berms and energy dissipators would be used on new spur roads to control run-off	Non-significant
Switching Station Clearing and grading of 3.0 acres for site preparation	Non-significant	Grading and drainage improvements would conform to County standards and be coordinated with County Department of Public Works to address site runoff.	Non-significant

Table 1.3-1
IMPACT SUMMARY TABLE (continued)

POTENTIAL IMPACTS	SIGNIFICANCE BEFORE MITIGATION	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
4.5 VEGETATION			
Transmission Line Temporary disturbance of a total of 2.0 acres of vegetation types due to pole installation: 0.2 acre of agricultural land; 1.4 acres of Kiawe-grass association; 0.01 acre of mixed native shrubland; 0.3 acre of mixed grassland/shrubland; and 0.1 acre of ruderal/roadside.	Non-significant	Following clean-up and removal of construction materials, punch straw and/or jute netting would be placed on disturbed areas to aid in revegetation. The location and design of new spew roads and helicopter pads would be reviewed by a qualified biologist to determine potential impacts to sensitive resources and the need for a survey of affected areas. Disturbed agricultural land would be recultivated, leaving clearance around poles for equipment and operations.	Non-significant
Permanent loss of 775 square feet of vegetation types due to pole footprints, and loss of an undetermined area of Kiawe-grass association, mixed native shrubland and mixed grassland/shrubland containing no sensitive species and of widespread distribution, due to new spur roads and helicopter pads.	Non-significant	None needed.	Non-significant
Possibility of fire due to construction equipment or in the event of a downed conductor.	Non-significant	Construction vehicles would be equipped with spark arrestors. Fire suppression equipment would be kept on hand and construction crews trained in its use.	Non-significant
Switching Station Elimination of 3.0 acres of agricultural land of little botanical interest.	Negligible Impact	None needed.	Negligible Impact
4.6 BIRDS AND MAMMALS			
Transmission Line Temporary disturbance of 2.0 acres of habitat due to pole installation and permanent loss due to new spur roads of an undetermined area of habitat not special, unique, or important to species and of widespread distribution.	Non-significant	None needed.	Non-significant
Switching Station Permanent loss of 3.0 acres of poor quality habitat.	Non-significant	None needed	Non-significant

Table 1.3-1
IMPACT SUMMARY TABLE (continued)

POTENTIAL IMPACTS	SIGNIFICANCE BEFORE MITIGATION	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
4.7 ARCHAEOLOGICAL RESOURCES			
Transmission Line Potential disturbance of known archaeological sites.	Potentially Significant	Ten currently proposed pole locations in the sensitive Maalaea, Ukumehame and Launiupoko areas (States C-1, C-2, 14-A through 14-E and 22-A through 22-C) would be maintained through final design and construction. Final pole locations and construction staging plans would be reviewed by archaeologist to verify site avoidance and maintenance of buffer zones. All sites would be flagged to avoid inadvertent disturbance. If access roads, spur roads or helicopter pads necessary within surveyed areas, plans would be submitted to State Historic Preservation Division (SHPD) for review. Construction would be monitored, if warranted. If necessary outside surveyed areas, proposed locations would be surveyed and results submitted to SHPD for review. All sites would be avoided and buffer zones maintained.	Non-significant
Potential disturbance of previously unknown archaeological sites that may be encountered during construction.	Potentially Significant	Construction personnel would be informed of possibility and proper procedures to follow if site encountered. Construction activity in area(s) would be stopped and SHPD consulted for appropriate action.	Non-significant

Table 1.3-1
IMPACT SUMMARY TABLE (continued)

POTENTIAL IMPACTS	SIGNIFICANCE BEFORE MITIGATION	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
Switching Station Potential disturbance of previously unknown archaeological sites that may be encountered during construction. Low probability due to previous agricultural disturbance.	Non-significant	Construction personnel would be informed of possibility and proper procedures to follow if site encountered. Construction activity in area(s) would be stopped and SHPD consulted for site evaluation and proper management.	Non-significant
4.8 SOCIOECONOMICS			
Transmission Line Enhanced reliability of electrical service to West Maui and added transmission capacity to meet power demands of existing and planned development.	Beneficial	None needed.	Beneficial
Generation of local construction jobs.	Beneficial	None needed.	Beneficial
Income and tax revenues generated by local construction procurements, payroll expenditures and personal expenditures.	Beneficial	None needed.	Beneficial
Foregone value of agricultural production of converted agricultural land.	Negligible impact	Compensation at fair market value for value of easement and effects on property.	Negligible Impact
Additional operating costs for Pioneer Mill Company due to additional time and effort in maneuvering around poles and lines.	Non-significant	Compensation at fair market value for value of easement and effects on property.	Negligible Impact
Switching Station Foregone value of agricultural production of 3.0 acres of converted agricultural land.	Negligible impacts	Compensation at fair market value for value of easement and effects on property.	Negligible Impact
Enhanced reliability of electrical service, added transmission capacity, generation of local construction jobs, and income and tax revenues.	Beneficial	None needed	Beneficial

Table 1.3-1
IMPACT SUMMARY TABLE (continued)

POTENTIAL IMPACTS	SIGNIFICANCE BEFORE MITIGATION	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
4.9 AIR QUALITY AND METEOROLOGY			
Transmission Line Short-term, temporary increases in dust (PM_{10}) concentrations during construction.	Negligible impact	Watering for dust abatement at least twice daily but more frequently with increased wind speeds.	Negligible impact
Exhaust emissions from construction equipment, delivery vehicles and employee vehicles.	Negligible impact	Construction contractors would be required to use standard pollution control devices on all construction vehicles and equipment and proper vehicle and equipment maintenance.	Negligible impact
Switching Station Short-term, temporary exposure of sensitive receptors to increases in dust (PM_{10}) concentrations during construction.	Non-significant	Watering for dust abatement at least twice daily but more frequently with increased wind speeds.	Non-significant
4.10 NOISE			
Transmission Line Short-term temporary construction noise.	Non-significant	Construction contractors would be required to comply with construction noise regulations and to equip all engines with mufflers.	Non-significant
Switching Station Exposure of sensitive receptors to short-term, temporary construction noise.	Non-significant	Construction contractors would be required to comply with construction noise regulations and to equip all engines with mufflers. Lahainaluna High School officials would be informed of the schedule for construction of segments 22 and 23 and the switching station.	Non-significant

Table 1.3-1
IMPACT SUMMARY TABLE (continued)

POTENTIAL IMPACTS	SIGNIFICANCE BEFORE MITIGATION	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
4.11 ELECTRIC AND MAGNETIC FIELD EFFECTS			
Transmission Line/Switching Station Scientists do not yet know if magnetic fields could produce public health impacts. Public health impacts from magnetic fields of the proposed transmission line and switching station remains an unresolved issue, as does the larger issue of health effects from existing lines, wall wiring, appliances and lighting fixtures.	Unresolved issue	Recognizing existing research is inconclusive, State Department of Health policy calls for "prudent avoidance" in siting new facilities. Prudent avoidance approach was used in project siting and design. Populated areas avoided in selection of alignment. Magnetic field levels reduced by optimum phasing arrangement (Delta for single-circuit portion, Like for double-circuit portion).	Unresolved issue
4.12 VISUAL RESOURCES			
Transmission Line Moderate visual impacts in Segments 1, 4 and 10. Low visual impacts in all other segments.	Non-significant	Poles colored sage/grey green and non-specular conductors and insulators used to reduce contrast and minimize visibility.	Non-significant
Switching Station Addition of a dominant, man-made element that contrasts sharply with surrounding cane fields with moderate viewer sensitivity from Lahainaluna Road.	Potentially significant	Landscaping with low maintenance plants installed around fenced perimeter.	Non-significant

Table 1.3-1
IMPACT SUMMARY TABLE (continued)

POTENTIAL IMPACTS	SIGNIFICANCE BEFORE MITIGATION	MITIGATION MEASURES	SIGNIFICANCE AFTER MITIGATION
4.13 TRAFFIC			
Transmission Line Short-term temporary, localized congestion and delay and potential safety considerations on North Kihei Road and at the Honoapiilani Highway/North Kihei Road intersection due to construction within roadway right-of-way.	Non-significant	Final pole locations determined with State Department of Transportation (SDOT) following SDOT and American Association of State Highway and Transportation Officials (AASHTO) guidelines. Implementation of SDOT-approved Traffic Control Plan meeting State and County regulations and incorporating such measures as two-way traffic operation whenever feasible, all lanes open during peak hours, and advance notice in posted places and newspapers.	Non-significant
Switching Station No impact	No impact	None needed.	No impact

(1) Note: Numbers preceding resource category headings denote the section of this EIS where each resource is discussed.

On April 3, 1991, the State of Hawaii, Department of Health (DOH) issued a policy relating to electric and magnetic fields from electric power lines. The policy states:

> *A prudent approach is needed at this time to regulate electric and magnetic fields around low-frequency electric power facilities, including high-voltage transmission lines. The existing research data are inconclusive and not sufficient enough for adequate, accurate risk assessment. However, the data suggest that a "prudent avoidance" approach to siting new facilities is appropriate. Where technically feasible and practical, public exposures should be minimized. Too little is presently known to be able to determine where or what rules would provide useful public-health protection.*
>
> *Implementing Actions:*
>
> *(a)* *All newly-installed power lines should be constructed with engineering controls to reduce exposure (for example, the "delta" configuration).*
>
> *(b)* *The Department of Health will continue to collect and evaluate research data on electromagnetic fields in order to be aware of significant findings with public health implications (State of Hawaii, Department of Health, 1991).*

MECO has adopted strategies consistent with the prudent avoidance approach in selecting an alignment and designing the transmission line. The alignment would be located along cane haul roads, public roadways and in remote, undeveloped areas to avoid populated areas. In addition, electric and magnetic field levels from the transmission line will be reduced by using the optimum phasing arrangement: Delta phasing for the single-circuit portion of the line (Segments 1 through 22) and like phasing for the double-circuit segment (Segment 23).

The issue of public health impacts from the magnetic fields of the proposed transmission lines and switching station remains an unresolved issue, as does the larger issue of health effects from magnetic fields produced by existing lines, wall wiring, appliances and lighting fixtures.

1.5 COMPATIBILITY WITH LAND USE PLANS AND POLICIES

The proposed project is generally consistent with State and local plans and policies, as summarized below. The relationship of the proposed action to land use plans, policies and controls is described in detail in Section 5.0.

1.5.1 Federal

There are no Federal plans or policies that directly relate to or influence the proposed action.

1.5.2 State

State plans, policies and programs that apply to the proposed action include: State land use and conservation and resource law related to land use districts; the Hawaii State Plan; the Hawaii Integrated Energy Plan and related energy plans; the Na Ala Hele Trails and Access Program; and the Coastal Zone Management Program.

The preferred alignment crosses the Agricultural District and three subzones within the Conservation District: the General, Limited and Resource Subzones. The proposed project is a permitted use in the Agricultural District; no permits or approvals are required. Locating the project within the Conservation District would require submittal of a Conservation District Use Application (CDUA) for review and approval by the Board of Land and Natural Resources (BLNR) and issuance of a permit. The project is consistent with the objectives of the Conservation District General, Limited and Resource Subzones.

The project is consistent with the Hawaii State Plan and Hawaii Integrated Energy Plan, and related energy plans inasmuch as it would provide economic, efficient and reliable electric service to existing and planned development in West Maui.

Portions of the proposed transmission line would be located within 1,000 feet of the Old Lahaina Pali trail, Maui's Demonstration Trail for the Na Ala Hele Trails and Access Program. The preferred alignment was selected after a long process of corridor analysis and evaluation, consultation with DLNR Na Ala Hele program specialists, and realignment to avoid adverse impacts to the trail. MECO conducted a computerized visual analysis to evaluate visual issues and aid in selecting the preferred alignment together with DLNR. The preferred alignment would not compromise the ability of the trail to fulfill the purpose of the Na Ala Hele program to provide recreational, cultural, religious and subsistence opportunities and help conserve Hawaii's cultural heritage and environment.

1.5.3 Maui County

The preferred alignment would be consistent with the Maui County General Plan. The project would serve existing and planned development and maintain reliable electric service to West Maui, avoid agricultural uses where possible and minimize interference with agricultural operations, not significantly affect scenic vistas and support employment and housing objectives. The project would not conflict with planned projects contained in the Lahaina Community Plan and Kihei-Makena Community Plan.

The project would be located entirely within the Maui County Agricultural zoning district and is a permitted use within that district.

The portion of the proposed transmission line located within the Maalaea Power Plant switchyard is located within the coastal zone Special Management Area (SMA), administered by Maui County. This small portion of the project would require an SMA Permit. The project is consistent with SMA policies, objectives and guidelines.

1.6 PERMITS AND APPROVALS

State and local permits and approvals required for the proposed transmission line and switching station are presented in Table 1.6-1 and described in detail in Section 5.0.

Permits and approvals would be required from various divisions of the DLNR. Approximately 4.8 miles of the proposed transmission line would be located within lands designated Conservation land use district, requiring BLNR approval and a Conservation District Use Permit from the Office of Conservation and Environmental Affairs (OCEA). Approximately 9.6 miles of the proposed transmission line would be located in State-owned lands, requiring a Use of State Lands Approval from the Land Management Division. Thirty-four archaeological sites were identified within areas surveyed for the project. All sites would be avoided during project construction. Historic Sites Review by SHPD would be required. Finally, because DLNR has authority for the Use of State Lands Approval and Conservation District Use Permit, DLNR is the accepting authority for this EIS.

Table 1.6-1
PERMITS AND APPROVALS

AGENCY/ORGANIZATION	APPROVAL/PERMIT/ACTION	ESTIMATED APPLICATION DATE	PROCESSING TIME	PUBLIC HEARING
Applicant: MECO Accepting Authority: State of Hawaii, DLNR	Draft and Final Environmental Impact Statements	April 93 EISPN December 93 DEIS March 94 FEIS	9-12 months	not required
State of Hawaii, DLNR Office of Conservation and Environmental Affairs (OCEA)	Conservation District Use Permit	October 93	6 months	not required
Maui County Planning Department	Special Management Area Permit	January 94	3-4 months	if required by Maui Planning Commission
State of Hawaii, DLNR Land Management Division	Use of State Lands Approval	October 93	6 months	if required by BLNR
State of Hawaii, DLNR Historic Preservation Division	Historic Sites Review	October 93	3 months	not required
Hawaii Public Utilities Commission (PUC)	Authorization to Construct - approval for expenditure of funds in excess of $500,000	January 94	8-10 months	if required by the PUC
State of Hawaii, DLNR	Acceptance of EIS	March 94	1 month	not required
SDOT, Highways Division	Permit to Perform Work on a State Highway	June 94	6-8 months	not required

is located within the SMA and would require an SMA Permit from Maui County, and if required review and approval by the Maui Planning Commission.

The project is estimated to cost approximately $8.0 million to $10.0 million, not including right-of-way acquisition costs. An Authorization to Construct and approval for expenditures in excess of $0.5 million would be required from the Hawaii Public Utilities Commission.

Approximately 1.1 miles of the proposed transmission line would be located within the rights-of-way of North Kihei Road and Honoapiilani Highway. Construction of these segments of the line would require a Permit to Perform Work on a State Highway from the SDOT, Highways Division.

1.7 PUBLIC, LANDOWNER, AND AGENCY CONSULTATION

The proposed project was developed, and this document prepared, after consultation and coordination with representatives of many state and local agencies, landowners, organizations and community members. The purpose of public involvement activities was to inform elected officials, landowners, agencies and the public about the project, to solicit their views and concerns, to meet agency consultation requirements and to provide opportunities for direct public involvement. Activities included official briefings, landowner and agency meetings, and two public informational meetings, as well as preparation of supporting materials, as summarized below. Section 7.0 describes the consultation process and presents a chronology of major consultations.

- Public Involvement Planning Group - established consisting of: MECO and Hawaiian Electric Company (HECO) management, engineering, land and legal department representatives; Dames & Moore, the project environmental consultant; and public involvement specialists.
    - Public Involvement Plan - prepared to clarify objectives and develop an approach for public involvement activities.
- Landowner Meetings - to discuss opportunities and constraints to locating the alignment within their properties. The following landowners/lessees were consulted: Wailuku Agribusiness/C. Brewer Properties; Pioneer Mill/AMFAC/JMB Hawaii, inc.; Bishop Estate; Alexander & Baldwin-Hawaii, Inc.; State of Hawaii, Housing Finance and Development Corporation (HFDC); Hawaiian Commercial & Sugar Company (HC&S); and Perreira Ranch Company.

- Agency Meetings - to discuss specific resources and permitting issues and identify siting constraints. The following agencies and organizations were consulted: Office of State Planning; Office of Hawaiian Affairs; U.S. Army Corps of Engineers; U.S. Fish and Wildlife Service; State Department of Education; DLNR, Historic Preservation Division; Maui County Public Works Department; Maui County Parks and Recreation Department; State Department of Transportation; Na Ala Hele Maui Citizen's Advisory Group; DLNR, Office of Conservation and Environmental Affairs; the West Maui Senior Citizens Group; and DLNR, Maui district office.
- Officials Briefings - to present the project and describe the project development process. The following groups were consulted: Maui County Mayors Office, Maui County Council, Maui County Planning director and Maui County Public Works director, Maui County Planning Commission.
- Public Meetings - to present, discuss and solicit comments on corridor alternatives (March 11 and 12, 1992) and to describe and solicit comments on selection of the preferred alignment (June 15 and 16, 1993).
- Public Consultation Period - 30-day period (May 23 through June 22, 1993) for public review and comment on the EIS Preparation Notice.
- Fact Sheets - distributed by mail and at meetings to initially announce the project (July 1991), to describe the routing study and continuing project status (March 1992), and to present the preferred alignment and announce the public meeting (May 1993).
- Mailing List - periodically updated to include additional interested parties.
- Informational Materials and Visual Aids - including regional environmental data maps and alternative corridor maps, preferred alignment maps, slide presentation and video for meetings and briefings.
- Preferred Corridor Response Form - distributed at meetings and through mailings to solicit preferences among alternatives.

SECTION 2

PROJECT DESCRIPTION

2.0 PROJECT DESCRIPTION

2.1 EXISTING POWER GENERATION AND TRANSMISSION SYSTEM

Maui Electric Company, Ltd. (MECO) provides electrical service to the residents and businesses of the tri-islands (Maui, Molokai and Lanai) which make up Maui County. Each island has its own generation and transmission system. The islands are not electrically interconnected at this time.

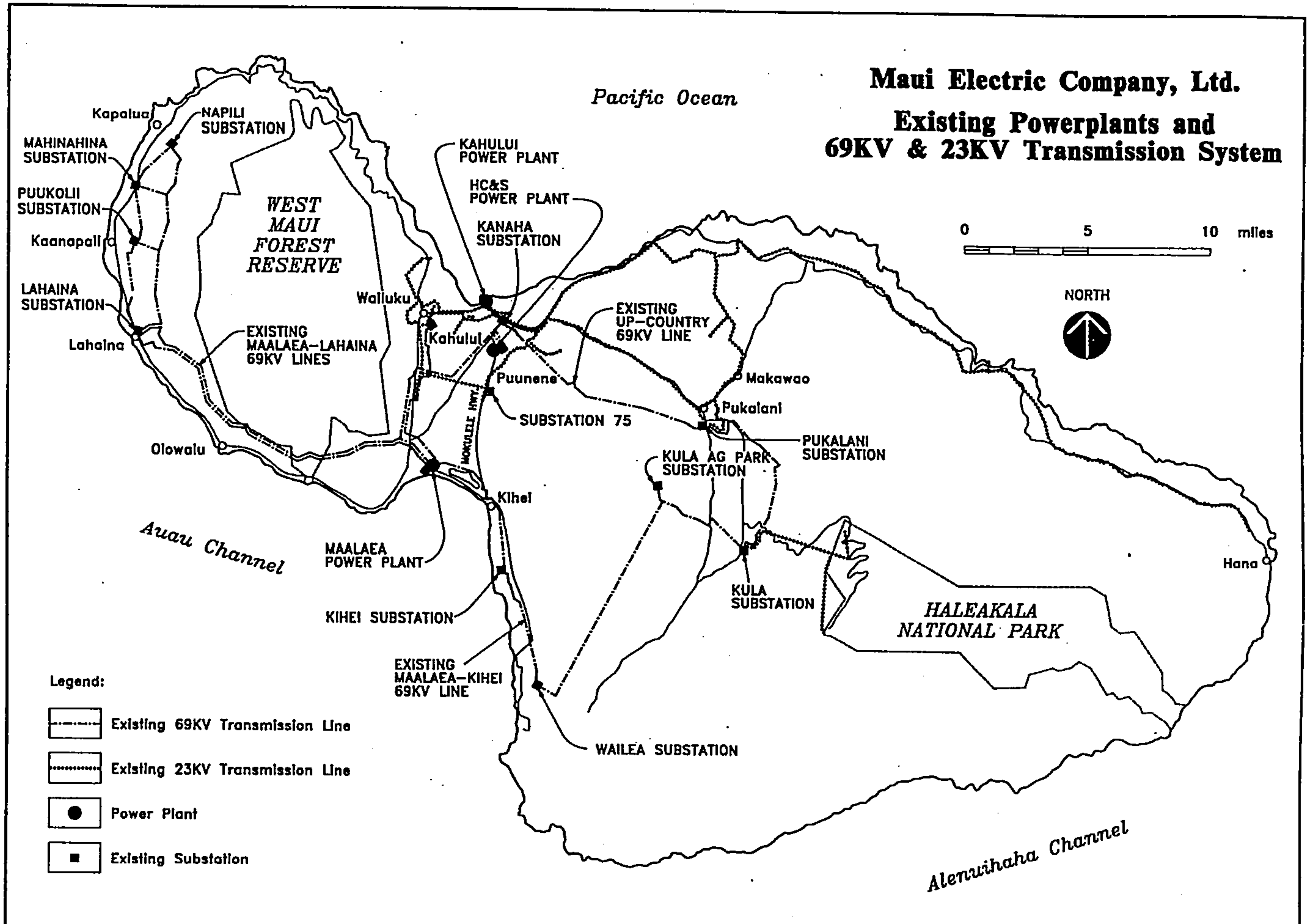
On Maui, MECO serves a population of over 91,000 residents with approximately 43,940 metered accounts. Maui County is the fastest growing county in the State. The County's population grew by 53.8 percent from 1970 to 1980 and 41.6 percent from 1980 to 1990. The island of Maui's population increase during the same period was even greater. From 1970 to 1980 Maui's population grew by 62.4 percent and increased by 45.4 percent during the period 1980 to 1990. MECO is responding to this growth by planning for additional generation and transmission capacity to meet the demand for power.

2.1.1 Generation Resources

MECO serves most of Maui's electricity requirements with its own combustion turbine and internal combustion diesel units at Maalaea (163.7 megawatt (MW) capacity) and oil-fired, steam turbine generation units at Kahului (37.6 MW capacity). Hawaiian Commercial & Sugar Company (HC&S) generates electricity through the burning of bagasse, oil or coal, and through hydro power. 16MW of power is supplied to MECO through a Power Purchase Agreement between MECO and HC&S. Currently, 17 percent of the generating capacity on Maui is supplied by MECO's Kahului Power Plant, 75 percent by MECO's Maalaea Power Plant and 8 percent by the HC&S Power Plant. Figure 2.1-1 illustrates the location of the MECO and HC&S power plants and the existing interconnecting 69 kilovolt (KV) and 23KV transmission systems. Table 2.1-1 shows the ratings of MECO and HC&S generating units.

2.1.2 Island-Wide Transmission and Distribution System

As power is generated, transformers step up the voltage to either 23KV or 69KV. The power is then transmitted through the 23KV and 69KV transmission grids. These higher voltages allow for more efficient transmission of large amounts of power over long distances to the substations at major load centers. Local area distribution substations reduce the voltage from 69KV and 23KV to MECO's



Maui Electric Company, Ltd.
Existing Powerplants and
69KV & 23KV Transmission System
Pacific Ocean
0
5
10
miles
NORTH
Kapalua
NAPILI SUBSTATION
MAHINAHINA SUBSTATION
PUUKOLII SUBSTATION
Kaanapali
LAHAINA SUBSTATION
Lahaina
WEST MAUI FOREST RESERVE
EXISTING MAALAEA–LAHAINA 69KV LINES
Olowalu
Wailuku
Kahului
KAHULUI POWER PLANT
HC&S POWER PLANT
KANAHA SUBSTATION
EXISTING UP-COUNTRY 69KV LINE
Puunene
SUBSTATION 75
MOKULELE HWY
Makawao
Pukalani
PUKALANI SUBSTATION
KULA AG PARK SUBSTATION
Kihei
KULA SUBSTATION
HALEAKALA NATIONAL PARK
Hana
Auau Channel
MAALAEA POWER PLANT
KIHEI SUBSTATION
EXISTING MAALAEA–KIHEI 69KV LINE
WAILEA SUBSTATION
Alenuihaha Channel
Legend:
Existing 69KV Transmission Line
Existing 23KV Transmission Line
Power Plant
Existing Substation

Figure 2.1-1

Table 2.1-1
MECO GENERATING UNIT RATINGS

POWER PLANT/ GENERATING UNITS	UNIT TYPE	RESERVE CAPACITY (MW)
Kahului Power Plant		
Unit No. 1	Steam	5.90
Unit No. 2	"	6.00
Unit No. 3	"	12.70
Unit No. 4	"	13.00
		Subtotal 37.60
Maalaea Power Plant		
Unit No. 1	Diesel	2.75
Unit No. 2	"	2.75
Unit No. 3	"	2.75
Unit No. 4	"	6.16
Unit No. 5	"	6.16
Unit No. 6	"	6.16
Unit No. 7	"	6.16
Unit No. 8	"	6.16
Unit No. 9	"	6.16
Unit No. 10	"	13.75
Unit No. 11	"	13.75
Unit No. 12	"	13.75
Unit No. 13	"	13.75
Unit No. X1	"	2.75
Unit No. X2	"	2.75
Unit No. 14	Combustion Turbine	20.00
Unit No. 15	Steam Turbine	18.00
Unit No. 16	Combustion Turbine	20.00
		Subtotal 163.70
HC&S/Puunene Interchange[1]		
Combined Generation		Subtotal 16.00
TOTAL FIRM GENERATING CAPACITY		217.30 MW

[1] Power purchased by MECO

Source: MECO Engineering Department, January 1992

12KV and 4KV local distribution voltage. Distribution feeders typically fan out from the 12KV and 4KV distribution substations along streets and roads either overhead or, where necessary, underground. Finally, individual customers are connected to the distribution system through small step-down distribution transformers sized for the particular load and voltage required by the customer. These transformers are located on poles or pads near the facilities they serve.

The 69KV system consists of 81 circuit miles of overhead lines and delivers power to West Maui (Lahaina to Napili) via two single-circuit 69KV lines, to South Maui (Kihei and Wailea) via a single-circuit line adjacent to the Piilani Highway and Up-Country (Kula and Pukalani) via a single-circuit line which forms a loop connecting Kanaha, Pukalani, Kula, Wailea, Kihei and the Maalaea Power Plant. The overhead system is designed to withstand most environmental hazards and remain continuously in service.

The 23KV system consists of 137 circuit miles of overhead lines and delivers power to Central Maui (Kahului, Kanaha, Wailuku, Waiinu) and East Maui (Paia, Makawao, Haiku, Hana).

MECO's distribution system contains nearly 730 circuit miles of 12KV and lower voltage feeders. This extensive network delivers power at utilization voltage to more than 43,000 customers. (HECO, 1992b).

2.2 PROJECT PURPOSE AND NEED

2.2.1 Summary

MECO has conducted system planning studies to determine West Maui transmission system needs over a five year period (1990-1995). The studies identified transmission line and substation additions necessary to correct existing and future system limitations and problems in West Maui. The Maalaea-Lahaina Third 69KV Transmission Line Project was identified as a critical system addition required to maintain electric service to major West Maui load centers.

The Maalaea-Lahaina Third 69KV Transmission Line Project is needed to:

- **Maintain reliable electric service to West Maui in the event that one or both of the existing 69KV lines from the Maalaea Power Plant to the region is out of service.**

At present, two 69KV lines carry electricity to West Maui. If one of the lines is out of service, the remaining line could be overloaded, potentially resulting in a blackout of West Maui. Addition of a third 69KV line and a new switching station would enable West Maui to be served by two lines if one is out of service.The existing two lines share a common power corridor. Because the lines are close to one another, an event such as high winds could result in a broken conductor on one line being thrown onto the adjacent line causing a blackout of West Maui. A second, physically separate power corridor, which would be provided by the new Maalaea-Lahaina Third 69KV Transmission Line Project, would provide an alternate path for power flow to West Maui in the event that one of the two existing lines is out of service.

- **Provide additional transmission capacity to serve load growth in West Maui.**
  The new line will meet the demand for power in West Maui resulting from existing and planned resort, commercial and residential developments.

2.2.2 Existing West Maui Transmission System

The West Maui transmission system currently consists of two wood-pole, single-circuit 69KV transmission lines from the Maalaea Power Plant to Lahaina. The easements for the two existing 69KV lines are located in a single power corridor with separation between the lines averaging 50 feet. In some areas, especially in the West Maui mountains, separation is less than 30 feet due to steep terrain, narrow ridges and numerous gulch crossings.

The two existing 69KV lines parallel each other to the vicinity of Wainee (a small community near Lahaina) where the lines separate. One circuit proceeds makai to the Lahaina Substation adjacent to Pioneer Mill. The other circuit continues westward another mile before turning makai into the Lahaina Substation. The two lines exit the Lahaina Substation and proceed on separate routes: one follows a mauka route with line extensions connecting Puukolii, Mahinahina, and Napili Substations serving the Lahaina to Kapalua areas; the other circuit follows a makai route to the same substations (Figure 2.1-1).

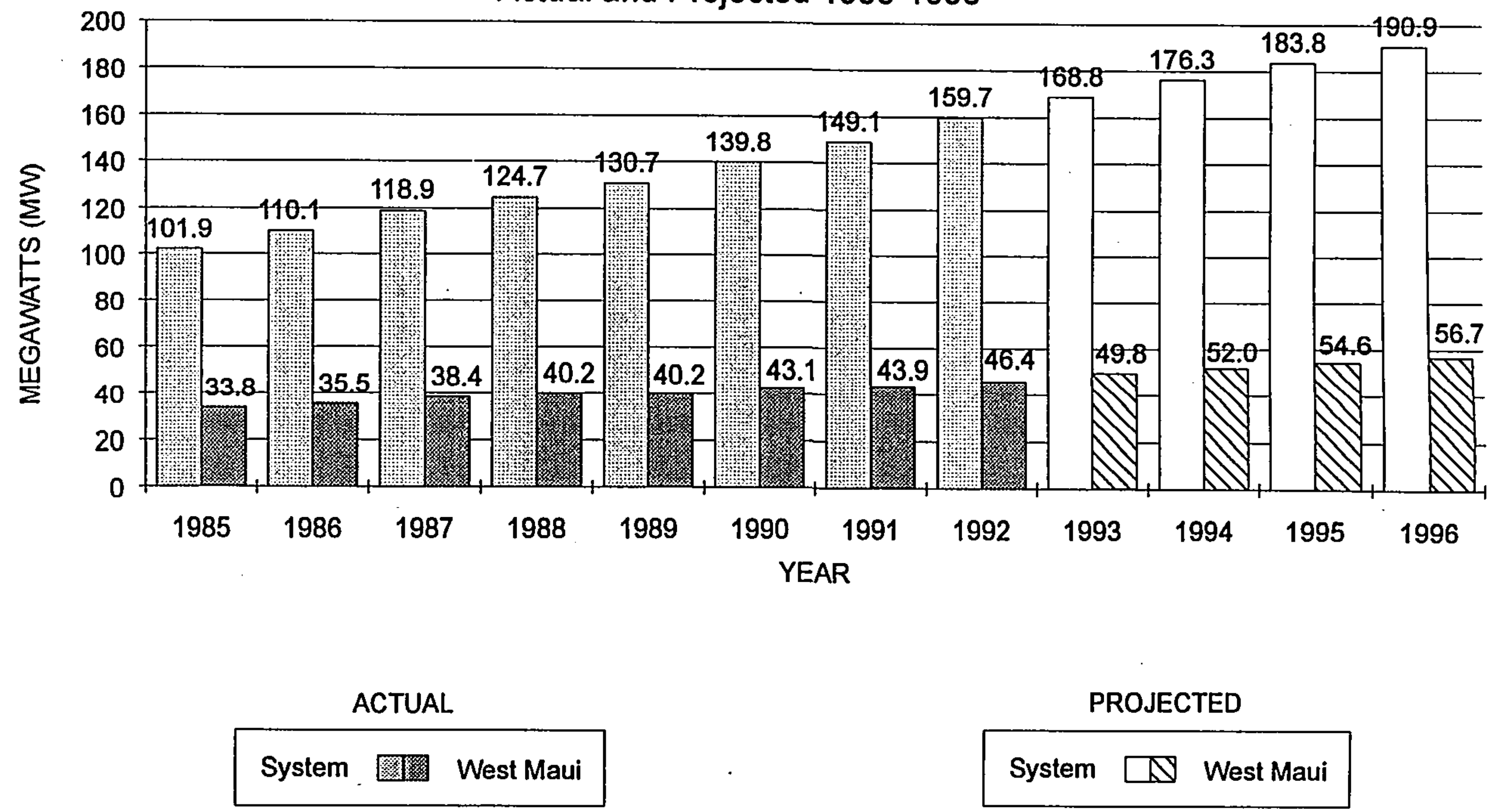
2.2.3 Existing and Future Loads

West Maui has experienced steady load growth since 1985, due in large part to new resort developments. Figure 2.2-1 shows actual peak electrical loads for the period 1985 through 1992 and

Figure 2.2-1

WEST MAUI AND SYSTEM PEAK ELECTRICAL LOADS

Actual and Projected 1985-1996



projected loads for the next four years (1993 to 1996) for West Maui. West Maui peak electrical load totaled 46.4 MW in 1992, or about one-third of the total MECO system peak load.

From 1989 through 1992, West Maui load growth increased by 6.2 MW from the 1989 peak, an increase of 15.4 percent. Between 1991 and 1992, peak load increased by 2.5 MW or 5.7 percent. This increase was largely attributable to completion of the Ritz Carlton Hotel.

A forecast of future loads is updated annually by MECO's Forecast Planning Committee. Factors considered in the load forecasts included historical data on loads and population growth, known or projected future development, and increases in population. Load forecasts are typically prepared for five- and 20-year periods.

Figure 2.2-1 shows that future peak loads are expected to grow approximately 17.7 percent between 1992 and 1995 in West Maui. The largest increase was predicted to occur in 1993 with a 3.4 MW or 7.3 percent increase over 1992. This increase is attributable to several major development projects including: Housing, Finance and Development Corporation (HFDC) Phase I, Lahaina Shopping Center, and Whaler's Village expansion. Beyond 1995, load growth is expected to level out with approximately a four percent per year increase from 1996 to 2009.

2.2.4 West Maui System Reliability

<u>Transmission Line Separation</u>

The two existing lines were constructed in 1957 and 1970. The lines are located parallel to each other in a single 100-foot-wide corridor. In some locations, due to constraints imposed by rugged terrain, the lines are less than 30 feet apart. While there has been a good record of electric service provided by these lines, there have been incidents where high winds have broken insulator hardware resulting in a downed line. In one instance, a downed line was thrown by high winds across the adjacent 69KV line resulting in a complete loss of power to West Maui.

There is a possibility that if a similar incident occurred today during a high demand period, it could result in over-frequency of the entire MECO system with possible loss of generation, since the load in West Maui constitutes almost one third of current overall system load for the island of Maui.

Separation between transmission lines can therefore be important to maintaining reliable service. The new third 69KV line must be located with a prudent separation from the two existing lines to avoid potential power outages from a downed line coming in contact with an adjacent line.

MECO is using a separation criterion of 250 feet or greater for the new line. This criterion is based on experience operating the two existing lines, as well as and the need to enhance West Maui system reliability.

<u>Transmission Line Capacity</u>

Under normal operating conditions, power generated at the Maalaea Power Plant flows through both existing 69KV lines serving West Maui. As projected loads increase, additional power needs to be generated and the amount of power flowing through the existing lines increases. System studies concluded that by 1995, given projected load growth in West Maui, if a third 69KV line is not in service and an unexpected outage occurs on either of the existing 69KV lines, there is a very high likelihood that the remaining transmission line in service could overload resulting in a blackout of West Maui.

The two existing 69KV lines from Maalaea to Lahaina are 336.4 KCM AAC (thousand circular mils, all-aluminum conductor) conductors with a normal capacity rating of 515 amps or 61.6 MVA (mega volts amperes) at 69KV operation. However, the capacity of the lines must be derated due to the age of the conductors (over 23 years old). If one of the existing 69KV lines is taken out of service (either due to an emergency condition or for maintenance purposes) the power flow through the remaining line will exceed its capacity rating by 1995.

The third 69KV line would provide additional transmission line capacity to West Maui to:

1) Maintain adequate voltage to serve existing and future loads; and
2) Ensure that, if one of the existing lines is out of service, sufficient transmission capacity remains to serve West Maui.

Until the new line can be constructed, interim improvements to the West Maui system are needed to maintain adequate voltages. MECO is installing capacitor banks (devices to boost voltage) at

Lahaina and Mahinahina Substations to provide voltage support to the West Maui system until the new Maalaea-Lahaina third 69KV transmission line can be constructed.

2.3 REQUIRED FACILITIES AND ACTIVITIES

The Maalaea-Lahaina Third 69KV Transmission Line Project will consist of the following facilities and activities:

1) Construction of 15.0 miles of new single-circuit 69KV transmission line, constructed on steel poles, from the Maalaea Power Plant Switching Station to the new Lahainaluna Switching Station;
2) Modification of the Maalaea Power Plant Switching Station to accommodate new electrical equipment;
3) Construction of the new Lahainaluna Switching Station approximately one mile mauka of the Pioneer Mill Factory off of Lahainaluna Road near a County water storage tank; and
4) Construction of 1,000 feet (0.2 mile) of new double-circuit 69KV transmission line, on steel poles, from the Lahainaluna Switching Station to a point of interconnection with the existing Puukolii and Lahaina 69KV lines.

The Maalaea-Lahaina third 69KV transmission line and Lahainaluna Switching Station are scheduled to be operational in 1996.

2.4 PROPOSED LOCATION

MECO conducted a detailed routing study to evaluate opportunities and constraints of alternative locations for the proposed transmission line. The routing study established a study area (Figure 2.4-1) for which patterns of land use, ownership and regulation, as well as biological, archaeological, earth and water resources, were evaluated. In addition, terrain and slope constraints were examined and a visibility analysis was conducted to aid in determining potential visibility of alternative line locations from the Lahaina Pali Trail and to help select a preferred corridor. Other factors considered in the identification and evaluation of alternative line locations included landowner, agency and public comments and concerns; MECO's existing transmission system; and potential environmental impacts related to transmission line construction and maintenance, including access, constructability, wind loading and cost.

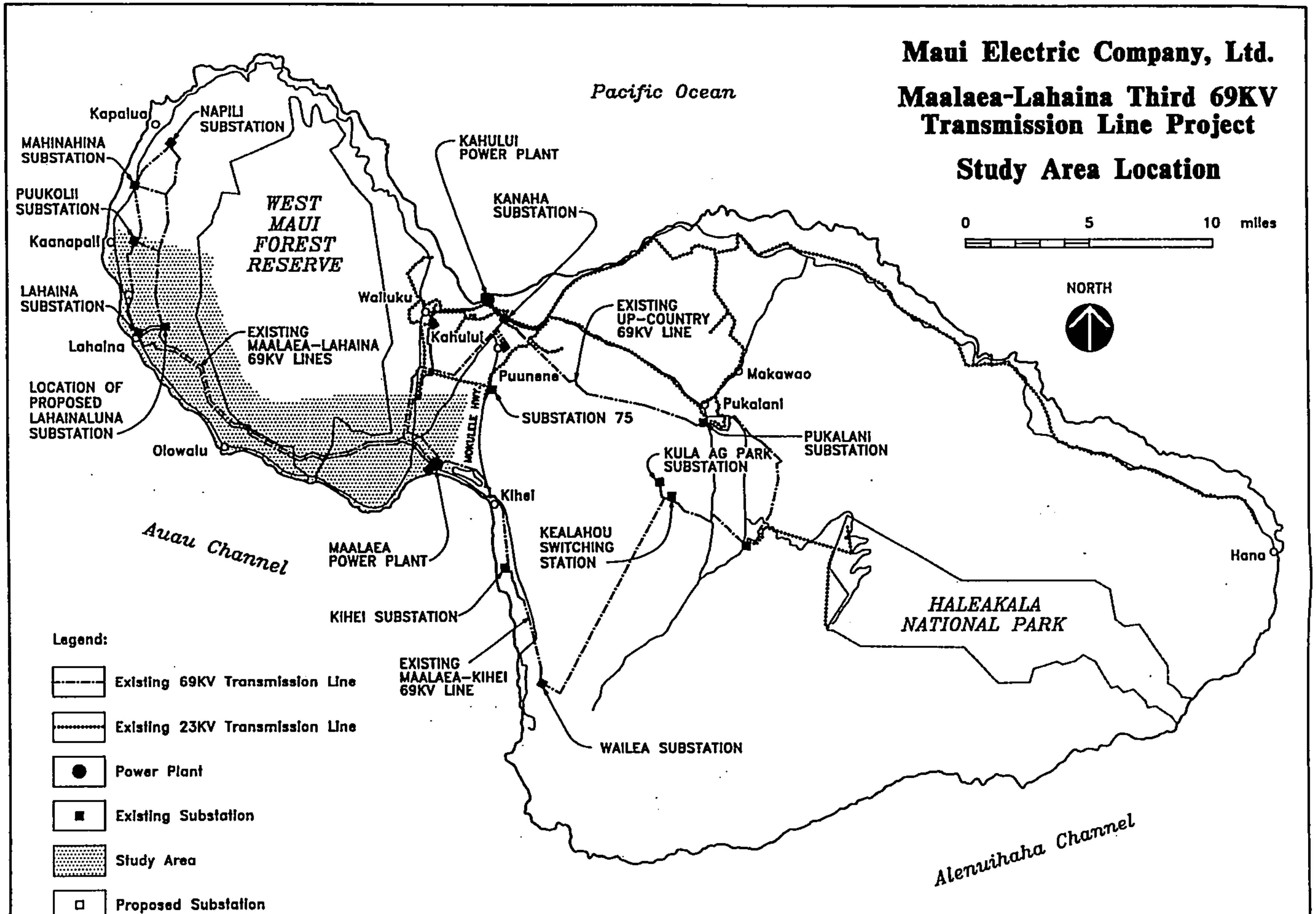
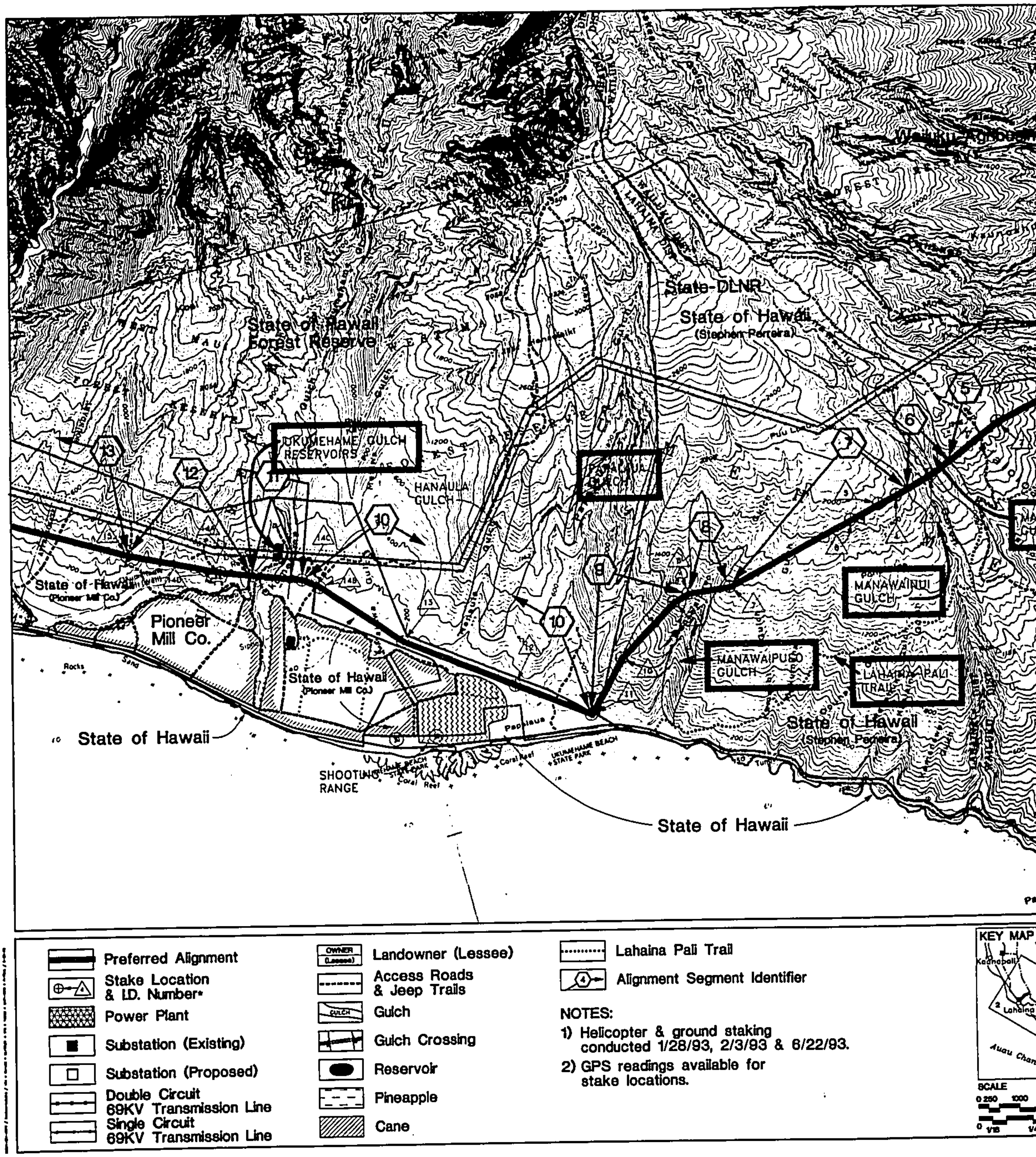

Maui Electric Company, Ltd.
Maalaea-Lahaina Third 69KV Transmission Line Project
Study Area Location
0
5
10
miles
NORTH
Pacific Ocean
Kapalua
NAPILI SUBSTATION
MAHINAHINA SUBSTATION
PUUKOLII SUBSTATION
Kaanapali
WEST MAUI FOREST RESERVE
LAHAINA SUBSTATION
Lahaina
EXISTING MAALAEA-LAHAINA 69KV LINES
LOCATION OF PROPOSED LAHAINALUNA SUBSTATION
Olowalu
Wailuku
Kahului
KAHULUI POWER PLANT
KANAHA SUBSTATION
EXISTING UP-COUNTRY 69KV LINE
Puunene
SUBSTATION 75
MOKULELE HWY.
Makawao
Pukalani
PUKALANI SUBSTATION
KULA AG PARK SUBSTATION
Kihei
KEALAHOU SWITCHING STATION
MAALAEA POWER PLANT
KIHEI SUBSTATION
EXISTING MAALAEA-KIHEI 69KV LINE
WAILEA SUBSTATION
Hana
HALEAKALA NATIONAL PARK
Auau Channel
Alenuihaha Channel
Legend:
Existing 69KV Transmission Line
Existing 23KV Transmission Line
Power Plant
Existing Substation
Study Area
Proposed Substation

Figure 2.4-1

The preferred alignment is shown on Figure 2.4-2 (Maps 1 & 2). The maps also show landownership and major land uses such as sugarcane.The new transmission line would begin at the Maalaea Power Plant and proceed along North Kihei Road to the intersection of North Kihei Road and Honoapiilani Highway. The line would cross Honoapiilani Highway, proceed through land owned by Wailuku Agribusiness/C. Brewer Properties, and continue up a ridge and over State-owned land in the West Maui mountains, crossing three major gulches before proceeding makai to the base of Papalaua Gulch. From this point, the line would proceed west at an elevation between 200 and 400 feet towards Lahaina. The new line would be located makai of the existing 69KV lines in kiawe-scrub and would avoid crossing cane fields with the exception of one 1,200-foot long segment of Pioneer Mill land near Olowalu. From Olowalu, the line proceeds through State-owned lands leased to Pioneer Mill above the old Olowalu Sanitary Landfill. In the vicinity of Puu Hipa, the new line would cross to the mauka side of the existing 69KV lines to avoid crossing cane lands in the vicinity of Launiupoko. To avoid physically crossing the existing lines, the new line would be placed underground for a distance of approximately 1,000 feet. The underground crossing of the existing lines would ensure that reliability would not be compromised by having lines in conflict with one another. If one or both of the existing lines were to fall, they would not come in contact with the conductors of the new third line. PUC General Order No.6 Section II stipulates requirements for all overhead lines including the avoidance of conflicts with existing lines.

From the Puu Hipa underground crossing, the new line would proceed through lands owned by Pioneer Mill, mauka of the existing lines, in a westerly direction above cane fields to Piilani Ditch Road. At this point, the line would proceed through Bishop Estate land along approximately one mile of Piilani Ditch Road (a cane haul road) to a new two- to three-acre switching station site set back from Lahainaluna Road. The switching station site is currently owned by Bishop Estate. MECO is in the process of acquiring the property for development of the switching station. The total distance of the single-circuit 69KV line from the Maalaea Power Plant to its termination at the proposed Lahainaluna Switching Station is approximately 15.0 miles. From the switching station, a 1,000-foot long segment of double-circuit 69KV line is required to interconnect to the existing 69KV transmission system at the existing Puukolii and Lahaina 69KV lines. The total project distance is approximately 15.2 miles.



State of Hawaii Forest Reserve
State-DLNR
State of Hawaii (Stephen Perreira)
UKUMEHAME GULCH RESERVOIRS
HANAULA GULCH
PAPALAUA GULCH
MANAWAINUI GULCH
MANAWAIPUEO GULCH
LAHAINA PALI TRAIL
State of Hawaii (Pioneer Mill Co.)
Pioneer Mill Co.
State of Hawaii (Pioneer Mill Co.)
State of Hawaii
SHOOTING RANGE
State of Hawaii
State of Hawaii (Stephen Perreira)
Preferred Alignment
Stake Location & I.D. Number*
Power Plant
Substation (Existing)
Substation (Proposed)
Double Circuit 69KV Transmission Line
Single Circuit 69KV Transmission Line
Landowner (Lessee)
Access Roads & Jeep Trails
Gulch
Gulch Crossing
Reservoir
Pineapple
Cane
Lahaina Pali Trail
Alignment Segment Identifier
NOTES:
1) Helicopter & ground staking conducted 1/28/93, 2/3/93 & 6/22/93.
2) GPS readings available for stake locations.
KEY MAP
SCALE

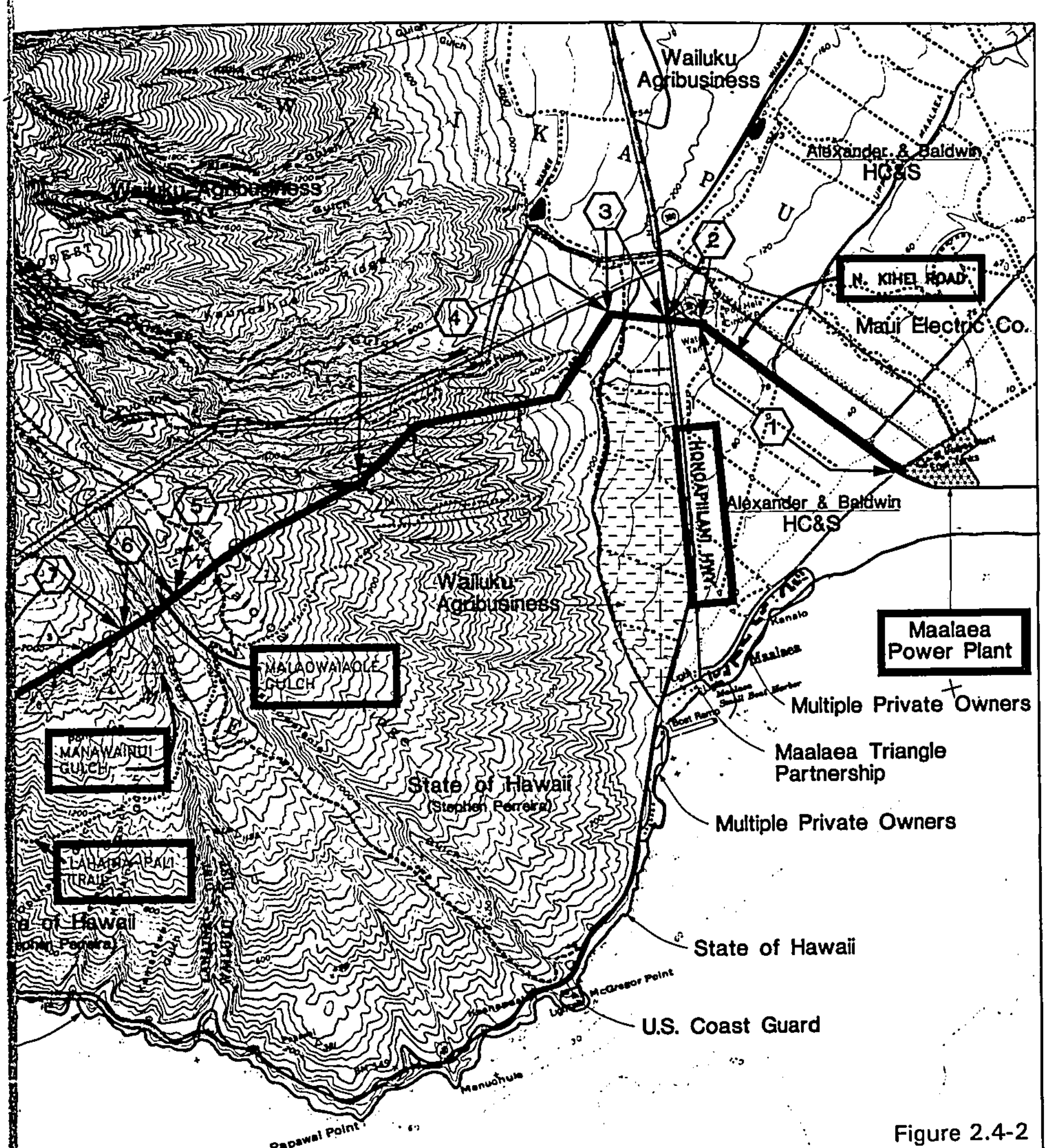
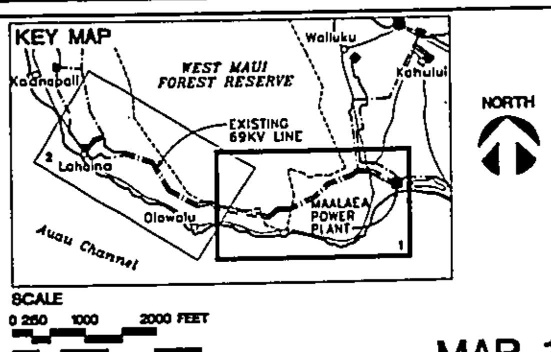


Figure 2.4-2

/93.



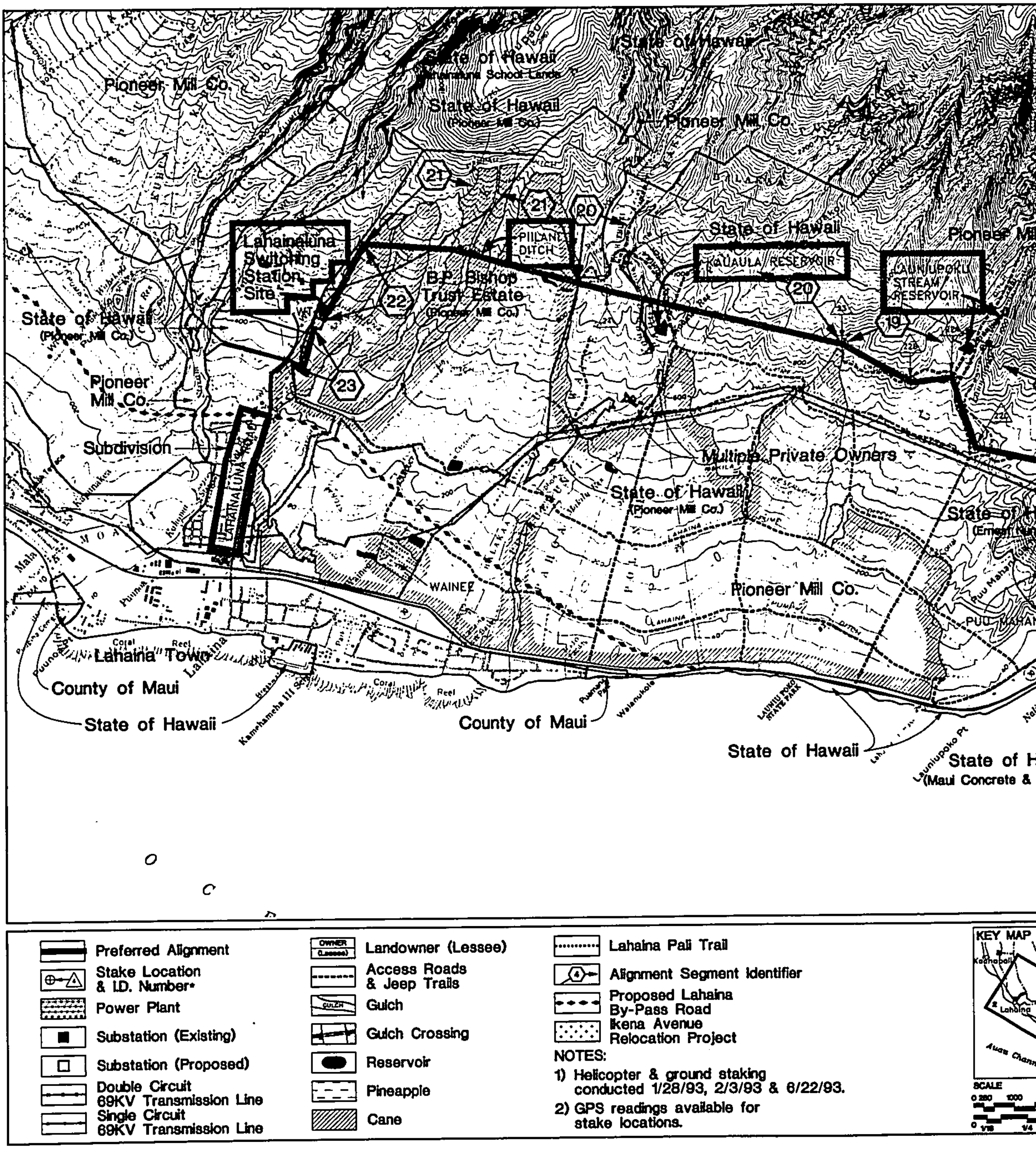
MAP 1

Preferred Alignment

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

DAMES & MOORE



Pioneer Mill Co.
State of Hawaii
Lahainaluna School Lands
State of Hawaii
(Pioneer Mill Co.)
State of Hawaii
Pioneer Mill Co.
21
21
20
Lahainaluna Switching Station Site
PIILANI DITCH
State of Hawaii
KAUAULA RESERVOIR
LAUNIUPOKO STREAM RESERVOIR
Pioneer Mi
B.P. Bishop Trust Estate
(Pioneer Mill Co.)
22
20
19
State of Hawaii
(Pioneer Mill Co.)
Pioneer Mill Co.
23
Subdivision
Multiple Private Owners
LAHAINALUNA ROAD
State of Hawaii
(Pioneer Mill Co.)
WAINEE
Pioneer Mill Co.
Lahaina Town
County of Maui
State of Hawaii
County of Maui
State of Hawaii
State of H
(Maui Concrete &
Preferred Alignment
Stake Location & I.D. Number*
Power Plant
Substation (Existing)
Substation (Proposed)
Double Circuit 69KV Transmission Line
Single Circuit 69KV Transmission Line
Landowner (Lessee)
Access Roads & Jeep Trails
Gulch
Gulch Crossing
Reservoir
Pineapple
Cane
Lahaina Pali Trail
Alignment Segment Identifier
Proposed Lahaina By-Pass Road
Ikena Avenue Relocation Project
NOTES:
1) Helicopter & ground staking conducted 1/28/93, 2/3/93 & 6/22/93.
2) GPS readings available for stake locations.
KEY MAP
SCALE

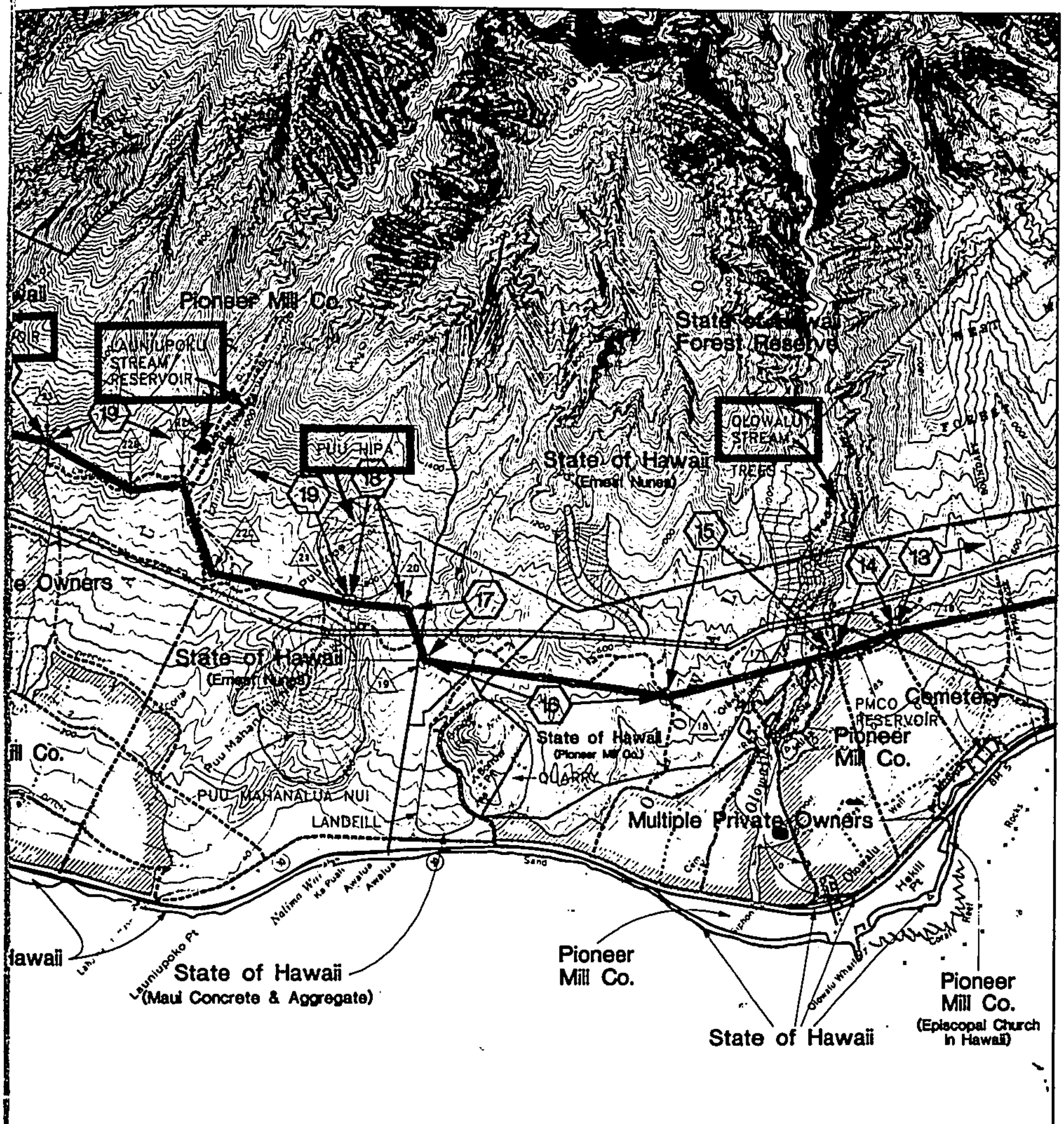
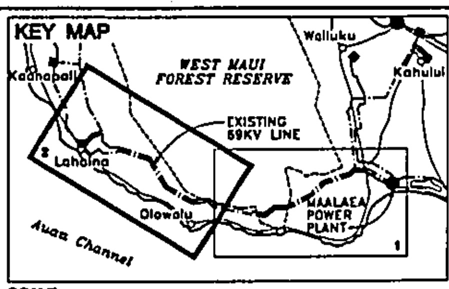


Figure 2.4-2



2/93.

SCALE
0 250 1000 2000 FEET
0 1/16 1/4 1/2 MILE

NORTH

MAP 2

Preferred Alignment

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

DAMES & MOORE

Table 2.4-1 presents a description of the alignment segments plus the elevation, distance, ownership and State land use district of lands crossed by the preferred alignment segments.

2.5 ENGINEERING DESCRIPTION

2.5.1 Electrical Configuration

Design construction, operation and maintenance of the Maalaea-Lahaina third 69KV transmission line would be in accordance with MECO and State of Hawaii standards for safety and protection of the public, landowners and property. Requirements of PUC General Order No.6 (Rules for Overhead Electric Line Construction) govern transmission line design. The proposed transmission line would be constructed on steel poles to a 138KV standard configuration. Table 2.5-1 summarizes the design characteristics of the proposed transmission line. The new poles would be placed along new rights-of-way between 50 and 75 feet wide. The new line would be located more than 250 feet makai of the existing transmission lines between the Maalaea Power Plant and Puu Hipa. Near Puu Hipa a 1,050-foot-long segment would be placed underground where the new line would cross the two existing 69KV lines. The new line would proceed west and mauka of the existing transmission lines to the site of the new Lahainaluna Switching Station.

2.5.2 Poles

Single, self-supporting, tapered-shaft, tubular steel poles would be used in moderate to level terrain. H-Frame or triple-pole configurations would be used for gulch crossings and in areas of steep or rugged terrain. A 1,000-foot-long segment of double-circuit pole would be used from the Lahainaluna Switching Station to the point of interconnection with the existing 69KV Puukolii and Lahaina transmission lines. The poles would be designed to withstand winds of 100 miles per hour (mph). Steel pole structure types and electrical configurations which would be used are shown in Figure 2.5-1.

Steel poles are typically custom designed to specifications reflecting factors where the pole would be installed which may include terrain, the lateral and resultant tension forces of the conductor on the pole, and soil conditions which influence whether the pole is direct-buried or requires a pier type foundation. Steel poles come in two or three sections and weigh between 3,000 and 7,000 pounds. The typical diameter of the base of the steel pole varies from 30 inches to 40 inches.

Table 2.4-1
ALIGNMENT SEGMENTS

Segment No.	Description	Elevation (feet)	Approximate Distance	Owner (Lessee)	State Land Use District
1	Maalaea Power Plant Switching Station - Right side of N. Kihei Road to intersection of Honoapiilani Highway	EL 10 to 140	4,900 ft.	State Department of Transportation	Agriculture
2	N. Kihei Road - Honoapiilani Highway crossing	EL 140	650 ft.	State Department of Transportation	Agriculture
3	Wailuku Ag hauler road across Wailuku Ag Property	EL 160 to 200	820 ft.	C. Brewer/ Wailuku Agribusiness	Agriculture
4	Crosses low-land kiawe scrub, up unnamed ridge	EL 200 to 1,200	6,500 ft. (4,500 Resource) (2,000 Ag)	State/DLNR	Conservation Resource Subzone Agriculture
5	Unnamed ridge across 4WD access road to edge of Malalowaiaole Gulch	EL 1,200 to 1,900	4,200 ft. (3,100 Resource) (1,100 General)	State/DLNR	Conservation Resource and General Subzones
6	Malalowaiaole Gulch crossing and Manawainui Gulch crossing	EL 1,900 to 1,800	Malawaiaole 500 ft. (General) Manawainui 800 ft. (Limited)	State/DLNR	Conservation General and Limited Subzones
7	Grassland/Scrub - Manawainui Gulch to Manawaipueo Gulch	EL 1,800 to 1,400	5,200 ft.	State/DLNR	Conservation General Subzone
8	Manawaipueo Gulch crossing	EL 1,400	700 ft.	State/DLNR	Conservation General Subzone
9	Manawaipueo Gulch makai to kiawe tree covered area, beginning of Papalaua Gulch	EL 1,400 to 200	3,500 ft.	State/DLNR	Conservation General and Resource Subzones
10	Papalaua Gulch mauka of shooting range and cane fields to Ukumehame Stream/Gulch	EL 200	7,900 ft. (3,500 General) (4,400 Ag)	State/DLNR & Pioneer Mill	Conservation General Subzone & Agriculture
11	Ukumehame Stream/Gulch, crossing makai of Ukumehame reservoirs and mauka of cane fields	EL 200	1,200 ft.	Pioneer Mill	Agriculture
12	Ukumehame Stream/Gulch to dirt access road mauka of cane fields	EL 400	3,200 ft.	State (Pioneer Mill)	Agriculture

Table 2.4-1 (cont'd)
ALIGNMENT SEGMENTS

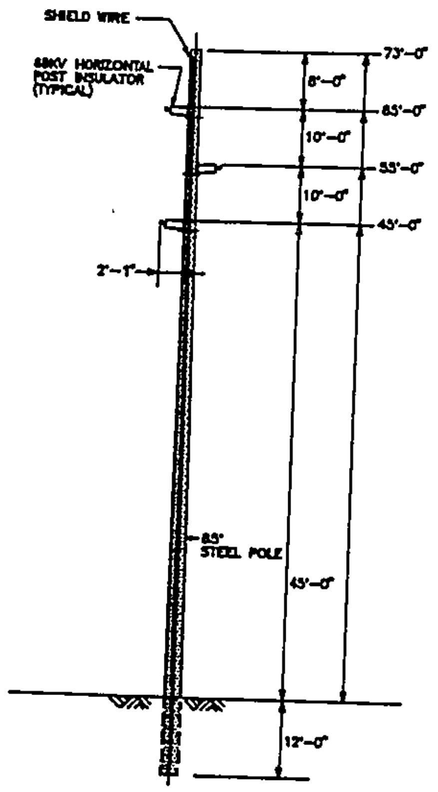
Segment No.	Description	Elevation (feet)	Approximate Distance	Owner (Lessee)	State Land Use District
13	Access road across cane field road near Olowalu Stream	EL 320	6,000 ft.	State (Pioneer Mill)	Agriculture
14	Pioneer Mill cane field crossing mauka of reservoir. Field edge road to field edge road	EL 320	1,200 ft.	State (Pioneer Mill) Pioneer Mill	Agriculture
15	Pioneer Mill field edge road/Olowalu to access road 2,000 ft mauka of cane - crosses scrub vegetation.	EL 400	3,400 ft.	Pioneer Mill and State (Pioneer Mill)	Conservation Resource Subzone & Agriculture
16	Access road to plateau mauka of quarry - crosses scrub vegetation.	EL 400 to 520	4,800 ft.	State (Pioneer Mill)	Agriculture
17	Underground crossing of existing 69KV lines - near Puu Hipa	EL 520 to 600	1,000 ft.	Pioneer Mill	Agriculture
18	From underground crossing to Puu Hipa máuka of access road	EL 600 to 640	1,000 ft.	Pioneer Mill	Agriculture
19	Puu Hipa across Launiupoko Stream to access road mauka of existing transmission lines	EL 640 to 940	7,400 ft.	Pioneer Mill	Agriculture
20	Access road mauka of cane across scrub veg. and Kauaula Stream to Piilani Ditch Road edge of cane	EL 940 to 1,000	6,600 ft.	Pioneer Mill	Agriculture
21	Piilani Ditch Road across cane to Bishop Estate property boundary	EL 940 to 840	5,400 ft.	Bishop Estate (Pioneer Mill)	Agriculture
22	From Piilani Ditch Road makai along cane field edge road and Bishop Estate property boundary to Lahainaluna Switching Station site	EL 840 to 460	2,100 ft.	Bishop Estate (Pioneer Mill)	Agriculture
23	From Lahainaluna Switching Station Double Circuit Line to point of interconnection with existing Puukolii and Lahaina 69KV lines	EL 460 to 320	1,000 ft.	Bishop Estate (Pioneer Mill)	Agriculture
	Total Approximate Distance		79,970 ft. (15.2 miles)		

Table 2.5-1
MAALAEA-LAHAINA THIRD 69KV TRANSMISSION LINE DESIGN CHARACTERISTICS

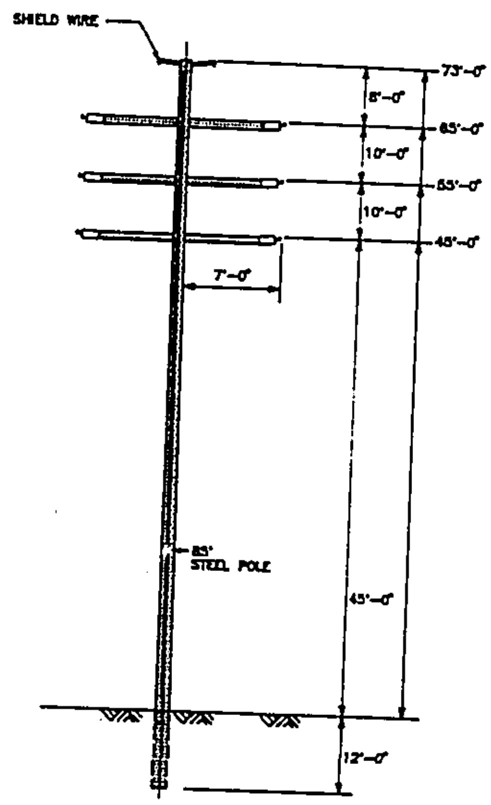
ELEMENTS	UNITS
Line length	15.2 Miles
Type of Structure	Single steel poles & double H-frame steel poles (long spans)
Structure height	60-85 feet above ground (varies according to terrain and span length)
Structure weight	3,000 to 7,000 pounds
Structure foundation type	Direct buried, pier or caisson
Average foundation depth	10 to 14 feet - Direct Buried 15 to 20 feet - Pier Foundation
Average Span Length	
• Single Pole	400 to 600 feet
• Double Pole	600 to 1,000 feet
• Triple Pole	1,000 feet to longer spans, if needed, depending on terrain or gulch crossings
Number of structures per mile	6 to 10 (approx. 150 total poles)
Right-of-way width	50 to 75 feet (varies)
69KV conductor configuration	
• Bundle description	One conductor per phase (three phases per circuit)
• Size and type	652.4 kcmil[1] AAAC "ELGIN"[2]
• Ground clearance	30 to 40 ft
• Shield wire	195.7 kcmil[1] AAAC "AMHERST"[3]
Normal operating voltage	69,000 volts AC (69KV) ±5 percent
69KV conductor thermal limit	89.0 MVA normal (745 amps) 103.4 MVA emergency (865 amps)
Winding loading factor	
• Horizontal pressure	25.6 pounds per square foot
• Wind speed	100 mph
Underground Transmission Cable	
• Purpose	Crossing of existing 69KV lines
• Length	Approximate 1,000 feet
• Cable type	69KV solid dielectric cable, 3 single phase cables required with spare duct
• Cable depth	3 to 5 feet deep - 3-foot wide trench, with concrete ducts covered with thermal backfill, concrete slab and soil

1 kcmil - cross-sectional measure of the conductor area in thousands of circular mils
2 "ELGIN" - aluminum industry standard code for the conductor and size of strands
3 "AMHERST" - aluminum industry standard code for the shield wire and size of strands

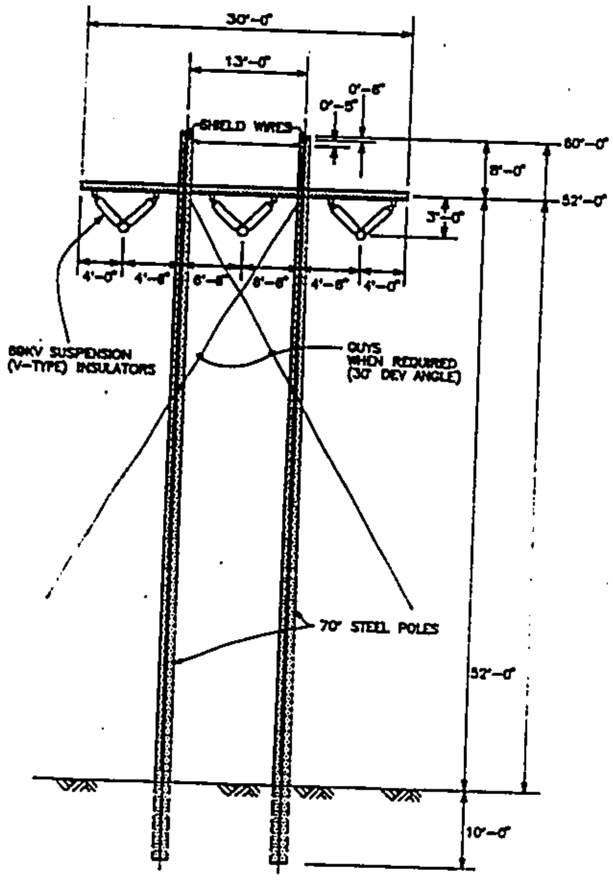
69KV STEEL POLE STRUCTURE TYPES AND ELECTRICAL CONFIGURATIONS



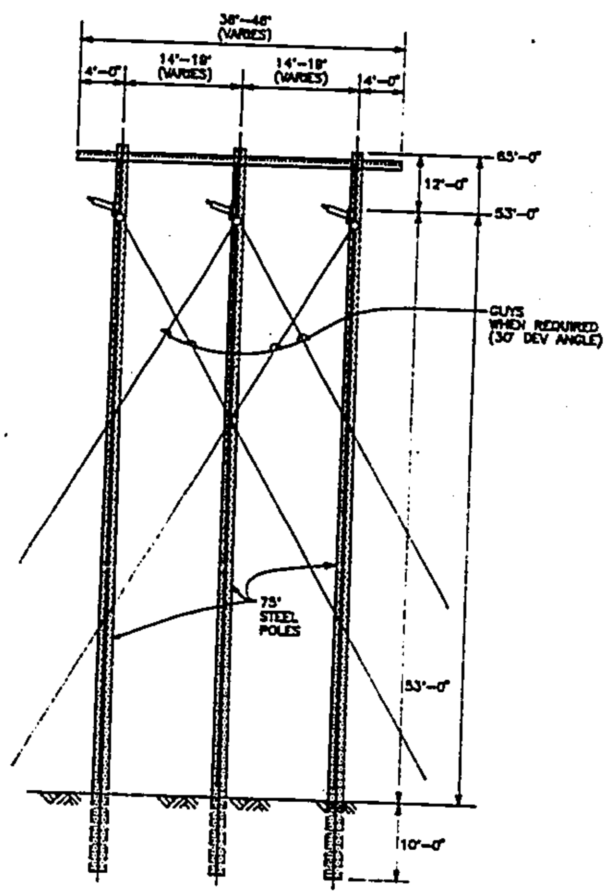
SINGLE CIRCUIT 69KV
(Typical Span 400–600ft.)



DOUBLE CIRCUIT 69KV
(Typical Span 400–600ft.)



"H" FRAME STRUCTURE – 69KV
(Typical Span 600–1000ft.)



TRIPLE POLE – 69KV
(Typical Span 1000ft. or greater)

Figure 2.5-1

Most poles would be direct-buried in the ground to a depth of 10 to 14 feet sufficient to resist overturning forces. Various types of backfill would be used to stabilize poles, most commonly sand or concrete. If required by local soil conditions, steel-reinforced, concrete pier-type foundations may be used. Concrete pier foundations can be four feet in diameter by 15 to 20 feet deep. In some locations, especially where soft, loose soils are encountered, caisson foundations may be used. Pole types, heights, location and span lengths will vary and are determined by the following factors: natural terrain and topography, gulch crossings, access for construction and maintenance, conductor clearances, costs, visual considerations, archaeological and biological considerations, existing and proposed land uses, road crossings and other criteria that are unique to the project and the location of the route.

The poles will vary in height from 60 to 85 feet above ground and will be spaced approximately 400 to 600 feet apart where single poles are used, 600 to 1,000 feet apart where H-Frame poles are used, and 1,000 feet or more part where triple-pole configurations are used. Span lengths will vary. Spans for gulch crossings will be longer, over 1,000 feet in some locations. Span lengths will also be determined by the number of angles in the alignment (i.e., more poles with shorter span lengths are needed for angles, whereas fewer poles and longer spans are possible with a straighter alignment).

2.5.3 Foundations

The types of foundations to be used in each pole location would be determined following foundation investigations conducted during final design involving borings, and field and laboratory testing at selected sites along the preferred alignment. In general, straight-line poles would be directly embedded, and angle or dead-end poles would be guyed and/or supported by pile or pier-type foundations, if required. Once soil conditions and strengths are determined by the foundation investigations, the depth and the effective diameter of the direct embedment or foundation would be determined so that the embedment would be able to support the conductor tension and wind loads. Foundation types are described in more detail in Section 2.7.5, Foundation Installation.

2.5.4 Conductors and Insulators

<u>69KV Conductors</u>

The transmission line will consist of a single-circuit line with three 652.4 kcmil all-aluminum alloy conductors (AAAC), "ELGIN", one conductor per phase, and three phases comprising a single circuit. For single poles, the conductors will be arranged in a vertical configuration of ten feet between conductors. For H-Frame and triple-pole configurations, conductors will be arranged in a horizontal configuration with approximately 11 feet between conductors depending on span lengths and conductor swing.

The double-circuit segment of the proposed transmission line, between the Lahainaluna Switching Station and the tie-in with the existing Puukolii and Lahaina 69KV lines, is a double-circuit, three-phase, nominal 69KV line with each circuit arranged in a vertical phase configuration with like phasing. Each circuit consists of one conductor per phase, 336.5 KCM-AAC (thousand circular mils, all-aluminum conductor), "Tulip" conductors.

<u>Shield Wires</u>

At the top of each pole is a shield wire. The shield wire is 195.7 kcmil all-aluminum alloy conductor (AAAC) "AMHERST" and is positioned to shield the 69KV circuit from direct lightning strikes. Lighting striking the shield wire is conducted to earth (grounded) through the steel pole to a copper wire connected 2 feet above ground level, to a coil of copper wire buried below the ground.

<u>Conductor to Ground Clearances</u>

MECO's current surface or ground to lowest conductor clearance standards vary according to pole locations and land use. Minimum conductor to ground clearance standards are as follows:

- Pineapple fields - 40 feet (by agreement with landowner)
- Sugarcane fields - 35 feet (by agreement with landowner)
- All other conditions - 30 feet (according to PUC General Order No.6)

<u>69KV Insulators</u>

Two types of insulators, post and suspension, may be used for the proposed transmission line. Post insulators are typically used on short or moderate span lengths. They are rigid, made of glazed porcelain or polymer material and mounted horizontally on a short bracket. A malleable iron fitting permits the connection of the conductor attachment hardware.

Suspension insulators are used for long spans or where H-Frame structures are required. The individual insulator units have a porcelain disc-shaped center section with malleable iron fittings for linking the insulators together and attaching other hardware. Suspension insulators are also used at large angle or deadend locations.

Non-ceramic (polymer) insulators will be considered for use throughout the project to reduce concerns about insulator shooting near a designated bird hunting area near Olowalu, the shooting range near Ukumehame Beach State Park, and elsewhere along the alignment.

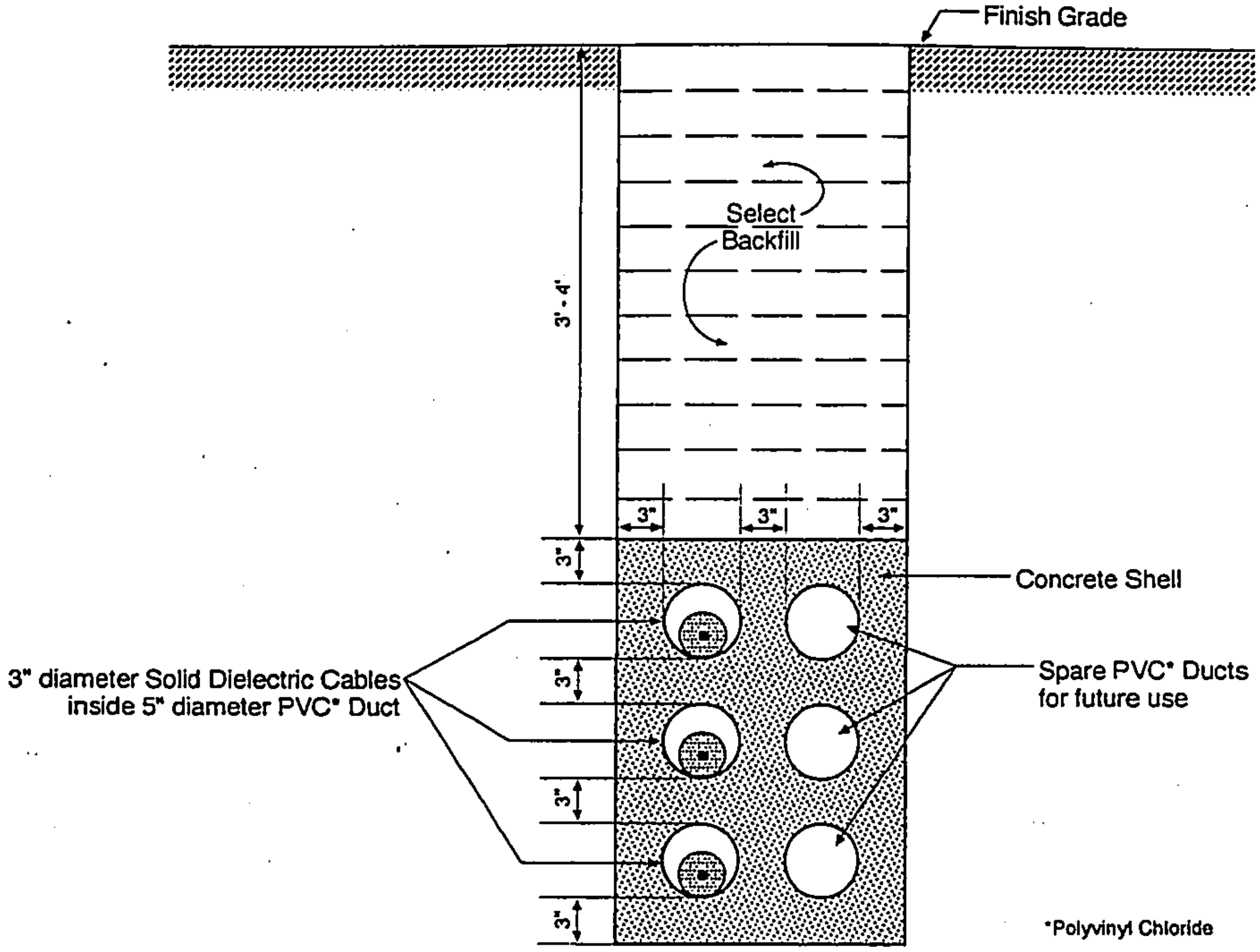
2.5.5 Underground Section

To maintain the separation from the existing 69KV lines and avoid physically crossing them, the new line will be placed underground for a distance of approximately 1,000 feet in the vicinity of Puu Hipa (Segment 17). The cable would be solid dielectric type. The three overhead transmission conductors would transition to underground cable on risers attached to the overhead pole. Three underground cables would be placed in polyvinyl chloride (PVC) ducts encased in a concrete shell buried to a depth of three to five feet in a trench approximately three feet wide. A warning sign would be posted in the vicinity of the underground ductline for future excavations. Figure 2.5-2 shows the typical 69KV underground cable system that would be used in the underground crossing of the existing 69KV lines.

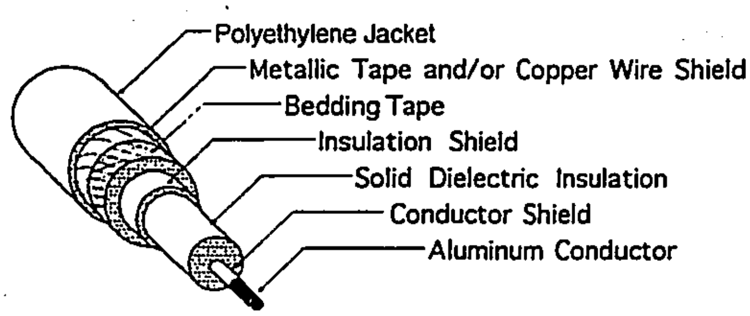
2.5.6 Switching Station Requirements

A proposed new Lahainaluna Switching Station will be constructed approximately one mile mauka of Pioneer Mill Factory off of Lahainaluna Road near a County water storage tank. The purpose of the Lahainaluna Switching Station is to terminate the new 69KV line and tie in to the existing 69KV transmission system. In addition, the switching station will provide system protection, control, communications and data acquisition for integration into MECO's existing transmission system. The switching station will be constructed on a two- to three-acre site with dimensions of approximately 260 feet by 320 feet. The additional 50 feet on two sides of the switching station will be used as a transmission and subtransmission line buffer for the termination of the incoming and outgoing lines.

DUCT ENCASEMENT DETAIL



69kv SOLID DIELECTRIC CABLE



TYPICAL 69kv
UNDERGROUND CABLE SYSTEM

Figure 2.5-2
Dames & Moore

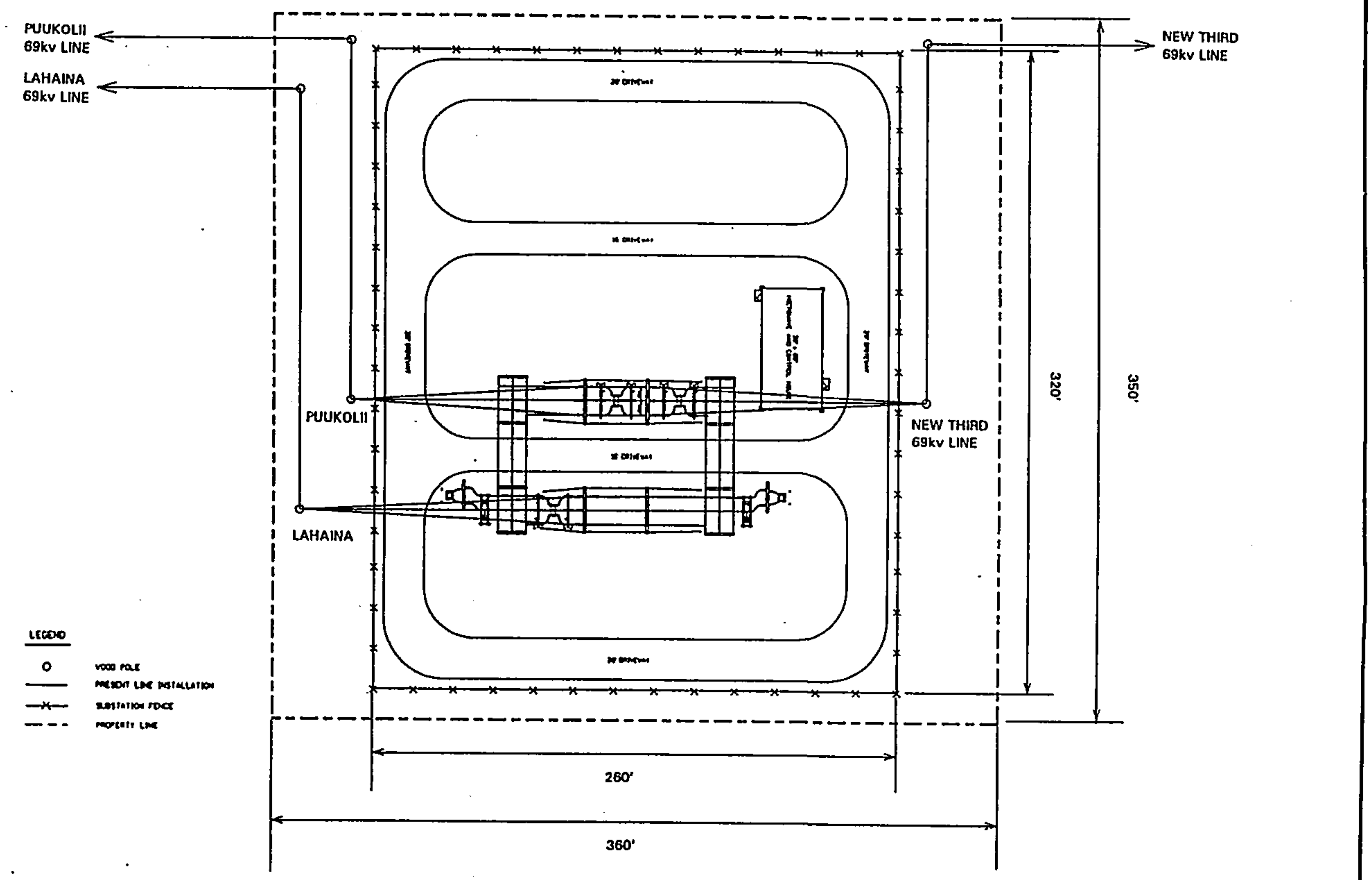
The site is located on property currently owned by Bishop Estate. MECO will purchase the site from the landowner. Access to the site will be from Lahainaluna Road.

Within the Lahainaluna Switching Station, MECO will construct three concrete pads for circuit breakers, foundations and steel structures to support disconnect switches, insulators, lightning arresters, station power transformers and potential transformers, 69KV aluminum buswork and steel deadend structures for the incoming and exiting 69KV lines. The switching station will be a low-profile design with support structures approximately 35 feet high. The station will have a low-profile control house approximately 35 feet long, 24 feet wide and 10 feet in height, and a paved driveway with access to Lahainaluna Road. A chain link fence will surround the switching station on all sides to provide safety and security. Figure 2.5-3 shows the preliminary layout for the new Lahainaluna Switching Station.

2.6 EASEMENT ACQUISITION

A transmission easement is a strip of land occupied by the transmission line. Easements are the land rights acquired for construction, maintenance, and operation of the transmission line. The easement for the transmission line is established only when all private easement rights and public land permits have been acquired, recorded and documented. MECO will negotiate acquisition of new easements with individual land owners.

The proposed transmission line alignment is shown in Figure 2.4-2 and described in Section 2.4. The typical single-circuit 69KV easement is approximately 50 to 75 feet wide. The easement width will vary depending on whether single-pole or H-Frame pole structures are required. For a single pole, the easement width typically will be 50 feet. For an H-Frame structure, the easement width typically will be 75 feet wide and may be wider (up to 100 feet) depending on the terrain and structure location (such as a gulch crossing). The easement for the double-circuit 69KV line from Lahainaluna Switching Station to the point of interconnection with the existing Puukolii and Lahaina 69KV lines will be between 75 feet to 100 feet wide. In places where poles are placed adjacent to a roadway, every attempt is made to keep the transmission line within the roadway right-of-way and thus eliminate the need for acquiring easements from private landowners.



PRELIMINARY LAYOUT
LAHAINALUNA SWITCHING STATION

Figure 2.5-3
Dames & Moore

2.6.1 Setback Requirements from Existing Roadways

Where the line is located parallel and adjacent to a County or State road, the pole must be set back from the edge of the travelled roadway. Clear roadside guidelines are provided in the State of Hawaii Department of Transportation (SDOT) Statewide Uniform Design Manual for Streets and Highways (SDOT, 1980) and the American Association of Standards for Highways and Transportation Officers Roadside Design Guide (AASHTO, 1989). Maui County Department of Public Works uses these guidelines in planning new roadways and for setbacks or clear zones along county roads. Clear zones are based on road geometry, travel speed and traffic volumes. SDOT has long-range plans (15 years) to widen portions of North Kihei Road, a State highway, to four lanes. These plans will be considered in final transmission line design and easement acquisition to avoid the need for line relocation if North Kihei Road is widened to four lanes.

2.6.2 Access Requirements

Access to the easement through adjacent properties will be required during construction, and following construction for maintenance and repair of the transmission line. During construction, access roads are needed to move construction equipment, poles and construction crews. Existing access roads in the area include cane field edge roads, jeep trails, and access roads for the existing 69KV transmission lines. The access roads built for construction of the existing transmission lines many years ago are still used for transmission line maintenance. Existing access roads are generally available for use in segments located near the existing lines. These existing roads could be used for access for construction and operation of the new line, with some new spur roads constructed to reach individual poles locations.

New spur roads would be constructed in relatively flat and open terrain. In areas of steep terrain, and where access is poor or non-existent, such as in the West Maui mountains, helicopters would be used for construction and maintenance. New spur roads would be permanent and maintained annually, or more frequently if needed. Where permanent spur roads are needed outside of the transmission easement, an easement for the spur road would be acquired from the landowner. The landowner would retain the right to control use of the road by unauthorized persons. Gates would be installed wherever fences cross new spur roads, if requested by the landowner. New spur road requirements and locations will be determined during final design after pole locations have been determined. Table 2.6-1 presents a preliminary determination by alignment segment of the planned

Table 2.6-1
CONSTRUCTION ACCESS

Segment No.	Manner of Access	Notes
1	Public Roadway	Located within North Kihei Road right-of-way.
2	Public Roadway/ Pineapple Field Road	Honoapiilani Highway crossing.
3	Pineapple Field Roads	Two poles at field edge, one in field center.
4	Helicopter	Pads needed.
5	Cross-country	Moderate slopes, passable terrain with grassland/shrubland.
6	Helicopter	Malaowaiaole and Manawainui Gulch crossings. Pads needed.
7	Cross-country	Moderate slopes, passable terrain with grassland/shrubland.
8	Helicopter	Manawaipueo Gulch crossing. Pads needed.
9	Helicopter	Pads needed.
10	New Spur Roads	From existing cane field roads 800 feet makai of and crossing alignment.
11	Cane Field Roads	Ukumehame Gulch crossing. Existing cane field roads cross alignment.
12	New Spur Roads	From existing transmission line access roads crossing alignment.
13	New Spur Roads	From existing transmission line access roads crossing alignment.
14	Cane Field Roads	Existing cane field road parallels alignment.
15	New Spur Roads	From existing transmission line access roads crossing alignment.
16	New Spur Roads	From existing transmission line access roads crossing alignment.
17	New Spur Roads	From existing transmission line access roads crossing alignment.
18	New Spur Roads	From existing transmission line access roads.
19	New Spur Roads	From existing access road located along alignment.
20	New Spur Roads	From existing Pioneer Mill access roads.
21	Cane Field Roads	Piilani Ditch Road.
22	Cane Field Roads	Field edge road between Piilani Ditch and Switching Station site.
Switching Station	Public Roadway	From Lahainaluna Road.
23	Cane Field Roads	To interconnect with Puukolii 69KV line.

Note: New spur roads would be permanent, maintained annually or more frequently, if needed. Helicopter pads would be developed in Segments 4, 6, 8 and 9.

manner for access: where existing access roads will be used, where new spur roads will be needed, and where helicopters will be used for construction and maintenance. Along North Kihei Road and Honoapiilani Highway, MECO's franchise rights granted by the State (S.B. No. 1522, 1991) provide unrestricted access from the roadway for construction and maintenance.

2.6.3 Easement Acquisition Process

Easements will be acquired for construction and maintenance of the transmission line, and for permanent new spur roads. The new line will require new easements and right-of-entry from the State of Hawaii, Wailuku Agribusiness/C. Brewer Properties, Pioneer Mill and Bishop Estate.

Several steps are involved in obtaining an easement. Initially, MECO's land agent contacts each owner (and other parties of interest) to negotiate an easement to accommodate the proposed transmission line. If purchasing land rights becomes necessary, the land to be crossed is surveyed and mapped and an appraisal is prepared to provide a basis for determining the market value of the land rights to be acquired. The appraisal is prepared by an independent real estate appraiser, and the report is the basis for determining a value payable for the easement. The owner of each affected parcel is then contacted by MECO's land agent, and a price for the easement is negotiated. Adjustments to the appraisal value may be necessary. When a price has been agreed upon with the owners, the required documents are prepared and executed, the landowner is paid, and the sale is recorded.

A "right-of-entry" (i.e., a temporary right of access) may also be negotiated if entry is necessary for surveys or construction before the easement has been recorded and takes effect. The landowner grants MECO an easement for its facilities but retains title to the land and full use of the easement area, subject to operational and safety limitations and other conditions mutually agreed upon by all parties.

Pre-existing land use activities (such as sugarcane cultivation and grazing) within and adjacent to the easement would be permitted with the terms of the easement documents. Incompatible activities within the easement include constructing buildings, drilling wells or other activities that may compromise safety.

Where easement negotiations with private landowners are unsuccessful and adjustment to construction or routing are impractical, MECO may invoke a legal option. State law grants certain public bodies and utilities the right of eminent domain (Chapter 101, HRS). This gives utilities the power to acquire property rights through the courts for facilities to be built in the public interest. Eminent domain proceedings (sometimes called condemnation actions) are used as a last resort, if an agreement cannot be reached between a private landowner and MECO or, occasionally, when an owner cannot for some reason legally grant an acceptable easement. The law provides for fair compensation to be paid for the easements acquired in condemnation actions.

MECO attempts to minimize the impact of construction activity on the easement. Claims for damages to land and crops are generally resolved through repair or compensation after construction is complete.

2.7 CONSTRUCTION PRACTICES

During construction of the proposed transmission line and switching station, the following phases of work must be accomplished:

- Surveying;
- Establishing construction staging areas where materials and equipment are stored and assembled;
- Hauling of poles and other materials to staging areas;
- Clearing and rough grading right-of-way;
- Hauling/helicopter lifting poles to pole sites;
- Boring pole holes or foundation installation;
- Erecting poles;
- Installing conductors; and
- Cleaning up and removing of construction materials and equipment.

Table 2.7-1 lists typical equipment that may to be used during construction.

2.7.1 Surveying

Surveying for construction of a transmission line includes property, right-of-way, ground profile, access road and construction surveys. A typical survey crew includes three people. Additionally, geotechnical investigations including borings may be required at selected locations to finalize pole

Table 2.7-1
TYPICAL EQUIPMENT USED DURING CONSTRUCTION

	CONSTRUCTION CATEGORY	PURPOSE
1.	Access, Clearing and Cleanup	
	1/2-ton pickup truck	Transport personnel and hand tools
	Crew-cab truck	Transport personnel and hand tools
	2-ton truck	Haul materials, debris
	Chipper	Dispose of cleared trees and limbs
	Helicopter	Transport personnel and tools
2.	Steel Pole Installation	
	A. **Pole Hole/Foundation**	
	Helicopter	Transport personnel and equipment
	1/2-ton pickup trucks	Transport personnel
	Crew-cab trucks	Transport personnel
	Mechanics' service trucks	Make field repairs
	Truck-mounted auger	Excavate pole holes
	Compressors	Drive pneumatic tools
	5-ton trucks	Haul materials
	10-ton trucks	Haul materials
	20-ton trailer	Haul materials
	Tilted trailer	Haul equipment
	Tool van	Tool storage
	Front-end loader	Load excavated material
	B. **Pole Erection**	
	Helicopter	*Pole transport and erection*
	1/2-ton pickup trucks	Transport personnel
	Crew-cab trucks	Transport personnel
	5-ton trucks	Haul materials
	10-ton trucks	Haul materials
	20-ton trailer	Haul materials
	30-ton cranes (mobile)	Erect structures
	15-ton cranes (mobile)	Erect structures
3.	Conductor Installation	
	Helicopter	Install conductor
	1/2-ton pickup trucks	Transport personnel
	Crew-cab trucks	Transport personnel
	Tensioners (truck-mounted)	Install conductor
	Pullers (truck-mounted)	Install conductor
	Reel trailer with reel stands (semi-trailer type)	Haul conductor
	Tractors (semi-type)	Haul conductor
	Low-bed trailer	Haul materials
	5-ton trucks	Haul materials
	10-ton trucks	Haul materials
	Take-up trailers (sock line)	Install conductor
	Reel winders	Install conductor
	Crawl tractors	Install conductor
	Line truck	Install clearance structures
	Tool vans	Tool storage

NOTE: This table lists equipment that may be used for each major task in the construction of the transmission line. This is an inclusive list; in many cases not all of the equipment listed here is required.

locations and determine the types of foundations required, and in the area proposed for undergrounding. If performed along public roads, this activity may require coning off a lane of traffic for a few hours at each test location.

2.7.2 Construction Baseyard and Staging Areas

Construction will be performed out of a construction yard headquarters, which will probably be located at the Kahului Baseyard. The construction yard headquarters is the base station where employees report at the start and end of each day's activities. This area is also used for other activities, including field office location, pole and laydown of materials, equipment and vehicle storage, and security.

Three or four staging areas will be required during transmission line construction for storage of materials and equipment and for helicopter support during lifting of poles to pole sites, and stringing conductors. Staging areas will need to be located near the beginning, middle and end of the preferred alignment. Each site will be approximately one acre in size. Staging area locations have not yet been identified. Possible locations include the vicinity of the Maalaea Power Plant, the shooting range mauka of Ukumehame Beach State Park, in the vicinity of the old Olowalu Sanitary Landfill and adjacent quarry, and the Lahainaluna Switching Station site.

Site preparation of staging areas would be limited to rough grading, if necessary, and installation of a perimeter security fence. Poles and other materials would be hauled to the staging area by a pole trailer and equipment trucks.

Staging areas would be used concurrently during construction. Transmission poles, insulators and hardware would be stored there until moved to specific pole sites. Some staging areas would be used for helicopter refueling and transport of steel pole sections to pole sites. Fuel trucks would serve staging areas, as needed. No fuel would be stored on site. After construction all equipment and materials would be removed.

2.7.3 Right-of-Way Clearing

Where needed, the right-of-way would be cleared to allow efficient installation of poles and conductors and to provide required clearances. Because of the open, park-like or grassland vegetation found throughout most of the preferred alignment, minimal right-of-way clearing is anticipated.

2.7.4 Traffic Management Practices

When poles are installed adjacent to roads, part of the road must sometimes be occupied by equipment used in installing poles, and conductors. Work on public roads must follow traffic control procedures prescribed by the Federal Highway Administration and SDOT. Work adjacent to a State road or highway requires a Permit to Perform Work on State Highways, which must incorporate a Traffic Control Plan approved by SDOT. Maui County requires adherence to State and Federal traffic control regulations for any work on County roads.

According to State procedures, only one lane at a time may be closed on a multi-lane highway. On a two-lane highway, lanes of adequate width in both directions must be provided wherever possible. All lanes must be open to traffic during morning peak hours (6:00 a.m. to 8:30 a.m.) and afternoon peak hours (3:00 p.m. to 6:00 p.m.). MECO and its construction contractors will follow State guidelines for the types of signs, lights, and markers, the position of traffic cones, the area coned off, and the use of flaggers and/or police officers (SDOT, 1980; FHWA, 1978).

2.7.5 Foundation Installation

Installation of a directly embedded pole requires excavation of a hole approximately two to three feet in diameter and ten to fourteen feet deep. Where access by road is possible, a truck-mounted auger will be used to bore each pole hole. Where access by road is not possible, pole holes may be excavated by hand with the aid of gas-powered augers lifted to pole sites by helicopter.

Depending on soil conditions and pole types, pile-on-pier foundations may be required at selected pole locations. An area approximately 25 feet in diameter (490 square feet) around each pole would be temporarily disturbed during foundation preparation and pole installation.

2.7.6 Pole Installation

After the pole holes are prepared or the foundations in place, the transmission poles and other hardware will be transported from the nearest laydown/staging area to the pole site either on trailer trucks or by helicopter. The poles will be laid next to the respective pole site and construction crews will install transmission and grounding fixtures, conductor clamps and insulators on the poles while on the ground. Poles will be lifted into place using a mobile crane or by helicopter. Backfill will then be placed and compacted around the hole.

2.7.7 Conductor Installation

Before conductor installation begins, temporary clearance structures may be installed at road crossings such as Honoapiilani Highway and at locations where the conductors might inadvertently contact existing electrical or communication lines and vehicular traffic during installation.

Reels of conductor and ground wire would be delivered by truck or helicopter to preselected stringing sites established at one-half to one-mile intervals. Poles would be rigged with string block at each conductor and groundwire position. "Tension stringing" is used to install the conductors. This method prevents the conductors from touching the ground or other objects, by maintaining a certain tension and sag during the stringing operation. Stringing would be performed by helicopter, or on the ground where suitable access is available for truck-mounted tensioner and pullers. A pulling line (or sock line), which is usually a polymer rope, is pulled from pole to pole through pulleys (sheaves) attached to the insulators. The conductor is then pulled through the sheaves behind the sock line by helicopter or ground equipment and brought to a specified ground clearance (sag) and "clipped-in" to deadend or suspension insulator clamps.

In pole locations adjacent to roadways one lane would be closed to traffic during pulling and sagging operations. Using the ground method, approximately two days is required to complete one mile of conductor installation. Using one or two helicopters, an average of two to three miles of conductor can be installed per day. Conductor installation generally requires a 10- or 12-person crew.

2.7.8 Clean-up and Removal of Construction Materials

As sections of the transmission line are completed, MECO makes thorough inspections of the work to verify that it is built according to specifications and standards. Anything that does not comply is corrected.

Clean-up of construction sites and staging areas includes:

- Removing all temporary crossing and clearance structures and backfilling any remaining holes used for temporary poles;

- Disposing of packing crates, reels, shipping material, and debris at staging areas;
- Cleaning up staging areas;
- Restoring access roads not required for line maintenance to preconstruction condition or better;
- Dressing roads, work sites, and pole sites to remove ruts, leveling, and preparing areas for seeding, if needed;
- Repairing gates and fences to their original condition or better;
- Grounding fences and trellises, as needed; and
- Repairing any damage that occurred during construction.

2.7.9 Lahainaluna Switching Station Construction

Construction of the proposed Lahainaluna Switching Station will include: grubbing and grading to level the site; fabrication and erection of steel structures; concrete foundation and pads, control house, fencing, paving, and underground ductlines; grounding work; and landscaping. The maximum height of the steel structures with electrical hardware mounted will be approximately 35 feet.

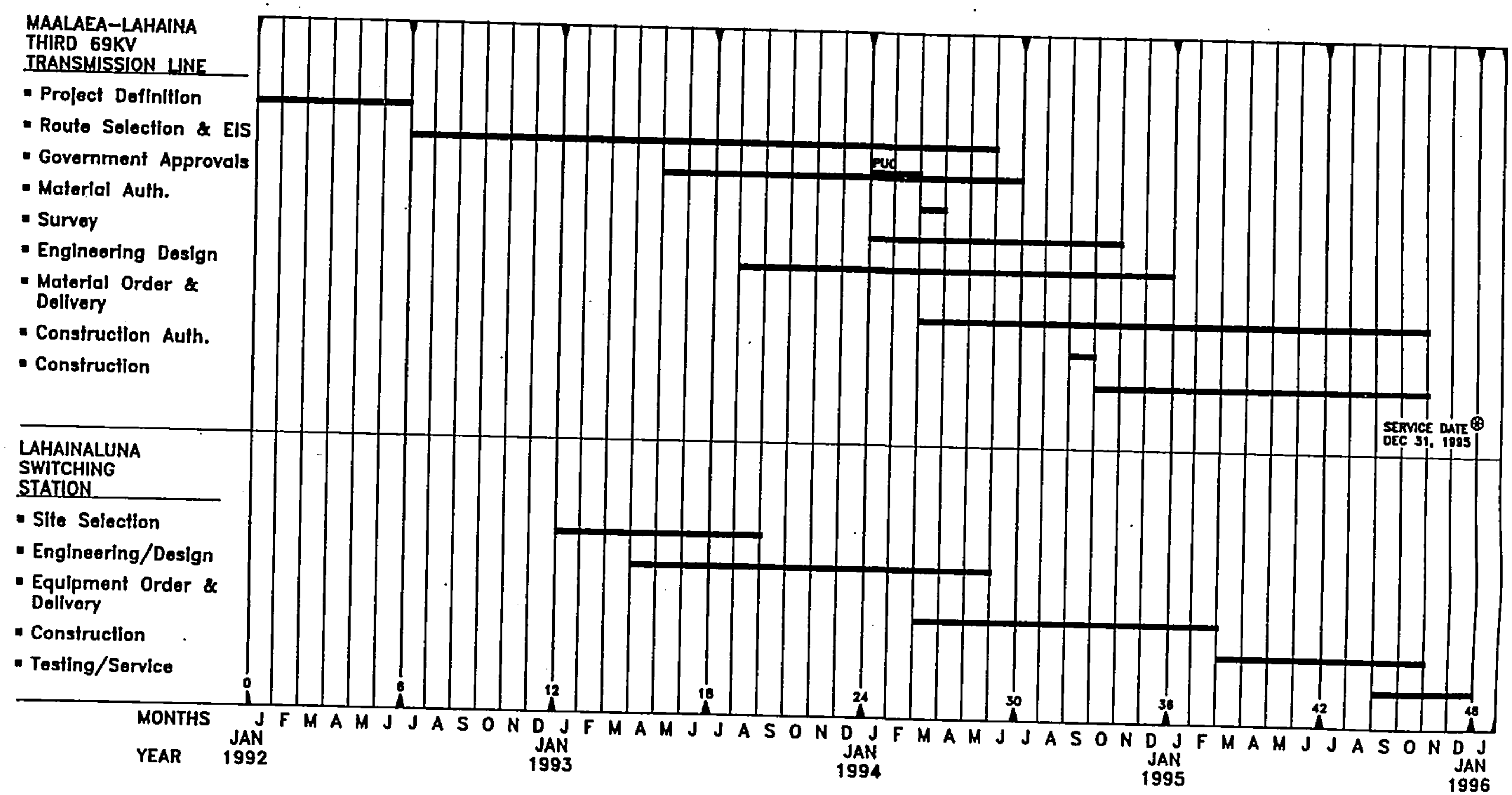
2.8 PROJECT SCHEDULE, COST, AND WORKFORCE

Figure 2.8-1 illustrates the project schedule and shows the duration of approvals, surveying, easement acquisition, engineering design and construction. Construction of the transmission line will take about 12 months, from October, 1994 to October, 1995. Operation of the line is scheduled for December, 1995.

Improvements at the Maalaea Switching Station necessary to operate the line will take place concurrently with line construction.

Construction of the new Lahainaluna Switching Station is scheduled to begin in March, 1995 and be completed in October, 1995. Testing will follow to enable an in-service date of December, 1995 for the transmission line.

The estimated capital cost for the Maalaea-Lahaina third 69KV transmission line is \$8.0 to \$10.0 million dollars (in 1994-1995 dollars). This does not include the cost of easements.



PROJECT SCHEDULE

Maalaea-Lahaina Third 69KV Transmission Line and Lahainaluna Switching Station

Figure 2.8-1

The estimated capital cost for the Lahainaluna Switching Station construction and equipment is $4.0 million (1994-1995 dollars). Land costs are not included.

The construction work force will average approximately 25 workers. There will be two separate workforces, one for switching station construction and another for transmission line construction.

A contractor will erect the poles and string the conductors with a workforce of approximately 15 workers, consisting of three four-person crews, a supervisor, equipment operator, and helicopter support. The Lahainaluna Switching Station workforce will consist of approximately 10 workers.

2.9 OPERATION AND MAINTENANCE

2.9.1 Operational Characteristics and Procedures

The proposed transmission line will be energized and operated at a nominal voltage of 69KV, plus or minus five percent. Changes in load flow may cause minor fluctuations in the actual operating voltage. With MECO's supervisory control system, dispatchers in a power control center will direct the day-to-day power scheduling and operate breakers and other devices as required to maintain and protect the system. Circuit breakers will operate automatically when a disturbance (e.g. lightning strike or insulator flash over) occurs to help ensure the security and stability of the system.

2.9.2 Maintenance Practices

MECO's existing transmission line maintenance program will be extended to include the new transmission line and switching station to ensure continued reliable service of the transmission system. Transmission line poles and right-of-way will be regularly inspected on foot, in vehicle, or by helicopter.

Emergency repairs will be made if the transmission line is damaged and requires immediate attention. Maintenance crews of less than ten persons would use tools, trucks, aerial lift trucks, cranes, helicopters and other equipment necessary for repairing and maintaining insulators, conductors and structures.

MECO's Distribution Department is considering developing a program for live line maintenance, which enables personnel to approach and work on transmission line hardware without de-energizing the transmission lines. Although specialized equipment and insulation are needed, live line maintenance procedures can be used to complete certain routine maintenance tasks with the lines energized to minimize outage requirements.

SECTION 3
ALTERNATIVES CONSIDERED

3.0 ALTERNATIVES CONSIDERED

3.1 INTRODUCTION

This section presents the alternatives that have been considered and either retained for further evaluation or eliminated from detailed consideration.

The first screening of alternatives occurred during a regularly scheduled transmission system evaluation. Hawaiian Electric Company (HECO) System Planning conducted studies in 1990 to evaluate if the current West Maui transmission system would be sufficient to meet Maui Electric Company, Ltd. (MECO) needs to provide adequate and reliable electrical service in future years.

The studies identified present and future problems with the West Maui 69 kilovolt (KV) system. Load flow and system reliability analyses were used to determine system limitations, specifically low voltages and line overloading. The system studies evaluated short-term, non-transmission alternatives including installation of series capacitor banks and a "no action" alternative. More long-term alternatives evaluated included generation unit additions in West Maui and upgrading the existing transmission lines to 138KV operation. These alternatives are discussed in Section 3.2.

The system planning studies concluded that an outage of either of the two existing 69KV lines could result in excessive power flow through the remaining in-service line beyond its conductor rating. The resulting overload could lead to loss of the remaining transmission line to West Maui, resulting in a potential blackout of the area. The Maalaea-Lahaina Third 69KV Transmission Line Project was recommended by the system studies as the preferred solution to this potential problem.

The next level of screening involved examination of design alternatives and transmission technologies. Overhead construction with wood poles, steel poles or concrete poles and underground construction and submarine cable were evaluated. Section 3.3 discusses the technology and design alternatives.

After evaluating the technology and design options, MECO chose conventional overhead line construction with steel poles. Steel poles were chosen because they can meet MECO's new wind loading criteria of 100 miles per hour (mph), the useful life of steel poles is greater than wood, and steel poles (which are hollow) are lighter weight than wood or concrete, which is better if helicopter construction techniques are used. Concrete poles were rejected because of their weight and high cost.

The third level of alternatives evaluation involved studies to locate a route for the new line. MECO retained Dames & Moore, an environmental and engineering consulting firm, to assist with route selection and to conduct studies to evaluate the opportunities and constraints of alternative line locations. Section 3.4 describes the locational alternatives and the process used in identifying the preferred alignment.

3.2 ELECTRICAL AND NON-TRANSMISSION ALTERNATIVES

3.2.1 No Action Alternative

The Hawaii Public Utilities Commission (PUC) mandates that MECO provide reliable electric service at a reasonable cost to its customers. The MECO Transmission System Study for the West Maui Region (HECO, *1990)* evaluated transmission system shortfalls and recommended improvements to ensure reliable electric service. Specifically, the study concluded that with the outage of either of the two existing 69KV lines, the power flow through the remaining in-service line would exceed its capacity rating. The system study also concluded that, based on MECO transmission planning criteria employed to maintain adequate and reliable service, the existing transmission network serving West Maui would be insufficient by 1995. The study, therefore, recommended that a new 69KV transmission line be constructed to serve West Maui.

The "no action" alternative would maintain current conditions and would not alleviate anticipated deficiencies in the West Maui transmission system, as identified by the 1990 West Maui Transmission System Study, and the reliability of electric service to MECO customers would be jeopardized. Therefore, the "no action" alternative is not a viable alternative and was eliminated from further consideration.

3.2.2 Shunt Capacitor Installation

The West Maui Transmission System Study recommended that capacitors be installed at Lahaina and Mahinahina substations as a short-term solution to provide peak load voltage support in West Maui until the new Maalaea-Lahaina third 69KV transmission line can be constructed. Capacitor installations were completed in 1993.

Capacitor installation was implemented as a short-term, interim improvement. However, as a stand-alone alternative, it cannot achieve the purpose and need of the project to provide additional transmission capacity and maintain reliable electric service in the event that one or both existing lines is out of service.

3.2.3 Generation Unit Additions in West Maui

The installation of additional generation units in West Maui was examined to determine if this action could prevent the overloading of the existing 69KV transmission lines and thereby defer the need for a third transmission line to the region.

Relocating high-speed diesel generation units from the Maalaea Power Plant to West Maui was evaluated as a potential source of regional generation. With their relatively compact size and self-contained housing, they could be easily installed if a suitable site was located. However, upon further examination, the forecasted rate of load growth in West Maui is such that each high speed diesel unit added to West Maui would only serve to defer the requirement for the new line by a single year. Thus, due to difficulties in adding larger generating units in a timely manner and the uncertainty of finding an appropriate site for future unit additions, this option was eliminated from further consideration.

Pioneer Mill was also considered as a possible source of power in West Maui which could assist in the deferral of the new transmission line to the region. The existing Pioneer Mill contract with MECO is for purchase of 8 megawatts (MW) of standby power upon MECO request. However, due to recent operating constraints, Pioneer Mill has experienced difficulty in fulfilling this agreement. Moreover, the adequacy of the bagasse fuel supply is questionable due to a decrease in sugar-producing acreage following the sale of agricultural land for development. This alternative was eliminated from further consideration.

3.2.4 Upgrade of Existing Transmission Lines to 138KV Operation

Another option considered was to upgrade the two existing 69KV transmission lines to 138KV operation. The evaluation established some guidelines to determine the feasibility of voltage conversion; specifically, using as much of the existing structures and hardware as possible and implementing the upgrade in a fashion that would not severely jeopardize reliable service to West Maui during the upgrade process.

The evaluation determined that since the present easements for the existing transmission lines are each 50 feet in width and share a common boundary yielding minimum clearance between the two lines, that only one 138KV circuit could be operated in the existing right-of way. To maintain adequate reliability to West Maui, a new transmission line would still be needed and a new right-of-way would have to be obtained.

Load flow analysis indicated that based on current load projections for West Maui, the 69KV operating voltage should be sufficient for approximately the next twenty years. The study also concluded that, due to the high cost of new 138KV switchyards and 69KV to 138KV power transformers, that it was not economical to transmit power to West Maui at 138KV anytime in the near future.

The study therefore, recommended that the existing 69KV lines remain intact and that a third 69KV transmission line be added to increase transmission capacity and maintain system reliability to the region.

3.3 TRANSMISSION DESIGN AND TECHNOLOGY ALTERNATIVES

Electrical transmission lines can be designed and constructed in three basic configurations: overhead lines, underground cable and submarine cable. A transmission project can, depending on the endpoints, use any one of the three types, or a combination of types. Determining factors are environmental considerations, economics and system reliability. Experience has shown that the most economical method of transmitting electrical power over a long distance is via overhead transmission lines. Underground transmission cables are used primarily in densely populated areas and over short distances. Submarine cables are used primarily where there is no land connecting the two terminal or end points.

3.3.1 Overhead Transmission Line

For the Maalaea-Lahaina Third 69KV Transmission Line Project, a conventional overhead transmission line on steel pole structures has been selected as the proposed transmission technology. Steel poles were chosen over wood poles because they can meet MECO's new wind loading criteria of 100 miles per hour (mph) or greater. Also, steel poles have a longer useful life and are not subject to termite damage or rot as are wood poles. Steel poles which are hollow are lighter than wood or concrete poles. This is an advantage if helicopter construction techniques are used. The use of concrete poles was evaluated but rejected due to the high cost and weight.

3.3.2 Submarine Cable

Submarine cables consist of a central conductor surrounded by insulating material, enclosed in hard armoring. There are four types of submarine cables depending on the type of insulation: self-contained (low pressure) fluid-filled; high pressure, fluid-filled pipe; solid paper; and solid dielectric. The self-contained, fluid-filled and solid dielectric types have a good history of performance in the transmission of 69KV power. In addition to the cable itself, a submarine cable system requires a landing site and transition station close to the shoreline where the cable is brought above ground and connected to overhead lines. Typically, near-shore wave scouring, possible damage by ship anchors and other factors require that submarine cables be buried in a trench starting offshore at an approximate depth of 100 feet.

In 1989, MECO conducted detailed engineering and environmental studies to evaluate the feasibility of interconnecting the islands of Molokai, Lanai, and Maui with a 69KV submarine cable. The Tri-Island Cable Project studies consisted of a deep water survey, preparation of sea floor bathymetric and geologic maps and identification of possible cable routes. Ocean current meters were set to provide data on currents as input to design and cost estimates. A landing site study encompassing shoreline areas on the south coast of Molokai, the east and northeast coasts of Lanai, and the north and northwest coasts of Maui was conducted to identify locations where the submarine cable could be brought to land to transition to overhead transmission lines. Other project features examined included expansion of the existing power plant on Molokai.

The Tri-Island Cable Project also examined whether a third 69KV transmission line to West Maui could be deferred if power could be delivered via submarine cable from additional generation on Molokai. The results of the engineering studies determined that the Tri-Island Cable Project was technically feasible but, with a cost estimate of over $100 million dollars, it was determined to be uneconomical at the present time.

The studies also concluded that without the installation of the cable network and a generation source on Molokai to transmit power to West Maui by 1995, a third 69KV transmission line was needed.

In addition to the Tri-Island Cable Project, MECO evaluated the possibility of laying a 69KV submarine cable from Maalaea Bay along the West Maui shoreline to the vicinity of Lahaina. A number of environmental, engineering, economic, and repair and maintenance considerations make the use of submarine cable undesirable for this project. These considerations are discussed below.

MECO has never used submarine cable technology; therefore, the potential for delays and cost overruns is greater. The location and repair of faults in a submarine cable, although likely to be rare, would be costly and time-consuming. Repairing a damaged or failed cable requires locating the fault, uncovering the faulted section of cable, raising it to a barge and splicing in a length of new cable. The cable repair technique is even more demanding than repairs on underground cables because the cable must be retrieved from the ocean bottom before repairs can be made. The time required to complete repairs can be lengthy and could affect restoration of service to customers.

Cable construction in near-shore and shoreline zones could result in impacts to littoral processes. Depending on the design of the cable and near-shore bottom characteristics, trenching through near-shore reefs could be required. Such alterations to near-shore reef topography could potentially affect near-shore wave approach and littoral currents. There is also the potential for impacts to the long-shore transport of sediment along the shore and changes in the beach profile.

The strength and direction of ocean currents could also affect the cable by causing difficulty in laying the cable and cyclically moving the cable free spans on the bottom causing cyclic fatigue in the cable which could result in faults.

Construction of submarine cable from Maalaea Bay along the West Maui shoreline to the vicinity of Lahaina could impact any of a number of life stages of protected marine species, including humpback whales and sea turtles. The whale breeding season is from December through May and the calving period is from January through April. Maalaea Bay and areas off McGregor Point are prime whale habitat and are perhaps the worst possible locations for laying a submarine cable (G. Nitta, March 1992, Personal communication, National Marine Fisheries Service [NMFS]). Electric and magnetic fields emitted by the cable could interfere with whale navigation. NMFS has expressed concern regarding this point. Construction and maintenance activities would be precluded during December through May of each year to avoid harassment to whales during calving. NMFS has also expressed concern regarding potential impacts to sea turtle foraging and resting areas if the cable were placed within 100 to 200 feet of the shoreline.

The construction cost per mile of submarine cable would exceed $1.5 million per mile compared to $450,000 to $500,000 per mile for overhead steel pole line construction. For these reasons, submarine cable was eliminated from further consideration as a transmission alternative for this project.

3.3.3 Underground Transmission Cable

Underground cables are used for the transmission of power where it becomes impracticable to use overhead construction. Situations or locations may include congested urban areas where overhead rights-of-way are unobtainable or would be excessively costly, where local ordinances specifically prohibit overhead lines for safety and/or land use and visual reasons, or where crossing existing lines for short distances to avoid physically crossing the lines.

The types of insulation and cable used depends on the voltage and service requirements. Insulating materials used for cable in the transmission of power at 69KV is oil-impregnated paper for fluid-filled cable systems or extruded polyethylene and cross-linked polyethylene for solid dielectric cable systems.

Paper-insulated, oil-impregnated 69KV cables with or without sheaths may be installed in pipes (conduits) or they may be provided with strong sheaths and installed in ducts or tunnels. 69KV cables are most often either low pressure, that is, not over 15 pounds per square inch (psi) or medium pressure, not over 45 psi. High pressure cables, up to 200 psi, installed in pipes have been found to be uneconomical for voltages of 69KV.

The purpose of pressurizing cable insulation is to eliminate voids and thereby prevent ionization of gas which would appear in the voids. Voids cannot be prevented without pressure, regardless of the care taken in winding the paper tapes. Bending of the cable during handling and installation and also expansion and contraction due to temperature changes can cause voids in insulation of a cable not under pressure. Continued presence of ionization will damage the insulation and eventually cause cable failure.

In self-contained, low-pressure, fluid-filled cable (LPFF) systems, each single conductor cable has a central hollow duct in the conductor which carries oil at pressures between 25 psi and 100 psi. For higher conductor ratings, parallel cables in groups of three are used. The cables are usually direct buried in a trench and backfilled with "thermal" soil of low resistivity. The cables are installed with lead or aluminum sheaths and cross-bonded to suppress circulating currents. LPFF cable requires a reservoir and monitoring system.

The primary advantages of LPFF cable are its high reliability and high capacity. A disadvantage is that the entire length of the trench (between splices) must be open for installing the cable. LPFF cables can also be installed in ducts or conduits.

Solid dielectric cables use an extruded dielectric material for insulation. Materials used most often are low-density, extruded polyethylene and cross-linked polyethylene (XLPE). For large, high voltage circuits, three single-phase cables are usually required for each transmission circuit.
The main advantages of solid dielectric cable compared with fluid-filled cable are: (1) decreased fire hazard; (2) easier and less expensive cable installation; (3) less maintenance, because fluid pumping and auxiliary facilities are not required; (4) shorter repair times and (5) reduced transition space compared to fluid-filled systems.

For all underground cable systems, splice vaults (manholes) are required at varying intervals along the line with a maximum interval of 2,000 to 4,000 feet.

Underground cable has other advantages and disadvantages to overhead construction. The principle advantages include a low level of visual impact and greater protection from high winds, fires and other natural and man-induced situations that could result in downed poles and lines. The disadvantages include significantly higher construction and maintenance costs and a much longer construction period than required for an overhead line. Costs specific to the construction of an underground cable system including the cable material, conduits, trenching, backfill, manholes and joint bays, are three to five times the cost of conventional overhead line construction. A 69KV underground transmission cable would cost between $1.5 million and $2.0 million per mile compared to $450,000 to $500,000 per mile for overhead steel pole construction, excluding easements. In addition, because of the difficulty of locating faults in an underground cable and getting access for repair crews and equipment, repair of outages would take far longer than for an overhead line (i.e., days or weeks rather than hours).

To maintain separation from the two existing 69KV lines and avoid physically crossing them, the proposed third 69KV line will be placed underground for a distance of approximately 1,000 feet in the vicinity of Puu Hipa. The cable would be a solid dielectric type. The underground crossing will ensure that reliability will not be compromised by having the lines conflict with one another. This means that if one or both of the existing lines were to overturn they would not come in contact with the conductors of the new line.

The small underground portion of line is a prudent engineering solution to ensure reliability. It would however, be difficult to justify the substantial additional cost to the ratepayer to underground the entire Maalaea-Lahaina third 69KV line since routing options exist where the overhead line can be located so as not to conflict with existing or planned land uses and where rights-of-way are obtainable from landowners and through MECO franchise. In addition, all 69KV transmission lines on Maui are overhead and have historically provided reliable service at a reasonable cost. For these reasons, use of underground transmission cable for the project was eliminated from further consideration.

3.4 LOCATIONAL ALTERNATIVES

MECO used a three-phase process to select the location of the preferred alignment for the transmission line. A flow diagram illustrating the transmission line route selection process for the Maalaea-Lahaina Third 69KV Transmission Line Project is shown in Figure 3.4-1. Each phase consisted of a sequence of analytical tasks. An overview of the process, a description of the tasks and the results of the routing study and the locational alternatives for the Maalaea-Lahaina third 69KV transmission line are summarized in this section. The preferred alignment is further described in Section 2.0, Project Description.

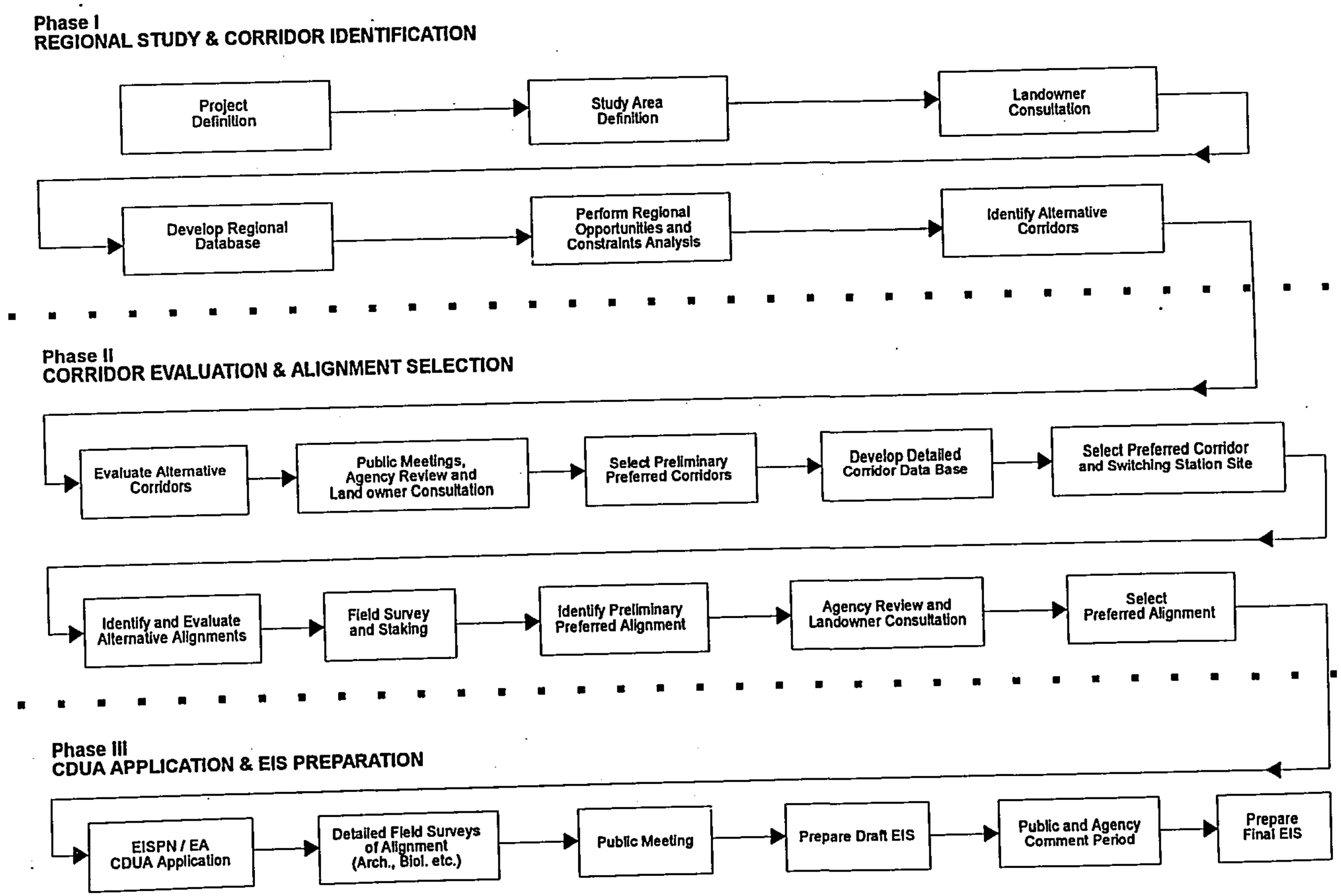
3.4.1 Overview of the Transmission Line Siting Process

A routing study was conducted to systematically evaluate engineering, environmental, economic, landowner, agency and public concerns to reduce or narrow a relatively large study area to alternative corridors through the identification of opportunities and constraints. The width of the alternative corridors varied, but were approximately 1/4 to 3/4 of a mile wide, depending on the number of constraining factors in any particular area.

Comparative evaluation of the alternative corridors resulted in the selection of preliminary preferred corridors. Following the collection of additional information on construction cost, conditions within the preferred corridors (from field observations and a viewshed analysis), agency meetings and landowner consultation; the preferred corridor was identified. During the landowner meetings, MECO determined that the proposed substation site in Wahikuli was no longer appropriate for the termination of the new transmission line due to delays in the land negotiations for the Housing Finance & Development Corporation's (HFDC) residential project. Therefore, MECO decided to (1) consider an alternate substation location that was independent from progress of the HFDC project to terminate the new transmission line, and (2) pursue the Wahikuli Substation site in the future to serve the distribution needs for the HFDC development as the need arose.

Resource data maps, field investigations and aerial photographic interpretation were used to identify alternative alignments. Alignments are strips of land within the corridor (100 to 300 feet wide) on which the transmission line could be sited and constructed. The alternative alignments were evaluated and the preferred alignment was selected and staked in the field.

Figure 3.4-1
ROUTE SELECTION PROCESS
Maalaea-Lahaina Third 69KV Transmission Line Project



Throughout the route identification and selection process, as the study area narrowed to a defined route, environmental data were collected and analyzed, field work was conducted and appropriate agencies, affected landowners and the public were consulted. The information and results gathered from these efforts were continually refined and reevaluated.

The siting process considered many factors simultaneously, including:

- Public comments and concerns;
- Government agency comments and concerns;
- Landowner comments and concerns;
- MECO's system reliability and existing transmission system;
- Potential environmental and land use impacts; and
- Economic impacts for both MECO and its customers.

The final phase of the process is to document the findings in this Draft Environmental Impact Statement (EIS), issue the Draft EIS for public and agency review, respond to comments and prepare the Final EIS and prepare and submit the applications for required permits.

3.4.2 Phase I - Regional Study and Corridor Identification

Project Definition

The first activities involved defining the project, developing engineering criteria and establishing computer mapping and database management systems. Other tasks included finalizing the work plan, assignment of project team and areas of responsibility, and development of a statement of purpose and need, general system requirements and a project fact sheet.

Study Area Definition

A study area was established to include the Maalaea Power Plant and the proposed Wahikuli Substation site near Lahaina but, to the extent possible, to minimize the distance required to connect the two. Other criteria used in establishing the study area were intended to:

- Include sufficient area around the Maalaea Power Plant to explore as many exit options as possible;
- Include the shoreline and the Honoapiilani Highway;
- Include Puukolii Substation for context;

- Include sufficient area to allow for a corridor either mauka or makai of the existing Maalaea-Lahaina Nos. 1 and 2 69KV transmission lines; and
- Exclude extremely rough, steep terrain (slopes greater than 40 percent).

A reproducible base map of the study area was prepared at a scale of 1:24,000 (1 inch equals 2,000 feet) using U.S. Geological Survey (USGS) topographic 7.5 minute quadrangle maps. The base map was registered for use in AutoCAD computer mapping system. The study area was subdivided into study sections. The study sections used for comparative analysis of the corridors were given names that identify their location.

The Power Plant Study Section I extends from the eastern project boundary near the Maalaea Power Plant to Honoapiilani Highway. The two existing Maalaea-Lahaina transmission lines traverse this study section and cross Honoapiilani Highway at the intersection with Kuihelani Highway. The Maalaea-Ukumehame Study Section II extends from Honoapiilani Highway to Ukumehame Gulch and from the coastline to the ridges approximately 2,000 feet above sea level. The Olowalu- Makila Study Section III extends from Ukumehame Gulch to the ahupuaa of Makila and Wainee and from the coastline to the mauka project boundary. The Lahaina-Wahikuli Study Section IV extends from the eastern boundary of Section III in Makila to the project boundary just west of Puukolii Substation. This study section includes Lahaina, Wainee, Kelawea, Lahainaluna School and the proposed endpoint of the transmission line in Wahikuli near the Lahaina Civic Center.

Once the study area was established and a base map prepared, a helicopter fly-over and ground reconnaissance were conducted. The purpose of the field reconnaissance was to review the project siting requirements and to make general observations of the environmental conditions and potential route options. During the helicopter survey, a video tape was made and still color photographs were taken for use in determining possible locational alternatives.

Landowner Consultation

Landowner involvement was important to identifying corridor locations for the Maalaea-Lahaina Third 69KV Transmission Line. To identify major landowners, property boundaries within the study area were mapped from the Real Estate Data Maps (Tax Map Keys) and a mailing list was developed that included landowners and their representatives. A landowner contact program was established as part of the public involvement program and each landowner was contacted and individual meetings held to discuss the project concept and opportunities and constraints to line location.

Land ownership and jurisdiction, existing uses, areas to avoid, and possible siting opportunities were discussed with major landowners during a series of meetings that took place between September 1991 and March 1992. Meetings or discussions held with major landowners are summarized in the consultation summary (Table 7.3-1). Comments received during these meetings were recorded and retained for use in the corridor identification tasks.

Develop Regional Database

A comprehensive range of resource categories and sets of environmental data factors were identified to structure the analysis and to provide a means to focus the study area on alternative corridors. The categories span the considerations that are appropriate to the data gathering needs for thoroughly evaluating a linear construction project.

The environmental data factors are listed in Table 3.4-1. Data was compiled from published sources including MECO system maps, Tax Map Keys, agency files, previous EISs prepared for other projects in the area, community planning documents and color aerial photographs taken specifically for this project.

Discrete data were mapped on regional data maps (scale 1:24,000 or 1 inch = 2,000 feet). The data base and maps served as the basis for the regional constraints analysis. These maps illustrated land ownership, land regulation, existing land use, proposed projects, transmission separation, geology/soils, slope, topographic features and water resources, sensitive biological resources and cultural resources.

Perform Regional Opportunities and Constraints Analysis

Information collected and mapped for the regional database was evaluated and discussed with agency personnel and landowners to identify siting issues that would influence the identification of potential corridors. Gaps in the resource information were identified and field checks were conducted to acquire or verify information and to locate sensitive areas.

Table 3.4-1
ENVIRONMENTAL DATA FACTORS AND CONSTRAINT RATINGS

DATA MAP	DATA FACTORS MAPPED	CONSTRAINT RATING
1. Exclusion Areas	Landfill/Refuse Areas	Active landfills are rated as EXCLUSION AREAS
2. Land Ownership	U.S. Fish and Wildlife Service U.S. Coast Guard State of Hawaii Lands County of Maui Lands Wailuku Agribusiness A&B Hawaii, Inc. Pioneer Mill Company B.P. Bishop Trust Estate Maalaea Triangle Partnership Other Private	• U.S. Fish and Wildlife Service and U.S. Coast Guard are rated as HIGH CONSTRAINT • All other areas are rated LOW CONSTRAINT
3. Land Regulation	State Land Use Districts - Urban - Agriculture - Conservation (Protective [P] Subzone) - Conservation (Limited [L] Subzone) - Conservation (Resource [R] Subzone) - Conservation (General [G] Subzone) Coastal Zone Management Special Management Area (SMA)	• State Conservation District lands (Protective [P] Subzone) are rated as HIGH CONSTRAINT • State Conservation District land (Limited [L] Subzone), (Resource [R] Subzone), and (General [G] Subzone), and Special Management Area (SMA) are rated MEDIUM CONSTRAINT • All other areas are rated LOW CONSTRAINT
4. Maui County Zoning	No map prepared. County of Maui zoning does not expressly prohibit utility line development	County of Maui zoning does not influence transmission line siting
5. Existing Land Use	- Residential - School - Resort - Parks/Recreation/Golf Course/ Cemetery - Public/Community Facility - Commercial - Industrial - Agriculture - Grazing - Rock Pile - Quarry - Landfill/Refuse Area - Shooting Range - Communication Site - Ditch - Reservoir - Gulch - Stream - Flood Control Channel - Undeveloped Open Space - Lahaina Pali Trail	• Shooting range is rated HIGH CONSTRAINT • Residential, resort, parks/recreation/golf course/cemetery, reservoir, quarry, school, communication site, public facilities, Lahaina Pali Trail, and commercial are rated MEDIUM CONSTRAINT • All other areas are rated LOW CONSTRAINT NOTE: Active landfills are rated as EXCLUSION AREAS
6. Proposed Projects	Proposed Planned Approved Under Construction	• Projects under construction are rated as if they were existing projects. The HFDC project is considered under construction and rated MEDIUM CONSTRAINT • Approved planned and proposed projects are rated LOW CONSTRAINT

Table 3.4-1 (cont'd)
ENVIRONMENTAL DATA FACTORS AND CONSTRAINT RATINGS

DATA MAP	DATA FACTORS MAPPED	CONSTRAINT RATING
7. Existing Utilities	Power Plant Substation MECO 69KV Line MECO 23KV Line	• Areas within 250 feet of existing 69KV line are rated HIGH CONSTRAINT • Areas within 500 feet of existing 69KV line are rated MEDIUM CONSTRAINT • All other areas are rated LOW CONSTRAINT NOTE: See transmission separation category and map for desired distances for existing 69KV lines and constraint rating
8. Transmission Separation	250 Feet (minimum separation) 500 Feet 1,000 Feet	• Areas within 250 feet of existing 69KV line are rated HIGH CONSTRAINT • Areas within 500 feet of existing 69KV line are rated MEDIUM CONSTRAINT • All other areas are rated LOW CONSTRAINT
9. Biological Resources	Vegetation Types - Urban - Agriculture - Kiawe-Buffel Grass Association - Mixed Grassland-Shrubland - Shrubland - Forest Vegetation - Forest Reserve Boundary - Stream - Gulch - Natural Area Reserve - ETS Species Habitat - Plant Sanctuary	• Natural area reserves, plant sanctuaries and ETS species are rated HIGH CONSTRAINT • All other areas are rated LOW CONSTRAINT
10. Topographic Features and Water Resources	- Tsunami Inundation Zone - Flood Prone Area (100-year flood) - Streams - Gulches/Intermittent Streams - Irrigation Ditches - Reservoirs - Major Ridges - Ditches - Puus - Flumes - Quarry/Borrow Pits	• Tsunami inundation zones are rated HIGH CONSTRAINT • Flood prone areas (100-year flood zone) are rated MEDIUM CONSTRAINT • All other areas are rated LOW CONSTRAINT NOTE: Gulches/streams called out to aid in determining possible locations of greater than average span length and special pole requirements

Table 3.4-1 (cont'd)
ENVIRONMENTAL DATA FACTORS AND CONSTRAINT RATINGS

DATA MAP	DATA FACTORS MAPPED	CONSTRAINT RATING
11. Slope	Slopes less than or equal to 30 percent Slopes greater than 30 percent	• Slopes greater than 30 percent are rated MEDIUM CONSTRAINT • All other areas are rated LOW CONSTRAINT
12. Geology/Soils	Soils with High Erosion Potential Areas of Landslide Deposits Areas Prone to Slope Instability Soft, Loose Materials - Recent Alluvium	• Areas of landslide deposits are rated HIGH CONSTRAINT • Soils with high erosion potential, areas prone to slope instability, and soft, loose materials are rated MEDIUM CONSTRAINT
13. Cultural Resources	National Register District National Register or Hawaiian Register Site Recorded Pre-Contact Site Recorded Post-Contact Site Land Commission Award (LCA) Parcel Area with Good Cultural Resources Potential Lahaina Pali Trail	• National Register Districts, Lahaina Pali Trail and National Register and/or Hawaiian Register sites are rated HIGH CONSTRAINT • Surveyed and recorded pre-contact and post-contact sites are rated MEDIUM CONSTRAINT • All other areas are rated LOW CONSTRAINT

To distinguish the data factors as opportunities or constraints, criteria were developed for interpreting the degree of sensitivity to the location of a transmission line corridor. The corridor constraint criteria listed in Table 3.4-2 were used as the standards for assigning constraint ratings to the data factors. The constraint categories - exclusion, high, medium or low - reflect the degree to which the data factor could affect the location of a transmission line corridor. If a particular factor precluded siting of transmission structures it was identified as an Exclusion Area. High and medium constraint ratings were applied if the data factor would conflict with or constrain transmission corridors. The low constraint rating was assigned to factors that were judged to be compatible with transmission lines or that could provide opportunities for siting. Generally, low constraint areas were considered areas of opportunity for the siting of a transmission corridor and included areas near or parallel to existing transmission lines, utility corridors, or major roadways.

After each data factor was assigned a constraint rating, computerized constraint maps were prepared. The resultant environmental constraint maps illustrated the range of constraints over all the data factors within each resource category as summarized in Table 3.4-3. When all of the constraint maps were overlaid to form a composite constraint map, areas having multiple exclusion, high, or medium constraints were considered to be the least suitable for siting a transmission line corridor. The analysis revealed the most highly constrained areas were in isolated areas where several factors considered high constraint occurred together (e.g., areas of steep slopes and landslide potential, the Lahaina Pali Trail, Natural Area Reserves and endangered and threatened species habitat) or in relatively larger areas where several medium constraint factors overlapped (e.g., Special Management Area, Residential/Commercial, flood prone areas and areas with soft/loose materials).

Perhaps the clearest implication of the composite constraint analysis was that most of the central portion of the study area, with the exception of the existing transmission corridor (minimum separation requirements), had few major constraints to siting a new transmission line. The analysis also revealed that existing public roads and cane field edge roads offered opportunities for transmission line siting.

Identify Alternative Corridors

The results of the constraint and opportunities analysis along with additional evaluation of the data maps was used to identify alternative corridors 1/4 to 3/4 mile wide. These alternative corridors

Table 3.4-2
CORRIDOR CONSTRAINT CRITERIA

EXCLUSION AREA

Areas where the siting of transmission lines is essentially precluded. This category includes areas:

- o regulated by policies that legally protect resources,
- o where government regulation expressly prohibits encroachment,
- o where the ownership and use of the land preempts the siting of a transmission line, or
- o where there would be unacceptable hazards to the construction or operation of a transmission line.

HIGH CONSTRAINT

Includes areas that have the following characteristics:

- o unique, highly valued, or complex resource areas
- o significant potential conflict with a current or planned use
- o areas possessing substantial hazards to construction or operation of a transmission line
- o resource areas or conflicts with identified hazards typically requiring long-term and costly mitigation or high design and construction costs
- o areas that require lengthy, complex review and permitting, with likelihood of approval uncertain or low

MEDIUM CONSTRAINT

Includes areas that have the following characteristics:

- o important, valued resources
- o resource hazards
- o special status resources
- o resources with some potential conflict with current or planned use
- o areas possessing some hazard to construction or operation of a transmission line
- o resource areas or conflicts with identified hazards that may require potentially difficult mitigation

LOW CONSTRAINT

Includes areas that have the following characteristics:

- o areas that have not been classified as exclusion, high constraint, or medium constraint
- o areas where required permits are routinely issued
- o areas with little or no conflict with a transmission line
- o no unique or special resources
- o resource conflicts or hazards to construction or operation can be routinely mitigated through compensation, location, or design

NOTE: Generally, low constraint areas are considered areas of opportunity for the siting of a transmission corridor, and include areas parallel to roads and other linear features.

Table 3.4-3
CONSTRAINT RATING SUMMARY

DATA CATEGORY	CONSTRAINT RATING
	Exclusion Areas
Existing Land Use	Active Landfills
	High
Land Ownership	U.S. Coast Guard Land
Land Regulation	State Conservation District Lands [Protective (CP) Subzone]
Existing Land Use	Shooting Range
Existing Utilities/Transmission Separation	Areas Within 250 Feet From Existing 69KV
Biological Resources	Natural Area Reserve Plant Sanctuary or Reserve Endangered, Threatened or Sensitive Plant Species Habitat
Topography and Water Resources	Tsunami Inundation Zone
Geology & Soils	Areas of Landslide Deposits
Cultural Resources	National Register District National Register Site (Hawaii Register Site) Lahaina Pali Trail
	Medium
Land Regulation	State Conservation District Lands [Limited (CL) Subzone] State Conservation District [Resource (CR) Subzone] State Conservation District [General (CG) Subzone] Special Management Area (SMA)
Existing Land Use	Residential Commercial School Resort Parks/Recreation/Golf Course/Cemetery Lahaina Pali Trail Public/Community Facility Quarry Communication Site Reservoir
Existing Utilities/Transmission Separation	Areas Within 500 Feet From Existing 69KV Lines
Proposed Land Use	Projects Under Construction
Topography and Water Resources	Flood-prone Areas (100-year flood zone)
Slope	Slopes Greater than 30%
Geology and Soils	Areas of High Erosion Potential Areas Prone to Slope Instability Soft/Loose Materials/Recent Alluvial Deposits
Cultural Resources	Surveyed & Recorded Pre-Contact Site Surveyed & Recorded Post-Contact Site

generally followed three main routes, mauka, central and makai from the Maalaea Power Plant to the vicinity of the proposed Wahikuli Substation. These alternatives had numerous opportunities to cross between the three main routes and subalternative routes to exit the power plant and to enter the proposed substation site.

The alternative corridors were identified as individual segments and the segments were labeled with letters referring to the study section in which they are located as well as a sequential number. For example those segments labeled "MU" indicate the corridor segments are within the Maalaea-Ukumehame study section. The alternative corridors are shown in Figure 3.4-2. The following is a brief description of the corridor segments in the four sections of the study area.

Power Plant Study Section I

In the Power Plant section, four corridor segments were identified. Segments PP-1 and PP-2 are parallel to each other and to the existing transmission lines exiting the power plant toward West Maui. PP-1 is on the Wailuku side of the existing transmission lines while PP-2 is on the Maalaea side. PP-3 follows the shoreline between the power plant and Honoapiilani Highway. Segment PP-4 is a connecting segment between the intersection of PP-1 or PP-2 and makai corridor segments; it follows Honoapiilani Highway for the entire length of the segment.

Maalaea-Ukumehame Study Section II

This section consists of thirteen corridor segments. The segments combine to form three basic corridor alternatives over the West Maui mountains, mauka (MU-1 and 2), central (MU-3A and 3B, MU-4, 5, 6, 7, 8 and 9) and makai (MU-10A and 10B).

Olowalu-Makila Study Section III

Three long corridor segments were identified across this study section. OM-1 is the mauka corridor, OM-2 is the central corridor and OM-3A and OM-3B make up the coastline corridor.

Lahaina-Wahikuli Study Section IV

Because of commercial and residential land use constraints in this study section, there are eleven short corridor segments that follow the perimeter of existing and proposed developments. Here

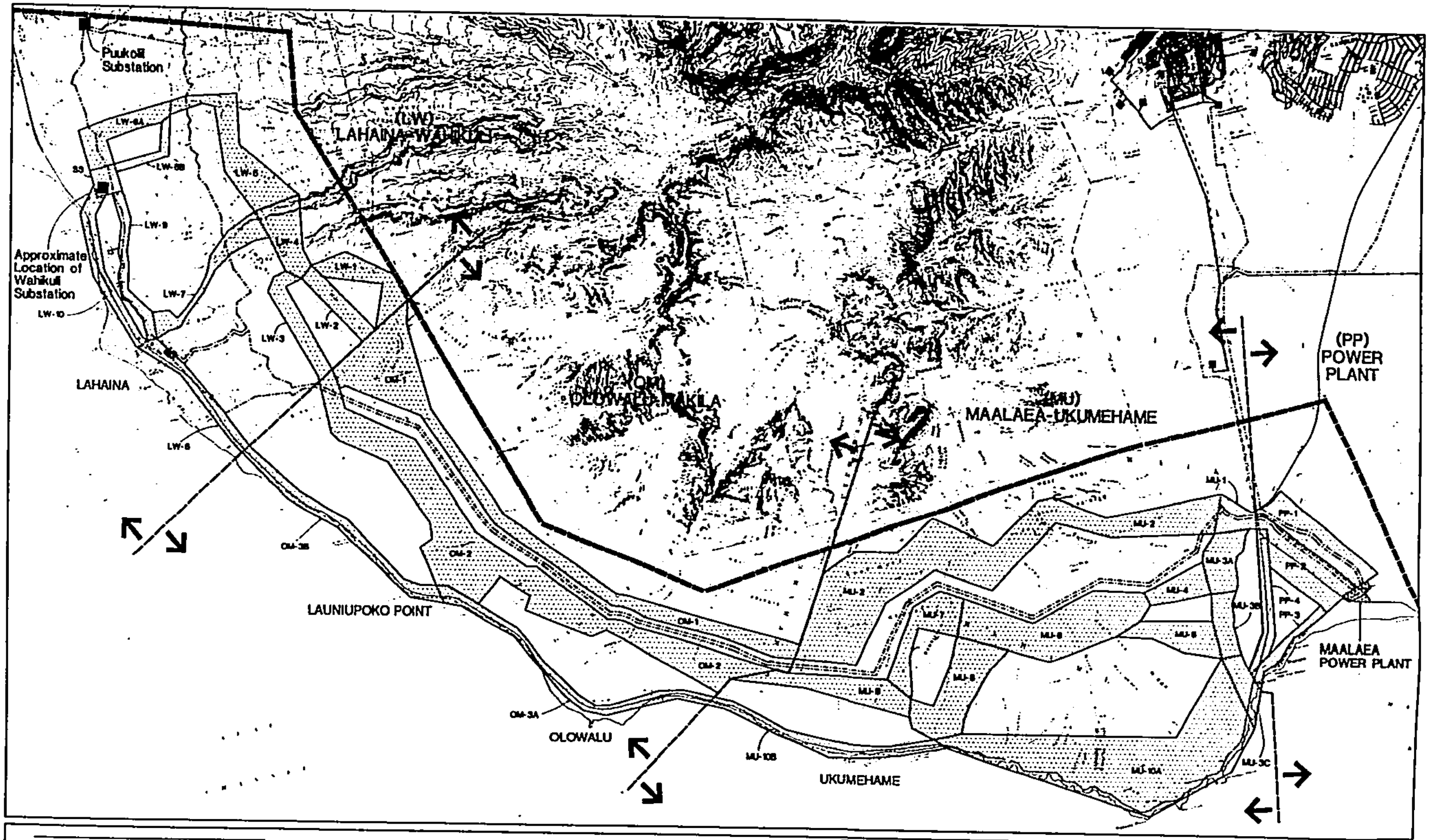


Figure 3.4-2

Alternative Corridors

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

Dames & Moore

again, there is essentially a mauka, central and coastal alternative, with a segment following the flood control channel that connects mauka and central corridor segments with the coastal alternative.

3.4.3 Phase II - Corridor Evaluation and Alignment Selection

Evaluate Alternative Corridors

An Alternative Corridor Selection Workshop was held with MECO and the project team on February 21, 1992, to consider the input received from agency and landowner consultation, to review the results of the regional study and constraint analysis and to compare feasible alternative corridors. In preparation for the workshop, comparative analyses were performed on over 58 feasible alternative corridors.

Both qualitative and semi-quantitative methods were used to compare the corridors, with the objective of selecting a preferred corridor that balanced engineering, environmental and economic factors as well as landowner preferences and concerns. A qualitative assessment was made by examining the *existing resources within each corridor segment and through discussions with landowners* (and lessees) and agricultural operations personnel. A semi-quantitative assessment was made by conducting a numerical sensitivity analysis of the various feasible corridor alternatives. The sensitivity analysis was designed to compare the constraints and opportunities of the alternative corridor segments and to assist in evaluation and screening of alternative corridors and selection of a preferred corridor.

Results of the Sensitivity Analysis

The constraint ratings assigned during the course of the regional study and constraint analysis were used to compare the corridor segments. Feasible corridor segment combinations were developed, and these combinations were linked across the four study sections to derive 58 different combinations and a sensitivity evaluation was conducted on the 58 feasible corridors.

Feasible corridors are defined as the combinations of corridor segments that represent the consultant team's judgement of the most logical and practical options among the many possible combinations of corridor segments. The net constraint units (weighted) and the net constraint units expressed as a percentage of linear units (total length) were calculated for the feasible corridors.

Those corridors with the lowest percentage score were ranked environmentally superior in terms of their potential for siting the transmission line. Those corridors with a higher percentage score had a higher number of constraints in the corridor.

The percentage scores for all the corridors fell within a range of 89.6 to 487.9. The highest percentage scores indicate corridors with combinations of higher-scored (multiple constraint factors) corridor segments. For example, corridors involving segment MU-2 or segment combinations of two or more of the following: MU-10A, MU-10B, OM-3A, OM-3B, or LW-10 ranked high.

Of the 58 feasible corridors analyzed, nineteen ranked less than 117, representing seven percent of the total range of scores and clustered around an arithmetic mean of 101. Six ranked between 141 and 150, representing approximately 15 percent of the total scores; eleven ranked between 153 and 168, or within 20 percent of the total scores; and 22 combinations scored 169 and above, greater than 20 percent of the total score. Table 3.4-4 shows corridors within the top seven percent total score of those evaluated.

The least constrained corridor alternatives had a number of characteristics in common:

- They did not include the shoreline or coastal segments;
- They avoided extremely steep terrain;
- They avoided biologically sensitive habitats and natural reserves in the mauka areas of the study area;
- They avoided crossing cane or pineapple fields, but in some cases utilized cane field edge roads or irrigation ditches;
- They avoided developed lands used for residential, commercial or recreational purposes; and
- They followed the perimeter of the HFDC development in Lahaina to the Wahikuli Substation site (segment LW-6B).

Construction cost was also considered as a corridor evaluation factor. Based on an approximate cost of $250,000 per mile for construction of a 69KV transmission line in terrain with slopes less than 20 percent and $350,000 per mile for construction in terrain with greater than 20 percent slope, the approximate construction cost was calculated for each of the top-ranked corridor alternatives (Table

Table 3.4-4
TOP RANKED ALTERNATIVE CORRIDORS

REFERENCE CODE	FEASIBLE CORRIDORS	NET CONST W/OPP WEIGHTED	LINEAR UNITS	NET CONST AS % LINEAR UNITS (Weighted)	LENGTH (miles)	CONST. COST ($M)	REFERENCE CODE
2 C 5 N	PP-2/MU-1/MU-3A/MU-4/MU-6/MU-8/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6B	42.10	46.95	89.67	17.78	4.45	2 C 5 N
2 E 5 N	PP-2/MU-1/MU-3A/MU-3B/MU-5/MU-6/MU-8/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6B	45.60	49.45	92.21	18.73	4.68	2 E 5 N
2 C 5 M	PP-2/MU-1/MU-3A/MU-4/MU-6/MU-8/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6A	44.90	48.05	93.44	18.20	4.55	2 C 5 M
2 E 5 M	PP-2/MU-1/MU-3A/MU-3B/MU-5/MU-6/MU-8/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6A	48.40	50.55	95.75	19.15	4.79	2 E 5 M
1 C 5 N	PP-1/MU-1/MU-3A/MU-4/MU-6/MU-8/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6B	45.70	47.60	96.01	18.03	4.51	1 C 5 N
2 D 5 N	PP-2MU-1/MU-3A/MU-3B/MU-5/MU-6/MU-7/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6B	49.90	51.05	97.75	19.34	4.83	2 D 5 N
1 E 5 N	PP-1/MU-1/MU-3A/MU-3B/MU-5/MU-6/MU-8/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6B	49.20	50.10	98.20	18.98	4.74	1 E 5 N
2 B 5 M	PP-2/MU-1/MU-3A/MU-4/MU-6/MU-7/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6A	49.20	49.65	99.09	18.81	4.70	2 B 5 M
3 H 5 N	PP-3/MU-3C/MU-10A/MU-8(part)/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6B	45.25	45.45	99.56	17.22	4.30	3 H 5 N
1 C 5 M	PP-1/MU-1/MU-3A/MU-4/MU-6/MU-8/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6A	48.50	48.70	99.59	18.45	4.61	1 C 5 M
2 D 5 M	PP-2/MU-1/MU-3A/MU-3B/MU-5/MU-6/MU-7/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6A	52.70	52.15	101.05	19.75	4.94	2 D 5 M
1 E 5 M	PP-1/MU-1/MU-3A/MU-3B/MU-5/MU-6/MU-8/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6A	52.00	51.20	101.56	19.39	4.85	1 E 5 M
1 D 5 N	PP-1/MU-1/MU-3A/MU-3B/MU-5/MU-6/MU-7/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6B	53.50	51.70	103.48	19.58	4.90	1 D 5 N
1 B 5 M	PP-1/MU-1/MU-3A/MU-4/MU-6/MU-7/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6A	52.80	50.30	104.97	19.05	4.76	1 B 5 M
2 B 5 N	PP-2/MU-1/MU-3A/MU-4/MU-6/MU-7/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6B	46.40	43.55	106.54	16.50	4.12	2 B 5 N
1 D 5 M	PP-1/MU-1/MU-3A/MU-3B/MU-5/MU-6/MU-7/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6A	56.30	52.80	106.63	20.00	5.00	1 D 5 M
2 B 5 S	PP-2/MU-1/MU-3A/MU-4/MU-6/MU-7/MU-9/OM-2/LW-3/LW-4/LW-7/LW-9	56.10	50.35	111.42	19.07	4.77	2 B 5 S
1 B 5 N	PP-1/MU-1/MU-3A/MU-4/MU-6/MU-7/MU-9/OM-2/LW-3/LW-4/LW-5/LW-6B	50.00	44.20	113.12	16.74	4.19	1 B 5 N
1 B 5 S	PP-1/MU-1/MU-3A/MU-4/MU-6/MU-7/MU-9/OM-2/LW-3/LW-4/LW-7/LW-9	59.70	51.00	117.06	19.32	4.83	1 B 5 S

3.4-4). This estimated cost was based on a wood pole designed to withstand 60 mph winds (the original design concept) and it did not include the cost to construct or improve access roads. The estimated costs ranged between $4.12 million and $5.00 million with an average cost of $4.65 million.

Primary Corridor Alternatives

Within the 58 feasible corridor combinations analyzed in the sensitivity analysis, four primary corridor alternatives emerged and are shown in Figures 3.4-3 through 3.4-6 and noted below.

Alternative 1	-	Mauka corridor
Alternative 2	-	Central Corridor
Alternative 3	-	Makai - Central Corridor
Alternative 4	-	Coastal Corridor

The least constrained corridor is Alternative 2, Central Corridor.

The feasible corridor segment combinations for all alternative corridors are shown in Table 3.4-5.

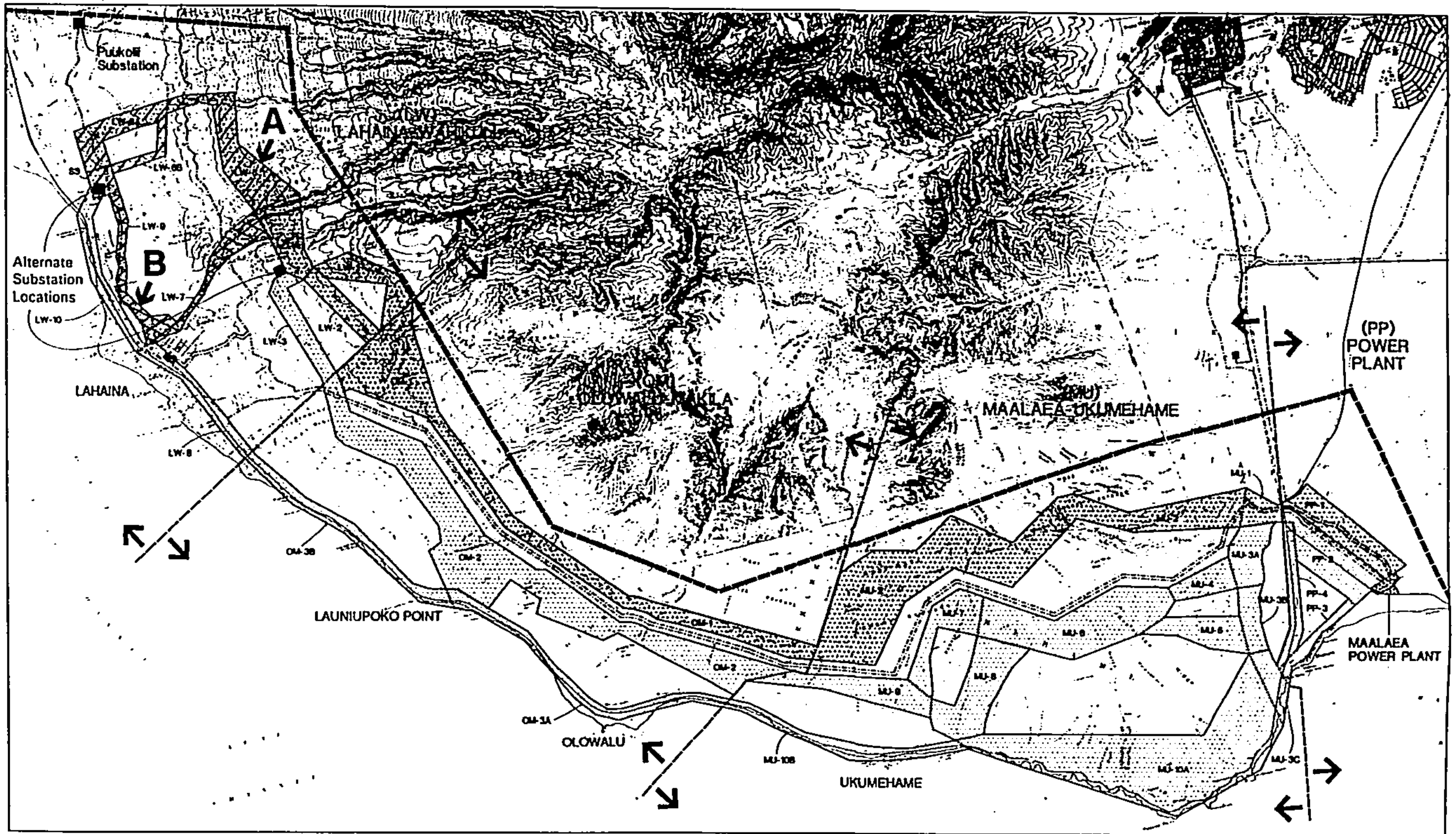
<u>Public Meetings, Agency Review and Landowner Consultation</u>

The four primary corridor alternatives were reviewed and discussed with the major landowners, presented in a project newsletter, and presented and discussed at the public meetings. The groups were asked to provide comments on the alternatives and to express a corridor preference.

Public Meetings

A public meeting announcement letter was sent to community groups, agencies, elected officials and landowners inviting them to attend a public information meeting on the project. A project fact sheet describing the project, routing studies and maps showing the primary corridor alternatives were prepared and distributed at the public meetings.

Public meetings were held on March 11, 1992, in Lahaina and March 12, 1992, in Kahului to present and discuss the route selection process and the alternative corridors. Environmental data and constraint maps and slides were used to present the results of the corridor identification process and to show the location of the corridor alternatives.



ALTERNATIVE #1

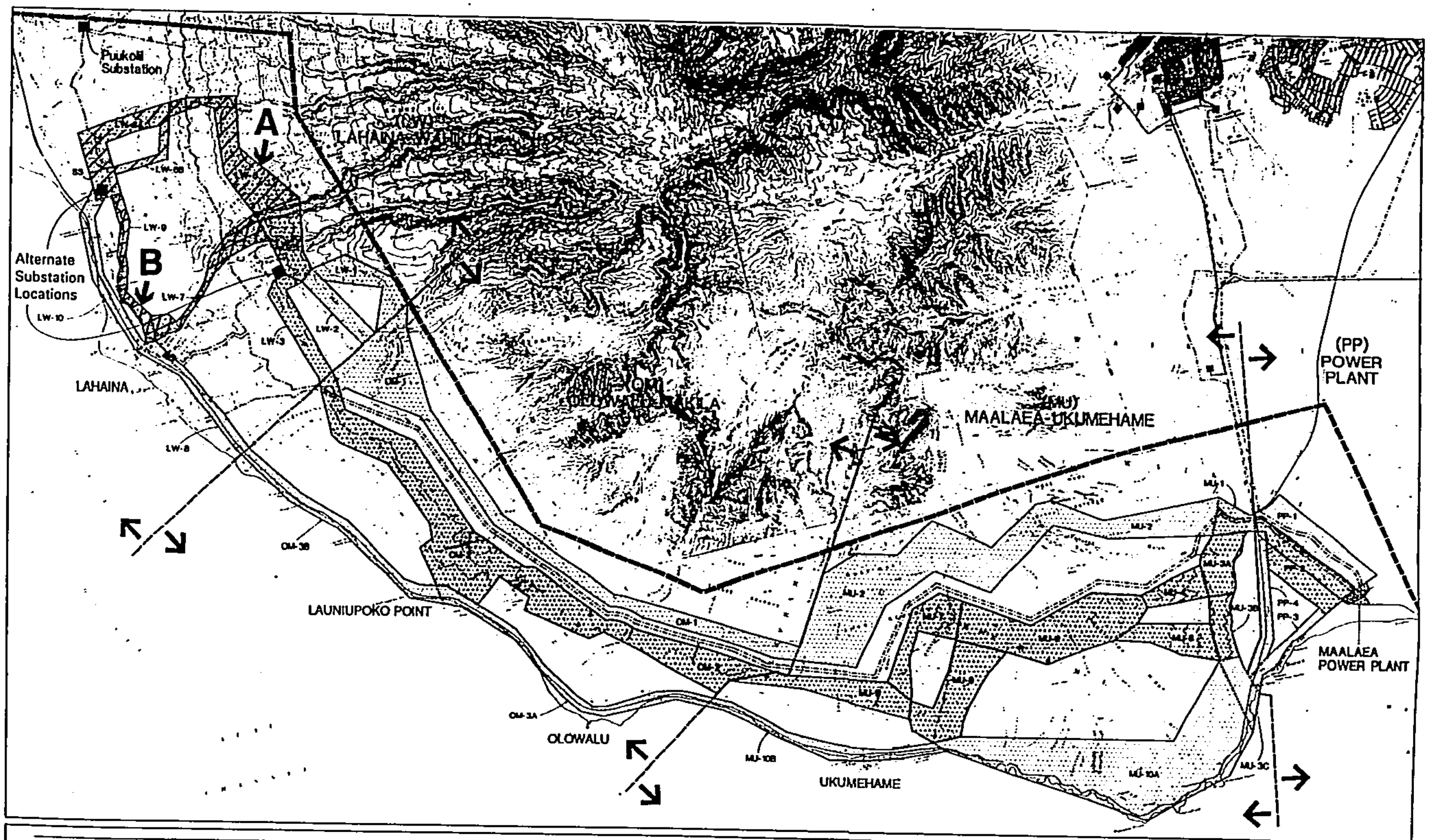
Figure 3.4-3

Alternative Corridors

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

Dames & Moore



Study Area Sections

Alternative Corridor Segments

ALTERNATIVE #2

KEY MAP

SCALE

Figure 3.4-4

Alternative Corridors

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

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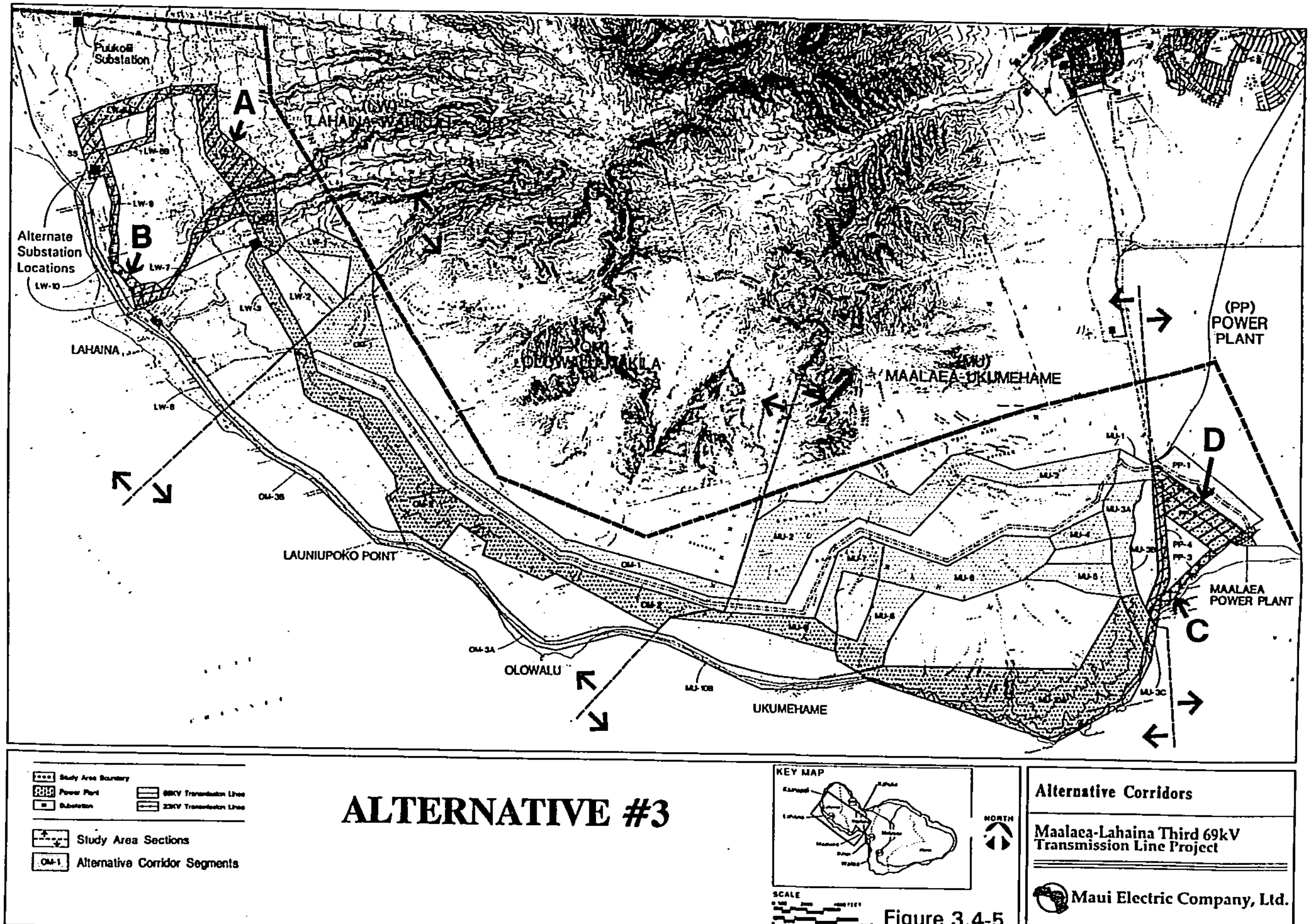


ALTERNATIVE #3

Alternative Corridors

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

Dames & Moore

Figure 3.4-5

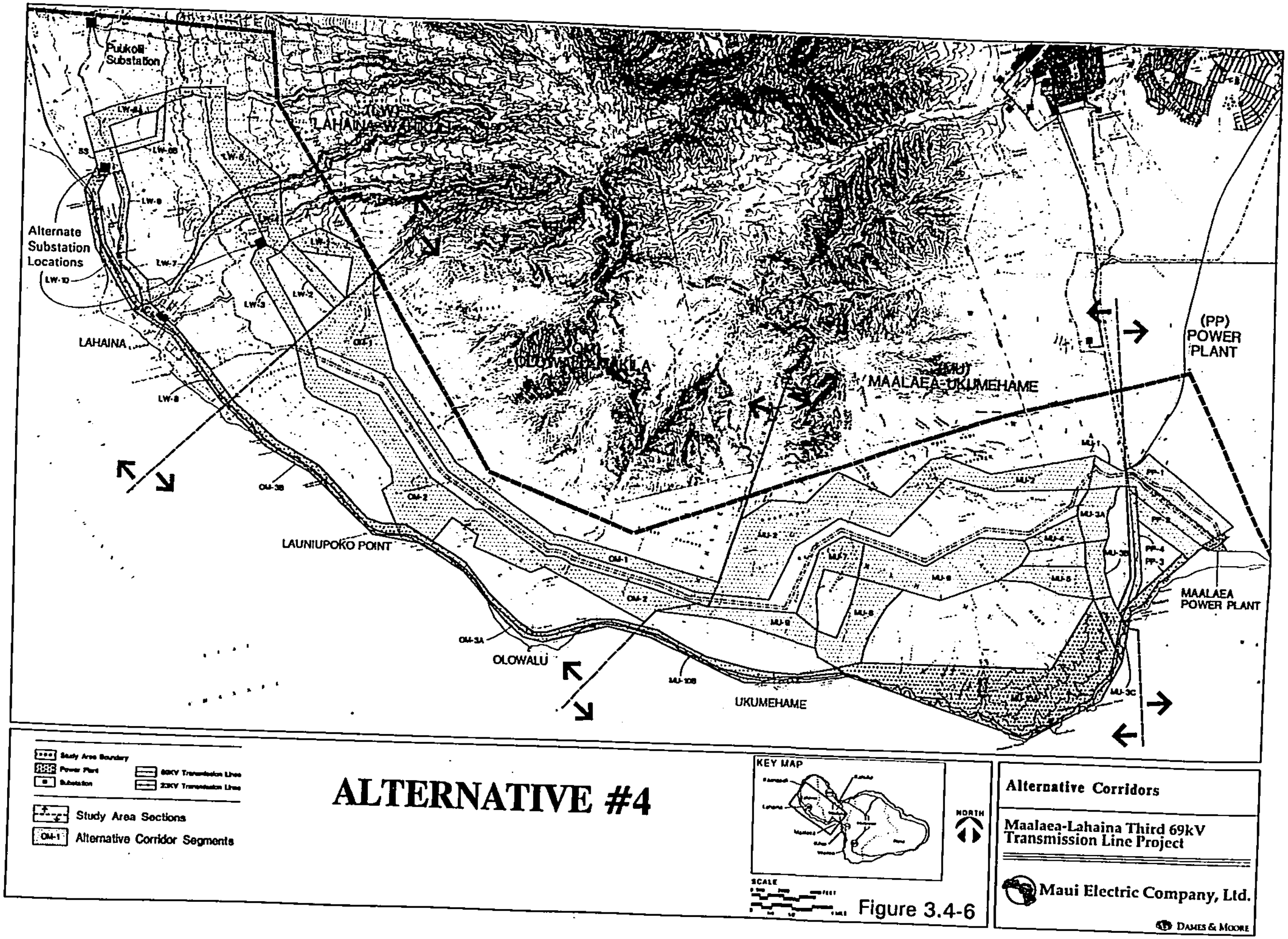

Pulkolii Substation
Alternate Substation Locations
LAHAINA
LAUNIUPOKO POINT
OLOWALU
UKUMEHAME
(MU) MAALAEA-UKUMEHAME
(PP) POWER PLANT
MAALAEA POWER PLANT
Study Area Sections
Alternative Corridor Segments
ALTERNATIVE #4
KEY MAP
NORTH
SCALE
Figure 3.4-6
Alternative Corridors
Maalaea-Lahaina Third 69kV Transmission Line Project
Maui Electric Company, Ltd.
DAMES & MOORE

Table 3.4-5
FEASIBLE SEGMENT COMBINATIONS FOR ALTERNATIVES

SEGMENT COMBINATIONS	LENGTH (mi.)	CONSTRAINT UNITS	COST ($K)	ALT. #1	ALT #2	ALT #3	ALT #4	ALT #5	ALT #6
Power Plant Study Section									
PP-1	1.63	9.75	260.0	X					X
PP-2	0.68	6.2	108.5		X				X
PP-2/PP-4	2.10	3.2	335.0			X		X	
PP-3	1.04	4.6	165.9			X	X	X	
Maalaea – Ukumehame Study Section									
MU-1/MU-2	5.98	36.1	3674.5	X					
MU-1/MU-3A/MU-4	2.36	9.5	951.2		X				X
MU-1/MU-3A/MU-3B/MU-5	3.11	13.0	1236.4		X				
MU-6/MU-7/MU-9	4.37	25.2	2510.5		X				X
MU-6/MU-8/MU-9	4.69	20.9	2709.9		X				
MU-3C/MU-10A/MU-9	5.42	39.9	3062.9			X		X	
MU-3C/MU-10A/MU-10B	6.50	75.8	2739.1				X	CROSS OVER	CROSS OVER
Olowalu – Makila Study Section									
OM-1	6.12	18.6	1582.9	X				X	X
OM-2	6.03	6.6	962.1		X	X			
OM-3A/OM-3B	6.08	80.8	970.1				X		
Lahaina – Wahikuli Study Section									
LW-1	1.32	6.8	438.6	X					
LW-2	1.00	1.0	258.7	X				X	X
LW-3	1.34	0.0	346.6		X	X			
LW-4/LW-5/LW-6A/SS	4.10	17.7	1063.5	X	X				
LW-4/LW-5/LW-6B/SS	3.84	11.7	1144.9	X	X				
LW-4/LW-5 (dbl. cir.)/LW-6B/SS	3.84	11.7	1339.0			X		X	X
LW-4/LW-7/LW-9/SS	3.61	21.3	931.0	X	X				
LW-4/LW-7/LW-9(single circuit)/SS	3.61	21.3	846.1			X		X	
LW-8/LW-10/SS	3.56	39.8	568.0				X		

The public was asked to provide input on each of the corridor alternatives that would assist MECO in selecting a final preferred corridor. The project fact sheet containing maps of the corridors and a mail-back response form were handed to each meeting attendee so that, if they did not provide input during the meeting, they could send a written response to MECO. The response form was structured so that individuals could indicate a preferred corridor.

Questions raised during the two meetings included, "why not locate the new line on the same poles within the same corridor as the existing two lines?" The purpose of the new line is to increase capacity and maintain reliability even under increased loads. Reliability is maintained by separating the existing and proposed transmission lines. MECO's minimum separation for planning purposes is 250 feet.

Several individuals spoke out against siting the line along the coastal highway because of aesthetic impacts and possible need to relocate it in the future to accommodate future highway widening or project development.

Of the 21 total meeting attendees, 11 written responses were received. The ranking of preferences was Alternative 2 (5), Alternative 3 (3), Alternative 1 (2) and Alternative 4 (1). Five responses received expressed opposition to Alternative 4, the coastal alternative, as well as their preference for either Alternatives 1 or 2.

Landowner Consultation

Individual meetings were held with major landowners: the State Department of Land and Natural Resources (DLNR), State HFDC, Alexander & Baldwin Hawaii, Inc. and Hawaiian Commercial & Sugar Company (HC&S), Wailuku Agribusiness and C. Brewer Properties, Inc., the State Department of Transportation, Pioneer Mill and AMFAC/JMB Hawaii, Inc. and Bishop Estate. Comments received from landowners included corridor preferences, areas to avoid and possible conflicts with existing and proposed land uses.

Specific siting issues discussed included: agricultural operations and safety requirements, use of existing state highway rights-of-way, protection of viewplanes from the Lahaina Pali Trail, protection of the future utility of the land currently used for sugar cane production, the proposed Lahaina

Bypass Road as a possible transmission line alignment and the status of the HFDC's land acquisition for development of the Lahaina Master Planned Community.

Several consultation meetings were held with DLNR representatives from the Division of Forestry and Wildlife, Land Management Division, Office of Conservation and Environmental Affairs, Historic Preservation Division and Na Ala Hele Trails and Access (Lahaina Pali Trail) program specialists between December 1991 through October 1992, to review the alternative corridors.

Alternative 1 was rejected because it was in steep terrain and contained endangered plant species habitat and dense areas of native dryland forest adjacent to a Natural Area Reserve.

With respect to the Lahaina Pali Trail , Alternatives 3 and 4 were not preferred because of concerns regarding possible line visibility from the trail and crossing of the trail. Preference was expressed for locating the line mauka of the Lahaina Pali Trail (see discussion of Lahaina Pali Trail viewshed analysis in Section 4.12 and Appendix I).

Alexander & Baldwin, Inc. and HC&S recommended using a corridor that paralleled North Kihei Road through their property.

Amfac/JMB Hawaii and Pioneer Mill sent a letter identifying a preference for locating the line in a mauka corridor segment just above their cane lands and along the proposed Lahaina Bypass Road alignment. Their recommended corridor involved crossing the existing 69KV transmission lines in the vicinity of Ukumehame Gulch.

The State Department of Transportation discouraged the use of the Lahaina Bypass Road as a potential corridor stating the coordination of planning for the two linear facilities could be difficult since the route for the bypass was not finalized.

Alternate Substation Site

Amfac/JMB Hawaii and Pioneer Mill provided a recommended corridor; however, a corridor to the proposed Wahikuli Substation site could not be agreed upon by the various landowners. Pioneer Mill wanted MECO to use the Lahaina Bypass Road alignment through the HFDC project. HFDC wanted the new line to be sited on the perimeter, but outside of their proposed residential community. Pioneer Mill wanted to limit cane field crossings and recommended placing the line within the HFDC property. MECO, therefore, decided to examine the possibility of an alternative switching station location near Lahaina. When electrical service is required for the HFDC development, MECO could extend a distribution line and build a new smaller substation within the development. Alternative sites along Lahainaluna Road just inside Bishop Estate property were identified and evaluated through landowner meetings and field inspection.

Select Preliminary Preferred Corridors

The various comparative corridor evaluations and discussions with public, agencies and landowners resulted in the identification of preliminary preferred corridors. Two additional corridors evolved out of the various responses from agency and landowner meetings and consultation. Corridor Alternatives 5 and 6 are shown on Figures 3.4-7 and 3.4-8. The two preliminary preferred corridors were similar except in the Maalaea-Ukumehame study section, where Alternative 5 proceeded along the lower slopes of the West Maui mountains and Alternative 6 proceeded above the Lahaina Pali Trail through the central West Maui mountains.

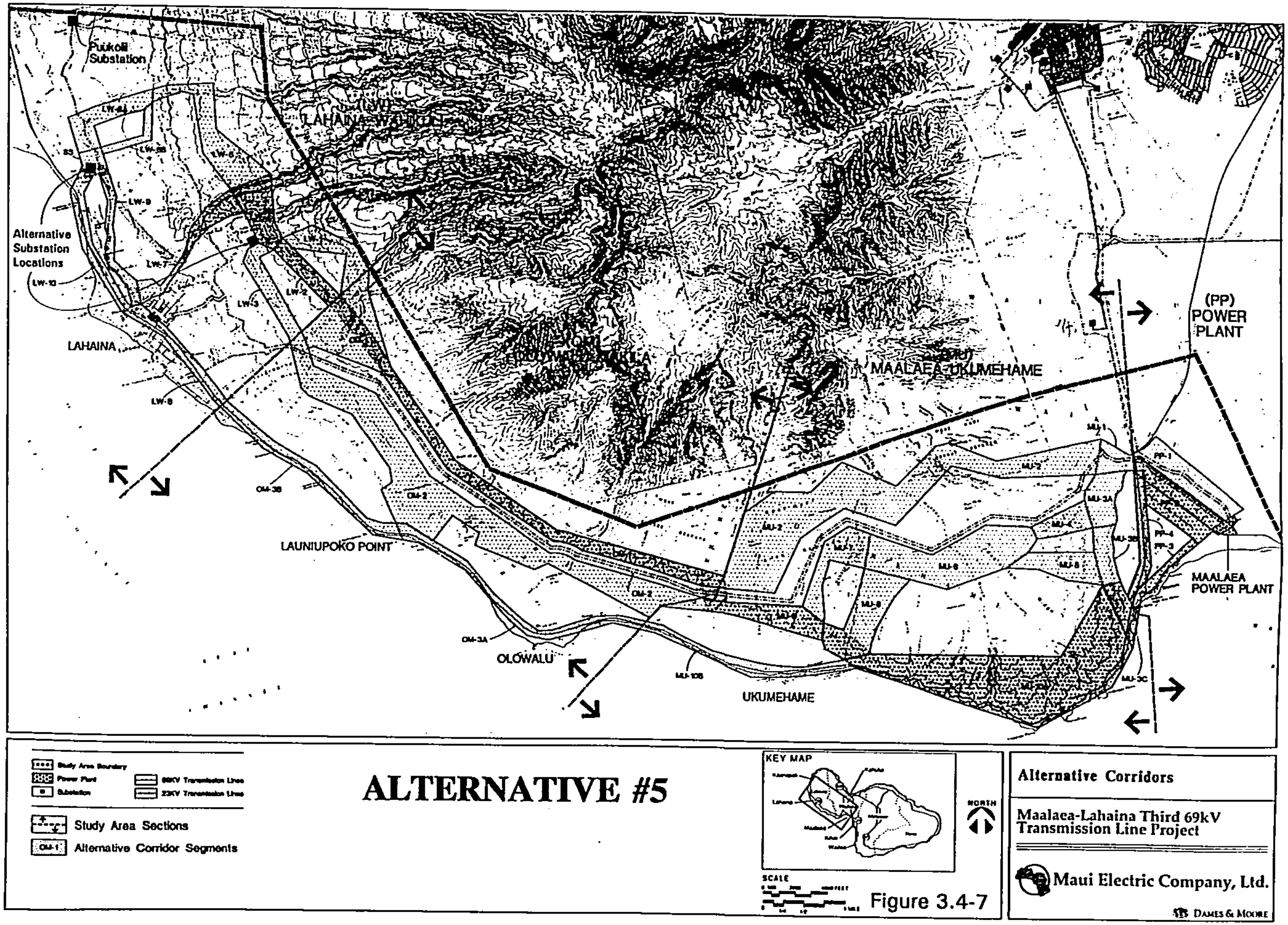
MECO determined that additional evaluation of several issues was warranted to provide more information upon which to base a final decision. Key areas that were evaluated further were the cost differences between the corridors, the potential visual effect of the new line from the Lahaina Pali Trail, constructibility and access.

Develop Detailed Corridor Data Base

Construction Cost Comparison

A construction cost estimate was prepared to include the labor, material, engineering and contingency for each corridor alternative. The estimate assumed wood pole construction designed to withstand 60 mph winds. Since the project was to be constructed across variable terrain, the estimate included cost of construction in five terrain categories: extreme mountainous, rugged mountainous, moderate mountainous, mountainous and level moderate terrain.

The cost estimate revealed that all the alternative corridors fell within the range of $4.0 million to $7.3 million depending on the various possible combinations of corridor segments that could be used



ALTERNATIVE #5

Figure 3.4-7

Alternative Corridors

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

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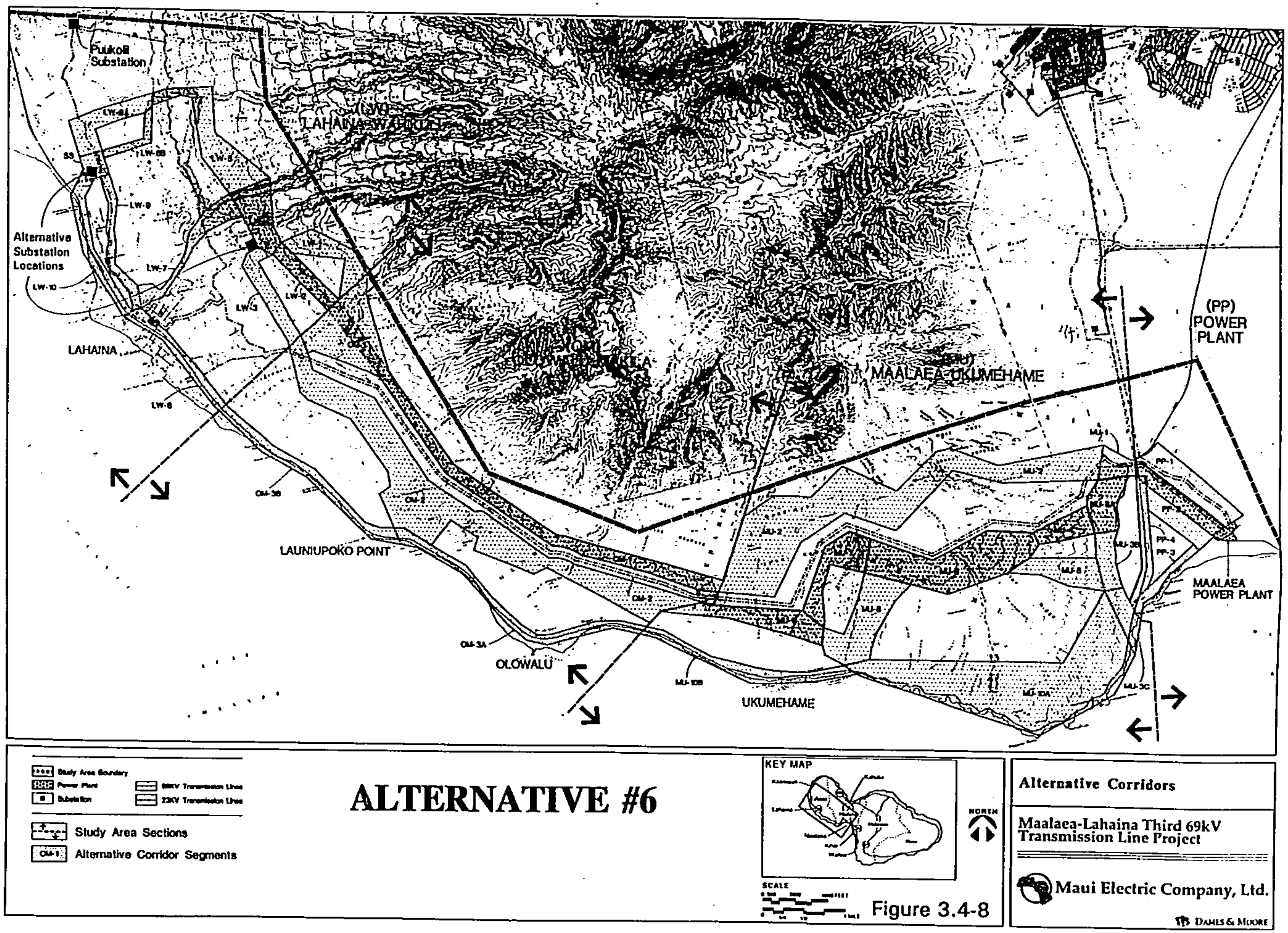

ALTERNATIVE #6

Figure 3.4-8

Alternative Corridors

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

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in any particular alternative. Alternative 4, the coastal alternative, was the least expensive at $4.0 million and Alternative 1, the mauka corridor, was the highest at $6.3 million to $7.3 million. The two central corridors, Alternatives 2 and 3, ranged from $4.9 million to $6.5 million again depending on the subalternatives selected near the endpoints. The cost for the preliminary preferred corridors 5 and 6 was $6.1 million and $6.7 million, respectively.

Based on better access for construction and maintenance and lower overall cost, MECO preferred Alternative 5. However, DLNR and Na Ala Hele had expressed concerns regarding the potential visibility of the line from the Lahaina Pali Trail.

To more fully understand the potential visual impact issues and attempt to come to an agreement on an acceptable corridor, MECO conducted a computerized viewshed analysis to provide an assessment of corridor visibility from the trail.

Lahaina Pali Trail Viewshed Analysis

A computerized viewshed visibility study was conducted to provide a factual rather than speculative basis for evaluating issues and concerns of transmission line visibility from the trail, and to aid in selecting a preferred corridor for detailed study to locate a suitable alignment for the transmission line.

The methodology and results of the Lahaina Pali Trail Viewshed Analysis are described in Appendix I.

The results of the viewshed study were presented and discussed with DLNR in October 1992. MECO and DLNR agreed that Corridor Alternative 6, the central corridor, would have the least visual impact to the trail. Construction of the line would not require crossing the trail and would not parallel the trail in close proximity resulting in none to low visibility.

<u>Select Preferred Corridor and Switching Station Site</u>

As a result of consultations with major landowners (HC&S, Wailuku Agribusiness, DLNR, Pioneer Mill/Amfac and Bishop Estate) corridor Alternative 6 was selected as the preferred corridor. The corridor was selected because it minimized visual concerns associated with the Lahaina Pali Trail, avoided crossing cane fields for most of its distance, met MECO's separation criteria from existing 69KV lines and afforded reasonable access for construction and maintenance by existing access roads for more than two-thirds of the corridor. Corridor Alternative 6 included a location in the vicinity of Ukumehame reservoir where the new line would crossover from makai of the existing 69KV lines to mauka of the existing lines (CO-1).

The purpose of the crossover was to accommodate Pioneer Mill's request that the new line not be sited through cane fields from Launiupoko to Lahaina. An alternative crossover point (CO-2) in the vicinity of Puu Hipa and Puu Mahanalua was identified because of terrain and possible archaeological resource constraints at the Ukumehame crossover location. The preferred corridor segments within State lands make up over 60 percent of the total corridor length with the remainder in private ownership. The preferred corridor is shown on Figure 3.4-9 and its segments are summarized in Table 3.4-6.

The Maalaea-Lahaina third 69KV transmission line will terminate at a new switching station from which power can be delivered into the West Maui transmission grid. MECO has consulted with Bishop Estate regarding a location for a two- to three-acre site for the switching station. A site off of Lahainaluna Road near a county water storage tank has been identified that is acceptable to Bishop Estate.

<u>Identify and Evaluate Alternative Alignments</u>

The next step in the route selection process involved investigation of characteristics and features within the preferred corridor to identify alignment alternatives approximately 100 to 150 feet wide.

Criteria used in identifying potential alignments included:

- To the extent possible, minimize the span length of required gulch crossings.
- Minimize the number of angles and turns.
- Locate alignments to ensure no or low visibility from the Lahaina Pali Trail.
- Avoid to the extent possible, crossing cane fields.
- Locate alignments to take advantage of existing access roads for construction and maintenance.

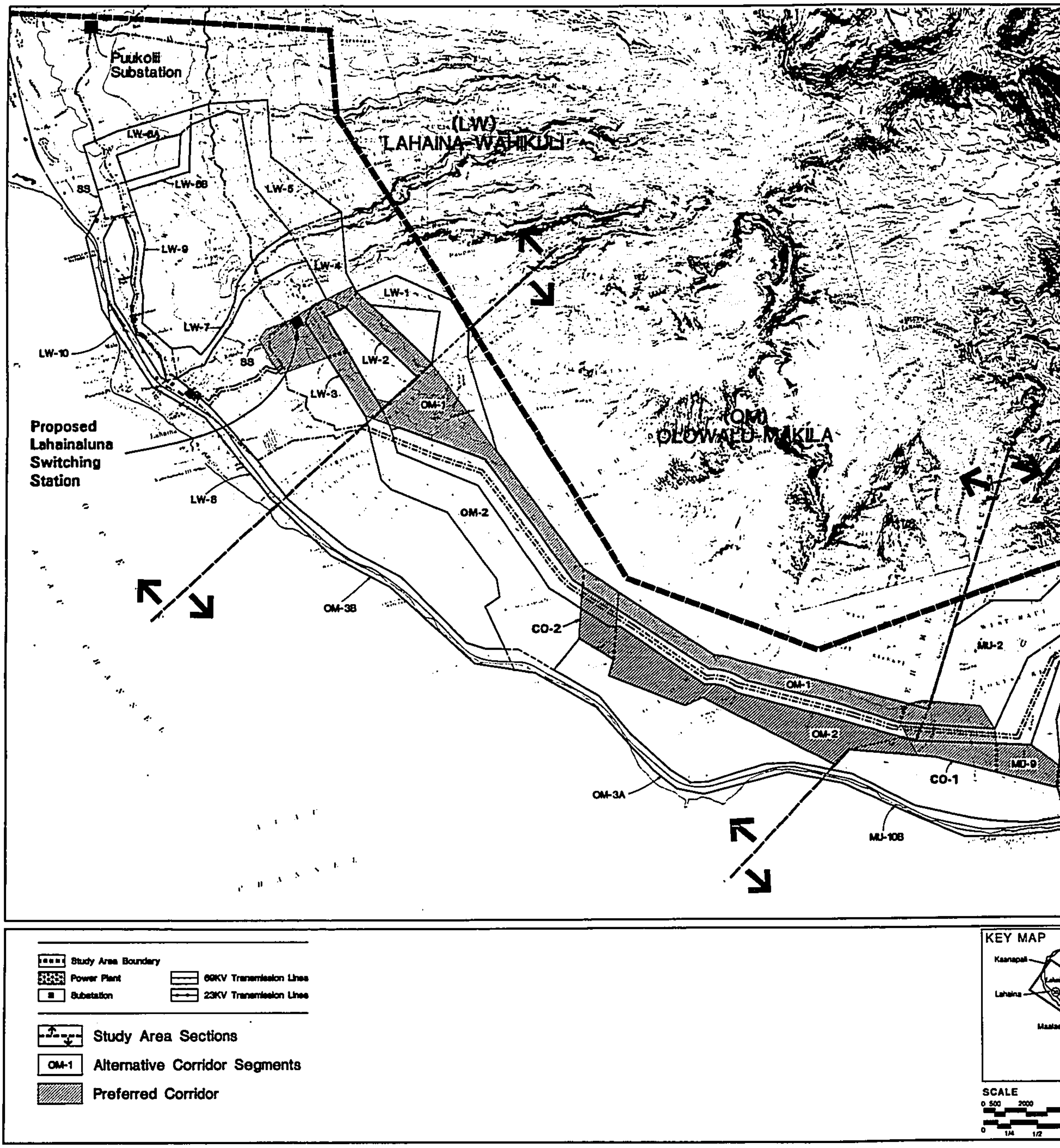
Table 3.4-6
PREFERRED CORRIDOR

Study Section	Corridor Segment	Location
Power Plant	PP-2	Maalaea Power Plant to N. Kihei Rd.
Maalaea-UkumehamePower Plant	MU-1	Honoapiilani Highway crossing
	MU-3A	Lower slopes of Kealaloloa Ridge
	MU-4	Slopes of Kealaloloa Ridge
	MU-6	Kealaloloa Ridge and Manawainui Gulch crossing
Maalaea-Ukumehame	MU-8	Downslope on the ridge adjacent to Manawaipueo Gulch
	MU-9	Edge of cane field
	CO-1PP-2	Ukumehame Gulch-Alternative Crossover 1M
	MU-1	
	MU-3A	
	MU-4	
	MU-6	
	MU-8	
Olowalu-Makila	OM-1 or	Corridor segment mauka of existing 69KV lines
	OM-2	Corridor segment makai of existing 69KV lines
	CO-2	Puu Hipa-Alternative Crossover 2
Lahaina - Wahikuli	LW-2 or	Piilani Ditch Road
	LW-3	Lahainaluna Ditch Road
	SS	Lahainaluna Switching Station

Using the environmental data base developed for corridor identification and large scale aerial photographs (1 inch = 1,000 feet and 1 inch = 500 feet), potential alignments were identified and mapped.

__Field Survey and Staking__

The next step was to inspect the alternatives identified from maps and photographs in the field. On January 28 and February 3, 1993, using helicopters, HECO, MECO and Dames & Moore engineers


Puukolii Substation
(LW) LAHAINA-WAHIKULI
LW-6A
LW-6B
LW-5
SS
LW-9
LW-4
LW-1
LW-7
LW-10
LW-2
LW-3
OM-1
Proposed Lahainaluna Switching Station
LW-8
OM-2
(OM) OLOWALU-MAKILA
OM-3B
CO-2
MU-2
OM-1
OM-2
MU-9
CO-1
OM-3A
MU-10B
Study Area Boundary
Power Plant
Substation
69KV Transmission Lines
23KV Transmission Lines
Study Area Sections
OM-1 Alternative Corridor Segments
Preferred Corridor
KEY MAP
Kaanapali
Lahaina
SCALE

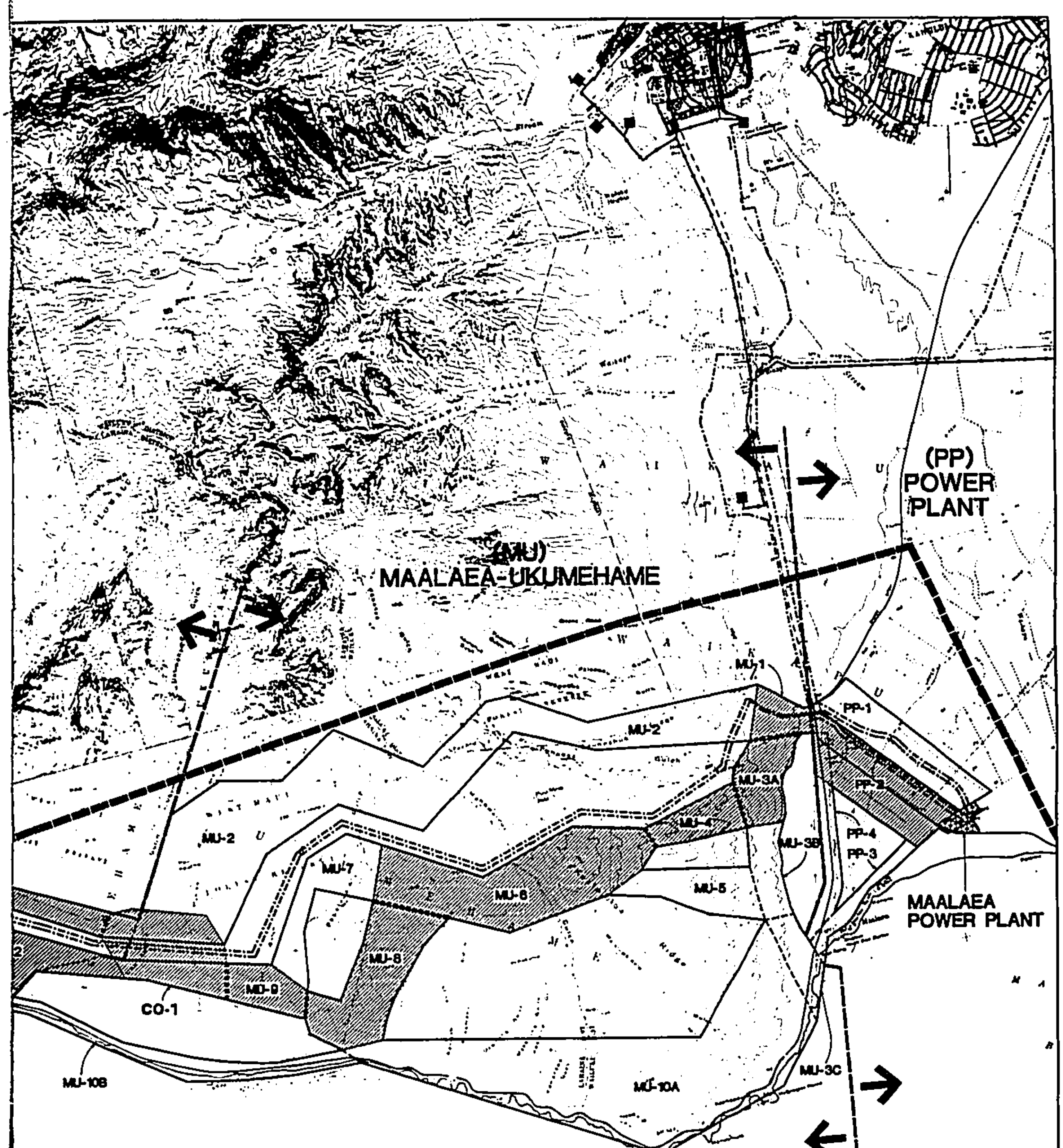
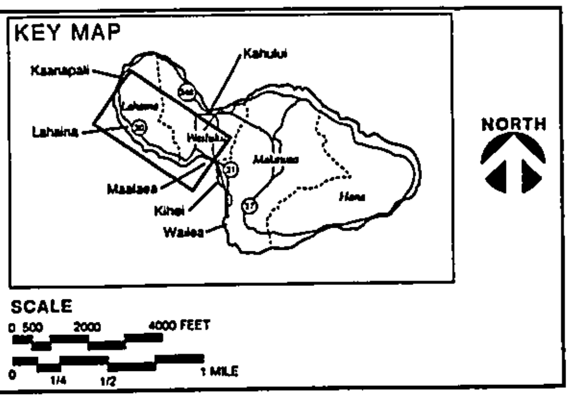


Figure 3.4-9



Preferred Corridor

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

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and environmental specialists conducted a field engineering reconnaissance to refine project siting requirements in the field and to stake key control points of a preferred alignment.

A preferred alignment was located during this field engineering effort and the staked locations were recorded using a global positioning system (GPS) to facilitate accurate mapping and future archaeological and biological surveys.

During the field survey, the two alternative locations for the crossover of existing lines were carefully examined. Because MECO proposes to underground the new line to cross the existing lines, a crossover at the Ukumehame Gulch was determined to be unfeasible due to steep terrain. The crossover in the vicinity of Puu Hipa was selected because of a more level terrain condition.

Agency Review and Landowner Consultation

Additional consultation with government agencies and landowners was conducted during February and March 1993, to review the findings of the field survey and present and discuss the preferred alignment. Meetings were held with Wailuku Agribusiness/C. Brewer Properties, Inc., DLNR, Pioneer Mill, Amfac/JMB Hawaii, Inc. and Bishop Estate to confirm the preferred alignment across their various properties. The State Department of Transportation and State Department of Education were also consulted regarding the preferred alignment, highway crossings and the proximity to Lahainaluna School respectively.

Select Preferred Alignment

Based primarily on the response from the landowners during the consultation task, the preferred alignment was refined and then mapped at 1:12,000 scale (1 inch = 1,000 feet). The preferred alignment is shown in Figure 2.3-2 of this environmental assessment.

3.4.4 Phase III - CDUA & Environmental Impact Statement Preparation

The third phase of the Routing Study process involved the preparation of a Environmental Impact Statement Preparation Notice and Environmental Assessment (EISPN\EA), application for a Conservation District Use Permit (CDUA) to the DLNR, detailed archaeological and floral/faunal surveys of the preferred alignment, public and focused community group meetings to discuss and receive comments of the preferred alignment and preparation of the Draft EIS.

EISPN/EA and CDUA

Because the proposed project would involve the use of State-owned lands and would cross land designated as Conservation District, compliance with Hawaii Revised Statutes (HRS) 343 and 342 and Title 11, Chapter 200 Department of Health Administrative Rules will be required. MECO prepared an EISPN/EA to initiate the environmental review process. The EISPN/EA was submitted to DLNR on April 20, 1993. Publication in the OEQC (Office of Environmental Quality Control) Bulletin occurred on May 23, 1993. The review period closed June 22, 1993. No comment letters were received by DLNR or OEQC. The CDUA was submitted to DLNR on April 20, 1993. The CDUA was accepted for processing on June 30, 1993.

Detailed Field Surveys of Preferred Alignment

A complete 100 percent archaeological inventory survey of the preferred alignment was conducted between April 26 and May 7, 1993. A botanical survey was conducted between April 27 and May 7, 1993. A bird and mammal field survey was conducted between May 7 and May 9, 1993.

Adjustments to Preferred Alignment

As a result of the archaeological inventory survey and further consultations with DLNR's Maui District Trails and Access Specialist adjustments to the preferred alignment were made in three areas: (1) In the Maalaea area the alignment was relocated to an adjacent ridge to further reduce the potential visibility of the line from the Lahaina Pali Trail; (2) In the Ukumehame area the alignment was adjusted to preserve the viewplane of the Ukumehame and Hikii Heiau and to create a buffer zone from identified archaeological sites; and (3) In the Launuipoko area the alignment was adjusted to avoid a dense concentration of archaeological features. A supplemental inventory-level archaeological survey of the three area of realignment was conducted between June 22 to June 24, 1993.

Public Meetings/Community Presentations

Public meetings were held in Wailuku on June 15, 1993 and in Lahaina on June 16, 1993 to provide a forum for community review of the preferred alignment and to ask questions and provide comments. A total of 17 persons attended the meetings. None of the attendees voiced objections to the project. The meetings were transcribed by a court reporting service. A presentation was given to over 130 persons of the West Maui Senior Citizens Group on June 10, 1993. The assembled group supported the need for the project.

Board of Land and Natural Resources(BLNR) Public Hearing

The BLNR held a public hearing in Kahului, Maui on August 26, 1993. The purpose of the hearing was to receive testimony from the public on the CDUA. The hearing was held because the preferred alignment passed through a small area of Protective Subzone at the base of Papalaua Gulch. No one from the community offered testimony at the hearing. The BLNR suggested that MECO move the alignment makai and out of the Protective Subzone.

Alignment Adjustment to Avoid Protective Subzone

Following the BLNR hearing MECO adjusted the location of the preferred alignment out of the Protective Subzone.

Prepare Draft EIS

Pursuant to HRS 343 for actions within Conservation District lands and for use of State-owned lands this Draft EIS has been prepared to present the alternatives considered and the potential impacts and mitigation measures for the proposed action.

Prepare Final EIS

A Final EIS will be prepared that incorporates public and agency comments. The Final EIS will be submitted to DLNR as the approving agency and accepting authority for this project as part of the permitting process.

SECTION 4

DESCRIPTION OF THE AFFECTED ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION MEASURES

4.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

4.1 INTRODUCTION

This section describes the existing conditions and potential environmental effects of the proposed action and includes mitigation measures. The proposed action consists of construction and operation of the Maalaea-Lahaina Third 69KV Transmission Line and the Lahainaluna Switching Station. The engineering, environmental and land jurisdiction/use characteristics of the preferred transmission line alignment and switching station are summarized in Table 4.1-1. Many potential impacts were anticipated during the course of the project planning and route selection process as described in Appendix A. A preferred alignment was selected that avoided or greatly reduced impacts on the environment and surrounding land uses; thus mitigation through avoidance of a potential impact has already been applied to this action.

Potential impacts (both temporary and permanent) that could result from construction and operation of the transmission line and switching station are described by topic in this section. Potential impacts identified were examined with regard to the significance criteria presented in Section 12, Chapter 200, Title 11 State Department of Health, Administrative Rules as authorized by Chapter 343, HRS. None of the potential impacts identified would be significant according to the criteria. Nevertheless, in many cases mitigation measures are proposed to maintain the identified impact at a non-significant level.

4.2 LAND OWNERSHIP AND REGULATION

This section describes land ownership, land regulation and associated permit requirements. Existing and proposed land uses are the subject of the next section. The relationship of the project to State and local plans and policies that guide the use of land and resources is described in Section 5.0.

4.2.1 Land Ownership

Figure 2.4-2 presents the preferred alignment and land ownership in the study area. Land owners crossed by the preferred alignment are presented for each segment in Table 4.2-1. Lands crossed by the preferred alignment are under the ownership of four land owners: the State of Hawaii, Department of Land and Natural Resources (DLNR) and Department of Transportation, Highways

Table 4.1-1
ALIGNMENT SEGMENT CHARACTERIZATION

Factor	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6	Segment 7	Segment 8
DESIGN FACTORS Length of segment (feet)	4,900	650	820	6,500	4,200	1,300	5,200	700
Easement Area (acres) (based on 75-foot average width)	8.44	1.12	1.41	11.19	7.23	2.24	8.95	1.21
Approximate No. of Angles	1	0	1	3	1	1	1	1
Approximate No. of Poles	9	2	2	12	8	3	10	2
Minimum Conductor to Ground Clearance (feet)	30	30	40	30	30	30	30	30
Construction Access	North Kihei Road R/W	Honoapiilani Hwy R/W	Pineapple Field Road	Helicopter	Cross-country	Helicopter	Cross-country	Helicopter
Approximate Distance from Existing 69KV lines (feet)	650	1,000	1,100	1,000	1,800	2,300	3,200	4,800
ENVIRONMENTAL FACTORS Landowner (easement required from)	State Department of Transportation	State Department of Transportation	Wailuku Agribusiness/C. Brewer Properties	State DLNR	State DLNR	State DLNR	State DLNR	State DLNR
State Land Use District	Agriculture	Agriculture	Agriculture	Agriculture Conservation - Resource	Conservation - Resource - General	Conservation - General - Limited	Conservation - General	Conservation - General
Land Use	Roadway R/W	Roadway R/W	Pineapple Field	Grazing	Grazing	Grazing	Grazing	Grazing
Major Stream/Gulch Crossings	None	None	None	Unnamed Gulch (1,500 feet)	None	Malalowaiole (700 feet); Manawainui (800 feet)	None	Manawaipueo (1,100 feet)
Archaeological Sites near Alignment	0	0	0	4	1	0	0	0
Geologic Formation	younger alluvium (Ra), older alluvium (Pa)	older alluvium (Pa)	older alluvium (Pa)	a'a and pahoehoe basalt, Wailuku series (Tw)	a'a and pahoehoe basalt, Wailuku series (Tw)	a'a and pahoehoe basalt, Wailuku series (Tw); andesitic lava, Honolua series (Tw)	a'a and pahoehoe basalt, Wailuku series (Tw)	a'a and pahoehoe basalt, Wailuku series (Tw)
Vegetation Type Crossed	Ruderal (4,900 feet)	Ruderal (650 feet)	Agricultural (570 feet); Kiawe-Grass Assn (250 feet)	Kiawe-Grass Assn (4,925 feet); Mixed Native Shrubland (375 feet); Mixed Grass/Shrubland (1,250 feet)	Mixed Grass/ Shrubland (4,200 feet)	Mixed Grass/ Shrubland (1,300 feet)	Mixed Grass/ Shrubland (5,200 feet)	Kiawe-Grass Association (700 feet)

Table 4.1-1 (Continued)
ALIGNMENT SEGMENT CHARACTERIZATION

Factor	Segment 9	Segment 10	Segment 11	Segment 12	Segment 13	Segment 14	Segment 15	Segment 16
DESIGN FACTORS Length of segment (feet)	3,500	7,900	1,200	3,200	6,000	1,200	3,400	4,800
Approximate No. of Angles	3	1	0	1	1	1	1	1
Approximate No. of Poles	7	15	2	6	11	2	7	9
Minimum Conductor to Ground Clearance (feet)	30	30	30	30	30	35	30	30
Construction Access	Helicopter	New Spur Roads	Cane Field Roads	New Spur Roads	New Spur Roads	Cane Field Roads	New Spur Roads	New Spur Roads
Approximate Distance from Existing 69KV lines (feet)	5,000	1,400	500	550	750	650	750	750
ENVIRONMENTAL FACTORS Landowner (easement required from)	State DLNR	State DLNR, Pioneer Mill	Pioneer Mill	State	State	State, Pioneer Mill	Pioneer Mill, State	State
State Land Use District	Conservation - General - Resource	Agriculture Conservation - General	Agriculture	Agriculture	Agriculture	Agriculture	Agriculture Conservation - Resource	Agriculture
Land Use	Grazing	Undeveloped	Undeveloped	Undeveloped	Undeveloped	Sugar Cane Field	Undeveloped	Undeveloped
Major Stream/Gulch Crossings	None	None	Ukumehame (1,000 feet)	None	None	None	Olowalu (600 feet)	None
Archaeological Sites near Alignment	0	3	6	5	2	0	2	0
Geologic Formation	a'a and pahoehoe basalt, Wailuku series (Tw)	a'a and pahoehoe basalt, Wailuku series (Tw); younger alluvium (Ra); older alluvian (Pa)	younger alluvium (Ra), older alluvium (Pa)	older alluvium (Pa); a'a and pahoehoe basalt, Wailuku series (Tw)	older alluvium (Pa)	older alluvium (Pa)	older alluvium (Pa)	older alluvium (Pa); andesitic lava, Honlolua series (Th)
Vegetation Type Crossed	Kiawe-Grass Assn (3,500 feet)	Kiawe-Grass Assn (8,000 feet)	Kiawe-Grass Assn (800 feet);	Kiawe-Grass Assn (3,200 feet);	Agricultural (500 feet); Kiawe-Grass Assn (5,500 feet)	Agricultural (1,200 feet)	Agricultural (200 feet); Kiawe-Grass Assn (3,200 feet)	Kiawe-Grass Assn (4,800 feet)

Table 4.1-1 (Continued)
ALIGNMENT SEGMENT CHARACTERIZATION

Factor	Segment 17	Segment 18	Segment 19	Segment 20	Segment 21	Segment 22	Segment 23	Switching Station Site
DESIGN FACTORS Length of segment (feet)	1,000	1,000	7,400	6,600	5,400	2,100	1,000	N/A
Easement Area (acres) (based on 75-foot average width)	1.81	1.72	12.74	11.36	9.29	3.62	1.72	3.00
Approximate No. of Angles	1	1	4	0	2	0	0	N/A
Approximate No. of Poles	0	2	13	13	10	4	2	N/A
Minimum Conductor to Ground Clearance (feet)	30	30	30	30	35	35	35	N/A
Construction Access	New Spur Roads	New Spur Roads	New Spur Roads	New Spur Roads	Cane Field Roads	Cane Field Roads	Cane Field Roads	Lahainaluna Road
Approximate Distance from Existing 69KV lines (feet)	Underground Crossing	450	900	2,500	4,500	3,100	Connects to existing line	1,000
ENVIRONMENTAL FACTORS Landowner (easement required from)	Pioneer Mill	Pioneer Mill	Pioneer Mill	Pioneer Mill	Bishop Estate	Bishop Estate	Bishop Estate	Bishop Estate
State Land Use District	Agriculture	Agriculture	Agriculture	Agriculture	Agriculture	Agriculture	Agriculture	Agriculture
Land Use	Undeveloped	Undeveloped	Undeveloped	Undeveloped	Sugar Cane Field	Sugar Cane Field	Sugar Cane Field	Sugar Cane Field
Major Stream/Gulch Crossings	None	None	None	None	Undeveloped	None	None	N/A
Archaeological Sites near Alignment	0	0	6	4	1	0	0	0
Geologic Formation	andesitic lava, Honlolua series (Th)	andesitic lava, Honlolua series (Th)	older alluvium (Pa); andesitic lava, Honlolua series (Th); a'a and pahoehoe basalt, Wailuku series (Tw)	older alluvium (Pa); a'a and pahoehoe basalt, Wailuku series (Tw)	a'a and pahoehoe basalt, Wailuku series (Tw)	a'a and pahoehoe basalt, Wailuku series (Tw)	a'a and pahoehoe basalt, Wailuku series (Tw)	a'a and pahoehoe basalt, Wailuku series (Tw)
Vegetation Type Crossed	Kiawe-Grass Assn (1,000 feet)	Kiawe-Grass Assn (550 feet) Mixed Grass/ Shrubland (450 feet)	Kiawe-Grass Assn (4,950 feet); Mixed Grass/ Shrubland (1,750 feet)	Kiawe-Grass Assn (6,600 feet)	Agricultural (3,550 feet); Kiawe-Grass Assn (1,850 feet)	Agricultural (1,800 feet;) Kiawe-Grass Assn (300 feet)	Agricultural (1,000 feet)	Agricultural (3.0 acres)

Table 4.2-1
LANDOWNERS CROSSED BY PREFERRED ALIGNMENT AND EASEMENT REQUIREMENTS

Segment No.	Distance Crossed (Feet)				
	State of Hawaii	Wailuku Agbusiness/ C. Brewer Homes	Pioneer Mill	Bishop Estate	Total
1	4,900				4,900
2	650				650
3		820			820
4	6,500				6,500
5	4,200				4,200
6	1,300				1,300
7	5,200				5,200
8	700				700
9	3,500				3,500
10	7,450		450		7,900
11			1,200		1,200
12	3,200				3,200
13	6,000				6,000
14	500		700		1,200
15	2,100		1,300		3,400
16	4,800				4,800
17			1,000		1,000
18			1,000		1,000
19			7,400		7,400
20			6,600		6,600
21				5,400	5,400
22				2,100	2,100
23				1,000	1,000
TOTAL (feet)	51,000	820	19,650	8,500	79,970
Miles	9.6	0.2	3.7	1.6	15.1
Percent of Total Distance	63.6	1.3	24.5	10.6	100.0
Area (Acres) 50-foot-wide Basement	58.5	0.9	22.6	9.8	91.8
Area (Acres) 75-foot-wide Basement	87.8	1.4	33.9	14.6	137.7

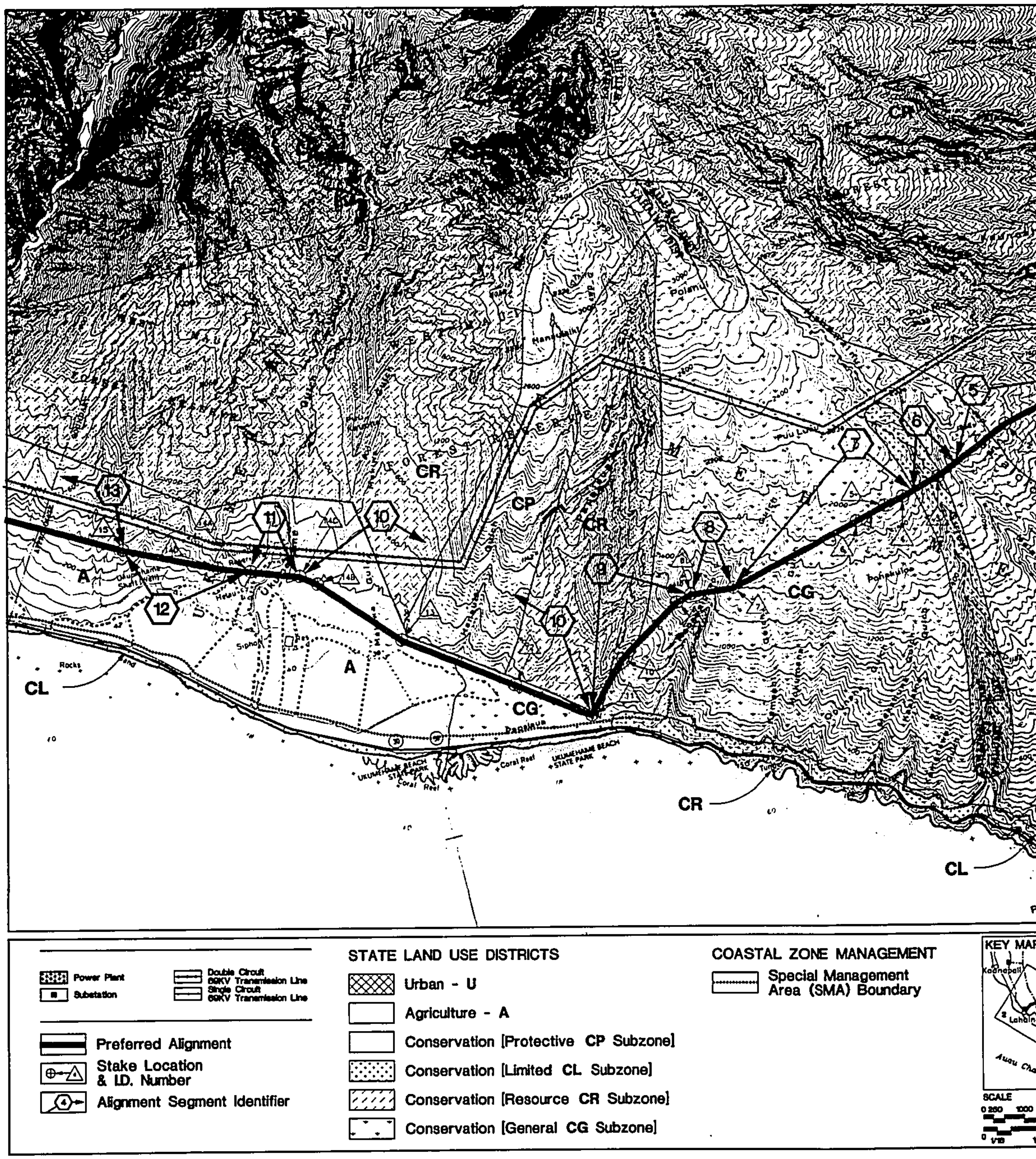
Division (SDOT); Wailuku Agribusiness/C. Brewer Properties; Pioneer Mill; and Bishop Estate. Approximately 64 percent of this land is owned by the State with the remainder in private ownership.

Segments 1 and 2 would be located within the rights-of-way of North Kihei Road and Honoapiilani Highway, which are SDOT property. Segment 3 would be located within a Wailuku Agribusiness/C. Brewer Properties pineapple field. Segments 4 through 9 would cross remote, undeveloped land in the West Maui mountains owned by the State and managed by DLNR. Some of this land is leased to Stephen Perreira for cattle grazing. Segment 10 would cross just mauka of cane fields through land owned primarily by the State, although some Pioneer Mill property would also be crossed. Segment 11 crosses Ukumehame Gulch on land owned by Pioneer Mill. Segment 12 through Segment 16 would cross undeveloped land mauka of cane fields that is owned by the State and leased to Pioneer Mill, as well as land that is owned by Pioneer Mill. Segment 17 through Segment 20 would cross generally undeveloped land owned by Pioneer Mill mauka of cane fields. Segments 21 through 23 would cross land that is owned by Bishop Estate and leased to Pioneer Mill for cane cultivation.

Easements through these properties would be acquired for construction and operation of the transmission line, and for permanent spur roads needed for construction, maintenance and repair. Easement width would vary between 50 and 75 feet depending on whether single or H-frame poles are used. Rights-of-entry and easements would be obtained from the State, Wailuku Agribusiness/ C. Brewer Properties, Pioneer Mill and Bishop Estate. Table 4.2-1 shows the approximate length by segment and total area of required easements assuming a 50-foot-wide easement and a 75-foot-wide easement. Existing land uses within and adjacent to the easements could continue, with limitations on such incompatible activities as constructing structures, drilling wells, or other activities that could compromise safety.

4.2.2 Land Regulation

Figures 4.2-1 and 4.2-2 present land regulation in the study area. The preferred alignment would cross several State Land Use Districts and Subzones, and would require a Conservation District Use Permit. Approximately 9.6 miles of State-owned land would be crossed, requiring a Use of State Lands Approval. As the preferred alignment exits the Maalaea Power Plant Switchyard to North Kihei Road, it would cross approximately 1,000 feet of the coastal zone Special Management Area,


CR
CP
CR
CG
CG
CL
CR
CL
A
A
Rocks
Coral Reef
UKUMEHAME BEACH STATE PARK
Power Plant
Substation
Double Circuit 69KV Transmission Line
Single Circuit 69KV Transmission Line
Preferred Alignment
Stake Location & I.D. Number
Alignment Segment Identifier
STATE LAND USE DISTRICTS
Urban - U
Agriculture - A
Conservation [Protective CP Subzone]
Conservation [Limited CL Subzone]
Conservation [Resource CR Subzone]
Conservation [General CG Subzone]
COASTAL ZONE MANAGEMENT
Special Management Area (SMA) Boundary
KEY MAP
SCALE

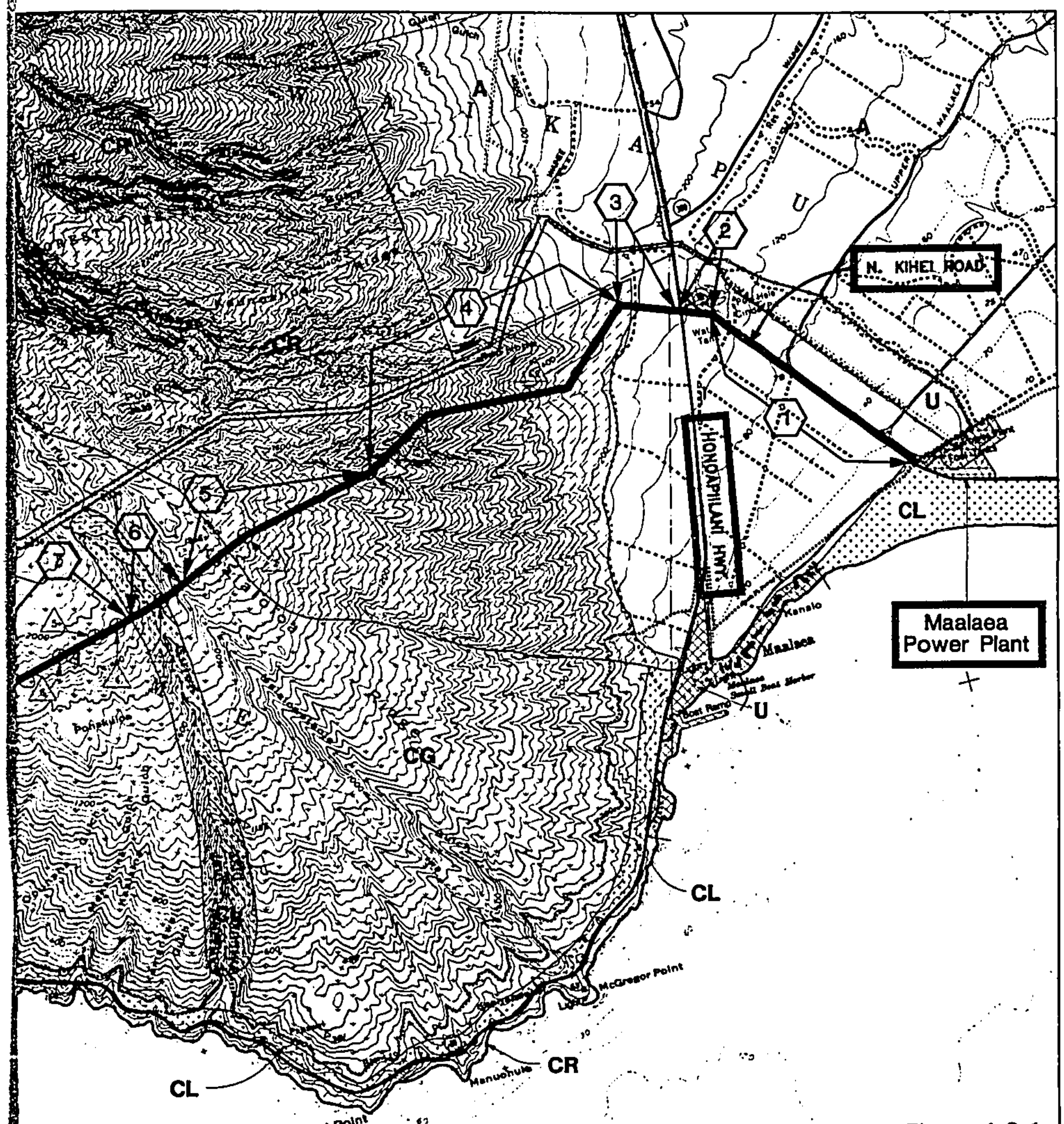
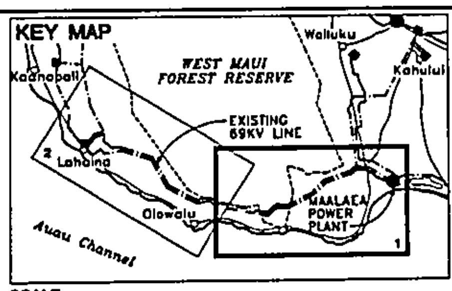


Figure 4.2-1

E MANAGEMENT

Management
MA) Boundary



NORTH

SCALE

0 250 1000 2000 FEET

0 1/16 1/4 1/2 MILE

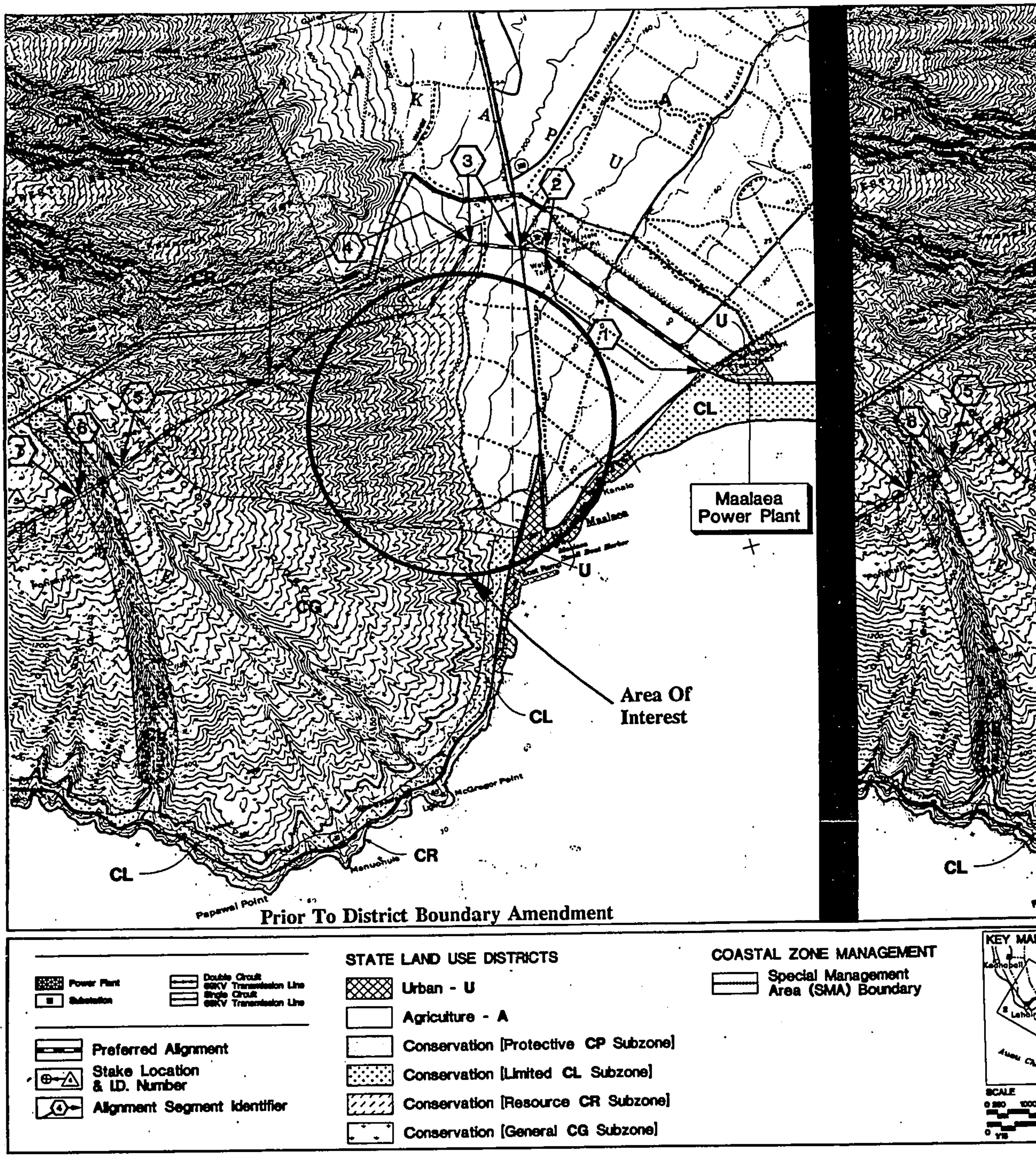
MAP 1

Land Regulation

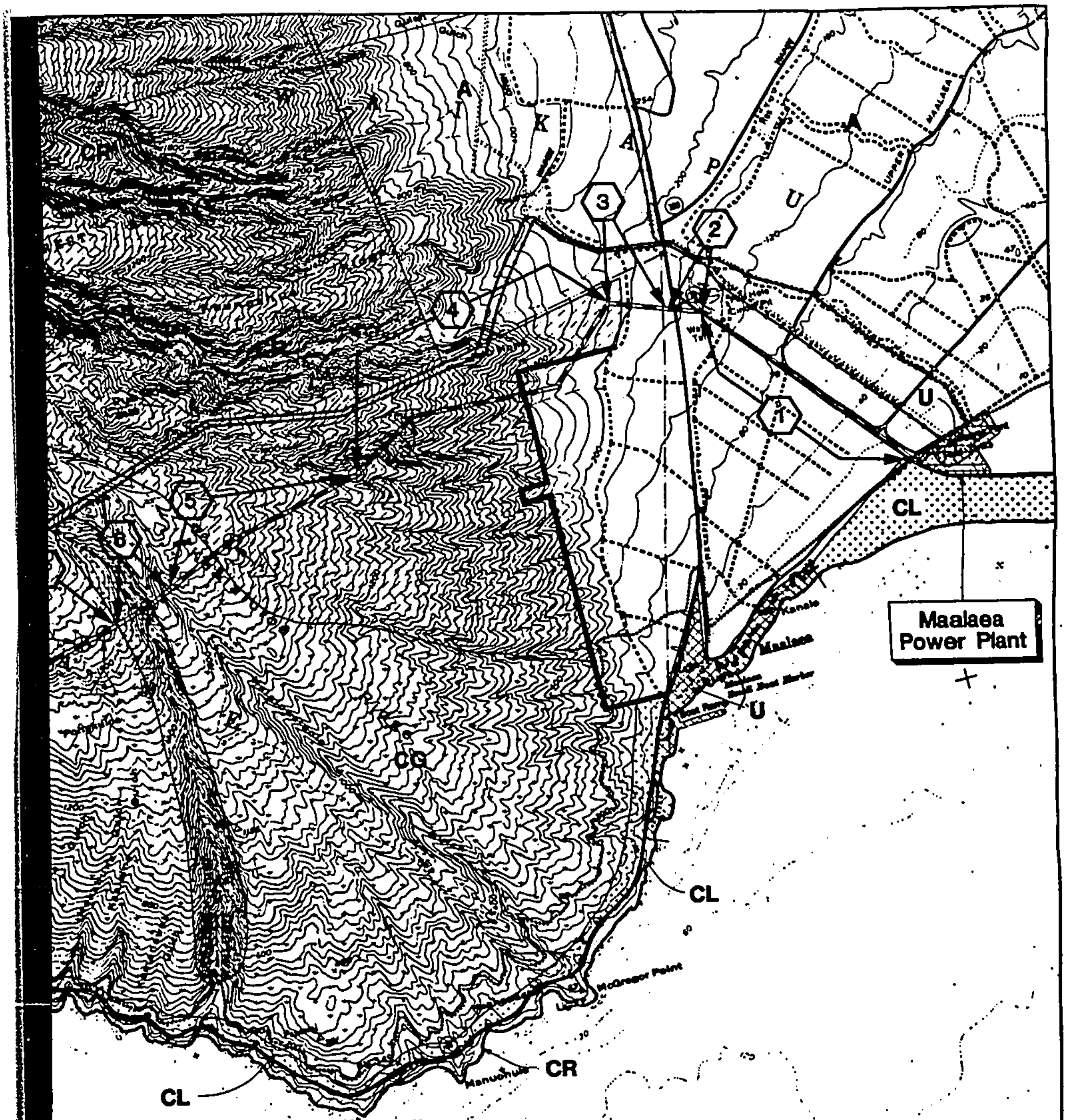
Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

DAMES & MOORE



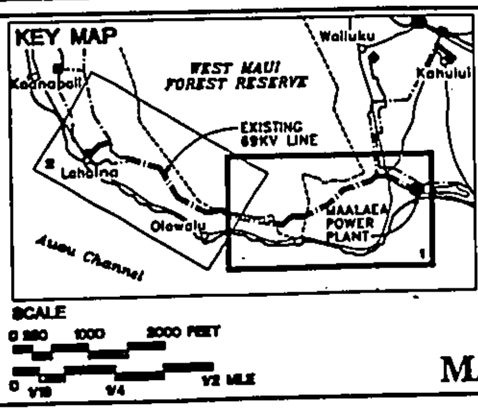
Prior To District Boundary Amendment



Current District Boundary

Figure 4.2-1

MANAGEMENT
anagement
A) Boundary



NORTH

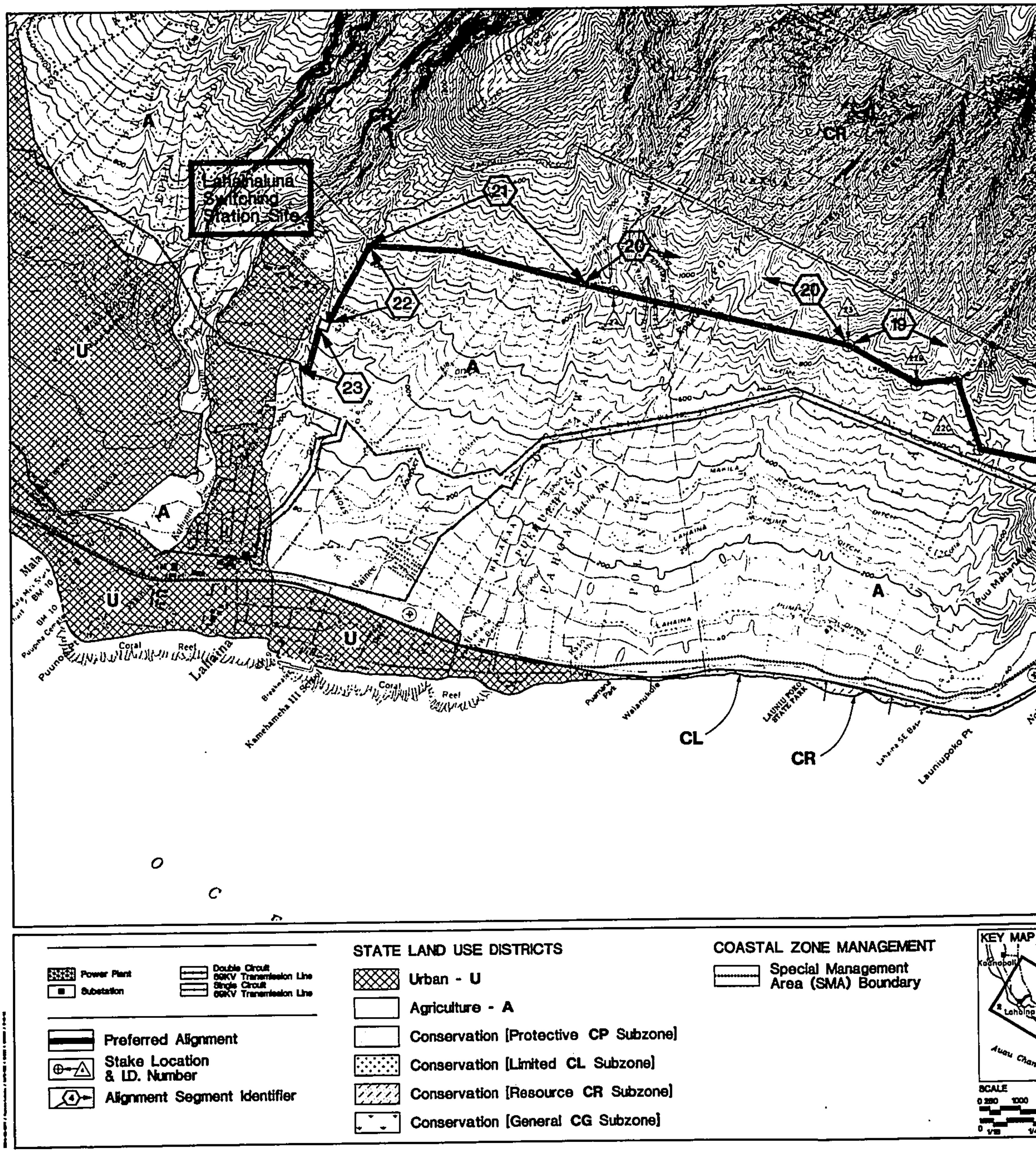
MAP 1-A

Land Regulation
Land Use District Boundary Amendment

Maalaea-Lahaina Third 69kV
Transmission Line Project

Maui Electric Company, Ltd.

DAMES & MOORE



Lahainaluna Switching Station Site
CR
A
U
CL
CR
Coral
Reef
Lahaina
Kamehameha III School
Puamana Park
Launiupoko State Park
Launiupoko Pt
Power Plant
Substation
Double Circuit 69KV Transmission Line
Single Circuit 69KV Transmission Line
Preferred Alignment
Stake Location & I.D. Number
Alignment Segment Identifier
STATE LAND USE DISTRICTS
Urban - U
Agriculture - A
Conservation [Protective CP Subzone]
Conservation [Limited CL Subzone]
Conservation [Resource CR Subzone]
Conservation [General CG Subzone]
COASTAL ZONE MANAGEMENT
Special Management Area (SMA) Boundary
KEY MAP
SCALE

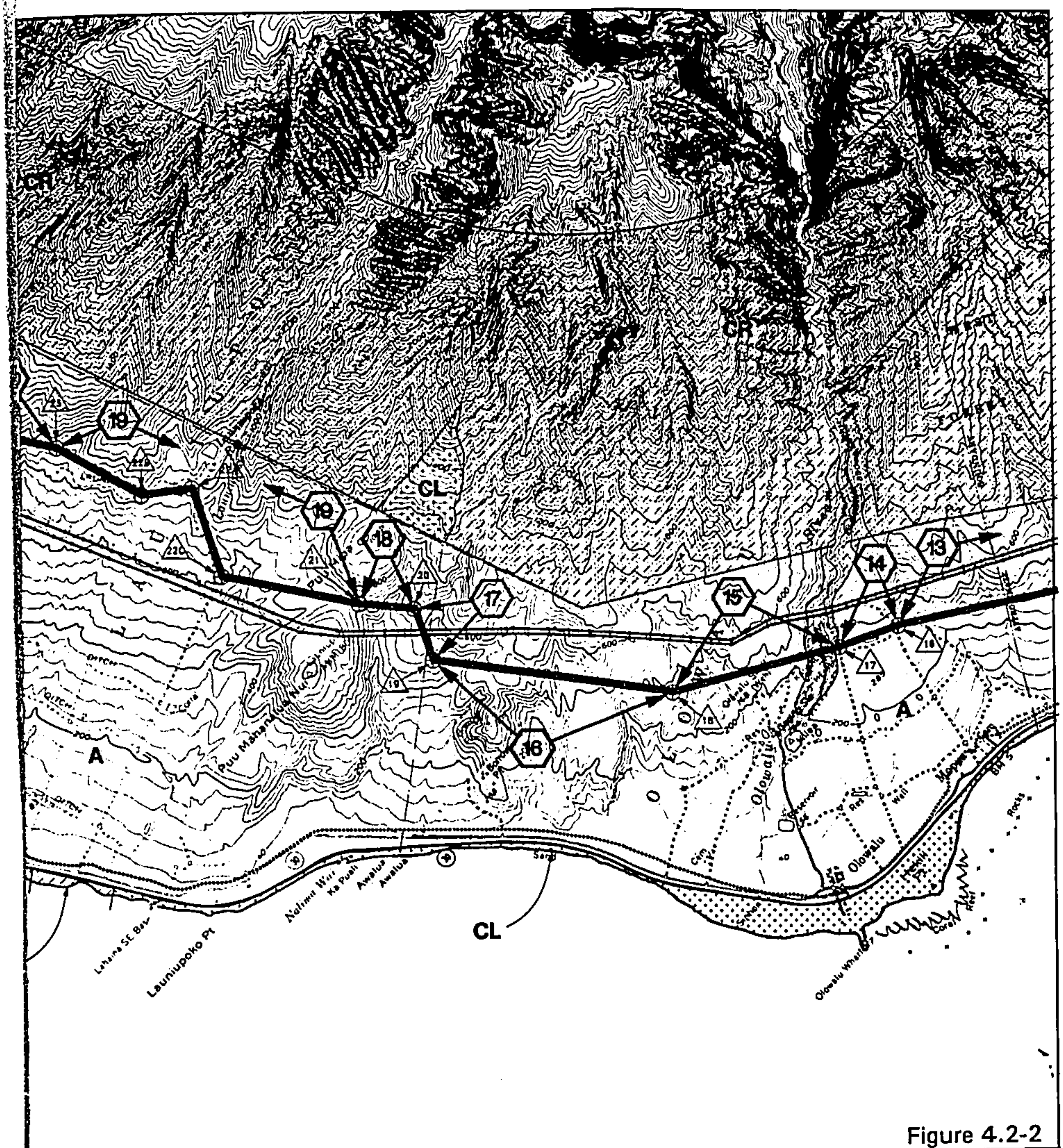
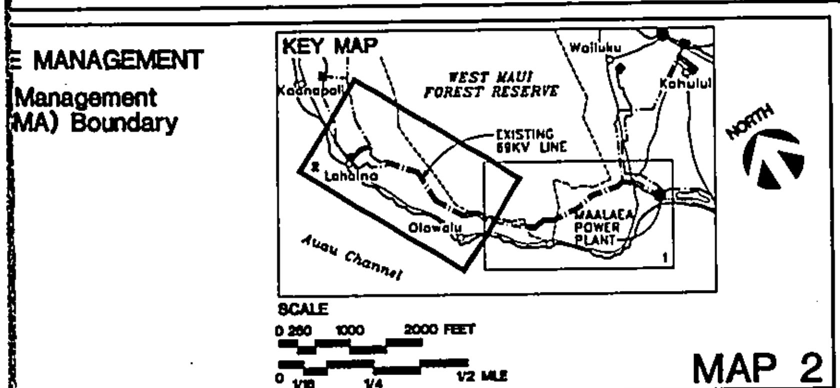


Figure 4.2-2



Land Regulation

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

DAMES & MOORE

requiring a Special Management Area Permit from Maui County. Land regulation and these related permit requirements are described below.

State Land Use Districts

The State Land Use Commission, pursuant to HRS Chapter 205, has established land use districts throughout the State. All lands in Hawaii are categorized into one of four land use districts: Urban, Rural, Agricultural and Conservation. The preferred alignment would cross the Agricultural and Conservation land use districts. State land use districts crossed by each segment of the preferred alignment are presented in Table 4.2-2.

Approximately 10.3 miles of the 15.2-mile Alignment (69 percent) crosses the Agricultural land use district. A total of 97.2 acres of Agricultural District lands would lie within the proposed *transmission line easement. This assumes an average right-of-way width of 75 feet requiring* 9.09 acres per mile. The Lahainaluna Switching Station is within the Agricultural District. Transmission lines and switching stations are permitted uses within the Agricultural District; a Special Use Permit and County Planning Commission and State Land Use Commission approval would not be required.

Approximately 4.5 miles of the preferred alignment would be located within the Conservation Land Use District. A total of 40.5 acres of Conservation District lands would lie within the proposed transmission line easement. Conservation District lands are further divided into five Subzones (from least to most restrictive): General, Resource, Limited, Protective and Special. The preferred alignment would cross the General, Resource and Limited Subzones, as shown in Table 4.2-2 and Figure 4.2-1. Conservation District Lands within the Protective Subzone would not be crossed by the preferred alignment.

The area designated Limited Subzone that would be crossed by the preferred alignment is located at Manawainui Gulch and is approximately 800 feet wide. Manawainui Gulch would be spanned by the overhead conductors. Poles would be placed on the ridges on each side of the gulch, well outside the Limited Subzone. Consultation with resource managers from the Maui District Office of DLNR established that this area has no special surface features or conditions that would make

Table 4.2-2
STATE LAND USE DISTRICTS CROSSED BY THE PREFERRED ALIGNMENT

Segment	LAND USE DISTRICT				Total Distance
	Agricultural	Conservation Resource	Conservation General	Conservation Limited	
1	4,900				4,900
2	650				650
3	820				820
4	2,000	4,500			6,500
5		3,100	1,100		4,200
6			500	800	1,300
7			5,200		5,200
8			700		700
9		1,800	1,700		3,500
10	4,300		3,600		7,900
11	1,200				1,200
12	3,200				3,200
13	6,000				6,000
14	1,200				1,200
15	2,900	500			3,400
16	4,800				4,800
17	1,000				1,000
18	1,000				1,000
19	7,400				7,400
20	6,600				6,600
21	5,400				5,400
22	2,100				2,100
23	1,000				1,000
Total Linear Feet	56,470.00	9,900.00	12,800.00	800.00	79,970.00
Miles	10.7	1.9	2.4	0.2	15.2
Area (acres) 50-foot right-of-way	64.8	11.4	14.7	0.9	91.8
Area (acres) 75-foot right-of-way	97.2	17.0	22.1	1.4	137.7

Note: The width of the final right-of-way will range from 50 to 75 feet wide depending on terrain and the configuration of the transmission line; therefore, the area of the land required within each Conservation District subzone is expressed for both the 50-foot-wide and 75-foot-wide rights-of-way.

Manawainui Gulch different from other gulches in the West Maui mountains (Hobdy, R., January 22, 1992. Personal communication).

The second largest amount of Conservation District Land that would be crossed by the preferred alignment is designated Resource Subzone. Alignment Segments 4, 5 and 9, and a small portion of Segment 15 (Olowalu Stream), are within the Resource Subzone. A total of 1.9 miles of Resource Subzone would be crossed and the transmission easement with a width of 75 feet could affect up to 17.0 acres of Resource Subzone. The Resource Subzone generally corresponds to lands owned or managed by the State as the West Maui Forest Reserve. The purpose of the Forest Reserve is watershed protection and management.

Approximately 2.4 miles of General Subzone would be crossed, the largest amount of Conservation District land crossed by the preferred alignment. The General Subzone in the study area generally covers most of the West Maui mountains from Kealaloloa Ridge makai to MacGregor and Papawai points and bordered by Papalaua Gulch on the West. Segments which cross the General Subzone include portions of Segments 5 through 10. Most of the General Subzone area is currently used for cattle grazing.

Each Subzone has different permitted uses; the proposed transmission line is a conditionally permitted use. The Board of Land and Natural Resources has the authority to approve conditional uses within Conservation District zones. Locating the proposed transmission line in a Conservation District within the General, Resource and Limited Subzones will require submittal of a Conservation District Use Application (CDUA) for review and approval by the Board of Land and Natural Resources. The proposed transmission line would not be expected to substantially change the character or use of the land, or conflict with the objectives of the Subzones (see Section 5.0, Relationship of the Proposed Action to Land Use Plans, Policies, and Controls).

Submittal of a CDUA triggers Chapter 343 HRS environmental reporting requirements which mandate either an environmental impact statement (EIS) or an environmental assessment. This EIS was prepared pursuant to Chapter 343 HRS requirements because the proposed transmission line would be located on State-owned land and within the Conservation District. The DLNR is the accepting authority for this EIS.

State-Owned Lands

The preferred alignment would cross approximately 9.6 miles of State-owned lands in Segments 4 through 10 and Segments 12 through 16. State lands crossed by the preferred alignment are presented in Table 4.2-1. A Use of State Lands Approval from the DLNR, Land Management Division would be required.

Special Management Area

Chapter 205A of the HRS, part of the State's Coastal Zone Management Policies, created Special Management Areas (SMAs) to control development along the coastline to avoid permanent losses of valuable resources and the foreclosure of management options, and to ensure adequate access to publicly owned or used beaches, recreation areas or natural reserves. The Maui County Planning Department designates the SMA boundaries and administers the SMA permit procedures.

Within the study area, the SMA includes the entire coastline, extending inland an average distance of 4,000 feet. The SMA includes the Kealia Pond area, the Maalaea Power Plant, and all communities, parks and facilities along the shoreline, including the greater part of Lahaina. The portion of the transmission line that would be constructed within the Maalaea Power Plant switchyard would be located within the SMA boundary (See Figure 4.2-1, Map 1). It would consist of installation of three poles and associated conductors, and installation of a 200-foot-long segment of underground transmission line to avoid conflict with the existing Maalaea-Lahaina Nos. 1 and 2 69KV transmission lines within the switchyard. An SMA permit would be required.

4.3 EXISTING AND PROPOSED LAND USE

This section describes existing and planned land uses in the study area, and assesses potential land use impacts.

4.3.1 Affected Environment

Transmission Line

Existing Land Use

Land use in the study area generally follows the terrain. Cane fields and some pineapple fields cover most of the lower slopes of the West Maui mountains. The higher slopes, characterized by rugged terrain with steep slopes and deeply incised ravines and gulches, are generally undeveloped, with some areas used for grazing. There are small pockets of residential development along the shoreline and in Olowalu Valley. A mix of residential, commercial and some industrial land uses are found in Lahaina and in Maalaea. Figure 2.4-2 presents major existing land uses. Approximately 55 percent of the project area is owned by the State of Hawaii. The remainder is privately owned by three large landowners.

Land uses, along each segment of the proposed transmission line are presented in Tables 4.1-1 and 4.3-2. The Maalaea Power Plant is the origin of the transmission line. Segment 1 of the preferred alignment extends from the power plant along North Kihei Road to Honoapiilani Highway. The transmission line would be located within the roadway right-of-way, under Maui Electric Company (MECO) franchise rights. Cane fields are located around the power plant and along both sides of North Kihei Road. Segment 2 crosses Honoapiilani Highway at the North Kihei Road intersection. Segment 3 would cross a pineapple field owned by Wailuku Agribusiness/C. Brewer Properties mauka of Honoapiilani Highway.

From this point the preferred alignment (Segments 4 through 9) extends up into the West Maui mountains crossing Kealaloloa Ridge at an elevation of over 1,800 feet, and spanning several major gulches (Malalowaiaole, Manawainui and Manawaipueo) as it traverses the West Maui mountains. This portion of the study area is remote and undeveloped, owned by the State and leased for cattle grazing. The old Lahaina Pali Trail, part of the Na Ala Hele Trails and Access Program and Maui's Demonstration Trail for the program, is located makai of and over 1,200 feet (at its closest point) from the preferred alignment in this area. The trail extends between an east trailhead at the Wailuku Agribusiness/C. Brewer Properties pineapple field and a west trailhead near Ukumehame Beach State Park. The preferred alignment does not cross the trail. At Manawaipueo Gulch, the alignment would descend from 1,400 feet makai to the base of Papalaua Gulch. At this point the line would be at an elevation of approximately 200 feet, well above the shoreline highway.

Segments 10 through 20 of the preferred alignment generally traverse undeveloped shrubland areas in the lower foothills mauka of cane fields, crossing Papalaua, Hanaula, Makiwa and Ukumehame Gulches, Olowalu Valley, Launiupoko Stream and Makila Stream. These areas are owned by the State and Pioneer Mill. The preferred alignment crosses to the mauka side of the existing 69 kilovolt

(KV) transmission lines in a flat area mauka of the old Olowalu Sanitary Landfill near Puu Hipa, and continues between Puu Hipa and Puu Mahanalua Nui to gently sloping shrubland (Segments 17 and 18).

Segments 21 and 22 of the preferred alignment continue to the Lahainaluna Switching Station site through Pioneer Mill cane fields on land owned by Bishop Estate and leased by Pioneer Mill. Most of this portion of the alignment would be located along Piilani Ditch Road, a private cane haul road. Segment 23 extends from the switching station site, through these cane fields, to a tie-in with the existing Puukolii and Lahaina 69KV transmission lines.

Planned Land Use

The Maui County General Plan sets forth the broad objectives and policies for the long-range development of the County. The Lahaina Community Plan and the Kihei-Makena Community Plan provide a relatively detailed scheme for implementing those objectives and policies relative to the Lahaina and Maalaea regions, respectively. These plans contain maps identifying the planned distribution and intensity of land uses and public facilities, focusing (in the study area) on developed areas in Lahaina and Maalaea. The preferred alignment would pass through areas designated for agricultural use. The relationship of the proposed project to the goals and objectives of the County General Plan and Community Plans is discussed in Section 5.0.

Through consultation with landowners, a number of proposed, planned or approved projects have been identified in the project area (Table 4.3-1 and Figure A1-4 in Appendix A). A proposed project is one for which a concept plan has been developed, but the project has not been incorporated into the Maui County community plans. A planned project is one that has been incorporated into the community plans, but for which permits and approvals have not been obtained. An approved project is one where most of the permits and approvals have been obtained and the project is in the final stages of planning and design.

Only two projects, the Ikena Avenue Relocation Project and the Kealia Pond Wildlife Refuge, are currently approved in the vicinity of the proposed transmission line. The Ikena Avenue Relocation Project is a five-acre residential development on Bishop Estate property intended to provide replacement homes for residents of Ikena Avenue displaced by the proposed Lahaina Bypass Project.

Table 4.3-1
PROPOSED PLANNED OR APPROVED PROJECTS IN PROJECT VICINITY

Project	Owner/Developer	Status	Size	Estimated Completion
Maalaea Village (Single Family/Mixed Use Development)	Alexander & Baldwin	Proposed	650 acres	2005
Maalaea Mauka	C. Brewer Properties	Planned	175 acres	2005
Honoapiilani Highway Widening	State Dept. of Transportation	Proposed	1.7 miles	1997
Kealia Pond Wildlife Refuge	U.S. Fish & Wildlife Service	Approved	700 acres	Improvements Continuous
Olowalu Planned Community	Amfac/JMB Hawaii	Proposed	500 acres	Undetermined
Puu Hipa Golf Course Project	Amfac/JMB Hawaii	Proposed	440.3 acres	Undetermined
Residential Development	Bishop Estate	Proposed	450 acres	Undetermined
Lahaina Bypass Corridor	State Department of Transportation	Planned	7.9 miles	1995
Ikena Avenue Relocation Project	Bishop Estate	Approved	5 acres	1995

An environmental assessment has been completed and the project should be under construction this year (Sairot, Robert, February 22, 1993, Personal communication). The Kealia Pond Wildlife Refuge, newly developed by the U.S. Fish and Wildlife Service, is undergoing continuous improvements.

The Lahaina Bypass Project is planned to connect Puamana to Kaanapali, bypassing critically congested intersections in Lahaina and providing an alternate highway route to the northwest side of the island. Honoapiilani Highway is proposed to be widened from two to four lanes from Kuihelani Highway to the Maalaea small boat harbor. Planning studies are currently being conducted for both projects and construction is scheduled to start in three years (Sairot, Robert, August 26, 1993, Personal communication).

Only two planned or proposed projects in the vicinity are reflected in current community plans: Maalaea Mauka, a 175-acre residential development proposed by C. Brewer Properties mauka of the Maalaea small boat harbor; and Maalaea Village, a single-family residential/mixed use development proposed by Alexander & Baldwin. The Maui County Planning Department is currently updating the Lahaina and Kihei-Makena Community Plans. The Citizen Advisory Committees have made their recommendations and public hearings were held. Final adoption of the updated plans is expected in 1994. Proposed projects must first be recommended by a Citizen Advisory Committee for inclusion in the updated plan, and then receive Planning Commission, County Council and mayor approval before the project is reflected in the updated community plan. The Maalaea-Kihei-Makena Citizens Advisory Committee recommended the Maalaea Mauka and Maalaea Village properties be designated for development in the updated Kihei-Makena Community Plan. In September 1993, the Planning Commission approved designation of these properties as "Future Growth Reserve" in the plan, meaning these projects would not be open to immediate urban classification but could be developed in the long-term.

Two other proposed projects have been identified in the project area: Olowalu Planned Community and Puu Hipa Golf Course Project. These proposed projects, both within the Lahaina Community Plan area, have not been recommended for inclusion in the Lahaina Community Plan update (Lahaina Citizens Advisory Committee, December 16, 1992).

Switching Station

The proposed switching station site is located on Bishop Estate property currently leased by Pioneer Mill and used for sugarcane cultivation. Cane fields are located to the north, east and south of the property. Lahainaluna Road, a County water tank and Lahainaluna High School are located immediately to the north. The high school playing field is located nearest the site (200 feet); the nearest classrooms or other occupied structures are located approximately 800 feet away.

4.3.2 Potential Impacts

This section describes changes in land use resulting from the project and evaluates project compatibility with existing and proposed land uses. Project consistency with local, State and Federal environmental and land use plans and policies is discussed in Section 5.0.

Transmission Line

Most of the potential land use impacts have been avoided through careful route selection and early consultation with landowners and agencies. The right-of-way of the proposed transmission line would be 50 to 75 feet wide and approximately 15.2 miles long. MECO would acquire easements from landowners for the right-of-way, but the landowner would retain title to the land and use of the easement area, subject only to safety limitations such as building height and vegetation clearances. The total land area affected by the transmission line right-of-way would be approximately 92 to 138 acres. Table 4.3-2 presents the length, right-of-way area, and area of each land use crossed by each segment of the preferred alignment.

As indicated in Table 4.3-2, most of the preferred alignment (8.1 miles or about 54 percent) would be located in undeveloped land. About 4.1 miles or 27 percent would be located in land currently used for grazing. The presence of the transmission line would not affect these uses. Approximately 1.8 miles or 12 percent of the preferred alignment would cross sugarcane fields. Approximately 820 feet or 1 percent of the total alignment length would cross pineapple fields. During the evaluation of alternative corridors, avoiding or limiting the crossing of lands used for agriculture (sugarcane and pineapple fields) was a major siting criterion. The preferred alignment avoids crossing major cane fields, but will require easements through several areas currently used for sugarcane cultivation. The preferred alignment will cross approximately 1,200 feet of cane field in Segment 14 near Olowalu requiring an easement of 2.07 acres; approximately 5,100 feet in Segment 21 located along

Table 4.3-2
GENERAL LAND USES CROSSED BY PREFERRED ALIGNMENT

Segment No.	LAND USE									
	Undeveloped/Unused		Grazing		Sugar Cane Field		Pineapple Field		Roadway R/W	
	Length (feet)	Area (acres)	Length (feet)	Area (acres)	Length (feet)	Area (acres)	Length (feet)	Area (acres)	Length (feet)	Area (acres)
1									4,900	8.44
2									650	1.12
3							820	1.41		
4			6,500	11.19						
5			4,200	7.23						
6			1,300	2.24						
7			5,200	8.95						
8			700	1.21						
9			3,500	6.03						
10	7,900	13.6								
11	1,200	2.07								
12	3,200	5.51								
13	6,000	10.33								
14					1,200	2.07				
15	3,400	5.85								
16	4,800	8.26								
17	1,000	1.81								
18	1,000	1.72								
19	7,400	12.74								
20	6,600	11.36								
21	300	0.51			5,100	8.78				
22					2,100	3.62				
23					1,000	1.72				
Total 79,970 feet (15.2 miles) 137.77 acres	42,800 (8.1 miles)	73.76 acres	21,400 (4.1 miles)	36.85 acres	9,400 (1.8 miles)	16.19 acres	820 (0.2 miles)	1.41 acres	5,550 (1.0 miles)	9.56 acres
Percent of Total	53.6	53.5	26.8	26.7	11.7	11.8	1.0	1.0	6.9	7.0

Note: Areas (acres) assumes 75-foot-wide right-of-way easement for segments 1-22 through (single-circuit line), and 100-foot-wide right-of-way easement for Segment 23 (double-circuit line).

Piilani Ditch, a cane field road, requiring an easement of 8.78 acres; approximately 2,100 feet in Segment 22 located along a cane field edge road between Piilani Ditch and the switching station site, requiring an easement of 3.62 acres; and 1,000 feet in Segment 23 between the switching station site and a tie-in with the existing Puukolii and Lahaina 69KV transmission lines, requiring an easement of 1.72 acres.

The use of the land for sugarcane cultivation will not be significantly affected by the proposed transmission line. Transmission lines are currently located in cane fields. Interference with sugarcane operations is limited to the extra care equipment operators must exercise in maneuvering around poles and lines during planting and harvesting activities, and aerial spraying. Selection of final pole locations during final design would occur in the field together with Pioneer Mill representatives. For the protection and safety of equipment and personnel, and to prevent hazards to the line from controlled burning or harvesting activities, minimum conductor to ground clearance would be 35 feet. Use of steel poles would minimize the need for guy wires (which increase the clearance needed around poles). Where guy wires are necessary, they will be located as close to the pole as possible.

A small segment (820 feet) of the preferred alignment would cross a Wailuku Agribusiness/C. Brewer Properties pineapple field. MECO consulted with C. Brewer Properties regarding an acceptable location of the alignment and poles in the pineapple field. C. Brewer Properties has approved the location of the line through their property (D. Blane, Vice President, C. Brewer Properties, Letter to Dames & Moore, March 10, 1993). Three poles would be required to span the pineapple field; two placed at existing field edge roads and one pole placed on an existing rock pile in the center of the field. The minimum conductor to ground clearance through the pineapple field would be 40 feet to prevent hazards to the line due to harvesting activities. Hazards around pineapple fields are primarily associated with crop spraying and night harvesting.

Approximately one mile of the preferred alignment would be located along North Kihei Road within the roadway right-of-way. In addition, a 650-foot-long segment of the preferred alignment would cross Honoapiilani Highway. MECO's franchise, granted by the State of Hawaii, permits construction of transmission lines within public (State and County) road rights-of-way (State of Hawaii, 1991).

The preferred alignment would not conflict with planned or approved developments. Segment 19 of the preferred alignment would pass near the location of a golf course proposed to be developed by Amfac/JMB Hawaii near Puu Hipa.

<u>Switching Station</u>

The proposed Lahainaluna Switching Station would permanently replace approximately three acres of existing cane field. The switching station would be compatible with surrounding agricultural uses, which would continue essentially unaffected. Access to the switching station would be provided from Lahainaluna Road. With the exception of periodic maintenance and repair activities, switching station operation would not be staffed and would involve no physical activity. Runoff from impervious site surfaces would drain to adjacent cane field stormwater and irrigation ditches. Grading and drainage improvements would conform to County standards and would be coordinated with the County Department of Public Works to address site runoff and maintain compatibility with adjacent cane field operations.

Lahainaluna High School abuts the proposed switching station site on the northwest side. The perimeter of the switching station property would be located approximately 800 feet from the nearest building or classroom, and approximately 200 feet from the high school playing fields. The switching station would be 40 to 50 feet lower in elevation than the adjacent school playing field. The switching station would be fenced for security and safety. No noise would be emitted from the switching station during operation. The switching station would be a generally compatible use with the adjacent school and cane fields.

4.3.3 Mitigation

Mitigation through avoidance of potential impacts has been employed throughout project planning so that existing and future beneficial uses of the land would not be limited by the proposed action. The location of the preferred alignment has been determined in large part through consultation with landowners and reflects a location that is suitable to them. MECO would implement the following specific measures to minimize impacts to agricultural operations:

- Locate poles five feet or more from the edge of the traveled way of main cane haul roads;
- Construct earthen berms adjacent to poles as a barrier to prevent pole damage by cane hauler vehicles;
- Minimize use of guy wires, and where they are necessary, locate them as close to the pole as possible;
- Place marker poles at the far end of guy wires to improve visibility to operators of agricultural equipment;
- Install reflective tape on poles and guy wires to improve visibility to operators of agricultural equipment; and
- Follow minimum conductor clearance standards for line locations adjacent to sugarcane and pineapple fields.

MECO will work with affected landowners on the location of poles during design and easement acquisition.

MECO will follow post-construction clean-up and removal practices detailed in Section 2.7.8.

4.4 EARTH AND WATER RESOURCES

This section describes topography, geology, soils and water resources in the study area, assesses potential hazards and conditions that may affect the proposed transmission line and switching station, and identifies mitigation measures that can be applied to avoid or minimize environmental effects. This information is based on a Geologic and Water Resources Technical Report, presented as Appendix C (Pacific Geotechnical Engineers, January 1992).

The engineering geologic and hydrologic study was performed to identify and evaluate geologic and hydrologic factors in corridor evaluation and route selection. This study included review of existing geologic, soils and hydrologic information, helicopter reconnaissance and review of aerial photos, mapping of engineering geologic and hydrologic factors, and evaluation of constraints.

4.4.1 Affected Environment

__Transmission Line__

Topography

The study area is located in the southern and southwestern coastal and alluvial plains, and foothills of the West Maui mountains. Study area topography ranges from gently sloping (five to 13 percent slope) coastal plains and alluvial fans at elevations up to about 400 feet, to mountainous terrain dissected by numerous steep (15 to 50 percent slope), V-shaped valleys and gulches at elevations up to 2,000 feet. These numerous valleys and gulches and several prominent ridges and puus influenced the location of the preferred alignment. Prominent valleys and gulches include Malaowaiaole, Manawainui, Manawaipueo, Papalaua, Hanaula, Ukumehame and Olowalu. Kealaloloa Ridge, a prominent ridge at the eastern end of the study area, separates the isthmus area and Maalaea from the coastal plains around Olowalu, Ukumehame and Lahaina to the west. Puu Hipa and Puu Mahanalua Nui are located near Launiupoko Stream.

Geology

The West Maui mountains are formed by the West Maui volcano, part of the Hawaiian Emperor volcanic chain of islands and seamounts, and one of two volcanos (Haleakala is the second) which form the island of Maui. These two volcanoes are separated by a flat isthmus composed of lava flows locally covered by dune sand and alluvial deposits. The most common geologic formation in West Maui is basaltic a'a and pahoehoe lava flows of the Wailuku Volcanic Series (Tw) with selected areas of cinder cones, friable vitric tuff, and weathered andesitic lava. There are no unique or unusual geologic resources or conditions known to exist along the preferred alignment.

Soil Conditions

Soils vary across the study area with soft, loose materials and recent alluvial deposits along the shoreline and areas of landslide deposits, areas prone to slope instability, and some areas of high erosion potential located in the upper (elevation 2,000 feet) slopes of the West Maui mountains where slopes are greater than 30 percent (see Appendix A). The preferred alignment passes through areas of recent alluvium (Ra), older alluvium consisting of stiff, bouldery clayey silts (Pa), isolated pockets of weathered andesitic lava of the Honolua Volcanic series (Th) and domes of this formation (Tha).

Water Resources

Rainfall in West Maui varies from only 20 inches at the coast to 400 inches in the higher elevations. There are two perennial streams in the study area, Olowalu Stream and Ukumehame Stream. Both streams are diverted in upper reaches for irrigation. There are several intermittent streams in the study area, including Papalaua, Launiupoko and Kauaula Streams, as well as ten unnamed intermittent streams. Study area streams generally occur in steep-sided gulches draining the mountain slopes. Major gulches and associated streams crossed by the preferred alignment are presented in Table 4.4-1.

Table 4.4-1
MAJOR GULCH/STREAM CROSSINGS

Segment	Gulch/Stream	Approximate Distance Spanned
4	Stake C1 and 1A - Unnamed Gulch	1,500
6	Malaowaiaole	700
6	Manawainui	800
8	Manawaipueo	1,100
11	Ukumehame	1,000
15	Olowalu	600

Potential 100-year flood zones are identified on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps at and near the mouths of Hakakea Gulch, Kahoma Stream, Olowalu Stream, part of Lahaina town and the Kealia Pond area (see Appendix A). The recent completion of the Kodama Stream flood control project in April 1990 appeared to reduce flooding areas to the general vicinity of the stream channel and some low-lying coastal areas (FEMA, 1991).

Generally only a narrow zone along the coast is prone to a 100-year coastal flood with velocity (Zone V-12) or tsunami inundation. The FEMA flood boundaries were estimated based on data and topography at the time of their evaluation (FEMA, 1981). Potential tsunami run-up heights may vary if topography in the coastal area changes.

In addition to these natural hydrologic features, there are also several reservoirs and irrigation ditches, flumes and aqueducts associated with cane irrigation. Irrigation features crossed by the preferred alignment include Launiupoko Ditch, Kauaula Ditch and Piilani Ditch.

Switching Station

The Lahainaluna Switching Station would be located on moderately sloping terrain (13 percent slope) at an elevation of 430 feet. The site is underlain by thin bedded flows of a'a and pahoehoe basalt (Tw) of the Wailuku Volcanic Series. The soil series in the general area is the Wainee series, while the soil type at the site is very stony, silty clay (WxC) (SCS, 1972). This soil is consistent with other well-drained soils located on the uplands of the island of Maui. Runoff is very slow to medium, permeability is moderately rapid, shrink-swell potential is low, and erosion potential is slight to moderate. Stones can cover between three and 15 percent of the surface in this soil type, although the depth to bedrock is generally greater than five feet.

Since the site is planted in sugarcane, most off-site and on-site runoff percolates into the ground, while any remaining runoff sheet flows into irrigation or storm ditches of the cane fields.

4.4.2 Potential Impacts

This section describes topographic, geologic and hydrologic hazards, or impacts that could result from construction activities.

Transmission Line

The preferred alignment and switching station site were selected to avoid areas of potential geologic and hydrologic hazards. Geologic factors particularly important to transmission line routing included slope, major geologic deposits and depth to rock, landslide, slope instability, erosion, and shrink-swell potential. Coastal areas were avoided due to the potential for tsunami inundation or coastal flooding and wave run-up, and the presence of soft, loose materials and recent alluvial deposits with low bearing capacities. The walls and bottoms of deep valleys and gulches were avoided due to potential landslides, progressive slope movement, flooding and flash flooding, and to avoid potential impacts to beneficial uses of streams in these areas. Areas of high erosion potential and areas of steep slopes or potential slope instability may affect the proposed transmission line, as described below.

Grading/Soil Disturbance

Grading would not be necessary for transmission line pole installation. Poles would be installed without affecting the existing topography although minimal right-of-way clearing would be used to provide for efficient installation and required electrical clearances. Disturbance would be limited to an approximately 490-square-foot area around each pole. Construction staging would be expected to be performed from existing cleared areas (the Maalaea Power Plant, shooting range, quarry or old landfill, and Lahainaluna Switching Station site) with minimal site preparation necessary at these locations.

Access will be required during construction and for maintenance of the transmission line. Table 2.6-1 presents a preliminary determination where existing access roads can be used and where new spur roads or helicopter pads would need to be constructed. Existing access roads are generally available for segments that are near the existing lines. It may be necessary to construct new spur roads from existing access roads to the easement and some pole locations. New spur roads would be constructed in relatively flat and open terrain. The roads would be approximately 10 feet wide. The total number, location and length of new spur roads will be determined during final pole placement and detailed design. New spur roads would be permanent and would be maintained annually or more frequently if needed.

Removal of vegetation (clearing) and disturbance of the upper soil horizon for construction of new spur roads can result in increased erosion potential during and immediately following construction. With proper mitigation the potential for soil erosion can be reduced.

In areas of steep terrain, or where access is poor or non-existent, such as the West Maui mountains, helicopters would be used for construction and maintenance. Temporary helicopter landing pads would be needed, which may require some leveling and vegetation clearing. The location and number of helicopter pads will be determined during detailed design.

Wind Speed

Hurricane Iniki, which struck Kauai in September, 1992 caused severe property damage, including extensive damage to electrical transmission and distribution systems. Wind speed may be amplified by terrain, such as that found in the study area. Wind speed is amplified in the narrow part of valleys due to the Venturi Effect. Wind speeds also accelerate downhill. Because of recent hurricane experiences, and the potential for wind speed amplification in the study area, the steel transmission line poles would be designed to withstand wind speeds of 100 miles per hour.

Geology

The ages of lavas of the West Maui Volcano are estimated to range between 2 million years to more than 25,000 years old. The likelihood of a future eruption on West Maui appears to be remote (Mullineaux et.al., 1987). Volcanic hazard potential is very low.

Seismic risk maps have been prepared for all of the Hawaiian Islands by the U.S. Coast and Geodetic Survey. The island of Maui is classified as seismic zone 2A in the Uniform Building Code (1989), the next to lowest risk category. The design and construction of the transmission line and switching station would conform to the requirements of the latest edition of the Uniform Building Code. Seismicity is not considered a significant risk factor.

Soils

Landslide/Slope Instability. The preferred alignment would cross several areas with slopes of greater than 30 percent, generally located in mauka portions of the study area and in the eastern portion of the study area around Kealaloloa Ridge. These areas may exhibit a greater potential for landslides and progressive slope movements.

North of the Manawaipueo Gulch crossing (Segment 7) and northwest of Launiupoko Stream (Segment 20), the preferred alignment would pass through areas of potential slope instability.

Erosion. Segment 18 of the preferred alignment would pass through an area of soils with high erosion potential at Puu Hipa and Puu Manalua Nui. These areas may be prone to erosion as a result of construction activities.

Shrink-Swell. The shrink-swell potential of study area soils was considered in corridor evaluation and alignment selection and areas with high potential were avoided. Adverse impacts to the proposed transmission line due to the shrink-swell potential of underlying soils would not be expected.

Soft, Loose Materials. Coastal areas were avoided in selection of the preferred alignment due to the presence of soft, loose materials with low bearing capacities. An area of recent alluvial deposits along Kahoma Stream is located north of Lahainaluna Road, outside the preferred alignment. Adverse impacts to the proposed transmission line due to the presence of soft, loose materials would not be expected.

Water Resources

No dredging or filling activities, or discharges into surface waters would be necessary for the proposed project. Installation of the transmission line would not affect groundwater quantity or quality.

Flooding. The proposed transmission line would not encroach on the 100-year floodplains of any study area streams. No poles would be placed within streams, gulches or associated floodplains. In all cases, poles would be located outside floodplains on adjoining ridges and high ground and the line would span the gulches and streams. Stream channels and gulches would not be altered. Beneficial uses of these streams would not be affected. Flood elevations and flood risks would not be affected.

Flash Flooding. Flash floods occur where drainage areas are small and slopes relatively steep. They are caused by intense rainfall of short duration with maximum runoff within a short time period. The proposed transmission line would not be located within streams, gulches or associated floodplains. Poles would be located on adjoining ridges and high ground outside areas prone to flash flooding, and the line would span the gulches and streams.

Tsunami Inundation. Tsunami (seismic sea wave) inundation zones identified in FEMA maps are limited to a narrow zone located along shoreline areas and would not affect the preferred alignment. The highest recorded tsunami wave height in the study area was 12 feet, on April 1, 1946. The most recent tsunami was May 23, 1960 between Lahaina and Maalaea with a height of nine to ten feet.

Switching Station

Site preparation for construction of the proposed switching station would involve clearing and grading the site to form pads suitable to meet design requirements. While the topography of the three-acre site would be locally modified, site preparation would not substantially change the overall topography characteristic of the region.

The proposed switching station would have a minor, non-significant impact on local area hydrology due to an increase in impervious site surface area and a resulting increase in the amount of stormwater runoff. Stormwater runoff from the switching station site would generally drain to irrigation and stormwater ditches located in adjacent cane fields.

4.4.3 Mitigation

While geologic and hydrologic hazards to construction and operation of the line are not anticipated, steep slopes, slope instability and erosion potential may affect some segments of the proposed transmission line. Mitigation would consist of taking these factors into site-specific consideration during final pole location, design of pole foundations, location of access roads, and construction practices.

Site-specific geotechnical investigations would be performed during selection of final pole locations and to provide site-specific conditions for design of pole foundations.

An erosion control plan will be developed and implemented. The plan will address clearing practices and vegetation stripping, access road construction, drainage control and restoration of disturbed areas.

Standard engineering techniques for controlling water run off on newly constructed access roads will be used. Water bars, or cross ditches, diversion ditches, berms, and energy dissipators will be used as appropriate to meet standards of road construction set by the Department of Land and Natural Resources (DLNR).

Erosion control measures consisting of placement of punch straw or jute netting would be used to minimize erosion and soil loss.

Grading and drainage improvements at the Lahainaluna Switching Station site would conform to County standards and would be coordinated with the County Department of Public Works. Final design of the switching station would address site runoff to avoid potential adverse impacts of stormwater runoff on adjacent properties.

4.5 VEGETATION

This section describes botanical resources within the study area, assesses potential impacts to those resources, and recommends mitigation measures for identified impacts. Background technical information for this botanical assessment is contained in a Regional Assessment of Botanical Resources and a Botanical Survey of the Preferred Alignment and Switching Station Site, presented as Appendix D (Char, W.P., January 1992 and June 1993).

The potential occurrence of sensitive botanical resources was evaluated in two phases. The first phase, conducted in October 1991 (prior to selection of the preferred alignment), consisted of a review of pertinent literature, personal interviews with government agency representatives and other botanists, and an aerial reconnaissance performed to provide an overview of the broad vegetation types present and the distribution of sensitive plant habitat within the regional study area. This information was used in corridor evaluation and selection of the preferred alignment. The second phase, conducted after the preferred alignment was selected in May 1993, consisted of a complete (100 percent) ground survey of an area ranging in width from 50 to 150 feet on either side of the centerline of the preferred alignment. The survey was performed to map vegetation types, develop a list of plant species in the survey area, locate sensitive plants (i.e., plants officially listed, or under consideration for listing, as threatened or endangered by the Federal government) identified in the literature review, and evaluate the suitability of habitats within the study area for sensitive plants. The West Maui mountains are known to contain some areas of native forests and a variety of endangered, threatened or sensitive (ETS) plant species; therefore, particular attention was paid to delineating native plant communities and to searching for ETS plants known within the study area.

4.5.1 Affected Environment

<u>Regional Overview</u>

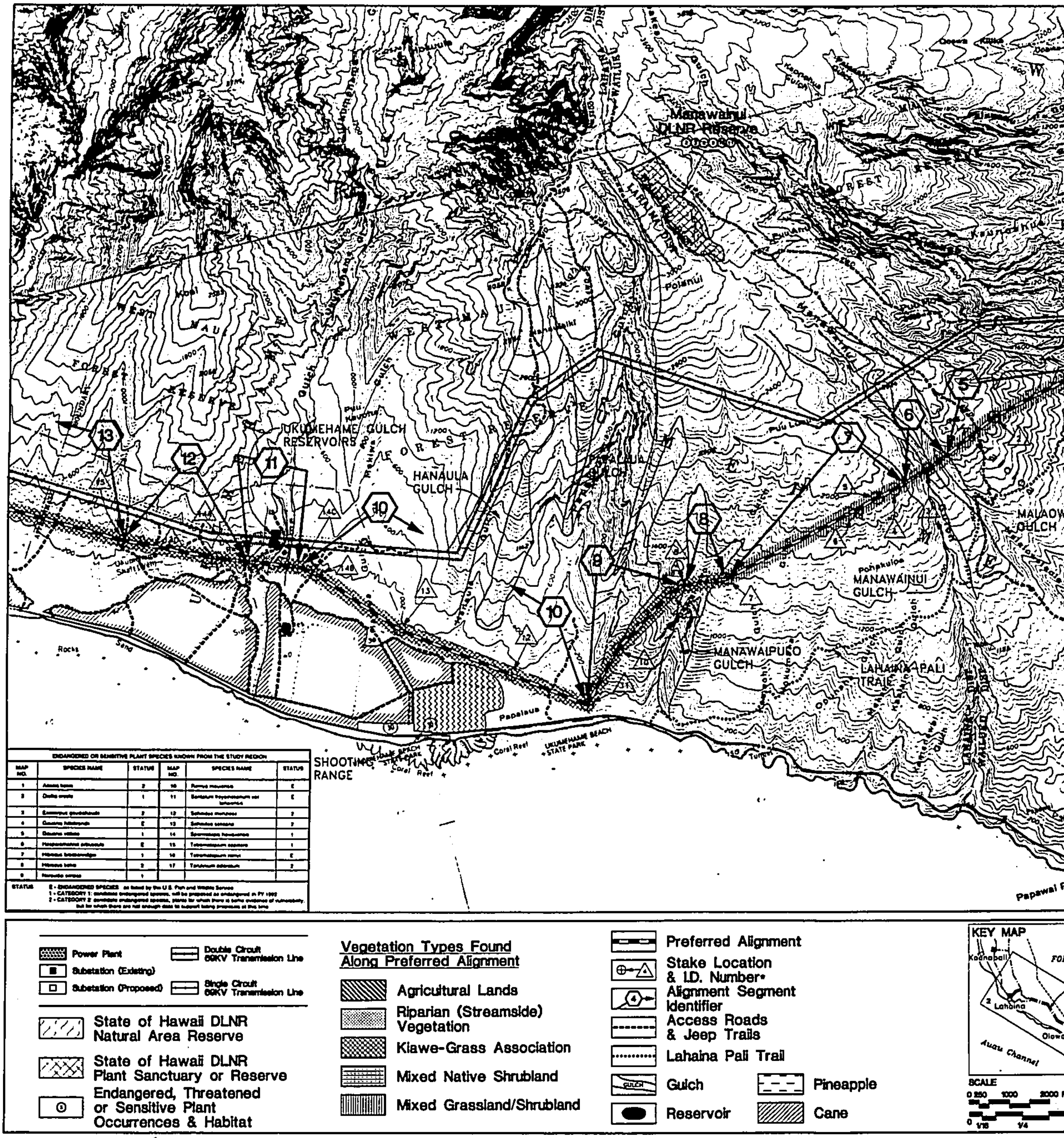
The study area is characterized by cane fields in the lower slopes of the West Maui mountains and deep ravines and gulches in the shrub-covered higher slopes. There are small pockets of residential and commercial development along the shoreline, but the study area is primarily undeveloped or used for agriculture. The West Maui mountains are known to contain some areas of native forests and several ETS plant species. Over 60 percent of the alignment is located on lands designated Agriculture District; the remaining portions are on lands in the Conservation District.

There are several botanical reserves within or adjacent to the study area (Figure 4.5-1). None would be encroached on by the preferred alignment or switching station. The Manawainui Plant Reserve, owned and managed by the Department of Land and Natural Resources (DLNR) and which contains a significant number of ETS plant species, is located within the study area along Manawainui Gulch. The Panaewa section of the DLNR West Maui Natural Area Reserve located at Paupau ridge, and the Lihau section near Puu Hipa, are outside but near the study area. Also located along Paupau ridge above Lahainaluna School and within the study area is the Paupau Plant Sanctuary, which contains eight ETS plant species. The Puu Hipa area is also known to provide habitat for sensitive plant communities.

<u>Transmission Line</u>

Vegetation Types

Five vegetation types occur along the preferred alignment for the transmission line: (1) agricultural lands; (2) riparian vegetation; (3) Kiawe-grass association; (4) mixed native shrubland; and (5) mixed grassland/shrubland (Figure 4.5-1). In addition to these five vegetation types, ruderal (weedy) vegetation occurs along disturbed roadside areas in Segements 1 and 2. The mixed native shrubland is a native vegetation type; the other vegetation types are non-native, although some native species may be found within them. The distribution of the five vegetation types is strongly influenced by elevation, rainfall, soil, and disturbance by grazing animals. Gently sloping areas at lower elevations with deep soils are used for agriculture. Uncultivated, rocky, leeward areas support a Kiawe-grass



ENDANGERED OR SENSITIVE PLANT SPECIES KNOWN FROM THE STUDY REGION

MAP NO.	SPECIES NAME	STATUS	MAP NO.	SPECIES NAME	STATUS
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2	[illegible]	1	11	[illegible]	E
3	[illegible]	2	12	[illegible]	2
4	[illegible]	E	13	[illegible]	2
5	[illegible]	1	14	[illegible]	1
6	[illegible]	E	15	[illegible]	1
7	[illegible]	1	16	[illegible]	E
8	[illegible]	2	17	[illegible]	2
9	[illegible]	1			

STATUS E - ENDANGERED SPECIES [illegible]
1 - CATEGORY 1: [illegible]
2 - CATEGORY 2: [illegible]

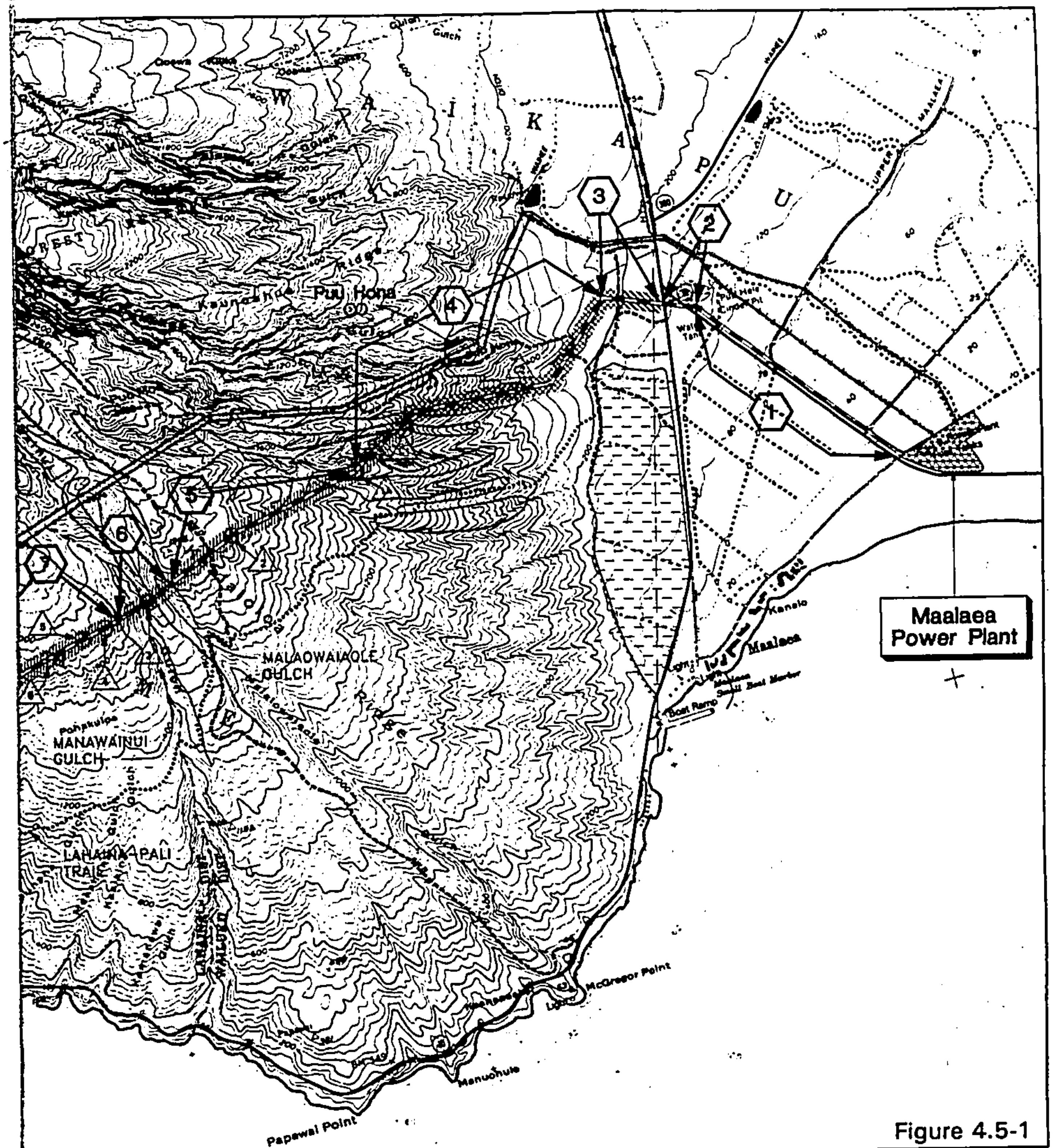
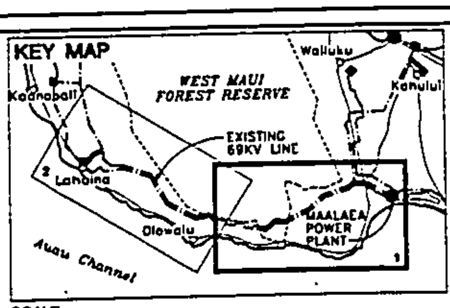


Figure 4.5-1



neapple

ane

SCALE

0 250 1000 2000 FEET

0 1/8 1/4 1/2 MILE

NORTH

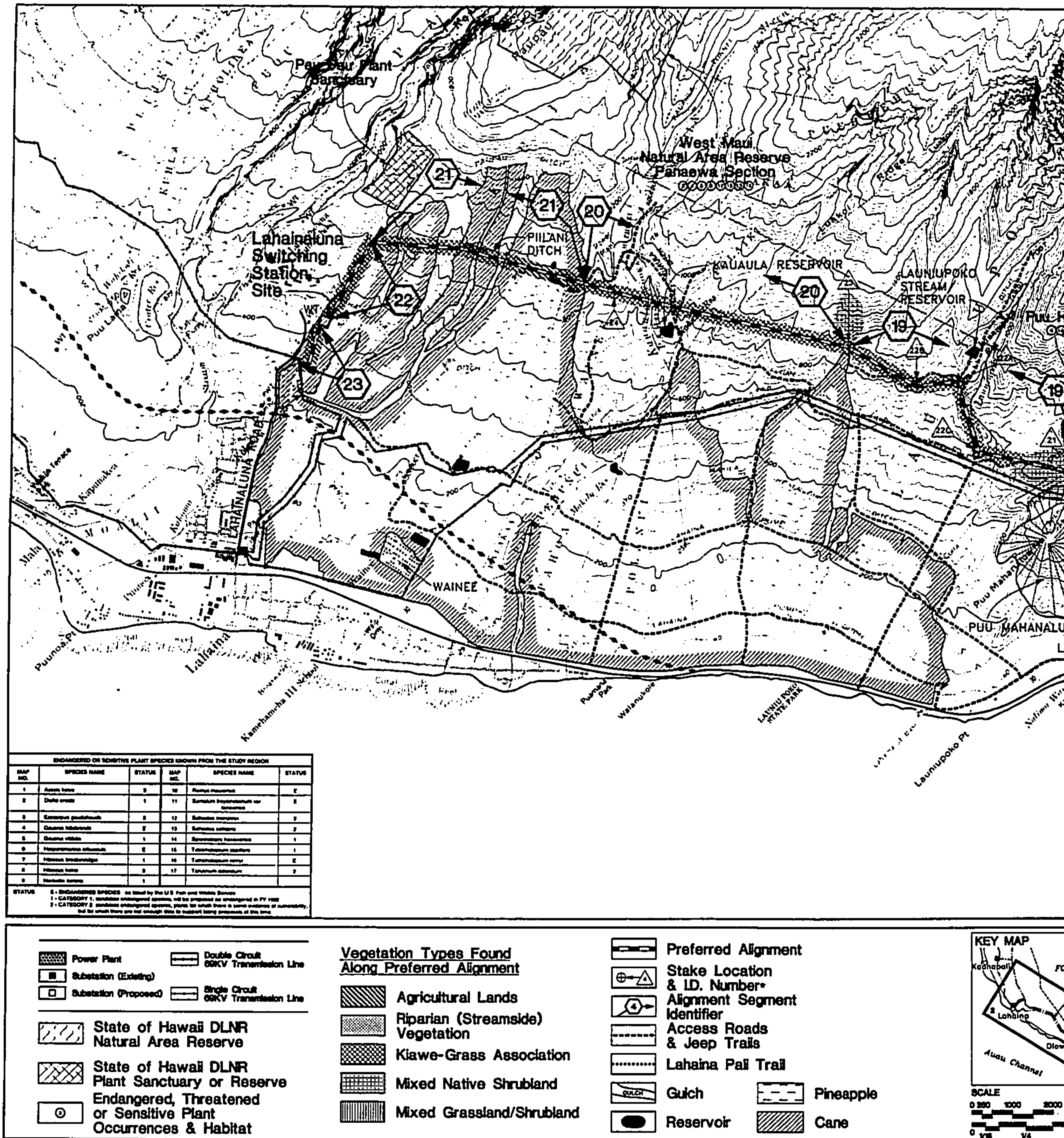
MAP 1

Botanical Inventory

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

DAMES & MOORE



ENDANGERED OR SENSITIVE PLANT SPECIES KNOWN FROM THE STUDY REGION

MAP NO.	SPECIES NAME	STATUS	MAP NO.	SPECIES NAME	STATUS
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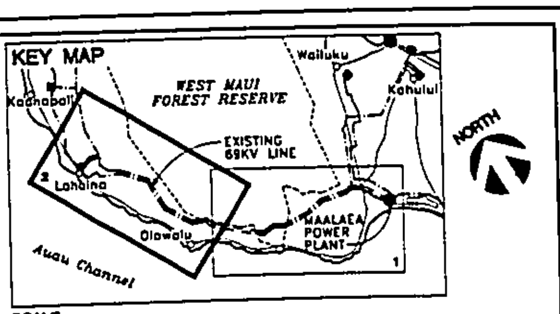
2	[illegible]	1	11	[illegible]	E
3	[illegible]	2	12	[illegible]	2
4	[illegible]	E	13	[illegible]	2
5	[illegible]	1	14	[illegible]	1
6	[illegible]	E	15	[illegible]	1
7	[illegible]	1	16	[illegible]	E
8	[illegible]	2	17	[illegible]	2
9	[illegible]	1			

STATUS E = ENDANGERED SPECIES [illegible]
1 = CATEGORY 1, [illegible]
2 = CATEGORY 2 [illegible]

Figure 4.5-1



neapple

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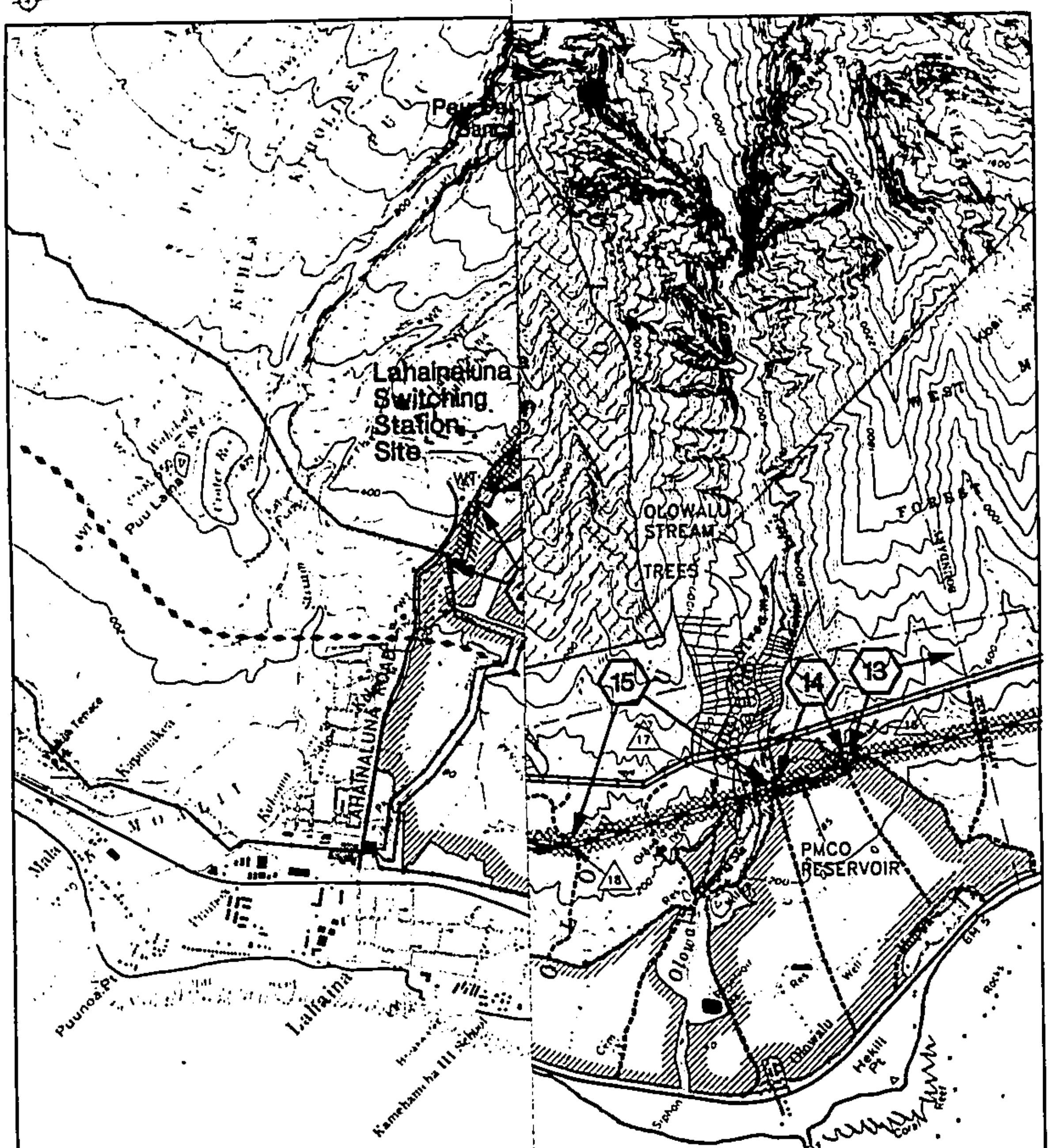
MAP 2

Botanical Inventory

Maalaea-Lahaina Third 69kV
Transmission Line Project

Maui Electric Company, Ltd.

DAMES & MOORE



ENDANGERED OR SENSITIVE PLANT SPECIES KNOWN FROM THE STUDY REGION					
MAP NO.	SPECIES NAME	STATUS	MAP NO.	SPECIES NAME	STATUS
1	[illegible]	2	10	[illegible]	E
2	[illegible]	1	11	[illegible]	E
3	[illegible]	2	12	[illegible]	2
4	[illegible]	E	13	[illegible]	2
5	[illegible]	1	14	[illegible]	1
6	[illegible]	E	15	[illegible]	1
7	[illegible]	1	16	[illegible]	E
8	[illegible]	2	17	[illegible]	2
9	[illegible]	1			

STATUS E - ENDANGERED SPECIES as listed by the U.S. Fish and Wildlife Service
1 - CATEGORY 1: candidate endangered species, will be proposed as endangered in FY [illegible]
2 - CATEGORY 2: candidate endangered species, plants for which there is some evidence of vulnerability but for which there are not enough data to support listing proposals at this time

Figure 4.5-1

Power Plant
Substation (Existing)
Substation (Proposed)
Double Circuit 69KV Transmission Line
Single Circuit 69KV Transmission Line
State of Hawaii DLNR Natural Area Reserve
State of Hawaii DLNR Plant Sanctuary or Reserve
Endangered, Threatened or Sensitive Plant Occurrences & Habitat

Botanical Inventory

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

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CORRECTION

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

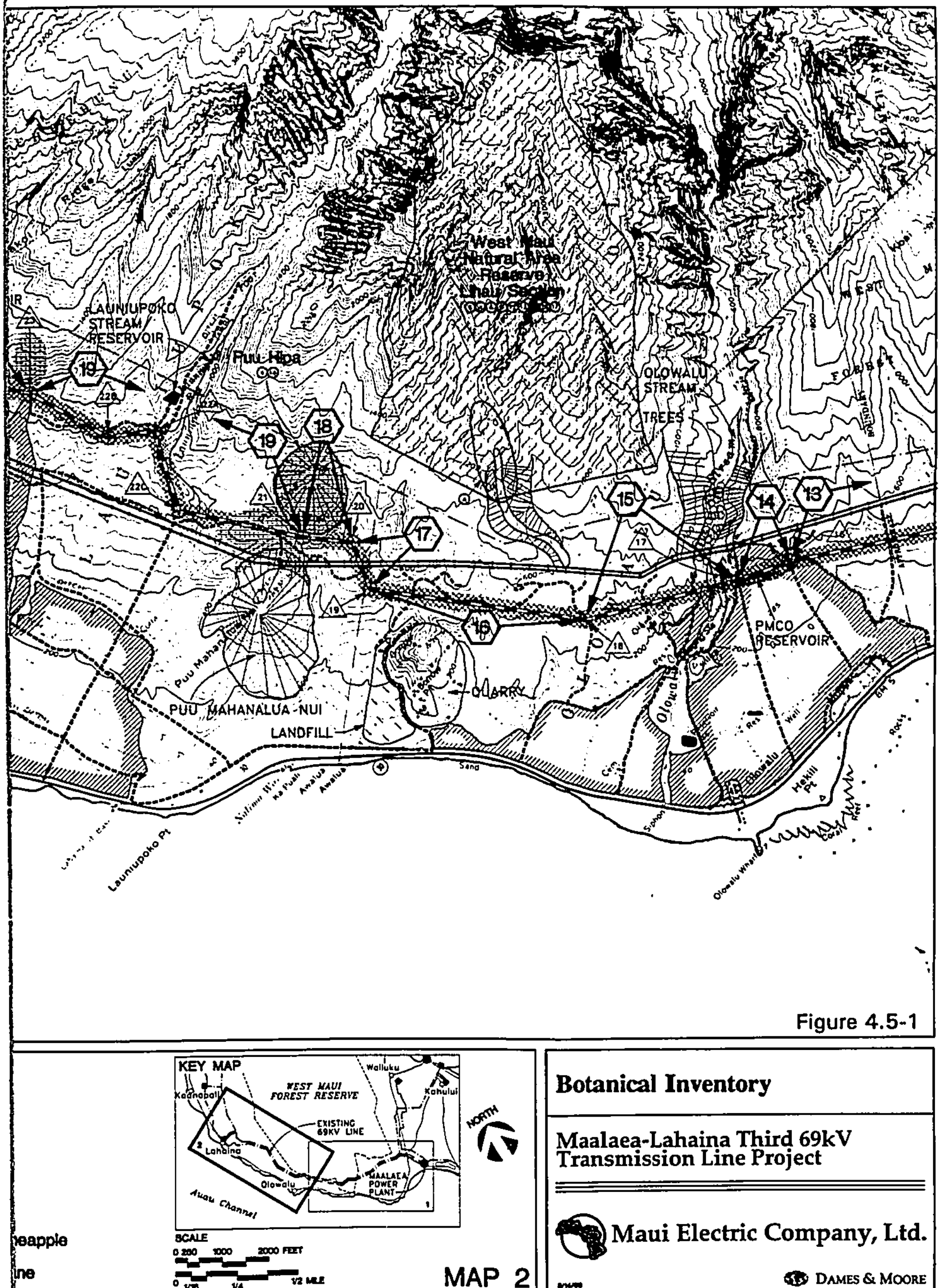

Figure 4.5-1

eapple

ine

Botanical Inventory

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

DAMES & MOORE

association and some areas of mixed native shrublands. Windward areas at higher elevations support mixed grassland/shrubland vegetation with several native plants. Riparian vegetation, a minor type, occurs at larger gulches with streams such as Olowalu and Ukumehame gulches. The five vegetation types are described in more detail below. A list of vascular plants encountered within the survey area is presented in Appendix D.

Agricultural Lands. Agricultural lands consist of sugarcane fields, recently fallowed fields, and pineapple fields. The preferred alignment would cross agricultural lands in Segments 3, 14 and 21 through 23. The preferred alignment for the most part would follow existing cane haul roads, irrigation ditches and the margins of fields (Figure 4.5-1). Agricultural lands support little of botanical interest. Weedy species predominate in less frequently disturbed areas such as along roadsides and irrigation ditches, while the cane fields themselves support few species because the fast-growing sugarcane shades out many of the weedy plants. Among the most commonly observed species are swollen finger grass (*Chloris barbata*), spiny amaranth (*Amaranthus spinosis*), false mallow (*Malastrum coromandelianum*), Guinea grass (*Panicum maximum*), pualele (*Emilia fosbergii*), and sow thistle (*Sonchus oleraceus*) along haul roads and the margins of fields, while wetter irrigation ditches support primrose willow (*Ludwigia octovalvis*) and Job's tears (*Coix lachryma-jobi*).

Riparian Vegetation. This minor vegetation type is found along the bottoms of Olowalu Gulch and Ukumehame Gulch which have perennial streams, and Launiupoko Gulch, which has an intermittent stream (Figure 4.5-1). Along the preferred alignment, riparian vegetation consists of a forest of opiuma (*Pithecellobium dulce*) and Java plum (*Syzygium cumini*), Kiawe (*Prosopis pallida*) and some Kukui (*Aleurites moluccana*) trees. Ground cover is patchy and consists of buffel grass (*Cenchrus ciliaris*), hairy abutilon (*Abutilon grandifolium*), woodfern (*Christella parasitica*), sour grass (*Digitaria insularis*), Guinea grass, West Indian sage (*Salvia occidentalis*) and castor bean (*Ricinus communis*). Job's tears (*Coix lachryma jobi*), hohono (*Commelina diffusa*), pamakani (*Ageratina riparia*) and primrose willow (*Lugwiga octovalvis*) grow along the streams.

Kiawe-Grass Association. The Kiawe-grass association is found on lower slopes with rocky outcrops and shallow soils just above the cane fields. Most of the preferred alignment passes through this vegetation type (Figure 4.5-1). It consists of an open woodland occurring in rocky, shallow soils with dense grass cover filling in between the Kiawe trees. Pili grass (*Heteropogon contortus*) is the dominant grass cover, with small clumps of buffel grass. Ilima (*Sida fallax*), a small native shrub, is common and the native Hawaiian cotton or mao (*Gossypium tomentosum*) and nehe (*Lipochaeta lavarum*) are occasional. Broad ridges and stony alluvial fans with fewer rocky outcrops are dominated by buffel grass. In grazed areas (portions of Segment 4) the pili grass and buffel grass are replaced by less palatable grasses including sour grass.

Mixed Native Shrubland. This vegetation type is uncommon along the preferred alignment, occurring on steep gulch walls below stakes C1 and 1A, on Puu Hipa, and on the ridges near stake 23 (Figure 4.5-1). It consists of low, scattered native shrubs which form an open shrubland. The most abundant shrub is aalii (*Dodonaea viscosa*). Other native elements include naio (*Myoporum sandwicense*), lowland or coastal sandalwood (*Santalum ellipticum*), pili grass, ilima and kookoolau (*Bidens menziesii*). There are also a variety of introduced or alien species.

Mixed Grassland/Shrubland. The mixed grassland/shrubland vegetation type is a patchwork of grassy areas interspersed among low thickets of aalii shrubs and scattered small stands of ironwood trees (*Casuarina equisetifolia*). Barren eroded areas are also common. This vegetation type is found along the upper elevation, cooler and wetter portions of the alignment between Segment 4 and Segment 7, where it ends at Manawaipueo gulch (Figure 4.5-1). Grassy areas on windward, higher slopes are dominated by African dropseed grass (*Sporobolus africanus*) and Natal redtop grass (*Rhynchelytrum repens*). Locally common are molasses grass (*Melinis multiflora*) and sour grass. On leeward, lower sides, pili grass is most abundant. Scattered shrubs include ilima, klu, aalii, Bidens and Lipochaeta, akia (*Wikstroemia oahuensis*) and ulei (*Osteomeles anthyllidifolia*).

Sensitive Plants

Seventeen (17) different sensitive plant species (i.e., officially listed, or a Category 1 or 2 candidate under consideration for listing, as threatened or endangered by the Federal government) are known to occur in the study area. Most of these species are protected by the State of Hawaii as well (Mehroff, March 29, 1993. Personal communication. U.S. Fish and Wildlife Service). These species are listed in Table 4.5-1 and known locations are shown on Figure 4.5-1. No sensitive plant species were observed during the field survey of the preferred alignment. These sensitive plants are located in generally undisturbed areas that provide good habitat for native plant species such as Puu

Table 4.5-1
ENDANGERED, THREATENED OR SENSITIVE PLANTS WITHIN THE STUDY AREA

# ON MAP (FIGURE 4.5-1)	SPECIES NAME	FEDERAL STATUS[1]	BISHOP MUSEUM RANK[2]
1	Acacia koaia	2	8e
2	Diellia erecta	1	5
3	Exocarpus gaudichaudii	2	6c
4	Gouania hillebrandii	E	8b
5	Gouania vitifolia	P	2b
6	Hesperomannia arbuscula	E	4a
7	Hibiscus brackenridgei	1	5d
8	Hibiscus kokio	2	-
9	Neraudia sericea	1	5a
10	Remya mauiensis	E	3b
11	Santalum freycinetianum var. lanaiensis	E	6e
12	Schiedea menziesii	2	8c
13	Schiedea salicaria	2	6c
14	Spermolepis hawaiiensis	1	8a
15	Tetramolopium capillare	1	4c
16	Tetramolopium remyi	E	3c
17	Torulinium odoratum	2	-

[1] Federal Status

E - Officially listed as endangered.

P - Proposed for listing as either endangered or threatened.

1 - Category 1 candidate endangered species.

2 - Category 2 taxa; plants for which there is some evidence of vulnerability, but for which there are not enough data to support listing proposals at this time (U.S. Fish and Wildlife Service, December 24, 1992).

[2] Rank is priority based on population size.

2 = 2-5 plants, 3 = 6-10 plants, 4 = 11-20 plants, 5 = 21-100 plants, 6 = 101-300 plants, 7 = 301-1,000 plants, 8 = >1,000 plants) and security of genus (a = entire genus at risk, b = >two-thirds at risk, c = one-third to two-thirds at risk, d = <one-third at risk, e = few at risk) (Wagner, et. al. 1990).

Hona, the Manawainui Plant Reserve, the Puu Hipa-Kihau-Olowalu area and Paupau Ridge. Although native species are the dominant components of the mixed native shrubland and the mixed grassland/shrubland, no endangered, threatened or sensitive plant species were found in these vegetation types within the survey area. All of the native species inventoried within the survey area can be found in similar habitats throughout the West Maui mountains.

Switching Station

Vegetation at the proposed Lahainaluna Switching Station site consists of agricultural lands (cane fields). The site contains no native vegetation. These agricultural lands support little of botanical interest. Weedy species predominate in less frequently disturbed areas such as along roadsides and irrigation ditches, while the cane fields themselves support few species because the fast-growing sugarcane shades out many of the weedy plants. Among the most commonly observed species are swollen finger grass, spiny amaranth, false mallow, Guinea grass, pualele, and sow thistle along haul roads and the margins of fields, while wetter irrigation ditches support primrose willow and Job's tears.

No endangered, threatened or sensitive plant species were encountered during the field survey of the switching station site.

4.5.2 Potential Impacts

The construction of the transmission line will result in both temporary disturbance and permanent loss or alteration of natural vegetation due to pole installation and construction of new spur roads. Construction of the switching station will result in permanent removal of three acres of cane fields. No unique or native ecosystems, endangered, threatened or sensitive plants species, or botanical preserves will be affected by construction of the transmission line or switching station. A major criterion for route selection was avoidance of unique or native ecosystems, sensitive plant species and botanical preserves. During evaluation of alternative corridors and selection of the preferred alignment, locations for listed candidate or proposed endangered and threatened plants or sensitive or unique communities were mapped and avoided.

Transmission Line

Construction of the proposed transmission line would result in the temporary disturbance of vegetation around each pole installed. Estimates of the distance across each vegetation type spanned by the line, and of the area of each vegetation type disturbed by each segment of the line are presented in Table 4.5-2. Pole installation would disturb an approximately 490 square foot area (25 foot diameter) around each pole, for a total area of temporary disturbance of 1.98 acres. This is based on an estimate of 151 poles. The amount of vegetation permanently removed by the base of each pole is approximately five square feet or a total of 755 square feet for the total project. Depending on the final location of poles in cane fields some additional permanent removal of cane would be necessary to maintain a clear area around poles and guy wires.

In non-agricultural areas, however, with the exception of an approximately five square foot area directly displaced by the base of the pole itself, disturbance would be temporary; areas disturbed by construction activities would be allowed to naturally revegetate following construction. Construction of the underground segment of the transmission line would temporarily disturb about 0.3 acre of Kiawe-grass association. This is based on a 12-foot-wide area of disturbance for the length of this segment. As with disturbance around poles, this area would be allowed to naturally revegetate following construction. Because of the small area disturbed, the abundance of affected vegetation types within the West Maui mountains, the temporary and short-term nature of the disturbance, and the potential for revegetation, vegetation disturbance during construction would be a non-significant impact.

Permanent new spur roads would be constructed from existing cane field roads or from maintenance access roads for the existing 69KV transmission lines to individual pole locations in Segments 10, 12, 13, and 15 through 20 (see Section 2.6.2, Access Requirements). Access in other segments would be provided by existing cane field roads and access roads, cross-country, or by helicopter in remote areas.

An undetermined area of vegetation would be permanently displaced by the construction of permanent new spur roads from existing access roads to the transmission line easement. The final location and number of spur roads required will be determined during final design after survey and pole locations are selected. The area of vegetation permanently displaced by new spur roads would

Table 4.5-2
VEGETATION TYPES CROSSED BY PREFERRED ALIGNMENT AND AREA DISTURBED BY POLE INSTALLATION

Segment Number	Segment Description	Vegetation Types Crossed/Disturbed														
		Agricultural		Riparian		Kiawe-Grass Association		Mixed Native Shrubland		Mixed Grassland Shrubland		Ruderal		Total		
		Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Apx # of poles	Area Disturbed (sq. ft.)
1	east side of N. Kihei Rd. r/w to Honoapiilani Hwy.											4,900	4,410	4,900	9	4,410
2	N. Kihei Rd./Honoapiilani Hwy. crossing											650	980	650	2	980
3	Wailuku Agribusiness/ C. Brewer haul road	570	490			250	490							820	2	980
4	lowland Kiawe scrub up unnamed ridge					4,9254	4,4104	3753	4904	1,2001	9809			6,500	12	5,880
5	unnamed ridge to edge of Malalowaiole Gulch									4,2004	3,9203			4,200	8	3,920
6	Malalowaiole and Manawainui Gulches									1,300	1,470			1,300	3	1,470
7	Manawainui Gulch to Manawaipueo Gulch									5,200	4,900			5,200	10	4,900
8	Manawaipueo Gulch crossing					700	980							700	2	980

Table 4.5-2 (Continued)
VEGETATION TYPES CROSSED BY PREFERRED ALIGNMENT AND AREA DISTURBED BY POLE INSTALLATION

Segment Number	Segment Description	Vegetation Types Crossed/Disturbed														
		Agricultural		Riparian		Kiawe-Grass Association		Mixed Native Shrubland		Mixed Grassland Shrubland		Ruderal		Total		
		Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Apx # of poles	Area Disturbed (sq. ft.)
9	Manawaipueo Gulch to Papalaua Gulch					3,500	3,430							3,500	7	3,430
10	Papalaua Gulch to Ukumehame Gulch					7,900	7,350							7,900	15	7,390
11	Ukumehame Gulch crossing			500		700	980							1,200	2	980
12	Ukumehame Gulch to dirt access road					3,200	2,940							3,200	6	2,940
13	access road across cane field near Olowalu Stream	500	490			5,500	4,900							6,000	11	5,390
14	cane field crossing, field edge road to field edge road	1,200	980											1,200	2	980
15	field edge road to access road	200	490	300		2,900	2,940							3,400	7	3,430
16	access road to plateau mauka of quarry					4,800	4,410							4,800	9	4,410
17	underground crossing					1,000	12,600							1,000	0	12,600

Table 4.5-2 (Continued)
VEGETATION TYPES CROSSED BY PREFERRED ALIGNMENT AND AREA DISTURBED BY POLE INSTALLATION

Segment Number	Segment Description	Vegetation Types Crossed/Disturbed														
		Agricultural		Riparian		Kiawe-Grass Association		Mixed Native Shrubland		Mixed Grassland Shrubland		Ruderal		Total		
		Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Apx # of poles	Area Disturbed (sq. ft.)
18	between underground crossing and Puu Hipa					550	490			450	490			1,000	2	980
19	Puu Hipa across Launiupoko Stream to access road					5,250	4,410			2,050	1,960			7,400	13	6,370
20	access road across Kauaula Stream to Piilani ditch road					6,600	6,370							6,600	13	6,370
21	Piilani ditch road to Bishop Estate property	3,550	3,430			1,850	1,470							5,400	10	4,900
22	Piilani ditch road along cane edge road & Bishop Estate property boundary to switching station site	1,800	1,470			300	490							2,100	4	1,960
23	Switching station to interconnection with Puukolii line	1,000	980											1,000	2	980
Subtotal - Transmission Line		8,820	8,330 s.f. 0.19 acre	800		49,925	58,660 s.f. 1.35 acres	375	490 s.f. 0.01 acre	14,400	13,720 s.f. 0.31 acre	5,550	5,390 s.f. 0.12 acre	79,970	151	86,630 s.f. 1.98 acre

Table 4.5-2 (Continued)
VEGETATION TYPES CROSSED BY PREFERRED ALIGNMENT AND AREA DISTURBED BY POLE INSTALLATION

Segment Number	Segment Description	Vegetation Types Crossed/Disturbed: Agricultural		Riparian		Kiawe-Grass Association		Mixed Native Shrubland		Mixed Grassland Shrubland		Ruderal		Total		
		Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Area Disturbed (sq. ft.)	Length Crossed (ft.)	Apx # of poles	Area Disturbed (sq. ft.)
	Lahainaluna Switching Station		130,680 s.f. 3 acres												0	130,680 s.f. 3 acres
	Total Project	8,820	138,030 s.f. 3.19 acres	800		49,925	58,660 s.f. 1.35 acres	375	490 s.f. 0.01 acre	14,400	13,720 s.f. 0.31 acre	5,550	5,390 s.f. 0.12 acre	79,970	151	217,310 s.f. 4.98 acres

Notes: Area disturbed assumes single pole construction and a 490-square-foot area (25-foot diameter, 78.5 circumference) around each pole; 12-foot-wide disturbance area along length of underground segment.

be minimized by using existing cane field edge roads, jeep trails and access roads for the existing 69KV transmission lines to the extent possible.

Sensitive Plants

A detailed botanical inventory of the preferred alignment indicated that no endangered, threatened or Category 1 or 2 plant species were present. Although native species are components of the mixed native shrubland and the mixed grassland/shrubland, no threatened and endangered species or rare and vulnerable plants were found in these vegetation types along the preferred alignment. All of the native species inventoried within the preferred alignment can be found in similar habitats throughout the West Maui mountains. Impacts on sensitive plant species would not be expected as a result of the proposed transmission line.

Other Impacts

Few trees are expected to be eliminated as a result of the project, because the trees found within the preferred alignment generally do not grow very tall. Some limbing of higher branches may be necessary to provide space for conductor tensioning during line construction.

Normal operations of the transmission line would have no effect on the surrounding vegetation. There would be a slight chance for wildfire to occur, if a transmission line were to fall and an energized conductor were to contact the ground. The probability of such an event occurring is very low.

Routine maintenance of the proposed line would not cause any impact on vegetation. No herbicide would be used because there are no locations within the preferred alignment that have extensive tree or bush cover requiring control measures.

Switching Station

The proposed switching station site contains no native vegetation and no endangered, threatened or sensitive plants due to extensive sugarcane agricultural operations. Development would involve clearing and permanent conversion of a cane field to approximately three acres of non-vegetated area (Table 4.5-2). Because this agricultural land contains little of botanical interest, this would not be a significant impact.

4.5.3 Mitigation

Existing access roads will be used wherever feasible. New spur roads will be designed to the minimum standards necessary for construction and maintenance vehicle access. The location and design of new spur roads and helicopter pads would be reviewed by a qualified biologist to determine the potential for disturbance of sensitive biological resources and to determine the need for a biological resource survey of areas proposed for new spur roads and helicopter pads.

All construction vehicles will be equipped with spark arrestors to reduce fire potential. Fire suppression equipment will be carried on trucks and construction crews will be trained in its use.

An erosion control plan will be developed and implemented. The plan will address clearing practices and vegetation stripping and removal, access road construction, restoration and/or maintenance of drainage, and measures to protect disturbed areas from erosion.

Surrounding vegetation will be allowed to naturally revegetate disturbed areas around the new poles. During the field survey of the preferred alignment, no signs of severe erosion problems around existing poles were observed. The surrounding vegetation especially the buffel grass (*Cenchrus ciliaris*) had covered over most of the disturbed areas. In some places, shrubs of a'alii (*Dodonaea visicosa*), a native species, were found growing at the base of the poles.

4.6 BIRDS AND MAMMALS

This section describes bird and feral mammals species occurrence in the study area and assesses whether the proposed transmission line and switching station would impact birds and mammals or their habitat. Background technical information for this assessment is contained in an Avifaunal and Feral Mammal Survey presented as Appendix E (Bruner, May 12, 1993).

The occurrence of birds and mammals along the preferred alignment and switching station site was evaluated through a field survey performed on May 7 through May 9, 1993. The survey was performed to:

- Document bird and mammal species that occur near the alignment and switching station, or that may occur given available habitat types;

- Provide some baseline data on the relative abundance of each species;
- Determine the presence or likely occurrence of native fauna, particularly any that are threatened or endangered, and, if encountered, identify what if any features of the habitat may be important for these species; and
- Determine whether the preferred alignment or switching station site contain special or unique habitats that, if eliminated or altered by the proposed action, could result in a significant impact on birds and mammals in West Maui.

At various locations along the preferred alignment (see Appendix E), eight-minute counts were made of all birds seen or heard, and special unusual observations of birds were also recorded. These data provided the basis for relative abundance estimates. The presence of mammals was ascertained by actual sightings or observation of scat or tracks. The field survey was supplemented by review of literature and unpublished reports.

4.6.1 Affected Environment

The study area is characterized by cane fields in the lower slopes of the West Maui mountains and deep ravines and gulches in the shrub-covered higher slopes. Three general habitat types dominate the majority of lands along the preferred alignment: (1) agricultural land with grass and weed lined ditches and irrigation reservoirs; (2) parkland with dry grass and scattered trees (kiawe) or shrubs; and (3) dry gulches with brush and trees.

Birds

Bird species recorded during the field survey, and their relative abundance, are presented in Table 4.6-1.

Resident Endemic and Indigenous Birds. No native birds were seen along the alignment. The Pueo or Hawaiian owl (*Asio flammeus sandwichensis*) is known to occur in the project area and, while none was observed during the three-day wildlife survey, one owl was observed during botanical surveys conducted for the project. Pueo forage in agricultural fields and in forested upland habitats. Eleven Black-crowned night heron (*Nycticorax nycticorax*), a native but not listed waterbird, were recorded at reservoirs and irrigation ditches throughout the cane fields in the survey area. The black-necked stilt (*Himantopus mexicanus knudseni*), an endangered native species which moves

Table 4.6-1
BIRDS SPECIES RECORDED DURING FIELD SURVEY

COMMON NAME	SCIENTIFIC NAME	NUMBER OBSERVED	RELATIVE ABUNDANCE[1]
Resident Endemic and Indigenous Birds			
Pueo (Hawaiian Owl)	*Asia flammeus sandwichensis*	1[2]	R
Black-crowned Night Heron	*Nycticorax nycticorax*	11	A
Black-necked Stilt	*Himantopus mexicanus*	4	U
Migratory Indigenous Birds	*knudseni*		
Pacific Golden Plover		1	R
Resident Indigenous Seabirds	*Pluvialis fulva*		
Whitetailed Tropicbird		3[2]	U
Exotic Birds	*Phaethon lepturus*		
Barn Owl		1	R
Cattle Egret	*Tyto alba*	3	R
Ring-necked Pheasant	*Bulbulcus ibis*	2	R
Black Francolin	*Phasianus colchicus*	2	U
Gray Francolin	*Francolinus francolinus*	7	C
Spotted Dove	*Francolinus pondicerianus*	4	U
Zebra Dove	*Streptopelia*	11	A
Rock Dove	*Geopelia striata*	16	R
Common Myna	*Columba livia*	13	A
Northern Mockingbird	*Acridotheres tristics*	3	U
Northern Cardinal	*Mimus polyglottus*	5	C
Red-crested Cardinal	*Cardinalis cardinalis*	8	R
Japanese White-eye	*Paroaria coronata*	11	A
Nutmeg Mannikin	*Zosterops japonica*	24	A
Warbling Silverbill	*Lonchura punctulata*	17	A
House Finch	*Lonchura malabarica*	10	A
House Sparrow	*Carpodacus mexicanus*	12	R
	Passer domesticus		

Key:

[1]Relative abundance = Based on number of times observed during eight minute counts in appropriate habitat.

- A = abundant (10+)
- C = common (5-10)
- U = uncommon (less than 5)
- R = recorded (seen or heard during one count only or at times other than during eight minute counts)

[2] = observed during botanical survey

between open water bodies in the region, is known to frequent Kealia Pond east of the Maalaea Power Plant, and Kanaha Pond east of Kahului. Four stilts were recorded far from the preferred alignment, at a pond near Honoapiilani Highway at Awalua.

Migratory Indigenous Birds. Migratory shorebirds winter in Hawaii between August and May. The only shorebird recorded during the field survey was one Pacific Golden Plover (*Pluvialis fulva*), the most abundant migratory shorebird species in Hawaii. Plover forage in open areas such as mud flats, lawns, pastures, plowed fields and roadsides. This species arrives in Hawaii from arctic breeding grounds in early August and stays until late April. Other shorebirds that could use the habitats within the study area, foraging in plowed fields, irrigation ditches, and reservoirs include ruddy turnstone (*Arenaria interpes*) and wandering tattler (*Heteroscelus incanus*).

Resident Indigenous Seabirds. No seabirds were recorded, nor would any be expected, along the preferred alignment. Three White-tailed Tropicbirds (*Phaethon lepturus*) were seen flying overhead during the botanical survey.

Exotic Birds. Seventeen species of exotic birds were recorded during the field survey, as noted in Table 4.6-1. Other introduced birds that could occur in this region include eurasian skylark and orange-cheeked waxbill.

Feral Mammals

Several mongoose and two feral cats were observed during the field survey. The endemic and endangered Hawaiian hoary bat is known to live on Maui, although none were observed during the field survey. Although it has not been established that there is a resident breeding population on Maui, this species is known to roost solitarily in trees and is often observed foraging over ponds and bays.

4.6.2 Potential Impacts

Transmission Line

The proposed transmission line would result in permanent loss of an undetermined area of vegetation and associated wildlife habitat that would be displaced by new spur roads. Permanent new spur roads for construction and ongoing maintenance of the line would be constructed in Segments 10, 12, 13, and 15 through 20 (see Section 2.6.2, Access Requirements). The habitat area displaced by new spur roads would be minimized by using existing access roads for the existing 69KV lines, cane field roads, and jeep trails to the extent possible.

The proposed transmission line would also result in minor temporary disturbance of vegetation types and associated wildlife habitat that occur along the preferred alignment. Pole installation would temporarily disturb an approximately 490-square-foot area around each pole for a total area of disturbance of approximately 1.98 acres. Areas disturbed by pole installation would be anticipated to naturally revegetate in approximately one growing season.

None of the habitat types affected are special, unique or important to bird or mammal species that may occur in the area. Habitat types found along the preferred alignment are abundant throughout the region.

The only native species recorded during the survey, the Black-crowned night heron and the Pacific Golden Plover, were seen infrequently and using habitats that will not be affected by the proposed action. Adverse impacts to these species would not be expected.

Switching Station

The proposed switching station site contains poor quality habitat due to agricultural use. Clearing and permanent conversion of this cane field to approximately three acres of nonvegetated area would have a negligible impact on birds and mammals.

4.6.3 Mitigation

No mitigation is necessary or proposed.

4.7 ARCHAEOLOGICAL RESOURCES

This section describes archaeological resources in the study area. This information is based on a Regional Assessment and an Archaeological Inventory Survey of the preferred alignment, presented as Appendix F and Appendix G, respectively (Hammat and Chiogioji, January 1992; Robins, et.al., 1993).

Literature review, maps and records research, and field surveys were undertaken. These investigations were conducted in two phases. The first phase, prior to selection of the preferred alignment, included: (1) review of documentary resources describing traditional Hawaiian use of the area; (2) review of previous archaeological studies; (3) consultation with Ms. Agnes Griffin of the Department of Land and Natural Resources (DLNR) Historic Preservation Division; and (4) an aerial reconnaissance survey of the study area. This information was used in corridor evaluation and selection of the preferred alignment.

The second phase, conducted after selection of the preferred alignment, consisted of a complete (100 percent) ground inventory survey of the preferred alignment and switching station site performed between April 26, 1993 and May 7, 1993, and June 22 and June 24, 1993. A 300-foot-wide area (150 feet on either side of the centerline of the preferred alignment) was surveyed. Inventoried sites were located, mapped, identified by type, and evaluated for function, interrelationships and eligibility for inclusion on the National Register of Historic Places (NRHP) and Hawaii Register of Historic Places (HRHP). Limited subsurface testing was conducted to obtain datable samples for chronological information.

The location of the preferred alignment in the field relative to identified archaeological sites was aided by locational stakes placed in the field using a helicopter-based Global Positioning System (GPS) as well as ground-based GPS. GPS uses satellites to very accurately (within 50 feet in this case) determine location in the field.

As a result of the inventory survey, minor adjustments were made to three segments of the preferred alignment (in the Maalaea, Ukumehame and Launiupoko areas) to avoid areas of dense site concentrations and particularly significant resources. The Maalaea segment was realigned to avoid the view plane of the Lahaina Pali Trail. The Ukumehame segment was realigned to preserve the view planes of Ukumehame heiau and Hikii heiau and avoid a dense concentration of sites. The Launiupoko segment was also realigned to avoid a dense concentration of archaeological features. The alignment adjustments were subjected to a supplemental inventory survey conducted between June 22 and June 24, 1993.

4.7.1 Affected Environment

Cultural Overview

The following overview of prehistory, ethnography and history is provided as a background to discussion of archaeological resources within the study area of the proposed transmission line and switching station.

Lands between Maalaea and Lahaina, particularly in the Lahaina District were used intensively during prehistoric and historic times. These lands offered abundant ocean resources and productive agricultural lands to sustain a thriving Hawaiian community and consequently, many battles ensued between warring chiefs to gain control over these valuable areas. Although the Maalaea area was less inhabited than the Lahaina region, it became a sort of crossroads for travelers due to its advantageous geographic location on the isthmus and important canoe landing at Maalaea Bay.

Traditional Hawaiian agriculture was practiced in the study area. Wetland taro and Loi and Kula crops were intensively cultivated by the Makaainana in the stream valleys and floodplains of Ukumehame, Olowalu, Kauaula, and possibly Launiupoko. The Alii likely controlled the maintenance and surplus of certain crops. Control over surplus agricultural goods following western contact was lucrative because agricultural goods were in great demand by whalers and sea-faring explorers and were traded for western goods coveted by Hawaiians.

Following western contact, Lahaina and surrounding areas changed as Euro-Americans introduced a different economy through the trade of western goods. Perhaps the biggest change was the western style of land ownership culminating in the Great Mahele of the mid-1800s. The preferred alignment extends through the ahupuaa of Waikapu, Ukumehame, Olowalu, Launiupoko, Polanui, Polaiki, Pahoa, Wainee and Kuia.

Assisted by the land divisions of the Great Mahele, foreigners were able to obtain land through lease or actual purchase. A majority of the prime agricultural lands between Maalaea and Lahaina were ultimately appropriated by foreign entities for large-scale sugarcane agriculture, which continues today together with residential development and tourism.

Transmission Line

Areas of Particular Significance

Within the immediate vicinity of the preferred transmission line alignment, the Maalaea, Ukumehame and Launiupoko areas were identified as areas of dense site concentrations and particularly significant resources. These areas are depicted in greater detail in figures contained in Appendix G and are described below.

Maalaea

Located in the Maalaea area is the Old Lahaina Pali Trail, part of the Na Ala Hele Trails & Access Program, established in 1988 to develop a statewide trail and access system. The program identifies a series of "Priority Trails" and one "Demonstration Trail" for each major island. The Old Lahaina Pali Trail was selected as Maui's Demonstration Trail.

The Old Lahaina Pali Trail is part of a trail system that once encircled the island of Maui. The 4.5-mile-long trail once connected the townships of Lahaina and Wailuku. It lies above the existing Honoapiilani Highway spanning the ahupuaa of Ukumehame between Olowalu on the west and Maalaea to the east. Written references to use of this trail date from the late 1830s to the early 1840s. The trail fell into disuse and disrepair in the 1890s when it was abandoned after construction of a carriage road (now known as "Old Government Road") to Lahaina and subsequent building of the Honoapiilani Highway during the 1940s and 1950s. Today the trail lies within State-owned lands used for grazing cattle.

A recent archaeological inventory survey of the trail (Tomanari-Tuggle and Tuggle, 1991) recorded 18 sites adjacent to the trail, including the following functional types: alternate trail routes, water diversion, quarrying, trailside art (petroglyphs), storage, and shelters. All sites except two are related to use of the trail.

Ukumehame

Previous studies (Walker, 1931) of Ukumehame and Olowalu stream areas identified three heiau: Hikii, Ukumehame and Kawaialoa heiau. All three heiau are thoroughly documented and included in the Hawaii Register of Historic Places.

Launiupoko

A previous survey (Graves, 1991) of the alluvial plain of Launiupoko Stream identified 47 sites consisting of over 70 component features representing a variety of functions: agriculture, animal husbandry, habitation, temporary habitation, and marker. Agricultural features, especially terraces, predominate, with associated habitation sites. Two distinct periods of traditional Hawaiian land use are indicated for the Launiupoko sites: the "Expansion Period" (A.D. 1100-1650), characterized by extensive irrigation and upland farming in newly exploited upland and leeward localities, and the "Proto-Historic Period" (A.D. 1650-1790) distinguished by an increase in permanent occupation associated with continuing agricultural practices. Some uncertainty remains as to whether the widespread terrace complex is indigenous Hawaiian in origin or was constructed for large-scale cane agriculture, which incorporated some of the more useful elements of earlier indigenous agriculture.

Inventory Survey Results

A total of 34 sites and site complexes were identified within the survey area for the proposed transmission line. Twelve of the 34 sites represent site complexes with component features, including concentrations of agricultural features and internal features of two identified heiau. Formal site types include walls, enclosures, cattle walls, canals, a kerbstone trail, a metal flume, a paved terrace, a railroad berm, and an upright stone. Seven primary functional categories of sites were identified: agriculture, cane irrigation and transportation, temporary and permanent habitation, heiau, marker, ranching and travel route. Some sites have more than one function.

Sites were evaluated for significance according to definitions derived from the broad criteria established for eligibility for inclusion in the NRHP (36 CFR 60.4 - *Criteria for Evaluation*). These evaluation criteria are presented in Table 4.7-1. The Hawaii State Historic Preservation Division uses criteria A through D of the NRHP for evaluating cultural resources. The Historic Preservation Division, however, uses a slightly different definition for Criterion E: "Site has traditional cultural significance to ethnic groups of the State of Hawaii."

All sites and site complexes were determined eligible for inclusion in the NRHP and HRHP. The two heiau (Sites 50-50-08-2 and 50-50-08-3) were determined eligible under all five criteria, indicating their particular significance. Four additional site complexes (Sites 50-50-03-2678 and 2679, 50-50-08-3165, 3168, and 3184) were also determined eligible under more than a single

Table 4.7-1
ARCHAEOLOGICAL SITE DESCRIPTION, SIGNIFICANCE AND DISTANCE FROM ALIGNMENT

State Site Number	Formal Site Type	Function	Applicable Eligibility Criteria	Applicable Buffer Zone Criteria (Feet)	Distance from Alignment Centerline (Feet)
50-50-08-2	Site Complex	Heiau (Hikii Heiau)	A,B,C,D,E	400	400' S of centerline/600' SW of Stake 14C
50-50-08-3	Site Complex	Heiau (Ukumehame Heiau)	A,B,C,D,E	400	500' S of centerline and Stake 14A
50-50-03-2678 & 2679	Site Complex	Agriculture, Habitation (T/P)	C,D	50	200' S of centerline
50-50-08-3165	Site Complex	Habitation (T)	C,D	100	200' S of centerline
50-50-08-3168	Site Complex	Ritual, Habitation (T)	C,D,E	100	125' SW of centerline
50-50-08-3184	Site Complex	Habitation (P), Possible burial	D,E	100	100' SE of Stake 14D
50-50-03-2677	Site Complex Metal Flume	Agriculture, Habitation (T, P)	D	50	75' S of centerline
50-50-03-3173	Wall	Cane irrigation	D	100	150' W of centerline
50-50-03-3174	Wall	Agriculture	D	50	Centerline crosses site
50-50-03-3175	Site Complex	Agriculture	D	50	100' W of centerline
50-50-03-3176	Wall	Cane irrigation	D	100	50' W of centerline
50-50-03-3177	Wall	Cane irrigation	D	100	Centerline crosses site
50-50-03-3178	Canal	Cane irrigation	D	100	Centerline crosses site
50-50-03-3189	Site Complex	Agriculture	D	50	Centerline crosses site
50-50-03-3190	Retaining Walls	Agriculture	D	50	Centerline crosses site
50-50-08-3163	Canal	Cane irrigation	D	100	50' SE of centerline
50-50-08-3164	Canal	Cane irrigation	D	100	250' S of centerline
50-50-08-3166	Irregular enclosures	Habitation (T)	D	100	300' S of centerline/400' SW of Stake 14A
50-50-08-3167	Cattle wall and chute	Ranching	D	100	Centerline crosses site
50-50-08-3169	Site Complex	Habitation (T)	D	100	200' S of centerline/500' SW of Stake 14D
50-50-08-3170	Cattle Wall	Ranching	D	100	Centerline crosses site
50-50-08-3171	Railroad berm	Cane transport	D	100	100' S of centerline

Table 4.7-1 (Cont'd)
ARCHAEOLOGICAL SITE DESCRIPTION, SIGNIFICANCE AND DISTANCE FROM ALIGNMENT

State Site Number	Formal Site Type	Function	Applicable Eligibility Criteria	Applicable Buffer Zone Criteria (Feet)	Distance from Alignment Centerline (Feet)
50-50-08-3172	Canal	Cane irrigation	D	100	Centerline crosses site
50-50-08-3180	Cattle wall	Ranching	D	100	Centerline crosses site
50-50-08-3183	Rectangular enclosure	Habitation (P)	D	100	300' N of centerline & Stake 14C
50-50-08-3185	Site complex	Agriculture, habitation (T)	D	50	100' N of centerline & Stake 14D
50-50-08-3186	C-shaped enclosure	Habitation (T)	D	100	Centerline crosses 200' SE of Stake 14C
50-50-08-3187	Site complex	Habitation (T)	D	100	100' N of centerline
50-50-08-3188	Modified rock shelter	Habitation (T)	D	100	100' N of centerline
50-50-09-2684	Rock shelter	Habitation (T)	D	100	In gulch 50' SW of centerline
50-50-09-3179	Circular enclosure	Habitation (T)	D	100	600' S of centerline/700' SE of Stake C2
50-50-09-3181	Wall	Habitation (T)	D	100	200' N of centerline
50-50-09-3182	Upright stone	Marker	D	100	300' NW of centerline
50-50-09-3191	Kerbstone trail	Travel route	D	100	600' SE of centerline

Key: Shading denotes sites crossed by the centerline of the preferred alignment or sites whose distance from the centerline is less than applicable buffer zone criteria. See text for discussion of potential impacts and mitigation.

(T) = Temporary Habitation

(P) = Permanent Habitation

National Register of Historic Places/Hawaii Register of Historic Places eligibility criteria:

- A Site reflects major trends or events in the history of the state or nation.
- B Site is associated with the lives of persons significant in our past.
- C Site is an excellent example of a site type.
- D Site may be likely to yield information important in prehistory or history.
- E Site has cultural significance; probable religious structures (shrines, heiau) and/or burials present.

Buffer zone criteria (as discussed with and informally approved by Ms. Agnes Griffin, DLNR, State Historic Preservation Division):

400 feet from heiau.

100 feet from isolated sites and site complexes.

50 feet from concentrated agricultural features.

criterion. The remaining 28 sites and site complexes were determined eligible only under Criterion D: "Site may be likely to yield information important in prehistory or history."

The locations of these sites and site complexes are presented in Figure 4.7-1. For each site, Table 4.7-1 presents site type, function, and the criteria under which the site was determined eligible for inclusion in the NRHP and HRHP. Summaries of each functional category are presented below.

Agriculture

Four of the 34 identified sites are interpreted as primarily agricultural in function. Two of these (sites 50-50-03-3174 and 50-50-03-3190) are retaining walls on the steep sides of gulches. The other two sites (sites 50-50-03-3175 located along Launiupoko Stream and 50-50-03-3189 located along Makila Stream) are complexes of intensive dryland agriculture features (networks of rough terraces and wall alignments forming planting areas and potential temporary habitation features).

Cane Irrigation and Transportation

Eight sites are associated with large-scale cane agriculture of the late 19th and early- to mid-20th centuries. Seven of these sites (50-50-08-3163, 3164 and 3172, and 50-50-03-3173, 3176, 3177 and 3178) are irrigation canals or ditches located along Olowalu and Ukumehame streams and on the alluvial plains of abandoned cane fields. Older canals are constructed of parallel or single stone wall alignments, while more recent canals consist of concrete and stone masonry. The remaining site (site 50-50-08-3171) is believed to have functioned as a railroad bed used to transport cane from fields to either the Olowalu Sugar Company mill at Olowalu or the Pioneer Mill mill in Lahaina. The railbed is a stone berm along an old stream drainage between Ukumehame and Olowalu valleys.

Permanent Habitation

Two sites (sites 50-50-03-3183 and 3184) are permanent habitations likely occupied during prehistoric or early historic times. A possible burial mound is a component feature of site 50-50-03-3184.

Temporary Habitation

Eleven sites (sites 50-50-09-2684 and 3179, and 50-50-08-3165, 3166, 3168, 3169, 3185, 3186, 3187 and 3188) are temporary habitations consisting of single or multiple enclosures or wall sections

Preferred Alignment Before Adjustments - 3/93	Stake Location & I.D. Number
Preferred Alignment After Adjustments - 6/93	Access Roads & Jeep Trails
Power Plant	Gulch
Substation (Existing)	Reservoir
Substation (Proposed)	Pineapple
Double Circuit 69KV Transmission Line	Cane
Single Circuit 69KV Transmission Line	Lahaina Pali Trail

3166 Archaeological Resource Location/State Site Number

Rock Wall or Flume

NOTES:

1) Survey's performed 4/26/93 thru 5/7/93 and 6/22/93 thru 6/24/93.
2) 100% coverage ground survey within 300 foot wide area (150 feet either side of centerline of alignment).
3) Alignment location adjusted in supplemental inventory survey (6/22-6/24/93) to avoid or provide buffer to sites identified in initial inventory survey (4/26-5/7/93).

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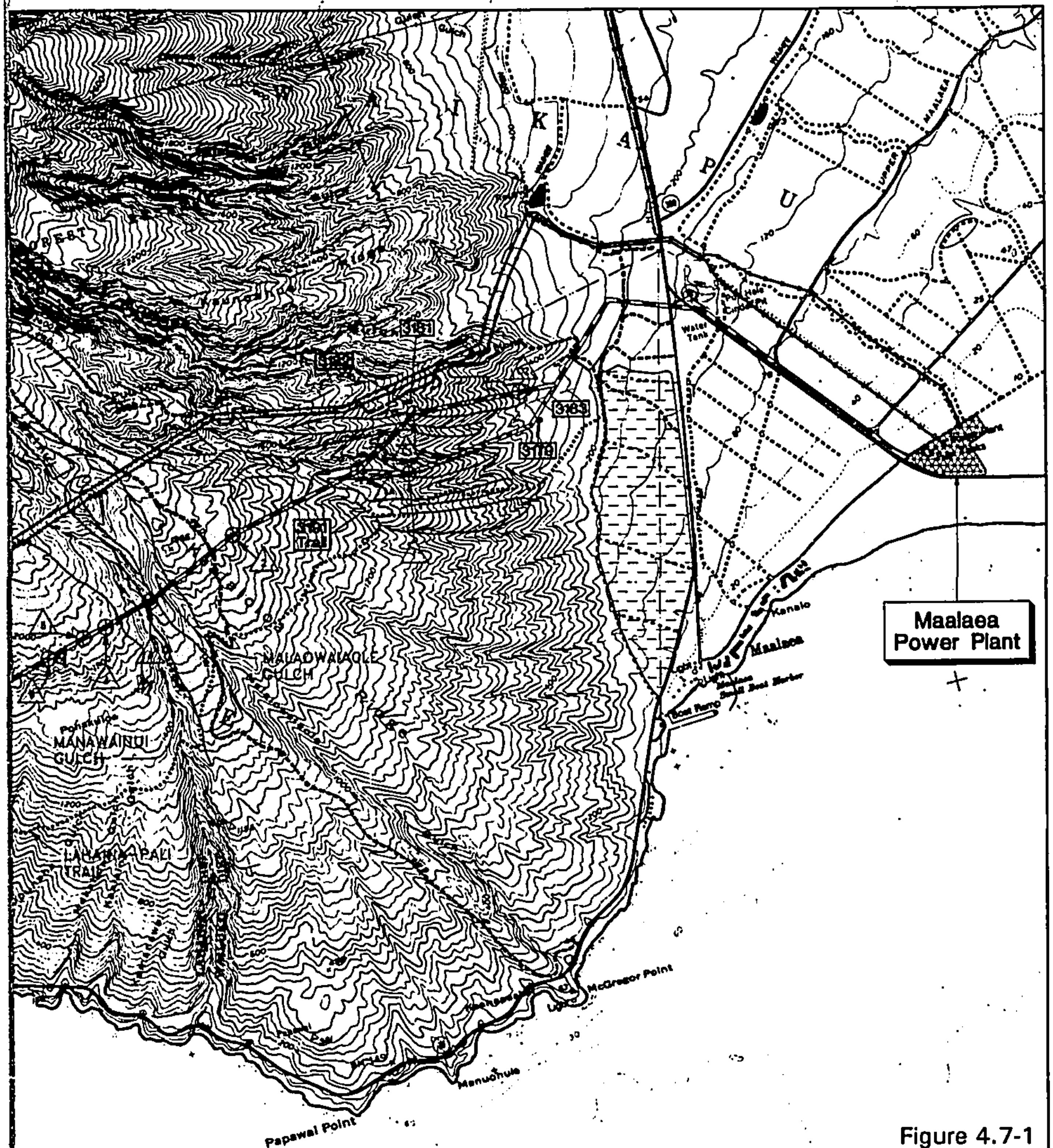
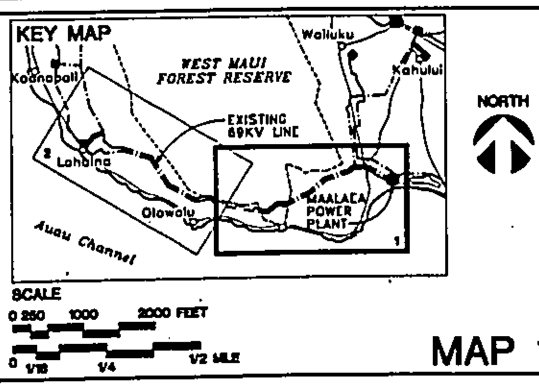


Figure 4.7-1



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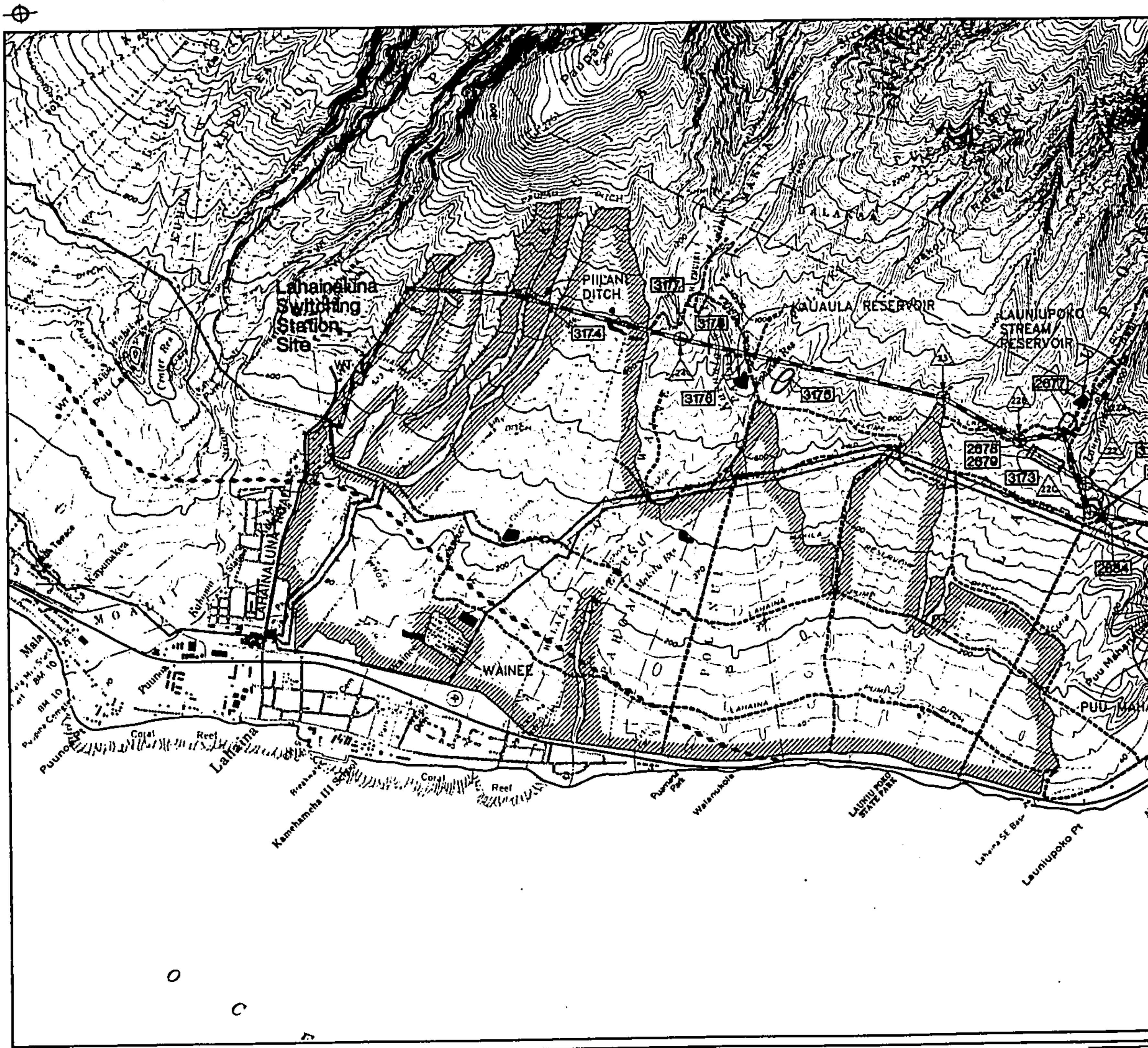
MAP 1

Archaeological Inventory Survey

Maalaea-Lahaina Third 69kV
Transmission Line Project

Maui Electric Company, Ltd.

DAMES & MOORE



Preferred Alignment Before Adjustments - 3/93

Preferred Alignment After Adjustments - 6/93

Power Plant

Substation (Existing)

Substation (Proposed)

Double Circuit 69KV Transmission Line

Single Circuit 69KV Transmission Line

Stake Location & I.D. Number

Access Roads & Jeep Trails

Reservoir

Pineapple

Cane

Proposed Lahaina By-Pass Road

Ikena Avenue Relocation Project

3168 Archaeological Resource Location/State Site Number

Rock Wall or Flume

NOTES:

1) Survey's performed 4/26/93 thru 5/7/93 and 6/22/93 thru 6/24/93.

2) 100% coverage ground survey within 300 foot wide area (150 feet either side of centerline of alignment).

3) Alignment location adjusted in supplemental inventory survey (6/22-6/24/93) to avoid or provide buffer to sites identified in initial inventory survey (4/26-5/7/93).

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Figure 4.7-1

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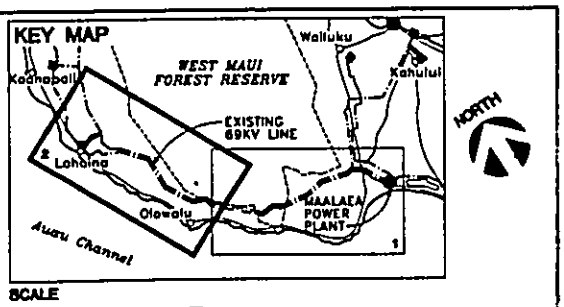

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MAP 2

Archaeological Inventory Survey

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

DAMES & MOORE

against natural landforms. Their location indicates they were used primarily while traversing mauka/makai travel routes.

Heiau

Two major heiau, Ukumehame heiau (site 50-50-08-03) and Hikii heiau (site 50-50-08-02), are located within the survey area on the east and west sides of Ukumehame stream, respectively. A third heiau, Kawaialoa heiau, is located near but outside the survey area on the east side of Olowalu Gulch. All three heiau are located overlooking the fertile agricultural lands of Ukumehame and Olowalu valleys.

Although located outside the area surveyed for the preferred alignment, Kawaialoa heiau is discussed here because it is the largest and most formally constructed of the three heiau. It consists of a high perimeter wall within which are a network of smaller enclosures, platforms and stone-lined depressions. Shelf-like terraces are located outside the wall. Hikii heiau located on the east side of Ukumehame Gulch, is similar in construction but distinctly smaller. Ukumehame Heiau is only partly preserved due to destructive historic activities associated with ranching and cane agriculture.

Marker

One site (site 50-50-09-3182) is interpreted as a marker for the location of a temporary habitation site or for a travel route to more mauka areas (although no associated trail was observed).

Ranching

Three sites (sites 50-50-08-3167, 3170 and 3180) are bifaced sections of stone walls between Ukumehame and Olowalu streams. They probably served to keep cattle upland of the cane fields.

Transportation Routes

One traditional Hawaiian trail remnant (site 50-50-09-3191), associated with the Lahaina Pali Trail, was identified outside the survey area.

Switching Station

No archaeological sites were identified through the literature review and records search, and no resources were encountered during the inventory survey of the switching station site. The site is located in a sugarcane field. Sugarcane has destroyed or damaged any archaeological surface sites.

4.7.2 Potential Impacts

This section describes impacts to archaeological resources that would result from the proposed transmission line and switching station.

Transmission Line

As described above, special care was taken in locating the preferred alignment to avoid sites, particularly in the Maalaea, Ukumehame and Launiupoko areas where there are numerous sites close to one another.

Physical disturbance of all sites would be avoided in final pole locations. In addition, intrusion into the view planes of the two heiau would be avoided. Buffer zones would be established and maintained between proposed pole locations and identified sites. A buffer zone of at least 400 feet would be maintained between pole locations and Ukumehame and Hikii heiau. A buffer zone of at least 100 feet would be maintained between pole locations and isolated sites and site complexes. A buffer zone of at least 50 feet would be maintained between pole locations and concentrated agricultural features. Table 4.7-1 presents applicable buffer zone criteria for each site, and the distance between the site and the centerline of the preferred alignment.

As indicated in Table 4.7-1, 21 of the 34 identified sites and site complexes would be located outside of the preferred alignment and would be separated from the transmission line by distances that meet or exceed established buffer zone criteria. (Measured distances between sites and the centerline of the preferred alignment may be conservative. Actual distances may be greater due to topographic relief.)

Thirteen (13) sites would be crossed by the preferred alignment or would be located closer to the preferred alignment than the prescribed buffer zone criteria (Table 4.7-1). Eight of the 13 sites are rock walls or irrigation ditches. These eight sites, located throughout the alignment, are historic in age and are associated with cane agriculture or ranching. These are linear sites, generally oriented perpendicular to and across the preferred alignment.

Three of the remaining sites that would be crossed by the preferred alignment or would not meet buffer zone criteria are agricultural, two of which may be associated with cane agriculture. Site 50-50-08-3189 is an agricultural complex consisting of a network of walls and terraces, and rough enclosures located on a plateau above Launiupoko Gulch. Site 50-50-03-3190 consists of two bifaced walls which retain a steep embankment along the edge of Launiupoko Gulch.

The remaining two sites are temporary habitations. Site 50-50-09-2684 is a rockshelter and adjoining wall on the north side of Launiupoko Gulch that functioned as a temporary habitation. Site 50-50-08-3186, also a temporary habitation, is a C-shaped enclosure consisting of a 2.3-foot-high wall constructed of boulders and cobbles, located on the alluvial plain east of Ukumehame Gulch.

Final pole locations would maintain an adequate buffer zone between the poles and these 13 sites; all sites crossing the preferred alignment would be spanned by the line. No adverse impacts would be expected.

New spur roads would be constructed from cane field roads or from access roads for the existing 69KV lines to pole locations in Segments 10, 12, 13, and 15 through 20. Helicopters would be used for construction and maintenance in Segments 4, 6, 8, and 9. Helicopter pads would be needed in these segments. New spur roads and helicopter pads could affect previously undetected prehistoric or historic sites. Final locations of these new spur roads and helipads would be determined during final design, and therefore, the sites for these facilities may or may not be included in archaeological surveys to date. Mitigation presented in the following section would afford the same level of protection to identified or unknown resources in these areas as is provided for the remainder of the project.

<u>Switching Station</u>

There are no identified archaeological resources at the proposed switching station site. No adverse impacts to archaeological resources would occur.

4.7.3 Mitigation

Where new spur roads or helicopter pads would be located within currently surveyed areas (i.e., the preferred alignment surveyed in April, 1993 and alignment adjustments subjected to supplemental surveys on June 22 and June 24, 1993), these plans would be submitted to the DLNR, State Historic Preservation Division and consulting archaeologists for review. If deemed necessary, archaeological monitoring would be done during road construction, especially in the archaeologically sensitive areas of Maalaea, Ukumehame, and Launiupoko. Monitoring would ensure that known sites are avoided and buffer zones maintained.

Where new spur roads and helicopter pads would be located outside of surveyed areas, additional survey work comprising 100 percent ground coverage would be performed and results submitted to the DLNR, State Historic Preservation Division for review. Spur roads and helicopter pads would be located to avoid known sites (i.e., sites known from historic records, past surveys, surveys conducted for this EIS, and future surveys as required) and maintain established buffer zones.

To further avoid potential impacts in the sensitive Maalaea, Ukumehame and Launiupoko areas of dense site concentrations and significant resources, the ten currently proposed pole locations in these areas, identified by locational stakes C-1, C-2, 14-A through 14-E and 22-A through 22-C, would be maintained through final design and construction.

Following final design and selection of pole locations, final construction plans and pole locations would be reviewed by a qualified archaeologist and the Historic Preservation Division to verify that all sites have been avoided in the location of poles, construction staging areas, helicopter pads and new spur roads, and that impacts to identified sites would not be expected.

Prior to and during construction, all sites and site boundaries within the 300 foot wide project corridor would be flagged to avoid inadvertent disturbance. This measure is of particular importance with respect to site complexes with dense concentrations of features (e.g., Launiupoko) and the two heiau.

Construction activities in sensitive areas such as Maalaea, Ukumehame and Launiupoko may require monitoring by a qualified archaeologist, depending on the final location of poles, staging areas, spur roads, and helipads.

If previously undetected prehistoric or historic sites are found during transmission line or switching station construction, all activity in the area will stop and the State Historic Preservation Division will be contacted. Appropriate mitigation will be determined in consultation with the State Historic Preservation Division. If human skeletal remains are inadvertently encountered during construction, procedures outlined in HRS 6E-43.6 will be followed. Field personnel involved in project construction will be informed about the potential for uncovering historic and/or prehistoric sites and about proper procedures to follow if a previously unidentified site is encountered.

4.8 SOCIOECONOMICS

This section describes socioeconomic conditions in the study area and evaluates potential socioeconomic impacts.

4.8.1 Affected Environment

Regional Overview

The study area is located in West Maui, partly within the Lahaina District and partly within the Wailuku District (Manawainui Gulch separates the two districts). Study area population is concentrated in Lahaina town.

Maui County had a 1990 resident population of 100,504 and a 1990 de facto population (resident plus visitor) of 147,700. The Lahaina District had a 1990 resident population of 14,574, representing 14.5 percent of Maui County population, while the Wailuku District, with 45,685 persons in 1990, represented 45.7 percent of the county total. Lahaina town and Maalaea had 1990 populations of 9,073 and 443, respectively (DBEDT, March 1993).

Maui County population increased 41.6 percent between 1980 and 1990. Population gains were even more pronounced in the 1970s with an increase of 53.8 percent, as the rapidly-developing visitor industry attracted new residents (DBEDT, March 1993). West Maui growth rates were similar. Rapid growth is projected to continue with projected populations for Lahaina district of 22,800 in the year 2000 and 38,400 in 2010. The estimated county population for the year 2010 is 145,200 (DBED, November 1988).

West Maui's steady growth has resulted in a corresponding increase in demand for electricity due in large part to new resort developments. Between 1987 and 1992, West Maui load growth increased 15 percent. Between 1991 and 1992 the increase was almost six percent. This increase was attributable to the completion of the Ritz-Carlton Resort. Future peak electrical loads are forecasted to increase by approximately 17 percent between 1992 and 1995. This increase is attributable to several major developments including HFDC Phase I housing, Lahaina Shopping Center and the Whaler's Village expansion.

As loads increase, additional power must be generated and the amount of power flowing through existing lines increases. In the future, the existing transmission system serving West Maui would be overloaded if an outage occurred on the Maalaea-Lahaina No. 1 or 2 lines during peak load conditions. Consequently, MECO has determined that a third 69 kilovolt (KV) line is needed to meet the projected demand and to avoid potential service interruptions on West Maui.

The economy of West Maui is largely dependent on the visitor industry. In 1990, total Maui County visitor expenditures were $2.2 billion. West Maui has emerged as one of the State's major resort destination areas.

Agriculture, chiefly sugarcane and pineapple, is another vital component of the West Maui economy. In 1991, Maui County had 42,500 acres of cane fields and the sugar crop was worth $57.9 million. Pineapples were grown on 15,700 acres and produced a $45.7 million crop (DBEDT, 1993). Within the study area, Pioneer Mill has 6,300 acres of cane fields. In 1992 Pioneer Mill cane fields produced 43,000 tons (approximately 15 percent of Maui's total) and employed 279 people (Falconer, Kimo, September 29, 1993. Personal communication. Pioneer Mill).

Increases in the civilian labor force combined with decreases in the total number of jobs has caused Maui County unemployment to increase. According to First Hawaiian Bank Research Department figures, the unemployment rate for June 1993 was 5.9 percent in Maui County. Available construction jobs have fallen from 1991 levels. The average number of available construction jobs in 1991 was 3,200, while the average for 1992 was 2,800. The number of construction jobs has remained steady with approximately 2,800 jobs in June 1993 (Department of Labor and Industrial Relations, 1993). The mix of construction work has shifted from building and special trades to other heavy construction (Shimabakuro, Jerry, March 1993. Personal Communication. Department of Labor and Industrial Relations).

Transmission Line

Along the preferred alignment of the proposed transmission line, businesses consist of agriculture and grazing. A Wailuku Agribusiness/C. Brewer Properties pineapple field is located beneath Kealaloloa Ridge along the west side of Honoapiilani Highway between the Maalaea small boat harbor and North Kihei Road. Pioneer Mill sugarcane fields are located on much of the flatter, coastal plains mauka of Honoapiilani Highway, west of Ukumehame Beach State Park along Ukumehame and Olowalu Streams and again west of Puu Mahanalua Nui. Much of the undeveloped, higher elevation portions of the preferred alignment are leased by the State of Hawaii for cattle grazing. No other businesses are located along or near the preferred alignment.

Switching Station

The Lahainaluna Switching Station site would be located on approximately two to three acres of land owned by Bishop Estate and leased to Pioneer Mill for sugarcane cultivation. No other businesses are located at or near the switching station site.

4.8.2 Potential Impacts

This section summarizes socioeconomic impacts of the proposed project. Potentially significant socioeconomic impacts in a community can include introduction of large numbers of non-local people to build or operate a new facility, displacement of residences or businesses and their occupants, inducement of growth beyond that which has been planned, changes in the economic base of the locale, and decreased property values. None of these is expected to occur as a result of the proposed project, as described below.

Transmission Line

Population and Housing

Transmission line construction would require approximately 15 workers during a seven- to nine-month construction period. Twelve of these workers (three 4-person crews) would be expected to be existing Maui County residents and would be expected to commute daily to the job site rather than relocating to the project area. Helicopter support would likely be from local helicopter companies. Remaining workers would be expected to be existing employees of off-island construction contractors who would obtain temporary accommodations on Maui for the duration of the project. Discernable impacts on population and housing are not expected during construction.

As described in Section 2.0, post-construction operation and maintenance activities would include regular inspection of transmission line poles and right-of-way on foot, in vehicle, or by helicopter two times per year. Emergency repairs would also be made if the transmission line were damaged and required immediate attention. Maintenance crews of less than 10 persons would use equipment necessary for repairing and maintaining the transmission line. In nearly all cases, maintenance and repairs would be performed by existing Maui Electric Company, Ltd. (MECO) employees using MECO equipment.

Displacement and Relocation

Because the proposed alignment crosses mostly undeveloped land and a small portion of land in sugarcane cultivation, the proposed project would not result in displacement of residences or businesses.

Public Services

Gas and electric service would not be required during construction. Substantial excavation is not expected; therefore water would not be needed for control of fugitive dust emissions. Sanitary wastes generated during construction would be collected in portable toilets. Solid wastes generated during construction that are not suitable for recycling, consisting of miscellaneous construction debris and refuse, would be transported to the Central Maui Landfill in Puunene. The existing 69KV transmission lines would not be affected by construction activities; service would not be interrupted. Adverse impacts on public services and utilities are not expected during construction.

The proposed transmission line would enhance the reliability of electric service to West Maui by enabling MECO to maintain electric service in the event that one or both of the existing 69KV lines from the Maalaea Power Plant to the region is out of service. It would also provide additional transmission capacity to meet the demand for power in West Maui resulting from existing and planned resort, commercial and residential developments and therefore, represents a beneficial effect on public services in the region.

Since the project would provide capacity to meet forecasted demand from planned levels of growth and would not induce unplanned growth, adverse secondary impacts on public services would not be expected.

Growth Inducement

Because the project would accommodate MECO's forecasted levels of electric power demand and maintain reliable electric service to existing load centers and planned developments in West Maui, the project is considered growth accommodating rather than growth inducing.

Economic Impacts

The estimated capital cost for the transmission line is $8.0 to $10.0 million (in 1994-1995 dollars). The estimated capital cost for the Lahainaluna Switching Station is $4.0 million (in 1994-1995 dollars). Most construction materials would be purchased from out-of-state suppliers. Local construction-related businesses would not be expected to benefit substantially from the proposed project, although there may be minor local procurements of materials, supplies and services. Local helicopter operators may benefit from contracts for helicopter support during construction. Local construction procurements would generate excise tax revenues that would accrue to state government.

The project would generate approximately 12 temporary, local (Maui) construction jobs. The project would not result in substantive changes in employment patterns, the unemployment rate or the distribution of the present labor force.

Payroll expenditures would be approximately $0.4 million to $0.6 million. Since most of the construction labor force would consist of existing Maui County residents who would commute to the project site on a daily basis, personal expenditures made as a result of the project would not change substantially. However, there may be some minor increases in activity for local retail and service businesses such as fast food restaurants, convenience stores, gasoline service stations and the like, as workers purchased meals or other goods and services. Payroll expenditures and personal expenditures would generate income and excise tax revenues.

The preferred alignment would avoid crossing major agricultural areas but would require easements through a Wailuku Agribusiness/C. Brewer Properties pineapple field and Pioneer Mill cane fields. Within Segment 3, approximately 820 feet of the preferred alignment would cross the Wailuku Agribusiness/C. Brewer pineapple field located immediately west of Honoapiilani Highway. Selection of the preferred alignment and pole locations was coordinated with and agreed to by Wailuku Agribusiness/C. Brewer Properties (Blane, D., February 22, 1993. Personal communication. Vice President, C. Brewer Properties). Three poles would be required to span the pineapple field: two placed at existing field edge roads and one pole placed on an existing rock pile in the center of the field. Construction of this segment of the transmission line would be completed in a few days. No pineapple fields would be permanently taken out of production and the company's operations would not be permanently affected.

Within Segments 13 and 14, near Olowalu stream, and again in Segments 21, 22 and 23 near the western end of the transmission line, the preferred alignment would cross a total of approximately 8,820 feet (1.7 miles) of Pioneer Mill cane fields. There would be a loss of the value of, and indirect economic activity generated by, portions of cane fields taken out of production by transmission line poles and guy wires. No agricultural land would be taken out of production for new spur roads. Existing cane field roads would provide access in agricultural areas. In addition to land taken out of production, transmission line poles would also affect planting, harvesting and aerial spraying operations. Additional time and effort would be necessary to maneuver around poles and lines, thereby resulting in additional operating costs. The financial impact on Pioneer Mill would be a function of the value of the crop and the amount of land taken out of production, as well as additional operating costs.

Temporary disturbance of pole installation areas would be short-term and minor (approximately 0.19 acre based on 1.7 miles of agricultural lands crossed, 10 poles per mile, and 490 square feet of area disturbed per pole). Some of this area would be returned to cultivation following construction.

However, some agricultural land would be permanently taken out of production to maintain sufficient clearance between agricultural operations and poles and guy wires. In 1991, the average value of Maui County sugarcane yields was approximately $1,362 per acre.

Pioneer Mill was consulted throughout the route selection studies and provided specific input regarding preferences for the location of the preferred alignment (Letter, March 17, 1992; Letter, August 3, 1992; Meeting, March 3, 1993). In addition Pioneer Mill was consulted regarding recommendations for protection and safety of their equipment and personnel, irrigation systems, aerial spraying operations, and planting and harvesting activities. Most poles would be located along cane haul roads and field edge roads. Actual selection of pole locations would occur in the field during final design and construction and would reflect additional input from Pioneer Mill. Steel poles would minimize the need for guy wires. Where guy wires would be necessary, they would be located as close to the poles as possible to minimize obstructions in the cane fields. The need for new spur road construction in existing agricultural areas is not anticipated because in these areas, the existing road network would provide access for construction, maintenance, and emergency repairs. Construction activities would be scheduled and coordinated to minimize impacts to their operations and to maintain the safety of construction and agricultural workers.

<u>Switching Station</u>

Construction of the Lahainaluna Switching Station would require approximately 10 workers. Workers would be expected to be existing Maui County residents and would be expected to commute daily to the job site. Discernable impacts on population and housing are not expected during construction of the switching station. No residences or businesses would be displaced. Minor economic and employment benefits would occur as a result of local construction procurements, payroll expenditures and personal expenditures, and minor tax revenues would be generated.

The proposed switching station would be located in an existing Pioneer Mill sugarcane field. Approximately three acres of existing cane fields would be converted for switching station use. There would be a less-than-significant impact in terms of the value (estimated at approximately $1,362 per acre in 1991) of cane fields that would be converted to the switching station site. The presence of the proposed switching station would not be expected to interfere with cane field operations.

4.8.3 Mitigation

Through property appraisals and discussion with landowners, MECO would determine the easement value and the effects the transmission line would have on the property. The amount of compensation is normally agreed upon through discussions between land agents and private property owners. Although the purchase of an easement would not avoid or reduce economic impacts from agricultural land taken out of production or additional operating costs due to greater time and effort necessary to maneuver around poles, it would compensate for these consequences.

The proposed new transmission line would improve the reliability of electrical service to West Maui and provide additional capacity to meet the demands of existing and planned development. Significant adverse socioeconomic impacts would not be expected. No other mitigation is necessary.

4.9 AIR QUALITY AND METEOROLOGY

This section describes existing air quality and meteorology in the study area and assesses potential air quality impacts.

4.9.1 Affected Environment

Air quality is determined primarily by meteorological conditions, the size and topography of the air basin, and the type and amount of pollutants emitted into the atmosphere.

Meteorology

The climate of Maui is relatively uniform throughout the year, characterized by moderate temperatures with rainy winters and moderately high humidity throughout the year. Prevailing surface winds in the study area are from the east/northeast. These northeasterly tradewinds occur over 70 percent of the time; however, during "kona" conditions the prevailing direction changes to a south/southwesterly direction. Wind patterns vary on a daily basis, with tradewinds generally being stronger in the afternoon. During the day, winds blow on shore toward the warmer land mass. In the evening, the reverse occurs, as breezes blow toward the relatively warm ocean.

The slopes of West Maui experience an interesting meteorological phenomenon due to topography and landform. The deep gulches and ravines create a natural wind tunnel that acts to accelerate wind speeds in the downslope direction, thereby also increasing wind velocity on the ridges immediately above these gulches (Chui, A., September 1991. Personal communication. University of Hawaii).

Due to the tempering influence of the Pacific Ocean and the tropical latitude of the Hawaiian Islands, the diurnal and seasonal ambient temperature variation is extremely small. During January, the temperature average ranges from a low of 62 degrees fahrenheit (° F) to a high of 81° F. In August, the warmest month, the average temperature ranges from 71° F to 87° F.

Most of the rainfall occurs during winter months. Over 80 percent of the annual rainfall occurs during a six-month period between November and April. Annual rainfall averages between 15 and 20 inches within the study area with higher average rainfall at higher elevations.

__Air Quality Standards__

Air quality standards, defined as the ambient air pollutant concentration level not to be exceeded more than once a year during a specified sampling period, have been adopted by the Federal and State governments for six major pollutants: Ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), fine particulates (PM_{10}), and total suspended particulates (TSP). Both State and Federal air quality standards apply to the study area, although state standards contained in Chapter 59, Title 11, Department of Health, Administrative Rules are generally more stringent.

__Existing Air Quality__

The nearest air quality monitoring stations to the study area are at Kihei Sewage Treatment Plant, Maalaea Power Plant and Lahaina Elementary School. No exceedances of State or Federal standards have occurred at these stations within the past year (Hendricks, Kathy, March 19, 1993. Personal communication. Department of Health).

Existing sources of air emissions in the study area include: sulfur dioxide from the Maalaea Power Plant; dust from wind erosion on steep slopes that have been overgrazed; components of engine exhaust from roadway traffic and agricultural operations; dust and other particulates from periodic cane burning, or cultivating or harvesting crops; and traces of chemicals used in pesticides, ripeners and other materials used in aerial spraying of crops. Thus, ambient air quality conditions in the study area include intermittent, temporary increases in pollutant emissions that vary with the time of day, wind conditions and seasonal activities.

4.9.2 Potential Impacts

Air quality impacts could result primarily from project construction. Emissions during project operation would be associated with maintenance and repair activities, would be minimal, and would be similar to construction impacts described below. The following assessment is limited to impacts during construction.

Transmission Line

During pole installation and conductor stringing, construction equipment including trucks, cranes and truck-mounted augers will be used. These vehicles would cause temporary increases in the gaseous components of combustion engine exhaust. Small amounts of nitrogen dioxide, sulfur oxides, carbon monoxide and particulates would be emitted for only a short period of time, would not be highly concentrated in the construction area, and would move as construction continually moves from one section of the line to the next. Earthwork operations would be limited to boring of holes for transmission poles or new spur road construction. Inasmuch as the project would be constructed in the midst of undeveloped grazing lands and near active agricultural lands with substantial amounts of blowing dust, construction of the transmission line would not substantially affect existing air quality.

Switching Station

Short-term construction effects would result from the operation of construction equipment and from clearing and grading the site. Excavation with a bulldozer would result in the temporary generation of dust which could result in greater particulate concentrations at sensitive receptors at the adjacent Lahainaluna High School. However, existing agricultural practices at the site, including burning of cane, currently generate substantial particulate emissions. The types of exhaust emissions generated by construction vehicles and equipment and employee vehicles would be similar to those described above for the transmission line.

4.9.3 Mitigation

Emissions of pollutants from heavy vehicles and equipment used for construction and transport would be controlled by ensuring that construction specifications require contractors to comply with standard State Department of Transportation construction vehicle and equipment operations and maintenance practices.

For control of emissions associated with grading of the Lahainaluna Switching Station site, exposed soil surfaces would be watered at a rate of 0.5 gallons of water per square yard two times per day, generally in the later morning and after each work day, or more often if needed. Watering would be increased when wind speeds exceed 15 miles per hour. This measure reduces particulate emissions (dust) by about 50 percent or more (EPA, 1977).

4.10 NOISE

This section describes applicable noise standards, sources of ambient noise and noise-sensitive receptors in the study area, reviews applicable noise standards and assesses potential impacts.

4.10.1 Affected Environment

Sound is measured in decibels (dB), a logarithmic ratio between pressures caused by a given sound and a standard sound pressure. The human ear is not equally sensitive to all frequencies in the sound spectrum; it is standard practice to represent sound levels using an "A-weighted" scale that takes into account the way human ears perceive sounds. A-weighted sound levels are noted as dBA. Light wind or rain is approximately 10 dBA; a normal conversation is between 50 dBA and 60 dBA. Sound levels of 45 dBA interfere with sleep. Constant sound levels of 85 dBA or greater can temporarily impair hearing and 130 dBA or greater causes pain and permanent damage.

<u>Noise Standards</u>

The State Department of Health, Environmental Health Services Division has established acceptable noise levels for different environments, based on zoning designations. Formal rules incorporating these standards already exist for Oahu. Rules for the outer islands, including Maui, have been developed and are currently being reviewed, with adoption anticipated by January, 1994. (Tome, James, September 29, 1993. Personal communication. Department of Health, Environmental Health Services Division). The maximum allowable sustained noise levels (over a 24-hour period) for local

Agricultural zoning districts is 70 dBA for either day or night. Construction-related noise falls under the category of permitted activities that can exceed the standards for specified periods of time: 7:00 a.m. to 6:00 p.m. Monday through Saturday for routine construction, and 9:00 a.m. to 5:00 p.m. Monday through Friday for especially loud equipment (e.g., pile driver, helicopter).

<u>Transmission Line</u>

With respect to ambient sound levels, the preferred alignment can be categorized into three main areas: areas along public roadways; remote, undeveloped areas; and agricultural areas. Along North Kihei Road and Honoapiilani Highway, traffic is the main source of ambient noise. Much of the study area is remote, undeveloped land where wind is the source of ambient noise. In agricultural areas, agricultural equipment operation is the primary noise source. In general, because of the absence of urban uses and highway traffic noise levels throughout most of the area crossed by the preferred alignment are quite low.

<u>Switching Station</u>

At the Lahainaluna Switching Station, agricultural equipment operation is the main source of noise in surrounding cane fields, with some noise generated at the Lahainaluna High School playing fields. Lahainaluna High School is the only noise-sensitive receptor. The school property adjoins the switching station site. The nearest occupied building is located approximately 800 feet from the site. The playing fields are about 200 feet away. The nearest residences are approximately 0.75 mile makai of the site.

4.10.2 Potential Impacts

Potential noise impacts could result from construction equipment and activities, or from transmission line and switching station operation.

Noise impacts from construction result primarily from operation of construction equipment. The magnitude of the impact depends on the type of construction activity, the noise level generated by various pieces of construction equipment, the duration of construction activities, the distance between the noise source and receptor, and the presence or absence of noise barriers.

Noise from point sources, such as construction equipment, decreases at a rate of 9 dBA for every doubling of distance near a "soft site" (an area where the earth is more likely to absorb noise, such as open space or agricultural land). For example, a noise level of 100 dBA, 50 feet from the source, would be about 91 dBA at 100 feet from the source, and 82 dBA at 200 feet from the source.

Short-term noise impacts, such as those generated by construction noise, are generally assessed on the basis of their potential to disturb noise-sensitive areas during noise-sensitive times, cause hearing damage or loss, or violate any applicable construction noise ordinances.

Transmission Line

Construction would result in temporary, short-term, localized noise increases in the vicinity of the construction activity. Noise would be generated from the use of construction equipment to install foundations and poles, and for conductor stringing. Project construction is expected to last 12 months, although construction activities at any one location would last only a few days, as various stages of the construction sequence are completed along each portion of the line. All construction activity would take place during daylight hours. Typical noise levels of construction equipment compared with common sound levels are shown on Table 4.10-1.

Transmission line construction would generally occur far from any sensitive receptors. The nearest sensitive receptor to construction of the transmission line would be Lahainaluna High School, in alignment Segment 22. The nearest occupied building at the school would be 200 feet from the alignment; a playing field would be 100 feet from the alignment.

Helicopters would be used for construction in Segments 4, 6, 8, and 9, where access by road is difficult or unavailable. Helicopters would transport poles and other material from staging areas to pole locations and would be used for stringing conductors. These segments of the preferred alignment are remote and undeveloped, far from any receptors. However, helicopter activity at staging areas may generate noise impacts. Although the exact location of staging areas have not yet been determined, the shooting range mauka of Ukumehame Beach State Park has been identified as a potential staging area for these segments of the preferred alignment.

Table 4.10-1
TRANSMISSION LINE CONSTRUCTION EQUIPMENT NOISE AND OTHER COMMON SOUND LEVELS

Equipment	A-Weighted Sound Level at 50 Feet Unless Specified (dBA)
Human voice - soft whisper (15 feet)	30
Light auto traffic (50 feet)	50
Freeway traffic	70
Crawler tractor (29 to 199 hp)	72
Wheeled tractor	72
Freight train	75
Truck, pickup, and 4-wheel drive*	77
Crawler tractor (200 to 450 hp)*	78
Pulling machine*	78
Tensioning machine*	78
Truck, mounted with boring equipment*	78
Truck, flatbed*	78
Truck, rear dump*	78
Dozer*	82
Crane, mobile (15 to 20 ton)*	83
Pneumatic tools*	85
Crane, mobile (50 ton)*	88
Helicopter (100 feet)*	98
Jet takeoff (200 feet)	120

* Construction equipment.

Source: Tomlinson, 1977.

Once the transmission line is in service, operation of the line would generate very low sound levels. Sound levels generated by transmission lines are barely audible on higher voltage lines (345KV and above), almost never reported on lines below 230KV, and usually not audible at all on 69KV lines. Estimated audible sound levels at the edge of the transmission line right-of-way would be about 1 or 2 dBA, an extremely low sound level (Enertech Consultants, 1992). In addition, changes in sound levels of less than 3 dBA are generally not perceptible. Audible changes in sound levels from the proposed transmission line would not be heard above ambient sound levels (see Appendix H).

Once the line is in service, helicopters may continue to be used for maintenance and repair of Segments 4, 6, 8, and 9. This would generate some occasional noise but would generally occur in areas far from any receptors.

Switching Station

Construction of the Lahainaluna Switching Station would result in temporary, short-term noise increases associated with use of equipment for such activities as clearing and grading the site, erecting steel structures, and pouring concrete pads and the control house foundation. Switching station construction is expected to last eight months, although construction activities may be intermittent. All construction activity would take place during daylight hours.

Noise-sensitive receptors in the vicinity of the site include classrooms 800 feet from the site and a playing field 200 feet from the site at Lahainaluna High School. The loudest piece of construction equipment that would be used for construction of the switching station would be a dozer. Noise levels generated by a dozer would be 83 dBA at 50 feet and would attenuate to 47 dBA at the nearest occupied school building located 800 feet from the site. Sound levels at the nearest playing field located approximately 200 feet from the site would be about 65 dBA. Actual noise attenuation may be greater due to the fact that the switching station is approximately 40 feet lower in elevation than the Lahainaluna High School property.

Under normal operation, sound levels generated by operation of the switching station would be very low. A low hum would be produced by station power transformers and some noise would be generated by the mechanical operation of circuit breakers and disconnect switches. The noise generated would generally be inaudible beyond the site. No noise-sensitive receptors would be affected by switching station operation.

4.10.3 Mitigation

Construction of Segments 22 and 23 of the proposed transmission line, as well as the Lahainaluna Switching Station could result in a short-term noise impact by increasing noise levels in the vicinity of noise-sensitive receptors at Lahainaluna High School. The following measures would be implemented to reduce the identified impact.

- Construction contractors would be required to comply with regulations relating to construction noise, and to equip all internal combustion engines with a manufacturer-recommended muffler.
- Lahainaluna High School officials would be informed of the schedule for construction of Segments 22 and 23, and the Lahainaluna Switching Station.

4.11 ELECTRIC AND MAGNETIC FIELDS

In recent years, interest and concern has grown with regard to potential effects associated with electric and magnetic fields in the vicinity of electric power transmission and distribution lines, and substations. This section describes electric and magnetic field fundamentals; typical field levels encountered in everyday activities; the current state of research regarding potential health effects from exposure to electric and magnetic fields; other potential effects of electric and magnetic fields; predicted electric and magnetic field levels near the proposed transmission line and switching station; and mitigation measures that would be implemented to reduce electric and magnetic field levels.

Because these issues are technically complex, Maui Electric Company, Ltd. (MECO) retained Enertech Consultants to conduct an investigation of the potential electric and magnetic fields that would result from the transmission line and switching station, and to evaluate the significance of their findings. The results of this investigation are contained in a *Technical Information Paper On Electric and Magnetic Field Effects for Maui Electric Company Proposed Lahainaluna Switching Station and Maalaea-Lahaina Third 69KV Transmission Line* (Enertech Consultants, October 1993) presented as Appendix H.

4.11.1 Affected Environment

<u>Electric and Magnetic Field Fundamentals</u>

Electric Fields

Electric fields are a result of the voltage, or electric potential, on an object. Any object with an electric charge on it has a voltage at its surface caused by the accumulation of more electrons on that surface compared with another object or surface. The voltage effect is not limited to the surface, but exists in the space surrounding the object. The change in voltage over distance is known as the electric field. The units describing an electric field are volts per meter (V/m) or kilovolts per meter (KV/m). The electric field is stronger near a charged object and decreases rapidly with distance from an object.

Electric fields are a common phenomenon. Static electric fields can result from friction generated when taking off a sweater or walking across a carpet. Most household appliances and other devices that operate on electricity create electric fields. The electric field is a result of the voltage on the appliance. The field decreases rapidly with distance. Fields from point-source household appliances generally decrease more rapidly with distance than fields from line sources such as power lines. Appliances need not be in operation to create an electric field; an electric field occurs whenever an appliance is connected to an electrical outlet. Typical values measured at 12 inches from some common appliances are shown in Table 4.11-1.

Magnetic Fields

An electric current flowing in any conductor (electric equipment, household appliance, or other) creates a magnetic field. The most commonly used unit for measuring magnetic fields is the Gauss, which is a measure of the magnetic flux density (intensity of magnetic field attraction per unit area). The unit mG (or milliGauss) is equal to one-thousandth of a Gauss. As a reference, the earth has a natural static direct current (dc) magnetic field of about 0.36 Gauss, or 360 mG, in the Hawaiian islands (Merrill and McElhinny, 1983).

Transmission lines, distribution lines, switching stations and substations also have magnetic fields, but the characteristics are different from earth's direct current fields because the power line field is due to alternating currents (ac). The magnetic fields under transmission and distribution lines, and near substations, are relatively low when compared to measurements near many household appliances

Table 4.11-1

TYPICAL ELECTRIC FIELD VALUES FOR HOUSEHOLD APPLIANCES

(at twelve inches)

Appliance	Electric Field (kilovolts/meter)
Electric blanket	0.25[1]
Broiler	0.13
Stereo	0.09
Refrigerator	0.06
Iron	0.06
Hand mixer	0.05
Phonograph	0.04
Coffee pot	0.03
[1] 1 to 10 KV/m next to blanket wires (Enertech Consultants, 1985).	

Source: Gauger, 1985.

and other equipment. The magnetic field near an appliance decreases rapidly with distance from the device. The magnetic field decreases with distance from electrical substation equipment (such as transformers and capacitor banks) as it does with appliances. Magnetic fields also decrease with distance from line sources, such as transmission lines, but not as rapidly as with substation equipment or appliances. A transmission line field is spatially more persistent. Since the magnetic field is caused by the flow of an electric current, a device must be operated to create a magnetic field. Magnetic field values of typical household appliances are presented in Table 4.11-2. A study of typical household appliances conducted for the Electric Power Research Institute (Silva et.al., January 1989) found that the mean magnetic field levels in residential homes was about 0.9 mG (at one meter above ground level). Table 4.11-3 presents magnetic field measurements at three different

Table 4.11-2
TYPICAL MAGNETIC FIELD VALUES FOR HOUSEHOLD APPLIANCES

Appliance	Magnetic Field (mG) 12 inches Away	Magnetic Field (mG) Maximum
Electric Range	3 to 30	100 to 1,200
Electric Oven	2 to 5	10 to 50
Garbage Disposal	10 to 20	850 to 1,250
Refrigerator	0.3 to 3	4 to 15
Clothes Washer	2 to 30	10 to 400
Clothes Dryer	1 to 3	3 to 80
Coffee Maker	0.8 to 1	15 to 250
Toaster	0.6 to 8	70 to 150
Crock Pot	0.8 to 1	15 to 80
Iron	1 to 3	90 to 300
Can Opener	35 to 250	10,000 to 20,000
Mixer	6 to 100	500 to 7,000
Blender, Popper, Processor	6 to 20	250 to 1,050
Vacuum Cleaner	20 to 200	2,000 to 8,000
Portable Heater	1 to 40	100 to 1,100
Fans/blowers	0.4 to 40	20 to 300
Hair Dryer	1 to 70	60 to 20,000
Electric Shaver	1 to 100	150 to 15,000
Color TV	9 to 20	150 to 500
Fluorescent Fixture	2 to 40	140 to 2,000
Fluorescent Desk Lamp	6 to 20	400 to 3,500
Circular Saws	10 to 250	2,000 to 10,000
Electric Drill	25 to 35	4,000 to 8,000

Source: Gauger, 1985; Silva et.al., January 1989

January 1989) found that the mean magnetic field levels in residential homes was about 0.9 mG (at one meter above ground level). Table 4.11-3 presents magnetic field measurements at three different locations in Hawaii that characterize typical everyday magnetic field levels: 1) at several public locations in Waipahu on Oahu (February 1992); 2) at several public locations on the Island of Hawaii (January 1990); and 3) at several public locations in Honolulu (October 1992).

Transmission Line

Transmission lines and switching stations are a part of the electric system that is used to distribute electric service to homes and businesses. High voltage or bulk power lines form the backbone of electric energy distribution systems. A network of about 338,000 circuit miles of transmission lines are in service in the United States; 81 circuit miles of 69KV lines form Maui's transmission system. The proposed Maalaea-Lahaina transmission line will be energized at 69KV which is lower than the highest voltage used in Hawaii (138KV), and substantially lower than the lowest voltage in operation in the mainland United States, where lines range from 115KV to 765KV.

Three 69KV transmission lines would be constructed as part of the proposed project: (1) the Maalaea-Lahaina third 69KV line between the Maalaea Power Plant and the Lahainaluna Switching Station (Segment 1 through Segment 22 of the preferred alignment); (2) the Lahainaluna-Puukolii line between the Lahainaluna Switching Station and the existing Puukolii transmission line (Segment 23); and (3) the Lahainaluna-Lahaina line between the Lahainaluna Switching Station and the existing Lahaina line (also segment 23). The Maalaea-Lahaina third 69KV line would be a single-circuit line. The Lahainaluna-Puukolii and Lahainaluna-Lahaina lines would be a double-circuit line.

The basic electrical design for the Maalaea-Lahaina third 69KV transmission line is a single-circuit, three-phase, nominal 69,000 volt (69KV) electric transmission line, with the circuit arranged in a delta phasing configuration (to mitigate magnetic field levels). The 69KV electric conductors are single (one conductor per phase) 652.4 KCM-AAAC (thousand circular mils, all-aluminum alloy concentric), 19-strand, 0.927-inch diameter "Elgin" conductors. The minimum ground clearance for this line is 35 feet at midspan, with an attachment height of 45 feet at the poles and span length ranging from 400 to 600 feet. A shield wire of single 195.7 KCM-AAAC is placed at the top of the supporting steel poles. This transmission line is designed to comply with the State of Hawaii Public Utilities Commission (PUC) General Order No.6 and the National Electrical Safety Code.

Table 4.11-3
SUMMARY OF EVERYDAY MAGNETIC FIELD LEVELS AT SELECTED OAHU AND BIG ISLAND LOCATIONS

Location	Magnetic Field (mG)
Waipahu - Oahu	
Gem's Department Store	0.2 to 2.5
Gem's Jewelry	10 to 300
Gem's Parking Lot	0.5 to 2.0
Times Supermarket	0.5 to 14
"Skill Crane" Game	12 to 50
Tokyo Deli	0.5 to 8
Bakery	2 to 5
Driving on Farrington Highway	0.5 to 10
McDonalds Restaurant	0.5 to 15
Waipahu Sporting Goods	1 to 5
Arakawa's Department Store	0.5 to 5
Arakawa's Jewelry	4 to 120
Honolulu - Oahu	
Dole Pineapple Cannery Shops	0.1 to 42
K-Mart Department Store	0.2 to 22
Safeway Grocery Store	0.6 to 38
McDonalds Restaurant	0.1 to 77
Ala Moana Shopping Mall	0.1 to 176
- Sears Department Store	0.1 to 4.6
- Longs Drug Store	0.3 to 22
- The Nature Company	0.8 to 63
- Food Court	0.3 to 18
- Honolulu Book Shop	2.5 to 13
Hilo - Big Island	
McDonalds Restaurant	1 to 32
Post Office	0.5 to 34
State Building	0.2 to 12
Sure Save Supermarket	0.2 to 57
Ben Franklin Department Store	0.5 to 70
J.C. Penney Department Store	0.2 to 5
7-11 Convenience Store	0.5 to 8
Liberty House Department Store	0.3 to 3
Tilt-Video Arcade	1 to 40
Kay Bee Toy Store	0.5 to 28
Puna - Big Island	
Pahoa Post Office	0.3 to 10
Dairy Queen Restaurant	0.5 to 12
Da Store -- Convenience Shop	0.5 to 5
Walking Past Stores on Highway No. 130	0.2 to 7

The basic electrical design for the Lahaina and Puukolii transmission lines is a double-circuit, three-phase, nominal 69KV electric transmission line, with each circuit arranged in a vertical phase configuration with like phasing. Each circuit is comprised of electrical conductors which are single (one conductor per phase) 336.5 KCM-AAC (thousand circular mils, all-aluminum conductors), 19-strand, 0.666-inch diameter "Tulip" conductors. The minimum ground clearance for this line is 35 feet at midspan, with an attachment height of 45 feet at the poles and span length ranging from 400 to 600 feet. Two shield wires of single 195.7 KCM-AAAC are placed above each circuit at the top of the supporting steel poles. This double-circuit transmission line is designed to comply with PUC General Order No.6 and the National Electrical Safety Code. Figure 2.5-1 presents the proposed line configurations.

__Switching Station__

High-voltage substation and switching station facilities are an important element in the electric energy distribution system. Substations receive higher-voltage electrical power from incoming transmission lines and convert it to lower-voltage electrical power for distribution to commercial and residential customers. Substations are classified by the voltage of the incoming transmission lines and outgoing distribution lines. Switching stations are a type of substation which distribute electrical power between similar voltage transmission lines.

Substations are also locations where safety devices can be installed to quickly disconnect electric circuits or equipment in the event of a fault (short circuit or other problem). The voltage of the outgoing distribution lines can be regulated at a substation and system operation is monitored at substations. Substations can have a number of components, including power transformers (for changing voltage), switches, circuit breakers, lightning arrestors, and relay and metering equipment. The energized portions of a substation are generally connected by rigid metal tubing called buswork. A typical substation has two or more incoming supply transmission lines for reliability. The layout of a substation is planned so that power lines or components can be taken out of service for maintenance without affecting the continuity of service to the utility customers.

The proposed Lahainaluna Switching Station would transfer electric power between three 69KV transmission lines (the Maalaea-Lahaina third 69KV line, Lahainaluna-Puukolii, and Lahainaluna-Lahaina). As described in Section 2.0, the switching station would be approximately 360 feet wide by 350 feet long, and consist of a control house, 69KV buswork, disconnect switches, circuit breakers, station power and potential transformers, insulators and lightning arrestors. Figure 4.11-1 presents a diagram of the proposed 69KV switching station facility.

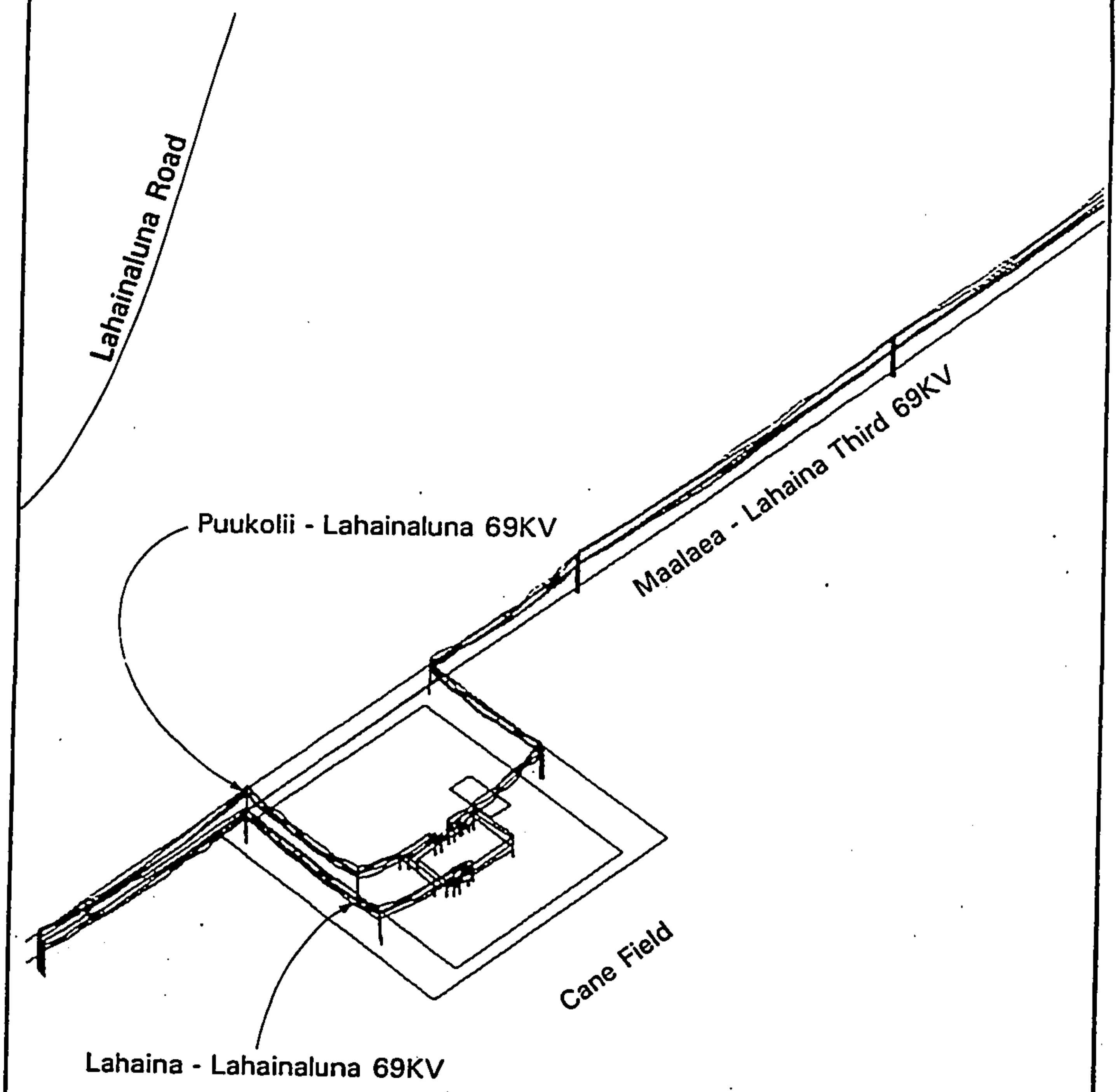
4.11.2 Potential Impacts

A predictive model was used to calculate the electric and magnetic field levels for the single-circuit Maalaea-Lahaina third 69KV transmission line and the double-circuit Lahaina and Puukolii transmission lines under normal loading and two emergency loading conditions. Calculations were also performed for the proposed Lahainaluna Switching Station under each of the three loading conditions. The loading of the switching station is based upon the combined load of the three 69KV transmission lines. Table 4.11-4 presents the three potential loading conditions (as provided by Hawaiian Electric Company [HECO]). Due to differences in power factors and other transmission line operational parameters, the power input does not exactly equal the power output in all cases. Furthermore, the direction of current flow for the Lahainaluna-Lahaina line changes, depending upon the load case. During Emergency Case 1 loading conditions, the current flows out of the switchyard; whereas for the Normal and Emergency Case 2 loading conditions, the current flows into the switchyard. It should be noted that emergency loading conditions would be rare and only occur for a short duration.

Table 4.11-4
LOADING CONDITIONS FOR 69KV TRANSMISSION LINES

Transmission Line	Normal Load (Amperes)	Emergency Load #1 (Amperes)	Emergency Load #2 (Amperes)
Maalaea - Lahaina Third 69KV	178 (in)	264 (in)	184(in)
Lahaina - Lahainaluna	44.2 (in)	76.3 (out)	146 (in)
Puukolii - Lahainaluna	198 (out)	201 (out)	330 (out)

The general methodology and results are discussed below, followed by a review of the current state of research regarding health effects from electric and magnetic fields.



LAHAINALUNA SWITCHING STATION DIAGRAM
(Not To Scale)

Figure 4.11-1
Dames & Moore

Transmission Line

Electric Fields

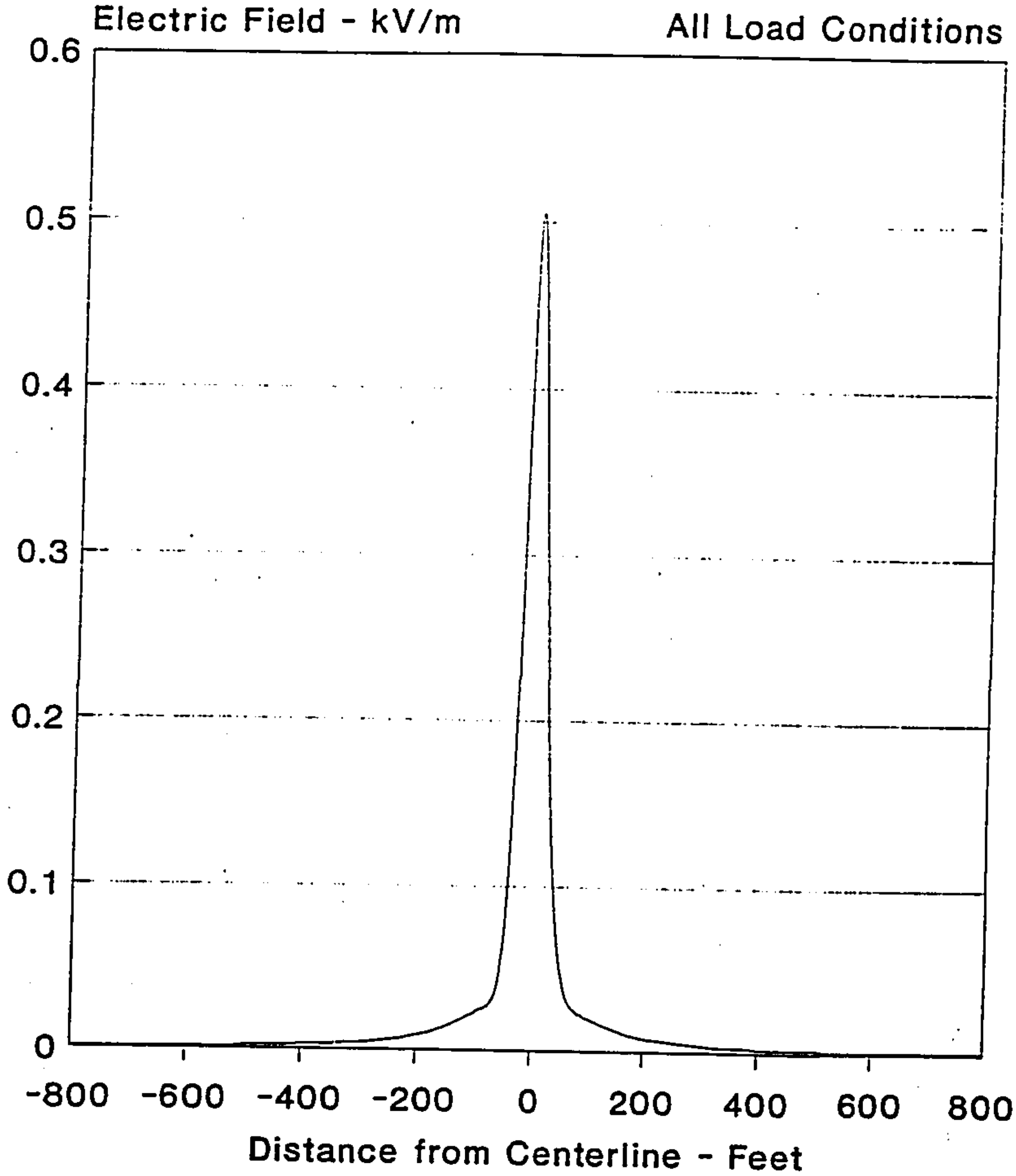
Electric fields are based only on the voltage of the transmission line and are not affected by changes in loading or direction of current flow; therefore calculations for electric fields were performed without regard to loading conditions.

The electric field for the proposed project would range from approximately 0.001 KV/m at a distance of about 525 feet from centerline to a maximum value of 0.506 KV/m underneath the conductors near midspan. Figure 4.11-2 presents a lateral profile of the electric field extending away from the Maalaea-Lahaina third 69KV line on both sides at midspan. This profile is a plot of the calculated maximum field as a function of distance from the center line or right-of-way center of the transmission line. Table 4.11-5 presents a tabular summary of electric field calculations for the Maalaea-Lahaina third 69KV line.

For the double-circuit Lahaina and Puukolii transmission lines, three different phasing arrangements were assessed to determine the arrangement which would produce the lowest fields: (1) vertical phasing arrangements with LIKE phasing; (2) vertical phasing arrangements with UNLIKE phasing; and (3) a mixed DELTA phasing arrangement with UNLIKE phasing. The three phasing arrangements are presented in Figure 4.11-3. Calculated electric fields range from 0.001 KV/m at a distance of about 325 feet from centerline to a maximum value of 0.248 KV/m underneath the conductors near midspan both for the UNLIKE and DELTA phasing configurations (since the phasing is the same for both configurations, calculated electric fields are the same). Calculated electric fields for the double-circuit line were higher for the LIKE phasing arrangement, where levels ranged from 0.001 KV/m to a maximum of 0.846 KV/m at centerline. Figure 4.11-4 presents a lateral profile of the electric field from the double-circuit Lahaina and Puukolii lines. Table 4.11-5 presents a tabular summary of the electric field calculations for these lines.

Magnetic Fields

For magnetic fields, three different loading conditions were assessed: Normal, Emergency Load 1, and Emergency Load 2. Calculations are at midspan with the proposed minimum ground clearance of 35 feet.



ELECTRIC FIELD FROM MAALAEA-LAHAINA THIRD 69KV SINGLE CIRCUIT LINE

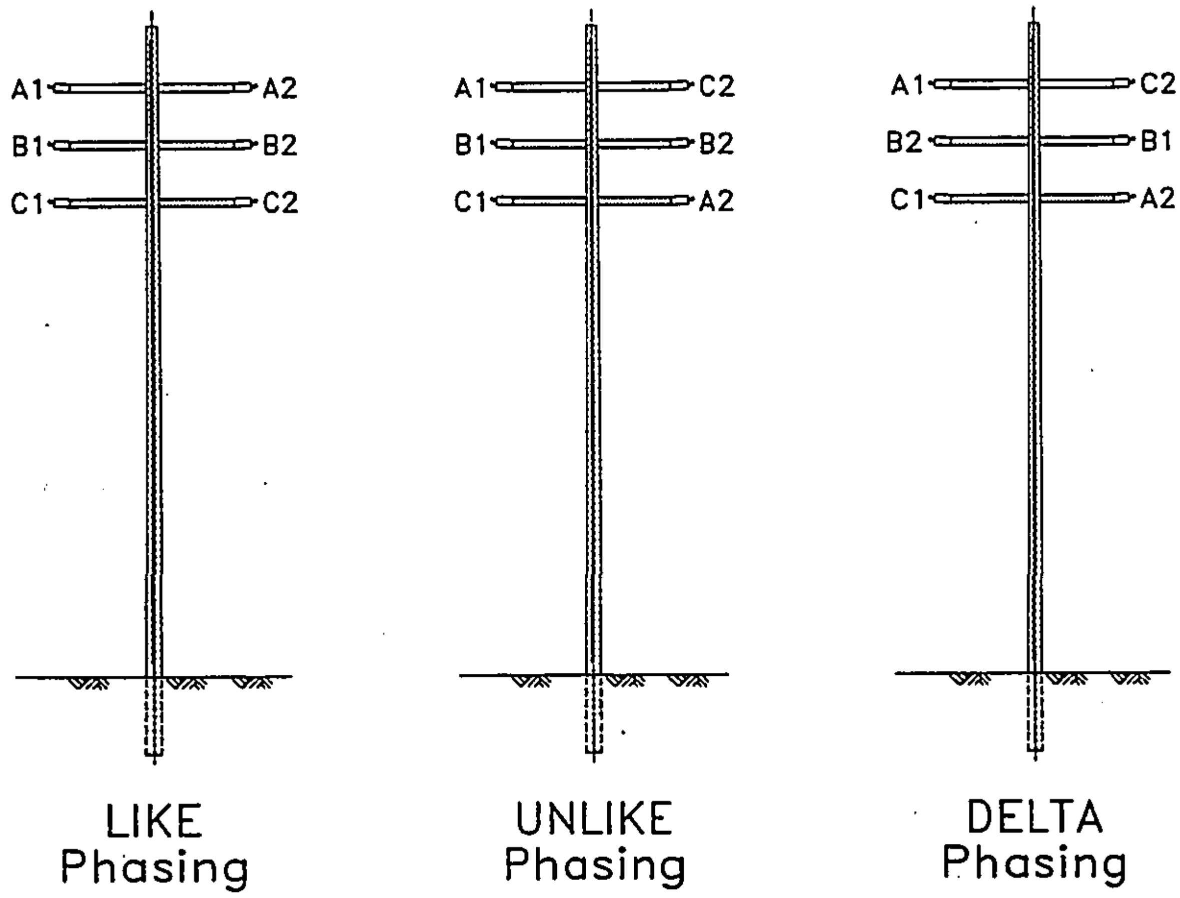
Figure 4.11-2

Dames & Moore

Table 4.11-5
CALCULATED ELECTRIC FIELDS
FROM PROPOSED TRANSMISSION LINES (KV/M)

Distance from centerline (feet)	Maalaea-Lahainaluna Single-circuit Line	Lahaina and Puukolii Double-Circuit Line		
		UNLIKE Phasing	LIKE Phasing	DELTA Phasing
0	0.500	0.222	0.846	0.222
10	0.404	0.246	0.755	0.246
20	0.263	0.227	0.544	0.227
30	0.153	0.157	0.328	0.157
40	0.085	0.091	0.173	0.091
50	0.050	0.047	0.079	0.047
100	0.020	0.009	0.026	0.009
150	0.013	0.006	0.020	0.006
200	0.008	0.003	0.013	0.003
400	0.002	0.001	0.004	0.001
600	0.001	0.000	0.002	0.000
800	0.001	0.000	0.001	0.000

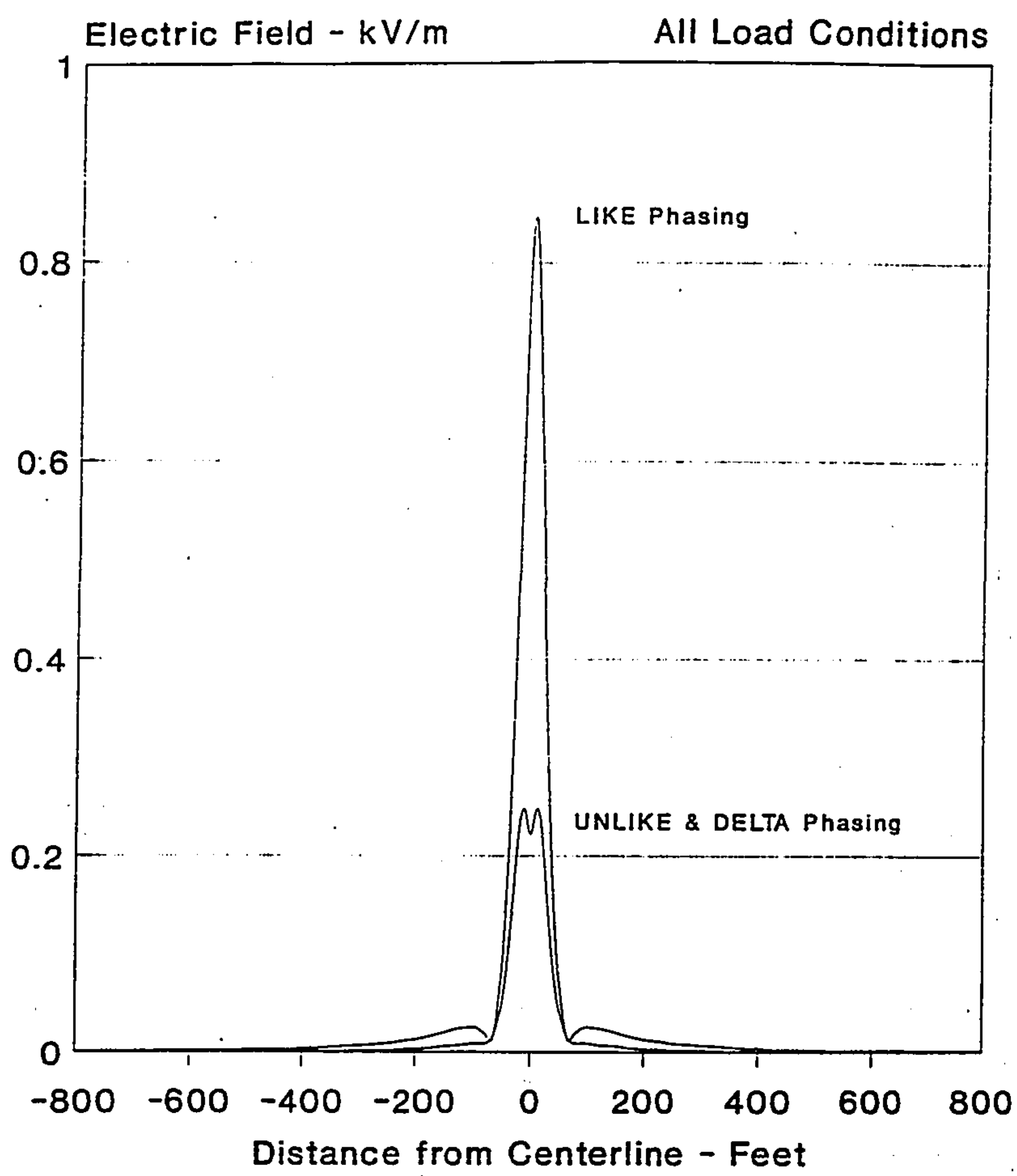
Figure 4.11-5 depicts calculated maximum magnetic field levels for normal and both emergency loading cases for the single-circuit Maalaea-Lahaina third 69KV line. These results are summarized in Table 4.11-6. For Normal loading, the calculated magnetic field ranges from about 0.1 mG at a distance of 800 feet from centerline to a maximum of about 14.1 mG directly under the conductors at midspan. For Emergency Case 1 loading, the calculated magnetic field ranges from about 0.2 mG at a distance of 800 feet from centerline to a maximum of about 21 mG directly under the conductors. For Emergency Case 2 loading, the calculated magnetic field ranges from about 0.1 mG at a distance of 800 feet from centerline to a maximum of about 14.6 mG. It should be noted that, for the two emergency load cases, these conditions would be rare and only occur for a short duration.



PHASING ARRANGEMENTS FOR LAHAINA AND PUUKOLII DOUBLE CIRCUIT 69KV LINE

Figure 4.11-3

Dames & Moore



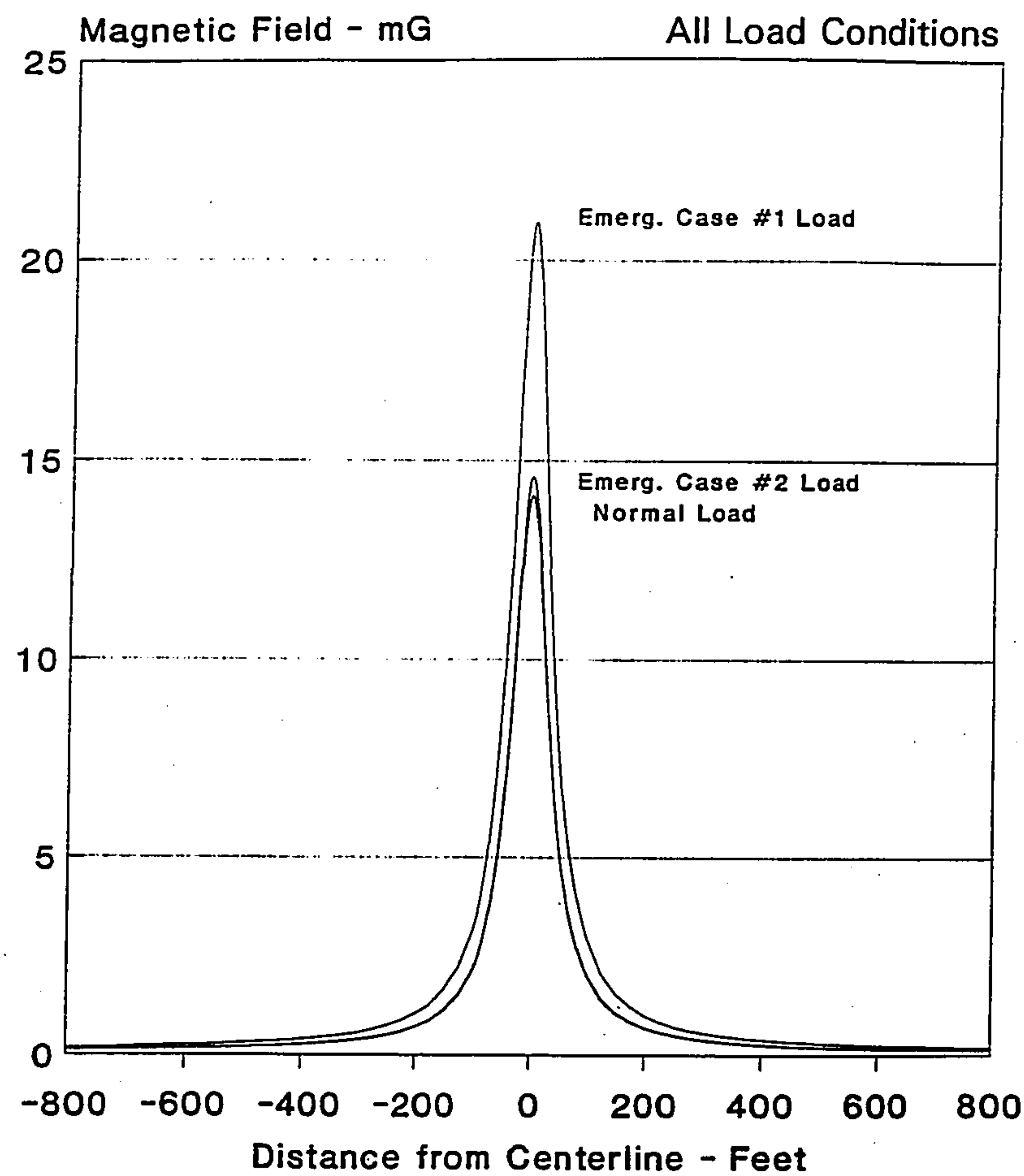
ELECTRIC FIELD FROM LAHAINA AND PUUKOLII DOUBLE CIRCUIT 69KV LINE

Figure 4.11-4
Dames & Moore

Table 4.11-6
CALCULATED MAGNETIC FIELD
FROM MAALAEA-LAHAINA THIRD 69KV SINGLE-CIRCUIT LINE

Distance from centerline (feet)	Maximum Magnetic Field (mG) by Loading Condition		
	Normal	Emergency 1	Emergency 2
0	14.09	20.89	14.56
10	12.83	19.03	13.26
20	10.60	15.73	10.96
30	8.38	12.42	8.66
40	6.55	9.72	6.77
50	5.16	7.66	5.34
100	1.99	2.95	2.05
150	1.05	1.56	1.09
200	0.68	1.00	0.70
400	0.26	0.39	0.27
600	0.17	0.25	0.17
800	0.12	0.18	0.13

For the double-circuit Lahaina and Puukolii transmission lines, the three phasing arrangements presented in Figure 4.11-3 were assessed for each loading condition. For Normal and Emergency Case 2 loading, calculated magnetic fields are lower for the LIKE phasing configuration (since load flows are in opposite directions). For Emergency Case 1, calculated fields are lower for the UNLIKE phasing configuration (since load flows are in the same direction). As demonstrated, changing the direction of current flow from the same direction to opposite directions produces the same effect as changing from UNLIKE phasing to LIKE phasing with respect to magnetic fields. Under Normal loading conditions, calculated magnetic fields range from about 0.1 mG at a distance of 800 feet from centerline to a maximum of about 13.4 mG directly under the conductors at midspan. Under Emergency Case 1 loading, calculated magnetic fields range from about 0.1 mG at a distance of 800 feet from centerline to a maximum of about 11.8 mG directly under the



MAGNETIC FIELD FROM MAALAEA-LAHAINA THIRD 69KV SINGLE CIRCUIT LINE

Figure 4.11-5
Dames & Moore

conductors. For Emergency Case 2 loading, calculated magnetic fields range from about 0.1 mG at a distance of 800 feet from centerline to a maximum of about 18.8 mG. Again, it should be noted that, for the two emergency load cases, these conditions would be rare and only occur for a short duration. Calculated maximum magnetic field levels for the double-circuit Lahaina and Puukolii lines for Normal loading conditions only for each of the three phasing arrangements are depicted in Figure 4.11-6. Calculated magnetic field levels for normal and both emergency loading conditions are summarized in Table 4.11-7.

Switching Station

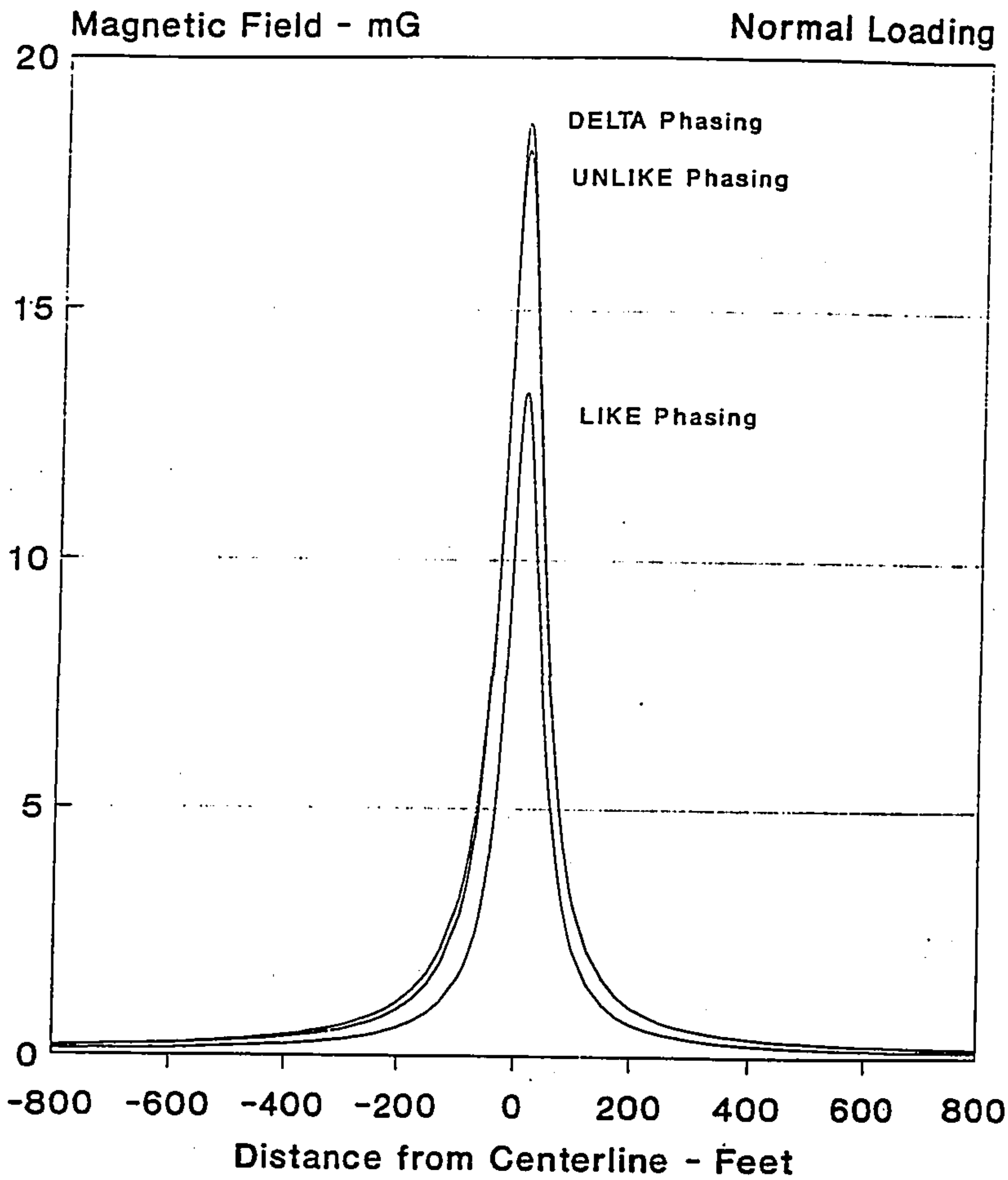
Electric Fields

Electric fields around switching stations are usually between 0.001 KV/m and 0.050 KV/m due to electric field shielding. The grounded metallic equipment housings and switching station walls constitute effective electric field shields, thereby reducing electric fields from internal equipment and buswork. Typically the major source of electric fields outside of switching stations are the overhead transmission lines associated with the facility.

As described above, electric field calculations for the three 69KV transmission lines associated with the Lahainaluna Switching Station ranged from approximately 0.001 KV/m (at a distance of 800 feet from the transmission line center) to a maximum of about 0.506 KV/m for the proposed Maalaea-Lahaina third 69KV line, and between 0.246 KV/m and 0.846 KV/m for the proposed double-circuit Lahaina and Puukolii lines (depending upon phasing arrangement). Electric fields from the proposed Lahainaluna Switching Station would be expected to be within the range of values calculated for the associated transmission lines. Most locations will probably be lower due to electric field shielding from nearby objects.

Magnetic Fields

Magnetic field predictive modeling was done for the Lahainaluna Switching Station for both a proposed layout and optional layout and for Normal and Emergency Case 1 and 2 loading conditions. Table 4.11-8 presents a summary of magnetic field calculations for the proposed layout and optional layout under each of the three loading conditions.



MAGNETIC FIELD FROM LAHAINA AND PUUKOLII DOUBLE CIRCUIT 69KV LINE

Figure 4.11-6

Dames & Moore

Table 4.11-7
CALCULATED MAGNETIC FIELD
FROM LAHAINA AND PUUKOLII DOUBLE-CIRCUIT 69KV LINE

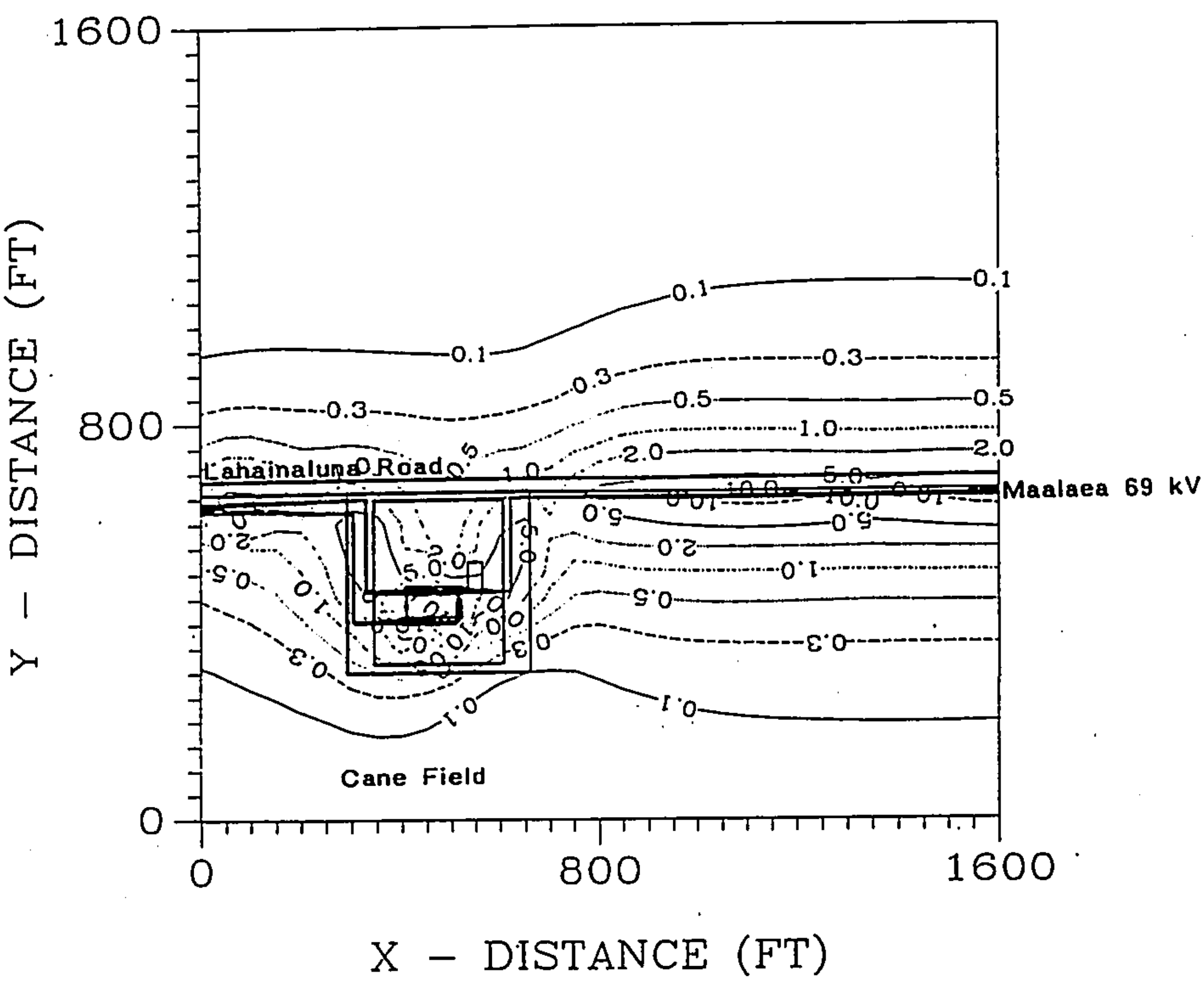
Distance from Centerline (feet)	Maximum Magnetic Field (mG) By Loading Condition/Phasing Arrangement								
	Normal			Emergency 1			Emergency 2		
	Unlike	Like	DELTA	Unlike	Like	DELTA	Unlike	Like	DELTA
0	17.86	12.65	18.37	11.10	20.58	12.39	34.70	17.56	35.00
10	17.98	13.34	18.48	11.70	20.41	12.63	34.26	18.78	34.77
20	16.12	12.12	16.48	10.69	18.17	11.16	30.47	17.01	30.92
30	13.31	9.97	13.53	8.75	14.95	9.00	25.10	13.87	25.44
40	10.56	7.84	10.71	6.84	11.87	6.97	19.96	10.79	20.20
50	8.32	6.11	8.43	5.30	9.35	5.36	15.76	8.32	15.95
100	3.05	2.13	3.09	1.80	3.46	1.80	5.85	2.78	5.96
150	1.57	1.06	1.59	0.88	1.79	0.87	3.04	1.34	3.10
200	0.99	0.66	1.00	0.54	1.14	0.53	1.94	0.82	1.97
400	0.38	0.25	0.38	0.20	0.45	0.19	0.75	0.30	0.74
600	0.24	0.15	0.26	0.13	0.28	0.14	0.48	0.18	0.51
800	0.18	0.12	0.18	0.10	0.21	0.09	0.35	0.14	0.35

Table 4.11-8
CALCULATED MAGNETIC FIELDS
FROM LAHAINALUNA SWITCHING STATION (MG)

Design Location	Magnetic Field (mG) By Loading Condition		
	Normal	Emergency 1	Emergency 2
Proposed Layout Overall Site North Perimeter	 0.0 to 47.2 0.0 to 10.7	 0.0 to 57.6 0.0 to 15.9	 0.0 to 77.5 0.0 to 11.1
Optional Layout Overall Site North Perimeter	 0.0 to 44.8 0.0 to 10.7	 0.0 to 56.0 0.0 to 15.9	 0.0 to 74.5 0.0 to 11.1

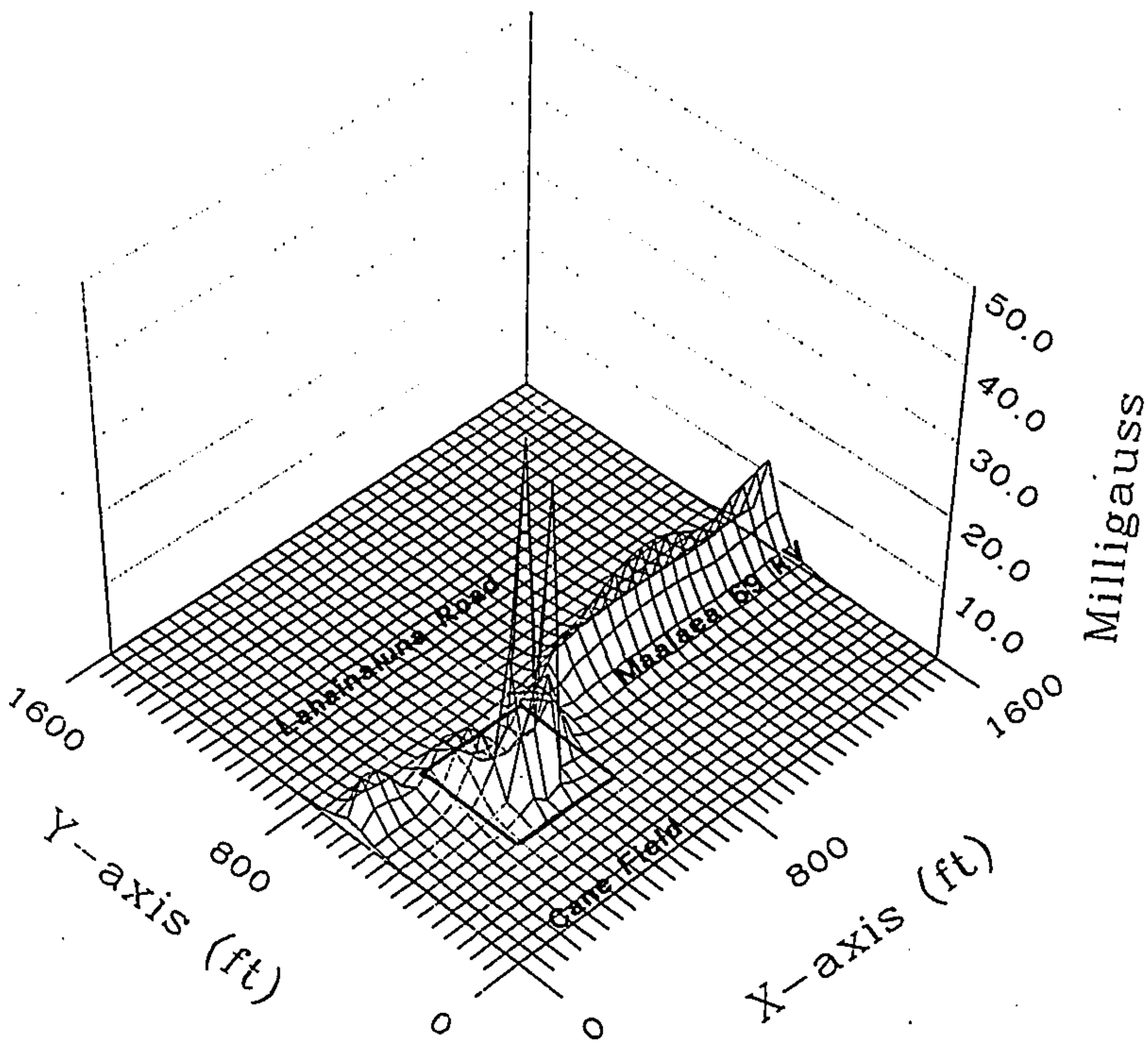
The calculated magnetic field for the proposed Lahainaluna Switching Station proposed layout under Normal loading conditions is presented in Figure 4.11-7 and 4.11-8. The maximum magnetic field. The maximum magnetic field occurs within the switchyard in the area of the 69KV buswork, and the dominant source of magnetic fields outside the switching station are the incoming transmission lines. Fields from the internal 69KV buswork are primarily contained within the switching station boundaries. The highest calculated magnetic field levels occur underneath the Maalaea-Lahaina third 69KV line where it enters the switchyard. The calculated magnetic field inside the switching station reaches a maximum of about 47.2 mG in the area of the 69KV buswork. Under Emergency Case 1 load conditions, magnetic fields range from about 0 mG to 57.6 mG. For Emergency Case 2, calculated magnetic fields range from 0 mG to 77.5 mG. Fields along the northern perimeter of the switching station range from less than 1 mG to about 5 mG, depending upon loading conditions.

For the optional layout, calculated maximum magnetic field levels within the switching station are slightly lower than for the preferred layout. This is due to the precision of the grid resolution of the computer model; the internal design of the switching station, would have a negligible effect on magnetic field levels outside of the switchyard. Again, the dominant source of magnetic fields within the switching station are in the area of the 69KV buswork, whereas field levels outside the station are primarily due to the incoming 69KV transmission lines. Magnetic field levels within the site range from about 44.8 mG to 74.5 mG, depending on load condition. The highest calculated



MAGNETIC FIELD CONTOUR MAP FOR LAHAINALUNA SWITCHING STATION UNDER NORMAL LOADING CONDITIONS

Figure 4.11-7
Dames & Moore



**3-D PLOT OF MAGNETIC FIELDS
LAHAINALUNA SWITCHING STATION
AND TRANSMISSION LINES**

Figure 4.11-8

Dames & Moore

magnetic field levels again occur underneath the proposed Maalaea-Lahaina third 69KV line as it enters the switchyard. Calculated magnetic fields along the site perimeter range from less than 1 mG to about 5 mG (depending upon loading conditions) and are identical to those calculated along the northern perimeter for the preferred layout.

Health Effects of Electric and Magnetic Fields

A number of studies in the 1960s and early 1970s found no obvious harmful effects from typical transmission line electric and magnetic fields. Some studies during this period did report the potential for harmful effects. More recent reports (since about 1979) have suggested a possible association between occupational and residential exposure to magnetic fields and adverse health effects, including cancer. The evidence for such an association is still inconclusive, and studies are under way to obtain more definitive information on this subject. Although most of the research has been prompted by concern about the effects of the large, extra-high-voltage, 765KV transmission lines, some recent research results are of interest in assessing potential health concerns related to smaller, 69KV lines and other electrical facilities. Some of the studies are summarized herein and the remainder are presented in the Electric and Magnetic Fields Technical Report, Appendix H.

New York State Power Lines Project

One of the most comprehensive recent research programs involved 16 studies and two follow-up projects conducted between 1985 and 1987. These studies, administered by the New York State Power Lines Project, were undertaken "to determine whether there are health hazards associated with electric and magnetic fields produced by 60 hertz (Hz) power transmission lines (especially 765KV lines)" (New York State Power Lines Project, 1987). The $5 million research effort was funded by electric utilities that serve the state of New York and was supervised by a scientific advisory panel reporting to the New York State Health Department. In general, the field levels used in the laboratory studies were larger than typical fields because of the 765KV lines.

The studies fall into the broad areas of epidemiology, laboratory animal, and cellular research. None of the studies showed significant adverse effects on reproduction, growth, or development because of the laboratory-created fields. The studies also showed no significant evidence of genetic or chromosomal damage that might lead to inherited effects or that might cause cancer. Two of the project's epidemiological studies, however, also examined the effects of lower-voltage distribution lines. These two studies (of childhood cancer in Denver and adult cancer in Seattle) have generated much public interest.

The Denver Study

The Denver study evaluated the incidence of cancer among children living in homes near different kinds of electric power lines. Measurements were taken inside each home with appliances turned off (low-power condition) and turned on (high-power condition). Distribution "wiring configuration codes" were used as a surrogate for likely magnetic field exposures over time in the home from external power lines. The wiring code is an index loosely based on the type, number, and diameter of conductors; the distance from house to power line; and the number of nearby service drops.

The New York Scientific Advisory Panel interpreted the Denver study to show an association between the household wiring codes and street addresses of the childhood cancer cases. The panel reported that the study appeared to show an increase in the frequency of childhood cancer in Denver from about 1 in 10,000 children per year to about 1.7 in 10,000. However, the study results were puzzling in several respects. There appeared to be no correlation when high-power condition measurements were used (that is, with many electrical appliances turned on). No clear relationship between the level of exposure and the increased incidence of cancer would be discovered for the low-power conditions (that is, with appliances turned off) for which a correlation with childhood cancer was found. The New York Scientific Advisory Panel was also concerned about the study's low interview response rate and possible coincidental factors, such as traffic density, that could also affect the incidence of cancer.

The Seattle Study

The other epidemiological cancer study funded by the New York State Power Lines Project was conducted in the Seattle area. The design of this study shared many features with the Denver study; for example, exposure to magnetic fields was assessed by field measurements and by the same wiring code system. In the Seattle study, the New York Scientific Advisory Panel found that "regardless of how exposure was characterized, no relationship with cancer incidence was disclosed." In other words, the results of this study were negative - there was no association between cancer and magnetic field exposure (as estimated by the wiring code system).

In evaluating the research results, the New York Scientific Advisory Panel cautioned that research has not found any biological mechanisms that could explain the role of magnetic fields in the development of cancer. The panel also noted that methodological uncertainties exist in quantifying magnetic field exposure levels. The panel concluded that the findings to date could not and should not be translated into specific recommendations for regulating right-of-way widths, line heights, or the location of transmission lines near homes.

The Los Angeles Study

A new residential epidemiology study, funded by the Electric Power Research Institute in an attempt to replicate the Denver study, was completed in 1990 in Los Angeles, California. The results generally confirm the results of the Denver study. There was an increased risk of cancer with certain wiring codes, but not with direct field measurements.

This study was essentially a replication of the Denver study, but in a different location. The researcher concluded that:. "our data offer no support for a relationship between measured electric field and leukemia risk, little support for the relationship between measured magnetic field exposure and leukemia risk, some support for a relationship between wiring configuration and leukemia risk, and considerable support for a relationship between children's electrical appliance use and leukemia risk" (University of Southern California, Department of Preventive Medicine, 1991). The reason that wiring configuration correlates with leukemia risk better than measured exposure does is not clear.

It remains unresolved why an indirect magnetic field measurement (such as wiring code) is associated with a positive finding, while direct field measurements are not. This is even more perplexing because this Los Angeles study had the most sophisticated direct measurements of magnetic fields to date. Possible explanations for these apparently contradictory research findings are:

- Wiring configuration codes are better predictors of long-term average magnetic field exposure than 24-hour measurements are;
- Wiring code categories are markers for some as-yet-unidentified biologically effective characteristics of the magnetic field (e.g., transient pulses or intermittent fields);

- Some wiring code categories are associated with some confounding factor or set of factors in the urban environment that are the true cause of the increased risk but that are unrelated to magnetic fields; or
- Relatively subtle biases in subject selection (especially for the controls) have produced a spurious association between wiring codes and leukemia risk in the Denver and Los Angeles studies.

The Swedish Studies

Two new epidemiological studies were released in September, 1992 in Sweden. The first study, *Magnetic Fields and Cancer in People Residing Near Swedish High Voltage Power Lines*, was a residential study of children and adults who live within 300 meters of 220KV and 400KV transmission lines in Sweden (Feychting and Ahlbom, September 1992). This residential study evaluated average magnetic field exposure via actual measurements and magnetic field calculations (for both contemporary and historical line loadings). The study also included an evaluation based on various distances from the power lines. The study found a statistical association between childhood leukemia and calculated historical fields (the main exposure metric was selected as the annual average of the calculated magnetic field generated by the power line). The study also found an association with distance from the power lines. No association was found with actual magnetic field measurements. For brain tumors and all childhood cancers together, there was little support for an association. The findings of an association with a surrogate, namely calculated historical magnetic fields, but not with actual field measurements, are consistent with earlier studies in Denver and Los Angeles (New York State Power Lines Project 1987). Similar results are achieved in this study by using distance from the power line. In this respect, this study is another "wire code" study since a distance criteria is used as the surrogate for magnetic field exposure.

The second study, *Occupational Exposure to Electromagnetic Fields in Relation to Leukemia and Brain Tumors: A Case-Control Study*, is an occupational study of adult males (Floderus, et.al. 1992). Based on the job held longest during the 10-year period before diagnosis, a statistical association between a certain subtype of leukemia and estimated magnetic field exposure was observed. (No association was found with the leukemia subtype most often discussed in other occupational EMF studies). The exposure assessment details were not sufficiently reported to allow a complete evaluation, but in general, some contemporary magnetic field exposure measurements were used as a surrogate to estimate historical exposure for selected job categories. In the occupational study, the exposure metrics included the mean field exposure value, median, standard deviation and time above 0.2 μT (2 mG) for exposure categories that included quartiles of exposure intensity and the 90th percentile.

Both studies reported that they have essentially confirmed earlier residential and occupational study findings, with some exceptions (e.g., in the residential study there were no positive findings for brain tumors). The most interesting features of these new studies is the exposure assessment, which includes contemporary measurements and historical field calculations for the residential study; and job category personal exposure measurements for the occupational study. An important issue for both studies is that if the exposure surrogates prove to be accurate in estimating historical exposure, then this may suggest that future exposure assessment attention is directed to average magnetic field values. In any event, these studies add to our overall scientific knowledge, would seem to confirm portions of earlier work, and will direct future research to understand what aspect of wire codes and other surrogates are related to health risks.

Office of Technology Assessment Background Paper

One of the more comprehensive studies on the biological effects of electric and magnetic fields was prepared for the U.S. Congress Office of Technology Assessment (Carnegie Mellon University, 1989).

The background paper provides a good overview of the sources and nature of electric and magnetic field exposure. It points out that we do not yet know what field attribute or combination of attributes, if any, could produce public health effects. This means that the simple assumption that "more is worse" may not be true. Because of this, simple field strength standards "cannot be adequately supported by the science that is now available."

The background paper also provides a summary of the basic areas for research: cellular experiments, whole animal experiments, exposure assessment, and epidemiological studies. Using the review of the scientific literature, the report states that:

As recently as a few years ago, scientists were making categorical statements that on the basis of all available evidence there are no health risks from human exposure to power-frequency fields. In our view, the emerging evidence no longer allows one to categorically assert that there are no risks. But it does not provide a basis for asserting that there is a significant risk.

If exposure to fields does turn out to pose a health risk, it is unlikely that high voltage transmission lines will be the only sources of concern. Power-frequency fields are also produced by distribution lines, wall wiring, appliances, and lighting fixtures. These non transmission sources are much more common than transmission lines and could play a far greater role than transmission lines in any public health problems.

The background paper also considers the public policy question of what should be done, given our present knowledge. Three basic approaches are suggested:

- ***Do nothing.*** *Conclude that there is not yet enough evidence to warrant any action.*
- ***Prudent avoidance.*** *Adopt strategies that can limit field exposures with small investments of money and effort. Do nothing drastic or expensive until research provides a clear picture of whether there is any risk at all.*
- ***Aggressive regulation.*** *Conclude that there is a problem and spend some serious time and money on an aggressive program to limit field exposure, while recognizing that we may eventually learn that some or all of this effort and money has been wasted.*

Continuing Research

Almost all researchers are careful to point out that it is difficult to identify health hazards that may be too subtle to detect or that are evident only after long periods of time. The converse is also true: no experiment, no matter how well designed, can prove no health hazards at all from any source studied. The studies that do suggest a health effect are usually repeated to verify the results. Because any one study can be fallible, a study needs to be replicated before any conclusions can be reached about health hazards.

Because of the difficulty of reaching any meaningful conclusions about health hazards from the current studies, most researchers recommend carrying out additional research. Several areas in particular merit further research:

- So far, research has not been able to discover the biological mechanism by which electric or magnetic fields might cause adverse health effects. Additional basic laboratory research is needed to determine whether physiological changes result from exposure to electric or magnetic fields, and how much changes might affect health.
- Another exposure assessment subject deserving further research is the effect of the fields typically experienced in homes - fields caused by televisions, electric blankets, hair dryers, other appliances, and electric wiring in house walls. Although field strengths near some of the larger transmission lines may be greater than field strengths at home, people can experience significant exposure to electric and magnetic fields at home. The Denver and Los Angeles studies found evidence of an association between the incidence of childhood cancer and the configuration of electric power line wiring outside the home (New York State Power Lines Project 1987). Further study will help clarify the relative risk, if any, from fields at home and near transmission or distribution lines.

Electric and Magnetic Field Standards

Currently, there are no electric and magnetic field standards for switching station or substation facilities. However, there are guidelines and standards regarding field levels from overhead power lines (which could originate or terminate at a substation facility). General transmission line safety standards are imposed by PUC General Order No.6 (Rules for Overhead Electric Line Construction) and the National Electrical Safety Code. The Maalaea-Lahaina Third 69 KV Transmission Line Project will be designed to comply with these codes and standards. These standards are presently not written to address concerns about the potential for health effects of electric and magnetic fields, nor to address fields generated by switching station facilities.

On April 3, 1991, the State of Hawaii Department of Health issued a policy relating to electric and magnetic fields from electric power facilities. The policy states:

A prudent approach is needed at this time to regulate electric and magnetic fields around low-frequency electric power facilities, including high-voltage transmission lines. The existing research data are inconclusive and not sufficient enough for adequate, accurate risk assessment. However, the data suggest that a "prudent avoidance" approach to siting new facilities is appropriate. Where technically feasible and practical, public exposures should be minimized. Too little is presently known to be able to determine where or what rules would provide useful public-health protection.

Implementing actions:

(a) All newly-installed power lines should be constructed with engineering controls to reduce exposure (for example, the "delta" configuration).

(b) The Department of Health will continue to collect and evaluate research data on electromagnetic fields in order to be aware of significant findings with public-health implications.

MECO has adopted a strategy consistent with the prudent avoidance approach in the routing and design of the Maalaea-Lahaina Third 69KV Transmission Line Project. Studies to locate an alignment evaluated existing and proposed land uses with the objective, in part, of avoiding populated areas. By locating the preferred alignment along cane haul roads, public roadways and in remote, undeveloped areas, the routing study applied the approach of prudent avoidance as a siting criterion.

Along with avoiding sensitive land uses, different engineering design options can be applied to reduce field levels. This too is consistent with the application of a prudent avoidance approach to this project. The use of unlike phasing (placing opposite phases next to each other) and delta phasing arrangements (Figure 4.11-3) can reduce field levels for the assumed magnitude and direction of current flow in each circuit. Phasing arrangements which reduce magnetic field levels will be used for the proposed transmission line.

Research to date has not demonstrated conclusive evidence of health hazards due to electric and magnetic fields from switching stations, switching station equipment, and associated electrical power lines. Nevertheless, the proposed Lahainaluna Switching Station layouts are designed to minimize public exposure to electric and magnetic fields. In the absence of more concrete scientific information and state and/or federal guidelines, the proposed designs will take modest and prudent steps to minimize exposure that are consistent with the approach suggested by the Office of Technology Assessment of the U.S. Congress. Electric and magnetic field levels outside of the proposed Lahainaluna Switching Station should be within the range of electric and magnetic fields present at other existing switching stations.

There are no national or federal government standards in the United States for electric or magnetic field exposure. A few states have some type of electric field guideline and two states have a magnetic field standard. These standards are summarized in Table 4.11-9. The purpose of most of the standards is to make the field levels from new lines similar to the field levels from existing lines or to avoid nuisance effects from the electric fields of the larger transmission lines. Field values for the proposed transmission line are far below any of the levels in this table.

The International Non-Ionizing Radiation Committee of the International Radiation Protection Association (IRPA) has published Interim Guidelines on Limits of Exposure to 50/60-Hz Electric and Magnetic Fields in the January 1990 issue of Health Physics. The guidelines were approved by the Executive Council of the IRPA on May 3, 1989; those guidelines relating to the general public are summarized in Table 4.11-10. As with the State standards, the calculated field values for the proposed Maalaea-Lahaina third 69KV transmission line and the Lahainaluna switching station are far below the values cited above.

Other Transmission Line Electrical Effects

Corona

One of the more interesting phenomena associated with all energized devices, including high-voltage transmission lines, is corona. Corona is the physical manifestation of energy loss, and can transform energy into very small amounts of light, sound, radio noise, chemical reaction, and heat. Because power loss is uneconomical, corona has been studied since the early part of this century. Consequently, it is well understood by engineers, and steps to minimize it are one of the major factors in line design. The line designer can control corona with good design practices, and it is usually not a problem for lines rated at 230KV and lower.

Table 4.11-9
STATE REGULATIONS THAT LIMIT FIELD STRENGTHS ON TRANSMISSION LINE RIGHTS-OF-WAY

State	Field Limit
Montana	1 KV/m at edge of ROW in residential areas
Minnesota	8 KV/m maximum in ROW
New Jersey	3 KV/m at edge of ROW
New York	1.6 KV/m at edge of ROW
North Dakota	200 mG at edge of ROW
Oregon	9 KV/m maximum in ROW
Florida	9 KV/m maximum in ROW
	10 KV/m maximum for 500 KV lines in ROW
	2 KV/m maximum for 500 KV line at edge of ROW
	8 KV/m maximum for 230 KV and smaller lines in ROW
	3 KV/m maximum for 230 KV and smaller lines at edge of ROW
	200 mG for 500 KV lines at edge of ROW
	250 mG for double-circuit 500 KV lines at edge of ROW
	150 mG for 230 KV and smaller lines at edge of ROW

Source: Carnegie Mellon University, 1989.

Table 4.11-10
IRPA GENERAL PUBLIC EXPOSURE CHARACTERISTICS

Exposure Time	Electric Field Strength (KV/m)	Magnetic Flux Density (mG)
Up to 24 hours/day	5	1,000
Few hours/day	10	10,000

When significant corona activity occurs on transmission lines it is usually on high-voltage lines of 345KV and above, and then mostly during inclement weather. The effects are local and should be considered a nuisance rather than a serious problem or hazard. For example, although radio noise in the AM range can be generated by corona discharge, it is usually of such low intensity that it cannot be detected outside the right-of-way.

The same is true of television interference and audible noise. The engineering design of the proposed transmission line will produce very low conductor surface gradients (because of the lower 69KV line voltage). The corona performance of the proposed 69KV lines will be as good as or better than other lines in this voltage classification. In summary, the proposed 69KV lines are expected to have little or no corona activity under most operating conditions.

Audible Noise

During corona activity, transmission lines (mainly 345KV and above) generate a small amount of sound energy. This audible noise from the line can barely be heard in fair-weather conditions on the higher-voltage lines and usually not at all on lines at 69KV. During inclement weather, water drops collect on the conductor and increase corona activity so that a crackling or humming sound may be heard near the line. This noise is caused by small electrical discharges through the water drops. Audible noise decreases with distance away from the line. Noise levels on typical 69 KV systems are low and have not been a problem; in fact, audible noise is almost never reported on transmission lines below 230KV.

Radio and Television Interference

As a general rule, overhead transmission lines do not interfere with normal radio or television reception. As described earlier, corona discharges can sometimes generate unwanted electrical signals. There are two potential sources of interference: corona and gap discharges. Corona may affect AM radios, while gap discharge can affect television as well as radio reception. Corona activity is lessened through proper line design and is almost never a source of interference, especially on lines operating below 230KV. Corona-generated interference decreases rapidly with distance, and beyond the edge of the right-of-way it decreases to very low values. For the proposed 69KV line design, the radio noise level, calculated for the edge of the right-of-way during foul weather, is about 27dBμV/m (decibels above a one μV/m (microvolt per meter) reference value). This level will meet the Federal Communications Commission level for satisfactory service. The conductor design of the 69KV lines is such that television interference levels will be extremely low, lower than on many 69KV lines on the mainland where television interference has not been a problem.

Gap discharges are a very different problem. They are caused by electrical discharges between broken or poorly fitting hardware, such as insulators, clamps, or brackets. Hardware is designed and installed to be problem-free, but wind motion, corrosion, gunshot damage, and other factors can sometimes create a gap discharge condition. When this condition develops, intermittent gaps at connection points between hardware items allow small electrical discharges to occur. This phenomenon is not limited to transmission lines and can often be found on distribution lines. The discharges act as small "transmitters" at frequencies that may be received on some radio and television receivers. Gap discharge sources can be located and repaired by electric utility personnel. The severity of interference depends on the strength and quality of the transmitted radio or television signal, the quality of the radio or television set and antenna system, and the distance between the set and the interference source. It should be obvious that radios and television sets are influenced more by interference sources in the home itself - because of their proximity - than from transmission lines. The large majority of interference complaints are found to be attributable to sources other than transmission lines (e.g., poor signal, poor antenna, heating pad, doorbell, sewing machine, freezer, ignition system, aquarium thermostat, appliances, fluorescent lights).

Transmission line engineers commonly design all transmission lines to be as free as possible from corona and other sources of interference. Radio and television interference complaints are recorded, evaluated, and investigated when necessary; corrective measures are taken as required.

Ozone

Ozone (O^3) is another possible by-product of the higher-voltage (345KV and above) transmission lines that has raised some concern. Ozone is formed when three oxygen molecules combine with each other. This can happen when air molecules are charged. Ambient ozone levels in rural areas are typically around 10 to 30 parts per billion (ppb) at night and may peak during the day at around 100 ppb. In urban areas, concentrations greater than 100 ppb are common. Cities such as Los Angeles may peak at 500 ppb. The National Ambient Air Quality Standard for Oxidants (of which ozone is usually 90 to 95 percent) is 120 ppb, not to be exceeded as a peak concentration on more than one day per year.

What kind of ozone level increase can be expected in the vicinity of a transmission line? A theoretical "worst case" would be provided by 10 or more continuous hours of heavy rains and light winds blowing exactly parallel to the lines. In this situation, close to the Maalaea-Lahaina third 69KV transmission line, ozone levels could be about 0.007 ppb. Concentrations below about 1.0 ppb are impossible to measure with even the most sensitive instrumentation. Nitrogen oxides can also be generated by transmission lines but on a scale much smaller than ozone, thus presenting a problem even less significant. Neither ozone nor nitrogen oxide is a problem associated with 69KV transmission lines.

Cardiac Pacemakers

One area of concern related to the electric fields of the 345 KV and larger lines has been the possibility of interference with cardiac pacemakers. There are two general types of pacemakers: asynchronous and synchronous. The asynchronous pacemaker pulses at a predetermined rate. It is practically immune to interference because it has no sensing circuitry and is not exceptionally complex. The synchronous pacemaker, on the other hand, pulses only when its sensing circuitry determines that pacing is necessary. Interference resulting from the transmission line electric field can cause a spurious signal in the pacemaker's sensing circuitry. However, when these pacemakers detect a spurious signal, such as a 60 Hz signal, they are programmed to revert to an asynchronous or fixed pacing mode of operation and return to synchronous operation within a specified time after the signal is no longer detected. Cardiovascular specialists do not consider prolonged asynchronous pacing a problem. As mentioned before, some pacemakers are designed to operate that way. Periods of operation in this mode are commonly induced by cardiologists to check pacemaker performance. So, while the transmission line electric field may interfere with the normal operation of some pacemakers, the result of the interference is not harmful and is of short duration.

4.11.3 Mitigation

Research to date has not demonstrated conclusive evidence of health hazards from 69KV transmission lines similar to those proposed for the Maalaea-Lahaina Third 69KV Transmission Line Project. Nevertheless, MECO has adopted strategies consistent with the prudent avoidance approach in routing and designing the transmission lines. Studies to locate an alignment evaluated existing and proposed land uses with the objective, in part, of avoiding populated areas to the extent possible. By locating the preferred alignment along cane haul roads, public roadways and in remote, undeveloped areas, the routing study applied the approach of prudent avoidance as a siting criterion.

MECO is committed to designing and operating 69KV transmission lines in a way that minimizes public exposure to both electric and magnetic fields measurable at ground level. MECO will use the optimum phasing arrangement that would reduce electric and magnetic field levels. The single-circuit portion of the proposed transmission line (Segments 1 through 22) will be constructed using a DELTA phasing arrangement, which is known to reduce electric and magnetic field levels. LIKE phasing will be used for the double-circuit segment of the proposed transmission line (Segment 23). LIKE phasing would result in lower electric and magnetic fields than UNLIKE phasing or DELTA phasing because load flows in the double-circuit segment are in opposite directions.

4.12 VISUAL RESOURCES

A visual resource analysis was conducted to assess the potential change in visual character, quality, and sensitivity of the landscape setting resulting from the proposed project. This section describes: (1) the analysis methodology; (2) the visual character and quality of the affected environment; (3) the visual sensitivity of the affected viewers and key viewpoints; (4) potential visual impacts and levels of significance; and (5) recommended mitigation measures. All figures referenced are found at the end of this section.

Methodology

The visual analysis began with a review of the project description, site photos, video documentary and alignment maps. A detailed site reconnaissance was conducted to inventory and photo-document visual conditions of the study area and the visibility of the preferred alignment from accessible key viewpoints. The site reconnaissance was used to evaluate existing visual conditions including landscape character, visual quality and visual sensitivity, and sensitive or unique key viewpoints.

Site photographs were used to develop a qualitative landscape characterization of existing visual conditions of the study area, and of the preferred alignment and switching station site. Elements of the characterization include: terrain type and variation (e.g., gulch, hillside/ridgeline and cane field);

visual containment (e.g., narrow valleys and open space); landmark features (e.g., rock outcrops, gulch/extreme topography and cane fields); vegetation; and man-made development.

A map of the visibility and roadside edge conditions along Honoapiilani Highway and accessible roads from Maalaea to Lahaina was also prepared as part of the site reconnaissance to photo-document existing landscape conditions and mauka views of the preferred alignment (Figures 4.12-1 and 4.12-2). Existing vegetative, cane field, and topographic (e.g., earth berms, hillsides, or road cuts) screening conditions were mapped to evaluate the extent of potential visibility of the preferred alignment from the highway. Areas that were inaccessible because of topography or vehicle restrictions were reached by hiking or reviewing aerial photography.

Sensitive and unique key viewpoint locations along Honoapiilani Highway were identified and mapped based on roadside edge conditions, the sensitivity and general number of viewers, visual quality of the setting, potential degree of visual disturbance, and viewing orientation. Representative photographs from these viewpoints were taken and annotated with graphic tape lines which were manually applied to reflect the general orientation and location of the preferred alignment (Figures 4.12-3 through 4.12-9). The viewpoint locations and view direction are shown on Figures 4.12-1 and 4.12-2.

The analysis included preparation of computer-generated visual simulations of selected viewpoints to assist in evaluating potential impacts (Figures 4.12-10 and 4.12-11).

<u>Sensitivity Criteria</u>

The following section describes the criteria used to evaluate the visual quality and sensitivity of characteristic landscape settings.

Visual Quality

Visual quality is a product of three primary factors: (1) ***vividness***, the memorability of the landscape resulting from distinctive landmark features or visual patterns; (2) ***intactness***, the visual integrity between natural and modified landscape components and the absence of encroaching disturbances; and (3) ***unity***, the visual coherence, composition, and harmony of landscape elements. Visual quality ratings of either "low", "moderate", or "high" were assigned to each characteristic landscape setting.

Low - The landscape setting is common to the region and exhibits few, if any, memorable features or patterns which provide visual diversity. A prevalence of encroaching man-made elements or landscape modifications exist which do not compatibly blend with the natural surroundings (low visual intactness and unity).

Moderate - The landscape setting exhibits reasonably attractive natural and man-made features/patterns, although they are not visually distinctive or unusual within the region. The landscape integrity of the area provides some positive visual experiences, for example natural open space with some existing disturbance (e.g., hiking trails), or well-maintained industrial parks and residential areas.

High - The landscape setting exhibits distinctive and memorable visual features (e.g., landform, rock outcrops) and patterns (e.g., vegetation, open space) which are largely undisturbed--usually a rural or open space setting. Development or visual disturbances, if present, are exceptionally well-planned to integrate with the natural landscape materials and character.

Viewer Sensitivity

Viewer sensitivity was also evaluated for each characteristic landscape setting. The "low", "moderate", or "high" levels are dependent on viewer types and exposure (i.e., number of viewers and frequency of views), view orientation and duration, and viewer awareness/sensitivity to visual changes. Primary viewer types include residents, highway tourists and local travelers, people engaged in recreation activities in parks, beaches and open space (e.g., swimming, surfing, hiking, biking, picnicking), industrial workers at the power plant, tourists and shoppers in commercial areas, and agricultural workers. Levels of viewer sensitivity were evaluated using the following general criteria:

Low - The primary viewer types generally include industrial, commercial, and agricultural workers. The numbers of viewers are generally smaller and the duration of view is shorter.

Viewer activities typically limit awareness/sensitivity of the visual character of the area. The orientation and extent of views are generally partially screened by landscaping or adjacent buildings.

Moderate - The primary viewer types are local travelers and commuters along Honoapiilani Highway and North Kihei Road. The numbers of viewers vary depending on location; however, on average, they tend to be low, based on overall low population densities of the West Maui study area. Viewer awareness and sensitivity are moderate because local travelers and commuters are typically more focused on driving, especially during peak traffic hours.

High - Residential and recreational/tourist viewer types are highly sensitive based primarily on their awareness and sensitivity to any change in the visual character of the surrounding landscape setting. The numbers of viewers of this type depends on location and time of year. The extent of visibility is based on roadside edge conditions along destination travel routes and the extent of landscape screening.

4.12.1 Affected Environment

This section describes the visual quality and sensitivity of the preferred alignment and switching station site.

Regional Overview

The study area is located makai of the West Maui Forest Reserve, in the general vicinity of the two existing 69KV transmission lines. The visual character of the study area is primarily rural and undeveloped with gently sloping to dramatically steep terrain. The West Maui Mountains rise abruptly from the edge of cane fields or from Honoapiilani Highway. The steep slopes are deeply dissected by prominent gulches and ravines. Development is limited to scattered residences, a shooting range and agricultural features, including cane haul roads and irrigation ditches.

The switching station site is located off of Lahainaluna Road which extends toward the mountains from the town of Lahaina. The visual character of the proposed site is common to the area's cane fields and located adjacent to an existing water tank.

Transmission Line

Some segments extend across landscape settings that are similar in visual character, quality and perceived sensitivity by accessible viewers. This section describes these segments and, where appropriate, references or combines segments that possess similar visual character, quality and sensitivity.

Segment 1 is the only segment located along a roadway close to motorists (Figure 4.12-10). This segment is located along North Kihei Road between the Honoapiilani Highway intersection and the Maalaea Power Plant. The roadside edge is disturbed by cane field activities. Visual quality is agricultural, moderate to high based on backdrop mauka views of the West Maui Mountains and sensitive makai views of Maalaea Bay. Visual unity and intactness are high as a result of the character of the cane fields and the natural fields across North Kihei Road. The vividness compared to other segments is considered high, due to the makai ocean views when traveling toward Kihei. The visual sensitivity of the makai views is high for tourists traveling in the makai direction along North Kihei Road.

Segments 2 and 3 exhibit low visual quality due to the visual disturbance from the two existing 69KV transmission lines crossing Honoapiilani Highway and the open fields mauka of the highway (Figure 4.12-3). Visual intactness, unity and vividness are all low. The sensitivity is considered moderate, since the viewer's orientation is generally beyond these areas toward the mountains and/or the ocean views. The visibility of these segments is high; however, the quality of the area and the orientation indicate a moderate level of sensitivity.

Segment 4 is unique based on the character of the terrain, vegetation and orientation toward viewers. The visual quality of this segment is moderate, due to the visibility of the existing 69KV transmission lines and access roads that are parallel to the preferred alignment. However, due to the vastness of the overall landscape setting and the character of the existing transmission lines and access roads, the disturbance is considered subordinate. Visual sensitivity is high, due to the open visibility and viewer orientation for tourists traveling north on North Kihei Road and in both directions on Honoapiilani Highway.

Segments 5 through 8 traverse terrain that is not visible from sensitive viewpoints. The visual character of these segments is rolling terrain with mixed grassland/shrubland vegetation, including low-lying aalii shrubs and scattered stands of ironwood trees. Visual quality is generally high, due to the lack of visual disturbance and natural character of the landscape. Unity and intactness are high. Malaowaiaole and Manawainui Gulches (Segment 6) represent unique visual elements which provide a high level of vividness to this segment. The visual sensitivity of these segments is low due to minimal or no visibility from Honoapiilani Highway.

Segment 9 is similar in visual character to Segment 4. The ridgeline topography is steep with scattered grassland vegetation. Visual quality is moderate to high based on high unity and intactness. Visual sensitivity is low due to partially-screened visibility from tourist and local travelers along Honoapiilani Highway.

Segments 10 through 14 extend along lower slopes of the West Maui Mountains on the makai side of the existing 69KV transmission lines. The visual character of this transition area from agricultural cane fields to rugged mountainous terrain is rolling topography with a variety of low-lying vegetative species. Visual quality is moderate due to the continued disturbances of agricultural activities and the presence of the shooting range located across the highway from Ukumehame Beach State Park. The shooting range represents the closest public access point along these segments of the preferred alignment with open unobstructed views of the transmission line. Unity and intactness are low to moderate. The visibility of the eastern portion of Segment 10 is high because of the lack of screening and close proximity of viewers at the shooting range. However, the sensitivity is evaluated as moderate, because of the type of activity at the shooting range and existing visual disturbance by the range itself. Segments 11 through 14 also possess moderate sensitivity due to variable screening from mature cane fields and other roadside vegetation along Honoapiilani Highway.

Segment 15 crosses Olowalu Stream, which is high in visual quality due to the vividness of the landscape character which consists of prominent topographic features created by the unique steep terrain of the valley. Unity and intactness are also high. Visual sensitivity is low to moderate due to the partially-screened views and the distance of the preferred alignment from Honoapiilani Highway (approximately one mile) and the fact that tourists and local travelers are generally oriented toward ocean views due to dense cane fields on the mauka side of the highway.

Segments 16 through 18 traverse more mountainous terrain above the Quarry towards Puu Hipa. The visual quality of these segments is moderate to high due to the uniqueness of the diverse topography of the Quarry and Puu Hipa. The vividness and intactness of these segments create a higher visual quality for the area. The two existing transmission lines slightly detract from the quality of the area. The overall visual quality is low to moderate. The visual sensitivity of these segments is generally low, due to the limited to no visibility from Honoapiilani Highway.

Segments 19 through 23 extend along the base of the steep slopes of the West Maui Mountains across open shrubland with more rocky terrain, dense grasses and scattered stands of Kiawe trees. Visual character is moderate to high because of the degree of unity and intactness, and the vividness of Launiupoku Stream, Kauaula Reservoir and Piilani Ditch. These landscape features create unique elements along these segments and increase their visual quality. The visual sensitivity of these segments is low primarily due to their distance from Honoapiilani Highway and the scattered residences of Lahaina. The visibility of Segments 22 and 23 is generally high from Lahainaluna Road near the proposed switching station site.

<u>Switching Station</u>

The three-acre Lahainaluna Switching Station site consists primarily of existing cane fields with no perimeter screening. Piilani Ditch and Paupau Ridge form the backdrop for views from Lahainaluna Road and Lahainaluna High School (Figure 4.12-9).

Visual quality is moderate due to the common landscape pattern of cane fields and moderate to high levels of unity and intactness. The topography of the site is gently sloping toward Lahaina, which increases the orientation and its potential visibility. Visual sensitivity is also moderate, due to the visual quality and viewer types found in the area. Viewer types generally include local residents of Lahaina Town, sugar mill workers and school district employees.

4.12.2 Potential Impacts

This section describes: criteria used to evaluate potential impacts and their significance; the, methods and results of the visibility analyses, including two computer-generated simulations of the transmission line; and potential visual impacts of the proposed transmission line and switching station.

Criteria

The potential for visual impacts was evaluated in terms of visual resource change and project visibility/viewer sensitivity. The visual resource changes anticipated as a result of the proposed project alignment were evaluated using two criteria:

(1) **Visual dominance** of project features (i.e., degree of visual character change). Visual dominance is an assessment of the contrast between the proposed transmission line and switching station and their setting, and indicates the amount of attention a feature is expected to attract, using the following range:

- **Not Evident:** visible, but not generally noticed;
- **Subordinate:** noticeable, but attracts less attention than other components of the visual setting;
- **Co-Dominant:** project attracts attention equally with other components of the setting; and
- **Dominant:** project dominates the view and attracts more attention than other components of the setting. Visual elements of scale, form, line, color, and texture determine the degree of contrast and dominance. Dominance is a descriptive rather than evaluative measure of change.

(2) **Visual quality** change. Visual quality is assessed in terms of a view's vividness, intactness, and unity, and is an evaluative measure of change.

In addition to these two basic assessments of visual change, other topics were examined:

- View obstruction or degradation;
- Community disruption, changes in viewer orientation; and
- Visual compatibility with existing landscape character.

The significance of impacts was determined by considering the combination of visual dominance, visual sensitivity and degree of change in visual quality. High sensitivity and moderate visual quality change or moderate sensitivity and a high visual quality change would be considered a potentially significant visual impact. Where sensitivity and visual quality change were both moderate, both low, or a combination of low and moderate, impacts were considered non-significant.

Visibility Analysis

The preferred alignment traverses mostly undeveloped terrain with no or limited public access. There are three primary public travel routes (the Lahaina Pali Trail, Honoapiilani Highway, and North Kihei Road), one residential/tourist community (Lahaina), and scattered local residences (Olowalu/Mopua) with potential views of the alignment that were considered as part of this analysis. The following discussions highlight the methods of evaluating the visibility from these four viewing areas and the overall results of the visibility analyses.

Lahaina Pali Trail

During the routing study, the Na Ala Hele Trails and Access Program, administered by the Department of Land and Natural Resources, Division of Forestry and Wildlife expressed concerns regarding the potential visibility of the proposed transmission line from the Lahaina Pali Trail. Na Ala Hele is restoring the trail located in the West Maui Mountains as a "demonstration" trail. The trail represents the closest public access and sensitive viewpoint for the eastern section of the project from Honoapiilani Highway near the Maalaea Power Plant to the trailhead located on the mauka side of the highway near Ukumehame Beach State Park.

In September 1992, Dames & Moore conducted a computerized viewshed analysis for the Lahaina Pali Trail. The purpose of the study was to: (1) provide for a factual rather than speculative basis for evaluating issues and concerns of transmission line visibility from the trail; (2) aid in discussions with DLNR and Na Ala Hele; and (3) assist in the selection of a preferred corridor for detailed study to locate a suitable alignment for the transmission line. The Lahaina Pali Trail viewshed analysis is presented as Appendix I. Appendix I includes a viewshed map which shows areas in which poles would be visible from the trail.

A series of twenty-nine viewpoints were chosen along the trail representing areas with the greatest potential visibility. A computer geographic information system was used to generate a viewshed map. A digital terrain model for the areas was produced from a USGS 1:24,000 scale digital data base. For each of the 29 trail viewpoints, the computer "looked" at the whole study area to calculate whether a pole 49 feet (15 meters) or higher would be visible from that viewpoint. The first viewshed modeling exercise generated a "seen" or "unseen" determination for each viewpoint. Data from all viewpoints were then combined to produce a final composite viewshed map. The results of the analysis and map are presented in Appendix I. The map illustrates the visible areas and their concentration based on the composited number of viewpoints along the trail from which a hiker would potentially see a transmission pole. Visibility was divided into four classes: none, low (seen from one to four viewpoints), moderate (five or six viewpoints), and high (seven or more viewpoints).

The implications of siting the line in a mauka, central or makai corridor were evaluated to consider potential visual issues together with other characteristics of the corridors. Table 4.12-1 provides an overview of the other factors evaluated for the three corridor alternatives. The mauka corridor was eliminated because it was located in extremely unstable steep terrain that contained considerable high-value wildlife habitat and native vegetation. The makai corridor was eliminated at the request of DLNR because it crossed the trail and was very visible from several points along the trail.

In December 1992, the central corridor was selected by both DLNR and MECO as the preferred corridor for locating an alignment. The central corridor had no trail crossing and did not parallel the trail in close proximity, resulting in none to very low visibility. This corridor also allowed the transmission line to avoid significant archaeological sites and native plant communities.

Following selection of a preferred corridor, MECO conducted a field visit to evaluate alternative alignment locations which would not impact views from the trail (March 3, 1993). A preliminary preferred alignment that was acceptable to MECO and DLNR was selected and mapped (March 24, 1993). In June 1993, DLNR requested that MECO reevaluate the location of the selected alignment (Segment 4) as it proceeds up a ridge parallel to the Lahaina Pali Trail. A meeting, field visit and helicopter flyover were conducted in late June 1993 and the alignment location was moved to a ridge closer to the existing 69KV transmission lines. The realignment was confirmed as acceptable in a letter from DLNR, Maui District to MECO on July 6, 1993.

Table 4.12-1
COMPARISON OF CORRIDORS SURROUNDING LAHAINA PALI TRAIL

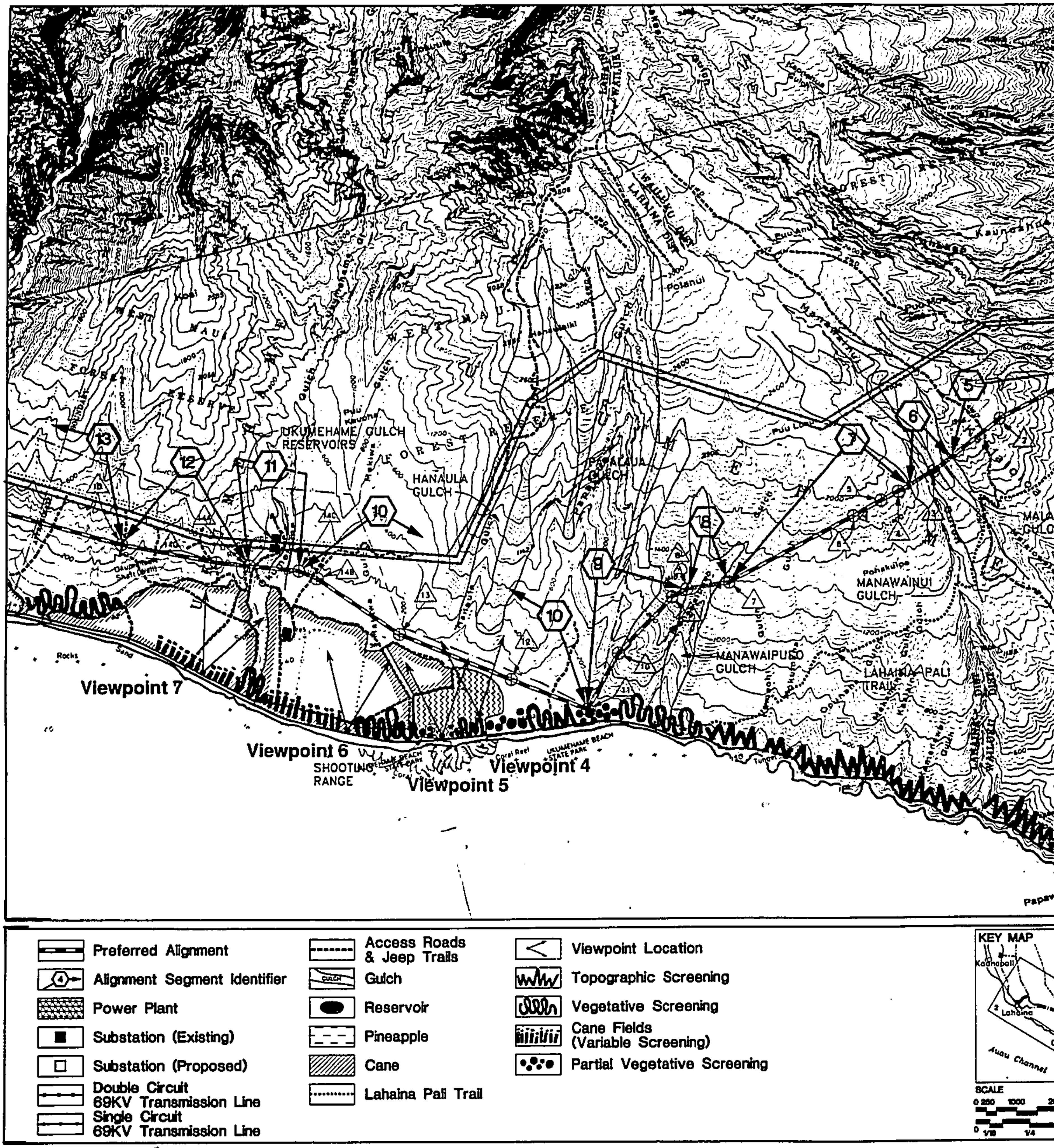
CATEGORY	MAUKA CORRIDOR	CENTRAL CORRIDOR	MAKAI CORRIDOR
Route Length (miles)	5.68	4.20	4.04
Access	Poor - Needs to be developed	Fair	Good
Constructibility	Difficult	Difficult	Fair
Crosses Existing 69KV Transmission Lines	Yes	No	No
Maintenance - Repair Response Time	3 + Hours	2 + Hours	< 1 hour
Terrain - Geology	Slope instability Extremely Mountainous	Mountainous	Moderate Slopes
Slope	>40%	>30%	10-30%
Biological resources	Rich	Few	Few
Archaeological Resources	Few	Few	Rich
Visibility from Lahaina Pali Trail	Not Visible	Low Visibility 1.4 miles along Upper Part of Trail	High Visible 0.4 mile - Lower Part of Trail at Whale Watching Area
Crosses Lahaina Pali Trail	No	No	Yes

Honoapiilani Highway

The visibility analysis also evaluated general viewing conditions along Honoapiilani Highway as either "screened," "partially screened," or "open." The analysis consisted of mapping existing roadside vegetative, topographic, and agricultural screening (Figure 4.12-1 and 4.12-2). Vegetative screening consists of dense shrubbery, large shade trees, and wind breaks planted with wili-wili trees. Topographic conditions include small earthen berms caused by agricultural operations, road cuts, and steep hillside terrain. Agricultural screening consists of sugarcane which grows to heights of 15 feet to 18 feet and can provide a dense visual screen for up to 14 months. The degree of agricultural screening also depends on the difference in elevation between the field and the roadside. The visibility analysis documented viewing conditions at the time of the study. However, screening conditions will change with sugarcane growth/harvest cycles. It is a rarity that all fields are cleared at one time, and the fields remain fallow only temporarily (one or two months) before being replanted. Therefore, some of the areas designated as screened may have temporary views of the transmission line after harvesting.

The visibility analysis for Honoapiilani Highway identified that a majority of the alignment segments result in either not evident or subordinate dominance levels, due to roadside edge conditions, the visual character of the area, or distance to the alignment. The exceptions are Segments 2, 3, 4, 10, 11, 12, and 14, which were determined to be co-dominant, due to their visual character and proximity of the alignment to the highway.

Segments 2, 3, and 4 would be visible where they cross Honoapiilani Highway and extend up the ridgeline which is perpendicular to the highway. The existing 69KV transmission lines currently orient the viewer in the direction of the proposed third line. Segment 10 would be visible from the shooting range and from the highway immediately west of the shooting range entrance. Segments 11, 12 and 14 would be intermittently visible from the highway, with partial screening provided by mature cane fields. Examples of the existing roadside edge conditions, key viewpoints, and approximate location of the preferred alignment are shown in Figures 4.12-3 through 4.12-9.



UKUMEHAME GULCH RESERVOIRS
HANAULA GULCH
PAPALAUA GULCH
MANAWAINUI GULCH
MANAWAIPUEO GULCH
LAHAINA PALI TRAIL
Viewpoint 7
Viewpoint 6
SHOOTING RANGE
Viewpoint 5
Viewpoint 4
Preferred Alignment
Alignment Segment Identifier
Power Plant
Substation (Existing)
Substation (Proposed)
Double Circuit 69KV Transmission Line
Single Circuit 69KV Transmission Line
Access Roads & Jeep Trails
Gulch
Reservoir
Pineapple
Cane
Lahaina Pali Trail
Viewpoint Location
Topographic Screening
Vegetative Screening
Cane Fields (Variable Screening)
Partial Vegetative Screening
KEY MAP
SCALE

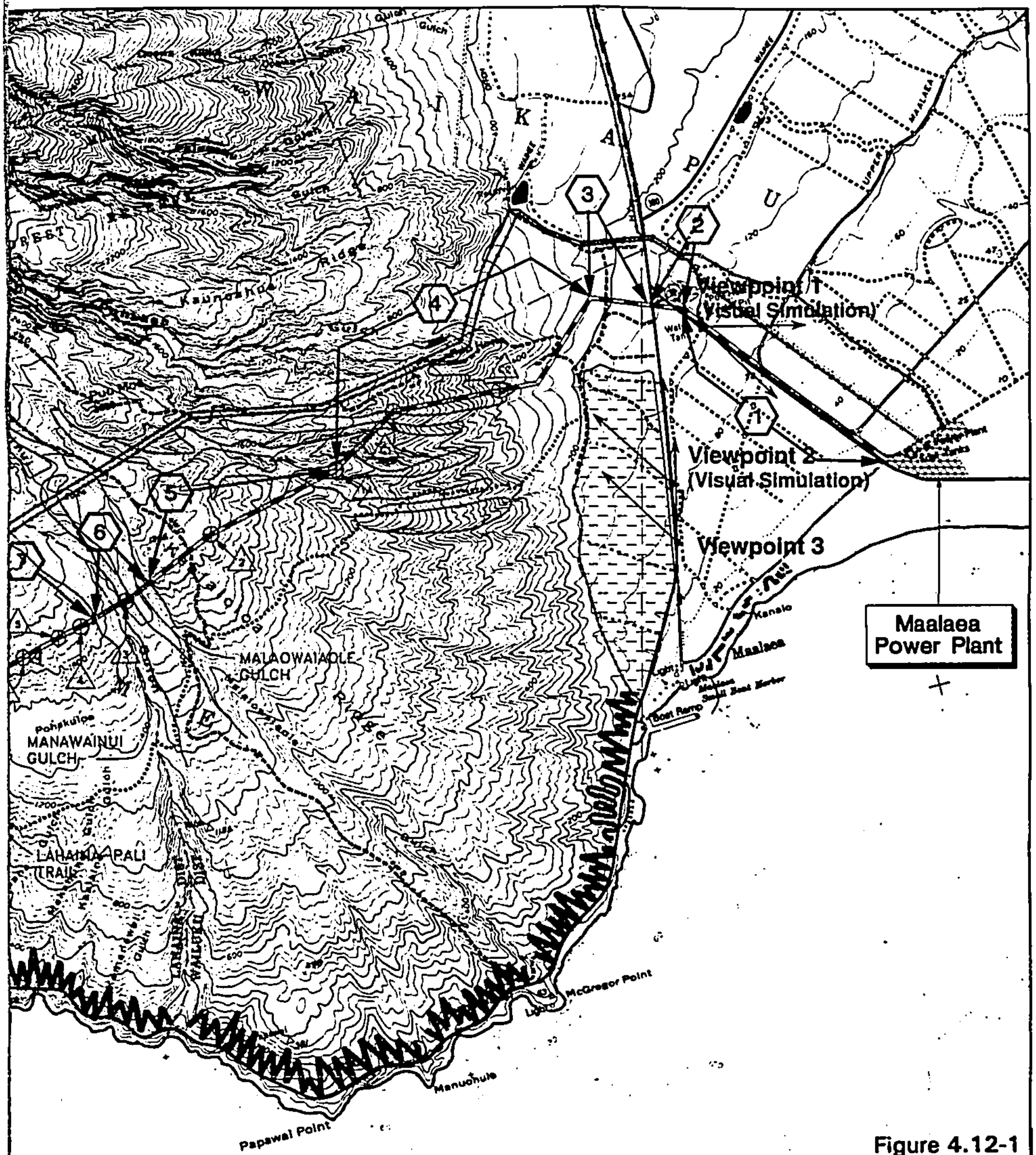
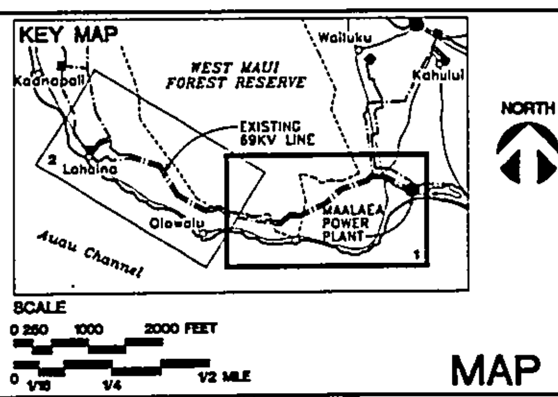


Figure 4.12-1



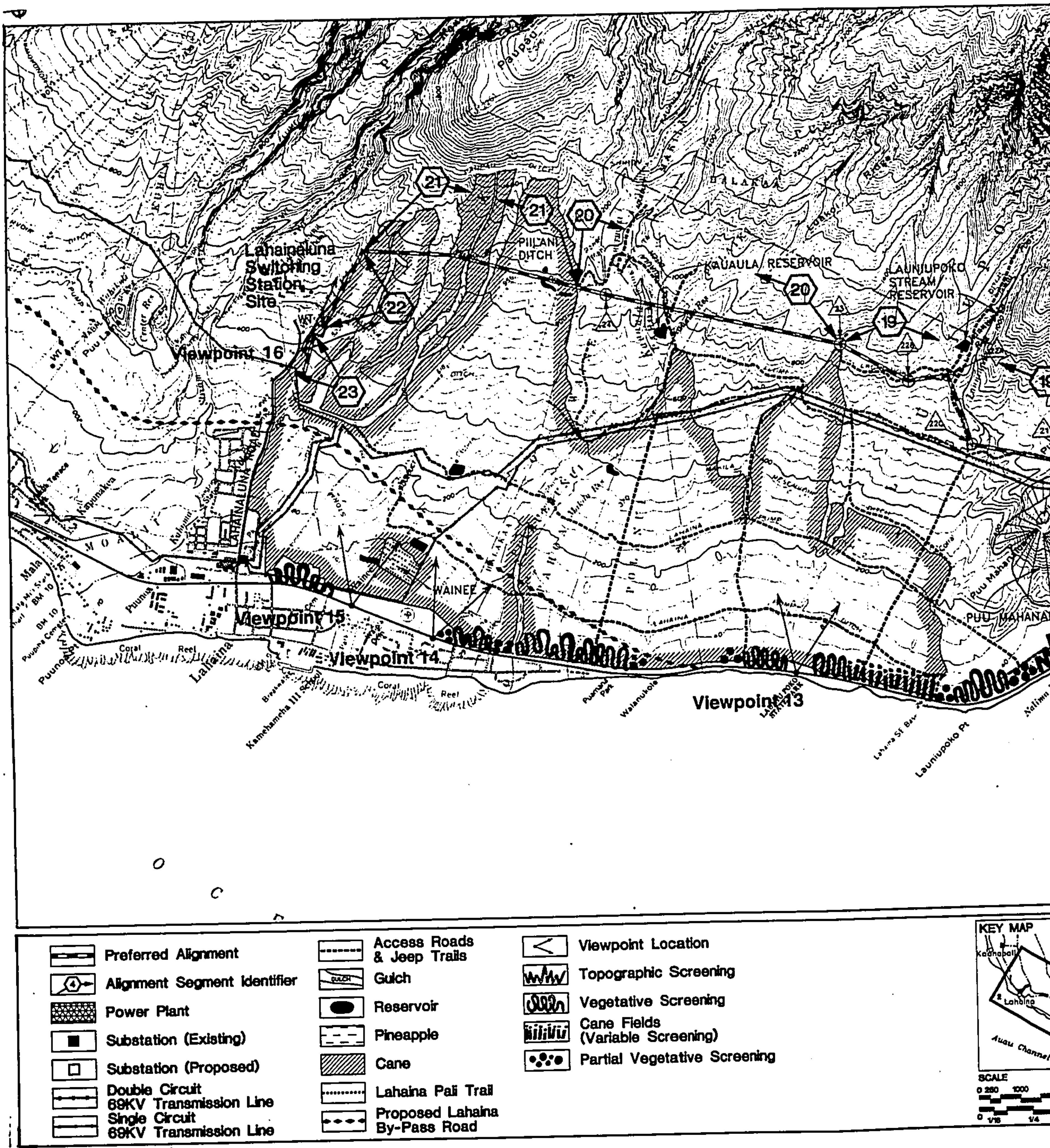
MAP 1

Visibility and Viewpoint Locations

Maalaea-Lahaina Third 69kV Transmission Line Project

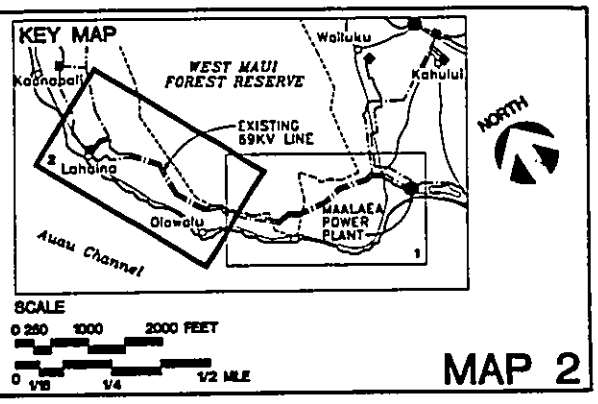
Maui Electric Company, Ltd.

DAMES & MOORE



Lahainaluna Switching Station Site
Viewpoint 16
Viewpoint 15
Viewpoint 14
Viewpoint 13
PIILANI DITCH
KAUAULA RESERVOIR
LAUNIUPOKO STREAM RESERVOIR
WAINEE
PUU MAHANA
Lahaina
Puunoa Pt
Kamehameha III School
Walanukole
Launiupoko Pt
Coral
Reef
21
20
22
23
19
Preferred Alignment
Alignment Segment Identifier
Power Plant
Substation (Existing)
Substation (Proposed)
Double Circuit 69KV Transmission Line
Single Circuit 69KV Transmission Line
Access Roads & Jeep Trails
Gulch
Reservoir
Pineapple
Cane
Lahaina Pali Trail
Proposed Lahaina By-Pass Road
Viewpoint Location
Topographic Screening
Vegetative Screening
Cane Fields (Variable Screening)
Partial Vegetative Screening
KEY MAP
Kaanapali
Lahaina
Auau Channel
SCALE

Figure 4.12-2



Visibility and Viewpoint Locations

Maalaea-Lahaina Third 69kV Transmission Line Project

Maui Electric Company, Ltd.

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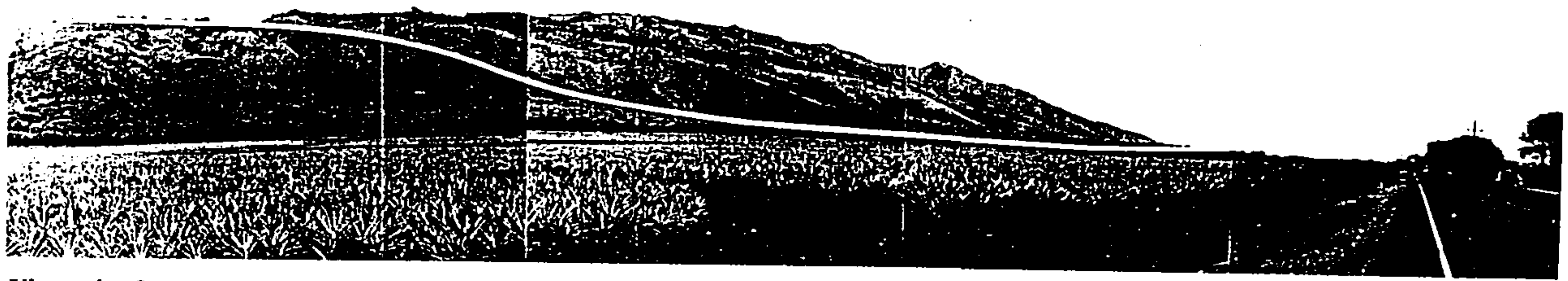
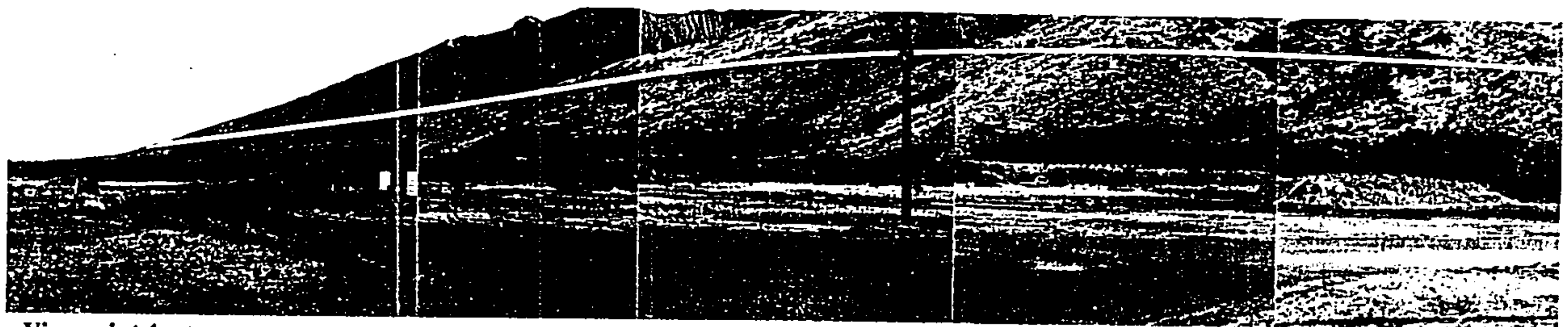


Viewpoint 3: • *View direction*: north (mauka) from Honoapiilani Highway to intersection with North Kihei Road (Segments 3 & 4) • *Visibility/edge conditions*: open, unobstructed, low growth pineapple fields • *Distance to project*: < .7 mile • *Dominance level*: co-dominant, project increases view orientation and contrast from existing lines



Viewpoint 4: • *View direction*: north (mauka) from entry road to Shooting Range (Segment 10) • *Visibility/edge conditions*: open, unobstructed, no screening • *Distance to project*: > .25 mile, one of closest visible project locations • *Dominance level*: co-dominant, contrasts with foreground views; subordinant - views westward.

VISUAL ANALYSIS

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Maalaea-Lahaina Third 69kV Transmission Line Project

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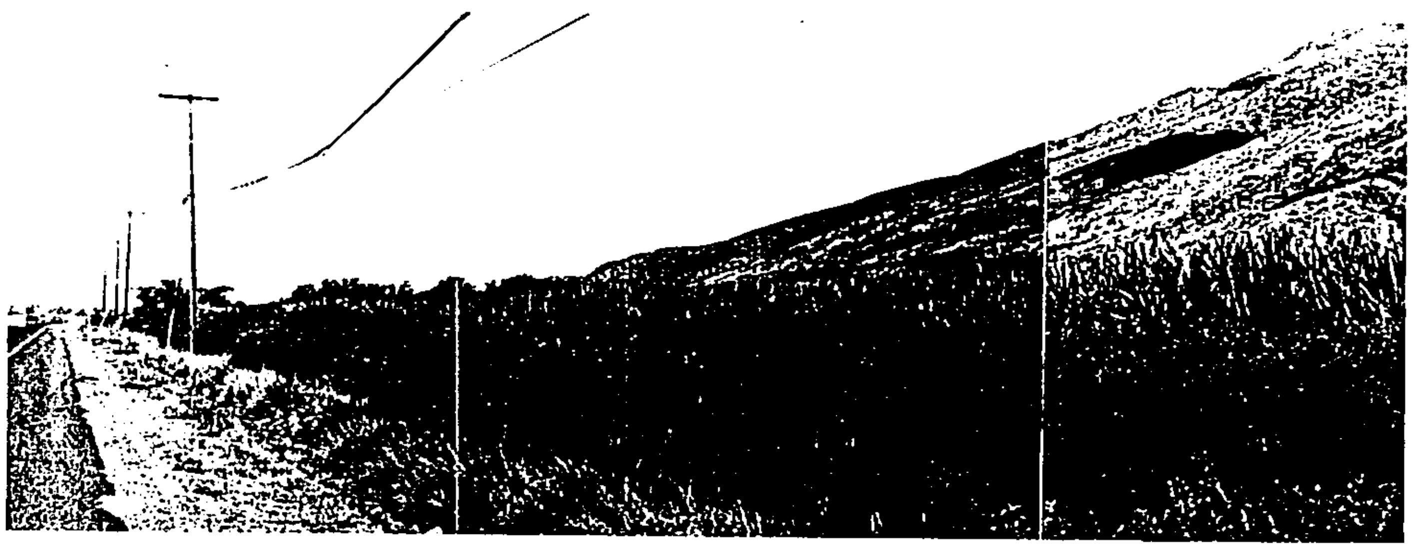
Figure 4.12-3

Viewpoint 5: • *View direction*: northwest (mauka) from Honoapiilani Highway across Shooting Range (Segment 10) •*Visibility/edge conditions*: open to partially-screened roadside vegetation •*Distance to project*: > .5 mile • *Dominance level*: subordinate, is not evident for existing line.



Viewpoint 6: • *View direction*: northwest (mauka) from Honoapiilani Highway to Ukumehame Gulch (Segments 11 & 12) • *Visibility/edge conditions*: partially-screened to fully-screened, cane and roadside shrubs • *Distance to project*: > .5 mile • *Dominance level*: not evident, no evidence of existing line.

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Maalaea-Lahaina Third 69kV Transmission Line Project

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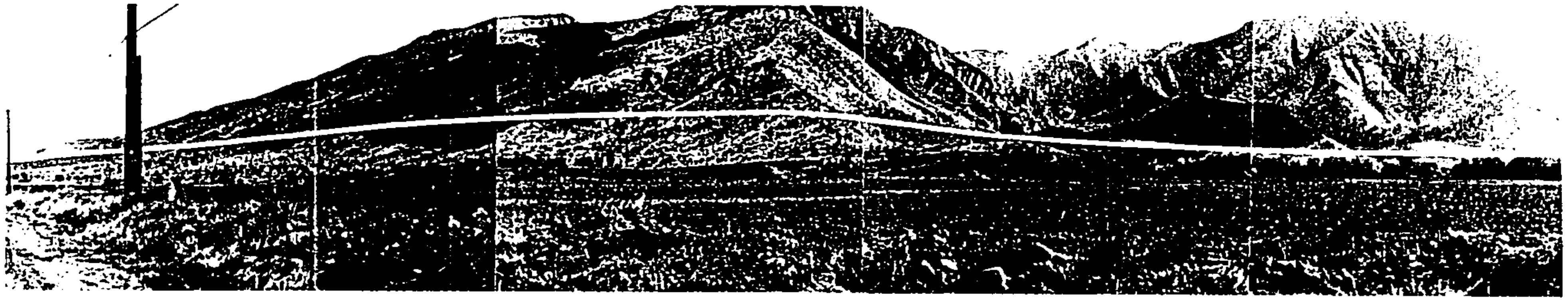
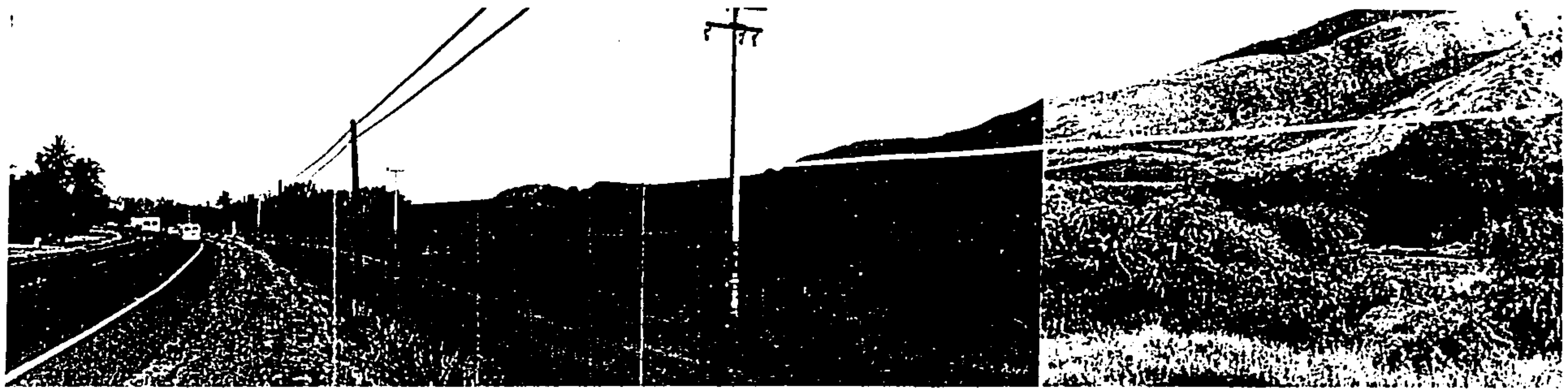
Figure 4.12-4



Viewpoint 7: • *View direction*: north view (mauka) from Honoapiilani Highway to Ukumehame Gulch crossing (Segment 11 & 12) • *Visibility/edge conditions*: open-recent burned cane field, potential for partial to full screening • *Distance to project*: <.4 mile • *Dominance level*: subordinate, existing lines are not evident.



Viewpoint 8: • *View direction*: northwest (mauka) from Honoapiilani to cane crossing (Segment 12) • *Visibility/edge conditions*: open-elevated road section, no potential screening • *Distance to project*: < .5 mile • *Dominance level*: subordinate, existing lines are not evident.

VISUAL ANALYSIS

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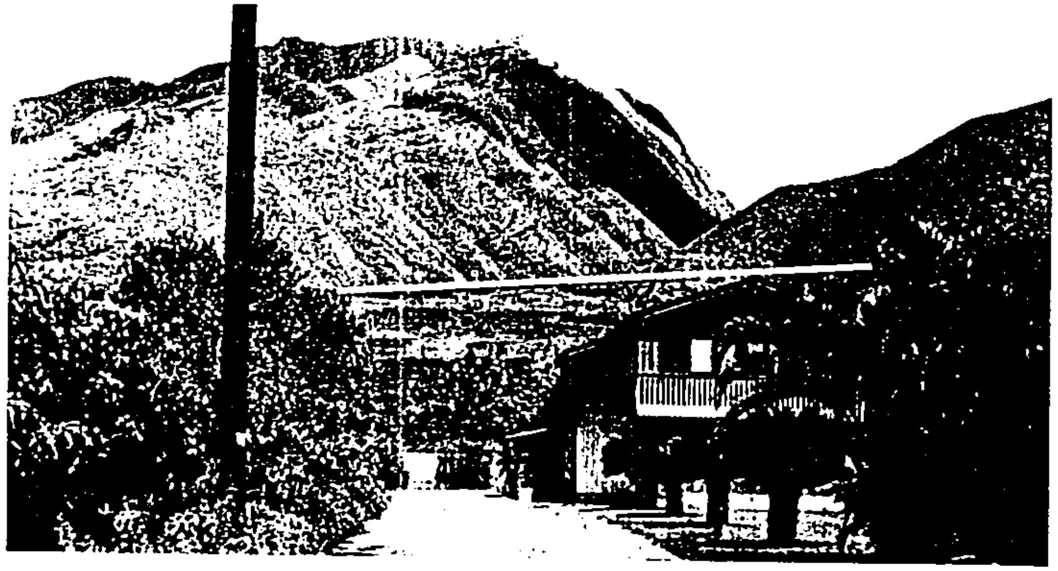
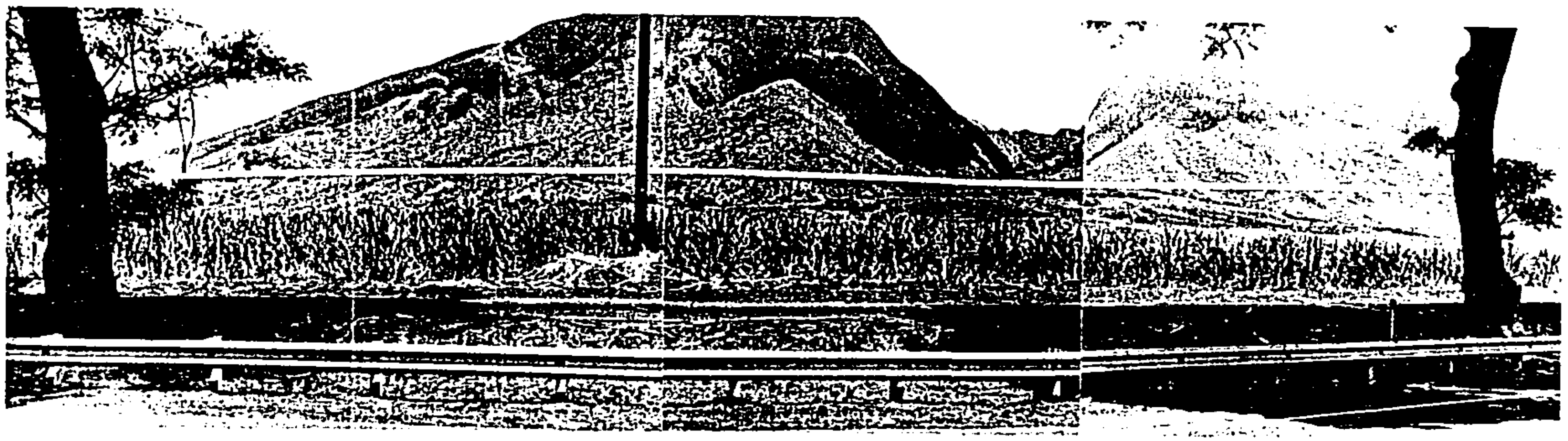
Maalaea-Lahaina Third 69kV
Transmission Line Project
Maui Electric Company, Ltd.

Figure 4.12-5



Viewpoint 9: • *View direction*: northeast (mauka) from Mopva residents to Olowalu Stream crossing (Segment 13 & 14) • *Visibility/edge conditions*: open, partially screened by vegetation and structures • *Distance to project*: > .5 mile • *Dominance level*: not evident.



Viewpoint 10: • *View direction*: north (mauka) from Honoapiilani Highway at Hekili Point to Olowah Stream crossing (Segment 14 & 15) • *Visibility/edge condition*: open to partially-screened, roadside trees and cane, potential for full screening • *Distance to project*: > .75 mile • *Dominance level*: not evident.

VISUAL ANALYSIS

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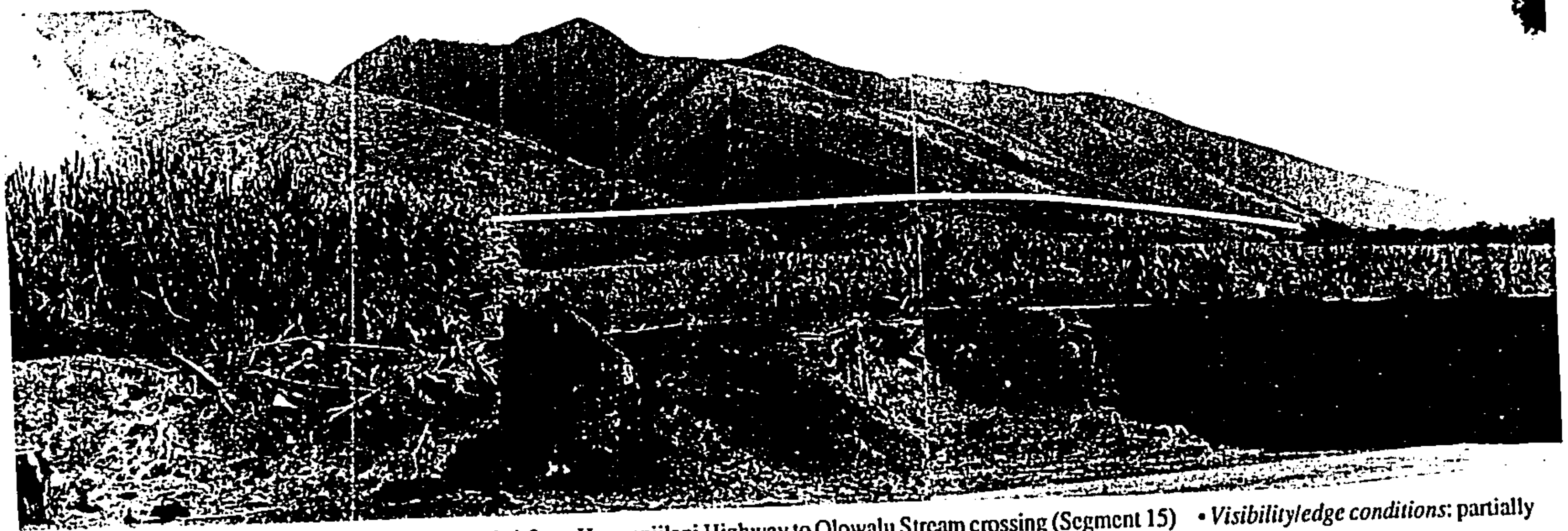
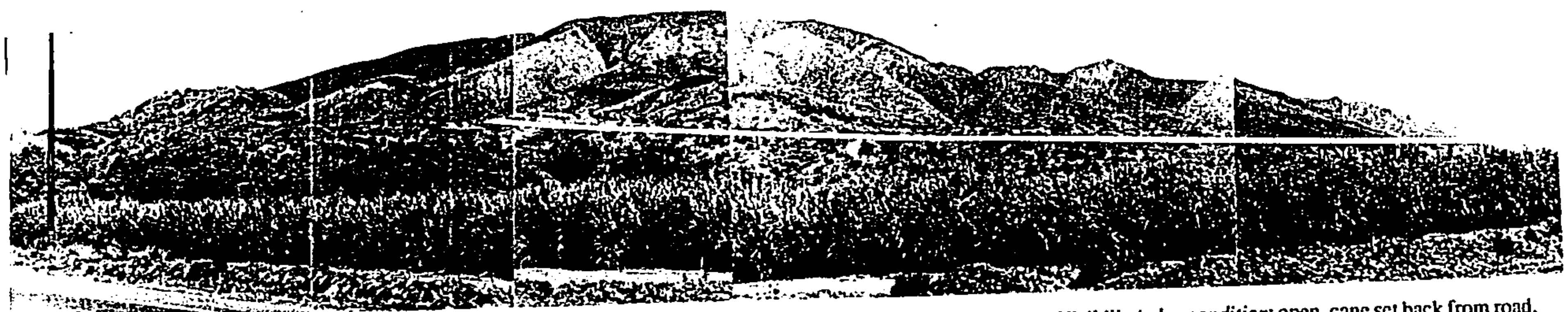
Maalaea-Lahaina Third 69kV Transmission Line Project
Maui Electric Company, Ltd.

Figure 4.12-6



Viewpoint 11: • *View direction*: northeast (mauka) from Honoapiilani Highway to Olowalu Stream crossing (Segment 15) • *Visibility/edge conditions*: partially screened-screened, variable height of cane affects screening • *Distance to project*: < .8 mile • *Dominance level:* not evident



Viewpoint 12: • *View direction*: northeast (mauka) from Honapiilani Highway to west side of quarry (Segment 16) • *Visibility/edge condition*: open, cane set back from road, potential for partial screening • *Distance to project*: < .6 mile • *Dominance level*: subordinate, existing line is not evident

Maalaea-Lahaina Third 69kV
Transmission Line Project
Maui Electric Company, Ltd.

VISUAL ANALYSIS

Figure 4.12-7

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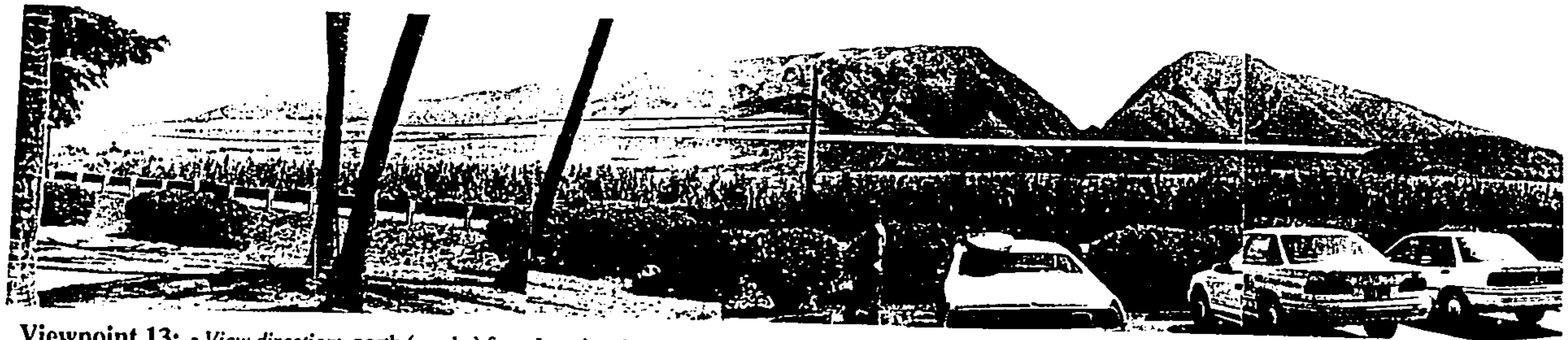
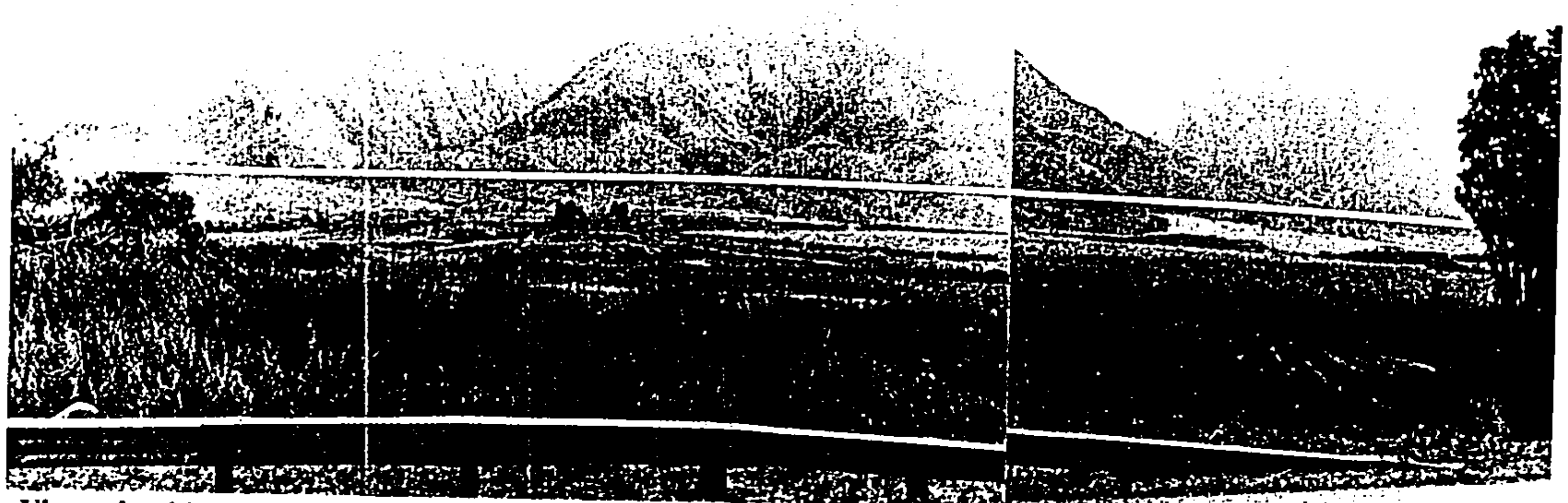


Viewpoint 13: • *View direction*: north (mauka) from Launiupoko Park to Launiupoko Stream/Gulch (Segment 19) • *Visibility/edge conditions*: open, unobstructed • *Distance to project*: > 1.5 miles • *Dominance level*: not evident.



Viewpoint 14: • *View direction*: northwest (mauka) from Honoapiilani Highway to Ukumehame Gulch (Segments 20 & 21) • *Visibility/edge conditions*: open to partially-screened wili-wili trees and roadside shrubs • *Distance to project*: > 1.75 mile • *Dominance level*: not evident, no evidence of existing line.

VISUAL ANALYSIS

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Maalaea-Lahaina Third 69kV Transmission Line Project

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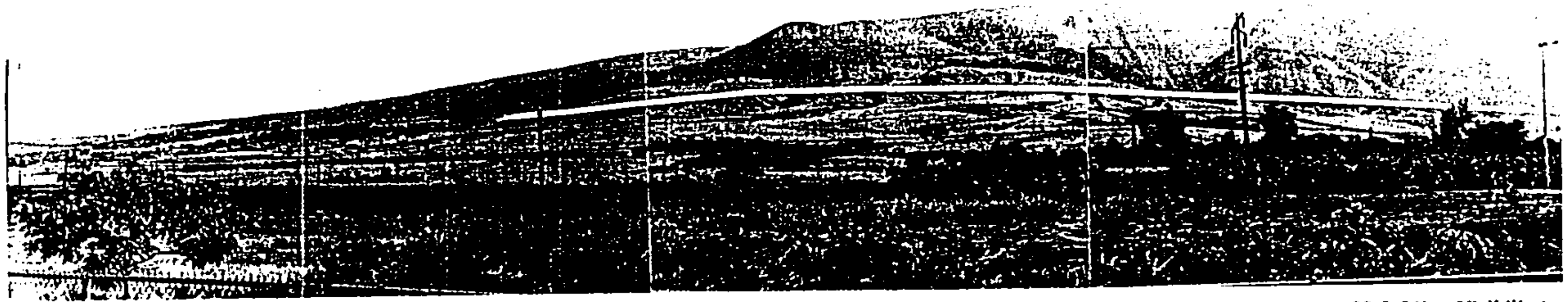
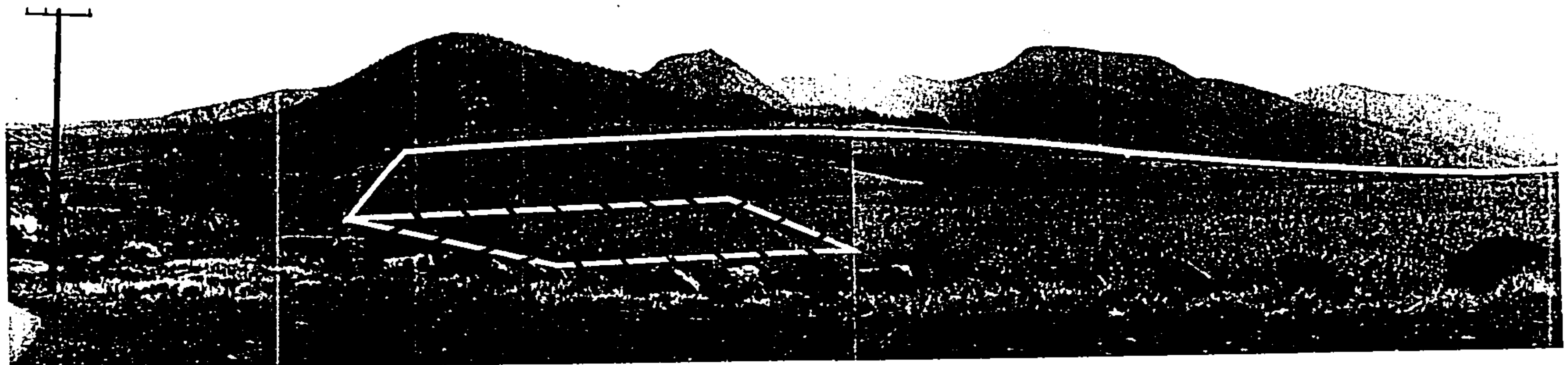
Figure 4.12-8



Viewpoint 15: • *View direction*: northeast (mauka) from Honoapiilani Highway across Wainee residential community to Piilani Ditch (Segments 20 & 21) • *Visibility/edge conditions*: open, unobstructed • *Distance to project*: < 1.75 miles • *Dominance level*: not evident



Viewpoint 16: • *View direction*: east (mauka) from Lahainaluna Road adjacent to Lahaina Intermediate School to switching station site (Segments 21 & 22) • *Visibility/edge conditions*: open, unobstructed • *Distance to project*: > .15 mile • *Dominance level*: Dominant, contrast level is high from character of switching station and hillside background.

Maalaea-Lahaina Third 69kV Transmission Line Project
Maui Electric Company, Ltd.

VISUAL ANALYSIS

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Figure 4.12-9

North Kihei Road

Visibility from North Kihei Road was evaluated using the same method as was used for Honoapiilani Highway. Views along North Kihei Road are generally open with limited and variable screening by cane fields. The Maalaea Power Plant is predominantly screened by dense vegetation for motorists traveling north and south. The power plant is visible across cane fields from the Honoapiilani Highway intersection to approximately 0.15 mile from the power plant. The two power plant stacks are visible from the road from the Honoapiilani Highway intersection to Sugar Beach Resort.

The visibility of Segments 1 and 2 is open and unobstructed. The combination of viewing conditions in this segment is unique. The visual simulation prepared for Viewpoint 1 (Figure 4.12-10) shows the appearance of the transmission line along North Kihei Road from the power plant proceeding towards Honoapiilani Highway.

Lahaina Town

The potential visibility of the line from Lahaina was evaluated during the field reconnaissance and analysis of Honoapiilani Highway. Views from residences or tourist viewpoints on the makai side of the highway would be blocked by vegetation and buildings. Visibility of the project from Wainee residences and the Lahaina Aquatic and Recreation Center on the mauka side of the highway would not be evident due to the distance of the alignment (over 1.5 miles) and the dominant visual character of the mountainous backdrop.

The visibility of the switching station site from Lahainaluna Road is open and unobstructed, due to topography and lack of roadside screening (see Figure 4.12-9). The agricultural character of the property will be influenced somewhat by the new switching station facility as it will add a human-made element to the landscape. Most of the switching station electrical equipment will be less than 10 feet high. The steel support structures will be approximately 35 feet high. The control house will be a low profile building approximately 10 feet high.

Olowalu/Mopua

Visibility from these small residential communities is generally open to partially-screened by existing vegetation and variable heights of sugarcane. The dominance level for these communities is subordinate to not evident, based on the distance to the alignment (one mile) and vegetative screening.

Transmission Line

Potential visual impacts of the proposed transmission line are summarized in Table 4.12-2. For each alignment segment, the table presents the three primary factors considered in the evaluation of potential visual impacts: (1) dominance level, (2) visual quality, and (3) visual sensitivity. Segments 1, 4 and 10 would result in moderate visual impacts. All other segments would result in a low visual quality change.

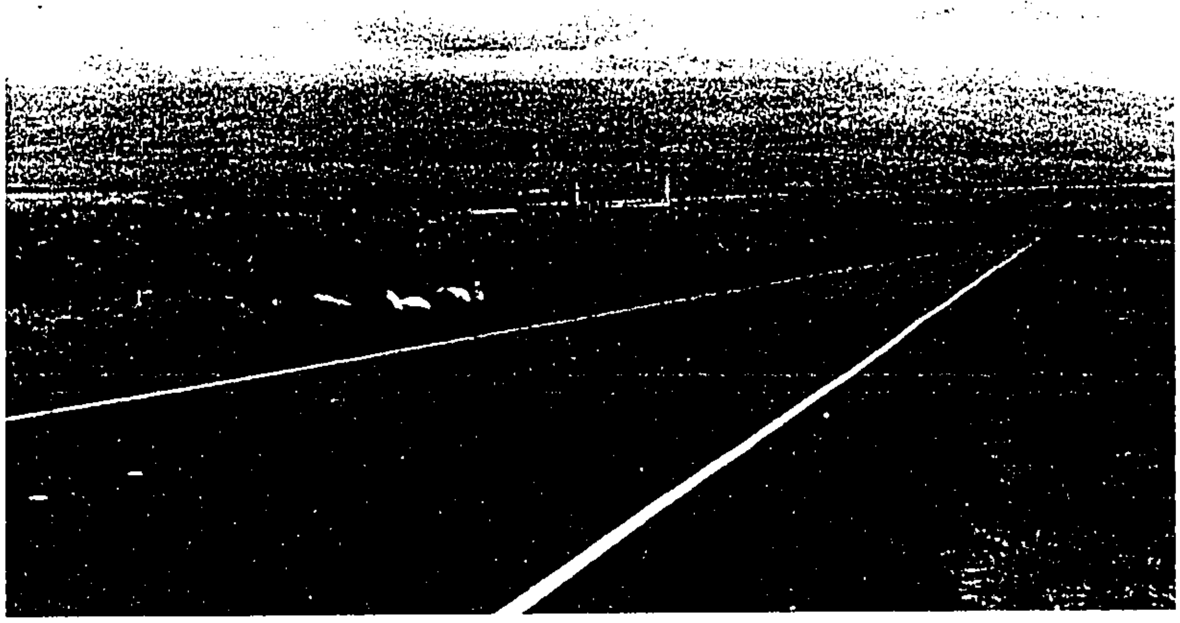
Along Segment 1 (North Kihei Road from the Honoapiilani Highway intersection to the Maalaea Power Plant) the proposed transmission line would introduce new poles which would represent a new man-made element in the landscape. Visual quality is moderate due to the presence of the power plant and visibility of the power plant stacks. Visual sensitivity is moderate due to the presence of motorists. The new poles would be co-dominant with the power plant in makai views. The change in visual quality due to the new poles would be moderate because of the dominance of the power plant. The visual impact is rated moderate and non-significant. Figure 4.12-10 simulates the project design and location of the alignment along North Kihei Road.

The visual impact of Segment 4 was rated moderate and non-significant. This is primarily due to the existence of the two 69KV transmission lines within the visual context of the preferred alignment. Visual sensitivity is moderate due to the presence of motorists along North Kihei Road and Honoapiilani Highway. The visual quality of the segment is degraded by the presence of the existing transmission lines and is rated moderate. In addition, the visibility of the preferred alignment would be reduced by the proposed coloring of the poles and the visual characteristics of the backdrop landscape. Therefore, the impact is moderate and non-significant.

Figure 4.12-11 is a simulation of the transmission line as viewed from Honoapiilani Highway. The simulation illustrates how the visibility of the project would diminish as it proceeds up the ridge of the West Maui Mountains. The view also demonstrates that the new line, like the existing transmission lines, is almost not visible.

Table 4.12-2
VISUAL IMPACTS SUMMARY

SEGMENT NUMBER	DOMINANCE LEVEL	VISUAL QUALITY	VISUAL SENSITIVITY	IMPACTS AND SIGNIFICANCE
1	Co-Dominant	Moderate	Moderate	Moderate/Non-significant
2 3	Co-Dominant	Low	Moderate	Low/Non-significant
4	Co-Dominant	Moderate	Moderate	Moderate/Non-significant
5 6 7 8	Not Evident	High	Low	Low/Non-significant
9	Subordinate	Moderate	Low	Low/Non-significant
10	Co-Dominant	Moderate	Moderate	Moderate/Non-significant
11 12	Co-Dominant	Moderate	Moderate	Low/Non-significant
13	Subordinate	Moderate	Moderate	Low/Non-significant
14	Subordinate	Moderate	Low	Low/Non-significant
15	Not Evident	High	Low	Low/Non-significant
16 17 18 19 20 21	Not Evident	Moderate-High	Low	Low/Non-significant
22 23	Subordinate	Moderate-High	Low	Low/Non-significant



Existing southeast view (makai) from North Kihei Road toward Maalaea Power Plant (Segment I)

VIEWPOINT 1: Visual simulation of 69kV powerline adjacent to North Kihei Road

Maalaea–Lahaina Third 69kV
Transmission Line Project

VISUAL ANALYSIS

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Figure 4.12–10

Existing view to the north (mauka) from Honoapiilani Highway to the intersection of North Kihei Road (Segments 2, 3, & 4).

VIEWPOINT 2: Visual simulation of 69kV powerline.

VISUAL ANALYSIS

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Maalaea–Lahaina Third 69kV
Transmission Line Project
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Figure 4.12–11

Segment 10 was also rated moderate and non-significant. The visual quality of the segment is degraded by the existing disturbances of the shooting range. The visual sensitivity is low because users of the shooting range are focused on the shooting activity rather than the visual quality of the area. The dominance level is considered co-dominant because of the closer proximity of the line to Honoapiilani Highway at the base of Papalaua Gulch and the open visibility in the vicinity of the entrance of the shooting range.

Visual impacts of all other segments were rated low and non-significant. Segments 2 and 3 were rated non-significant primarily due to the low visual quality of the area from the existing 69KV transmission lines. Segments 5 through 9 were considered non-significant because they would not be visible from Honoapiilani Highway or the Lahaina Pali Trail. Segments 11 through 13 were considered non-significant because of the variable screening along Honoapiilani Highway and the moderate level of visual quality and sensitivity. Segment 15 has high visual quality due to the Olowalu Stream crossing; however, the visibility is low and dominance level is not evident for views from Honoapiilani Highway, resulting in a non-significant impact. Segments 16 through 22 were also considered non-significant, due to the distance to the alignment from viewpoints along Honoapiilani Highway or in Lahaina. The dominance level is not evident and the design of the project would reduce any potential visibility.

<u>Switching Station</u>

The visual impacts associated with the proposed Lahainaluna Switching Station were evaluated as potentially significant but mitigable due to the change in visual character of the site and the degree of dominance of the project. The sensitivity of local viewers from Lahainaluna Road are considered moderate. However, the dominance level is dominant due to the contrast in visual character and quality of the site. The visual contrast with the surrounding cane fields is evaluated as high, due to the change from a natural/agricultural cane field to a developed industrial site.

4.12.3 Mitigation

The transmission line siting process has included extensive efforts to minimize or avoid visual impacts to sensitive views and historic/recreational values. Close coordination with Na Ala Hele trails and access specialists has resulted in an alignment that minimizes visual impacts to the Lahaina

Pali Trail. Alignment adjustments have avoided impacting the viewplanes from Hikii and Ukumehame heiaus toward the ocean.

Existing vegetative or topographic screening along Honoapiilani Highway reduces the visibility of the project from the highway. The exception is the necessary link from the Maalaea Power Plant along North Kihei Road to Honoapiilani Highway (Segment 1).

MECO is proposing to color all poles a sage/grey green color to reduce contrast and minimize visibility. Non-specular (i.e., non-reflective) conductors and insulators would be used throughout the project to minimize conductor and insulator visibility.

Landscaping will be installed around the fenced perimeter of the Lahainaluna Switching Station to screen the facility. Low maintenance plant materials would be used. Once the landscape screening becomes well established the contrast of the switching station with the surrounding landscape should be non-significant.

4.13 TRAFFIC

This section describes the existing transportation system in the study area, focusing on roadways potentially affected by the project. This section also describes potential impacts of construction and operation of the proposed project on those facilities and mitigation measures to avoid or reduce potential traffic impacts.

4.13.1 Affected Environment

<u>Regional Overview</u>

Honoapiilani Highway (State Route 30) is the only major roadway in the study area and the only link between West Maui and the rest of the island. (The Kahekili Highway extends along the north coast of the island but is only a single traffic lane in many places, providing limited access). Honoapiilani Highway originates in Wailuku and extends south through the isthmus, through Waikapu, to Maalaea, and follows the coast to Lahaina, continuing to Kaanapali, Honokowai, Kapalua, and Napili.

North Kihei Road (State Route 31) is a secondary thoroughfare that runs from Kihei past the Maalaea Power Plant to Honoapiilani Highway. Most Kihei traffic follows Mokulele Highway to Puunene and Kahului, rather than using North Kihei Road.

Kuihelani Highway (State Route 330) extends east of and generally parallel to Honoapiilani Highway between Kahului and Honoapiilani Highway, intersecting Honoapiilani Highway approximately 0.5 mile north of Kihei Road.

Minor roadways, many of them unimproved, provide local circulation in the Maalaea area and in Lahaina. Within the undeveloped portions of the study area between Maalaea and Lahaina, local circulation is provided by private paved and dirt cane haul roads within cane fields and private access roads across undeveloped grazing lands.

<u>Transmission Line</u>

In the vicinity of the preferred alignment (between Kuihelani Highway and Maalaea), Honoapiilani Highway is a two-lane, undivided highway with a 24- to 30-foot-wide pavement and a posted speed limit of between 35 and 55 miles per hour. North Kihei Road, between the Maalaea Power Plant and Honoapiilani Highway, is a two-lane, undivided highway with 24-foot-wide pavement. The intersection of Honoapiilani Highway and North Kihei Road has a "Y"-shaped configuration, with separated turning movements.

Traffic volumes on Honoapiilani Highway have increased steadily from 13,325 vehicles per day at the North Kihei Road intersection in 1979 to 23,594 vehicles per day in 1991, an increase of 77 percent. Traffic volumes on North Kihei Road have increased 88 percent, from 6,947 in 1979 to 13,060 in 1991 (SDOT, 1991). 1991 AM and PM peak-hour and 24-hour traffic volumes at the Honoapiilani Highway/North Kihei Road intersection are presented in Table 4.13-1.

Since the highway is congested, the State Department of Transportation, Highways Division (SDOT) has plans to widen Honoapiilani Highway from two lanes to four lanes from Kuihelani Highway to the Maalaea small boat harbor. Planning studies are currently being conducted by the Maui District Office and construction is scheduled for completion within three years (Sariot, August 1993, Personal communication, Maui District Engineer, SDOT).

Table 4.13-1
TRAFFIC VOLUME SUMMARY (1991)
Honoapiilani Highway and Kihei Road

Roadway	24-Hour			AM Peak Hour			PM Peak Hour		
	NB/WB	SB/EB	Total	NB/WB	SB/EB	Total	NB/WB	SB/EB	Total
Honoapiilani Highway (South of Kihei Road)	11,520	11,541	23,061	650 (8:00-9:00)	947 (6:30-7:30)	1,543 (9:45-10:45)	1,068 (3:30-4:30)	911 (3:15-4:15)	1,923 (3:15-4:15)
(North of Kihei Road)	11,774	11,820	23,594	992 (7:00-8:00)	879 (6:30-7:30)	1,794 (7:00-8:00)	1,051 (3:30-4:30)	1,009 (3:00-4:00)	2,023 (3:15-4:15)
Kihei Road	6,560	6,500	13,060	765 (6:45-7:45)	356 (6:15-7:15)	1,064 (6:30-7:30)	563 (3:15-4:15)	701 (4:30-5:30)	1,166 (3:30-4:30)

Source: SDOT, 1991

Notes:

Volumes for May 13, 1991

Volumes at Honoapiilani Highway immediately south of Kihei Road and Kihei Road immediately east of Honoapiilani Highway (locations of proposed transmission line crossings).

NB/WB = northbound on Honoapiilani Highway, westbound on Kihei Road

SB/EB = southbound on Honoapiilani Highway, eastbound on Kihei Road

At the Lahaina end of the project, Honoapiilani Highway is congested due to the mix of local circulation with regional through traffic through Lahaina. The Lahaina Bypass is planned to connect Puamana to Kaanapali, bypassing critically congested intersections in Lahaina and providing an alternate highway route to the northwest side of the island.

On North Kihei Road, shoulders were recently widened to improve safety. SDOT has long-range plans (15 years) to widen portions of North Kihei Road to four lanes. These plans will be considered in final design and easement acquisition to avoid the need for line relocation due to roadway widening.

MECO's franchise granted by the State of Hawaii permits construction of transmission lines within public (State and County) road rights-of-way (State of Hawaii, S.B. No. 1522, 1991). This agreement requires review and approval of construction plans either by SDOT or the Maui County Public Works Department. A "Permit to Perform Work within a State or County Road Right-of-way" is required prior to commencing construction activities.

Switching Station

The Lahainaluna Switching Station would be located near the end of Lahainaluna Road, a local, two-lane roadway. Lahainaluna Road is a primary east-west thoroughfare in Lahaina, providing access for development that extends mauka along the roadway, and to Lahaina Intermediate School, as well as the historic Lahainaluna High School and Hale Pai Printing House. Because of its location near the end of Lahainaluna Road beyond most development, and because Lahainaluna Road is not a through road, traffic is light in this area.

4.13.2 Potential Impacts

The principal causes of potential traffic impacts from the proposed transmission line and switching station would be construction along and across public roadways and private cane haul roads, and the addition of construction materials/equipment delivery trips and construction employee trips to the roadway network. These impacts would be expected to be minor, as described below.

Transmission Line

Access to the easement through adjacent properties would be necessary for construction, and following construction for maintenance and repair of the line. The manner of access would vary by segment, as presented in Table 2.6-1. Segments 1 and 2 would be located along public road rights-of-way; access would be from the edge of roadway. Access to Segment 3 would be via pineapple field roads. Access to Segments 4, 6, 8 and 9, located in the remote, rugged terrain of the West Maui mountains, would be by helicopter. While Segments 5 and 7 are also located in the West Maui mountains, the terrain in these segments is more moderate with grassland terrain and existing jeep trails located nearby. Access to these segments would be cross-country. Existing cane field roads would be used for access to Segments 11, 14 and 21 through 23. Permanent new spur roads would be constructed from existing cane field roads or from access roads for the existing 69KV transmission lines to individual pole locations in Segments 10, 12, 13 and 15 through 20. Spur roads would be located and designed in coordination with DLNR.

Approximately 1.1 miles of the preferred alignment would be located along public road rights-of-way where temporary traffic impacts would occur during pole installation and stringing of conductors. The preferred alignment would parallel North Kihei Road for a distance of 4,900 feet from the Maalaea Power Plant to Honoapiilani Highway, where it would cross the highway, a span of 650 feet (Figure 2.3-3, Segments 1 and 2). Pole installation and stringing of conductors in this area would occur within the roadway right-of-way, using the roadway shoulder and areas adjacent to the roadway. Sometimes part of the road surface, in addition to the road shoulder, would be used to station equipment. Coning off a lane of traffic may be required. Construction in these areas would last approximately one week, during which motorists would experience slower travel speeds, and temporary, localized congestion and delay. These impacts would be greater at the Honoapiilani Highway crossing due to greater traffic volumes on Honoapiilani Highway and turning movements associated with the North Kihei Road intersection.

The Maui Electric Company, Ltd. (MECO) Kahului baseyard will serve as the construction yard headquarters, the base station where employees report at the beginning and end of each day's activities. This area is also used for field office location, laydown of poles and materials, equipment and vehicle storage and security. In addition, three to four staging areas would be required for equipment and materials staging and helicopter support. Although the precise locations of staging areas have not yet been identified, possible locations include the Maalaea Power Plant, the shooting range mauka of Ukumehame Beach State Park, a site in the vicinity of the quarry or old landfill, and the Lahainaluna Switching Station site.

Approximately 75 two-way truck trips would be required for pole delivery (assuming a total of 150 poles and two poles per truck). Additional trips would be required for delivery of conductors and miscellaneous construction materials. Delivery and transport trips would be few and would be distributed throughout the year-long construction period and among the four staging areas and base yard. Transmission line construction would also generate approximately 15 two-way construction employee trips per day. Because these trips would represent only a small percentage of total traffic volumes on affected roadways, and would be short-term and temporary, traffic impacts would be expected to be negligible.

Portions of the preferred alignment (approximately 1.5 miles) would be located along private cane haul roads and cane and pineapple field edge roads, including Piilani Ditch, a Pioneer Mill cane haul road. Construction of the line along Piilani Ditch and other private roads would be coordinated with Pioneer Mill and Wailuku Agribusiness/C. Brewer Properties representatives to ensure that construction schedules and practices maximize safety of construction crews and minimize disruption of agricultural operations.

Post-construction operation and maintenance activities would consist of regular inspection of the transmission line poles and right-of-way on foot, in vehicle, or by helicopter. No long-term traffic impacts would occur.

Switching Station

Construction of the Lahainaluna Switching Station would not encroach on the Lahainaluna Road right-of-way. Construction materials would be brought to the site via Honoapiilani Highway and Lahainaluna Road. Delivery trips for construction equipment and materials, and employee commute trips would not be expected to disrupt traffic flow along these roadways.

Post-construction operation and maintenance of the switching station would require infrequent trips for inspection and maintenance. Employees would not be located at the station. No long-term traffic impacts would occur.

4.13.3 Mitigation

Final pole locations and setbacks from the edge of the travelled way along North Kihei Road and at the Honoapiilani highway crossing would be determined through consultation and plan review with SDOT. The SDOT Uniform Design Manual for Streets and Highways (SDOT, 1980) and the American Association of Standards For Highways and Transportation Officers Roadside Design Guide (AASHTO, 1989) will be used as guidelines for pole placement.

Work within or crossing the State route right-of-way will require a "Permit to Perform Work on a State Highway" which must incorporate a Traffic Control Plan approved by the Highways Division. Construction activities along North Kihei Road and Honoapiilani Highway will be conducted in compliance with the Traffic Control Plan approved by SDOT, which would outline measures and practices to avoid and reduce adverse effects on public circulation, access and safety during construction.

According to State highway regulations, only one lane at a time may be closed on a multilane highway; on a two-lane highway, lanes of adequate width in both directions must be provided whenever possible. All lanes must be open to traffic during normal peak hours (generally 6:00 to 8:30 a.m.) and afternoon peak hours (generally 3:00 to 6:00 p.m.). MECO and its construction contractors will follow state guidelines for the types of signs, lights, and markers; the position of traffic cones and areas coned off; and the use of flaggers and/or police officers. Lane closures will be avoided wherever possible by using an approved channelization plan to maintain two-way traffic. Where roadway width is insufficient to maintain two-way traffic, all work that requires lanes of traffic to be coned off will take place during off-peak traffic hours.

When working along a public highway, construction workers and contractors will comply with State laws and Maui County regulations regarding vehicle safety (i.e., marking, signing, flagging, lighting and pilot vehicles).

In addition, advance public notice of construction in the forms of posted notices in the study area, and local newspaper notices, would also be provided.

SECTION 5

RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS

5.0 RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS

The following section describes the relationship of the proposed Maalaea-Lahaina Third 69KV Transmission Line Project to the goals and objectives of Federal, State and County plans, policies and land controls that pertain to development of electric transmission systems.

5.1 FEDERAL

There are no Federal plans or policies that directly relate to or influence the proposed action. Several of the alternatives considered would have been affected by major Federal statutes for protection of the environment. For example, the submarine alternative would have required review and approval with regard to the Endangered Species Act as well as compliance with the Clean Water Act for actions within the waters of the United States. Those alternatives that involved federally protected lands or resources were eliminated in the early phases of the project.

5.2 STATE OF HAWAII

Goals and objectives of the following State statutes, plans, policies and programs apply to this action: the State Land Use Law and Conservation and Resources Law as it relates to uses within the four land use districts including Conservation Districts or water and forest reserves; the Hawaii State Plan; the Hawaii Integrated Energy Policy and related energy plans; the Na Ala Hele Trails and Access Program and the Coastal Zone Management Program.

5.2.1 State Land Use Law (HRS Chapter 205) and Conservation and Resources Law (HRS Chapter 183)

Chapter 205, Hawaii Revised Statutes (HRS) relating to the land use commission, establishes and sets standards for determining the boundaries of the four major land use districts into which all lands in the State of Hawaii are designated. The four land use districts are Urban, Rural, Agricultural and Conservation. The preferred alignment and the site for the switching station fall within the Agricultural and Conservation Districts; no Urban or Rural Districts are crossed (Figure 4.2-1).

Agricultural District

Approximately 10.3 miles of the 15.2-mile alignment (68 percent) crosses the Agricultural District. Assuming an average right-of-way width of 75 feet, the transmission line easement would require 9.09 acres per mile, or a total of 93.6 acres, of Agricultural District lands.

The boundaries of the Agricultural District were established with the "greatest possible protection given to those lands with a high capacity for intensive cultivation." However, the statute recognizes that "these districts (Agricultural) include areas which are not used for, or which are not suited to agricultural and ancillary activities by reason of topography, soils, and other related characteristics." Permitted uses within Agricultural Districts include: "public, private and quasi-public utility lines and roadways, transformer stations, communications equipment building, solid waste transfer stations, major water storage tanks and appurtenant small buildings such as booster pumping stations, but not including offices or yards for equipment, material vehicle storage repair or maintenance, or treatment plants or corporation yards or other like structures." Therefore, the proposed transmission line and switching station are permitted uses within the Agricultural District according to the HRS Chapter 205-4.5.

Although the State land use commission authorizes development within the various land use districts, the power to set minimum lot sizes is granted to Maui County. The county zoning ordinance establishes minimum lot sizes for facilities on agricultural land; however, according to the HRS 205-5, Zoning , "The county may also allow lot sizes of less than the minimum lot size as specified by law for lots created or used for public, private and quasi-public utility purposes...". See County Zoning in Section 5.3.3 below for a description of the relationship of the proposed action to Maui County zoning.

Conservation District

The preferred alignment crosses 4.8 miles of Conservation Land Use District. HRS Chapter 205-2, Districting and classification of lands, establishes Conservation Districts from what until 1961 were known as *forest and water reserves zones* as defined in HRS 183-41.

By definition, the Conservation Districts include areas necessary for protecting watersheds and water sources, preserving scenic and historic areas, providing parklands, wilderness and beach reserves;

conserving endemic plants, fish and wildlife; preventing floods and soil erosions; forestry; open space areas whose existing openness, natural conditions, or present state of use if retained would enhance the present or potential value of abutting or surrounding communities or would maintain or enhance the conservation of natural or scenic resources; permitted uses not detrimental to a multiple use conservation concept."

Chapter 205-5 grants the power to the Department of Land and Natural Resources (DLNR) to govern the zoning within the Conservation District. As such, under Title 13 Chapter 2 of the DLNR administrative rules, Conservation District lands are divided into five separate subzones entitled General, Resource, Limited, Protective and Special. The subzones vary in their degree of restrictiveness; the most restrictive is the Protective Subzone.

Conservation District lands traversed by the alignment include Limited, Resource and General Subzones. Conservation District lands within the Protective Subzone would not be crossed. Table 5.2-1 shows the linear distance and acreage affected by the proposed transmission alignment for each of the three affected Conservation Subzones. Total Conservation District crossed is 4.8 miles affecting approximately 44.1 acres of land.

Table 5.2-1
CONSERVATION DISTRICT LAND CROSSED BY PREFERRED ALIGNMENT

Subzone	Miles Crossed	Acreage (75 Ft. Right-of-way)
Conservation General	2.4	22.1
Conservation Resource	2.2	20.6
Conservation Limited	0.2	1.4
Total	4.8 miles	44.1 acres

Each subzone has different permitted uses and objectives for their management. The power to grant conditional uses within Conservation District lands rests with the Board of Land and Natural Resources. Siting a new transmission line in a Conservation District within any subzone requires submittal of a Conservation District Use Application (CDUA) for review and approval by the Board of Land and Natural Resources and issuance of a permit. The applicant must demonstrate that the proposed use would maintain the objectives of the subzones in which it would be located. The relationship of the proposed transmission line to the objectives of Conservation District subzones crossed by the project is described below.

Limited Subzone

The objective of the Limited Subzone is to limit uses where natural conditions suggest constraints on human activities. About 800 feet of the preferred alignment crosses the Limited Subzone at Manawainui Gulch. This portion of the alignment will be spanned by the overhead conductors and the poles will be placed well outside of the Limited Subzone.

Resource Subzone

The objective of the Resource Subzone is to develop, with proper management, areas to ensure sustained use of the natural resources of those areas. The second largest amount of Conservation District land that is affected by the project falls within the Resource Subzone. Resource Subzone lands are found in mauka portions of the study area and generally extend makai to the edge of cane fields. These lands are owned by the State and managed as the West Maui Forest and Forest Reserve. Resource Subzone lands are located in Segments 4, 5, and 9 and in a small portion of Segment 15 at Olowalu Stream. A total of 2.2 miles would be crossed and the transmission easement with a width of 75 feet could affect up to 20.6 acres of Resource Subzone. The transmission line would not conflict with the objectives of the Resource Subzone.

General Subzone

The objective of the General Subzone is to designate open space where specific conservation uses may not be defined, but where urban use would be premature. The General Subzone in the project area covers most of the West Maui mountains from Kealaloloa Ridge makai to MacGregor and Papawai points and bordered by Papalaua Gulch on the west. The preferred alignment crosses 2.4 miles and affects approximately 22.1 acres within the General Subzone. The area affected is currently used for grazing cattle. The proposed project would not change the character or the use of this land nor would it conflict with the objective of this subzone.

5.2.2 Hawaii State Plan (HRS Chapter 226, Revised 1989)

The Hawaii State Plan provides a long-range guide for Hawaii's future. It establishes State goals, objectives and policies, and a statewide planning system to carry them out.

Construction of the proposed transmission line is consistent with, and in many cases supports, the State of Hawaii's long-term goals and policies. The portion of the Hawaii State Plan that is most directly relevant to the proposed project is Section 226-18, Objectives and Policies for Facility Systems - Energy/Telecommunications, which reads as follows:

> (a) *Planning for the State's facility systems with regard to energy/telecommunications shall be directed towards the achievement of the following objectives:*
>
> > (1) *Dependable, efficient, and economical state-wide energy and telecommunication systems capable of supporting the needs of the people.*
>
> (b) *To achieve the energy/telecommunication objectives, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable power and telecommunication services to accommodate demand.*

The proposed project supports these policies because the purpose of the Maalaea-Lahaina third 69KV transmission line is to ensure the reliable, efficient and economic provision of electricity to existing and planned development in West Maui. The new line will provide a power corridor separate from the two existing Maalaea-Lahaina 69KV lines that now are the only transmission lines serving West Maui. The separation of this third line from the existing two is critical to providing reliable electric service in the event that one or both of the existing lines is out of service.

Section 226-18(c)(4) states that:

> (c) *To further the energy objectives, it shall be the policy of this State to:*
>
> > (2) *Ensure a sufficient supply of energy to enable power systems to support the demands of growth.*

The proposed project will allow the transmission of power to accommodate (support) growth in West Maui.

> (4) *Ensure that the development or expansion of power systems and sources adequately consider environmental, public health and safety concerns, and resource limitations.*

Comprehensive planning and analysis support MECO's development of this project. This Environmental Impact Statement (EIS) and the supporting studies and documents include the environmental, public health, safety, and other resource considerations that are fundamental to project planning, evaluation of locational alternatives and selection of the preferred alignment.

The EIS and supporting studies also document that the project complies with Section 226-11(b) (2-4), Objectives and Policies for the Physical Environment - Land-Based, Shoreline, and Marine Resources:

> (b) *To achieve the land-based, shoreline, and marine resource objectives, it shall be the policy of this State to:*
>
> (2) *Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.*

Water-based activities were avoided during the alternatives analysis and corridor identification phase of the route selection process.

> (3) *Take into account the physical attributes of areas when planning and designing activities and facilities.*

Existing physical attributes of the study area including the topographic features, puus, ridges and gulches, existing land uses (urban areas and agricultural fields) and existing improved or unimproved roads and easements, were considered throughout the planning process.

(4) *Manage natural resource and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.*

Siting constraints and opportunities were determined early in the planning process in order to minimize impacts on existing land uses and to encourage beneficial and multiple use without adverse environmental degradation.

During evaluation of the alternative corridors and the preferred alignment, studies were conducted to compare the viewplanes of various alternatives in relation to the Lahaina Pali Trail and site-specific field surveys were conducted to identify and avoid areas of high archaeological and biological resource value.

5.2.3 Hawaii Energy Plans and Policies

<u>State Energy Functional Plan</u>

The State Energy Functional Plan describes objectives, policies, and implementing actions in the following areas:

- Energy Conservation and Efficiency
- Alternate and Renewable Energy
- Energy Education
- Legislation
- Integrated Energy Management
- Energy Emergency Preparedness

<u>Integrated Resource Planning Program</u>

On January 10, 1990, the State of Hawaii Public Utilities Commission (PUC) instituted a proceeding to require energy utilities in Hawaii, including Maui Electric Company, Ltd. (MECO), to implement integrated resource planning (IRP). The PUC issued a subsequent IRP Decision and Order on May 22, 1992 requiring preparation of IRPs (plans) by Hawaiian utilities by November 1993. MECO completed its first IRP in November 1993. The IRP evaluates the optimum mix of energy resources for meeting energy needs over the next 20 years by considering all reasonable supply and demand

demand side management programs, including renewable energy technologies and other non-oil fuel generation options. Transmission projects that are growth accommodating are not specifically addressed in the IRP process; therefore, the project does not conflict with the objectives of the IRP (Kobayashi, C., August 1992, Personal Communication, MECO).

Hawaii Integrated Energy Policy

In November 1991, the State of Hawaii, Department of Business, Economic Development and Tourism, Energy Division issued a proposal to develop an Integrated Energy Strategy for the State. The purpose of the program is to achieve the following goals:

- Increased diversification of fuels and sources of supply of these fuels;
- Increased energy efficiency and conservation;
- Development and implementation of regulated and non-regulated energy development strategies with the least possible overall costs to Hawaii's society;
- Establishment of a comprehensive energy policy analysis, planning, and evaluation system;
- Increased use of indigenous, renewable energy resources; and
- Enhanced contingency planning capability to effectively contend with energy supply disruptions.

The integrated energy policy for Hawaii evolved from the energy strategy and with the aid of the Hawaii Energy Program which is based on the individual components within the various functional areas: 1) electric and gas utility resource planning, 2) renewable energy and energy efficiency development, 3) transportation energy use, 4) energy emergency preparedness and 5) institutional needs and capabilities.

The proposed transmission line supports the electric utility resource planning aspect of the integrated policy by increasing the efficiency of delivery of available electric power to West Maui.

The goals and objectives of both the State Energy Functional Plan and the Integrated Energy Policy address generation, alternate energy sources, reduction of petroleum dependency and conservation. The project does not conflict with any of the objectives, policies, or implementing actions of these programs as it is required to accommodate growth in the Lahaina and Napili areas, and to maintain reliability in the West Maui transmission system.

5.2.4 Coastal Zone Management Program

The relationship of the proposed action to the State's coastal zone management are addressed in the Section 5.3.4, Maui County Special Management Area.

5.2.5 Na Ala Hele Trails and Access Program

The Na Ala Hele Trails and Access Program, established in 1988 by Act 236 (Chapter 198D of the Hawaii Revised Statutes), assigned to DLNR the responsibilities of planning, developing, acquiring, constructing, and engaging in coordinating activities to implement a statewide trail and access system.

The intent of the Na Ala Hele program is to ensure adequate public access to coastal and mountain areas consistent with sound conservation principles. The program's vision statement:

> *To develop, via the Na Ala Hele program, a trail and access network and management system which:*
>
> *(1) provides a broad range of recreational, cultural, religious, and subsistence opportunities for all of Hawaii's people, and*
>
> *(2) helps to conserve Hawaii's cultural heritage and environment.*

A series of priority trails and one demonstration trail were recommended for immediate development. The Demonstration trails were intended to demonstrate the program's potential in acquiring and managing trails in a variety of settings and governmental jurisdictions, and to acquaint Na Ala Hele staff and advisory councils with the concerns, processes and procedures involved in trail acquisition and development. The nine-member Maui Na Ala Hele Advisory Council selected the Old Lahaina Pali Trail as Maui's Demonstration Trail.

The Old Lahaina Pali Trail is part of a historic trail system that once encircled the island. The trail once connected Lahaina and Wailuku. From the trail, one can enjoy excellent scenic vistas of Kahoolawe and Lanai. Whales can be observed during the winter months. The trail is near Lahaina, Kihei, Wailuku and Kahului, while offering a remote outdoor experience. Native plants and interesting geologic features can be found along the trail. The east end of the trail is near the Maalaea small boat harbor where there are historic sites, refreshments, restrooms and other facilities. The west end is near Ukumehame Beach State Park where snorkeling and surfing are excellent, and one can find shade and picnic.

The preferred alignment was selected after a long process of corridor analysis and evaluation, consultation with DLNR Na Ala Hele program specialists, and realignments to avoid adverse impacts. DLNR and the Maui Na Ala Hele Advisory Council expressed concern regarding visibility of the proposed transmission line from the Lahaina Pali Trail. MECO conducted a computerized viewshed analysis to more fully understand potential adverse visual impacts, to provide a factual rather than speculative basis for evaluating visual issues, and to aid in selecting a preferred alignment. A viewshed map was generated which identified areas in which poles would be visible from viewpoints on the Lahaina Pali Trail.

Based on the results of the viewshed analysis, and considering such other factors as archaeological sites, botanical resources, access and constructibility, a mauka, central and makai alignment were evaluated. The central alignment was selected by both DLNR and MECO as the preferred corridor because it avoided crossing or very closely approaching the trail, while avoiding unstable terrain and sensitive biological resources in more mauka areas. Upon further consideration DLNR requested the preferred alignment be adjusted further mauka to increase the distance of the transmission line from the trail. The location of the alignment was adjusted in the field with Michael Baker of DLNR, Maui District Trails and Access Specialist, on June 22, 1993.

The preferred alignment, therefore, has undergone a series of analyses and refinements to minimize impacts to the Lahaina Pali Trail. The preferred alignment would not compromise the ability of the trail to fulfill the purpose of the Na Ala Hele program to provide recreational, cultural, religious and subsistence opportunities and help conserve Hawaii's cultural heritage and environment.

5.3 MAUI COUNTY

The plans and policies guiding development in Maui that directly relate to the proposed action include: The Maui County General Plan, Lahaina Community Plan, Kihei-Makena County Plan, and the Maui County Zoning Ordinance.

5.3.1 Maui County General Plan

The purpose of the Maui County General Plan, adopted in 1980 and updated in 1990, is to "recognize and state the major problems and opportunities concerning the needs and the development of the county and the social, economic and environmental effects of such development and [to] set forth the desired sequence, patterns and characteristics of future development." The purpose of the General Plan update (which is required every 10 years) is to address changes in socioeconomic conditions, physical environment and current and emerging planning issues through amendments to the objectives and policies set for in the General Plan.

The General Plan objective that is most directly related to this proposal is in Objective 1, Policy (c) of Transportation - Public Utilities and Facilities:

> ***Objective 1:*** *To anticipate and provide public utilities which will meet community needs in a timely manner.*
> ***Policy c:*** *Assure the availability of power systems and sources that meet public health and safety standards.*

This planning objective is supported by the purpose of the Maalaea-Lahaina Third 69KV Transmission Line Project, which is to serve existing and planned developments and to maintain reliable service to West Maui.

Other objectives and policies of the General Plan that apply to the project include Objective 3, Policies (a) and (d) of the Population, Land Use, the Environment and Cultural Resources - Land Use:

Objective 3: To preserve lands that are well suited for agricultural pursuits.
Policy a: Protect prime agricultural lands from competing non-agricultural uses.
Policy d: Discourage the conversion, through zoning or other means, of productive or potentially productive agricultural lands to non-agricultural uses, including but not limited to golf courses and residential subdivisions.

The transmission line will generally not cross cultivated agricultural fields; rather, it will follow field edge roads or cane haul roads and will be designed to minimize interference with agricultural operations. Private owners of agricultural lands who grant MECO an easement for transmission lines retain title to the land and use of the easement area, subject only to safety limitations such as building heights and vegetation clearances. Approximately, three acres of cane field would be converted for development of the Lahainaluna Switching Station. An additional small amount of land may be taken out of production to maintain a clear area around poles and guy wires for agricultural equipment.

Objective 1, Policies (a) and (b) of Population, Land Use, the Environment and Cultural Resources - Environment are relevant to the Project:

Objective 1: To preserve and protect the county's unique and fragile environmental resources.
Policy a: Preserve for present and future generations the opportunity to experience the natural beauty of the islands.
Policy b: Preserve scenic vistas and natural features.

The project avoids the shoreline and the Kealia Pond natural area. The alignment follows North Kihei Road and crosses Honoapiilani Highway and proceeds up and across the open, expansive landscape of the West Maui mountains. The proposed transmission line would not be visible from the shoreline and would be located mauka of the Lahaina Pali Trail. The line would be above cane fields along the lower slopes of the West Maui mountains through undeveloped scrub grassland of Ukumehame, Olowalu and Launiupoko. The alignment would follow a cane field road into the Lahainaluna Switching Station site. Because the alignment is generally located at the base of the

West Maui mountains, scenic vistas toward the ocean would not be affected. The transmission line would generally not be visible from the shoreline (see Section 4.12, Visual Resources).

The project would not alter any natural land features nor affect any unique or fragile environmental resources; therefore, the project meets the objectives of this element.

Objective 2, Policy (a) of Economic Activity- General is supported by the proposed action:

> ***Objective 2:*** *To provide a balance between visitor industry employment and non-visitor employment for a broader range of employment choices for the County's residents.*
> ***Policy a:*** *Encourage industries that will utilize the human resources available from within Maui County rather than having to import workers.*

The project would provide an estimated 25 short-term construction jobs, nearly all of which would be expected to be filled by Maui residents for construction of the transmission line and switching station.

Objective 1, Policy (a) of Housing and Urban Design - Housing states:

> ***Objective 1:*** *To provide a choice of attractive, sanitary and affordable homes for all our residents.*
> ***Policy a:*** *Provide or require adequate physical infrastructure to meet the demands of present and planned future affordable housing needs.*

The project supports this objective by improving the electrical transmission infrastructure needed to serve existing and planned residential developments and to maintain reliable service to the residents of West Maui.

5.3.2 Community Plans

The Maui County General Plan sets forth broad objectives and policies for the long-range development of the County. The Lahaina Community Plan and Kihei-Makena Community Plan provide a relatively detailed scheme for implementing those objectives and policies relative to the Lahaina and Maalaea regions, respectively. These plans contain maps identifying the planned distribution and intensity of land uses and public facilities, focusing (in the study area) on developed areas in Lahaina and Maalaea.

The transmission alignment and switching station site are located in areas designated agricultural within the two community planning regions. This designation permits agricultural activity "in keeping with the economic base of the County and the requirements and procedures of Chapter 205 HRS, as amended."

The community plans have a 20-year planning horizon and are updated every ten years. The County is currently updating the community plans. Proposed projects must be recommended by a Citizen Advisory Committee (CAC), and receive planning commission, county council and mayor approval before the project is reflected in the updated community plan. The planning commission has received CAC recommendations, taken public testimony and voted on some CAC recommendations. Adoption of updated community plans is expected in 1994.

The proposed transmission line would be located within the vicinity of one planned project expected to be reflected in the updated Kihei-Makena Community Plan. The Maalaea Village project, proposed by Alexander & Baldwin Hawaii, Inc. and expected to be included in the Kihei-Makena Community Plan with a "Future Growth Reserve" designation, would be located on cane fields surrounding the Maalaea Power Plant. The current landowner and the proposed developer have reviewed and agreed to the preferred alignment. No other planned or proposed projects in the current Kihei-Makena Community Plan, or expected to be included in the updated plan, would be affected by the transmission line.

There are no planned or proposed projects currently in the Lahaina Community Plan, or expected to be included in the updated plan, that would be affected by the transmission line or switching station. Since all landowners in the study area were consulted throughout project planning and alignment selection, new proposals that could conflict with the project would not be expected.

5.3.3 County Zoning

The proposed transmission line and switching station would be located entirely within the Agricultural zoning district. Permitted uses within the Agricultural district include, "Public, private, and quasi-public utility lines, but not including offices or yards for equipment, material, vehicle storage, repair or maintenance." The proposed transmission line and switching station would be permitted uses within the Agricultural district.

5.3.4 Special Management Area

The portion of the proposed transmission line located within the Maalaea Power Plant switchyard is located within the coastal zone Special Management Area (SMA) and would require an SMA Permit from Maui County pursuant to the Hawaii Coastal Zone Management Program (HRS Chapter 205A). The purpose of the SMA permit is to preserve, protect and restore natural resources along the shoreline in order to avoid permanent loss of resources and foreclosure of land use and management options, and to ensure adequate public access to beaches, recreational areas and natural reserves.

The Maui County Planning Department administers the SMA permit process. The County requires compliance with Chapter 343 HRS and the EIS Rules of the State Department of Health to determine the cost and potential environmental impacts of development proposed within the SMA. Approximately 1,000 feet of the proposed transmission line would be located within the SMA. The portion of the project located within the SMA would consist of installation of four poles and associated conductors, and installation of a 400-foot-long segment of underground transmission line to avoid conflict with the existing Maalaea-Lahaina Nos. 1 and 2 69KV transmission lines within the switchyard. An SMA permit would be required.

Consistency of the proposed project with the objectives, policies and guidelines of the SMA Rules and Regulations is discussed below.

Section 2-8, Special Management Area Objectives, Policies, and Guidelines lists the following objectives and policies to be used by Maui County for the review of developments proposed within the SMA:

1. **OBJECTIVES**

a. *Provide coastal recreational opportunities accessible to the public;*

The proposed action would not impede access to beaches or natural reserves.

b. *Protect, preserve, and where desirable, restore those natural and man-made historic and pre-historic resources in the coastal zone management area that are significant in Hawaiian and American history and culture;*

There are no archaeological sites in the portion of the preferred alignment within the SMA.

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

The project will not affect the use or quality of the coastal scenic or open space resources. Where it is within the SMA, the project is located in area already affected by tall power plant stacks and the new line will not substantially alter the existing appearance of the Maalaea Power Plant and existing transmission lines.

d. *Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems;*

The project area has been used for intensive agricultural purposes since the early part of this century, and few natural areas exist along or near the proposed alignment. There are no areas of natural plant or animal communities, or habitat for rare, threatened, or endangered species and no sensitive plant communities within the proposed alignment.

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

The project is essential for transmission system reliability and to serve additional load growth in West Maui. The technical appendices of this EIS document how consideration of engineering, environmental and other factors led to the selection of the final alignment as a suitable location for the line and switching station.

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

Hazards due to flooding, storms and tsunamis were identified and mapped as constraints in the regional study and, where possible, were avoided in locating the preferred alignment. The tsunami zone approaches the project at its origin, the Maalaea Power Plant. Historical storms have not significantly affected the operation of the generating facility; however, transmission poles have been downed under heavy storm conditions. MECO has designed the poles to withstand 100 mile-per-hour winds and flooding associated with extreme storm conditions.

g. *Improve the development review process, communication, and public participation in the management of coastal resources and hazards.*

The alignment selection process for this project used extensive public and landowner participation, including public informational meetings, private meetings/briefings and presentations to elected officials and the public. No comments were received during the public participation process that indicated a concern that coastal resources would be affected by the project.

2. POLICIES

b. Historic resources;

1) *Identify and analyze significant archaeological resources;*

Archaeological resources surveys were conducted between April and June, 1993 (see Section 4.7, Cultural Resources). Thirty-four sites were identified, evaluated, and mapped. As a result of the inventory survey, minor adjustments were made to three segments of the preferred alignment to avoid areas of dense concentrations and particularly significant resources. Mitigation measures were developed in consultation with the State Historic Preservation Division that would avoid impacts to identified sites, including establishment of buffer areas and special construction practices and monitoring.

2) *Maximize information retention through preservation of remains and artifacts or salvage operations; and*

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

If any evidence of surface or subsurface cultural resources is discovered during excavation for pole placement or new spur roads, work will be interrupted until the extent and significance of the resource have been evaluated by an archaeologist and the State Historic Preservation Division will be notified of the findings.

c. *Scenic and open space resources*

1) *Identify valued scenic resources in the coastal zone management area;*

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

3) *Preserve, maintain, and where desirable, improve and restore shoreline open space and scenic resources; and*

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

The addition of the Maalaea-Lahaina third 69KV transmission line will not significantly alter the existing visual quality of the project area and it will have no effect on the shoreline and coastal areas. The potential effects are described and simulated in Section 4.12, Visual Resources.

d. *Coastal Ecosystems;*

1) *Improve the technical basis for natural resource management;*

2) *Preserve valuable coastal ecosystems of significant biological or economic importance*

3) *Minimize disruption or degradation of coastal stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and*

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

The biological, geological and water resources surveys of the project area conducted as part of the regional study identified no sensitive species or habitats within or near the preferred transmission line alignment and switching station site. As discussed in Sections 4.4, 4.5, and 4.6, Earth and Water Resources, Vegetation, and Birds and Mammals, respectively, no poles will be placed in or near stream channels or gulches. There will be no impacts on coastal water ecosystems or water quality. Therefore, the project does not conflict with this objective.

e. *Economic uses*

1) *Concentrate in appropriate areas the location of coastal dependent development necessary to the State's economy;*

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

3) *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:*

a) *Utilization of presently designated locations is not feasible;*

b) *Adverse environmental effects are minimized; and*

c) *Important to the State's economy.*

The Maalaea Power Plant is within the SMA boundary. The existing transmission lines exiting the Maalaea Switching Station extend through the SMA for a short distance. The Maalaea-Lahaina third 69KV transmission line will be located in the same general area as the Maalaea Power Plant. No additional land will be required. Four poles will be placed within the SMA and a 400-foot-long underground segment of line will be installed. This design was chosen to consolidate and minimize the visual and environmental impacts associated with siting facilities within the coastal zone.

This EIS and in particular, Appendix A, documents the consideration of social, visual and environmental impacts that guided the evaluation of alternative corridors and the selection of the preferred alignment. The project complies with this objective of the Coastal Zone Management Program and SMA Rules.

f. *Coastal hazards;*

1) *Develop and communicate adequate information on storm wave, tsunami, flood, erosion, and subsidence hazard;*

2) *Control development in areas subject to storm wave, tsunami, flood, erosion, and subsidence hazard;*

3) *Ensure that developments comply with requirements of the Federal Flood Insurance Program;*

4) *Prevent coastal flooding from inland projects.*

Outside of the Maalaea Power Plant property, the preferred alignment is not located in areas subject to storm wave, tsunami or flood inundation, or erosion. The transmission line will be designed to avoid placing poles within flood-prone areas. Poles located within flood-prone areas will be designed and constructed to conform with the requirements of the National Flood Insurance Program. The project will not cause or contribute to coastal flooding.

After incorporating by reference the objectives and policies contained in HRS Section 205A-2, Article II of the SMA Rules and Regulations continues with the following guidelines for review of proposed developments by the authority.

1) *The development is consistent with the Maui County General Plan, development plans, zoning and subdivision codes, and other applicable ordinances.*

The project is consistent with the Maui County General Plan, Community Plans, and zoning as evaluated in detail in Section 5.3.1, 5.3.2, and 5.3.3 Consistency of the project with other proposed developments and various ordinances pertaining to Noise, Air Quality, and Traffic are discussed in Section 4.0.

a. *The council shall seek to minimize, where reasonable:*

1) *Dredging, filling, or otherwise altering any bay, estuary, salt marsh, river mouth, slough, or lagoon.*

2) *Any development that would reduce the size of any beach or other area usable for public recreation.*

3) *Any development that would reduce or impose restrictions upon public access to tidal and submerged lands, beaches, portions of rivers and streams within the Special Management Area and the mean high tide line where there is no beach.*

4) *Any development that would substantially interfere with or detract from the line of sight toward the sea from the state highway nearest the coast.*

5) *Any development that would adversely affect water quality, existing areas of open water free of visible structures, existing and potential fisheries and fishing grounds, wildlife habitats, or potential or existing agricultural uses of land.*

The project will not involve dredging, filling, nor will it otherwise affect any bay, estuary, salt marsh, river mouth, slough, or lagoon (see Sections 4.4). The project will not reduce or impose restrictions upon any of the lands cited in this paragraph of the SMA guidelines. The project will not reduce the size of any beach or other area useable for public recreation. The new line will not substantially detract from the shoreward views from the highway.

The project will not affect water quality or other aquatic resources, avoids wildlife habitats, and will not affect the use of agricultural lands traversed (see Sections 4.3, 4.5 and 4.6). No conflict exists between these policies and the proposed action.

5.4 PERMITS AND APPROVALS

This section discusses state and county discretionary permits or authorizations that may be required because of the location or design of the Maalaea-Lahaina Third 69KV Transmission Line Project. Required permits and approvals are listed in Table 5.4-1. There are no Federal permits or approvals that apply to the project. Alternatives that involved Federally-protected lands or resources were eliminated in the early phases of the project.

5.4.1 State Permits and Approvals

<u>Environmental Impact Statement</u>

The use of State lands within a State Conservation Land Use District requires compliance with Chapter 343, HRS, the State's environmental impact statement law. This EIS is being prepared in conformance with Chapter 343, HRS. The accepting authority for this EIS is the DLNR.

Table 5.4-1
PERMITS AND APPROVALS

AGENCY/ORGANIZATION	APPROVAL/PERMIT/ACTION	ESTIMATED APPLICATION DATE	PROCESSING TIME	PUBLIC HEARING
Applicant: Maui Electric Company, Ltd. Accepting Authority: State of Hawaii, Dept. of Land & Natural Resources	Draft and Final Environmental Impact Statements	April 93 EISPN December 93 DEIS March 94 FEIS	9-12 months	not required
State of Hawaii, Dept. of Land & Natural Resources Office of Conservation and Environmental Affairs	Conservation District Use Permit	October 93	6 months	not required
Maui County Planning Department	Special Management Area Permit	January 94	3-4 months	Maui Planning Commission, if required
State of Hawaii, Dept. of Land & Natural Resources, Land Management Division	Use of State Lands Approval	October 93	6 months	if required by Board of Land and Natural Resources
State of Hawaii, Dept. of Land & Natural Resources, Historic Preservation Division	Historic Sites Review	October 93	3 months	not required
Hawaii Public Utilities Commission	Authorization to Construct - approval for expenditure of funds in excess of $500,000	January 94	8-10 months	if required
State of Hawaii, Dept. of Land & Natural Resources	Acceptance of Environmental Impact Statement	March 94	1 month	not required
State of Hawaii, Dept. of Transportation, Highways Division	Permit to Perform Work on a State Highway	June 94	6-8 months	not required

Use of State Lands

Approximately 9.6 miles of the proposed transmission line would be located on state-owned land. The project would require an application to the DLNR, Division of Land Management, for use of state lands pursuant to Chapter 171, HRS. The Division of Land Management recommends action on the application to the Board of Land and Natural Resources, the permitting body.

Conservation District Use Application

Approximately 4.8 miles of the proposed transmission line would be located within lands designated Conservation Land Use District. A Conservation District Use Application would be required pursuant to Chapters 205 and 183 of the Hawaii Revised Statutes. A Conservation District Use Application requires review and approval by the Board of Land and Natural Resources.

Historic Site Review

Thirty-four archaeological sites determined eligible for the Hawaii and National Registers of Historic Places were identified in the vicinity of the preferred alignment. All sites would be avoided during construction, as discussed in preliminary consultation with the Historic Preservation Division. The Historic Preservation Division of DLNR is responsible for review of construction in the vicinity of a site that is listed on either the Hawaii or National Register of Historic Places. The State's review requires notice of intention to work on a site and plans depicting the nature of the proposed construction and location with respect to any sites on the Hawaii or National Register of Historic Places be submitted 90 days in advance for review and comment.

Permit to Perform Work on a State Highway

Approximately 1.1 miles of the proposed transmission line would be located within the rights-of-way of North Kihei Road and Honoapiilani Highway. The transmission line would require a Permit to Perform Work within a State Highway pursuant to Chapter 264 of the HRS and the Department of Transportation Administrative Rules, Chapter 105, Title 19. This permit is an administrative authorization issued by the Highways Division of the State Department of Transportation and is required for any work within a State highway right-of-way. Published notice and a public hearing are not required.

Hawaii Public Utilities Commission Authorization

The project is estimated to cost approximately $8.0 million to $10.0 million, not including right-of-way acquisition costs. PUC authorization under PUC General Order No. 7 is required for the project because construction costs would exceed $500,000. The PUC's consideration of the project would follow all other State and County approvals affecting the design and location of the project.

5.4.2 County Permits and Approvals

The proposed transmission line and switching station are consistent with County land use designations and are permitted uses in the underlying County zoning district; the project would not require amendments to the General Plan or zoning ordinance.

The portion of the proposed transmission line located within the Maalaea Power Plant switchyard is located within the coastal zone Special Management Area and would require an SMA permit from Maui County pursuant to the Hawaii Coastal Zone Management Program (HRS Chapter 205A). Work proposed within the SMA boundary consists of installation of four poles and a 400-foot-long underground segment to avoid conflict with the existing Maalaea-Lahaina Nos. 1 and 2 69KV lines. An SMA permit would be required.

SECTION 6
TOPICAL ISSUES

6.0 TOPICAL ISSUES

6.1 RELATIONSHIP BETWEEN SHORT-TERM USES AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Impacts associated with the proposed Maalaea-Lahaina Third 69KV Transmission Line Project would be mostly construction-related, localized, short-term and temporary, and would be non-significant or mitigated to a non-significant level. The long-term productivity of resources would not be substantially affected. The project is linear in nature and not land-consumptive. There would be some permanent loss of vegetation due to new spur roads and minor effects on agricultural operations due to the need to maneuver around poles and lines. However, the project would not substantially impair the long-term productivity of the land, existing land uses, or coastal zone resources.

Use of or impacts to earth resources would be short-term and associated with soil disturbances, and *potential* erosion. Impacts to air quality would be short-term and associated only with localized fugitive dust emissions from construction vehicles. The project will create new jobs and support the local economy in the short-term.

Approximately 0.3 acres of agricultural land would be disturbed by pole installation and a total of approximately 20.6 acres of agricultural land would be within the right-of-way easement for the proposed transmission line and switching station. Most of this land would be returned to cultivation following construction. However, a small portion would be permanently taken out of production due to the area occupied by the poles (0.3 acres or 755 square feet) and three acres at the switching station site. In addition, agricultural operations would be slightly impaired on some of this acreage due to the presence of and potential interference with poles. This would be a long-term effect of the project. However, the project would provide more reliable electric service and sufficient capacity to meet growing power demand in West Maui.

Electricity is essential to the long-term productivity of the West Maui economy. Transmission lines are the link between power generation and those who use electricity. The proposed transmission line and switching station would ensure that electric service continues to be provided reliably and efficiently. Because reliable electric service is critical to so many activities, a properly-functioning electrical transmission system is important to long-term productivity.

6.2 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

The Maalaea-Lahaina Third 69KV Transmission Line Project would result in the irreversible and irretrievable commitment of certain resources. An irreversible commitment of a resource is one that cannot be changed once it occurs. An irretrievable commitment occurs when the resource cannot be recovered or reused.

Irretrievable resources include materials, capital, labor and energy needed to plan, design, construct, operate and maintain the proposed transmission line and switching station: concrete, steel and conductor wire for poles and pole foundations, and switching station foundations and equipment; energy and fuel used in the manufacture and delivery of steel poles, conductors and other physical components; and fuel for equipment during construction and routine operations and maintenance activities.

The proposed transmission line would limit the range of potential uses of land within the easement; specifically, no buildings or structures could be constructed. The current uses of land associated with the transmission line easement would not be substantially affected, including undeveloped land, grazing land, sugarcane fields, pineapple fields, and roadway rights-of-way. Archaeological resources would be avoided; no resources would be committed to loss or destruction. The project would permanently disturb vegetation due to new spur roads. The project would also temporarily disturb about 2.0 acres of vegetation during construction, although virtually all of this area would naturally revegetate and would support much the same biological values as existed before construction. The project is linear in nature and not land-consumptive. Although there may be a minor long-term effect on agricultural operations due to the need to maneuver around poles, the project would not substantially impair the long-term productivity of the land or existing land uses. The project is generally compatible with existing land uses, which would continue.

6.3 UNRESOLVED ISSUES

A comprehensive background paper on the biological effects of 60 Hertz (Hz) magnetic fields noted that scientists do not yet know what attributes of magnetic fields could produce adverse public health effects (Carnegie Mellon University, 1989). This 1989 paper also noted that the simple assumption that "more is worse" may not be true, and consequently, that a simple standard for a maximum limit to magnetic field levels "cannot be adequately supported by the science that is now available." The paper also stated:

As recently as a few years ago, scientists were making categorical statements that on the basis of all available evidence there are no health risks from human exposure to power-frequency fields. In our view, the emerging evidence no longer allows one to categorically assert that there are no risks. But it does not provide a basis for asserting that there is a significant risk. (Carnegie Mellon University, 1989).

The paper considered the question of public health policy and what should be done given our present knowledge. The paper suggested three possible courses of action:

- **Do Nothing.** Conclude that there is not yet enough evidence to warrant any action.
- **Prudent Avoidance.** Adopt strategies that limit field exposures with small investments of money and effort. Do nothing drastic or expensive until research provides a clear picture of whether there is any risk at all.
- **Aggressive Regulation.** Conclude that there is a problem and spend some serious time and money on an aggressive program to limit field exposure, while recognizing that we may eventually learn that some or all of this effort and money has been wasted.

On April 3, 1991, the State of Hawaii, Department of Health issued a policy relating to electric and magnetic fields from electric power lines. The policy states:

A prudent approach is needed at this time to regulate electric and magnetic fields around low-frequency electric power facilities, including high-voltage transmission lines. The existing research data are inconclusive and not sufficient enough for adequate, accurate risk assessment. However, the data suggest that a "prudent avoidance" approach to siting new facilities is appropriate. Where technically feasible and practical, public exposures should be minimized. Too little is presently known to be able to determine where or what rules would provide useful public-health protection.

Implementing Actions:

(a) *All newly-installed power lines should be constructed with engineering controls to reduce exposure (for example, the "delta" configuration).*

(b) *The Department of Health will continue to collect and evaluate research data on electromagnetic fields in order to be aware of significant findings with public health implications (State of Hawaii, Department of Health, 1991).*

Maui Electric Company, Ltd (MECO) has adopted strategies consistent with the prudent avoidance approach in selecting an alignment for and designing the Maalaea-Lahaina Third 69KV Transmission Line Project. Evaluation of alternative corridors and selection of the preferred alignment considered existing and proposed land uses with the objective, in part, of avoiding more densely populated areas. By locating the preferred alignment along cane haul roads, public roadways and in remote, undeveloped areas, the prudent avoidance approach was applied as a siting criterion. Different engineering design options can also be applied to reduce field levels, consistent with the prudent avoidance approach. MECO will reduce magnetic field levels of the double-circuit segment of the transmission line by equalizing the currents in the two conductors and by using "unlike" or "delta" phasing arrangements.

The issue of public health impacts from the magnetic fields of the proposed transmission line and switching station remains an unresolved issue, as does the larger issue of health effects from magnetic fields produced by existing distribution lines, wall wiring, appliances and lighting fixtures.

6.4 UNAVOIDABLE ADVERSE IMPACTS

The proposed transmission line and switching station would not result in any unavoidable significant adverse impacts. In all cases, impacts would be beneficial, negligible or non-significant after mitigation. There would be no significant impacts that cannot be mitigated to a non-significant level. Impacts, and feasible measures to mitigate adverse impacts, are described in detail in Section 4.0 and summarized in Table 1.3-1.

SECTION 7

PUBLIC, LANDOWNER,AND AGENCY CONSULTATION

7.0 PUBLIC, LANDOWNER AND AGENCY CONSULTATION

7.1 PUBLIC INVOLVEMENT PLANNING GROUP

A public involvement planning group was established for the Maalaea-Lahaina Third 69KV Transmission Line Project in July 1991. The public involvement planning group consisted of personnel from Maui Electric Company, Ltd. (MECO) and Hawaiian Electric Company, Inc. (HECO), the environmental consultant, Dames & Moore, and subconsultants who are experts in the field of public involvement. Participants from MECO and HECO included representatives from management, transmission engineering, land acquisition and legal departments.

7.2 PUBLIC INVOLVEMENT PLAN

A public involvement plan was prepared which formulated the objectives and approaches to landowner, agency and public consultation for the project. It was determined that major landowners, including the State of Hawaii, would have the most significant stake in the project, followed by agencies and the general public. This is because the study area where the line would be sited is largely undeveloped and unpopulated, and in grazing or agricultural use.

Over sixty percent of the study area is owned by the State and the remainder is owned by private landowners; individual landowners would, to a large extent, determine where the line could be located within their properties. The public involvement plan and program, therefore, emphasized consultation with major landowners and agencies.

As stated in the public involvement plan, the purposes of the consultation program were to:

- inform elected officials, landowners, agencies and the public about the project and about their opportunities to participate;
- ensure that affected agencies, interest groups, elected officials, and landowners were well informed about the project;
- reflect landowner interests in the study approach;
- provide timely information to the project team and to MECO and HECO decision makers about landowner and agency views and opinions on the various corridor options;
- alert the project team to potential conflicts and provide mechanisms for resolution; and
- meet implicit and explicit consultation requirements of permitting agencies.

7.3 PUBLIC INVOLVEMENT ACTIVITIES

Public involvement activities were designed to include means for dissemination of information, as well as opportunities for direct public involvement. The principal activities were organized around elected official briefings, landowner meetings, agency meetings and two public informational meetings.

7.3.1 Phase I - Regional Study & Corridor Identification

The following is a description of the key activities that were conducted during the initial phase of the project.

Fact Sheet (July 1991)

A two-page fact sheet was prepared to serve as the public announcement for the project. It briefly described the need for the project, the scope and schedule of the route selection study, opportunities for public involvement, and it contained a map of the study area.

Mailing List (July 1991)

At the beginning of the project, a mailing list of key agencies, organizations, and individuals was prepared. The mailing list included elected officials: federal, state and county agencies; major landowners; community and service organizations; and interested persons. Several times during the first phase of the project the mailing list was updated to include those who contacted MECO or its consultants for project-related information, persons who attended meetings, and other organizations and individuals who responded to the project fact sheet and announcement, or otherwise requested that their name be added.

Develop Briefing Materials (July 1991)

Briefing materials (i.e., overhead projection diagrams, agendas, handouts) were prepared that illustrated some of the key aspects of the project purpose and need, location, actual and peak electrical loads and projected future loads, the transmission siting process and study workplan, siting factors and issues, the public involvement program and project schedule.

MECO Management Briefing (July 15, 1991)

A presentation was conducted for managers and selected staff of MECO and HECO to describe the need for the project, to introduce the project team, and to describe the routing study approach, workplan and schedule.

Conduct Briefings for Maui County Officials (August 12 and 13, 1991)

Prior to issuing announcement letters, MECO conducted project information briefings for the elected officials of Maui County. The purpose of the briefings was to present the purpose and need for the project, the study process and schedule, and to answer questions about the project. Briefings were conducted for the Maui County Council on August 12 and the Mayor of Maui County and the Maui County Department Directors of Planning and Public Works on August 13.

Announcement Letter (August 21, 1991)

A letter and project fact sheet announcing the project and requesting assistance in providing data were mailed to elected officials, Federal, State and County agencies, landowners, and interested individuals. The letter identified MECO as the proponent and Dames & Moore as the consultant for the project, and asked each agency to designate a contact person.

Telephone Calls/Landowner Contact Program (August - December 1991)

Elected officials were contacted by phone to inform them about the project and to inquire whether they wished to have a briefing about the project. Each of the major landowners within the study area were contacted by phone to establish a dialogue about the project, to inquire whether they received the project announcement letter and fact sheet, and to request a meeting to discuss the project.

Meetings with Major Landowners (September 1991 - January 1992)

Members of the project team met with the major landowners in the study area to discuss the project and opportunities and constraints to locating the line within their property. The meetings held are listed below in chronological order:

September 23, 1991	Wailuku Agribusiness/C. Brewer Properties, Inc.
September 24, 1991	Pioneer Mill/AMFAC/JMB Hawaii, Inc.
October 8, 1991	Bishop Estate

October 10, 1991	Housing Finance and Development Corp., State of Hawaii
October 24, 1991	HC&S
December 3, 1991	HC&S
January 21, 1992	Perreira Ranch Co. (lessee to State of Hawaii)

<u>Maui County Planning Commission Briefing</u> **(October 7, 1991)**

The Maui County Planning Commission briefing was held in October when most of the commissioners were available to attend. The purpose of the briefing was to inform the Commission of the transmission line project and to discuss MECO's plans for development of future generating facilities.

<u>Agency Meetings/Briefings</u> **(October 1991 - February 1992)**

MECO conducted project information meetings with county and state agencies for the purpose of briefing the agencies on the project and collecting or requesting data for the regional study. The agency meetings conducted during the regional study are listed below:

October 7, 1991	State Historic Preservation Division, Department of Land and Natural Resources (DLNR)
October 24, 1991	Maui County Public Works Department
October 31, 1991	State Department of Transportation, Advanced Planning Office
November 1, 1991	State Department of Transportation, Maui District Office
December 16, 1991	Maui County Public Works Department
December 16, 1991	Maui County Parks and Recreation Department
December 18, 1993	Maui Citizens Advisory Council, Na Ala Hele Trails & Access Program, DLNR
December 19, 1991	Office of Conservation and Environmental Affairs, DLNR
January 22, 1992	Maui County Public Works Department
January 22, 1992	Maui District Office, DLNR
January 23, 1992	State Historic Preservation Division, DLNR

7.3.2 Phase II - Corridor Evaluation & Alignment Selection

Major public involvement activities conducted during the corridor evaluation and alignment selection phase of the work are presented below.

Mailing List Update (February 1992)

The original mailing list was updated to refine the listings for the major landowners and their representatives, agencies, elected officials and community organizations and interested individuals. Names, addresses and phone numbers were checked and updated.

Public Involvement Planning Group Meeting #2 (February 21, 1992)

A meeting was held with the project team to discuss plans for the public information meetings. The format for the presentation, preparation activities and roles and responsibilities for the public meetings were agreed upon at this meeting.

Public Meeting Announcement (February 25, 1992)

MECO issued a public meeting announcement letter to all parties on the mailing list. In addition, the public meeting was announced on the local radio station and in local newspapers.

Project Fact Sheet #2 (March 1992)

Project Fact Sheet #2 was prepared that included the approach to the routing study and the status of the project. The fact sheet was a four-page, folded newsletter that contained map inserts and detailed descriptions of each of the four alternative corridors. The fact sheets were provided to the public during the public meetings and were distributed in mailings.

Informational Materials and Visual Aids (February and March 1992)

Regional study environmental data maps and alternative corridor maps were prepared, mounted and colored to be used as display maps at the public meeting. A slide show was developed from slides that had been taken during the helicopter flyover to illustrate the various aspects of the study region and the siting opportunities and constraints associated with the alternative corridors. In addition, a mail-back response form, agendas, overhead slides and sign-in sheets were prepared.

<u>Public Meetings</u> (March 11 and 12, 1992)

A public meeting announcement letter was sent to community groups, agencies, elected officials and landowners inviting them to attend a public information meeting on the project. Public meetings were held at the Lahaina Civic Center on March 11 and at the Kahului Library on March 12 to present and discuss the route selection process and the corridor alternatives.

Each attendee was provided a fact sheet and mail-back response form through which individuals could express preferences on the corridor alternatives as well as general comments regarding the project.

<u>Distribution of Project Fact Sheet #2</u> (April 10, 1992)

Project Fact Sheet #2 was mailed to elected officials, agencies, landowners and others on the mailing list that had not received a copy at a meeting or briefing.

<u>Preferred Corridor Response Form</u> (March - April 1992)

During the public meetings, through the mailing, and in subsequent individual meetings and consultation, individuals were asked to prepare a response form indicating their preference among the four corridor alternatives and variations at the endpoints of the transmission line. Numerous responses were received and collated.

Of the twenty-one total meeting attendees, eleven written responses were received. The ranking of preferences was Alternative 2 (5), Alternative 3 (3), Alternative 1 (2) and Alternative 4 (1). Five of the respondents expressed opposition to the Alternative 4 coastal corridor and instead endorsed either Alternatives 1 or 2.

<u>Agency and Landowner Meetings/Briefings</u> (March - October 1992)

Additional meetings were held with agency personnel and landowners to review and discuss the alternative corridors, specific resource and permitting issues, and land use and operational constraints to siting the line in the various corridors, and to solicit comments on a preference regarding the location of the preferred corridor. Comments or topics discussed are presented in Table 7.3.1. Meetings took place with the following:

March 4, 1992	Office of State Planning
March 5, 1992	Pioneer Mill

March 30, 1992	DLNR-Office of Conservation and Environmental Affairs, Division of Land Management, Division of Forestry and Wildlife, Historic Preservation Division and Office of Hawaiian Affairs.
March 31, 1992	U.S. Army Corps of Engineers - Planning Branch
April 1, 1992	State Department of Transportation, Advanced Planning
April 7, 1992	State Department of Education
April 13, 1992	State Department of Transportation, Highway Division, Planning Branch
April 16, 1992	Housing Development and Finance Corporation
May 5, 1992	U.S. Fish and Wildlife Service - Pacific Wildlife Refuge Complex
May 14, 1992	Wailuku Agribusiness/C. Brewer Properties, Inc.
May 18, 1992	HC&S
July 14, 1992	Maui County Planning Department
August 3, 1992	Pioneer Mill, AMFAC/JMB Hawaii, Inc.
August 5, 1992	Bishop Estate
August 10, 1992	Maui County Public Works Department
August 12, 1992	Na Ala Hele Trails and Access Program, Maui Citizens Advisory Council
August 27, 1992	Alexander & Baldwin-Hawaii, Inc./HC&S
September 28, 1992	U.S. Fish and Wildlife Service
October 9, 1992	Alexander & Baldwin-Hawaii, Inc./HC&S
October 21, 1992	DLNR, Division of Forestry and Wildlife, Maui Trails and Access Specialist

<u>Landowner/Agency Consultation Regarding Alignments</u> **(December 1992 - August 1993)**

Using the environmental database developed for corridor identification and large scale aerial photographs, characteristics and features of the preferred corridor were evaluated and potential alignments were identified and mapped. The alternatives were inspected in the field in February 1993, and a preliminary preferred alignment was staked and the location recorded using a global positioning system. The preliminary preferred alignment was then mapped. Additional consultation with government agencies and landowners were conducted to review the findings of the field survey, to present and discuss the preferred alignment, and to invite comments and discuss any adjustments that might be warranted. During and following the meetings, individual landowners were asked to provide verbal and written confirmation that the preferred alignment (and the switching station site, if applicable) was generally acceptable to them. They were also asked to provide any conditions they would request during the easement acquisition process. Meetings, letters, and phone consultation that took place included:

Landowner	Date	Topic
Bishop Estate	December 8 and 28, 1992	Discuss/request alignment and switching station site
	February 24, 1993	Confirmed location of preferred alignment and switching station site
	March 4, 1993	Report concurrence by Pioneer Mill (lessee) on alignment and switching station site on Bishop Estate property
Wailuku Agribusiness/ C.Brewer Properties	January 25, 1993	Meeting to request alignment across property
	January 28, 1993	Letter from C. Brewer on possible alignment
	February 22, 1993	Confirmation request on alignment and pole locations
	March 10, 1993	Approved letter received from C. Brewer
Pioneer Mill/ AMFAC/JMB	March 3, 1993	Review preferred alignment and switching station site. Location acceptable
	March 10, 1993	Request AMFAC confirmation of location
	May 27, 1993	Letter to AMFAC to request approval confirmation
	June 6, 1993	AMFAC responds with alignment acceptable
DLNR	December 7, 1992	Letter from Division of Forestry and Wildlife (DOFAW) Maui District, Trails and Access. Preferred corridor acceptable
	February 22, 1993	Meeting with Maui District to coordinate archaeology and biology survey
	March 3, 1993	Meeting with Maui District to review preferred alignment; generally acceptable
	March 15, 1993	Site visit with Trails and Access Specialist regarding alignment and Lahaina Pali trail
	March 18, 1993	Letter to Maui District/DOFAW request confirmation of acceptability of preferred alignment
	March 15, 1993	Office of Conservation and Environmental Affairs (OCEA) regarding EISPN/EA and CDUA application
	March 24, 1993	DOFAW/Maui District confirms via letter preferred alignment acceptable relative to Lahaina Pali Trail

Landowner	Date	Topic
	April 9, 1993	Letter to Maui District request right-of-entry for field surveys
	April 13, 1993	Receive approval for field surveys
	April 20, 1993	Submit CDUA Application and EISPN/EA
	April 21, 1993	Video or preferred alignment to Maui District and OCEA
	June 2, 1993	Buffer zone criteria for archaeology sites from Historic Preservation Division, DLNR
	June 4, 1993	Request from DOFAW/Maui District (Trails) relook at location of alignment regarding Lahaina Pali Trail
	June 16, 1993	Meeting to discuss alignment adjustments regarding trail with DOFAW/Maui District
	June 22, 1993	Field visit with DOFAW/Maui District alignment adjustments and restaking
	July 6, 1993	Letter from DOFAW/Maui District confirms realignment acceptable
	September 28, 1993	Draft Archaeology Inventory Report to Historic Preservation Division
State Department of Education	June 15, 1993	Lahainaluna High School and proximity to switching station. No concerns expressed.

7.3.3 Phase III - Conservation District Use Application (CDUA) & Environmental Impact Statement (EIS) Preparation

The major public involvement activities that were conducted during preparation of the EIS and permit application process phase of the work are presented below.

<u>EISPN and CDUA</u> (May 23, 1993)

The EIS Preparation Notice (EISPN) was issued to the Office of Environmental Quality Control (OEQC) through the accepting authority, the DLNR. The EISPN was published in the May 23, 1993 OEQC bulletin. The comment period of 30 days was from May 23, 1993 through June 22, 1993. The CDUA was submitted to DLNR on April 20, 1993; the application was accepted for processing on June 30, 1993.

Public Involvement Planning Group Session (May 24, 1993)

A meeting was held with the project team to discuss plans for the second round of public information meetings to present and receive comments on the preferred alignment. The format for the presentation, preparation activities and roles and responsibilities for the public meetings were agreed upon at this meeting.

Informational Materials and Visual Aids (May - June 1993)

Preferred alignment maps were prepared, mounted and colored to be used as display maps and overhead projector slides at the public meetings. A video of the preferred alignment was prepared from film taken during helicopter field inspection surveys of the alignment. In addition, agendas, overhead slides and full-size colored graphics were prepared.

Public Consultation Period (May 23 - June 22, 1993)

The 30-day public consultation period for the EISPN began on May 23, 1993 in accordance with Chapter 343 Hawaii Revised Statutes. The consultation period closed June 22, 1993. No formal replies to the EISPN requesting to be a consulted party were received. No comment letters were received by DLNR or OEQC.

Project Fact Sheet #3 (May 1993)

Project Fact Sheet #3 was prepared that included: maps of the location of the preferred alignment; information about the need for the project, cost, and schedule; a description of the routing studies; and illustrations showing the steel pole types that would be used to construct the line. The fact sheet was a folded newsletter format that contained map inserts of the preferred alignment and a detailed description of the rationale for selection. The fact sheets were mailed with a public meeting announcement to the individuals on the mailing list. Extra copies were provided to the public meeting attendees and distributed in private meetings.

Public Meeting Announcement Letter (May 28, 1993)

The public meeting was announced through a letter and fact sheet sent to each person on the mailing list directly from MECO. The mailing list prepared in the Phase II activities was updated to include changes in elected officials as a result of the November 1992 general election. Over 150 letters and fact sheets were mailed. In addition, the meetings were announced in local newspapers and on local radio stations.

<u>Presentation to Community Group</u> **(June 10, 1993)**

A presentation was given to the West Maui Senior Citizens Group for the purpose of informing them of the progress of the project and the selection of the preferred alignment. The assembled group supported the need for the project.

<u>Public Meetings</u> **(June 15 and 16, 1993)**

Public meetings were held to present the results of the engineering and environmental studies to locate a preferred alignment for the transmission line and a switching station site. A video, maps, and photographs were part of the presentation. Questions and comments regarding the project were solicited. The community meetings were held during the 30-day consultation period following the publication of the EISPN in the OEQC Bulletin. Over 150 agencies, individuals and organizations were sent announcement letters and fact sheets, and were encouraged to send written comments to DLNR, OEQC or MECO. The first meeting was held June 15, 1993, at Maui Memorial Hospital in Wailuku and the second meeting was held on June 16, 1993, at the Lahaina Civic Center. A total of 17 persons attended the meetings.

None of the attendees voiced objections or opposition to the project or its proposed location. The meetings were transcribed by a court reporting service.

<u>Board of Land and Natural Resources (BLNR) Public Hearing</u> **(August 26, 1993)**

The BLNR held a public hearing in Kahului, Maui on August 26, 1993. The purpose of the hearing was to receive testimony from the public or any interested party on the Conservation District Use Application. The hearing was held because the preferred alignment passed through a small portion of Protective Subzone at the base of Papalaua Gulch. No one from the community attended or offered oral or written testimony at the hearing. The BLNR suggested MECO move the alignment makai and out of the Protective Subzone. Following the hearing, MECO adjusted the location of the alignment out of the Protective Subzone.

7.3.4 Consultation Summary Chronology

Table 7.3-1 presents a chronology of the significant consultations made with elected officials, agencies, landowners, and individuals throughout a two-year period (July 1991 to September 1993) of routing studies leading to selection of a preferred alignment and switching station site. The table presents the organization and person consulted, the data and type of communication (letter, phone call, meeting or field visit), and the topics discussed.

7.3.5 Agencies and Organizations Consulted

An extensive pubic, landowner, and agency consultation process began in July 1992 and continued through the preparation of this Draft EIS. Table 7.3-2 presents a list of elected officials, Federal, State and County agencies, landowners, organizations, and interested individuals who were contacted through mailings, meetings, phone, and correspondence.

Table 7.3-1
CONSULTATION SUMMARY
MAALAEA – LAHAINA THIRD 69KV TRANSMISSION LINE PROJECT

DATE	ORGANIZATION	PERSON(S) CONTACTED	TYPE	TOPICS DISCUSSED
8-15-91	Maui County General Planning	Brian Miskae	L	MECO requests SMA Maps
8-27-91	State Dept. of Health Environmental Office	Art Bauckham	P	Response to Agency Notification Letter
8-28-91	State Land Use Commission	Esther Ueda Bert Saruwatari	L	Response to Agency Notification Letter
8-28-91	Office of State Planning Office of the Governor	Harold S. Masumoto Sallie Edmunds	L	Response to Agency Notification Letter
8-29-91	Office of the Mayor County of Maui	Mayor Linda Crockett Lingle	L	Response to Agency Notification Letter Endorses project and expresses interest in working with MECO to assure appropriate placement of the transmission facilities
9-5-91	University of Hawaii	Dr. Arthur Chiu	M	Wind considerations in transmission line siting
9-11-91	State Dept. of Health Environmental Health	Bruce S. Anderson	L	Response to Agency Notification Letter Sent the Dept.'s policy on EMF and identified Leslie Au as DOH's contact on EMF
9-11-91	State Dept. of Transportation	Edward Y. Hirata	L	Response to Agency Notification Letter The proposed line in central Maui appears to be free of conflict with the Piilani Highway
9-17-91	State Historic Preservation Division – DLNR	Dr. Don Hibbard	L	Response to Agency Notification Letter Recommended meeting with Annie Griffin to obtain specific information regarding archaeological resources
9-19-91	Dept. of Water Supply County of Maui	Rae M. Shikuma	L	Response to Agency Notification Letter Offered to provide information to assist MECO in the design of the project. Identified Edwin Kagehiro engineering division of DWS as contact
9-23-91	Wailuku Agribusiness C. Brewer Properties	Stephen W. Knox Clayton Suzuki Brian Tokeshi David Blane Jim Murray	M	Initial landowner meeting, data collection re: property boundaries, agricultural operations, future use of property Information re: proposed use of C. Brewer lands, possible route alternatives for West Maui Project
9-24-91	Pioneer Mill Co. AMFAC/JMB Hawaii	Keoki Freeland Kimo Falconer Dave Morrell Michael Burke	M	Initial Landowner meeting, data collection re: current and proposed use of lands
10-7-91	Maui County Planning Commission	Planning Commissioners	M	Briefing to inform them of the project and to discuss MECO's plans for future generating facilities

TYPE = Type of communication P = phone call; L = Letter; M = Meeting; F = Field visit

Table 7.3–1 (continued)

DATE	ORGANIZATION	PERSON(S) CONTACTED	TYPE	TOPICS DISCUSSED
10–7–91	State Historic Preservation Division – DLNR	Annie Griffin, Archaeologist for Maui	M	Data collection and consultation regarding historic sites within the study area
10–8–91	B.P. Bishop Estate	Kapu Smith Allen Young	M	Initial landowner meeting; process to request an easement from Bishop Estate
10–10–91	Housing Finance and Development Corp.	Neal Wu, HFDC Project Manager Warren Unemori, Cons. Engr.	M	Status of HFDC Lahaina Master Planned Community Project; phasing and build–out schedule
10–11–91	State Dept. of Land and Natural Resources	William W. Paty, Chairman Board of Land and Natural Resources	L	Response to Agency Notification Letter No additional comments other than historic preservation comments already provided 9/17/91
10–24–91	Hawaiian Commercial & Sugar Company, A Division of Alexander & Baldwin	Robert Warzecha, Vice President Randall C. Moore, Manager Irrigation Dept.	M	Initial landowner meeting, data collection re: property boundaries, agricultural operations identification of potential corridors
10–24–91	County of Maui	Karl Yamashita		
10–31–91	State Dept. of Transportation Highways Division – Advanced Planning Branch	Julia Tsumoto, Systems Planner	M	Initial Agency Briefing – State Highway Long Range Planning and Priority Projects
11–1–91	State Dept. of Transportation Highways Division – Maui District Office	Robert Sairot, District Engineer	M	Initial Agency Briefing
12–3–91	Hawaiian Commercial & Sugar Company	Louis Ferreira, Manager Harvesting & Utilities Randall C. Moore, Manager Irrigation Dept. Bob Cushnie, Operations Foreman	M,F	Discussed issues relating to operations and safety. Examined possible locations for the line through HC&S property on field maps. Field inspection of possible transmission routes pole setback, guy wires, marker poles, fire conductor clearance, Pulehu airstrip safety
12–16–91	County of Maui, Dept. of Parks and Recreation	Roger Neher	M	Agency briefing and data collection
12–18–91	Na Ala Hele Advisory Council	Phillip S. Bose, Chairman	M	Inform MECO of the Lahaina Pali Trail
12–19–91	State Office of Conservation and Environmental Affairs –DLNR	Don Horiuchi, Planner	M	Briefing on Project Studies
1–21–92	Perreira Ranch Company	Annette Niles	M	Briefing on Project, discussed grazing operations
1–22–92	Maui District Office – State Dept. of Land and Natural Resources	Allen Tokunaga, Land Agent Robert Hobdy, Forester John Cummings, Biologist	M	Briefing on Project Studies, Review of Regional Study Maps and discussion of resources within study region
1–23–92	State Historic Preservation Division	Annie Griffin, Archaeologist for Maui	M	Discussion and data collection re: Lahaina Pali Trail
2–27–92	Na Ala Hele Trails and Access System – DLNR	Christine Meller	P	MECO requests program document for Na Ala Hele

TYPE = Type of communication P = phone call; L = Letter; M = Meeting; F = Field visit

Table 7.3-1 (continued)

DATE	ORGANIZATION	PERSON(S) CONTACTED	TYPE	TOPICS DISCUSSED
3-4-92	Office of State Planning Dept. of Business, Economic Development & Tourism	Lorraine Maki Abe Mitsuda Gerald Lesperance	M	Presentation on the projects; discussion of corridor selection process
3-6-92	Pioneer Mill Company	David Morrell	L	MECO transmits alternative corridor maps
3-20-92	State Historic Preservation Division – DLNR	Agnes Griffin, Archaeologist for Maui	L	MECO sends Phase I Archaeological Assessment
3-20-92	State Land Management Division – DLNR	Mason Young, Land Manager Allen Tokunaga, Maui Land Agent	L	MECO transmits alternative corridor maps
3-30-92	State Dept. of Land and Natural Resources	Mason Young, Land Manager Michael Buck, Administrator Div. of Forestry & Wildlife Don Horiuchi, Planner, Office of Cons.Env. Affairs Annie Griffin, State Historic Preservation Division	M	Agency briefing on route selection study and alternative corridors. Use of existing rights-of-way is a good concept Avoid the mauka corridor for conservation of biological resources within the West Maui Mtns. Why not use the coastal corridor along the highway
	Office of Hawaiian Affairs	Linda Lee, OHA, Environmental	M	Examine alternatives within the EIS such as upgrading the lines to 138KV and using the same corridor
3-31-92	U.S. Army Corps of Engineers	Clarence Lee	L	Request or comments on Lahaina corridors near Kahoma Stream Flood Control Channel
3-31-92	State Historic Preservation Division – DLNR	Annie Griffin, Archaeologist	L	MECO transmits updated archaeological reports.
4-30-92	Dept. of Human Concerns County of Maui	Director	L	No comments
5-5-92	U.S. Fish & Wildlife Service Pacific National Wildlife Refuge Complex	Mike Silbernagle, Wildlife Biologist Jerry Leinecke, Deputy Project Leader	M	Reviewed the proposed alignment Kealia Pond would probably not be impacted by the project; sent them a map
5-8-92	County of Maui Parks and Recreation	Charmaine Tavares	L	No impact to County parks
5-11-92	County of Maui Planning Department	Brian Miskae, Planning Director	L	Preserve coastal views and view corridors minimize visual impacts by locating the line as far mauka as possible to reduce visual impact, minimize health risks near urban centers Energy Division recommends constructing new line at a higher design standard than Lahaina 1&2
5-12-92	County of Maui Office of the Mayor	Nolan G. Perreira (Mayor L. Crockett-Lingle)	L	Transmitting comments from County Depts.

TYPE = Type of communication P = phone call; L = Letter; M = Meeting; F = Field visit

Table 7.3-1 (continued)

DATE	ORGANIZATION	PERSON(S) CONTACTED	TYPE	TOPICS DISCUSSED
5-12-92	County of Maui Dept. of Public Works	Charles Jencks, Deputy Director	L	Site line as far away as possible from existing highways.
5-12-92	U.S. Fish & Wildlife Service Pacific National Wildlife Refuge Complex	Jerry Leinecke, Deputy Project Leader	P	Kealia Pond Wildlife Sanctuary; contacts for information regarding wildlife use in the area
5-14-92	C. Brewer Properties	James M. Murray	M	Locate the new line on the Wailuku side of the existing line through C. Brewer's property mauka of H-P Highway to enable pineapple cultivation in the field on the Maalaea side of the existing line. Realize this may require a crossover of existing lines, but want MECO to consider this
5-18-92	Hawaiian Commercial & Sugar Company	Randall C. Moore, Manager Irrigation Dept.	L	Recommended siting the Lahaina line from Maalaea Power Plant along N. Kihei Road to Honoapiilani Hwy
6-9-92	State Dept. of Health	John C. Lewin, Director	L	Response to newsletter re: alternative corridors
7-7-92	Na Ala Hele Program Maui District Office-DLNR	Michael Baker, Trails Specialist	P	Discuss status of Lahaina Pali Trail planning and alts. corridors. Opposed to makai corridor.
7-15-92	Hawaiian Commercial & Sugar	Randall C. Moore	P	Discussion of alternate corridors across HC&S lands
7-16-92	Warren S. Unemori Engineering, Inc.	Warren Unemori Neal Wu, HFDC	L	MECO transmits Wahikuli Substation Site Plan
8-3-92	AMFAC/JMB Hawaii, Inc.	Mike Burke	L	Preferred corridor selection, switching station site
8-5-92	Bishop Estate	Kapu Smith Allen Young	M	Briefing on proposed new switching station site
8-10-92	County of Maui Public Works Department	Ralph Nagamine, Chief Engineer	P	Permits required for use of county right-of-way
8-10-92	County of Maui Public Works Department	Charles Jencks, Deputy Director	P	Decision as to whether an EA is required according to HRS 343 for use of County road right-of-way
8-11-92	County of Maui Public Works Department	Charles Jencks, Deputy Director	L	Request for clarification on MECO's responsibilities for environmental compliance: EA and permits
8-12-92	Na Ala Hele Advisory Council Hawaii Trail & Access System	Phil Bose Mary Evanson Michael Baker Robert Kekuna Dave Brown	M	MECO presents status of route selection studies, alternative corridors. Group is opposed to a makai corridor; want to protect the views from Lahaina Pali Trail
8-17-92	State of Hawaii Dept. of Transportation Highways Division, Permitting	Ken Unemoto, Engineer Construction and Maintenance	P	Status of the route selection studies, final alignment; responsibilities under HRS 343 for use of identification of State Dept. of Transportation as approving agency for EA
8-18-92	County of Maui Public Works Department	Charles Jencks, Deputy Director	P	Setback requirements along County roadways 2 foot along curb side; 6 foot along the travel roadway

TYPE = Type of communication P = phone call; L = Letter; M = Meeting; F = Field visit

Table 7.3–1 (continued)

DATE	ORGANIZATION	PERSON(S) CONTACTED	TYPE	TOPICS DISCUSSED
8–20–92	Na Ala Hele Advisory Council Hawaii Trail & Access System	Phillip S. Bose Chairperson	L	Recommend siting new line as near as possible to existing lines, preferably above
8–27–92	A&B–Hawaii, Inc.	Stanley Kuriyama, V. Pres. Tom Witten, PBR	M	Maalaea Village Project proposed by A&B; possible siting alternative across their property
8–31–92	County of Maui Planning Dept.	Colleen Suyama Bob Medeiros Calvin Kobayashi	P	County Zoning, Community Plan Update Status Integrated Resource Planning
9–1–92	State Department of Health Noise Section	Jeff Eckerd	P	Noise Standards and Required Permits; Assessment of Construction and Operational Impacts
9–1–92	U.S. Fish and Wildlife Service	Andy Yuen	P	Relationship of Project to Kealia Pond
9–4–92	State Department of Health	Willie Nagamine	P	Air Standards and Construction Emissions
9–28–92	U.S. Fish & Wildlife	Karen Evans	P	Issues related to birds that use the Kealia Pond
10–2–92	U.S. Fish & Wildlife	Karen Evans	L	MECO requests response on alts. corridors
10–9–92	A&B Hawaii, Inc.	Stanley Kuriyama, V. Pres. Tom Witten, PBR	M	Maalaea Village development concept and realignment of the first segment of the to avoid the project district
10–20–92	A&B Hawaii, Inc. Hawaiian Commercial & Sugar	Stanley Kuriyama, V. Pres. Randall C. Moore	L	Request to confirm change to the alignment Adjustment to the Routing of Final Alignment
10–21–92	Division of Forestry & Wildlife Maui District Office – DLNR	Michael Baker Theresa Donhom	M	Reviewed viewshed analysis and selected preferred corridor (Central corridor).
11–2–92	Division of Forestry & Wildlife Maui District Office – DLNR	Michael Baker	L	MECO requests written confirmation of the central corridor as acceptable to DLNR.
12–7–92	Division of Forestry & Wildlife Maui District Office – DLNR	Michael Baker	L	DLNR responds to MECO and confirms central corridor. DLNR requests involvement in pole–placement surveys asks that MECO site poles in the lowest visibility alignments.
12–8–92	B.P. Bishop Estate	Kelvin Kai Allen Young	M	Discuss possible transmission alignments and the proposed switching station site on Bishop land.
12–28–92	B. P. Bishop Estate	Kapu Smith	L	Bishop send map of Ikena Avenue Relocation Site Map
1–25–93	Wailuku Agribusiness C. Brewer Properties	Clayton Suzuki Jeffrey Takaeta James Herberg	M	Final alignment location across pineapple fields.
1–28–93	C. Brewer Properties	David Blane	L	Map of preferred alignment across their property.
1–29–93	Pioneer Mill	Peter Brodie	M	Review of preliminary preferred alignment and Lahainaluna Switching Station location.
2–19–93	Department of Education Lahainaluna Schools	David Keala	P	Location of Lahainaluna Switching Station and school master plan.
2–19–93	Bishop Estate	Kelvin Kai	P	Location of Lahainaluna Switching Station and schedule meeting with Kapu Smith.

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Table 7.3-1 (continued)

DATE	ORGANIZATION	PERSON(S) CONTACTED	TYPE	TOPICS DISCUSSED
2-22-93	Maui County Planning Dept.	Bill Medeiros	P	Community Plan Update process and projects.
2-22-93	C. Brewer Properties, Inc.	David Blane, V. Pres.	L	Proposed MECO Pole Locations and Transmission Line Route through Wailuku Agribusiness Field 101
2-24-93	Bishop Estate	Kapu Smith Kelvin Kai Allen Young	M	Agreed upon switching station location and preferred alignment on Bishop property (Piilani Ditch Road). Bishop Trustees will review and approve and send confirmation.
3-3-93	Pioneer Mill Co.	Kimo Falconer Charles Bornnett Jim Bailey Keoki Freeland Peter Brodie	M	Reviewed preferred alignment and switching station. No major objections. Requested approval in letter. Amfac to comment.
3-3-93	Div. of Forestry & Wildlife Land Management Division Maui District Office – DNLR	Allen Tokunaga Michael Baker Robert Hobdy Meyer Ueoka Phil Ohtz John Cummings	M	Agreed on preferred alignment across State lands. Planned a final field check of segment 4 location. Concern of safety of lines in public hunting area at Olowalu.
3-4-93	Bishop Estate	Kapu Smith	P	Report on meeting with Pioneer Mill.
3-9-93	Pioneer Mill	Keoki Freeland	P	Freeland presented alignment to Amfac/JMB. PMCo has no objections. Subject to Amfac approval.
3-10-93	Amfac/JMB	A. Shimisu	P	Status of Amfac review. Preliminary response–no major objections. Needs to check Puu Hipa golf course location.
3-10-93	Wailuku Agribusiness	David Blane	L	Letter from D. Blane. Approves route and pole locations.
3-15-93	Div. of Forestry & Wildlife Land Management Division Maui District Office – DLNR	Michael Baker	F	Field check of alignment segment number 4. Decision to leave as is until detailed design stage.
3-18-93	Div. of Forestry & Wildlife Land Management Division Maui District Office – DLNR	Michael Baker	L	Letter from MECO requesting confirmation of alignment with conditions.
3-24-93	Div. of Forestry & Wildlife Land Management Division Maui District Office – DLNR	Michael Baker	L	Confirmation of the alignment and that DLNR should be consulted during pole siting.
4-9-93	Land Management Division Maui District Office – DLNR	Alan Tokunaga	L	MECO requests right-of-entry on state lands for purpose of conducting field surveys – April 26 – May 22nd
4-13-93	Land Management Division Maui District Office – DLNR	Alan Tokunaga	L	Granting access with reqquest to contact lessee, Perreira Ranch Co. directly regarding access.
4-20-93	Pioneer Mill Company	Keoki Freeland	L	MECO requests right-of-entry on state lands for purpose of conducting field surveys – April 26 – May 22nd

TYPE = Type of communication P = phone call; L = Letter; M = Meeting; F = Field visit

Table 7.3–1 (continued)

DATE	ORGANIZATION	PERSON(S) CONTACTED	TYPE	TOPICS DISCUSSED
4–20–93	Perreira Ranch Company	Annette Niles	P,L	MECO requests right–of–entry on state lands for purpose of conducting field surveys – April 26 – May 22nd
4–20–93	B. P. Bishop Estate	Kapu Smith	P,L	MECO request for right–of–entry on state lands for purpose of conducting field surveys – April 26 – May 22nd
4–20–93	Amfac/JMB Hawaii, Inc.	Anne Lo Shimizu	L	MECO request for right–of–entry on state lands for purpose of conducting field surveys – April 26 – May 22nd
4–20–93	State Dept. of Land and Natural Resources	Keith Ahue	L	Submitted Notice of EIS Preparation and Conservation District Use Permit Application
4–27–93	Div. of Forestry & Wildlife Maui District Office – DLNR	Michael Baker	F	Helicopter Survey of preferred alignment across state owned lands near Lahaina Pali Trail
5–27–93	Amfac/JMB Hawaii, Inc.	Anne Lo Shimizu	L	MECO requests confirmation/approval of the location of the alignment across Amfac lands
6–4–93	Div. of Forestry & Wildlife Maui District Office – DLNR	Michael Baker	P	DLNR requests that the alignment be shifted mauka in one section (Segment 4) which parallels the Lahaina Pali Trail

TYPE = Type of communication P = phone call; L = Letter; M = Meeting; F = Field visit

Table 7.3-2
AGENCIES, ORGANIZATIONS AND INDIVIDUALS CONSULTED

ELECTED OFFICIALS

Hawaii Congressional Delegation
Senator Daniel K. Inouye
Senator Daniel K. Akaka
Representative Patsy T. Mink

State of Hawaii
Governor John D. Waihee
Senator Rich Reed
Senator Joseph Tanaha
Representative Rosalyn Baker
Representative Robert Nakasone
Representative Russel Blair
Representative Joseph Souki

County of Maui
Mayor Linda Crockett-Lingle
Councilman Manuel Moniz
Councilman Patrick Kawano
Councilwoman Lynn Britton
Councilman Rick Medina
Councilman Dennis Nakamura
Councilman James Apuna
Councilwoman Alice Lee
Councilwoman Goro Hokama

Planning Commissioners
Anne Fujii
John Akana
Kenneth Burr
Marion Hanlan
Edwina Smythe
Norman Barroga
Daniel Kimura
Herbert Sukukihara
William Nishibayashi

AGENCIES

Federal
U.S. Army Corps of Engineers
U.S. Department of Agriculture, Soil Conservation Service
U.S. Department of the Interior, National Park Service
U.S. Department of the Interior, Geological Survey
U.S. Department of Transportation, Federal Aviation Administration
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
National Marine Fisheries Service

State
Office of State Planning
Department of Land and Natural Resources
- Keith Ahue, Chairman, Board of Land and Natural Resources
- Historic Preservation Division
- State Parks and Recreation Division
- Office of Conservation and Environmental Affairs
- Division of Water and Land Development
- Division of Forestry and Wildlife
- Na Ala Hele Trails and Access Program
- Maui Citizens Advisory Council, Na Ala Hele Trails and Access Program
- Division of Land Management
- Maui Land Agent, Division of Land Management
- Office of Environmental Quality Control

Office of Hawaiian Affairs
State Department of Transportation
- Highways Division
- Advanced Planning Branch
- Highways Division, Maui District Office

Department of Hawaiian Home Lands
- Planning Office
- Hawaiian Homes Commission

Department of Health
Department of Business, Economic Development and Tourism
- Energy Division
- State Land Use Commission

Housing Finance and Development Corporation
Hawaii Public Utilities Commission
Department of Education
Department of Accounting and General Services
Department of Agriculture
Department of Defense
University of Hawaii, Environmental Center
University of Hawaii, Water Resources Research Center

County
Managing Director
Department of Human Concerns
Department of Planning
Energy Program Specialist, Department of Planning
Department of Public Works
Department of Water Supply
Department of Parks and Recreation
Office of Economic Development
Chairman and Superintendent, Second School District - Maui (5)
Provost, Maui Community College

LANDOWNERS

C. Brewer Properties, Inc.
HC&S
Alexander & Baldwin, Inc.
Bishop Estate
AMFAC/JMB Hawaii, Inc.
Pioneer Mill
Wailuku Agribusiness Company, Inc.
Maalaea Triangle Partnership
Perreira Ranch Company

ORGANIZATIONS/ASSOCIATIONS

The Nature Conservancy
Sierra Club
Maui Tomorrow
Maui Historical Society
Hawaii Audubon Society
Maui Economic Development Board
Maui Board of Realtors
Maui Chamber of Commerce
Maui Hotel Association
West Maui Taxpayers Association
Maalaea Community Association
Lahainatown Action Committee
West Maui Senior Citizen Group

INTERESTED PERSONS

Sanford Langa
B. Martin Luna
Michie Kosaka
Lee Radner
Ry Barbin
Rose Ohashi
Jean Igarashi

MEDIA

Pacific Business News
Hawaii Business
Lahaina News
Maui News
KGMB-TV
KGU 76-Communications Hawaii, Inc.
KHON TV 2
KHVH Newsradio 99
KITV 4
KKUA/KHPR Public Radio
KSSK - AM59 and FM92 Radio
South Maui Times

PERSONS ATTENDING PUBLIC MEETINGS

Lahaina Civic Center, Lahaina, March 11, 1992
Lee Radner, Office of Representative Rosalyn Baker
Sallie Edmonds, Office of State Planning
Michie Kosaka, Lahaina-Honolua Senior Citizens Club
Lawrence T. Minami, Lahaina-Honolua Senior Citizens Club
Elizabeth Campos
Alan Ashby
Maggie Creighton
Glenn Walters

Kahului Public Library, Kahului, March 12, 1992
Michael Baker, Department of Land and Natural Resources, Division of Forestry and Wildlife
Robert O. Siarot, State Department of Transportation, Maui District Office
Thelma Shimaoka, Office of Hawaiian Affairs
David Keala, Department of Education, Maui
Ron Gammie, Maalaea Community Association
Romelda and Jack Mueller, Maalaea Community Association
Jerome Kaiser, South Maui Times
Walbert S. Chong
Wanda L. Hughes
Lesley Anne Bruce
Lisa Hamilton
Donna Clayton
Jim Williamson

Maui Memorial Hospital, Wailuku, June 15, 1993
Clarence Okamura, Office of Representative Patsy T. Mink
Nolan Perrera, Mayor's Office, County of Maui
Robert O. Siarot, State Department of Transportation, Maui District Office
Bryan Kageyama, Hawaii Public Utilities Commission
David Keala, Department of Education, Maui
Anna Palomino, Hoolawa Farms
Stan Kuriyama, Alexander & Baldwin Properties
Ron Gammie, Maalaea Community Association
Romelda and Jack Mueller, Maalaea Community Association
Rene D. Silva
Glenn L. Shepherd
Michael Suzuki

Lahaina Civic Center, Lahaina, June 16, 1993
Lee Radner, Office of Representative Rosalyn Baker
Representative Rosalyn Baker
George Keoki Freeland, Pioneer Mill
Lawrence T. Minami, West Maui Senior Citizen Group
Shannon Drayson, Lahaina News

SECTION 8

DRAFT EIS REVIEW: PARTIES CONSULTED, COMMENTS, AND RESPONSES

8.0 DRAFT EIS REVIEW: PARTIES CONSULTED, COMMENTS, AND RESPONSES

A Draft Environmental Impact Statement (EIS) for the proposed Maalaea-Lahaina Third 69KV Transmission Line Project was prepared pursuant to Chapter 343, Hawaii Revised Statues. The consulted entities listed in Section 7.0 were integral to the development of the Draft EIS. A Notice of Availability of the Draft EIS was published in Volume X, No. 24 of the Office of Environmental Quality Control *OEQC Bulletin* on December 23, 1993. The OEQC publication initiated a 45-day public review period, ending February 7, 1994.

8.1 DRAFT EIS DISTRIBUTION

The following is the OEQC approved list of agencies, groups and individuals who were mailed copies of the Draft EIS at the initiation of the 45-day review period. The fourteen entities who provided comments on the Draft EIS are listed in boldface. The comments and corresponding response letters are reproduced in Section 8.3 of this document.

ENTITY RECEIVING DRAFT EIS	COMMENT DATE
Federal Agencies	
U.S. Army Corps of Engineers, Operations Division	
U.S. Department of Agriculture, Soil Conservation Service	
U.S. Department of Transportation, Federal Aviation Administration	
U.S. Environmental Protection Agency, Region IX	
U.S. Fish and Wildlife Service	
U.S. Department of Commerce, National Marine Fisheries Service	
U.S. Department of the Interior, Geological Survey	**January 6, 1994**
U.S. Coast Guard	
United States Army Support Command Hawaii	
Naval Base Pearl Harbor	**January 4, 1994**
State Agencies	
Office of State Planning	
Board of Land and Natural Resources	
Department of Land & Natural Resources	
• **State Historic Preservation Division**	**February 15, 1994**
• State Parks & Outdoor Recreation Division	
• Office of Conservation & Environmental Affairs	
• Division of Water and Land Development	
• Division of Forestry and Wildlife	
• **Division of Land Management**	**February 11, 1994**
Department of Transportation	
• Advanced Planning Branch	
• Maui District Office	

Department of Health	**February 3, 1994**
• **Office of Environmental Quality Control**	**February 7, 1994**
Department of Business, Economic Development & Tourism	
• **Energy Division**	**January 5, 1994**
• **State Land Use Commission**	**December 27, 1993**
Department of Budget and Finance	
• **Housing Finance and Development Corporation**	**February 8, 1994**
Department of Education	
Department of Accounting and General Services	
• **Public Works Division, Planning Branch**	**February 11, 1994**
Board of Agriculture, Department of Agriculture	
Department of Defense	**February 8, 1994**
State Archivist	

<u>University of Hawaii</u>

Environmental Center	**February 7, 1994**
Water Resources Research Center	

<u>News Media</u>

Lahaina News
Maui News
Sun Press
Honolulu Star Bulletin
Honolulu Advertiser
South Maui Times

<u>County of Maui</u>

Mayor's Office	**January 26, 1994**
Department of Planning	
Department of Public Works	**February 3, 1994**
Department of Water Supply	
Department of Parks and Recreation	
Office of Economic Development	

<u>Non-governmental Agencies</u>

Office of Hawaiian Affairs
American Lung Association

<u>Libraries</u>

Department of Business and Economic Development and Tourism
Legislative Reference Bureau
University of Hawaii Hamilton Library
State Main Library
Kaimuki Regional Library
Pearl City Regional Library
Wailuku Regional Library
Kaneohe Regional Library
Hilo Regional Library
Kauai Regional Library
Maui Community College
Kahului Library
Lahaina Library

Consulted Parties

The Honorable Patsy T. Mink, U.S. House of Representatives
The Honorable Rick Reed, State Senate
The Honorable Rosalyn Baker, Hawaii House of Representatives
The Honorable Joseph M. Souki, Hawaii House of Representatives
The Honorable Linda Crockett-Lingle, Mayor, County of Maui
The Honorable Dennis Nakamura, Maui County Council
The Honorable Chairman and Members of the Hawaii Public Utilities Commission
Mr. Bryan Kageyama, Maui District Representative
C. Brewer Properties, Inc.
HC&S
Maalaea Community Organization
Alexander & Baldwin, Inc., Kahului
Alexander & Baldwin, Inc., Honolulu
Maalaea Triangle Partnership
AMFAC Properties, Maui
AMFAC/JMB Hawaii, Inc., Honolulu — January 7, 1994
Bishop Estate, Lihue
Bishop Estate, Honolulu
Pioneer Mill
West Maui Senior Citizen Group
Perreira Ranch Company
Wailuku Agribusiness Company, Inc.
Mr. Richard Haake, Jr., Managing Director, County of Maui
Mr. Kalvin Kobayashi, Energy Program Specialist, Department of Planning, Maui

8.2 INDIVIDUALS NOTIFIED OF DRAFT EIS AVAILABILITY

In addition to the entities listed in Section 7.4.1, forty-nine were notified by letter of locations where the Draft EIS was available for review. No comments were received from these entities.

The Honorable Daniel K. Inouye
The Honorable Daniel K. Akaka
The Honorable John D. Waihee, III
The Honorable Joseph Tanaka
Mrs. Sarajean Tokunaga
The Honorable Robert Nakasone
The Honorable Russel Blair
The Honorable Mauel Moniz, Jr.
The Honorable Patrick S. Kawano
The Honorable Thomas P. Morrow
The Honorable Lynn Britton
The Honorable Rick Medina
The Honorable James H. Apana, Jr.
The Honorable Alice L. Lee
The Honorable Goro Hokama
U.S. Department of the Interior, National Park Service
Reverend Anne Fujii, Maui Planning Commission
Mr. John Akana, Maui Planning Commission
Mr. Kenneth Barr, Maui Planning Commission
Dr. Marion Hanlon, Maui Planning Commission
Ms. Edwina Smythe, Maui Planning Commission
Ms. Norma Barroga, Maui Planning Commission

Mr. Daniel Kimura, Maui Planning Commission
Mr. Herbert Sakakihara, Maui Planning Commission
Mr. William O. Nishibayashi, Maui Planning Commission
Mr. Alec J.W. McBarnet, Jr., District Superintendent, Second School District - Maui
The Honorable David Morihara
The Honorable Paula Ishii-Morikami
The Honorable Avery B. Chumbley
Mr. Mark White, The Nature Conservancy - Maui
Mr. Bill Mills, The Nature Conservancy - Oahu
Mr. Nelson Ho, Sierra Club - Hawaii Chapter
Ms. Betsy Gagne, Sierra Club - Maui Chapter
Mr. Anthony Rankin, Maui Tomorrow
Mr. Charles Keau, Maui Historical Society
Mr. Reggie Davis, Hawaii Audobon Society
Mr. Michael Boughton, Maui Economic Development Board
Ms. Barbara Wattiker Stellway, Maui Board of Realtors
Mr. Wayne Hedani, Maui Chamber of Commerce
Ms. Terryl Vencl. Maui Hotel Association
Mr. Mark Percell, West Maui Taxpayers Association
Ms. Fran Mitsumura, Lahainatown Action Committee
Mr. Sanford Langa
Mr. B. Martin Luna
Mr. Michie Kosaka
Mr. Lee Radner
Mr. Ry Barbin
Ms. Rose Ohashi
Ms. Jean Igarashi

8.3 COMMENT LETTERS ON THE DRAFT EIS AND RESPONSE LETTERS

On the following pages are reproductions of substantive written comments made on the Draft EIS, as well as responses to these comments.

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
Room 104, Old Federal Building
335 Merchant Street
Honolulu, Hawaii 96813
Telephone 587-3822

ESTHER UEDA
EXECUTIVE OFFICER

RECEIVED
DEC 28 1993
DAMES & MOORE

December 27, 1993

Mr. Don Horiuchi
Department of Land and Natural Resources
State of Hawaii
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Horiuchi:

Subject: Maalaea-Lahaina Third 69KV Transmission Line
<u>Project Draft Environmental Impact Statement</u>

We have reviewed the subject Draft Environmental Impact Statement ("DEIS") for the proposed project and have the following comments to offer:

1) We confirm that the following parcels are within the respective State Land Use Districts:

Tax Map Key No.	District
3-5-01: por. 14	Conservation
3-6-01: por. 18	Agricultural
3-8-05: por. 02	Agricultural
4-6-18: por. 01, por. 03	Agricultural
4-6-20: por. 02, por. 05	Agricultural
4-6-21: por. 01, por. 03	Agricultural
4-6-26: por. 18	Urban
4-7-01: por. 02	Agricultural
4-7-05: por. 01	Agricultural
4-8-01: por. 01, por. 02	Agricultural
4-8-02: por. 02, por. 08, por. 09	Agricultural
4-8-03: por. 08, por. 40	Agricultural
4-8-03: por. 10	Agricultural and Conservation

2) We wish to note that the proposed 1,000-foot long, double circuit 69KV transmission line that connects the proposed Lahainaluna Switching Station to the existing 69KV Puukolii and Lahaina 69KV lines (Map 2, Figure 2.4-2) does not appear to involve TMK: 4-6-26: por. 18 as listed on page 1-2 of the DEIS. TMK: 4-6-26: por. 18 is within the State Land Use Urban District, as stated in the above paragraph. However, the DEIS indicates that Urban and Rural District lands will not be involved. Clarification is needed as to whether said TMK is being affected by the proposed project.

3) The State Land Use District Boundaries on Map 1, Figure 4.2-1, are depicted incorrectly in the vicinity of Maalaea. The Agricultural/Conservation District Boundary was amended by the Commission's approval of LUC Docket No. A92-672/C. Brewer Properties, Inc.

Enclosed for your use is a reproduction of a portion of USGS Quadrangle M-6 (Maalaea) which shows the current boundaries.

4) We wish to note that the following areas that are adjacent to the proposed project are recommendations made by the Office of State Planning pursuant to the State Land Use District Boundary Review Report for Maui/Molokai/Lanai (§205-18, HRS):

a) Addition to Kealia Wetland - Priority 1 recommendation to reclassify approximately 615 acres from Agricultural to Conservation adjacent to the Maalaea Power Plant.

b) Wainee Affordable Housing Site - Priority 2 recommendation to reclassify approximately 100 acres from Agricultural to Urban surrounding the town of Wainee.

Enclosed are location maps for the above recommendations.

We have no further comments to offer at this time.

Thank you for the opportunity to provide comments on the DEIS. If you should have any questions in regards to this matter, please feel free to contact me or Leo Asuncion of my staff at 587-3822.

Sincerely,

ESTHER UEDA
Executive Officer

EU:lra

Encl.

cc: Mr. David Park, Maui Electric Co. Ltd. (w/enclosures)
Mr. John Everingham, Dames & Moore (w/enclosures)
OEQC (w/o enclosures)
DBEDT - Dir. Referral #93-363-0 (w/enclosures)

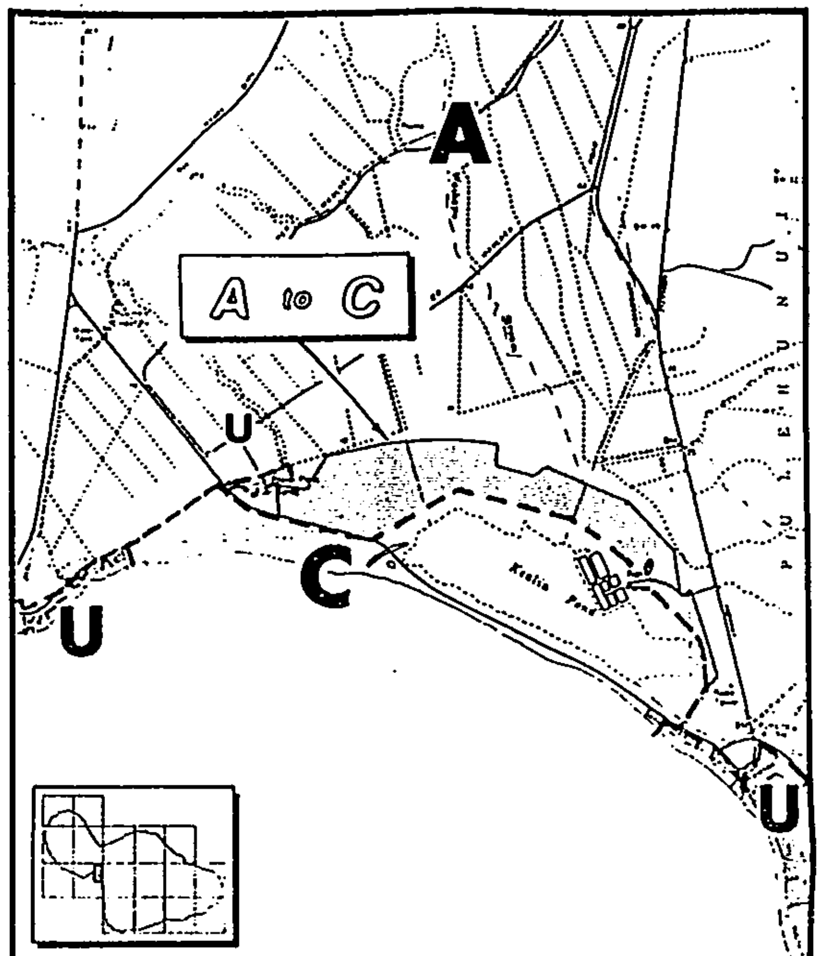
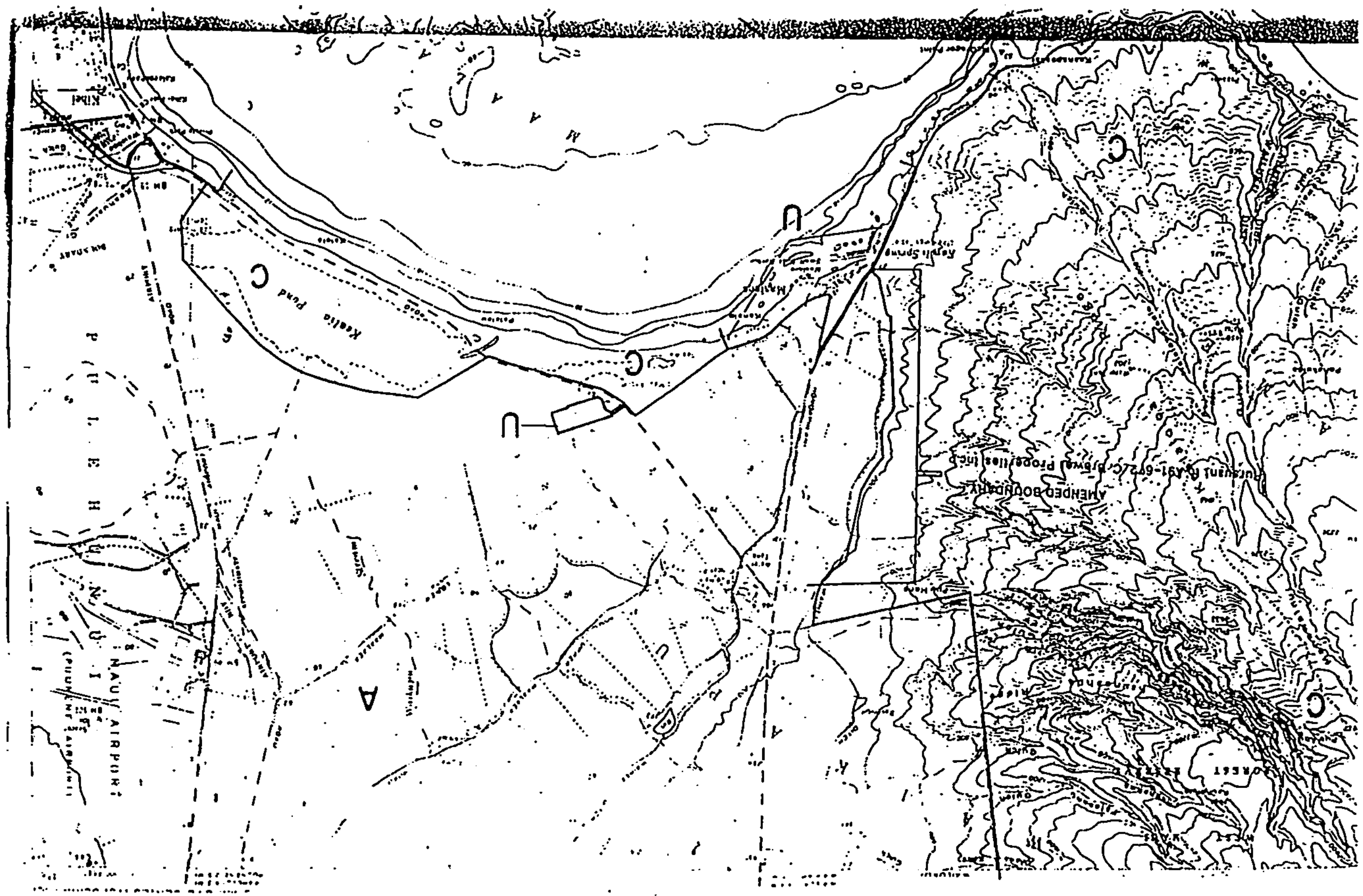
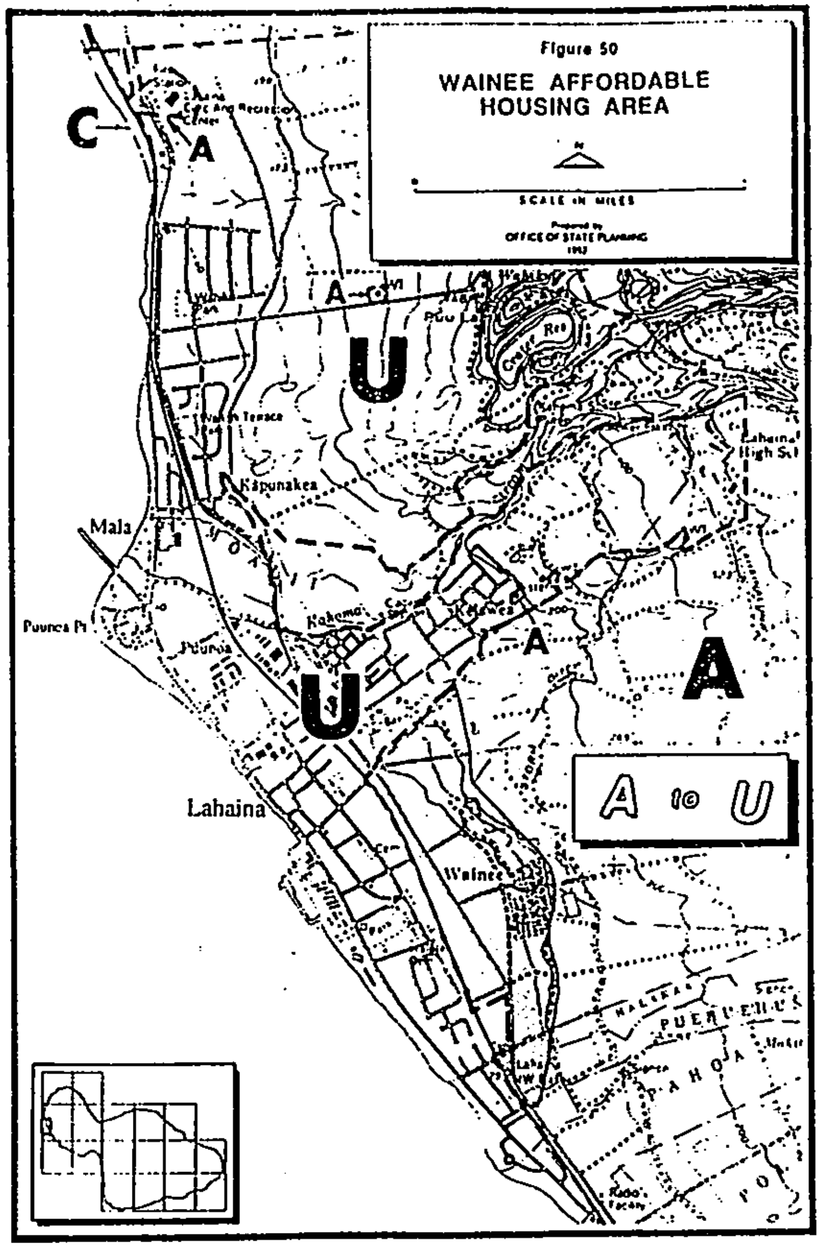


Figure 49
ADDITION TO KEALIA WETLAND


Kealia Pond
AMENDED BOUNDARY
MAUI AIRPORT
Kihei



DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

January 28, 1994

Ms. Esther Ueda, Executive Officer
Department of Business, Economic Development & Tourism
Land Use Commission
Old Federal Building, Room 104
335 Merchant Street
Honolulu, Hawaii 96813

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Ms. Ueda:

Thank you for your letter of December 27, 1993, regarding the subject Draft EIS. The following is in response to your comments:

1) Your confirmation of parcels within State Land Use Districts is noted.
2) Your observation that the proposed 0.2 mile 69 kV interconnecting line between the proposed Lahainaluna Switching Station and existing transmission facilities is not within TMK: 4-6-26: 18 is correct. The sentence on page 1-2 has been revised to read 4-6-18: 3. Because the proposed project does not involve TMK: 4-6-26: 18, which is within the Urban District, the EIS is accurate in stating that Urban and Rural District Lands will not be affected.
3) Your input regarding the amendment of the Agricultural/Conservation District Boundary is noted. With concurrence of Mr. Leo Asuncion of your staff, an additional clarifying map will be included in the document which will clearly represent the boundary change.
4) Your input regarding recommended Land Use Boundary amendments in the vicinity of Kealia Wetland and Wainee is noted.

Maui Electric Company, Ltd. (MECO) appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372 or me.

Sincerely,
DAMES & MOORE

Gayle Borchard, AICP
Environmental Project Manager

GB/ln

(119 3 22941-001-001)

DEPARTMENT OF THE NAVY
COMMANDER
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860-5020

IN REPLY REFER TO
11010
Ser N4(23)/3756
04 Jan 94

RECEIVED
JAN 6 1994
DAMES & MOORE

Mr. Brian Choy
Office of Environmental Quality Control
Fourth Floor
220 South King Street
Honolulu, HI 96813-4186

Dear Mr. Choy:

Subj: MAALAEA-LAHAINA THIRD 69KV TRANSMISSION LINE PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
WAILUKU/LAHAINA, MAUI, HAWAII

Thank you for the opportunity to review the Draft Environmental Impact Statement (DEIS) for the Maalaea-Lahaina Third 69Kv Transmission Line Project, Wailuku/Lahaina, Maui, Hawaii.

The Navy has no comments to offer at this time and appreciates the opportunity to participate in your review process.

The Navy's point of contact is Mr. Stanford Yuen at 474-0439.

Sincerely,

M. D. CLAUSSEN
Commander, CEC, U.S. Navy
Deputy ACOS Facilities and Environment
By direction of
the Commander

Copy to: (w/o encl)
Department of Land and
Natural Resources
1151 Punchbowl Street
Honolulu, HI 96813

Maui Electric Company, Ltd.
P.O. Box 398
Kahului, HI 96732-0398

Dames & Moore
1050 Queen Street, Suite 204
Honolulu, HI 96814

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

January 26, 1994

M.D. Claussen, Commander, CEC, U.S. Navy
Department of the Navy
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860-5020

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Commander Claussen:

Thank you for your letter of January 4, 1994, which states you have no comments to offer on the subject Draft EIS.

Maui Electric Company, Limited (MECO) appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372, or me.

Sincerely,

DAMES & MOORE

Gayle Borchard, AICP
Environmental Project Manager

GB/ln

DEPARTMENT OF BUSINESS,
ECONOMIC DEVELOPMENT & TOURISM

ENERGY DIVISION, 335 MERCHANT ST., RM. 110, HONOLULU, HAWAII 96813 PHONE: (808) 587-3800 FAX: (808) 587-3820

W2:94-081J

RECEIVED
JAN 6 1994
DAMES & MOORE

January 5, 1994

MEMORANDUM

TO: Mr. Don Horiuchi
Department of Land and Natural Resources

FROM: Maurice H. Kaya
Energy Program Administrator

SUBJECT: Review of Draft Environmental Impact Statement (DEIS) for Maalaea-Lahaina Third 69KV Transmission Line Project

The Energy Division has reviewed the DEIS and offers the following comments:

1. The DEIS states that Maui Electric Company (MECO) plans to use steel poles as support structures for the proposed third 69KV line. Similar support structures used by Kauai Electric Company withstood the winds of Hurricane Iniki with only one structural failure, which was later attributed to a structural assembly fault. However, approximately one third of all wooden support structures failed in the hurricane.

2. To further increase the reliability of the proposed line, MECO has proposed a minimum separation distance from existing lines of 250 feet. Further, where the proposed third line does cross the existing two 69KV lines (Puu Hipa), MECO plans to place the new line underground to prevent the existing lines from contacting the proposed third line should one or both of the existing lines fail.

We concur with MECO's assertion that the additional line with the features mentioned above will increase system reliability, as well as adding additional transmission capacity to serve future loads in West Maui.

Thank you for the opportunity to provide these comments.

cc: Dr. Takeshi Yoshihara
David Park, MECO
John Everingham, Dames & Moore
Office of Environmental Quality Control

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

January 26, 1994

Mr. Maurice H. Kaya, Energy Program Administrator
Department of Business, Economic Development & Tourism
Energy Division
335 Merchant Street, Room 110
Honolulu, Hawaii 96813

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Mr. Kaya:

Thank you for your letter of January 5, 1994, which states your belief the following project elements would increase system reliability as well as add transmission capacity to serve future West Maui loads:

1) The use of steel poles as support structures for the proposed transmission line.
2) Minimum separation distance from existing lines of 250 feet and undergrounding of the proposed transmission line at its crossing with existing 69 kV transmission lines.

Maui Electric Company, Limited (MECO) appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372, or me.

Sincerely,

DAMES & MOORE

Gayle Borchard, AICP
Environmental Project Manager

GB/ln

United States Department of the Interior

GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
677 Ala Moana Blvd., Suite 415
Honolulu, HI 96813

TAKE PRIDE IN AMERICA

RECEIVED
JAN 10 1994
DAMES & MOORE

January 6, 1993

Mr. Don Horiuchi
Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Horiuchi:

Subject: Maalaea-Lahaina Third 69KV Transmission Line Project, Draft Environmental Impact Statement (DEIS), Wailuku/Lahaina, Maui

We are in receipt of the subject DEIS. We have reviewed the subject DEIS and we have no comments to offer at this time.

Thank you for allowing us to review this DEIS

We are returning the DEIS to your office for your future use

Sincerely,

William Meyer
District Chief

Enclosure

cc: Office of Environmental Quality Control
State of Hawaii
220 South King Street
Fourth Floor
Honolulu, HI 96813

Mr. David Park
Maui Electric Company Ltd.
P.O. Box 398
Kahului, Hawaii 96732-0398

Mr. John Everingham
Dames & Moore
1050 Queen Street, Suite 204
Honolulu, HI 96814

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

January 26, 1994

Mr. William Myer, District Chief
United States Department of the Interior
Geological Survey, Water Resources Division
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawaii 96813

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Mr. Myer:

Thank you for your letter of January 6, 1994, which states you have no comments to offer on the subject Draft EIS.

Maui Electric Company, Limited (MECO) appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372, or me.

Sincerely,

DAMES & MOORE

Gayle Borchard

Gayle Borchard, AICP
Environmental Project Manager

GB/ln

LINDA CROCKETT LINGLE
Mayor
TELEPHONE 243-7855

OFFICE OF THE MAYOR
COUNTY OF MAUI
WAILUKU, MAUI, HAWAII 96793

January 26, 1994

RECEIVED
'94 FEB 2 PM 3:13
DLNR
OCEA

Mr. Don Horiuchi
Department of Land and Natural
Resources
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Horiuchi:

RE: Maalaea-Lahaina Third 69KV Transmission Line Project

We have reviewed the Draft Environmental Impact Statement dated December, 1993, for the above-referenced project.

Based on this review, we have no objection to the project.

Sincerely,

RICHARD H HAAKE, JR.
Acting Mayor, County of Maui

NP:jso
c:\letter\923

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

February 11, 1994

Mr. Richard H. Haake, Jr., Acting Mayor
County of Maui
Wailuku, Maui, Hawaii 96795

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Mr. Haake:

Thank you for your letter of January 25, 1994, which states you have no comments to offer on the subject Draft EIS.

Maui Electric Company, Ltd. (MECO) appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372 or me.

Sincerely,

DAMES & MOORE

Gayle Borchard, AICP
Environmental Project Manager

GB/ln

(119.1.22941-001-001)

Printed on recycled paper

JOHN WAIHEE
GOVERNOR OF HAWAII

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

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

In reply, please refer to:

RECEIVED
FEB 10 1994
DAMES & MOORE

February 3, 1994

93-352/epo

Mr. Don Horiuchi
Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Horiuchi:

Subject: Draft Environmental Impact Statement
Maalaea-Lahaina Third 69KV Transmission Line Project
TMK: 3-8-05: 02
Maui, Hawaii

Thank you for allowing us to review and comment on the subject document. We do not have any comments to offer at this time.

Very truly yours,

JOHN C. LEWIN, M.D.
Director of Health

c: Maui Electric Company Ltd.
Dames & Moore

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

February 11, 1994

Dr. John C. Lewin, M.D., Director of Health
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Dr. Lewin:

Thank you for your letter of February 3, 1994, which states you have no comments to offer on the subject Draft EIS.

Maui Electric Company, Ltd. (MECO) appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372 or me.

Sincerely,

DAMES & MOORE

Gayle Borchard, AICP
Environmental Project Manager

GB/ln

(119 1:22941-001 001)

LINDA CROCKETT LINGLE
Mayor
GEORGE N. KAYA
Director
CHARLES JENCKS
Deputy Director
AARON SHINMOTO, P.E.
Chief Staff Engineer

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND WASTE MANAGEMENT
LAND USE AND CODES ADMINISTRATION
250 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration
EASSIE MILLER, P.E.
Wastewater Reclamation Division
LLOYD P.C.W. LEE, P.E.
Engineering Division
DAVID WISSMAR, P.E.
Solid Waste Division
BRIAN HASHIRO, P.E.
Highways Division

February 3, 1994

RECEIVED
'94 FEB 8 PM 2:36
DLNR
OCEA

Mr. Don Horiuchi
State of Hawaii
Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, HI 96813

SUBJECT: Draft Environmental Impact Statement (DEIS) for Maalaea-Lahaina Third 69KV Transmission Line Project
TMK: 3-8-5:2; 3-6-1:18; 3-6-1:14; 4-8-1:1, 2; 4-8-2:2, 8, 4-8-2:9; 4-8-3:8, 40; 4-8-3:10, 4-7-1:2; 4-7-5:1, 4-6-21:1, 3; 4-6-20:2, 5; 4-6-18:1; 4-6-18:3; 4-6-26:18

Dear Mr. Horiuchi:

We reviewed the subject draft and have the following comments:

1. Comments from the Engineering Division:

This division has reviewed this submittal and has no comments at this time.

2. Comments from the Wastewater Reclamation Division:

This division has reviewed this submittal and has no comments at this time.

3. Comments from the Solid Waste Division:

a. Alternative means of disposal of grubbed material and rock shall be utilized other than disposed of at the County landfills.

The applicant is requested to contact the Solid Waste Division at 243-7875 for additional information.

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4. Comments from the Land Use and Codes Administration:

This division has reviewed this submittal and has no comments at this time.

Very truly yours,

George N. Kaya

GEORGE N. KAYA
Director of Public Works and
Waste Management

RMN:sy
xc: L.U.C.A.
Engineering Division
Solid Waste Division
Wastewater Reclamation Division

a:deismaalah

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

February 14, 1994

Mr. George N. Kaya, Director
County of Maui
Department of Public Works and Waste Management
250 South High Street
Wailuku, Maui, Hawaii 96793

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Mr. Kaya:

Thank you for your letter of February 3, 1994, which states the Maui County Engineering Division, Wastewater Reclamation Division, and Land Use and Code Administration have no comments to offer on the subject Draft EIS. The following is in response to the comment provided by the Solid Waste Division:

1) Your direction that alternative means of disposal other than landfilling shall be utilized for grubbed materials and rock will be followed, should the need arise. Due to the open grassland vegetation found throughout most of the preferred alignment, minimal right-of-way clearing for the transmission facilities, spur roads, and helipads is anticipated. Therefore, amounts of grubbed material and rock generated are anticipated to be minimal, and would not be removed from the project site. Should a currently unforeseen need to dispose of such material arise, the project applicant will contact the County of Maui Solid Waste Division for direction regarding acceptable disposal practices.

Maui Electric Company, Ltd. (MECO) appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372, or me.

Sincerely,

DAMES & MOORE

Gayle Borchard, AICP
Environmental Project Manager

GB/ln

(119.4 22941-001-001)

JOHN WAIHEE
GOVERNOR

BRUCE S. ANDERSON, Ph.D.
INTERIM DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813

FEB 8 1994

February 7, 1994

Honorable Keith W. Ahue, Chairperson
Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, Hawaii 96813

Attention: Mr. Don Horiuchi, OCEA

Dear Mr. Ahue:

Subject: Draft Environmental Impact Statement for the Maalaea-Lahaina Third 69KV Transmission Line Project

Thank you for the opportunity to review the subject draft environmental impact statement. We do not have any comments to offer.

Sincerely,

for Bruce S. Anderson, Ph.D.
Interim Director

c: Maui Electric Company
Dames and Moore

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

February 11, 1994

Mr. Bruce S. Anderson, Ph.D., Interim Director
Office of Environmental Quality Control
220 South King Street, Fourth Floor
Honolulu, Hawaii 96813

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Mr. Anderson:

Thank you for your letter of February 7, 1994, which states you have no comments to offer on the subject Draft EIS.

Maui Electric Company, Ltd. (MECO) appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372 or me.

Sincerely,

DAMES & MOORE

Gayle Borchard, AICP
Environmental Project Manager

GB/ln

(119.1:22941-001-001)

University of Hawaii at Manoa

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

February 7, 1994
RE:0643

Mr. Don Horiuchi
Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Horiuchi:

Draft Environmental Impact Statement (DEIS)
Maalaea-Lahaina Third 69KV Transmission Line Project
Wailuku/Lahaina, Maui

Maui Electric Company (MECO) proposes to construct the Maalaea-Lahaina Third 69 Kilovolt (KV) Transmission Line Project, to deliver power from the Maalaea Power Plant to West Maui. The proposed project consists of: (1) a new 14.9-mile long single-circuit 69 KV transmission line between the Maalaea Power Plant and Lahaina; (2) a new Lahainaluna Switching Station located off of Lahainaluna road to distribute electrical power from the new line to the existing transmission system; and (3) a new 1,000-foot long, double-circuit 69 KV transmission line to connect the new switching station to the existing transmission system.

The Environmental Center has reviewed the referenced document with the assistance of Peter Flachsbart, Urban and Regional Planning; Ruth Gay, Botany; Michael Graves, Anthropology; Kazutoshi Najita, Electrical Engineering; and Heather Keevill, Environmental Center.

Location of New Switching Station

While the impact of noise resulting from construction of the Lahainaluna Switching Station was discussed in relation to the nearby Lahainaluna High School, consideration of any additional potential impacts on the school were not included in the document. If the switching station is to be built within 200 feet of the Lahainaluna High School playing field, does that limit the potential expansion of the school particularly since the school is located on a hillside with limited expansion possibilities? The purpose of the proposed additional transmission line and switching station is to provide power for the growing demand in West Maui. If electricity demand is growing, partially as a result of additional residential demand,

then the impact on the high school must be considered. What is the projected growth rate for the Lahainaluna High School? Given the close proximity of the high school to the switching station, the relative location of the high school should be indicated on maps related to the proposed switching station.

Lahaina Pali Trail Viewshed Analysis

Questions regarding the visual impact of the transmission lines on the Old Lahaina Pali Trail were addressed in Appendix I. While a viewshed map was prepared to identify the areas in which the poles would be visible, the map does not succeed in providing a clear picture of the impacts. We suggest a simulated picture be prepared for the Final EIS similar to the comparisons shown in figures 4.12-10 and 4.12-11.

Botanical Concerns

There is an inconsistency with regard to the presence of endangered species within the study area as described in table 4.5-1, figure 4.5-1 and the text under sensitive plants on page 4-35. For instance, all five of the officially endangered plant species listed are located either right on or very close to the preferred alignment corridor. Bishop Museum's ranking indicates the risk to each individual species likely to result from the construction of the transmission lines. At the same time, the Sensitive Plants description on page 4-35 states that "No endangered, threatened or sensitive plant species were found in these vegetation types within the survey area". These conflicting tables, maps and statements should be clarified in the Final EIS.

Also discussed is the need to construct additional spur roads to provide access to the transmission lines. While it is stated that the impact will be minimized in the construction of the new roads, the number and location of these roads should be indicated in the EIS so that the impacts can be determined. Road locations should be identified and studied to avoid erosion or drainage problems, negative impacts on rare or endangered species, and/or destruction of archaeological sites.

In addition, the Final EIS should include information on the initial corridor clearing and leveling process and maintenance procedures in relation to nearby vegetation for both the transmission lines and the spur roads. For example, it would be important to disclose any plans to use herbicides for vegetation control.

Archaeological Concerns

It is stated that there are no prehistoric archaeological remains located on sugar lands, presumably because any sites that may have existed have been plowed up as a result of agricultural activities. Since this hypothesis has not been confirmed or refuted by an in depth study, we urge that the area be inspected by an archaeologist and that some systematic shovel testing of the corridor be undertaken prior to construction.

Electric and Magnetic Fields

We are pleased to note that the project will follow the Department of Health's policy of "prudent avoidance" with regards to electric and magnetic fields. We note that this is the approach suggested by the Carnegie Mellon University report of 1989 to the U.S. Congress Office of Technology Assessment.

Thank you for the opportunity to review this document. We hope you will find our comments useful in the preparation of the Final EIS.

Sincerely,

Jacquelin N. Miller

Jacquelin N. Miller
Associate Environmental Coordinator

cc: OEQC
David Park, Maui Electric Company
✓John Everingham, Dames and Moore
Roger Fujioka
Peter Flachsbart
Ruth Gay
Michael Graves
Kazutoshi Najita
Heather Keevill

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

February 25, 1994

Ms. Jacquelin M. Miller, Associate Environmental Coordinator
University of Hawaii at Manoa, Environmental Center
Crawford 3107
2550 Campus Road
Honolulu, Hawaii 96822

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Ms. Miller:

Thank you for your letter of February 7, 1994, regarding the subject Draft EIS. The following is in response to your comments:

1) Your comment regarding potential effects on future expansion of the Lahainaluna High School due to the siting of the proposed switching station is noted. The process of siting of the Lahainaluna switching station included consultation with representatives for the Lahainaluna High School as well as the District Supervisor of the Department of Education. Input regarding development plans for the school was provided to Maui Electric Company (MECO) representatives by the District. This input includes the current official Lahainaluna High School Master Plan, dated March 13, 1992. As currently conceived, the switching station would not limit or otherwise affect school expansion plans as identified in the school's Master Plan. On February 14, 1994, R.M. Murakami, District Superintendent of Schools, re-confirmed the District is satisfied with the siting of the proposed switching station, and stated the District has no concerns regarding the proposed location.

Your comment regarding identification of the location of the high school relative to the proposed switching station site is noted. Enclosed, please find a map which identifies the school and its property boundary, as well as the site of the proposed switching station. The location of State of Hawaii Lahainaluna School Lands relative to the proposed switching station site is also depicted on Figure 2.4-2, Map 2 of the Draft EIS.

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2) Your suggestion regarding development of an additional simulated picture in order to better understand visual impacts to users of the Old Lahaina Pali Trail is noted. The preferred alignment was developed in part based on input regarding potential visual impacts to trail users along the eastern portion of the alignment obtained from the responsible agency, the Division of Forestry & Wildlife (DOFW) of the Department of Natural Resources. In addition, input regarding the trail was provided by the advisory Council to the Na Ala Hele Trails and Access System. Agency input was based on experience, and was supplemented by a field investigation and helicopter reconnaissance of the eastern portion of the alignment. Response to agency input included relocation of the eastern portion of the line to minimize impacts to views from the trail toward the proposed project. The DOFW recently reconfirmed this relocation addresses their concerns regarding potential visual impacts to trail users. Based on this recent reconfirmation, development of additional visual simulations would not be warranted.

3) Your concern regarding inconsistency in the Draft EIS relative to the possible presence of endangered species within the study area and/or the preferred alignment, and your conclusion that all five of the officially endangered plant species listed are in close proximity or within the preferred alignment appears to be based on possible misinterpretation of information presented. Several separate numbering systems are utilized on the biology mapping: one each for identification of species, stake locations, and for project segments; this may have contributed to the possible misinterpretation and appearance of an inconsistency.

The following information regarding biological resources is extracted from a response prepared by Char & Associates upon review of your comments. The proposed alignment does not cross areas containing threatened and/or endangered species. As shown on Figure 4.5-1 of the Draft EIS, Segments 18 and 19 are the closest to an identified endangered species (Gouania hilebrandii), in the vicinity of Pu'u Hipa. The species is found on the summit of the pu'u at elevation 1002 feet, while the proposed transmission line would be located at the base of the pu'u, at approximately elevation 600 feet.

4) Your concerns regarding potential effects of spur road and helipad construction on biological and archaeological resources, as well as the potential for spur road construction to generate impacts related to erosion or drainage is noted. These facilities will be required to construct and maintain the proposed project. For environmental and economic reasons, existing roads will be used to access the preferred corridor for construction and maintenance to the extent possible, the number of helipads and spur roads will be kept as low as possible, and the locations of these facilities will be chosen to minimize grading. Helipads will be located to take advantage of the corridor's flat terrain and will require only the minimum amount of grading necessary to allow for safe off-loading of personnel and materials. Helipad surfaces will be maintained in the naturally occurring vegetation of the project area, which is short-stature grassland and scrubland. Once final additional spur road and helipad requirements are identified, they will be subject to further investigation and possibly mitigation as identified in the Draft EIS.

The biological survey conducted for the Draft EIS included existing roadways that may require some additional grading to make them passable. Once final requirements for necessary additional spur roads are identified, the location and design of additional roads and/or helipads will be reviewed by a qualified biologist to identify if there is a need for additional biological surveys.

Once identified, spur road or helipad locations not within the limits of the archaeological survey conducted for the Draft EIS will undergo 100 percent survey coverage; results of these additional surveys will be submitted to the DLNR State Historic Preservation Division for review. Additional information and mitigation related to this issue have been incorporated into Sections 4.7.2 and 4.7.3 of the EIS at the request of the Division.

Helipads would be located on flat terrain, and are not anticipated to result in erosion or to generate drainage problems. Mitigation as identified in the Draft EIS requires use of water bars, cross ditches, diversion ditches, berms, and energy dissipaters to control runoff from spur roads; punch straw or jute netting will be utilized as needed to minimize erosion and soil loss.

5) Your comment requesting additional information regarding grubbing, grading, and maintenance activities is noted. Due to the nature of vegetation occurring in the project area—short-stature grassland and scrubland—minimal grubbing is anticipated; grading, where necessary will be conducted mechanically. Maui Electric Company does not currently manually clear or use herbicides to control these low-profile vegetation types; manual or chemical maintenance of right-of-way is currently not anticipated for the proposed transmission facility.

6) Your comment regarding the apparent lack of identified surface prehistoric archaeological remains or sites on sugar lands is noted; however this statement is not made in the Draft EIS, as appears to be the conclusion drawn in your letter. Your follow-up comment regarding a possible presumption that agricultural activities have destroyed any such "agricultural zone" resources, but that insufficient study occurred to substantiate this conclusion is also noted. A response follows which describes the context for discussion of sugar land resources in the project area; this response is extracted from a letter prepared by Cultural Surveys Hawaii upon review of your comments.

Certain factors contribute to the lack of archaeological sites in cane fields of the preferred alignment, including settlement and land use patterns and natural erosion in conjunction with historic practices, especially plantation style sugarcane cultivation.

a) Hawaiian settlement and land use patterns, based on distribution of Land Commission Awards and on associated testimony, as well as on distribution of archaeological sites identified in and near the project area, have been defined. The pattern in this area is one of Hawaiian habitation sites (and other domestic sites) located along upper ridges of mountain slopes and along lower alluvial terraces of major stream valleys of Olowalu, Ukumehame, Launiupoko, and Kaua'ula. Agricultural sites are concentrated on lower alluvial terraces within major river valleys, but also occur on ancient alluvial fans outside of active river gorges. Therefore, given the documented settlement pattern, there is potential for dryland agricultural sites occurring in cane fields.

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b) The natural environment acting upon landforms of the project area, including effects of rain and other weathering on surficial sediments of ancient alluvial fans is largely erosional (as opposed to depositional), thus cultural horizons in the sedimentary history are rising to the surface or being eroded away at the surface. In addition, dry land or non-ponded agricultural sites in Hawaii tend not to sustain tangible cultural deposits. The former point has again been demonstrated in results of test excavations at habitation site 50-50-08-3165 on the ancient fan of Ukumehame Valley, where cultural deposits occur immediately below ground surface.

About 1350 linear feet of the approximately 79,970 linear foot preferred alignment crosses land currently in sugarcane production. Generally, this land is situated in upland regions of the Lahaina area, high up on the ancient alluvial fan formations. Thus, Cultural Survey Hawaii argues the shallow nature of cultural deposits, especially agricultural horizons in the environment of these ancient fans, renders them unrecognizable in the mixed context of the historic cane field plow zones within the preferred alignment.

7) Your comment regarding EMF is noted and appreciated.

Maui Electric Company, Ltd. appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372, or me.

Sincerely,

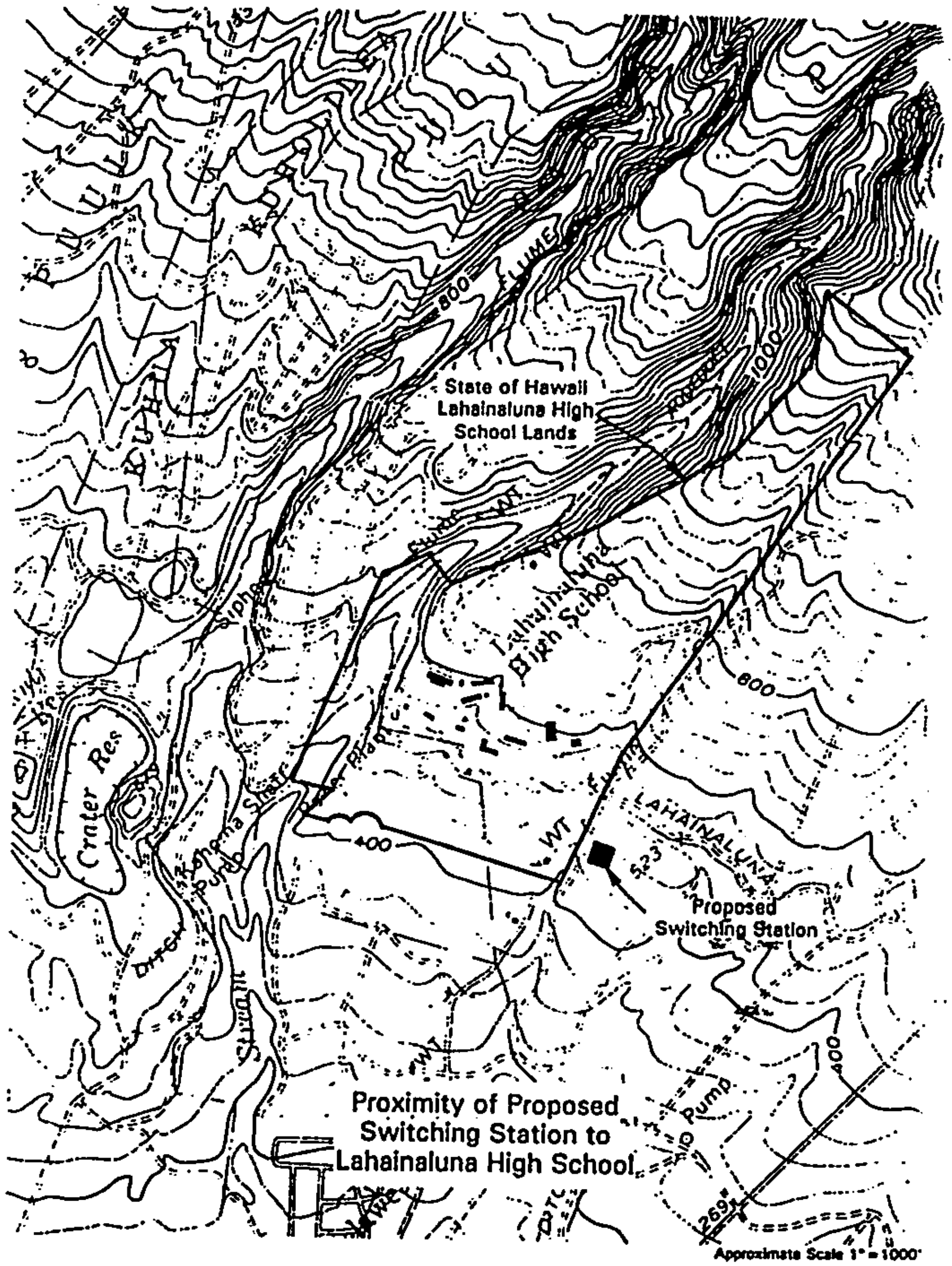
DAMES & MOORE

Gayle Borchard

Gayle Borchard, AICP
Environmental Project Manager

GB/an

(119.9.72941-001-001)



Proximity of Proposed
Switching Station to
Lahainaluna High School

AMFAC/JMB HAWAII, INC
700 Bishop Street
P.O. Box 3230
Honolulu, Hawaii 96801
(808) 945-8111
Fax (808) 945-8153

Amfac

February 7, 1994

Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, HI 96813

Re: Maalaea-Lahaina Third 69KV Transmission Line

Gentlemen:

We have a completed our review of the Draft Environmental Impact Statement for the subject project. Our comments are as follows:

1. The alignment as proposed appears to be one with relatively low level of impact on Pioneer Mill Company's (PMCo) operation.

2. From a property standpoint, the alignment will encumber a substantial amount of PMCo lands. It is our understanding that the third line will replace the lines currently in place some time in the future. What will be your time table for that and if and when the lines go out of service, will the land encumbered by the line be returned to the prior owners. We certainly understand the need for a stable power supply for a growing West Maui but we are not totally convinced that it is necessary to encumber more land for this purpose.

3. We remain concerned with the portion of the alignment that passes through our Olowalu property. The location of the power line will significantly impact the mauka portion of this parcel. We need to continue to explore alternate alignments to minimize unnecessary impacts.

Thank your for affording Pioneer Mill Company the opportunity to comment on this project.

Very truly yours,

Anne Lo-Shimazu
Anne Lo-Shimazu
Manager, Land Administration

/als

(Copies to: See attached list)

Re: Maalaea-Lahaina Third 69KV Transmission Line
February 7, 1994
Page 2.

FEB 8 1994

cc: Office of Environmental Quality Control
220 So. King Street
Fourth Floor
Honolulu, HI 96813

Mr. David Park
Maui Electric Company, Ltd.
P.O. Box 398
Kahului, Maui, HI 96732-0398

Mr. John Everingham
Dames & Moore
1050 Queen Street - Suite 204
Honolulu, HI 96814

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

March 2, 1994

Ms. Anne Lo-Shimazu, Manager, Land Administration
Amfac/JMB Hawaii, Inc.
P.O. Box 3230
700 Bishop Street
Honolulu, Hawaii 96801

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Ms. Lo-Shimazu:

Thank you for your letter of January 7, 1994, in which you offer several comments regarding potential effects of the proposed project which you believe could affect Pioneer Mill Company properties. Also, thank you for meeting with David Park of Maui Electric Company (MECO) and myself March 1, 1994 to specifically identify concerns you generally mention in your letter. The following is in response to your comments:

1) Your observation that the alignment appears to present a relatively low level of impact on Pioneer Mill Company (PMCo) operation is noted. As you know, the preferred alignment was determined via a process incorporating a great deal of community input, as well as close coordination with potentially affected landowners. The purpose of utilizing this process was to identify and address community concerns, avoid or reduce environmental impacts, and to minimize to the extent feasible effects on economic operations such as those undertaken by PMCo.

2) The chief purposes of the proposed project are to a) maintain reliable electric service to West Maui in the event that one or more of the two existing 69 kV lines from the Maalaea Power Plant to the region is out of service; and, b) provide additional transmission capacity to serve anticipated load growth in West Maui. System planning studies conducted by the Maui Electric Company, Limited (MECO) identify the proposed project as a critical addition to a system which includes the two existing 69 kV lines in question; this entire system is required to achieve desired reliability and needed capacity. Therefore, there are currently no plans to replace a portion or all of either or both of the existing 69 kV lines with the proposed project.

3) Your concern regarding that portion of the alignment which passes through PMCo's Olowalu property is noted. At our March 1, 1994 meeting you specifically identified the following two environmental concerns:

- EMF exposure for cane roads passing beneath the alignment; and
- loss of flexibility in current agricultural and planned land use of the *mauka* portion of this property.

As described in section 4.11 of the EIS, siting of the project is consistent with the preferred "prudent avoidance" approach. In the subject location, the line would utilize a DELTA phasing, identified in the EIS as known to reduce EMF relevant to lines not using this phasing. The facilities in this location would be comparable to existing transmission facilities in proximity to roadways.

Regarding potential loss of flexibility to current agricultural uses on that portion of Amfac's property located *mauka* of the proposed transmission facility due to vertical clearances, MECO will design the project to maintain the required clearances, generally 35 feet for sugar cane operations. Therefore, loss of flexibility should not occur to the current land use of agriculture.

Potential loss of flexibility to planned uses of that portion of Amfac's property due to visual effects or perceived separation effects will depend on the planned land use and development scheme. Future development of the property would not be precluded by the proposed project.

Extensive detailed analyses were conducted to identify a corridor that was preferred based on environmental, economic, legal, and design criteria, and then to site a preferred alignment within that corridor. As you know, a parallel land owner, agency, and community consultation program was conducted to ensure necessary input was obtained and concerns identified. Input from Amfac and PMCo was sought throughout the site selection process, and was provided on several occasions; in fact, Amfac/PMCo input influenced several alignment siting decisions.

DAMES & MOORE

Amfac/JMB Hawaii, Inc.
March 2, 1994
Page 3

Maui Electric Company is pleased Amfac continues to participate in this process and to provide input, and is confident any residual concerns outside the purview of the environmental review process can be addressed during the easement acquisition phase of the project.

Maui Electric Company, Ltd. appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372, or me.

Sincerely,

DAMES & MOORE

Gayle Borchard, AICP
Environmental Project Manager

GB/ln

(1193-22941-001-001)

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
HOUSING FINANCE AND DEVELOPMENT CORPORATION
677 QUEEN STREET, SUITE 300
HONOLULU, HAWAII 96813
FAX (808) 587-0600

RECEIVED
FEB 14 1994
DAMES & MOORE

JOSEPH K. CONANT
EXECUTIVE DIRECTOR

IN REPLY REFER TO
94:PPE/586

February 8, 1994

TO: Don Horiuchi
Department of Land and Natural Resources

FROM: Joseph K. Conant
Executive Director

SUBJECT: Draft EIS for Maalaea-Lahaina Third 69KV Trahsmission Line Project

The proposed alignment for the Maalaea-Lahaina Third 69KV transmission line does not impact the Villages of Leiali'i, a planned residential community sponsored by HFDC. However, we request that any continuation or realignment of the line be routed to lands mauka of the Villages of Leiali'i.

Thank you for the opportunity to comment.

c: OEQC
David Park, Maui Electric
✓John Everingham, Dames & Moore

HFDC

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

February 16, 1994

Mr. Joseph K. Conant, Executive Director
Department of Budget and Finance
Housing Finance and Development Corporation
677 Queen Street, Suite 300
Honolulu, Hawaii 96813

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Mr. Conant:

Thank you for your letter of February 8, 1994, which states the proposed alignment would not impact the Villages of Leiali'i, an HFDC-sponsored project.

Your comment requesting future extension or realignment of the proposed transmission lines be routed to lands mauka of the Villages of Leiali'i is noted. Should extension or realignment of these facilities be contemplated in the future, HFDC will be consulted during the planning process.

Maui Electric Company, Ltd. (MECO) appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372, or me.

Sincerely,

DAMES & MOORE

Gayle Borchard, AICP
Environmental Project Manager

GB/In

(119 & 22941-001-001)

JOHN WAIHEE
GOVERNOR
MAJOR GENERAL EDWARD V. RICHARDSON
DIRECTOR OF CIVIL DEFENSE
ROY C. PRICE, SR.
VICE DIRECTOR OF CIVIL DEFENSE

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE DIRECTOR OF CIVIL DEFENSE
3949 DIAMOND HEAD ROAD
HONOLULU, HAWAII 96816-4495

PHONE (808) 734-2161

RECEIVED
FEB 10 1994

February 8, 1994

TO: Mr. Don Horiuchi
Department of Land and Natural Resources

FROM: Roy C. Price, Sr.
Vice Director of Civil Defense

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS); HAALAEA-LAHAINA THIRD 69 KV TRANSMISSION LINE PROJECT

We appreciate this opportunity to comment on the DEIS by Maui Electric Company, Inc., on the island of Maui, Wailuku/Lahaina district, Tax Map Key Numbers: Transmission Line (Single Circuit), 3-8-05:02; 3-6-01:18; 3-6-01:14; 4-8-01:1,2; 4-8-02:2,8; 4-8-02:9; 4-8-03:8,40: 4-8-03:10; 4-7-01:2; 4-7-05:1; 4-6-21:1,3; 4-6-20:2,5; 4-6-18:1; 4-6-18:3; Switching Station, 4-6-18:3; Transmission Line (Double Circuit), 4-6-26:18.

State Civil Defense (SCD) does not have any negative comments directed specifically at the DEIS. However, a section of the proposed area covered by this DEIS is not covered by an existing outdoor alerting/warning siren. We propose that one (1) siren and siren support infrastructure be purchased and installed by the applicant to help alert personnel of an impending or actual event that threatens the area. The siren must be solar powered, have a minimum output of 115 dB and be compatible with the existing civil defense siren warning system. The proposed siren location requires a 100-foot buffer zone as annotated in red on the enclosed Figure 4.2-2 (outside the southwest corner of the "Switching Station Site" along Lahainaluna Road).

Well Locations

Section 4.0, "DESCRIPTION OF THE AFFECTED ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION MEASURES," paragraph 4.11, "Electric and Magnetic Fields," subparagraph 4.11.1, "Affected Environment," "Other Transmission Line Electrical Effects," "Corona and Radio and Television Interference," address the corona and gap discharge phenomena--both potential sources of radio frequency interference. We do have a concern that these phenomena

could possibly interfere with the proper operation of the siren alerting system, a very high frequency (VHF) high-band receiver based system in the 150-160 MHz range. Should this concern be verified at a later date, the impacted receiver may have to be resited and relocated in the vicinity of its previous location. The cost of the move to be borne by the applicant.

Section 4.0, "DESCRIPTION OF THE AFFECTED ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION MEASURES," paragraph 4.4, "EARTH AND WATER RESOURCES," subparagraph 4.4.1, "Affected Environment," "Transmission Line," Topography, "Switching Station," subparagraph 4.4.2, "Potential Impacts," Transmission Line, Wind Speed, address slope, elevation and wind amplification, respectively. The elevation of the study area ranges from gently sloping coastal plains to about 400 feet to approximately 2,000 feet. The impact of terrain amplification of high winds and heavy rainfall associated with tropical cyclones and hurricanes require additional consideration. Structures within the project area must be designed and constructed to resist the potentially destructive amplified winds at project elevations.

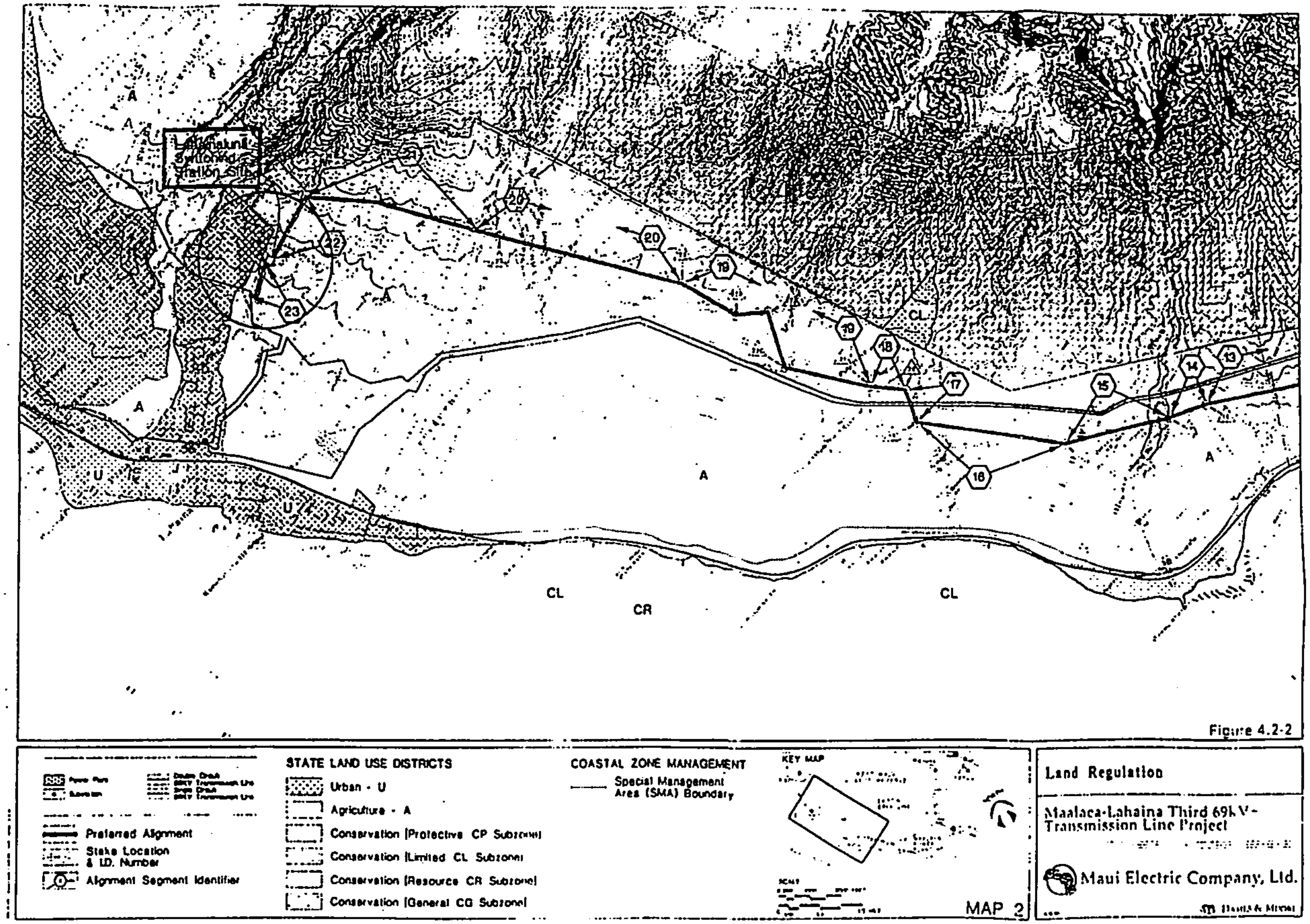
Our SCD planners and technicians are available to discuss this further if there is a requirement. Please have your staff call Mr. Mel Nishihara of my staff at 734-2161.

Enc:

c: Mr. David Park
Maui Electric Company, Ltd.

Mr. John Everingham
Dames & Moore

Office of Environmental Quality Control


Switching Station Site
A
U
CL
CR
Figure 4.2-2
Preferred Alignment
Stake Location & I.D. Number
Alignment Segment Identifier
STATE LAND USE DISTRICTS
Urban - U
Agriculture - A
Conservation (Protective CP Subzone)
Conservation (Limited CL Subzone)
Conservation (Resource CR Subzone)
Conservation (General CG Subzone)
COASTAL ZONE MANAGEMENT
Special Management Area (SMA) Boundary
KEY MAP
MAP 2
Land Regulation
Maalaea-Lahaina Third 69kV Transmission Line Project
Maui Electric Company, Ltd.

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

February 25, 1994

Mr. Roy C. Price, Sr., Vice Director of Civil Defense
State of Hawaii Department of Defense
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Mr. Price:

Thank you for your letter of February 8, 1994, regarding the subject Draft EIS. The following responds to your suggestions and comments:

1) Your proposal that Maui Electric Company (MECO) install an outdoor alerting/warning system comprising a siren and siren supporting structure in the vicinity of the proposed Lahainaluna switching station is under consideration. MECO is investigating your proposal, and hopes to incorporate such a system into project design.

2) Your concern regarding effects of radio frequency interference on the proposed outdoor alerting/warning system is noted. MECO's investigation of your proposal includes recognition and assessment of this issue.

3) Your comment regarding the potential effects of heavy rainfall in combination with terrain amplification of winds is noted. These potential effects were taken into consideration when project design criteria were established. The 100-mph sustained wind speed criterion is currently utilized by MECO for its new transmission line projects. The more recent wind load standard was recently (1993) established in response to the effects of Hurricane Iniki. The new standard was developed by MECO in conjunction with Dr. Arthur Chiu of the University of Hawaii; Dr. Chiu is a specialist in structural/civil engineering and wind mechanics.

(119.8:22941-001-001)

Maui Electric Company, Ltd. (MECO) appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372, or me.

Sincerely,

DAMES & MOORE

Gayle Borchard

Gayle Borchard, AICP
Environmental Project Manager

GB/an

(119.8:22941-001-001)

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FEB 15 1994
DAMES & MOORE

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF LAND MANAGEMENT
54 SOUTH HIGH STREET, Rm. 101
WAILUKU, HAWAII 96793

February 11, 1994

MEMORANDUM

TO: Mr. Don Horiuchi

FROM: Alan Tokunaga

SUBJECT: Draft Environmental Impact Statement for the Proposed Maalaea-Lahaina Third 69KV Transmission Line Project Wailuku and Lahaina, Maui.

The Maui District Land Office has reviewed and has no comment regarding the subject Draft Environmental Impact Statement for the Maalaea-Lahaina Third 69KV Transmission Line Project, Wailuku and Lahaina, Maui, which is proposed to traverse on portions of State-owned lands.

If you may have any questions, please contact Mr. Philip Ohta at the above address or by telephone at 243-5352.

Very truly yours,

Alan Tokunaga
ALAN TOKUNAGA
Maui District Land Agent

cc: Mr. W. Mason Young
Mr. W. Kennison
Mr. D. Park
Mr. J. Everingham

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

February 15, 1994

Mr. Alan Tokunaga, Maui District Land Agent
Department of Land and Natural Resources
Division of Land Management
54 South High Street, Room 101
Wailuku, Hawaii 96793

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Mr. Tokunaga:

Thank you for your letter of February 11, 1994, which states you have no comments to offer on the subject Draft EIS.

Maui Electric Company, Ltd. (MECO) appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372, or me.

Sincerely,

DAMES & MOORE

Gayle Borchard
Gayle Borchard, AICP
Environmental Project Manager

GB/ln

(119 I:22941-001-001)

RECEIVED
FEB 15 1994
DAMES & MOORE

(P)1094.4

Department of Land and
Natural Resources
State of Hawaii
Honolulu, Hawaii

Attention: Mr. Don Horiuchi

Gentlemen:

Subject: Maalaea-Lahaina Third 69KV Transmission Line
Wailuku-Lahaina, Maui
Draft Environmental Impact Statement

Thank you for the opportunity to review the subject document. Although we understand the justification for the location of the preferred alternative route between Maalaea and Lahaina, we are unclear as to why portions of that route were at such substantial distances from the existing power corridor.

If there are any questions regarding the above, please call Mr. Ralph Yukumoto of the Planning Branch at 586-0488.

Very truly yours,

Gordon Matsuoka

GORDON MATSUOKA
State Public Works Engineer

RY:jk
cc: Maui Electric Company, Ltd.
Dames and Moore
OEQC

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

February 15, 1994

Mr. Gordon Matsuoka, State Public Works Engineer
Department of Accounting and General Services
Division of Public Works
P.O. Box 119
Honolulu, Hawaii 96810

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Mr. Matsuoka:

Thank you for your letter of February 11, 1994, regarding the subject Draft EIS. The following is in response to your comment regarding horizontal separation between the proposed and existing transmission facilities, and is intended to clarify factors utilized to determine separation:

1) In order to ensure system reliability to the extent feasible, Maui Electric Company (MECO) adopted a design standard of a minimum 250-foot separation between the existing and proposed transmission facilities. The preferred alignment evolved through a process focused on adherence to this and other design standards and criteria, as well as for ease of constructability, accessibility, cost effectiveness, and minimization of economic and environmental impacts.

2) In some portions of the proposed alignment within the West Maui Mountains, it was not possible to maintain the minimum 250-foot separation without encountering existing conditions of extremely rugged (steep) terrain and/or pockets of slope instability. Therefore, in some instances, the proposed alignment was shifted to the next nearest ridge line from the existing facilities. In addition, within the West Maui Mountains, visual access to the proposed project from the Old Lahaina Pali Trail was an issue, and the alignment was selected to minimize impacts to recreationalists along the trail.

For the Ukumehame, or more makai portion of the proposed project, alignment siting was influenced by land owner concerns, minimization of impacts to historic economic operations, avoidance of archaeological resources, and minimization of project visibility from the Honolapiilani Highway and Lahaina. In addition, the alignment was located for ease of maintenance by avoiding the upper toe of slopes where possible, and to utilize existing cane or other roads for maintenance access, thus minimizing impacts related to construction of new spur roads.

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DAMES & MOORE

Maui Electric Company, Ltd. appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372, or me.

Sincerely,

DAMES & MOORE

Gayle Borchard

Gayle Borchard, AICP
Environmental Project Manager

GB/ln

(119 7-22941-001-001)

RECEIVED
FEB 1 7 1994
DAMES & MOORE

February 15, 1994

MEMORANDUM

LOG NO: 10368
DOC NO: 9402KD12

TO: Roger C. Evans, Administrator
Office of Conservation and Environmental Affairs

FROM: Don Hibbard, Administrator
State Historic Preservation Division

SUBJECT: **Historic Preservation Review of the Draft Environmental Impact Statement Ma'alaea-Lahaina Third 69KV Transmission Line Project, Wailuku and Lahaina, Maui**
TMK: 3-8-05: 02; 3-6-01: 14, 18; 4-8-01: 1, 2; 4-8-02: 2, 8, 9; 4-8-03: 10; 4-7-01: 2; 4-7-05: 1; 4-6-21: 1, 3; 4-6-20: 2, 5; 4-6-18: 1

The Ma'alaea-Lahaina Transmission Line Project consists of a 14.9 mile long power line, a switching station at Lahainaluna, and a 1,000 foot connector line.

The document states that historic preservation concerns were addressed in two phases. During the first phase, a regional overview study and aerial reconnaissance survey was conducted. Consultation with the Historic Preservation Division also occurred. During the second phase, a 100% pedestrian survey was conducted of a 300 foot wide corridor along the proposed power line route. The power line route was then altered so as to avoid identified historic sites. The buffer zones for various historic sites were established in consultation with the Historic Preservation Division.

A Draft of the 100% archaeological inventory survey is attached as Appendix G (Robbins et al. 1993. *An Archaeological Inventory Survey of an Approximately 14.7 Mile Proposed Transmission Line, From Ma'alaea to Lahaina, Maui, Hawai'i.* Cultural Surveys Hawaii ms.). Our review of this report indicates that it is acceptable, if minor revisions are made (see attachment).

The inventory survey identified 34 historic sites. A total feature count was not given for the extensive agricultural complexes at Launiopoko (sites 2677 & 2678/2679). The boundaries of these sites were not established during this survey, or during a previous survey of the Launiopoko area. It is likely that these sites, and adjacent complexes at Launiopoko, are contiguous. This point regarding the Launiopoko area should be kept in mind when impacts of the transmission line are considered.

We concur with the mitigation measures for the corridor activities as stated in the draft, and recommend that they be included, with minor revisions, in the final document. These include:

1) Prior to and during construction, all sites and site boundaries located within the 300 foot wide project area corridor will be flagged to avoid inadvertent disturbance.

2) Final construction plans and pole locations will be reviewed by a qualified archaeologist and the Historic Preservation Division, in order to verify that all sites have been avoided in the location of poles, staging areas, helicopter pads and spur roads.

3) Construction activities in sensitive areas, such as Ma'alaea, Ukumehame, and Launiopoko may require monitoring by a qualified archaeologist, depending upon the final location of poles, staging areas, spur roads, and helicopter pads.

4) If previously undetected historic sites are found during transmission line or switching station construction, all activity in the area will stop and the State Historic Preservation Division will be contacted. Appropriate mitigation measures will be determined in consultation with the Division. If human skeletal remains are inadvertently encountered during construction, procedures outlined in Hawaii Revised Statutes 6E-43.6 will be followed.

However, we recommend that Final EIS include more information concerning the presence or absence of historic sites in proposed spur road or helicopter pad locations that are not within the 300 foot wide corridor that was surveyed. The document states that four helicopter pads and nine new spur roads will be constructed in order to install the power line. The document does not clearly state whether these areas were included in the inventory survey. It is implied on page 4-60 that some of these facilities are outside of the surveyed area. While it is stated on page 4-60 that spur roads and helicopter pads would be located to avoid known sites and maintain established buffer zones, if these project elements are in unsurveyed areas, this mitigation aim cannot be achieved without survey first occurring.

Please contact Ms Theresa K. Donham at 243-5165 if you have any questions.

KD:jen

c: David Park, (Maui Electric Company, Ltd.)
Gayle Borchard, (Dames & Moore)
Hallett Hammatt, Cultural Surveys Hawaii

ITEMS NEEDING REVISION

An Archaeological Inventory Survey of an Approximately 14.7 Mile Proposed Transmission Line, From Ma'alaea to Lahaina, Hawai'i

Jennifer J. Robbins, William H. Folk, Hallett H. Hammatt

We find this report to be generally well written, concise, and a contribution to the history and prehistory of leeward West Maui. We request a few revisions and clarifications of the draft document, as part of its finalization.

INTRODUCTION

D. Methods
Please include more specific information regarding how the corridor was surveyed, such as number of persons in crew, distance between surveyors, orientation of transects (parallel with corridor?). Also, some description of the excavation techniques used during testing should be included here. Was soil screened, if so, screen size. Were arbitrary level used, or natural layers, for vertical control? There should also be some information regarding laboratory procedures, and current status of collected materials and artifacts. Please include information regarding how the sites were marked. Were permanent or semi-permanent tags used, or were they marked with flagging tape? Do the tags have the SIHP number or the CHS number?

CULTURAL SETTING

A. Prehistory and Early History
The discussion on page 18 opens with the statement that "Many battles were fought between the two island polities..." Is this in reference to Wailuku and Hana? A brief explanation of what polities are being referred to would help here. The discussion on page 20 of Ma'alaea as a crossroads might include reference to the canoe landing site (Kapoli) at Ma'alaea (see Kamakau 1992).

B. Early 19th Century
Nineteenth and early twentieth century landings were present at both Ma'alaea (50-09-2947) and McGregor (50-09-2949). Both of these landings serviced inter island steamers, bringing freight, mail, passengers, etc. The 19th century mauka/makai trails in the Kealaloloa area (p. 21) may well have served to access these landings, connecting them with the Lahaina-Pali Trail.

C. Mid 19th Century through Mid 20th Century
On page 25, there is some indication that the surveyed corridor crosses through Land Commission Awards. Additional descriptive information, such as how many

reader can find the appropriate site photos while reading the site descriptions.

The following author citations were not found in the list of references:

Mac Donald and Abbot 1974 (p 16)
Schmitt 1973 (p 22)
State of Hawaii and National Park Service 1990 (p 16)
Thrum 1918 (p 47 and elsewhere)
Wilcox n.d. (p 26)

References to Tomanari-Tuggle and Tuggle 1991 and Robbins et. al. in the References Cited are not alphabetized (p 112).

The citation on page 20 which reads "in Graves 1991:A1" should read "Wong-Smith in Graves 1991:A1"

We request that two copies of the final archaeological inventory survey report be provided to the Historic Preservation Division for placement in the research library. Please send one copy to the Honolulu office and one copy to the Maui office (1325 Lower Main Street, Suite 108, Wailuku, HI 96793). Thank you.

LCA are within the corridor and where they occur, would be appropriate here. Some type of table providing the LCA number, ahupua'a, acreage and awardee (all available from the Indices of Awards) would be most helpful.

PREVIOUS ARCHAEOLOGICAL RESEARCH

-Ukumehame and Olowalu Stream Areas

On page 34, the Ukumehame Heiau sites are described as being "established in the Hawaii Register of Historic Places". These sites are in the Hawaii Inventory of Historic Places (SIHP), but are not in the Hawaii Register of Historic Places (HRHP).

SURVEY RESULTS

Tables 1 and 2 (and the text on page 41) are not congruent. Table 1 enumerates 42 identified features; according to the text, there are 34 sites, with 20 features at 12 of these sites, for a total of 42 identified features. Table 2 lists 40 identified features.

Table 3 is somewhat incongruent with the text. This table lists 5 agriculture sites; four are discussed in the text. Two agriculture/temporary habitation sites are enumerated in Table 3; only one is discussed in the text. One agriculture/permanent/temporary habitation site is listed in Table 3, whereas two are discussed in the text.

The site descriptions are thorough and well done. We question why the nineteen features previously enumerated for Site 50-03-2677 (appendix) are not included in the overall feature counts for the project area. Are some of these nineteen features outside the surveyed corridor?

SITE DISTRIBUTION AND SETTLEMENT PATTERN

This discussion is very good. Regarding the traditional settlement pattern in Ukumehame, ongoing SHPD survey work in the Perreira Ranch lease lands has identified agricultural terraces in the small gulches, north of the McGregor Complex, near the petroglyphs. This village may have been more diversified than fishing only. The reference to "Kealalaloa" on page 96: is this spelling based on historic sources? The name is spelled Kealaloloa on cartographic sources.

SIGNIFICANCE ASSESSMENTS

We agree with the assessments stated, and recommended avoidance, with buffer zones, as a mitigative measure.

MISCELLANEOUS

The photographs provided at the end of the report are of good quality and are identified well. Please put citations in the text of the site descriptions, so that the

DAMES & MOORE
1050 QUEEN STREET, SUITE 204, HONOLULU, HAWAII 96814
(808) 593-1116 FAX: (808) 593-1198

February 22, 1994

Mr. Don Hibbard, Administrator
Department of Land and Natural Resources
State Historic Preservation Division
33 South King Street, 6th Floor
Honolulu, Hawaii 96813

Maalaea-Lahaina Third 69 kV Transmission Line Project
Draft Environmental Impact Statement (EIS)

Dear Mr. Hibbard:

Thank you for your letter of February 15, 1994, regarding the subject Draft EIS. The following is in response to your comments:

1) Appendix G, *An Archaeological Inventory Survey of an Approximately 14.7 Mile Proposed Transmission Line, From Ma'alaea to Lahaina, Maui, Hawaii*, will be modified to incorporate the minor changes you suggested.

2) Your comment that the adjacent agricultural complexes and Launiopoko are likely contiguous is noted, and according to Cultural Surveys Hawaii this was kept in mind when potential project impacts were assessed.

3) The Final EIS incorporates the changes to mitigation in Section 4.7.3 that you recommended. There will be no construction in unsurveyed areas. If final construction plans call for construction of spur road or helipad facilities outside of survey areas described in Appendix G, additional survey work comprising 100 percent ground coverage would be performed and results submitted to the DLNR, State Historic Preservation Division for review prior to construction. Additional mitigation, if required, would be determined in consultation with the State Historic Preservation Division.

4) Additional information addressing spur roads and helicopter pads has been added in Sections 4.7.2 and 4.7.3.

Maui Electric Company, Ltd. (MECO) appreciates your participation in the environmental review process for the Maalaea-Lahaina Third 69 kV Transmission Line Project. Should you have questions or require further information, please contact Mr. David Park, MECO Project Manager, at 871-2372, or me.

Sincerely,

DAMES & MOORE

Gayle Borchard

Gayle Borchard, AICP
Environmental Project Manager

GB/ln

SECTION 9

REFERENCES

9.0 REFERENCES

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SECTION 10

LIST OF INDIVIDUALS WHO CONTRIBUTED TO THE EIS

10.0 LIST OF INDIVIDUALS WHO CONTRIBUTED TO THE EIS

Maui Electric Company	
Thomas Jezierny	President
Ed Reinhardt	Manager, Engineering Department
David Park	Project Manager
Neal Shinyama	Senior Electrical Engineer
Jerry Miller	Land Agent
Hawaiian Electric Company	
Ed Lagundimao	Project Engineer
Roy Noda	Senior Civil/Structural Engineer
Eric Shimono	System Planner
Nick Kashiwabara	Principal Engineer, Steering Committee Member
Francis Hirakami	Senior Electrical Engineer, Steering Committee Member
Gemini Yau	System Planner
Dames & Moore	
John Everingham	Environmental Project Managers
Gayle Borchard, AICP	
Nancy Olmsted	Project Technical Director/Principal Planner
Ricardo Bressanutti	Planner
Faith Caplan	Planner
Dennis Papilion	Visual Assessment and Simulations
John Carlson	Computer Mapping and AutoCAD operator
Linda Lee	Graphic Artist
Amelia Yuen-Ng	Word Processing/Production
Subconsultants	
James T. Creighton	**Creighton & Creighton** - Public involvement planning, public meeting facilitator
Mike Silva Chris Hooper	**Enertech Consultants** - Electric and magnetic field effects (EMF) Assessment

Chris Hart	**Chris Hart & Partners** - Proposed land use
Winona Char	**Char & Associates** - Botanical resources assessments and inventory survey
Phil Bruner	**Phil Bruner** - Bird and mammal assessment
Hallet Hammatt Jennifer Robins Doug Borthwick	**Cultural Surveys Hawaii** - Archaeological resources assessment and inventory survey
James Kwong	**Pacific Geotechnical Engineers** - Geology, hydrology and soils assessment
Jay Whiteford	**Air Survey Hawaii** - Aerial photographs