JOHN WAIHEE
GOVERNOR OF HAWAII

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
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AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
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WATER AND LAND DEVELOPMENT

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MAY 9 1989

File No.: HA-2205
Doc. No.: 5633E

Mr. Albert Hee, President
Mauna Kea Power Incorporated
Grosvenor Center, Suite 2460
747 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Hee,

Subject: Final Environmental Impact Statement for the Honolii Stream Hydroelectric Project

Thank you for submitting to us the final Environmental Impact Statement (EIS) prepared for your Conservation District Use Application (CDUA HA-2205) on the subject project.

We have determined that the document is acceptable under the rules and regulations established by Chapter 343, Hawaii Revised Statutes. More specifically, we believe the document meets the following criteria.

General Criteria

Acceptability of a statement shall be evaluated on the basis of whether the statement, in its completed form, represents an informational instrument which fulfills the definition of an EIS and adequately discloses and describes all identifiable environmental impacts, and satisfactorily responds to review comments.

Specific Criteria

Procedures for assessment, consultation process, a review responsive to comments, and the preparation and submission of the statement, have all been completed satisfactorily;

the content requirements described under Sections 11-200-17 and 18 of the EIS Rules and Regulations have been satisfied; and, comments submitted during the review process have received responses satisfactory to the accepting authority, and have been incorporated or appended, at the discretion of the applicant to the statement.

Please bear in mind that acceptance of the document means only that we recognize the EIS as an informational document prepared in compliance with the rules and regulations promulgated under Chapter 343-5 and which discloses the environmental effects of the proposed action on the economic and social welfare of the community and State, effects of the economic activities arising out of the proposed action, measures proposed to minimize adverse effects and alternatives to the action and their environmental effects. Acceptance of the document does not imply or presume approval of the CDUA, the Petition to Amend the Interim Instream Flow Standard, or any other necessary approval for the project. We are still concerned with some of the issues of the project.

As you may be aware, petitions for a contested case hearing have been filed for this project. The Department of Attorney General has determined that all of the petitioners have legal standing in the case. The matter must now be brought before the Board of Land and Natural Resources for direction. We will notify you of the time, date, and place of the Board's next meeting on this matter.

If you require further information on your CDUA, please contact Don Horiuchi of our Office of Conservation and Environmental Affairs at 548-7837.

Very truly yours,

W W Paty

William W. Paty, Chairperson
Board of Land and Natural Resources

cc: Board Members
DHM, Inc.
OEQC

Honolii Hydroelectric Power Project

Environmental Impact Statement

MAUNA KEA POWER, INC.

ERRATA SHEET

Pg. i - The phone number for Mauna Kea Power Company, Inc. is 599-4383.

Pg. xi - APPENDIX F also includes the Stream Channel Alteration Permit and the Diversion Works Permit.

Pg. 42 - Insert a "," between the words "weir" and "intake" in the second to last line of the first paragraph.

Pg. 51 - Enclose the word "Honoli'i" at the end of line 6 in the second paragraph in parentheses ().

Pg. 125 - Change the word "recommend" to "recommends" in the second to last line of the first paragraph.

Pg. 188 - The following should be added:

ISSUING AGENCY	PERMIT/APPROVAL	STATUS
U. S. Federal Energy Regulatory Commission	Declaration of Intention/Request for Non-Jurisdiction	Application filed on Feb. 24, 1989.

Pg. 193 - Replace the word "conducively" with "conclusively" on line 11 of the first paragraph.

ENVIRONMENTAL IMPACT STATEMENT
FOR
HONOLI'I HYDROELECTRIC POWER

Submitted Pursuant to Chapter 343,
Hawaii Revised Statutes,
Environmental Impact Statement Regulations

Duk Hee Murabayashi, President

DHM inc.
Environmental Planning Consultant for
Mauna Kea Power, Inc.

April 1989

PROJECT TEAM

KELLY M. ARCHER
Aquatic Biologist

DR. ANDREW J. BERGER
Bird & Mammal

CHAR & ASSOCIATES
Botany

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Archaeology

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Land Use and Environmental Planning

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Edie Yamaguchi
Lynn Taguchi

HONOLI'I HYDROELECTRIC POWER PROJECT

PERSON SUBMITTING ENVIRONMENTAL IMPACT STATEMENT

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APPLICANT

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737 Bishop Street
Honolulu, Hawaii 96813
Phone: 599-4441

ACCEPTING AUTHORITY

Board of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

PROJECT SITE

Project Location:	Along Honoli'i Stream, South Hilo District, Island of Hawaii
Tax Map Key:	Portions of: 2-6-09:11 2-6-12:29 & 30 2-7-02:21
State Land Use District:	Conservation District: Limited Subzone
EIS Preparation Notice:	October 23, 1988, OEQC Bulletin
Draft Environmental Impact Statement:	December 20, 1988
Comments and Concerns:	In response to comments expressed during the review period, revisions and additions to the draft Environmental Impact Statement are in **bold** type.

FOREWORD

As the most oil-dependent state in the nation, Hawaii relies on the use of fossil fuel to produce over 90 percent of its electricity. All of this resource must be imported, with over half coming from foreign sources. The State of Hawaii, recognizing its particular vulnerability to the unstable nature of foreign oil has recently requested for the second time that the Federal government establish a Regional Petroleum Reserve in Hawaii.

The continued use of petroleum for energy production is also causing serious environmental damage to Hawaii's air quality, contributing to respiratory and other related health problems; acid rain which has proven to be harmful to plants and animals; lead poisoning problems in the islands water catchment systems; and, warming problems associated with the greenhouse effect. This is of particular concern to the Big Island of Hawaii where the additional emissions from volcanic activity compound the air pollution problems associated with burning fossil fuels.

Over the past decade, the Big Island of Hawaii has tried to reduce its dependence on imported oil and become more energy self-sufficient. The island has made use of several alternate sources of energy such as biomass, geothermal energy, and hydroelectric power to meet its growing need for electrical power. However, due to lower oil prices, a declining sugar industry, and delays in the development of geothermal energy, Hawaii County's reliance on imported oil has increased in the last year from 55 to over 70 percent of its electrical energy production.

Hawaii needs to reaffirm its commitment to reducing its dependence on imported oil while continuing to meet the growing need for electricity by its residents. Alternate, renewable sources of energy which are reliable and environmentally less damaging than fossil fuels must be developed. Development of all sources of energy involve both negative and positive impacts to society and the environment. However, when weighing the impacts of a carefully chosen and designed hydroelectric site such as Honoli'i, the public benefits to society and the environment clearly outweigh any localized negative impacts.

President, Mauna Kea Power Company, Inc.

SUMMARY

Mauna Kea Power Company, Inc. is proposing to develop a hydroelectric power plant which will provide up to 14.6 megawatts (MW) of "clean" power to the Hawaii Island electrical grid. The proposed project will be a combination run-of-the-river operation and conduit-type operation, and will consist of a diversion weir, a 20,350-foot long penstock, a power plant and substation, access roads to the weir and powerhouse, a 69 kV electric transmission line, and a 5 kV power line.

The proposed project will be located along Honoli'i Stream on the eastern coast of the island of Hawaii, about three miles north of Hilo. A portion of the proposed project area is located within the boundaries of the Conservation District Limited Subzone as defined by the State Department of Land and Natural Resources (DLNR). Therefore, the project will require the approval of a Conservation District Use Application (CDUA) by the Hawaii State Board of Land and Natural Resources. The DLNR has determined that an Environmental Impact Statement (EIS) is required as part of the CDUA review process. This document was prepared to fulfill that requirement.

The Honoli'i hydroelectric power project will have significant benefits. As a clean, renewable energy source, the project will save over one million dollars per year in imported oil and result

CORRECTION

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

SUMMARY

Mauna Kea Power Company, Inc. is proposing to develop a hydroelectric power plant which will provide up to 14.6 megawatts (MW) of "clean" power to the Hawaii Island electrical grid. The proposed project will be a combination run-of-the-river operation and conduit-type operation, and will consist of a diversion weir, a 20,350-foot long penstock, a power plant and substation, access roads to the weir and powerhouse, a 69 kV electric transmission line, and a 5 kV power line.

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The Honoli'i hydroelectric power project will have significant benefits. As a clean, renewable energy source, the project will save over one million dollars per year in imported oil and result

in increased island energy self-sufficiency. Other benefits will be improved system reliability, reduced air pollution from fossil fuel combustion, and creation of jobs during construction.

Construction of the project will create localized and short-term impacts on noise levels, air and water quality, vegetative cover, and the rate of soil erosion. Appropriate mitigation measures will be used to minimize the degree of these impacts. The long-term adverse effects on natural habitats and stream fauna, if any, are not expected to be significant. The weir and intake design and the release of a continuous flow will, at least in part, mitigate these impacts.

Several alternatives to the proposed action were considered. The project-related alternatives fall into three categories: 1) those relating to the basic project type, 2) those relating to the location of the various project features, and 3) those relating to the generating equipment to be used. The "no action" alternative was also considered.

The project will require an irreversible commitment of resources such as capital, labor and construction materials. However, it will not irreversibly or irretrievably commit land and water resources.

Hydroelectric power development, as a means of increasing energy self-sufficiency, is consistent with the land use and energy plans and policies of both the County of Hawaii and the State of Hawaii.

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APPENDICES

Chapter I

I. STATEMENT OF PURPOSE AND NEED FOR ACTION

A. STATEMENT OF PURPOSE

Mauna Kea Power Company, Inc. (MKP) proposes to develop a hydroelectric power plant and appurtenances which will provide up to 14.6 megawatts (MW) of "clean" power to the Island of Hawaii. The proposed hydropower project will have significant benefits to island residents. As a clean, renewable energy source, the project will lessen the island's dependency on imported oil and insulate a portion of the island's electricity from the supply and price fluctuations of oil. It will also eliminate the need for over a million dollars per year, which would otherwise be spent on oil, to leave the state. By displacing fossil fuel generation, the project will reduce air pollution created by fossil fuel combustion.

While over 90% of this proposed project will take place on lands currently classified for agricultural use, a small portion is located within the boundaries of the Conservation District Limited Subzone as defined by the Department of Land and Natural Resources (Administrative Rules, Title 13, Chapter 2; Regulation No. 4). Therefore, a Conservation District Use Permit is required to develop this project. This environmental impact statement (EIS) was prepared to fulfill the requirements of Chapter 343, Hawaii Revised Statutes, as part of the review of a Conservation District Use Application for the proposed action.

(Corrections and additional discussions to the draft EIS are in **bold** type set in this final EIS).

B. NEED FOR ACTION

In addition to direct economic and employment benefits that will result from construction of the Honoli'i hydroelectric power project, the proposed project meets four other primary needs of the Big Island. The project will: 1) reduce the island's dependency on oil and support energy self-sufficiency; 2) add 35,000 megawatt hours annually (maximum 14.6 MW) to the existing system which is currently inadequate to meet projected energy demands; 3) generate power without creating air pollutants that are known to contribute to acid rain, vog and the greenhouse effect; and 4) further diversify the sources of electrical power generation on the island.

1. Reduction in Dependency on Imported Oil

Hawaii is the most petroleum-vulnerable state in the nation. In 1987, Hawaii depended upon petroleum to generate over 90 percent of its electricity needs, compared to the national average of 4.6 percent.[1] In addition, in 1986 Hawaii spent over one billion dollars - 10 percent of its gross state product - on this energy source, all of which must be imported into the state. Further, about 56 percent of Hawaii's net oil import comes from

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1. Department of Business and Economic Development records.

foreign sources, compared to the national average of 33 percent.[2] Such a dependency makes Hawaii especially susceptible to the volatile political situations in other oil-rich countries of the world as well as to our own nations rapidly diminishing supply of domestic oil. Although fuel prices have decreased in recent years, the situation in the future is likely to change depending on world-wide demand and political conditions. Should there be an oil shortage such as the one experienced during the 1973 Arab Oil Embargo, Hawaii would again suffer severe economic and social hardships.

The awareness of the economic as well as adverse political and environmental impacts of the near-exclusive use of imported fuel oil, has resulted in policy changes at the State and County levels toward energy self-sufficiency.[3] The local utility companies have also supported the development of alternate energy in Hawaii to reduce the state's dependence on fuel oil.

Although Hawaii County is closer to energy self-sufficiency than the State as a whole, the trend toward self-sufficiency on the Big Island is slowing. In 1987, 55.8 percent of energy sold was produced from

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2. DBED, State Energy Resources Coordinator Annual Report, 1986-1987.

3. These policies are discussed in detail in Chapter V.

oil. Indigenous sources including biomass (37.8%), geothermal (2.3%), hydroelectric (2.4%), and wind power (1.7%) account for the remaining 44.2 percent of energy sold by Hawaii Electric Light Company (HELCO). Presently, however, about 71 percent of energy sold is generated from oil and 29 percent from indigenous energy sources.

HELCO currently operates 23 oil-fired generating units with a total generation capability of 118 MW. In addition, HELCO purchases 30.4 MW of additional capacity from non-utility firm power generators such as sugar companies and the existing geothermal plant, for a total firm[4] generating capability of 148.4 MW. Non-firm energy sources such as wind and hydroelectric supply 15.75 MW of power. In 1987, approximately 635,000 megawatt hours (MWH) of electricity were sold by the utility.[5]

There are several reasons for the decline in self-sufficiency on the Big Island, which has resulted in increased dependency on imported oil. First, the future of biomass, specifically bagasse, as an alternate energy resource, depends on the long-term

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4. Firm power is power which can be supplied on a 24-hour, 365 day-per-year basis.

5. Clyde Nagata, Engineering Manager, HELCO, Personal communication, November 18, 1988.

viability of sugar production in the islands. In recent years, the level of sugar production has declined and several sugar plantations have closed. In August 1988, HELCO took over operation of the former Puna biomass power plant and is now producing 14 MW of oil-generated electricity. Amfac was previously burning woodchips at the former sugar power plant to produce 8 MW, however woodchips became non-competitive as the cost of fuel oil dropped and stabilized.

HELCO currently relies on 28 MW of firm power from two sugar companies, Hilo Coast Processing Company (HCPC) and Hamakua Sugar. **However, power from those sugar factories has proven unreliable recently.** Island residents have experienced frequent power outages in the past two years from the instability of the HCPC power plant and its frequent and sudden failures.[6] The uncertain future of sugar on the Hilo and Hamakua coasts **as evidenced by the necessity for low interest, emergency State loans** could result in the sugar companies burning oil or coal at their plants in place of bagasse; or result in the complete closure of the plants and loss of the 28 MW of power; or as in the case of Puna Sugar, HELCO could take over the plants and produce oil-fired electricity. In all cases, the dependency on imported fossil fuels will be increased.

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6. "Dream of self-reliance goes up in diesel smoke," Honolulu Star Bulletin and Advertiser, 29 May 1988, p. B-4.

Delays in expected geothermal development on the Big Island have also been a cause for the decrease in energy self-sufficiency. Although HELCO has a contract for a 12.5 MW geothermal unit, scheduled for commercial operation by December 1989, and an additional 12.5 MW by 1993, these dates appear unlikely to be met. Equivalent generation must be produced another way to meet demands.

The tremendous growth and increased economic development in Hawaii has created increased demands for power, which has resulted in the addition of fossil-fuel generated power plants. This issue is discussed in more detail in the next section.

Another reason for the decline in energy self-sufficiency in Hawaii (and nation-wide) is the drop in oil prices. When oil prices are high, alternate energy development attracts venture capital and public support, and planning for these projects proliferates. However, a world-wide glut in the mid 1980's brought oil prices crashing down (from about $42 per barrel in 1981), stabilizing in 1987 at about $20 per barrel and as low as $14 per barrel in late 1988. With oil prices this low, there is little economic incentive for developing alternate energy projects.

Development of alternate energy projects must be pursued however, in order for the projects to be on-line during the next energy crisis.

2. Contribution to the Future Power Demand

On an island-wide scale, Hawaii's demand for additional power generation has been increasing at an accelerated rate. The County is projected to undergo significant growth between 1988 and 2005. The annual peak load for 1988 and projected peak loads for the near future exceed HELCO's generating capacity of 125.4 MW.[7] Therefore, the utility needs to increase its ability to provide power immediately.

The steady rise in demand for electricity from 1980 to 1988 is shown in the table below. The average increase per year for this eight-year period is 4.90 percent, and the average increase over the last three years is 7.25 percent.

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7. HELCO's planning criteria require that the total system firm capacity (148.4 MW) be able to cover the loss of the largest unit (23 MW). As a result, HELCO's total generating capacity is 125.4 MW.

Annual Peak Load

1980 - 1988[8]

Year	Annual Peak Load	Percent increase over previous year
1980	86.3 MW	
1981	89.4	3.59%
1982	91.6	2.46
1983	95.8	4.58
1984	97.4	1.67
1985	102.4	5.13
1986	108.6	6.05
1987	116.0	6.81
1988	126.3	8.88

HELCO annually updates its 5-year load forecast of projected peak demands. The forecast for 1989 through 1992 is shown below:

Projected Peak Load

1989 - 1992[9]

Year	Projected Peak Load	Percent increase over previous year
1989	129 MW	4.03
1990	134	3.88
1991	139	3.73
1992	144	3.60

The current firm generating capability, 125.4 MW, is less than the 1989 forecasted peak of 129 MW. HELCO is presently experiencing a serious shortage of generation capability to meet short-term projected peak loads.

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8. Clyde Nagata

9. Hawaii Electric Light Company, Inc. Forecast Planning Committee Projection, April 6, 1988.

In response, HELCO has been actively pursuing the purchase of additional firm power from the sugar mills and from long-term contracts for geothermal power. But as mentioned above, the availability of bagasse-fired generation depends on survival of the sugar companies, and long-awaited geothermal development has been repeatedly delayed. As a result, HELCO has purchased an $11 million, 14 MW combustion turbine generating unit that will burn diesel fuel at the Keahole plant. It is expected to be operating in July 1989. HELCO's long-range projections, using the 5-year forecast from 1987 and the 3 percent growth rate after 1991, indicate the need for about 180 MW of additional generation over the next 20 years. These additions also account for the retirement of existing units that will no longer be economical to maintain or operate. Another scenario, using a 5 percent growth after 1991, indicates that, without geothermal generation and with the retirement of the sugar plantations' power generation, 275 MW of new generation will be needed over the next 20 years. These additions include the replacement of a projected 80 MW of HELCO plant retirements.

As part of their long range planning, HELCO commissioned a study to evaluate potential sites for future power generation expansion on the west side of the island. The study identified four sites that could accommodate at least 200 MW of new generation capacity. The types of fuel sources to be considered for these sites include diesel, medium sulfur, heavy fuel oil, and coal - all non-indigenous, non-renewable fossil fuels.

3. <u>No Additional Air Pollutants</u>

Air quality concerns related to power generation are directly related to the type of energy source and the amount of generation. Although Hawaii is generally conceived to have pristine air, the air quality on the Big Island is becoming more and more of a concern because of the recent volcanic activity and awareness of acid rain problems.

The volcano isn't the only source of gas and particulate emissions on the island. It is a long-known fact that fossil fuel generation of electricity produces numerous air pollutants. Some alternate energy sources, such as geothermal and biomass, produce air pollutants as well. A summary of the characteristics of the energy sources used on Hawaii is shown in the table below.

Energy Source	Indigenous to Island	Potential Emissions
Fuel oil	No	SOx, NOx, CO, CO2, and HC emissions
Coal	No	SOx, NOx, CO, CO2, HC and particulate emissions
Biomass	Yes	SOx, NOx, CO, CO2, HC and particulate emissions
Geothermal	Yes	H2S emissions
Wind	Yes	None
Hydroelectric	Yes	None

Source: Puna Geothermal Venture Project, Draft EIS, August 1987.

A comparison of the emission levels of five pollutants for fuel oil, coal, biomass, geothermal, wind and hydro is shown in the following table.

EMISSION LEVELS ON A 30 MW BASIS
(LB EMITTED/HR)

	Particulates	Sulfur As SO2	Nitrogen NO2	Carbon Monoxide	HydroCarbons
Fuel Oil	4.5	160	45	11	1.1
Coal	2100	300	262	6.6	2.6
Geothermal	---	8	---	---	---
Biomass (Wood)	433	7.4	138	200	98
Wind	---	---	---	---	---
Hydroelectric	---	---	---	---	---

Source: Puna Geothermal Venture Project, Draft EIS, August 1987.

As indicated above, the environmental costs of using fuel oil and coal are extremely high. Control of the emissions is costly and only partially effective. Pollution abatement systems are expensive to install and maintain, and decrease the efficiency of a plant. This, in turn, increases the price of electricity that consumers pay.

The emissions are also common irritants to lungs and eyes, and can be permanently harmful at high levels. In addition, sulfur dioxide, hydrogen sulfide, and nitrogen oxide cause acid rain which can destroy vegetation, aquatic life, and pollute streams and drinking water. Acid rain is formed when these gases come in contact with water vapor in the air, forming acid. The recent problems on the Big Island are the result of sulfur dioxide emissions from the volcano (vog) becoming acid rain, which causes lead from paint, nails, flashing and solder to enter water catchment systems. Lead-tainted water ends up in household water supplies. **Vog in the Hilo and Kona areas has been so persistent recently that a ban on all open burning has been in effect more often than not the last two months.** Although there is not enough information yet available to make an indisputable link between acid rain and yields of agricultural crops, Hawaii farmers of anthuriums, avocados, macadamia nuts, coffee, sugar, and other crops are convinced acid rain is "responsible for a variety of ills".[10] Acid rain is also considered to cause damage to sugarcane crops.[11]

In addition to air pollution and acid rain, the "greenhouse effect" is impacted by the burning of oil and coal. Carbon dioxide and nitrous oxides, byproducts of burning oil and coal, are among the so-called greenhouse gases that trap heat in the atmosphere. Renewable energy resources, such as solar, ocean thermal and hydro power, are recommended to help slow the potentially disastrous global climate changes expected from the greenhouse effect.[12]

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10. "Acid Rain Falling on Big Island," Honolulu Star Bulletin and Advertiser, 12 June 1988, p. A-1.

11. "Sugar losses putting C. Brewer in a bind," Pacific Business News, 5 December 1988, p. A-1.

12. Vic Phillips, Bioresources/Environmental Coordinator at Hawaii Natural Energy Institute, Testimony before Congress, June, 1988.

Chapter II

II. PROJECT DESCRIPTION

A. BACKGROUND

A State and Federal-sponsored study[13] was conducted in 1981 to take a new look at the economics of hydropower in Hawaii. This state-wide hydropower reconnaissance study identified a number of existing hydropower resources in the State, and a number of potential sites on Kauai, Maui, and Hawaii which appeared economically feasible to develop. Honoli'i Stream on Hawaii was one of these.

In 1984, at the request of the Director of the (then) State Department of Planning and Economic Development, the U.S. Army Corps of Engineers performed reconnaissance phase site specific feasibility studies for developing hydroelectric power on the Wailuku River and the Honoli'i Stream in the Hilo area of Hawaii. The results of their studies have been published as Wailuku/Honolii Hydropower Study, Island of Hawaii, Hawaii, Reconnaissance Phase Documentation, September 1984. The purpose of the reconnaissance phase study was to determine whether or not further planning should proceed based on a preliminary appraisal of the Government interest, project costs and benefits, and environmental impacts of the potential plan. Although

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13. W.A. Hirai & Associates, Inc., for State Department of Planning and Economic Development, Hydroelectric Power in Hawaii, Hilo, Hawaii, February 1981.

hydroelectric development on both Wailuku and Honoli'i was deemed worthy of further study, the Federal government decided that this was the responsibility of the State.

Reference is made to both of these previous studies of Honoli'i Stream within this EIS.

B. PROJECT LOCATION

The proposed project will be located along Honoli'i Stream on the eastern coast of the island of Hawaii. The stream generally flows in a west to east direction, emptying into Hilo Bay at Honoli'i Cove, three miles north of Hilo, the county seat. (Refer to Exhibit II-1.)

Honoli'i Stream flows perennially within a narrow, deep gulch in the primarily rural South Hilo district of Hawaii County. Except at the coastline, where there is low density residential development near the main highway, the stream is surrounded by intensively used agricultural lands to the north and south. The upper reaches of the stream, outside the project area, are located within the Hilo Forest Reserve.

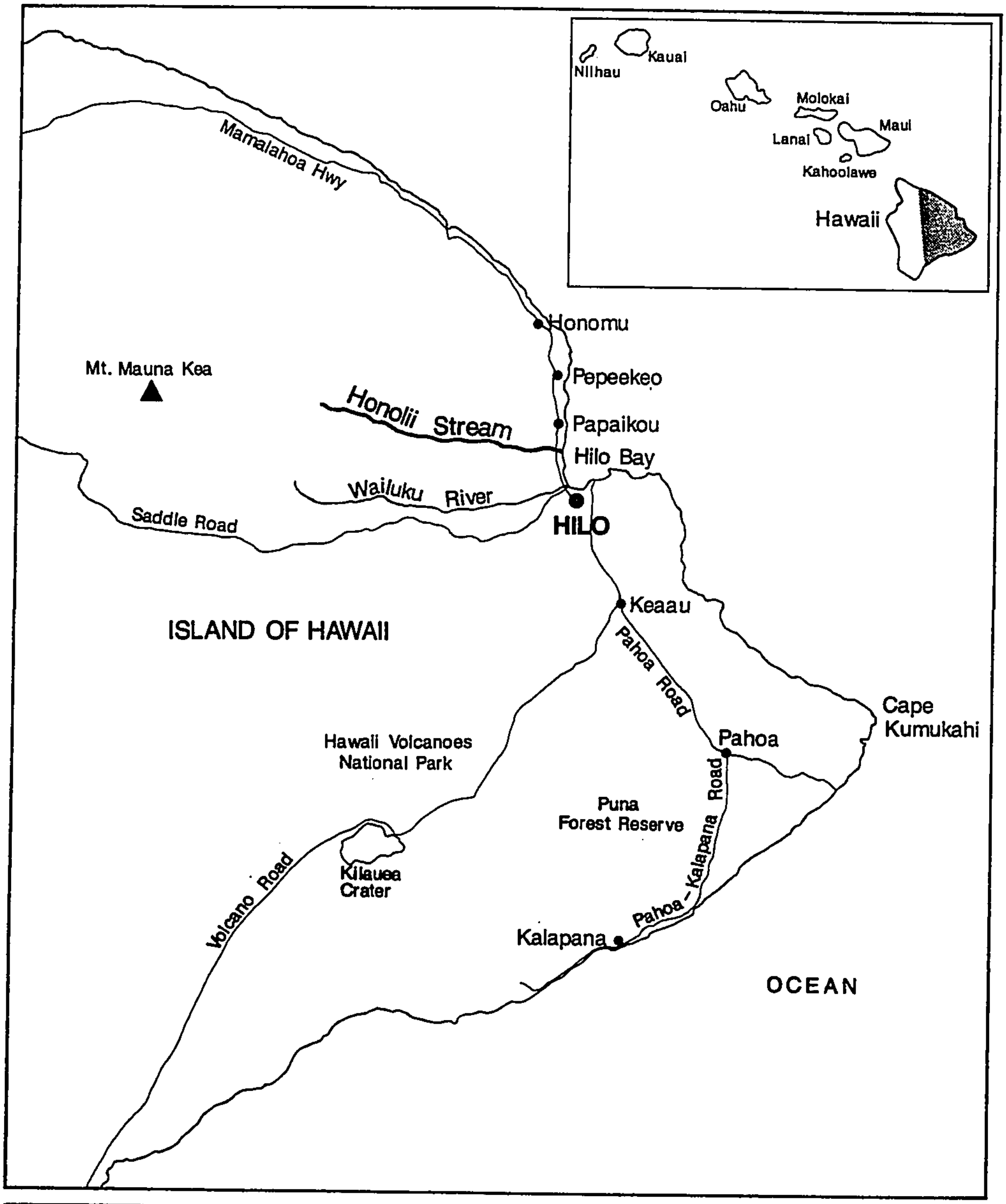

Exhibit II-1
Location Map

0 5 MILES 10 15

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Land Use and Environmental Planning

C. PROJECT FEATURES

1. General description

The proposed project will be a combination run-of-the-river and conduit-type operation. As a run-of-the-river installation, the power generated at any given time will depend on the instantaneous stream flow, which varies considerably from day to day. Run-of-the-river hydroelectric projects do not store water in a reservoir, leaving the power production dependent upon the amount of water running in the stream at any one time. Therefore, during low stream flows, the plant will not be able to operate. Also, as a conduit-type operation, usable flow is diverted from the stream to a conduit (penstock) by means of a weir. The penstock alignment is carefully selected to take advantage of terrain to overcome the flow variability and poor stream storage characteristics. Flow in excess of the maximum design flow of the generating equipment, 150 cubic feet per second (cfs), passes over the weir. All of the water that is diverted through the penstock is returned to the stream after passing through the downstream powerhouse.

The project will consist of a diversion weir, a 20,350-foot long penstock, a power plant and substation, access roads to the weir and powerhouse, a 69 kV electric transmission line, and a 5 kV power line. (See Exhibit II-2). The proposed project will

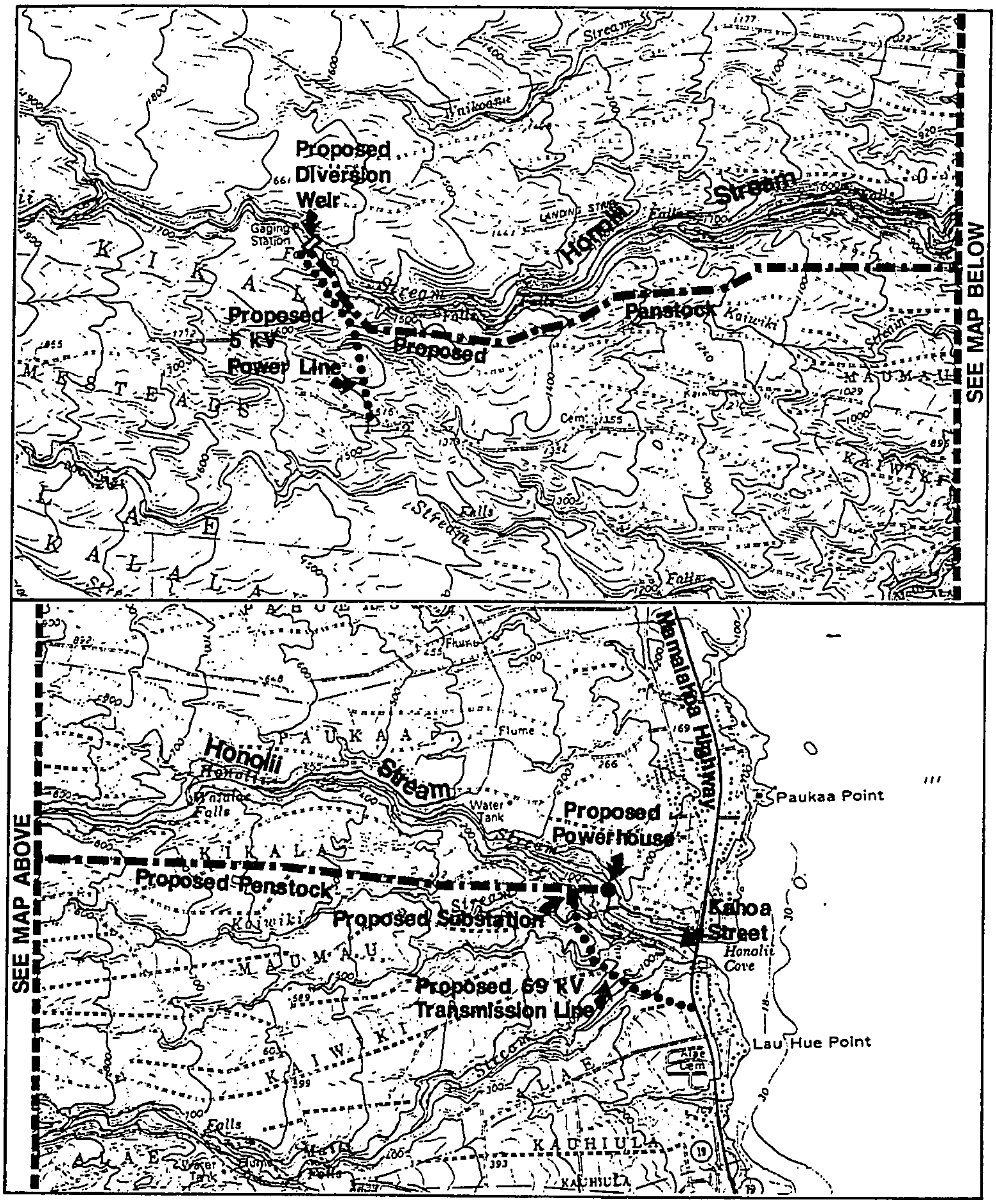

Exhibit II-2
Project Feature Location

0 1000 2000 FEET 4000

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be constructed and operated by Mauna Kea Power Company, Inc. The plant will have a maximum capacity of 14.6 megawatts (MW), and will produce approximately 35,000 megawatt hours (MWH) of electric power annually which will be sold to Hawaii Electric Light Company.[14]

The layout of the proposed project on Honoli'i Stream reflects consideration of environmental, social, and economic implications by the development team. The major guiding principle for the project design is to balance the development of an economically feasible project while protecting and maintaining the natural environment.

2. Diversion Weir and Intake Structures (Exhibits II-3, II-4 and II-5).

The diversion weir will be located approximately four miles upstream from the mouth of the stream, at an elevation of 1,535 feet mean sea level (MSL). The weir will be designed to allow native fauna to migrate both upstream and downstream. Its crest will be approximately 74 feet long and 15 feet high above the river bed. The weir will be constructed of existing river rock embedded in concrete. This construction method will allow the weir to closely resemble natural

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14. The current generating capacity of HELCO is 148.4 MW. The proposed project will produce nearly 10% more. The average annual usage on the Big Island for residential customers is approximately 6 MWH. Therefore, the proposed project will generate enough power to supply over 5,800 homes annually.

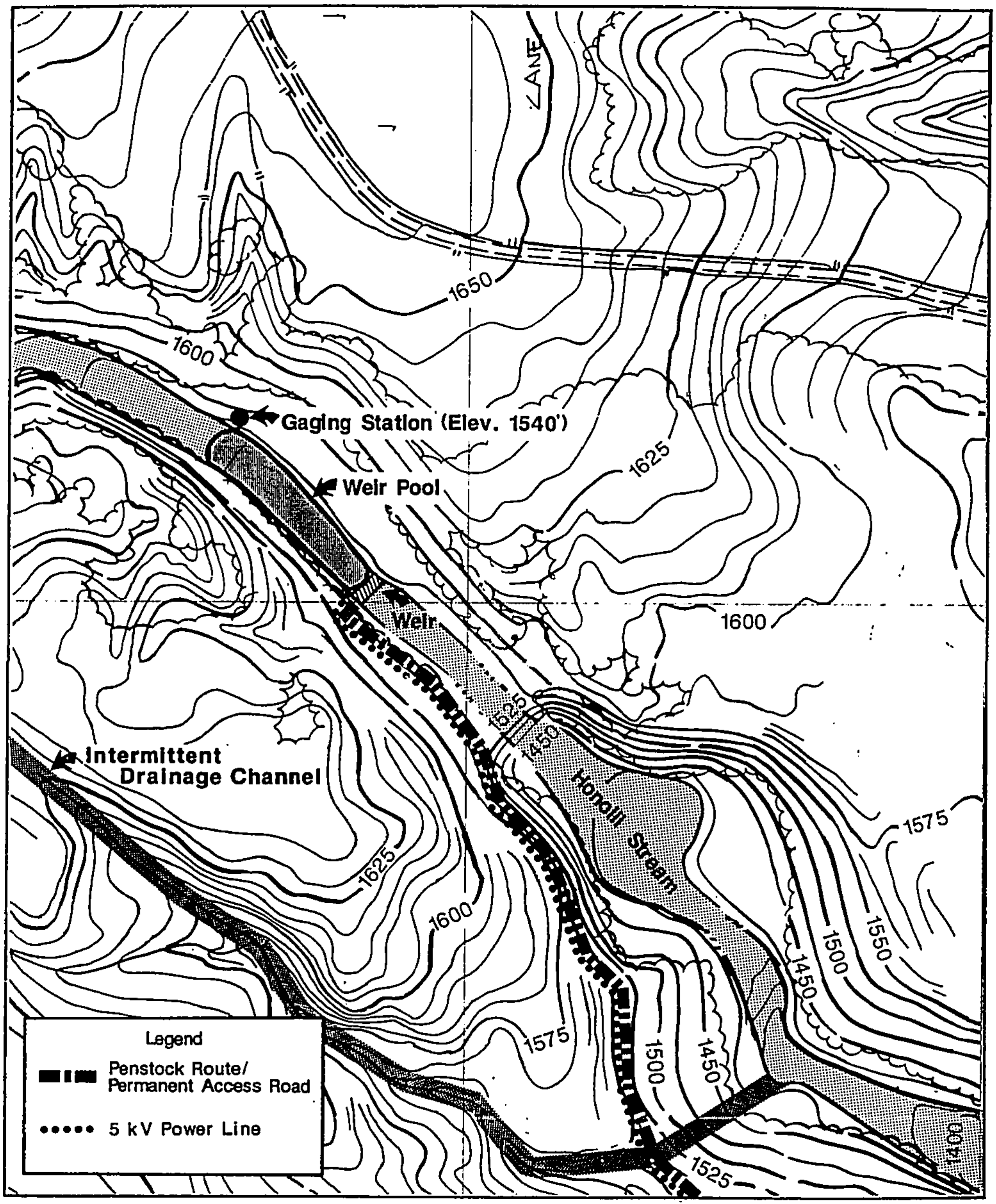

Exhibit II-3

Proposed Weir Area

0 100 200 FEET 400

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cascades normally found in the streambed. The function of the weir is to divert a portion of the streamflow into the intake while ensuring at all times (unless stream flow is less than 10 cfs) 10 cfs[15] or 75 gallons per second of water flows past the weir and continues in the stream bed. A pool will be created behind the weir, however, unlike a dam, the weir will not impound, or store, water for future use. A maximum of 150 cfs[16] may be diverted by the weir. Flows exceeding 150 cfs will overtop the weir and continue downstream in the natural stream channel. During those times when stream flow is less than 14 cfs (see pg. 35) no water will be diverted and all flow will remain in the natural stream channel. When the stream flow is greater than 14 cfs, and the proposed hydro plant is operating, a flow of 10 cfs will be maintained immediately downstream of the weir. The 10 cfs will flow over the top of the weir through a two-foot wide by one-foot deep notch located on the left side of the weir, as viewed looking downstream. The notch will also be grouted with cobblestones. Intermittently, during periods of high flow, a radial gate located on the right side of the weir will be opened to allow gravel and other debris that has built up behind the weir and in front of the intake trash racks to continue

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15. 10 cfs is equivalent to 4,488 gallons per minute.

16. 150 cfs is equivalent to 67,325 gallons per minute.

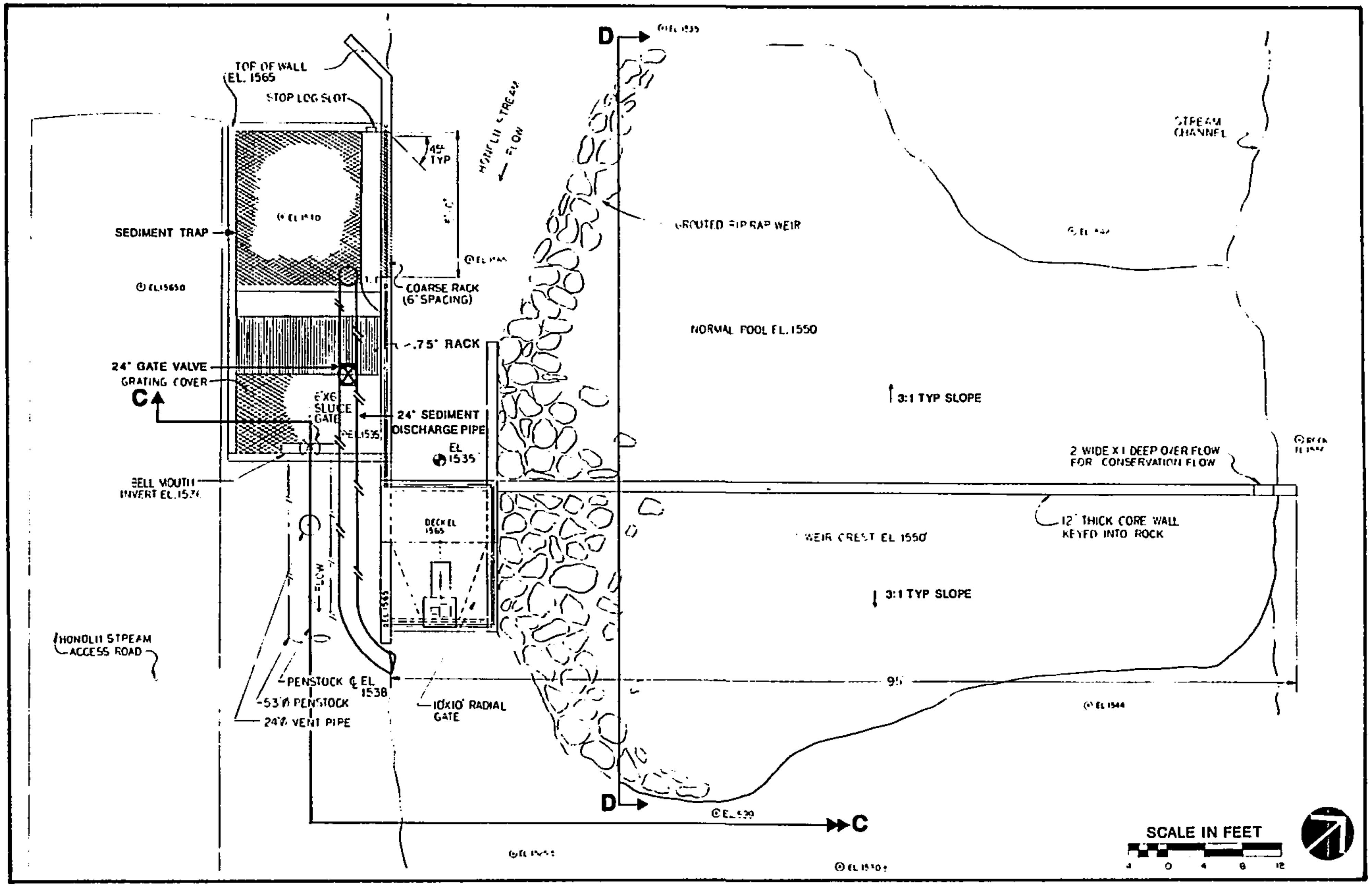

Exhibit II–4
Proposed Weir & Intake Plan

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downstream. The frequency of opening the radial gate will be determined by the buildup of sediment and debris, but it is anticipated to occur once a month.

The intake canal and headworks will be located along the right bank, as viewed looking downstream. A coarse set of racks (6 inch spacing) will be located at the entrance to the canal to prevent trash and large debris from entering the canal. The racks will be aligned parallel to the stream flow with rack bars angled 45 degrees with respect to the rack. This will allow stream water to sweep across the racks and remove debris during times of high river flows.

A second set of racks, with a maximum opening of .75 inch (sized to prevent adult 'o'opu from being able to pass), will be located in the intake canal to prevent small debris and fish from entering the penstock. At the request of USFWS, several different alignments and various size openings for the second set of racks were given careful consideration. Based on the biological characteristics of the 'o'opu alamo'o and the design and performance of the 1 inch racks at existing hydroelectric facilities in Hawaii, it was determined that alignment of a .75 inch rack perpendicular to the penstock is the best alternative. This alternative will provide less chance of eddies and whirlpools being created which would cause higher flow velocities in the intake, fish disorientation and disruption resulting in entrainment. The velocity of the water moving through the intake and trash racks will be at or below one foot per second (fps). The low velocity of the water through the intake (1 fps) will allow fish to swim out of the intake area, and will allow the gravel and sand, which might otherwise enter the penstock and damage the turbine, to settle in a sediment trap.

The sediment trap will be located in the intake canal downstream of the stop log structure. During periods of high flow, a valve will be opened allowing water and the sediment in the trap to continue downstream without entering the penstock. **The frequency of cleaning will be determined by the amount of sediment collected in the trap, but it is anticipated to occur once a month.**

Other intake works will include a stop log structure, located just behind the coarse set of trash racks. When necessary, stop logs, which prevent water from entering the intake canal, will be used to facilitate intake cleaning, maintenance, and inspection of the canal. An automatic sluice gate will be located at the bell mouth leading to the penstock. This gate will be used to completely prevent water from entering the penstock during emergencies (leaks or breaks in the penstock), maintenance, and inspection.

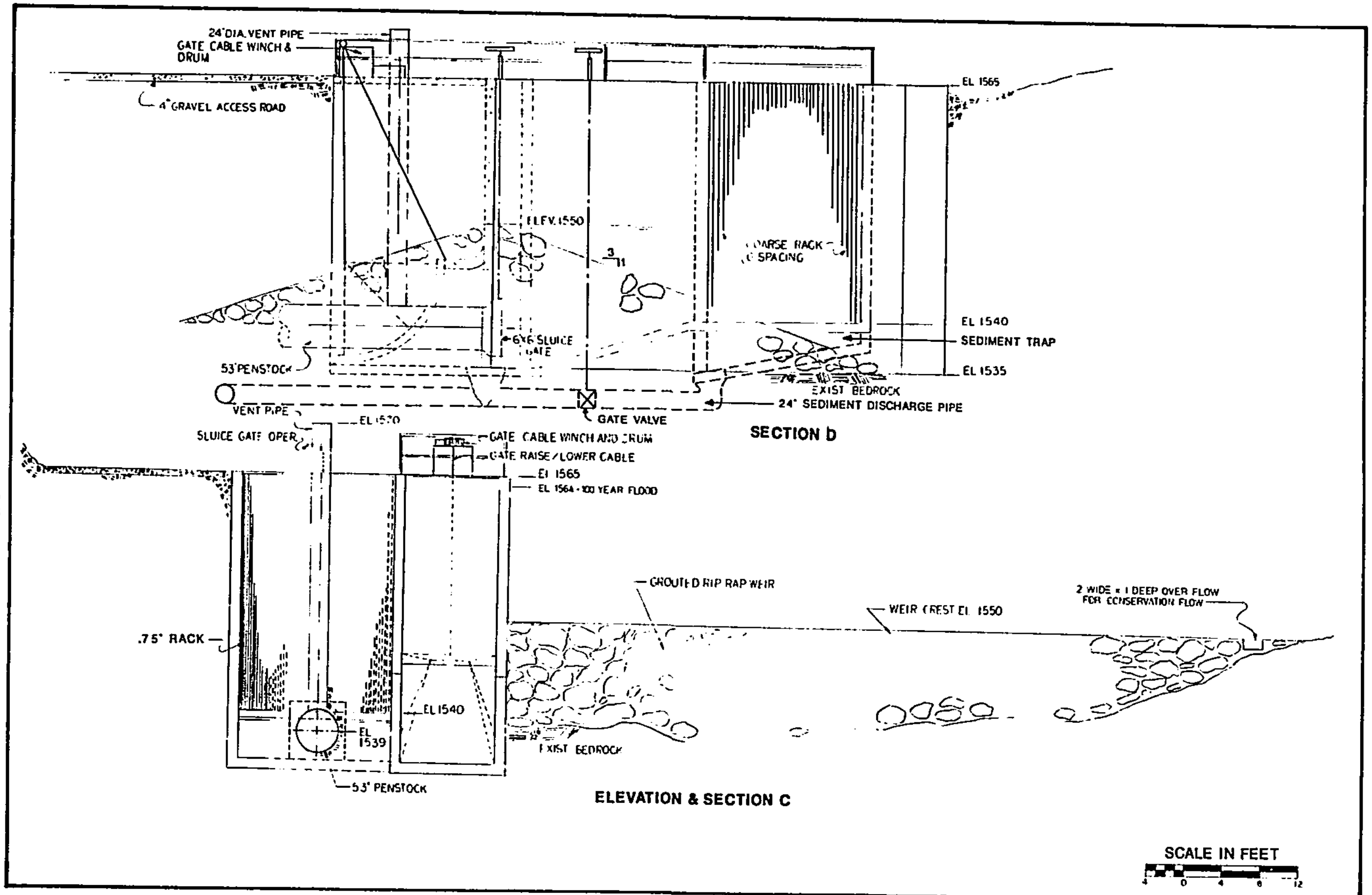

Exhibit II–5
Proposed Weir & Intake Section & Elevation

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Electric motors will be located at the intake to power the radial gate and any motorized rack cleaners that may be necessary. Emergency lighting will also be provided in the event that there is a need to perform maintenance or emergency repairs at night.

Electrical water sensors will be placed in the pool created by the weir and in the intake canal just before the penstock. The sensors will control electrical valves in the turbines which determine the amount of water entering the penstock. These valves are normally closed and need electrical power to remain open. The sensor in the weir pool will be used to maintain the water level necessary to insure that a minimum of 10 cfs flows through the conservation-flow notch whenever streamflow is 10 cfs or greater. The level sensor located in the intake canal will be used to detect a clogged trash rack condition. It will compare the water elevation in the pool behind the weir with the water elevation in the canal to determine reduced flow through the racks. If the amount of water flowing past the racks is less than necessary to operate the turbines (minimum 4 cfs), the turbine controls will automatically shut down the turbine(s) to prevent the penstock from becoming dewatered. An alarm would notify the operator that the racks may need cleaning. Should electrical power be lost to the powerhouse a battery backup system will be used to operate the water sensors. Should the backup system fail, the valves will close preventing water from entering the penstock. In the event of a total loss of power, all water will remain in the natural stream channel.

Telecommunications equipment will also be installed between the intake and the powerhouse for use during plant operations, maintenance, and for water level sensor calibration.

3. Penstock (Exhibits II-6 and II-7)

The penstock will be a 53-inch inside diameter steel pipe, coated with coal tar epoxy on both the inside and outside. Penstock thickness will vary from 1/4 inch at the intake to about one inch at the powerhouse. Each 40-foot section of the pipe will have a bell and a spigot end to facilitate field welding of the sections. The total length of penstock will be approximately 20,350 feet. The pipe will be buried about 5-1/2 feet below grade to minimize environmental and visual impact, prevent thermal expansion, and allow for reuse of the adjacent sugarcane fields once the pipe is installed. Thrust blocks will be located where needed and at each bend of the penstock.

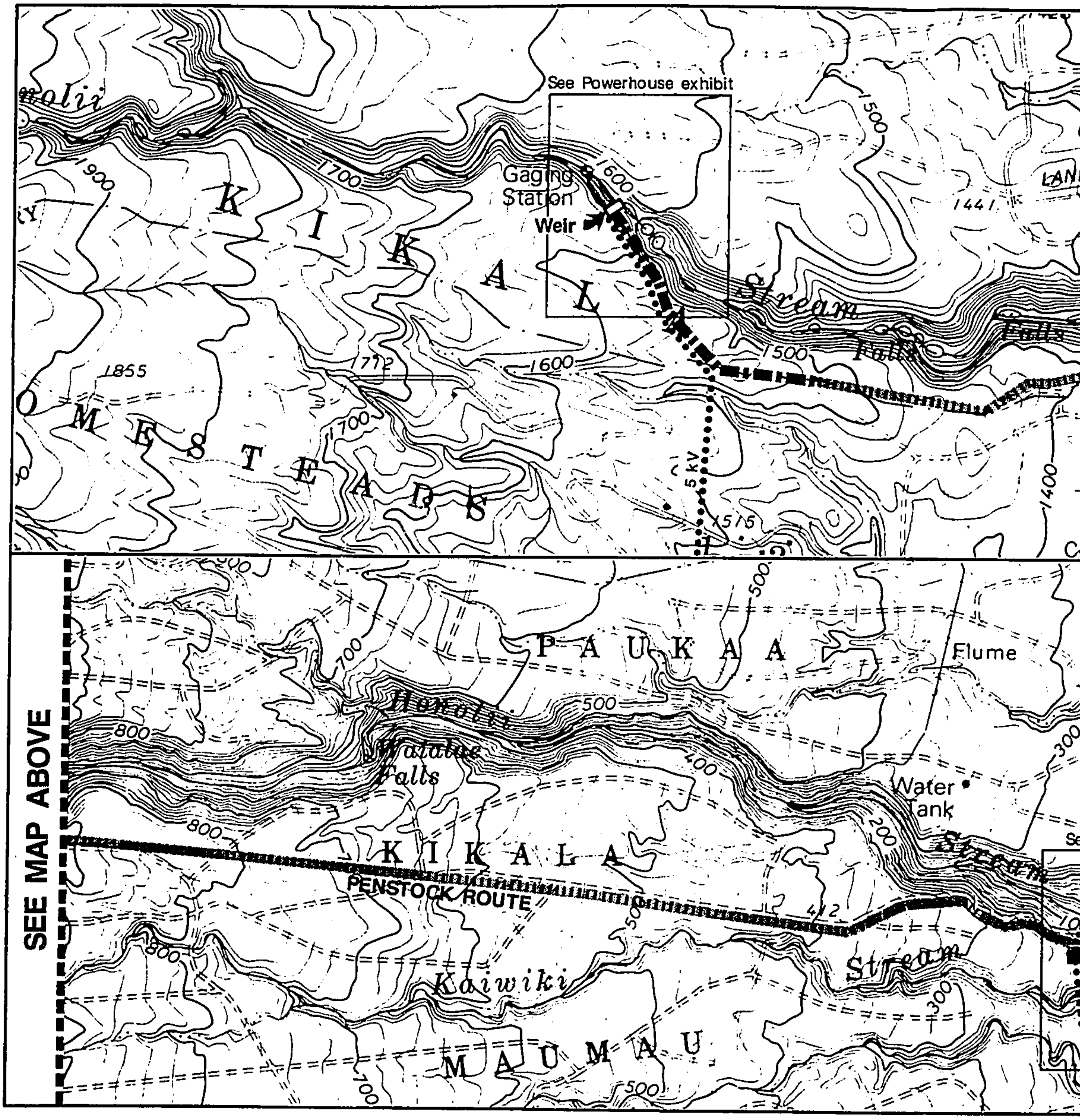
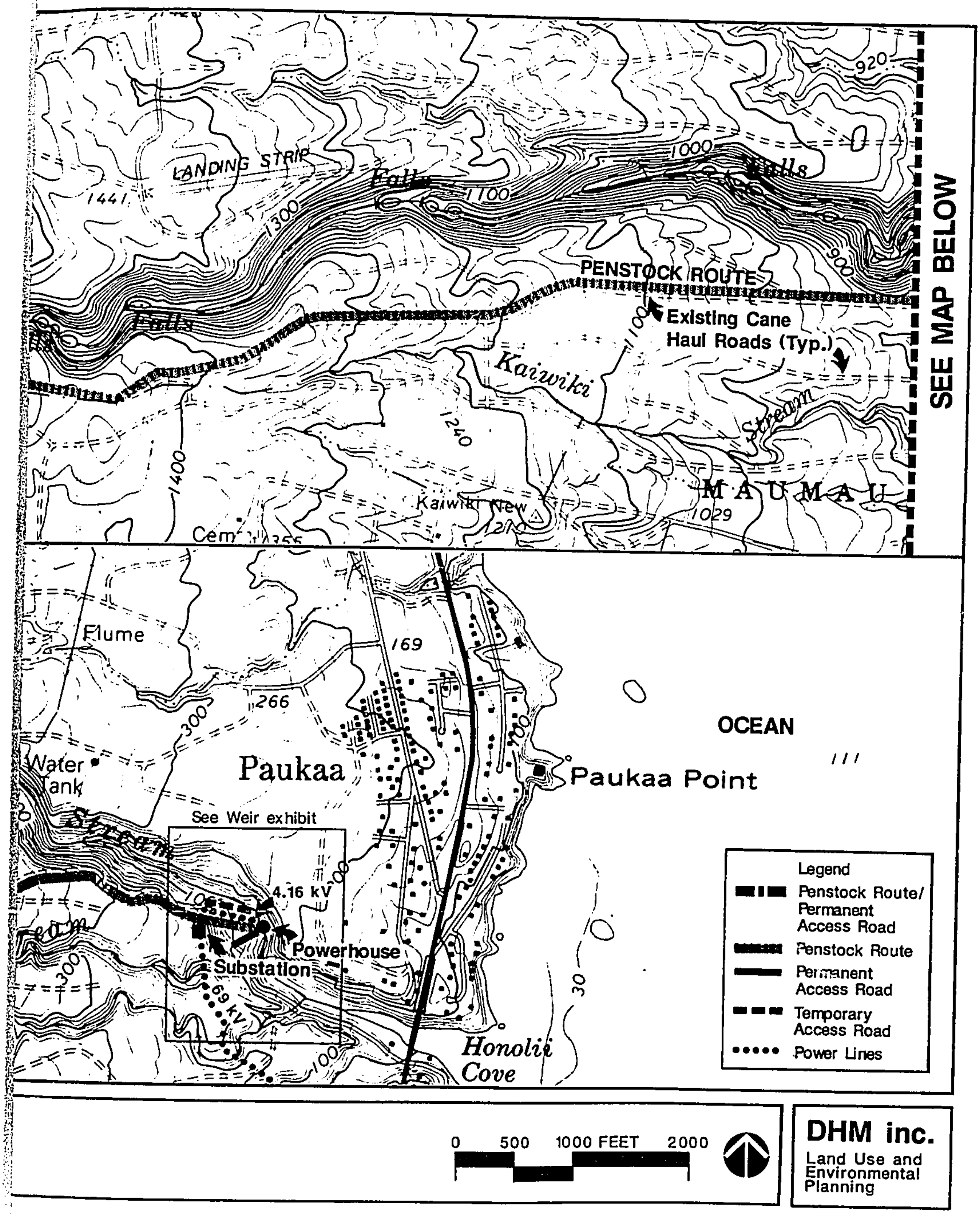


Exhibit II-6
Proposed Penstock Route



LANDING STRIP
1441
Falls
1100
1300
1000
Falls
920
900
PENSTOCK ROUTE
Existing Cane
Haul Roads (Typ.)
Falls
Kaiwiki
1000
Stream
1240
1400
MAUMAU
Kaiwiki New
1029
Cem
SEE MAP BELOW
Flume
169
266
300
OCEAN
Water
Tank
Paukaa
Paukaa Point
See Weir exhibit
Stream
4.16 kV
Powerhouse
Substation
69 kV
300
100
30
Honolii
Cove
Legend
Penstock Route/
Permanent
Access Road
Penstock Route
Permanent
Access Road
Temporary
Access Road
Power Lines
0
500
1000 FEET
2000
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Air release/vacuum breaker valves and manholes will be located at various spots along the penstock. The valves will allow entrapped air to escape, and will also allow air to enter the penstock if vacuum becomes critical. This will eliminate the chance of penstock collapse in the event of penstock break or blockage at the intake to the pipe. Manholes will allow access for maintenance and inspection of the penstock as well as electrical and telecommunication lines if the conduit alternative is used. (See Section 5). Another sediment trap will be located at the low point in the penstock line, just above the powerhouse, to catch any fine material that has passed through the intake racks. The trap will be equipped with a valve which will be opened when flushing of the trap is required.

The penstock will be primarily buried alongside existing cane roads on the south side of the stream and will not cross any perennial stream channels. One intermittent drainage channel will need to be crossed by the penstock. (Refer to Exhibit II-3). A standard culvert, sized to accommodate flood flows, will be installed to allow water to flow under the penstock.

The most difficult area for installation of the penstock will be the first 1,200 feet starting at the intake. Since water must gravity-feed into the penstock, the penstock must slope downward from the intake. To accomplish this, a "bench" will be cut into the bedrock stream bank. This is the structurally and economically preferred method of burying the penstock. The bench will also be used as a permanent access road to the intake and weir. (See Exhibit II-7). The first 1,200 feet of cut will virtually all be in solid bedrock. As a result, slope instability during and after construction will not be a problem.

After the first 1,200 feet, the penstock route will follow the existing contour of the land. This will not require any additional major excavation other than the trenching necessary to permit burial of the pipe. A construction easement 75 to 100 feet wide will be needed, as shown in Exhibit II-7.

4. <u>Powerhouse</u> (Exhibits II-8, II-9 and II-10)

The powerhouse will be located approximately 50 feet from the stream at elevation 80 feet MSL, 3.7 miles downstream from the diversion weir. The proposed site offers favorable ground elevations and slopes which will enable the powerhouse to be constructed without the need for significant clearing and grading. The foundation will be about 20 feet above the stream channel and one foot above the 100-year flood level to protect equipment from flood damage. The building will be a concrete block design of approximately 86 feet by 32 feet. The height from the floor to the roof peak

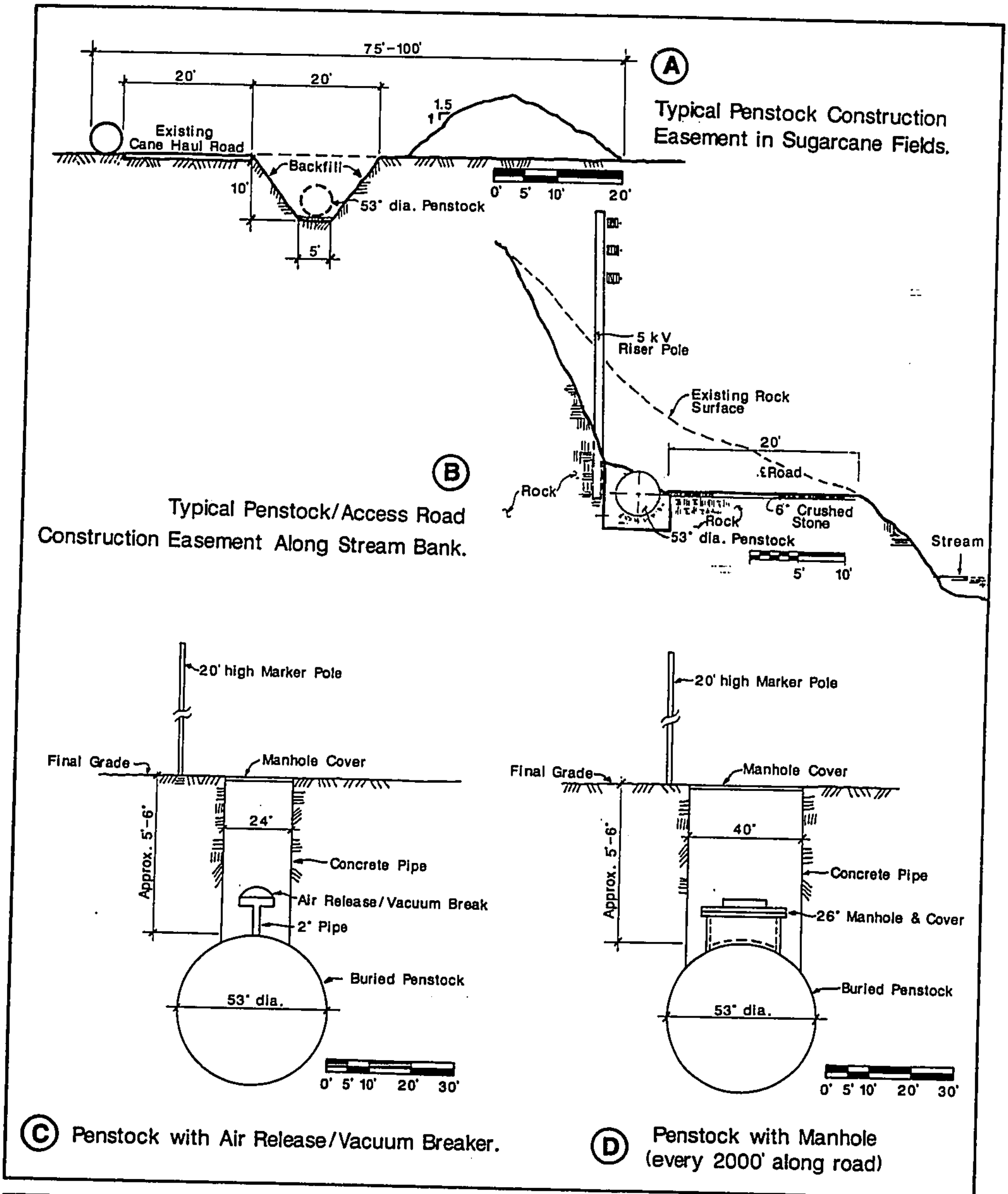

Exhibit II-7
Penstock Details

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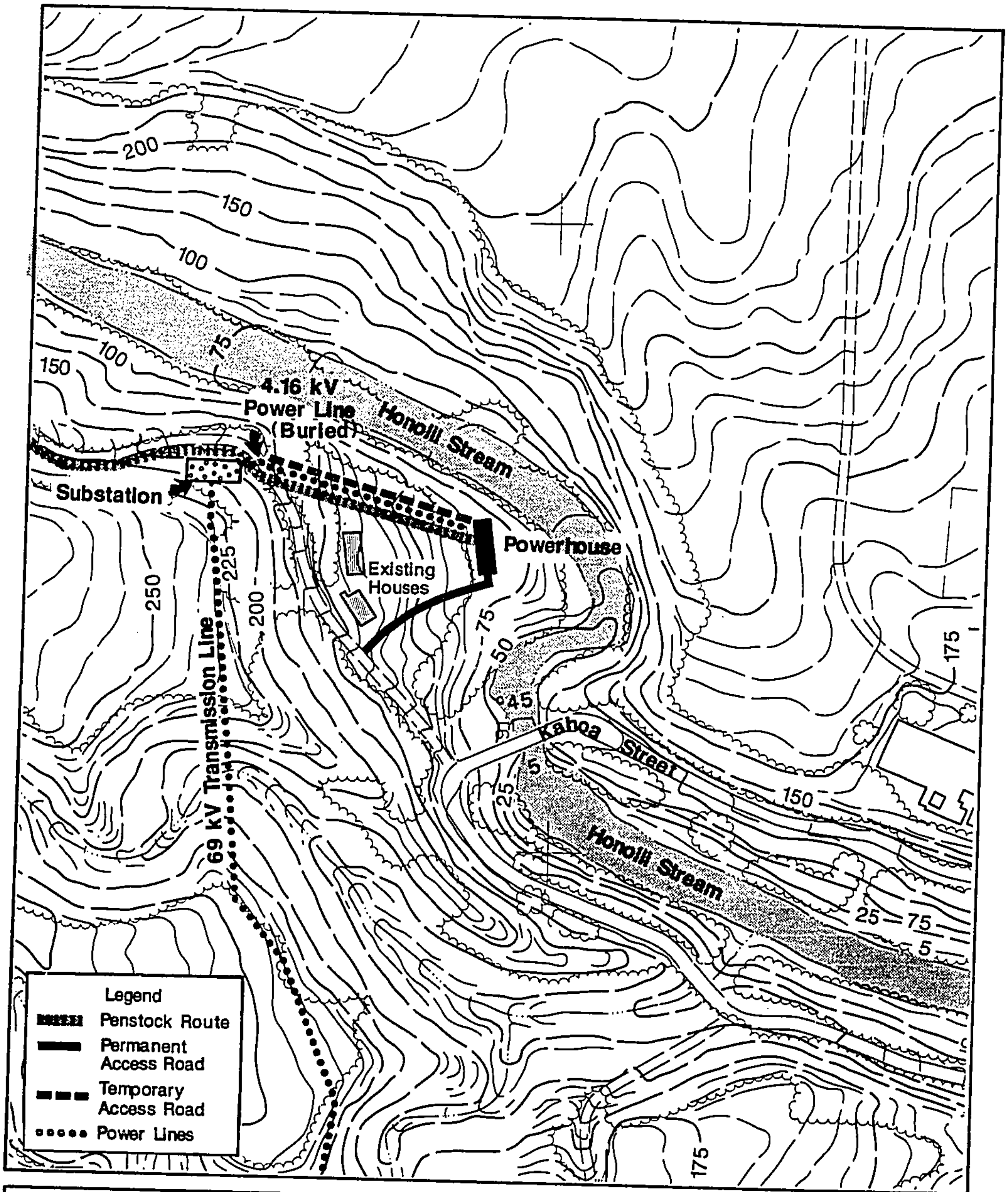

Exhibit II-8
Proposed Powerhouse Area

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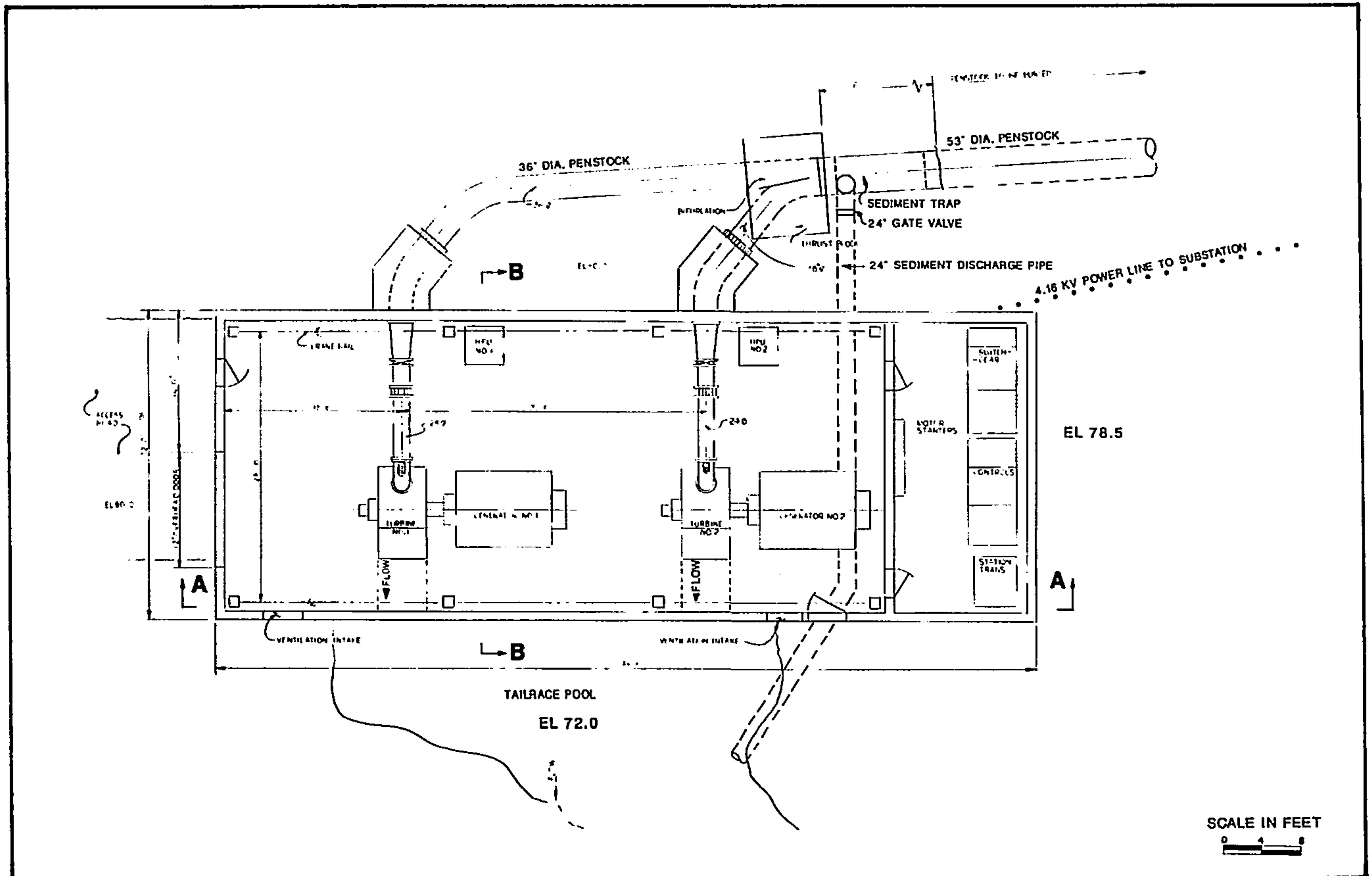

Exhibit II-9
Proposed Powerhouse Plan

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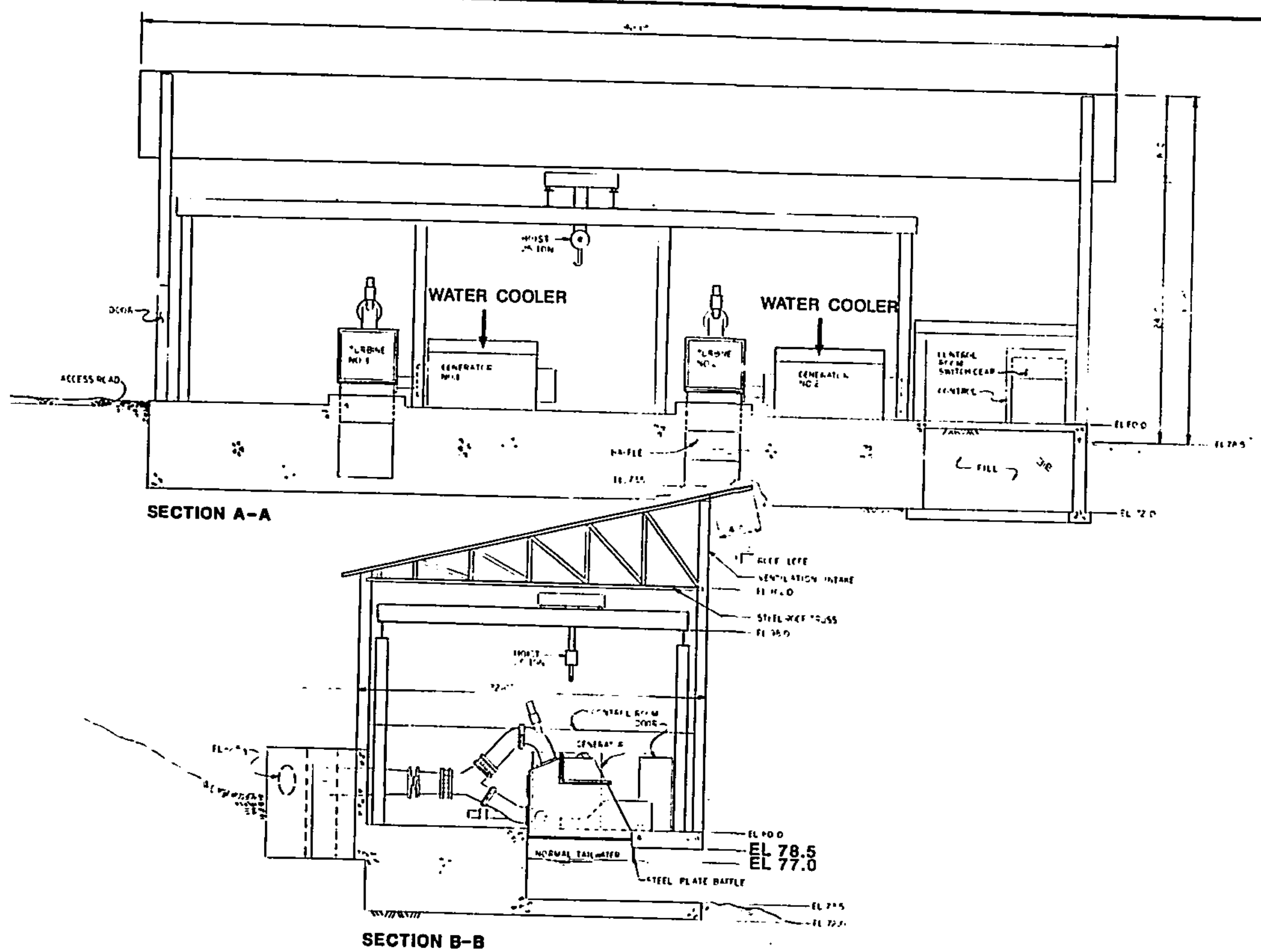

Exhibit II-10
Proposed Powerhouse Sections

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will be 32 feet. Entry will be through two personnel doors and one 12-foot wide by 14-foot high rolling door. A room inside the powerhouse will be used as a control room and office and will contain all switchgear and controls. A 25-ton overhead crane will be installed in the powerhouse for use during installation and for maintenance of equipment. The crane will be capable of lifting the heaviest single component used in the powerhouse.

Generating equipment will consist of two identical turbine and generating units. The turbines will be Pelton-type and will operate under a net head of 1,330 feet. **The turbines will be designed to operate between a minimum flow of 4 cfs to a maximum flow of 75 cfs** each. Each generator will have an output of 7.3 MW and a voltage of 4,160 (4.16 kV). A 4.16 kV power line will carry the power to the substation.

After running through the turbines, the water will fall into a pool located below the powerhouse. From the pool, the water will flow down the tailrace into either an open canal or pipe **overhanging the stream, and then** free fall approximately ten feet back into the stream. This will prevent migrating fish from entering the tailrace.

5. <u>Substation and Power Lines</u>

An electrical substation, approximately 80 feet by 40 feet, will be located about 400 feet upstream of the powerhouse on agricultural zoned land. The substation will transform the generator voltage of 4,160 (4.16 kV) to be compatible with HELCO's existing 69,000 volt (69 kV) transmission line. Substation equipment designed to meet HELCO's specifications will include a manual disconnect switch, current and potential transformers, lightning arrestors, a grounding system, 69 kV circuit breakers, protective relaying and metering devices, 4.16-69 kV step-up transformer, and supervisory control system to HELCO Operations Center. The substation will have a gravel base and will be surrounded by an eight-foot high security fence.

The project will consist of three power lines. A 4.16 kV line will carry power from the powerhouse to the substation through an underground conduit. A new 69 kV transmission line will be built from the substation to the existing 69 kV line along Mamalahoa Highway, a distance of about 2,500 feet. (Refer to Exhibit II-6). The new line will be mounted on standard wooden utility poles, a minimum 42 feet in height, with standoff insulators. (Exhibit II-11). Every effort will be made to request a tie in point from HELCO that will minimize any impact on nearby residences. Telephone

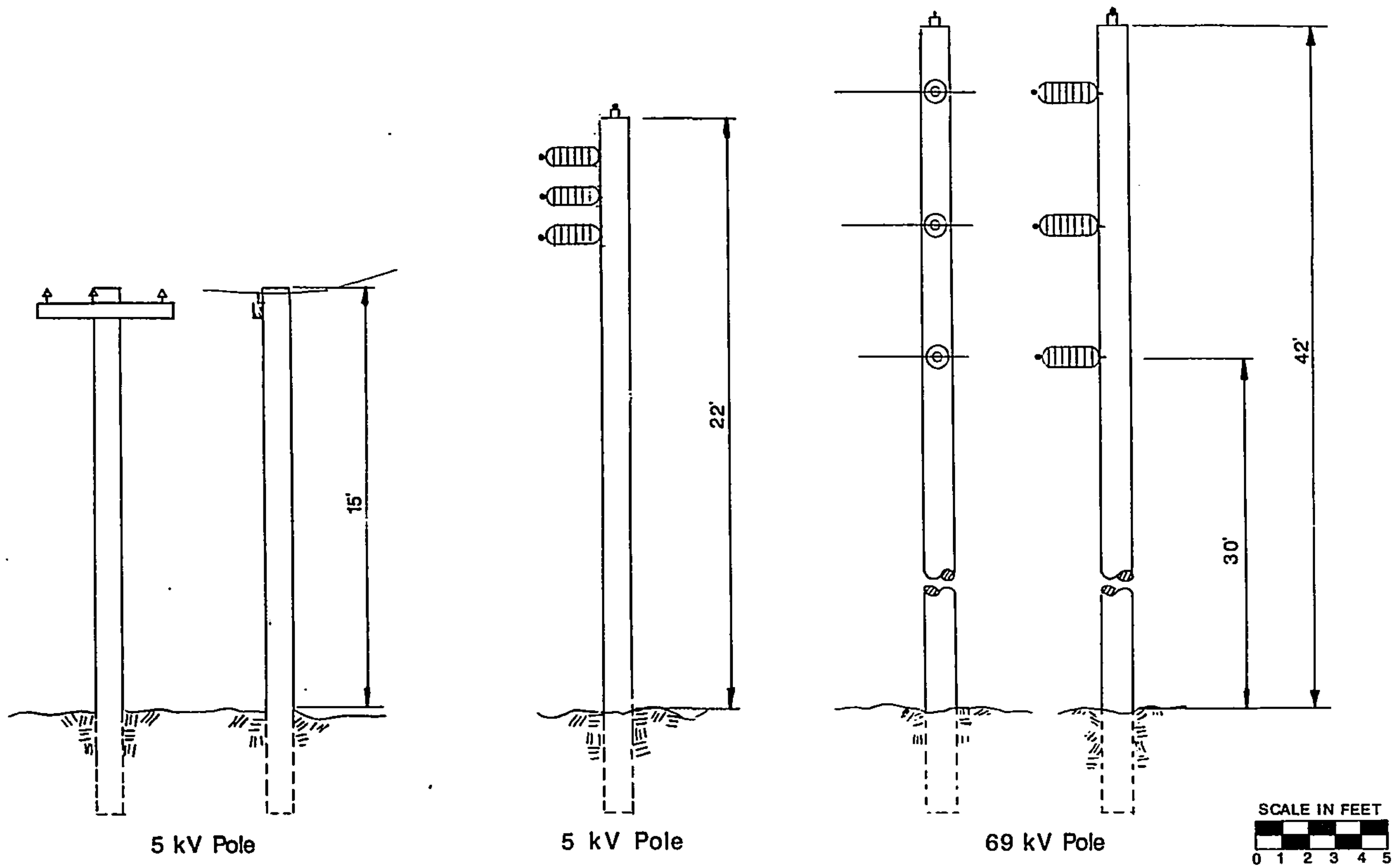

Exhibit II–11
Power Line Structures

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and substation control lines will also be hung on the poles. Electricity to operate the equipment at the intake will be provided by one of two methods. The first method would consist of a 5 kV line buried in a conduit parallel to the penstock between the powerhouse and the intake. In addition, a separate conduit would carry cables for telephone communication and for water level sensor transmissions. The second method would involve running 5 kV overhead lines from the upland community of Kaiwiki through the sugarcane field to the intake as shown in Exhibit II-6.

6. Access Roads

Access to the weir and intake will be provided by approximately 2,400 feet of permanent access from the south (Exhibits II-3 and II-6). The permanent access road will follow the penstock route between the intake and the nearest cane haul road. The roads will have a maximum grade of 14 percent. In areas where the penstock runs through cane fields, a temporary access road will be created for use during construction only. No new roads will cross stream channels. In areas where a temporary road crosses drainage channels, steel culverts will be temporarily installed to allow continued drainage during construction, and then be removed with the road. The substation will be accessible via the existing cane haul road along the penstock route. A temporary access road, 400 feet long, will connect the substation with the powerhouse. A permanent 220-foot long access road between the powerhouse and the existing driveway will be built for post-construction access to the powerhouse from Kahoa Street. (Exhibit II-8).

All equipment and construction materials that need to be shipped in will pass through the Hilo port and be trucked to the site via access roads near Alae Cemetery. No weight or size limitation problems in transporting the equipment are anticipated.

D. CONSTRUCTION

During construction of the Honoli'i project, all heavy equipment and supplies will access the project area from Mamalahoa Highway onto existing cane haul roads south of the stream in the immediate area of Alae Cemetery. Use of the old government road (Kahoa Street) will be minimal and no heavy equipment will need to cross the scenic Kahoa Street Bridge. As described above, additional access roads will be built where required.

To construct the diversion weir, it will be necessary to temporarily (1-2 months) divert the flow of Honoli'i for a length of about 200 feet. Two 15-foot high cofferdams will be built, one upstream and one downstream of the proposed weir. They will be constructed of earth fill with a waterproof membrane covering, and rip-rapped sides.

(Exhibit II-12). A 200-foot long, five-foot diameter culvert will be used to divert water from the upstream to the downstream cofferdam. The culvert will be capable of passing 300 cfs before water begins overtopping the upstream cofferdam. **Care will be taken to insure construction of the weir takes place during a historically dryer period.** Once the area between the cofferdams is dewatered, the stream bed will be cleared of all loose material. The site of the proposed weir consists of solid nonfractured bedrock with no sediment on the bottom. As a result, no dredging will be required. A keyway will be cut into the rock to serve as a footing for a 12-inch thick core wall. Limited blasting may be required for the keyway. However, if blasting is necessary, it will be done in the dewatered areas and all loose materials will be removed. Once the core wall has been built, gradually-sloped upstream and downstream faces of the weir will be constructed using boulders and cobble stone from the surrounding area that will be grouted in place. Grout pipes will be installed to enable the weir foundation to be grouted in the event that unacceptable leakage is encountered after the weir is complete. The intake stoplog structure and radial gate will also be built during this time. Once these structures are complete, the culvert and cofferdams will be removed, and stream water will either flow over the weir or through the radial gate **until the penstock and powerhouse are completed.**

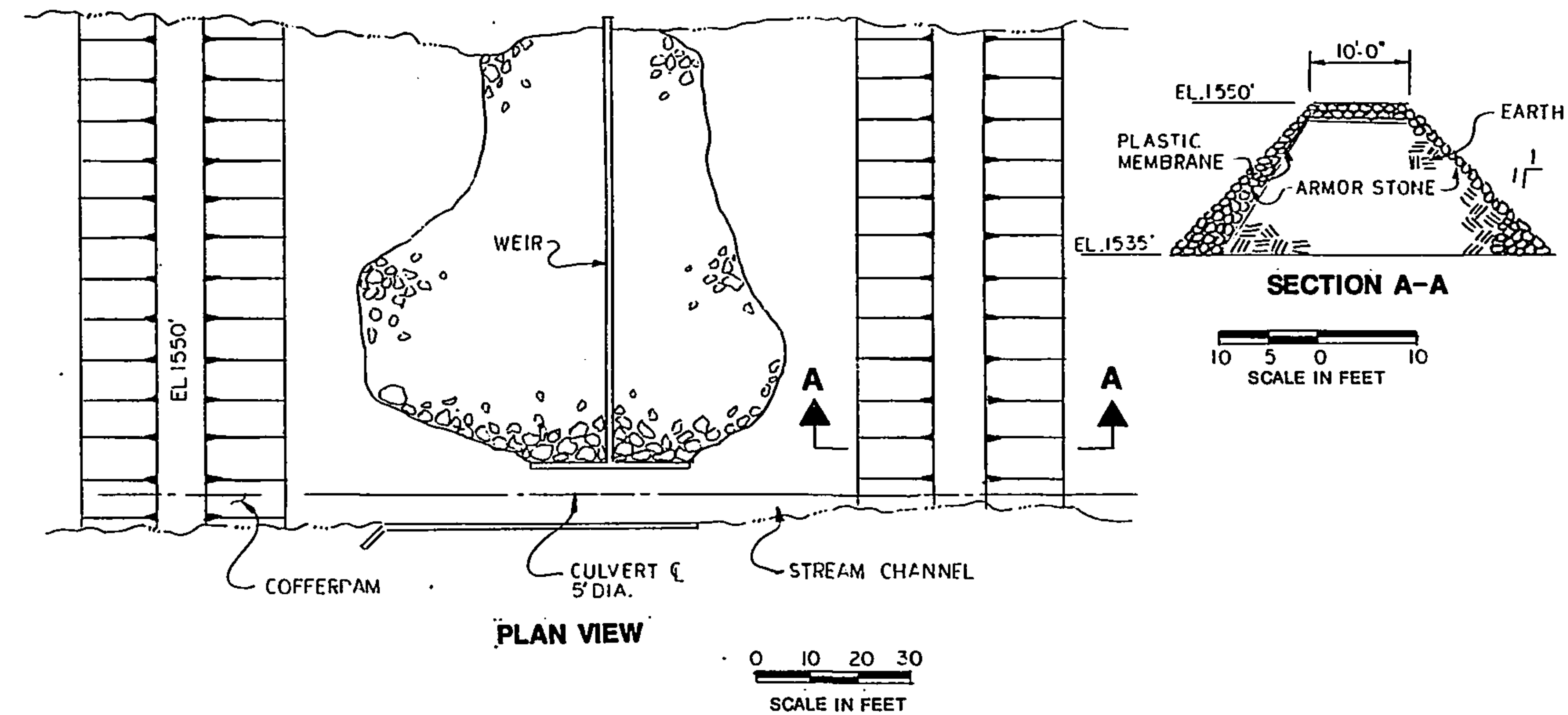

Exhibit II–12
Proposed Use of Cofferdams

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To construct the first 1,200 feet of the penstock, a bench will be cut into the stream bank. The bank in this area consists of virtually solid bedrock and some blasting will be required to fracture the rock into less than four-foot diameter boulders. Once the rock is fractured, heavy equipment with special attachments will remove the boulders from the area. **The excavated rock will be re-used in the weir intake, penstock, and powerhouse construction and where culverts are required.**

Construction of the powerhouse and tailrace will take place completely outside of the streambed. Excavation will not be required as the powerhouse floor is slightly above the existing grade. A retaining wall and fill will be used to construct the powerhouse foundation.

E. DEVELOPMENT SCHEDULE AND CONSTRUCTION COST

Construction is scheduled to take place over a one-year period from June 1989 to June 1990. Commencement is contingent upon satisfying license and permit requirements, financing, and upon equipment and materials acquisition. Another factor which could affect the construction schedule would be weather. Winter months have more rainfall which would slow down construction in some areas and impede construction in the stream bed.

Construction cost of the project is estimated to be 20 million dollars (1989 value). Mauna Kea Power Company, Inc. assumes all of the costs and risks of project development, including planning, engineering, permits and approvals, goods and materials, and employment of workers. Being privately owned and operated, the project will bring needed services to the public without ratepayer risk or capital.

Chapter III

III. EXISTING ENVIRONMENTAL SETTING

A. GEOLOGIC CONDITIONS

The Honoli'i study area is located on the lower slopes of Mauna Kea, a volcanic mountain which has been inactive in recent geologic time, is generally oval and dome-shaped, and was formed almost entirely by the accumulation of thousands of lava flows. The stream valley in this area is narrow, steep-walled and approximately 150 feet deep. It is mantled by a ± 10-foot thick ash deposit underlain by Mauna Kea basalt flows of the upper member of the Hamakua Volcanic Series.[17] The rocks exposed in the streambed and the valley walls consist of hard, essentially unweathered olivine basalt. The stream bottom (substrate) consists of boulder and cobble with very little gravel or sand sized material. After heavy rains, terrigenous[18] material is washed downstream, creating pockets of sedimentation of varying size, however this sediment eventually washes further downstream and into the ocean.[19] The substrate in the lower reaches is typically coated with a thick (1 cm) layer of gelatinous "scum" composed of algae and decomposing terrestrial vegetation.[20] In the upper reaches, near the

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17. U.S. Army Corps of Engineers, Wailuku/Honolii Hydropower Study, Island of Hawaii, Hawaii, Reconnaissance Phase Documentation, September 1984. p. D-4.

18. Terrigenous material is that which is related to oceanic sediment derived directly from the destruction of rocks on the earth's surface.

19. Ibid., p. E-2.

20. Kelly M. Archer, Aquatic Survey of Honolii Stream, Island of Hawaii, November, 1988.

gaging station, the substrate is not as thickly coated with the scum, but there are areas where a substantial growth of moss is present on the substrate. The growth pattern of the moss in relation to the stream level during the field survey probably indicates fluctuating flow levels.

The site of the proposed diversion weir near elevation 1,535 feet, is on exposed bedrock. The site of the proposed powerhouse, on the right (south) bank at approximately elevation 80 feet, is a relatively flat terrace of soil overburden at approximately 20 feet above the stream bed.

According to the Soil Survey of the Soil Conservation Service,[21] the project area consists of three soil types, Rough broken land, Hilo Series and Kaiwiki Series, as described below, and shown on Exhibit III-1.

The stream beds of Honoli'i and its tributaries are classified as Rough broken land (RB). Rough broken land is a miscellaneous land type that consists of very steep, precipitous land broken by many intermittent drainage channels. It occurs primarily in gulches, and the slope is predominantly 35-70 percent. The soil material ranges from very shallow to deep. Stones and rock outcrops are common in some areas. The elevation of this land-type ranges from

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21. U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of Island of Hawaii, State of Hawaii, December 1973.

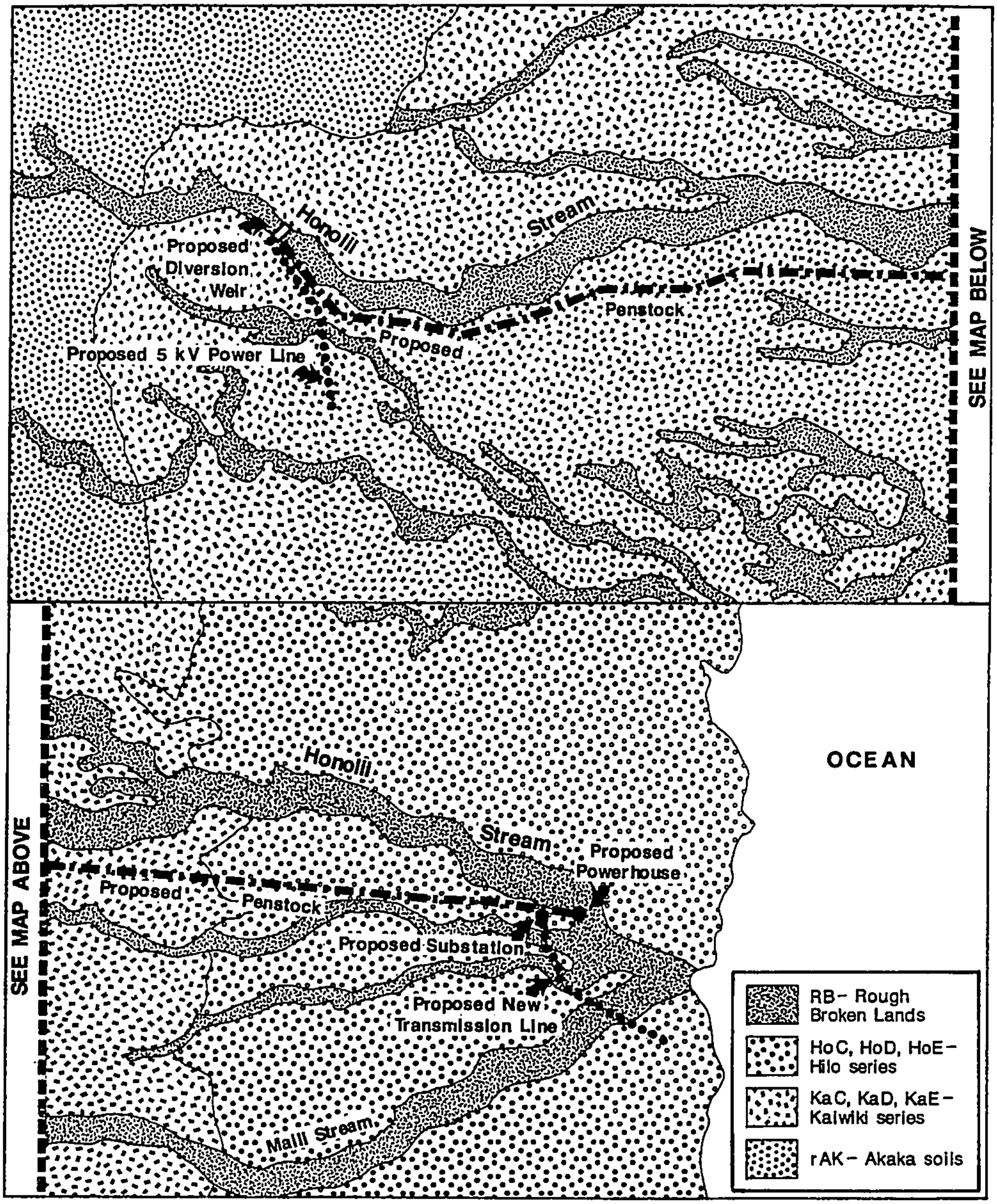

Exhibit III-1
Soils

0 1000 2000 FEET 4000

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near sea level to 3,000 feet, with the presence of a few scattered waterfalls. Rough Broken land is typically used for pasture, woodland, wildlife habitat, and recreation areas.

Soils of the Hilo series (HoC, HoD, HoE) are gently sloping to steep soils on uplands at elevations ranging from near sea level to 800 feet. They consist of well drained silty clay loams, were formed in a series of layers of volcanic ash and have a banded appearance. Permeability of these soils is rapid, runoff is slow to moderate, and the erosion hazard is slight to moderate. The natural vegetation of this soil type consists of ohia, tree fern, guava, Hilo grass, and California grass. Hilo soils are normally used for sugarcane, truck crops, orchards and pasture.

Soils of the Kaiwiki series (KaC, KaD, KaE) are gently sloping to steep soils located on the agricultural uplands bordering the stream, at elevations ranging from 800 to 1500 feet. The Kaiwiki series consists of well-drained silty clay loams, formed in the same way as the Hilo series. They have a high shrink-swell potential, rapid permeability, slow to medium runoff, and slight to moderate erosion hazard. The natural vegetation consists of ohia, tree fern, California grass, Hilo grass, and Wainaku grass. Kaiwiki soils are primarily used for sugarcane, with small acreage for pasture, truck crops and woodland.

Akaka soils (rAK) are shown above the project area on Exhibit III-1. These soils are in the rain forest above the sugarcane fields. Their slope generally ranges from three to twenty percent, but they are dissected by many small drainage ways, some of which have slopes of forty or fifty percent.

The island of Hawaii is more susceptible to earthquake activity and lava flows than the other islands of the Hawaiian chain, but the risk generally decreases with distance from the northeast rift zone of Mauna Loa volcano. Areas of highest risk are those where historic flows have occurred within the past 200 years. The frequency of volcanic activity is less in areas where flows or rift zones were active between 200 and 5,000 years ago. Honoli'i Stream is in an area where flows are older than 5,000 years, and is in the lowest hazard or risk area on the island. (Exhibit III-2). The most recent flow in the project vicinity was a flow in March 1984 which came no closer than about five miles to Honoli'i Stream.

B. CLIMATIC CHARACTERISTICS

Honoli'i Stream is located within the 20-mile stretch of the Hamakua coast from Hilo to Laupahoehoe which is the wettest region of the Big Island, with rainfall averaging 300 inches annually at the 2,000 to 3,000-foot elevations. Except for the Kohala Mountains, the Hamakua coast is the only area on

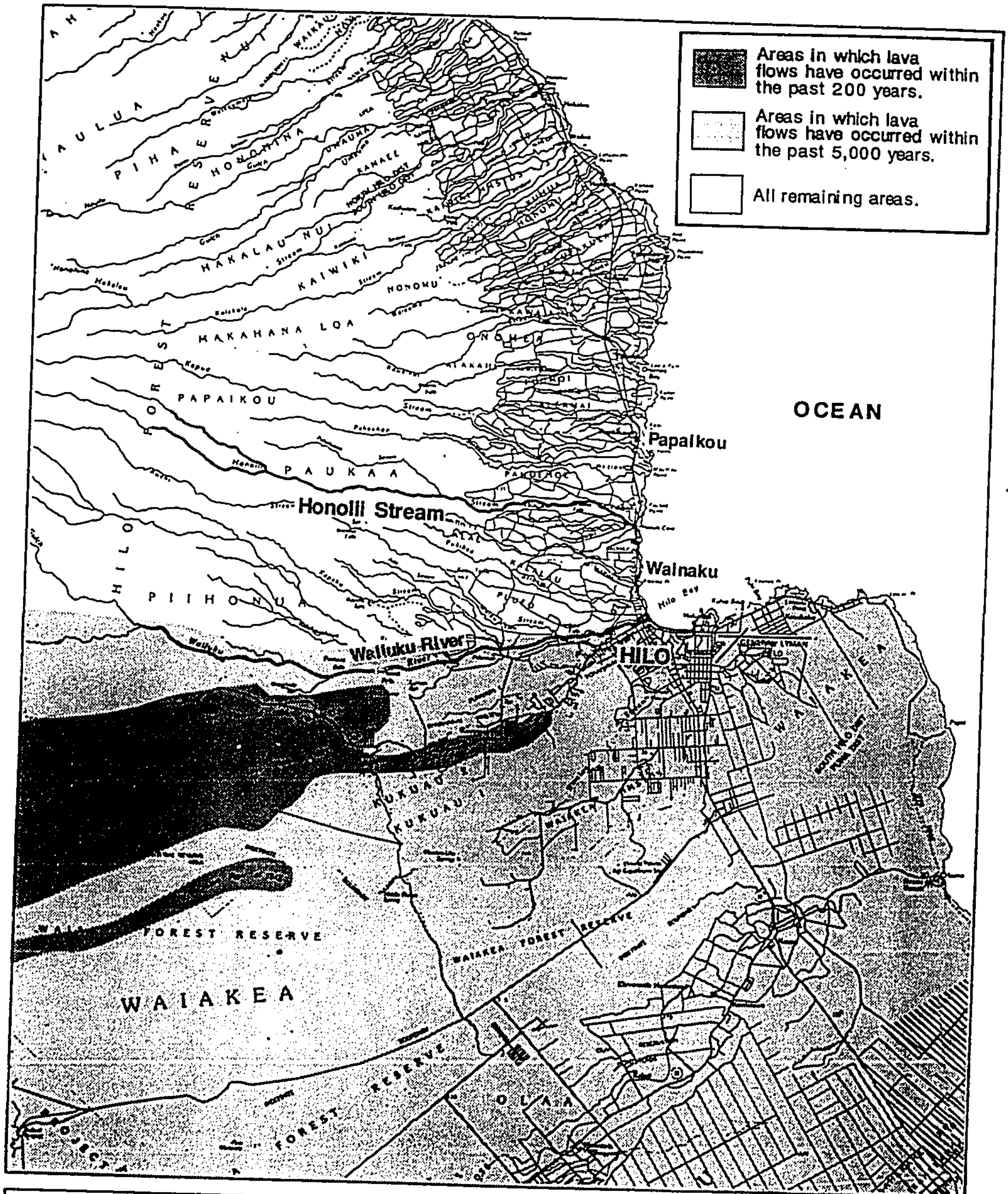

Exhibit III-2
Geologic Hazards

0 1 2 3 4
SCALE IN MILES

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the Big Island where perennial streams reach the sea. Springs fed by perched groundwater proliferate along the coast between sea level and 2,000 feet elevation.[22]

Because of the abundant rainfall, numerous springs, and relatively easy access, the Hamakua coast is a good prospect for hydropower development.

In the proposed project area, the average annual rainfall is between 100 inches near the powerhouse location and 275 inches near the proposed weir site. The highest rainfalls occur during the winter months from about October through April. The average temperature in Hilo ranges from about 71 degrees in February to 76 degrees in August. In general, Hawaii's warmest and driest months are August and September, and its coolest and wettest are February and March.

C. HYDROLOGICAL CHARACTERISTICS

1. Stream Characteristics

Honoli'i Stream is within the South Hamakua watershed which is located in the Hilo Hydrographic Area (Area II). Honoli'i's intermittent headwaters originate near the 5,840-foot elevation on Mauna Kea's windward slopes and flow nearly 16 miles to Hilo Bay, three miles north of Hilo.

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22. Department of Planning and Economic Development, Hydroelectric Power in Hawaii, A Reconnaissance Survey, February 1981, p.27.

Honoli'i is a continuous perennial stream which flows to the ocean throughout the year. As are most of the streams along the Hamakua coast of Mauna Kea, it is generally extremely steep from the headwaters to the confluence with the sea. The profile is characterized generally by a series of falls ranging from as low as a few feet to over 75 feet, interspersed by reaches of swift flowing water and deep pools. The stream is not diverted or channelized.

Orographic (mountain) rainfall is the primary source of water for nearly all streams in Hawaii, including Honoli'i. Streams are characterized as having highly variable flows. In addition to seasonal and monthly variability, daily and hourly flows range over a broad spectrum depending on rainfall. On any day, Honoli'i, as with most Hawaiian streams, can be observed flowing clear and steady. "Next thing, the water goes turbid and rises...(then) out of nowhere comes a shocking flood, with a rush and a roar, a collosal natural bulldozer...fierce enough to pick up...giant boulders...raking them over the stream bottom..."[23]

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23. Gavin Daws, _Hawaii: the Islands of Life_, The Nature Conservancy of Hawaii, October 1988, p. 87.

Honoli'i Stream is the principal river in the Honoli'i basin. Perennial tributaries to the stream are the Kaiwiki, Pohakupaa and the Honoli'i segment. There are two unnamed tributaries along the north bank, and numerous locations of groundwater seepage from the valley wall exist along both banks. (Exhibit III-3). At lower elevations closer to the sea, there are numerous spring sources which continue to feed the streams in dry weather, giving a more constant flow.

Honoli'i Stream is gaged by the U.S. Geological Survey (USGS) gaging station (No. 16717000) at elevation 1,540 feet. (Exhibit III-3). Continuous records of stream flow and water quality are available from 1967 to the present, and a three-year period of flow data is available for the years 1911 to 1913.[24] The drainage area at the gage and weir site is practically the same, 11.6 square miles. The drainage area at the proposed powerhouse is 13.5 square miles. The stream's average annual flow for the entire period of record is 126 cubic feet per second (cfs), with a record maximum flow of 22,600 cfs in 1978 and a record minimum flow of 0.8 cfs in 1912. The 100-year storm has peak flows of about 26,700 cfs.

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24. Honoli'i Stream was partially diverted (3.2 cfs) upstream for fluming and domestic use from 1911 to 1913.

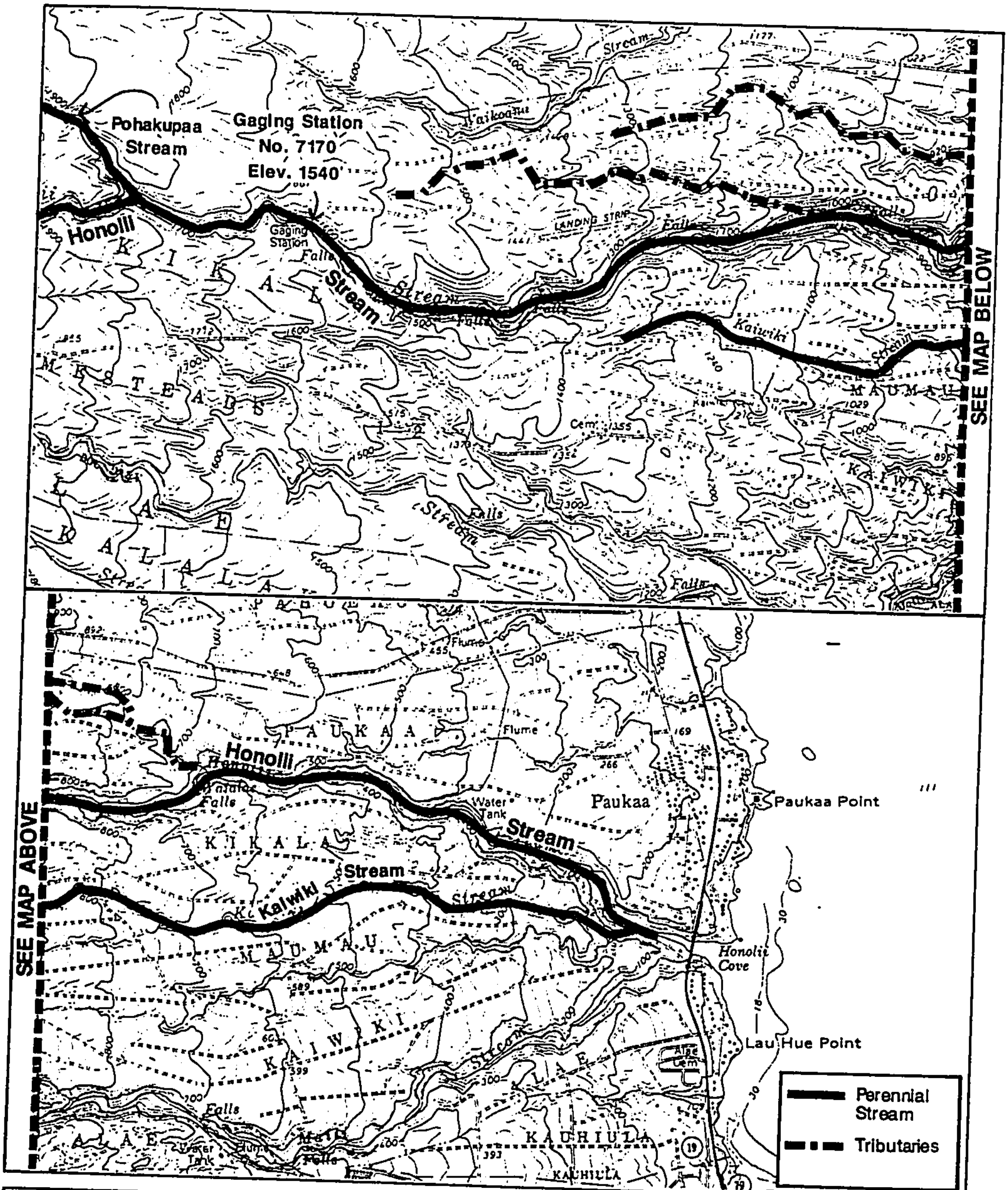

Exhibit III-3
Honolii Stream & Tributaries

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The discharge records for the Honoli'i gage indicate there is considerable variation of both the average annual flow and average mean monthly flow as shown on Exhibit III-4. The driest water year between 1969 and 1987 was 1981 with an average annual flow of 53.1 cfs. The second and third driest years were 1984 and 1983 with average flows of 63.4 cfs and 72.8 cfs respectively. The two wettest years in this time period were those immediately preceding and following the driest year - 1980 and 1982 with average annual flows of 214 and 191 cfs respectively. The average monthly flows illustrate that the stream flows are highly variable due to the variability of precipitation. There is little seasonal pattern to runoff. This is demonstrated by the fact that over the period of record, March has had the minimum annual flow most frequently, as well as the second-most frequent maximum annual flow.

The flow duration curve, Exhibit III-5, illustrates the flow characteristics of the stream on an average annual basis for the period of record at the gage. The base flow of Honoli'i, or the flow exceeded 90 percent of the time, is 10 cfs. The flow duration curve also illustrates that the median flow is 40 cfs (flow exceeded 50 percent of the time).

Average Annual Flow

Water Year	Flow (cfs)	Water Year	Flow (cfs)
1987	118	1977	131
1986	138	1976	136
1985	159	1975	144
1984	63.4	1974	117
1983	72.8	1973	106
1982	191	1972	122
1981	53.1	1971	125
1980	214	1970	116
1979	130	1969	190
1978	77.6	1968	116

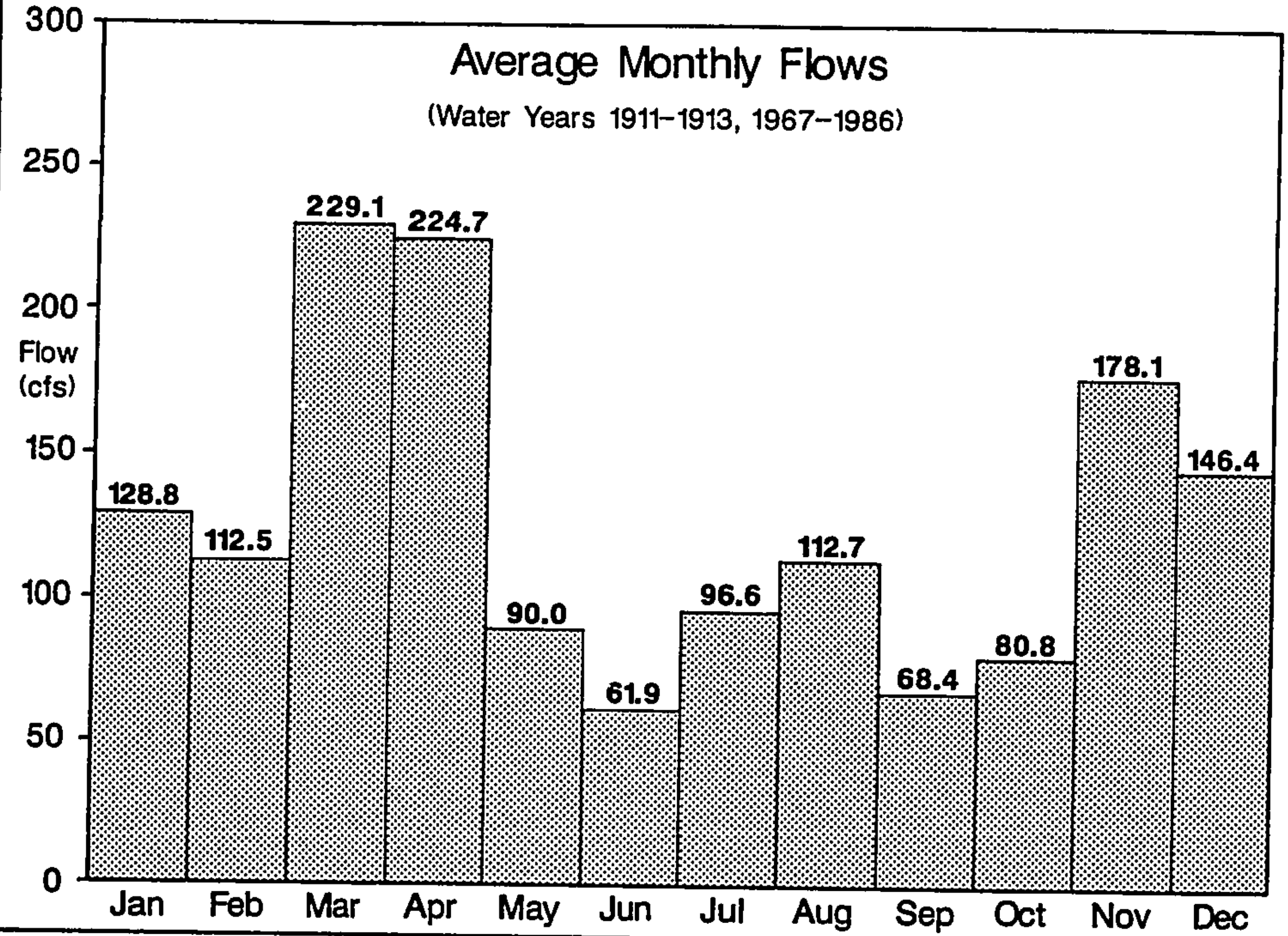

Exhibit III-4
Average Annual and Monthly
Stream Flow in Honolii Stream

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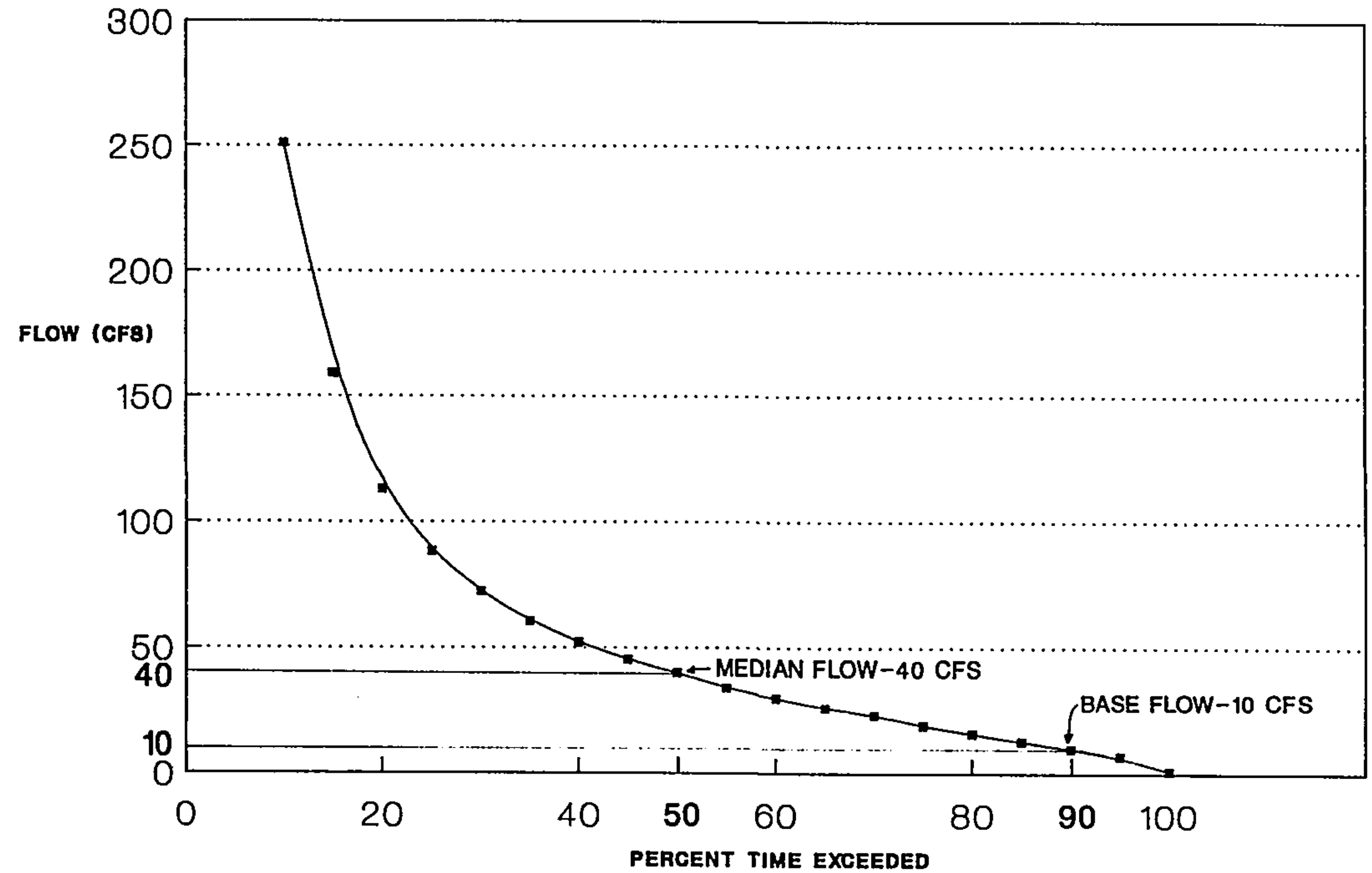

Exhibit III-5
Average Annual Flow Duration Curve
for Honolii Stream

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The plot of low flow recurrence intervals appears on Exhibit III-6. A series of low flow durations, 1, 7, 14, and 30 days is plotted. These curves are based upon annual values of daily average flow data for the period of record of the gaging station. These curves illustrate that the base flow of 10 cfs occurs consistently every one to two years for periods of 14 consecutive days at a time.[25]

As mentioned earlier, precipitation is highly responsible for the variability of the stream flows. Rainstorms create a rapid runoff response in the stream. This is seen by the shape of the hydrograph plotted in Exhibit III-6. This shape is characteristic of the runoff pattern of virtually all of the short duration, non-antecedent precipitation rainfall events in the valley. The hydrograph has a time of rise of 1 to 6 hours and recision period of 30 to 36 hours during which time the rainfall drains out of the valley. It is relatively common for the flows to vary from base flow to thousands of cfs in 2 to 4 hours. This characteristic response is due to the shape, size, and slope of the drainage area.

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25. During the dEIS review period several agencies, especially USFWS, have questioned the accuracy of the flow duration curves because of a reported diversion of 3.2 cfs during the period 1911 to 1913. Unfortunately there are no accurate records of the diversion. However, statistically a diversion of 3.2 cfs for 3 years is insignificant when compared to the mean flow of 126 cfs for 23 years (the entire period of record).

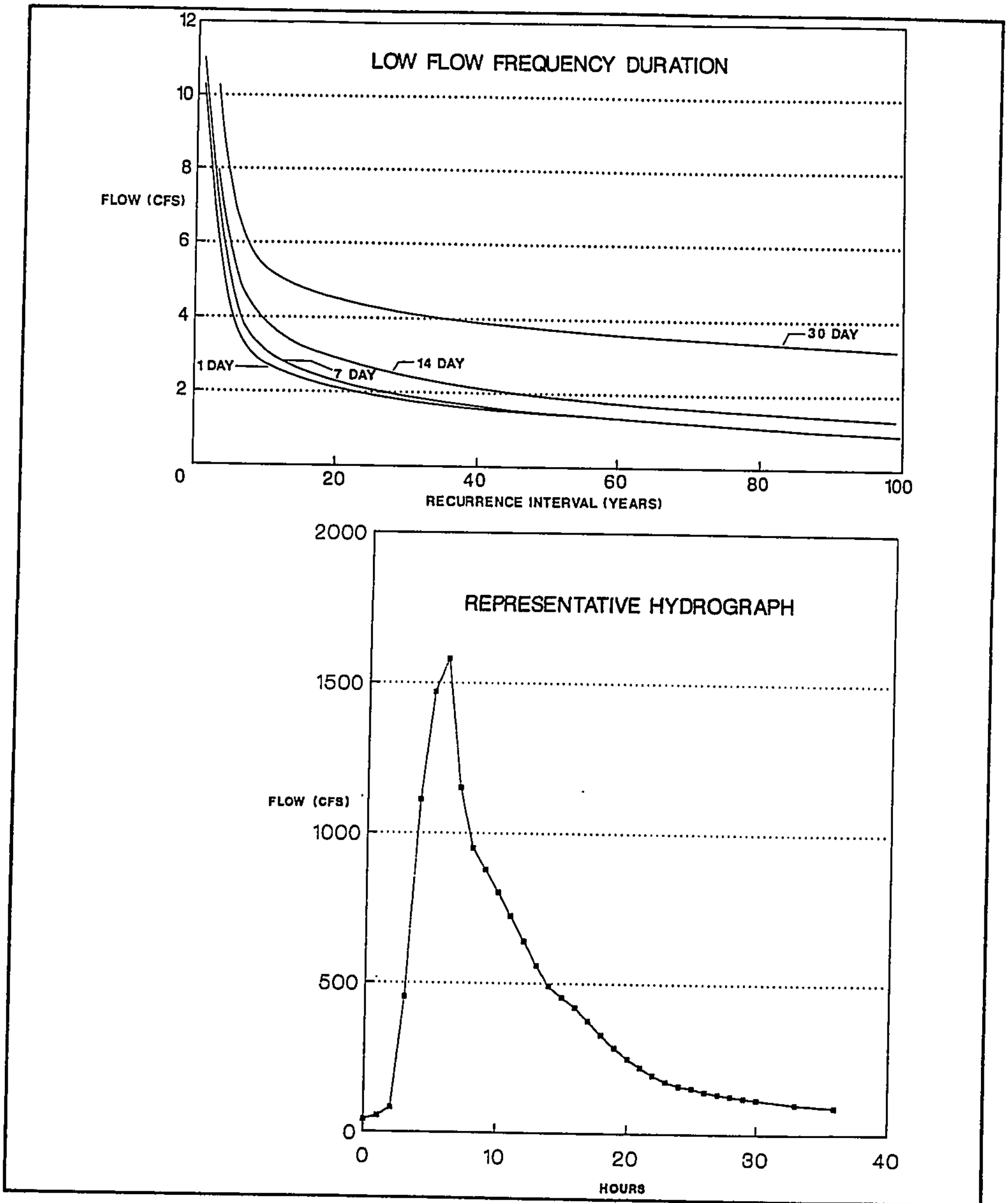

Exhibit III-6
Flow Characteristics
of Honolii Stream

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The benthic habitat of Honoli'i Stream immediately above the gage consists of a cobble-boulder riffle.[26] Deeper pools and cascades, underlain with bedrock, extend to the lip of the falls just downstream from the gage. The more characteristic fall-pool-riffle habitat predominates in the lower reaches. The riffles, in particular, are characterized by the presence of large boulders which create quiet areas adjacent to turbulent flows.

Over the past ten years, during which time there have been three record dry years, none of the riffles in the reach of the stream near the proposed powerhouse have been observed to completely dry up.[27] Even when the flow is near record lows at the gaging station, flow continues to increase downstream due to seepage, tributaries, and rainfall from the rest of the drainage area. **The additive nature of the stream below the USGS gage was confirmed by an actual field measurement. (Refer to Exhibit IV-4.)**

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26. "Riffle" is defined as a shallow extending across a streambed and causing broken water.

27. Personal communication between Albert Hee of MKP and Ms. Emma Kiyan, resident along Honoli'i Stream.

2. Flooding

There are two principal types of floods - riverine and coastal. Riverine flooding occurs when high rainfall causes stream overflow. Coastal flooding occurs due to high waves or tsunami inundation. Major flood zones for both riverine and coastal floods are designated in the Flood Insurance Rate Maps (FIRM) prepared by the Federal Emergency Management Agency (FEMA).

According to the Flood Insurance Study for Hawaii County, the project area is located in a designated Zone X, "Other Areas" determined to be outside of the 500-year floodplain.[28]

The streambed lies at the bottom of a relatively steep, deep channel which is able to contain flows much higher than the average flow; however, heavy rains can cause flows greater than 200 times the average.[29] These rare peak flows may cause flooding in some areas where the channel is more shallow, but the study area is located in State Conservation District and is bordered by cane fields so that flood damage is minimal.

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28. FEMA, FIRM panels 860, 870, 880, September 1988.

29. U.S. Army Corps of Engineers, Environmental Assessment, Wailuku/Honolii Hydropower Study, September 1984, p. 10.

3. Water Quality

Water quality readings for Honoli'i Stream have been taken at the USGS gaging station since 1968.[30] In a 1984 report,[31] the U.S. Fish and Wildlife Service indicated that "there is no evidence of pollution or other factors which may be detrimental to fish and wildlife resources." However, the stream is normally turbid, a condition common for streams north of Hilo due to the frequent rainstorms which carry heavy sedimentation from surrounding forest and agricultural lands. In its 1984 Reconnaissance Report, the U.S. Army Corps of Engineers estimated over 1,200 tons of sediment a year pass through Honoli'i Stream.[32] Water quality data are presented in Exhibit III-7.

Honoli'i Stream empties into the Class A coastal waters along the Hamakua coast. The Hawaii Water Resources Plan describes Class A waters as those suitable for recreation, aquatic life, and aesthetic enjoyment. All discharges to these waters must receive best

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30. USGS water quality data for Honolii Stream is available for each individual water year in Water Resources Data, Hawaii and other Pacific Areas, Water Years 1968-1987; and in Summary of Available Data on Surface Water, State of Hawaii, Volume 2, USGS Open-File Report 81-1056, December 1983.

31. U.S. Fish and Wildlife Service, Draft Coordination Act Report, Wailuku-Honolii Hydropower Study, Island of Hawaii, June 1984, p.9.

32. U.S. Army Corps of Engineers, Appendix B, p. II-44.

EXHIBIT III-7

WATER QUALITY DATA FOR HONOLI'I STREAM*

PARAMETER	MEAN VALUE	N**	RANGE
Instantaneous Streamflow (cfs)	86.7	140	3.5 - 2980
Specific conductance (umhos)	47.7	104	11 - 100
pH (units)	6.9	104	5.2 - 8.2
Temperature (degrees centigrade)	18.5	141	15 - 24
Dissolved oxygen (mg/l)	9.0	90	6.6 - 11
Hardness (mg/l as CaCO3)	18.8	106	2 - 45
Dissolved solids (residue at 180 C)	39.6	86	6 - 79
Total NO2 + NO3 (mg/l as N)	.08	56	.01 - 1.8
Total Phosphorus (mg/l as P)	.005	12	0 - .010
Total organic Carbon (mg/l as C)	6.5	2	3.5 - 9.5
Suspended sediment (mg/l)	2.9	106	0 - 42

*Source: Table M. Statistical Summary of Partial-Record Analyses. USGS, Summary of Available Data on Surface Water, Open-File Report 81-1056.

**N = Number of analyses made for the particular parameter for the period of record.

practicable treatment. The Statewide Silt Basin Investigation[33] identifies the coastal waters of this area as "red water areas, siltation areas and sediment sinks."

D. BIOLOGICAL CHARACTERISTICS

1. Stream Fauna

At least three in-depth surveys of Honoli'i Stream fauna have been conducted in recent years. In 1966, the (then) Hawaii Division of Fish and Game sampled near the stream mouth at 100 feet and at the 500-foot elevation.[34] In 1983, U.S. Fish and Wildlife Service (USFWS) personnel surveyed from the stream mouth to approximately 100-foot elevation and a 1,200 foot long stream reach between 1,500-foot and 1,600-foot elevation (gaging station elevation is 1,540 feet), as part of the U.S. Army Corps of Engineers Wailuku/Honoli'i Hydropower Study, 1984. Their findings are recorded in their Draft Coordination Act Report, Wailuku/Honoli'i Hydropower Study, June, 1984. In August, 1988, Kelly M. Archer conducted a biological survey of Honoli'i Stream as part of the scope of work of this EIS.

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33. Fukunaga and Associates, Inc., Statewide Silt Basin Investigation, State of Hawaii, Honolulu, December 1980.

34. The 1966 survey was conducted to evaluate the stream in terms of suitable habitat for introduced sport-fishing species. Counts of existing stream fauna were not taken.

During the 1983 survey by the USFWS, its aquatic biologists found small numbers of endemic fishes ('o'opu alamo'o, 'o'opu nakea and 'o'opu nopili), endemic shrimp ('opae kala'ole), and endemic snails (hihiwai) in the stream. Populations of these species in the lower reaches were small; and only the shrimp was observed in significant numbers in the upper reaches at the gage. Only three adult 'o'opu alamo'o and one 'o'opu nopili were seen in the riffle just above the gage. Despite substantial streamflow and natural bed material present during the 1983 survey, the aquatic biologists determined that the significant bed load of fine terrigenous sediments from adjacent canelands reduced the value of the habitat for native species.[35] The USFWS concluded in their 1984 report that Honoli'i stream provided medium to low habitat for native stream fishes. In conjunction with the Service's Mitigation Policy, the USFWS classified Honoli'i Stream as Resource Category 4: Medium to low value for evaluation species.

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35. Letter from USFWS (Ernest Kosaka) to Albert Hee of MKP, Inc. dated May 24, 1988.

The Service's four Resource Categories and Mitigation Planning Goals are:

Resource Category	Designation Criteria	Mitigation Planning Goal
1	High value for evaluation species and is unique and irreplaceable.	No loss of existing habitat value.
2	High value for evaluation species and is scarce or becoming scarce.	No net loss of in-kind habitat value.
3	High to medium value for evaluation species and is relatively abundant on a national basis.	No net loss of habitat value while minimizing loss of in-kind habitat value.
4	Medium to low value for evaluation species.	Minimize loss of habitat value.

It is important to note here that the U.S. Fish and Wildlife Service established its Mitigation Policy to guide "USFWS personnel involved in making recommendations to protect or conserve fish and wildlife resources."[36] The purpose of the policy is to "(1) ensure consistent and effective Service recommendations; (2) allow Federal and private developers to anticipate Service recommendations and plan for mitigation needs early; and (3) reduce Service and developer conflicts as well as project delays."[37] A complete copy of the Mitigation Policy is contained in Appendix E of this report.

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36. Department of the Interior, Federal Register, "USFWS Mitigation Policy; Notice of Final Policy," Vol. 46, No. 15, January 23, 1981.

37. Ibid.

Correspondence from the USFWS indicates that two additional unpublished and non-quantitative field checks of Honoli'i Stream were completed in 1986 and 1987. Findings of these field checks have not been made available to Mauna Kea Power despite numerous requests. Nevertheless, based on these field checks, the Service has stated that the Honoli'i Stream now provides high value habitat for native fishes.[38] However, the conditions of the stream, upon which the Category 4 classification was based, have not been changed between 1983 and 1986-1987, or even 1988. No additional aquatic species have been found in the stream; agricultural lands surrounding the stream are still in active production; and the stream substrate is still extensively covered with terrigenous sediments.

Archer's 1988 survey involved stream sampling at three stations within and above the project area using a snorkel and mask to carefully inspect the streambed and identify and enumerate the species present. Exhibit III-8 shows the extent of the stream sampling stations. Exhibits III-9, III-10 and III-11 show photographs of the stream at each station. Physical descriptions of the stream environment at each station can be found in Archer's 1988 report which is included as Appendix C of

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38. Andy Yuen, U.S. Fish and Wildlife Service, Personal communication, September 1, 1988.

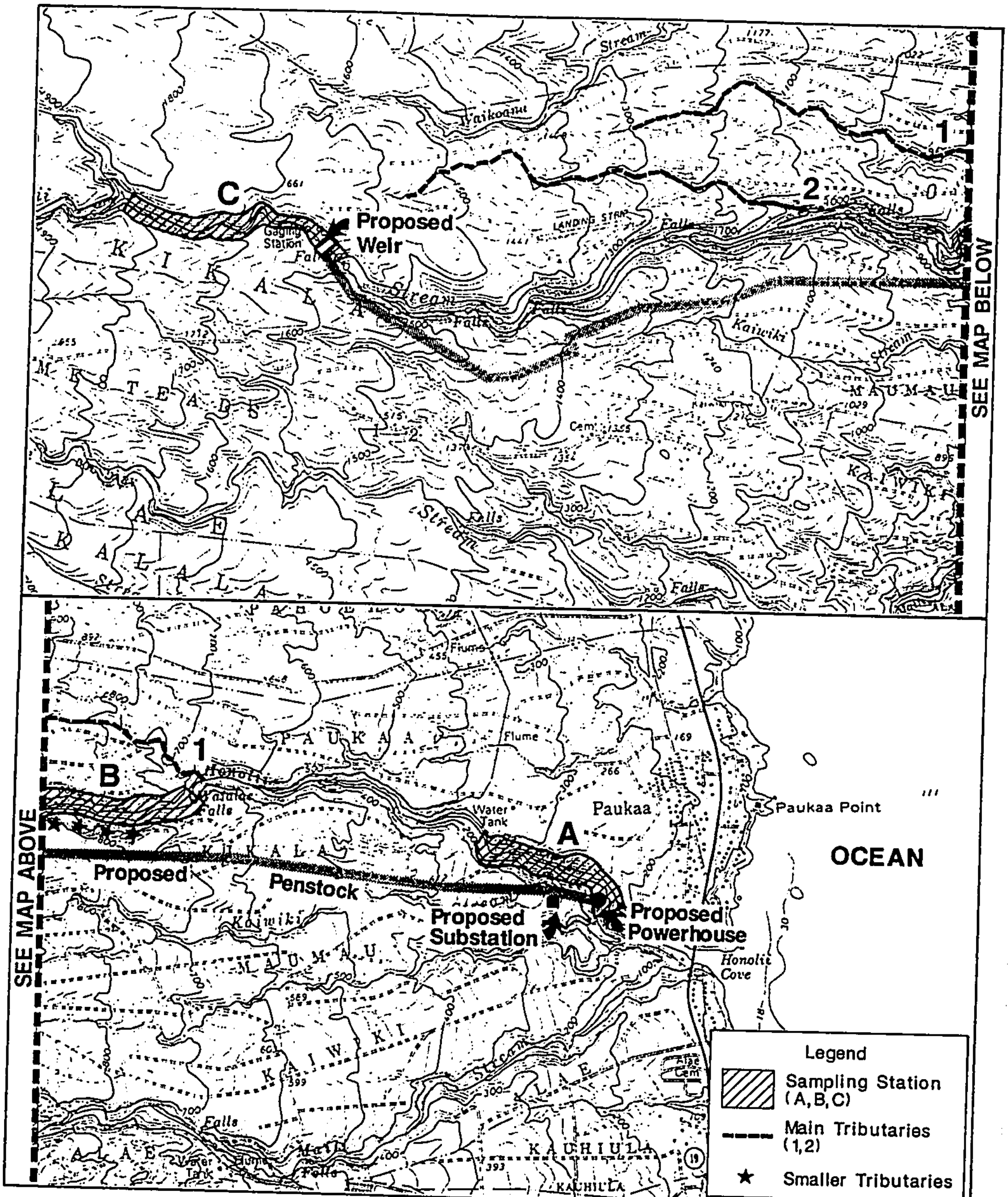

Exhibit III-8
Stream Fauna Sampling Stations, 1988 Survey

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Upstream view from lowest reach of Station A

Second upstream view of Station A

Exhibit III-9
Honolii Stream: Sampling Station A, 1988 Survey

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Upstream view from lowest reach of Station B

Second upstream view of Station B

Exhibit III–10
Honolii Stream: Sampling Station B, 1988 Survey

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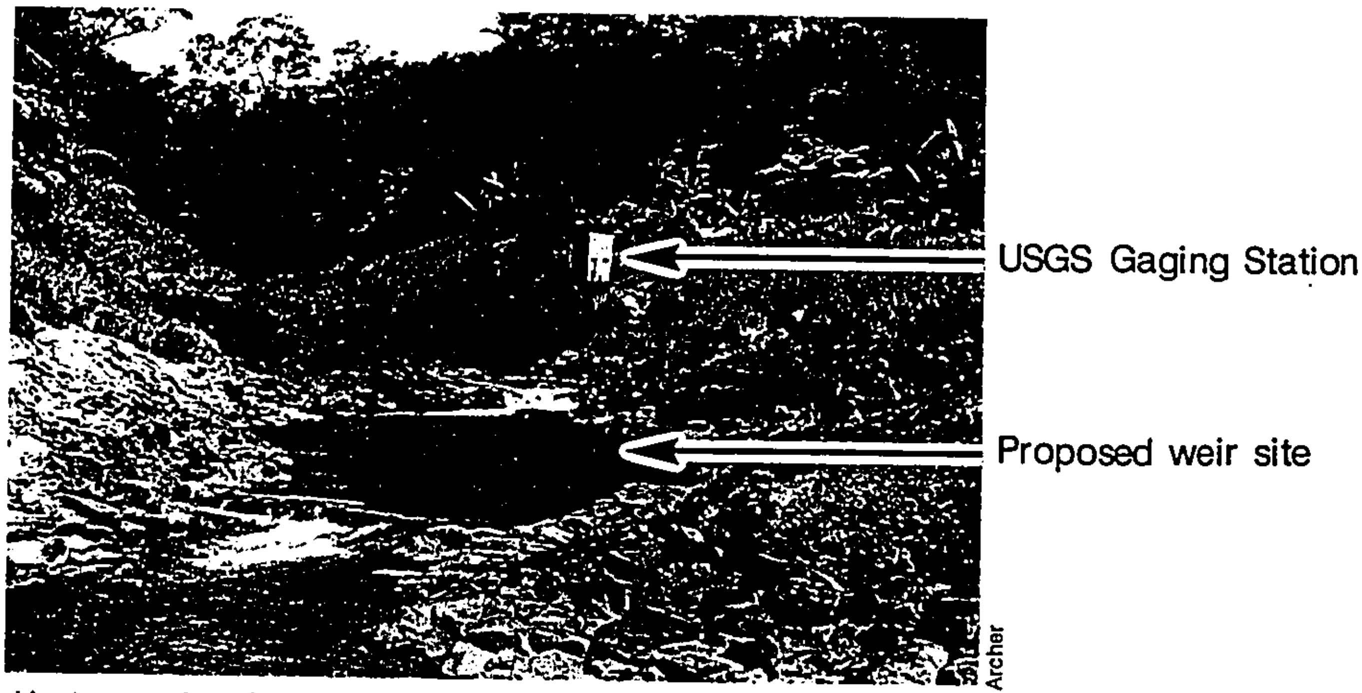
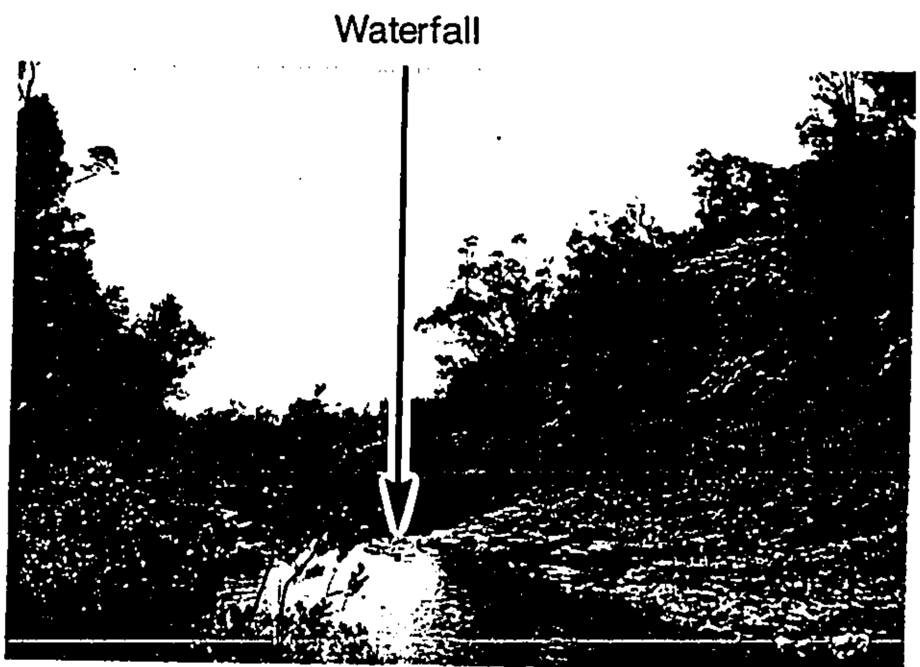


Upstream view from waterfall towards gaging station (Station C)



View from proposed weir site towards waterfall

Exhibit III-11
Honolii Stream: Sampling Station C, 1988 Survey

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this EIS. A listing of the stream species identified at each sampling station and the relative abundance of each species is shown in Exhibit III-12.

Of the six species of stream fauna identified during Archer's 1988 survey, five are endemic (i.e. they are found naturally only in Hawaii), apparently with established and actively recruiting populations. One alien, or introduced, species was seen. None of the species is listed as endangered or threatened pursuant to the Endangered Species Act of 1973 or pursuant to Chapter 195D, Hawaii Revised Statutes. However, one species, 'o'opu alamo'o, is listed as "Category 1" in the Federal Register, which states that "the Service currently has substantial information on hand to support the biological appropriateness of proposing to list [the species] as endangered or threatened. Proposed rules have not yet been issued because they have been precluded at present by other listing activity."[39]

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39. Federal Register, 50 CFR, Part 17, Notice of Review, January 6, 1989.

EXHIBIT III-12

CONSPICUOUS ADULT STREAM FAUNA IDENTIFIED IN HONOLI'I STREAM

Species	Endemic/ Alien	Diadromous	Remarks	Station A	Station B	Station C
Crustaceans						
Opae Kala'ole (Atyoida bisulcata)	endemic	diadromous		o	++++	++++
Tahitian Prawn (Macrobrachium lar)	alien	diadromous		++	++	o
Molluscs						
Hihiwai (Neritina granosa)	endemic	diadromous		+++	++	o
Fishes						
'O'opu nakea (Awaous stamineus)	endemic	diadromous		++	+++	o
'O'opu alamo'o (Lentipes concolor)	endemic	diadromous		o	+	++
'O'opu nopili (Sicyopterus stimpsoni)	endemic	diadromous		+	++	+

Legend:
- o = not found
- + = less than 5 individuals per 10m sampling station
- ++ = 5 to 25 individuals per 10m sampling station
- +++ = 26 to 50 individuals per 10m sampling station
- ++++ = more than 50 individuals per 10m sampling station

Source: Kelly M. Archer, Aquatic Survey of Honoli'i Stream, October 1988.

Hawaii's stream environment is characterized by native fauna which require open access to the ocean in order to complete their life cycle. These diadromous species breed and spawn in freshwater, the larvae are then washed into the ocean and mature in the plankton for as long as 8 months.[40] Juveniles then return to a stream environment to complete the cycle. Unlike the Pacific Salmon, however, no homing ability has been recognized in these species.[41] All six species identified during Archer's 1988 survey are diadromous.

A large number of 'o'opu (native goby fish) juveniles (hinana) were present at the downstream portion of Station A. Adults were rarely seen until above the second falls from the mouth of the stream. Adults of two native fish species, 'o'opu nakea and 'o'opu nopili became more common as sampling moved upstream. Frequently observed throughout Station A was the ubiquitous Tahitian prawn. The endemic mollusc, hihiwai, was found in abundance on the cleanest of the substrate surfaces at this downstream station.

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40. The planktonic larvae period for the 'o'opu nakea is approximately 135 days according to R.L. Radtke, R.A. Kinzie, S.D. Folsom, "Age at recruitment of Hawaiian Freshwater Gobies," Environmental Biology of Fishes, 1988, 23(3):205-213.

41. Archer, Reference #6, p. C-14.

Generally, the surface of the substrate at Station A was coated with a thick (1 cm) layer of gelatinous "scum" and frequently also coated with a layer of filamentous bluegreen algae. The mean temperature at this station was 23 degrees centigrade.

Additional species found at the mid-elevation Station B include the endemic 'o'opu alamo'o and opae kala'ole. The alamo'o were only rarely seen at this station with the fish community consisting of large numbers of nakea and nopili. The number of the endemic hihiwai present at Station B was very noticeably reduced from that at the downstream station. Nearly all of the substrate material had the gelatinous scum layer. The mean stream temperature was 21 degrees centigrade.

Station C, the upper-most stream reach sampled during this survey, yielded the smallest number of species. The 'o'opu alamo'o and the opae kala'ole were observed at this station. The alamo'o population appeared healthy, with both males and females of various sizes identified. Although the substrate in this station was not as thickly coated with the gelatinous scum present at lower elevations, there were areas in the stream where a substantial growth of moss is present on substrate, probably indicating fluctuating flow levels. Stream temperature was 19 degrees centigrade.

Archer states that all five native (endemic) stream species identified apparently have established and recruiting populations. Based on studies within the State, it appears that interrupted stream flow is a natural environmental factor which native aquatic fauna have endured with various levels of success.[42] Apparently the populations of stream fauna present in Honoli'i are capable of thriving under flow conditions which range from very low levels to high, freshet flows.[43] Stream life in the Hawaiian Islands has adapted itself to a wide variety of natural circumstances - from the shock of flash flood, to seasonal and annual variations in stream flow caused by drought, to the rigors of the dispersal of larvae between island streams.[44]

2. Vegetation

A botanical survey of the project area was conducted by Winona P. Char in July 1988 as part of this EIS. (Appendix B). The objectives of the study were to provide a general description of the vegetation, inventory the terrestrial flora, and search for

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42. Archer, p. 17.

43. Archer, p. 22.

44. Gavin Daws, Hawaii: the Islands of Life, The Nature Conservancy of Hawaii, October 1988, p. 88.

officially listed, proposed, and candidate threatened and endangered plant species. The findings of the study are summarized below.

The project area consists of three general vegetation types. The steep slopes of the stream bed near the proposed diversion weir contain closed canopy, tall stature, native ohia and koa trees. The understory is composed of non-native or introduced species, such as yellow strawberry guava, melastoma, and rose apple. Open and disturbed areas are dominated by uluhe fern on the slopes and dense sprawling colonies of California grass bordering the streamsides.

Along the proposed penstock route, the vegetation consists of sugarcane fields with an assortment of weedy species commonly associated with cultivated lands.

The vegetation along the lower reaches of Honoli'i Stream near the proposed power plant site is characterized by a mixture of introduced and native species. Among the introduced or non-native trees and shrubs are rose apple, mango, guava, melastoma, and avocado. Several large clumps of bamboo occur in this forest type. Native trees and shrubs include ohia, hau, and neneleau. Some plants introduced by the Polynesians were also observed, including banana, breadfruit, ti, kukui, and others. The groundcover in this forest type is not usually dense and consists of scattered patches of more shade-tolerant species such as blechnum fern, Hilo grass, sword fern and yellow ginger.

Of the 133 plant species inventoried during the survey, about 20 percent are native. The majority of the native plants were found in the koa-ohia forest. None of the species found during the survey is officially listed as endangered or threatened; nor are any of these species proposed or candidate for such status.

3. Wildlife

Dr. Andrew J. Berger conducted a field survey to inventory the birds and mammals inhabiting the area in July 1988. Following is a summary of his findings. A complete copy of his report is included in Appendix A.

The mixed forest (native and introduced vegetation) in the stream bed and the weedy sugarcane lands bordering the gulch are not likely to be important habitat for Hawaii's threatened or endangered wildlife. The majority of the existing wildlife in the project area consists of introduced species including bullfrogs, feral pigs, mongooses, rats, and several introduced birds such as spotted dove, barred dove, Japanese white-eye, laughing thrush, myna, nutmeg mannikin, house sparrow, cardinal, and house finch.

While some indigenous and endemic birds may occasionally forage in the general area (such as the golden plover, black-crowned night heron, Hawaiian hawk and Hawaiian owl), only the Hawaiian hawk (io) is endangered. Dr. Berger did not see any hawks during his field survey, however Winona Char spotted one soaring above the middle-reach of the stream. The Hawaiian hawk is currently listed as endangered, and according to U.S. Fish and Wildlife Service,[45] the hawk occurs mainly on the Island of Hawaii and is known to breed only on that island. The species is widely distributed on Hawaii, being locally common on the slopes of Mauna Loa, on both windward and Kona coasts, and to a lesser extent on Mauna Kea. It is known to occur from sea level to roughly 8,500 feet elevation and utilizes a wide array of both exotic and native habitats. The hawk is able to utilize highly modified habitats such as pastureland and some agricultural areas which have adequate stands of trees for nesting and perching.

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45. U.S. Fish and Wildlife Service, Draft Coordination Act Report, Wailuku-Honolii Hydropower Study, Honolulu, June 1984, p. 7.

The endemic Hawaiian duck, or koloa, an endangered waterbird, is known to use mountain streams, particularly on Kauai where their major predator, the mongoose, is not present. They feed on freshwater mollusks, insect larvae and other invertebrates and seeds. No koloa were observed by Dr. Berger in 1988 or by the U.S. Fish and Wildlife Service during their 1983 reconnaissance survey of the Wailuku and Honoli'i stream areas, however a population has been re-established in the Kohala Mountain region. The Hawaiian Waterbirds Recovery Plan indicates that the koloa appear to have "expanded their range and are also found at stock ponds, small reservoirs, mountain streams and in irrigation ditches around the northeast and southeast slopes of Mauna Kea." (p.7).

The only endemic mammal in the Hawaiian Islands, now classified as an endangered species, is the Hawaiian bat. It has a widely scattered population on Hawaii including urban areas as well as outlying regions, and therefore may be in the found in the study area. The bat is nocturnal, and none was seen during Dr. Berger's field survey.

E. HISTORICAL/ARCHAEOLOGICAL RESOURCES

The State Historic Sites Office of the Department of Land and Natural Resources identifies only one historic site near the entire project area on their inventory - the Honoli'i

Stream bridge (on Kahoa Street), site number 10-26-7400. This site, which is not on the Hawaii Register or National Register of Historic Places, will not be disturbed.

According to records at the Historic Sites Office, there has been one previous archaeological survey conducted within or in the general vicinity of the present hydroelectric project area. This reconnaissance survey was conducted by Cox in 1983 as part of the U.S. Army Corps of Engineer's Wailuku/Honoli'i Hydropower Study of 1984. Cox found no archaeological sites of any kind at the proposed weir location near the existing gaging station. An agricultural terrace in fair condition was identified outside the present project area at the 1,300-foot elevation on the north streambank.

In August, 1988, an archaeological "inventory survey" was conducted in the Honoli'i hydroelectric project area by Paul H. Rosendahl, Ph.D., Inc. to determine the presence or absence of historical/archaeological resources in the area. A complete copy of the report from this survey is contained in Appendix D. The survey did not identify any sites within the proposed weir location, powerhouse and substation sites, or within the penstock corridor. A field inspection in February 1989 did not locate any sites along the transmission line or access road routes.

Although all are outside the project area, the August survey identified three sites in the vicinity of the proposed power plant location. The sites include a habitation terrace (Site T-1), a boundary/agriculture wall (Site T-2), and a habitation complex (Site T-3), and their locations are shown on Exhibit III-13. Site T-3 is 100 feet from the proposed powerhouse site, and is the former location of a Kiyan family house complex that was used in the early 1900s, and moved from the site in the 1940s.[46] It consists of stacked rounded boulders, concrete blocks, and concrete foundations set into the ground, and is located on a relatively level shelf about 15-18 feet above the stream. The Kiyan family is not aware of any burial sites on their property, and they have no reservations about the proposed powerhouse being built near the former house site.

Historical data of the region and information from long-time residents suggest that the Kiyan property and other areas on the banks of Honoli'i Stream were once used for limited agriculture - possibly to grow taro.

F. EXISTING LAND USE AND LANDOWNERSHIP

As depicted on Exhibit III-14, Honoli'i Stream serves as a property line between lands owned by Mauna Kea Agribusiness Co., Inc. (MKA) to the north and B.P. Bishop Estate lands to the south. MKA lands are leased to Hilo Coast Processing

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46. Personal communication with Ms. Emma Kiyan, current landowner and resident on the property, November 2, 1988.

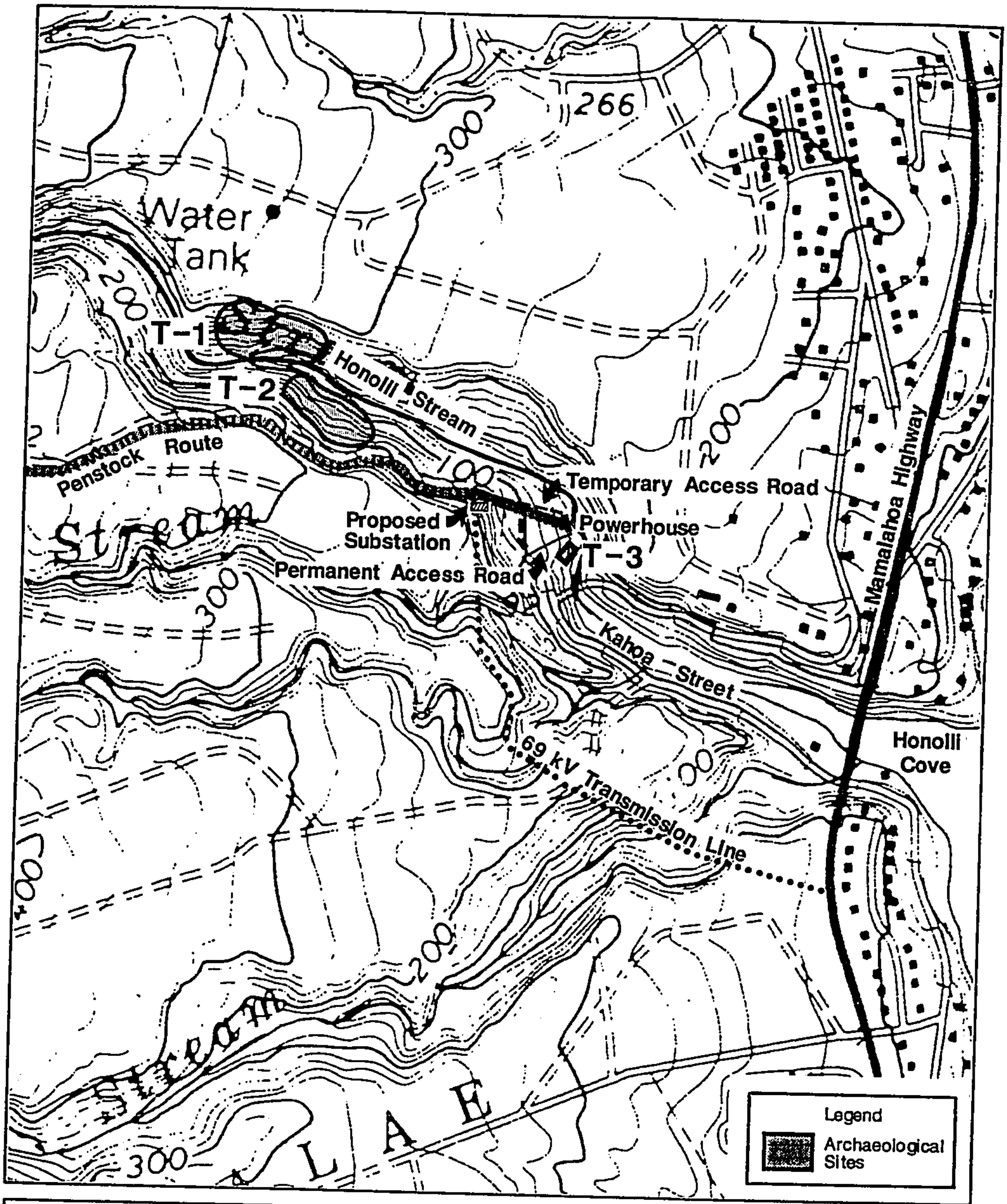

Exhibit III-13
Historical Sites

0 300 600 FEET 1200

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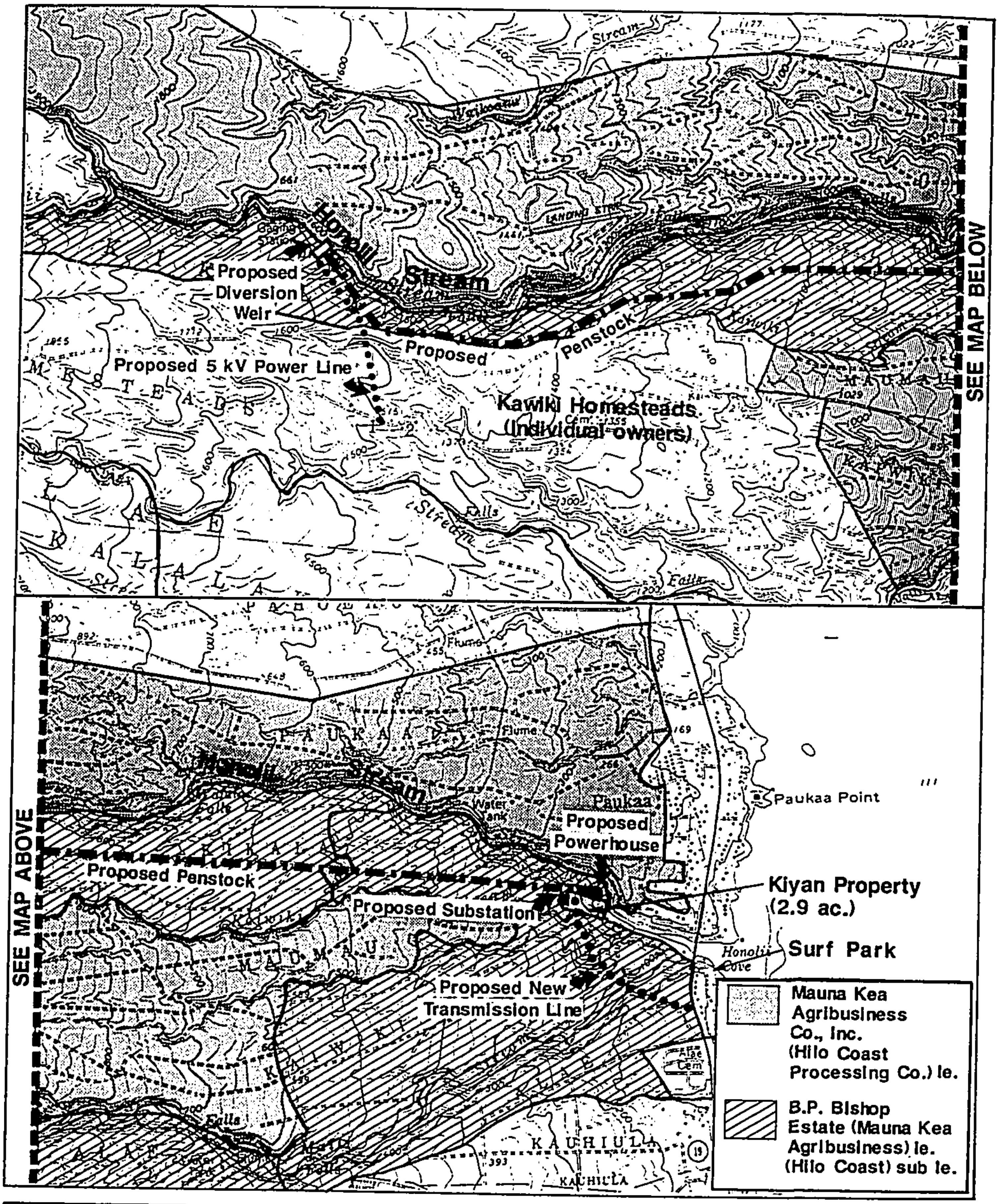

Exhibit III–14
Land Ownership

0 1000 2000 FEET 4000

DHM inc.
Land Use and Environmental Planning

Company and the lands along the stream valley are presently used for growing sugarcane and macadamia nut trees. Bishop Estate lands are leased to MKA and subleased to Hilo Coast Processing, and are used primarily for sugarcane. Crews are active in the sugarcane fields during the first six months after cultivation of a new crop, and then again during harvest two years later. The existing airstrip on the north side of the stream is used intermittently, a total of about six days per month. The planes disperse fertilizers (350 pounds of dry fertilizer per acre), herbicides to young fields (diuron and atrazine), and ripeners ("Polado" by Monsanto). A single pass of the plane at 20 to 30 feet high, covers a 40-foot width of a field. Crews are moved 500 feet from a field during the spraying of herbicides, but can return to work within 15 minutes.

South of the project area, above elevation 1,000 feet, are the Kaiwiki Homestead lands which consist of numerous parcels ranging from 2 to 20 acres, owned by private individuals, the State, and Mauna Kea Agribusiness. These lots are used primarily for farming although many contain a single family residence as allowed by the County zoning.

There is no existing land use within the stream valley with the exception of the USGS gaging station near the proposed weir site and occasional fishing and gathering of aquatic resources.

Along the lower reach of the stream, in the immediate vicinity of the powerhouse, above Kahoa Street, is the private 2.9-acre parcel owned by the Kiyan family. It contains two single family dwellings.

G. PUBLIC SERVICES AND FACILITIES

1. Transportation

Mamalahoa Highway (State Highway 19) is the major coastal belt road which serves this region of the island. This road is also called Bayfront Highway along Hilo Bay. The three-mile section between Hilo and Honoli'i is two-lane, paved, and in good condition, with a large bridge spanning Honoli'i Cove. This highway and Kahoa Street (the former highway) are the only two public roads leading to the private canehaul roads which provide access to the project area. Kahoa Street is a substandard road with a pavement width of 20 to 25 feet. The historic Kahoa Street bridge over Honoli'i Stream is about 2,000 feet inland from the highway and has a ten ton weight limit.

The State Department of Transportation (DOT) conducted a traffic count at Honoli'i Bridge on Mamalahoa Highway in May 1988. Over 14,000 vehicles crossed the bridge in a 24-hour period - 6,352 southbound (toward Hilo) and 7,813 northbound. Peak morning traffic at this station occurs between 7:15 and 8:15 a.m. with a count of 690 southbound vehicles and 421 northbound. Peak afternoon traffic occurs from 4:30 to 5:30 p.m. with 442 vehicles southbound and 820 vehicles northbound. Traffic volumes on the highway are generally quite low and there are no significant problems with traffic flow, even during peak periods.

Interisland transportation facilities to the island of Hawaii are good. The main port on Hawaii is the deep-water Hilo Harbor, just 4.5 miles from the powerhouse project area. This harbor can handle ocean-going freighter traffic directly from the mainland and foreign countries as well as interisland cargo barges. Roll on - roll off container service is available at Hilo as well as barge service. Hilo also has a State airport which serves as a terminal for interisland passengers and freight traffic.

2. Utilities

There is no public sewer system or water line near the site or the surrounding area. Cesspools serve the two dwelling units on the 2.9 acre parcel, and catchment systems are used for domestic water. Honoli'i Stream is not a source of domestic water for residents, nor is it used for agricultural irrigation purposes.

Electric distribution lines and telephone lines are provided along Mamalahoa Highway. The residence downstream of the powerhouse, below and adjacent to the highway, receives its telephone and electrical service from the transmission line along the highway. There is no existing electrical or telephone service to the Kiyan property.

Two existing 69 kV electric transmission lines cross Honoli'i Stream. One line is located along Mamalahoa Highway at the coast. The other, which interconnects substations in Kaumana and Pepeekeo, crosses the stream about two miles upstream from the highway, at approximately 900 to 1,000 feet elevation.

3. Schools, Medical, and Health Services

Facilities for these services do not exist in the Honoli'i area. The closest school is Haaheo Elementary school in Wainaku. Elementary and intermediate schools are located in Pepeekeo, and the high school is in Hilo, three miles from Honoli'i. Medical and health facilities are also located in Hilo.

4. Scenic and Recreation Resources

The County's 2.8-acre Honoli'i Surf Park is located near the mouth of the stream, over 2,000 feet from the powerhouse site. (Refer to Exhibit III-14). The project, including its transmission lines, will not be visible from the Surf Park.

The Bayfront (Mamalahoa) Highway (State Highway 19) is a scenic drive along the coast with breathtaking views of the shoreline, waterfalls, and rural landscape. The project area is not visible from either the highway or Kahoa Street due to the winding nature of the stream and the riparian vegetation.

Although Honoli'i Stream is on private land, surrounded by agricultural land uses, limited use for fishing and gathering of aquatic resources has been reported. Access to the lower reaches (up to 100 feet elevation) from the County park and Kahoa Street is relatively easy. However, access to the middle and upper reaches of the stream for recreational use is very difficult due to the steep banks, rocky nature of the stream bed, and the lack of public access roads.

H. SOCIO-ECONOMIC CHARACTERISTICS

The proposed project area is not near any existing residential developments with the exception of the two dwelling units on the 2.9-acre Kiyan property near the Kahoa Street bridge. There is one residence (Lutkenhouse) located approximately 1,300 feet downstream from the powerhouse. It is near the surf park, and adjacent to and below the Mamalahoa Highway. The next closest houses are along Kahoa Street in Paukaa, about 2,000 feet northeast of the powerhouse site. There are no residences near the penstock site or diversion weir as these areas are surrounded by productive agricultural lands.

The project area is within the South Hilo district of the county of Hawaii. Honoli'i Stream is the boundary between census tract (CT) 201 to the north and census tract 202 to the south, as defined by the U.S. Bureau of the Census. Exhibit III-15 shows the census tract boundaries and census designated places in the vicinity of the stream. Population and socio-economic data for these census tracts and statistical areas is used in this section to give an overall picture of the existing characteristics of the project area.[47]

1. Population Characteristics

The resident population of the South Hilo district grew at about the same rate as the State's population from 1970 to 1980, but at a slower rate than Hawaii County's population.[48] The State population increased 25 percent in this time period. In South Hilo, the increase was also 25 percent, from 34,000 to 42,300. Island-wide there was a 45 percent increase over the

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47. All data, unless otherwise noted, is based on the U.S. Bureau of the Census, 1980 Census of Population and Housing, Census Tracts, Hawaii, Issued June 1983.

48. Department of Business and Economic Development, State of Hawaii Data Book, 1987.

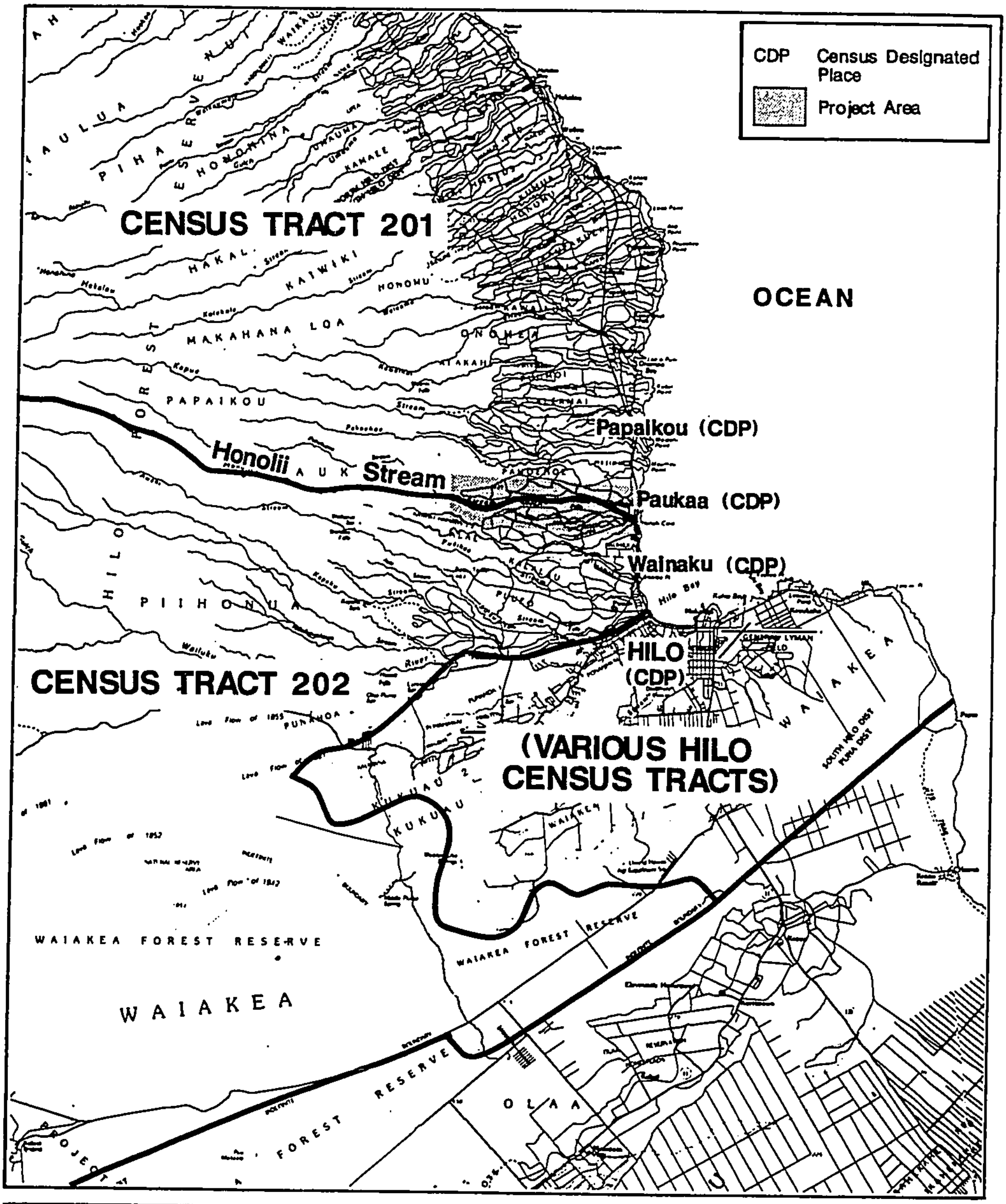

Exhibit III-15
Census Statistical Areas

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1970 population, from about 63,500 to 92,000. Contrarily, the populations of census tracts 201 and 202 decreased between 1970 and 1980 by 4.4 percent and 15 percent respectively.

More recently, from 1980 to 1986, the State's population increased 10 percent, while the South Hilo population increased about 6.5 percent to 45,000 residents. The County population grew over 21 percent in this time period to 111,800 residents.

Census designated places (CDP)[49] in the vicinity of the project area are shown on Exhibit III-15. The 1980 resident population for each CDP is shown below:

Hilo	35,269
Wainaku	1,045
Paukaa	544
Papaikou	1,567

The residents in the rural area around Hilo tend to be older than the average Hawaii County resident, and the average household size is larger. The median age in CT 201 and 202 is around 32 years, while that of the County is 29 years. There is an average of 3.4 people per household in the area compared to an island-wide average of 3.1.

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49. CDP's have been identified by the Census Bureau to represent named population concentrations.

While the same four ethnic groups make up about 95 percent of the population both in rural South Hilo district and island-wide, there is a greater proportion of Filipinos and Japanese in the project area and fewer Caucasians and Hawaiians.

	CT 201	CT 202	Hawaii Co.
Caucasian	24%	30%	34%
Japanese	34%	27%	27%
Filipino	25%	29%	14%
Hawaiian	12%	10%	19%

The place of birth of residents in census tracts 201 and 202 is markedly different when compared to the Hawaii County average. The percent of foreign-born residents in the project region is significantly higher than the county average while the percent of Mainland-born residents is much lower. The proportion of Hawaii-born residents is close to the island-wide percentage.

Place of Birth	CT 201	CT 202	Hawaii Co.
Hawaii	76%	74%	71%
Mainland	8%	8%	19%
Foreign	16%	13%	9%

2. Housing Conditions

Residents in rural South Hilo district are more likely to own their homes than residents on Hawaii in general. Sixty-five percent of the households in CT 201 and 71 percent in CT 202 own their residences as compared to the Hawaii County average of 52 percent. However, the median value of owner-occupied homes in the two census tracts is about $19,000 less than the County median. Vacancy status of housing units in CT's 201 and 202 is 5.7 percent and 2.5 percent respectively. In Hilo, the largest city on the island, three miles from the project area, the vacancy rate is 5 percent.

3. Employment and Income

There is no employment associated with the project area within the currently vacant stream bed. Agricultural activities on surrounding lands are an important source of jobs in the area.

The labor force profiles of the two census tracts are notably different from each other and the county as a whole. This is depicted by the figures in the table below.

	CT 201	CT 202	Hawaii Co.
% Persons 16 years & over in Labor Force	50%	59%	61%
% High School Graduates	48%	58%	69%
% Civilian Labor Force Unemployed	7%	5%	7%
Median Income	$15,310	$20,224	$16,975

A greater percent of the labor force (74%) in the rural South Hilo district is in the "private wage and salary" class of workers than is typical for the county (66%). A smaller percent work for the government and about the same percent are self-employed. In terms of occupations, the proportion of operators, fabricators and laborers in the project region is higher than in the county and the proportion of managerial and professional specialty occupations is lower. The proportion of workers in farming, forestry, and fishing is consistent with the island-wide figure.

Chapter IV

IV. ANTICIPATED IMPACTS AND MITIGATIVE MEASURES

A. SLOPE STABILITY

The Soil Conservation Service is not aware of a history of landslides in the project area, and air photographs do not reveal recent landslides. However, as with any area of steep slopes, there is the potential for landslides during periods of heavy and prolonged rainfall. The potential for slope stability problems will be mitigated by locating most of the penstock along existing cane roads in relatively stable and level cane fields. Where new access roads are needed, they will be located as much as possible on either natural ground or in gently sloped cuts, and will have a maximum gradient of 14 percent. Fills will be avoided to the extent possible as a way of reducing slope stability problems. Using cuts may invite some potential slope stability problems, but these can be mitigated by adjusting cut slope angles, insuring adequate drainage, providing berms, revegetating cuts, and reinforcing the slope materials as required. The benchcut necessary for the first 1,200 feet will be in exposed bedrock and highly unlikely to slide.

B. WATER QUALITY

Construction of the proposed project is likely to have short-term effects on water quality in the form of periodic increases in turbidity. Construction of the diversion weir will take place in the stream within a dewatered area between cofferdams. Construction and removal of the cofferdams will produce some fine sediment which will increase turbidity for a few days or until the first freshet. The preferred method of using sheet-pile instead of earthfilled cofferdams was not possible due to the solid bedrock in the stream. The cofferdams will have the capacity to divert about 300 cfs. Should overtopping occur during construction of the weir, turbidity will increase for the duration of the high flow and is not expected to be significant compared to the high turbidity which occurs naturally during similar periods of high flow. During penstock and access road construction, exposed areas will be susceptible to erosion during rainy periods which could also temporarily increase the fine sediment load entering the stream and result in a short-term change in water quality. To minimize this problem, only one access road to the weir will be constructed - the previously proposed access from the north bank has been eliminated. The streambank crossed by the penstock and access route consists of solid bedrock with little, if any, soil cover. However, for maximum protection against potential sedimentation, construction of features adjacent to the stream will take place during historically drier periods and removal of riparian vegetation will be limited. Engineered cuts and fills in erodable materials will be revegetated with plants common in the area. State and County construction standards will be met. The potential increase of turbidity is not expected to be significant compared to the normal high turbidity which occurs in the stream due to sediment entering the stream from surrounding agricultural lands during each rainstorm.

Powerhouse and tailrace construction will be about 50 feet from the stream and therefore will not significantly affect water quality.

Over the long term, there may be temporary periods when the proposed project will affect water quality. The diversion of stream water will decrease the volume and flow rate in the affected reach between the diversion weir and tailrace. The consequences to water quality of the reduction in flow may be noticeable during extended dry periods, but will be mitigated by maintaining a continuous "conservation" flow to augment flow in the affected reach during extended dry periods. (See following section on stream flows.) Aggradation of particulate material may also be associated with a reduction in flow within a stream reach, but because of Honoli'i's normally turbid waters and frequent freshet flows, the proposed reduction in the stream's mid-reaches would probably not affect turbidity levels facing the aquatic fauna.[50]

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50. Kelly M. Archer, Aquatic Survey of Honoli'i Stream, October 1988, p.18.

There will be no thermal or chemical pollutants discharged from the plant and no chemicals for algal or corrosion control will be used in the operation of the project.

No significant adverse change in water quality of the stream is expected as a result of the proposed project. Information from historical hydrological records and aquatic surveys near the existing Wainiha hydroelectric plant on Kauai demonstrates that the project will not alter water quality to the point of loss of stream fauna. One, the water quality of the river is good and a diversity of stream fauna has survived extremely variable flow conditions and extensive periods of low flow. Two, the proposed project will not capture tributary streams or groundwater seepage entering the affected reach. And three, a continuous flow will be maintained.

C. STREAM FLOWS

Based on the annual flow duration curve (Exhibit IV-1), the design flow of the proposed project (4-150 cfs), and the continuous minimum stream flow to be maintained during operation of the project (10 cfs), the resultant stream flow after completion of the project has been projected. At least 10 cfs will continue to flow over the weir 90 percent of the time (328 days a year). During 91 of these days, flows of more than 10 cfs, up to thousands of cfs, will flow over the weir. Approximately 20 percent of the time,

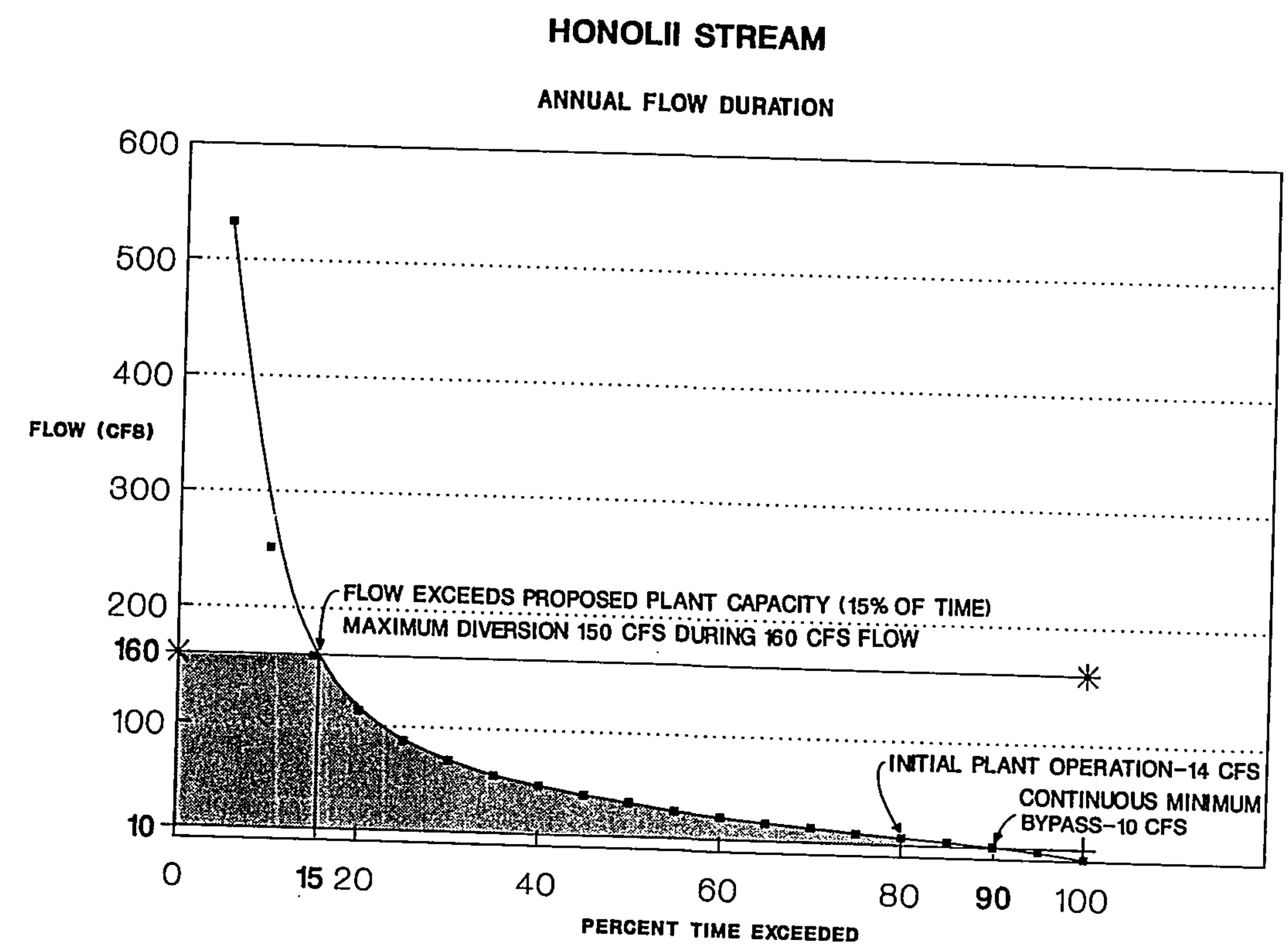

Exhibit IV–1
Extent of Stream Flow Diversion by Project

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the natural flows in Honoli'i Stream will range from 1 to 14 cfs. During these periods, the total flow (100%) will pass over the weir and continue downstream. Plant operations will be completely shut down. When the stream flow to the weir is between 14 and 160 cfs, there is adequate water to operate the power plant while maintaining a continuous minimum stream flow of 10 cfs over the weir. This situation will occur 65 percent of the time. During the remaining 15 percent of the time, when flows exceed 160 cfs, 150 cfs will be diverted from the stream for electric power generation and the remaining flows, ranging from 10 cfs to several thousand cfs, will pass over the weir and continue downstream. This projected stream flow is summarized below.

Natural Stream flow above the weir	Flow continuing over the weir		Percent of time
1 - 10 cfs	1 - 10 cfs	Natural flow	10%
10 - 14 cfs	10 - 14 cfs	Natural flow	10%
14 - 160 cfs	10 cfs	Minimum flow	65%
160 - 5,600 cfs	10 - 5,450 cfs	Natural flow minus 150 cfs	15%

As mentioned earlier, the flows in Honoli'i are extremely variable due to orographic (mountain) rainfall. Gage data shows that flows well over 160 cfs in the stream are not restricted to seasonal parts of the year, but occur regularly throughout the year. This means that while the hydroelectric project will divert water, natural stream flow will exceed plant capacity on a frequent basis to provide flushing flows for the stream. The regularity of monthly flows over 160 cfs is significant since these freshet flows continually replenish pools and riffle, remove accumulated siltation, reduce the growth of algae, and maintain the habitat for stream fauna.

The table below and Exhibit IV-2 indicate the regular frequency throughout the year of flows exceeding 160 cfs. The table summarizes data from the monthly flow duration curves which are included as Exhibit IV-3-A,B,C.

Percent of Time the Average Monthly Flow
Exceeds 160 cfs

Month	Percent
January	13
February	14
March	27
April	32
May	14
June	8
July	13
August	11
September	9
October	11
November	22
December	18

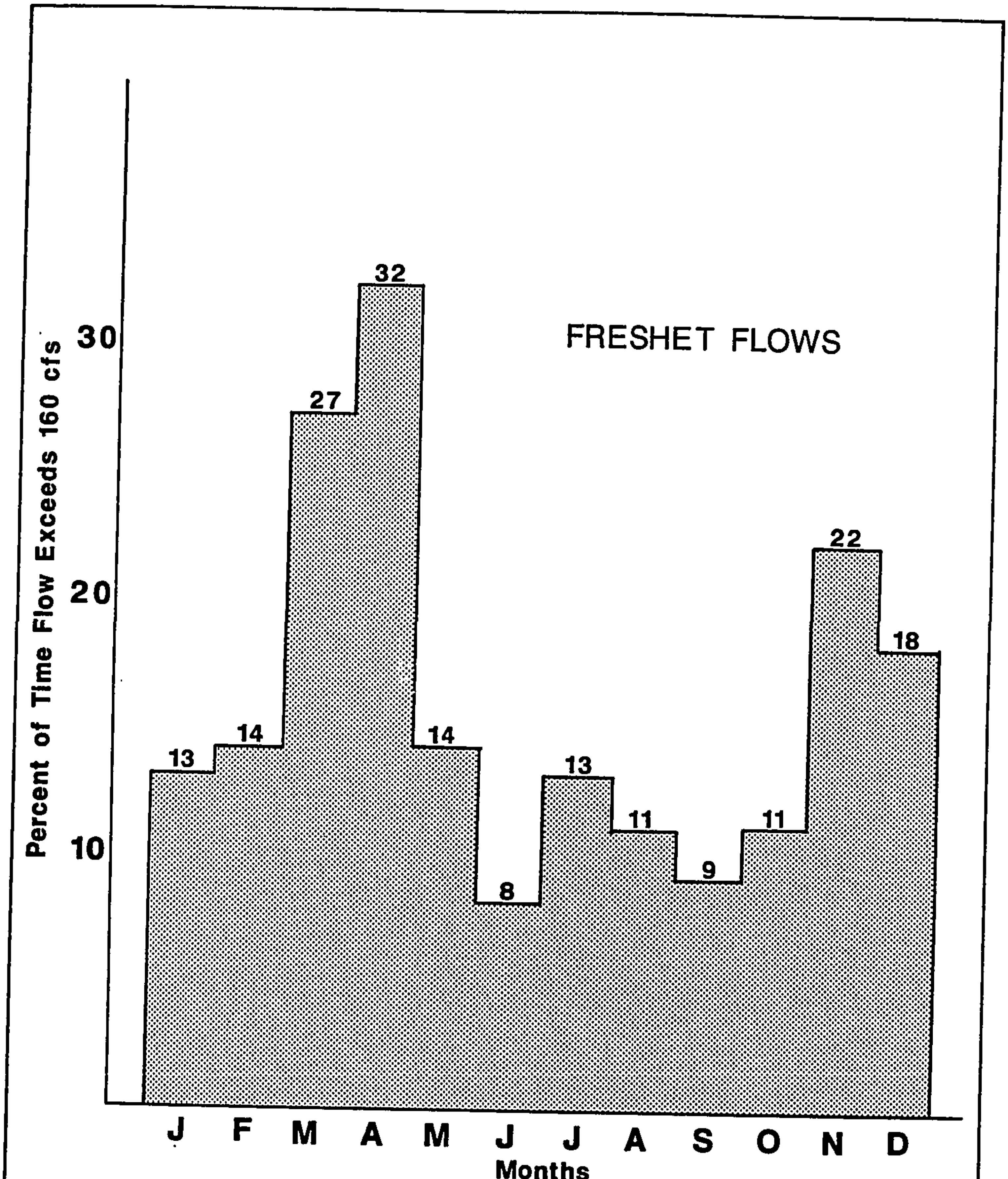

Exhibit IV–2
Average Monthly Flows Greater Than 160 CFS

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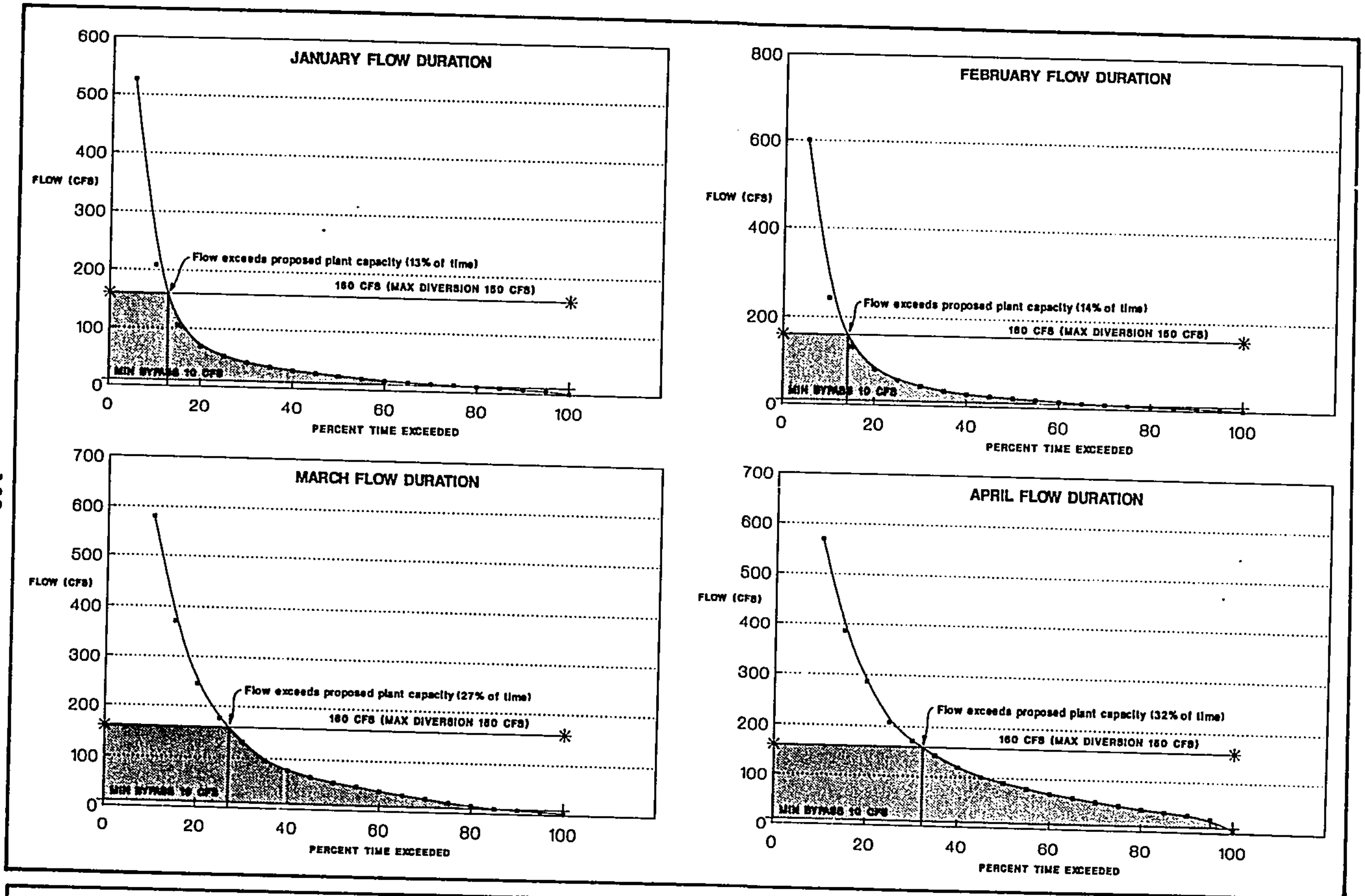

Exhibit IV-3-A
Average Monthly Flow Duration, January to April

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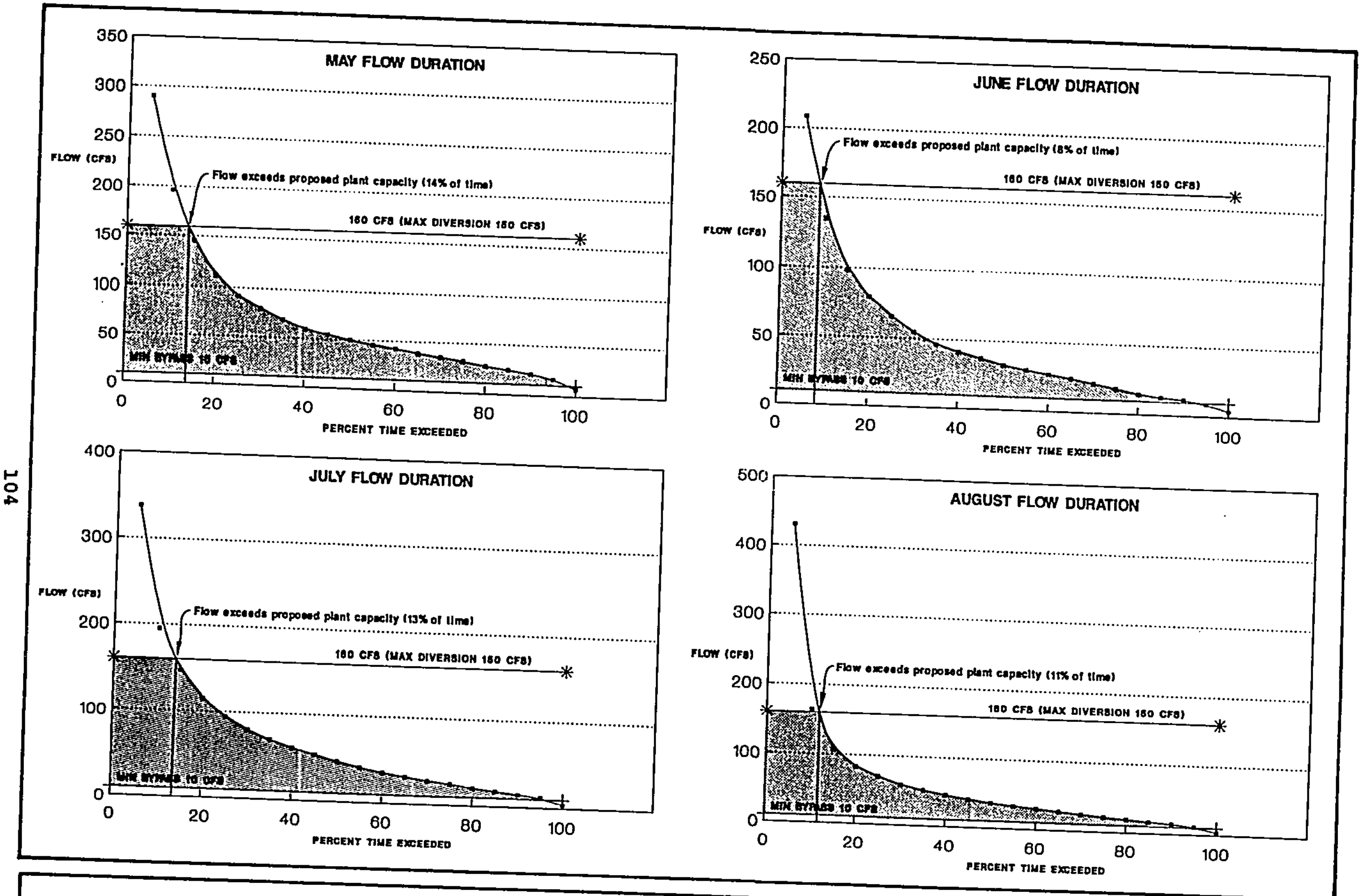

Exhibit IV-3-B
Average Monthly Flow Duration, May to August

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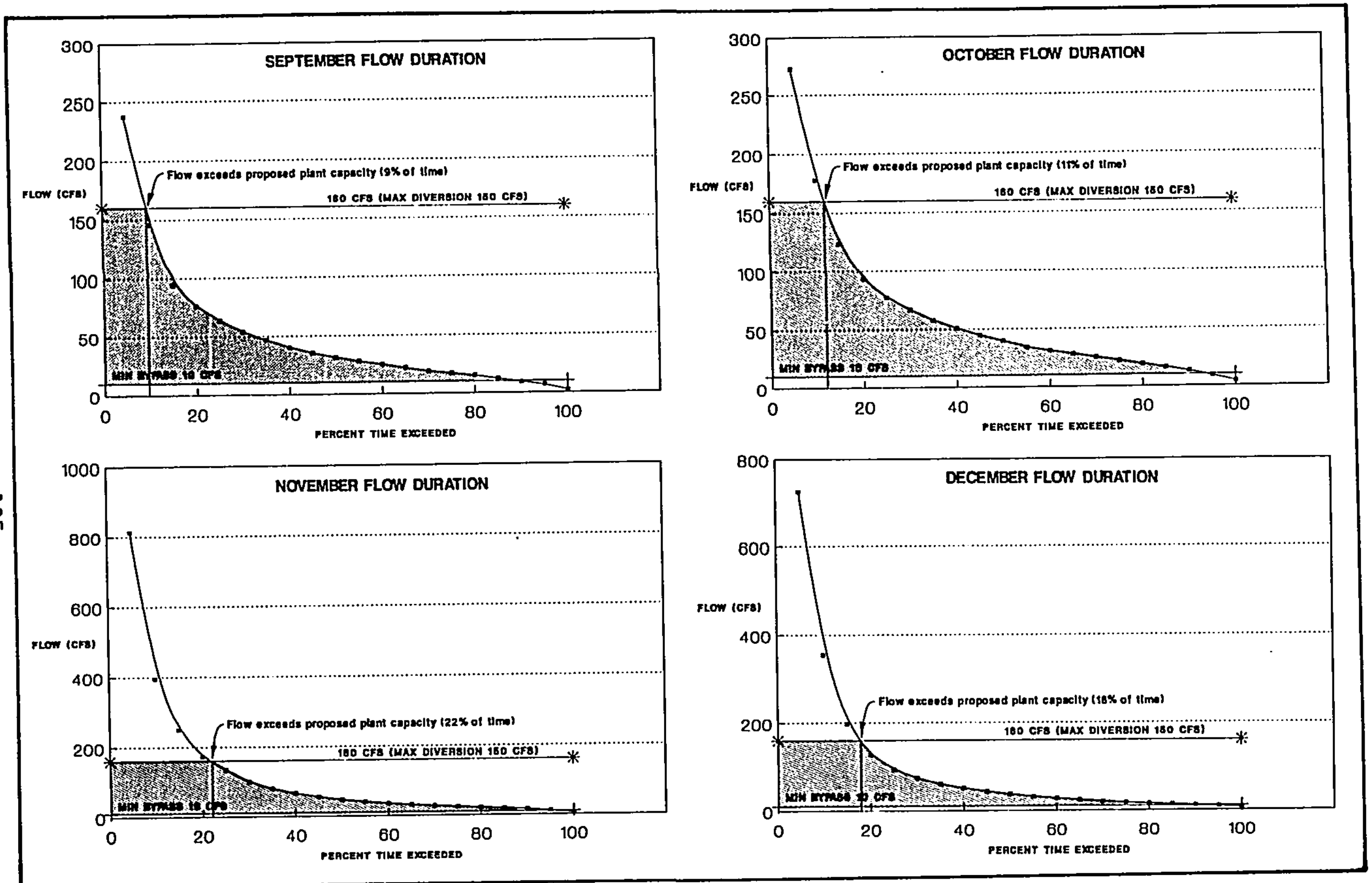

Exhibit IV-3-C
Average Monthly Flow Duration, September to December

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The information and figures above are based upon daily average flows. As indicated previously, the hydrographs from precipitation events have similar characteristics due to the relatively small drainage area and steep river slope. An example of such a hydrograph is presented in Exhibit III-6 in the previous chapter. The rise time is rapid and the recision limb is consistent in shape. As a result, the average daily flow recorded during a precipitation event would be the average of the 24 hour flow readings for that day. This would be considerably less than the actual peak flow which occurred during the rainfall due to the fast rise and recision times.

As an example of the difference between average daily flows and instantaneous flows, the published daily average water flow data for the 1984 water year indicate that a flow of 160 cfs was exceeded 37 days, throughout eight non-consecutive months. An examination of the hourly flow records indicates that instantaneous flows of 160 cfs were exceeded 53 times in ten months. The number of times for each month of water year 1984 the flow exceeded 160 cfs, based on the daily average flow and the hourly flow readings at the gage, is as follows:

	Total	O	N	D	J	F	M	A	M	J	J	A	S
Daily	37	7	1	-	5	4	-	16	-	2	1	1	-
Hourly	53	11	2	-	7	5	2	18	1	2	3	2	-

Water year 1984 is the second driest year of record, with an average annual flow of 63.4 cfs - just half of the average annual flow for the period of record which is 126 cfs. Yet, from the table above, it is apparent that flows exceeding 160 cfs are distributed relatively evenly throughout the year. Therefore, during a year of average rainfall, it can be expected that flows would exceed 160 cfs significantly more often, every month of the year.

The length of stream channel which will be affected by the proposed project will be about 3.7 miles. However, flows below the weir will increase as a result of added flow contributed by runoff, seepage, and various tributaries that feed Honoli'i Stream. None of the runoff or tributaries below the weir will be affected by the project.

Based on USGS gage data, annual average rainfall, and the drainage area for the stream below the weir, the additional flow which will be contributed in various stream segments below the weir has been calculated. The table below shows the accumulated flow (cfs) which is naturally added to the stream by points 1.5 miles, 2.5 miles, and 3.7 miles downstream of the weir. **(Exhibit IV-4).** The final location is just above the proposed tailrace. The flows indicated are in addition to the flow over the weir.

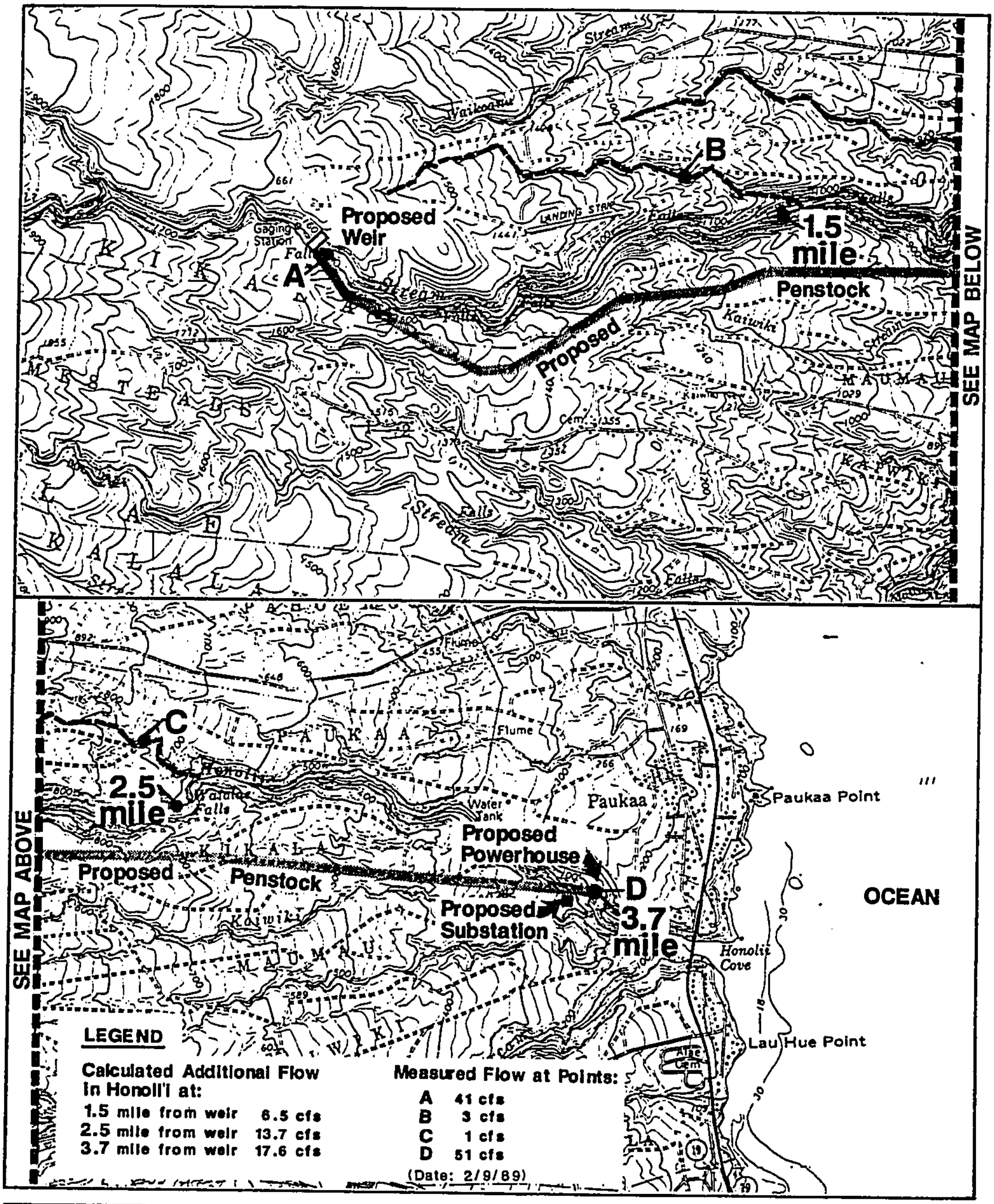

Exhibit IV-4
Sites of Calculated and Measured Additional Flow

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Distance from weir	Drainage area (accumulative)	Additional flow (accumulative)
1.5 miles	.70 sq. mi.	6.5 cfs
2.5 miles	1.48 sq. mi.	13.7 cfs
3.7 miles	1.90 sq. mi.	17.6 cfs

As this data shows, appreciable additional flows are present in the affected reach below the proposed diversion.

This added flow can be seen on the annual flow duration curves that were produced for these respective locations between the weir and powerhouse. (Exhibit IV-5-A,B).

Stream flow measurements were taken at the proposed weir and powerhouse sites on February 9, 1989 in an effort to verify the validity of the methodology described above. No rain had occurred in the area for three days prior to the measurements being taken. Using a Price Type AA Current Meter on a round weighted rod, 41 cfs was measured flowing in the stream at the weir site and 51 cfs was measured at the powerhouse site, an increase of 10 cfs. Contributing to the stream on this day was 3 cfs from tributary "B" and 1 cfs from tributary "C". (See Exhibit IV-4).

Using the equation to calculate the additional flow that would be added between the weir and powerhouse sites based on the 41 cfs measurement at the weir site results in an estimated 5.7 cfs in additional flow being added to the stream. This compares with the 10 cfs which was derived through actual field measurements.

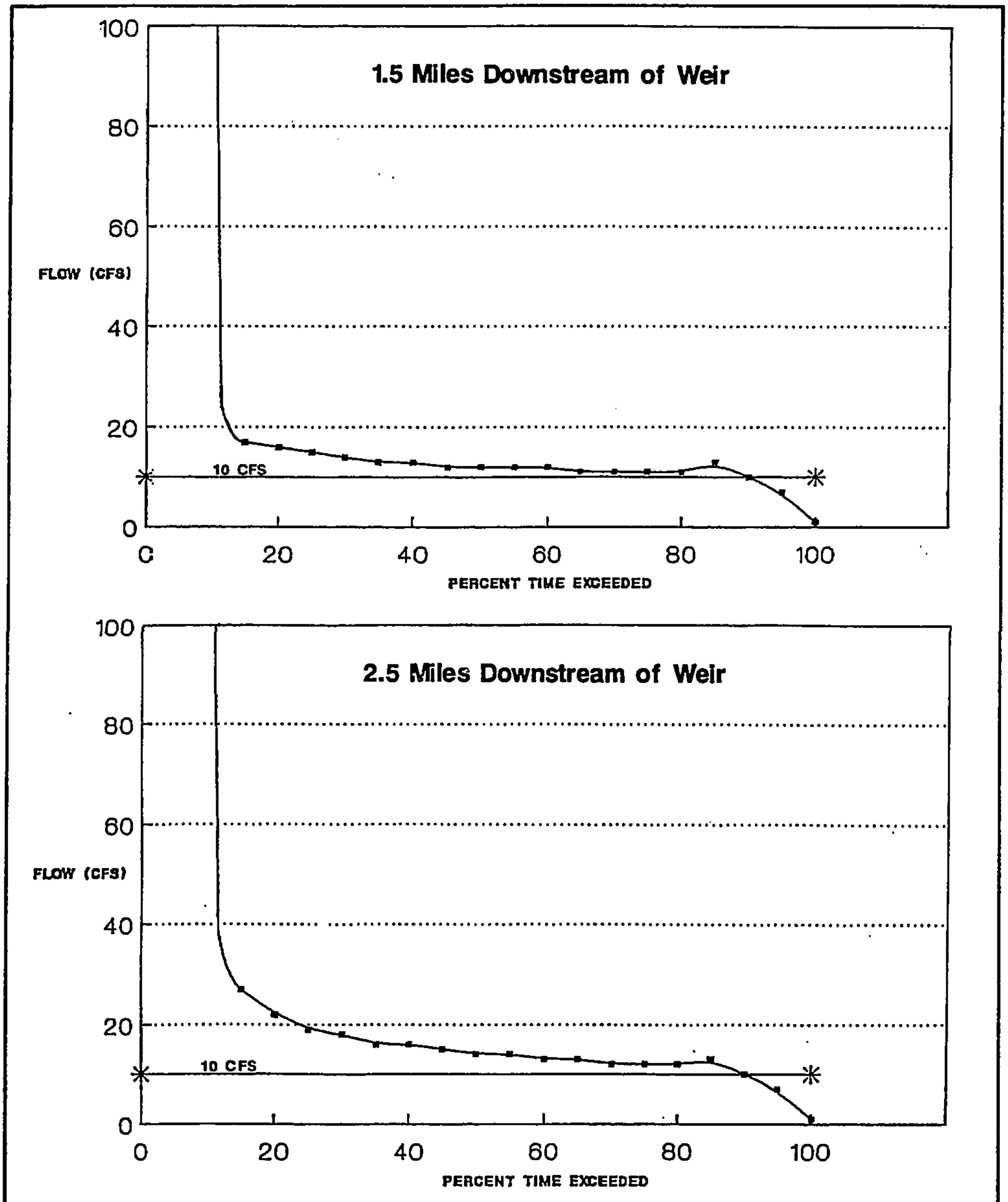

Exhibit IV-5-A
Annual Flow Duration Curves
for Honolii Stream During Project Operation

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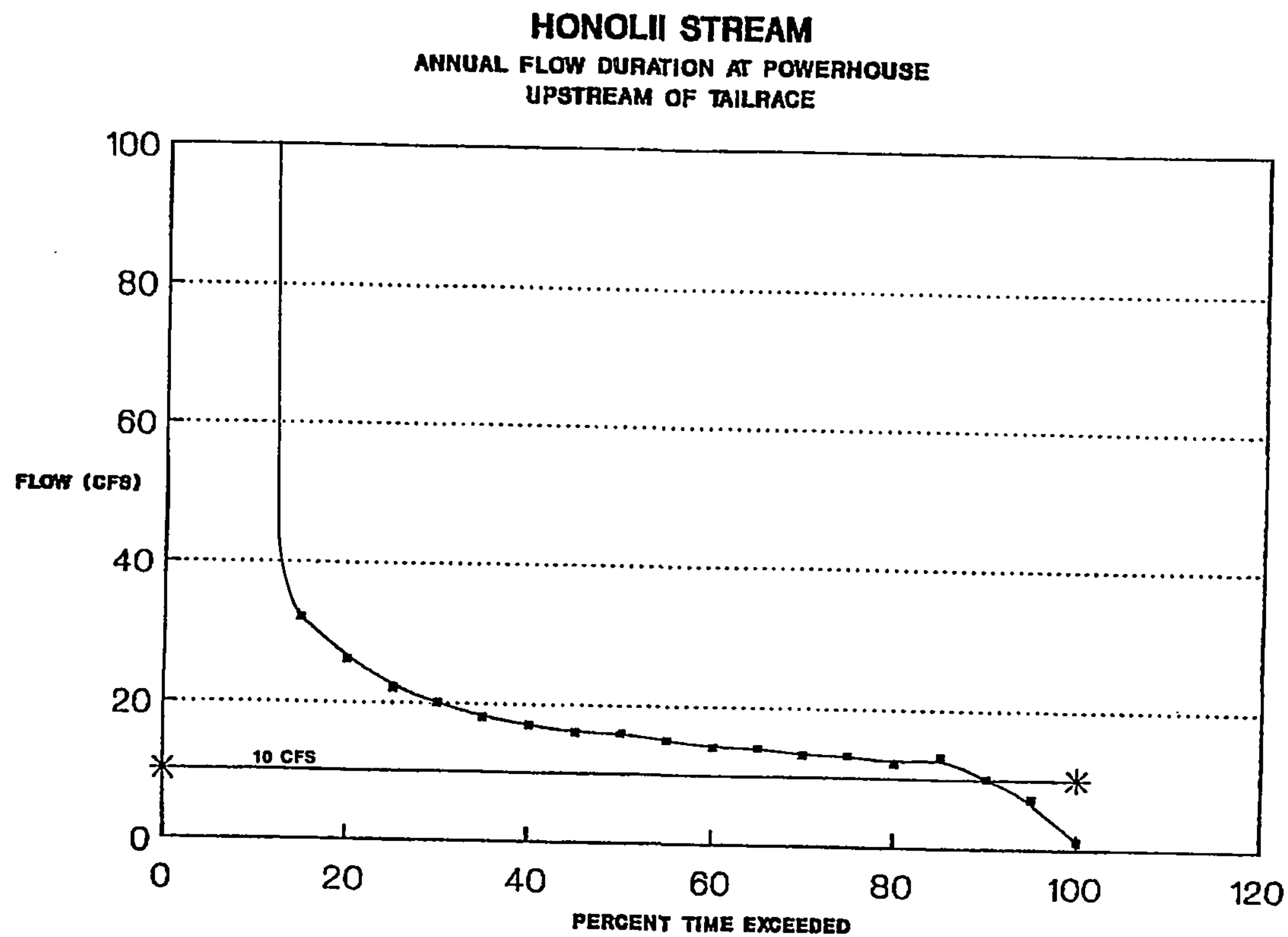

Exhibit IV–5–B
Annual Flow Duration Curve for Honolii Stream
at Powerhouse/Tailrace During Project Operation

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since the equation uses average annual rainfall, and variables such as evaporation and seepage cannot be accurately accounted for, these findings appear to suggest that the methodology described above does provide a reasonable, and perhaps conservative, approach to calculating the amount of stream flow that would be added to the stream between the proposed weir and powerhouse sites.

D. STREAM FAUNA

Based on the findings of a 1983 U.S. Fish and Wildlife Service aquatic survey, and in accordance with the USFWS Mitigation Policy, the Service classified Honoli'i Stream (in 1984) as Resource Category 4: habitat of medium to low value for the evaluation species. As described in Chapter III, two of the three reasons for the USFWS Mitigation Policy deal with minimizing conflicts between developers and the USFWS.

In 1988, after project discussions had been initiated by Mauna Kea Power Company, the USFWS provided the DLNR with a list of high-value streams on Hawaii. The list, which included Honoli'i, was prepared in response to the State's efforts to establish interim instream flow standards for Hawaii island. The criteria used to classify the streams for the State's efforts were different than those used by the USFWS in its Mitigation Policy. The State, however, discarded the stream classification system in favor of a "status quo" interim instream flow standard which allows for flexibility and individual review on a project by project basis.

Aquatic biologist Kelly Archer, in his 1988 survey of Honoli'i Stream, found the same habitat conditions and native freshwater species (including the 'o'opu alamo'o, Lentipes concolor) which were found by the USFWS in its 1983 survey and were used as the basis for ranking Honoli'i Stream as Category 4.

There are no endangered freshwater aquatic species in Hawaii. Honoli'i's stream fauna are, therefore, not subject to special protection under the provisions of existing threatened and endangered species regulations. One species, the 'o'opu alamo'o (Lentipes concolor), was reclassified in 1985 from a Category 2 candidate species to Category 1 by the USFWS.[51] (Refer to Chapter III.D.) This reclassification has, however, been questioned by the DLNR Aquatic Resources Division because of the substantial numbers of 'o'opu alamo'o found in some streams in Hawaii.[52] The upgrading still does not entitle the 'o'opu alamo'o to any special protection provisions. Nevertheless, since the alamo'o is the highest category freshwater aquatic species

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51. Federal Register, Vol. 50 No. 181, Wednesday, September 18, 1985, pp. 37958-37961.

52. Comment letter on Honoli'i DEIS, DLNR, Division of Aquatic Resources, January 23, 1989, p. 2.

found in Hawaii, it should be given particular attention when assessing the impact of the proposed project relative to stream fauna.

There is currently little information available on the migratory and habitat requirements of the various species of native fauna in Hawaii. However, the 'o'opu alamo'o was the subject of a statewide survey conducted by Dr. Amadeo S. Timbol in 1979 and 1980.[53] Sponsored jointly by the (then) Hawaii Division of Fish and Game and the U.S. Fish and Wildlife Service, the survey found 36 streams statewide and 14 streams on Hawaii where the 'o'opu alamo'o can be found. Based on the results of Timbol's survey, past experience, and published and unpublished research by others, an estimate of the total number of "Lentipes streams"[54] in the State was made. Timbol estimated that 56 of the 366 perennial streams statewide provided suitable habitat and could be considered "Lentipes streams". Honoli'i Stream was not one of the 15 "Lentipes streams" on the Island of Hawaii. Hawaii island streams were found to have the lowest average population densities of the four islands which have

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53. Timbol, et al., "Distribution, Relative Abundance, and Stream Environment of Lentipes Concolor (Gill 1860), and Associated Fauna in Hawaiian Streams," WRRC Cooperative Report No. 5, June 1980.

54. Timbol's definition of "Lentipes stream" is any stream that contains Lentipes in any number.

functional populations of this species; the highest densities being found on Kauai, followed by Maui and Molokai.[55] Since Timbol's survey in 1979/80, aquatic surveys by State and Federal agencies and individual researchers have identified the 'o'opu alamo'o in several additional streams statewide, including Honoli'i.

The presence of the 'o'opu alamo'o in Honoli'i and other streams not listed by Timbol as providing suitable habitat suggests either that the alamo'o is more widespread than previously suspected, or that more biological study needs to be completed before special protection is granted. The findings of large numbers of <u>Lentipes</u> in selected streams statewide (estimates of between 2,900 and 3,400 individuals in Piinaau Stream on Maui, between 10,800 and 12,600 in Hanakapiai on Kauai, between 3,100 and 3,700 in Peleau on Hawaii, and between 2,900 and 3,400 in Halawa on Molokai[56] and counts of up to 500 individuals per pool and estimated population in excess of 10,000 individuals in the Waikolu Stream on Molokai[57]) support the need for more study before federal protection is granted.

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55. Ibid. p. 46.

56. Ibid. p.46.

57. Comment letter on Honoli'i DEIS, DLNR, Division of Aquatic Resources, January 23, 1989, p.2.

Timbol's report also concluded that, "Lentipes streams are most likely to be small to moderate in size, moderately deep, fast-flowing, with clear waters, and a bedrock-boulder-cobble substrate."[58] Timbol states that the adult alamo'o typically reside in the middle to upper stream reaches (165-1,650 feet elevation). As a diadromous species, the Lentipes spawn in the freshwater and are washed into the ocean, where they spend up to eight months of larval life maturing as marine plankton. The juveniles then migrate upstream as colorless fry to complete their life cycle. There is no evidence of homing ability in the Hawaiian gobies ('o'opu). As a result, larvae from any stream may ascend other streams.[59] Known to be strong climbers, 'o'opu juveniles use sucker-like fused pelvic fins to cling to stones in riffles and waterfalls. They have been known to surmount single waterfalls 330 feet high.[60]

Although the 1988 stream survey reveals the presence of 'o'opu alamo'o, Timbol's findings suggest that, in its present and foreseeable future condition, Honoli'i Stream does not provide suitable habitat for the alamo'o. The stream is normally turbid due to heavy sedimentation from the surrounding area. As long as agricultural activity

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58. Ibid. p. 47.

59. Ibid. p. 2.

60. Maciolek, J. A. 1977. Taxonomic status of Hawaiian Lentipes, a diadromous goby, with notes on its biology and distribution. Pac. Sci. 31(4): 355-62.

continues on the adjacent lands, this condition is unlikely to change. The Army Corps Report estimates that over 1,200 tons of sediment flow into Honoli'i Stream annually.[61]

After the Honoli'i Hydroelectric Project is completed and in operation, the conditions in the stream will not change significantly. There will be no change in the turbidity of the water, and there is no evidence to indicate that the reduced stream flow and presence of the 15-foot high weir will be a barrier to the life cycle or survival of the 'o'opu alamo'o. In fact, given the ability of this species to negotiate cascades and waterfalls, an effective migration barrier could only be created if the stream were entirely diverted.[62]

In an effort to assess the impact of this project on the various aquatic species found in Honoli'i Stream and determine a suitable conservation flow, two steps were taken. One, a physical survey of the site was performed by a professional aquatic biologist (Archer), recommended by the USFWS, who is familiar with Hawaii's unique aquatic fauna. Two, biological, hydraulic, engineering, and

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61. U.S. Army Corp of Engineers, Wailuku/Honolii Hydropower Study, Island of Hawaii, Hawaii, Reconnaissance Phase Documentation. Honolulu, September 1984, Appendix B, p. II-44.

62. Thomas R. Payne and Associates, Analysis of Instream Flow Requirements and Flow Release Recommendation, Lumahai River Hydroelectric Project, Kauai, Hawaii (July 31, 1987), p. 5.

physical data available from other scientific studies conducted over the past thirty years was reviewed. Of particular value were the aquatic surveys[63] conducted near three existing hydroelectric plants that have been in operation for over 65 years: Waiau and Puueo plants on the Wailuku River, Hawaii, and Wainiha plant on the Wainiha River, Kauai. Existing, post-operation conditions at these projects offer significant insight into the potential impacts of the proposed project on the 'o'opu alamo'o and other native stream fauna. They also provide extensive information on the effects of intake design on these aquatic species.

The Waiau and Puueo plants, owned and operated by HELCO, are located on the Wailuku River just 3.4 miles south of Honoli'i Stream. (See Exhibit IV-6.) They have been in operation since 1920. These plants use diversion weirs to divert a portion of the stream flow into an intake canal and penstock. There are no requirements for a conservation flow. Despite the reduction in stream flow resulting from the diversions, the 'o'opu alamo'o was sighted in the Hookelekele Stream above the diversion weirs of both the Waiau and Puueo projects in a 1984 aquatic survey conducted by the USFWS for the Wailuku/Honolii Hydropower Study.

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63. USFWS, Draft Coordination Act Report, Wailuku-Honoli'i Hydropower Study, 1984; and Amadeo S. Timbol, for EDAW inc., A Survey of Aquatic Macrofauna in Wainiha River, Kauai, February 1983.

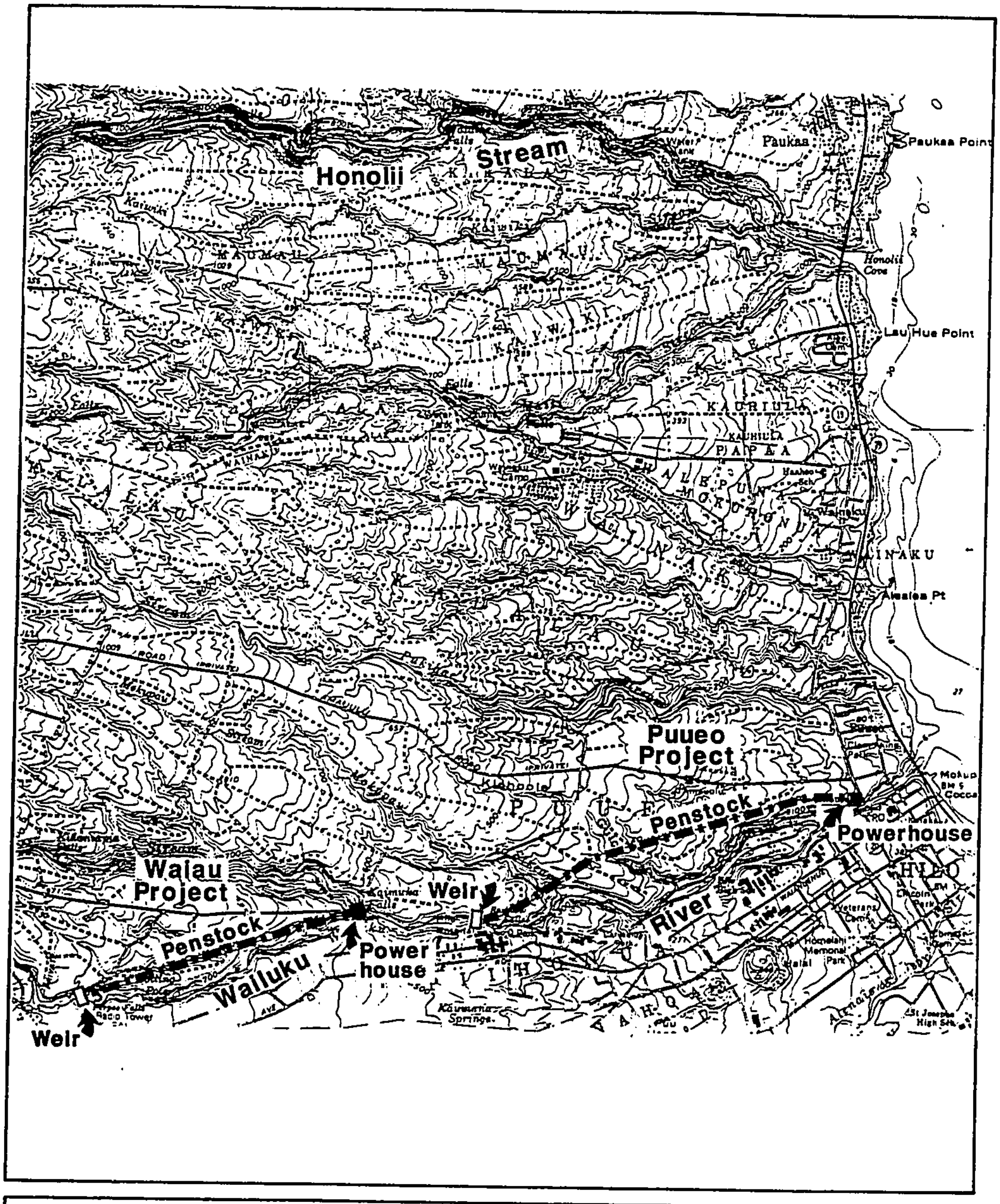

Exhibit IV-6
Existing Waiau and Puueo
Hydroelectric Projects

Scale:
1"=2500'

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Environmental
Planning

As shown in Exhibit IV-7, the intake canals for these two projects are 5 feet deep by 10 feet wide, and are designed to accommodate a maximum approach velocity of 2.56 feet per second (fps). (Honoli'i's proposed intake will have a maximum velocity of just 1 fps.) Neither Waiau or Puueo uses a fish screen, although each has a one-inch rack in the intake canal aligned perpendicular to the flow to help prevent fish and debris from entering their penstocks.

The Wainiha hydroelectric plant was built by the McBryde Sugar Company and has been in commercial operation since 1906. The project has a 17-foot high concrete and steel diversion weir which diverts water through a series of ditches and tunnels into a penstock leading to the powerhouse. (Exhibit IV-8). As with the Waiau and Puueo plants, the Wainiha project has no conservation flow requirement. With a diversion capacity of 100 cfs, no water is allowed to flow past the weir until the instream flow is greater than 100 cfs, which occurs about 40 percent of the time. As a result, the weir and streambed immediately downstream have been historically dry for extended periods of time each year. During the period of record of the USGS gage, the weir has been dry an average of 212 days per year on a daily average basis.[64] This diversion also results in a reduced flow along a 4.5-mile reach before the water is returned to the stream.

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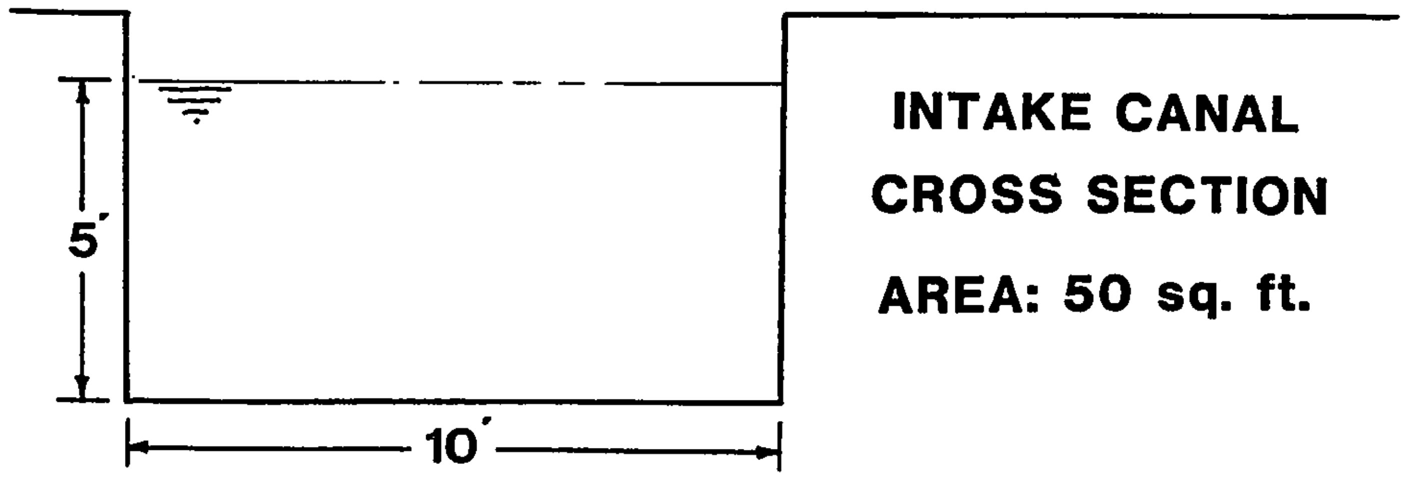
64. Wainiha Hydroelectric Project, Environmental Impact Statement, McBryde Sugar Company, August 1983, p. 90.

WAIAU/PUUEO Hydroelectric Plants



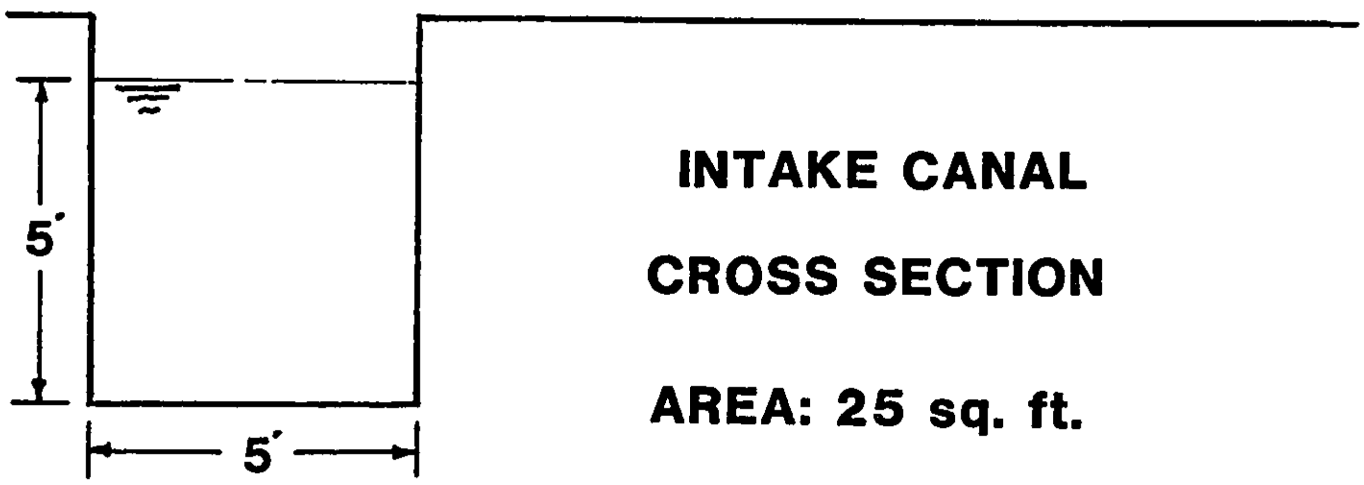
INTAKE CANAL CROSS SECTION

AREA: 50 sq. ft.

Design Flow: 128 cfs
Design Velocity: 2.56 fps

Present Flow: 52 cfs
Present Velocity: 1.04 fps

WAINIHA Hydroelectric Plant



INTAKE CANAL CROSS SECTION

AREA: 25 sq. ft.

Design Flow: 100 cfs

Design Velocity: 4 fps

Exhibit IV-7
Existing Hydroelectric Intake Canals

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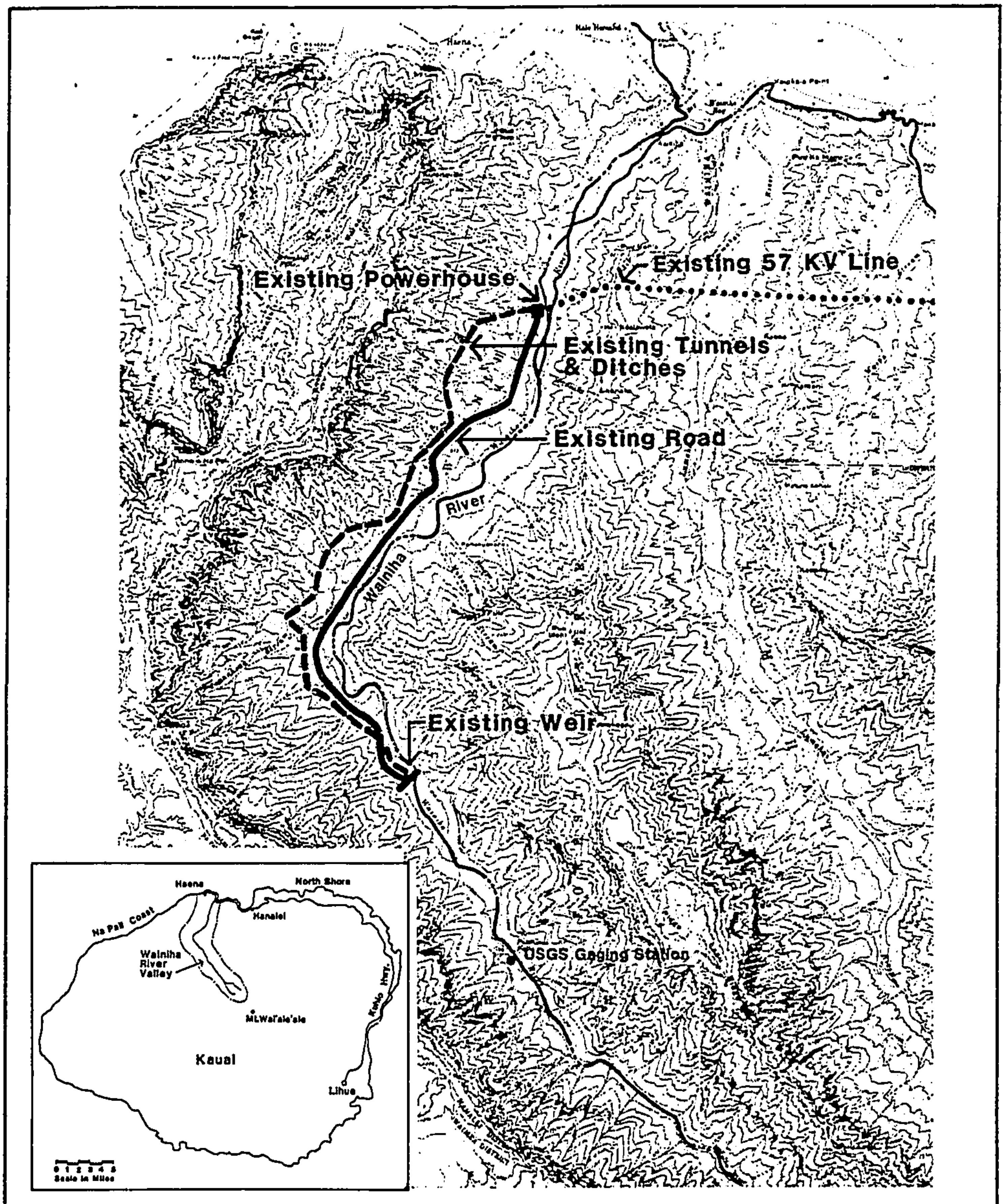

Exhibit IV-8
Existing Wainiha Hydroelectric Project

DHM inc.
Land Use and Environmental Planning

The diversion weir and subsequent reduced stream flow in a 4.5-mile reach of the river have not served to deplete the composition or number of 'o'opu in the river. In a 1982-83 aquatic survey conducted by Dr. Amadeo S. Timbol, five species of 'o'opu, including the 'o'opu alamo'o, were found above the diversion weir.[65] According to Timbol, "the presence of the Lentipes concolor ('o'opu alamo'o) upstream of the diversion ditch indicates that the alamo'o is capable of avoiding the existing hydropower plant, ditch and intake system to reach the upper elevations.[66]

As shown in Exhibit IV-7, the Wainiha project has an intake canal which is 5 feet deep by 5 feet wide, and is designed to divert a maximum of 100 cfs. As a result, the velocity of the water flowing through the intake canal is 4 fps. Wainiha also has a six-inch rack at the entrance to the intake canal which screens out large debris, and a one-inch rack at the entrance to the penstock to further insure that fish and debris do not enter the penstock.

The presence of diadromous native aquatic fauna, including the 'o'opu alamo'o, upstream of the diversion weirs of these three existing hydroelectric projects indicates that the diversion weirs and reaches of the stream with reduced flow

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65. Amadeo S. Timbol, for EDAW inc., A Survey of Aquatic Macrofauna in Wainiha River, Kauai, February 1983, p. 8. (Included as Appendix C in Wainiha Hydroelectric Project EIS.)

66. Ibid. p. 9.

have not been a barrier to migration, and that the native stream fauna are capable of surviving and migrating both upstream and downstream without the presence of a continuous stream flow.

Based on this knowledge (documented by the studies of streams with existing hydroelectric projects), as well as aquatic surveys by professional aquatic biologists and the review of pertinent scientific reports prepared over the past thirty years, the Board of Land and Natural Resources and the U.S. Army Corps of Engineers have approved three proposed hydroelectric projects with various conservation flows. These projects, all on Kauai, are: Kitano (1983), no conservation flow; Upper Wainiha (1984), conservation flow of 3 cfs; and Lower Wailua (1986) conservation flow of 15 cfs. The high conservation flow for the Lower Wailua project was necessary to ensure that the scenic Wailua Falls, a heavily used tourist attraction, remained.

This same methodology has been used to assess the potential impact of the proposed Honoli'i project and to determine that the proposed 10 cfs conservation flow is adequate to protect the stream fauna.

Despite the validity and historic acceptance of the above method, three concerned parties have recommended that an Instream Flow Incremental Method (IFIM) study be required for this project.[67] IFIM, developed by USFWS, uses computer modeling programs to simulate hydraulic conditions of the microhabitat (water velocity, depth, and substratum) in order to evaluate the effects of flow-induced changes on fish and invertebrate habitat.[68] The computer model must be provided with distribution data concerning water velocity, depth, and substratum available and the habitat requirements during the various life stages of the target species. IFIM can take over a year to complete, with no assurance of conclusive results, due to the highly variable flows in Hawaii's streams, the scarcity of target species, and the lack of information on the life stages of the various species. Nevertheless, USFWS recommend IFIM almost exclusively as the best available technology.

The IFIM studies that have been completed on Hawaii streams reveal that IFIM's use in Hawaii is more of a tool for determining its applicability than it is a practical instrument of predicting impacts.[69] The findings contain so many qualifications that they <u>cannot provide conclusive biological results</u> upon which decisions can be defended. In

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67. The following parties have recommended an IFIM for this project: U.S. Fish and Wildlife Service, University of Hawaii Environmental Center, and Sierra Club Legal Defense Fund, Inc.

68. C. L. Armour, et al., Comparison of the use of the Habitat Evaluation Procedures (HEP) and Instream Flow Incremental Methodology (IFIM) in aquatic analysis, FWS/OBS-84/11, U.S. Fish and Wildlife Service, 30 p., (1984).

69. A detailed discussion of the use of IFIM in Hawaii is included as Appendix G.

two IFIM studies conducted on the Lumahai and Hanalei Rivers where the 'o'opu alamo'o were found, neither study could provide any biological information on the 'o'opu alamo'o's required stream flow. An IFIM study, therefore, provides no more biological information than the study method used for this project. IFIM's value, then, as a guide to public policy is questionable. Scientists and researchers may argue that although IFIM cannot provide conclusive evidence, its use demonstrates an overall direction of quantifying impacts. However, as stated earlier, the results from all recent IFIM studies in Hawaii have been inconclusive and qualified.

Thus, based on the documented presence of Hawaii's stream fauna in streams where hydroelectric plants have operated with no requirement for a conservation flow; and on the findings and recommendations of the physical survey of Honoli'i by a professional aquatic biologist; and on the review of pertinent scientific reports, potential impacts of the project relative to stream fauna have been identified and appropriate mitigative measures were developed. These are described below according to their occurrence during the construction phase or the long-term operation of the project.

1. Construction-Related Impacts

Potential impacts on stream fauna associated with the construction phase of the project will be temporary and not significant. Of principal concern is the potential for direct impact to the existing fauna by construction activity in the stream and addition of sediment during construction activities near the stream.

Direct impact to existing stream fauna is minimized by locating the proposed weir on the bedrock substrate between the falls and the gaging station. Both Archer,[70] the project biologist, and the U. S. Fish and Wildlife Service[71] agree that the bedrock substrate of this reach is not productive or suitable fishery habitat. "Bedrock provides little shelter against strong currents, abrasive particulates and predators, and is probably unsuitable as spawning habitat for most species of native fishes."[72]

Construction and disturbance in the natural streambed will be limited to the 200-foot area between the cofferdams. Construction will not disturb the more suitable cobble-boulder habitat located in other sections of the stream. There may be, however, some

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70. Archer, p. 20.

71. USFWS, June 1984, pp. 9 and 11.

72. Ibid. p. 6.

reduction in available habitat during construction due to flow diversion and temporary dewaterment between cofferdams.

The principal secondary effect of construction is the potential for increased turbidity and sedimentation. This will be minimized by locating only the weir, intake, and initial portion of the penstock in the natural stream channel. The access road, majority of the penstock, and powerhouse will be located away from the stream. There is expected to be a temporary (1-2 month) increase in turbidity during the construction and removal of the cofferdams. However, since the upper cofferdam will be installed first and removed last, the area where the lower cofferdam will be located will remain relatively dry during installation and removal and is not expected to contribute any sedimentation to the stream. The upper cofferdam will be constructed and removed during low flows to minimize sediment entering the stream. Effective measures will be taken to minimize erosion, including minimal removal of vegetation along the stream bank.

Existing natural freshet flows are of sufficient volume and frequency to flush the small amount of sediment that may enter the stream. Construction activities should not result in loss of stream fauna or habitat due to fill, erosion and/or sediment entering the stream.

2. Operation-Related Impacts

During operation of the project, impacts on stream fauna may occur in three areas: migratory passage, entrainment, and habitat maintenance, as described below.

a. Migratory Passage

The proposed Honoli'i diversion weir, along with the mitigative measures incorporated into the design, is not expected to be a physical barrier to the migration of diadromous stream fauna. This conclusion is based on the aquatic surveys of streams containing the three existing hydroelectric projects (Waiau, Puueo and Wainiha), and the biological characteristics of the fauna themselves.

'O'opu alamo'o have successfully climbed the numerous waterfalls considerably more severe than the height and slope of the proposed weir (15 feet and 33 percent respectively). For example, the falls just below the proposed weir site is about 75 feet high and nearly vertical. Migrating past this waterfall is not unusual for gobies. "Tiny diadromous fry, entering a stream from the ocean, must surmount steep gradients and cascading water if they are to reach their adult habitat.... Goby fry have been observed climbing up a smooth vertical surface at a rate of eighteen inches in twenty seconds and hanging upside-down as they progress up the undercut faces of waterfalls."[73]

In a comment letter for a Maui hydroelectric project EIS, the Fish and Wildlife Service wrote, "It is unlikely that any individual waterfall on East or West Wailuaiki Streams exceeds the climbing ability of the native, diadromous stream animals. For example, the 'o'opu alamo'o, opae kala'ole, and hihiwai migrate to elevations of 1,300 feet above the 400-foot high Akaka Falls on the undiverted reaches of Kolekole Stream on Hawaii."[74] In addition, Thomas Payne, in his instream flow report for Lumahai River on Kauai stated, "Given the ability of these species[75] to

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73. John I. Ford and Robert A. Kinzie, III, "Life Crawls Upstream, "Natural History; December, 1982, pp. 60-67.

74. Ernest Kosaka, USFWS, Letter to Susumu Ono of DLNR dated August 25, 1986.

75. "these species" refers to all native aquatic species, including 'o'opu, found in Lumahai. All native species found by Archer in Honoli'i were also found in Lumahai by Payne.

negotiate cascades and waterfalls, an effective migration barrier could only be created if the stream were entirely diverted."[76]

While the goby have been seen to climb smooth vertical surfaces, the gently sloped (3:1) face of the weir and the conservation-flow notch will be constructed of stream cobbles to resemble natural cascades and to facilitate upstream migration.

Reduced stream flow due to the diversion of water upstream may also affect the migratory passage of the stream's diadromous species. However, the siting of native stream fauna, including gobies, above the diversion weirs of the Waiau, Puueo, and Wainiha hydroelectric plants provides evidence that stream fauna are capable of upstream and downstream migration without the presence of a continuous stream flow. The frequency of large freshet flows on Honoli'i, the natural flow that will continue over the weir 20 percent of the time (1-14 cfs), and the proposed continuous minimum streamflow (10 cfs) can be expected to be adequate to maintain the migratory pathway.[77]

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76. Thomas R. Payne, Analysis of Instream Flow Requirements..., Lumahai River Hydroelectric Project, p. 5.

77. Archer, p. 17.

b. Entrainment

The proposed project intake lies just downstream of a confirmed population of the 'o'opu alamo'o near the gaging station. Using the three existing hydroelectric projects as models, the proposed Honoli'i intake has been designed to prevent the entrapment, impingement, disorientation, or entrainment of these fish. The proposed intake canal will be oriented parallel to the stream flow and will be physically separated from the mainstream. A 6-inch trash rack will be located at the entrance to the intake to prevent large debris from entering the canal. The maximum approach velocity within the intake will be one foot per second to allow adult fish to easily swim out of the intake and avoid entrapment.

The Waiau, Puueo, and Wainiha plants use a 1-inch rack, aligned perpendicular to the stream flow, as a final measure to prevent fish and debris from entering the penstock. On the advice of the aquatic biologist, Archer, the size of the rack in the intake canal of the proposed project will be reduced from 1 inch to 0.75 inch. Studies have shown that 'o'opu alamo'o prefer fast flowing water. Therefore, the 'o'opu alamo'o is not expected to enter the slow flowing water in the intake canal. However, in the unlikely event that an adult fish should swim into the intake, the 0.75-inch rack will be small enough to prevent the fish from continuing into the penstock. A rack or screen of any smaller size may increase the potential for impingement of fish, since it will be more easily clogged, with the resulting reduced area causing eddies, whirlpools, and an increase in the approach velocity.

Designing the intake to allow a maximum approach velocity of one foot per second and using a 0.75-inch rack within the intake oriented perpendicular to the penstock is expected to be adequate to prevent the entrapment, impingement, disorientation, or entrainment of native fish.

The tailrace will have no adverse impact on stream fauna, as it is designed to overhang the stream so water will "free fall" a maximum of ten feet back into the stream. This will prevent the possibility of delay or disorientation of juveniles migrating upstream.

c. Habitat Maintenance

The critical environmental concern for aquatic fauna of this project is the withdrawal of stream water near elevation 1,535 feet which will reduce stream flow from this point to the powerhouse at the 80-foot elevation.

The affected reach of the proposed project is part of the migratory life-cycle habitat for the diadromous species. Riffles and pools are special aquatic sites (Clean Water Act, Section 404(b)). The riffle and pool nature in the reach of stream affected by the project also changes during periods of low flow. The riffles diminish, but as is presently true during low flows, the pools remain and provide suitable habitat during dry spells. Their suitability is evidenced by the number of healthy species surviving extended dry spells during which pools provide almost all of the habitat. The riffles and pools will be continually replenished by the project's conservation flow.

The likely reduction in habitat in the affected reach of the project is the only potentially significant adverse impact which may be unavoidable. The impact is dependent on the quantity of water which is allowed to flow within the affected reach.

A physical survey of Honoli'i Stream shows that the proposed conservation flow of 10 cfs (6.5 million gallons per day) provides wetted habitat for stream fauna. (To indicate the amount of flow created by 10 cfs, the photos in Exhibit IV-9 show 12 cfs flowing in Wailuku River.) Further, field measurements taken on February 9, 1989 provide documented evidence of the additive nature of tributaries and seepage. Forty-one (41) cfs were measured at the site of the proposed diversion weir, and 51 cfs were measured at the proposed powerhouse site. If the hydroelectric plant had been in operation on this day, 31 cfs would be diverted through the penstock and returned to the stream at the powerhouse, and 20 cfs would be flowing in the natural stream channel (10 cfs conservation flow plus 10 cfs from tributaries and seepage). This continuous stream flow will provide at least 10 cfs immediately downstream of the weir 90 percent of the time. Fifteen (15) to 20 percent of the time, the flows will be greater than 10 cfs, up to thousands as described in the previous section.

Photos taken 2/10/89

Exhibit IV-9
12 cfs Flow in Wailuku Stream

DHM inc.
Land Use and Environmental Planning

Photos taken 2/10/89

Exhibit IV-9

12 cfs Flow in Wailuku Stream

DHM inc.

Land Use and Environmental Planning

Flow duration curves also show that flushing flows occur regularly and frequently every month, as rainstorms cause flashing in the stream. As a result, 10 cfs is not normally sustained for long periods of time. The curves also suggest that stream fauna present in Honoli'i stream are apparently capable of living and reproducing under conditions which range from very low to high freshet flows.

Published surveys of the aquatic fauna in the areas surrounding the existing Waiau, Puueo, and Wainiha plants show that even with no required conservation flow, abundant stream life, including the 'o'opu alamo'o, has been able to migrate past the dewatered reaches and the diversion weirs.

For example, as mentioned earlier, the Wainiha hydroelectric project has no conservation flow. As a result, the weir is dry an average of 212 days a year, and the flow in the 4.5-mile downstream reach is significantly reduced. Nevertheless, all of the aquatic species found in Honoli'i Stream are found above the Wainiha diversion weir. These findings indicate that 1) a conservation flow of 10 cfs will not result in irreparable loss or significant alteration of habitat, and 2) the aquatic species found in

Honoli'i will able to migrate up the 3.7-mile reach of reduced flow and over the 15-foot high diversion weir that will be releasing the conservation flow. A biologically defensible basis, therefore, exists for concluding that a required conservation flow of 10 cfs is adequate for the protection of native fauna.

Another effect of decreased volume and flow rate due to diversion of the stream is the influence on the temperature characteristics of Honoli'i Stream in the affected reach. Increased temperatures could affect the food organisms available for the conspicuous stream fauna or alter other important stream water characteristics as discussed previously under "Water Quality." However, large increases in temperature are not anticipated in Honoli'i Stream due to the following factors. The continuous stream flow to be maintained during project operation will help mitigate potential increases in water temperatures during low flows. In addition, existing streamside vegetation will be maintained as it helps provide direct and indirect cover for fish and wildlife, and the tall stature trees provide shade over portions of the stream which also maintain water temperatures. In the affected reach of the stream, the freshets regularly flush the pools, maintaining water quality well. Modest increases in pH and temperature and decreases in dissolved oxygen may accompany dry periods. It has been observed that these changes often are accompanied by the growth of filamentous green algae, the most prominent constituent in the diet of 'o'opu.[78]

Other factors, such as turbidity and aggradation of particulate material, which may be associated with a reduction in flow within a stream reach, are of minor importance in this instance. Because of the existing stream characteristics and because Honoli'i is normally turbid, even during low flow, the project biologist concluded that "the diversion of water in Honoli'i and consequent reduction in flow in the stream's mid-reaches, would probably not affect turbidity levels facing the aquatic fauna."[79]

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78. Kenji Ego, for the Territory of Hawaii Division of Fish and Game, "Life History of Fresh Water Gobies," Project No. F-4-R, 1956, p. 24.

79. Archer, p. 18.

E. <u>VEGETATION AND WILDLIFE</u>

The proposed project is not expected to have a significant impact on the total State-wide populations of the limited native species involved. The native species found in the area are also found in similar environmental habitats along the Hamakua coast.

No officially listed, proposed or candidate threatened and endangered plant species will be affected by the project.[80] The construction of the weir access road, and portions of the penstock near the streambed walls will remove some native ohia and koa trees, however, a very small fraction of the native forest on the slopes will be affected. The greatest amount of disturbance will take place on the sugarcane fields. As a mitigating measure to reduce erosion and sedimentation problems, exposed land will be revegetated with grasses already in the area.

Potential impacts on birds and mammals in the area will occur during the construction phase. The noise and concentrated human activity in the normally undisturbed upstream area will temporarily disrupt the habitat for the various species of birds and mammals that are known to exist in the area. Wildlife can be expected to retreat from the immediate area into the adjacent watershed area while construction is taking place but return after the project is

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80. Winona P. Char, <u>Botanical Survey, Honolii Hydroelectric Power Project</u>, August 1988, p. 7. (See Appendix B).

in operation. The construction and operation of the proposed project will not have an adverse long-term impact on birds and mammals or their habitat.

None of the thirteen species of introduced birds seen in and around the project area is an endangered species, and they are all abundant species and highly adaptable to varying ecological habitats. Many have proven to be serious pests to agriculture in Hawaii.

No indigenous or endemic birds were seen in the project area during the botanical or ornithological field surveys for the Honoli'i hydropower project, except for one Hawaiian hawk. However, because of the hawk's abundance, wide distribution, and high reproductive success, it has been suggested that its endangered status be reevaluated.[81] The construction and operation of the proposed project is not expected to have any adverse effect on the hawk or the other indigenous and endemic birds which may utilize the area.

Although no koloa were seen by Dr. Berger during his recent field survey or by U.S. Fish and Wildlife Service during its survey in 1983, it is possible that this endangered waterbird uses the stream habitat. The main concern for

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81. C.R. Griffin, Biology of Hawaiian Hawk, University of Missouri, Columbia, 1985, p.166.

koloa with respect to the proposed project is that the flow of water be adequate to provide the necessary habitat. The specific flow or habitat that is required by koloa is not known. However, it has been recorded that "uniform water levels provide constant food supply, but [koloa] may seek out freshly drained reservoirs for temporarily abundant food. Koloa will disperse widely when heavy rains create temporary feeding habitat. The availability of loafing sites is probably important to the continued use of feeding habitats."[82] Furthermore, the koloa regularly moves to different sites during the day to satisfy "one or more of its requirements, such as food, loafing area, nesting cover, or others."[83] The proposed conservation flow of 10 cfs and the regularity of large freshet flows in Honoli'i Stream are expected to maintain adequate feeding habitat and loafing sites for the koloa. During extremely low and high flows, the koloa will disperse throughout the region, as they do now, for its food and other needs. As a result, there should be no adverse effects on any koloa that may inhabit or visit the stream.

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82. Ahuimanu Productions and Robert J. Shallenberger, Ornithological Survey of Hawaiian Wetlands, Vol. 2, Dec. 1977, p.32.

83. Gerald Swedberg, The Koloa, DLNR, 1967.

The only endemic land mammal found in the Hawaiian Islands is the Hawaiian hoary bat, now classified as an endangered species. As it is nocturnal, it was not seen during the field survey. However, if it does inhabit the area, the project would have no adverse effects on this species.[84] All of the remaining mammals in the project area are introduced and are generally considered pests.

The project will have no impact on green sea turtles which have been seen off-shore at the mouth of Honoli'i Stream, over 2,000 feet from the proposed powerhouse site. All water diverted by the project will be returned to the stream at the powerhouse. Stream flow and turbidity levels below this point will not change.

F. HISTORIC/ARCHAEOLOGICAL RESOURCES

None of the three historic sites identified along the lower reaches of the stream will be affected by the project. In the unlikely event that any cave or previously unidentified cultural feature of significance is encountered during construction, work in the immediate area will be halted and professional archaeological consultation will be sought.

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84. Andrew J. Berger, Terrestrial Vertebrate Animals of the Honolii River System, August 1988, p.24. (See Appendix A).

G. AIR QUALITY

During construction activities, the project area will be subjected to increased levels of dust and vehicle exhaust emissions. Dust would be generated principally during construction of the penstock and short access roads through clearing and grubbing activities, excavation, backfilling, and road construction operations. Emissions would be generated during the operation of construction equipment and vehicles. The level of dust and emissions will be similar to, or less than, those normally associated with agricultural operations in the area. The tradewinds would rapidly dissipate the dust and emissions and tend to carry them away from the streambed and across the cane fields. Air quality will revert to its present level when construction is completed, and no long-range significant effects are expected. At no time will State or Federal air quality standards be exceeded.

Construction will primarily occur in undeveloped areas where there would be no impacts on residents or businesses. Under normal atmospheric conditions, these construction effects will probably not be noticed by anyone other than workers on the construction site. Only construction at the powerhouse site may potentially impact the two nearby residences.

The operation of the project will also have no effect on the air quality in the area. Hydroelectric power production uses the energy of falling water to create electricity; no noxious emissions are created through the production of electricity. Additionally, hydroelectric plants are long-lived (well over 50 years), and so the environmental benefits of producing electricity without adding pollutants to the water or air are multiplied. In other words, the adverse environmental effects of an equivalent amount of fuel oil burned for over 50 years will be eliminated by the long-term electrical production from this hydroelectric plant. By displacing fossil fuel generation, the plant will have a beneficial effect on air quality elsewhere on Hawaii. (Refer also to Chapter I: Need for Action).

H. NOISE

Construction activity and operation of equipment will temporarily raise noise levels. As with air quality concerns, construction noise will primarily occur in undeveloped areas where there would be no impacts on residents or businesses, and will probably not be noticed by anyone other than workers on the construction site and adjacent cane lands. Noise levels during construction near the powerhouse site will temporarily impact the two nearby residences. All applicable State and Federal ambient noise standards will be met and standard mitigation practices will be followed.

Operation of the proposed powerhouse and substation will not significantly affect existing noise levels in the area. Specific measures will be taken in siting and design of these facilities to ensure that noise levels stay within state and federal standards at all times. The powerhouse will be constructed of concrete blocks in order to contain the noise produced by operation of the water turbines and generators. Noise will be further minimized through the use of water-cooled generators which are much quieter than air-cooled generators. Use of water-cooled generators will also allow the powerhouse to be built with fewer ventilation openings, while still meeting health and safety standards. Smaller ventilation fans will be used, reducing fan noise, and the turbines will be partially embedded in concrete to absorb vibration and thereby reduce noise levels. Sound levels during normal operation of the powerplant will not be high enough to interfere with normal conversation outside the building when the doors are closed.

Several actions are planned to control the noise produced by water flowing from the tailrace back into the stream. The powerhouse will be situated so the concrete building will block much of the sound from the two nearby Kiyan residences. The tailrace will also be located in a natural depression surrounded by heavy vegetation which will serve as an additional noise buffer. As a result, tailrace noise levels will approximate those produced by the normal flow of the stream.

No significant substation noise is anticipated. The substation will be located outside the conservation area in agriculturally zoned land and will be buffered by natural vegetation. In addition, a high quality transformer will be used to eliminate transformer hum.

Except for the two Kiyan residences, other residences in the area are located immediately adjacent to Mamalahoa Highway. Since this is the major highway on the island, all vehicles, including large trucks and tour buses, use the highway at all times. The noise from the vehicles utilizing the highway is much louder than any noise that will be created from operating the power plant.

I. PUBLIC FACILITIES AND SERVICES

Except during the construction phase, the action will not rely on public facilities or services such as schools, parks, water, sewer, and health care. Temporary and minor increases in demands on some of these facilities or services during construction could be created by construction personnel moving to Hawaii Island. The average daily workforce for the one-year construction period is expected to be about 25 persons, with a peak workforce of up to 40 or 50. However, most workers will already be Big Island residents, and any imported workers will be on the project for a short time and would probably not relocate their families to the island. The capacity of public services on Hawaii appears to be adequate to accommodate any temporary increase resulting from the project construction.

Construction-related vehicles will create short-term impacts on traffic conditions along Mamalahoa Highway between Hilo and the project area. The most frequent and regular type of vehicle trip during the construction period will be the transporting of workers to and from the site each day, except weekends. The number of vehicles used to transport the workers to the site and to transport materials between the Hilo docks and local supply sources is expected to have an insignificant impact on traffic flow. The most concentrated use of the highway will be the hauling of penstock sections from the harbor to the site. Approximately 250 trips will be required, however, only a limited number of trucks will be used, making continuous trips until all penstock sections are delivered to the construction site.

Construction-related traffic will be limited to weekday daylight hours except for possible overtime or additional shifts. Most project vehicles will exit the highway onto the canehaul road just north of Alae Cemetery, about 1,500 feet south of the Honoli'i bridge. Project-related vehicles using Kahoa Street or the Kahoa Street bridge will be limited to cars, vans, and pick-up trucks. **Kahoa Street will not be used for the transportation of heavy equipment** and material to the project site. Slow moving, large transport vehicles carrying concrete, penstock sections, and other heavy materials may delay other drivers from time to time, but increased traffic resulting from the project will not generally be noticeable along the major State highway.

J. <u>SURROUNDING LAND USES</u>

The project will not significantly impact existing land uses in the immediate area. The agricultural lands north of the stream will not be impacted in any way. Intermittent use of canehaul roads through these lands for access to the diversion weir site during construction will not interrupt field operations or operation of the airstrip. The penstock construction along existing cane roads south of the stream will restrict use of the roads by cane trucks for limited periods. However, crop production and field operations in the immediate area are expected to continue without conflict. Portions of the proposed penstock route are along abandoned cane roads and will not impact agricultural operations. Construction in the productive agricultural lands will be closely coordinated with the sugar companies and landowners to minimize potential conflicts. The sugar companies will be compensated for any productive cane land that is taken out of production or cane that is damaged during penstock construction. Once the project is complete, there will be no project-related activity on the agricultural lands except for occasional use of cane roads to access the penstock and weir site for maintenance and inspection purposes.

The project is not expected to impact the use of the stream by occasional recreationists, nor will it increase public accessibility to the remote streambed. Permission for access across the private land surrounding the stream will continue to be handled by the landowner and/or lessee.

With the exception of the two Kiyan family residences near the proposed powerhouse site, there will be no impact to residents in the Honoli'i area. The powerhouse will not be visible from any existing residence downstream of the Kahoa Street Bridge nor will any noise other than the natural sound of water being returned to the stream be audible. Close coordination and communication will be maintained with the Kiyan family, and all measures will be taken to minimize disturbance to their property and daily activities. At the Kiyan's request, the developer has agreed to run the 4.16 kV transmission line between the powerhouse and substation in underground conduits.

There will be no effect on the residences and surf park makai of the historic Kahoa Street bridge. All water diverted will be returned to the stream approximately 300 feet upstream of the Kahoa Street bridge. The small amount of accumulated sediment and debris will be flushed periodically from the diversion weir and sediment traps during monthly freshet flows. The process of sediment entering the stream as runoff and being carried to the mouth of the stream occurs naturally during rainy periods. Since these rainy periods are also responsible for the frequent freshet and infrequent flood flows which will overtop the weir and continue in the natural stream channel, the natural process for sediment, gravel, cobble, boulders and debris to be carried to the mouth will not change after the project is built. All sediment entering the penstock will be returned to the stream at the tailrace.

K. SOCIO-ECONOMIC IMPACTS

The immediate and long-term socio-economic impacts of the proposed project will be positive. The immediate benefit would be the infusion of capital and the provision of temporary construction jobs in the region. The average daily construction workforce is estimated to be about 25 persons with a peak workforce of about 40 to 50. To the extent possible, materials will be purchased in Hawaii. Specialized equipment, such as turbines, generators, and the penstock, will have to be purchased out of state. The major portion of the labor and services required will be provided from within the State and County. These expenditures will provide tax revenues to the County, State and Federal governments. The direct expenditures, particularly wages and salaries, will also generate an increased demand for goods and services from construction workers and suppliers.

After completion of construction, the plant will be supervised by an operator. Additional part-time or temporary employment may be necessary for occasional maintenance tasks.

The proposed project will not significantly or adversely impact the existing housing stock and population level in the area. Construction personnel's need for housing will have a negligible impact on local communities and may, through the collection of rent, benefit the local economy. Most workers will be local residents. However, if skilled workers for specialized tasks are not available on the island, they will be brought in from outside Hawaii and will make their own arrangements for housing. Because they will be residing on Hawaii for a relatively short time, it is likely that they would rent quarters rather than build or buy housing. In addition, there will be no displacement or relocation caused by the project.

The project is not expected to adversely affect present recreational activities in the area. As explained in the previous section on stream fauna, the proposed conservation flow is expected to maintain significant stream fauna populations throughout the affected reach of the stream, thereby causing no significant impact on the limited recreational fishing and gathering that occurs. Surfing conditions at the popular Honoli'i Surf Park near the mouth of the stream will not be impacted by the project. All water diverted by the project will be returned to the stream at the tailrace, over 2,000 feet from the surf site. The stream flow and turbidity levels below this point will not change. Boulders, mud and debris associated with freshet and flood flows will continue down to the surf park. The surfing conditions will therefore experience no change.

The long-term effects of the project on the island and state economies will be beneficial. The generation of hydroelectric power, a renewable resource, will reduce the county's dependence on oil-generated electricity. This contribution to energy self-sufficiency will strengthen the economy by replacing the use of an unpredictably priced, imported, nonrenewable oil resource with a near inflation-proof and nonpolluting renewable resource. Energy purchased from the project by HELCO would be inflation-proof to the extent that it would relieve HELCO of the inflation-affected costs of planning, purchase and installation of generating equipment and the resulting labor costs to operate and maintain the equipment. Furthermore, the replacement of 70,500 barrels of imported oil represents a savings of over one million dollars annually, much of which will stay in the County and State economies. The estimated annual energy production of the project, 35,000 MWH, is about 5.5 percent of the electric power sales on Hawaii.

As requested, the BLNR will have the opportunity to review the economic performance of this project on a confidential basis. The information is of a proprietary nature and therefore will not be made available to the general public. However, any power purchase contract must be approved by the Public Utilities Commission - the agency with statutory responsibility for insuring the public is paying a reasonable and fair rate for electricity.

Another long-term benefit to Big Islanders is the non-polluting nature of hydroelectric power. By displacing the burning of fossil fuels and bagasse, there will be less sulfur dioxide, nitrogen oxide, and carbon monoxide released into the atmosphere. This is a very positive benefit in view of the implications of acid rain, vog, and the greenhouse effect, all of which directly affect the residents of the Big Island.

Electric power consumers on Hawaii will benefit in a number of ways:

1. Rate Stabilization - As mentioned above, the project will help to stabilize the local energy rate as it will not be subject to the price and supply fluctuations of the oil market. Power purchase negotiations will insure that the project will not exceed the true avoided cost to the consumers over a specified period

of time. The Public Utilities Commission must approve any agreements before it can be included in the rate base.

2. Additional Capacity - On an island-wide scale, Hawaii's demand for additional power generation is increasing at an accelerated rate because of increased economic development. The County has been experiencing blackouts recently, and indications are that much of this problem is attributable to shortcomings in the present electrical grid system.[85] The proposed project will increase system capability by 14.6 MW (nearly 10%) to accommodate the demands of new development. This substantial increase may also mitigate incremental failures within the island-wide system.

3. Increased Reliability - Having new equipment and technology on line will strengthen the local utility's present system by enhancing the reliability of the electrical grid. As HELCO's system ages, problems are to be expected. Updating portions of the system will minimize problems arising from an aging network.[86]

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85. Dante Carpenter, Letter to William Paty, Chairman, Board of Land and Natural Resources dated October 12, 1988.

86. Ibid.

The project will also increase reliability by diversifying the sources of renewable energy available to produce electricity. Currently, a significant amount of electricity is produced from bagasse, a by-product of the unstable sugar industry.

Improving the reliability and availability of electric power service to an area or the island has more than a direct dollar value. The rapid restoration or maintenance of service to the area after a major outage is a clear benefit to public safety and welfare. As demonstrated after Hurricane Iwa devastated Kauai, hydroelectric generated power is particularly valued for its "black start"[87] capability.

L. VISUAL QUALITY

None of the project features, with the exception of the proposed 69 kV transmission line, will be visible from the highway or any other area where public views would be possible.

A short section of the new transmission line from the project substation to HELCO's existing 69 kV line along Mamalahoa Highway will be visible from the highway. It will be located in the sugarcane fields along the Honoli'i gulch,

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87. "Black start" is the ability to commence generating electricity without external assistance or irregardless of the condition of the utility.

spanning Maili Stream gulch. Riparian vegetation along Maili Stream gulch, just a few yards from the highway, is expected to screen any view of the line beyond this point.

Another potential for view exposure to the project area is by means of helicopter overflights. Commercial helicopter services on Hawaii do offer scenic tours and this area can probably be viewed on some of these flights. If the project features were to be seen, they would appear quite small in relation to the scale of the surroundings.

Chapter V

V. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR THE AFFECTED AREA

A. FEDERAL

1. Clean Water Act (Section 404)

The U.S. Army Corps of Engineers will evaluate this project in terms of its effects on the waters of the United States. If the Corps finds that the project is in the public interest, a permit will be issued. The Corps' permit application review triggers the five following Federal requirements:

- National Environmental Policy Act (NEPA)

  The Corps will determine whether or not an Environmental Impact Statement (EIS) is required under NEPA.

- National Historic Preservation Act

  The Corps will determine whether consultation with the Advisory Council on Historic Preservation is required. The project will not affect any sites listed on the National Register of Historic Places.

- Endangered Species Act and Fish and Wildlife Coordination Act

  The Corps will consult with the U.S. Fish and Wildlife Service to determine whether any rare or endangered species would be adversely affected by the proposed project. As discussed in earlier chapters, only one such species, the Hawaiian hawk, was seen in the project area. The proposed project is not expected to have any adverse effect on this species or its habitat.

- Coastal Zone Management Act

  Hawaii's Federally-approved Coastal Zone Management (CZM) Program requires non-Federal applicants for a Federal permit to certify that the proposed action will comply with the State's CZM Program. The Corps will not issue a permit until the Hawaii Office of State Planning, which administers Hawaii's CZM Program, concurs with the applicant's certification. The applicant hereby certifies that the proposed activity complies with the State of Hawaii approved coastal management program and will be conducted in a manner consistent with the program.

- Clean Water Act

  A State Water Quality Certification pursuant to Section 401 of the Clean Water Act is required by any applicant for a Federal permit to conduct any activity which may result in discharge into the waters of the State of Hawaii. As with the CZM act above, the Corps will not issue their permit until Water Quality Certification for the project is granted by the State Department of Health.

2. Federal Flood Insurance Program

The Federal Flood Insurance Program does not specifically pertain to hydroelectric projects. However, some project features (weir, intake, and portion of penstock) will be within the 100-year flood plain of Honoli'i Stream. Based on USGS stream flow data, the 100-year storm is projected to have a flow of 31,100 cfs near the powerhouse, and a maximum water level of 79 feet. The finished floor elevation of the powerhouse will be above the inundation level of this design flood.

3. Federal Power Act

Section 23(b) of the Federal Power Act requires that water power projects be licensed by the Federal Energy Regulatory Commission (FERC) if they are located on navigable waters of the United States, occupy any part of public lands or reservations of the United States, use surplus water or water power from a federal government dam, or, if constructed after August 26, 1935, they are located on a non-navigable water subject to Congress' jurisdiction under the Commerce Clause and affect the interests of interstate or foreign commerce.

The Honoli'i Stream is non-navigable at the site of, and in the immediate vicinity of, the proposed project. In addition, the project will be located entirely on privately-owned lands, will not use water from a federal government dam, and will not affect any aspect of commerce.

Currently there are no hydropower plants in the State licensed by FERC. The issue of FERC's jurisdiction over streams in the state of Hawaii is currently being re-evaluated at both the State and Federal levels. **A Declaration of Intention and request for non-jurisdiction has been filed with FERC for this project.**

B. STATE

1. The Hawaii State Plan

The Hawaii State Plan (Chapter 226 of the Hawaii Revised Statutes, as amended in May 1986) establishes goals, objectives, policies, and priority guidelines to provide general direction for the growth and development of the State. The proposed hydroelectric power project is in agreement with the provisions of the plan, and relevant sections of the plan are discussed below.

STATE GOALS

1) A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawaii's present and future generations.

2) A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.

Objectives and Policies for the Economy - General

Objectives

- o Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people.
- o A steadily growing and diversified economic base that is not overly dependent on a few industries.

Policies

2) Promote Hawaii as an attractive market for environmentally and socially sound investment activities that benefit Hawaii's people.

5) Assure that the basic economic needs of Hawaii's people are maintained in the event of disruptions in overseas transportation.

13) Encourage businesses that have favorable financial multiplier effects within Hawaii's economy.

Comment: The proposed hydroelectric project is an environmentally and socially sound activity that will benefit Hawaii's people in many ways. Hydropower is a clean, efficient, economical and proven dependable energy source, as seen by the successful operation of many such facilities throughout the State and Nation. Hydropower facilities are characterized by long operational life spans with corresponding low maintenance costs. The project will help meet demands of occurring growth on the island and fulfill the needs and expectations that Hawaii residents have for power without adverse impacts to the environment. It will also reduce the dependency on imported fuel oil, thus increasing the island's energy self-sufficiency.

The proposed hydroelectric project will provide employment opportunities during the planning, design, construction and operation phases. The project will benefit both the local and State economy by increasing employment and by the purchasing of construction materials. The purchase of goods, services, and materials will stimulate the economy, and, due to the multiplier effect, indirect economic benefits will be realized as well.

Objectives and Policies for the Economy - Potential Growth Activities

Objective

o Development and expansion of potential growth activities that serve to increase and diversify Hawaii's economic base.

Policies

1) Facilitate investment and employment in economic activities that have the potential for growth such as ...energy and marine related industries.

2) Accelerate research and development of new energy-related industries based on wind, solar, ocean, and underground resources and solid waste.

5) Promote Hawaii's geographic, environmental, social, and technological advantages to attract new economic activities into the State.

6) Provide public incentives and encourage private initiative to attract new industries that best support Hawaii's social, economic, physical, and environmental objectives.

Comment: Hawaii's geographic, environmental, social and technological attributes allow for potential growth of alternate energy development, particularly hydroelectric power. The expansion and continued development of indigenous energy sources in Hawaii will help to diversify the economy by reducing the dependence on petroleum fuels which must be imported. Hydropower facilities support Hawaii's objectives of energy self-sufficiency; diversified and viable economy; beautiful, clean, stable and unique environment; and enhanced public safety, comfort and well-being.

Objectives and Policies for the Physical Environment - Land Based, Shoreline and Marine Resources

Objectives

- o Prudent use of Hawaii's land-based, shoreline, and marine resources.
- o Effective protection of Hawaii's unique and fragile environmental resources.

Policies

2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.

4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.

5) Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions.

6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaii.

8) Pursue compatible relationships among activities, facilities, and natural resources.

Comment: The proposed hydropower project is a compatible use of the stream environment as it is a nonconsumptive and nonpolluting use of the water resource. Extensive, detailed studies of the Honoli'i environment were completed in the project planning and design to ensure protection of and compatibility with the natural resources and ecological systems. Appropriate mitigative measures will be taken to avoid potential environmental damage.

Objectives and Policies for the Physical Environment - Land, Air and Water Quality

Objective

o Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources.

Policies

2) Promote the proper management of Hawaii's land and water resources.

4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaii's people.

Comment: The land, water and air resources of the site are its principal assets. These features will be maintained and protected. Proper management of the area's resources is handled through the CDUA/EIS process of the Department of Land and Natural Resources and the requirements of the Water Commission. The project will comply with all pertinent state regulations and permit conditions to assure proper management.

The nonpolluting hydropower project will have a beneficial effect on air quality since it will displace fossil fuel generation of an equal amount of electricity.

<u>Objectives and Policies for Facility Systems - Energy/ Telecommunications</u>

<u>Objectives</u>

- o Dependable, efficient, and economical statewide energy and telecommunication systems capable of supporting the needs of the people.
- o Increased energy self-sufficiency.

<u>Policies</u>

1) Support research and development as well as promote the use of renewable energy sources.

2) Ensure a sufficient supply of energy to enable power systems to support the demands of growth.

4) Ensure that the development or expansion of power systems and sources adequately consider environmental, public health, and safety concerns, and resource limitations.

Comment: The natural stream flow of Honoli'i is a renewable energy resource which can be harnessed to provide "clean" power to meet current and future electricity demands. Throughout the design phase, environmental impact statement process, and other permit processes, the project will evaluate and mitigate potential environmental, safety and resource limitations.

PRIORITY GUIDELINES

Economic Priority Guidelines

- Provide public incentives and encourage private initiative to develop and attract industries which promise long-term growth potentials and which have the following characteristics:

  (A) An industry that can take advantage of Hawaii's unique location and available physical and human resources.

  (B) A clean industry that would have minimal adverse effects on Hawaii's environment.

- Encourage the development, demonstration, and commercialization of renewable energy sources.

Comment: The proposed hydropower project is a clean industry that takes advantage of one of Hawaii's renewable resources to produce energy. The project will have minimum adverse effects on the environment, as described in this EIS.

Population Growth and Land Resources Priority Guidelines

- Utilize Hawaii's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline, conservation lands, and other limited resources for future generations.

- Protect and enhance Hawaii's shoreline, open spaces, and scenic resources.

Comment: The Honoli'i hydropower project will contribute to meeting Hawaii's energy needs to support its growing population. It will be a non-consumptive user of the water resource and will cause minimal disruption to the natural environment or agricultural resources. The integrity of the Conservation District will be retained by environmentally sensitive design and development.

2. <u>State Functional Plans</u>

Functional plans have been prepared by State agencies and serve as the primary implementing vehicles for the goals, objectives, and policies of the Hawaii State Plan. The following functional plans are pertinent to the proposed project:

<u>State Agriculture Functional Plan</u>

The focus of the State Agriculture Functional Plan is towards lands "suitable and used (or potentially usable) for agriculture production." Such lands are found primarily within the State Agricultural District.

The proposed project's penstock will be buried alongside existing cane roads in productive agriculture lands south of the stream. Except for temporary closure of cane road sections during penstock installation, the project will not adversely affect any agricultural production or operations.

State Conservation Lands Functional Plan

The purpose of this plan is to "establish a rational basis for managing the Conservation lands and resources in Hawaii." It attempts to address areas of statewide concern including watersheds, terrestrial habitat, ocean habitat, areas with endangered species, natural streams, shoreline, open space, natural areas, air and water quality sensitive areas, and historic and cultural sites.

The proposed project contains no watershed areas, ocean habitat, or shoreline. It does, however, contain terrestrial habitats which may be used by endangered avifauna, a natural stream and significant stream habitat, open space, natural areas, pristine air and water conditions, and limited historic and cultural sites.

A primary reason for the preparation of this EIS is to use it to support an application to the Board of Land and Natural Resources for a Conservation District Use Permit. The basic premise of this action is that adequate mitigative actions have been proposed to allow the proposed development to take place with minimal impact to the site's natural, physical and cultural features. This EIS identifies adverse impacts and mitigative measures to help maintain the highest possible environmental quality while providing electricity from an indigenous, non-consumptive, non-polluting source.

<u>State Energy Functional Plan</u>

The intent of the State Energy Plan is to further define and implement the long-term energy objectives of the Hawaii State Plan, discussed above, which support the State's goal to encourage development of renewable, indigenous energy sources and to increase energy self-sufficiency.

The proposed action directly supports the objectives of the energy plan in that it is a private sector project which uses appropriate alternate energy technology to produce electricity. Furthermore, the economics of the project show that it is a good long-term energy choice. Once the construction capital is amortized, experience in Hawaii has shown that the hydropower plant continues to produce energy efficiently for decades with minimal additional costs for operation and maintenance. The project further meets the objectives of the energy plan in that significant attention has been given to impact management during the initial planning stages of the development in order to maintain a high degree of environmental quality, preserve future resource use options and increase community acceptance of energy projects.

State Health Functional Plan

The purpose of this plan is to guide State and County agencies and the private sector in maintaining a clean and healthful environment and in providing adequate health care services and facilities for Hawaii's people. Objectives of the plan include preventing degradation and enhancing the quality of Hawaii's air, land and water. One implementing action for this objective is to operate the EIS process through the Office of Environmental Quality Control.

The project's compliance with the EIS process has been discussed above. The project also prevents degradation of Hawaii's air and water as discussed in the relevant sections of this EIS.

State Historic Preservation Functional Plan

Purpose of plan is to set forth guidelines for the preservation of history in Hawaii, and to promote the preservation of significant historic records, artifacts, oral histories, and traditional arts and skills.

An archaeological survey of the project area has been conducted (Appendix D) to locate, describe and determine the significance of the historic and archaeologic sites within the project area. Close coordination will be maintained with the State Historic

Sites Office and the County Planning Department throughout the development process to assure preservation of significant sites.

<u>**State Water Resources Development Functional Plan**</u>

The purpose of this functional plan is to present guidelines for the regulation, development, and preservation of water resources. The State Water Code, discussed separately in this chapter, is the result of implementing the plan's objective to "enunciate state water policy and improve management framework." Other relevant objectives are to maintain long-term availability of water supplies, to assure adequate water for municipal and agricultural uses, to support programs for hydroelectric power production, and to protect and enhance Hawaii's freshwater and estuarine environment.

Honoli'i Stream is not a source of domestic water, nor will the project be located in a watershed area. The stream is not used or diverted for agriculture irrigation either. Due to these conditions, and the fact that the project is a non-consumptive user of water, the project will not affect the availability of water for other uses.

Although the plan's objectives to support the production of hydroelectric power and to protect and enhance the water environment seem contradictory, careful planning and design can accommodate important developmental and environmental values in a harmonious solution. Such a solution is further refined through the permit and review processes at the Federal, State and County levels.

3. <u>State Land Use Laws (Chapters 183 and 205, HRS)</u>

The Honoli'i hydroelectric project will encompass lands within the State Conservation and State Agricultural Districts as designated by the State Land Use Commission. The proposed weir, powerhouse substation, and a portion of the new 69 kV line are within the Conservation District, while the proposed penstock, which will follow existing canehaul roads on the south side of the stream, and the remainder of the transmission line are within the Agricultural District, as shown on Exhibit V-1.

The project area in the State Conservation District is under the jurisdiction of the State Board of Land and Natural Resources (BLNR). BLNR's Regulation No. 4 establishes controls for designated subzones of the

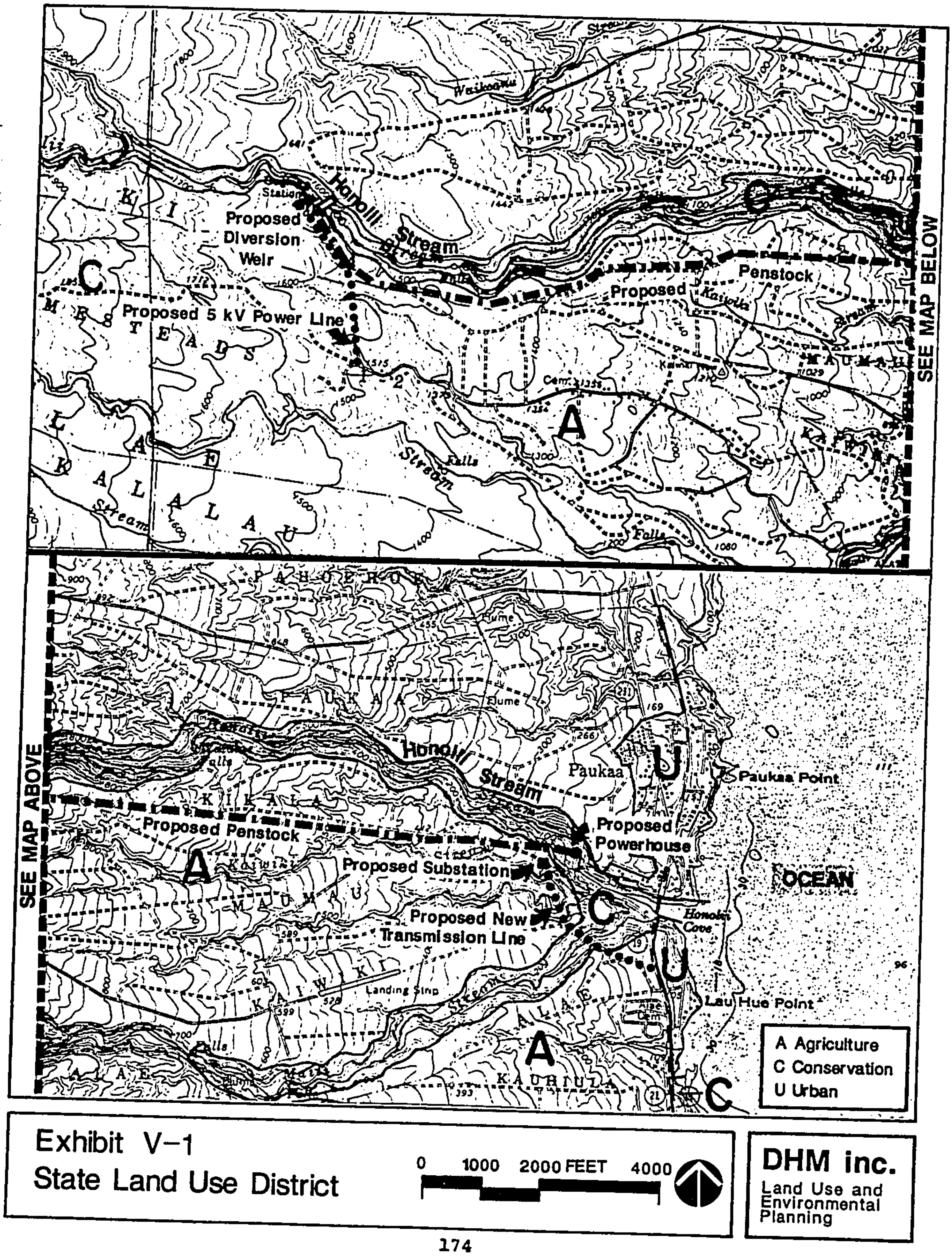

Exhibit V-1
State Land Use District

Conservation District. All of the project features are situated within the Limited subzone. (See Exhibit V-2). The Limited subzone is the second most restrictive of the four Conservation District subzones as to permitted uses.

Although hydroelectric systems are not expressly permitted in the Limited subzone, the BLNR may approve a CDUA to allow such use if it can be shown that the public benefit outweighs any adverse impact on the Conservation District and complies with the general objectives of the subzone. The proposed project will provide numerous public benefits as described in Chapters I and IV. The objective of the Limited subzone is to limit uses where natural conditions (such as steep slopes and lands susceptible to floods and erosion) suggest constraints or potential danger to human activities. The proposed hydroelectric project is consistent with the objectives of the subzone in that it will not increase public use of the area nor endanger the health and safety of the public.

The project area in the State Agriculture District is under the jurisdiction of the County since the project will encompass less than 15 acres of land.

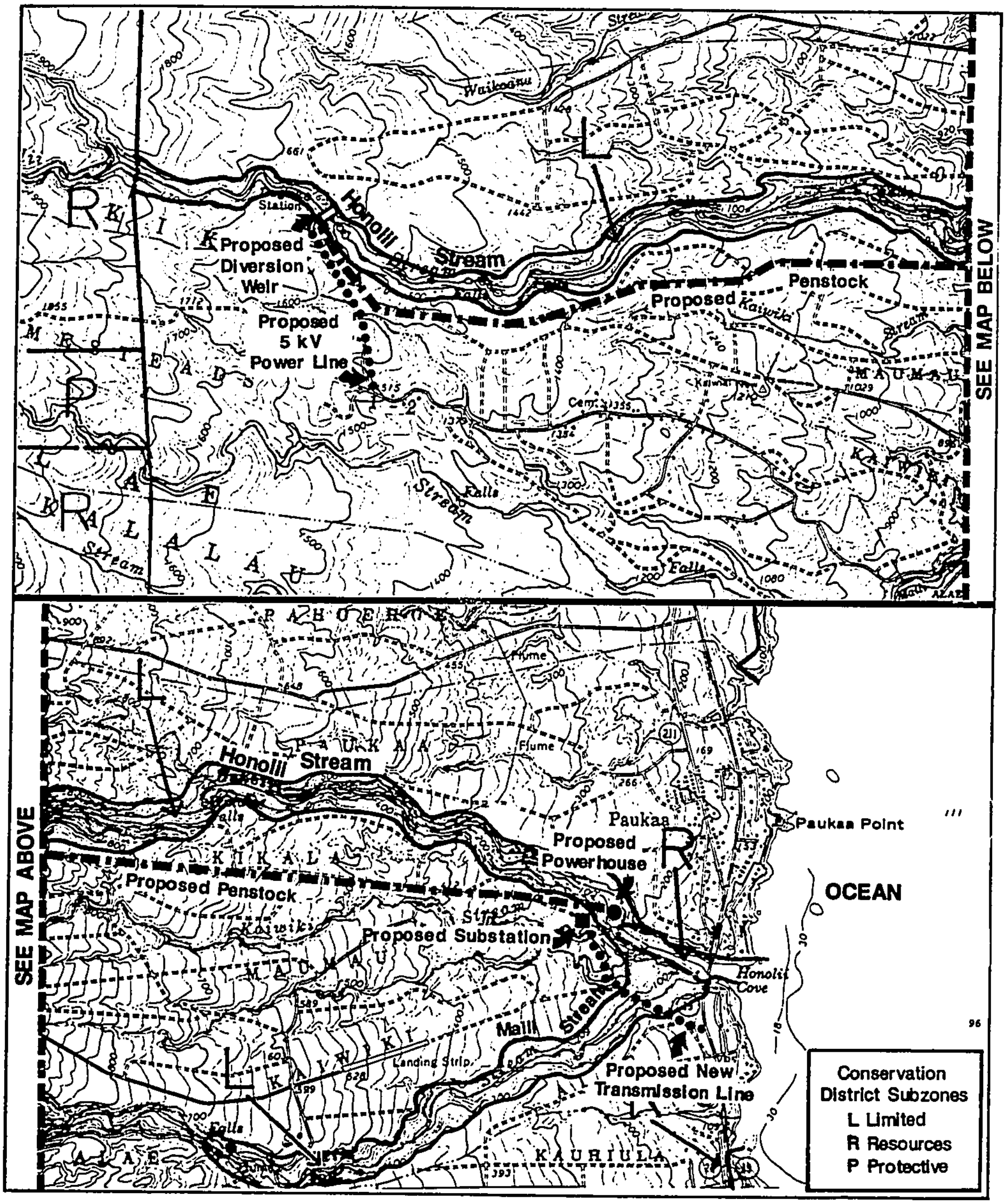

Exhibit V-2
State Conservation District Subzones

0 1000 2000 FEET 4000

DHM inc.
Land Use and Environmental Planning

4. Environmental Impact Statements (Chapter 343, HRS)

At the time a CDUA is accepted for processing, proposed actions within the State Conservation District require a determination by the Department of Land and Natural Resources (DLNR) whether or not an Environmental Impact Statement (EIS) is required. DLNR has determined that an EIS is required for the proposed action and this document has been prepared to satisfy that requirement. As "approving agency" for the CDUA, DLNR must accept the EIS as having met Chapter 343, HRS requirements before the CDUA can be approved by the BLNR.

5. State Environmental Policy (Chapter 344, HRS)

The proposed hydroelectric power project is consistent with the State Environmental Policy which is to "promote efforts which will prevent or eliminate damage to the environment and biosphere ...," and to protect the natural resources from pollution.

6. State Water Code (Chapter 174C, HRS)

Section 7 of the Constitution of the State of Hawaii mandates the State's obligation to protect, control and regulate the use of Hawaii's water resources for the benefit of its people. The State Water Code, effective July 1, 1987, created the legal basis by which to carry out this mandate. The administration of the Water Code rests with the newly-formed Commission on Water Resource Management ("Water Commission").

Pursuant to the requirements of the Water Code, the Water Commission established an interim instream flow standard for all Hawaii streams in June 1988 which essentially maintains existing flow conditions on all streams. This "status quo" approach and the delay in permanent instream flow standards are due to the lack of sufficient information on the effects of environmental disturbance, stream ecosystems and aquatic fauna of Hawaii. Recognizing the need to be flexible in applying the standard, the Commission provided conditions to allow amendments to the standard. In accordance with the conditions, an amendment petition has been filed with the Commission for the proposed diversion of Honoli'i Stream. The amendment petition is expected to be processed concurrently with the CDUA, and the decision on the petition is to precede that of the CDUA.[88]

Two construction-related permits will be required for the Honoli'i project as mandated by the State Water Code: a stream channel alteration permit and stream diversion works permit.

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88. William W. Paty, letter to DHM Planners dated October 14, 1988.

7. <u>Coastal Zone Management Act (Chapter 205-A, HRS)</u>

The Coastal Zone Management Act (CZM) mandated the counties to designate Special Management Areas along their coastlines, and to regulate land use in these areas. The proposed project is not located within the SMA of Hawaii County.

8. <u>Other Energy-Related Legislation</u>

In 1974, the State Legislature adopted Act 237 (Chapter 196, HRS) which, among other things, created the position of a State Energy Resource Coordinator (ERC) to review and formulate existing and proposed energy resource programs. In 1978, the chapter was amended to designate the Director of the State Department of Business and Economic Development (DBED) as the ERC.

Also in 1974, the State Legislature established the Hawaii Natural Energy Institute (HNEI) (Act 235, HRS) to foster development of local natural energy research at the University of Hawaii. The HNEI maintains cooperation and coordination between all levels of government and private organizations involved with energy related projects with potential for Federal funding, and serves as the central source of information on natural energy policies and programs.

C. COUNTY

1. General Plan

The General Plan for the County of Hawaii is the policy document for the long-range comprehensive development of the island of Hawaii, providing direction for balanced growth of the County. The County of Hawaii General Plan was adopted in 1971, with revisions in 1979 and 1980. A 1987 Draft Hawaii County General Plan was published in April 1987, however it has not been adopted by the County Council. The plan contains goals, policies, and standards concerning 13 study elements as well as a series of land use maps referred to as the Land Use Pattern Allocation Guide (LUPAG) maps. The current LUPAG map designates the stream valley as "Conservation" and most of the surrounding area as "Agriculture," as shown on Exhibit V-3. The Paukaa area is shown as "Low Density Urban Development" with some "Alternate Urban Expansion" along the northern bank. North of Honoli'i Stream, the 1987 LUPAG proposes the change from Alternate Urban Expansion to Low Density Urban Development. The project has no effect on this area or proposed change.

The Honoli'i hydropower project is consistent with the goals and policies of the General Plan as indicated below.

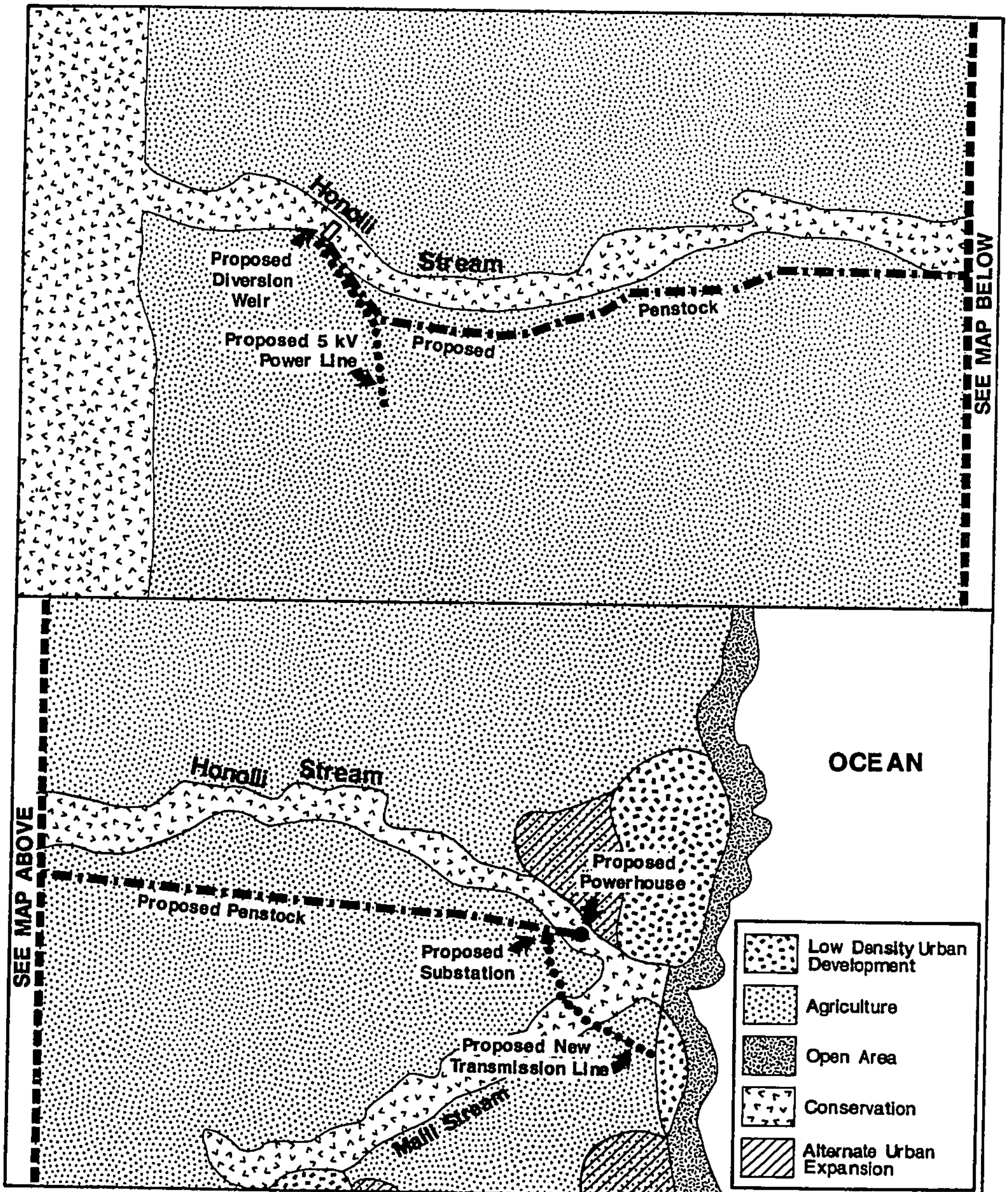

Exhibit V-3
General Plan Land Use

0 1000 2000 FEET 4000

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Land Use and Environmental Planning

Energy Element

In 1979/1980, the "Energy Element" was added to the General Plan. The following goals and policies are directly relevant to this project:

Goals:

- To strive towards energy self sufficiency for Hawaii County.
- To establish the Big Island as a demonstration community for the development and use of natural energy resources.

Policies:

- The County shall encourage the development of alternative energy resources.
- The County shall encourage the expansion of energy research industry.
- The County shall ensure a proper balance between the development of alternative energy resources and the preservation of environmental fitness.
- The County shall strive to assure a sufficient supply of energy to support present and future demands.
- The County shall coordinate energy research and development efforts of both the government and private sectors.

Economic Element

Policy:

- The County of Hawaii shall strive for diversification of its economy by strengthening existing industries and attracting new endeavors.

Environmental Quality

Policy:

- The County of Hawaii shall take positive action to further maintain the quality of the environment for residents both in the present and future.

Historic Sites

Goal:

- Protect and enhance the sites, buildings and objects of historical and cultural importance to Hawaii.

Policy:

- Require developers of land either public or private to provide a historical survey prior to the clearing or development of land when there are indications that the land under consideration has historical significance.

Natural Beauty

Goal:

- Protect and enhance the integrity of areas endowed with natural beauty.

Natural Resources and Shorelines

Goal:

- Protect and conserve the natural resources of the County from undue exploitation, encroachment and damage.

Public Utilities

Goals:

- To ensure that adequate, efficient and dependable public utility services will be available to users.

- To maximize efficiency and economy in the provision of public utility services.

Policies:

- Public utility facilities shall be designed so as to complement adjacent land uses and shall be operated so as to avoid pollution or disturbance.

- New power plants shall incorporate devices which minimize pollution.

Land Use

Goal:

- Protect and preserve forest, water, natural and scientific reserves and open areas.

2. Northeast Hawaii Community Development Plan and Hilo Community Development Plan

The community development plans were adopted in February 1979 and May 1975 respectively, and serve as medium range plans which implement the longer range General Plan, and serve as a more precise guide in land use regulation.

Although the plans do not specifically address the project area, reference is made to the following issues, all of which are supported by the project: reduce air pollution, protect natural resources and historic sites, and preserve productive agricultural lands.

3. County Zoning

Most of the project area and immediate surroundings are zoned by the County as A-20a (Agricultural district with required building site area of 20 acres). A small portion of the penstock and part of the 5 kV power line cross the A-10a zoned lands of Kaiwiki Homesteads. (Exhibit V-4). However, Hawaii County only has direct jurisdiction over the lands outside the stream bed, in the State Agricultural District. Project features in this area are subject to plan approval under the county's zoning code. The project area within the stream gulch which is entirely within the State Conservation District is under the authority of the BLNR.

However, permit applications for grading and building will be submitted to the County after the CDUA and Federal Section 404 applications are approved and detailed construction design plans are prepared.

4. <u>Special Management Area</u>

The entire project is outside the Special Management Area (SMA) and is therefore not subject to the SMA Rules and Regulations of the County of Hawaii (Chapter 205-A HRS and Rule No. 9, Hawaii County Planning Commission, Dec. 1975, as amended). (Exhibit V-5).

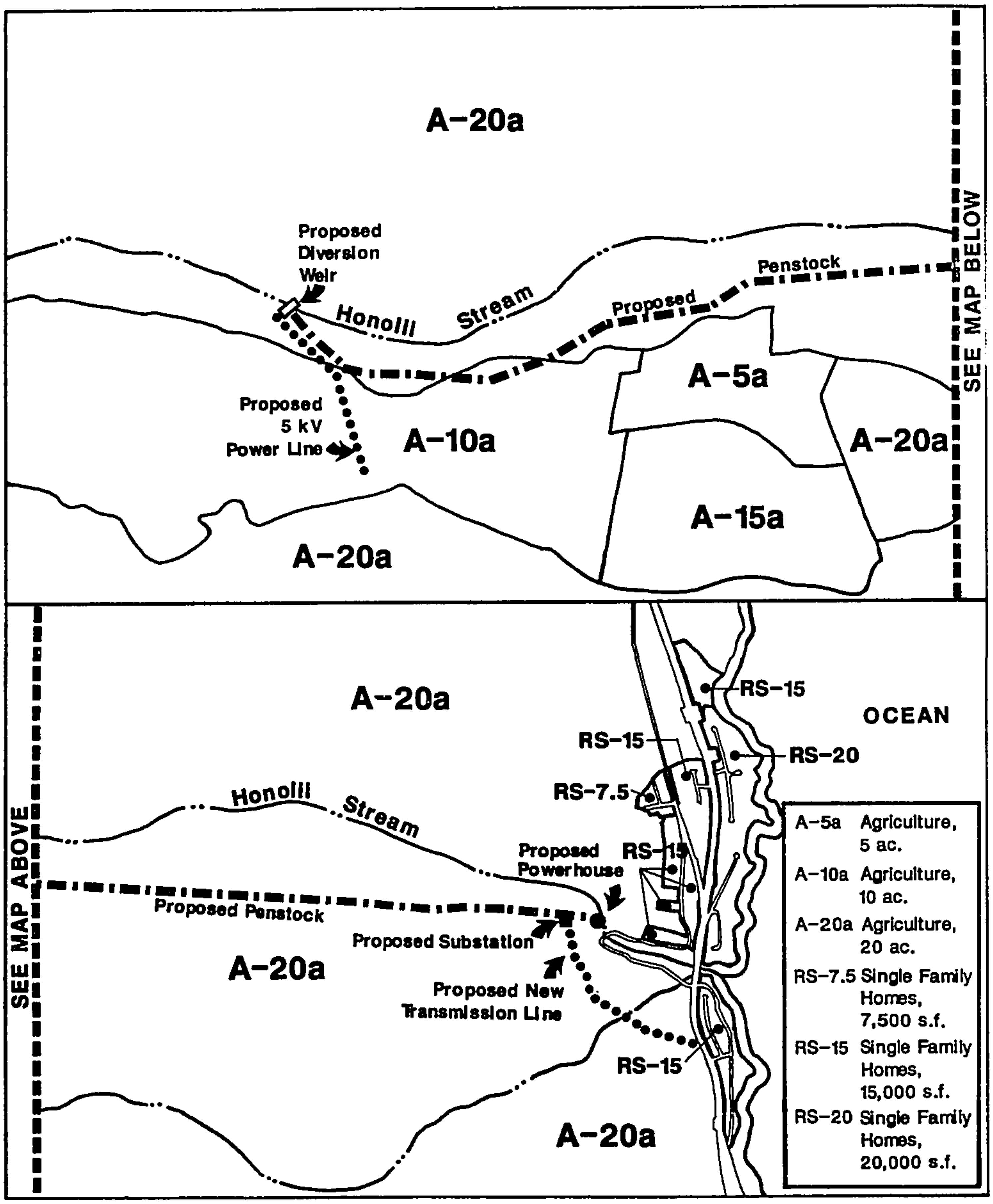

Exhibit V-4
Zoning

0 1000 2000 FEET 4000

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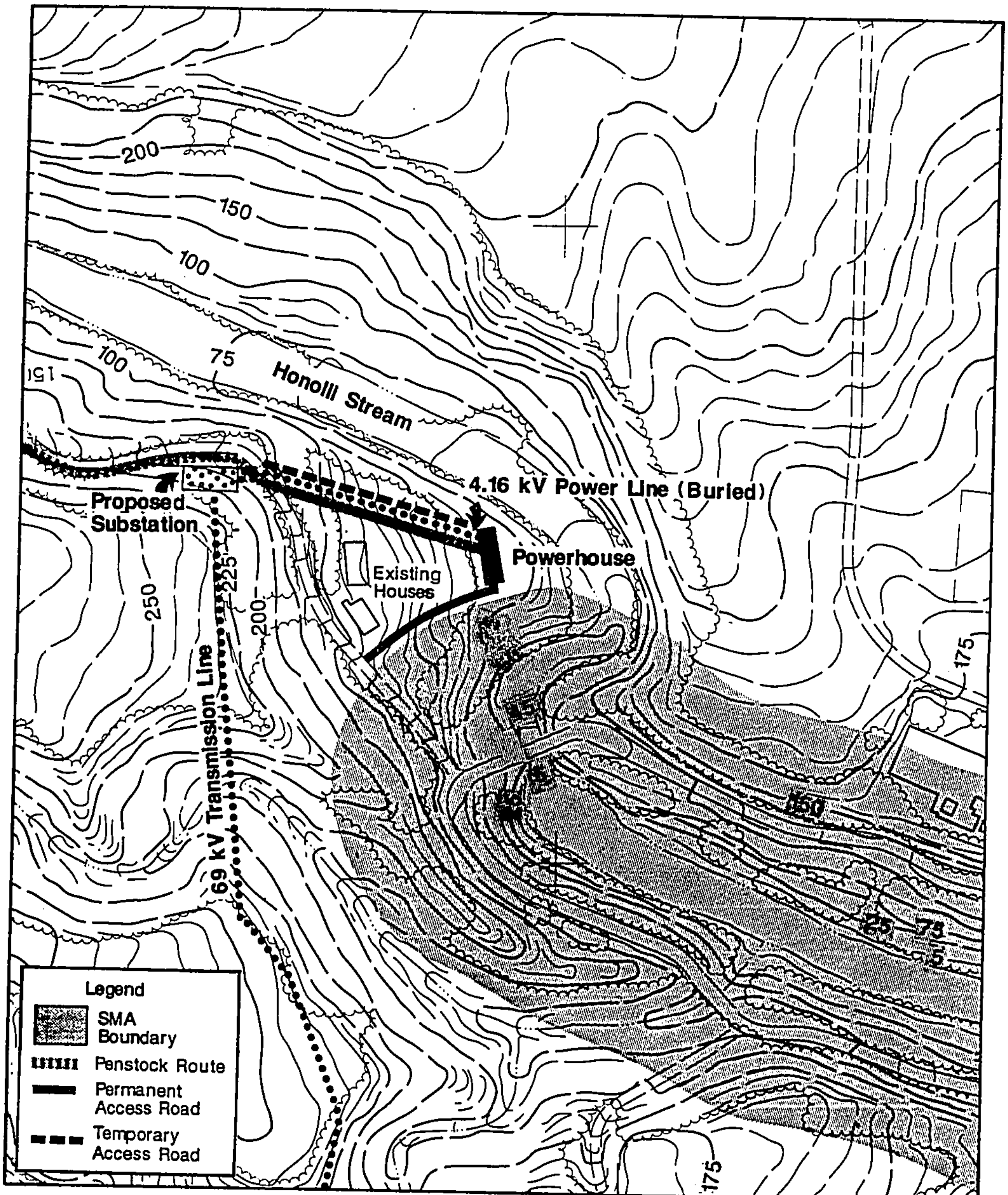

Exhibit V-5
Special Management Area

0 100 200 FEET 400

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D. LIST OF NECESSARY PERMITS

ISSUING AGENCY	PERMIT/APPROVAL	STATUS
U.S. Army Corps of Engineers	Section 404	**Application filed Jan. 20, 1989.**
State of Hawaii Department of Business & Economic Development	Coastal Zone Management Federal Consistency	**Application filed Jan. 23, 1989.**
State of Hawaii Department of Health	Section 401	**Application filed Jan. 23, 1989.**
State of Hawaii Board of Land and Natural Resources	Conservation District Use Permit	Application filed and accepted 9/12/88.
State of Hawaii Commission on Water Resource Management	Interim Instream Flow Standard Amendment	Petition filed 12/9/88.
State of Hawaii Commission on Water Resource Management	Stream Diversion Works Construction	Application filed 12/9/88.
State of Hawaii Commission on Water Resource Management	Stream Channel Alteration	Application filed 12/9/88.
County of Hawaii Planning Department	Plan Approval	Application to be filed upon CDUA approval
County of Hawaii Department of Public Works	Grading/Grubbing/ Building Permits	Applications to be filed upon CDUA approval

Chapter VI

VI. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Operation of the proposed hydropower project will result in a long-term environmental and economic gain for the region and island. The project involves a non-consumptive use of the clean, renewable water resources of Honoli'i Stream to produce energy. Once developed, the site will continue to produce pollutant-free power as long as the facility is maintained, and will reduce the dependence on oil-generated power.

Some short-term losses will occur during the project construction phase. These include disturbance to the stream bed, terrain, and vegetative cover in the localized areas of the project features.

Long-term loss related to the project is limited to the potential reduction of aquatic habitat within the affected reach of the stream.

Development of the Honoli'i hydropower project does not foreclose future options as the hydropower operation could be terminated, and the stream flow returned to its natural condition. Neither does it narrow the range of beneficial uses of the environment. In fact, the project expands the range of beneficial uses of a natural resource without eliminating other concurrent uses. There are no risks to health or safety associated with this project.

Chapter VII

VII. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Localized and temporary adverse impacts on noise levels and air and water quality are unavoidable during project construction. The movement of construction equipment, grading and blasting activities will increase the amount of air-borne dust and particulate emissions, and contribute to soil erosion around excavation sites and to sedimentation in low-lying elevations. The disturbance to land areas during construction will have an adverse effect on some native plants and possibly on the rate of soil erosion. **Any impacts will be minor in comparison to the noise, dust and disruption caused during harvesting of sugarcane which occurs every two years.** Due to the precautions which have and will be taken, the adverse impacts are not expected to be significant over the long term. It is expected these impacts will be perceived by few people other than construction workers because of the remoteness of most of the proposed activities from urbanized areas.

The diversion of water for the project may reduce habitat for stream fauna, but the survival of any species is not expected to be threatened. Long-term unavoidable adverse impacts of reduced habitat to stream fauna, which may occur, will be minor. **These statements can be made with confidence based on the observed effect the operation of the Wainiha** hydroelectric project has had on stream fauna. The weir and intake design and the release of a continuous flow will, at least in part, mitigate these impacts.

The potential for unavoidable adverse impacts must be weighed against the significant long-term benefits of the project. Producing power with an indigenous energy source will displace considerable consumption of non-renewable, imported fuel oil, decrease the island's overwhelming dependency on oil, and reduce the amount of air pollutants currently emitted by the oil-generation of 14.6 MW of power. In addition, jobs will be created during the construction phase, local and state economies will be stimulated, and the money now spent on imported oil may be retained in the local and state economies.

The potential adverse impacts to the environment must also be evaluated against the numerous State and County plans and policies intended to achieve energy self-sufficiency. The adverse impacts of the project are mitigable to levels which allow for balanced and acceptable tradeoffs between Conservation-type plans and policies and Energy-type plans and policies.

Chapter VIII

VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Construction and operation of the Honoli'i hydropower project will require an irreversible commitment of investment capital, labor, and construction materials. Once installed, the facilities will remain there for the life of the project

In the future, the project could be demolished and the land could be regraded and reclaimed. The river would adjust itself to a natural state similar to that prevailing now. Both on land and in the water, any incremental changes to habitat resulting from the proposed project can be reversed. The proposed project will not irreversibly or irretrievably commit land and water resources.

Chapter IX

IX. SUMMARY OF UNRESOLVED ISSUES

The potential impacts of the proposed action are generally known, and appropriate mitigation measures have been developed to address these impacts. Comments received from agencies, organizations and individuals possessing jurisdiction, expertise, and/or interest in the project have been responded to. Some commenters suggested than an Instream Flow Incremental Methodology (IFIM) study be conducted as a mitigation measure to determine the adequacy of a 10 cfs conservation flow. However, the applicability of IFIM in Hawaii is unresolved and recently completed IFIM studies have been unable to conducively determine an adequate conservation flow. The applicability of IFIM was the subject of a 3-year study for DLNR's Division of Water and Land Development (DOWALD) completed in October 1986. The study has not yet been accepted by DOWALD. The IFIM issue is covered in detail in Appendix G.

Other commenters have questioned the preference of using this renewable resource instead of others such as wind, solar etc. The alternative development of other types of renewable energy sources has been covered in detail both in the Reconnaissance Phase Documentation, Wailuku/Honoli'i Hydropower Study, completed by the U.S. Army Corps of Engineers in 1984 and the Hawaii Integrated Energy Assessment by the Department of Planning and Economic Development and the U.S. Department of Energy in 1981.

The developers of Honoli'i Hydroelectric Project are not advocating hydroelectric development at the expense of other types of alternate energy development that are being pursued by other developers. Since this project does not entail any public funds, development of the Honoli'i project will not jeopardize other alternate energy development. Also, as shown in Chapter I, HELCO has projected a need for between 180 and 275 MW of new generation in the next 20 years. This indicates that development of other renewable resources can be accommodated.

At this time, Mauna Kea Power believes that no significant issues are left unresolved.

Chapter X

X. ALTERNATIVES TO THE PROPOSED ACTION

A. PROJECT-RELATED ALTERNATIVES

Alternatives which were considered by Mauna Kea Power in planning the proposed project are described below.

1. Basic Project Type

The proposed project location and basic project type were largely based on previous studies by Hirai and Associates[89] and the U.S. Army Corps of Engineers.[90] The basic type of project appropriate for Honoli'i Stream was examined by the Corps as well as by Mauna Kea Power. A storage-dam-type project was compared with a run-of-the-river-type project. As is typical for Hawaii streams, a run-of-the-river/conduit-type project was selected for Honoli'i Stream because a storage dam is neither technically, economically, nor environmentally attractive.

2. Siting of Project Features

a. Diversion Weir

The proposed diversion weir is located at elevation 1,535 feet, 300 feet downstream from the existing gaging station. An alternate weir site considered was just below the fork in the stream,

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89. W.A. Hirai and Associates, for the State of Hawaii Department of Planning and Economic Development, Hydroelectric Power in Hawaii - A Reconnaissance Survey, February 1981.

90. Wailuku/Honolii Hydropower Study, 1984.

at about elevation 1,700 feet, 3,200 feet upstream from the gaging station. (Exhibit X-1). Although this alternate site would provide 165 feet of additional head (i.e. the difference in elevation between the diversion and the turbine), it was not selected for several reasons. One, the fork site is located within the Hilo Forest Reserve. Second, the quantity of flow at this site is less than the selected diversion site because it is farther upstream and there is a smaller drainage area contributing to the flow. Third, there is greater flow uncertainty at the fork because it is located 3,200 feet upstream from the gaging station.

To divert above the fork was not considered as an alternative because of the environmental and economic consequences associated with the construction of two weirs and splitting the penstock at the fork.

b. <u>Penstock</u>

The proposed penstock is located primarily along existing cane haul roads and will have minimal impact on the environment. An alternate route would have been to follow the stream the entire

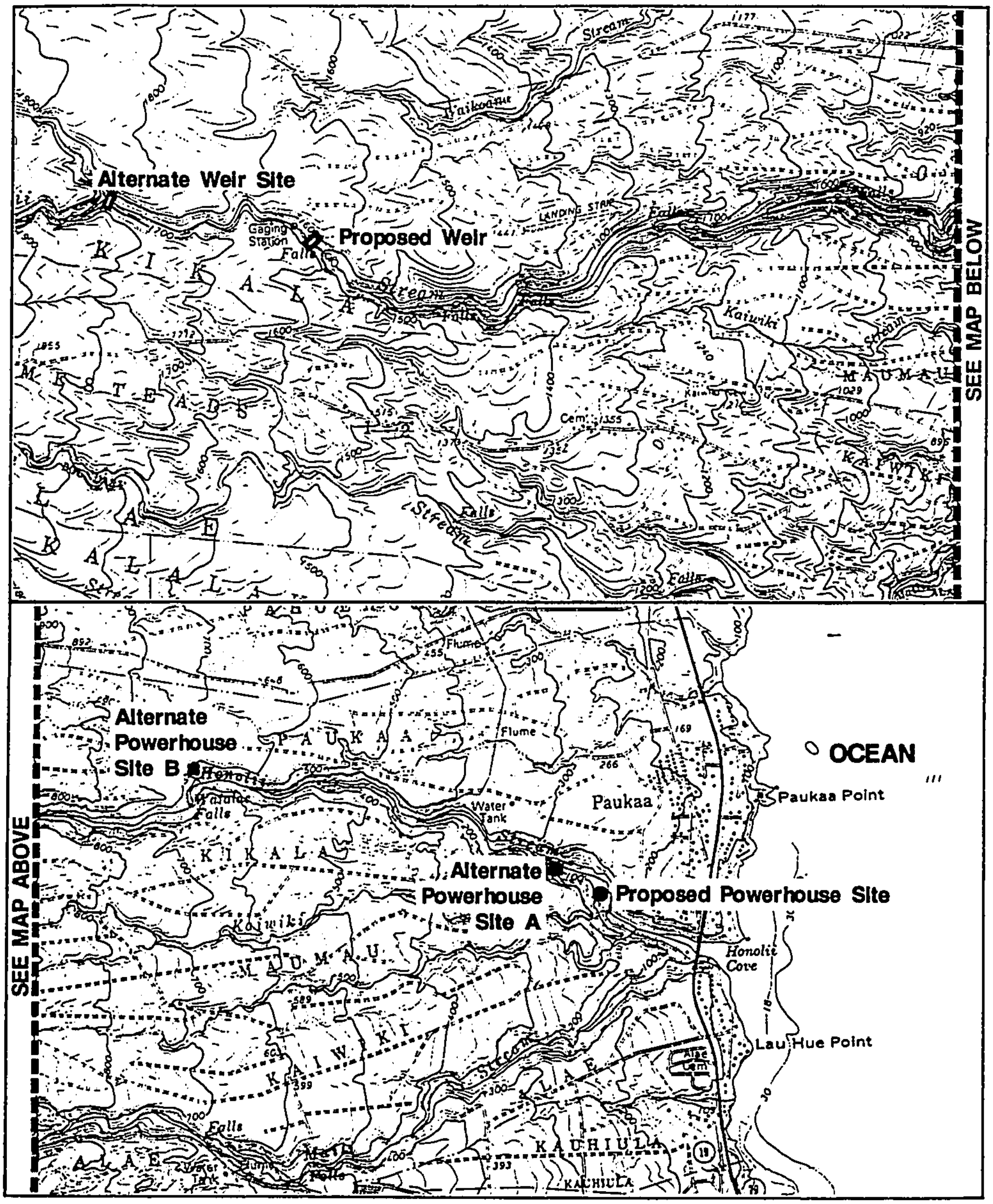

Exhibit X-1
Alternate Weir &
Powerhouse Sites

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length to the powerhouse. This was considered not practical, feasible, or desirable for the following reasons:

- The amount of earthwork required for penstock installation along the steep stream banks would cause significantly more damage to the stream environment in terms of removal of existing vegetation, disturbance to wildlife, and increased sediment in the stream, than will the cane road route.

- The steep terrain of the stream banks and numerous waterfalls would make access for penstock construction and maintenance difficult and result in higher costs.

c. <u>Powerhouse</u>

The proposed powerhouse will be located at elevation 80 feet, 3.7 miles downstream from the diversion weir, outside of the special management area (SMA). This site was selected because it will result in the least amount of environmental impact, is easily accessible for construction, and will generate the maximum amount of energy when compared to other sites which were considered.

Two alternate powerhouse locations were evaluated, and both were ultimately found to be less desirable from an environmental and economic perspective than the proposed site. The incremental savings in materials for a shorter penstock are not significant to the overall cost of the project since all other cost items (diversion weir, powerhouse, substation, transmission line, etc.) would remain relatively the same.

Alternate site "A" is located at elevation 100 feet, approximately 700 feet upstream from the proposed powerhouse site. (Exhibit X-1). It was considered because it would require a shorter penstock and therefore cost less, and a smaller reach of the stream would be affected by reduced flow. However, because of the location on the steep stream bank, access to this site would require the construction of an access road that would be benched into the stream bank. The powerhouse structure would also have to be benched into the bank. The grading and excavation involved would result in significantly higher construction costs, and also cause greater damage to the surrounding area than will occur with the proposed site.

A second alternate powerhouse location, "B", just below Waialae Falls at elevation 550 feet, 6,500 feet upstream from the proposed site, was also considered. Considerably less penstock material would be required and the reach of stream affected would be 1.3 miles less than using the proposed powerhouse site. This location would require the construction of a new access road of about 1,000 feet. Because of the relatively flat terrain in this area, the environmental impacts and construction costs involved in grading and excavation would be less than those for the alternate site A, but more than for the proposed site. The primary disadvantage of alternate site B is that a plant here would generate 35% less energy because of the reduced amount of water head.

3. <u>Generating Equipment</u>

The proposed project will utilize two units (turbine/generator sets) based on a consideration of the relative costs, shipping and installation factors, reliability and efficiency, environmental impacts, and engineering difficulties. The installation of three smaller units was considered because they would have the same total capacity (14.6 MW) as two larger units and would provide slightly greater efficiency, particularly during low flows. However, three units would require a larger powerhouse building.

B. NO ACTION ALTERNATIVE

If the proposed Honoli'i hydroelectric power project is not constructed, the physical and biological environments within and along the stream would remain in their present states. However, the no action alternative would have impacts, just as action alternatives do: The potential positive economic benefits to the State and community, by the development, will not materialize. For example, the employment required for construction of the project would not be realized, and tax revenues and direct and indirect revenues for goods and services would not be realized.

By not developing the site for the proposed use, the no action alternative would have a number of other impacts. The need for additional power on the Big Island will not be met with a clean, alternate, renewable resource. Instead, the utility will continue to generate electricity using oil and bagasse as primary fuels. Consequently, the no action alternative will preclude the intent of the State Plan, Energy Functional Plan, and the County General Plan which is to aid and promote the development of renewable energy resources in the state, increase energy self-sufficiency, utilize water resources, and control air pollution.

Chapter XI

XI. AGENCIES, ORGANIZATIONS, AND INDIVIDUALS CONSULTED

A. FEDERAL

Department of Agriculture, Soil Conservation Service
Department of the Army, U.S. Army Corps of Engineers
Department of the Interior, Fish & Wildlife Service
Department of the Interior, Geological Survey

B. STATE

Department of Business & Economic Development

Energy Division

Department of Health

Department of Land and Natural Resources

Aquatic Resources Division
Forestry and Wildlife Division
Land Management Division
Office of Conservation and Environmental Affairs
State Parks and Historic Sites Division
Water and Land Development Division
District Land Agent, Island of Hawaii

Office of Environmental Quality Control
Office of Hawaiian Affairs
Office of State Planning
University of Hawaii Environmental Center

C. COUNTY

Mayor's Office
Planning Department

D. OTHER

Hawaii Electric Light Company
Mauna Kea Agribusiness Company, Inc.
B.P. Bishop Estate
Mr. and Mrs. Isao Kiyan

Chapter XII

XII. COMMENTS AND RESPONSES DURING THE CONSULTATION PHASE

The EIS Preparation Notice was published in the <u>OEQC Bulletin</u> of November 8, 1988. All comment letters received by either the Department of Land and Natural Resources or the applicant during the consultation phase are included on the following pages.

Substantive comments received were addressed in the Draft EIS. Letters containing substantive comments were responded to by the applicant prior to filing the Draft EIS. These response letters are also included in this chapter.

MAUNA KEA POWER, INC.

May 10, 1988

Mr. William W. Paty
Chairperson, Commission on Water
Resource Management
P.O. Box 621
Honolulu, Hawaii 96809

Re: Proposed Interim Instream Flow Standard for Hawaii Streams

Dear Chairman Paty;

I have received a copy of the proposed standards for instream flows and would like to submit the enclosed comments. I am particularly concerned with the proposed interim standards for Honoli'i Stream on the Big Island.

The U.S. Army Corp of Engineers, Honolulu District (Corps), in cooperation with the applicable Federal and State agencies undertook an extensive study of the impacts associated with developing a hydroelectric facility on Honoli'i Stream. The study was published in September, 1984 (Attachment A). As part of that study, the U.S. Fish and Wildlife Service (Service) conducted studies which included reviewing existing data and reconnaissance surveys of Honoli'i. The Service then prepared a "Draft Coordination Act Report," the purpose of which was, "to advise you (the Corps) of significant fish and wildlife resources within the study area, and to identify appropriate planning considerations for your use during future project evaluations."

The Service's Report and subsequent classification of the habitat value of Honoli'i for native fish and wildlife populations, was prepared in accordance with the U.S. Fish and Wildlife Service Mitigation Policy. The "U.S. Fish and Wildlife Service Mitigation Policy; Notice of Final Policy," was published by the U.S. Department of Interior in the Federal Register on January 23, 1981 (Attachment B). It stated the following:

> "SUMMARY: This Notice establishes final policy guidance for U.S. Fish and Wildlife Service personnel involved in making recommendations to protect or conserve fish and wildlife resources. The policy is needed to: (1) ensure consistent and effective Service recommendations; (2) allow Federal and private developers to anticipate Service recommendations and plan for mitigation needs early; and (3) reduce Service and developer conflicts as well as project delays. The intended effect of the policy is to protect and conserve the most important and valuable fish and wildlife resources while facilitating balanced development of the Nation's natural resources."

P.O. Box 673, Kailua, Hawaii 96734 (808) 263-3896

Many of the concerns the Service sought to address in issuing their Mitigation Policy are similar to the concerns that the Hawaii Commission on Water Resource Management (Commission) seeks to partially address in issuing the Proposed Interim Instream Flow Standards (Standards). In classifying the quality of the resource, both the Commission and the Service use categories which range from High Value to Low Value. The one difference is that the Commission uses three categories where the Service uses four.

The Service's four Resource Categories and Mitigation Planning Goals are:

Resource category	Designation criteria	Mitigation planning goal
1	High value for evaluation species and is unique and irreplaceable.	No loss of existing habitat value.
2	High value for evaluation species and is scarce or becoming scarce.	No net loss of in-kind habitat value.
3	High to medium value for evaluation species and is relatively abundant on a national basis.	No net loss of habitat value while minimizing loss of in-kind habitat value.
4	Medium to low value for evaluation species.	Minimize loss of habitat value.

Comparison of the Service's Resource Categories with the Commission's Standards indicates the Service's Resource Category 1 corresponds to the Commission's High-Value Streams, Resource Categories 2 and 3 to Intermediate-Value Streams, and Resource Category 4 to Low-Value Streams.

In accordance with the Service's Mitigation Policy and existing biological data, the Service classified Honoli'i Stream in Resource Category 4, the category reserved for streams determined to have the LOWEST HABITAT VALUE for native fish and wildlife (Attachment C, page 10). No significant additional evaluations of Honoli'i Stream have been undertaken since that time. In a letter dated June 20, 1984, Mr. Susumu Ono, in his capacity as Chairperson of the Board of Land and Natural Resources at that time, concured with the Service's classification (Attachment D).

The Service's classification of Honoli'i Stream under Resource Category 4 was: (1) based on review of the existing data and reconnaissance surveys of Honoli'i; (2) made in conjunction with the Service's Mitigation Policy, the intended effect of which is to protect and conserve the most important and valuable fish and wildlife resources while facilitating balanced development of the Nation's natural resources; (3) the last significant evaluation of Honoli'i Stream; and (4) supported by Department of Land and Natural Resources. In light of these facts, Honoli'i should be placed in the corresponding interim category for Low-Value Streams.

Mauna Kea Power Company has been working on developing a hydroelectric facility on Honoli'i Stream for over the past two years. We fully appreciate the difficulty the Commission has in meeting the deadlines to classify all streams in Hawaii. Where there is no data specific to a particular stream we support the Commission's decision to take a conservative approach based on empirical formulas pending site specific studies. However, as in the case of Honoli'i where site specific studies were completed, we believe the Commission should rely on the specific data collected and the recommendations made from those studies. This would be consistent with the Commission's decision to utilize actual records from the U.S. Geological Survey where available rather than an empirical formula to determine stream flow.

After reviewing the specific environmental information available for Honoli'i Stream, classifying Honoli'i as having a pristine, high natural quality which provides optimum habitat for aquatic life is unjustified. In the Service's report, Honoli'i is described as having "heavy sedimentation (which) has, in part, made this habitat less suitable for native fishes." (Attachment C, page 11) An interim Standard of High-Value would cause public confusion and undue delays for development of a hydroelectric facility. During the process of obtaining a Conservation District Use Application Permit, more site specific studies will be conducted in accordance with the Service's recommendations. After the additional site specific

studies are completed, the Commission would have a firm basis to change the Service's classification if necessary.

Thank you for this cpportunity to submit comments on the Proposed Interim Instream Flow Standards. I hope our comments are helpful.

Very Truly Yours,

Albert S. N. Hee
Mauna Kea Power Co.

cc: Commission members
Bishop Estate
C. Brewer
U.S. Fish and Wildlife

wc-dpifs

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96850

ES
Room 6307

MAY 24 1988

Mr. Albert S. N. Hee
Mauna Kea Power, Inc.
P.O. Box 673
Kailua, Hawaii 96734

Re: Honoli'i Hydroelectric Power Project, Hawai'i

Dear Mr. Hee:

The purpose of this letter is to clarify the Service's evaluation of the biological resources of the Honoli'i River, Hawai'i. In 1984, the Service prepared a Draft Coordination Act Report on the proposed Wailuku-Honoli'i Hydroelectric Power project for the U.S. Army Corps of Engineers. Our report was based on a 1983 survey of aquatic macrofauna of the Honoli'i River.

During the 1983 survey, our aquatic biologist found small numbers of endemic fishes (o'opu alamo'o, o'opu nakea, and o'opu nopili), endemic shrimp ('opae kala'ole), and endemic snails (hihiwai) in the river. Populations of these species in the lower reaches were small; and only the shrimp was observed in significant numbers in the upper reaches. Despite substantial streamflow and natural bed material present during the 1983 survey, our aquatic biologist determined that the significant bed load of fine terrigenous sediments from adjacent canelands reduced the value of the habitat for native species. Thus, the Service concluded in our 1984 draft report that the Honoli'i River provided medium to low habitat for native stream fishes.

In 1988, the Service provided the Department of Land and Natural Resources (Department) with a list of high-value streams on Hawai'i that included Honoli'i River. The list was developed at the request of the Department for the proposed interim instream flow standards for Hawai'i Island. The criteria used by the Service to designate the Honoli'i River as high-quality were given equal weight and included the following:

a. High habitat value for native migratory stream animals;

b. Presence of the candidate endangered fish Lentipes concolor;

c. Essential habitat for the endangered koloa based on the Hawaiian Waterbird Recovery Plan (1985).

Our designation of Honoli'i Stream as high-value reflected the observations of another Service biologist who conducted surveys of the river in 1986 and 1987. In light of these recent observations, we concluded that the Honoli'i River does provide high value habitat for native fishes.

Please note that the Honoli'i River would still meet two other criteria for listing as high-value in the proposed interim instream flow standards even if the issue of habitat value were disputed.

If you have further questions on the biological value of Honoli'i River, please contact our Senior Staff Biologist John Ford (541-2749).

Sincerely yours,

Ernest Kosaka, Field Supervisor
Office of Environmental Services
Pacific Islands Office

cc: DLNR
Commission on Water Resource Management
DOWALD
DAR
Planning
Mr. Sydney Keliipuleole

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United States Department of the Interior
FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE
P.O. BOX 50167
HONOLULU, HAWAII 96850

ES
Room 6307

NOV 4 1993

Mr. William W. Paty
Chairperson, Board of Land and
Natural Resources
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Re: Conservation District Use Application No. 2205 and Environmental Assessment, Proposed Hydroelectric Power Project on Honolii Stream, Hawaii

Dear Mr. Paty:

We have reviewed the referenced Conservation District Use Application and Environmental Assessment (EA) and offer the following comments for your consideration.

General Comments

The U.S. Fish and Wildlife Service (Service) conducted a reconnaissance study of Honolii Stream in 1984, and prepared a Draft Coordination Act Report for the Draft Reconnaissance Hydroelectric Power Study for the Wailuku River and Honolii Stream (U.S. Army Corps of Engineers, 1984). Since then, staff biologists have conducted several site visits of portions of Honolii Stream. We have also met with the developer and consultant to discuss the proposed hydroelectric power project.

Specific Comments

a. Statement of Objective. Page 2. The determination by the applicant that the proposed hydroelectric power project is "consistent with the objective of the Limited subzone" should be clarified. The Administrative Rules governing land uses within the Conservation District state that the uses permitted in the Limited subzone include those allowed in the Protective subzone; emergency warning or emergency telephone systems; flood, erosion, or siltation control projects; and growing and harvesting of forest products (Section 13-2-12(c)(1-4)). The uses permitted in the Limited and Protective subzones do not specifically include hydroelectric power projects.

b. Diversion Weir and Intake Structures. Page 8. The statement that the diversion weir would allow "a minimum amount of flow to continue in the stream bed" should be corrected to state "a continuous instream flow sufficient to support existing populations of endemic diadromous stream fauna."

c. Diversion Weir and Intake Structures. Page 8. The proposed Draft Environmental Impact Statement (EIS) should include scale drawings of the diversion weir and passage structure. The weir should be designed to allow the upstream passage of native diadromous species over the crest of the weir. For example, the face of the weir may be grouted with cobble stones and indented with shallow irregularly spaced holes to mimic natural cascades. The notch at the crest of the diversion weir should be rectangular in cross-section, and be grouted with cobble stones to create a turbulent flow through the notch. The proposed fish passage structure should be designed in coordination with the Division of Aquatic Resources and the Service. We may recommend specific water velocities through the notch to allow upstream migration of native species based on further study of the project design.

d. Diversion Weir and Intake Structures. Page 8. The method of and justification for determining ten cubic feet per second (cfs) as a biologically suitable instream flow should be clarified. Honolii Stream has a discharge lower than 11 cfs less than 8% of the time (U.S. Geological Survey. Open-File Report 81-1056). Therefore, the proposed conservation flow of ten cfs may be too low to maintain existing populations of native fishes and invertebrates in Honolii Stream.

We believe that insufficient information has been presented in the EA to identify a biologically suitable instream flow for the affected reach of Honolii Stream. We recommend that detailed instream flow studies based on empirical field measurements be conducted to determine an instream flow to protect native freshwater fishes and invertebrates.

e. Diversion Weir and Intake Structures. Page 9. The Draft EIS should include scale drawings of the proposed trash racks and fish screens. The fish screens should also be designed to exclude the native 'opae kala'ole (*Atyoida bisulcata*). For the Wailua River hydroelectric power project on Kauai, the Service recommended fish screens with mesh size of 0.25 inches and maximum approach velocities of 0.5 feet per second measured immediately in front of the fish screens. We recommend the same standards for this project. In addition, the fish screens should be aligned parallel to the stream flow rather than at 90 degrees to the flow and the velocities should be evenly distributed across the face of the fish screen.

We remain concerned, as with the other hydropower projects in Hawaii, that the penstock intake would entrain newly hatched larval fish and invertebrates. The mortality of native stream fishes, invertebrates, and their larvae from the passage through pressurized penstocks and turbines of hydropower facilities in Hawaii is not known. However, the turbine-induced mortality of these life stages can be significant (Enclosure 1).

f. Diversion Weir and Intake Structures. Page 10. The Draft EIS should include details on the electronic water sensors that would be used to regulate water levels in the pool and the release of the conservation flow. We recommend that the diversion weir be designed to allow the water to spill through the release structure without the need for mechanical or electronic regulators. As with other proposed hydropower projects in Hawaii, we recommend that a stream gaging station be constructed downstream of the intake to insure compliance with the required instream flow.

g. Diversion Weir and Intake Structures. Page 11. Detailed drawings of the design and placement of the cable crane should be included in the Draft EIS. The need for temporary cofferdams for the construction of the diversion weir should be discussed in the Draft EIS.

h. Penstock. Page 13. Geotechnical studies should be conducted for the diversion weir, the first 1,600 feet of the penstock, the powerhouse site, and the access roads to determine the potential for slope failure and penstock collapse. Erosion control plans for the construction of the weir, penstock, and powerhouse should be discussed in the Draft EIS. It may be appropriate to install silt fences and erosion control fabric along steep cuts to minimize erosion before native vegetation can be replanted.

i. Powerhouse. Page 14. The amount of earthwork necessary to construct the powerhouse and access road should be discussed in the Draft EIS.

j. Powerhouse. Page 14. The Draft EIS should state whether the proposed project would use a two or three turbine generator configuration. In addition, the type of turbine units and the minimum and maximum flow to run each turbine should be included in the Draft EIS.

k. Access Roads. Page 16. Grading and erosion control plans for the construction of access roads should be discussed in the Draft EIS. Sites for spoil disposal from construction activities should also be identified.

l. Geologic Conditions. Page 26. This section should clarify the relationship between "growth of moss" and "fluctuating flow levels."

m. Stream Characteristics. Page 32. The legend for Exhibit IV-8 should identify the tributaries as perennial or intermittent. The Draft EIS should include field measurements of groundwater seepage and spring sources, and document flow accretion along the affected reach of Honolii Stream.

n. Stream Characteristics. Page 34. The Draft EIS should note that Honolii Stream was partially diverted for fluming cane and domestic use from 1911 - 1913 from a diversion upstream of the U.S. Geological Survey gaging station. Therefore, we recommend that the flow records from this gaging station for this period not be used to describe the hydrology of this stream.

o. Water Quality. Page 36. Water quality parameters, including turbidity and suspended sediments, are measured regularly at the existing U.S. Geological Survey station. This information should be used to substantiate the statement that Honolii Stream is "normally turbid."

p. Stream Fauna. Page 37. Recent studies by University of Hawaii scientists indicate that the planktonic larval period for the o'opu nakea (Awaous stamineus) and o'opu naniha (Stenogobius genivittatus) is approximately 135 and 161 days, respectively (Radtke, R.A.; R.A. Kinzie, III; and S.D. Folsom. Age at recruitment of Hawaiian freshwater gobies. Environ. Biol. Fish. (in press).

q. Stream Fauna. Page 37; Vegetation. Page 39; and Wildlife. Page 39. We understand that detailed studies describing the aquatic fauna, vegetation, and wildlife in the project area will be conducted for the Draft EIS. These studies should be coordinated with your Department and the Service. We understand that the aquatic survey of Honolii Stream by Mr. Kelly Archer has been completed. We would appreciate receiving an advance copy of his survey for our review. These reports should be appended to the Draft EIS. In the Service's 1984 Draft Coordination Act Report, we noted that the threatened Newell's Townsend's Shearwater (Puffinus auricularis newelli) was reported to have flown into the booms of cranes during the night harvest of sugar cane in Papaikou. We recommend that professional ornithologists conduct surveys to determine the presence of nesting sites and fledglings for the Newell's Townsend's Shearwater in the project area.

The Draft EIS should note that the Recovery Plan for Hawaiian Waterbirds (U.S. Fish and Wildlife Service, 1985) identifies streams along windward Mauna Kea as essential habitat for the recovery of the endangered koloa or Hawaiian Duck (Anas wyvilliana).

r. Water Quality. Page 51. In addition to the construction of the weir, intake works, and penstock, construction of the access road to the powerhouse and cable crane may also erode sediments into the stream.

aquatic habitat for native freshwater fishes and invertebrates. To mitigate this adverse impact, we recommend that the developer plant a permanent vegetative cover in a strip of agricultural land along the north and south banks of the Honolii Stream affected by the project. Each vegetative strip would be approximately 300-ft. wide and would consist of a permanent planting of trees, shrubs, and understory. The vegetative strip would control the run-off of sediments into the stream from the surrounding agricultural lands. The intermittent drainages that drain into Honolii Stream from agricultural lands would also be planted with a permanent vegetative cover.

iv. Ramping rates and flushing flows to remove accumulated stream bed sediments should be described in the Draft EIS.

v. The Draft EIS should discuss the cumulative impacts of hydroelectric power developments and related activities on native freshwater aquatic resources in Hawaii.

Summary Comments

Protection of the native aquatic resources in Honolii Stream from impacts associated with the proposed project will require both the establishment of biologically appropriate instream flows and the implementation of land treatment measures to control erosion and sedimentation of aquatic habitats. We recommend that the proposed project be designed and evaluated with these planning considerations.

The Service's mitigation goal to protect the native aquatic fauna is no net loss of habitat value. Our conservation flow recommendations will be fully consistent with this goal. We recommend that the developer initiate detailed instream flow studies through consultation with your Department and the Service using the IFIM to determine a biologically suitable conservation flow. My staff is available to assist in these instream flow studies.

The Commission on Water Resource Management (Commission) identified Honolii Stream as a high-value stream in the April 3, 1988 notice regarding the proposed Interim Instream Flow Standards for Hawaii. In response, our May 25, 1988 letter to the Commission stated that we had no objections to the registering of existing diversions, with the recommendation that there be no additional diversions on high quality streams in the State. In our opinion, additional diversions on high quality streams throughout Hawaii will stress populations of the candidate endangered o'opu alamo'o (Lentipes concolor). The

s. Water Quality. Page 52. This section states that the Draft EIS will discuss impacts to water temperature, pH, dissolved oxygen, and nutrient levels from reduced flow in the affected reach. We recommend that the Draft EIS also discuss impacts to aquatic habitat availability and suitability, and native fish and invertebrate populations from reduced flow in the project reach.

t. Socio-economic Impacts. Page 58. There is insufficient evidence presented to support the statement that the "proposed conservation flow is expected to maintain the existing stream fauna populations throughout the affected reach of the stream." We recommend that the best available technology and methods be used to determine the instream flow for this project. As with other significant hydroelectric power projects proposed for Hawaii, we recommend that the Instream Flow Incremental Methodology (IFIM) be used to determine a biologically appropriate conservation flow to protect native freshwater resources. To the best of our knowledge, detailed instream flow studies have not yet been conducted for this project.

In addition to the items described above, we recommend that the following topics be discussed in the Draft EIS.

i. We have recommended that watershed management plans be included as an integral part of proposed hydropower developments in Hawaii. Hydropower developments on the Wailuku River (Hawaii) and East and West Wailuaiki Streams (Maui) have included plans to control feral ungulates in the watersheds that feed the project streams. We recommend that this project also include a watershed management plan. It is in the developer's long-term interest to protect the water-retention capacity of the forest that feeds the project stream. We recommend the developer coordinate the watershed protection plan with your Department; U.S. Department of Agriculture, Animal Damage Control Program; and our office.

ii. The Draft EIS should identify less-damaging project alternatives, that is, project alignments that would reduce the length of stream that would be dewatered by stream diversion. For example, the Draft Reconnaissance Hydroelectric Power Study for the Wailuku River and Honolii Stream (U.S. Army Corps of Engineers, 1984), identified three alternatives for the Honolii Stream project that affected varying lengths of stream.

iii. The EA makes several references to sedimentation of Honolii Stream from run-off from surrounding agricultural lands. The retention of fine sediments within the stream bed may be worsened by decreased stream flows resulting from project operation. Fine sediments reduce the amount and quality of threats to this rare fish from the cumulative impacts of additional water diversion and hydroelectric power projects may militate for the listing of this fish as an endangered or threatened species.

We appreciate the opportunity to comment.

Sincerely,

Ernest Kosaka
for Allan Marmelstein
Pacific Islands Administrator

cc: U.S. Army Corps of Engineers, Operations Branch
Commission of Water Resource Management
Planning Department, Hawaii County
EPA, San Francisco
DAR, Hawaii
OEQC
ADC

0C29

392

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

October 19, 1988

Operations Branch

RECEIVED

'88 OCT 24 AM 7:46

DLNR OCEA

Mr. William W. Paty
Chairperson
Board of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Paty:

This is in response to your letter of October 7, 1988, regarding the CDUA for a hydroelectric project on the Honolii Stream in South Hilo District, Hawaii.

The project would require a Department of the Army permit. In addition, it would require the Federal Energy Regulatory Commission (FERC) license. The FERC license should be obtained prior to applying for a Department of the Army permit. The applicant should be advised to consult with the FERC for compliance with their licensing requirements.

Sincerely,

Stanley T. Arakaki
Chief, Operations Branch
Construction-Operations Division

DHM inc.
land use and environmental planning
1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

November 7, 1988

Mr. Stanley T. Arakaki
Chief, Operations Branch
Construction-Operations Division
Department of the Army
Fort Shafter, Hawaii 96858-5440

Dear Mr. Arakaki:

Subject: Honolii Hydroelectric Power Project

I am writing in response to your letter of October 19, 1988 to Mr. Paty of the State Board of Land and Natural Resources. In your letter, you indicated that the proposed hydroelectric project on Honolii Stream would require a FERC license and that such license should be obtained prior to applying for the Department of the Army permit.

As you are no doubt aware, there is currently some concern between the State of Hawaii and FERC over FERC jurisdiction on Hawaii streams. Under the circumstance, I would appreciate clarification of the basis for the Corps's position that the applicant must obtain a FERC license prior to applying for the Department of the Army permit. Please include copies of the statutes, rules, administration procedures or other such regulation that supports this position.

Thank you for your assistance with this issue.

Sincerely,

DHM Planners, inc.

Dyk Hee Murabayashi (Mrs.)
President

WH

cc: Mauna Kea Power, Inc.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

November 14, 1988

REPLY TO ATTENTION OF
Operations Branch

SUBJECT: Honolii Hydroelectric Power Project

Mrs. Duk Hee Murabayashi, President
DHM Inc.
Suite 2405
1188 Bishop Street
Honolulu, HI 96813

Dear Mrs. Murabayashi:

In regards to your letter of November 7, 1988, the Corps of Engineers can accept a Department of the Army (DA) permit application concurrent with your application for a Federal Energy Regulatory Agency (FERC) license to construct and operate a hydropower plant on Honolii Stream. However, the Corps will not make a decision on the DA permit application until after FERC has issued a FERC license or until FERC indicates in writing that the hydropower project is not under the jurisdiction of FERC.

FERC has only recently begun regulating or licensing hydropower projects in Hawaii. Because of FERC jurisdiction we informed potential hydropower developers to check with FERC about licensing requirements before applying for a DA permit.

The Corps will not take the lead federal agency role in hydropower development assessments for those projects under FERC jurisdiction. Under the Federal Power Act of 1920, FERC issues licenses for the construction, operation and maintenance of dams, water conduits, reservoirs, power houses, transmission lines and other physical structures of a hydropower project. Because of FERC's role, the Corps navigation responsibilities are addressed when appropriate provisions for navigation are included in the FERC license rather than a separate DA permit. Existing Corps regulations require a separate DA permit if the construction of the hydropower project requires the discharge of dredged or fill material.

In recognition of FERC's lead federal agency role, the Corps issued a nationwide permit for hydropower development. However, this nationwide permit is limited to modifications at existing reservoirs with a total generating capacity of 1500 kilowatts (2,000 horsepower). The Corps is presently developing a broader nationwide permit that will authorize the discharge of dredged and fill material for any FERC-licensed powerplant.

Similar to the Corps navigation responsibilities, the Corps expects to provide Clean Water Act recommendations for FERC consideration, but FERC will be the Federal agency principally responsible for determining minimum in-stream flow releases and other environmental controls for the hydropower project. As a matter of Corps policy, minimum instream flow releases is embodied in the State agency enpowered to allocate water quantities within the State. If conflicts arise, the Corps recognizes that state water allocations and preferences represent the public interest. In cases where State water allocations and preferences conflict with Federal statute or substantial interest (endangered species, navigation, Clean Water Act compliance or other applicable law), the Corps will refer the matter to Washington DC for guidance.

We hope that this letter clarifies the Corps position and policies regarding FERC licenses for hydropower projects and DA permit applications. A copy of the Corps regulations is provided for your information with reference to Sections 320.3(f), 330.5(a)(17), 330.5(b) and 330.6 (Enclosure).

Sincerely,

Stanley T. Arakaki
Stanley T. Arakaki
Chief, Operations Branch
Construction-Operations Division

Enclosure

Copies Furnished: (w/o Enclosure)

Dept. of Land & Natural Resources, Honolulu, HI
Div. of Water & Land Development, Honolulu, HI
US Fish & Wildlife Service, Honolulu, HI

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF THE ATTORNEY GENERAL
LAND/TRANSPORTATION DIVISION
ROOM 300, KEKUANAO'A BUILDING
465 SOUTH KING STREET
HONOLULU, HAWAII 96813

WARREN PRICE, III
ATTORNEY GENERAL

CORINNE K. A. WATANABE
FIRST DEPUTY ATTORNEY GENERAL

December 8, 1988

Mr. Stanley T. Arakaki
Chief, Operations Branch
Construction-Operations Division
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

Dear Mr. Arakaki:

Re: Hydroelectric Project in Hawaii:
Upper Wailua River, Kauai
East, West, and Middle Wailua River, Maui
Hanalei River, Kauai
Wailuku River, South Hilo, Hawaii
Honolii Stream, South Hilo, Hawaii

I am writing in response to your October 19 and November 1, 1988, letters to Mr. William W. Paty, your June 7, 1988, letter to Mr. Clark M. Mower (Bingham Engineering), and your September 20, 1988, letter to Ms. Jacqueline Parnell (KRP Information Services), regarding proposed hydroelectric power projects in the State of Hawaii.

In each of these letters your office indicates that the applicant must obtain a license from the Federal Energy Regulatory Commission to develop the project. We believe this view is not correct in the cases noted above.

The Federal Energy Regulatory Commission (FERC) succeeded the old Federal Power Commission (FPC) and exists pursuant to the Federal Power Act, 16 USC 791-828. FERC's authority to require a license for hydroelectric project derives from

section 23(b) of the Act which is codified at 16 USC 817. FERC only has jurisdiction over proposed hydroelectric projects which are:

1) ". . . across, along, or in any of the navigable waters of the United States (including the Territories) . . ."; or

2) "upon any part of the public lands or reservations of the United States (including the Territories) . . ."; or

3) "(which) utilize the surplus water or water power from any Government dam . . ."; or

4) on streams " . . . over which Congress has jurisdiction under its authority to regulate commerce with foreign nations and among the several state . . ." 16 USC 817

Each of the Hawaiian islands is geographically separated from each other by ocean channels. Electrical power does not travel instrastate, let alone in interstate commerce. None of the proposed projects are to be built on federal lands or reservations. None will use surplus water or water power from any government dam. None of the streams identified above are navigable at the site of the proposed projects. In fact, many of the proposed sites are above waterfalls.

Based upon these facts, FERC has no jurisdiction to issue a license. Accordingly, we would request that you review your letters to proposed hydroelectric developers and revise your previous advice regarding the necessity of obtaining FERC licenses.

We would appreciate your early consideration of this matter as there are a number of applications pending both with the State and before FERC. An expeditious resolution of this matter would be beneficial to all concerned. Without greater clarity of these jurisdictional questions, both private parties and the State could face enormous expenses and delays in administrative process and litigation.

Please contact me at your earliest possible convenience to discuss this matter if you have any questions (ph. 548-8931).

Thank you for your consideration of this matter.

Very truly yours,

William M. Tam
Deputy Attorney General
State of Hawaii

WMT:kk
cc: Wiliam Paty
Clark M. Mower
Dean Anderson
McNeill Watkins
Jacqueline Parnell
√ Al Hee
Doug John

ocea

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:
EPHSD

October 27, 1988

RECEIVED
'88 NOV 3 AM 9:09
DLNR
OCEA

MEMORANDUM

To: The Honorable William W. Paty, Chairperson
Board of Land and Natural Resources

From: Director of Health

Subject: Conservation District Use Application
File No: HA-9/12/88-2205
Request: Hydroelectric Power Project, Honolii Stream, South Hilo, Hawaii

The applicant should check with the Corps of Engineers if a Section 401 Water Quality Certification (WQC) is needed.

for JOHN C. LEWIN, M.D.

cc: DHO, Hawaii

586

ocea

H2

DEPARTMENT OF BUSINESS
AND ECONOMIC DEVELOPMENT

ENERGY DIVISION, 335 MERCHANT ST., RM. 110, HONOLULU, HAWAII 96813

JOHN WAIHEE
GOVERNOR
ROGER A. ULVELING
DIRECTOR
BARBARA KIM STANTON
DEPUTY DIRECTOR
LESLIE S. MATSUBARA
DEPUTY DIRECTOR

1218A:448

October 18, 1988

RECEIVED
'88 OCT 24 AM 7:48
DLNR
OCEA

MEMORANDUM

TO: The Honorable William W. Paty, Chairperson
Board of Land and Natural Resources

FROM: Roger A. Ulveling

SUBJECT: Comments on Conservation District Use Application

A hydroelectric power facility on the Honolii Stream in the South Hilo District on the Island of Hawaii would provide additional electrical energy from a renewable energy source which will further reduce the island's dependency on imported oil.

We support the development of a hydroelectric power plant on the Honolii Stream provided environmental factors are adequately addressed.

for Director

RAU/TOB:lta

DEPARTMENT OF LAND AND NATURAL RESOURCES
Office of Conservation and Environmental Affairs
Honolulu, Hawaii

FILE NO.: HA-9/12/88-2205
180-Day Exp. Date: 3/11/89
SUSPENSE DATE: 21 Days
DOCUMENT NO.: 4399E

OCT 6 1988

MEMORANDUM

TO: Aquatic Resources; DOWALD; Forestry and Wildlife; NARS; State Parks/Historic Sites; Land Management

FROM: Office of Conservation and Environmental Affairs

SUBJECT: REQUEST FOR COMMENTS
Conservation District Use Application

APPLICANT: Mauna Kea Power, Inc

FILE NO.: HA-9/12/88-2205

REQUEST: Hydroelectric Power Project

LOCATION: Honolii Stream, South Hilo District

THKs: 2-7-2: 21, 2-6-9: 11, and 2-6-12: 29

PUBLIC HEARING: YES_X_ NO____

Edward Henry
for Roger C. Evans

Attach.

DIVISION'S COMMENTS: Date: ____________

By: ____________

RECEIVED
'88 OCT 31 PM 4:16
DLNR
OCEA

THE PROPOSED LAND USE ... EFFECT ON THE EXISTING ... FISHERIES PROGRAM.
10-31-88

216

DIVISION OF AQUATIC RESOURCES

[illegible]		Suspense Date	
[illegible]		Draft Reply	☑
[illegible]	✓	Reply Direct	☐
[illegible]	✓	Forward	
[illegible]		Information	☐
[illegible]		Comp. Act & File	☐
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Bob Your comments by 10/21 please
EO 10/[illegible]

DEPARTMENT OF LAND AND NATURAL RESOURCES
Office of Conservation and Environmental Affairs
Honolulu, Hawaii

FILE NO.: HA-9/12/88-2205
180-Day Exp. Date: 3/11/89
SUSPENSE DATE: 21 Days 10/17
DOCUMENT NO.: 4399E

OCT 6 1988

DK

MEMORANDUM

TO: Aquatic Resources; DOWALD; Forestry and Wildlife; NARS; State Parks/Historic Sites; Land Management

FROM: Office of Conservation and Environmental Affairs

SUBJECT: REQUEST FOR COMMENTS
Conservation District Use Application

APPLICANT: Mauna Kea Power, Inc

FILE NO.: HA-9/12/88-2205

REQUEST: Hydroelectric Power Project

LOCATION: Honolii Stream, South Hilo District

THKs: 2-7-2: 21, 2-6-9: 11, and 2-6-12: 29

PUBLIC HEARING: YES_X_ NO____

RECEIVED
OCT 7 1988
Div. of Aquatic Resources

Edward Henry
for Roger C. Evans

RECEIVED
'88 OCT 28 AM 10:39
DLNR
OCEA

Attach.

DIVISION'S COMMENTS: Date: 10/27/88

See attached

By: Henry M. Sakuda

RECEIVED
[illegible]
Div. of Aquatic Resources

12/22/87

State of Hawaii
Department of Land and Natural Resources
DIVISION OF AQUATIC RESOURCES

DATE: October 27, 1988

MEMORANDUM

TO: Paul Kawamoto, Program Manager, Aquatic Resources & Environmental Protection
THRU: Eric Onizuka, Program Manager, Recreational Fisheries
FROM: Robert T. Nishimoto, Aquatic Biologist, Hawaii
SUBJECT: Comments on X 1. Conservation District Use Application HA-9/12/88-2205
2.

Comment Requested by Roger Evans, Office of Conservation and Environmental Affairs — Date of Request 10/06/88 — Date Rec'd 10/11/88

Summary of Proposed Project

Title: Environmental Assessment, Honolii Hydroelectric Power Project

Project by: Mauna Kea Power, Inc. (Agent: DHM Planners, Inc.)

Location: Honolii Stream, South Hilo District

Brief Description:

Mauna Kea Power, Inc. proposes to construct a 14.6 MW run-of-the water hydroelectric plant along the Honolii River. A diversion weir will be located at the 1530 feet elevation, and the water diverted through a 20,000 feet long penstock to a power plant and substation, both located 3.7 miles downstream at the 100 feet elevation. The tailrace will be designed so the water will free fall into the river to prevent fish entrainment. A 3.7-mile segment of the Honolii River will be diverted. A conservation water flow of 10 cfs is proposed in the affected reaches of the River, maintained by water level sensors at the weir.

217

An EIS will be prepared. Aquatic surveys are currently underway to identify conspicuous aquatic fauna and determine the effects of the project on the ecology of the River. Mitigative measures to lessen or avoid potential impacts on stream fauna and habitat is to be discussed in the EIS.

Comments:

1. Additional elaboration of the proposed designation of 10 cfs as the conservation water flow rate is needed, as this value may not meet the minimum water flow criterion for existing stream organisms and habitats. We suggest that the minimum 10 cfs flow is premature and additional evaluations/studies are needed.

2. The 10 cfs flow rate will be monitored immediately below the diversion weir. It is not clear whether or not this flow rate will be "maintained" throughout the entire diverted 3.7 mile segment of the Honolii River (increase flow is suggested from the tributaries and/or springs). The minimum determined conservation water flow should be maintained throughout the diverted segment of the stream.

Memo to Paul Kawamoto
Page 2

Re: Environmental Assessment - Honolii Hydroelectric Power Project

3. The conservation water flow will be maintained through a shallow notch over the top of the 15 feet high weir. This design will effectively form a barrier for the diadromous migration of aquatic organisms. A modification in the weir design should be considered to include a fishway to accommodate both the up and downstream migration of diadromous organisms.

for ROBERT T. NISHIMOTO

RECEIVED
'00 OCT 20 AM 10:39
DLNR
OCEA

October 19, 1988

MEMORANDUM:

TO: Calvin W.S. Lum, D.V.M., Administrator

FROM: Charles K. Wakida, District Forester
Ronald E. Bachman, District Wildlife Biologist

SUBJECT: CDUA HA-9/12/88-2205, Hydroelectric Power Project, Honolii Stream, South Hilo District

Forestry Comments:

We have no comments at this time. We reserve comments for the draft Environmental Impact Statement to be submitted for review.

Wildlife Comments:

The EIS should, however, cover current changes in land use patterns specifically where macadamia nuts are replacing sugar cane and how conditions in the stream may improve with less run-off. Stream fauna will be expected to proliferate with less sedimentation making habitat better than marginal. Will this be affected?

Aukuu and other wildlife may inhabit pond (penstock) areas. Are there any objections? If limu becomes a problem, how will it be met?

CHARLES K. WAKIDA

RONALD E. BACHMAN

RECEIVED '88 OCT 24 AM 1:30 DLNR OCEA

WTS/REB:flr

ENDORSEMENT 10/20/88

I concur with Hawaii District's comments.

CALVIN W. S. LUM, D.V.M.

RECEIVED '88 OCT 20 AM 8:08 DLNR OCEA

October 18, 1988

MEMORANDUM

TO: Roger Evans, OCEA

FROM: Ralston H. Nagata, State Parks Administrator

SUBJECT: CDUA HA-2205 -- Honolii Hydroelectric Power Project (Mauna Kea Power Inc.) Kikala, South Hilo, Hawaii

HISTORIC SITES SECTION CONCERNS:

The EA (p. 54) indicates that an archaeological inventory survey will be conducted for the EIS to identify all significant historic sites in the project area. We will thus await the findings of this survey before providing historic preservation review comments.

RECREATION CONCERNS:

There are no state park recreation concerns.

RALSTON H. NAGATA

ocea

402

OFFICE OF STATE PLANNING
Office of the Governor
STATE CAPITOL, HONOLULU, HAWAII 96813 TELEPHONE: (808) 548-3493

JOHN WAIHEE, Governor

Ref. No. P-8825

October 20, 1988

RECEIVED
'88 OCT 24 AM 7:58
DLNR
OCEA

MEMORANDUM

TO: The Honorable William W. Paty, Chairperson
Department of Land and Natural Resources

SUBJECT: Conservation District Use Application, Honolii Hydroelectric Power Project, Hilo, Hawaii, (HA-9/12/88-2205)

We have reviewed the subject application and offer the following comments.

The Hawaii Coastal Zone Management (CZM) Program establishes objectives and policies for managing coastal resources, including coastal ecosystems and historical resources. The CZM coastal ecosystem policies in Chapter 205A, HRS, call for an improved technical basis for natural resources management, the preservation of valuable coastal ecosystems of significant biological importance, and minimizing disruption or degradation of coastal water ecosystems by effective regulation of stream diversions. With respect to these policies, we are concerned that the proposed diversions will alter water quality and quantity in ways which can adversely affect stream flora and fauna. In particular, we are uncertain about the adequacy of the proposed maintenance flow of 10 cubic feet per second (CFS) for Honolii Stream in sustaining habitat essential to the health and diversity of the stream ecosystem.

We understand that additional environmental studies are planned to address this concern and to assess potential impacts upon historic resources. It is important for these studies to be completed and reviewed in determining the project's consistency with CZM objectives and policies.

Since this project will also require a Federal permit, a CZM Federal consistency detemination will have to be submitted to our office for review.

Thank you for the opportunity to comment.

Harold S. Masumoto

Harold S. Masumoto
Director

OCEA

383

Office of the Mayor

Dante K. Carpenter
Mayor

October 12, 1988

DH.

RECEIVED
'88 OCT 2? 8:50
DLNR
OCEA

Mr. William Paty, Chairman
Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, HI 96813

Dear Bill:

This is to support Mauna Kea Power, Inc.'s application for a Conservation District Use Permit to construct and operate a hydroelectric power project on Honolii Stream on the Big Island.

220

Basically, there is a need for more power development on the Big Island. Because of increased economic development, we are experiencing greater demands for power than ever before. We also have been experiencing blackouts recently, and indications are that much of this problem is attributable to shortcomings in the present system.

Having an independent, private power producer may contribute to the solution of this situation in several ways. First, the capability of the system would be increased by 14.6 MW to accommodate the demands of new development. An increase of this magnitude may also mitigate incremental failures within the total system.

Second, having new equipment and technology on line would strengthen the local utility's present system by enhancing the reliability of the electrical grid. As HELCO's system ages, problems are to be expected. Updating portions of the system will minimize problems arising from an aging network.

In addition to these reasons, having a hydroelectric power plant provides the things we have been discussing for the past two decades--less dependence upon imported fossil fuels and retention of Hawaii's dollars, less pollution, and utilization of local resources.

Thank you for your assistance in this matter. If you have any questions regarding this matter, please call Minoru Shintani at the Department of Research and Development at 961-8366.

Sincerely,

Dante K. Carpenter
Mayor

#1532

KRP Information Services

320 Ward Avenue, Suite 106, Honolulu, Hawaii 96814
Mailing Address: PO Box 27506, Honolulu, HI 96827
Phone: 808 545-3633

November 18, 1988

Ms. Duk Hee Murabayashi
DHM Planners Inc.
1188 Bishop Street, Suite 2405
Honolulu HI 96813

Subject: Environmental Assessment and Notice of Preparation of Environmental Impact Statement for a Hydroelectric Power Project on the Honolii Stream in the South Hilo District, Hawaii.

Please send us a copy of the above-referenced document and place us on the list to receive a copy of the draft Environmental Impact Statement.

Sincerely,

Jacqueline A. Parnell
Jacqueline A. Parnell
KRP INFORMATION SERVICES

cc: Don Horiuchi, DLNR

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

November 21, 1988

Ms. Jacqueline A. Parnell
KRP Information Services
320 Ward Avenue, Suite 106
Honolulu, Hawaii 96814

Dear Ms. Parnell:

SUBJECT: EIS PREPARATION NOTICE
HONOLII HYDROELECTRIC POWER PROJECT

Enclosed, per your request, is a copy of the Environmental Assessment for the subject project on the island of Hawaii.

The draft EIS will be circulated in December and we will see that a copy is sent to you.

Sincerely,

DHM Planners inc.

Wendie McAllaster
Wendie McAllaster
Project Manager

WM:lt

Enclosure

MOKU·LOA·GROUP
SIERRA CLUB • HAWAII CHAPTER

Duk Hee Murabayashi
DHM Plannners Inc.
1188 Bishop St Ste. 2405
Honolulu, Hi 96813

November 7, 1988

RE: PROPOSED HONOLII STREAM HYDROELECTRIC PROJECT, SOUTH HILO

The Moku Loa Group of the Sierra Club requests to be a consulted party on Mauna Kea Power Company's proposed hydro electric project.

Our Club is generally supportive of hydropower if it can be conditioned so the instream biota can be maintained, and the rare plant life around the project would not be jeopardized. For this particular project, we are concerned about the 20,000 feet of stream to be dewatered.

Is this stream fed by springs? These streams are often the most valuable. There are distinct riparian Hawaiian fauna and flora. The Cyaneas, lobeliads and ferns are rare but inhabit only the spray and splash zones associated with streams. Changes in stream flow and dewatering are detrimental to these organisms.

How does this project relate to and interact with the Water Code? What hearings must take place before this Commission?

What is the amount of instantaneous stream flow that is needed to generate 14 megawatts of electricity? What is the projected amount of electricity to be generated over a "normalized" year?

There should be included in the draft EIS a "needs" analysis for this electricity.

Please include a discussion of the schedule for PUC permit hearings if any are necessary.

What are the impacts of this project upon the proposed 5 MW Wailuku/Hookelekele project proposed by Garratt-Callahan Company in March of 1986?

Please send the draft EIS to Nelson Ho, PO box 590 Mountain View, 96771.

Mahalo,

Nelson Ho

Nelson Ho
for the Conservation Committe

P.O. BOX 1137 • HILO • HAWAII • 96721

DHM inc.
land use
and environmental
planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

November 8, 1988

Mr. Nelson Ho
Conservation Committee
Moku Loa Group
Sierra Club, Hawaii Chapter
P.O. Box 1137
Hilo, Hawaii 96721

Dear Mr. Ho:

SUBJECT: EIS PREPARATION NOTICE
HONOLII HYDROELECTRIC POWER PROJECT

Thank you for your letter of November 7, 1988 indicating your interest in the Honolii Project. The comments offered in your letter have been noted and will be addressed in the Environmental Impact Statement. A copy of the draft EIS will be sent to you for review when it is filed with the Office of Environmental Quality Control.

Enclosed is a copy of the environmental assessment for the project. Please feel free to call me if you have any additional comments.

Sincerely,

DHM Planners inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

Enclosure

cc: Mauna Kea Power Company

Sunrise, Mt. McKinley   Ansel Adams

SIERRA CLUB
LEGAL DEFENSE FUND, INC.

212 Merchant Street, Suite 202   Honolulu, Hawaii 96813   (808) 599-2436
FAX (808) 521-6841

HAWAII OFFICE
Arnold L. Lum
Michael R. Sherwood
Staff Attorneys
Marjorie F. Y. Ziegler
Resource Analyst

Other Offices

SAN FRANCISCO OFFICE
2044 Fillmore Street
San Francisco, CA 94115
(415) 567-6100

ROCKY MOUNTAIN OFFICE
1600 Broadway St.
Suite 1600
Denver, CO 80202
(303) 863-9898

WASHINGTON, DC OFFICE
1516 P Street, N.W.
Suite 200
Washington, DC 20005
(202) 667-4500

ALASKA OFFICE
325 Fourth Street
Juneau, AK 99801
(907) 586-2751

NORTHWEST OFFICE
216 First Avenue, South
Suite 330
Seattle, WA 98104
(206) 343-7340

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November 1, 1988

Duk Hee Murabayashi
DHM Planners, Inc.
1188 Bishop Street
Suite 2405
Honolulu, Hawaii 96813

Re: Environmental Assessment and Notice of Preparation of EIS for the Honolii Stream Hydroelectric Project, South Hilo District, Hawaii

Dear Mr. Murabayashi:

The Sierra Club Legal Defense Fund would like to request a copy of the Environmental Assessment for the above-referenced project, and in addition, would like to be made a consulted party.

Very truly yours,

A.L.L.

Arnold L. Lum

ALL:sw/murlet

cc: Steve Holmes

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

November 3, 1988

Mr. Arnold L. Lum
Sierra Club Legal Defense Fund, Inc.
212 Merchant Street, Suite 202
Honolulu, Hawaii 96813

Dear Mr. Lum:

SUBJECT: EIS PREPARATION NOTICE
HONOLII HYDROELECTRIC POWER PROJECT

Enclosed, per your request, is a copy of the Environmental Assessment for the subject project on the island of Hawaii.

We appreciate your interest in reviewing the document. If there is specific information which you would like covered in the forthcoming draft EIS, please inform us accordingly by November 22, 1988.

The draft EIS will be circulated in early December and we will see that a copy is sent to you.

Sincerely,

DHM Planners inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

WM:lt

Enclosure

SR 93
Ha'iku, HI. 96708
November 4, 1988

Duk Hee Murabayashi
DHM Planners Inc.
1188 Bishop St., Suite 2405
Honolulu, HI. 96813

Dear Mr. Murabayashi:

I wish to be a consulted party in the EIS process for the proposed hydroelectric power project on the Honolii Stream in the South Hilo District, Hawaii. Please send me copies of the Environmental Assessment and EIS Preparation Notice immediately via first class mail. Please send me also any other publications and information which become available concerning this proposal, including copies of any engineering reports, draft EIS and final EIS.

Thank you.

Sincerely,

Elaine S. Wender

Elaine S. Wender

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

November 7, 1988

Ms. Elaine S. Wender
SR 93
Ha'iku, Hawaii 96708

Dear Ms. Wender:

SUBJECT: EIS PREPARATION NOTICE
HONOLII HYDROELECTRIC POWER PROJECT

Enclosed, per your request, is a copy of the Environmental Assessment for the subject project on the island of Hawaii.

We appreciate your interest in reviewing the document. If there is specific information which you would like covered in the forthcoming draft EIS, please inform us accordingly by November 22, 1988.

The draft EIS will be circulated in early December and we will see that a copy is sent to you.

Sincerely,

DHM Planners Inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

WM:lt

Enclosure

Carol Wilcox
111 Royal Circle
Honolulu, HI 96816

November 4, 1988

Mauna Kea Power Company
Contact: Duk Hee Murabayashi
DHM Planners Inc
1188 Bishop Street, #2405
Honolulu, HI 96813

Dear Sir,

I wish to be consulted party in the "Hydroelectric Power Project on the Honolii Stream." I would appreciate a copy of your preliminary proposal so I can familiarize myself with your project.

Sincerely

Carol Wilcox

Carol Wilcox

cc. Department of Land; and Natural Resources
OEQC

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

November 4, 1988

Ms. Carol Wilcox
111 Royal Circle
Honolulu, Hawaii 96816

Dear Ms. Wilcox:

SUBJECT: EIS PREPARATION NOTICE
HONOLII HYDROELECTRIC POWER PROJECT

Enclosed, per your request, is a copy of the Environmental Assessment for the subject project on the island of Hawaii.

We appreciate your interest in reviewing the document. If there is specific information which you would like covered in the forthcoming draft EIS, please inform us accordingly by November 22, 1988.

The draft EIS will be circulated in early December and we will see that a copy is sent to you.

Sincerely,

DHM Planners inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

WM:lt

Enclosure

Chapter XIII

XIII. COMMENTS AND RESPONSES DURING PUBLIC REVIEW PERIOD

Written responses to the draft Environmental Impact Statement were received from the following persons and agencies. Comments postmarked after the review period deadline of February 6, 1989, are indicated by an asterisk (*) beside the reviewer's name. A double asterisk (**) indicates no substantive comments.

Federal

- U.S. Department of the Army, Army Engineer District, Honolulu
- *U.S. Fish and Wildlife Service
- **U.S. Department of the Navy

State

- *Commission on Water Resource Management
- Department of Accounting & General Services
  - **Division of Public Works
- **Department of Agriculture
- Department of Business and Economic Development
  - **Energy Division
  - **Housing Finance and Development Corporation
- **Department of Defense
- *Department of Health
- Department of Land and Natural Resources
  - Aquatic Resources Division
  - **Forest and Wildlife Division
  - State Parks Division
- **Department of Transportation
- Office of Environmental Quality Control
- University of Hawaii, Environmental Center

County of Hawaii

- **Department of Parks and Recreation
- **Department of Public Works
- **Department of Water Supply
- Planning Department

Others

- Hawaii Electric Light Company, Inc.
- **Hawaiian Electric Company, Inc.
- *Moku Loa Group, Sierra Club
- Sierra Club Legal Defense Fund
- Wai'ola
- Carol Wilcox

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

February 3, 1989

Planning Branch

Mr. William W. Paty, Director
State of Hawaii, Department of
Land and Natural Resources
Kalanimoku Building
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Paty:

Thank you for the opportunity to review the Draft Environmental Impact Statement (DEIS) for the proposed Honolii Hydroelectric Power Project, South Hilo District, Island of Hawaii. The following comments are offered:

a. The applicant has been advised by Operations Branch to determine if the Federal Energy Regulatory Commission has jurisdiction over the project before applying for a Department of the Army permit. If further clarification of permit requirements is needed, the applicant should contact Operations Branch (telephone (808) 438-9258).

b. The second paragraph of section III.C.2 (page 57) of the DEIS should be revised to read: "According to the Flood Insurance Study for Hawaii County, the project site is located in a designated Zone X, "Other Areas" determined to be outside of the 500-year flood plain (FIRM panel numbers 860, 870, and 880) as designated by the Federal Emergency Management Agency (FEMA) in September 1988." Section V.A.2 (page 131) of the DEIS

should likewise be revised to reflect the current availability of FIRM panels for the project site.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

Copies furnished:

Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Mrs. Duk Hee Murabayashi
DHM Planners, Inc.
1188 Bishop Street, Suite 2405
Honolulu, Hawaii 96813

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. Kisuk Cheung
Chief, Engineering Division
Department of the Army
U.S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, Hawaii 96858-5440

Dear Mr. Cheung:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your letter to William Paty regarding the above. The following comments are in response to your letter.

a. A clarification of FERC jurisdiction is pending.

b. The Final EIS will reflect the change to the new FIRM panels for the project area. Thank you for bringing this to our attention.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

United States Department of the Interior
FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE
PO BOX 50167
HONOLULU, HAWAII 96850

ES
Room 6307

FEB 7 1989

Mr. William W. Paty
Chairperson, Board of Land and
Natural Resources
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96813

Re: Draft Environmental Impact Statement for the Proposed Honolii Hydroelectric Power Project, Hawaii

Dear Mr. Paty:

We have reviewed the referenced Draft Environmental Impact Statement (EIS) and offer the following comments for your consideration.

General Comments

Insufficient information is provided in the Draft EIS to justify the proposed conservation flow of ten cubic feet per second (cfs) as adequate to protect native fishes and invertebrates in Honolii Stream. As with other hydroelectric power projects affecting continuous streams or high natural resource value, we recommend that an Instream Flow Incremental Methodology (IFIM) study be conducted in the Honolii Stream to determine a biologically suitable instream flow. Until this study has been completed, and the other resource issues raised in this letter have been addressed, we recommend that further action on the proposed project be held in abeyance.

Specific Comments

a. Diversion Weir and Intake Structures. Page 19. The Draft EIS states that the ten cfs flow would pass through a one-foot deep by two-foot wide notch cut in the crest of the diversion weir. The velocity of water moving through this notch should be calculated to determine if native fishes and shrimps would be able to migrate through the notch. As stated in our November 4, 1988 letter, we recommended that the fish passage structure be designed in coordination with the Division of Aquatic Resources (DAR) and the Service. To date, no meetings with the developer or consultant to design the passage structure with DAR and the Service have been held. We recommend that the passage structure design be completed, and be approved by the resource agencies before the publication of the Final EIS.

b. Diversion Weir and Intake Structures. Page 21. The proposed intake structure is inadequately designed and would allow the entrapment and entrainment of adult fishes and invertebrates. In our November 4, 1988 letter, we recommended a fish screen with mesh size of 0.25 inches and an approach velocity of 0.5 feet per second. We also recommended that the screen be aligned parallel to the flow. Instead, the screen has a mesh size of one inch, an approach velocity of one foot per second, and the screen is perpendicular to the stream flow. In addition, the fish screen is boxed in by the intake headworks, thereby making the escape of fishes and shrimps from the screens difficult. We recommend that the fish screen be redesigned, and be approved by the resource agencies prior to the publication of the Final EIS.

We do not concur with the proposed conservation flow of ten cfs. Studies to justify ten cfs as a biologically appropriate instream flow to protect native freshwater fishes and invertebrates have not been conducted. We recommend that these flow studies be completed before the publication of the Final EIS.

c. Diversion Weir and Intake Structures. Page 24. The release of the conservation flow would be controlled by an electronic water sensor that would monitor water levels in the pool formed by the diversion weir. The mechanism for controlling the flow through the penstock based on water levels in the diversion pool should be discussed in the Final EIS. As stated in our November 4, 1988 letter, a stream gaging station should be installed downstream of the proposed intake to insure compliance with the required instream flow (Enclosure 1).

d. Penstock. Page 28. As stated in our November 4, 1988 letter, we recommend that geotechnical studies of the first 1,200 feet of penstock, the powerhouse site, and associated access roads be conducted to determine the potential for excessive erosion, slope failure, and penstock collapse. Mitigation measures to address slope instability should be based on these engineering studies.

e. Access Roads. Page 37. As stated in our November 4, 1988 letter, grading and erosion control plans for the access roads should be included in the Final EIS. Access roads can be a major source of sediment input into streams if not properly designed.

f. Construction. Page 38. The proposed method for constructing the cofferdams at the diversion weir would result in the release of sediments into the stream. The Final EIS should include a discussion of less-damaging alternatives for the construction of the cofferdams and diversion weir.

g. Hydrological Characteristics. Page 51. The hydrology of Honolii Stream that is described in the Draft EIS is misleading. Honolii Stream was partially diverted from 1911-1913 upstream of the existing U.S. Geological Survey gaging station. Inclusion of the flow records for this period would result in artificially lower estimates of discharge in Honolii Stream. Therefore, we recommend that the hydrology of Honolii Stream be described without the flow records from 1911-1913 as recommended in our November 4, 1988 letter.

h. Biological Characteristics. Stream Fauna. Pages 61-63. The Service's designation of a resource category for a particular habitat type is based on the best available information. Data collected since 1984 indicates that Honolii Stream provides higher quality habitat than was noted in 1984. We consider Honolii Stream to provide high value habitat for native fishes and invertebrates (Enclosure 2). For your information, since 1985, Lentipes concolor has been listed as a Category 1 candidate endangered species.

i. Biological Characteristics. Wildlife. Pages 73-75. As stated in our November 4, 1988 letter, we recommend that surveys be conducted to determine the potential presence of nesting sites for the threatened Newell's Townsend's Shearwater (Puffinus auricularis newelli). We recommend that fledglings and nesting sites be located by professional ornithologists during the nesting season using playback tapes of Newell's Townsend's Shearwater songs.

j. Stream Flows. Pages 93-103. Streamflows lower than 14 cfs occur less than 14 percent of the time under existing conditions (U.S. Geological Survey, Open-File Report 81-1056). Under project conditions, however, streamflows lower than 14 cfs would occur approximately 85% of the time downstream of the diversion weir. The biological effects of substantially lengthening this low flow period have not been adequately analyzed in the Draft EIS. As recommended in our November 4, 1988 letter, we recommend that flow accretion along the affected reach of Honolii Stream be measured using stream gaging techniques. This information should be included in the Final EIS and would corroborate the calculated accretion flow in the affected reach.

k. Habitat Maintenance. Pages 109-113. A reduction in flow may increase sediment deposition and accumulation in the affected reach of Honolii Stream. Therefore, flushing flows and land treatment methods to control non-point source run-off may be necessary to limit the deposition of sediment in the affected reach of Honolii Stream.

l. The cumulative impacts to endemic freshwater fishes and invertebrates, and in particular, the candidate endangered Lentipes concolor from the numerous hydroelectric power projects in the State have not been adequately addressed in the Draft EIS. The Final EIS should include an analysis of the cumulative impacts to freshwater fishery resources from this and other hydropower projects in the State.

Summary Comments

The Draft EIS is deficient on the following major points:

a. Studies to support a biologically suitable instream flow have not been completed;

b. The intake structure is of an unsuitable design and would likely entrain adult fishes and invertebrates;

c. Measures to control erosion from the construction of the penstock and access roads, and the potential for slope failure and penstock collapse have not been adequately studied;

d. The description of the hydrology of Honolii Stream includes both pre-diversion and post-diversion flows and does not correctly define pre-project conditions.

These issues should be resolved prior to the publication of the Final EIS. For further coordination, please contact staff biologist Andy Yuen (541-2749).

We appreciate this opportunity to comment.

Sincerely yours,

Allan Marmelstein

Allan Harmelstein
Pacific Islands Administrator

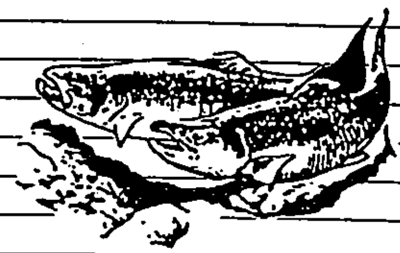
cc: U.S. Army Corps of Engineers
EPA, San Francisco
OEQC
DAR
DHM, Inc.

Research

Information bulletin

U.S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

NO. 88-50
DATE July 1988



Streamflow Records Indicate Frequent Failures in Meeting Minimum Flow Standards

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Of 61 stream locations evaluated in three western States, 54 (89%) exhibited flows below those established in streamflow agreements on at least some occasions; 28 locations (46%) had flows 25% of the established agreement or less. Several locations showed chronic deviations. Actual flows were lower than agreed-to flows for 20% or more of the time at 17 (28%) of the 61 locations.

Streamflow Records Were Analyzed

Evaluations of acceptance, implementation, and effectiveness of recommendations are important parts of the mitigation process. One area of concern is the extent to which streamflows below water development projects are maintained at levels established or negotiated as part of mitigation. To address this concern, we examined water development projects in Colorado, Montana, and Wyoming. All known projects with streamflow agreements and data on streamflow below the development were assessed to determine the frequency of discrepancies between agreed-to and actual flows. We chose to use the term "discrepancy" instead of violation in our analysis because many agreements do not carry legally binding responsibilities for compliance.

A total of 73 water development projects were identified, involving 119 locations with minimum streamflow agreements. Of the 119 locations, only 61 (51%) had streamflow data. There were no apparent patterns of discrepancies related to the agency responsible for the development or the formality of the agreement. Regional precipitation, extent of water development, and primary uses of water appeared to be factors related to variations in discrepancies among the three States. Projects in Colorado had the highest frequency of discrepancies, but Colorado also had the overall lowest precipitation, highest extent of water development, and greatest demand by municipal and industrial users.

Additional Monitoring Is Needed

Lack of streamflow data for many streams and lack of routine monitoring probably decrease the effectiveness of streamflow agreements. Without flow data and systematic analyses, it is impossible to evaluate the implementation of instream flow agreements, identify factors contributing to lack of implementation, or assess biological effectiveness. Institutional responsibilities for monitoring and enforcement need to be clearly delineated at the time mitigation recommendations are established. The detailed biological assessment techniques and strenuous negotiations employed in reaching streamflow agreements may not lead to the desired results in many cases due to failure to maintain agreed-to flows.

For further information contact:

Wayne A. Hubert or Stanley Anderson
Wyoming Cooperative Fish and Wildlife Research Unit
University of Wyoming
Box 3166, University Station
Laramie, WY 82071
(307) 766-5415 or FTS 328-0111

James E. Roelle
National Ecology Research Center
Creekside One Building
2627 Redwing Road
Fort Collins, CO 80526-2899
(303) 226-9435 or FTS 323-5435

Enclosure 1

Table 1. Frequency with which different magnitudes of flow discrepancies occur. For a particular discrepancy criterion, entries represent the number of stream locations in each frequency class.

Discrepancy criterion	Frequency class[a]						Total locations
	0%	<1%	1–20%	21–40%	41–60%	61–80%	
Flows below the minimum	7	10	27	11	4	2	61
Flows 90% of the minimum or less	11	11	29	7	3	0	61
Flows 75% of the minimum or less	16	13	25	6	1	0	61
Flows 50% of the minimum or less	23	15	21	2	0	0	61
Flows 25% of the minimum or less	33	20	8	0	0	0	61

[a] Percentage of days in the period of hydrologic record when measured streamflows were below the stated discrepancy criterion.

ES
Room 6307
MAY 24 1989

Mr. Albert S. N. Hee
Mauna Kea Power, Inc.
P.O. Box 673
Kailua, Hawaii 96734

Re: Honoli'i Hydroelectric Power Project, Hawai'i

Dear Mr. Hee:

The purpose of this letter is to clarify the Service's evaluation of the biological resources of the Honoli'i River, Hawai'i. In 1984, the Service prepared a Draft Coordination Act Report on the proposed Wailuku-Honoli'i Hydroelectric Power project for the U.S. Army Corps of Engineers. Our report was based on a 1983 survey of aquatic macrofauna of the Honoli'i River.

During the 1983 survey, our aquatic biologist found small numbers of endemic fishes (o'opu alamo'o, o'opu nakea, and o'opu nopili), endemic shrimp ('opae kala'ole), and endemic snails (hihiwai) in the river. Populations of these species in the lower reaches were small; and only the shrimp was observed in significant numbers in the upper reaches. Despite substantial streamflow and natural bed material present during the 1983 survey, our aquatic biologist determined that the significant bed load of fine terrigenous sediments from adjacent canelands reduced the value of the habitat for native species. Thus, the Service concluded in our 1984 draft report that the Honoli'i River provided medium to low habitat for native stream fishes.

In 1988, the Service provided the Department of Land and Natural Resources (Department) with a list of high-value streams on Hawai'i that included Honoli'i River. The list was developed at the request of the Department for the proposed interim instream flow standards for Hawai'i Island. The criteria used by the Service to designate the Honoli'i River as high-quality were given equal weight and included the following:

a. High habitat value for native migratory stream animals;

b. Presence of the candidate endangered fish *Lentipes concolor*;

c. Essential habitat for the endangered koloa based on the Hawaiian Waterbird Recovery Plan (1985).

Our designation of Honoli'i Stream as high-value reflected the observations of another Service biologist who conducted surveys of the river in 1986 and 1987. In light of these recent observations, we concluded that the Honoli'i River does provide high value habitat for native fishes.

Please note that the Honoli'i River would still meet two other criteria for listing as high-value in the proposed interim instream flow standards even if the issue of habitat value were disputed.

If you have further questions on the biological value of Honoli'i River, please contact our Senior Staff Biologist John Ford (541-2749).

Sincerely yours,

Original signed by
Ernest Kosaka, Field Supervisor
Office of Environmental Services
Pacific Islands Office

cc: DLNR
Commission on Water Resource Management
DOWALD
DAR
Planning
Mr. Sydney Keliipuleole

Enclosure 2

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9655

February 28, 1989

Mr. Allan Marmelstein
Pacific Islands Administrator
Fish and Wildlife Service
United States Department of the Interior
P.O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Marmelstein:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your letter to William Paty regarding the above. The following responses reflect the sequence of your comments:

General Comments

The developer acknowledges that the proposed 10 cfs conservation flow is not based solely on the biological findings of an instream flow study. However, the developer also does not agree that an IFIM study, as recommended by the Service, will produce valid information from which a biologically suitable instream flow can be determined. This methodology was developed for streams and rivers located in the continental U.S. These streams are generally characterized as having fairly constant flows, in contrast to the highly variable, flashy nature of Hawaii's streams.

As in any scientific study, before the findings and subsequent conclusions are accepted, the methodology needs to be field tested to validate it's applicability, a procedure that requires several years. In the absence of a proven scientific method from which valid biological conclusions concerning instream flow can be reached, the developer has been fortunate to be able to rely on actual information developed from three existing hydroelectric plants in Hawaii.

The Wainiha Hydroelectric Plant, which has been in operation for over 65 years, does not allow water to flow past the diversion weir until the instream flow is greater than 100 cfs. This flow condition occurs an average of 153 days a year. In a 1983 aquatic survey conducted by Dr. Timbol, five species of native goby (including the Lentipes concolor) were found above the diversion weir. The Lentipes concolor has also been sited above the Waiau and Puueo Hydroelectric Plants, located on the Wailuku River. The presence of the native goby above the diversion weirs indicates that they are capable of migrating upstream without the presence of a continuous conservation flow. The developer does agree that the absence of a continuous conservation flow for extended periods in excess of those that occur naturally will subject the native fauna to unnecessary periods of stress.

It is important to emphasize that the development of the Honoli'i Hydroelectric Project was undertaken in accordance with the Mitigation Policy promulgated by the USF&WS in 1984, which concluded in the Wailuku/Honoli'i Hydropower Study that Honoli'i Stream may be considered Resource Category 4: the habitat to be impacted is of medium to low value for the evaluation species. In view of this finding, it is difficult to understand on what basis

the Service has made its recommendation to the DLNR that Honoli'i Stream should now be considered to offer high-value habitat for native fauna. As has been noted, in 1983 the USF&WS's aquatic biologist determined that the significant bedload of fine terrigenous sediments from adjacent canelands reduced the value of the habitat for native species. In 1988, when the Service provided DLNR with its list of high-value streams in Hawaii that included Honoli'i, (a) the habitat for native migratory stream animals had not changed; (b) the presence of Lentipes concolor had not changed; and (c) the endangered koloa was not sighted, as it hadn't been in 1983. In fact, as stated in 1984, although the koloa had been released in the area of the Wailuku River, it was not sighted in this area either.

In your attached letter of 24 May 1988, the Service sites as a basis for its recommendation observations conducted in 1986 and 1987. Although the Service has been asked to provide the information which was used as a basis for changing its designation, no data has been presented to date to substantiate this change in designation.

Specific Comments

a. Diversion Weir and Intake Structures, pg. 19.

The passage of the 10 cfs conservation flow through the one-foot by two-foot notch will result in an approach velocity of 5 feet per second (fps). Flows greater than 10 cfs will pass over the crest of the weir. As has already been determined, native species have proven their ability to migrate up vertical waterfalls in excess of 50 feet. We therefore believe that the approach velocity through the notch will not be a barrier to fish migrating upstream.

While the developer would be happy to meet with the Division of Aquatic Resources, the Division has not requested a meeting, nor has the Division questioned the proposed design of the diversion weir and intake structures.

b. Diversion Weir and Intake Structures, pg. 21.

The design of the proposed intake structure and the approach velocity was based on the design used by three existing hydroelectric power projects in Hawaii. The Lower Wainiha Hydroelectric Plant on Kauai has a 5-ft. by 5-ft. canal designed for 100 cfs. As such, the approach velocity in the canal is 4 fps. Although this project does not use a fish screen, in 1982 Timbol found 5 species of o'opu above the diversion weir, including the three species which were also found in the Honoli'i Stream. HELCO's Waiau Hydroelectric Project in Hilo has a 5-ft. by 10-ft. canal, which currently passes 52 cfs, although it is designed to accommodate 128 cfs. Based on 52 cfs, the approach velocity in the canal is 1.04 fps. This project does not have a fish screen either. In the 1984 USF&WS survey, the Lentipes concolor was found in the Hookelekele Stream, above the intake. HELCO's Puueo Project, located below Waiau, does not have a fish screen. Both the Waiau and Puueo projects do, however, use a one-inch rack to help prevent fish and debris from entering the canals.

Based on the experience from these existing projects which have been continuously operating for over 65 years, it is believed that a 1 fps approach velocity in the intake in addition to a one-inch rack is an adequate design. However, as was indicated in the previous correspondence and was recommended by the aquatic biologist, a .75-inch rack will be used at the entrance to the intake.

Use of a fish screen with a 0.25 inch mesh size, as the USF&WS suggests, may actually pose a greater danger to the entrapment and entrainment of aquatic fishes. Approach velocity is a function of the volume of water and the area through which the water must flow. Reducing the size of the fish screen will reduce the area available for water to flow through, resulting in an increase in the approach velocity through the screen. As a result, instead of reducing fishkill by preventing fish from entering the penstock, the increased velocity may cause more fish to be impinged and killed against the fish screen.

Prior to submitting the final EIS, the feasibility of aligning the .75-inch rack parallel to the flow will be explored.

Please refer to the above <u>General Comments</u> regarding the conservation flow of 10 cfs. If the USF&WS has any validated biological information concerning approach velocities and/or conservation flows to support its recommendations, sharing the information would be greatly appreciated.

c. Division and Intake Structures, Pg. 24.

The need for a stream gaging station downstream of the weir is not justified to insure compliance with the required instream flow. The amount of water flowing through the intake will be controlled by a valve which will be opened and closed automatically based on information received from a water level sensor located upstream of the weir. By keeping the level of the pool behind the weir at a predetermined elevation and by calculating the area of the conservation notch, it can be assured that 10 cfs will always flow through the conservation notch. This is the same principal used by the USGS to measure stream flow. The proposed project measurements will be more accurate, however, since the area of the conservation notch will remain constant.

d.&e. Penstock and Access Roads, pg. 28, 37.

The only construction which will take place within the streambed will occur in solid bedrock. Geotechnical studies will therefore not be needed.

The proposed temporary access road from the north side at the intake will not be used. This change will be included in the final EIS. The penstock and access roads to the powerhouse will be along existing cane roads. If necessary, an erosion control plan will be prepared.

f. Construction, pg. 38.

The preferred use of steel sheet pile was considered instead of earthwork, however, because of the bedrock in the stream channel, the use of steel sheet pile is not feasible.

g. Hydrological Characteristics, pg. 51.

The draft EIS clearly states that 3.2 cfs was diverted from 1911-1913 (p. 51). As was explained in the previous response of December 19, 1988, the flow duration curves provided by the USGS encompassed the entire period of record (24 years). Because of the lack of information concerning whether the USGS flow data during the

periods 1911-1913 were taken with or without diverted flows, the information was used as is. The diversion of 3.2 cfs during 21 months of this period is negligible. In fact, if one were to look at the mean flow for the period of record - 126 cfs, 3.2 cfs represents only 2.5 percent of this amount. It is, therefore, believed that the data presented in the EIS adequately describes the hydrological conditions occurring within the Honoli'i Stream.

h. Biological Characteristic, Stream Fauna pg. 61-63.

Please refer to the above response to the <u>General Comments</u>. As stated earlier, receipt of a copy of the data collected since 1984, which the USF&WS used as its basis for recommending to DLNR that Honoli'i Stream provides high-value habitat for native fishes, would be appreciated.

i. Biological Characteristic, Wildlife, pg. 73-75.

As stated in the previous response of December 19, 1988, a professional ornithologist conducted a survey of the project area and did not see, nor did he expect to find, Newell's Townsend Shearwaters. According to Robert L. Pyle of the Hawaii Audubon Society, Newell's Townsend Shearwaters are found primarily on Kauai, and there are no records of them <u>nesting</u> on the Big Island. Based on the unlikely presence of Shearwater nests on the Big Island and the small construction-impact area within the streambed (weir site), further fieldwork at this time is not warranted.

j. Stream Flows, pg. 93-103.

We again refer to the above response to the <u>General Comments</u> to address the concerns raised regarding the biological effects of the proposed conservation flow. Moreover, field measurements were recently taken to verify the calculated accretion flow discussed in the draft EIS. On the day that the stream flow measurements were taken, there had been no rain in the area for the three previous days. Using a Price Type AA Current Meter on a round weighted rod, 41 cfs was measured flowing in the stream at the weir site, and 51 cfs was measured at the powerhouse site, an increase of 10 cfs. These findings support the calculated accretion flows discussed in the draft EIS, and will be discussed in detail in the final EIS.

k. Habitat Maintenance, pg. 109-113.

A reduction in flow will not increase sediment entering the stream, although it will increase the amount of time sediment may remain in the stream before it is removed by freshet flows. Analysis of the hydrological characteristics of Honoli'i Stream reveals that freshet flows ranging from 160 cfs up to thousands of cfs occur regularly during each month of the year. These flows will help to flush any accumulated deposition of sediment that has taken place. In addition, Honoli'i Stream is located in a deep narrow gulch with thick vegetation along the sides. Any additional treatment the USF&WS suggests would involve taking land out of agricultural production, and would have to be addressed by the existing landowners.

I. Cumulative Impacts.

The developer is no more qualified or able to address the cumulative impacts of hydroelectric power projects in the State on endemic freshwater fishes and invertebrates than he is qualified to address the impacts of the no action alternative - the continued burning of more fossil fuels to generate electricity - and the cumulative impacts it will have on the environment. To insure the validity of these types of impacts, long-term extensive studies will be required. It can then be said that it is properly the responsibility of the applicable governmental agencies i.e. USF&WS, Division of Aquatic Resources/DLNR, the Department of Health, etc. to conduct these studies. The developer may cooperate with the agencies in conducting such studies.

Summary Comments

A. There is currently no validated method from which acceptable biological conclusions of the effect of various levels of instream flow have on native fauna can be made. According to the Wailuku/Honoli'i Hydropower Study, the USF&WS was to have conducted such studies. In the absence of these studies, the developer has chosen to rely on the experience and records of three existing hydroelectric plants in the State encompassing over 65 years of operation, and the effect these plants have had on native fauna.

B. The design of the intake structure, the approach velocity, and the use of a .75-inch rack to keep fish out of the penstock is based on three existing hydroelectric plants. Modifications will be made, as appropriate, to improve the system's ability to prevent the entrapment and entrainment of aquatic species.

C. Other than the intake area which will be built on exposed bedrock, and the powerhouse which will be built in an area that has already been cleared, the remainder of project construction will occur outside of the stream channel in heavily used agricultural lands. Standard engineering and construction practices will be employed to control erosion and prevent runoff.

D. The hydrological information contained in the draft EIS was provided by the USGS. This information adequately describes the flow conditions in the stream.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR, Director
DLNR-DAR
OEQC
U.S. Army Corps of Engineers

MAUNA KEA POWER, INC.

March 22, 1989

Mr. Allan Marmelstein
Pacific Islands Administrator
Fish and Wildlife Service
United States Department of the Interior
P.O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Marmelstein:

Subject: Fish and Wildlife Services Resource Classification of Honoli'i Stream

There is a great deal of confusion concerning the resource classification of Honoli'i Stream under the Fish and Wildlife Services' (Service) Mitigation Policy as published by the U.S. Department of the Interior. In 1984, as part of its Draft Coordination Act Report, the Service classified Honoli'i Stream as Resource Category 4. Subsequent to that, in response to the State's originally proposed Interim Instream Flow Standards, which were subsequently replaced with the status quo, the Service listed Honoli'i Stream as having high value habitat. It still is not clear to me whether your May 1988 letter to me and your subsequent letters to Mr. Paty upgraded the classification under the Service's mitigation policy since you did not list a new Resource Category number.

Rather than try to reconstruct the unclear positions the Service has taken in the past, please tell me what the resource category is for Honoli'i Stream under the Service's Mitigation Policy today. If it has been designated anything other than Resource Category 4, please provide me with a detailed explanation of the biological reasons for upgrading the habitat value and what was found in the Service's 1986 and 1987 unpublished surveys justifying the reasons. I have repeatedly requested these surveys and have been unable to obtain them. The upgrading of the 'o'opu alamo'o from Category 2 to Category 1 does not justify changing a <u>habitat</u> valuation.

The Service's mitigation policy has three purposes, two of which are to reduce developer-Service conflicts. The Service is now indicating a reclassification occurred after I had begun

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(808) 599-4383 Facsimile (808) 599-4653

discussing the project with Service biologists. This hardly reduces developer-Service conflicts.

In 1988, our biologist found the same conditions which were found by the Service's biologist in his 1983 survey. Furthermore, our biologist did not find any additional native freshwater aquatic species. If you have any additional biological reasons to upgrade the Honoli'i Stream would you please make that information available to me.

Very truly yours,

Albert S. N. Hee
President

cc: Mr. William W. Paty
Mr. Wally Stuki, USFWS
Pacific Regional Office

d:marmel.ltr

United States Department of the Interior

FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE
P.O. BOX 50167
HONOLULU, HAWAII 96850

Received
MAR 2 3 1989
DHM inc.

MAR 2 2 1989

Mr. William W. Paty, Chairperson
Board of Land and Natural Resources,
Water Resources Management Commission
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

Re: Petition to Amend Interim Instream Flow Standard
Application for Stream Channel Alteration Permit
Application for a Diversion Works Permit
Conservation District Use Permit Application
Honolii Stream Hydroelectric Power Project (Mauna Kea Power, Inc.)

Dear Mr. Paty:

This letter is in response to your recent conversation with Mr. John Ford of my staff. At the request of Mr. Manabu Tagomori, the Fish and Wildlife Service (Service) submitted both written and verbal comments regarding the subject proposal at the joint Land Board/Water Commission public hearing held in Hilo on March 9, 1989. During and after that hearing, Mr. Ford became aware that considerable confusion existed about the Service's position regarding certain aspects of this proposal. The purpose of this letter is to clarify our position for the record.

As early as May 1988, we determined that the affected reaches of Honolii Stream were of high value to indigenous, migratory fishes and invertebrates, including the 'o'opu alamo'o (Lentipes concolor), a category 1 candidate endangered species. That determination superceded our previous assessment of habitat value expressed in our Draft Coordination Act Report of June 4, 1984 prepared for the Corps of Engineers. Our decision to revise the assessment of habitat value was based upon the results of subsequent staff surveys of Honolii Stream, and the September 18, 1985 listing of the 'o'opu alamo'o as a category 1 candidate endangered species (50 FR 37961).

This revised position was stated in a May 24, 1988 letter to Mr. Albert Hee of Mauna Kea Power, Inc. It was subsequently restated in Service letters dated November 4, 1988 (regarding the subject CDUA); February 7, 1989 (regarding the developer's draft environmental impact statement); and again on March 9, 1989 (regarding the subject amendment to the instream flow standards). The Department of Land and Natural Resources and/or the Water Resources Management Commission received a copy of each letter.

The Service does not object to hydropower development on Honolii Stream provided that a biologically defensible conservation flow is establish through the application of the best available technology. We continue to recommend the use of the Instream Flow Incremental Method (IFIM) as the best available technology in this instance.

Should you have any questions regarding our position or other aspects of this issue, please contact John Ford (phone 541-2749). Thank you for your assistance and consideration.

Sincerely,

Allan Marmelstein
Pacific Islands Administrator

cc: Mauna Kea Power, Inc.
✓DHM, Inc.

DEPARTMENT OF THE NAVY
COMMANDER
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860-5020

IN REPLY REFER TO

5090 (92B)
Ser 032/72
4 Jan 1989

Deptartment of Land & Natural Resources
Kalanimoku Building
1151 Punchbowl Street
Honolulu, HI 96813

Gentlemen:

HONOLI'I HYDROELECTRIC POWER PROJECT DEIS

The Draft Environmental Impact Statement (DEIS) for Honoli'i Hydroelectric Power Project-TMK 2-6-09:11; 2-6-12:18, 24, 29, 30, 31; 2-7-02:21 has been reviewed, and we have no comments to offer. Since we have no further use for the DEIS, it is being returned to the Office of Environmental Quality Control.

Thank you for the opportunity to review the draft.

Sincerely,

W. K. Liu

W. K. LIU
Assistant Base Civil Engineer
By direction of
the Commander

Copy to:
Duk Hee Murabayashi
DHM Planners, Inc.
1188 Bishop St., Suite 2405
Honolulu, HI 96813

Office of Environmental Quality Control (w/DEIS)

DHM inc.
land use
and environmental
planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. W. K. Liu
Assistant Base Civil Engineer
Department of the Navy
Commander
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860-5020

Dear Mr. Liu:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your correspondence in reference to the above. We appreciate your review of the document and prompt response.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

February 6, 1989

MEMORANDUM

TO: Mr. Roger Evans, Administrator
Office of Conservation and Environmental Affairs

FROM: Manabu Tagomori, Deputy Director
Commission on Water Resource Management

SUBJECT: Draft Environmental Impact Statement Review
Honolii Hydroelectric Power Project

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PROJECT DESCRIPTION

Mauna Kea Power Company, Inc. proposes to develop a run-of-the-river 14.6 MW hydroelectric power plant along Honolii Stream on the island of Hawaii. The proposed project will be located approximately three miles north of Hilo and will consist of a diversion weir on Honolii Stream, a 20,350-foot long penstock, a power plant and substation, access roads to the weir and powerhouse, a 69 kV transmission line, and a 5 kV powerline. The weir and intake design and the release of a continuous flow will be used to mitigate adverse impacts on the aquatic habitat and fauna.

COMMENTS

(1) Page 21. The anticipated frequency of operation of the radial gate should be mentioned and the impact of its operation described.

(2) Page 23. Will any device or structure be used to prevent fish or other aquatic animals in the intake area from entering the penstock?

(3) Page 23. The anticipated frequency of flushing the sediment trap should be mentioned and the impact of its operations described.

(4) Page 24. How will the electrical water sensor maintain the water level necessary for a conservation flow through the 2-foot by 1-foot notch?

(5) Page 24. How was a minimum of 10 cfs determined to be the conservation flow?

(6) Page 28. Elaborate on the number and location of non-perennial streams that will be crossed. Constructing a culvert in the stream channel or burying the penstock in the channel will require a stream channel alteration permit.

(7) Page 30, Exhibit II-7; Exhibit II-7-B should show the "bench" in relation to the stream since it is stated on page 28 that the bench will be cut into the stream bank.

(8) Page 34. Will some type of energy dissipation structure be placed in Honolii Stream when the water from the powerhouse is "allowed to free fall approximately 10 feet back into the stream"?

(9) Page 37. Provide details on the temporary steel culverts that will be used to cross stream channels.

(10) Page 38. How long will the cofferdams be in place?

(11) Page 38. Elaborate on the impact of constructing and removing the cofferdams. Were alternatives to earthfill considered?

(12) Page 40. Estimate the amount of "boulders and cobble stone from the surrounding areas" that will be needed in creating the upstream and downstream faces of the weir. Also, what constitutes the "surrounding areas"?

(13) Page 51. Clarify whether the flow data for the years 1911 to 1913 were adjusted to include the diverted flows.

(14) Page 69. Provide proper citation for the University of Hawaii studies in footnote 36.

(15) Page 83. Clarify whether the project will be visible from Honolii Surf Park.

(16) Page 91. When the cofferdams are removed, will the stream channel be restored to its pre-project condition?

(17) Page 100. Is any portion of the stream that will be affected by the project (about 3.7 miles) a "losing" stream reach where the streamflow would decrease due to seepage into the channel?

(18) Page 101. Elaborate on the mathematical equation, rainfall data, and USGS gage data used to calculate the accumulated flows.

(19) Page 105. As mentioned earlier, describe the impact of the construction and removal of the cofferdams.

(20) Page 108. Will there be any type of channel or pathway along the downstream face of the weir connecting the conservation-flow notch and the stream channel?

(21) Page 108. Does the Archer Study conclude that 10 cfs is adequate to maintain a migratory pathway?

(22) Page 109. Are there any anticipated impacts on fish populations if juvenile, larvae, and eggs flow through the penstock and powerhouse?

A copy of these comments will be sent directly to the proposing party, DHM Planners, Inc.

for MANABU TAGOMORI

SC:dh
cc: DHM Planners, Inc.

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 23, 1989

Mr. Manabu Tagomori
Deputy Director
Commission on Water Resource Management
Department of Land and Natural Resources
Division of Water and Land Development
P.O. Box 373
Honolulu, Hawaii 96809

Dear Mr. Tagomori:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your memorandum to Roger Evans. The following responses are numbered in sequence with your comments:

1. Pg. 21 - The radial gate is designed to allow silt that has accumulated behind the weir to continue down the stream channel. At this time, the developer anticipates opening the gate a minimum of once a month. Since the gate will be opened during high freshet flows, the impact on the turbidity of the stream will be negligible.

2. Pg. 23 - A 6-inch trash rack is proposed at the opening to the intake and a 1-inch rack at the opening to the penstock. By maintaining a low velocity of the water in the intake, which will be designed for a maximum of one foot-per-second, adult fish will be able to swim out of the intake.

3. Pg. 23 - The sediment trap is designed to collect silt before it might otherwise enter the penstock. At this time, the developer anticipates opening the trap a minimum of once a month to allow the sediment to continue down the stream channel. Since the trap will be opened during high freshet flows, the impact on the turbidity of the stream will be negligible.

4. Pg. 24 - The amount of water flowing through the intake will be controlled by a valve which will be opened and closed automatically based on information received from a water level sensor located upstream of the weir. By keeping the level of the pool behind the weir at a predetermined elevation and by calculating the area of the conservation notch, it can be assured that 10 cfs will always flow through the conservation notch.

5. Pg. 24 - The proposed 10 cfs conservation flow is based on the hydrological characteristics of Honoli'i Stream, the field studies conducted by a professional aquatic biologist, and on actual information developed from three existing hydroelectric projects in Hawaii. The Lower Wainiha project, which has been in operation for over 65 years, does not allow water to flow past the diversion weir

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until the stream flow is greater than 100 cfs. In a 1983 aquatic survey conducted by Dr. Timbol, five species of native goby (including Lentipes concolor) were found upstream of the weir. Moreover, the Lentipes concolor has also been sited above the Waiau and Puueo hydroelectric plants on the Wailuku River. The presence of the native goby above the diversion weirs indicates that they are capable of migrating upstream without the presence of a continuous conservation flow. In 1983 the Upper Wainiha project was approved with a 3 cfs conservation flow. Finally, the U.S. Army Corp of Engineers, in their reconnaisance study of Honoli'i (which was performed in cooperation with the Fish and Wildlife Service), recommends a conservation flow of 9 cfs. Based on these findings, the developers felt that a proposed 10 cfs conservation flow would be adequate for this project.

6. Pg. 28 - There is one non-perennial drainage channel which will need to be crossed. The culvert will be sized to allow flood flows to pass freely. As this drainage channel is normally dry, no impact to the surrounding area is expected. A Stream Channel Alteration permit will be prepared and filed, if necessary, for this unnamed drainage channel.

7. Pg. 30 - Diagrams showing the bench in relation to the stream will be included in the Final EIS.

8. Pg. 34 - The area where the water will be allowed to free-fall back into the stream contains numerous large boulders which will dissipate the energy from the falling water.

9. Pg. 37 - No stream channels will be crossed. Standard culverts will be used as required in locations where access roads cross drainage channels. The culverts will be sized to accommodate the largest expected flow in the drainage channels. Standard engineering and road construction practices will be employed during the design and installation of the culverts to minimize erosion and other damage to the surrounding area.

10. Pg. 38 - The cofferdams necessary for the construction of the weir are expected to be in place for one to two months.

11. Pg. 38 - There will be a temporary increase in turbidity during the construction and removal of the upper cofferdam. However, this will occur during low flows, therefore minimizing the amount of earth entering the stream channel. There will be no impact during the construction and removal of the lower cofferdam.

    The preferred method of using steel sheet pile was considered instead of earthfill for the cofferdams. However, because of the bedrock in the stream channel, steel sheet pile cannot be used.

12. Pg. 40 - It is estimated that 1,200 cubic yards of cobblestone and boulders will be used in the construction of the weir.

    The boulders and cobblestones will come from the "surrounding areas" in which bench cuts are made for the access road to the weir site along the penstock route on the south side of the stream.

13. Pg. 51 - Because of the uncertainty whether the flow data during the periods 1911-1913 were taken with or without diverted flows, the available information from USGS was used as is. The flow duration curves available from the USGS encompass the total period of record (24 years). Given the long period of record and a mean flow of 126 cfs, the difference of whether or not the 3-cfs diversion was taken into account is negligible.

14. Pg. 69 - This information was provided by USFWS in their EIS Prep Notice comment letter (p. 175 of EIS). The citation for the paper referred to by FWS will be included in the Final EIS and is as follows: Radtke, R.L., R.A. Kinzie, S.D. Folsom. "Age at Recruitment of Hawaiian Freshwater Gobies." Environmental Biology of Fishes. 1988. 23(3):205-213.

15. Pg. 83 - The project will not be visible from Honoli'i Surf Park. This fact will be clearly stated in the Final EIS.

16. Pg. 91 - Yes, with the exception of the weir and the intake area.

17. Pg. 100 - No, the stream channel is composed of bedrock therefore no significant seepage occurs.

18. Pg. 101 - The additional flow that would be contributed to the stream below the diversion by runoff, seepage, and various tributaries that feed Honoli'i Stream was derived using stream flow data from the USGS gage, annual average rainfall data from the U.S. Army Corps of Engineers, and the drainage area below the weir at points 1.5 miles, 2.5 miles and 3.7 miles downstream of the proposed weir site.

Honoli'i Stream has a mean flow of 126 cfs over the entire period of record. The drainage area above the weir is 11.6 sq. miles. Average annual rainfall is about 207 inches above the gage and 175 inches below the gage.

With this information, the following equation was used to calculate the additional flow:

$$\frac{\text{Drainage Area (Gage)}}{\text{Flow (Gage)}} = \frac{\text{Drainage Area (Below the Gage)}}{\text{Flow (Downstream)}}$$

These results were adjusted by a rainfall factor which was derived by taking a ratio of the average annual rainfall below the gage (175") to the average annual rainfall above the gage (207") i.e. (175/207 = 0.85).

For example, the additional stream flow added to the stream between the weir and a point 1.5 miles downstream was calculated as follows:

$$\frac{11.6}{126} = \frac{0.70}{X}, \quad X = 7.7 \text{ cfs}, \; 7.7 \times 0.85 = \underline{6.5 \text{ cfs}}$$

Stream flow measurements were recently taken at the proposed weir and powerhouse sites in an effort to verify the validity of the methodology described above. No rain had occurred in the area for three days prior to the measurements being taken. Using a Price Type AA Current Meter on a round weighted rod, 41 cfs was measured flowing in the stream at the weir site and 51 cfs was measured at the powerhouse site, an increase of 10 cfs.

Using the equation to calculate the additional flow that would be added between the weir and powerhouse sites based on the 41 cfs measurement at the weir site results in an estimated 5.7 cfs in additional flow being added to the stream. This compares with the 10 cfs which was derived through actual field measurements.

Since the equation uses average annual rainfall, and variables such as evaporation and seepage cannot be accurately accounted for, these findings appear to suggest that the methodology described above does provide a reasonable, and perhaps conservative, approach to calculating the amount of stream flow that would be added to the stream between the proposed weir and powerhouse sites.

19. Pg. 105 - There will be a temporary increase in turbidity during the construction and removal of the upper cofferdam. However, this will occur during low flows, therefore minimizing the amount of earth entering the stream channel.

20. Pg. 108 - The weir will be constructed of cobblestone and boulder at a three-to-one (3:1) slope. The water flowing through the conservation notch will flow down the face of the weir to the stream channel.

21. Pg. 108 - The Archer Study made no conclusions as to the adequacy of 10 cfs.

22. Pg. 109 - There are no definitive studies of the mortality rate of juvenile, larvae, and eggs of native aquatic fauna passing through the penstock and turbines. A significant impact on fish populations would result only if a large number of juvenile, larvae and eggs were to pass through the penstock and turbines. This is not expected to occur due to the design of the intake and its slow flow (1 fps). According to the Sierra Club, "the published literature (e.g., Timbol, et al., 1980. Distribution, Relative Abundance, and Stream Environment of the Lentipes concolor, etc., WWRC Coop. Rept. No. 5) suggests that Lentipes require fast flowing streams...." Therefore, these fish are not likely to enter the intake.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

(P)1012.9

JAN 12 1989

Department of Land
  and Natural Resources
State of Hawaii
Honolulu, Hawaii

Office of Environmental
  Quality Control
465 South King Street, Room 104
Honolulu, Hawaii

Gentlemen:

Subject: Draft Environmental Impact Statement
Honolii Hydroelectric Power Project

We have reviewed the subject document and have no comments to offer.

Very truly yours,

T. Tominaga

TEUANE TOMINAGA
State Public Works Engineer

SM:jk
cc: Ms. Duk Hee Murabayashi

DHM inc.
land use
and environmental
planning

1168 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

March 6, 1989

Mr. Teuane Tominaga
State Public Works Engineer
Department of Accounting
  and General Services
Division of of Public Works
P.O. Box 119
Honolulu, Hawaii 96810-0119

Dear Mr. Tominaga:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your correspondence in reference to the above. We appreciate your review of the document and prompt response.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

JOHN WAIHEE
GOVERNOR

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814-2512

YUKIO KITAGAWA
CHAIRPERSON, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRPERSON

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822-0159

January 23, 1989

MEMORANDUM

To: Mr. William W. Paty, Chairperson
Board of Land and Natural Resources

Subject: Draft Environmental Impact Statement (DEIS) for
Honolii Hydroelectric Power Project
Mauna Kea Power, Inc.
THK: 2-6-09: 11
2-6-12: 18, 24, 29, 30, 31
2-7-02: 21
South Hilo, Hawaii

The Department of Agriculture has reviewed the subject DEIS and offers the following comments.

According to the DEIS (pages 122-123), the proposed project will result in some impact to the sugarcane cultivated fields in the immediate area. However, coordination with the sugar companies will be done during construction to minimize potential conflicts. Affected sugar companies will be compensated for any productive cane land taken out of production. Once the project is complete, sugarcane cultivation can recommence over the buried penstock.

Based on these proposed conditions, we are of the opinion that the proposed project will not adversely affect the agricultural resources of the area in the long run.

Thank you for the opportunity to comment.

Yukio Kitagawa
YUKIO KITAGAWA
Chairman, Board of Agriculture

cc: √DHM Planners, Inc.
OEQC

DHM inc.
land use
and environmental
planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. Yukio Kitagawa
Chairman
Board of Agriculture
State of Hawaii
1428 South King Street
Honolulu, Hawaii 96814-2512

Dear Mr. Kitagawa:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your correspondence in reference to the above. We appreciate your review of the document and prompt response.

Sincerely,

DHM inc.

Wendie McAllaster
Wendie McAllaster
Project Manager

cc: DLNR
OEQC

DEPARTMENT OF BUSINESS AND ECONOMIC DEVELOPMENT

ENERGY DIVISION 335 MERCHANT ST., RM. 110, HONOLULU, HAWAII 96813

JOHN WAIHEE, GOVERNOR
ROGER A. ULVELING, DIRECTOR
BARBARA KIM STANTON, DEPUTY DIRECTOR
LESLIE S. MATSUBARA, DEPUTY DIRECTOR

89:1273A-59

January 30, 1989

Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Gentlemen:

This is to acknowledge receipt of the Draft EIS for the Honolii Hydroelectric Power Project, Island of Hawaii.

The Department of Business and Economic Development supports the construction of a hydroelectric plant at this site which will provide about 35 million kilowatt hours of electricity annually from a renewable energy source. This environmentally benign project will further the State's goal of attaining greater energy independence by replacing 58,000 barrels of imported oil.

Sincerely,

for Roger A. Ulveling

RAU/TOB:geo

cc: DLNR
✓DHM Planners Inc.

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. Roger A. Ulveling
Department of Business and Economic Development
Energy Division
State of Hawaii
335 Merchant Street, Room 110
Honolulu, Hawaii 96813

Dear Mr. Ulveling:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your correspondence in reference to the above. We appreciate your review of the document and prompt response.

Sincerely,

DHM inc.

Wendie McAllaster
Wendie McAllaster
Project Manager

cc: DLNR
OEQC

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF BUSINESS AND ECONOMIC DEVELOPMENT
HOUSING FINANCE AND DEVELOPMENT CORPORATION
P. O. BOX 29360
HONOLULU, HAWAII 96820-1760

JOSEPH K. CONANT
EXECUTIVE DIRECTOR

IN REPLY REFER
TO:

89:PLNG/212B JT

January 20, 1989

MEMORANDUM

TO: Dr. Marvin T. Miura, Director
Office of Environmental Quality
Control

FROM: Joseph K. Conant

SUBJECT: Draft EIS for the Proposed Honoli'i Hydroelectric Power Project

Thank you for the opportunity to review the subject report. We have no comments to offer.

As we have no further use for the draft EIS, we are returning it to your office.

JOSEPH K. CONANT
Executive Director

Enclosure

cc: Dept. of Land & Natural Resources
Mrs. Duk Hee Murabayashi, DHM Planners, Inc.

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. Joseph K. Conant
Executive Director
Department of Business Development
Housing Finance and Development Corporation
State of Hawaii
P.O. Box 29360
Honolulu, Hawaii 96820-1760

Dear Mr. Conant:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your correspondence in reference to the above. We appreciate your review of the document and prompt response.

Sincerely,

DHM inc.

Wendie McAllaster
Wendie McAllaster
Project Manager

cc: DLNR
OEQC

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816-4495

JAN 06 1989

Engineering Office

Dept. of Land & Natural Resources
Kalanimoku Building
1151 Punchbowl Street
Honolulu, Hawaii 96813

Ofc of Environmental Quality Control
465 S. King St., Rm. 104
Honolulu, Hawaii 96813

Dear Gentlemen:

Draft Environmental Impact Statement Honoli'i
Hydroelectric Power Project
TMK: 2-6-09; 11; 2-6-12:18, 24, 29, 30, 31; 2-7-02:21
South Hilo District, Island of Hawaii

Thank you for providing us the opportunity to review the subject project.

We have no comments to offer at this time regarding this project.

Sincerely,

SIGNED

Jerry H. Matsuda
Major, Hawaii Air National Guard
Contr & Engr Officer

Enclosures

cc: Duk Hee Murabayashi ✓

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. Jerry M. Matsuda
Major, Hawaii Air National Guard
Department of Defense
State of Hawaii
Office of the Adjutant General
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

Dear Mr. Matsuda:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your correspondence in reference to the above. We appreciate your review of the document and prompt response.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

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:
EPHSD

February 1, 1989

MEMORANDUM

To: Honorable William W. Paty, Chairperson
Board of Land & Natural Resources

From: Director of Health

Subject: Draft Environmental Impact Statement for Honoli'i Hydroelectric Power Project, South Hilo, Hawaii

Thank you for the opportunity to review and comment on the proposed project. The following are my comments:

Drinking Water

1. The proposed site is located above the Underground Injection Control (UIC) line.
2. There is no mention of injection wells or proposed wastewater disposal systems. Cesspools are said to serve two dwelling units on the 2.9 acre parcel.
3. The applicant should be made aware that effective January 1, 1990 treatment individual wastewater systems (IWS) will be necessary if additional systems are required.

Also, an injection well or seepage pit disposing of over 1,000 gallons per day (current regulations) for a facility will not be allowed to operate in areas above the UIC line.

Water Quality

Please note page 131, item number 3. The Federal Energy Regulatory Commission (FERC) may also require a 401 Water Quality Certification (WQC). The applicant should contact the Corps of Engineers and the FERC to coordinate a joint 401 WQC.

JOHN C. LEWIN, M.D.

cc: Duk Hee Murabayashi
DHO, Hawaii

DHM inc.
land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Dr. John C. Lewin
State of Hawaii
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Lewin:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your memorandum of February 1, 1989 to William Paty regarding the above.

Drinking Water

The proposed project will not require injection wells or wastewater disposal systems.

Water Quality

An application for a 401 Water Quality Certification was mailed to your office by the project developer Mauna Kea Power, Inc. on January 23, 1989.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

12/22/87

State of Hawaii
Department of Land and Natural Resources
DIVISION OF AQUATIC RESOURCES

MEMORANDUM

DATE: January 23, 1989

TO: Paul Kawamoto, Program Manager, Aquatic Resources & Environmental Protection
THRU: Eric Onizuka, Program Manager, Recreational Fisheries
FROM: Robert T. Nishimoto, Aquatic Biologist, Hawaii
SUBJECT: Comments on X 1. Conservation District Use Application HA-9/12/88-2205
2.

Comment Requested by Roger Evans, Office of Conservation and Environmental Affairs Date of Request 10/06/88 Date Rec'd 10/11/88

Summary of Proposed Project

Title: Environmental Assessment, Honolii Hydroelectric Power Project

Project by: Mauna Kea Power, Inc. (Agent: DHM Planners, Inc.)

Location: Honolii Stream, South Hilo District

Brief Description:

Mauna Kea Power, Inc. proposes to construct a 14.6 MW run-of-the water hydroelectric plant along the Honolii River. A diversion weir will be located at the 1530 feet elevation, and the water diverted through a 20,000 feet long penstock to a power plant and substation, both located 3.7 miles downstream at the 100 feet elevation. The tailrace will be designed so the water will free fall into the river to prevent fish entrainment. A 3.7-mile segment of the Honolii River will be diverted. A conservation water flow of 10 cfs is proposed in the affected reaches of the river, maintained by water level sensors at the weir.

249

Comments:

P. 38 (2nd paragraph) — There is no indication as to how long the stream will be interrupted/diverted during construction of the diversion weir. Dewaterment of the stream for any length of time, especially during the dry, warm summer months, may seriously impact the downstream aquatic fauna.

P. 49 (2nd paragraph) — Also, a (concentrated) high velocity flow due to natural and increased orographic runoff through the (by-pass) culvert to be used during the construction of the diversion weir could impact (injure or kill) downstream migration and/or prevent upstream migration of the native diadromous stream fauna .

P. 69 (2nd paragraph) — "...no homing ability has been recognized in these species..." should be cautiously used as we are unaware of any local study to test this hypothesis. It is pointed out that homing has been suggested for the postlarvae of the goby, Sicydium plumieri, by Erdman (Rhythmicity of juvenile gobies, Sicydium plumieri (Bloch) migrating upstream in Puerto Rico, 1984).

P. 71 (2nd paragraph) — The statement, "...are capable of thriving..." may be incorrect, especially during prolonged very low flow levels. Many stream organisms will stop feeding, possibly not reproduce and experience other stress (including disease and death) under suboptimal environmental conditions like low water flow and high water temperatures (conditions which favor exotic species). There was no observation of feeding and territorial behaviors in populations of o'opu nopili (Sicyopterus stimpsoni) in Nanue Stream during the mini drought we experienced several years ago. In fact, most of the gobies were concentrated in large clusters in the middle of the stream and were susceptible to predators (such as the night heron).

Re: Honolii Hydroelectric Power Project

P. 108 (2nd and 3rd paragraphs) -- Please provide quantitative information to your statement that "...the proposed continuous minimum streamflow (10 cfs) are expected to be adequate to maintain the migratory pathway." It is not clear what the cumulative impact of decreased water flow, turbidity, aggregation of particulate materials, increased temperatures, pH, and decreased oxygen will have on the diadromous organisms in the Honolii Stream, including migration and recruitment of the "...significant population of the goby, 'o'opu alamo'o near the gauging station" and on the large populations of the o'opu nakea (Awaous stamineus) in the middle portion of the affected reach and opae kalaole (Atyoida bisculata) in both the middel and upper reaches.

Also, P. 63 (3rd paragraph) and Appendix C, P. 12 (2nd paragraph). We question that the o'opu alamo'o (Lentipes concolor) should be considered as a candidate for inclusion on the "Federal List of Endangered or Threatened Species." Some scientists have suggested that the Lentipes is becoming threatened in some areas of the State. However, it has been determined that the species occurs in only certain streams/rivers. As an example, the species is very abundant in Waikolu Stream on Molokai, where counts of up to 500 individuals per pool and estimated population in excess of 10,000 were made. In addition, should the Lentipes be listed as Endangered, Honolii Stream may not be used for hydropower purposes.

fw ROBERT T. NISHIMOTO

RECEIVED
'89 JAN 24 PM 2:41
DLNR
OCEA

250

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. Robert T. Nishimoto
State of Hawaii
Department of Land and Natural Resources
Division of Aquatic Resources
1151 Punchbowl Street, Suite 330
Honolulu, Hawaii 96813

Dear Mr. Nishimoto:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

We received a copy of your memorandum to Paul Kawamoto regarding the above. The following responses reflect the sequence of your comments:

Pg. 38 One to two months will be required to construct the weir. The stream area that will be dewatered for this limited period is 200 feet. The downstream reach of the stream will not be adversely impacted since that natural stream flow will pass through a culvert across the construction area and continue downstream.

Pg. 49 Construction of the weir will occur during the dry summer months. The 5 foot diameter culvert is more than large enough to simulate the natural stream channel during low flows typical of these months. The culvert will be designed to pass up to 135 cfs (totally full of water, but not under pressure), and up to 300 cfs (totally full and under 6 psi of pressure). Water will overtop the upstream cofferdam after 300 cfs (thereby flooding the construction site and continuing down the natural stream channel). According to the flow duration curves for Honoli'i, flows over 300 cfs during the months of construction (June-August) occur less than 8% of the time.

Pg. 69 Based on studies conducted in Hawaiian streams, R.A. Kinzie III and John Ford state in their report ("Population Biology in Small Hawaiian Streams," Technical Report No. 147, Water Resources Research Center, University of Hawaii, 1982) that no homing ability has been recognized in the native stream fauna of Hawaii. Furthermore, the genetic and morphological similarity between species collected from different islands would argue against this ability. This local study is cited in Archer's report, Appendix C of the EIS.

Pg. 71 Observations of the native goby species in the Honoli'i Stream have not shown an appreciable drop in population despite the large variations in flow over the past five years.

Pg. 108 There are no definitive studies on any of the goby species that populate Hawaii streams in terms of how they thrive under specific flows. Similarly, there are no studies available concerning the impact on the goby of diversions for hydroelectric plants and agricultural irrigation. However, observations can be made on existing hydroelectric plants and the effect they have had on the native goby populations. Three hydroelectric plants that have been in operation since the 1920's can be used for this purpose. The Wainiha plant on Kauai has a diversion weir with no minimum flow. During the environmental studies for a proposed plant above the existing weir, five species of the native goby were found above the weir, including Lentipes concolor. According to A. Timbol ("A Survey of Aquatic Macrofauna in Wainiha River, Kauai," February 1983, p.9), "the presence of L. concolor upstream of the diversion ditch indicates that the alamo'o is capable of avoiding the existing hydropower plant, ditch and intake system to reach the upper elevations." The two hydroelectric plants that HELCO operates on the Wailuku River also have not depleted the native goby population as they are still found above both plants.

Pg. 63 & App. C We concur with your statement concerning Lentipes concolor.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

January 18, 1989

RECEIVED
'89 JAN 23 P1:36
FORESTRY & WILDLIFE
STATE OF HAWAII

DX

MEMORANDUM:

TO: Calvin W.S. Lum, D.V.M., Administrator

FROM: Charles K. Wakida, District Forester
Ronald E. Bachman, District Wildlife Biologist

SUBJECT: CDUA HA-9/12/88-2205, Draft EIS for Hydroelectric Power Project at Honolii, S. Hilo, Hawaii

Forestry Comments:

We see no conflicts between the proposed project and any forest reserve areas or forest resources in the area. Comments concerning wildlife resources follow.

Wildlife Comments:

Problems are not expected to result to wildlife as long as diversion devices do not deprive existing streambeds of minimal water flow.

CHARLES K. WAKIDA

RONALD E. BACHMAN

Enclosures

RECEIVED
'89 JAN 24 2:41
DLNR
OCEA

WTS/REB:flr

DHM inc.
land use and environmental planning
1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Messrs. Charles K. Wakida and
Ronald E. Bachman
Department of Land and Natural Resources
Forestry and Wildlife Division
State of Hawaii
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

Dear Mssrs. Wakida and Bachman:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

We received a copy of your memorandum to Mr. Lum regarding the above. Thank you for reviewing the EIS.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

January 24, 1989

MEMORANDUM

TO: Roger Evans, OCEA

FROM: Ralston H. Nagata, State Parks Administrator

SUBJECT: CDUA HA-2205: Draft EIS -- Honolii Hydroelectric Power Project (Mauna Kea Power Co.)
Kikala, South Hilo, Hawaii
TMK: 2-6-9: 11; 2-6-12: 18, 24, 29, 30, 31; 2-7-2: 21

HISTORIC SITES SECTION CONCERNS:

Compliance with the National Historic Preservation Act and Chapter 6E is needed as federal and state actions are involved. Project elements are a diversion weir, penstock, power plant/substation, temporary and permanent access roads, electric transmission line and power line (Draft EIS: iii, 18, 20).

Based on our review, it appears that the archaeological survey covered only some of the project elements. In order for the project to be in compliance with the historic preservation laws, the presence/absence of significant historic sites in relation to all the project elements needs to be covered. The EIS text should be revised to meet these concerns. We recommend the following revisions:

1. The transmission lines and access roads are not discussed in the archaeological survey report (App. D) or in the Draft EIS text (pp. 75-78). The presence/absence of significant historic sites in these areas must be resolved.

2. The archaeological survey covered the power plant/substation, penstock corridor, and weir areas (pp. 2). No sites were found, but this conclusion is not clear as it could be in the Existing Conditions text (pp. 75-78). Considerable discussion is devoted to 3 historic sites found in the vicinity of the power plant/substation, and the fact that all these sites are outside the area is somewhat hidden, although it is in the text (pp. 76, 78, 117) and the archaeological report (pp. 11, 13). We recommend the EIS text be revised to simply and flatly state that the sites are outside the project area. A map (p. 77) shows the proposed substation and the temporary access road within site T-3; this is incorrect based on the text, and it should be revised.

RALSTON H. NAGATA

cc: DHM Planners, Inc.
PHRI

252

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. Ralston H. Nagata
State Parks Administrator
Department of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Nagata:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your memorandum of January 24, 1989 to Roger Evans regarding the above. The following responses are numbered to correlate with your comments:

1. The project archaeologist inspected the proposed sites for transmission lines and access roads on February 8, 1989 and no historic sites were located. The project archaeologist has discussed the results of the field inspection with Mr. Ross Cordy of your staff (see the attached copy of Margaret Rosendahl's letter dated February 8, 1989). In regards to Mr. Cordy's concern regarding potential caves along the gulch, archaeological consultation will be sought immediately if a cave or unidentified subsurface cultural feature is encountered.

2. The EIS will be revised to clearly indicate that the three sites found during the survey are outside the project area. The map on page 77 correctly shows site T-3 as a small rectangular area downstream of the powerhouse and access road.

Sincerely,

DHM inc.

Wendie McAllaster
Wendie McAllaster
Project Manager

cc: DLNR
OEQC

PAUL H. ROSENDAHL, Ph.D., Inc.
Consulting Archaeologist

466-021089

February 8, 1989

Ms. Wendie McAllaster
DHM Planners, Inc.
1188 Bishop Street, Suite 2405
Honolulu, Hawaii 96813

Re: Archaeological Survey
Honolii Hydroelectric Project Area
Kikala and Paukaa, South Hilo, Hawaii
TMK:2-6-9:11; 2-6-12:18,24,29-31; 2-7-2:21

Dear Ms. McAllaster,

At your request, this letter addresses the concerns discussed in the DLNR-HSS review of the Draft EIS (memorandum dated January 24, 1989 from State Parks Administrator Ralston H. Nagata to Roger Evans, OCEA). In regard to revision #1. in Mr. Nagata's memorandum, the transmission lines and access roads were not included in the original archaeological survey, and therefore were not discussed in the original archaeological survey report (PHRI Report 466-081988). The transmission lines and access roads were inspected on February 8, 1969 by PHRI Supervisory Archaeologist Margaret L.K. Rosendahl. During the inspection, no historic sites were located (see attached map). The substation, powerhouse, and associated access road are sited along the periphery of an existing clearing. The clearing has been used extensively and has been modified by the family residing on the property. The transmission lines will cross existing cane fields and will span the Kaiwiki and Maili streambeds; poles for the transmission lines will not impact the areas of the streambeds.

The results of the field inspection were discussed with Dr. Ross Cordy of DLNR-HSS (February 8, 1989). Dr. Cordy was concerned that the steep walls of Honolii Gulch may contain caves which may be identified during initial grubbing. Should a cave or any previously unidentified subsurface cultural features or deposits of significance be encountered in the course of subsequent land modifications, archaeological consultation should be sought immediately.

If I can be of further assistance, please contact me at our Hilo office at 969-1763.

Yours truly,

for Margaret L.K. Rosendahl, B.A., S.O.P.A.
Supervisory Archaeologist

Attachment: Project Area Location Map

305 Mohouli Street • Hilo, Hawaii 96720 • (808) 969-1763 or 966-8038

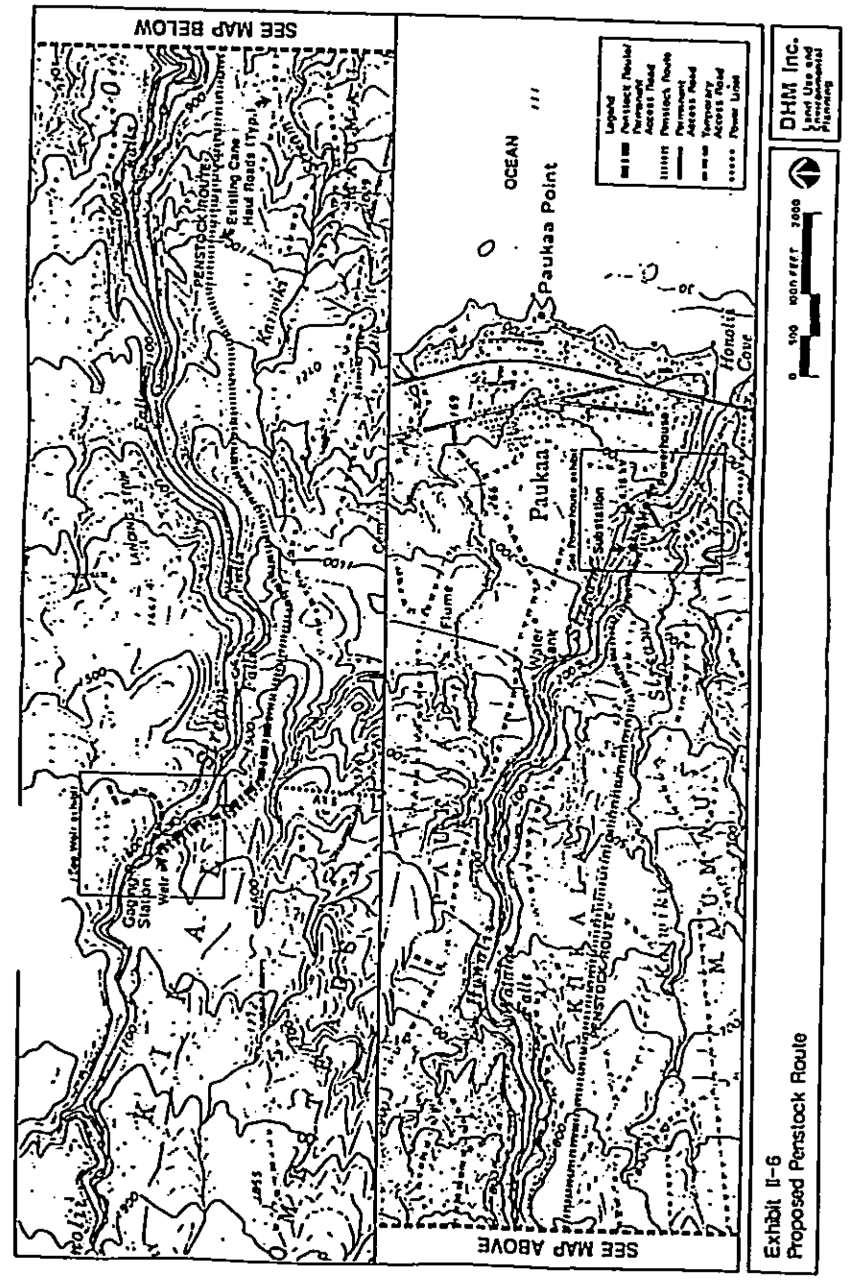

Exhibit II-6
Proposed Penstock Route

19.002.1j
4622

STP 8.3295

January 3, 1989

MEMORANDUM

TO: The Honorable William W. Paty, Chairperson
Board of Land and Natural Resources

FROM: Director of Transportation

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT
HONOLI'I HYDROELECTRIC POWER PROJECT
SOUTH HILO, HAWAII

We have no objection to the proposed Honoli'i Hydroelectric Power Project. Care should be taken, however, to insure that our highway facilities are not subjected to unusual loads during the construction period. Information on highway loading requirements can be obtained from our Highways Division Hawaii District Office.

Thank you for this opportunity to provide comments.

Edward Y. Hirata

DT:ko

cc: OEQC
Duk Hee Murabayashi
HWY, STP(dt)

DHM inc.
land use
and environmental
planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. Edward Y. Hirata
Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Hirata:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your correspondence in reference to the above. We appreciate your review of the document and prompt response.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

JOHN WAIHEE
GOVERNOR

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

MARVIN T. MIURA, Ph.D.
DIRECTOR

TELEPHONE NO.
548-6915

FEB 13 1989

Mrs. Duk Hee Murabayashi
1188 Bishop Street, Suite 2405
Honolulu, HI 96813

Dear Mrs. Murabayashi:

SUBJECT: Comments on the Draft EIS for the Honolii Hydroelectric Power Project

We have reviewed your Draft EIS for this project and offer the following comments for your consideration:

1. The EIS states that a minimum stream flow of 10 cfs will be maintained at all times. This level of flow is considerably lower than existing stream flow (see page 52) and thus will have significant effect upon stream fauna along the 3.85 mile length of the diversion. We understand that the 'o'opu alamo'o exist in Honolii Stream which is a candidate endangered species.

2. On page 54 the graph entitled 'Average Annual Flow Duration Curve for Honolii Stream' is actually an average daily duration curve.

3. There should be safeguards against flooding in the event there is a break in the penstock from earthquake or some other cause. In such an event, stopping the flow at the intake may not be sufficient, because of the large volume of water in the length of the penstock.

Thank you for providing us the opportunity of reviewing this EIS.

Sincerely,

Marvin T. Miura, Ph.D.
Director, Office of Environmental Quality Control

Roy Sakamoto
Environmental Technical Specialist

cc: Harold Masumoto, OSP
Manabu Tagamori, DOWALD

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 24, 1989

Dr. Marvin T. Miura, Director
Mr. Roy Sakamoto, Environmental
Technical Specialist
Office of Environmental Quality Control
465 South King Street, Suite 104
Honolulu, Hawaii 96813

Dear Dr. Miura and Mr. Sakamoto:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for your letter of February 13, 1989 regarding the above. The following responses are numbered in the sequence of your comments.

1. There are no proven biological studies available to assess the impact of the proposed 10 cfs conservation flow on the stream fauna in Honoli'i Stream. However, in Hawaii there are three existing hydroelectric plants (Wainiha on Wainiha River, Kauai, and Puueo and Waiau on Wailuku River, Hawaii) which have been continuously operating for more than 65 years with less than 10 cfs conservation flows. Observations of native fauna in the areas surrounding these existing plants offer significant insight into the potential impacts of the proposed project. In the absence of proven scientific biological information, standards were developed based on information from the existing plants. The diversion weir at the existing Wainiha plant does not allow any water to pass until the stream flow is greater than 100 cfs, which occurs over 153 days a year. This affects a 4.5-mile length of stream. Native aquatic fauna, including the o'opu alamo'o, have been found upstream of the diversion weirs at all three of these projects. Moreover, the Division of Aquatic Resources, DLNR, has questioned the appropriateness of including the 'o'opu alamo'o as a candidate on the Federal List of Endangered or Threatened Species, since it has been found to be in abundance in certain island streams.

2. The flow duration curve is based on information provided by the U.S. Geological Service and represents data for all the years of record for which stream flow data is available. Based on this information, the flow duration curve indicates the percentage of time, on an average <u>annual</u> basis, that various stream flows can be expected to occur.

3. The design of the emergency tainter gate in the intake will be based on detailed engineering studies including a hydraulic transient analysis, and will be adequate to minimize damage in the event of penstock collapse. This is based on information derived from an actual penstock collapse that occurred in the U.S. Northwest. It should be noted that, although the island of Hawaii is more susceptible to earthquake activity than the other islands of the Hawaiian chain, the Honoli'i Stream is located in the lowest risk zone of the island. Should a penstock break occur, the effected area will entirely consist of sugarcane fields and the existing streambed, and will not pose a danger or cause flooding to the residential communities in the surrounding area.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
Harold Masumoto (OSP)
Manabu Tagomori (DOWALD)

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

February 6, 1989
RE:0518
Revised

Mr. William Paty, Director
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Paty:

Draft Environmental Impact Statement
Honoli'i Hydroelectric Power Project
South Hilo District, Hawaii

The above referenced document proposes construction of a 14.6 megawatt hydroelectric power plant on the Honoli'i Stream on the eastern coast of the Island of Hawaii. The proposed project, a combination run-of-the-river operation and conduit-type operation, will consist of a diversion weir, a 20,350 foot-long penstock, a power plant and substation, access roads to the weir and powerhouse, a 69 kV electric transmission line, and a 5 kV power line. This review was conducted with the assistance of John Chan, Biology-UH Hilo; Joseph Halbig, Geology-UH Hilo; Bion Griffin, Anthropology; James Parrish, Hawaii Cooperative Fisheries Research Unit; Yu-Si Fok, Civil Engineering; and Anna Ulaszewski, Environmental Center.

In general, this seems to be a well thought out document; however, there are several problem areas which we believe could have been resolved if an In-stream Flow Incremental Model (IFIM) had been done. The problem areas we have identified pertained primarily to the viability of Honoli'i Stream as a habitat after the construction of the project. The following areas have been noted by our reviewers for further consideration in the Final Environmental Impact Statement (EIS):

Economic Analysis

According to page 41, paragraph 2, "the project will bring needed services to the public without ratepayer risk or capital." Since information concerning debt-financing is not provided by this document, it is not possible to determine the effects of potential default on the ratepayer.

Also, because ultimate decisions regarding the approval and construction of this project are, in part, based on economic benefits, the Final EIS should contain a cost/benefit analysis.

Weir design

The weir plays an important role in the conservation of stream biota and because of this, there should be detailed drawings of the weir, including the conservation flow notch. Also, information about approach velocity and pressure, control and monitoring of flow, and fish passage over the weir face should be included. The information provide by this document is too vague and it should be specific enough to depict the actual design and conditions at the weir once the project is completed.

Sedimentation control

There should be a more detailed discussion of sedimentation and its control, both during and after construction. Erosion control should be used along the cane field and by fresh cuts to mitigate erosion and sedimentation. Once the area is stabilized and re-vegetated, turbidity will still increase because of lower flow rates over a course of time. While the actual rate of erosion may remain the same, the amount of stream flow available to dilute and transport the sediment will be less.

Specific Comments

Page 23. The maximum opening of one inch in the second set of racks will not prevent fish from entering the penstock. This opening is large enough to allow passage of adult gobie.

Pages 34 and 109. Allowing the water to "free fall" into the stream will not necessarily prevent migrating fish from entering the tailrace. As is pointed out on page 107, gobies can easily navigate water falls. It is more likely to be effective if the tailrace or discharge pipe extends downstream so as to overhang the stream. The lip of the discharge structure should be designed in such a way as to prevent a continuous wetted surface for the fish to ascend.

Page 53. The curves in Exhibit III-5 and 6 indicate that the base flow of 10 cfs occurs consistently every 1-2 years (not every year as stated), for periods of up to 14 days, almost as often as the stated 7 days, and up to 30 days every 5 years.

Page 68. There are several errors in Exhibit III-12. The title should read: CONSPICUOUS ADULT STREAM FAUNA IDENTIFIED IN HONOLI'I STREAM (add ADULT). The "Legend" should be corrected to read: ++26 to 50, not 30 as stated. Also, the "Source" should read: Aquatic Survey of Honoli'i (not Hawaii) Stream.

<u>Page 70.</u> It would be clearer, in paragraph 1, if the station was designated, ie. Station A.

<u>Page 71.</u> According to paragraph 2, "Apparently the populations of stream fauna present in Honoli'i are capable of thriving under flow conditions which range from very low levels to high, freshet flows." There is no reference cited for making this assumption; also it is not made clear what is meant by "very low levels".

<u>Page 92.</u> Paragraph 1 states that "turbidity and aggradation of particulate material may also be associated with a reduction in flow within a stream reach" and then further states, the "consequent reduction in the streams's mid-reaches would probably not affect turbidity levels." Since it also states that "Honoli'i is normally turbid water", it can only be discerned that the reduction in flow will exacerbate this condition. This section seems to contradict itself.

According to paragraph 3, water quality will not be altered to the point of loss of stream fauna. The rationale for this assumption is not clear. An IFIM is needed to determine this.

<u>Page 93.</u> While the stream fauna may have "survived extremely variable flow conditions and extensive periods of low flow," it is not known if it will survive worse conditions for more extended periods of time.

Section C, line 14 should read "flow <u>to the weir</u> between..." (adding the words "to the weir".

<u>Page 109.</u> According to paragraph 1, "If necessary, suitable fish screens will be installed at the intake to prevent adult fish from entering." Because of the relevant size of the adult fish to the intake, it <u>will</u> be necessary to install fish screens.

<u>Page 112.</u> Paragraph 2 states that the freshets will be reduced during operations; how can it be determined that the reduced frequency and flow of the freshets will be sufficient to flush the pools and maintain water quality "well within the tolerance levels of the stream fauna"? This paragraph further states that, "Modest increases in pH and temperature and decreases in dissolved oxygen may accompany dry periods." What is the definition of "modest"? By measuring during conditions resembling those of operation, it might be possible to extrapolate the conditions to the much longer period they will occur during operation.

<u>Page 116.</u> According to paragraph 1, the "conservation flow of 10 cfs is expected to maintain adequate feeding habitat and loafing sites for the koloa." Without documentation, how can this assumption be made?

<u>Page 148.</u> Section 5 would lead us to believe that the project is "consistent" with the State Environmental Policy, because it "will prevent or eliminate damage to the environment and biosphere" and it will "protect the natural resources from pollution". This is difficult to discern in view of the potential significance of the impacts this project will have on the existing stream ecosystem.

<u>Page 149.</u> The present approach taken by the Water Commission to establish instream flow standards is "status quo". This section suggests that there are conditions under which this project would be granted a waiver to divert the stream flow. This document does not state what those conditions are, nor is there a copy of the October 14, 1988, letter from William W. Paty to DHM Planners. We are unaware of any specific guidelines or criteria for granting waivers.

<u>Page 164.</u> According to Section IX, there are "no significant issues left unresolved." We have stated our concerns about several significant issues which we do not consider resolved. An IFIM study should be conducted to determine the full range of impacts on the stream ecosystem.

<u>Appendix C</u>, page 15. According to Section 1, the project "could threaten the viability of the <u>Lentipes</u> population in Honolii Stream." However, the Draft EIS fails to state this and we are led to believe that the impact of the project will not be significant.

<u>Page 16.</u> According to Section 1, "it is doubtful that habitat constraints are the cause of the low densities of this endemic fish [<u>Lentipes concolor</u>]." However, since "no information is available", what is the rationale for this assumption?

Thank you for the opportunity to comment on this Draft EIS. We hope our comments will be helpful in preparing the final document.

Yours truly,

John Harrison
Environmental Coordinator

cc: OEQC
DHM Planners Inc. ✓
L. Stephen Lau
Bion Griffin
John Chan
James Parrish
Yu-Si Fok
Joseph Halbig
Anna Ulaszewski

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. John Harrison
Environmental Coordinator
Environmental Center
University of Hawaii at Manoa
Crawford 317
2550 Campus Road
Honolulu, Hawaii 96822

Dear Mr. Harrison:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your letter to William Paty regarding the above. The following responses are in the sequence of your comments:

<u>Economic Analysis</u>

The developer will be responsible for all debt financing and equity acquisition necessary for the project. Any consequences of a default will be borne by the developer and not the ratepayer.

The inclusion of cost/benefit information in the final EIS will depend on the developer's ability to finalize a power purchase contract with HELCO. Negotiations between the parties on the details of such a contract are continuing, however it is unlikely that an agreement will be reached until there is reasonable assurance that the necessary permits will be issued. Any discussion of the projected costs and/or economic benefits to be generated by the project would therefore be premature. It should be noted, however, that even if the developer is unable to provide a cost/benefit analysis in the final EIS for the reasons discussed above, any agreement that is ultimately reached on the details of a power purchase contract with HELCO will have to be approved by the State Public Utilities Commission, which is responsible for protecting the interests of the ratepayer.

<u>Weir Design</u>

The information provided in the Draft EIS is sufficient enough to answer all of the questions. If the developer can be of any assistance in interpreting the information, a meeting can be arranged.

<u>Sedimentation Control</u>

The only area in which an open cut will be made for the routing of the penstock within the stream channel will be at the intake. The cut will be made through bedrock and therefore no sedimentation and erosion is expected to flow into the stream. Once the penstock is out of the stream channel and crossing the existing canefields, no increase in erosion is expected. Re-vegetation will be controlled by the existing agricultural growers. Monthly flow duration curves show that freshet flows occur regularly each month. These flows will remove accumulated sediment on a regular basis.

<u>Specific Comments</u>

Pg. 23 — The intake will be designed for a maximum velocity of one foot-per-second. At those flows, the adult goby will be able to swim out of the intake area. If a fish screen were installed, those fish not able to exit the intake would become impinged on the fish screen and eventually die.

Pg. 34 & 109 — The intention of the free-fall is to prevent migrating fish from entering the tailrace. We concur with the method you propose.

Pg. 53 — We concur.

Pg. 68 — Thank you for bringing these errors to our attention. They will be corrected as you indicate in the Final EIS.

Pg. 70 — The Final EIS will designate "Station A" in the first paragraph.

Pg. 71 — The reference for this statement is the aquatic biologist's report, Appendix C, p. 22. It is based on the large variations in flow in Honoli'i and the biologist's professional experience with Hawaii streams.

"Very low levels" refers to the low flow of a given water year. The low flow of record is 0.8 cfs.

Pg. 92 — The Final EIS will be revised to clarify this issue.

Regarding Paragraph 3, an IFIM without established habitability curves for native aquatic fauna will not provide any more information on their survivability.

Pg. 93 — We concur that this information is not known.

Regarding Section C, the Final EIS will be revised as you suggest.

Pg. 109 — Based on available information from existing hydropower plants which do not have fish screens, it is difficult to believe that fish screens are necessary; it is more important to keep the flow through the intake at a maximum of one foot-per-second, which will allow the fish to swim out of the intake.

Pg. 112 — The number of freshets will not be reduced during operations. Archer states that (Appendix C, p. 19) "the substantial and numerous high flow conditions of the stream ... will not be greatly affected by the diversion of stream water for hydroelectric production." Since existing freshets maintain adequate water quality and habitat for the stream fauna, it is expected that they will continue to do so. "Modest" is used here to mean "slight" changes in stream conditions during dry periods. While a numerical value to "modest" or "slight" cannot be given, the aquatic biologist believes the degree of change in temperature, pH, and dissolved oxygen due to the project will be insignificant (Appendix C, p. 24).

In order to accumulate sufficient data necessary to extrapolate the conditions resembling those during operation, we would need to take samples over a significant period of five to ten years. Since it is not practical for us to do this, and since there is no certainty that the information gathered will be statistically significant enough to make definitive conclusions concerning pH, temperature, and dissolved oxygen, we have chosen to rely on established, observed information of the native goby having survived dry periods in Hawaii's streams.

Pg. 116 — This sentence will be revised to read: "The proposed conservation flow of 10 cfs and the regularity of large freshet flows in Honoli'i Stream are expected to maintain adequate feeding habitat and loafing sites for the Koloa."

Pg. 148 — Balancing the positive and negative impacts to the total environment, such as reducing fossil fuel emissions vs. reducing stream habitat, is a subjective process that is properly left with the Board of Land and Natural Resources after a review of available information.

Pg. 149 — We are complying with all instructions and procedures established by the State Commission on Water Resources Management. Appendix F contains a copy of the "Petition to Amend Interim Instream Flow Standards." A copy of the October 14, 1988 letter from William Paty will be included in the Final EIS.

Pg. 164 — At this time, it is difficult to believe an IFIM will produce any significant information which will be of value in helping the Commission determine the full range of impacts on the stream ecosystem. IFIM was developed on the Continental U.S. for streams and rivers which are characterized by fairly constant flows with little differences in mean and median.

Appendix C, Pg. 15 — In the sentence you refer to, the project biologist is stating that the project could potentially "entrap, impinge or entrain these fish (Lentipes)..." In the Mitigative Measures section the biologist recommends mitigative measures which have been incorporated into the intake design to minimize entrapment, impingement, and entrainment of the Lentipes.

Appendix C, Pg. 16 — This conclusion was based on the aquatic biologist's professional experience and knowledge of native Hawaiian streams and fauna. In his field survey of Honoli'i, the biologist found significant stream reaches and surface area providing an abundance of appropriate substrate and habitat for Lentipes. Yet the population of Lentipes is smaller than would be expected considering the habitat.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

Bernard K. Akana
Mayor

Susan Labrenz
Managing Director

Larry S. Tanimoto
Director

George Yoshida
Deputy Director

DEPARTMENT OF PARKS & RECREATION
COUNTY OF HAWAII

January 24, 1989

Office of Environmental Quality Control
456 S. King Street, Room 104
Honolulu, Hawaii 96813

Subject: Draft Environmental Impact Statement for Honolii Hydroelectric Power Project, South Hilo, Hawaii

The draft EIS has been reviewed and we have no adverse comments to offer since no impacts are anticipated at the County's Honolii Beach Park, located at the mouth of the Honolii Stream.

The report is being returned for your further use.

Thank you for the opportunity to review and provide input on the project.

Sincerely,

Larry Tanimoto
Director

enc.

cc: Department of Land & Natural Resources
Duk Hee Murabayashi

• 25 AUPUNI STREET • HILO, HAWAII 96720 • TELEPHONE 961-8311

DHM inc.
land use
and environmental
planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. Larry Tanimoto
Director
Department of Parks & Recreation
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Tanimoto:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your correspondence in reference to the above. We appreciate your review of the document and prompt response.

Sincerely,

DHM inc.

Wendie McAllaster
Wendie McAllaster
Project Manager

cc: DLNR
OEQC

DEPARTMENT OF PUBLIC WORKS
COUNTY OF HAWAII • 25 AUPUNI STREET • HILO, HAWAII 96720 • TELEPHONE (808) 961-8321

BERNARD K. AKANA
Mayor

HUGH Y. ONO
Chief Engineer

BRUCE C. McCLURE
Deputy Chief Engineer

January 9, 1989

'89 JAN 12 A10:59

OFFICE OF ENVIRONMENTAL QUALITY CONTROL
465 S KING STREET ROOM 104
HONOLULU HI 96813

SUBJECT: DRAFT EIS - HONOLI'I HYDROELECTRIC POWER PROJECT
TMK: 2-6-9: 11; 2-6-12: 18, 24, 29, 30, 31; 2-7-2: 21
S. Hilo, HI

Thank you for the opportunity to review the subject Draft EIS.

In April 26, 1973, an earthquake with an intensity of 6.2 on the Richter Scale occurred off the Hamakua Coast. There was considerable failure of cut and fill slopes because of this earthquake. Grading work shall conform to the Grading Ordinance. Particular attention should be paid to the proposed cut slopes.

HUGH Y. ONO, P.E.
Chief Engineer

DHM:jjs

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

March 14, 1989

Mr. Hugh Y. Ono, P.E.
Chief Engineer
Department of Public Works
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Ono:

RE: Honolii Hydroelectric Power Project
Draft Environmental Impact Statement

We just recently received a copy of your January 9, 1989 letter to OEQC regarding the above.

Thank you for your comments concerning cut and fill slopes. The proposed access road to the weir site will involve a cut slope within existing bedrock. All grading work will conform to the County Grading Ordinance, as you suggest.

Sincerely,

DHM inc.

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

COPY

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII
25 AUPUNI STREET • HILO, HAWAII 96720

January 3, 1989

Department of Land and Natural Resources
Kalanimoku Building
1151 Punchbowl Street
Honolulu, HI 96813

DRAFT ENVIRONMENTAL IMPACT STATEMENT
HONOLI'I HYDROELECTRIC POWER PROJECT
SOUTH HILO DISTRICT, ISLAND OF HAWAII

Thank you for giving us the opportunity to review the subject draft.

The Honoli'i Stream is not utilized by this Department, and the proposed action should not interfere with our operations. Therefore, we have no objections to the request.

H. William Sewake
H. William Sewake
Manager

CS

cc - DHM Planners, Inc.

...Water brings progress...

DHM inc. land use and environmental planning
1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. H. William Sewake
Manager
Department of Water Supply
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Sewake:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your correspondence in reference to the above. We appreciate your review of the document and prompt response.

Sincerely,

DHM inc.

Wendie McAllaster
Wendie McAllaster
Project Manager

cc: DLNR
OEQC

COPY

PLANNING DEPARTMENT
25 AUPUNI STREET
COUNTY OF HAWAII
HILO, HAWAII 96720

February 6, 1989

Mr. William W. Paty, Chairperson
Board of Land & Natural Resources
P. O. Box 621
Honolulu, HI 96809

Dear Mr. Paty:

EIS and CDUA HA-2205
Honolii Hydroelectric Power Project
S. Hilo, Hawaii

We recommend approval of this project but have the following comments to help clarify the EIS and application:

The County Department of Water Supply has informed us that they are not considering Honolii Stream for future water source development so this allays our initial concern over the drop in stream flow volume between the weir and powerhouse.

Construction - While canehaul road will be used for access and transport, the exceptionally steep high banks of the stream in the vicinity of the weir and powerhouse/substation will likely present severe obstacles to providing access down them to the building sites for construction machinery and materiel.

Utilities - page 82. It is stated that "the stream is not a source of domestic water for residents". Might it also be true that the stream is not necessary for any irrigation use? If so, it might be so stated to quell that concern.

Visual Quality - page 127. The transmission line from the substation in the stream bed to the canefield and plateau to the south will also be visible from the old highway (Kahoa Street) and especially the old scenic bridge at the bottom of the road where presently no man-made objects mar the scene upstream.

County Zoning - page 155. The report states "the entire project area ...... and immediate surroundings are zoned A-40". Yet, the map (page 157) shows A-5 and A-10 zones in the vicinity.

SMA - The proposed development is outside the County's Special Management Area, thus our SMA rules are not applicable in this case.

Sincerely,

DUANE KAHUHA
Planning Director

DT:aeb

cc: OEQC
✓DHM Planners
Glenn Taguchi
Board Member
Mauna Kea Power

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. Duane Kanuha
Planning Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Kanuha:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your letter to William Paty regarding the above. The following responses are in the sequence of your comments:

<u>Construction</u>

The maximum slope on all access roads will be 14%, thereby providing adequate access necessary for construction machinery and materials.

<u>Utilities</u>

Mauna Kea Agribusiness has no plans at this time to use Honoli'i Stream for irrigation purposes. This issue will be included in the final EIS.

<u>Visual Quality</u>

Every effort will be made to minimize the visibility of the transmission lines from the old scenic bridge.

<u>County Zoning</u>

A correction will be made in the Final EIS.

Thank you for your recommendation approving this project.

Sincerely,

DHM inc.

Wendie McAllaster
Wendie McAllaster
Project Manager

cc: DLNR
OEQC

Hawaii Electric Light Company, Inc. • PO Box 1027 • Hilo, HI 96721-1027

GENPP 19-8
H-W/G

January 4, 1989

Duk Hee Murabayashi
DHM Planners, Inc.
1188 Bishop Street, Suite 2405
Honolulu, HI 96813

Dear Duk Hee:

Subject: Honoli'i Hydroelectric Power Plant
Environmental Impact Statement

The following are our comments to the subject draft EIS statement:

Page 7 - The 1988 actual HELCO system peak was 126.3MW an 8.88% increase from 1987.

Page 8 - Footnote 9 should read "per HELCO Forecast Planning Committee Projection, dated April 6, 1988."

Page 34 - Substation lot size should be at least 150' x 120' to accommodate required electrical equipment.

Page 35 - Add to HELCO specifications: 1) 69KV circuit breakers, 2) protective relaying and metering devices, 3) 69 - 4.16KV step-up transformer and 4) supervisory control system to HELCO Operations Center.

Thank you for the opportunity to comment on the subject EIS.

Very truly yours,

Clyde H. Nagata

Clyde H. Nagata, Manager
Engineering Department

HKK
CHN:HKK:ts

cc: H. Kamigaki

An HEI Company

266

DHM inc. land use and environmental planning
1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. Clyde H. Nagata
Manager
Engineering Department
Hawaii Electric Light Company, Inc.
P.O. Box 1027
Hilo, Hawaii 96721-1027

Dear Mr. Nagata:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for your letter of January 4, 1989 regarding the above. The following responses are numbered in the sequence of your comments:

Pg. 7 Thank you for this updated information. It will be included in the Final EIS.

Pg. 8 Footnote 9 will be corrected accordingly.

Pg. 34 The substation will be located on agriculture-zoned lane and there will be sufficient space to accommodate expansion if necessary. The final size will be determined once final engineering for the project is complete.

Pg. 35 The Final EIS will be revised to include the HELCO specifications you mentioned.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

HAWAIIAN ELECTRIC COMPANY, INC.
Box 2750 / Honolulu, Hawaii / 96840

2/2/89

Duk Hee Murabayashi
DHM Planners, Inc
1188 Bishop St.
Suite 2405
Honolulu Hi 96813

Dear Sirs:

Please send ~~information regarding price and availability of:~~ 2 copies of the EIS for Honoli'i Hydroelectric power project.

We are considering acquisition of this/these publication(s) for our collection.

Sincerely,

Deborah Uchida
Corporate Librarian

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Ms. Deborah Uchida
Corporate Librarian
Hawaiian Electric Company, Inc.
Box 2750
Honolulu, Hawaii 96840

Dear Ms. Uchida:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Per your request of February 2, 1989, we will see that you receive two copies of the final EIS for Honoli'i Hydroelectric Power Project.

Sincerely,

DHM inc.

Wendie McAllaster
Wendie McAllaster
Project Manager

cc: DLNR
OEQC

MOKU·LOA·GROUP
SIERRA CLUB·HAWAII CHAPTER

February 6, 1989

Office of Environmental Quality Control
465 S. King St.
Honolulu, HI 96813

Department of Land and Natural Resources
1151 Punchbowl St.
Honolulu, HI 96813

Re: Honolii Hyroelectric Power Project, Hilo, HI

Thank you for the opportunity to review the DEIS for the proposed Honolii Hydroelectric Power Project. The following comments are offered.

1) We are concerned that increased turbidity and agradation of particulate matter frou road cuts and construction, as well as accumulations from the dewatered portion of the stream, may impact on the green sea turtles that live at the mouth of the Honolii stream. As the DEIS does not mention any potential impacts on the protected turtle, nor any mitigative measures, we request that you investigate this issue.

2) Further, no mention of socio-economic impacts was noted with regard to potential changes in surfing conditions at Honolii, a popular surfing spot. As accumulated silt and debris could diminish the recreational value and shift the currents, this impact should be considered.

3) Of foremost concern, we note that Honolii Stream and Wailuku River are the two perennial waterways on the island of Hawaii, other streams being intermittent. The native wildlife in the streams are already severely impacted by human agricultural activity on the land adjacent to the streams, despite laws which require sedimentation reduction. We are concerned that reducing the flow in the stream by as much as 85% during all but three months of the year could further reduce the value of the stream as native habitat.

The DEIS notes that "the stream is normally turbid, a condition common for North of Hilo due to the heavy sedimentation from surrounding agricultural lands." The DEIS goes on to say "despite substantial streamflow and natural bed material... the significant load of fine terragenous sediments from adjacent canelands reduced the value for native species."

The USFWS had declared in 1983 that Honolii Stream provided medium to low habitat value for native streamlife due to the turbid conditions. Nevertheless, the 'o'opu alamo'o, one of five native aquatic organisms found in the stream, is now a candidate for listing as an endangered species. This may explain a recent (1988) communication form USFWS suggesting that this habitat be redesignated as a high value habitat.

The uncertain future of cane as an agricultural crop leads to the possibility that cane land may soon revert to permanent vegetative cover. Should this be the case, the silt load and turbidity of the water could rapidly decrease, and the habitat for aquatic wildlife could markedly improve.

We suggest that a statewide hydro-electric master plan, being developed by the National Park Service and DLNR, will take into account the relative value of the aquatic habitat in the state as well as the hydroelectric potential. We therefore request that pursuit of this project be postponed until such time as this plan is complete and the report can be included in the Environmental Impact analysis.

Thank you for considering these concerns.

Sincerely,

Deborah Ward

Deborah Ward
Conservation Chair
Moku Loa Group
Sierra Club, Hawaii Chapter

P.O. BOX 1137·HILO·HAWAII·96721

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Ms. Deborah Ward
Conservation Chair
Moku Loa Group
Sierra Club, Hawaii Chapter
P.O. Box 1137
Hilo, Hawaii 96721

Dear Ms. Ward:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

We received a copy of your letter to OEQC regarding the above. The following responses are numbered in the sequence of your comments:

1. Appropriate mitigative measures will be taken to minimize agradation of particulate matter during construction. Operation of the project will not create increased sediment. Furthermore, since all water removed from the stream will be returned at the powerhouse site, the amount of water flowing at the mouth of the stream and the turbidity level will not change. Therefore, the project will have no effect on green sea turtles that live at the mouth of Honoli'i Stream.

2. The project will not increase the amount of silt and debris within the stream channel, nor will it decrease the amount of water flowing from the stream at its mouth. There will be no impact on surfing conditions at Honoli'i.

3. There are 123 perennial streams on the island of Hawaii (not two as you state) according to Stream Channel Modification in Hawaii: Part A: Statewide Inventory of Streams, by Amadeo Timbol and John Maciolek, for USFWS, April 1978, p. 39 and Appendix A.

   Please provide us with specific information concerning the native wildlife in the stream being severely impacted by agricultural activities. Field surveys by the aquatic biologist, botanist, and ornithologist do not indicate that the wildlife in the stream will be severely impacted by project activities. While the stream flow will be reduced as indicated by the monthly flow duration curves, the reduction in flow will be uniformly distributed throughout the year. As shown on the table on page 99 of the draft EIS, the natural stream flow will exceed plant capacity on a frequent basis, every month of the year. The regularity of these flows will serve to continually replenish pools and riffle, remove accumulated siltation, reduce the growth of algae, and maintain the habitat for stream fauna.

4. The U.S. Fish and Wildlife Service has not changed its 1984 "low-to-medium" habitat classification of the Honoli'i Stream, which was made in accordance with its Mitigation Policy. Furthermore, DLNR's Division of Aquatic Resources has questioned the appropriateness of considering o'opu alamo'o (Lentipes concolor) as an endangered species candidate.

5. Once a parcel is classified and zoned as "agriculture," neither the State nor the county has any control over the type of crop that is grown.

6. According to a recent discussion (2-14-89) with the DLNR Division of Water and Land Development, the development of a State-wide hydroelectric master plan has not been specifically proposed or initiated. DLNR and the National Park Service are, however, in the initial stages of organizing the "Hawaii Rivers Assessment Project" which is intended to be an inventory of stream resources in Hawaii. The time frame for completion of this study is uncertain, but likely to be one to two years from now. If DLNR and NPS decide to prepare a hydroelectric master plan as part of this study, its time frame would likely be greater than that of the initial Rivers Assessment project.

   Hydroelectric development on the Honoli'i Stream has been studied and recommended by both state and federal agencies for the past ten years. It is difficult to see any value in postponement of this project.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

Source, Mt. McKinley — Ansel Adams

SIERRA CLUB LEGAL DEFENSE FUND, INC.

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February 6, 1989

Mrs. Duk Hee Murabayashi
DHM, Inc.
Suite 2405
1188 Bishop Street
Honolulu, HI 96813

RE: Honolii Hydroelectric Power Project

Dear Mrs. Murabayashi:

On behalf of the Sierra Club Legal Defense Fund and other Hawaii conservationists, we hereby submit our comments on the draft environmental impact statement (DEIS) for the above-referenced project:

The aquatic survey prepared for Mauna Kea Power by Kelly Archer discloses that the hydroelectric intake for the project will be constructed just downstream of a significant population of the o'opu alamo'o (Lentipes concolor) which, as you know, is a "category 2" candidate for listing under the federal Endangered Species Act.

The DEIS discloses a number of negative impacts which will affect Lentipes. Mr. Archer concludes that entrapment, impingement or entrainment of individuals in the penstock or turbine could cause mortality and might threaten the viability of the Lentipes population in Honolii Stream. The Archer survey also discloses that there will be a loss of habitat:

> The reduction of flow for nearly 3.6 miles of the stream will undoubtedly result in both loss and alteration of useable habitat for the aquatic community.

DEIS, Appendix C, p.16.

The project calls for a minimum stream flow of 10 cfs, however the DEIS fails to spell out with specificity why this flow rate is adequate to mitigate the impact of habitat loss. Accordingly, we request that the final EIS provide a detailed analysis of the instream flow regime necessary to protect Lentipes, and other native aquatic species. The impacts of entrainment, etc.-related mortality and loss of habitat due to the removal of water from the stream bed will not be adequately assessed until they are considered in the context of an instream flow study, prepared with a view towards mitigating these impacts on aquatic wildlife. We also request that, after the instream flow study is completed, the alternatives to the project be thoroughly evaluated in light of the recommendations to come from that study.

Very truly yours,

Arnold L. Lum

cc: Nelson Ho

Sunrise, Mt. McKinley   Ansel Adams

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February 8, 1989

Mrs. Duk Hee Murabayashi
DHM, Inc.
Suite 2405
1188 Bishop Street
Honolulu, HI 96813

RE: Honolii Hydroelectric Power Project

Dear Mrs. Murabayashi:

In our comments submitted in regard to the above-referenced project, I incorrectly referred to the o'opu alamo'o as a "category 2" candidate, which is how it was described in the project DEIS. Please note that o'opu alamo'o is a category 1 candidate for listing under the federal Endangered Species Act. See, 54 Fed. Reg. 554 (1/9/89).

We would also like to add a follow-up comment on the DEIS. The published literature (e.g., Timbol, et al., 1980. Distribution, Relative Abundance, and Stream Environment of Lentipes concolor, etc., WWRC Coop. Rept. No. 5) suggests that Lentipes requires fast flowing streams, and we believe that the proposed 10 cfs minimum flow may be inadequate to sustain the o'opu alamo'o population in Honolii stream.

Very truly yours,

ALL

Arnold L. Lum

ALL:sw/muralet

cc: Nelson Ho

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Mr. Arnold L. Lum
Sierra Club
Legal Defense Fund, Inc.
212 Merchant Street, Suite 202
Honolulu, Hawaii 96813

Dear Mr. Lum:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for your letters of February 6 and 8, 1979 regarding the above. The following responses are number in the sequence of your comments:

<u>February 6 and 8 letters</u>

1. Thank you for clarifying that o'opu alamo'o is a category 1 candidate for listing under the federal Endangered Species Act, not category 2 as the EIS indicates. We will revised the final EIS accordingly.

<u>February 6 letter</u>

2. The intake has been located and designed to minimize entrapment, impingement, and entrainment of the <u>lentipes</u>, in accordance with recommendations of the aquatic biologist. (Appendix C, p. 19-20.)

3. In the absence of quantitative studies dealing with minimum flow and its effect on native aquatic life, the developers looked at existing and approved hydroelectric projects. The Lower Wainiha project has a "0" conservation flow and the native goby were found to be in significant populations above the weir. The Upper Wainiha Plant was approved with a conservation flow of 3 cfs. The Army Corps of Engineers, in their reconnaissance study of Honoli'i (which was performed in cooperation with the Fish and Wildlife Service), recommended a conservation flow of 9 cfs. Based on the above, as well as the hydrologic characteristics of Honoli'i Stream, and on the field studies by a professional aquatic biologist, the developers felt that 10 cfs would be adequate.

   IFIM was developed for streams with fairly steady flows as is common on the continental U.S., and not for streams which have extremely high variable flows similar to those in Hawaii. An IFIM without established habitability curves for native aquatic fauna will not provide any more information on its survivability.

<u>February 8 letter</u>

2. As indicated in the draft EIS, Honoli'i Stream flows are extremely variable. Large, fast, freshet flows occur regularly throughout the year. Low, slow flows also occur regularly and for long periods of time, yet <u>Lentipes</u> population in Honoli'i is healthy and established. The velocity of stream flow is a function of flow and area. The velocity of the proposed 10 cfs minimum flow through the 1' x 2' notch will be 5 feet per second (fps), as compared with the measured velocity of only 1-2 fps for the median flow in Honoli'i stream, 40 cfs, in the vicinity of the existing gaging station.

Sincerely,

DHM inc.

Wendie McAllaster
Wendie McAllaster
Project Manager

cc: DLNR
OEQC

WAI 'OLA

P. O. Box 791, Hanalei, Kauai, Hawaii 96714
Telephone: Kauai - Mina Morita 826-9828, [redacted]

February 6, 1989

Mrs. Duk Hee Murabayashi
President, DHM, inc.
1188 Bishop Street, Suite 2405
Honolulu, Hawaii 96813

Ref: Honolii Hydroelectric Power Project
Comments on Draft Environmental Impact Statement

Dear Mrs. Murabayashi:

With reference to the Honolii Hydroelectric Power Project, I have the following comments and questions concerning the Draft Environmental Impact Statement:

- The U.S. Fish and Wildlife Service most recent reevaluation of Honolii Stream indicates that it provides a high value habitat, however the developer defers to a 1984 USFWS report that indicates medium to low value. A 1978 survey entitled "Stream Channel Modification in Hawaii, Part A: Statewide Inventory of Streams, Habitat Factors and Associated Biota" classifies Honolii Stream as a "II", defined as limited consumptive, streams of moderate to high quality where use is controlled.

  These varying opinions, which will be used to set the foundation for sound decisions, need to be further clarified.

  How does Honolii Stream compare with other Big Island streams with regard to habitat factor? How does it compare on a statewide basis for this resource? Does Honolii Stream have other significant characteristics which cannot be found in other streams on the Big Island? How does Honolii compare with Wailuku River, a waterway nominated for Wild and Scenic River designation?

- The developer only considers a "conservation" flow of 10 cfs. What are other flow alternatives? At what level does the required instream flow make the project economically unviable?

"Ho'omalu Na Kai Ewalu"

Ref: Honolii Hydroelectric Power Project

- The accretion flow from the point of diversion to the power house is a significant factor in determining adequate instream flow standards. How was the data on page 101 compiled and during what period?

Thank you for the opportunity to comment on the DEIS.

Sincerely,

Mina Morita

Mina Morita

cc: State of Hawaii
Department of Land & Natural Resources
Office of Conservation & Environmental Affairs

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Ms. Mina Morita
Wai'ola
P.O. Box 791
Hanalei, Kauai, HI 96714

Dear Ms. Morita:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for your comments of February 6, 1989. The following responses are numbered in the sequence of your comments:

1. The U.S. Fish and Wildlife Service has not changed its 1984 "low-to-medium" habitat classification of the Honoli'i Stream, which was made in accordance with its Mitigation Policy.

2. a. Honoli'i Stream is very similar to other Big Island Streams on the Hamakua Coast in regards to habitat factor, with no noteworthy differences. The similarities include: bound by canefields and other agricultural land, large quantities of runoff, erradic flows, very turbid waters, and similar substrate.

   b. A State-wide comparison of streams and habitat was done in 1980 by A.S. Timbol, et.al, "Distribution, relative abundance and stream environment of Lentipes concolor, and associated fauna in Hawaiian streams."

   c. The project biologist does not believe that Honoli'i Stream has significant characteristics that cannot be found in other streams on the Big Island, particularly the Hamakua Coast.

   d. Wailuku River is relatively undisturbed in the upper regions as it is within a protected watershed. Turbidity is less because it is not adjacent to agriculture land until the lower reaches. Wailuku has a much larger flow than Honoli'i and has a different substrate - more bedrock and less cobble/boulder in Wailuku.

3. At this point, the developer believes that 10 cfs is the maximum conservation flow which is economically viable. However, a power purchase contract has not been finalized and all indications are that it will not be finalized until reasonable assurances can be made for the issuance of necessary permits. Also, since the price of electricity is dependent on the price and supply of oil, it is difficult to predict the long-term rate of electricity production costs. Therefore, it is difficult, at this time, to determine precisely at what level the instream flow would make the project economically unviable.

4. The additional flow that would be contributed to the stream below the diversion by runoff, seepage, and various tributaries that feed Honoli'i Stream was derived using stream flow data from the USGS gage, annual average rainfall data from the U.S. Army Corps of Engineers, and the drainage area below the weir at points 1.5 miles, 2.5 miles and 3.7 miles downstream of the proposed weir site.

Honoli'i Stream has a mean flow of 126 cfs over the entire period of record. The drainage area above the weir is 11.6 sq. miles. Average annual rainfall is about 207 inches above the gage and 175 inches below the gage.

With this information, the following equation was used to calculate the additional flow:

$$\frac{\text{Drainage Area (Gage)}}{\text{Flow (Gage)}} = \frac{\text{Drainage Area (Below the Gage)}}{\text{Flow (Downstream)}}$$

These results were adjusted by a rainfall factor which was derived by taking a ratio of the average annual rainfall below the gage (175") to the average annual rainfall above the gage (207") i.e. (175/207 = 0.85).

For example, the additional stream flow added to the stream between the weir and a point 1.5 miles downstream was calculated as follows:

$$\frac{11.6}{126} = \frac{0.70}{X}, \quad X = 7.7 \text{ cfs}, \; 7.7 \times 0.85 = \underline{6.5 \text{ cfs}}$$

Stream flow measurements were recently taken at the proposed weir and powerhouse sites in an effort to verify the validity of the methodology described above. No rain had occurred in the area for three days prior to the measurements being taken. Using a Price Type AA Current Meter on a round weighted rod, 41 cfs was measured flowing in the stream at the weir site and 51 cfs was measured at the powerhouse site, an increase of 10 cfs.

Using the equation to calculate the additional flow that would be added between the weir and powerhouse sites based on the 41 cfs measurement at the weir site results in an estimated 5.7 cfs in additional flow being added to the stream. This compares with the 10 cfs which was derived through actual field measurements.

Since the equation uses average annual rainfall, and variables such as evaporation and seepage cannot be accurately accounted for, these findings appear to suggest that the methodology described above does provide a reasonable, and perhaps conservative, approach to calculating the amount of stream flow that would be added to the stream between the proposed weir and powerhouse sites.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

Carol Wilcox
111 Royal Circle
Honolulu 96816

February 6, 1989

Dept of Land and Natural Resources
Kalanimoku Bldg
1151 Punchbowl Street
Honolulu, HI 96813

RE: DEIS Honoli'i Hydroelectric Power Project, South Hilo District, Island of Hawaii

Dear Sir,

Thank you for the opportunity to comment on this project. I have the following questions;

The developer isn't clearly identified in the DEIS. I couldn't find an address or name of any principals involved. Has the company had any experience in this type of enterprise? What protection does the public/government have to insure the completion of this project?

Has the developer initiated discussion with the landowners? Have any agreements been reached?

There is no economic benefit information. Have power purchase agreements been reached?

Since the temporary and the permanent access roads to the weir appear to be cutting through Rough broken lands with a probable high erosion hazard rating, there is a possibility that sedimentation from construction will affect the entire reach of the stream and into the ocean. Although this project is "entirely outside of the SMA" (p.156) Honoli'i river ends at a surfing site and a turtle habitat. Sedimentation at this site might impact these important recreational and marine life resources. It wasn't clear how much problem was anticipated and what mitigation was being proposed in these more critical areas.
a. Could the final EIS be more specific about the road approaches and mitigation through RB terrain?
b. Could the developer ask the county for comment regarding possible monitoring of Honoli'i Bay during construction?

Since this could be the first major diversion project in Hawaii in many many years, it seems like a perfect opportunity to study the impact of significantly reduced instream flow on the existing native biota. Could the developer consult with USF&WS and the Division of Aquatic Resources, DLRN, to see if they thought such initiating such studies is practical?

Wouldn't periodic flushing be desirable to encourage continuation of instream biota if, during dry times, this doesn't occur through normal peak flows? Could the developer, after consulting with F&W and Aquatic Resources, suggest such a schedule?

This may be an opportunity to develop new recreational opportunities in conjunction with this project. Could the developer contact the appropriate state and county agencies to explore this possibility?

Thank you again for the chance to review.

Sincerely

Carol Wilcox

Carol Wilcox

cc. OEQC
DHM Planners, Inc

DHM inc. land use and environmental planning

1188 Bishop Street
Suite 2405
Honolulu, HI 96813
Ph. (808) 521-9855

February 21, 1989

Ms. Carol Wilcox
111 Royal Circle
Honolulu, Hawaii 96816

Dear Ms. Wilcox:

RE: Honoli'i Hydroelectric Power Project
Draft Environmental Impact Statement

Thank you for the copy of your letter to DLNR regarding the above. The following responses are numbered in the sequence of your comments:

1. The developer of the subject project is Mauna Kea Power Company, whose address is 737 Bishop Street, Suite 2460, Honolulu, Hawaii 96813. One of the principals in the company has had extensive experience in developing small hydropower projects across the continental United States. No public funds are involved in this project.

2. Discussions with the landowners have been initiated and preliminary agreements reached.

3. A power purchase contract has not been finalized and is not expected to be finalized until there is reasonable assurance that the project will receive the necessary permit approvals.

4. The "rough broken" land which will be crossed by the southern access road to the weir consists of bedrock with very shallow soil cover. There will be no access to the weir site from the north bank. The access road to the powerhouse will follow existing cane roads. Adequate mitigative measures will be taken to minimize sedimentation from construction and these will be elaborated on in the Final EIS. There will be no adverse impact to the surfing site or turtle habitat at the mouth of the stream.

   a. The Final EIS will contain more information concerning mitigation of the road approaches through "rough broken" terrain.

   b. The developer is in contact with the County Planning and Public Works Departments concerning this project.

5. Following project approval and completion, the developer would be willing to explore with DLNR and the USFWS how they might participate in a study of the impact of reduced instream flow on existing aquatic biota. A detailed plan of action would be needed however before a final determination could be made.

6. Periodic flushing will occur naturally each month as indicated by monthly flow duration curves. Since there is extremely limited storage capability behind the weir, the developer has no ability to periodically release water during dry periods.

7. At this time, the developer and landowners have no plans to develop recreational opportunities in conjunction with the project.

Sincerely,

DHM inc.

Wendie McAllaster

Wendie McAllaster
Project Manager

cc: DLNR
OEQC

Chapter XIV

XIV. COMMENTS AND RESPONSES PERTAINING TO THE PUBLIC HEARING

MAUNA KEA POWER, INC.

March 17, 1989

The Honorable William W. Paty, Chairman
Members of the Board of Land and Natural
Resources
Members of the Commission on Water
Resource Management
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Paty:

A primary concern voiced by several agencies, both in letters and through oral testimony received at the recent public hearing, is the impact the proposed conservation flow will have on native stream fauna.

Mauna Kea Power Company (MKPC) chose to use a physical survey of the site performed by a professional aquatic biologist familiar with Hawaii's unique aquatic fauna, in conjunction with biological, hydraulic, engineering, and physical data available from other scientific reports published over the past 30 years, and in particular the aquatic surveys conducted near three hydroelectric plants that have been in operation in Hawaii for over 65 years. Several agencies, in particular the United States Fish and Wildlife Service (FWS), have strongly recommended that an Instream Flow Incremental Method (IFIM) study be required before the Board of Land and Natural Resources (BLNR) and the Water Commission (WC) take any further action on the permits necessary to develop the Honoli'i Hydroelectric Project (Project).

During the public hearing, the Sierra Club Legal Defense Fund (SCLDF) stated they would petition for a "contested case" proceeding if any further action on MKPC's permit applications was taken without completion of an IFIM study and another public hearing. SCLDF stated that without an IFIM study, any decision made by the BLNR and WC would not be based on a scientific study and therefore be "arbitrary and capricious."

There are no statutes or administrative rules requiring a specific type of aquatic study be performed, the results of which the BLNR and WC would be required to utilize in their decision making process. The method used by MKPC has been widely accepted by various agencies including the BLNR in previous actions involving stream diversions for hydroelectric projects. The most recent projects that received a favorable ruling from the BLNR, based in part on information from a professional aquatic

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biologist's study are: the Kitano Ditch Hydroelectric Project, 1983; Upper Wainiha Hydroelectric Project, 1984; and the Wailua Falls Hydroelectric Project, 1986. A currently pending permit application for a hydroelectric project on the Hanalei Tunnel (Upper Wailua), which is being considered jointly by both the BLNR and WC, is also using a professional aquatic biologist's study as the basis for recommending a reduced streamflow. At the public hearing held in January 1989 for this project the use of an aquatic biologist's study was not challenged. An IFIM study was not mentioned and neither the FWS nor the SCLDF submitted testimony.

FWS and SCLDF referred to several recent IFIM studies performed in Hawaii on other streams in conjunction with other proposed hydroelectric projects. Since the public hearing, MKPC has been able to review all of the IFIM studies referred to with the exception of the one performed on Kopiliula Stream. FWS and SCLDF also referred to Technical Report No. 171, Habitat Modeling of Hawaiian Streams (TR171), which was completed by the Water Resources Research Center (WRRC) in October 1986. TR171 has until now been unavailable to MKPC, however through the efforts of Mr. John Ford (FWS) we have been able to secure a copy for review. MKPC is somewhat confused as to the report's applicability since it is stamped, "PRELIMINARY DRAFT COPY; NOT FOR REPRODUCTION OR QUOTATION." However, since it was used in testimony at the public hearing, references to it will be made until we are advised otherwise.

TR171, although completed two and a half years ago, has not been accepted by the agency for which it was prepared, DLNR Division of Water and Land Development (DOWALD). In fact, although the purpose of TR171 was to assess the applicability of IFIM studies in Hawaii, as is shown in Attachment B, the existing IFIM studies in Hawaii are so seriously qualified they cannot provide conclusive biological results upon which decisions can be defended. The biological information derived from an IFIM study in Hawaii therefore provides no more biological information on native stream fauna than the scientific study method used by MKPC.

MKPC believes that the information presented to-date, plus the additional information that will be contained in the Final Environmental Impact Statement, contains the substantial evidence necessary for the BLNR and WC to render a decision based on information similar to the type that has been used in all BLNR determinations made to-date (see Attachment A). Therefore, a decision based on the information available to the BLNR and WC will not be "arbitrary and capricious." For these reasons there are no legal grounds for a contested case proceeding; indeed if the true objective of SCLDF is to force the BLNR and WC to amend their procedures to require a specific type of study and another public hearing, the proper forum for this is the Legislature.

Very truly yours,

Albert S. N. Hee
President

attachments

cc: Mr. Manabu Tagomori
Mr. Roger Evans
Mr. Johnson Wong

Attachment A

DECISION-MAKING

EXECUTIVE SUMMARY The question before the Board of Land and Natural Resources (BLNR) and the Water Commission (WC) is a factual question and not a legal question. The factual issue is whether, in the BLNR and WC's opinion, 10 cfs is a suitable conservation flow which will provide adequate protection for native fauna in the Honoli'i Stream while at the same time sufficiently address the island's other needs, especially its need for clean renewable energy. Actions of the BLNR and WC based upon facts, inferences, and/or conclusions are not disturbed, so long as there is a rational basis for the decision and all conclusions are based upon facts supported by substantial evidence.

The Sierra Club Legal Defense Fund (SCLDF) at the hearing raised the issue of the use of the Instream Flow Incremental Methodology (IFIM) and asserted that it had been "consistently used" in Hawaii. SCLDF stated that without an IFIM study being performed, any decision by the BLNR and WC on an instream flow could be contested as arbitrary and capricious. The SCLDF is simply wrong.

IFIM has not been validated as applicable in Hawaii. Attachment B reviews the IFIM studies and gives further comment to its validity. There is clearly no basis to raise this methodology to a level of a fixed requirement, the results of which must be used before a decision on proposed stream diversions can be made. Indeed, on mainland streams and rivers, where the methodology has received some validation for certain target species of fish, IFIM is not required on every project due to its high cost, length of time required to complete the study, and its inability to give conclusive results all the time. In those cases, physical surveys of the sites by qualified aquatic biologists coupled with review of operating plants in the vicinity, have sufficed as a basis for making decisions concerning minimum flow.

The only question that remains is whether substantial evidence exists in the record upon which the BLNR and WC can make a rational decision. Mauna Kea Power Company (MKPC) believes the attachments clearly demonstrate that there is.

The facts in the record include:

<u>PROFESSIONAL AQUATIC BIOLOGISTS SURVEY</u> MKPC retained the services of an aquatic biologist familiar with Hawaii's streams and its fauna. The biologist, Mr. Kelly Archer, was recommended by U.S. Fish and Wildlife Service (FWS) and has participated in many similar type surveys. The results of Archer's survey confirmed the results of two other surveys conducted earlier by FWS and DLNR's Aquatic Resources Division. Archer's survey and its results are contained (in total) in the Draft EIS.

<u>REVIEW OF EXISTING PLANTS</u> Physical surveys with photos were taken of three similar hydroelectric facilities that have been in operation on two streams for over 65 years. Published surveys of aquatic fauna in the area around the three facilities show that even with no required conservation flow, abundant stream life, including the o'opu alamo'o, were able to migrate past the diversion weirs. The diversion weir on the Wainiha hydroelectric project is dry an average of 212 days per year, but all of the stream life found in Honoli'i Stream is found above the Wainiha diversion weir. In view of this, a required conservation flow of 10 cfs provides a biological basis upon which decision makers can logically infer that an adequate measure is being made for the protection of native fauna.

<u>REVIEW OF THE SITE</u> A physical survey of the stream shows that 10 cfs (6.5 million gallons a day) provides wetted habitat for stream fauna. Further, field measurements have proven the additive nature of tributaries and seepage. On February 9, 1989, 41 cfs was measured at the site of the proposed diversion weir. A field measurement made at the proposed powerhouse site showed 51 cfs. If the hydroelectric plant was in operation on this day, 31 cfs would be flowing out of the tailrace and 20 cfs would be flowing in the natural stream channel (10 cfs conservation flow plus 10 cfs from tributaries and seepage). According to flow duration curves, developed by utilizing USGS data, this condition will occur 50% of the time.

<u>REVIEW OF HYDROLOGY RECORDS</u> According to the flow duration curves, a daily mean value of 10 cfs occurs for 30 days consecutively at least every five to seven years. 10 cfs may therefore be a natural limiting factor in the biological carrying capacity of the stream. In the 1984 water year, which while dryer than normal was not the driest year in the last ten years, a daily mean value of 10 cfs or less occurred in excess of 16 consecutive days three times. During dry periods, minimum flow in the stream at the proposed diversion weir would need to exceed 14 cfs before any diversion could take place, since 4 cfs is the minimum flow necessary for the turbine to operate.

Flow duration curves show flushing flows above 160 cfs occur regularly and frequently every month, as rainstorms cause flashing in the stream. Therefore, 10 cfs is not normally sustained for long periods of time.

IFIM IS NOT VALIDATED This is further discussed in Attachment B.

PREVIOUS DECISIONS The SCLDF has maintained that IFIM has been "consistently" used to determine minimum streamflow. This is simply untrue. IFIM has never been used to determine streamflow in any proceeding which resulted in a CDUA permit being issued. Cases include: Wailua Falls (1986, 15 cfs in a drainage area three times the size of Honoli'i and site of a major scenic waterfall); Upper Wainiha (1984, 3 cfs, based upon review of aquatic conditions at the lower Wainiha Plant); and Kitano Ditch (1983, 0 cfs based upon absence of abundant stream fauna). In addition, on the proposed Upper Wailua project which is currently pending before the BLNR and WC, no mention of requiring an IFIM study was made by SCLDF, at the public hearing or otherwise.

OTHER AGENCY DATA The Corps of Engineers, in their 1984 Reconnaissance Report, previously recommended a 9 cfs conservation flow. The applicant's 10 cfs exceeds their recommendation.

BALANCING TEST The BLNR and WC are tasked with balancing protection of native aquatic fauna in Honoli'i Stream with the island's other societal needs. Testimony was presented concerning pollution from fossil fuel plants, rolling blackouts, the native Hawaiian nature of this proposal, and the overall need for clean renewable energy to free Hawaii from oil dependence. These issues must be given appropriate weight in a balancing test of all facts in the record when deciding whether the proposed minimum flow provides adequate protection to Honoli'i's stream fauna.

SUMMARY MKPC believes that the information presented to-date, plus information that will be contained the Final EIS, composes the substantial evidence necessary for the BLNR and WC to render a decision in this case. There are no grounds upon which the BLNR and WC can be accused of being arbitrary and capricious. If the FWS and SCLDF wish the BLNR and WC to mandate IFIM studies for all applicants, the first step must be to demonstrate that the methodology has been validated for use in Hawaii. They have not done so. Furthermore, if the SCLDF wishes additional public hearings, it may request them without petitioning for a contested case proceeding. Changes to the statutes, such as mandatory public hearings after publication of the Final EIS, is a matter properly referred to the Legislature for action.

ATTACHMENT B

Attachment B has been incorporated into the Final EIS as Appendix G.

SIERRA CLUB
LEGAL DEFENSE FUND, INC.

212 Merchant Street, Suite 202   Honolulu, Hawaii 96813   (808) 599-2436
FAX (808) 521-6841

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Seattle, WA 98104
(206) 343-7340

283

March 21, 1989

William W. Paty, Jr.
Chairperson
Board of Land and Natural Resources
1151 Punchbowl Street
Honolulu, HI 96813

Re: Request for Contested Case Hearing,
Honolii Hydroelectric Power Project

Dear Mr. Paty:

In our Request For Contested Case Hearing filed on March 16, 1989 in regard to the above-referenced project, we requested that the Board of Land and Natural Resources stay further processing of Mauna Kea Power, Inc.'s CDUA until a conservation flow study is prepared and an FEIS has been completed and accepted. If the Board orders the Applicant to prepare a conservation flow study, but it appears that the Applicant cannot complete the study and FEIS within 180 days following receipt of the CDUA then we request in this event that the Board deny without prejudice the Applicant's CDUA until such time as the study has been completed and the FEIS accepted.

Very truly yours,

Arnold L. Lum
Counsel for Petitioners
Sierra Club and
Life of the Land

ALL:sw/patylet

cc: Sierra Club (Debbie Ward)
Life of the Land (Doug Heller)
Mauna Kea Power, Inc.
Alan Okamoto, Esq.

MICHAEL R. SHERWOOD #872-0
ARNOLD L. LUM #3523-0
Sierra Club Legal Defense Fund, Inc.
212 Merchant Street, Room 202
Honolulu, Hawaii 96813
Telephone: (808) 599-2436

Attorneys for Petitioners

RECEIVED
89 MAR 17 AM 11:19
STATE OF HAWAII

APPLICATION TO BE A PARTY IN A CONTESTED CASE HEARING
BEFORE THE BOARD OF LAND AND NATURAL RESOURCES
AND COMMISSION ON WATER RESOURCE MANAGEMENT

SIERRA CLUB, a California non-profit corporation; and LIFE OF THE LAND, Hawaii non-profit corporation, Petitioners.	REQUEST FOR CONTESTED CASE HEARING and CERTIFICATE OF SERVICE DATE OF PUBLIC HEARING: March 9, 1989 LOCATION: Hilo, Hawaii

REQUEST FOR CONTESTED CASE HEARING

I. INTRODUCTION

Petitioners Sierra Club, by its Hawaii Chapter, which is located at 1100 Alakea Street, Room 330, Honolulu, Hawaii 96813, and Life of the Land, a Hawaii corporation, whose offices are located at 2500 Pali Highway, Honolulu, Hawaii 96817 ("Petitioners"), through counsel, hereby request that a contested case hearing pertaining to the Honolii Hydroelectric Power Project ("Project") be convened by the Board of Land and Natural Resources ("Board") and Commission on Water Resources Management ("Commission"). An oral request for contested case hearing was made by counsel prior to the close of the joint public hearing, held before the Board and Commission at Hilo, Hawaii, on March 9, 1989.

Petitioners request that the Board and Commission order the Applicant, Mauna Kea Power, Inc., to prepare a conservation flow study and to incorporate the results of that study into Applicant's draft environmental impact statement ("EIS"), before further action is taken by the Board and Commission to process the Applicant's conservation use district application ("CDUA"), petition to modify instream flow standard, and stream channel alteration and diversion works construction permits (collectively "permits").

II. LEGAL AUTHORITY UNDER WHICH THE CONTESTED CASE HEARING IS TO BE HELD

The public hearing on the Project was jointly noticed and held by both the Board and Commission. Accordingly, legal authority under which this contested case hearing is requested resides both in H.R.S. § 183-41, which applies to Board hearings for CDUA permits, and H.R.S. § 174C-9, which authorizes the Commission to hold hearings to consider to the issuance, modification, or revocation of any permit or license under the water code.

III. PETITIONERS' INTERESTS THAT MAY BE AFFECTED

The Sierra Club is a California non-profit corporation whose principal place of business is located at 730 Polk Street, San Francisco, CA 94109. The Hawaii Chapter of the Sierra Club maintains its Chapter office at 1100 Alakea Street, Honolulu, HI

96813. The Hawaii Chapter's Moku Loa Group is comprised of Sierra Club members who reside on the Island of Hawaii. The Group's mailing address is P.O. Box 1137, Hilo, HI 96721. Life of the Land is a Hawaii non-profit corporation. Its offices and mailing address are located at 2500 Pali Highway, Honolulu, HI 96817.

The Sierra Club and Life of the Land participate in and support efforts to protect Hawaii's land, water and ocean resources from environmentally damaging and other inappropriate uses, and in efforts to preserve those resources for future generations. Petitioners also participate in and support actions to protect Hawaii's endemic flora and fauna, especially rare, threatened or endangered species, including their natural habitats. Notwithstanding the policies set forth above, Petitioners also support energy conservation and development of sources of energy for Hawaii that will advance Hawaii's energy self-sufficiency.

Sierra Club member Ron Terry, who is also a member of the Club's executive committee, surfs the break located at the mouth of Honolii stream. Mr. Terry, who is a coastal geomorphologist, is specifically concerned about the impact of the Project on the timing of sediment delivery to the stream mouth, and its effect on the quality of the surf.

Sierra Club member Dan J. Lutkenhouse owns property on both sides of the Honolii Stream, in the vicinity of the Project. He is concerned about the impact of the Project on the stream environment.

Other Sierra Club members use the Honolii beach area for picnicking, swimming and other recreational activities.

Petitioners' particular interest in the Project is to insure that conservation measures are developed which will protect and preserve Honolii Stream's high quality habitat for native fauna. In particular, Petitioners are concerned that the Project may reduce the quantity and quality of the habitat of the o'opu alamo'o (Lentipes concolor), which is a category 1 candidate for listing under the federal Endangered Species Act.

Petitioners also have an interest in ensuring the integrity of the environmental impact assessment process, and they have requested herein that the Board and Commission stay further processing of the Applicant's permits until a final EIS has been published and accepted pursuant to the procedures set forth in H.R.S. § 343.

At the public hearing, the Sierra Club submitted written comments which specifically address the above, and other concerns in regard to the Project, and these written comments are incorporated herein by reference.

IV. THE ISSUES THAT ARE BEING CONTESTED BY PETITIONERS

Petitioners contend that the Applicant should undertake an instream flow study to determine a conservation flow for the o'opu alamo'o which study should be incorporated into Applicant's draft EIS. Petitioners also contend that the Board and Commission

should stay further processing of the Applicant's permits pending the acceptance of a final EIS.

Petitioners submit that Applicant's proposed conservation flow of 10 cubic feet per second (cfs) is arbitrary, capricious and not based upon the biological requirements of the stream fauna which will be affected by the proposed hydroelectric diversion. Moreover, it is clear from the statements made by the Applicant that a 10 cfs conservation flow was proposed not because it has any particular biological value, but because it represents a rate of flow which may be low enough to allow the hydroelectric project to achieve economic viability.

There a number of other matters which are being contested, including: (1) the Applicant's failure to use daily data to gauge stream output, substituting instead monthly averages, which yields stream output values which may be skewed in the direction of higher values due to flooding; (2) lack of data to gauge stream flow between the weir and the first of the two tributaries which feed into Honolii Stream, which is necessary to determine percolation through the bed; (3) lack of biological assessment on the impact of dewatering at differing rates (e.g., 10, 20, 30, etc. cfs); (4) lack of adequate mitigation plans for avoiding fish disorientation, disruption or entrainment during diversion and discharge of water; (5) lack of an economic/power output analysis based on differing water diversion rates; and (6) lack of analysis of alternatives to hydroelectric power generation, such as solar energy.

V. BASIC FACTS AND ISSUES RAISED

The Applicant has petitioned the Commission to modify the June 15, 1988 interim instream flow standard for Honolii Stream from its current level of approximately 40 cfs (median flow) down to 10 cfs. Petitioners challenge said petition upon the basis that the proposed 10 cfs conservation flow is not biologically-based.

Petitioners also object to the processing by the Board and Commission of the Applicant's permits prior to the publication and acceptance of a final EIS.

Petitioners also object to the inadequacy of the draft EIS, including the following:

(1) The Applicant's use of monthly, as opposed to daily data to gauge stream output;

(2) Lack of data to gauge stream flow between the proposed weir and the first of the two tributaries which empty into Honolii Stream;

(3) Lack of biological assessment of the impact of dewatering at differing rates;

(4) Lack adequate mitigation plans to avoid fish disorientation, disruption or entrainment;

(5) Lack of an economic/power output analysis based on differing rates of diversion; and

(6) Lack of analysis of alternatives to hydroelectric power generation.

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VI. RELIEF SOUGHT BY PETITIONERS

Petitioners request that the Board and Commission stay further processing of the Applicant's permits until an instream flow study is conducted using appropriate methodology, the results of that study are incorporated into the draft EIS, and a final EIS is published and accepted.

VII. IDENTIFICATION OF ANY AND ALL OTHER PERSONS WHO MAY OR WILL BE AFFECTED BY THE RELIEF SOUGHT[1]

The developer of the Honolii hydroelectric power project, Mauna Kea Power, Inc., or its successors or assigns.

DATED: Honolulu, Hawaii, MAR 16 1990.

ARNOLD L. LUM
MICHAEL R. SHERWOOD

[1] This criterion is applicable only to requests for contested case hearings before the Commission on Water Resource Management, see, Haw. Admn. Rule § 13-167-52; Cf. Haw. Admn. Rule § 13-1-29.

CERTIFICATE OF SERVICE

I hereby certify that a filed copy of the foregoing Request For Contested Case Hearing was duly served upon the following persons by hand-delivering same to the addresses shown below on MAR 16 1989:

BOARD OF LAND AND NATURAL RESOURCES
Kalanimoku Building
1151 Punchbowl Street
Honolulu, Hawaii 96813

COMMISSION ON WATER RESOURCE MANAGEMENT
Kalanimoku Building
1151 Punchbowl Street
Honolulu, Hawaii 96813

DATED: Honolulu, Hawaii, MAR 16 1989.

ARNOLD L. LUM
MICHAEL R. SHERWOOD

NAKAMOTO, YOSHIOKA & OKAMOTO
ATTORNEYS AT LAW, A LAW CORPORATION
187 KAPIOLANI STREET
HILO, HAWAII 96720
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ROY K. NAKAMOTO
TERENCE T. YOSHIOKA
ALAN M. OKAMOTO
JEREL I. YAMAMOTO

KONA OFFICE
TERRITORIAL CENTRE
75-5751 KUAKINI HIGHWAY
SUITE 204
KAILUA-KONA, HAWAII 96740
(808) 329-2733

FILE NO. ____

March 16, 1989

William Paty, Chairman
Board of Land & Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96813

Re: CDUA Application of Mauna Kea Power, Inc.
CDUA No. HA-9/12/88-2205
Application to be a Party in Contested Case

Dear Mr. Paty:

I represent Mr. Daniel J. Lutkenhouse. My client reside at 248 Kahoa Road, Hilo, Hawaii. His residence telephone number is (808) 935-4703.

I am hereby applying on behalf of my client for admission as a party to the CDUA proceedings. This application is made under Rule 13-1-31 Title 13 Subtitle I, Chapter 1 Rules of Practice and Procedure, Department of Land and Natural Resources.

In support of said application, the following is submitted:

1. Nature of applicant's statutory or other right.

Applicant is owner and resident of property located in the Honolii valley which is downstream of the proposed site for the power plant and which adjoins the Honolii Stream. Applicant resides in such proximity to the proposed plant and to the Honolii Stream that impacts from the proposed project will directly affect his beneficial use and enjoyment of his home. My client is greatly concerned over the long term impacts in terms of the noise generated from the power plant, the change in the water quality of the Honolii Stream, the potential for the accumulation of material in the mauka sections of the streambed because of the reduction in natural streamflow which material would be washed down in flood conditions to jeopardize applicant's home, the loss of important aesthetic values because of construction of the power

plant, power lines and supporting structures in the lower Honolii Valley. In addition, my client is greatly concerned about short term impacts during the construction stages. These impacts include noise, stream siltation, mud, debris and traffic congestion on the only road access to applicant's residence.

Applicant also has a long standing interest and commitment to preserving suitable habitat for fish and aquatic species, birds and other wildlife.

My client also have a long standing commitment to the preservation of the scenic values and botanical resources of areas such as Honolii Valley for the people of Hawaii and visitors. He chose this area as his home because of the unique surroundings and feels that they should be preserved for everyone's benefit. As such, my client will be directly and immediately affected by this project so that his interest is clearly distinguishable from members of the general public.

2. Tax Map Key Numbers.

My client's real property consist of Tax Map Key Numbers 2-6-12:33 (1.6 acres), 2-6-12:23 (1.28 acres) and 2-7-14:1 (6.14 acres on the north side of the stream).

The real property involved in petitioner's proposal was designated Tax Map Key Number 2-6-12:29, 2-6-09:11 (fee owner B. P. Bishop Estate), 2-7-02:20 & 21 (fee owner Mauna Kea Agribusiness) and 2-6-12:24 (fee owner Emma Kiyan).

3. Effect of any decision in the proceeding on applicant's interest.

A decision to grant a permit to the petitioner would allow petitioner to conduct activities and to establish a power plant in a location which would seriously and permanently impair the applicant's beneficial use and enjoyment of his residence.

4. Difference in the effect of the proposed action on applicant's interest and the effects of the proposed action on the general public.

Unlike members of the general public, applicant lives in close proximity to the site of the proposed power plant and high voltage electric transmission lines (within 1,200 feet of the power plant site). Unlike anyone other than the County of Hawaii which operates the beach park facility, the downstream effects of the project will directly affect the applicant's property, which is downstream of the power plant and adjacent to the Honolii Stream.

5. Other considerations.

Because there are no other residents downstream of the proposed power plant, the applicant's concerns about the impacts on his residential use are not likely to be represented by anyone else. As a resident of the valley, applicant can provide the Board with substantial evidence of day to day conditions in the valley and the stream based on first hand observation. Applicant also knows of the importance of the surfing beach to the island's residents and the nature, frequency and intensity of the recreational uses of the beach. Applicant is familiar with the interest of tourists in the Hilo/Hamakua Coast area and the scenic values represented by areas such as Honolii valley. These matters should be presented to the Board so that the numbers can properly assess the projects impact on the Limited Subzone. The applicant's intervention would provide significant information on the downstream impacts of the project that were not properly addressed by petitioners. Applicant do not believe that his participation of itself will broaden any issues or delay the proceedings. Any delays are most likely to be the result of Petitioners proceeding to public hearing without completing studies to assess impacts from the proposed project.

For these reasons, I request that my client Daniel J. Lutkenhouse be allowed to intervene as a party in this action.

Very truly yours,

Alan M. Okamoto

Alan M. Okamoto

APPLICANT:

Daniel J. Lutkenhouse

DANIEL J. LUTKENHOUSE

AMO/cc

cc: Mr. Daniel J. Lutkenhouse
Mr. Roger Evans, DLNR
Mauna Kea Power Company
DHM, Inc.
Arnold Lum, Esq. for Sierra Club
Pat Matsueda, OEQC
Army Corps of Engineers

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SUITE 204
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(808) 329-2733

FILE NO. ______

March 16, 1989

William Paty, Chairman
Board of Land & Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96813

Re: CDUA Application of Mauna Kea Power, Inc.
CDUA No.:HA-9/12/88-2205
Request for Contested Case Hearing and for Waiver of Time to Request Hearing Petition for Contested Case Hearing

Dear Mr. Paty:

I represent Mr. Daniel J. Lutkenhouse. This request for contested case hearing is being filed concurrently with an application in my client's behalf for admission as a party in the pending CDUA proceeding.

I understand that the Sierra Club has already made a timely request for contested case hearing prior to closing of the public hearing. Although my client is fully supportive of the Sierra Club and its concerns, my client's interest is somewhat different from the Sierra Club and any other party in this action. As such, my client hereby submit a separate contested case request.

I must acknowledge that this request is late under Rule 13-1-29(a) of your Rules, but my client only found out about the hearing when he happened to read a newspaper article. Mauna Kea Power, Inc. failed to notify my client about the proposed Hydroplant even though he is a significant property owner on the Honolii Stream. He had not seen a copy of the draft EIS, nor had he been able to consult with me or anyone else who could have told him about the Rule 13-1-29 time limits. My client had obtained information at the public hearing that he had ten (10) days after the public hearing to make a request of this type. Since the Sierra Club did make a timely request, none of the parties should be prejudiced if the Board considers our request for contested case hearing. Given these circumstances, I would ask that the Board waive the deadline.

This letter is intended to and shall also serve as our petition for contested case hearing. The following information is hereby submitted in support of the petition:

1. Legal authority under which the proceeding is to be held.

The Board of Land & Natural Resources is processing a CDUA application under Chapter 2, Subtitle 1, Title 13 Rules of the Department of Land & Natural Resources, State of Hawaii.

2. Petitioner's (Lutkenhouse) interest that may be affected.

Petitioner owns residential property downstream of the proposed power plant. That property is immediately adjacent to the Honolii Stream. Petitioner lives on his property and his beneficial use and enjoyment of his residence will be seriously impaired if the project proceeds as proposed.

3. The disagreement, denial or grievance which is being contested by petitioner.

Petitioner believes that based upon the information now available to him, that Mauna Kea Power, Inc. failed to provide the Board of Land & Natural Resources with adequate analysis and studies of the impacts of their proposed project and alternatives. Petitioner also believes that the project is not consistent with the applicable land use policies of the State of Hawaii and County of Hawaii.

4. Basic facts and issues revised.

Based on the information now available to petitioner (Lutkenhouse), Mauna Kea Power, Inc. had a draft EIS prepared and submitted to the Board of Land & Natural Resources. The draft EIS contains a number of conclusory statements related to minimal long term environmental impacts, but does not address in depth any of these impacts, especially those downstream of the proposed power plant.

The responses from third parties which were included in the draft EIS appear to be those in response to an environmental assessment. No substantive responses to the concerns raised are attached. The final EIS was not done by the time of the public hearing. As such, many of the signficant concerns raised were not handled.

The downstream impacts should have received attention from the outset. The mouth of the stream has the only safe beach with consistent surf suitable for recreational uses by the public on the eastern part of the island. The beach is used throughout the week by many families. Because of the narrowness of the only access road (Kahoa Road) and the need to park along that road, this major recreational use could hardly have escaped the notice of the applicant. There is an evident need to examine this studies done and the conclusions presented therein to see if other important impacts may have been passed over without comment. Petitioner's home will be directly affected by adverse changes in water quality, debris washed down from the streambed during flood conditions and noise generated by the project.

5. Relief which this petitioner seeks.

Petitioner seeks to have a thorough study of the various impacts that this project would have on his use and possible damage to his residential property and the possibility of the destruction of a significant public recreational and surfing beach. Studies should address any viable alternatives and specific mitigative measures that could lessen or eliminate those impacts. Since some adverse impacts will undeniably occur, the studies should also assess the claimed benefits to the public against these adverse impacts. The project will intrude into an area of undeniable scenic value because of Kahoa Road's accessibility to residents and visitors alike. The Honolii Stream site is not the only hydroelectric site available. The studies do not address the upgrading or replacement of the existing hydroelectric plant owned by HELCO on the Wailuku River. That facility has been in place for many years and could provide significantly more energy than it

currently produces. An increase in such production would provide benefits to the public equal to the Honolii project with no adverse environmental impacts. While hydroelectric power is a means of generating power without using fossil fuel, other alternatives to the public have not been considered. These would include geothermal energy, bio power and refurbishing or replacing old facilities.

If significant impacts are found as a result of these studies and no reasonable alternatives or mitigations will lessen the impacts to an acceptable level, petitioner would request that the CDUA application be denied.

Very truly yours,

Alan M. Okamoto

Alan M. Okamoto

APPLICANT:

Daniel J. Lutkenhouse

DANIEL J. LUTKENHOUSE

AMO/cc

cc: Mr. Daniel J. Lutkenhouse
Roger Evans
Mauna Kea Power Company
DHM, Inc.
Arnold Lum, Esq. for Sierra Club
Pat Matsueda, OEQC
Army Corps of Engineers

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(808) 329-2733
FILE NO. ____

March 16, 1989

William Paty, Chairman
Commission on Water Resource Management
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96813

Re: Petition of Mauna Kea Power Company to Amend Interim Instream Flow Standard
Request for Contested Case Hearing and For Waiver of Time to Request Hearing
Petition for Contested Case Hearing

Dear Mr. Paty:

I represent Mr. Daniel J. Lutkenhouse. This request for contested case hearing is being filed concurrently with an application on my client's behalf for admission as a party in the pending CDUA proceeding.

I understand that the Sierra Club has already made a timely request for contested case hearing prior to closing of the public hearing. Although my client is fully supportive of the Sierra Club and its concerns, my client's interest is different from the Sierra Club and any other party in this action. As such, we submit a separate contested case request pursuant to Rule 13-167-52(a), Rules of Practice and Procedure For the Commission on Water Resource Management.

My client only found out about the hearing by chance when he happened to read a newspaper article about the project. Prior to the March 9 public hearing, my client had not seen a copy of the draft EIS, nor had he been able to consult with me or anyone else who could have told him about the requirements in Rule 13-167-52. Since the Sierra Club did make a timely request, none of the parties should be prejudiced in the Commission considering another request for contested case hearing. Although a public hearing was held, we understand that the Petition of Mauna Kea Power does not require such a hearing. Under the Rules, a contested case application can be made at the Commission meeting where the matter is scheduled for disposition. The Commission has not taken action on the Petition.

This letter is intended to and shall also serve as our petition for contested case hearing. The following information is hereby submitted in support of the petition:

1. Legal authority under which the proceeding is to be held.

The Commission on Water Resource Management is processing a Petition To Amend Instream Flow Standard, and Chapter 169, Subtitle 7, Title 13, Rules of Practice and Procedure For the Commission on Water Resource Management.

2. Petitioner's (Lutkenhouse) interest that may be affected.

Petitioner owns residential property downstream of the proposed power plant. Petitioner lives on his property and his beneficial use and enjoyment of his residence will be seriously impaired if the project proceeds as proposed.

3. The disagreement, denial or grievance which is being contested by petitioner.

Petitioner believes that based upon the information now available to him, that Mauna Kea Power, Inc. failed to provide the Board of Land & Natural Resources and the Commission on Water Resource Management with adequate analysis and studies of the impacts of their proposed project and alternatives. Petitioner also believes that the project is not consistent with the applicable land use policies of the State of Hawaii and County of Hawaii.

4. Basic facts and issues raised.

Based on the information now available to Petitioner (Lutkenhouse), Mauna Kea Power, Inc. had a draft EIS prepared and submitted to the Board of Land & Natural Resources and the Commission of Water Resource Management. The draft EIS contains a number of conclusory statements related to minimal long term environmental impacts, but the Draft EIS does not address in depth these impacts downstream of the proposed power plant.

The responses from third parties which were included in the draft EIS appear to be those in response to an environmental assessment. No substantive responses to the concerns raised are attached. The final EIS was not done by the time of the public hearing. As such, many of the signficant concerns raised were not addressed.

The downstream impacts should have received attention from the outset. The mouth of the stream has the only safe beaches with consistent surf suitable for recreational uses by the public on the eastern part of the island. The beach is used throughout the week by many families. Because of the narrowness of the only access road (Kahoa Road) and the need to park along that road, this major recreational use could hardly have escaped the notice of the applicant. There is an evident need to examine the studies done and the conclusions presented therein to see if other important impacts may have been passed over without comment.

Moreover, Applicant owns and resides on property located in the Honolii valley which is downstream of the proposed site for the power plant. Applicant's property and residence adjoins the Honolii Stream. Applicant reside in such proximity to the proposed plant and to the Honolii Stream that impacts from the proposed project will directly affect his beneficial use and enjoyment of his home. My client is greatly concerned over the long term impacts from the noise generated from the power plant, the change in the water quality of the Honolii Stream, the potential for the accumulation of material in the mauka sections of the streambed because of the reduction in natural streamflow which material would be washed down in flood conditions to jeopardize applicant's home, the loss of important aesthetic values because of construction of the power plant, power lines and supporting structures in the lower Honolii Valley. In addition, my client is greatly concerned about short term impacts during the construction stages. These impacts include noise, stream siltation, mud, debris and traffic congestion on the only road giving access to applicant's residence.

5. Relief which this petitioner seeks.

Petitioner requests that his request for contested case hearing be granted. Additionally, Petitioner seeks to have applicant present a thorough study of the various impacts that this project would have on his use of his residential property. Studies should address any viable alternatives and specific mitigative measures that could lessen or eliminate those impacts. Since some adverse impacts will undeniably occur, the studies should also assess the claimed benefits to the public against these adverse impacts. The project will intrude into an area of undeniable scenic value because of Kaoha Road's accessibility to residents and visitors alike. The Honolii stream site is not the only hydroelectric site

available. The studies do not address the upgrading or replacement of the existing hydroelectric plant owned by HELCO on the Wailuku River. That facility has been in place for many years amd could provide significantly more energy than it currently produces. An increase in such production would provide benefits to the public equal to the Honolii project with no adverse environmental impacts. While hydroelectric power is a means of generating power without using fossil fuel, other alternatives to the public against these adverse impacts have not been considered. These would include geothermal energy, bio power and refurbishing or replacing old facilities.

If significant impacts are found as a result of these studies and no reasonable alternatives or mitigations will lessen the impacts to an acceptable level, petitioner would request that the CDUA application be denied.

6. Identification of Any and All other Persons Who May or Will be Afffected by the Relief Which Petitioner Seeks

Applicant Mauna Kea Power, Inc. will be affected if Petitioner's requested relief, denial of the application, is granted. Other persons who may be affected are surfers and regular users of the Honolii Beach Park site.

Very truly yours,

Alan M. Okamoto

APPLICANT:

DANIEL J. LUTKENHOUSE

AMO/cc

cc: Mr. Daniel J. Lutkenhouse
Roger Evans
Mauna Kea Power Company
DHM, Inc.
Arnold Lum, Esq. for Sierra Club

NAKAMOTO, YOSHIOKA & OKAMOTO
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TIM LUI-KWAN

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SUITE 204
KAILUA-KONA, HAWAII 96740
(808) 329-2733

FILE NO ____

March 16, 1989

William Paty, Chairman
Commission on Water Resource Management
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96813

Re: Petition of Mauna Kea Power Company to Amend Interim Instream Flow Standard
<u>Application to be Party in Contested Case</u>

Dear Mr. Paty:

I represent Mr. Daniel J. Lutkenhouse. My client resides at 248 Kahoa Road, Hilo, Hawaii. His residence telephone number is (808) 935-4703.

I am hereby applying on behalf of my client for admission as a party to the Petition to Amend Interim Instream Flow Standard proceedings. This application is made under Rule 13-167-54, Title 13, Subtitle 7, Chapter 167 Rules of Practice and Procedure For the Commission on Water Resource Management.

In support of said application, the following is submitted:

1. <u>Nature of applicant's statutory or other right</u>.

Applicant owns and resides on property located in the Honolii valley which is downstream of the proposed site for the power plant. Applicant's property and residence adjoins the Honolii Stream. Applicant resides in such proximity to the proposed plant and to the Honolii Stream that impacts from the proposed project will directly affect his beneficial use and enjoyment of his home. My client is greatly concerned over the long term impacts from the noise generated from the power plant, the change in the water quality of the Honolii Stream, the potential for the accumulation of material in the mauka sections of the streambed because of the reduction in natural streamflow which material would be washed down in flood conditions to jeopardize applicant's home, the loss of important aesthetic values because of construction of the power plant, power lines and supporting structures in the lower Honolii Valley. In addition, my client is greatly concerned

about short term impacts during the construction stages. These impacts include noise, stream siltation, mud, debris and traffic congestion on the only road access to applicant's residence.

Applicant also has a long standing interest and commitment to preserving suitable habitat for fish and aquatic species, birds and other wildlife.

Applicant also has a long standing commitment to the preservation of the scenic values and botanical resources of areas such as Honolii Valley for people of Hawaii and visitors. He chose this area as his home because of the unique surroundings and feels that they should be preserved for everyone's benefit. As such, my client will be directly and immediately affected by this project so that his interest is clearly distinquishable from members of the general public.

The foregoing and the balance of this application establish that Applicant is a party within the definition of Rule 13-167-54(a)(3), Rules of Practice and Procedure For the Commission on Water Resource Management, which reads as follows:

> (3) All persons within a hydrologic unit who have some property interest in the land, who lawfully reside on the land, who are adjacent property owners, or who otherwise can demonstrate that they will be so directly and immediately affected by the proposed change that their interest in the proceeding is clearly distinguishable from that of the general public shall be admitted as parties upon timely application.

Mr. Lutkenhouse, a property owner down stream who is in close proximity to the proposed project will be directly and immediatly affected by the change. Mr. Lutkenhouse's interest, as a property owner, is not the same as the general public and is clearly distinguishable.

2. <u>Tax Map Key Numbers</u>.

My client's real property consist of Tax Map Key Numbers 2-6-12:33 (1.6 acres) and 2-6-12:23 (1.28 acres) and Tax Map Key 2-7-14:1 (6.14 acres on the north side of the stream).

The real property involved in petitioner's proposal was designated Tax Map Key Number 2-6-12:29, 2-6-09:11 (fee owner B. P. Bishop Estate), 2-7-02:20 & 21 (fee owner Mauna Kea Agribusiness) and 2-6-12:24 (fee owner Emma Kiyan).

3. Effect of any decision in the proceeding on applicant's interest.

A decision to grant a permit to the petitioner would allow petitioner to conduct activities and to establish a power plant in a location which would seriously and permanently impair the applicant's beneficial use and enjoyment of his residence. In addition, a favorable decision would affect the water quality and areas surrounding his property holdings, through stream siltation, mud and debris.

4. Difference in the effect of the proposed action on applicant's interest and the effects of the proposed action on the general public.

Unlike members of the general public, applicant lives in relatively close proximity to the site of the proposed power plant and high voltage electric transmission lines (within 1200 feet of the power plant site). Unlike anyone other than the County of Hawaii which operates the beach park facility, the downstream effects of the project will directly affect the applicant's property, which is downstream of the power plant and adjacent to the Honolii Stream.

5. Other considerations.

Because there are no other residents downstream of the proposed power plant, the applicant's concerns about the impacts on his residential use are not likely to be represented by anyone else. As resident of the Valley, applicant can provide the Board with substantial evidence of day to day conditions in the valley and the stream based on first hand observation. Applicant also knows of the importance of the surfing beach to the island's residents and the nature, frequency and intensity of the recreational uses of the beach. Applicant is familiar with the interest of tourists in the Hilo/Hamakua Coast area and the scenic values represented by areas such as Honolii valley. These matters should be presented to the Board so that the members can properly assess the project's impact on the Limited Subzone. The applicant's intervention would provide significant information on the

downstream impacts of the project that were not properly addressed by petitioners. Applicant does not believe that his participation of itself will broaden any issues or delay the proceedings. Any delays are most likely to be the result of Petitioners proceeding to public hearing without completing studies to assess impacts from the proposed project.

For these reasons, pursuant to Rules 13-167-54(a)(e) and (f), I request that my client Daniel J. Lutkenhouse be allowed to intervene as party in this action.

Very truly yours,

Alan M. Okamoto

APPLICANT:

DANIEL J. LUTKENHOUSE

AMO/cc

cc: Mr. Daniel J. Lutkenhouse
Mr. Roger Evans, DLNR
Mauna Kea Power Company
DHM, Inc.
Arnold Lum, Esq. for Sierra Club
Army Corp. of Engineers
Division of Water and Land Development

MAUNA KEA POWER, INC.

March 22, 1989

The Honorable William W. Paty,
Chairman
Members of the Board of Land and
Natural Resources
Members of the Commission on Water
Resource Management
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Paty:

Subject: Request for Contested Case Hearing and for Waiver of Time to Request Hearing Petition; Daniel J. Lutkenhouse

I received a copy of Mr. Lutkenhouse's request for waiver of the rules to allow a contested case hearing to both the Board of Land and Natural Resources and the Commission on Water Resource Management (Commission) on March 20, 1989. Prior to this, since Mr. Lutkenhouse did not make an oral request as required during his testimony at the Public Hearing, I was not aware that Mr. Lutkenhouse had any intention of filing this request.

Mr. Lutkenhouse's attorney, Mr. Alan H. Okamoto, clearly acknowledges in his letter(s) of March 16, 1989, that the request for a contested case hearing is "late under Rule 13-1-29(a) of your (DLNR and Commission) rules." Mr. Okamoto further states that his client "had (not) been able to consult with me or anyone else who could have told him about Rule 13-1-29 time limits." Mr. Okamoto also acknowledges the Sierra Club's request, but goes on to say, "my client's interest is somewhat different...As such my client hereby submit(s) a separate request."

I met with Mr. Lutkenhouse and Mr. Okamoto today, March 22, at Mr. Okamoto's offices in Hilo, Hawaii. The purpose of the meeting was to get a better understanding of Mr. Lutkenhouse's concerns and answer whatever questions he had. During the meeting, the question of Mr. Lutkenhouse's knowledge of DLNR rules regarding Conservation District Use Application (CDUA) procedures and related contested case hearings came up. I expressed surprise that Mr. Lutkenhouse did not know of the procedures since 1) his house is located within a conservation district and 2) his botanical gardens at Onomea are also in a conservation district. Mr. Lutkenhouse replied that he knew all of the rules concerning a CDUA and obtaining Special Management Area (SMA) permits since he had performed substantial work on his botanical gardens. Mr. Lutkenhouse has in fact applied for a CDUA for his Hawaii Tropical Botanical Gardens.

The concerns Mr. Lutkenhouse raises in his petition concerning the Honoli'i Hydroelectric Project have been addressed in the Draft EIS and will be further addressed in the Final EIS.

Since Mr. Lutkenhouse not only owns and lives on lands within a conservation district and SMA, but has also created a botanical garden with an application for a CDUA, he can hardly be considered ignorant of the rules. Mr. Lutkenhouse's concerns have been addressed in the Draft EIS and will be further clarified in the Final EIS, in accordance with the normal procedures for a CDUA. Therefore, Mr. Lutkenhouse, through his attorney, does not have any grounds to request a waiver of the contested case rules. Furthermore, since Mr. Lutkenhouse has clearly stated his desire to be separate from the Sierra Club's request, he should not be allowed to be listed as a participant in the Sierra Club's request.

Very truly yours,

Albert S. N. Hee
President

cc: Mr. Manabu Tagomori
Mr. Roger Evans
Mr. Johnson Wong
Mr. Daniel Lutkenhouse
Sierra Club Legal Defense Fund

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Refererences

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Appendix A

Terrestrial Vertebrate Animals of the Honolii River System

By Andrew J. Berger

This report was prepared on instructions received from Mrs. Duk Hee Murabayshi, President of DHM Inc., in a letter dated June 15, 1988, and in a contract dated July 18, 1988, with Mauna Kea Power, Inc., and signed by Mr. Albert Hee.

My field studies were conducted on July 25 and 26, 1988.

The Habitat

With respect to endemic forests and their animal life, the entire region can be called a "wasteland." There is no undisturbed, endemic ecosystem anywhere near the site of the proposed wier location and the proposed Penstock. In fact, the Penstock would be "buried 5' below an existing cane-haul road." Sugar cane fields now occupy the higher land on both sides of the Honolii River.

There will be a separate report on the flora of the region, but I was struck by the wide variety of introduced plants found in the lower reaches of the river; by "lower reaches" I mean below 1,700 feet elevation. The kukui or candlenut tree (*Aleurites moluccana*) occurs scattered along the course of the river. This tree, which is "native from Polynesia west to southern Asia" (Neal, 1965:504), was important to the Hawaiians. Also found along the slopes of the river gorge is a large number of introduced plants: several species of palm trees, many guavas (*Psidium* spp.), banana (*Musa* sp.), shrubs and vines.

There are plantations of Norfolk Island pine trees (*Araucaria heterophylla*) on the higher land on the Hilo side of the river, and African tulip trees (*Spathodea campanulata*) are scattered both on the higher ground and in the gorge itself. St. John (1973) has discussed more than 4,500 exotic flowering plants that have been introduced to the Hawaiian Islands.

The Amphibians

There are no endemic amphibians in the Hawaiian Islands. All, therefore, have been introduced by man. None are endangered species and none are of any significance for an environmental impact statement.

Four species of frogs have been introduced to the islands, and three of these have been introduced to the Big Island:

A. Family Ranidae, True Frogs

1. Bullfrog (*Rana catesbeiana*)

Oliver and Shaw (1953) wrote that "this was probably one of the first species of amphibians to be introduced to the Hawaiian Islands, and may have been one of the frogs that was imported prior to 1867." McKeown (1978) said that the bullfrog "was purposely introduced in 1867 and again in 1879 from California as an additional food source." It now is found on all of the main islands in the chain. Bullfrogs are active primarily at night, and I did not happen to see or hear any during my two days of field work. In the past I have seen bullfrogs in the vicinity of Hilo and they undoubtedly occur in the general area.

Bullfrogs are serious predators on the small ducklings of the Koloa or Hawaiian duck (Anas wyvilliana), an endangered species. I have found the remains of the small Koloa ducklings in the stomach of a bullfrog.

2. Wrinkled Frog (Rana rugosa)

This frog is native to Japan. It was introduced to Hawaii in 1896 for insect control. "It has since become established in most mountain streams which offer both abundant shade and year-round clear, cool, running water. . . . It coinhabits some streams with the Bullfrog, the latter thriving in the broad deeper sections, while the Wrinkled Frog is found in shallow pools" (McKeown, 1978; Hunsaker and Breese, 1967).

B. Family Buffonidae, True Toads

3. Giant Neotropical Toad (Bufo marinus)

This toad was first introduced to the islands in 1932 "when Dr. C. E. Pemberton brought 148 adult toads from Puerto Rico. Eighty of these were liberated in a taro patch near Waipio, Oahu, and 69 were released in a swampy part of Manoa Valley" (Oliver and Shaw, 1953:77). The toads were very successful and "in a little over two years more than 100,000 descendents of the original stock were distributed through Dr. Pemberton's activities throughout the islands." Hunsaker and Breese (1967) wrote that this toad was the "commonest species of amphibians" in Hawaii. These toads are active primarily at night and I did not happen to see any during my daytime field studies. The upland areas may be too dry for these toads, even though they require water only for their breeding activities. According to McKeown (1978) these toads eat "large quantities of cockroaches,

beetles, grubs, crickets, grasshoppers, other insects, spiders, and centipeds.

The Reptiles

There are no endemic land reptiles in the Hawaiian Islands. All have been introduced (either intentionally or accidentally) by man. None is an endangered species and none is of any importance for an environmental impact assessment.

A. Family Typhlopidae, Blind Snakes

1. Blind snake (Typhlina bramina)

"This small, secretive snake was apparently introduced from the Philippines in the dirt surrounding plants that were brought in for landscaping the campus of the Kamehameha Boys School in Honolulu. It was first found there in January of 1930" (Oliver and Shaw, 1933). These blind, worm-like snakes are rarely seen until they are flooded from underground burrows by heavy rains or unless one looks for them under branches and other debris on the ground. These small, harmless snakes are of no significnace for an environmental impact assessment and I did not look for them. They are found on all of the main islands in the chain (McKeown, 1978).

B. Family Iguanidae, Iguanid Lizards

2. Green anole lizard (Anolis carolinensis porcatus)

C. Family Gekkonidae, Geckos

3. Mourning gecko (Lepidodactylus lugubris)

4. Stump-toed gecko (Gehyra mutilata)

5. Tree gecko (Hemiphyllodactylus typus)

6. Indo-Pacific gecko (Hemidactylus garnoti)

7. House gecko (*Hemidactylus frenatus*)

D. Family Scincidae, Skinks

8. Metallic skink (*Leiopisma metallicum*)

9. Snake-eyed skink (*Cryptoblephanus boutoni*)

10. Moth skink (*Lipinia noctua*)

These skinks and geckos of the Big Island are irrelevant to an impact assessment, in part, because they adapt well to both urban and rural areas and because all are alien species in Hawaii.

The Birds

More than 170 species of exotic or alien bird species have been introduced to the Hawaiian Islands since 1796 (Berger, 1981). Approximately 50 species have established breeding populations in the islands. I found the following birds on the project site or on lands surrounding the site. I include birds seen on "lands surrounding the site" for several reasons: First, the site lies adjacent to other land uses; secondly, my field studies were conducted on only two days in late July 1988; and, thirdly, some of the species seen in surrounding areas certainly enter the river valley at times or fly over it.

A. Order Ciconiiformes

a. Family Ardeidae, herons and egrets

1. Cattle Egret (*Bubulcus ibis*). This species was imported to Hawaii from Florida, to aid "in the battle to control house flies, horn flies, and other flies that damage hides and cause lower weight gains in cattle" (Breese, 1959). This egret

is native to Spain, Africa, and Asia. The birds appeared naturally in British Guiana about 1930, apparently being wind-borne from Africa, a natural colonization of the New World. By 1965 the birds had reached California (Peterson 1954; Van Tyne and Berger, 1976). A total of 105 birds was released on five islands between July 17 and August 24, 1959; . . . and two sites each on Oahu and Hawaii." On the island of Hawaii, I saw one cattle egret at an elevation of about 900 feet along the Chain of Craters Road on November 21, 1970, and other egrets were seen at South Point and the Nakagawa Pond near Hilo in 1972. The population has increased greatly with the passing of years. During January of 1986, personnel of the StateDivision of Forestry and Wildlife recorded 682 egrets on the island of Hawaii (Bachman amd Walker, 1986). The Cattle Egret became a serious threat at Hilo airport but this threat apparently has been alleviated, as pointed out by Pratt (1988), who wrote: "Extensive efforts to reduce the Cattle Egret population near Hilo airport, H., has resulted in a marked decrease in the species' numbers. Fewer than 10 were reported at their traditional roost in Lokoaka Pond near Hilo." Unlike early field studies in the region, I saw only one Cattle Egret during my field studies. (See, also, Paton, Fellows, and Tomich, 1986.)

B. Order Columbiformes

a. Family Columbidae, pigeons and doves

2. Rock dove or feral pigeon (*Columba livia*). The pigeon probably was the first exotic bird to be introduced to

the Hawaiian Islands. Their importation has been traced back to 1796. Schwartz and Schwartz (1949) wrote that the feral pigeon roosts and nests the year around in sheltered portions of cliffs along the sea coast, in rocky gulches, and in collapsed lava tubes up to 10,000 feet on Mauna Kea. These authors also found heavy parasitism of feral pigeons by tapeworms, and they stated that the tapeworm infestation retards proper nutrition and "occludes the intestine, produces undesirable toxins, and hinders breeding." They added that "in certain places where rookeries are accessible to humans, it was, and still is, the custom for local residents to periodically take the squabs for food."

Navvab Gojrati (1970) reported infection by bird malaria, Haemaproteus, and Leucocytozoon in birds studied at the Honolulu Zoo. Kishimoto and Baker (1969) reported finding the fungus Cryptococcus neoformans in 13 out of 17 samples of pigeon droppings collected on Oahu. The full significance of their findings was never determined in Hawaii, but, in man, this fungus causes a chronic cerebrospinal meningitis, and Hull (1963) remarked that "in all but the cutaneous forms the prognosis is very grave." The rock dove is found throughout the region.

5. Spotted or Lace-necked Dove (Streptopelia chinensis)

Also called the Chinese dove, this Asian species was released in the Hawaiian Islands at an early date; the exact date appears to be unknown, but the birds are said to have been very common on Oahu by 1879. Although this species does occur

where the rainfall exceeds 100 inches per year, the highest densities are found in drier areas, especially where the alien kiawe or mesquite (Prosopis pallida) is one of the dominant plants. Schwartz and Schwartz (1949), for example, reported densities as great as 100 birds per square mile in dry areas on Molokai. Although it is considered a game bird in Hawaii, only 14 birds were shot during the 1986-1987 game bird season on Hawaii (Bachman and Walker, 1987). The spotted dove is common in all habitats on the Hamakua Coast of the island.

4. Barred Dove or Zebra Dove (Geopelia striata). This dove is native to Australia and the Orient. The species is said to have been introduced to Hawaii sometime after 1922 (Bryan, 1958). It now is an abundant species on all of the islands. This dove also prefers the drier areas. Schwartz and Schwartz (1949) reported densities as high as 400 to 800 birds per square mile in some areas on Oahu: for example, Barber's Point to Makaha.

The barred dove also is classified as a game bird in Hawaii, although, because of its small size, only two birds were shot on Hawaii during the 1986-1987 gamebird season (Bachman and Walker, 1987).

One study of the food habits in Hawaii revealed that the diet consists of 97 percent seeds and other plant materials; the 3 percent animal matter included several species of beetles, weevils, and wireworm larvae. Kocan and Banko (1974) reported on zebra doves from the Big Island that were infected with trichomonas; this parasite has "catastrophic" effects on doves in North America. The barred dove is very common in nearly all habitats (not in dense forests) along the Hamakua Coast.

C. Order Strigiformes

a. family Tytonidae, Barn Owls

5. Barn Owl (<u>Tyto alba pratincola</u>). Barn owls differ from typical owls in that they have a heart-shaped facial disc of feathers, hence the name of "monkey-faced owl." Barn owls were first released on the island of Hawaii during 1958 (Tomich, 1962; Berger, 1981). Like the mongoose earlier, the owls were released in the hope that they would help to control rats in the sugarcane fields. Few studies of the food habits of the barn owl have been conducted in Hawaii, but one study on the island of Hawaii revealed that about 90 percent of the food consisted of house mice (Tomich, 1971). Byrd and Telfer (1980) reported that barn owls had killed more than 100 seabirds and their chicks on Kauai and Kaula Island. "The known spread of the Barn Owl in Hawaii to grazing land and to forested areas suggests . . . that this species has done no more in controlling rats in the sugarcane fields than did the mongooses" (Berger, 1981:182). Barn owls are nocturnal in habits, and I did not happen to find one during my daytime field work. This owl does inhabit the general region and undoubtedly seeks food in the project area.

D. Order Passeriformes

a. Family Timaliidae, Babblers and Their Allies

6. Melodious Laughing-thrush (<u>Garrulax canorus</u>)

Although it has long been called the Chinese Thrush in Hawaii, this bird is not a member of the thrush family (Turdidae) but is a babbler. The Chinese name is Hwa-mei. The species is native to the Yangtze Valley in China and southward into Laos, and it occurs in Formosa.

The birds were brought to Hawaii as cage birds. "A number obtained their freedom at the time of the great fire in the Oriental quarter of Honolulu in 1900, and took to the hills behindthe city" (Caum, 1933). Birds later were imported and released on other islands. Birds from Oahu were released on Kauai in 1918. Ord (1967) said that this species was abundant "on Hawaii, Maui, and Oahu, from 400 feet up to the tree limit." I found this to be a very conspicuous species during late July because the birds were singing not only in the river valley but whereever there were trees and thickets on the sugar cane land (that is, in gullies not suitable for the cane).

b. Family Zosteropidae, White-eyes and Silver-eyes

7. Japanese White-eye (<u>Zosterops japonicus</u>). This white-eye is native to the main islands of Japan, from Honshu to Kyushu and the islands lying between Japan and Korea. The first Japanese white-eyes (also called Mejiro) were released on Oahu by the Territorial Board of Agriculture and Forestry

in 1929 (Caum, 1933). At least 252 white-eyes were released on the island of Hawaii during June 1937 (Berger, 1975b).

The white-eye presents an example par excellence of the success of introduced birds in the absence of their normal predators and diseases. This species now occurs from sea level to tree line on Maui and Hawaii, and inhabits very dry regions (e.g., Kawaihae) and those with 300 or more inches of rainfall per year. There is virtually no habitat in Hawaii that is not inhabited by the Japanese White-eye. I believe it to be the most abundant song bird in the islands. It, therefore, occurs throughout the project site, both in the river gorge and in the cane fields.

White-eyes eat insects, nectar, soft fruits, the pulp of berries, and flower buds, so that they can be a serious pest to farmers. The California State Department of Agriculture is greatly concerned about the accidental release of a related species (gray-backed white eye, Z. palpebrosa) at San Diego. Two pairs escaped there in 1973 or 1974; 150 offspring had been captured in less than 10 years. "Estimates of the potential loss in soft-fruit crops, should white-eyes even begin to multiply rapidly and establish large populations, run as high as $2 million a year" (Audubon Magazine, September, 1982).

c. Family Sturnidae, Starlings and Mynas

8. Common Indian Myna (Acridotheres tristis). This myna is native to India, West Pakistan, Nepal, and adjacent regions. The myna was introduced to the islands from India

"in 1865 by Dr. William Hillebrand to combat the plague of army worms that was ravaging the pasture lands of the islands. It has spread and multiplied to an amazing extent; reported to be abundant in Honolulu in 1879, it is now extremely common throughout the territory" (Caum, 1933). The myna is common to abundant in lowland areas of all of the inhabited islands, being most common in residential areas and in the vicinity of houses and barns in rural areas, but birds also occur in outlying areas. I saw several birds along the edges of cane fields.

d. Family Ploceidae, Weaverbirds and Their Allies

9. Warbling Silverbill (Lonchura malabarica cantans)

This silverbill is native to Africa, being found from Senegal to western and southern Sudan (Traylor, 1968). Silverbills have been characterized as being "preeminently desert birds."

There are no published records of the release of this species in Hawaii (Bryan, 1958; Berger, 1975a). It is assumed that cage birds were released on the Puuwaawaa Ranch, probably during the 1960s. I first discovered this silverbill near Kawaihae on March 22, 1972 (Berger, 1975a). Later observations have revealed that large populations have become established on the leeward slopes of the Kohala Mountain, on Mauna Kea (including Pohakuloa), Hualalai, and South Kona. I know of no actual reports of the occurence of this siverbill in the Hilo or Hamakua District, but it is only a matter of time before the species establishes itself in these areas.

The significance of the silverbill is that it predominantly is a seed eater. With the other seed eaters already well established on the Big Island the harvesting of small grain crops will be virtually impossible on theisland of Hawaii (see house finch, to follow).

10. Nutmeg Mannikin or Ricebird (Lonchura punctulata)

Also called the spotted munia, this species has a wide distribution in Sri Lanka, India, Nepal, Burma, and southward into Malayasia and the Indo-Chinese subregion, and in the Philippines. The species was introduced to Oahu by Dr. William Hillebrand in 1865. Caum (1933) wrote that this species "feeds on seeds of weeds and grasses and does considerable damage to green rice." Although rice is no longer grown in Hawaii, this seed-eating bird continues to be a pest for certain agricultural crops (see explanation under house finch). Ricebirds are highly gregarious and flocks of 75 birds or more are not uncommon at certain times of the year. I have found active nests in every month of the year. Ricebirds are not inhabitants of dense forests and thickets but are found wherever thereare weed seeds and fairly open spaces: for example, pastures, golf courses, along dirt roads and cane haul roads, weedy fields, and in residential areas. This was the most common species seen in the project area during my two days of field work. Flocks of 20 or more birds were flushed repeatedly, along cane haul roads and other open spaces.

11. House Sparrow (Passer domesticus)

Incorrectly sometimes called the English sparrow, this species has a wide distribution in Europe and Asia as well as in England. This sparrow was first imported to Oahu in 1871, when nine birds were brought in from New Zealand (where they had been introduced earlier from England). Caum (1933) wrote that the species was reported to be numerous in Honolulu in 1879. In North America, the house sparrow (first introduced in Brooklyn, New York, in 1852) became a serious pest and tons of thousands of dollars were spent in attempting to control thepopoulations. (Dearborn, 1912). This sparrow apparently never became a pest in Hawaii. It is omnivorous in diet, eating weed seeds as well as insects and their larvae. The house sparrow typically is found in the vicinity of man and his buildings but they also forage in outlying areas, such as along the edges of cane fields.

e. Family Fringillidae, Cardinals and Buntings

12. Cardinal (Cardinalis cardinalis)

This bird also is called the Virginia Cardinal, Kentucky Cardinal, and Kentucky Redbird. Its native range is the eastern part of North America, east of the plains and northward into Ontario. Cardinals were released several times on Hawaii between 1929 and 1931 (Caum, 1933; Berger, 1975b, 1981). On Hawaii it occurs from sea level to at least 7,500 feet on Mauna Kea and Mauna Loa. It inhabits very dry areas and those with a high annual rainfall. This bird is very common in the project area, especially noticeable because of their singing.

13. House Finch (<u>Carpodacus mexicanus frontalis</u>)

This seed-eating finch is native to western North America, although populations have become established from Michigan to New York, presumably because of the release of pet store birds. House finches were first brought to Hawaii "prior to 1870, probably from San Francisco" (Caum, 1933). It now is an abundant species on all of the islands, in residential areas, rural areas, and in thehigh ranch and open forest lands on Maui and Hawaii. It probably is the second most abundant song bird in the islands now.

Although the birds sometimes eat overripe papaya (hence, the local name of papayabird), the house finch is predominantly a seed-eater. House finches and nutmeg mannikins caused great damage to experimental crops of sorghum planted on Kauai and Hawaii during 1971-1972. "A report by the Senate Committee on Ecology, Environment, and Recreation says that ricebirds and linnets [equals house finch] caused a 30 to 50 percent loss in the sorghum fields at Kilauea on Kauai last year. . . . Seed-eating birds at Kohala ate about 50 tons of sorghum grain in a 30-acre experimental field that was expected to produce 60 tons" (Honolulu Advertiser, March 14, 1972, page B-2). Hence, the growing of small grain crops in the islands is not a promising potential for the much talked-about "diversified agriculture" in the State. Two other seed-eating birds (the silverbill and the Java sparrow) have

since that time become established on the island of Hawaii. The house finch is an abundant bird throughout the project area.

II. Indigenous Birds

These are species that are native to the Hawaiian Islands but which are not unique to them; their total range includes other islands in the Pacific Basin and/or in North America or Siberia. These are the black-crowned night heron, 22 species of seabirds, and a number of migratory species that nest in Alaska or Siberia and which spend the winter or nonbreeding season in the islands.

A. Order Ciconiiformes

a. Family Ardeidae, Herons and Egrets

1. Black-crowned Night Heron (<u>Nycticorax hoactli</u>)

This subspecies has a breeding range that includes Hawaii and the Western Hemisphere from Washington and Oregon southward to northern Chile and south-central Argentina. Because the Hawaiian birds are considered to be the same subspecies as the continental birds, they are not classified as endangered, even though their continued survival in Hawaii depends on the preservation of the same wetlands on which the endemic Hawaiian waterbirds depend.

These herons feed on a wide variety of aquatic and terrestrial life: for example, fish, frogs, crayfish, mice, and insects. In Hawaii, they also eat the downy young of some of the seabirds and probably the downy young of the endangered waterbirds. They also relish prawns, and the State Land Board gave prawn producers a "120-day permit to destroy black-crowned night herons which have caused economic havoc at Oahu's Kahuku prawn farm as well as other aquaculture farms statewide" (Honolulu Star-Bulletin, October 26, page A-8 and October 30, 1985, front page).

I did not see any herons during my two days of field studies, but they may occasionally feed along the river's edge. However, this heron is uncommon on the Big Island . Personnel of the State Division of Forestry and Wildlife counted only nine herons on the island during their semiannual waterbird census on July 27, 1983, and only eight birds during January 1986 (Bachman and Walker, 1986).

B, Seabirds

None of the seabirds nest or forage in the vicinity of the project site.

C. Migratory Birds

By the end of May the migratory species have left the Hawaiian Islands for their breeding ground. None were present during my field studies in late July. I would anticipate finding only two species in the cane fields and/or along the river itself.

1. Lesser or Pacific Golden Plover (Pluvialis dominica fulva).

This subspecies nests in Siberia and Alaska and other parts of arctic America. It is a very common winter resident in the islands, being found from sea level to at

least 10,000 feet elevation on Hawaii island. During their winter stay in the islands, they frequent lawns in residential areas, golf courses, weedy pastures, open areas in the mountains, mud flats, cane haul roads, and grassy areas around air fields. They would certainly be found on the cane haul roads during the winter months. During early March of 1986, I found a dozen plovers at an elevation of 1,200 feet along the Hanalei River on Kauai.

2. Wandering Tattler(Heteroscelus incanus)

This shorebird nests in Alaska and northwestern British Columbia. This species is a regular winter resident in the islands. The birds usually are seen along beaches and reef flats but I found several birds along Hanalei River at elevations up to an elevation of 1,000 feet during March of 1986.

The other migratory species (i.e., shorebirds and ducks) are restricted to ponds, mud flats, reservoirs. I would not expect to find them in the project area.

III. Endemic Birds

These are birds that are unique to the Hawaiian Islands; they do not occur naturally in any other part of the world. At least 40 percent of these unique birds already are extinct and another 40 percent are now classified as threatened or endangered with extinction (see Berger, 1981; Kirch, 1982; Stone and Scott, 1985; and Scott, et al., 1986).

Most of these endangered birds are forest species and there is no native ecosystem at the elevations for the project.

A. Order Anseriformes

a. Family Anatidae, Ducks, Geese, and Swans

1. Koloa or Hawaiian duck (Anas wyvilliana)

This endangered species occurred on all of the main islands except Lanai and Kahoolawe into the 1940s. Man may have been the most serious predator on the Koloa because the birds could be hunted legally during the 1920s, when the bag limit was 25 ducks per day. The decline in taro growing, the cessation of commercial rice growing, and the draining of marshland for development also led to the decline in the numbers of ducks, and the species was extirpated from all islands except Kauai by about 1960. The State Division of Fish and Game initiated a Koloa restoration program at Pohakuloa in 1972. By 1979, a total of 293 Koloa had been released on Hawaii.

The Hawaiian Waterbirds Recovery Plan (U. S. Fish and Wildlife Service, 1985) discusses habitats of importance to the waterbirds on Hawaii Island. In addition to Opaeula and Aimakapa on the Kona Coast, several areas on the Hamkua Coast were given special mention: for example, Pololu, Waimanu, Waipio, Waiakea, and Loko Aka. Most of these habitats are important especially for the Hawaiian Coot (Fulica americana alai); only 26 Hawaiian stilts (Himantopus mexicanus knudseni) were counted on the island of Hawaii by personnel of the Division of Forestry and Wildlife during January of 1986 (Bachman, et al., 1986).

The Recovery Plan reports that "various reservoirs and stockponds on Hawaii . . . provide limited habitat for koloa. In the Kohala Mountains and around Mauna Kea there are scattered sightings of koloa using various kinds of ponds" (page 57).

I did not see any Koloa during my two days along the Honolii river system. I believe that the only concern if there are Koloa that use this river system is that the flow of water would be decreased drastically by diverting water to the Penstock. If the flow is adequate both for the Penstock and the river, there should be no adverse effects on any Koloa that do inhabit or visit this system.

B. Order Falconiformes

a. Family Accipitridae, Hawks

1. Hawaiian Hawk or 'Io (Buteo solitarius)

This endemic hawk is an adaptable species, feeding on spiders, insects, mammals (especially mice) and both endemic and introduced birds (Berger, 1981). Similarly, Scott and his coworkers wrote (1986) that the "'I'o occupies a broad range of habitats from papaya and macadamia orchards through virtually all types of forest including ohia rain forest and subalpine-mamane-naio woodland." Moreover, Griffin (1985, Abstract to Thesis) found "no differences . . . in success of 'io nests in habitats dominated by native (77%) versus exotic (65%) vegetation." Griffin also found the home range of this hawk to be 1,104 acres. and he wrote that "given the abundance. wide distribution, and high reproductive success of this species

. . . , it seems appropriate to reevaluate its endangered status" (Griffin, 1985:166; also, 1984). I did not see any hawks during my two days in the field, but because of its large home range, varied habitat utilized, and food habits, the proposed construction would have no adverse effects on this hawk.

C. Order Strigiformes

a. Family Stridgidae, Typical Owls

1. Hawaiian Owl or Pueo (Asio flammeus sandvicensis)

The Pueo is a subspecies of the North American short-eared owl. It is a permanent resident on all of the islands. The birds occur from sea level to at least 8,000 feet on Mauna Kea and Mauna Loa. This diurnal owl typically is seen soaring over pastures and brushland looking for prey, largely mice and rats. I did not see any Pueo during my field studies during late July, 1988, but I have seen in in the general region in the past. At any rate, the consturction and operation of the proposed project would have no adverse effects on this owl.

The Mammals

I. Endemic Mammals

The only endemic land mammal in the Hawaiian Islands is the Hawaiian bat (Lasiurus cinereus semotus), a subspecies of the American hoary bat. This bat occurs primarily on the islands of Hawaii and Kauai. It is most common on Hawaii, and has been seen from sea level to 13,200 feet elevation (Kramer, 1971;

Tomich, 1986). Tomich wrote that the "rarity of the hoary bat is a myth which stems from a lack of understanding by the casual observer of how a nonsocial and scattered population should appear." He added (1974): "The Hawaiian hoary bat is typically a solitary, tree-roosting animal. Occasional specimens are found singly in rock crevices or even in buildings. Thus, the population is widely scattered." Since he wrote, the bat also has been found to use lava tubes for roosting. The bats are nocturnal in habits and I did not see any during my daytime field studies. The bats feed on insects at night and they would continue to do so if the proposed project is completed.

II. Introduced Mammals

All of the introduced mammals have proven highly detrimental to man, his buildings, products and agricultural crops and/or to the native forests and their animal life. None of these alien mammals is an endangered species and none is of any concern as far as detrimental effects on them caused by any construction or change in land use in the project site. It would, in fact, be a great boon to the islands if it were possible to exterminate all of them, which it is not.

Some of these mammals were first released in the islands by Captains Cook and Vancouver over 200 years ago. Feral cattle (Bos taurus), goats (Capra hircus), sheep (Ovis aries), and pigs (Sus scrofa) have been destroying the Hawaiian native forests since 1800, and they continue to do so today (see

Mueller-Dombois, et al, 1981). With the possible exception of the pig, the other large mammals are found in different habitats and usually at much higher elevations.

With the possible exception of the house mouse (Mus musculus), all of the smaller alien mammals prey on birds, their eggs, and young. These small mammals include the roof rat (Rattus rattus), the Norway rat (Rattus norvegicus), Polynesian rat (Rattus exulans), small Indian mongoose (Herpestes auropunctatus), feral cat (Felis catus), and feral dog (Canis familiaris). These mammals prey on endemic forest birds, introduced birds, endangered Hawaiian waterbirds, as well as poultry and other domestic birds.

The mongoose is active during the daytime, and I saw several during my field studies. I did not attempt to trap the nocturnal rodents because their presence is irrelevant to an environmental impact assessment and because all are alien and pestiferous species. It seems certain that all of them occur in the project region (Kramer, 1971; Tomich, 1986).

Summary and Conclusions

1. More than 4,500 species of exotic plants have been introduced to the Hawaiian Islands (St. John, 1973). There is no semblance of any native ecosystem anywhere near the project site. A wide variety of introduced plants grow in the river gorge. The uplands are devoted primarily to sugarcane production, with groves of Norfolk Island pine

and other introduced tree species. The construction of the wier and Penstock will have no adverse effect on any native ecosystem or even on those already present.

2. Because there are no endemic amphibians or land reptiles in the Hawaiian Islands, all of those that are present are alien or introduced. Their occurrence in the area is irrelevant to an impact assessment. Some (e.g., the bullfrog) pose a threat to the downy young of endangered Hawaiian waterbirds; the neotropical toad has poison glands that are a threat to dogs and to young children.

3. None of the 13 species of introduced birds discussed in this report. is an endangered species and a number have proven to be serious pests to agriculture in Hawaii. The two species of dover and the myna have been implicated in the spread of the seeds of such noxious plants as Lantana camara.) The destruction to sorghum crops by the nutmeg mannikin and the house finch has been discussed above. The Japanese white-eye causes considerable damage to ornamental flowers and to fruit crops (see Keffer, et al., 1976). The barn owl has been reported to kill seabirds on Kauai, and may kill other birds on Hawaii. It seems reasonable to conclude, therefore, that the presence of these alien bird species is irrelevant to an impact assessment.

4. I saw no indigenous bird species during my late July 1988 survey of the project area. It is certain that the lesser golden plover does inhabit the cane haul roads during their stay in the Hawaiian Islands. It is possible that the wandering tattler uses the river during the winter months. The black-crowned night heron is a rare species on theisland of Hawaii, and probably does not feed or forage along the river. If what I have just written is true, the proposed project still would have no adverse effect on any of these three species.

5. The Hawaiian hawk and the Pueo may at times fly over the cane fields, searching for food. Nevertheless, because of my discussion above of these two endemic birds, it is my considered opinion that the project would have absolutely no effect on these raptorial birds.

6. The only endemic land mammal in the Hawaiian Islands is the Hawaiian hoary bat, now classified as an endangered species. The nocturnal, insect-eating bat inhabits urban areas as well as outlying regions, and it would continue to do so if the proposed project were completed. The project would have no adverse effects on the bat.

7. All of the remaining mammals in the project area are introduced species and all are serious pests to man,

his buildings, products, agriculture and to the native flora and fauna. The three species of rats prey on the nests of ground-nesting birds (both wild and domestic) and even on some tree-nesting birds; the mouse and the rats cause great damage to agriculture as well as homes and businesses. The very common diurnal mongoose is a serious predator on some of the endangered waterbirds as well as on poultry and other domestic birds. If it were possible to exterminate all of these alien mammals, it would be a great benefit to the Hawaiian Islands. There presence, therefore, is irrelevant to an environmental impact assessment.

8. Therefore, I can see no biological reason for opposing construction of the Honolii Hydroelectric Power Project.

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Appendix B

BOTANICAL SURVEY

HONOLI'I HYDROELECTRIC POWER PROJECT

SOUTH HILO DISTRICT, ISLAND OF HAWAI'I

by

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Prepared for: DHM inc.
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MAUNA KEA POWER, INC.

August 1988

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BOTANICAL SURVEY
HONOLI'I HYDROELECTRIC POWER PROJECT
SOUTH HILO DISTRICT, ISLAND OF HAWAI'I

SUMMARY

A botanical survey was conducted on lands which would be directly affected by the construction of the proposed Honoli'i hydroelectric power plant. Three vegetation types are recognized on the study area. Near the site of the diversion weir, the forest consists of closed canopy, tall stature, native koa and 'ohi'a trees. However, the shrub and subcanopy layers are composed primarily of waiawi or yellow strawberry guava, melastoma, and rose apple, all introduced or non-native species. Within the koa-'ohi'a forest, open, disturbed areas are dominated by tangles of the mat-forming uluhe fern on the slopes and by dense, sprawling colonies of California grass bordering the streamsides. Along the proposed penstock route, the vegetation consists of sugar cane fields with an assortment of weedy species commonly associated with cultivated lands. The vegetation along the lower reaches of Honoli'i Stream, where the proposed power plant site will be located, is characterized by a mixture of introduced and native species. A few plants introduced by the early Polynesians, such as ti, banana, shampoo ginger, breadfruit, kukui, etc., are also found occasionally in these mixed forests.

A total of 133 plant species were inventoried during the survey. Of these, 98 (73.7%) are introduced plants; 8 (6%) are of Polynesian origin; and 27 (20.3%) are native. Of these 27 native species, 17 are endemic (i.e., found only in the Hawaiian Islands) and 10 are indigenous (i.e., native to the islands and other geographic areas). The majority of the native plants are found in the koa-'ohi'a forest.

None of the species found during the survey are officially listed as endangered or threatened; nor are any of these species proposed or candidate for such status.

INTRODUCTION

Mauna Kea Power, Inc., proposes to construct a hydroelectric power plant along the Honoli'i Stream, District of South Hilo, Hawai'i island. The proposed weir will be located near an existing gauging station at about the 1,600 ft. elevation. The length of the proposed 4-foot diameter penstock is approximately 3.75 miles; it will be buried 5 ft. below an existing cane-haul road. The power plant will be located in the general area above the old highway bridge. The survey thus covered both banks of the stream from the area above the old bridge to about the 200 ft. elevation contour.

The survey to assess the botanical resources in the areas which would be directly affected by the proposed hydroelectric project was conducted on 03 August 1988. The primary objectives of the study were to 1) provide a general description of the vegetation; 2) inventory the terrestrial, vascular flora; and 3) search for officially listed, proposed or candidate threatened and endangered plant species.

SURVEY METHODS

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

Existing topographic maps were examined to determine access, terrain characteristics, boundaries, and reference points. Access to the forested areas at the weir location and the power plant site was by existing cane-haul roads, the old highway, and foot trails. The proposed penstock route is located largely along an existing cane-haul road.

Notes were made on plant associations and distribution, substrate types, topography, exposure, etc. Species identifications were made in the field; plants which could not be positively identified were collected for later determination in the herbarium and for comparison with the taxonomic literature.

DESCRIPTION OF THE VEGETATION

Native forests of 'ohi'a and koa, as well as planted forests of various _Eucalyptus_ species, are found along the Hamakua coast above sugar cane fields and farmlands. On the lower elevation portions of the many streams which drain the slopes of Mauna Kea and cut through the cane fields, the vegetation consists primarily of introduced plants or, in places, a mixture of introduced and native species. Some recent studies describing the botanical resources of these areas have been conducted for the nearby Pu'u'eo Forest (Bioenergy Development Corp. 1982), between the 1,600 and 2,400 ft. contours, and along the Wailuku River for a similiar hydroelectric power project (Corps of Engineers 1984).

Within the study area, three vegetation types are recognized and are described in detail below. A checklist of all the vascular plant species found during the survey is provided in the Appendix at the end of this technical report.

Koa-'Ohi'a Forest -- This forest type is found on the steep slopes above the existing gauging station, near the proposed weir location. Koa trees (_Acacia koa_), 40 to 45 ft. tall, form a closed canopy forest (cover greater than 60%). Trees of 'ohi'a (_Metrosideros polymorpha_ var. _polymorpha_ and var. _glaberrima_), 20 to 30 ft. tall, occur as scattered individuals among the koa, although on the steeper gulch walls and on uluhe (_Dicranopteris

linearis_) covered areas 'ohi'a becomes a common component.

Waiawi or yellow strawberry guava (_Psidium cattleianum_) forms a dense, almost impenetrable layer under the koa and 'ohi'a. Waiawi is usually 12 to 18 ft. tall but in places may reach 25 ft. Locally common are dense stands of rose apple (_Syzygium jambos_), 25 to 30 ft. tall, and solid thickets of melastoma (_Melastoma candidum_). While both species of the native tree fern or hapu'u (_Cibotium glaucum_, _Cibotium chamissoi_) are commonly observed in this forest type, other native understory species are uncommon to rare. These include kopiko (_Psychotria hawaiiensis_), hame (_Antidesma platyphyllum_), maile (_Alyxia oliviformis_), mamaki (_Pipturus albidus_), ie'ie (_Freycinetia arborea_), and papa'a-hekili (_Clermontia parviflora_).

Where the tree canopy is open and there is more available light, various grasses such as Hilo grass (_Paspalum conjugatum_), Glenwood grass (_Sacciolepis indica_), palmgrass (_Setaria palmifolia_), and large basketgrass (_Oplismenus compositus_) or the native matted fern, uluhe, are abundant. The relatively level area around the gauging station has been cleared of surrounding trees and shrubs at some time in the past and a dense growth of California grass (_Brachiaria mutica_) covers this area as well as the proposed weir location. Scattered clumps of banana (_Musa X paradisiaca_), ti (_Cordyline fruticosa_), waiawi, 'ohi'a, koa, and tree fern are found in the grass. Along the stream in this area are impatiens (_Impatiens wallerana_), puakamoli (_Cuphea carthagenensis_), pamakani (_Ageratina riparia_), rockweed (_Pilea microphylla_), and other species which prefer the open, sunny streamsides.

Mixed Forest -- From below the gauging station and to the mouth of Honoli'i Stream, the vegetation on the slopes above the stream consists of a mixture of introduced and native species. Among the introduced or non-native trees and shrubs are rose apple, mango (_Mangifera indica_), waiawi, guava (_Psidium guajava_), melastoma, white moho (Heliocarpus popayanensis), and avocado (Persea americana). Several large clumps of a bamboo species (Bambusa sp.) occur in this forest type. Native trees and shrubs include 'ohi'a, hau (Hibiscus tiliaceus), and neneleau (Rhus sandwicensis). Plants introduced by the Polynesians are also occasionally observed; these include banana, breadfruit (Artocarpus altilis), mountain apple (Syzygium malaccense), ti, kukui (Aleurites moluccana), and 'awapuhi kua-hiwi or shampoo ginger (Zingiber zerumbet).

Ground cover is usually not dense under this forest type and consists of scattered patches of more shade-tolerant species such as blechnum fern (Blechnum occidentale), Hilo grass, sword fern (Nephrolepis multiflora), yellow ginger (Hedychium flavescens), and Diplazium esculentum (along the stream banks).

Sugar Cane Fields -- The proposed penstock will be located largely along an existing cane-haul road. The roadsides and margins of sugar cane (Saccharum officinarum) fields support a number of weedy species commonly associated with cultivated lands. Species composition varies from island to island, being strongly influenced by the amount of rainfall and to a lesser extent by substrate type. Typical weedy species in the cane fields of the wetter Hamakua area are false pimpernel (Lindernia crustacea), 'Ola'a beauty (Torenia asiatica), spermococe (Spermococe mauritiana), several members of the Sedge Family (Cyperaceae), polygola (Polygola paniculata), field Indian paintbrush (Castilleja arvensis), and wild begonia (Begonia hirtella).

Fallow fields are found in the area behind (north of) the farmlands at Kaiwiki Homesteads, above 1,500 ft. elevation. California grass covers most of the former cane land, although scattered clumps of cane still persist and are common.

RESULTS AND DISCUSSION

Vegetation on the proposed weir site consists of California grass with scattered trees and shrubs; on the gulch slopes around the weir site is a tall stature koa-'ohi'a forest. The majority of the native species are found in this habitat. The proposed penstock route is largely located along a cane-haul road through actively cultivated fields. The proposed power plant has been sited in a mixed forest composed of introduced plants as well as native species and plants originally introduced by the Polynesians.

Two candidate endangered species are known from the forests in the general area. They are Metrosideros polymorpha var. newellii, a rare variety of 'ohi'a, known only from the Wailuku River drainage (Corps of Engineers 1984) and Stenogyne scrophularioides, an endemic member of the Mint Family (Lamiaceae), recorded from the nearby Pu'u'eo Forest (Bioenergy Development Corp. 1982). The Metrosideros is a Category 1 taxon, that is, the U. S. Fish and Wildlife Service (1985) currently has on file substantial information on biological vulnerability and threat(s) to support the appropriateness of proposing to list it as an endangered or threatened species. The Stenogyne is a Category 2 taxon, that is, information now in possession of the Service indicates that proposing to list it as endangered or threatened is possibly appropriate, but for which substantial data on biological vulnerability and threat(s) are not currently known or on file to support the immediate preparation of such rules.

During the field studies, an intensive search was made for these two species within the project site; this also included the areas adjacent to the project site as they may be indirectly impacted by construction activities. None of these two species were found nor were there any other officially listed, proposed or candidate threatened and endangered species designated by the Federal and/or State governments (U.S. Fish and Wildlife Service 1985;

Herbst 1987) on or adjacent to the project site,

The proposed project is not expected to have a significant impact on the total State-wide populations of the species involved. The native species are found in similiar environmental habitats along the Hamakua coast. In addtion, the total area of native forest which will be affected by the project is relatively small; the greatest amount of disturbance will take place on sugar cane fields.

Of some concern, is the generation of sediments into the nearby streams. It is recommended that cuts along the gulch slopes be kept to a minimum and revegetated as soon as possible. Grasses already in the area, such as Hilo grass and carpetgrass (Axonopus fissifolius), could be used.

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APPENDIX. PLANT SPECIES LIST
HONOLI'I HYDROELECTRIC POWER PROJECT
SOUTH HILO DISTRICT, ISLAND OF HAWAI'I

In the following species list, the plants are divided into three groups: Ferns and Fern Allies, Monocots, and Dicots. Taxonomy and nomenclature of the Ferns and Fern Allies follow Lamoureux's (1984) treatment of the Hawaiian taxa. The flowering plants (Monocots and Dicots) are in accordance with Wagner et al (in press). In most cases, common English names follow St. John (1973); Hawaiian names are in accordance with Porter (1972) or St. John (1973).

The checklist provides the following information:

1. Scientific name with author citation.
2. Common English or Hawaiian name, when known.
3. Biogeographic status of each species. The following symbols are used:
   - E = endemic = native only to the Hawaiian Islands
   - I = indigenous = native to the islands and also to one or more other geographic area(s)
   - P = Polynesian = plants of Polynesian introduction brought to the islands prior to Western contact (1778); not native
   - X = introduced or exotic = brought here deliberately or accidentally after Western contact; not native.
4. Presence (+) or absence (-) of a species within each of three vegetation types recognized on the project site (see text for discussion).
   - k-o = Koa-'Ohi'a Forest
   - mxf = Mixed Forest
   - c = Sugar Cane Fields

Scientific name	Common name	Status	Vegetation type k-o	mxf	c
FERNS AND FERN ALLIES					
ADIANTACEAE (Maiden-hair Fern Family)					
Adiantum hispidulum Sw.	maiden-hair fern	X	-	+	-
ASPLENIACEAE (Bird's-nest Fern Family)					
Asplenium sp.		I	+	-	-
ATHYRIACEAE (Athyrium Family)					
Athyriopsis japonica (Thunb.) Ching		X	+	+	-
Diplazium esculentum (Retz.) Sw.		X	-	+	-
BLECHNACEAE (Blechnum Family)					
Blechnum occidentale L.	blechnum fern	X	+	+	-
DICKSONIACEAE (Tree Fern Family)					
Cibotium chamissoi Kaulf.	hapu'u 'i'i	E	+	+	-
Cibotium glaucum (J. Sm.) H. & A.	hapu'u	E	+	+	-
GLEICHENIACEAE (Gleichenia Family)					
Dicranopteris linearis (Burm.) Underw.	uluhe	I	+	+	-
GRAMMITACEAE (Grammitis Family)					
Adenophorus pinnatifidus Gaud.		E	+	-	-
Adenophorus tamariscinus (Kaulf.) Hook. & Grev.	wahine-noho-mauna	E	+	-	-
Grammitis tenella Kaulf.	kolokolo, mahina-lau	E	+	-	-
HEMIONITIDACEAE (Gold Fern Family)					
Pityrogramma calomelanos (L.) Link	silver fern	X	-	+	-
HYMENOPHYLLACEAE (Filmy Fern Family)					
Mecodium recurvum (Gaud.) Copel.		E	+	-	-

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Scientific name	Common name	Status	Vegetation type k-o	mxf	c
LINDSAEACEAE (Lace Fern Family)					
Sphenomeris chinensis (L.) Maxon	pala'a	I	+	+	-
NEPHROLEPIDACEAE (Sword Fern Family)					
Nephrolepis cordifolia (L.) Presl	ni'ani'au, okupukupu	I	+	-	-
Nephrolepis multiflora (Roxb.) Jarrett ex Morton	hairy sword fern	X	+	+	-
OPHIOGLOSSACEAE (Adder's Tongue Family)					
Ophioglossum pendulum ssp. falcatum (Presl) Clausen	puapua-moe	E	+	-	-
POLYPODIACEAE (Common Fern Family)					
Phlebodium aureum (L.) J. Sm.	laua'e-haole	X	-	+	-
Pleopeltis thunbergiana Kaulf.	'ekaha-'akolea, pakahakaha	I	+	+	-
PSILOTACEAE (Psilotum Family)					
Psilotum complanatum Sw.	moa, pipi	I	+	-	-
Psilotum nudum (L.) Beauv.	moa, pipi	I	+	+	-
SELAGINELLACEAE (Small Club Moss Family)					
Selaginella arbuscula (Kaulf.) Spring	lepelepe-a-moa	E	-	+	-
THELYPTERIDACEAE (Downy Woodfern Family)					
Christella parasitica (L.) Levl.	woodfern	X	+	+	-
MONOCOTS					
AGAVACEAE (Agave Family)					
Cordyline fruticosa (L.) A. Chev.	ti, ki	P	+	+	-
ARACEAE (Arum Family)					
Caladium sp.	caladium	X	-	-	+

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Scientific name	Common name	Status	Vegetation type k-o	mxf	c
COMMELINACEAE (Spiderwort Family)					
Commelina diffusa Burm. f.	honohono	X	+	+	+
CYPERACEAE (Sedge Family)					
Cyperus halpan L.		X	-	-	+
Cyperus rotundus L.	nutgrass	X	-	-	+
Cyperus sp.		X	-	-	+
Kyllinga brevifolia Rottb.	kyllinga	X	-	-	+
Pycreus polystachyos (Rottb.) Beauv.		I	+	-	+
IRIDACEAE (Iris Family)					
Crocosmia X crocosmiiflora (Lemoine ex E. Morr.) N. E. Brown	montbretia	X	+	-	-
JUNCACEAE (Rush Family)					
Juncus planifolius R. Br.		X	+	-	-
MUSACEAE (Banana Family)					
Musa X paradisiaca L.	banana, maia	P	+	+	-
ORCHIDACEAE (Orchid Family)					
Arundina graminifolia (D. Don) Hochr.	bamboo orchid	X	+	+	-
Spathoglottis plicata Bl.		X	-	+	-
PANDANACEAE (Pandanus Family)					
Freycinetia arborea Gaud.	ie'ie	I	+	-	-
POACEAE (Grass Family)					
Andropogon virginicus L.	broomsedge	X	+	-	-
Axonopus fissifolius (Raddi) Kuhlm.	carpetgrass	X	+	+	-
Brachiaria mutica (Forsk.) Stapf	California grass	X	+	+	+
Coix lachryma-jobi L.	Job's-tears	X	-	-	+
Digitaria fuscescens (Presl)Henr.		X	-	-	+
Digitaria setigera Roth.	large crabgrass	X	-	-	+
Digitaria violescens Link	crabgrass	X	-	-	+

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Scientific name	Common name	Status	Vegetation type k-o	mxf	c
Echinochloa colona (L.) Link	jungle rice	X	-	-	+
Eleusine indica (L.) Gaertn.	wiregrass	X	-	-	+
Eragrostis sp.		X	-	-	+
Oplismenus compositus (L.) Beauv.	large basketgrass	X	+	+	-
Panicum af. repens L.	Wainaku grass	X	+	-	-
Paspalum conjugatum Berg.	Hilo grass	X	+	+	+
Paspalum plicatum Michx.	browntop millet	X	-	-	+
Paspalum scrobiculatum L.	paspalum grass	X	-	-	+
Saccharum officinarum L.	sugar cane, ko	P	-	-	+
Sacciolepis indica (L.) Chase	Glenwood grass	X	+	+	-
Setaria gracilis Kunth	foxtail grass	X	-	-	+
Setaria palmifolia (Koen.) Stapf	palmgrass	X	+	+	+
ZINGIBERACEAE (Ginger Family)					
Hedychium flavescens Carey	yellow ginger	X	-	+	-
Zingiber zerumbet (L.) Roscoe	shampoo ginger, 'awapuhi kua-hiwi	P	-	+	-
DICOTS					
ANACARDIACEAE (Mango Family)					
Mangifera indica L.	mango	X	-	+	-
Rhus sandwicensis A. Gray	neneleau	E	-	+	-
APIACEAE (Carrot Family)					
Centella asiatica (L.) Urb.	Asiatic pennywort	X	-	-	+
APOCYNACEAE (Periwinkle Family)					
Alyxia oliviformis Gaud.	maile	E	+	-	-
ASTERACEAE (Daisy Family)					
Ageratina riparia (Regel) R. King & H. Robinson	pamakani	X	+	+	+
Ageratum conyzoides L.	ageratum, maile-hohono	X	-	+	-
Ageratum houstonianum Mill.		X	+	+	+

Scientific name	Common name	Status	Vegetation type k-o	mxf	c
Crassocephalum crepidioides (Benth.) S. Moore	crassocephalum	X	-	+	+
Eclipta alba (L.) Hassk.	false daisy	X	-	-	+
Elephantopus mollis Kunth	elephant's foot	X	-	-	+
Emilia fosbergii Nicol.	red pua-lele	X	-	-	+
Erechtites valerianifolia (Wolf) DC.		X	+	+	+
Pluchea symphytifolia (Mill.) Gillis	pluchea	X	-	+	+
Vernonia cinerea var. parviflora (Reinw.) DC.	ironweed	X	-	-	+
Youngia japonica (L.) DC.	oriental hawksbeard	X	-	-	+
BALSAMINACEAE					
Impatiens wallerana J. D. Hook	impatiens	X	+	+	-
BEGONIACEAE (Begonia Family)					
Begonia hirtella Link	wild begonia	X	-	+	+
BRASSICACEAE (Mustard Family)					
Cardamine flexuosa With	bittercress	X	+	-	-
BUDDLEJACEAE (Buddleia Family)					
Buddleia asiatica Lour.	Asiatic butterfly bush	X	-	-	+
CAMPANULACEAE (Bellflower Family)					
Clermontia aff. parviflora Gaud. ex Gray		E	+	-	-
CARYOPHYLLACEAE (Carnation Family)					
Drymaria cordata var. pacifica Mizush.	drymaria, pipili	X	+	+	-
CLUSIACEAE (Mangosteen Family)					
Hypericum mutilum L.	St. Johnswort	X	-	-	+
CONVOLVULACEAE (Morning-glory Family)					
Ipomoea alba L.	moonflower	X	+	+	-

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Scientific name	Common name	Status	Vegetation type k-o	mxf	c
Ipomoea triloba L.	little bell	X	-	-	+
EUPHORBIACEAE (Spurge Family)					
Aleurites moluccana (L.) Willd.	kukui, tutui	P	-	+	-
Antidesma platyphyllum Mann	hame	E	+	-	-
Chamaesyce hirta L.	garden spurge	X	-	-	+
Chamaesyce hypericifolia (L.) Millsp.	spurge	X	-	-	+
Chamaesyce hyssopifolia (L.) Sm.	spurge	X	-	-	+
Chamaesyce prostrata (Ait.) Sm.	prostrate spurge	X	-	-	+
Chamaesyce thymifolia (L.) Millsp.	thyme-leaved spurge	X	-	-	+
Phyllanthus debilis Klein ex Willd.	phyllanthus weed	X	-	-	+
Ricinus communis L.	castor bean, koli	X	-	-	+
FABACEAE (Pea Family)					
Acacia koa Gray	koa	E	+	-	-
Chamaecrista nictitans (L.) Moench	partridge pea, lauki	X	-	-	+
Crotalaria assamica Benth.	crotalaria	X	-	-	+
Desmodium canum DC.	Spanish clover	X	+	+	+
Desmodium intortum (Mill.) Urb.	desmodium	X	-	-	+
Desmodium triflorum (L.) DC.	three-flowered beggarweed	X	-	-	+
Desmodium sp.		X	-	-	+
Dioclea wilsonii Standl.	sea bean	X	-	+	-
Mimosa pudica var. unijuga (Duchass. & Walp.) Griseb.	sensitive plant, pua-hilahila	X	-	-	+
LAMIACEAE (Mint Family)					
Hyptis pectinata (L.) Poit.	comb hyptis	X	-	-	+
LAURACEAE (Laurel Family)					
Persea americana Mill.	avocado	X	-	+	-
LYTHRACEAE (Loosestrife Family)					
Cuphea carthagenensis (Jacq.) Macbr.	cuphea, puakamoli	X	+	-	+
Cuphea hyssopifolia Kunth	cuphea	X	-	+	-

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Scientific name	Common name	Status	Vegetation type k-o	mxf	c
MALVACEAE (Mallow Family)					
Hibiscus tiliaceus L.	hau	I	-	+	-
Sida rhombifolia L.	Cuba jute	X	-	-	+
MELASTOMATACEAE (Melastome Family)					
Melastoma candidum D. Don	melastome	X	+	+	-
MORACEAE (Mulberry Family)					
Artocarpus altilis (Parkins ex Z) Fosb.	breadfruit, 'ulu	P	-	+	-
MYRTACEAE (Myrtle Family)					
Metrosideros polymorpha Gaud. var. polymorpha	'ohi'a, 'ohi'a-lehua	E	+	+	-
Metrosideros polymorpha var. glaberimma (H. Lev.) St. John	'ohi'a	E	+	+	-
Psidium cattleianum Sabine	yellow strawberry guava, waiawi	X	+	+	-
Psidium guajava L.	guava, kuawa	X	-	+	-
Syzygium jambos (L.) Alston	rose apple	X	+	+	-
Syzygium malaccense (L.) Merr. & Perry	mountain apple, 'ohi'a-'ai	P	-	+	-
ONAGRACEAE (Evening Primrose Family)					
Ludwigia octovalvis (Jacq.) Raven	primrose willow, kamole	P	-	-	+
Ludwigia palustris (L.) Elliott	water purslane	X	-	-	+
OXALIDACEAE (Wood Sorrel Family)					
Oxalis corymbosa DC.	wood sorrel, 'ihi	X	-	-	+
PLANTAGINACEAE (Plantago Family)					
Plantago major L.	broad-leaved plantago, lauki	X	-	-	+
POLYGALACEAE (Polygala Family)					
Polygala paniculata L.	polygala	X	-	-	+

Scientific name	Common name	Status	Vegetation type k-o	mxf	c
POLYGONACEAE (Buckwheat Family)					
Polygonum punctatum Elliott	water smartweed	X	+	-	-
ROSACEAE (Rose Family)					
Rubus rosaefolius Sm.	thimbleberry	X	+	+	-
RUBIACEAE (Coffee Family)					
Hedyotis corymbosa (L.) Lam.		X	-	-	+
Psychotria hawaiiensis (Gray) Fosb.	kopiko	E	+	-	-
Spermococe assurgens Ruiz & Pav.	buttonweed	X	-	-	+
Spermococe mauritiana Gideon	spermococe	X	-	-	+
SCROPHULARIACEAE (Snapdragon Family)					
Castilleja arvensis Cham.& Schlechtend.	field Indian paintbrush	X	-	-	+
Lindernia crustacea (L.) F. v. Muell.	false pimpernel, lindernia	X	-	-	+
Torenia asiatica L.	'Ola'a beauty, nani-o-Ola'a	X	-	-	+
SOLANACEAE (Tomato Family)					
Cestrum nocturnum L.	night cestrum	X	-	+	-
TILIACEAE (Linden Family)					
Heliocarpus popayanensis Kunth	white moho	X	-	+	-
URTICACEAE (Nettle Family)					
Pilea microphylla (L.) Liebm.	rockweed	X	+	-	-
Pipturus albidus (H. & A.) Gray	mamaki	E	+	-	-
VERBENACEAE (Verbena Family)					
Stachytarpheta dichotoma (Ruiz & Pav.) Vahl	vervain	X	+	+	+

Appendix C

Aquatic Survey of Honolii Stream

Island of Hawaii

Submitted to: DHM Inc.
Honolulu, HI

Submitted by:
Kelly M. Archer

October, 1988

CONTENTS

INTRODUCTION

During the month of July, 1988, a biological survey was conducted of Honolii Stream, a continuous, perennial stream on the island of Hawaii. The purpose of the survey was to identify the conspicuous aquatic fauna present and to determine what effects the development of a hydroelectric power plant would have on the ecology of the stream.

Honolii Stream's intermittent headwaters originate near 5,000 ft elevation on Mauna Kea's windward (eastern) slopes. It then flows approximately 15 miles and empties into Hilo Bay three miles north of Hilo. The stream is gaged by the United States Geological Survey at approximately 1540 ft elevation. Records of stream flow and water quality are available from approximately 1967 to the present, and a three year period of flow data is available from the years 1911 to 1913. The stream's average discharge is 126 cfs, with a record maximum flow of 22,600 cfs in 1978 and a record minimum flow of 0.8 cfs in 1912. The stream is not diverted but flows in a deep valley between fields of sugarcane and macadamia nuts between the elevations of 1700 ft and sea level. The surrounding land has supported sugarcane for many years. Much of the stream within the project area is inaccessible due to the steep valley walls and substantial waterfalls.

The proposed Honolii Hydroelectric Power Plant would draw water from the stream at approximately 1520 feet elevation. Water would then flow in a penstock buried five feet below grade alongside an existing cane-haul road, returning to the streambed at the powerhouse, located near 100 feet elevation. Although the project constitutes a non-consumptive use of water, approximately 3.6 miles of the middle reaches of Honolii Stream would be impacted by the diversion.

Historically, stream water in Hawaii has had extensive irrigation and domestic use. In recent years, there has been an interest in the effects on the aquatic environment of dewatering, diversion and channelization of streams in the State (Refs. 1 - 5). Hawaii's stream environment is characterized by native fauna which require open access to the ocean in order to complete their life cycle. These diadromous species breed and spawn in freshwater, the larvae are then washed into the ocean and mature in the plankton for as long as 8 months (Ref. 6). Juveniles then return to the stream environment to complete the cycle. Unlike the Pacific salmon, no homing ability has been recognized in these native species, and the genetic and morphological similarity between individuals collected from different islands would argue against this ability (Ref. 6). It is obvious that for these native species to survive in a stream, adequate access between the ocean and the middle to upper stream reaches characteristically inhabited by these species must be insured.

A number of recent biological surveys of streams in the State have been conducted using two basic sampling methods (Refs. 6 - 11): 1) the use of an electroshocking device which temporarily stuns the fauna, allowing capture and further study prior to release. 2) using a snorkel and mask to carefully inspect the stream bed and identify and enumerate the species present. Characteristically, data is then reported on the location and relative abundance of each species in the stream. Studies have also detailed the life habits of various aquatic fauna (Refs. 12 - 18). Although the general life history of most native species is understood, specific details about habitat requirements and the life cycles of these animals may be incomplete (Ref. 6). As a result of these surveys, streams in windward O'ahu have been "rated" based on physical and biological standards (Ref. 8). Various studies have also commented on the effects on stream quality of certain projects which have involved the terrestrial environment adjacent to the stream or the use of stream water itself (Refs. 6-11, 19-26). No long-term, construction/post-development studies have been conducted to identify the effects on the aquatic fauna of specific developments; therefore, no recognized standard methodology or manner of evaluating effects on stream fauna of various projects have been established in Hawaii to deal with the growing encroachment of man on the unique stream environment. Frequently, mainland standards and values are utilized which may or may not be appropriate (Ref. 26).

At least two previous surveys of Honolii Stream have been conducted in recent years. In 1966, the (then) Hawaii Division of Fish and Game sampled near the stream mouth, at 100 ft and at the 500 ft elevation (Ref 27). Then, in 1983, U. S. Fish and Wildlife Service personnel surveyed from the stream mouth to approximately 100 ft elevation and a 1200 ft long stream reach between 1500 ft and 1600 ft elevation (Ref. 27). The results of these surveys will be discussed later in this report.

Considering the purpose of this biological survey of Honolii Stream, it is important to discuss two current methods of evaluating stream quality and, in one case, determining the effect of environmental perturbation on stream biology. The first method, Instream Flow Incremental Methodology, "can be thought of as a collection of computer models and analytical procedures designed to predict changes in fish habitat due to increments of flow change" (Ref. 28). In fact, the IFIM should be thought of as a water management tool which predicts the impacts of different alternatives. Involved is a large effort to collect as much data as possible about the existing stream environment and, using models, predict various effects on the system brought about by changes such as stream-side development or dewatering. An integral part of IFIM is the physical habitat simulation (PHABSIM), which involves an effort to determine habitat preferences for key indicator species, define the range of habitat conditions that the species will tolerate and quantify the area of the stream which meets these conditions. Obviously, this method of evaluating the possible effects brought on by defined perturbations to the stream environment requires a great deal of time and effort to collect the data needed to lend reliability to the models. This methodology has been utilized extensively on the mainland. Currently, information is becoming available on the range of habitat preferences of many of the native Hawaiian stream fauna to possibly adapt the IFIM to meet the needs of Hawaii's water management concerns (Refs. 29,30).

The second method currently being used and receiving notice in recent journal articles , is entitled Index of Biotic Integrity (IBI), (Refs. 31-33). Many stream surveys in Hawaii have utilized an approach to determining stream quality very similar to that suggested by Karr in 1981 (Ref. 31).

> The IBI was designed to evaluate the quality or condition of an aquatic resource based on the attributes of indigenous fish communities. Three categories of fish community attributes (metrics) - species composition, trophic composition, and health and abundance of fish - are scored by comparison with those expected in the absence of human influence. The resulting IBI value should reflect the condition of the fish community and the environment supporting it. (Ref. 33)

Although comparison values would have to be established for Hawaiian streams, the IBI method seems easily adapted for use in Hawaii. This methodology of evaluating stream quality does not in itself, however, predict the effect of environmental perturbation on the stream ecosystem. The methods employed during this survey to determine the biological quality of Honolii Stream are discussed below.

METHODS AND MATERIALS

Figure 1 is a map of the project area indicating sampling stations. Stations within and above the project area were established to identify stream species in the areas to be affected by the proposed project.

Sampling Methods

Stream fauna

Visual sampling techniques were utilized during this survey. In this method, the sampler uses snorkel and mask to visually identify species present in the stream. The sampler slowly works upstream from the lower portion of the sampling station identifying and counting the species located. This method is particularly useful in larger streams having an average depth of greater than eight inches.

Substrate

The characteristics of the stream bottom (substrate) within each station was approximated subjectively (e.g. 50% boulder, 30% cobble) based upon a modified Wentworth classification of particle size:

Substrate	Size Range (mm)
Bedrock	solid, lava slab
Boulder	250-4000
Cobble	65-250
Gravel	5-65
Sand	1-5
Silt	<1

Sampling Stations

Station A

Located just mauka of the first waterfall above the mouth of Honolii Stream, the stream at Station A is characterized by swift flowing riffles with intermittent pools. The substrate consists principally of boulder (50%), cobble/gravel/sand (30%), and bedrock (20%). Nearly every surface of the substrate was coated with a thick (1 cm) layer of gelatinous "scum" apparently composed of diatoms, other algae and fragments of decomposing terrestrial vegetation. Frequently, portions of the substrate were also coated with a layer of filamentous bluegreen algae. The mean stream temperature at this station was 23 C and bamboo (family Gramineae), guava (Psidium guajava L.), roseapple (Eugenia jambos L.), breadfruit (Artocarpus altilis) and kukui (Aleurites moluccana) comprised the riparian vegetation. The valley walls along this stream reach are not as precipitous as further upstream and the riparian vegetation does not cover

any portion of the stream. Visual sampling at this station was possible to a point above the streams' fourth falls, a distance of approximately 2,000 feet (Figs. 2,3).

Station B

At approximately 500 ft elevation, Station B is located within precipitous valley walls and is characterized by riffles connecting shallow, swift flowing pools. Boulders (70%), cobble (20%) and gravel/sand (10%), nearly all having the gelatinous scum layer, make up the substrate of the stream. The mean stream temperature at this station was 21 C and the riparian vegetation for much of the 3,000 foot reach sampled, consisted primarily of roseapple, with isolated kukui and banana (Musa sp.) trees. As a result of the narrow valley floor at this elevation, the vegetation provided a significant canopy, casting a shadow over much of the stream at times other than mid-day (Figs. 4,5).

Station C

Station C is located at the U.S.G.S. gaging station, elevation 1540 ft. Approximately 4,000 feet of the stream was sampled, from the top of the falls just below the gaging station, upstream to the point were Pohakupaa Stream joins Honolii Stream (Fig. 1). The stream reach consisted of a series of riffle-pool-cascade regions with a boulder (70%) and cobble/gravel/sand (20%) and bedrock (10%) substrate. Although the substrate is not as thickly coated with the gelatinous scum present at lower elevations, there are areas in the stream where a substantial growth of moss is present on the substrate, probably indicating fluctuating flow levels. Stream temperature was 19 C and the riparian vegetation is composed of eucalyptus (Eucalyptus sp.), hapuu (Cibotium glaucum), guava and herbaceous species. There was no vegetative canopy along this reach of stream (Figs. 6,7).

RESULTS AND DISCUSSION

Stream Biology

Table 1 is a listing of the stream species identified at each of the sampling stations during this survey. The relative abundance of each species at the sampling stations is also indicated. These results represent a single-season survey extending over a two week period in July.

A large number of o'opu (native goby fish) juveniles (hinana) were present at the downstream portion of Station A. Adult's were rarely seen until above the second falls from the mouth of the stream. Adults of two native fish species (o'opu), Awaous stamineus (nakea) and Sicyopterus stimpsoni (nopili), became more common as sampling moved upstream. Frequently observed throughout the station was the ubiquitous Tahitian prawn (Macrobrachium lar). The endemic mollusc Neritina granosa was found in abundance on the cleanest of the substrate surfaces at this downstream station.

Additional species found at the mid-elevation Station B include the endemic o'opu alamo'o (Lentipes concolor) and opae

kala'ola (Atyoida bisulcata). The alamo'o were only rarely seen at this station with the fish community consisting of large numbers of nakea and nopili. The numbers of the endemic mollusc, Neritina granosa, present at Station B were very noticably reduced from that at the downstream station described earlier.

Station C, the upper-most stream reach sampled during this survey, yielded the smallest number of species. The o'opu alamo'o (L. concolor) and the opae (A. bisulcata) were observed at this station. The Lentipes population appeared healthy, with both males and females of various sizes identified.

Description of Fauna Identified in Honolii Stream

Stream fauna in Hawaii are commonly discussed in terms of their origin. Native species are those found naturally in Hawaii. These species are either endemic, which means found naturally only in Hawaii, or indigenous, found naturally in Hawaii and elsewhere. Table 2 is a listing of the aquatic fauna collected in streams in Hawaii (adapted from Ref. 8). The species identified in Honolii Stream are discussed below.

Native Stream Fauna

Ten of the 24 species listed in Table 2 are considered native aquatic fauna. Two crustaceans, two molluscs and six fishes are found naturally in Hawaiian streams. Both crustacean species, one of the mollusc species and five of the fishes are diadromous.

As discussed earlier, this life style requires a period of larval development in the ocean and upstream migration. Adults live and spawn in fresh water. The following is a brief summary of the life-style and distribution each of the native species found in the project area of Honolii Stream during this survey.

1. _Atyoida bisulcata:_ opae kala'ole.

A small (2-4 cm) endemic shrimp, common and abundant in perennial Hawaiian streams to 3,000 ft elevation. The opae is primarily a detrital feeder and is diadromous, although there is still some question as to whether the diadromy is obligatory.

2. _Neritina granosa:_ hihiwai.

This endemic, diadromous mollusc is common in remote streams on the Neighbor Islands. Reaching a size of over 5 cm, this mollusc feeds on algae and is usually found on clean rock surfaces in riffle areas having high flow velocities.

3. _Awaous stamineus:_ o'opu nakea

This endemic, diadromous o'opu is the largest of the native gobies, reaching a maximum length of 30 cm. A small fishery is supported by nakea on the island of Kauai. The nakea is widely distributed on all islands but is found in small numbers on O'ahu and is considered "depleted" there (Ref. 34). This o'opu is omnivorous, feeding on filamentous

algae and benthic animals. Adult nakea are known to migrate downstream during spawning (Ref. 35) although there are varying opinions on the seasonality of the spawning event (Ref. 6).

4. _Lentipes concolor:_ o'opu alamo'o.

Endemic, diadromous and comparatively rare, this Hawaiian goby is currently listed as "Category 2" in the Federal Register, which states that "information now in possession of the Service (USFWS) indicates that proposing to list the species as endangered or threatened is possibly appropriate, but for which substantial data are not currently available to biologically support a proposed rule" (Ref. 27). Lentipes may be found in only 15% of all Hawaiian streams (Ref. 12), and its abundance is frequently low, with distribution limited to upstream areas. Although omnivorous, larger Lentipes (to 14 cm) eat more animal material (primarily atyid shrimp and insect larvae), while smaller fishes appear to consume more algal material (Ref. 14). Currently, there is no evidence that adult alamo'o migrate downstream to spawn or that spawning and recruitment is based on anything other than stochastic processes (Ref. 6).

5. _Sicyopterus stimpsoni:_ o'opu nopili.

The nopili is an endemic, diadromous goby and is the only member of the genus _Sicyopterus_ in Hawaii. Ranging in size up to 13 cm, the nopili is found on all islands in varying abundances but is listed as "threatened" on O'ahu (Ref. 34) and of "special concern" for the entire state (Ref. 16). It is adapted for feeding on the epilithic community, primarily algae with microzoan associates. As with alamo'o, there is no evidence to suggest that adult nopili migrate downstream to spawn (Ref. 6).

Alien Stream Fauna

1. Macrobrachium lar: Tahitian prawn.

Introduced to the State in 1956 (Ref. 13), this insular, Indo-Pacific prawn has established itself successfully in fresh and mixohaline waters on all of the major islands. Males grow to over 14 cm in total length while females attain lengths greater than 11 cm. This prawn is diadromous and an omnivorous bottom scavenger but also preys on gobies and other invertebrates (Ref. 13). Throughout the State, residents aware of the prawns' presence engage in harvesting the crustacean for both home consumption and, in a limited way, the marketplace.

TRIBUTARIES IN THE PROJECT AREA

Two major tributaries to Honolii Stream (Figs. 8,9) were found within the project area. The markings 1 and 2 on Figure 1 represent the locations of these tributaries, each of

which appear to contribute from two to eight cfs to Honolii Stream (confirmed using the float and cross-sectional area method). Four other small (<= 1 cfs) tributaries (represented by X's on Figure 1) were also identified within Station A and B. Figure 10 is an example of the type of flow represented by these four smaller tributaries. These small tributaries appear to represent seepage of groundwater directly from the valley wall as they could not be located along the ridge of the valley. A thorough search of the region along the valley ridge, and consultation with both U.S.G.S maps and a map of the region provided by Mauna Kea Agribusiness, Inc., indicate that the two major tributaries located during this survey are the only two surface tributaries which regularly feed into Honolii Stream within the project area.

EFFECT OF PROJECT ON CONSPICUOUS STREAM FAUNA

The proposed hydroelectric power plant for Honolii Stream will result in at least three categories of impacts: construction, facilities and operations (Ref. 36).

Construction

The impacts on stream fauna associated with the construction phase of the project are probably temporary and of lesser importance than the ongoing impacts brought on by the facilities once the power plant is operational. Of principle concern is the addition of sediments and toxic chemicals, including hydrocarbons, during construction activities near the stream. The diversion itself and the power plant appear to be the only facilities which will be adjacent to the stream so the removal of riparian vegetation for facilities and support roads should be minimal.

Facilities

Two major impacts regarding the hydropower plant facilities are important to discuss: mortality of aquatic fauna due to the intake, penstock and turbine of the power plant, and the disorientation of the returning juveniles of diadromous species in the tailrace of the power plant.

1. The proposed intake for the project lies just downstream of a significant population of the goby, Lentipes concolor. This fish has been previously identified as an important evaluation species by the U.S. Fish and Wildlife Service for determining the Resource Category of stream reaches within proposed developments (Ref. 27). Entrapment, impingement or entrainment of these fish within the intake and their subsequent mortality in the penstock or within the turbine could threaten the viability of the Lentipes population in Honolii Stream.

2. Delay of migratory fish due to disorientation has been found to impact fish populations in run-of-river hydropower plants (Ref. 36). Tailrace flow from the power plant located alongside the stream at 100 ft elevation could provide the most significant flow at the site and serve to

disorient juveniles traveling upstream and thus delay, or even prevent, further upstream movement. Populations of important native stream species could then be threatened.

Operations

The critical environmental concern for aquatic fauna of this project is the withdrawal of stream water near the 1520 ft elevation. This will reduce stream flow from this point to the powerplant at 100 ft elevation. Three major impacts are foreseen as a result of dewatering the stream.

1. Loss of Habitat - The reduction of flow for nearly 3.6 miles of the stream will undoubtedly result in both loss and alteration of usable habitat for the aquatic community. This survey did not find any evidence suggesting that habitat was a limiting factor for the populations present, however, there is currently little information about what the habitat requirements of these species are (Refs. 6,12,30). _Lentipes concolor_ populations in streams on the island of Hawaii, for example, were generally low in comparison with Lentipes streams around the State (Ref. 12). Although it is doubtful that habitat constraints are the cause of the low densities of this endemic fish in streams on the island, no information is available to evaluate this. The extent of the loss and alteration of habitat will be directly dependent on the flow remaining in the dewatered reach of the stream.

2. Blockage of Migration of Diadromous Species - All of the conspicuous aquatic fauna found during this survey are diadromous. Access to the ocean must be available to insure the continued survival of these species in Honolii Stream. Inadequate stream flow due to withdrawal of water upstream could present such a migratory block. Studies completed within the State have not consistently shown that even complete dewatering of a stream reach prevents the continued survival and recruitment of diadromous species in upstream reaches. Certain West Maui streams were found not to contain diadromous species above their diversions (Ref. 2). In other studies, the diadromous mollusc, Neritina granosa, were found in small numbers above diversions which completely dewatered stream reaches in East and West Wailuaiki Streams in East Maui (Ref. 29); diadromous shrimp and three goby species, nakea, nopili and alamo'o, were found above a diversion for a hydroelectric power plant on the Wainiha River, Kauai (Ref. 26); a number of intermittent streams in Windward O'ahu were found to contain various diadromous species upstream of dry stream reaches (Ref. 8). In fact, one of the streams, Koloa Stream, was ranked as one of the highest quality streams in the region because of the number of native fauna present in the stream and other physical factors. It would appear interrupted stream flow is a natural environmental factor which native aquatic fauna have endured with various levels of success. Although little evidence is available to support this, it would seem likely that intermittent, interrupted flow

within a stream could influence the population size of diadromous species, resulting in fewer individuals and less recruitment then under continuous flow patterns. As with the loss of habitat question dealt with above, the extent to which the migration of diadromous species is hindered will be dependent upon the extent of the dewatering which will take place because of the project.

3. Increased Water Temperature - Decreased volume and flow rate due to diversion of stream water will influence the temperature characteristics of Honolii Stream in the affected reach. Increased temperatures might affect the food organisms available for the conspicuous stream fauna or alter other important stream water characteristics (oxygen carrying capacity, microbial populations, nutrient level, etc.). Native species appear to be more sensitive to increased temperatures than introduced, alien species (Ref. 3). Low flow and higher temperatures could possibly favor the establishment of alien species in the middle reaches of Honolii Stream (Ref. 4).

Other factors, such as turbidity and aggradation of particulate material, which may be associated with a reduction in flow within a stream reach, are probably of minor importance in this instance. Honolii Stream is apparently normally turbid, even during low flow. This condition is common in streams north of Hilo. Because of these stream characteristics the diversion of water in Honolii Stream, and consequent reduction in flow in the stream's mid-reaches, would probably not affect turbidity levels facing the aquatic fauna. The stream is also subject to extremely variable flow conditions. The substantial and numerous high flow conditions of the stream, which effectively scour the stream bed, will not be greatly affected by the diversion of stream water for hydroelectric production.

MITIGATIVE MEASURES

Mitigative measures to lessen the impact on stream fauna caused by the proposed hydropower plant must include actions to deal with all three categories described above; construction, facilities and operation.

Construction

Construction must involve a minimum of disturbance to the stream. Appropriate construction practices must be adhered to to insure this. For example, the introduction of fill directly to the stream and erosion of exposed stream banks must be minimized.

Facilities

The design of hydropower facilities with attention to the concerns mentioned above is possible and could decrease the negative impact of the project as a whole. Fish mortality or impingement due to the intake-penstock-turbine facilities can be reduced by careful design using existing technology (Ref. 36).

Placement of the intake and diversion must be given careful consideration. The reach just downstream of the gaging station is mainly composed of bedrock substrate. This substrate does not provide suitable habitat for the Lentipes population and could be the location for the project intake. The intake itself should be physically separated from the mainstream as much as possible, located to one side within the pool behind the diversion to insure that water enters at the minimum possible velocity. Vortex preventers and screening appropriate for fish in the size range of the native gobies (5 - 15cm) must be installed over the mouth of the intake. Good intake design is one way to reduce the mortality suffered by Lentipes in the penstock and turbine.

The long penstock called for in the proposed project would probably necessitate air valves to reduce pressure within the system. As the penstock design undoubtedly provides the added "head" needed to make the project viable, the velocity of water within the penstock will be as high as possible. No relief for entrapped fauna can be found here. Selection of the least damaging model of turbine for fish of the 5 - 15 cm range will be necessary. Design of the turbine, size, efficiency and blade clearance within the housing are all important factors determining the level of fish mortality (Ref. 36).

The location and design of the tailrace must reduce the possibility of delay and disorientation of upstream migrating juveniles of the diadromous native species. A "free fall" design to one side of the stream might constitute the best possible choice. Water exiting the turbine housing would fall directly from the base of the power house. This would eliminate solid, wet surfaces which might attract the juveniles to attempt to climb in their effort to move "upstream" against the current.

Operation

The three impacts associated with the operation of the power plant discussed above, loss of habitat, blockage of migration and water temperature, result from the dewatering of a significant portion of the middle reaches of Honolii Stream. All the impacts are also dependent in degree on the quantity of water which is allowed to flow within the dewatered reach, the instream flow.

Although there is concern for developing instream flow standards and standard methodologies for determining instream flow within the State, there is currently no recognized standard or methodology (Ref. 29). Proposed minimum flow rates for certain suggested projects in the State have utilized flow duration curves. The maintenance of a minimum flow equal to the stream flow which is normally exceeded 90% of the time, would be an example of such a flow-duration generated rate. These rates are not related to any biologically important criterion but provide clear, measurable standards.

The body of information about the habitat criteria of native stream fauna is growing (Ref. 30); however, there does not appear to be enough information present at this time to determine what the necessary flow requirements are to insure continuing recruitment and the reproductive success of these fauna. This indicates that developing instream flow rates in Hawaii is indeed an inexact science at this time. Ideally, no restriction on stream flow should be imposed, but this is more and more difficult to insure.

The volume of flow in Honolii Stream is highly variable. During water year 1986 the range was from a low of 5.4 cfs to a high of 5640 cfs. For nearly one third of the year, principally the months of November through March, flow did not exceed 20 cfs. In fact, during the entire month of February, 1986, flow did not exceed 9 cfs (Ref. 37). Apparently the populations of stream fauna present in Honolii are capable of thriving under flow conditions which range from quite low levels to high, freshet flows.

The flow within Honolii Stream, including the contributions of the tributaries within the affected reach, must insure the preservation of adequate habitat, migratory passage and water quality conditions conducive to continued success for the native fauna of Honolii Stream. Although not mentioned in the Facilities section above, it is important that the diversion weir be designed to insure that the water required for maintaining the instream flow be released prior to diversion to the project intake. This consideration would insure that instream flow needs are met prior to water being available for energy production.

SUMMARY STATEMENT

This report is the result of a onetime, one-season field survey of Honolii Stream, island of Hawaii. The results of this survey should be discussed with this in mind.

The stream flow was fairly low and the water was turbid during this July, 1988, survey. Five native stream species were identified, all apparently with established and actively recruiting populations; the shrimp, A. bisulcata: mollusc, N. granosa: and three native fish, A. stamineus, S. stimpsoni and L. concolor. The proposed project will draw water from Honolii Stream at approximately 1520 ft elevation, the water will then flow in a penstock below five feet below grade alongside an existing cane road, pass through the power house at approximately 100 ft elevation and reenter the stream. Approximately 3.6 miles of the stream will have substantially reduced flow.

The project will have impacts on the stream fauna which fall into at least three categories: construction, facilities and operations. The primary impacts from construction will be short term and consist of the likely introduction of sediment to the stream and the possibility of the addition of toxic chemicals including hydrocarbons. Two potential impacts associated with project facilities were identified: the entrapment, impingement or entrainment and subsequent mortality of native stream fauna within the intake structure

(particularly Lentipes concolor, the endemic goby of specific concern to many involved in stream fauna issues in the State) and the delay of upstream migrating fish due to disorientation caused by the discharge from the tailrace of the power plant. Loss of stream habitat and blockage of the migratory pathway of native diadromous species due to reduced flow in nearly 3.6 miles of the stream are the principle impacts caused by the operation of the power plant. Other factors, including the possible alteration of water temperature dynamics, sediment load and aggradation of particulates in the stream are probably insignificant in this project.

Mitigation measures were identified to deal with each of the possible impact categories discussed. Appropriate construction practices must be adhered to to insure minimum disturbance of the stream and riparian vegetation. Careful design and placement of the project intake, and use of vortex preventers and appropriate screening, will reduce stream fauna mortality. Design of a "freefall" powerhouse tailrace will reduce the possibility of disorientation of juvenile native fauna returning from larval development in the ocean. During operation of the power plant, sufficient flow must be maintained downstream of the project intake to insure that adequate habitat is preserved, water quality is not altered dramatically, and migration of the diadromous native fauna is not greatly affected.

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Table 1. Conspicuous stream fauna identified in Honolii Stream, July 1988.

SPECIES	STATION A	STATION B	STATION C
Crustaceans			
Atyoida bisulcata	0	++++	++++
Macrobrachium lar	++	++	0
Molluscs			
Neritina granosa	+++	++	0
Fishes			
Awaous stamineus	++	+++	0
Lentipes concolor	0	+	++
Sicyopterus stimpsoni	+	++	+

Legend:
- 0 = not found
- + = less than 5 individuals per 10m sampling station
- ++ = 5 to 25 individuals per 10m sampling station
- +++ = 26 to 50 individuals per 10m sampling station
- ++++ = more than 50 individuals per 10m sampling station

Table 2. List of conspicuous invertebrates and fishes commonly found in streams in the Hawaiian Islands.

Scientific Name	Local Name	Origin[1]
Crustaceans		
Atyoida bisulcata	opae kala'ole	endemic
Macrobrachium grandimanus	opae o'eha'a	endemic
Macrobrachium lar	Tahitian prawn	alien
Procambarus clarkii	crayfish	alien
Molluscs		
Melanoides sp.	pond snail	indigenous
Neritina granosa	hihiwai	endemic
Fishes		
Awaous stamineus	o'opu nakea	endemic[2]
Clarias fuscus	chinese catfish	alien
Cichlasoma sp.	cichlid	alien
Cyprinus carpio	carp	alien
Eleotris sandwicensis	o'opu okuhe	endemic
Gambusia affinis	mosquitofish	alien
Kuhlia sandvicensis	aholehole	endemic
Lentipes concolor	o'opu alamo'o	endemic
Lepomis macrochirus	bluegill	alien
Micropterus dolomieui	smallmouth bass	alien
Misgurnus anguillicaudatus	dojo, loach	alien
Ophicephalus striatus	snakehead	alien
Poecilia spp.	guppys, mollies	alien
Sicyopterus stimpsoni	o'opu nopili	endemic
Stenogobius genivittatus	o'opu naniha	indigenous
Tilapia (Sarotherodon) spp.	tilapia	alien
Xiphophorus helleri	swordtail	alien
Xiphophorus maculatus	Southern platyfish	alien

1 alien - not found naturally in Hawaii, introduced
endemic - found naturally in Hawaii only.
indigenous - found naturally in Hawaii and elsewhere

2 The systematics of this species and other native gobies may still be in question. See Kinzie and Ford (Ref. 6) for a discussion of this topic.

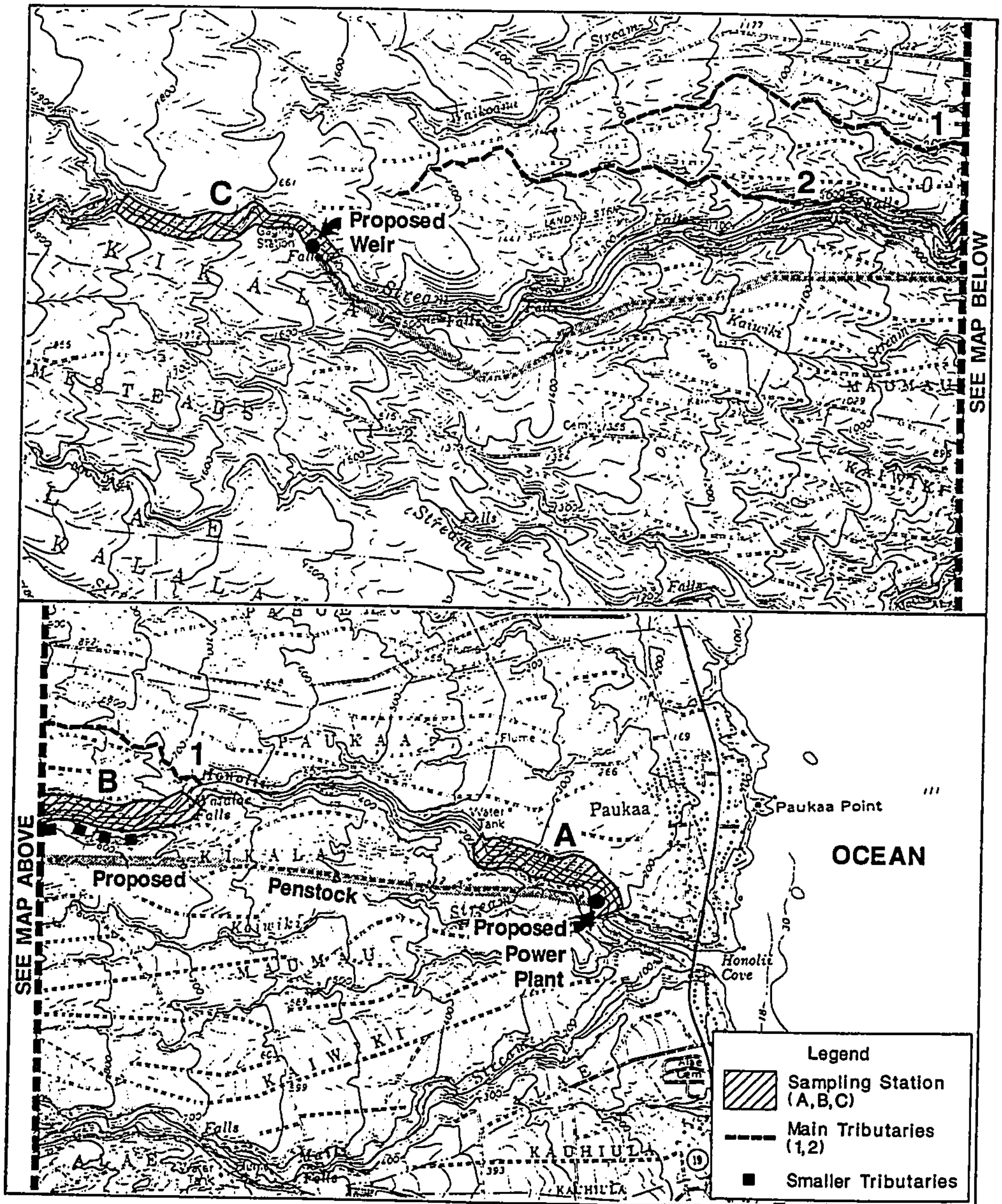

Figure 1:
Stream Fauna Sampling Stations

Figure 2: Station A looking upstream from the lowest reach of the station.

Figure 3: Station A looking further upstream.

Figure 4: Station B looking upstream from the lowest reach of the station.

Figure 5: A second upstream view of Station B.

Figures 2–5:
Photographs of Project Area

Figure 6: Station C looking upstream from the lowest reach of the station.

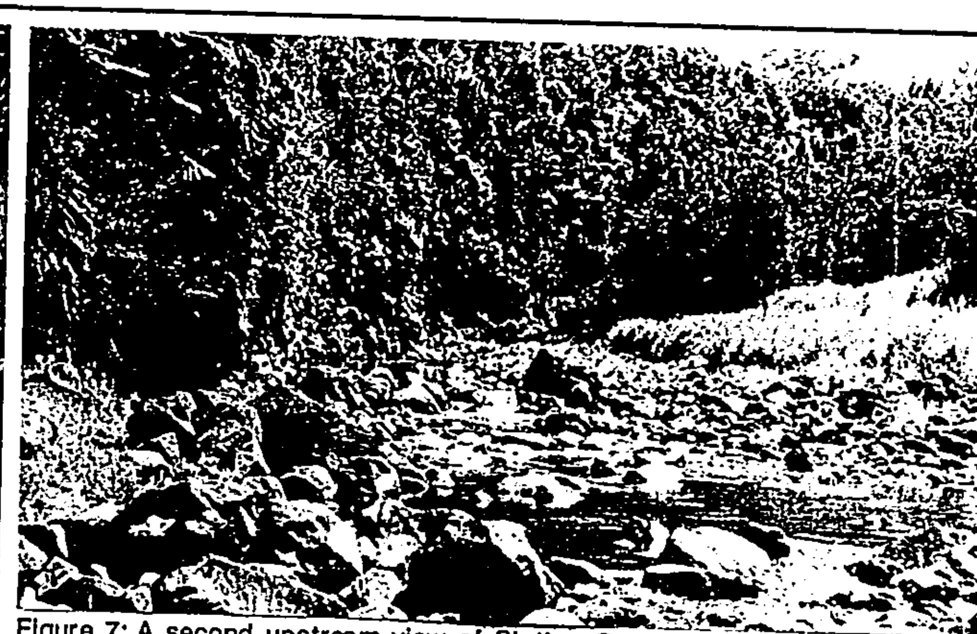

Figure 7: A second upstream view of Station C.

Figure 8: One of the major tributaries to Honolii Stream within the project area.

Figures 6–8:
Photographs of Project Area

Figure 9: The second major tributary to Honolii Stream identified in the project area.

Figure 10: An example of the flow entering Honolii Stream from the small tributaries located in Stations A and B.

Figures 9–10:
Photographs of Project Area

Appendix D

PAUL H. ROSENDAHL, Ph.D., Inc.
Consulting Archaeologist

Report 466-081988

ARCHAEOLOGICAL SURVEY FOR ENVIRONMENTAL IMPACT STATEMENT (EIS) HONOLII HYDROELECTRIC PROJECT AREA

Lands of Kikala and Paukaa, District of South Hilo
Island of Hawaii
(TMK:3-2-6:Var; 3-2-7:Var.)

by

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INTRODUCTION

BACKGROUND

At the request of DHM, Inc., on behalf of their client, Hauna Kea Power, Inc., Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted an archaeological survey of the Honolii Hydroelectric project area, located in the Lands of Kikala and Paukaa, South Hilo District, Island of Hawaii (TMK:3-2-6:var.; 3-2-7:var.). The overall objective of the survey was to provide information appropriate to and sufficient for the preparation of an Environmental Impact Statement (EIS) to be prepared in conjunction with various development permit applications to be made to the appropriate state and county agencies.

The field work was conducted on August 3, 1988 by PHRI Supervisory Archaeologist Margaret L.K. Rosendahl and PHRI Field Archaeologist Robert Noah. Approximately 16 man-hours of labor were expended in conducting the field work. Upon completion of the field work, findings and preliminary conclusions--including tentative evaluations and recommendations--were discussed with Dr. Ross Cordy of the Department of Land and Natural Resources-Historic Sites Section (DLNR-HSS). The project findings and tentative evaluations and recommendations will be formally reviewed by the DLNR-HSS and the Hawaii County Planning Department (HCPD) upon submission of this final report.

SCOPE OF WORK

The basic purpose of the survey was to identify--to discover and locate on available maps--all sites and features of potential archaeological significance present within the specified project area. Formerly called a reconnaissance survey and more recently referred to as an inventory survey, the proposed survey comprises the initial level of archaeological investigation. It is extensive rather than intensive in scope, and is conducted basically to determine the presence or absence of archaeological resources within a specified project area. This level of survey indicates both the general nature and variety of archaeological remains present, and the general distribution and density of such remains. It permits a general significance assessment of the archaeological resources, and facilitates formulation of realistic recommendations and estimates for such further work as might be necessary or appropriate. Such work could include intensive survey--data collection involving detailed recording of sites and features, and selected test excavations; and possibly subsequent mitigation--data recovery research excavations, construction monitoring, interpretive planning and development, and/or preservation of sites and features with significant scientific research, interpretive, and/or cultural values.

The basic objectives of the survey were four-fold: (a) to identify (find and locate) all sites and site complexes present within the

specified project area; (b) to evaluate the potential general significance of all identified archaeological remains; (c) to determine the possible impacts of proposed development upon the identified remains; and (d) to define the general scope of any subsequent data collection and/or mitigation work that might be necessary or appropriate.

The reconnaissance or inventory survey was carried out in accordance with the minimum requirements for reconnaissance-level survey recommended as standard by the Society for Hawaiian Archaeology (SHA). These standards are currently used by the HCPD and DLNR-HSS as guidelines for review and evaluation of archaeological reconnaissance survey reports submitted in conjunction with various development permit applications.

PROJECT AREA DESCRIPTION

The Honolii Hydroelectric project area is situated in the Lands of Kikala and Paukaa, District of South Hilo, Island of Hawaii (Figure 1). According to the Hawaii State tax maps, the Land of Paukaa includes Honolii Stream, whereas the USGS Map (Scale 1:24000, Quad Maps 25 and 26) shows the land boundary between Kikala and Paukaa running through the center of Honolii Stream. The Land of Kikala contains three Land Commission Awards (LCAs)--LCA 4578 to I. Kaika (2.51 acres), LCA 4563 to Waimaka (3 acres), and LCA 9971 to Wm. P. Leleiohoku (640 acres). The Land of Paukaa contains nine LCAs--LCA 7715 to Lot Kamehameha (6,200 acres), LCA 4968 to Kaheana (4.97 acres), 4972-B to Kahiva 2 (2.07 acres), 4969 to Kalama (1.88 acres), 5111 to Kanibo (2.19 acres), 4735 to Haa (1.04 acres), 4595 to Makuahine (1.91 acres), 4784 to Nuhi (2.47 acres), and 4528 to Opunui (1.02 acres).

The project area consists of a proposed weir location, a proposed power plant location, and a proposed penstock corridor (Figure 2). The weir location is generally situated within Honolii Stream at about 1,530 ft above mean sea level (AMSL). The exact location of the weir is at present still undetermined, but according to Mr. Ben Henderson of Mauna Kea Power, Inc., it will be located on an approximately half-acre parcel along the stream within the general location of the present gauging station. The power plant location, consisting of less than one-half acre (exact size presently undetermined), is situated inland of the third Honolii bridge near the 100-ft elevation contour in the area of Honolii Stream (Figure 3). The penstock corridor extends from the weir to the power plant. The corridor, about 3.75 miles long, is situated south of Honolii Stream. The corridor is generally within 300 meters of the stream and follows the edge of existing cane haul roads.

Vegetation in the vicinity of the weir consists primarily of 'ohia (Metrosideros collina [Forst.] Gray subsp. polymorpha [Gaud.] Rock), koa (Acacia koa Gray), uluhe (Dicranopteris linearis [Burm.] Underw.), strawberry guava (Psidium cattleianum Sabine), and hapu'u (Cibotium splendens [Gaud.] Krajina). Vegetation at the proposed power plant site consists mostly of Java plum (Eugenia jambolana Lam.), guava (Psidium

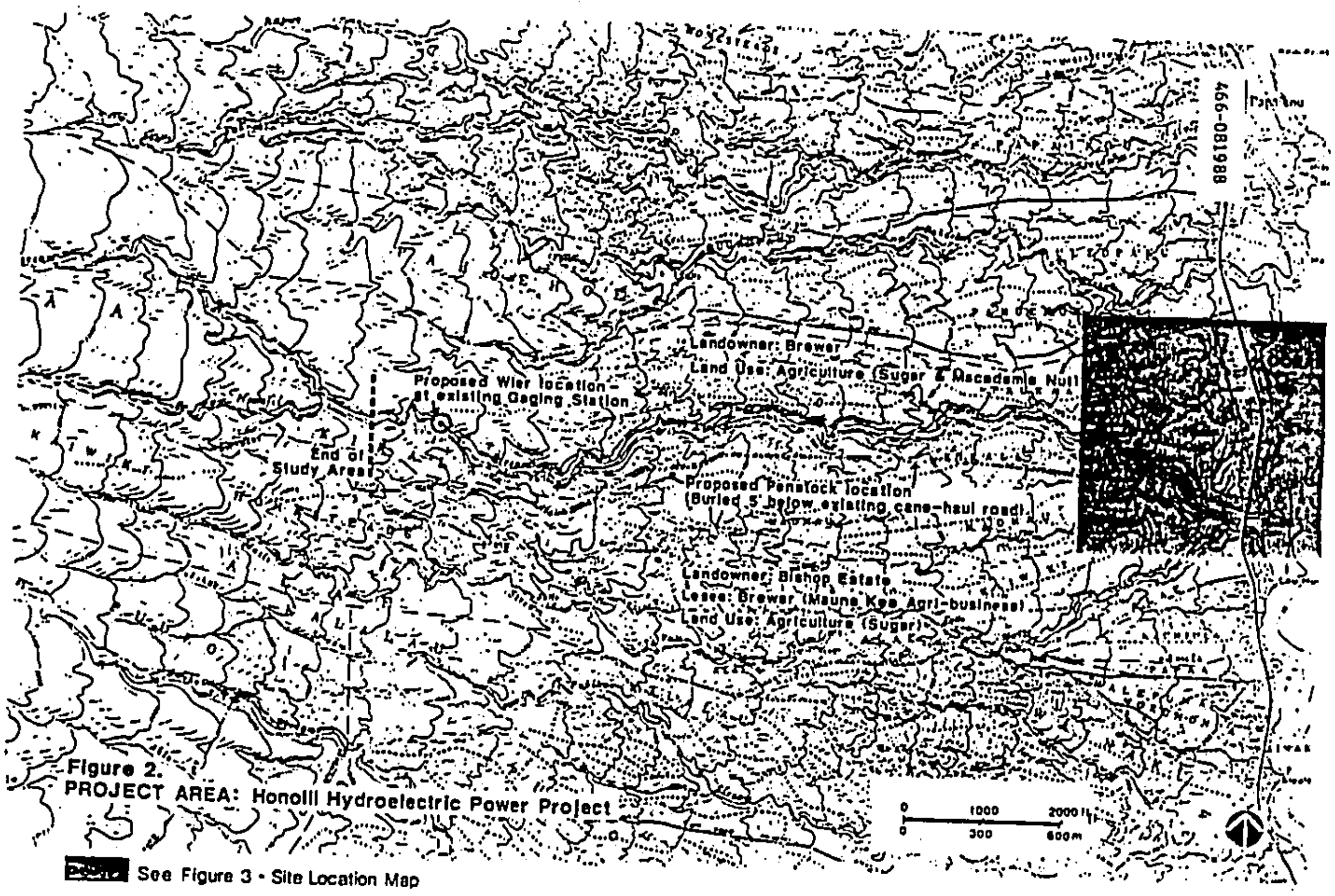

Figure 2.
PROJECT AREA: Honolii Hydroelectric Power Project

See Figure 3 - Site Location Map

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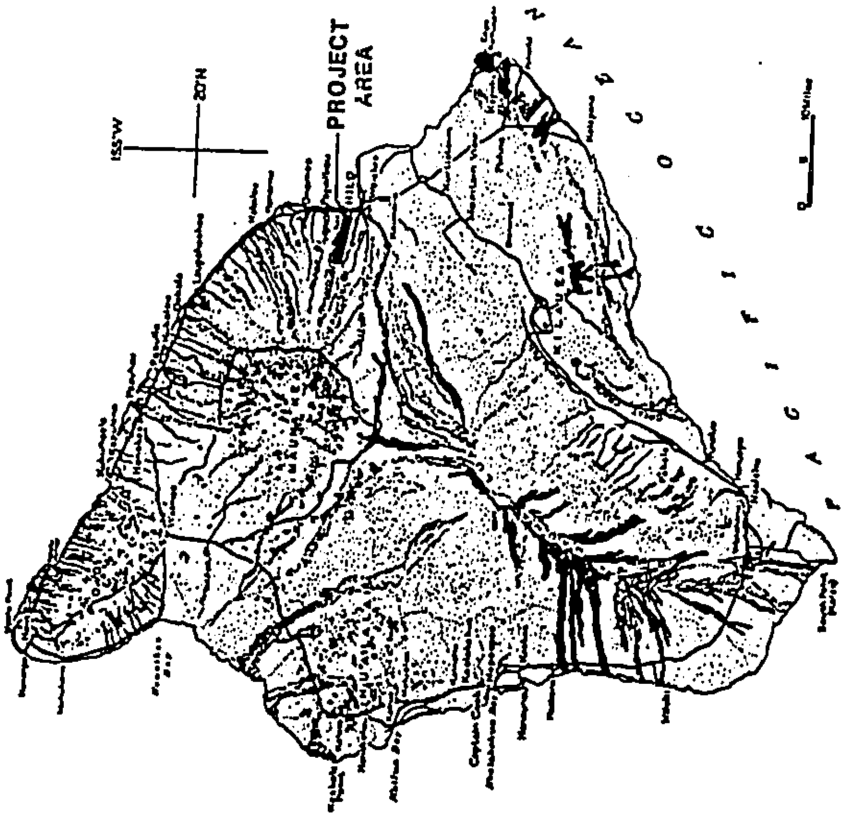

Figure 1. PROJECT LOCATION MAP

Archaeological Survey
Honolii Hydroelectric Project Area
Lands of Kikala and Paukaa, District of South Hilo
Island of Hawaii (TMK:3-2-6:var.; 3-2-7:var.)

PHRI 88-466 August 1988

(Map taken from Macdonald and Abbott 1970:288.)

466-081988

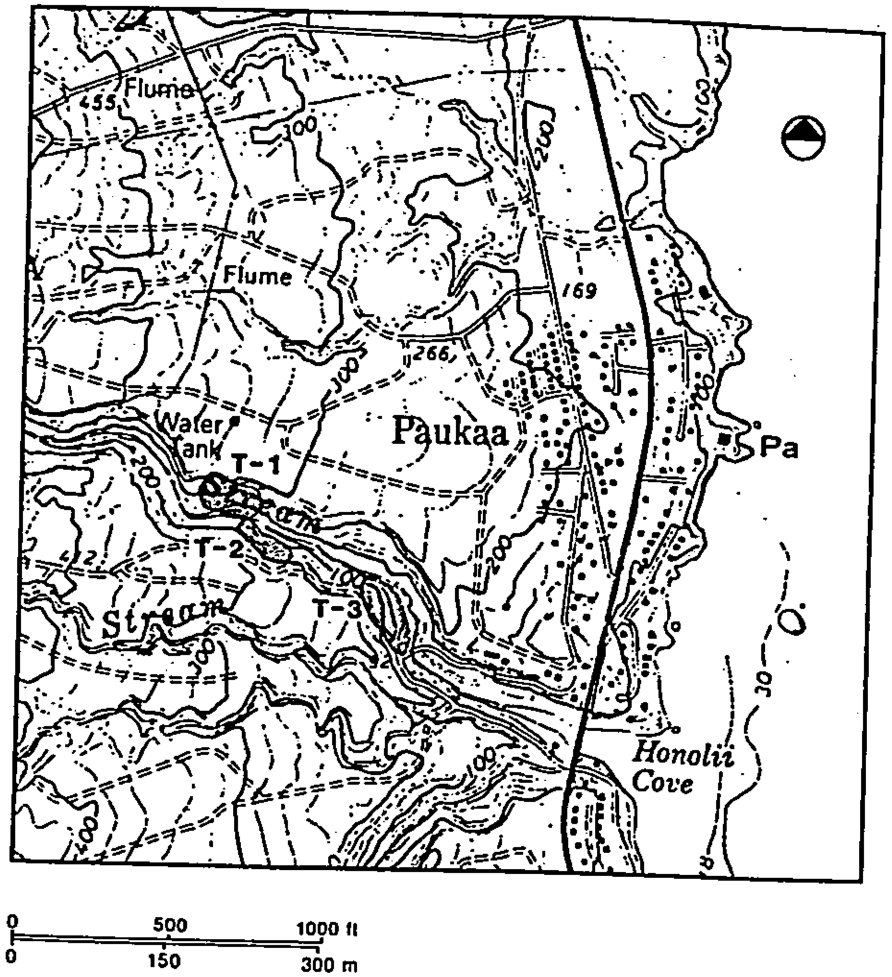

Figure 3. SITE LOCATION MAP

guajava [L.]), ulu (Artocarpus communis Forst.), banana (Musa), bamboo (unidentified), ki (Cordyline terminalis [L.] Kunth), ginger, and various ferns. Vegetation along the proposed penstock corridor consisted of, among other species, macadamia nut (Macadamia integrifolia Maiden and Betche) in the lower elevations and sugarcane (Saccharum officinarum [L.]) in upper elevations.

The terrain in much of the vicinity of the weir consists of exposed smooth basalt outcroppings and large boulders. The northern bank of Honolii Stream near the weir is covered with thick grass and a clump of banana trees. The terrain along Honolii Stream between the weir and the proposed power plant site is similar to the terrain at the weir. According to the Soil Survey of the Island of Hawaii (Sato et al. 1973: Map Sheet 65), the terrain in the vicinity of the present project area consists of "rough broken land" (within the stream bed), and "Hilo silty clay loam" and "Kaiwiki silty clay loam" (along the penstock corridor). Average rainfall in the general vicinity of the project area is 150 to 200 inches per year (Armstrong 1983:62).

PREVIOUS ARCHAEOLOGICAL AND HISTORICAL RESEARCH

According to records at the DLNR-HSS, there has been only one archeological survey conducted within or in the general vicinity of the present project area. This survey was conducted in 1983 by Cox (Cox 1983). The DLNR-HSS did not have a copy of the report on the study, so Cox was contacted directly. According to Cox, the survey consisted of a reconnaissance of the Honolii Stream Hydropower Study Areas conducted as part of a feasibility study by the U.S. Army Corps of Engineers. During the project, two areas were examined--the gauging station site and the northern crest of Honolii Stream. The gauging station site is the area called the proposed weir location in the present report. The northern crest of Honolii Stream is situated outside of the present project area. During the Cox survey, no archaeological sites of any kind were located within the weir location. Cox's examination of the northern stream banks identified a single site. This site, situated about a quarter mile downslope of the present landing field (at the 1,300-ft elevation) part way down the stream bank, consists of a terrace approximately 40 m long. The terrace is situated roughly one-fourth way down a gentle slope, at which point the terrain drops steeply to the river. The terrace retaining wall, constructed of large round stones, is slightly bowed. The platform area of the terrace, about 10.0 m wide, is fairly level and consists of soil. Cox described the terrace as an agricultural terrace in fair condition.

Historical research indicates that certain areas on the banks of Honolii Stream may have been used for agriculture--primarily to grow taro. According to Handy and Handy:

> In North Hilo there were taro terraces in and below Laupahoehoe Gulch, watered by the stream of that name. The other streams along the North Hilo coast whose valleys were

terraced for wet taro were Maulua, Hakalau, Wailea, Honomu, Kapehu, Kawainui, and Aalakahi; they empty into Onomea Bay, Pahoehoe, and Honoli'i (1972:538).

Although Honolii Stream is not specifically mentioned, it is very likely its banks were once used for cultivating taro. During the current project several bank areas surveyed were sufficiently above stream level to allow cultivation of dryland taro. The description of the general area of Honolii Stream by Ellis as he sailed along the coast suggests streams such as Honolii were used as such:

> The face of the country by which we sailed, was fertile and beautiful, and the population throughout considerable. The numerous plantations on the tops or sides of the deep ravines, or vallies, by which they were frequently interspersed, with the meandering streams running down them into the sea, presented altogether a most agreeable prospect (1825:191).

Based on an examination of the Indices of Awards made by the Board of Commissioners (1929), there were three Land Commission Awards (LCAs) in Kikala and nine in Paukaa. The ahupua'a of Kikala, comprised of 640 acres, with the exception of the rights of the native tenants, was held in title by Wm. P. Leleiohoku (LCA 9971). The kuleana in Kikala were awarded to I. Kaika (LCA 4578, 2.51 acres) and Waimaka (LCA 4563, 3.0 acres). Historical Researcher Carol Silva provided the following information on these two awards:

> L.C.Aw. 4578 was made up of two lots. One lot was described as having two cultivated fields, two houses, and was not enclosed by any kind of fence. It was bound by mountain and a stream. The second lot had no house. The land was received from the konohiki in 1839.
>
> L.C.Aw. 4563 was a single lot described as a cultivated garden and one house. The land was received from the parents who received it at the time of Kamehameha I. It was cultivated in taro, sweet potato, pumpkins, and corn. The boundaries were described as the ditch or auwai on the mauka side, a mountain road on the Hamakua side, a valley to the makai, and beach on the Puna side. According to Silva, this "beach" may have been a mountain stream that through the translations was changed.

LCA 4578 appears to correlate with privately owned property, the Kiyan residence, and is in the vicinity of the proposed power plant site. The property is located immediately inland of the third bridge on the southern bank of Honolii Stream. LCA 4563 is situated on a level plateau, south of the Honolii Stream and gulch area.

A situation similar to the Kikala Ahupuaa exists for Paukaa, located north of Honolii Stream. The ahupua'a, formerly held by Lot Kamehameha (LCA 7715), is comprised of 6,200 acres and contains eight LCAs ranging from 1.02 to 4.97 acres (LCA 4968 to Kaheana, 4.97 acres; 4972-B to Kahiwa

2, 2.07 acres; 4969 to Kalama, 1.88 acres; 5111 to Kaniho, 2.19 acres; 4735 to Maa, 1.04 acres; 4595 to Makuahine, 1.91 acres; 4784 to Nuhi, 2.47 acres; and 4528 to Opunui, 1.02 acres). The kuleana are generally distributed along the northeast portion of Paukaa Ahupuaa, most appear to be outside of the project area. Translation of the original land documents for the Paukaa land awards is necessary; it will provide more information on land use during the mid-1800s.

FIELD WORK PROCEDURES

Field investigations were conducted on August 3, 1988 by PHRI Supervisory Archaeologist Margaret L.K. Rosendahl and PHRI Field Archaeologist Robert Noah. Mr. Ben Henderson of Mauna Kea Power, Inc. accompanied the field team on the survey. Sixteen man-hours of labor were expended in conducting the field work. The proposed weir location, defined by steep river walls and extending from the area of the gauging station to the first set of falls, was inspected by means of pedestrian sweeps along the northern river bank. The southern bank was much narrower and access to it was difficult due to heavy rainfall and full river capacity. The distance between sweeping crew members was 5-10 m. The proposed power plant site was surveyed in a similar manner, with the field team criss-crossing the river to examine shelves of land adjacent to the river. The power plant site survey covered the area which extends from the third bridge to approximately the 300-ft elevation, at which point Honolii Stream turns from its westerly orientation toward the northwest. To survey the proposed penstock corridor, the field team traversed by vehicle the present cane haul road, which runs roughly parallel with and adjacent to the penstock corridor. Visibility from the road was good.

Identified sites were assigned sequential PHRI temporary site numbers (beginning with T-1) and sites were plotted on a USGS map of the project area. Descriptive data and feature dimensions for the sites were recorded on standard PHRI site survey record forms. Due to inclement weather, the sites were not photographed. Subsequent to recording, the sites were marked with red-and-white and pink flagging tape, and were tagged with an aluminum tag denoting the temporary site number, the PHRI project number (88-466), the letters "PHRI," and the date.

FINDINGS

The reconnaissance survey of the Honolii Hydroelectric project area did not identify any sites within the proposed weir location or within the penstock corridor; it did, however, identify three sites within or in the vicinity of the proposed power plant location (see Table 1, which summarizes each site in terms of PHRI temporary number, formal type, tentative function, CRM value mode assessments, and field work tasks). The three sites consist of both single and multiple features. Feature types in the project area include wall, terrace, and alignment. Functional types include habitation and boundary or agriculture.

SITE T-1 - TERRACE

Site T-1 is a terrace situated about 8.0 m north of Honolii Stream, about 25 ft northwest of the proposed power plant location (Figures 3 and 4). The retaining wall of the terrace consists of subangular basalt boulders which are stacked two high in places, and which are in other places only a single course high and loosely aligned. The wall is somewhat U-shaped in plan view, with the U-shape opening to the north. The east-west running portion of the U-shape wall is about 12.0 m long.

Table 1.

SUMMARY OF IDENTIFIED SITES AND FEATURES
HONOLII HYDROELECTRIC PROJECT AREA

Site/Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation	#CRM Value Mode Assess.			+Field Work Tasks		
			R	I	C	DR	SC	EX
T-1	Terrace	Habitation	H	L	L	+	+	+
T-2	Wall	Boundary/ Agriculture	L	L	L	+	-	-
T-3	Complex	Habitation Complex	M	M	H/M	+	+	+

#Cultural Resource Management
Value Mode Assessment--Nature: R = scientific research, I = interpretive, C = cultural;
--Degree: H = high, M = moderate, L = low.

+Field Work Tasks: DR = detailed recording (scaled drawings, photographs, and written descriptions), SC = surface collections, EX = test excavations.

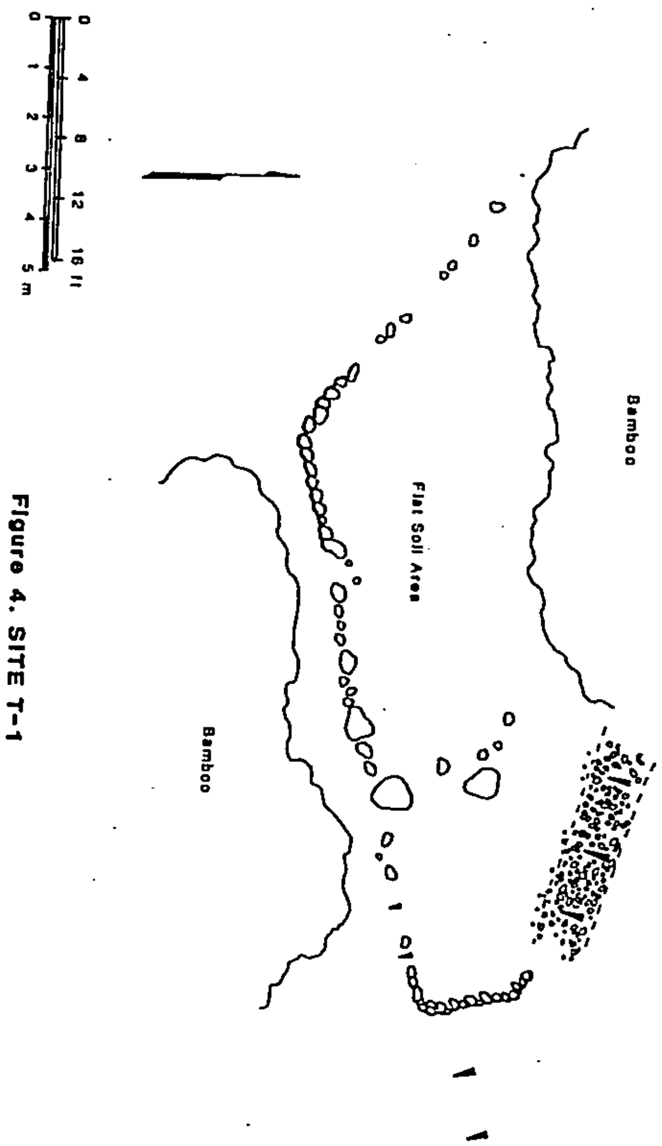

Figure 4. SITE T-1

The U-shape encloses a flat soiled area which measures roughly 5.0 by 14.0 m. Present within the soiled area are a few boulders and cobbles. Present on the northeast corner of the terrace is a 1.0 by 5.0 m inclined area which consists of soil and stones. Overall, the terrace is in fair condition. Portable remains observed at the terrace include a metal pipe elbow, a metal doorlock, and a light-green soft drink bottle.

SITE T-2 - WALL

Site T-2 is a wall situated southeast of Site T-1, south of Honolii Stream about 4.5 m above the level of the stream water, partly within the proposed power plant location (Figures 3 and 5). The wall, which is in fair condition, extends roughly northwest-southeast and consists of stacked rounded basalt boulders, some as large as 90 cm in diameter. The wall measures 20.0+ meters long by c. 90 m wide by c. 60 cm high. Present south of the wall is a shallow accumulation of soil. Present along the south side of the wall is a wooden post. Portable remains observed at the feature include a metal strip with holes in it.

SITE T-3 - COMPLEX

Site T-3 is a complex consisting primarily of walls and alignments (Figure 3). The walls and alignments, which are in fair condition, comprise the remnants of an historic habitation area. The complex is situated on a relatively level shelf about 5-6 meters above Honolii Stream, on the south bank of the stream. The complex may be outside of the present project area; however, this cannot be positively determined as the project area was not staked out nor was it accurately represented on the map provided. Site T-3 covers roughly 40-50.0 m by 75.0 m; it consists of stacked rounded boulders, concrete blocks, and concrete foundations set into the ground to give the area a low, stepped appearance. According to an informant (the son of Ms. Emma Kiyan), Site T-3 is on private property belonging to the Kiyan family. The site, the informant said, is the former location of a Kiyan family house complex that was used in the early 1900s. According to the informant, his mother was born in the house. There is a slight possibility that the area of Site T-3 contains burials.

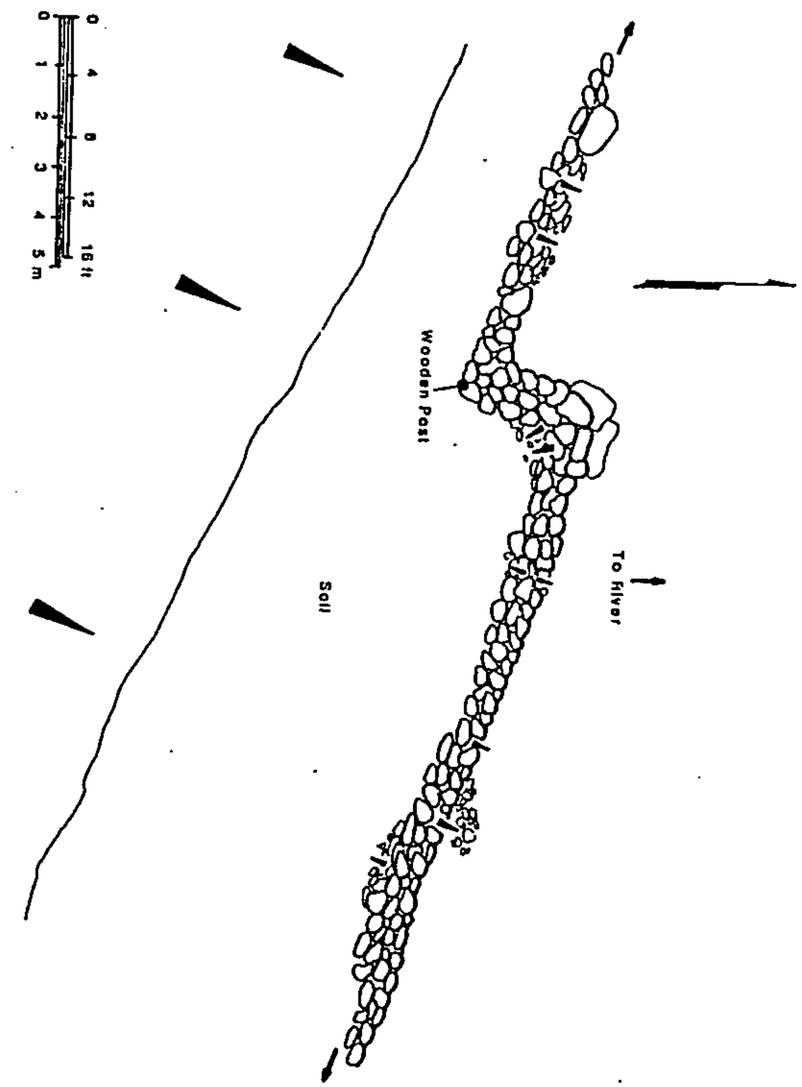

Figure 5. SITE T-2

CONCLUSION

DISCUSSION

The present reconnaissance survey was conducted without clear definition of the project area and without a definite location for the proposed power plant. The map provided was a USGS quad map on which was essentially no details which corresponded with Honolii Stream. The project area and location of the power plant was not outlined on the map, and neither was the project area staked out in the field. The following discussion of findings, therefore, is subject to these constraints.

During the survey, three archaeological sites were identified. All the sites are situated at the seaward end of the project area, in the vicinity of the proposed power plant. The sites include a habitation terrace (Site T-1), a wall (Site T-2), and a habitation complex (Site T-3). All sites appear to be historic.

At Site T-1, surface artifacts (door handle and pipe section) suggest the site comprises the remains of a house. According to long-time residents, a Chinese man once resided in the area of the site. A bamboo thicket is encroaching on the site from the west and dead leaves from the thicket form a thick layer over the site. Additional surface artifacts are probably present at the site beneath the leaves.

Site T-2 appears to form a boundary wall that runs parallel to the riverbed area adjacent to it. A wooden post and metal bar present near the western more formal section of the wall suggest a gate may have been located there. At the western portion of the wall, a land shelf present between the wall and a steep slope to the south narrows to only about two meters in width. The eastern portion of the wall is deteriorated and forms a crude retaining wall at the river's bank. A portion of Site T-2 wall may have originally served as a retaining wall for an agricultural terrace.

Site T-3, though probably outside the project area (if the project area had been clearly defined on a map), was included in the survey findings. The Kiyan family, who claim to be owners of the property the site is on, are descendents of a family that has occupied the land in the immediate vicinity of the project area for generations. In a brief meeting with several family members it was obvious they had a strong attachment to their family land. The Kiyan residences presently comprise houses and associated cultivated areas. The residences and the area of Site T-3 appear to correlate with LCA 4578. According to one young member of the Kiyan family (who has hiked extensively in the vicinity of Honolii Stream), there are additional terraces present further upstream, outside the project area.

Based on an initial examination of the banks of Honolii Stream within the project area and on historical documentary research, it is likely that the banks of the stream in the project area once supported taro

cultivation. Documentary research indicates there was at least one habitation complex in the area of the stream during the mid-1800s (the complex roughly corresponds with the Kiyan residences).

Due to the preliminary nature of the current project, and given the constraints of the project, further work is recommended for all three sites if after the clear definition of the project area and the definite location of the power plant it is determined the sites will be affected by the construction of the plant. Prior to beginning further work it is suggested that a detailed topographic map of the project area that identifies the selected location of the power plant area be provided. The project area should be clearly defined on the map. The sites identified during the current survey should then be accurately recorded and then plotted on the map, and then appropriate data recovery should take place at the sites. Due to the indefinite location of the power plant site and the project area not being clearly demarcated, it is entirely possible that once the power plant site is selected, that the sites identified in the present project may lie outside the new project limits and that unsurveyed areas within the new project limits will have to be surveyed.

Based on the present findings, it is recommended that the area of Site T-3 be avoided as a possible site. The area is very likely private property.

GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS

Site significance assessments are based on the National Register criteria for evaluation, outlined in the Code of Federal Regulations (36 CFR Part 60). The Hawaii State Department of Land and Natural Resources-Historic Sites Section (DLNR-HSS) uses these criteria for evaluating site significance. Sites determined to be potentially significant for information content fall under Criterion D (Category A, Table 2), which defines significant resources as ones which "have yielded, or may be likely to yield, information important in prehistory or history" (36 CFR Sec. 60.4). Sites potentially significant as representative examples of site types are evaluated under Criterion C (Category B, Table 2), which defines significant resources as those which "embody the distinctive characteristics of a type, period, or method of construction...or that represent a significant and distinguishable entity whose components may lack individual distinction" (36 CFR Sec. 60.4).

Sites with potential cultural significance (Category C, Table 2) are evaluated under guidelines prepared by the Advisory Council on Historic Preservation (ACHP) entitled "Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review" (ACHP 1985). The guidelines define cultural value as "...the contribution made by an historic property to an ongoing society or cultural system. A traditional cultural value is a cultural value that has historical depth" (1985:1). The guidelines further specify that "[a] property need not have been in consistent use since antiquity by a cultural system in order to have traditional cultural value" (1985:7).

Table 2.

SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS HONOLII HYDROELECTRIC PROJECT AREA

Site No.	Significance Category A	X	B	C	Recommended Treatment FDC	NFW	PID	PAI
T-1	+	-	-	-	+	-	-	-
T-2	+	-	-	-	+	-	-	-
T-3	+	-	-	*	+	-	-	-

General Significance Categories:

A=Important for information content, further data collection necessary (PHRI=research value);
X=Important for information content, no further data collection necessary (PHRI=research value, SHPO=not significant);
B=Excellent example of site type at local, region, island, State, or National level (PHRI=interpretive value); and
C=Culturally significant (PHRI=cultural value).

Recommended General Treatments:

FDC=Further data collection necessary (intensive survey and testing, and possible subsequent data recovery/mitigation excavations);
NFW=No further work of any kind necessary, sufficient data collected, archaeological clearance recommended, no preservation potential (possible inclusion into landscaping suggested for consideration);
PID=Preservation with some level of interpretive development recommended (including appropriate related data recovery work); and
PAI=Preservation "as is," with no further work (and possible inclusion into landscaping), or minimal further data collection necessary.

*Provisional assessment; there is a slight possibility that the area of this site contains burials. Definite assessment pending further data collection.

Based on the above federal and state criteria, all three sites in the project area are assessed as important for information content. In addition, Site T-3 is tentatively assessed as important for cultural value. Further data collection is recommended for all three sites (see Table 1 for specific work tasks).

In order to facilitate future client management decisions regarding site treatments, sites are further evaluated on terms of three value modes which are derived from the previously mentioned state and federal evaluation criteria. The archaeological sites are evaluated in terms of potential scientific research, interpretive, and/or cultural values. Research value refers to the potential of archaeological resources to produce information useful in the understanding of culture history, past

lifeways, and cultural processes at the local, regional, and interregional levels of organization. Interpretive value refers to the potential of archaeological resources for public education and recreation. Cultural value refers to the potential of archaeological resources to preserve and promote cultural and ethnic identity and values. Based on these three value modes, the sites in the present project area are assessed as having low to moderate research and interpretive values, and low to high cultural values (see Table 1 for evaluations of individual sites).

The evaluations and recommendations presented within this final report have been based on a surface reconnaissance survey of the project area. There is always the possibility, however remote, that potentially significant, unidentified surface structural remains, subsurface cultural features, or deposits will be encountered in the course of future archaeological investigations or subsequent development activities. In such situations, archaeological consultation should be sought immediately.

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Appendix E

federal register

Friday
January 23, 1981

Part III

Department of the Interior

Fish and Wildlife Service

U.S. Fish and Wildlife Service Mitigation Policy

[As corrected in the Federal Register of February 4, 1981]

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

U.S. Fish and Wildlife Service Mitigation Policy; Notice of Final Policy

AGENCY: U.S. Fish and Wildlife Service, Department of the Interior.

ACTION: Notice of Final Policy.

SUMMARY: This Notice establishes final policy guidance for U.S. Fish and Wildlife Service personnel involved in making recommendations to protect or conserve fish and wildlife resources. The policy is needed to: (1) ensure consistent and effective Service recommendations; (2) allow Federal and private developers to anticipate Service recommendations and plan for mitigation needs early; and (3) reduce Service and developer conflicts as well as project delays. The intended effect of the policy is to protect and conserve the most important and valuable fish and wildlife resources while facilitating balanced development of the Nation's natural resources.

EFFECTIVE DATE: January 23, 1981.

ADDRESS: Comments submitted on the proposed policy may be inspected in Room 738, 1375 K Street, N.W., Washington, D.C. 20005, between 9 a.m. and 3 p.m. *on business days.*

FOR FURTHER INFORMATION CONTACT: John Christian, Policy Group Leader—Environment, U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. 20240, (202) 343-7151.

SUPPLEMENTARY INFORMATION:

BACKGROUND

The development and use of the Nation's natural resources continues in an effort to provide people with their basic needs and to improve their lives. Fish and wildlife and the intricate fabric of natural resources upon which they depend provide benefits to people in many ways. Fishing, hunting, and bird watching are basic benefits that come to mind immediately. These activities involve the direct use of these renewable "natural resources." Perhaps a greater benefit, although more difficult for some to understand, is the maintenance of the structure and function of the ecosystem that comprises all living species, including people. The presence of diverse, healthy fish and wildlife populations generally signals a healthy ecosystem which contains those elements necessary for human survival, including unpolluted air and productive land.

That fabric of natural resources called habitat is the supply for fish and wildlife renewal. The life requirements for plant and animal species are varied and complex. Each species requires a different set of environmental conditions for survival and vigorous growth. These conditions form the habitat of the various species. The development and use of natural resources leads to changes in environmental conditions that can redefine habitat and thus change the mix and abundance of plant and animal species.

A given change in habitat might increase or decrease overall habitat productivity or result in gains or losses of species that are valuable to people or ecosystems. In some cases, habitat modifications can also increase the numbers of species considered undesirable, and create a nuisance to people or crowd out more valuable species. Therefore, development actions can cause habitat changes that are considered either beneficial or adverse depending on the intended wildlife management objectives.

When professional biologists determine that a given development action will cause a change that is considered adverse, it is appropriate to consider ways to avoid or minimize and compensate for such adverse change or loss of public resources. This is commonly referred to as mitigation.

Fish and wildlife resources are public in nature. The Service has provided Federal leadership for over 40 years to protect and conserve fish and wildlife and their habitat for the benefit of the people of the United States. Under its legal authorities, the Service conducts fish and wildlife impact investigations and provides mitigation recommendations on development projects of all kinds. These efforts have been conducted through a full partnership with State agencies responsible for fish and wildlife resources, and since 1970, with the National Marine Fisheries Service of the U.S. Department of Commerce. The recommendations of the Service are considered by the Federal development and regulatory agencies for their adoption as permitted by law.

Over the years, the Service has reviewed innumerable project and program plans with the potential to adversely affect fish and wildlife resources. The mitigation recommended in recent years by Service personnel to prevent or ameliorate adverse impacts has been governed primarily by a broad policy statement on mitigation promulgated in 1974 and by specific guidelines issued as needed. Recent events have prompted the Service to make known its mitigation objectives and policies. Specific management needs include:

(1) Recent legislative, executive and regulatory developments concerning the environment which have led to a need to update and expand the advice within the 1974 Service policy statement;

(2) Increasing Service review responsibilities which require issuance of comprehensive guidance on mitigation to maintain the quality and consistency of Service mitigation recommendations;

(3) An explicit summary of Service mitigation planning goals and policies to be disclosed to developers and action agencies to aid their earliest planning efforts; and

(4) Finally, the current national need to accelerate development of energy resources which requires that early planning decisions be made that can minimize conflict between important environmental values and energy development.

For these reasons, it was determined to be necessary to fully outline the overall mitigation policy of the U.S. Fish and Wildlife Service. The final Service policy statement integrates and outlines the major aspects of current Service mitigation efforts. Intended as an overview document, its guidance is based on an analysis of current Service field recommendations and on the guidance contained in recent Service *management documents.*

This policy conditions only the actions of Service employees involved in providing mitigation recommendations. It does not dictate actions or positions that Federal action agencies or individuals must accept. However, it is hoped that the policy will provide a common basis for mitigation decisionmaking and facilitate earlier consideration of fish and wildlife values in project planning activities.

Finally, it should be stressed that this Service policy outlines mitigation needs for fish and wildlife, their habitat and uses thereof. Others interested in mitigation of project impacts on other aspects of the environment such as human health or heritage conservation may find the Service policy does not fully cover their needs. There was no intent to develop a mitigation policy that covers all possible public impacts except those stated. However, the Service strongly believes that preservation and conservation of natural resources is a necessary prerequisite to human existence.

DISCUSSION

The following items are included to provide a better understanding of the policy's relationship to other guidance and to improve the understanding of its technical basis.

1. Relationship of Service Mitigation Policy to Other Service Planning Activities.

The final policy is designed to stand on its own. However, for a clearer perspective of the relationship of the policy to the goals and objectives of the U.S. Fish and Wildlife Service, it can be read with the Service Management Plan and the Habitat Preservation Program Management Document.

The Service Management Plan describes the overall direction of the Service and the interrelationships of the four major categories, including Habitat Preservation, Wildlife Resources, Fishery Resources, and Federal Aid-Endangered Species.

The Habitat Preservation Program Management Document outlines what the Service will do over a one- to five-year period to ensure the conservation and proper management of fish and wildlife habitat. It provides guidance to Service personnel and other interested parties on the goals, objectives, policies, and strategies of the Habitat Preservation Category of the U.S. Fish and Wildlife Service. It includes a discussion of important resource problems that the Service believes require priority attention.

2. Relationship of the Mitigation Policy to any future Fish and Wildlife Coordination Act (FWCA) Regulations and the National Environmental Policy Act (42 U.S.C. 4321-4347) (NEPA).

The Service mitigation policy outlines internal guidance for Service personnel for all investigations and recommendations for mitigation under relevant Service authorities, including the FWCA and NEPA. However, the coverage of the policy is basically different from that of any future FWCA regulations as was explained in the preamble to the proposed policy (September 9, 1980) (45 FR 59486-59494). Any future FWCA regulations will principally recommend procedures for all affected agencies to ensure compliance with that Act before and after they receive fish and wildlife agency recommendations. In contrast, the Service mitigation policy only applies to Service personnel and outlines mitigation planning goals and policies for impact analyses and recommendations.

The relationship of the mitigation policy to NEPA requirements is also a complementary one. The regulations implementing NEPA (43 FR 55978-56007) recognize "appropriate" mitigation recommendations as an important element of the rigorous analysis and display of alternatives including the proposed action (40 CFR Part 1502.14). The NEPA regulations later specify that Service impact analyses and mitigation recommendations shall be used as input to preparation of draft environmental impact statements (DEIS) as follows:

"To the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with environmental impact analyses and related surveys and studies required by the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), the National Historic Preservation Act of 1966 (16 U.S.C. 470 et seq.), the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), and other environmental review laws and executive orders." (40 CFR 1502.25(a)).

These provisions provide clear direction that NEPA requirements are not duplicative of or substitute for mitigation recommendations developed under the Fish and Wildlife Coordination Act and other Service authorities. In fact, the NEPA regulations require that Service recommendations be fully integrated into the NEPA process as vital information necessary to comply with NEPA.

3. Focus of the Policy on Habitat Value.

The policy covers impacts to fish and wildlife populations, their habitat and the human uses thereof. However, the primary focus in terms of specific guidance is on the mitigation of losses of habitat value. Population estimates are considered by many to be unreliable indicators for evaluating fish and wildlife impacts. Sampling errors, cyclic fluctuations of populations and the lack of time series data all contribute to the problem. Therefore, the Service feels that habitat value, by measuring carrying capacity, is a much better basis for determining mitigation requirements. However, the use of population information is not foreclosed by the policy. In fact, concern for population losses led to formulation of the "General Policy" section to ". . . seek to mitigate all losses of fish, wildlife, their habitat and uses thereof. . ." The Service agrees that mitigation of population losses is a necessary aspect of this policy, for example, when habitat value is not affected but migration routes are blocked off as in the case of dam construction on a salmon river.

Mitigation of human use losses of fish and wildlife resources is also a necessary aspect of the policy. However, if mitigation of habitat value occurs, then in the majority of cases, losses of human use are also minimized. But, in some cases, public access to the resource may be cut off by the project and significant recreational or commercial benefits may be lost.

In those cases where mitigation of habitat value is not deemed adequate for losses of fish and wildlife populations or human uses, the Service will seek to mitigate such losses in accordance with the general principles and concepts presented in the policy. However, in the majority of cases, the Service feels that mitigation of impacts on habitat values will assure a continuous supply of fish and wildlife populations and human use opportunities.

The Service has recently revised and updated its *Habitat Evaluation Procedures* (HEP). It can be used, where appropriate, to determine mitigation needs based on habitat value losses. In some cases, the project may not be deemed appropriate for applying the methodology as in the case of activities conducted on the high seas under the Outer Continental Shelf (OCS) leasing program. In such cases, the use of other methods to describe habitat value impacts is clearly acceptable, including the best professional judgment of Service biologists. Other limitations related to the use of HEP are outlined in the Ecological Services Manual (100 ESM 1). The HEP are available upon request from the Chief, Division of Ecological Services, U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. 20240.

4. Acre for Acre Loss Replacement Is Not Necessarily Recommended by the Policy.

As explained above, the policy focuses on habitat value. The habitat value of an acre of habitat can vary considerably depending on the type of vegetation and other physical, biological or chemical features. Service recommendations, therefore, will be based on the habitat value adversely impacted, as opposed to strictly acreage. For example, loss of one acre of a specific type of wetland might result in recommendations for replacement of less than one acre of a different type of wetland of greater habitat value. If the habitat value of the wetland available for replacement was equal to that lost, then recommendations could be on an acre-for-acre basis.

5. Rationale for Mitigation Planning Goals.

In developing this policy, it was agreed that the fundamental principles guiding mitigation are: 1) that avoidance or compensation be recommended for the most valued resources; and 2) that the degree of mitigation requested correspond to the value and scarcity of the habitat at risk. Four Resource Categories of decreasing importance were identified, with mitigation planning goals of decreasing stringency developed for these categories. Table 1 summarizes all categories and their goals.

Table 1: Resource Categories and Mitigation Planning Goals

Resource category	Designation criteria	Mitigation planning goal
1	High value for evaluation species and unique and irreplaceable.	No loss of existing habitat value.
2	High value for evaluation species and scarce or becoming scarce.	No net loss of in-kind habitat value.
3	High to medium value for evaluation species and abundant.	No net loss of habitat value while minimizing loss of in-kind habitat value.
4	Medium to low value for evaluation species.	Minimize loss of habitat value.

POLICY HISTORY

The policy statement integrates and outlines the major aspects of current Service mitigation efforts. Intended as an overview document, its guidance is based on an analysis of over 350 Service field recommendations and on the guidance contained in recent Service management documents. The proposed policy was published in the Federal Register on September 9, 1980 (45 FR 59486–59494). A correction notice which corrected insignificant formatting and typographical errors was published on September 19, 1980 (45 FR 62564). A notice extending the comment period on the proposed policy to November 10, 1980, was published on October 8, 1980 (45 FR 66878). The final publication is based on full and thorough consideration of the public comments as discussed below.

RESPONSE TO COMMENTS

Over 90 sets of comments were received on the proposed policy. All comments were thoroughly analyzed and cataloged and considered. Many commentors expressed agreement with Service publication of the policy, sensing a more consistent and predictable Service approach to mitigation recommendations and a resultant decrease in the degree of conflict with developers. Many felt the policy represented a rational approach to fish and wildlife resource management, and that it would provide for adequate protection and conservation of the Nation's fish and wildlife resources. The underlying concept that the degree of mitigation requested should correspond to the importance and scarcity of the habitat at risk was also supported by many commentors. Numerous commentors also praised its scope, cohesiveness and clarity, and stressed that it should provide valuable guidance for Government personnel providing technical and project planning assistance.

Detailed responses to significant comments follow:

GENERAL COMMENTS ON THE PROPOSED SERVICE MITIGATION POLICY

Comment: Although the Service prepared an Environmental Assessment and, from its findings, concluded that policy issuance did not constitute a major Federal action which would significantly affect the quality of the human environment within the meaning of Section 102(2)(C) of the National Environmental Policy Act (NEPA), a few commentors disagreed with the Service's conclusion that an Environmental Impact Statement (EIS) was not necessary for the proposed action.

Response: During policy development, the Service took action to determine if preparation of an environmental impact statement under NEPA was required. Although section 1508.18 of the Council on Environmental Quality's (CEQ) Regulations for implementing the procedural provisions of NEPA classified adoption of an official policy as a "Federal action," it remained unclear as to whether this action was "major," or whether it would "significantly" affect the quality of the human environment, since policy implementation would not result in or substantially alter agency programs. As was stated in the preamble, this policy is basically a distillation of approaches and policy currently being practiced by Service field personnel in providing mitigation recommendations.

In order to resolve this uncertainty, an Environmental Assessment was prepared for the proposed and final policy. By doing so, the Service has complied with one of the major purposes of the NEPA regulations, which is to have NEPA applied early in the decisionmaking process.

The NEPA regulations do not, in the opinion of the Service, require that the agency speculate on future, possible events without any relation to actual, existing impacts of an action. Section 1502.2 of the NEPA regulations directs that an EIS is to be analytical, however, the Service action simply does not create any impacts capable of such analysis. Thus, there is no reasonable or scientific way for the Service to analyze any environmental impacts, significant or otherwise, as discussed in §§ 1502.16 and 1508.27.

This problem is particularly vexsome when those impacts depend on future contingencies and can be more appropriately analyzed when those contingencies occur. Even § 1502.4, which discussed EIS's in terms of broad agency actions, does so in the context of specific impacts caused by the action. In the opinion of the Service, it has fully complied with the letter and spirit of NEPA and its regulations.

Comment: One commentor felt that the preamble statement that an EIS would be premature at this time contradicted a finding of no significant impact.

Response: The Service sees no contradiction with a finding of no significant impact and the statement that an EIS is premature. The finding of no significant impact derives from an analysis showing that the policy has no significant impacts amenable to analysis at the present time. However, when in the future the Service does apply the policy in developing mitigation recommendations for a major Federal action which might significantly affect the quality of the human environment, then the environmental impacts associated with implementing those recommendations which are considered justifiable by the development agency can be analyzed by that development agency. The Service has no way of predicting which of its recommendations will be accepted by the developer; therefore, analysis of impacts of accepted mitigation recommendations is the responsibility of the developer.

Comment: One commentor was of the opinion that an EIS "should be prepared for the Service's proposed mitigation recommendations on each project." Moreover, the commentor felt that a significant portion of these EIS's should be devoted to analysis of economic impacts.

Response: Mitigation recommendations and actions cannot be meaningfully analyzed except in the context of the development action initiating them. And, since an EIS would be required for any major Federal action which would significantly affect the quality of the human environment and whose alternatives would include consideration of mitigation, a separate EIS would not be necessary for mitigation actions.

Under the FWCA, the action agency which makes the ultimate decision is to include all "justifiable mitigation means and measures" in project formulation. The burden of analyzing the economic impacts of "justifiable" mitigation measures therefore rests primarily with the project sponsor, who will likely use the Water Resources Council's Principles and Standards to assist in the analysis.

Comment: The substantive requirements of the Service mitigation policy should be consistent with the requirements of the National Environmental Policy Act's implementing regulations and the Water Resources Council's Principles and Standards.

Response: We agree. The proposed and final policy have been developed consistent with the substantive and procedural requirements of these regulations.

Comment: The Environmental Assessment identifies as one of the advantages of the proposed mitigation policy the establishment of "* * * minimum performance standards for FWS recommendations (which) would serve as benchmarks by which the FWS and developers or action agencies * * * could assess individual Service mitigation proposals." However, neither the **Federal Register** notice nor the Environmental Assessment identify or discuss these "benchmarks."

Response: The term "benchmarks" referred to the mitigation goals and planning procedures. Both the proposed policy preamble and its Environmental Assessment discussed these guidelines, explaining their derivation and importance to policy purposes. However, a point of clarification is needed regarding these guidelines. It is the recommendations made by Service personnel that would be measured against these standards, not the mitigation implemented by an action agency. The final policy makes this point explicit.

Comment: Many commentors argued that the proposed policy goes beyond that authorized by law. Specific concern was expressed over the use of words that were mandatory in tone (e.g., "require" and "must") as opposed to advisory. In addition, some commented that the Service has no authority to support or oppose projects as stated in the policy.

Response: The Service agrees that the legal authorities for the mitigation policy do not authorize the Service to exercise veto power over land and water development activities. That understanding was implicit in the proposed policy. Appropriate changes have been made in the policy to more explicitly recognize and signify the advisory nature of the Service responsibility.

However, it should be clearly noted that the Fish and Wildlife Coordination Act places clear mandatory requirements on Federal development agencies falling under that Act's authority to (1) consult with the Service, National Marine Fisheries Service (NMFS) and State agencies responsible for fish and wildlife resources; (2) incorporate such reports and recommendations in one overall project report; (3) provide "full consideration" of the "reports and recommendations;" (4) include in the project plan "such justifiable means and measures for wildlife purposes as the reporting agency finds should be adopted to obtain overall maximum project benefits;" and (5) other requirements related to funding and land acquisition.

The clear intent of Congress was that recommendations developed by the U.S. Fish and Wildlife Service, NMFS, and State agencies responsible for fish and wildlife resources be taken seriously, and we know of no law which prohibits the Service from taking a position for or against a project when making mitigation recommendations.

Comment: The policy will adversely impact developmental interests.

Response: The goal of the policy is to provide for equal consideration of fish and wildlife conservation while facilitating development.

Congress has clearly stated that "wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development programs" (Pub. L. 85-624, Fish and Wildlife Coordination Act). This advice is further amplified in Senate Report 1981 on the FWCA (84th Congress, 2nd Session (1958)). The Congress recognized that in some instances, the level of dollar benefits to some purposes might have to be diminished "in some slight degree" in order to accomplish the fish and wildlife conservation objectives of the Act.

However, policy issuance should benefit developmental interests. By providing developers with a clear picture of Service mitigation concerns and priorities, the policy will allow developers to anticipate Service mitigation recommendations prior to final decisions on project design and location. By reducing a developer's planning uncertainties, the policy will result in lowered project costs and fewer project delays and conflicts.

Comment: Does the policy present general guidance or minimum required standards? The Service appears to be trying to establish required standards.

Response: The final policy sets out mitigation goals and planning guidance to guide the development of Service mitigation recommendations. It does not require absolute strict adherence to a required standard. Changes have been made to reflect this.

Comment: No mention is made of the State role in mitigation planning to assure a compatible approach. The States' authorities and decisionmaking prerogatives with respect to fish and wildlife resources should be denoted and the States' roles in mitigation should be emphasized further.

Response: A compatible approach is desirable. We have included appropriate changes. However, the policy is solely for Service personnel. There is no intent to infringe on the States' prerogatives.

Comment: The policy should require full public disclosure of Service mitigation analyses, determinations, and recommendations.

Response: We agree that full disclosure of Service analyses, determinations and recommendations during the mitigation process would serve the public interest. All public documents associated with Service recommendations for mitigation on specific land and water developments are available for review in Ecological Services field offices. No change in the policy is necessary.

Comment: The Service should specifically address the acid rain problem in its policy. In particular, the policy should address the impact of Federal policies and programs that support power plant conversions to coal.

Response: The Service currently reviews such Federal actions under NEPA, since these policies and programs are likely to require an EIS. Because acid rain has been highlighted as an Important Resource Problem (IRP) by the Service, environmental analyses which do not adequately address acid rain problems will receive particular attention by Service reviewers. Our comments will be technically reinforced by Service research already being conducted in this area. Since the policy already covers this issue, no change is necessary.

Comment: Could the mitigation policy call for a recommendation as extreme as reflooding of the Mississippi River Valley?

Response: The mitigation policy would not lead to so extreme a recommendation because it does not apply to development actions completed prior to enactment of Service authorities or exempted by those authorities. In those situations where the policy does apply, there will be no recommendations for mitigation over and above the level of impacts associated with a project. This policy acts to minimize impacts of projects, not reverse them.

Comment: Which agency enforces this policy and what power does it have?

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
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LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

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Comment: Which agency enforces this policy and what power does it have?

Response: This is a policy that applies only to Service personnel. It does not predetermine the actions of other Federal agencies, nor the actions of State agencies or developers. Although the policy statement is not judicially enforceable, the Service will administer the policy by monitoring the mitigation recommendations made by its own personnel.

Comment: Too often land acquired for mitigation does not provide the spectrum of resource values previously available because the managing agency's philosophy prevents it from managing the land for a mix of goals.

Response: Lands acquired for mitigation purposes must provide the specific mitigation benefits for which they were intended. Secondary land uses, such as provision of timber, oil and gas exploration, or recreational benefits, should be attempted where these uses are compatible with the mitigation lands' primary purpose. This concept has been added to the policy.

SPECIFIC COMMENTS ON THE MITIGATION POLICY

(These comments are keyed to sections of the proposed policy.)

I. Purpose

Comment: Why is this policy apparently unconcerned with flora?

Response: Mitigating for fish and wildlife losses necessarily means dealing with the plant communities on which all animal life indirectly depends. When habitat is preserved, it is the plant communities that are the vast bulk of the living material of that habitat.

Plants *per se* are addressed by other authorities of the Service which are not within the scope of this policy, such as the Endangered Species Act and associated regulations.

II. Authority

No significant comments.

III. Scope

Comment: How does the policy affect projects already completed or under construction?

Response: Appropriate changes in the Scope section have been made to clarify policy coverage with regard to completed projects or projects under construction.

Comment: Since Federal permit renewals will result in no new effects on the environment, they should be exempt from the policy.

Response: The permit or license renewal process provides an opportunity to re-evaluate the project. Depending on new scientific information concerning impacts, the adequacy of past developer mitigation efforts, or new authorities, new mitigation recommendations may be necessary.

Not infrequently, permit or license holders use the renewal process as a convenient occasion to seek changes in their permits. Any changes in permit or license holders' activities have to be evaluated to determine whether or not they necessitate new mitigation recommendations.

This policy, therefore, will be used by the Service in permit or license renewal proceedings, keeping in mind that Service recommendations are advisory to action agencies. Appropriate changes were made in the policy to reflect this position.

Comment: Does this policy apply to man-induced wetlands?

Response: Where the Service has the authority and responsibility to recommend mitigation for these habitats, the tenets of the policy shall apply.

Comment: There is a need for a mechanism for evaluating enhancement and a means to differentiate it from mitigation.

Response: Although enhancement is an important concern of the Service, the Service mitigation policy should not serve as the primary vehicle for discussing enhancement. The final policy does differentiate between enhancement and mitigation recommendations by defining enhancement to include measures which would improve fish and wildlife resources beyond that which would exist without the project and which cannot be used to satisfy the appropriate mitigation planning goal. As for evaluating enhancement, it would appear likely that many of the procedures that can be used to evaluate mitigation can be used to evaluate enhancement.

Comment: What is the basis for the policy position that enhancement cannot occur until all losses are compensated? There is no legislative history for this.

Response: Unfortunately, the term "enhancement" suffers from wide differences in semantic usage. The proposed policy used the term to be synonymous with improvements beyond the achievement of full mitigation. This strict interpretation appeared to spark controversy.

The final policy incorporates a different usage of the term. Enhancement is used to describe measures not necessary to accomplish mitigation purposes.

Comment: The policy should credit towards mitigation goals those habitat value increases associated with areas of the habitat which are enhanced by the project. Habitat value should be computed for enhancement activities, and the inclusion of habitat enhancement factors would provide for a more accurate estimate of the project's impact on the environment.

Response: Use of the term "habitat enhancement" to describe development or improvement efforts is confused by this comment. The mitigation policy does not cover enhancement as we have described it. However, where habitat improvement or development caused by a project will result in habitat value increases, it may be considered as mitigation when consistent with the resource category designation criteria and the appropriate mitigation planning goal.

Comment: There should be a clear statement that all opportunities for enhancement of fish and wildlife resources be thoroughly considered and included in project plans to the extent feasible.

Response: We agree. Appropriate changes were made.

IV. Definition of Mitigation

Comment: Some commentors indicated concern over the definition of mitigation as used in the policy. Specific concern was expressed that those aspects of project planning that include avoidance or actions to minimize impacts should be considered good project planning and that mitigation should be confined solely to actions to compensate for resource losses.

Response: The Service agrees that avoidance or actions to minimize impacts should be part of the early design of projects and not just an afterthought. Some consider mitigation to be a separate and distinct process that occurs after project planning has been completed. The legally binding definition of mitigation as used in the regulations to implement the National Environmental Policy Act (NEPA) can have the effect of altering this notion through incorporation of all those actions that can lessen project impacts throughout the planning process.

The policy has been modified to more clearly state that the Service supports and encourages incorporation of features that will reduce adverse impacts on fish and wildlife resources as part of early planning and project design in order to avoid delays or conflicts. But without the emphasis on avoidance and minimization provided by the NEPA regulations' definition, there would be little incentive for development agencies to incorporate such features. The Service, therefore, supports and adopts that definition.

V. Mitigation Policy of the U.S. Fish and Wildlife Service

Comment: A number of documents are referred to in the draft policy. They are essential to the functioning of the policy and should be published as an appendix and otherwise made available for public comment, including public hearings.

Response: The preamble to the proposed policy clearly indicated that the policy was designed to stand on its own. The referenced documents are not essential to the functioning of the policy. For instance, even though Service field personnel will rely basically on the *Habitat Evaluation Procedures* in conducting project analyses, the policy indicates that other methods can be used where appropriate and available. The concept of habitat value has been recognized throughout the history of fish and wildlife management. It is not new.

Regardless of the fact that the policy stands on its own, the referenced documents have undergone varying degrees of public scrutiny independent of the mitigation policy. For instance, a notice of availability and request for public comment was published in the **Federal Register** for the Service Management Plan and Program Management Document on September 29, 1980 (45 FR 64271–64272). A habitat-based evaluation methodology has been under active development in the Service since 1973. The first document officially called the *Habitat Evaluation Procedures* was published in 1976 with the most recent revision in 1980. During this 7 year period, the Nation's top wildlife biologists have been consulted, both within the government and outside. The procedures have been presented at numerous public conferences and have been the subject of intense scrutiny.

Finally, the referenced documents were made available to reviewers. Over 75 requests were made and immediately filled to allow commentors the full benefit of this information in preparing comments, including the group providing this comment. Minor changes were made in the policy to more clearly indicate that the policy can stand on its own.

A. General Principles

Comment: Pursued to its logical conclusion, the concept of fish and wildlife as public trust resources could lead to serious restrictions on the use and management of private lands.

Response: When the concept of personal property rights is exercised in such a way as to jeopardize the interests of the public in fish and wildlife resources on public or private lands, the government may use its authorities to see that any damage to those interests is prevented or mitigated.

The Service does and will attempt to fulfill its duties within its authorities and in a reasonable manner. It is certainly cognizant of the fact that pursuing any concept to its logical extreme may lead to unreasonableness, and will continue to strive to prevent this from happening in its mitigation activities.

Comment: What does "equal consideration" of wildlife conservation mean within the context of the Fish and Wildlife Coordination Act and this mitigation policy?

Response: "Equal consideration" was not defined in the Act or this policy, and has no particular meaning in the context of this policy. This policy only covers Service recommendations, not action agency requirements.

Comment: The proposed Service policy now absolutely precludes support for non-water dependent projects within or affecting waters of the United States. This should be modified to conform to the requirements of Federal regulatory agencies such as the Army Corps of Engineers (COE) and the Environmental Protection Agency (EPA).

Response: The Service policy clearly does not exercise veto power over development actions. Moreover, the Service will execute its responsibilities fully within the context of existing laws and regulations governing environmental reviews. However, the Service feels that wetlands and shallow water habitats should not be subjected to *needless* development because of the public values of these areas. The Service policy statement does not include water dependency as the "sole" criterion for its recommendations. Other factors, including the likelihood of a significant loss, are considered prior to a Service recommendation for support of a project or the "no project" alternative.

The provisions of the policy have been modified to make such recommendations discretionary.

Comment: Congress, not the Service, is the entity that has the authority to require and fund compensation for Federal projects.

Response: We agree. The policy has been modified.

Comment: Mitigation should not be required for an indefinite period of time.

Response: Mitigation is appropriate for the entire time period that habitat losses persist, which includes the life of the project and as long afterwards as the impacts of the project continue to exist. The policy reflects this position.

Comment: Under "General Principles," the policy should seek and endorse novel or imaginative approaches to mitigation.

Response: The Service fully supports development of novel and imaginative approaches that mitigate losses of fish and wildlife, their habitat, and uses thereof, and has been in the forefront of such development. No change is necessary.

Comment: An Indian tribe strongly supports the Department of the Interior's recognition of the role of Indian tribal governments in mitigation planning.

Response: Our national heritage and, in some cases, the livelihood of Indian tribes, can be directly linked with the conservation and use of fish and wildlife resources. Therefore, the U.S. Fish and Wildlife Service will continue to recognize and support Indian tribal governments' efforts to mitigate impacts on these resources.

B. U.S. Fish and Wildlife Service Mitigation Goals by Resource Category

Comment: The mitigation goals for the resource categories were characterized as: reasonable, too strict, or not strict enough.

Response: As was explained in the preamble to the draft policy, the resource categories and their mitigation goals were abstracted from an analysis of actual field recommendations. The designation criteria for the resource categories (replaceability, scarcity, and value for evaluation species) are the basic decision factors used by Service personnel to assess relative mitigation needs. The mitigation goals represent reasonable mitigation expectations for projects, viewed in the light of our two-faceted goal—(1) to conserve, protect and enhance fish and wildlife and their habitats, and (2) to facilitate balanced development of our Nation's natural resources.

Numerous comments were received commending us on the balanced approach embodied in this policy. Since its tenets derive from field recommendations and comments, the credit belongs entirely to our field staff.

Some commentors criticized the mitigation goals. One group felt that one or several of the mitigation goals were too strict. These commentors objected to what they considered to be unreasonably high goals for fish and wildlife mitigation. In contrast to this first group, another set of commentors felt that the goals were not strict enough, and called attention to our legislative responsibility to seek protection for all fish and wildlife resources.

Our response is that the mitigation goals represent the best professional judgment and cumulative experience of Service field supervisors in developing mitigation proposals that would satisfy our legislative mandates, operate under time and money constraints, and assist in maximizing overall social well-being. The basic concept, therefore, is unchanged in the final policy, although minor changes were made to improve understanding based on the comments.

Comment: Rather than rely on strict inflexible mitigation goals, the Service should use "tradeoff" evaluation procedures in developing mitigation proposals.

Response: It is the responsibility of the Federal action agency to use tradeoff evaluation procedures consistent with the Water Resources Council's Principles and Standards, where applicable, to select a mitigation alternative that will assist in maximizing overall project benefits. The Fish and Wildlife Coordination Act specifies that "the project plan shall include such justifiable means and measures for wildlife purposes as the *reporting agency* (emphasis added) finds should be adopted to obtain maximum overall project benefits." The role of the Service is to represent those public trust resources under its jurisdiction. The proposed policy outlined a system wherein the highest valued resources would be subject to the most protective mitigation recommendations. Few, if any, commentors have disagreed with this valuation perspective. Therefore, no changes were made.

However, many commentors have questioned the reasonableness of a seemingly uncompromising system that did not appear to allow occasional deviations from these goals.

The system is not rigid. As stated in the Purpose section of the policy, the policy advice will be used as guidance for Service personnel, but variations appropriate to individual circumstances are permitted.

Comment: Numerous commentors raised the issue of the somewhat subjective nature of identifying certain species as "important" for the purposes of the policy. In addition, commentors indicated that such distinctions could lead to mis-classification of habitats in terms of resource categories and that clear criteria were needed. Finally, many commentors felt that the artificial distinction of certain species as "important" was both a violation of the public trust and Service legal authorities.

Response: People perceive some species to be more important than others. In the context of biology and ecology, all species are important, serving a useful purpose within the confines of their biological niche. The mitigation policy must address *both* the needs and desires of human society *and* the ecosystem perspective. This is a difficult task. But human decisions concerning fish and wildlife resources in the face of a development action require judgment about the values of what will be lost and the need to avoid or minimize and compensate for loss of such values.

The specific criteria for such determinations are also exceedingly difficult to frame in a National policy context. The importance of a species to society depends on a complex, changing mix of factors. The importance of a species within an ecosystem is also subject to many dynamic factors. But human decisions about the level and type of mitigation necessary for development actions must be made in the absence of perfect information concerning these factors. In addition, the Service biologist reviewing project impacts has severe constraints on the number of species and ecosystem linkages that can be analyzed given funding, personnel and time limitations. Somehow, choices must be made.

We have deleted the term "important species" from the policy and replaced it with a more precise term, "evaluation species." The criteria for selection of evaluation species still includes those species of high resource value to humans or that represent a broader ecological perspective of an area. Other changes have been made related to the determination of resource categories to allow for additional public input and resource agency coordination into such determinations, where appropriate.

The effect of this change is not intended and shall not be interpreted to broaden the scope or extent of application of this policy. But it does remove the implication that species can be ranked against each other in terms of their overall importance to society, which many considered quite beyond the capability of human beings.

Comment: The wording of the policy should clearly indicate that species selected for analysis should only be those demonstrated to actually utilize an area.

Response: We agree, except for situations where fish and wildlife restoration or improvement plans have been approved by State or Federal resource agencies. In that case the analysis will include species identified in such plans. Appropriate clarification has been added to the definition of evaluation species.

Comment: The proper focus of the policy should be the ecosystem rather than particular species.

Response: Aside from the very real technical problems of applying a complex concept such as the ecosystem to mitigation planning, the authorities underlying this policy deal with fish and wildlife and their habitat, rather than ecosystems.

Ecosystems are addressed under this policy in two ways. First, one criterion in the selection of an evaluation species is the biological importance of the species to the functioning of its ecosystem. Secondly, when habitat loss is mitigated, the part of the ecosystem comprising that habitat is itself protected. No changes have been made.

Comment: Recreational use losses may at times have to be directly mitigated. The goal statements should reflect this need.

Response: We agree. Appropriate changes were made.

Comment: In addition to assessing conditions of scarcity from a biogeographical viewpoint, i.e., ecoregions, the policy should also use geopolitical subdivisions, e.g., state boundaries.

Response: As a Federal agency, the Service perceives its major responsibility to be to protect those fish and wildlife and their habitat that are valuable and scarce on a national level, whether or not they transcend state boundaries. However, should State resource agencies wish to outline relative scarcity on a more local basis, Service personnel would certainly assist, whenever practicable. This point has been added to the policy.

Comment: The policy should scale the relative need to achieve a particular mitigation goal to the degree a particular habitat will be impacted. For example, if a half-acre of important habitat is affected by a project and it is part of a one-acre plot, this circumstance should lead to a mitigation recommendation different from the situation where the same half-acre is part of a ten thousand acre area. As drafted, the policy does not reflect the differences in these situations.

Response: The Purpose section of the policy states that it will be used as guidance for Service personnel, but variations appropriate to individual circumstances will be permitted. The relative need to achieve a particular mitigation goal depends primarily on the perceived value of the habitat, its scarcity, and the replaceability of the threatened habitat. Other factors, such as scaling considerations, can combine to modify this general Service perspective on what constitutes appropriate mitigation.

Comment: The resource categories and mitigation goals are general, lack definition, and provide no guidance on habitat value. These categories are all subject to interpretation by the Service field personnel.

Response: It would be counterproductive, if not impossible, for a national policy to be worded as precisely as the commentor suggests and still be implemented in a reasonable manner under numerous and diverse local circumstances. Words used to describe resource categories and mitigation goals do have generally understood meanings. It is essential that field personnel be allowed to exercise professional judgment in applying resource categories and mitigation goals to specific activities. However, numerous clarifying changes were made based on the comments to increase comprehension and understanding.

Comment: It is essential to other agencies' review to know what general types of habitat will be most important in the U.S. Fish and Wildlife Service mitigation policy. At a minimum, some examples of the types of habitat within each category should be given.

Response: The final policy does give guidance on areas that will be generally considered for Resource Category 1 or 2. Providing examples for all resource categories could be misleading since the same type of habitat may fall into several different resource categories, depending on, among other factors, its relative scarcity and quality from one locale to another across the nation.

On the other hand, field professionals are generally familiar with the quality and abundance of a given type of habitat that is in their area, so it is preferable not to burden them with potentially inappropriate guidelines of this nature.

Comment: The policy should clearly distinguish between upland habitats and the more valuable wetland habitats.

Response: In some cases, upland habitats may be determined to have resource values equal to or greater than wetland habitats, so a policy that solely favored one habitat type over the other would not be in the best public interest. However, the policy has been changed to indicate that certain habitats within Service-identified Important Resource Problems (IRPs) and special aquatic sites should be given special consideration as Resource Category 1 or 2. The IRPs contain a predominance of wetland coastal areas.

Comment: If you build something in a habitat, it just changes it to another habitat that some other animal or fish lives in—including the human being, although the Service does not seem to appreciate that. For example, if you build a highway, it is bad for dogs, rabbits, opossums and field rats and such that get run over by cars and trucks, but it is good for crows and buzzards that eat dead meat.

Response: The Service has not come across many instances where crows and buzzards could be considered scarce, but when such a circumstance can be documented and verified, the Service will certainly try to protect and enhance valuable highway habitat.

- *Resource Category 1*

Comment: A literal interpretation of the Resource Category 1 mitigation goal would require absolutely no habitat loss—not even a nature trail. Resource Category 1 should be deleted.

Response: Not all environmental changes are adverse to the habitat of a fish and wildlife resource. If a nature trail resulted in an insignificant impact on habitat value that was determined not to be adverse, then the Service would not recommend against it. The policy has been clarified to reflect this point.

Comment: Endangered and threatened species should be included as part of Resource Category 1.

Response: It would be inappropriate to expand the scope of the Mitigation Policy to include threatened and endangered species. The treatment of these species is addressed in an extensive body of complex and detailed legislation and regulation. The Congress has legislated very specific and precise law with regard to threatened and endangered species. Inclusion of these species under this policy would only confuse the issue and compound the difficulties involved in implementation of the Endangered Species Act and its associated regulations. Other reasons are discussed in the scope section of the final policy.

Comment: For all practical purposes, Resource Categories 1 and 2 adopt a "no growth" policy.

Response: The U.S. Fish and Wildlife Service is not advocating a "no growth" mitigation policy. The means and measures to achieve mitigation for Resource Categories 1 and 2 are designed to provide some flexibility so that limited growth can occur in an environmentally prudent manner. The policy reflects the national consensus that some habitats are of exceptional public value and should be carefully conserved, as evidenced in the Wild and Scenic Rivers Act (Pub. L. 90-542), the Wilderness Act (Pub. L. 88-577), and the National Trails System Act (Pub. L. 94-527).

- *Resource Category 2*

Comment: It is ill-advised to support in-kind replacement involving trading habitat for lesser value habitat which is then improved to support the species affected by the project. It takes too long, and in the meantime, populations supported by the habitat on the project site are lost.

Response: If the period required for improving the replacement habitat to the appropriate condition was exceedingly long, this may be one indication that the habitat at risk was unique or irreplaceable and actually belonged in Resource Category 1. In that case in-kind replacement through improvement of lesser quality habitat would be an inappropriate mitigation recommendation. Also, additional measures aimed at population restoration could be recommended to restock the area, provided suitable habitat was available to support the stocked species. No changes were made.

Comment: One commenter was perturbed by an apparently rigid insistence by the policy of in-kind replacement of lost habitat. The commentor pointed out that there could be occasions in which in-kind habitat was not available to a project sponsor.

Response: The policy guideline for Resource Category 2 includes an exception when "* * * in-kind replacement is not physically or biologically attainable". No change was necessary.

Comment: The policy appears to insist upon "acre-for-acre" replacement of in-kind habitat.

Response: The policy does not insist on "acre-for-acre" replacement of in-kind habitat. The mitigation planning goals involving in-kind replacement specifically ask for replacement of in-kind habitat *value*. This point has been further clarified in the definitions section, throughout the policy, and in the policy preamble.

- *Resource Category 3*

Comment: The mitigation goal for Resource Category 3 is not authorized by law and will be difficult to implement due to professional disagreement on satisfactory achievement.

Response: Under the Fish and Wildlife Coordination Act, the Service has the responsibility to recommend compensation for the loss of fish and wildlife resources. The Act does not restrict compensation to in-kind compensation. By recommending out-of-kind compensation under certain circumstances, the Service increases the range of options that developers may use to mitigate project impacts to include development and improvement of marginal resources different from those lost. However, modifications have been made in the policy to indicate that in-kind replacement is preferred for Resource Category 3.

Comment: The mitigation goal for Resource Category 3 should emphasize that in-kind habitat value replacement is preferable to out-of-kind replacement.

Response: We agree. This point has been brought out in the final policy statement.

Comment: Although out-of-kind replacement is acceptable for Resource Category 3 losses and, under certain circumstances, may be accepted for Resource Category 2 losses, the policy should advise against replacement of rare habitat types for more common habitat types.

Response: We agree with the commentor's point and expect that Service field personnel will recommend mitigation alternatives that incorporate this concept, to the extent practicable. The Service is entirely in favor of preserving and/or promoting habitat diversity. No changes were necessary.

• *Resource Categories 4 and 5*

Comment: Compensation should be included as a means for satisfying the mitigation goal for Resource Category 4.

Response: Appropriate language changes have been made to allow for such recommendations.

Comment: Habitats encompassed by Resource Categories 4 and 5 are the only areas wherein significant increases in fish and wildlife can be realized through habitat improvement. Yet, the mitigation goals for these categories allow continual loss of these areas which possess great potential for improvements in carrying capacity.

Response: The Service appreciates the significance of areas with relatively low existing habitat values with respect to their potential for carrying capacity improvements. In fact, the Service may recommend improvement of these areas' habitat values to mitigate for unavoidable losses in Resource Categories 2 and 3. In addition, where these areas are included in a project planning area and are not appropriate for mitigation efforts, the Service will recommend that all opportunities for enhancement of these areas be thoroughly considered and included in project plans, where practicable.

We have amended the policy to include the above guidance.

Comment: Resource Category 5 is confusing and unnecessary. All habitat has some value, no matter how low. It should be redefined or deleted.

Response: We agree. This resource category has been deleted from the final policy.

C. Mitigation Planning Procedures

1. *Mitigation Goals*

Comment: Developers, Federal resource agencies, and the public should participate with the Service and State agencies in making Resource Category determinations and in developing mitigation proposals.

Response: Developers, as well as other members of the public, may provide information that will assist the Service in making Resource Category determinations. This opportunity has been noted in the final policy statement. Moreover, where these parties' inputs will significantly aid in development of mitigation proposals that will adequately satisfy mitigation planning goals, the Service will welcome their input.

Comment: It is hoped that reclassification of habitats in Resource Category 3 to Resource Categories 2 or 1 can be readily employed if and when certain habitats become more scarce.

Response: Resource Category determinations are made on the basis of conditions likely to occur without the project. If those conditions later change, the Resource Category of a given habitat can be redetermined.

However, once a mitigation plan in connection with a given project has been agreed upon, the U.S. Fish and Wildlife Service will not provide new or additional recommendations except under limited circumstances as outlined in the policy under the scope section.

2. *Impact Assessment Methods*

Comment: The policy does not appear to recognize that development activities may also show positive environmental effects. For example, cleared spaces beneath power lines can provide browsing areas for wildlife. Such positive effects should be factored into the mitigation assessment process.

Response: We agree. This point has been included in the final policy statement. The final policy further indicates that the Service and other State and Federal resource agencies shall make the determination of whether a biological change constitutes a beneficial or adverse impact. However, when determining mitigation needs for a planning area, the Service will utilize these policy guidelines to determine whether these positive effects can be applied towards mitigation.

Comment: The draft policy indicates "no net loss" as a goal for certain Resource Categories but it is unclear in defining the time period allowed to restore the land to its original value as in the case of strip mining operations. Maintenance of "no net loss" throughout the life of a long-term operation is not possible.

Response: The policy states that the net biological impact of a specific project proposal is the difference in predicted habitat value between the future with the action and the future without the action. This is based on the procedures established by the Water Resources Council's Principles and Standards. The future with the project determination includes consideration of losses during the life of the project. Under the policy, if the disturbed habitat is of sufficient value for evaluation species to warrant a Resource Category 2 or 3 level determination, the Service will provide recommendations for "no net loss" over the life of the project. The ability of the project sponsor to achieve this goal depends on many factors that cannot be predicted in advance. In many cases, it will be possible to achieve this goal. No change was necessary.

Comment: The with and without analyses should make allowances for human activities and natural species successions which can reasonably be expected to take place in the project area.

Response: We agree. Appropriate changes have been made in this policy.

Comment: Many commentors disagreed with the emphasis placed on the *Habitat Evaluation Procedures* (HEP) within the Service policy statement. Some commentors felt it should be de-emphasized, whereas others felt it deserved further emphasis.

Response: Although references to the more technical aspects of HEP have been deleted, the methodology itself remains one of the Service's more important impact assessment tools. The policy does not recommend exclusive use of HEP, since time or resource contraints may, in some cases, show alternative methods to be more practical. Where HEP habitat value assessments do not fully capture important biological characteristics within a planning area, Service personnel will use supplemental data, methodologies, and/or professional judgment to develop appropriate mitigation proposals.

Comment: What are the "other habitat evaluation systems" alluded to in the policy's section on impact assessment methods? This reference is very vague.

Response: Other systems can include the Habitat Evaluation System (HES) developed by the Department of the Army, and the Instream Flow Incremental Methodology (IFIM) of the U.S. Fish and Wildlife Service. Additional systems are referenced by the Water Resources Council in a draft document entitled, "Analysis of

Wetland Evaluation Procedures" and other publications. This information is not appropriate for inclusion into the policy so no change was made.

Comment: If other methodologies are found to be more appropriate for use than the Instream Flow Incremental Methodology (IFIM) for measuring flow impacts, they should be used.

Response: We agree. The final policy does state, however, that consideration should be given to the use of the IFIM.

Comment: Hopefully, this policy will stop the piecemeal destruction of valuable habitat, especially in areas like the Florida Keys where insidious lot-by-lot development continues in low wetland sites with the concurrence of the U.S. Fish and Wildlife Service.

Response: The Service does not concur with piecemeal development where significant resource losses will occur. Cumulative impacts are addressed by this policy. The Service is sensitive to this loss of habitat and will seek mitigation consistent with this policy. No change was necessary.

Comment: Population information should be included as an additional factor in determining mitigation requirements.

Response: We agree. Although population mitigation was an implicit part of the proposed policy, further language clarifying this point has been added to the final policy statement.

Comment: Professional judgment should be used as an alternative method for assessing project impacts.

Response: We agree that this is a valuable method that has been in use for many years. It is difficult to improve on informed and considered scientific judgment by an expert. The Service will continue to rely heavily on this approach. The policy was changed to reflect this emphasis.

3. *Mitigation Recommendations*

Comment: Service recommendations should be timely.

Response: The proposed and final policy specifically require Service personnel to present mitigation recommendations "* * * at the earliest possible stage of project planning to assure maximum consideration." This point has been echoed throughout Service management documents. Service personnel can generally provide timely guidance provided developers make a point of notifying them of proposed projects still in the planning stage and provided Federal action agencies supply sufficient transfer funding with which to conduct environmental investigations. Under Section 2(e) of the Fish and Wildlife Coordination Act, Federal action agencies are authorized to transfer funds to the Service "* * * as may be necessary to conduct all or part of the investigations required to carry out the purposes of * * * (Section 2 of the Act)." The Service uses these transfer funds to conduct project-specific investigations.

Comment: Requiring field biologists to consider cost-effectiveness in providing mitigation recommendations is beyond their capability and may conflict with the lead agencies' role as the determiner of overall public interest. Habitat protection should be a higher priority than cost-effectiveness.

Response: The proposed policy did not require a cost-effectiveness analysis by Service biologists in a formal sense. We fully agree that Service personnel must perceive their responsibility to be analysis and recommendations based on the biological aspects of project proposals. There is no intent to require Service biologists to do a formal economic analysis for which they are not trained nor for which there is clear legislative direction. However, the Service has a responsibility to the public to give consideration to cost while recommending ways to conserve fish and wildlife. The policy has been changed to reflect this need for consideration of other factors.

Comment: The Federal action agency should have the option of non-Service expertise to develop mitigation measures in those instances where the Service cannot meet lead agency program requirements.

Response: Although the Service cannot prevent other agencies from utilizing biological expertise from non-Federal sources to develop mitigation plans, the Fish and Wildlife Coordination Act specifically authorizes the Secretary of the Interior to prepare a report and recommendations on the fish and wildlife aspects of projects, including mitigation. This report and recommendations are to receive "full consideration" by the development agency. If the Federal action agency involves the Service early and provides sufficient transfer funds, then the Service should be able to meet their needs. No change in the policy was necessary.

Comment: Several mitigation proposals should be prepared for each alternative structural or non-structural plan.

Response: The Service is willing to prepare multiple proposals provided funds and time are available.

Comment: Some commentors felt that concurrent and proportionate funding of mitigation may not always lead to optimal mitigation and should not be a rigid requirement. Other commentors strongly supported concurrent and proportionate funding.

Response: The Water Resources Council's Principles and Standards require "* * * *at least* concurrent and proportionate implementation with other major project features, except where such concurrent and proportionate mitigation is physically impossible" (emphasis added).

We agree with the Council, and endorse expenditure of funds at an earlier stage of project planning when this will lead to more effective mitigation. Appropriate changes to the policy on this matter have been made.

Comment: Mitigation costs should include the cost of managing the acquired land for the life of the project, and the value of present and future timber and crops on acquired land. In addition, an environmental benefit/cost analysis should be developed for each project, and Congress should not authorize a project unless the project plan includes the proposed mitigation program and all its costs, including the cost of lost timber productivity and other resources.

Response: Costing of projects is determined by the Water Resource Council's Principles and Standards and is therefore beyond the jurisdiction of this policy. We point out that Service policy does not preclude timber harvest or other resource recovery operations on mitigation lands when the activity is compatible with fish and wildlife management objectives.

Comment: The Service mitigation policy should more clearly note that fee-simple land acquisition should be a measure of last resort.

Response: The policy statement has undergone further modification to more clearly stress the conditions when land acquisition is to be recommended by Service personnel. In the future, the Service will place far greater emphasis on developing mitigation recommendations that avoid, minimize, or rectify impacts in order to reduce the need for compensation lands. Amplification of this point may be seen in the section on mitigation planning procedures.

Comment: If some interest in land must be acquired, areas of marginal productivity should be considered first. Such underdeveloped land would benefit from better management of its productive capacity and respond more vigorously than land already at higher levels of production.

Response: We agree that special consideration should be given to marginal lands, and have changed the policy accordingly.

Comment: Who owns land acquired for mitigation purposes?

Response: Depending on the individual circumstances of the project, land acquired through fee-simple title is usually owned either by the Federal or State government and administered by appropriate Federal or State resource agencies. Where wildlife easements are acquired, the land belongs to the property owner, and the easement right to the Federal or State government.

Comment: The policy should require Service personnel to identify the authority to be used in implementing any mitigation recommendations that are made.

Response: The final policy clearly identifies the legal authorities under which the Service is expected to develop mitigation recommendations. In addition, the policy only applies to Service recommendations and is not an instrument directing legal research in individual circumstances. It would be inappropriate to instruct our personnel to identify the implementing authority for the development agencies which are fully aware of the authorities available to implement Service recommendations. In the case of projects to be authorized by Congress, authorities to implement mitigation can be, and increasingly have been, spelled out.

Comment: The policy neglects to indicate the necessary process if an agency does not agree with Service mitigation recommendations.

Response: This process has already been established for most Federal agencies. If the project planners and the Service field office cannot agree on a modified or substitute proposal for mitigation, the matter often is referred upwards to the next highest level. Higher management levels are then generally able to resolve the issue quickly, although the Federal action agency has the final say. No change was necessary.

Comment: Mitigation recommendations should ensure that habitats which are preserved are adequate in size and contiguous to ensure species survival and ecosystem functioning.

Response: We agree. This point has not, however, been added to the policy since it is standard operating procedure at the field level.

Comment: Improvement of public use prospects within a project area should not be considered mitigation for habitat value losses. Development of public access is legitimate mitigation only when public uses are lost as a result of project action.

Response: We agree. Construction of public access facilities does not replace habitat lost or degraded and may even reduce wildlife habitat and invite degradation by making an area more accessible to more people. Construction of public use facilities may be in the public interest but should not be disguised as mitigation for loss or degradation of wildlife habitat. This point has been added to the policy.

4. *Follow-up*

Comment: The Service should initiate post-project evaluation studies, as well as encourage, support, and participate in these studies.

Response: We agree and will do so within the constraints of time, personnel and cost. The Service will initiate additional follow-up studies when funds are provided by the Federal action agency. The policy has been changed to reflect this.

Comment: Follow-up studies must be designed so as to separate the effects on fish and wildlife populations of implementing mitigation recommendations from other causes of changes in species numbers. This has not been the case in past studies.

Response: We agree in principle, but point out that this is a very difficult task technically, and that the conclusions in this regard rarely withstand vigorous analysis.

Nonetheless, distinguishing the true causes of population changes should be one of the goals of the follow-up study.

Comment: The policy should indicate what actions would occur if post-project evaluation shows mitigation recommendations are not being achieved as agreed to by the developer.

Response: We agree. The policy now includes provisions instructing Service personnel to recommend corrective action in such situations.

Appendix A

No significant comments.

Appendix B

Comment: Why not include more intensive management of remaining habitat as a way of reducing net habitat loss?

Response: We agree, and have modified the policy accordingly in the Means and Measures section, which has since been integrated into the body of the final policy.

The section clearly places priority on increased habitat management as a means of replacing habitat losses, and additionally stresses use of existing public lands to accomplish these ends.

Comment: A mitigation recommendation of "No project" is not logical or valid as a mitigation measure.

Response: The Council on Environmental Quality's definition of mitigation, which has been adopted in this policy, clearly states that mitigation includes "... avoiding the impact altogether by not taking a certain action or parts of an action. ..." Obviously, a mitigation recommendation of "No project" falls under this subset of the definition, since a project's impact can be avoided *altogether* by a decision not to construct a project.

Appendix C

Comment: The definition of the word "practicable" should be amended to denote that the burden of identifying alternative mitigation measures and of conducting a searching inquiry into their practicability rests with the Service as well as the Federal action agency.

Response: The policy indicates that the Service will strive to provide mitigation recommendations that represent the best judgment of the Service on the most effective means and measures to achieve the mitigation goal, including consideration of cost.

Comment: A definition for "developments" (as used in Section V.A., "General Principles") should be provided in Appendix C.

Response: "Development" is a general-purpose term encompassing those activities falling under the scope of Service mitigation authorities cited within this policy. For example, if timber *harvesting activities* require preparation of an EIS, or involves waters of the U.S. and requires the issuance of a Federal permit or license, the Service would provide mitigation recommendations consistent with the policy.

NATIONAL ENVIRONMENTAL POLICY ACT REQUIREMENTS

The Service has prepared an Environmental Assessment of this final policy. Based on an analysis of the Environmental Assessment, the Director of the U.S. Fish and Wildlife Service has concluded that the final action is not a major Federal action which would significantly affect the quality of the human environment within the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969 (42 U.S.C. 4321–4347). Thus the policy does not require an Environmental Impact Statement (EIS).

The Environmental Assessment and Finding of No Significant Impact will be furnished upon request.

REGULATORY ANALYSIS

This policy statement has been issued in conformity with the Department of the Interior's rulemaking requirements, which apply to actions meeting the broad definition of a rule set forth in the Administrative Procedures Act, 5 U.S.C.

551(4) and 43 CFR Part 14.2(e) (1980). This statement is not intended to be judicially enforceable. It will not be codified. It does not create private rights. It only guides internal Service administration and is not to be inflexibly applied by Service personnel. The Department had previously determined that the proposed policy was not a significant rule and did not require a regulatory analysis under Executive Order 12044 and 43 Part 14. No significant changes were made in the final policy that required a new determination.

ACKNOWLEDGEMENTS

The primary author of this final policy is John Christian, Leader, Policy Group—Environment, U.S. Fish and Wildlife Service, (202) 343-7151. Primary support for policy development was provided by policy analysts Nancy Chu, Scott Cameron, and Peter Ciborowski; and Ecological Services Washington Office and field personnel. Manuscript preparation was accomplished by Roberta Hissey, Karen Baker, Carol Prescott, and Jinethel Baynes.

Accordingly, the mitigation policy of the U.S. Fish and Wildlife Service is set forth as follows:

U.S. FISH AND WILDLIFE SERVICE MITIGATION POLICY

I. PURPOSE

This document establishes policy for U.S. Fish and Wildlife Service recommendations on mitigating the adverse impacts of land and water developments on fish, wildlife, their habitats, and uses thereof. It will help to assure consistent and effective recommendations by outlining policy for the levels of mitigation needed and the various methods for accomplishing mitigation. It will allow Federal action agencies and private developers to anticipate Service recommendations and plan for mitigation measures early, thus avoiding delays and assuring equal consideration of fish and wildlife resources with other project features and purposes. This policy provides guidance for Service personnel but variations appropriate to individual circumstances are permitted.

This policy supersedes the December 18, 1974, policy statement entitled "Position Paper of the Fish and Wildlife Service Relative to Losses to Fish and Wildlife Habitat Caused by Federally Planned or Constructed Water Resource Developments" and the Service River Basin Studies Manual Release 2.350 entitled "General Bureau Policy on River Basin Studies."

II. AUTHORITY

This policy is established in accordance with the following major authorities: (See Appendix A for other authorities.)

Fish and Wildlife Act of 1956 (16 U.S.C. 742(a)–754). This Act authorizes the development and distribution of fish and wildlife information to the public, Congress, and the President, and the development of policies and procedures that are necessary and desirable to carry out the laws relating to fish and wildlife including: (1) ". . . take such steps as may be required for the development, advancement, management, conservation, and protection of the fisheries resources;" and (2) ". . . take such steps as may be required for the development, management, advancement, conservation, and protection of wildlife resources through research . . . and other means."

Fish and Wildlife Coordination Act (16 U.S.C. 661–667(e)). This Act authorizes the U.S. Fish and Wildlife Service, National Marine Fisheries Service (NMFS), and State agencies responsible for fish and wildlife resources to investigate all proposed Federal undertakings and non-Federal actions needing a Federal permit or license which would impound, divert, deepen, or otherwise control or modify a stream or other body of water and to make mitigation and enhancement recommendations to the involved Federal agency. "Recommendations . . . shall be as specific as practicable with respect to features recommended for wildlife conservation and development, lands to be utilized or acquired for such purposes, the results expected, and shall describe the damage to wildlife attributable to the project and the measures proposed for mitigating or compensating for these damages." In addition, the Act requires that wildlife conservation be coordinated with other features of water resource development programs.

Determinations under this authority for specific projects located in estuarine areas constitute compliance with the provisions of the Estuary Protection Act. (See Appendix A.)

Watershed Protection and Flood Prevention Act (16 U.S.C. 1001–1009). This Act allows the Secretary of the Interior to make surveys, investigations, and ". . . prepare a report with recommendations concerning the conservation and development of wildlife resources . . ." *on small* watershed projects.

National Environmental Policy Act of 1969 (42 U.S.C. 4321–4347). This Act and its implementing regulations (40 CFR Part 1500–1508) requires that the U.S. Fish and Wildlife Service be notified of all major Federal actions affecting fish and wildlife resources and their views and recommendations solicited. Upon completion of a draft Environmental Impact Statement, the Service is required to review it and make comments and recommendations, as appropriate. In addition, the Act provides that "the Congress authorizes and directs that, to the fullest extent possible . . . all agencies of the Federal Government shall . . . identify and develop methods and procedures . . . which will ensure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations."

III. SCOPE

A. Coverage

This policy applies to all activities of the Service related to the evaluation of impacts of land and water developments and the subsequent recommendations to mitigate those adverse impacts except as specifically excluded below. This includes: (1) investigations and recommendations for all actions requiring a federally issued permit or license that would impact waters of the U.S.; (2) all major Federal actions significantly affecting the quality of the human environment; and (3) other Federal actions for which the Service has legislative authority or executive direction for involvement including, but not limited to: coal, minerals, and outer continental shelf lease sales or Federal approval of State permit programs for the control of discharges of dredged or fill material.

B. Exclusions

This policy does not apply to threatened or endangered species. The requirements for threatened and endangered species are covered in the Endangered Species Act of 1973 and accompanying regulations at 50 CFR Parts 17, 402, and 424. Under Section 7 of the Endangered Species Act, as amended, all Federal agencies shall ensure that activities authorized, funded, or carried out by them are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. Mitigating adverse impacts of a project would not in itself be viewed as satisfactory agency compliance with Section 7. Furthermore, it is clear to the Service that Congress considered the traditional concept of mitigation to be inappropriate for Federal activities impacting listed species or their critical habitat.

This policy does not apply to Service recommendations for Federal projects completed or other projects permitted or licensed prior to enactment of Service authorities (unless indicated otherwise in a specific statute) or specifically exempted by them and not subject to reauthorization or renewal. It also does not apply where mitigation plans have already been agreed to by the Service, except where new activities or changes in current activities would result in new impacts or where new authorities, new scientific information, or developer failure to implement agreed upon recommendations make it necessary. Service personnel involved in land and water development investigations will make a judgment as to the applicability of the policy for mitigation plans under development and not yet agreed upon as of the date of final publication of this policy.

Finally, this policy does not apply to Service recommendations related to the enhancement of fish and wildlife resources. Recommendations for measures which improve fish and wildlife resources beyond that which would exist without the project and which cannot be used to satisfy the appropriate mitigation planning goal should be considered as enhancement measures. The Service strongly supports enhancement of fish and wildlife resources. The Service will recommend that all opportunities for fish and wildlife resource enhancement be thoroughly considered and included in project plans, to the extent practicable.

IV. DEFINITION OF MITIGATION

The President's Council on Environmental Quality defined the term "mitigation" in the National Environmental Policy Act regulations to include: "(a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (e) compensating for the impact by replacing or providing substitute resources or environments." (40 CFR Part 1508.20(a–e)).

The Service supports and adopts this definition of mitigation and considers the specific elements to represent the desirable sequence of steps in the mitigation planning process. (See Appendix B for definitions of other important terms necessary to understand this policy.)

V. MITIGATION POLICY OF THE U.S. FISH AND WILDLIFE SERVICE

The overall goals and objectives of the Service are outlined in the Service Management Plan and an accompanying Important Resource Problems document which describes specific fish and wildlife problems of importance for planning purposes. Goals and objectives for Service activities related to land and water development are contained in the Habitat Preservation Program Management Document. The mitigation policy was designed to stand on its own; however, these documents will be consulted by Service personnel to provide the proper perspective for the Service mitigation policy. They are available upon request from the Director, U.S. Fish and Wildlife Service, Washington, D.C. 20240.

A. General Policy

The mission of the U.S. Fish and Wildlife Service is to:

PROVIDE THE FEDERAL LEADERSHIP TO CONSERVE, PROTECT AND ENHANCE FISH AND WILDLIFE AND THEIR HABITATS FOR THE CONTINUING BENEFIT OF THE PEOPLE.

The goal of Service activities oriented toward land and water development responds to Congressional direction that fish and wildlife resource conservation receive equal consideration and be coordinated with other features of Federal resource development and regulatory programs through effective and harmonious planning, development, maintenance and coordination of fish and wildlife resource conservation and rehabilitation in the United States, its territories and possessions. The goal is to:

CONSERVE, PROTECT AND ENHANCE FISH AND WILDLIFE AND THEIR HABITATS AND FACILITATE BALANCED DEVELOPMENT OF THIS NATION'S NATURAL RESOURCES BY TIMELY AND EFFECTIVE PROVISION OF FISH AND WILDLIFE INFORMATION AND RECOMMENDATIONS.

Fish and wildlife and their habitats are public resources with clear commercial, recreational, social, and ecological value to the Nation. They are conserved and managed for the people by State, Federal and Indian tribal Governments. If land or water developments are proposed which may reduce or eliminate the public benefits that are provided by such natural resources, then State and Federal resource agencies and Indian tribal agencies have a responsibility to recommend means and measures to mitigate such losses. Accordingly:

IN THE INTEREST OF SERVING THE PUBLIC, IT IS THE POLICY OF THE U.S. FISH AND WILDLIFE SERVICE TO SEEK TO MITIGATE LOSSES OF FISH, WILDLIFE, THEIR HABITATS, AND USES THEREOF FROM LAND AND WATER DEVELOPMENTS.

In administering this policy, the Service will strive to provide information and recommendations that fully support the Nation's need for fish and wildlife resource conservation as well as sound economic and social development through balanced multiple use of the Nation's natural resources. The Service will actively seek to facilitate needed development and avoid conflicts and delays through early involvement in land and water development planning activities in advance of proposals for specific projects or during the early planning and design stage of specific projects.

This should include early identification of resource areas containing high and low habitat values for important species and the development of ecological design information that outlines specific practicable means and measures for avoiding or minimizing impacts. The former can be used by developers to site projects in the least valuable areas. This could possibly lower total project costs to development interests. These actions are part of good planning and are in the best public interest.

The early provision of information to private and public agencies in a form which enables them to avoid or minimize fish and wildlife losses as a part of initial project design is the preferred form of fish and wildlife conservation.

B. U.S. Fish and Wildlife Service Mitigation Planning Goals by Resource Category

The planning goals and guidelines that follow will be used to guide Service recommendations on mitigation of project impacts. Four Resource Categories are used to indicate that the level of mitigation recommended will be consistent with the fish and wildlife resource values involved.

The policy covers impacts to fish and wildlife populations, their habitat and the human uses thereof. However, the primary focus in terms of specific guidance is on recommendations related to habitat value losses. In many cases, compensation of habitat value losses should result in replacement of fish and wildlife populations and human uses. But where it does not, the Service will recommend appropriate additional means and measures.

RESOURCE CATEGORY 1

a. Designation Criteria

Habitat to be impacted is of high value for evaluation species and is unique and irreplaceable on a national basis or in the ecoregion section.

b. Mitigation Goal

No Loss of Existing Habitat Value.

c. Guideline

The Service will recommend that all losses of existing habitat be prevented as these one-of-a-kind areas cannot be replaced. Insignificant changes that do not result in adverse impacts on habitat value may be acceptable provided they will have no significant cumulative impact.

RESOURCE CATEGORY 2

a. Designation Criteria

Habitat to be impacted is of high value for evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion section.

b. Mitigation Goal

No Net Loss of In-Kind Habitat Value.

c. Guideline

The Service will recommend ways to avoid or minimize losses. If losses are likely to occur, then the Service will recommend ways to immediately rectify them or reduce or eliminate them over time. If losses remain likely to occur, then the Service will recommend that those losses be compensated by replacement of the same kind of habitat value so that the total loss of such in-kind habitat value will be eliminated.

Specific ways to achieve this planning goal include: (1) physical modification of replacement habitat to convert it to the same type lost; (2) restoration or rehabilitation of previously altered habitat; (3) increased management of similar replacement habitat so that the in-kind value of the lost habitat is replaced, or (4) a combination of these measures. By replacing habitat value losses with similar habitat values, populations of species associated with that habitat may remain relatively stable in the area over time. This is generally referred to as in-kind replacement.

Exceptions: An exception can be made to this planning goal when: (1) *different habitats and species available* for replacement are determined to be of greater value than those lost, *or* (2) in-kind replacement is not physically or biologically attainable in the ecoregion section. In either case, replacement involving different habitat kinds may be recommended provided that the total value of the habitat lost is recommended for replacement (see the guideline for Category 3 mitigation below).

RESOURCE CATEGORY 3

a. Designation Criteria

Habitat to be impacted is of high to medium value for evaluation species and is relatively abundant on a national basis.

b. Mitigation Goal

No Net Loss of Habitat Value While Minimizing Loss of In-Kind Habitat Value.

c. Guideline

The Service will recommend ways to avoid or minimize losses. If losses are likely to occur, then the Service will recommend ways to immediately rectify them or reduce or eliminate them over time. If losses remain likely to occur, then the Service will recommend that those losses be compensated by replacement of habitat value so that the total loss of habitat value will be eliminated.

It is preferable, in most cases, to recommend ways to replace such habitat value losses in-kind. However, if the Service determines that in-kind replacement is not desirable or possible, then other specific ways to achieve this planning goal include: (1) substituting different kinds of habitats, or (2) increasing management of different replacement habitats so that the value of the lost habitat is replaced. By replacing habitat value losses with different habitats or increasing management of different habitats, populations of species will be different, depending on the ecological attributes of the replacement habitat. This will result in no net loss of total habitat value, but may result in significant differences in fish and wildlife populations. This is generally referred to as out-of-kind replacement.

RESOURCE CATEGORY 4

a. Designation Criteria

Habitat to be impacted is of medium to low value for evaluation species.

b. Mitigation Goal

Minimize Loss of Habitat Value.

c. Guideline

The Service will recommend ways to avoid or minimize losses. If losses are likely to occur, then the Service will recommend ways to immediately rectify them or reduce or eliminate them over time. If losses remain likely to occur, then the Service may make a recommendation for compensation, depending on the significance of the potential loss.

However, because these areas possess relatively low habitat values, they will likely exhibit the greatest potential for significant habitat value improvements. Service personnel will fully investigate these areas' potential for improvement, since they could be used to mitigate Resource Category 2 and 3 losses.

C. Mitigation Planning Policies

1. State-Federal Partnership

a. The U.S. Fish and Wildlife Service will fully coordinate activities with those State agencies responsible for fish and wildlife resources, the National Marine Fisheries Service (NMFS) and the Environmental Protection Agency (EPA) related to the investigation of project proposals and development of mitigation recommendations for resources of concern to the State, NMFS or EPA.

b. Service personnel will place special emphasis on working with State agencies responsible for fish and wildlife resources, NMFS and EPA to develop compatible approaches and to avoid duplication of efforts.

2. Resource Category Determinations

a. The Service will make Resource Category determinations as part of the mitigation planning process. Such determinations will be made early in the planning process and transmitted to the Federal action agency or private developer to aid them in their project planning, to the extent practicable.

b. Resource Category determinations will be made through consultation and coordination with State agencies responsible for fish and wildlife resources and other Federal resource agencies, particularly the National Marine Fisheries Service and the Environmental Protection Agency, whenever resources of concern to those groups are involved. Where other elements of the public, including development groups, have information that can assist in making such determinations, the Service will welcome such information.

c. All Resource Category determinations will contain a technical rationale consistent with the designation criteria. The rationale will: (1) outline the reasons why the evaluation species were selected; (2) discuss the value of the habitat to the evaluation species; and (3) discuss and contrast the relative scarcity of the fish and wildlife resource on a national and ecoregion section basis.

Note.—If the State agency responsible for fish and wildlife resources wishes to outline scarcity on a more local basis, U.S. Fish and Wildlife Service personnel should assist in developing such rationale, whenever practicable.

d. When funding, personnel, and available information make it practicable, specific geographic areas or, alternatively, specific habitat types that comprise a given Resource Category should be designated in advance of development. Priority for predesignation will be placed on those areas that are of high value for evaluation species and are subject to development pressure in the near future. Such predesignations can be used by developers or regulators to determine the least valuable areas for use in project planning and siting considerations.

e. The following examples should be given special consideration as either Resource Category 1 or 2:

(1) Certain habitats within Service-identified Important Resource Problem (IRP) areas. Those IRPs dealing with threatened or endangered species are not covered by this policy. (See Scope)

(2) Special aquatic and terrestrial sites including legally designated or set-aside

areas such as sanctuaries, fish and wildlife management areas, hatcheries, and refuges, and other aquatic sites such as floodplains, wetlands, mudflats, vegetated shallows, coral reefs, riffles and pools, and springs and seeps.

3. Impact Assessment Principles

a. Changes in fish and wildlife productivity or ecosystem structure and function may not result in a biologically adverse impact. The determination as to whether a biological change constitutes an adverse impact for which mitigation should be recommended is the responsibility of the Service and other involved Federal and State resource agencies.

b. The net biological impact of a development proposal (or alternatives) is the difference in predicted biological conditions between the future with the action and the future without the action. If the future without the action cannot be reasonably predicted and documented by the project sponsor, then the Service analysis should be based on biological conditions that would be expected to exist over the planning period due to natural species succession or implementation of approved restoration/improvement plans or conditions which currently exist in the planning area.

c. Service review of project impacts will consider, whenever practicable:

(1) The total long-term biological impact of the project, including any secondary or indirect impacts regardless of location; and (2) any cumulative effects when viewed in the context of existing or anticipated projects.

d. The *Habitat Evaluation Procedures* will be used by the Service as a basic tool for evaluating project impacts and as a basis for formulating subsequent recommendations for mitigation subject to the exemptions in the Ecological Services Manual (100 ESM 1). When the *Habitat Evaluation Procedures* do not apply, then other evaluation systems may be used provided such use conforms with policies provided herein.

e. In those cases where instream flows are an important determinant of habitat value, consideration should be given to the use of the Service's Instream Flow Incremental Methodology to develop instream flow mitigation recommendations, where appropriate.

f. Where specific impact evaluation methods or mitigation technologies are not available, Service employees shall continue to apply their best professional judgment to develop mitigation recommendations.

4. Mitigation Recommendations

a. The Service may recommend support of projects or other proposals when the following criteria are met:

(1) They are ecologically sound;

(2) The least environmentally damaging reasonable alternative is selected;

(3) Every reasonable effort is made to avoid or minimize damage or loss of fish and wildlife resources and uses;

(4) All important recommended means and measures have been adopted with guaranteed implementation to satisfactorily compensate for unavoidable damage or loss consistent with the appropriate mitigation goal; and

(5) For wetlands and shallow water habitats, the proposed activity is clearly water dependent and there is a demonstrated public need.

The Service may recommend the "no project" alternative for those projects or other proposals that do not meet all of the above criteria and where there is likely to be a significant fish and wildlife resource loss.

b. Recommendations will be presented by the Service at the earliest possible stage of project planning to assure maximum consideration. The Service will strive to provide mitigation recommendations that represent the best judgment of the Service, including consideration of cost, on the most effective means and measures of satisfactorily achieving the mitigation planning goal. Such recommendations will be developed in cooperation with the Federal action agency or private developer responsible for the project, whenever practicable, and will place heavy reliance on cost estimates provided by that Federal action agency or private developer.

c. The Service will recommend that the Federal action agency include designated funds for all fish and wildlife resource mitigation (including, but not limited to, Service investigation costs, initial development costs and continuing operation, maintenance, replacement, and administrative costs) as part of the initial and any alternative project plans and that mitigation funds (as authorized and appropriated by Congress for Federal projects) be spent concurrently and proportionately with overall project construction and operation funds throughout the life of the project.

Note.—Prevention of losses may necessitate expenditure of funds at an earlier stage of project planning. This is acceptable and preferred.

d. Service mitigation recommendations will be made under an explicit expectation that these means and measures: (1) would be the ultimate responsibility of the appropriate Federal action agency to implement or enforce; and (2) would provide for a duration of effectiveness for the life of the project plus such additional time required for the adverse effects of an abandoned project to cease to occur.

e. Land acquisition in fee title for the purpose of compensation will be recommended by the Service *only* under one or more of the following three conditions:

(1) When a change in ownership is necessary to guarantee the future conservation of the fish and wildlife resource consistent with the mitigation goal for the specific project area; *or*

(2) When other means and measures for mitigation (see Section 5 below) will not compensate habitat losses consistent with the mitigation goal for the specific project area; *or*

(3) When land acquisition in fee title is the most cost-effective means that may partially or completely achieve the mitigation goal for the specific project area.

Service recommendations for fee title land acquisition will seek to identify mitigation lands with marginal economic potential.

f. First priority will be given to recommendation of a mitigation site within the planning area. Second priority will be given to recommendation *of a mitigation site* in proximity to the planning area within the same ecoregion section. Third priority will be given to recommendation of a mitigation site elsewhere within the same ecoregion section.

g. Service personnel will fully support a variety of uses on mitigation lands where such uses are compatible with dominant fish and wildlife uses and, for Federal wildlife refuges, are consistent with the provisions of the Refuge Recreation Act and the National Wildlife Refuge Administration Act. However, it may be in the best public interest to recommend limiting certain uses that would significantly decrease habitat value for species of high public interest. In such cases, the Service may recommend against such incompatible uses.

h. Measures to increase recreation values will not be recommended by Service personnel to compensate for losses of habitat value. Recreation use losses not restored through habitat value mitigation will be addressed through separate and distinct recommended measures to offset those specific losses.

i. The guidelines contained in this policy do not apply to threatened or endangered species. However, where both habitat and endangered or threatened species impacts are involved, Service personnel shall fully coordinate Environment efforts with Endangered Species efforts to provide timely, consistent, and unified recommendations for resolution of fish and wildlife impacts, to the extent possible. More specifically, Environment and Endangered Species personnel shall coordinate all related activities dealing with investigations of land and water developments. This includes full use of all provisions that can expedite Service achievement of "one-stop shopping," including coordinated early planning involvement, shared permit review activities, consolidated permit reporting, and consolidated flow of pre-project information to developers, consistent with legislative mandates and deadlines.

j. The Service will place high priority on and continue to develop and implement procedures for reducing delays and conflicts in permit related activities. Such procedures will include, but not be limited to:

(1) Joint processing of permits.
(2) Resource mapping.
(3) Early provision of ecological design information.
(4) Involvement in Special Area Management Planning.

k. The Service will encourage predevelopment compensation actions by Federal action agencies which can be used to offset future unavoidable losses for lands or waters not adequately protected by an existing law, policy, or program.

Banking of habitat value for the express purpose of compensation for unavoidable future losses will be considered to be a mitigation measure and not an enhancement measure. Withdrawals from the mitigation "bank" to offset future unavoidable losses will be based on habitat value replacement, not acreage or cost for land purchase and management.

5. Mitigation Means and Measures

Mitigation recommendations can include, but are not limited to, the types of actions presented below. These means and measures are presented in the general order and priority in which they should be recommended by Service personnel with the exception of the "no project" alternative. (See Section 4(a)).

a. Avoid the impact

(1) Design project to avoid damage or loss of fish and wildlife resources including management practices such as timing of activities or structural features such as multiple outlets, passage or avoidance structures and water pollution control facilities.
(2) Use of nonstructural alternative to proposed project.
(3) No project.

b. Minimize the impact

(1) Include conservation of fish and wildlife as an authorized purpose of Federal projects.
(2) Locate at the least environmentally damaging site.
(3) Reduce the size of the project.
(4) Schedule timing and control of initial construction operations and subsequent operation and maintenance to minimize disruption of biological community structure and function.
(5) Selective tree clearing or other habitat manipulation.
(6) Control water pollution through best management practices.
(7) Time and control flow diversions and releases.
(8) Maintain public access.
(9) Control public access for recreational or commercial purposes.
(10) Control domestic livestock use.

c. Rectify the impact

(1) Regrade disturbed areas to contours which provide optimal fish and wildlife habitat or approximate original contours.
(2) Seed, fertilize and treat areas as necessary to restore fish and wildlife resources.
(3) Plant shrubs and trees and other vegetation to speed recovery.
(4) Control polluted spoil areas.
(5) Restock fish and wildlife resources in repaired areas. Fish stocking or introductions will be consistent with the Service Fish Health Policy (January 3, 1978).

d. Reduce or eliminate the impact over time

(1) Provide periodic monitoring of mitigation features to assure continuous operation.
(2) Assure proper training of project personnel in the operations of the facility to preserve existing or restored fish and wildlife resources at project sites.
(3) Maintain or replace equipment or structures so that future loss of fish and wildlife resources due to equipment or structure failure does not occur.

e. Compensate for impacts

(1) Conduct wildlife management activities to increase habitat values of existing areas, with project lands and nearby public lands receiving priority.
(2) Conduct habitat construction activities to fully restore or rehabilitate previously altered habitat or modify existing habitat suited to evaluation species for the purpose of completely offsetting habitat value losses.
(3) Build fishery propagation facilities.
(4) Arrange legislative set-aside or protective designation for public lands.
(5) Provide buffer zones.
(6) Lease habitat.
(7) Acquire wildlife easements.
(8) Acquire water rights.
(9) Acquire land in fee title.

6. Follow-up

The Service encourages, supports, and will initiate, whenever practicable, post-project evaluations to determine the effectiveness of recommendations in achieving the mitigation planning goal. The Service will initiate additional follow-up studies when funds are provided by the Federal action agency.

In those instances where Service personnel determine that Federal agencies or private developers have not carried out those agreed upon mitigation means and measures, then the Service will request the responsible Federal action agency to initiate corrective action.

APPENDIX A—OTHER AUTHORITIES AND DIRECTION FOR SERVICE MITIGATION RECOMMENDATIONS

LEGISLATIVE

Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq.). The 1977 amendments require the Fish and Wildlife Service ". . . upon request of the Governor of a State, and without reimbursement, to provide technical assistance to such State in developing a Statewide (water quality planning) program and in implementing such program after its approval." In addition, this Act requires the Service to comment on proposed State permit programs for the control of discharges of dredged or fill material and to comment on all Federal permits within 90 days of receipt.

Federal Power Act of 1920, as amended (16 U.S.C. 791(a), 803, 811). This Act authorizes the Secretary of the Interior to impose conditions on licenses issued for hydroelectric projects within specific withdrawn public lands. The Secretary is given specific authority to prescribe fishways to be constructed, maintained, and operated at the licensee's expense.

Estuary Protection Act (16 U.S.C. 1221–1226). This Act requires the Secretary of the Interior to review all project plans and reports for land and water resource development affecting estuaries and to make recommendations for conservation, protection, and enhancement.

Coastal Zone Management Act of 1972 (16 U.S.C. 1451–1464). This Act requires the Secretary of Commerce to obtain the views of Federal agencies affected by the program, including the Department of the Interior, and to ensure that these views have been given adequate consideration before approval of Coastal Zone Management Plans. The Service provides the Department's views about fish and wildlife resources. Pursuant to the Coastal Zone Management Act Amendments of 1980 (Pub. L. 96-464) the Department of Interior provides comments on Federal grants to help States protect and preserve coastal areas because of their ". . . conservational, recreational, ecological or aesthetic values." The 1980 Amendments also authorize the Department of Interior to enter into Special Area Management Planning to ". . . provide for increased specificity in protecting natural resources, reasonable coast dependent economic growth . . . and improved predictability in government decisionmaking."

Water Bank Act (16 U.S.C. 1301-1311). This Act requires that the Secretary of Agriculture ". . . shall consult with the Secretary of Interior and take appropriate measures to insure that the program carried out . . . is in harmony with wetlands programs administered by the Secretary of the Interior."

Wild and Scenic Rivers Act (16 U.S.C. 1271-1287). This Act requires the Secretary of the Interior to comment on such proposals. The Fish and Wildlife Service provides the Department's views with regard to fish and wildlife resources.

Geothermal Steam Act of 1970 (30 U.S.C. 1001-1025). This Act requires that the Fish and Wildlife Service recommend to the Secretary those lands that shall not be leased for geothermal development by reason of their status as ". . . a fish hatchery administered by the Secretary, wildlife refuge, wildlife range, game range, wildlife management area, waterfowl production area, or for lands acquired or reserved for the protection and conservation of fish and wildlife that are threatened with extinction."

Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.). This Act requires the Department of the Interior to regulate surface mining and reclamation at existing and future mining areas. The Fish and Wildlife Service provides the Department with technical assistance regarding fish and wildlife aspects of Department programs on active and abandoned mine lands, including review of State regulatory submissions and mining plans, and comments on mining and reclamation plans.

Outer Continental Shelf Lands Act Amendments of 1978 (43 U.S.C. 1801). This Act requires the Secretary of the Interior to manage an environmentally sound oil and natural gas development program on the outer continental shelf. The Fish and Wildlife Service provides recommendations for the Department regarding potential ecological impacts before leasing in specific areas and contributes to environmental studies undertaken subsequent to leasing.

Mineral Leasing Act of 1920, as amended (30 U.S.C. 185). This Act authorizes the Secretary of the Interior to grant rights-of-way through Federal lands for pipelines transporting oil, natural gas, synthetic liquids or gaseous fuels, or any other refined liquid fuel. Prior to granting a right-of-way for a project which may have a significant impact on the environment, the Secretary is required by this Act to request and review the applicant's plan for construction, operation, and rehabilitation of the right-of-way. Also, the Secretary is authorized to issue guidelines and impose stipulations for such projects which shall include, but not be limited to, ". . . requirements for restoration, revegetation and curtailment or erosion of surface land; . . . requirements designed to control or prevent damage to the environment (including damage to fish and wildlife habitat); and . . . requirements to protect the interests of individuals living in the general area of the right-of-way or permit who rely on the fish, wildlife and biotic resources of the area for subsistence purposes."

Cooperative Unit Act (16 U.S.C. 753(a)-753(b)). This Act provides for cooperative programs for research and training between the Fish and Wildlife Service, the States, and universities.

Airport and Airway Development Act (49 U.S.C. 1716). This Act requires the Secretary of Transportation to ". . . consult with the Secretary of the Interior with regard to the effect that any project . . . may have on natural resources including, but not limited to, fish and wildlife, natural, scenic, and recreation assets, water and air quality, and other factors affecting the environment . . .".

Department of Transportation Act (49 U.S.C. 1653(f)). This Act makes it national policy that ". . . special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites . . .," and requires that the Secretary of Transportation ". . . cooperate and consult with the Secretary of the Interior in developing transportation plans and programs that include measures to maintain or enhance the natural beauty of the lands traversed." The Department of Transportation projects using protected lands cannot be approved unless there are no feasible and prudent alternatives to avoid such use and, if none, all possible measures to minimize harm have been considered.

EXECUTIVE

President's Water Policy Message (June 6, 1978). This Message directs the Secretary of the Interior to promulgate procedures for determination of measures to mitigate losses of fish and wildlife resources.

Water Resources Council's *Final Rules; Principles and Standards for Water and Related Land Resources Planning—Level C* (September 29, 1980). These rules reiterate the importance of participation in the development planning process by interested Federal agencies, including the Department of the Interior. This participation includes review, coordination, or consultation required under various legislative and executive authorities. Under these rules, "Consideration is to be given to mitigation (as defined in 40 CFR 1508.20) of the adverse effects of each alternative plan. Appropriate mitigation is to be included where suitable as determined by the agency decisionmaker. Mitigation measures included are to be planned for at least concurrent and proportionate implementation with other major project features, except where such concurrent and proportionate mitigation is physically impossible. In the latter case, the reasons for deviation from this rule are to be presented in the planning report, and mitigation is to be planned for the earliest possible implementation. Mitigation for fish and wildlife and their habitat is to be planned in coordination with Federal and State fish and wildlife agencies in accordance with the Fish and Wildlife Coordination Act of 1958 (16 U.S.C. 661-664) (sic)."

Executive Order 11990—Protection of Wetlands (May 24, 1977). This Executive Order requires that each Federal agency ". . . take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for: (1) acquiring, managing and disposing of Federal lands and facilities; and (2) providing federally undertaken, financed or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation and licensing activities." Relevant wetland concerns and values include, but are not limited to, maintenance of natural systems and long-term productivity of existing flora and fauna, habitat diversity, hydrological utility, fish, wildlife, timber, and food. Under this Order, a developmental project in a wetland may proceed only if no practicable alternatives can be ascertained and if the proposal . . . includes all practicable measures to minimize harm to the wetland that may result from its use."

Executive Order 11988—Floodplain Management (May 24, 1977). This Executive Order requires that Federal agencies take floodplain management into account when formulating or evaluating water or land use plans and that these concerns be reflected in the budgets, procedures, and regulations of the various agencies. This Order allows developmental activities to proceed in floodplain areas only when the relevant agencies have ". . . considered alternatives to avoid adverse effects and incompatible development in the floodplains . . ." or when, in lieu of this, they have ". . . designed or modified their actions in order to minimize potential harm to or within the floodplain . . .".

Executive Order 11987—Exotic Organisms (May 24, 1977). This Executive Order requires that Federal agencies shall restrict, to the extent permitted by law, the introduction of exotic species into the lands or waters which they own, lease, or hold for purposes of administration, and encourage the States, local governments, and private citizens to do the same. This Executive Order also requires Federal agencies to restrict, to the extent permitted by law, the importation of exotic species and to restrict the use of Federal funds and programs for such importation. The Secretary of the Interior, in consultation with the Secretary of Agriculture, is authorized to develop by rule or regulation a system to standardize and simplify the requirements and procedures appropriate for implementing this Order.

NATIONAL/INTERNATIONAL TREATIES

Federal Trust Responsibility to Indian Tribes. This responsibility is reflected in the numerous Federal treaties with the Indian tribes. These treaties have the force of law. Protection of Indian hunting and fishing rights necessitates conservation of fish and wildlife and their habitat.

Convention Between the United States and Japan (September 19, 1974). This Treaty endorses the establishment of sanctuaries and fixes preservation and enhancement of migratory bird habitat as a major goal of the signatories.

Convention Between the United States and the Union of Soviet Socialist Republics Concerning the Conservation of Migratory Birds and Their Environments (November 8, 1978). This Treaty endorses the establishment of sanctuaries, refuges, and protected areas. It mandates reducing or eliminating damage to all migratory birds. Furthermore, it provides for designation of special areas for migratory bird breeding, wintering, feeding, and molting, and commits the signatories to "... undertake measures necessary to protect the ecosystems in these areas ... against pollution, detrimental alteration and other environmental degradation." Implementing legislation, Pub. L. 95–616, was passed in the United States in 1978.

Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere (April 15, 1941). This Treaty has several provisions requiring parties to conserve certain wildlife resources and their habitats.

Convention Between the United States and Great Britain (for Canada) for Protection of Migratory Birds (August 1, 1916, as amended January 30, 1979). This Treaty provides for a uniform "... system of protection for certain species of birds which migrate between the United States and Canada, in order to assure the preservation of species either harmless or beneficial to man." The Treaty prohibits hunting insectivorous birds, but allows killing of birds under permit when injurious to agriculture. The 1979 amendment allows subsistence hunting of waterfowl outside of the normal hunting season.

APPENDIX B—OTHER DEFINITIONS

"Compensation," when used in the context of Service mitigation recommendations, means full replacement of project-induced losses to fish and wildlife resources, provided such full replacement has been judged by the Service to be consistent with the appropriate mitigation planning goal.

"Ecoregion" refers to a large biogeographical unit characterized by distinctive biotic and abiotic relationships. An ecoregion may be subclassified into domains, divisions, provinces, and sections. A technical explanation and map is provided in the "Ecoregions of the United States" by Robert G. Bailey, published by the U.S. Forest Service, 1976.

"Ecosystem" means all of the biotic elements (i.e., species, populations, and communities) and abiotic elements (i.e., land, air, water, energy) interacting in a given geographic area so that a flow of energy leads to a *clearly* defined trophic structure, biotic diversity, and material cycles. (Eugene P. Odum. 1971. *Fundamentals of Ecology*)

"Evaluation species" means those fish and wildlife resources in the planning area that are selected for impact analysis. They must currently be present or known to occur in the planning area during at least one stage of their life history except where species not present (1) have been identified in fish and wildlife restoration or improvement plans approved by State or Federal resource agencies, or (2) will result from natural species succession over the life of the project. In these cases, the analysis may include such identified species not currently in the planning area.

There are two basic approaches to the selection of evaluation species: (1) selection of species with high public interest, economic value or both; and (2) selection of species to provide a broader ecological perspective of an area. The choice of one approach in lieu of the other may result in a completely different outcome in the analysis of a proposed land or water development. Therefore, the objectives of the study should be clearly defined before species selection is initiated. If the objectives of a study are to base a decision on potential impacts to an entire ecological community, such as a unique wetland, then a more ecologically based approach is desirable. If, however, a land or water use decision is to be based on potential impacts to a public use area, then species selection should favor animals with significant human use values. In actual practice, species should be selected to represent social, economic and broad ecological views because mitigation planning efforts incorporate objectives that have social, economic, and ecological aspects. Species selection always should be approached in a manner that will optimize contributions to the stated objectives of the mitigation planning effort.

Most land and water development decisions are strongly influenced by the perceived impacts of the proposed action on human use. Since economically or socially important species have clearly defined linkages to human use, they should be included as evaluation species in all appropriate land and water studies. As a guideline, the following types of species should be considered:

- Species that are associated with Important Resource Problems as designated by the Director of the Fish and Wildlife Service (except for threatened or endangered species).

• Other species with monetary and non-monetary benefits to people accruing from consumptive and nonconsumptive human uses including, but not limited to, fishing, hunting, bird-watching and educational, aesthetic, scientific or subsistence uses.

An analysis based only on those species with directly identifiable economic or social value may not be broad enough to adequately describe all of the ramifications of a land and water use proposal. If it is desirable to increase the ecological perspective of an assessment, the following types of species should be considered:

• Species known to be sensitive to specific land and water use actions. The species selected with this approach serve as "early warning" or indicator species for the affected fish and wildlife community.

• Species that perform a key role in a community because of their role in nutrient cycling or energy flows. These species also serve as indicators for a large segment of the fish and wildlife community, but may be difficult to identify.

• Species that represent groups of species which utilize a common environmental resource (guilds). A representative species is selected from each guild and predicted environmental impacts for the selected species are extended with some degree of confidence to other guild members.

"Federal action agency" means a department, agency or instrumentality of the United States which plans, constructs, operates or maintains a project, or which plans for or approves a permit, lease, or license for projects or manages Federal lands.

"Fish and wildlife resources" means birds, fishes, mammals, and all other classes of wild animals and all types of aquatic and land vegetation upon which wildlife is dependent.

"Habitat" means the area which provides direct support for a given species, population, or community. It includes all environmental features that comprise an area such as air quality, water quality, vegetation and soil characteristics and water supply (including both surface and groundwater).

"Habitat value" means the suitability of an area to support a given evaluation species.

"Important Resource Problem" means a clearly defined problem with a single important population or a community of similar species in a given geographic area as defined by the Director of the Fish and Wildlife Service.

"In-kind replacement" means providing or managing substitute resources to replace the habitat value of the resources lost, where such substitute resources are physically and biologically the same or closely approximate those lost.

"Loss" means a change in fish and wildlife resources due to human activities that is considered adverse and;

(1) reduces the biological value of that habitat for evaluation species;

(2) reduces population numbers of evaluation species;

(3) increases population numbers of "nuisance" species;

(4) reduces the human use of those fish and wildlife resources; or

(5) disrupts ecosystem structure and function.

Changes that improve the value of existing habitat for evaluation species are not to be considered losses, i.e., burning or selective tree harvesting for wildlife management purposes. In addition, reductions in animal populations for the purpose of harvest or fish and wildlife managment will not be considered as losses for the purpose of this policy.

"Minimize" means to reduce to the smallest practicable amount or degree.

"Mitigation banking" means habitat *protection or improvement actions* taken expressly for the purpose of compensating for unavoidable losses from specific future development actions. It only includes those actions above and beyond those typically taken by Congress for protection of fish and wildlife resources.

"Out-of-kind replacement" means providing or managing substitute resources to replace the habitat value of the resources lost, where such substitute resources are physically or biologically different from those lost.

"Planning area" means a geographic space with an identified boundary that includes:

(1) The area identified in the study's authorizing document;

(2) The locations of resources included in the study's identified problems and opportunities;

(3) The locations of alternative plans, often called "project areas;" and

(4) The locations of resources that would be directly, indirectly, or cumulatively affected by alternative plans, often called the "affected area."

"Practicable" means capable of being done within existing constraints. The test of what is practicable depends upon the situation and includes consideration of the pertinent factors, such as environment, cost, or technology.

"Project" means any action, planning or approval process relating to an action that will directly or indirectly affect fish and wildlife resources.

"Replacement" means the substitution or offsetting of fish and wildlife resource losses with resources considered to be of equivalent biological value. However, resources used for replacement represent loss or modification of another type of habitat value. Replacement actions still result in a loss of habitat acreage and types which will continually diminish the overall national resource base. It should be clearly understood that replacement actions never restore the lost fish and wildlife resource—that is lost forever.

Dated: January 13, 1981.

Cecil Andrus,

Secretary of the Department of the Interior.

[FR Doc. 81-1895 Filed 1-22-81; 8:45 am]

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Appendix F

State of Hawaii
Commission on Water Resource Management
P.O. Box 373
Honolulu, Hawaii 96809

PETITION TO AMEND INTERIM INSTREAM FLOW STANDARD

For the purpose of securing a waiver of the Interim Instream Flow Standard to divert or otherwise utilize streamwaters, a request is hereby made to the Commission on Water Resource Management, based on the following representations, submitted in accordance with Hawaii Administrative Rules Chapter 13-169, as amended.

1. **PETITIONER**

Name MAUNA KEA POWER COMPANY
Address 737 Bishop Street, Suite 2460, Honolulu, HI 96813
Contact person Albert S. N. Hee   Telephone 599-4441

2. **PROJECT**

Project title HONOLI'I HYDROELECTRIC POWER PROJECT
Project location Along Honoli'i Stream, South Hilo District, Island of Hawaii
Stream(s) affected Honoli'i Stream

Tax map key(s)	2-6-12:29; 2-6-09:11	2-7-02:20,21	2-6-12:24
Landowner(s)	B.P. Bishop Estate	Mauna Kea Agribsn.	Emma Kiyan
State land use district	Ag/Conservation	Ag/Conservation	Ag/Conservation
County zoning	A-20a	A-20a	A-20a

Project description The applicant proposes to develop a hydroelectric power plant which will provide up to 14.6 megawatts (MW) of power to the Hawaii Island grid. Project features will consist of a diversion weir, a 20,000-foot long penstock, a power plant and substation, access roads and transmission line. (See attached EA)
(Attach maps, plans, environmental assessment, or other appropriate documentation.)

Commencement date June 1989   Completion date June 1989

3. **EXISTING INSTREAM AND OFFSTREAM WATER USES** (above, within, and below project area):

TMK	Owner	Use
NONE		

4. **STREAMFLOW** *

USGS stream gaging station 16717000   Period of record 1911 - 1913, 1967 - Present
Location Lat. 19 deg. 46 min. 00 sec., Long. 155 deg. 09 min. 16 sec.; on the left bank 0.7 mi. downstream from Pohakupaa Stream, 4.1 mi. west of Papaikou, and 4.8 mi. northwest of Hilo Post Office.
Average monthly streamflow within the affected stream reach, in cfs:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual	Median
128.8	112.5	229.1	224.7	90.0	61.9	96.6	112.7	68.4	80.8	178.1	146.4	127.5	112.5

(continued)

*SEE ATTACHED STREAM FLOW ANALYSIS

EA encl w/ petition

Proposed average monthly diversion, in cfs:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual	Median
34.6	32.2	66.5	89.2	56.3	37.9	53.4	43.5	39.6	46.5	65.0	51.4	51.3	46.5

Average monthly streamflow after diversion in cfs (min. release flow):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual	Median
94.2	80.3	162.6	135.5	33.7	24.0	43.2	69.2	28.8	34.3	113.1	95.0	76.2	69.2

5. PROJECT IMPACT

Assessment of potential project impact to instream and offstream uses (Above, within, and below the affected stream reach):
DHM, Inc., is preparing a CDUA and accompanying environmental impact statement which will assess the potential impact of the project on instream and offstream uses. The EIS Preparation Notice was published in the October 23, 1988 OEQC Bulletin. This project is not expected to cause significant environmental impacts. Minimum stream flow will be maintained to protect existing aquatic life and stream vegetation. Noise and visual impacts will be minimal. Access to project facilities will be mostly along existing can roads. A copy of the DEIS and EIS addressing the impacts of the project will be provided when they are completed.

Bases for conclusions regarding above-noted impacts: 1) At all times (unless stream flow is less than 10 cfs) a flow of 10 cfs will be maintained downstream of the diversion weir. 2) Project facilities will not cross any perennial (Honoli'i is crossed by weir) tributaries or infringe upon native forests. 3) No significant archaeological sites were found in the project area. 4) The project will be located entirely on privately-owned lands. 5) The surrounding area has been used for the cultivation of sugar cane for over sixty years. 6) Several perennial tributaries feed into the Honoli'i Stream below the proposed diversion weir. None of the tributaries will be diverted by the proposed project. (See attached EA)

(Attach supporting documentation, preliminary plans, drawings.)

12/9/88 (Signed) __________
Date Petitioner

HONOLI'I STREAM HYDROELECTRIC PROJECT

STREAM FLOW ANALYSIS

This analysis is provided to supplement the "Petition to Amend Interim Instream Flow Standards" for the Honoli'i Hydroelectric Project. Section 4 of the petition includes breakdowns of average monthly streamflow, proposed average monthly diversion, and average monthly streamflow after diversion.

The average monthly streamflows were obtained from the USGS data for Honoli'i Stream, Gaging Station no. 16717000, located approximately 300 feet upstream of the proposed diversion weir. Due to this proximity, the drainage area at both the gage and the site of the proposed weir are essentially the same, 11.6 miles. As a result, a correction factor was not used to adjust the average stream flow at the gage to the average stream flow at the weir. This analysis is based on records from the entire period of gage operations, 1911-1913 and 1968-1988.

The proposed average monthly diversion was determined by plotting the monthly flow duration curves and then overlaying the operational ranges of turbines. The equipment which has been selected for this project will be capable of operating over a range of flows through the turbines from 4 to 150 cfs. At flows below 4 cfs there will not be enough water to operate the turbines.

The proposed diversion weir will divert a maximum of 150 cfs. At the same time, a shallow notch in the weir will

allow a minimum stream flow of 10 cfs to be passed through and maintained downstream of the weir at all times that there is at least 10 cfs flowing in the streambed. As a result, the turbines will not operate unless there is at least 14 cfs flowing through the stream. As the stream flow approaches 160 cfs, the 10 cfs minimum stream flow will continue passing through the weir and the remaining flow will be diverted through the intake and penstock down to the turbines for electric generation. As the stream flow exceeds 160 cfs, all flows exceeding 150 cfs will overtop the weir and continue downstream in the natural stream channel.

Based on the annual flow duration curve, the design flow of the proposed project (4-150 cfs), and the continuous minimum stream flow to be maintained during operation of the project (10 cfs), the resultant stream flow can be projected. Approximately 20 percent of the time, the natural flows in Honoli'i Stream will range from 1 to 14 cfs. During these periods, 100 percent of the flow will pass over the weir and continue downstream, and plant operations will be completely shut down. Stream flows of between 14 and 160 cfs will occur about 65 percent of the time. During these periods, there is adequate water to operate the turbines and produce power while maintaining the 10 cfs minimum stream flow over the weir. Flows will exceed 160 cfs 15 percent of the time. When this occurs, 150 cfs will be diverted from the stream for electric power generation, and the remaining flows ranging from 10 cfs to several thousand cfs will pass over the weir and continue downstream. At least 10 cfs will flow over the weir 328 days a year (90% of the time). During 91 of these days, flows of over 10 cfs up to thousands of cfs will flow over the weir.

It should be noted that the function of the weir is to divert a portion of the streamflow into the intake while insuring that a minimum amount of flow continues in the stream bed. Unlike a dam, the weir will not impound, or store water for future use. Because of the "flashy" nature of the stream, with flows exceeding the project flow capacity of 150 cfs, an average of 15% monthly, the average monthly diversion does not equal the average streamflow less the proposed minimum flow of 10 cfs.

The flows in Honoli'i are extremely variable due to orographic rainfall. Gage data shows that flows well over 160 cfs in the stream are not restricted to seasonal parts of the year. This means that while the hydroelectric project will divert water, natural stream flows will exceed plant capacity on a frequent basis to provide flushing flows for the stream. The regularity of flows over 160 cfs is significant in that these freshet flows continually replenish pools and riffles, remove accumulated siltation, reduce the growth of moss, and maintain the habitat for stream fauna.

Since the project will use a maximum of 150 cfs for electric generation, there will be periods during each month when very large amounts of flow will pass over the weir. The

average monthly streamflow after project diversion has therefore been determined by taking the average monthly streamflow less the proposed monthly diversion.

The table below indicates the regular frequency throughout the year of flows exceeding 160 cfs. The table summarizes data derived from monthly flow duration curves of Honoli'i Stream.

Percent of Time Average Monthly Flow
Exceeds 160 cfs

Month	Percent
January	13
February	14
March	27
April	32
May	14
June	8
July	13
August	11
September	9
October	12
November	22
December	18

The length of stream channel which will be affected by the proposed project will be about 3.7 miles. However, flows below the weir will increase in a downstream direction as the result of added flow contributed by runoff and various tributaries that feed Honoli'i Stream. There are three perennial tributaries to the stream, the Kaiwiki, Pohakupaa and Honoli'i segments, and two unnamed tributaries along the north bank. None of the tributaries below the gaging station will be diverted by the proposed project. They will all contribute additional flow to the stream below the site of the proposed weir.

The total drainage area above the proposed weir is 11.6 miles. The total drainage area between the proposed weir and the powerhouse is 1.9 square miles. This area is about 16 percent as large as the total drainage area above the weir. All runoff in the drainage area below the weir will enter the mainstem of the Honoli'i Stream.

Average rainfall over the drainage area above the weir ranges from between 75" and 300" per year, depending on the distance from the coast. The average annual rainfall in the Honoli'i watershed is about 207" per year. The average annual rainfall between the proposed weir and powerhouse sites ranges from 100 to 275 inches per year, again depending upon the distance from the coast.

The drainage area between the weir and a point 1.5 miles downstream is 0.7 square miles. This is equal to 6 percent of the total drainage area above the weir. Based on the average annual rainfall in these areas, we estimate that approximately 6.5 cfs will be added to the stream over this reach.

Over the next mile of the stream, a distance of 2.5 miles from the weir, an additional 7.2 cfs will be added to the flow in the Honoli'i Stream. Assuming that only a minimum flow of 10 cfs is being released through the weir, a total minimum flow of 23.7 cfs would be occuring at this point.

From the point 2.5 miles below the weir to the powerhouse, a distance of 1.5 miles, an annual average of 3.9

cfs will again be added to the Honoli'i Stream, increasing the minimum flow to an estimated 27.6 cfs on an average annual basis.

Based on this analysis, the proposed minimum flow of 10 cfs will only occur immediately downstream of the weir and only when total streamflow is less than 160 cfs. As the Honoli'i Stream flows towards the ocean, the streamflow will continue to increase as it is fed by runoff and tributaries below the weir that have not been diverted.

State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources
Division of Water Resource Management

APPLICATION FOR STREAM CHANNEL ALTERATION PERMIT

INSTRUCTIONS: Please print or type and send completed application with attachments to the Division of Water and Land Development, P.O. Box 373, Honolulu, Hawaii 96809. Application must be accompanied by a non-refundable filing fee of $25.00 payable to the Department of Land and Natural Resources. (Filing fee waived for government agencies.) If necessary, phone 548-7543, Hydrology/Geology Section for assistance.

1. APPLICANT

Firm Name MAUNA KEA POWER COMPANY Contact Person ALBERT S. N. HEE
Address 737 Bishop Street, Suite 2460 Honolulu, HI 96813 Phone 599-4383
Signature see attached CDUA application Date

2. LANDOWNER

Firm Name B. P. BISHOP ESTATE Contact Person KAPU SMITH (MRS.)
Address 567 South King Street, 2nd Floor Honolulu, HI 96813 Phone 523-6243
Signature see attached CDUA application Date

3. CONTRACTOR YAMADA AND SONS
Address 733 Kanoelehua Ave. Hilo, HI 96720 Phone 935-2911
Contractor License No. AC-1714

4. STREAM NAME AND LOCATION (Attach USGS map, (scale 1"=2000'), and property tax map showing stream location and access to site of proposed channel alteration referenced to established property boundaries.):

Honoli'i Stream, South Hilo District, Island of Hawaii

State Land Use District Conservation Tax Map Key No. 2-6-12:29, 2-7-02:21 Island Hawaii

5. DESCRIPTION OF PROPOSED CHANNEL ALTERATION AND RELATED FACILITIES (attach plans, specifications, and diagrams as appropriate):

A diversion weir will be constructed at an elevation of 1,535 feet mean sea level (MSL). Its crest will be approximately 74 feet long and 15 feet high above the river bed. A maximum of 150 cfs will be diverted by the weir. A shallow notch will be located on the left side of the weir to allow a minimum of 10 cfs to be maintained dowstream at all times.

Estimated Starting Date June 1989 Estimated Completion Date June 1990

6. STATEMENT OF PROJECT PURPOSE AND REASON FOR ALTERATION:

The purpose of the proposed project is to develop a hydroelectric power plant which will provide up to 14.6 megawatts (MW) of power to the Hawaii Island electric grid. The alteration will permit the construction of a diversion weir, intake canal and headworks.

7. IDENTIFY AND BRIEFLY DESCRIBE ANY POTENTIAL ENVIRONMENTAL IMPACTS RELATED TO THE PROPOSED ALTERATION (i.e. instream standards):

DHM, Inc. is preparing an environmental impact statement (EIS) for this project. The EIS Preparation Notice was published in the October 23, 1988 OEQC Bulletin. The EIS will address the environmental impacts of the proposed project.

For Official Use Only:

Field checked by ________ *Latitude* ________ *Hydrologic Unit* ________
Date ________ *Longitude* ________ *SCAP No.* ________

State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources
Division of Water Resource Management

APPLICATION FOR

_X_ STREAM DIVERSION WORKS CONSTRUCTION PERMIT

_X_ STREAM DIVERSION WORKS ALTERATION PERMIT

INSTRUCTIONS: Please print or type and send completed application with attachments to the Division of Water and Land Development, P.O. Box 373, Honolulu, Hawaii 96809. Application must be accompanied by a non-refundable filing fee of $25.00 payable to the Department of Land and Natural Resources. (Filing fee waived for government agencies.) If necessary, phone 548-7543, Hydrology/Geology Section for assistance.

A. APPLICANT

Firm Name MAUNA KEA POWER COMPANY
Contact Person ALBERT S. N. HEE
Address 737 Bishop St., Suite 2460
Honolulu, HI Zip 96813
Phone 599-4383 Date ______
Signature see attached CDUA application

B. LANDOWNER

Firm Name B. P. BISHOP ESTATE
Contact Person KAPU SMITH
Address 567 So. King St., 2nd Floor
Honolulu, HI Zip 96813
Phone 523-6243 Date ______
Signature see attached CDUA application

C. PROPOSED CONTRACTOR YAMADA AND SONS Phone 935-2911
Address 733 Kanoelehua Ave., Hilo, HI 96720
Contractor License No. AC-1714

D. STREAM LOCATION: Island Hawaii Tax Map Key 2-6-12:29 2-7-02:21
(Attach USGS map (scale 1"=2000') and property tax map, showing location and access to site, proposed construction or alteration work.)
State Land Use District: ☐ Agriculture ☐ Urban ☐ Rural ☒ Conservation

E. STREAM DATA
Stream Name Honoli'i Stream
Streamflow is: ☒ Perennial ☐ Intermittent
Average Annual Flow (if available) is: 127.5 ☐ mgd ☐ gpm ☒ cfs

F. DIVERSION WORKS DATA
Is Diversion Works planned as part of a battery of stream diversions? ☐ Yes ☒ No
If yes, briefly describe system as related to other existing diversions ______

Diverted Flow will be: ☒ Controlled ☐ Uncontrolled
Proposed Diversion Works Elevation (msl) 1,550 ft.
Diversion Structure will be: ☐ Concrete Masonry ☐ Wood ☐ Pipe
☒ Other (describe) Grouted Rock
Estimated Date of Completion June 1990
Proposed Divertible Flow is 150 max. ☐ mgd ☐ gpm ☒ cfs
Amount of Water to be Returned to the Stream 150 ☐ mgd ☐ gpm ☒ cfs
(Attach plans, specifications, and diagrams.) Name, address, and phone No. of person who prepared plans and specifications for construction or alteration:

(Name)	(Address)	(Phone)
Albert S. N. Hee	Mauna Kea Power Co. 737 Bishop St. Suite 2460	599-4383

(continued over)

For Official Use Only:
Field Checked By ______ *Latitude* ______ *Hydrologic Unit* ______
Date ______ *Longitude* ______ *Diversion Works No.* ______

G. PROPOSED USE: ☐ Municipal (including hotels, stores, etc.)

☐ Irrigation:

Type: ☐ Sugar ☐ Pineapple ☐ Horticulture

☐ Landscape ☐ Golf Course

Method: ☐ Drip ☐ Furrow ☐ Sprinkler

☐ Industrial: ☐ Cooling ☐ Mill

☐ Mfg. ☐ Other (specify) ______

☐ Domestic (individual, noncommercial water systems):

Number of Persons Served ______

☐ Military

☒ Hydroelectric

☐ Other (specify livestock, aquaculture, etc.) ______

H. DESCRIBE PROPOSED ALTERATION A diversion weir will be constructed at an elevation of 1,535 feet mean sea level (MSL). Its crest will be approximately 74 feet long and 15 feet high above the river bed. A maximum of 150 cfs will be diverted by the weir. A shallow notch will be located on the left side of the wier to allow a minimum of 10 cfs to maintained downstream at all times.

I. STATEMENT OF PROJECT PURPOSE AND REASONS FOR CONSTRUCTION OR ALTERATION:

The purpose of the proposed project is to develop a hydroelectric power plant which will provide up to 14.6 megawatts (MW) of power to the Hawaii Island electric grid. The alteration is being requested to permit the construction of a diversion weir, intake canal and headworks.

J. IDENTIFY AND BRIEFLY DESCRIBE ANY POTENTIAL ENVIRONMENTAL IMPACTS RELATED TO THE PROPOSED DIVERSION WORKS CONSTRUCTION OR ALTERATION (such as instream standards):

DHM, Inc. is preparing an environmental impact statement (EIS) for the proposed project. The EIS Preparation Notice was published in the October 23, 1988 OEQC Bulletin. The EIS will address the environmental impacts of the project.

Appendix G

ANALYSIS OF IFIM IN HAWAII

Prepared by Mauna Kea Power Company

EXECUTIVE SUMMARY Instream Flow Incremental Methodology (IFIM) is one of several scientific study methods used to address the impacts of reduced stream flow on freshwater aquatic fauna. IFIM attempts to quantify the relationship between stream flow and stream fauna habitat. The technique is not intended to generate a single solution or "minimum flow", rather, it attempts to predict the impacts of different flow regimes; thus allowing decision makers the opportunity to evaluate several options.

Several unique features of IFIM are: it attempts to quantify predicted impacts through computer simulation; there are several variations to the standard model to allow for different physical characteristics found in different geographic areas of the country; it is very expensive (10 times more than other types of studies) and can take over a year to complete; and, it was developed by the U. S. Fish and Wildlife Service (FWS) and therefore enjoys widespread and nearly exclusive promotion by the agency.

A three year study to evaluate the applicability of IFIM to Hawaiian streams was completed for DOWALD in October 1986. The study concluded that IFIM is suitable for certain Hawaiian conditions provided that appropriate precautions in design, data collection, and simulation studies are taken. As part of the conclusion, the following five concepts were emphasized; (1) A flow that is beneficial to one life stage may be detrimental to another; (2) A flow that is beneficial to one species may be detrimental to another; (3) Various life stages and species may require different amounts of water at different times of the year; (4) A flow that maximizes usable habitat in one part of the stream may not provide very much usable habitat in another part of the stream; and, (5) More water does not necessarily mean more habitat. <u>NEITHER THE STUDY, NOR ITS CONCLUSIONS AND/OR CONCEPTS, HAS BEEN ACCEPTED BY DOWALD.</u>

Since completion of the applicability study in October 1986, several IFIM studies have been performed on various streams in Hawaii. Several disturbing conclusions from these studies clearly show that at this time <u>IFIM IS NOT ABLE TO GENERATE MORE CONCLUSIVE INFORMATION THAN IS AVAILABLE FROM OTHER TYPES OF STUDIES CURRENTLY BEING USED IN HAWAII.</u> The most poignant example is that IFIM has been unable to provide any information on the effects various stream flows have on the <u>Lentipes concolor</u> (o'opu alamo'o). The Lentipes is the only fresh water species in Hawaii listed as category one.

It should be emphasized that IFIM's inability to generate more definitive information should not be interpreted as evidence it is inferior to other accepted methods of scientific study, only that it has definitely proven not to be superior and at this time, IFIM possesses severe application limitations in Hawaii.

ANALYSIS OF IFIM IN HAWAII

BACKGROUND Quantifying the effects reduced streamflow will have on native fauna has been a concern in Hawaii for many years. The Minimum Streamflow Subcommittee of the Honolulu Federal Executive Board, established in 1979, concluded that a program or procedure that would weigh the societal costs and benefits of reduced streamflow against those of current instream uses was the most appropriate solution to Hawaii's need to standardize decisions dealing on appropriate stream uses. In response to this concern, the Division of Water and Land Development (DOWALD) of the Hawaii State Department of Land and Natural Resources (DLNR) initiated an interdisciplinary instream flow study in 1980. In conjunction with this study, DOWALD supported a three-year research program to evaluate the applicability in Hawaii of the Instream Flow Incremental Methodology (IFIM).[1] TR171 is the result of this program.

The most important components of a stream ecosystem which ultimately determine the productivity of riverine fisheries are flow regime, physical habitat structure, water quality and

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[1]Robert A. Kinzie, III, et al., Habitat Modelling of Hawaiian Streams (Technical Report No. 171), (Honolulu: University of Hawaii, Water Resources Research Center, 1986), p. 1.

nutrients.[2,3] Each must be evaluated separately as well as interactively before clear, concise conclusions of suitable habitat versus stream flow can be made. IFIM was developed by the National Ecology Center, Aquatic System Branch (formerly the Instream Flow Group) of the FWS as an attempt to quantify the changes that would occur to available stream habitat as stream flow varies.[4] The known habitat preferences of aquatic fauna are then compared with the IFIM predicted habitat changes at different levels of streamflow.

IFIM uses computer modeling programs to simulate hydraulic conditions of the microhabitat (water velocity, depth and substratum) in order to evaluate the effects of flow-induced changes on fish and invertebrate habitat.[5] The program must be provided with distribution data concerning water velocity, depth and substratum available and the habitat requirements during each life stage of the target species.

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[2]J. R. Karr and D. R. Dudley, Biological integrity of a headwater stream, (Submitted to Bioscience, 1978); and "A primer on the biological integrity of running waters." (Unpublished manuscript, 1978).

[3]D. J. Orth and O. E. Maughan, Evaluation of the incremental methodology for recommending instream flow for fishes, Trans. Am. Fish. Soc. 111:413-45, (1982).

[4]Thomas R. Payne & Associates, Instream Flow Assessment for the Hanalei River Hydroelectric Project, Kauai, Hawaii, (October 10, 1988), p. 1.

[5]C. L. Armour, et al., Comparison of the use of the Habitat Evaluation Procedures (HEP) and the Instream Flow Incremental Methodology (IFIM) in aquatic analyses, FWS/OBS-84/11, U.S. Fish and Wildlife Serv. 30 p., (1984).

Distribution information on the microhabitat is obtained by random selection of numerous transects and cells in the stream. These cells and transects are then classified during a physical inspection, using a standard method to evaluate and classify the microhabitat found. Assumptions with regard to the habitat requirements of the target species during its present life stage are also made, depending on the stream fauna found and providing the proper identification of its present life stage is made. IFIM is used extensively and with apparent success on the streams and rivers on the Mainland.

APPLICABILITY TO HAWAII Any study is only as good as its ability to accurately model, with a computer or otherwise, all known conditions that occur. Provided the study is applicable, then its conclusions will only be as good as the quality and quantity of the data that the study will manipulate. IFIM requires information on the physical conditions (substratum, depth, width, velocity, range of flows over time, etc.) of the stream and the biology of the aquatic species present. This information is then processed and a computer model that simulates various flow conditions is developed. While it has been applied and the results verified on a large number of streams and rivers on the Mainland, it has not been verified in Hawaii.

Physical Characteristics

Hawaii's streams typically consist of a series of short riffles, runs, falls, and deep plunge pools.[6] A further characteristic of most Hawaiian streams is the great variability in flow regime both seasonally and over shorter intervals.[7] Hawaii streams respond rapidly to rainfall and the island watersheds "differ from watersheds in the continental (Mainland) areas in size, topography, precipitation received, infiltration capacity, vegetative cover, interflow, and channel storage".[8,9] Indeed, as shown in the hydrograph for Honoli'i, during a single short heavy rain the flow can increase from 40 to 1600 cfs in a period of less than 10 hours.[10]

The typical substratum in Hawaii's streams varies from narrow channels cut in exposed bedrock at the upper reaches to wide channels containing a heterogeneous mixture of boulders, cobbles, gravel and, where agriculture cultivation is present, heavy siltation. The entire length of the stream will contain numerous waterfalls of various heights. In addition, during the

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[6]Kinzie, III, et al., (TR171, 1986), p. 3.

[7]J. I. Ford, "Biology of a Hawaiian fluvial gastropod Neritina granosa Sowerby (Prosobranchia:Neritidae)," Master's thesis (Zoology), University of Hawaii at Manoa, (1979).

[8]G. A. MacDonald and A. T. Abbott, Volcanoes in the sea, (Honolulu: University of Hawaii Press, 1970), 441 p.

[9]I. Wu, Flood hydrology of small watersheds: Evaluation of time parameters and determination of peak discharge, Trans. Am. Soc. Agr. Engr. 12(5):655-63, (1969).

[10]DHM, Inc., Draft Environmental Impact Statement for Honoli'i Hydroelectric Power Project, (December 1988), p. 55.

frequent heavy freshet flows and infrequent heavier flood flows, the heterogeneous mixture that makes up the substratum changes dramatically with boulders, cobble, gravel, siltation and vegetative cover washed downstream into the ocean. At the mouth of the streams, interaction with ocean conditions introduces additional conditions.

Aquatic Biology

The biology of Hawaii's stream biota has not been studied in detail until relatively recently.[11] There is widespread agreement among biologists that Hawaii's stream fauna is derived from marine families. The major representatives retain a link to their marine ancestry in the form of a diadromous life cycle.[12] Mature adults located in the stream move seaward where their larvae is carried by coastal currents for a period of up to several months.[13,14] The larvae then mature to a juvenile phase in the nearest stream mouth and eventually migrate upstream and mature. Kinzie and Ford (1982) concluded that the fauna respond to instream signals rather than breeding based on seasonal clues. They also concluded that populations within a given stream may be

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[11] Kinzie, III, et al., (TR171, 1986), p. 3.

[12] Ibid., p. 4.

[13] J. I. Ford & R. A. Kinzie, III, Life crawls upstream, Nat. History 91(12):61-67, (1982).

[14] R. Radtke, et al., Age at recruitment of Hawaiian freshwater gobies, Environ. Biol. Fishes (in press, n.d.).

acting in isolation from populations in neighboring streams in regard to breeding.[15]

Computer Simulation

The hydraulic model recommended by the IFG, FWS, for simulations in high gradient, turbulent, or other difficult stream situations is the IFG4.[16] IFG4 is best suited for use with IFIM in Hawaii.[17]

Previous Studies

Since IFIM has been used to study several streams in Hawaii, conclusions about its applicability can be made by looking at the results of the studies.

Lumahai - An IFIM study of a 4-mile segment of the Lumahai River was undertaken over the course 13 months, beginning in June 1986, with publication in July 1987. Observations were restricted to stream flows from 60 cfs up to approximately 200 cfs.[18] Stream

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[15]Kinzie, III, et al., (TR171, 1986) p. 4.

[16]Thomas R. Payne & Associates, Instream Flow Assessment for Lumahai River, Lumahai River Hydroelectric Project, Kauai, Hawaii (July 31, 1987), p. 4.

[17]Kinzie, III, et al., (TR171, 1986), p. 51.

[18]Thomas R. Payne & Associates, Habitat Utilization Criteria for Four Native Hawaiian Freshwater Aquatic Species in the Lumahai River, Kauai, Hawaii (July 31, 1987), p. 4.

gradient is relatively consistent at 3-4% throughout the reach.[19] The study contained the following comments:

1) Lentipes concolor (o'opu alamo'o) was not found in sufficient abundance to be modeled.[20]

2) Cascades and falls were eliminated and the remaining stream categories normalized to total 100%. This habitat type (cascades and falls) cannot be modeled with hydraulic simulation techniques.[21]

3) The flow measurements required to calibrate the IFG4 computer model were taken during the summer of 1986. No more than a few transects could be measured on any one day before the stage (conditions of the stream) changed sufficiently to halt data collection due to the rapidly changing flow regime.[22]

4) Different criteria curves for the same species over only four miles of river make interpretation of the impact of flow releases from a single point of diversion highly complex and unmanageable.[23]

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[19] Thomas R. Payne & Associates, Instream Flow Assessment for Lumahai River, Lumahai River Hydroelectric Project, Kauai, Hawaii (July 31, 1987), p. 2.

[20] Ibid., p. 3.

[21] Ibid., p. 2.

[22] Ibid., p. 3.

[23] Thomas R. Payne & Associates, Habitat Utilization Criteria for Four Native Hawaiian Freshwater Aquatic Species in the Lumahai River, Kauai, Hawaii (July 31, 1987), p. 5.

5) The specific locations where opae kala'ole were found (very slow water velocities) did not coincide with visual observations of opae in stream channels where the velocity could be considered "shooting" as observed by Couret (1976).[24]

6) All observations were made during daylight hours and in the absence of freshet flows when individuals could be seen. The utilization curves reflect only habitat use by these species during daylight hours. Use of habitat at night may be entirely different.[25]

7) The lowest flow simulated was 20 cfs.[26]

8) Interpretation of impacts of flow releases should consider the habitat needs such as feeding, migration, reproduction and protection from predators...At this time, little is known about the life histories or behavior of the aquatic species...far less is known about them than is known about species such as salmon or trout.[27]

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[24] Ibid., p. 6.

[25] Ibid., p. 7.

[26] Thomas R. Payne & Associates, Instream Flow Assessment for Lumahai River, Lumahai River Hydroelectric Project, Kauai, Hawaii (July 31, 1987), p. 5.

[27] Thomas R. Payne & Associates, Analysis of Instream Flow Requirements and Flow Release Recommendation, Lumahai River Hydroelectric Project, Kauai, Hawaii (July 31, 1987), p. 4.

9) Instream flow is also not directly related to reproduction.[28]

10) The primary consideration required of any water development project to account for diadromous life cycles is to ensure that no barriers to migration or direct sources of mortality are created or exacerbated by project construction and operation...Given the ability of these species to negotiate cascades and waterfalls, an effective migration barrier could only be created if the stream were entirely diverted.[29]

Hanalei - An IFIM study of 4.8 miles of the Hanalei River between elevation 640' and 100' msl was undertaken over the course of 15 months, beginning in July 1987, with publication in October 1988. The study contained the following comments:

1) The aquatic species of primary interest are the o'opu nakea and o'opu nopili...Another goby, o'opu alamo'o (Lentipes concolor)...have been reported but are very uncommon.[30] (It therefore was not modeled.)

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[28] Ibid., p. 5.

[29] Ibid., p. 5.

[30] Thomas R. Payne & Associates, Instream Flow Assessment for the Hanalei River Hydroelectric Project, Kauai, Hawaii (October 10, 1988), p. 3.

2) Stream gradient lowers considerably below the headwaters from near-vertical to an average of 2.1% over the 4.8-mile project reach.[31]

3) Some information on the biology and life history of the species of concern is known, but the actual effects of flow alteration on migration, food production, reproduction, predation, competition, water temperature, and sedimentation (both independently and interactively) cannot be accurately predicted.[32]

4) The range in measured discharge was 35 to 290 cfs.[33] To be accurate, a recommended flow should consider the effects of high or low events such as floods and droughts...[34]

5) In many instances, aquatic populations are determined by short-term events...Unfortunately, there is so little known about the behavior and biology of the Hawaiian species that the limiting factors cannot be adequately determined.[35]

East & West Wailuaiki - An IFIM study of approximately two miles between elevation 2500' and 1300' msl was undertaken over the

[31] Ibid., p. 2.

[32] Ibid., p. 7.

[33] Ibid., p. 5.

[34] Ibid., p. 9.

[35] Ibid.

course of 11 months, beginning in July 1987 and resulting in publication in June 1988. The study contained the following comments:

1) The aquatic species of principal interest is Atyoida bisulcata (opae kala'ole). No other aquatic species are present in large numbers.[36]

2) The streams have cut steep-sided channels...alternating between low gradients (3-4%) and high waterfalls...[37]

3) Cascades and waterfalls were not represented in the collection of data and are not included (in the data used to develop the model).[38]

4) Because of the unstable flow regime at high flow, only middle and low flow depth and velocity sets were acquired.[39]

5) Streamflows respond rapidly...rising and falling by the hour...[40]

6) One cell not included (in the model)...was occupied by opae at densities so high they could not be counted...along a near-vertical rock wall. Due to the vertical nature of the bedrock and the extremely

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[36]Thomas R. Payne & Associates, Instream Flow Assessment for East, Middle, and West Wailuaiki Streams, East and West Wailuaiki Hydroelectric Project, Maui, Hawaii, (June 15, 1988), p. 2.

[37]Ibid.

[38]Ibid., p. 3.

[39]Ibid.

[40]Ibid., p. 2.

turbulent water, the boundaries of the cell could not be established...Since there was no usable data, and it could not be determined if these opae were feeding or only pausing, the cell was deleted.[41]

7) Some information on biology...is known, but the actual effects of flow alteration on migration, food production, reproduction, predation, competition, water temperature, and sedimentation (both independently and interactively) cannot be accurately predicted.[42]

<u>Wainiha & Nanue</u> - As part of TR171, an IFIM was performed on the Wainiha Stream on Kauai and the Nanue Stream on the Hamakua Coast of Hawaii during a three-year period. The physical characteristics of the study areas in the two streams are diverse. The area studied on Wainiha was a wide, low-gradient (0.7%) channel with small boulders and cobbles.[43] The study areas on Nanue were: a short reach (50 meters) beginning at the top of an 80-foot waterfall and extending upstream through a boulder and bedrock channel, with an average gradient of 6.5%; and a narrow gulch at elevation 1,120-feet msl, across sugarcane fields, consisting of bedrock with small cascades and an average gradient of 3.1%.[44] The report contained the following comments:

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[41] <u>Ibid.</u>, p. 5.

[42] <u>Ibid.</u>, p. 7.

[43] Kinzie, III, et al., (TR171, 1986), p. 7.

[44] <u>Ibid.</u>, p. 10.

1) A sample size of 150 to 200 observations may be required in order to construct reasonably smooth histograms (curves). We were not able to obtain samples this large.[45]

2) There are at least three life stage subcategories for which we did not gather biological data but which we consider to be very important in the biology of all three species (o'opu alamo'o, o'opu nopili, o'opu nakea).[46]

3) Very little information on any aspect of the biology of these species exists (o'opu alamo'o, nakea, and nopili), and no quantitative data on their microhabitat requirements are available.[47]

4) The second critical (life) stage is when the larvae make the transition from marine to riverine environment. This occurs at the interface of the stream mouth and the sea, so is not suitable for IFIM studies.[48]

5) Exclusion of the three life stages other than adult does not imply that we consider them to be of less importance, only that logistic and time constraints

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[45] Ibid., p. 14.

[46] Ibid., p. 11.

[47] Ibid.

[48] Ibid.

precluded our ability to gather sufficient data on them.[49]

6) Fewer than 1% of the observation sets encompassed waterfalls greater than 1.5 feet. It was therefore not analyzed.[50]

7) Although necessary hydraulic simulation information was only taken from the Wainiha and Nanue Streams, data on fish distribution and utilization was also collected and used from Hanawi Stream on Maui.[51]

8) Velocity frequency histograms at higher velocities were grouped into larger increments to avoid too many null categories.[52]

9) Several assumptions were made on the o'opu nopili's habitat requirements to accommodate the computer model.[53]

10) Wainiha is gaged with recorded streamflow between 33 cfs and 28,100 cfs. Computer flow simulations were limited to a maximum flow of 330 cfs.[54]

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[49] Ibid., p. 12.

[50] Ibid., p. 13.

[51] Ibid., pp. 5, 20.

[52] Ibid., p. 20.

[53] Ibid., p. 26.

[54] Ibid., pp. 5, 41.

11) Wainiha habitat area values derived from this report should not be construed to be the most realistic values predicted by IFIM.[55]

12) Utilization curves for the o'opu alamo'o in the upper Nanue Stream reflecting habitat area values should not be construed to be the most realistic values predicted by IFIM.[56]

13) The model predictions for flows between 28 and 60 cfs on the middle Nanue Stream should not be assumed to be accurate.[57]

14) It is very important to note that cross-section 10 on the middle Nanue Stream cannot be accurately modeled by IFG4.[58]

15) Flow simulation should not be extrapolated beyond the range of measured flows when studying complex channels such as Nanue Stream.[59]

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[55] Ibid., p. 42.

[56] Ibid., p. 44.

[57] Ibid., p. 47.

[58] Ibid.

[59] Ibid., pp. 50-51.

CONCLUSION: At this time the applicability of IFIM in Hawaii is severely limited by its:

1) Inability to accurately model all known conditions that occur. The best computer simulation model available, IFG4, which was developed for "simulations in high gradient, turbulent, or other difficult stream situations,"[60] cannot accommodate the known conditions found in a typical stream in Hawaii.

a) Cascades and waterfalls must be eliminated and the remaining categories normalized to represent 100 percent of the study area.[61,62,63] Elimination skews the simulation model by creating a stream that has a lower average gradient over the project reach and not allowing the inclusion of any species found on the vertical face of a waterfall. Sometimes, as in the case of opae kala'ole, this can be a substantial number.[64] Cascades and waterfalls have numerous

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[60] Thomas R. Payne & Associates, Instream Flow Assessment for Lumahai River, Lumahai River Hydroelectric Project, Kauai, Hawaii, (July 31, 1987), p. 4.

[61] Ibid., p. 2.

[62] Thomas R. Payne & Associates, Instream Flow Assessment for East, Middle, and West Wailuaiki Streams, East and West Wailuaiki Hydroelectric Project, Maui, Hawaii, (June 15, 1988), p. 3.

[63] Kinzie, III, et al., (TR171, 1986), p. 13.

[64] Thomas R. Payne & Associates, Instream Flow Assessment for East, Middle, and West Wailuaiki Streams, East and West Wailuaiki Hydroelectric Project, Maui, Hawaii, (June 15, 1988), p. 5.

important roles in the habitability of streams. In water quality, it provides conditions for re-oxygenation in addition to releasing of many gaseous pollutants. If located near the stream mouth, it provides a barrier to those predators unable to follow the migrating larvae as it climbs the waterfalls vertical face.

b) The interface of the stream mouth and the sea, which is arguably the most important biological area, cannot be modeled.[65] Native stream fauna is affected in two of its life stages by the conditions that exist in this area. It is here that they enter as larvae and return as juvenile from the ocean.

c) Existing physical conditions found in complex channels, such as was found in Nanue Stream, cannot be accurately modeled.[66]

2) Inability to model with reasonable accuracy, stream conditions that occur within the total range of flows known to exist based on the number of actual field measurements that are obtainable. Collection of data must be carried out when "optimal" conditions occur in the stream. This is a practical matter not only from the standpoint of safety for the observer, who must enter the water, but also from the

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[65] Kinzie, III, et al., p. 11.

[66] *Ibid.*, p. 47.

standpoint of ability to make accurate observations. "Because of the unstable flow regime at high flow, only middle and low flow depth and velocity sets were acquired."[67] Since we cannot expect observations to be made during turbid, freshet and/or flood conditions, the ability of the model to predict with reasonable accuracy stream conditions over a wide range of flows is extremely important. "To be accurate, a recommended flow should consider the effects of high or low events such as floods and droughts."[68]

a) The IFIM study conducted on Lumahai could not simulate flows below 20 cfs.[69]

b) The study on Nanue Stream cautioned against using model predictions for flows between 28 and 60 cfs[70]. The IFIM study concluded that, "Flow simulation should not be extrapolated beyond the range of measured flow when studying complex channels such as Nanue Stream."[71]

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[67]Thomas R. Payne & Associates, Instream Flow Assessment for East, Middle, and West Wailuaiki Streams, East and West Wailuaiki Hydroelectric Project, Maui, Hawaii, (June 15, 1988), p. 3.

[68]Thomas R. Payne & Associates, Instream Flow Assessment for the Hanalei River Hydroelectric Project, Kauai, Hawaii, (October 10, 1988), p. 9.

[69]Thomas R. Payne & Associates, Instream Flow Assessment for Lumahai River, Lumahai River Hydroelectric Project, Kauai, Hawaii (July 31, 1987), p. 5.

[70]Kinzie, III, et al., (TR171, 1986) p. 47.

[71]Ibid., p. 50-51.

c) Computer flow simulations were limited to a maximum flow of 330 cfs.[72] However, the range of flow that has been recorded in Wainiha is between 33 cfs and 28,100 cfs.

3) Dependence on the biological information presently known about the native aquatic species found in Hawaiian Streams which in many aspects has been widely acknowledged as lacking. It is widely accepted that freshwater aquatic species in Hawaii are diadromous. The IFIM model generates habitability and suitability curves for target species based on a single observation of the species within a micro-habitat. The model assumes that the microhabitat in which large populations are found is the preferred usable microhabitat. The usable microhabitat, called weighted usable area (WUA), is a discrete value for each section of the stream during each life stage of the species found and at each flow that occurs.[73] Since the freshwater aquatic species must migrate both upstream and downstream to complete its life cycle, during some life stage, it must cross and therefore can be expected to be found, in all available habitat that is present within the stream. It is

[72] Ibid., (TR171, 1986), pp. 5, 41.

[73] K. D. Bovee, A guide to stream habitat analysis using the Instream Flow Incremental Methodology, Instream Flow Information Paper 12, (U.S.D.I. Fish and Wildlife Service, Office of Biological Services., 1982), p. 75.

therefore extremely important to know biological information for each species at each life stage.

a) As was concluded in the Lumahai IFIM study, "Different criteria curves for the same species over only four miles of river make interpretation of impact of flow releases from a single point ... highly complex and unmanageable."[74] The study went on to say, "Interpretation of impacts of flow releases should consider the habitat needs such as feeding, migration, reproduction and protection from predators...At this time, little is known about the life histories or behavior of the aquatic species...far less is known about them than is known about species such as salmon or trout."[75]

b) The necessity and absence of biological information was reiterated in the Hanalei and East & West Wailuaiki IFIM studies. Some information on the biology and life history of the species of concern is known, but the actual effects of flow alteration on migration, food production, reproduction, predation, competition, water temperature, and sedimentation (both independently and

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[74]Thomas R. Payne & Associates, Habitat Utilization Criteria for Four Native Hawaiian Freshwater Aquatic Species in the Lumahai River, Kauai, Hawaii (July 31, 1987), p. 5.

[75]Thomas R. Payne & Associates, Analysis of Instream Flow Requirements and Flow Release Recommendation, Lumahai River Hydroelectric Project, Kauai, Hawaii (July 31, 1987), p. 4.

interactively) cannot be accurately predicted.[76,77]

c) Another problem of limited biological information is the inability to predict the impact short term events (droughts, floods etc.) will have on the species. These limiting factors cannot therefore be accurately predicted and mitigated.[78]

d) The lack and importance of biological data on all aspects of native freshwater species, including microhabitat and different life stages, was cited extensively as limiting factors in the development and use of the utilization curves for freshwater species in Wainiha and Nanue.[79]

4) Dependence on large sample sizes for each aquatic species. For the most threatened species, Lentipes concolor (o'opu alamo'o), it is impossible to gather a large enough sample size to accurately model and develop criteria curves. A sample size of 150 to 200 observations may be required in

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[76]Thomas R. Payne & Associates, Instream Flow Assessment for the Hanalei River Hydroelectric Project, Kauai, Hawaii (October 10, 1988), p. 7.

[77]Thomas R. Payne & Associates, Instream Flow Assessment for East, Middle, and West Wailuaiki Streams, East and West Wailuaiki Hydroelectric Project, Maui, Hawaii, (June 15, 1988), p. 7.

[78]Thomas R. Payne & Associates, Instream Flow Assessment for the Hanalei River Hydroelectric Project, Kauai, Hawaii, (October 10, 1988), p. 9.

[79]Kinzie, III, et al., (TR171, 1986), pp. 11, 12, 26, 42, 44.

order to construct reasonably smooth histograms.[80] Habitat utilization data from fish in one stream cannot be reliably transferred to another stream.[81]

a) Lentipes concolor was not found in sufficient abundance to be modeled in Lumahai.[82]

b) Lentipes concolor was very uncommon and therefore not modeled in Hanalei.[83]

c) Other than the aquatic species opae kala'ole, no other aquatic species are present in large numbers (in East & West Wailuaiki).[84]

d) Although necessary hydraulic simulation information was only taken from the Wainiha River and Nanue Stream, because of the lack of fish observations, fish distribution and utilization data was also collected and used in the model from Hanawi Stream on Maui.[85]

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[80] Ibid., p. 14.

[81] Ibid., p. v (Abstract).

[82] Thomas R. Payne & Associates, Instream Flow Assessment for Lumahai River, Lumahai River Hydroelectric Project, Kauai, Hawaii, (July 31, 1987), p. 3.

[83] Thomas R. Payne & Associates, Instream Flow Assessment for the Hanalei River Hydroelectric Project, Kauai, Hawaii (October 10, 1988), p. 3.

[84] Thomas R. Payne & Associates, Instream Flow Assessment for East, Middle, and West Wailuaiki Streams, East and West Wailuaiki Hydroelectric Project, Maui, Hawaii (June 15, 1988), p. 2.

[85] Kinzie, III, et al., (TR171, 1986), pp. 5, 14, 20.

These limitations force assumptions to be made in order for the computer simulation to develop criteria curves. Since IFIM is a computer simulated mathematical model, each assumption reduces the accuracy and ability of the model to predict with confidence a relationship between streamflow and fish habitat area. IFIM assumes that habitat (and therefore impact on native stream fauna) can be quantified. However because of the serious limitations described, its usefulness and applicability in generating accurate quantitative information in Hawaii, from which decisions can be made, must be questioned.