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WATER AND LAND DEVELOPMENT

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

AUG 1 0 1983

REF. NO.: CPO-404

Mr. Randall Hee, Engineering Superintendent
McBryde Sugar Company, Ltd.
P. O. Box 8
Eleele, Hawaii 96705

Dear Mr. Hee:

We have completed our review of your Final Environmental Impact Statement (EIS) filed with the Department on August 5, 1983. A thirty (30) day extension to the response period was granted on July 20, 1983 at your request to provide additional time to fully address all reviews and comments.

Background

The Environmental Impact Statement has been reviewed in a manner provided by Sections 1:70, 1:71 and 1:72 of the EIS Regulations and Chapter 343, Hawaii Revised Statutes.

The overriding criteria in the determination of acceptability of a statement as stated in Section 1:70 of the EIS Regulations is as follows:

> "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. (Emphasis added)

An Environmental Impact Statement as defined in the EIS Regulations is "an informational document prepared in compliance with Chapter 343, Hawaii Revised Statutes, applicable rules, and these Regulations, and which discloses: the environmental effects of a proposed action, the effects of a proposed action on the economic and social welfare of the community and State, the effects of the economic activities arising out of the proposed action, the measures proposed to minimize adverse effects, and the alternatives to the action and their environmental effects."

Further examination of the Statement shall be predicated upon the criteria enumerated in Sections 1:71 and 1:42 of the EIS Regulations. These criteria can be categorized as procedural, review process and content related requirements.

CPO-404

With reference to content requirements, the document must satisfactorily comply with the provisions as specified under Section 1:42 of the EIS Regulations.

Analysis

Satisfactory Compliance

Procedural Requirement

1. An assessment of the project was submitted to the Department on January 10, 1983 as part of the Conservation District Use Application.
2. A Preparation Notice was filed with Environmental Quality Commission on March 8, 1983.
3. The applicant had consulted agencies at the Federal, State and County levels during the sixty (60) days consultation period.
4. The DEIS was officially filed with the EQC on May 23, 1983.
5. Comments stemming from the consultation period were addressed and incorporated into the DEIS.
6. Comments regarding the DEIS were appended to the Final EIS. Responses were made and incorporated into the FEIS.

Review Process Requirements

1. Comments submitted at all levels of review including the assessment phase and the DEIS phase were responded to and appended to the FEIS.
2. The applicant had solicited advance comments and reviews from the Department and other government agencies for early assessment purposes before the Preparation Notice was filed with the Environmental Quality Commission.

Content Requirements

1. The Department finds the FEIS to have satisfactorily met the requirements enumerated in Sections 1:42 (a), 1:42 (b), 1:42(1), 1:42 (m), 1:42 (o) of the EIS Regulations.
2. A section pertaining to the environmental setting had been incorporated. Such descriptions of the existing conditions include geology, climate and hydrology, stream fauna, terrestrial and avian wildlife, vegetation, archaeology, public services and socio-economic characteristics. All survey reports have been incorporated as appendices.
3. Point by point discussion of the potential impacts arising from the proposed project and the proposed mitigation measures have been adequately discussed.

CPO-404

4. Unavoidable adverse environmental effects, irreversible and irretrievable commitments of resources and possible alternatives have been described.

Conclusion

The Department has determined that the Revised EIS for the Wainiha Hydroelectric Facility situated at Wainiha, Kauai on property also described as TMK 5-8-01: 1 and 5-8-02: 2 has adequately disclosed and described all identifiable environmental impacts and represents an informational document as required by Chapter 343, Hawaii Revised Statutes. The document is therefore deemed acceptable.

The Department puts special emphasis on the definition of acceptance in that it "does not mean that the action is environmentally sound or unsound but only that the document has complied with Chapter 343, HRS and its regulations". The Department is concerned with the level of continuous minimum stream flow that needs to be maintained to prevent further habitat degradation of the oopu once the system is installed. The Department is even more concerned with the design of the project. Consideration must be given to alternate designs which in itself may present solutions to major environmental problems. Unless appropriate attention is paid to alleviate the above concerns, the Board of Land and Natural Resources may take action to assure that proper mitigative measures are taken.

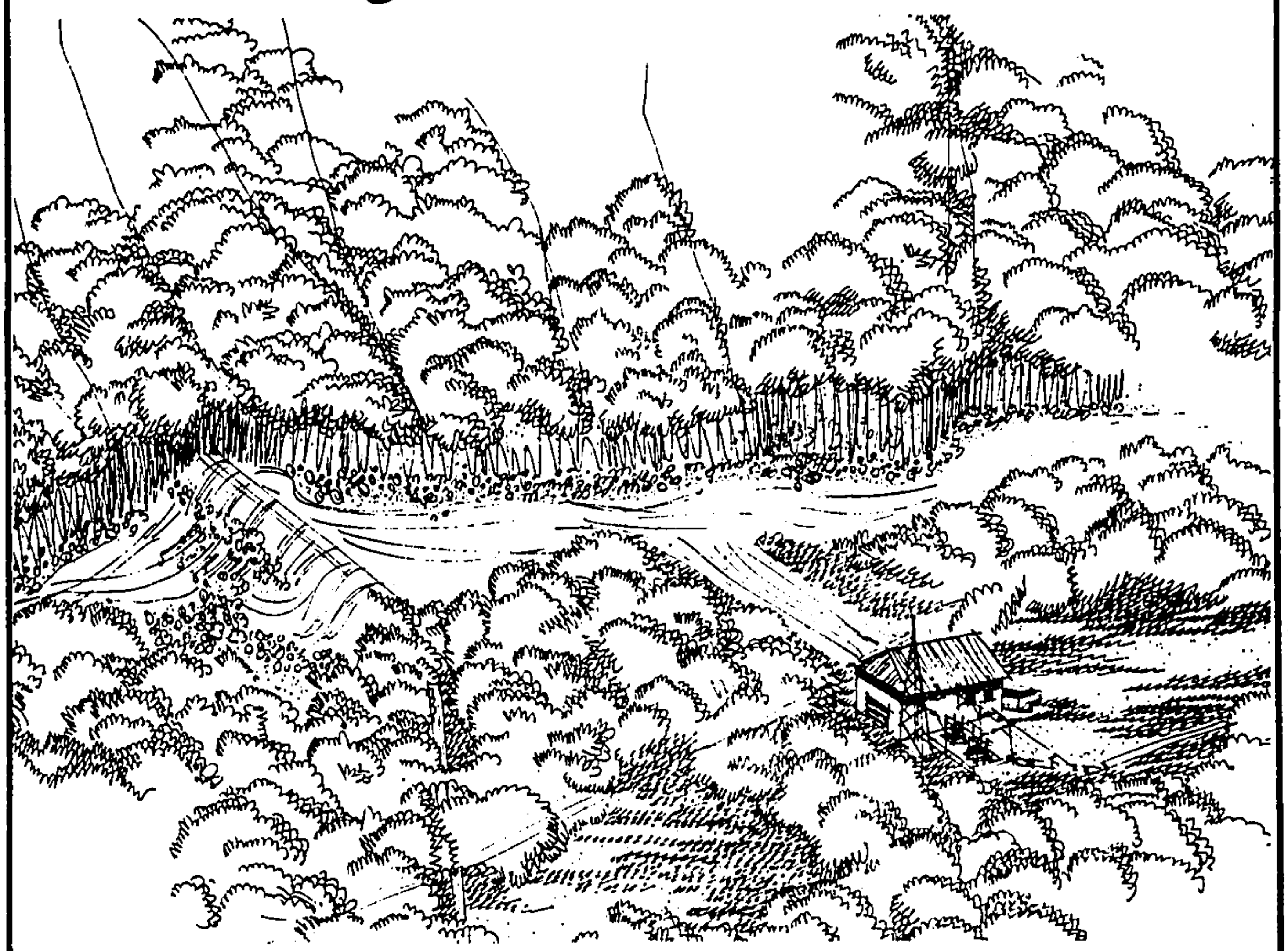
We hope the foregoing will help you in your pursuit for an environmentally sound and economically viable project. If you have further questions, please don't hesitate to contact Ms. Anne Lo-Shimazu of our Planning Office at 548-7837.

Very truly yours,

SUSUMU ONO, Chairperson
Board of Land and Natural Resources

cc: EQC
EDAW

Wainiha Hydroelectric Project



FINAL
ENVIRONMENTAL IMPACT STATEMENT

McBryde
SUGAR COMPANY, LIMITED

WAINIHA HYDROELECTRIC PROJECT

Environmental Impact Statement

McBryde Sugar Company, Limited

Submitted pursuant to Chapter 343, Hawaii Revised Statutes

Accepting Authority: State of Hawaii
Department of Land and Natural Resources

August 1983

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Chapter

CHAPTER I: SUMMARY

McBryde Sugar Company, Ltd., (McBryde) has operated a hydroelectric plant on the Wainiha River on Kauai, Hawaii, since 1906. The long-term success of this plant and the remaining economic resource of the river are such that McBryde proposes to construct a second run-of-the river hydroelectric plant upstream of the existing plant. The proposed plant will cost about $10 million to construct and will generate about 22 million kilowatt hours per year. The output of the plant will be sold to Kauai Electric Company (KE).

Prior to making a decision on the feasibility of an upstream project, McBryde undertook a series of engineering, environmental, economic, and financial studies. These studies demonstrated that the project could be built for a definable cost and that it was economically and financially feasible. The environmental studies, which included field surveys of aquatic macrofauna, birds, mammals, vegetation, and archaeological and historical resources, defined existing environmental conditions and helped to define impacts and mitigation measures. The project will have certain short-term impacts during construction, such as an increase in turbidity in the river. Longer term impacts center on fish populations.

Studies have shown that the Wainiha River, which has supported the existing project since 1906, has maintained conditions which promote the abundance and diversity of stream fauna. Since the proposed project will have characteristics similar to the existing project, it is reasonable to conclude that the proposed project's effects on stream fauna will be similar, but cumulative. There may be a reduction in habitat in the affected reach of the proposed project. This reduction is the only potentially significant adverse impact which may be unavoidable. Entrainment will be avoided by screening the intake. Migratory passage will be maintained by constructing the proposed weir similar to the existing weir. The reduction in habitat will be mitigated, at least in part, by maintaining a continuous flow of one cfs, about 650,000 gallons per day, in the affected reach and by screening the intake at the existing project. To the extent that these measures may not entirely mitigate the potential for loss resulting from the reduction in habitat, then that potential loss must be weighed against the benefits of the proposed project.

The proposed project will have significant benefits. As a clean, renewable energy source, the project will save about $1.5 million per year in imported oil and result in a direct benefit of $339,000 per year to KE's customers. Other benefits will be improved system reliability, reduced air pollution from fossil fuel combustion, and creation of jobs during construction. The project will benefit McBryde by providing income which will enable it to better survive the instabilities that afflict the Hawaiian sugar industry. This will help to ensure the long-term viability of McBryde, a mainstay to the economy of Kauai and its people.

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. It also has been prepared with a view toward furnishing the environmental data required for the environmental assessment of McBryde's application for a Section 404 (Clean Water Act) permit.

The EIS describes potential environmental impacts of building and operating the project and proposed mitigation measures. It also describes alternatives to the proposed action, including the "no project" alternative, and the consultation process involved in the preparation of the EIS.

Changes to the text of the Draft EIS are indicated by vertical bars in the margin of the Final EIS.

Chapter 11

CHAPTER II: PROJECT DESCRIPTION

A. Location

The proposed project is located on Kauai, a roughly circular-shaped island of 549 square miles situated approximately 100 miles northwest of Oahu. Kauai, the northernmost inhabited island in the Hawaiian chain, was formed by a single volcano, Mount Wai'ale'ale which rises to a height of 5,200 feet above sea level.

Wainiha Valley, the project area, is in the rural North Shore region of Kauai and is somewhat isolated from the County seat of Lihue and other major population centers of the island. Two miles east of Wainiha is Lumaha'i, another deep, verdant valley, a portion of which has been designated as a National Wildlife Refuge. Immediately west of Wainiha is the village of Ha'ena, at the terminus of Kuhio Highway, the major road connecting the coastal communities of Kauai. Beyond Ha'ena is the rugged Na Pali Coast, which is inaccessible to vehicles. (See Exhibit II-1.)

B. Background and Objectives

1. Existing project

McBryde Sugar Company owns and operates an existing hydroelectric project in Wainiha Valley.

The existing project, placed in commercial operation in 1906, consists of a diversion weir and headworks, 4.5 miles of water conductors (ditch, tunnel and penstock system), a powerhouse, electrical transformers, transmission line and unpaved access road. (See Exhibits II-2 and II-3.) A maximum of about 100 cubic feet per second (cfs) of water is diverted at the weir and travels through the system of tunnels and ditches to a forebay at an elevation 560 feet above the powerhouse. Water then flows through a penstock to the powerhouse where it turns four Pelton hydraulic turbines. These turbines power two generators which have a total capacity to produce 4,000 kilowatts (kw) of electricity. The annual output averages 28 million kilowatt hours (kwh), which is fed into the Kauai Electric Company (KE) grid system. Power exchange agreements

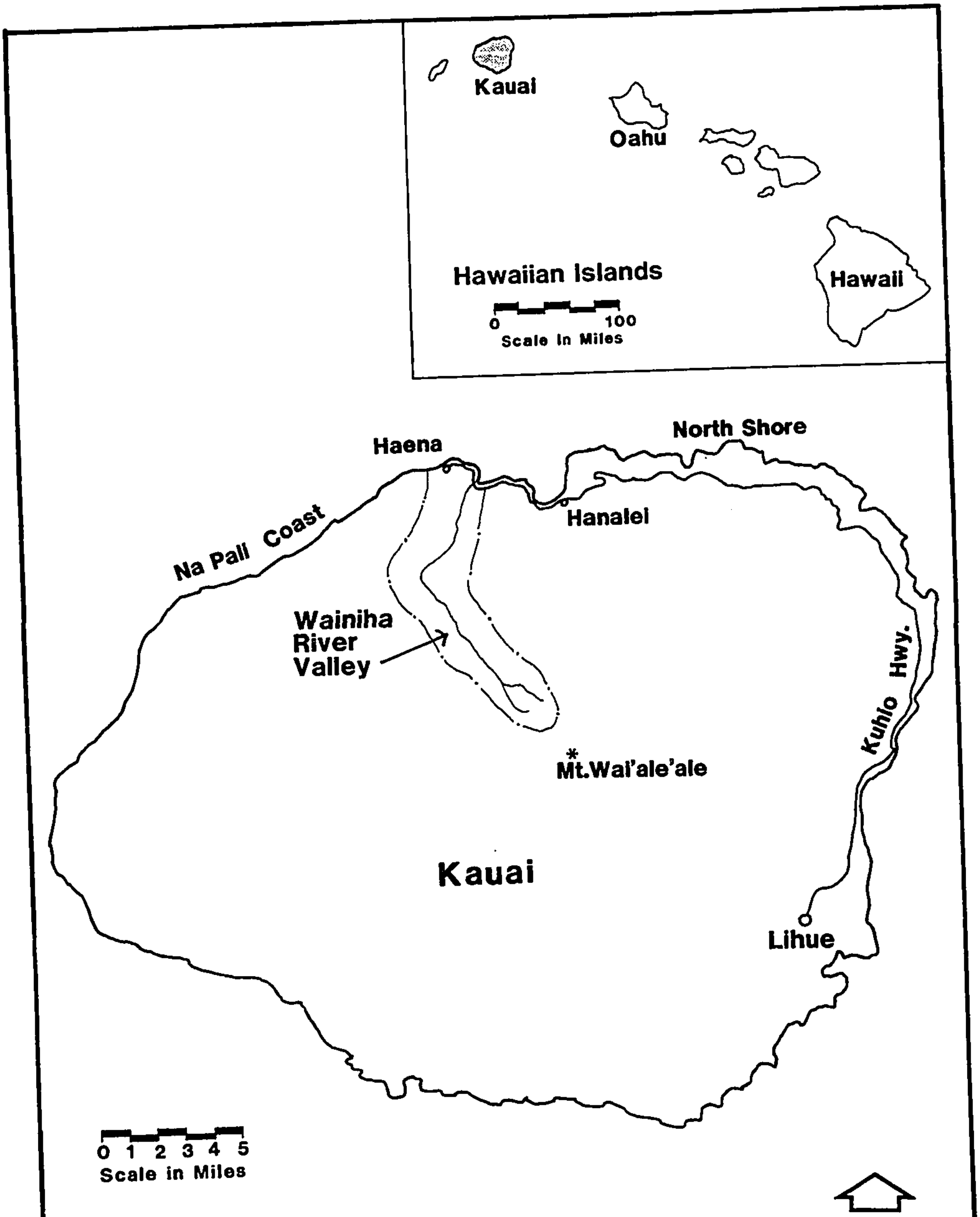


EXHIBIT II-1 LOCATION MAP

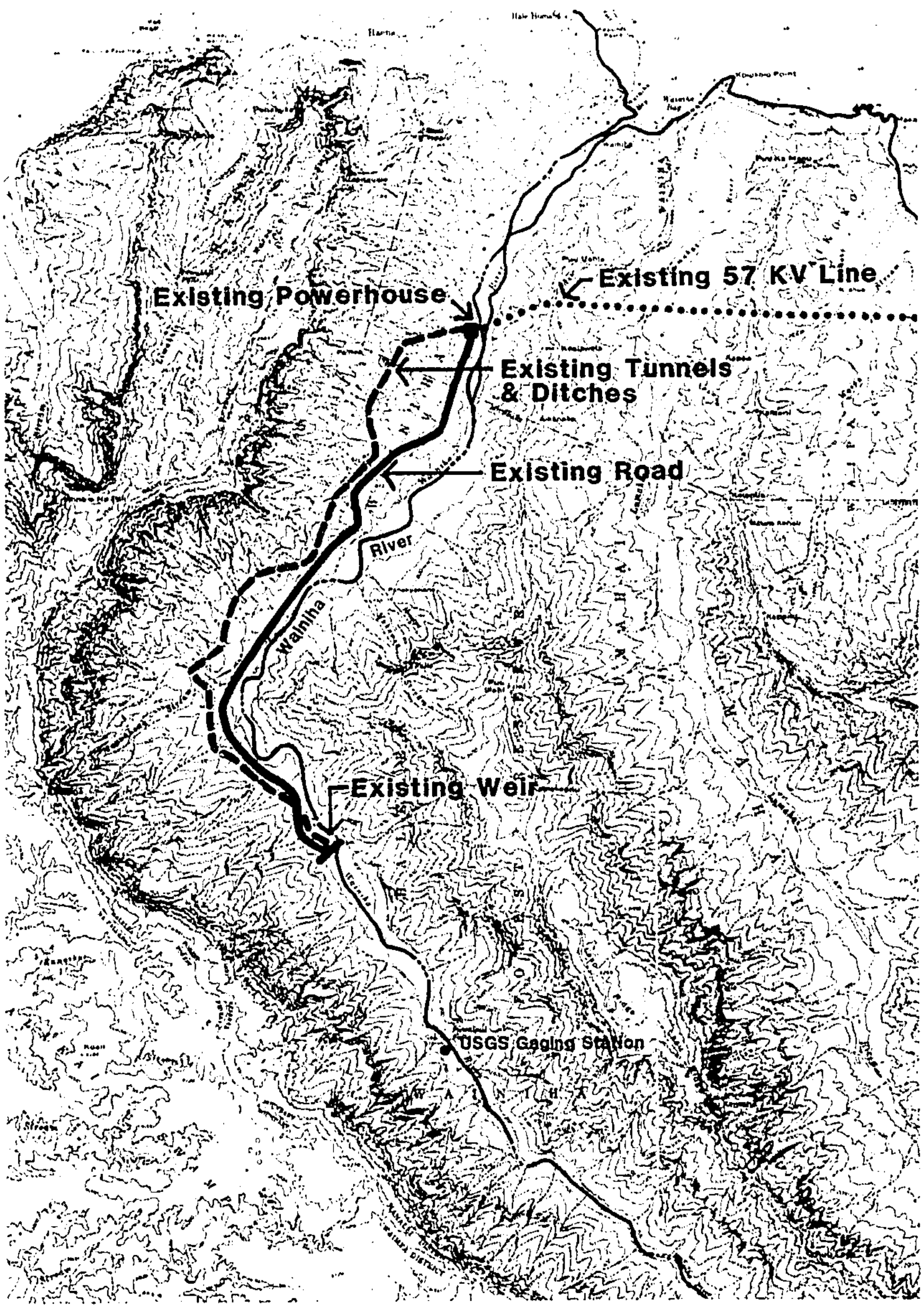
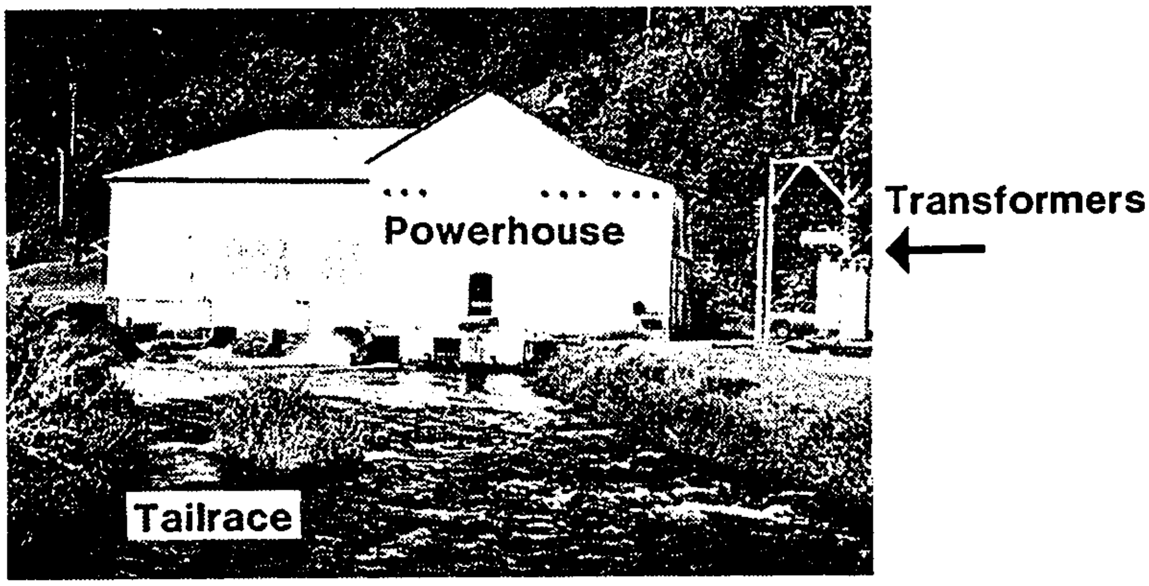
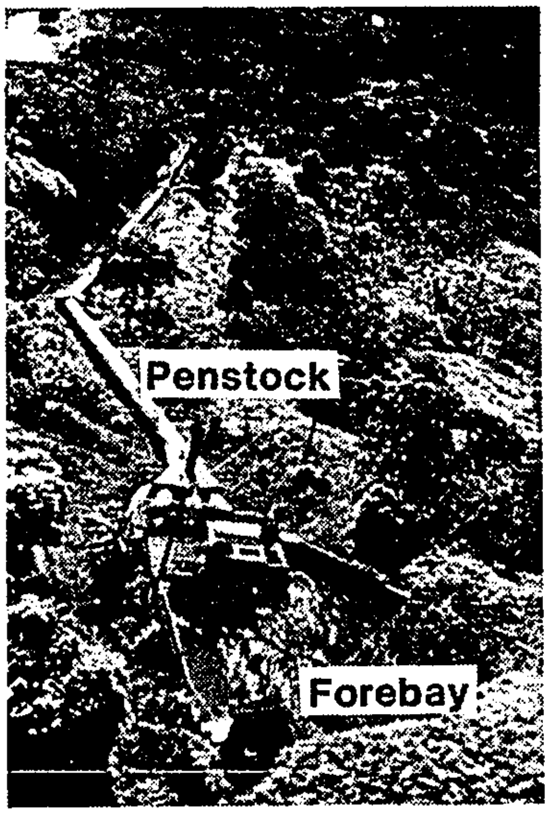


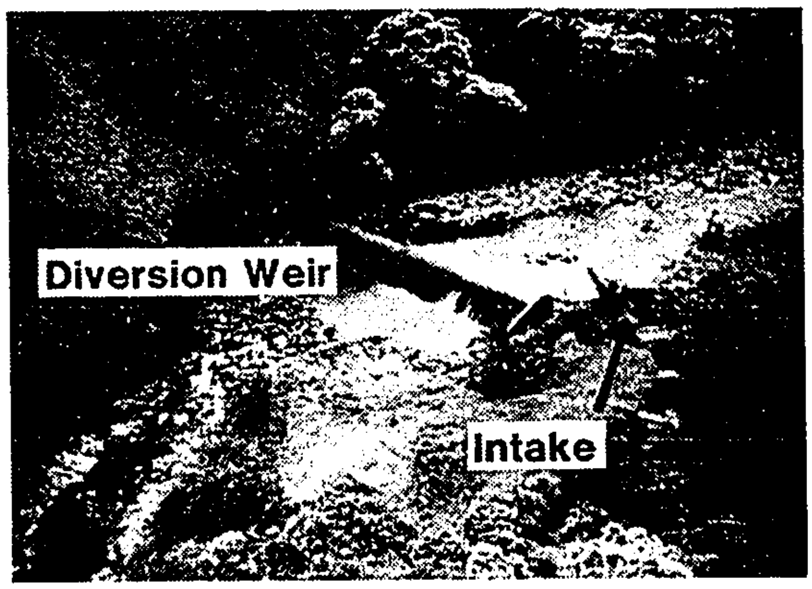
EXHIBIT II -2
EXISTING PROJECT



POWERHOUSE AND TAILRACE



PENSTOCK LEADING INTO FOREBAY



DIVERSION WEIR AND INTAKE

EXHIBIT II-3
EXISTING PROJECT FEATURES

allow the energy to be combined with other McBryde generating sources. Most of the power is used by McBryde in the production of sugar cane. The remaining energy is sold to KE.*

2. Proposed project

In 1982 McBryde studied ways to increase generation of electricity.** The study concluded that, besides improving the existing system, an upstream project could increase energy production. The entire output of the upstream project could be sold to KE since McBryde is already energy self-sufficient. McBryde then proceeded with studies to identify a technically, economically, and environmentally feasible project. Currently, of the 224 million kwh produced for public consumption on Kauai, 58% is produced by Kauai Electric from fossil fuel. Another 35% is produced by several plantations, other than McBryde, from non-fossil fuel resources such as bagasse and hydroelectric power. McBryde currently provides 7% of Kauai's total public energy requirements. The proposed project will provide an additional 22 million kwh, increasing McBryde's contribution of

*McBryde produces a total of 59 million kwh annually from its bagasse (27 million kwh) and hydroelectric (28 million kwh at Wainiha and 4 million kwh at Kalaheo) operations. Of the 59 million kwh, McBryde uses 43 for its own activities and sells 16 million kwh to KE.

**EDAW inc., for McBryde Sugar Company, Ltd., Wainiha Hydroelectric Project Planning Report, March, 1982.

non-fossil fuel energy production from 7% to 17%. As a result, islandwide fossil fuel energy production will fall to 48% (See Exhibit II-4.)*

C. Principal Project Features

The proposed project will be similar to the existing one in that it will consist of a diversion weir, intake and headworks, water conductors, powerhouse, electrical transforming substation, transmission line and access road. (See Exhibit II-5.)

The new diversion weir will be located approximately 2.1 miles upstream of the existing weir, at about elevation 1140 feet. Its crest will be approximately 160 feet long and 14 feet high above the river bed. It will have an ogee shape with an apron downstream to avoid scour. The weir will be a concrete structure. The function of the weir is to divert water into the intake. Like the existing weir, it will not impound, or store, water. A maximum of 150 cfs will be diverted by the weir. Flows exceeding 150 cfs will overtop the weir and continue downstream in the natural stream channel. The crest will have a shallow notch near the right bank to maintain continuous flow in the river.

*Assuming no change in energy production by Kauai Electric and other plantations.

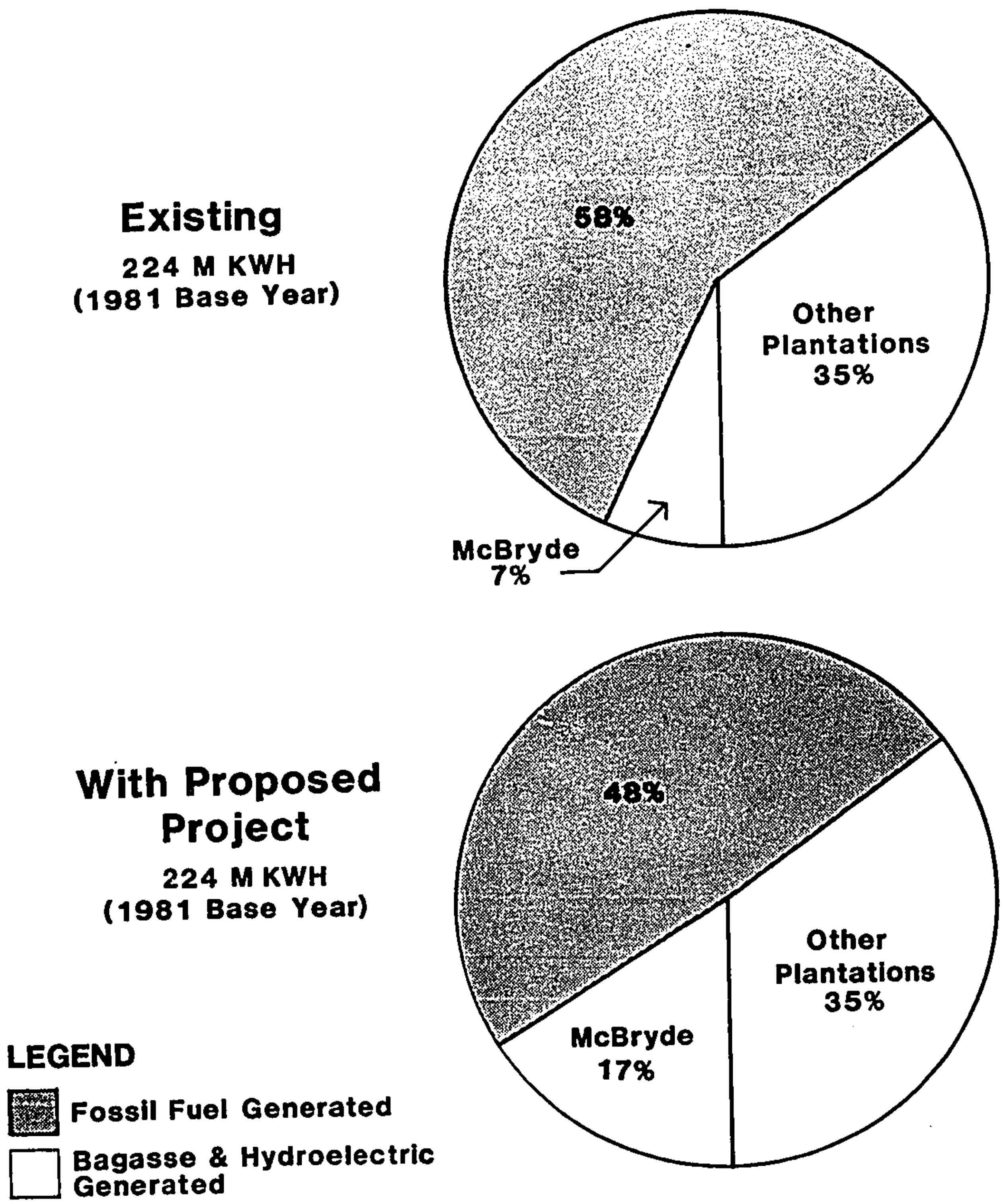


EXHIBIT II-4
SOURCES OF ELECTRIC ENERGY FOR PUBLIC CONSUMPTION ON KAUAI

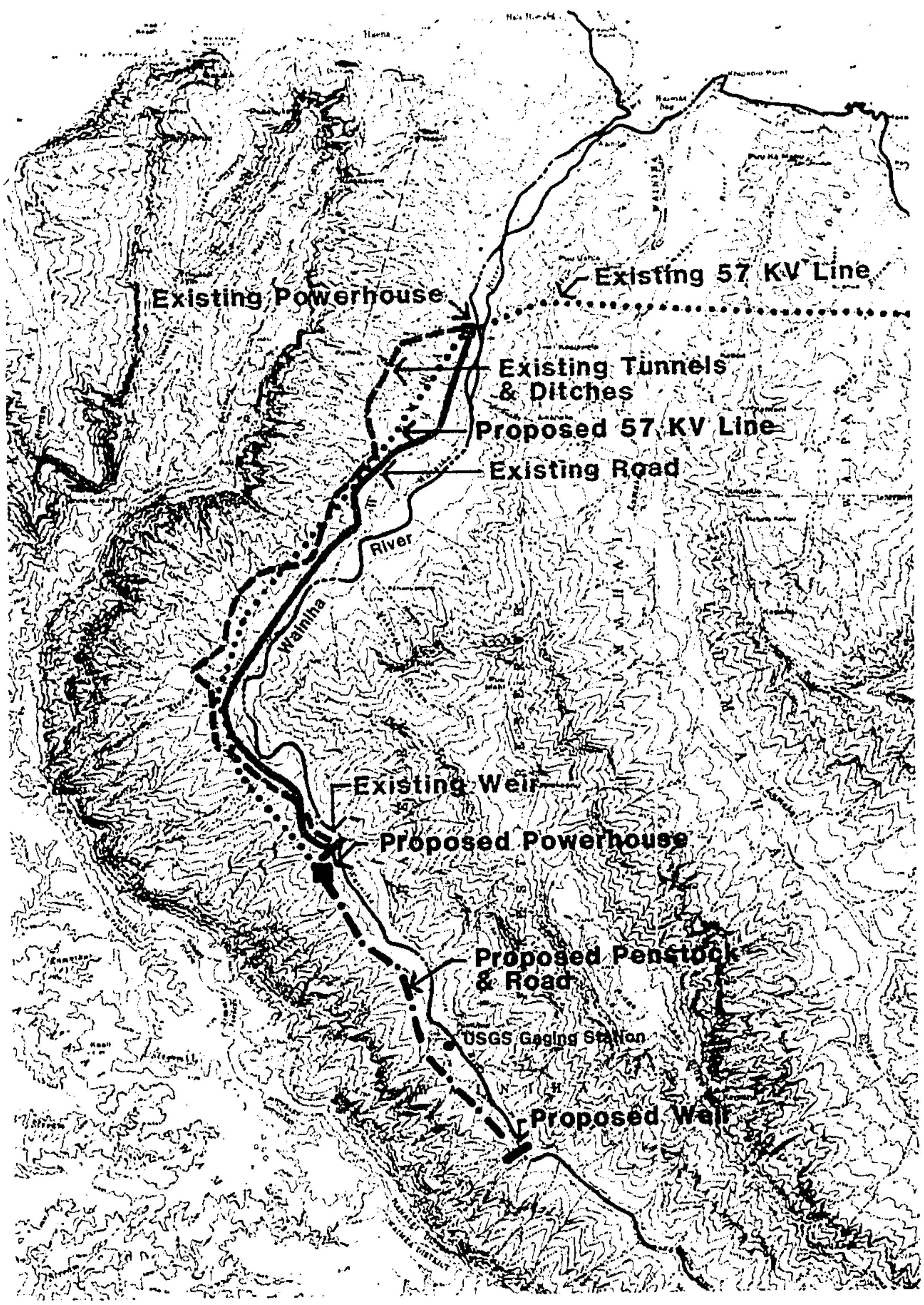


EXHIBIT II-5
PROPOSED PROJECT

The intake and headworks will be constructed along the left bank, as viewed looking downstream. The headworks will control the amount of flow into the water conductors and screen fish, trash and debris. The intake will have a design velocity of 2 feet per second, and its face will be parallel to the river. Coarse trash racks with bars spaced 6 inches apart and angled 45 degrees to the flow will screen the entrance to the intake. These racks will keep out large trash. The angled bars or racks will allow the flow to sweep past the intake to clear it of accumulated trash at times when there is sufficient flow to wash the trash over the top of the weir. (See Exhibit II-6.)

A 3-foot deep grit and gravel trap will be constructed downstream of the intake. Stoplogs placed in slots will allow de-watering of the system for maintenance, which will occur approximately two weeks out of the year.

Downstream of the stoplog slots will be a traveling water screen having 1/2-in. mesh openings to exclude fish and trash from the penstock. The screen will be inclined to the vertical in order to retain trash and to facilitate cleaning.

A tainter gate will be installed behind the screen and ahead of the transition to the penstock. This gate will be lowered to stop flow into the penstock. It will also be rigged to close in case of a penstock rupture.

A water level sensor will be installed ahead of the penstock. This sensor will detect water availability and adjust the power plant output to match stream flow. When stream flow exceeds 150 cfs, the excess will flow over the weir and through the natural stream channel.

The deck will support machinery and facilitate access to the intake. It will be constructed to allow operation at flows equal to the design flood. The design flood approximates the flood of record. The electrical machinery at the headworks will be set at an elevation above the deck to provide additional flood protection. At flows greater than the design flood, the plant may have to shut down, but no damages are expected. Electrical machinery will consist of motors, cables, and controls used to operate the screen and the tainter gate.

The penstock will be 48-inch diameter spiral-welded steel pipe. The pipe will be 3/8-inches thick and coated with coal tar epoxy to prevent corrosion. It will be fabricated and transported to the site in 40-foot lengths and connected with mechanical couplings during installation. Each section of pipe will be supported by two saddles, one at each end, with a holddown strap at one end. (See Exhibit II-7.)

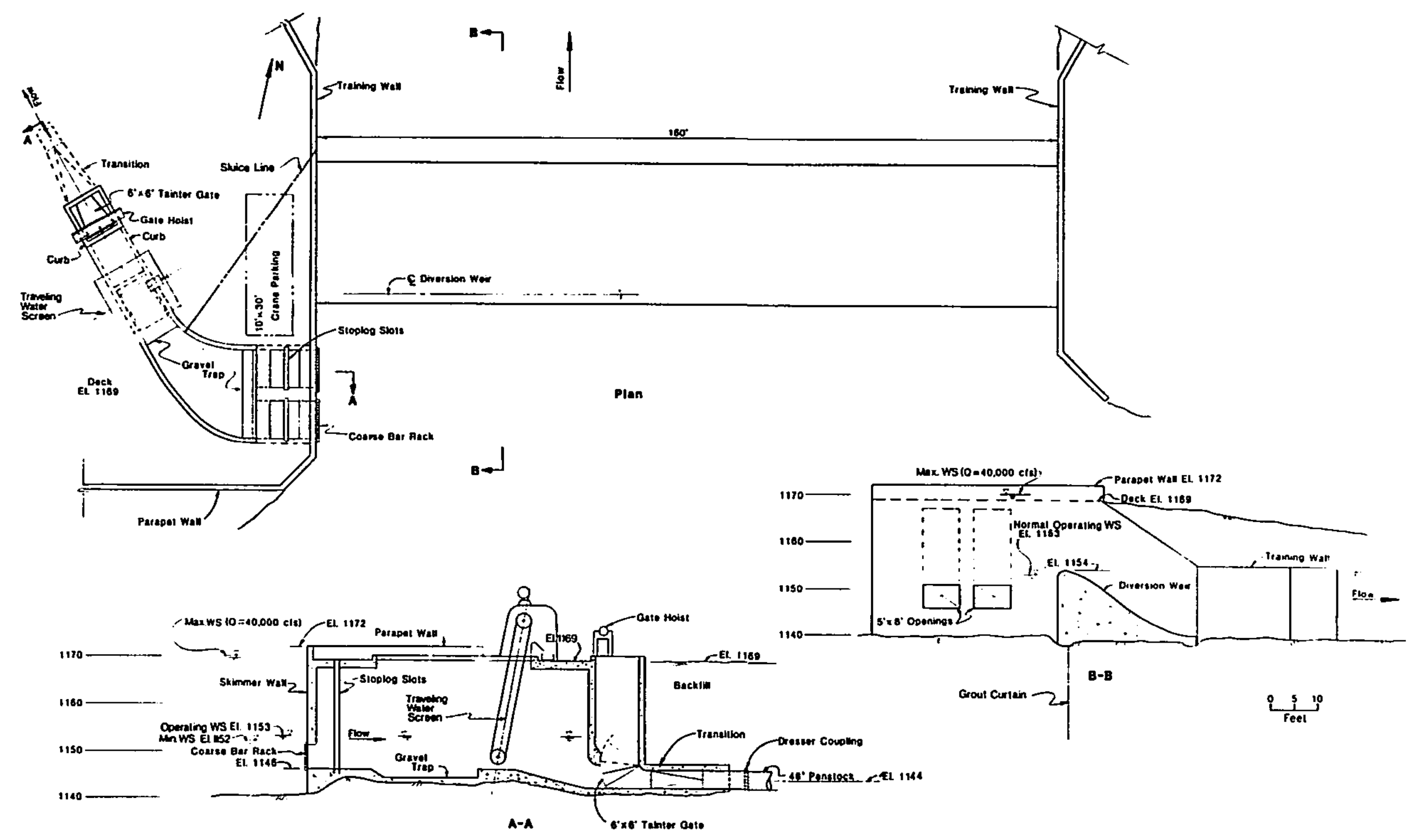


EXHIBIT II-6
PROPOSED WEIR AND INTAKE

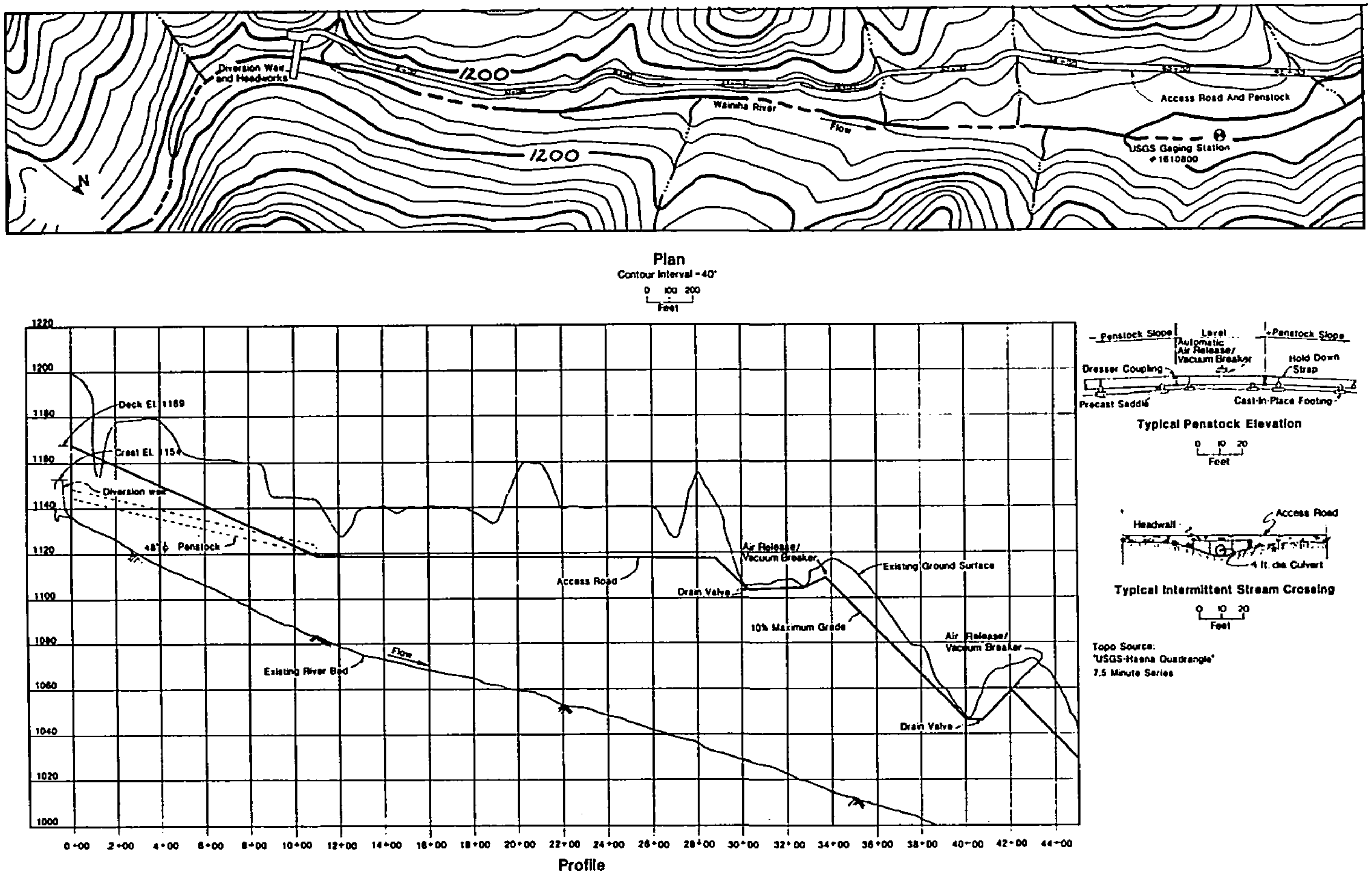


EXHIBIT II-7
PROPOSED PENSTOCK AND ROAD - Section 1

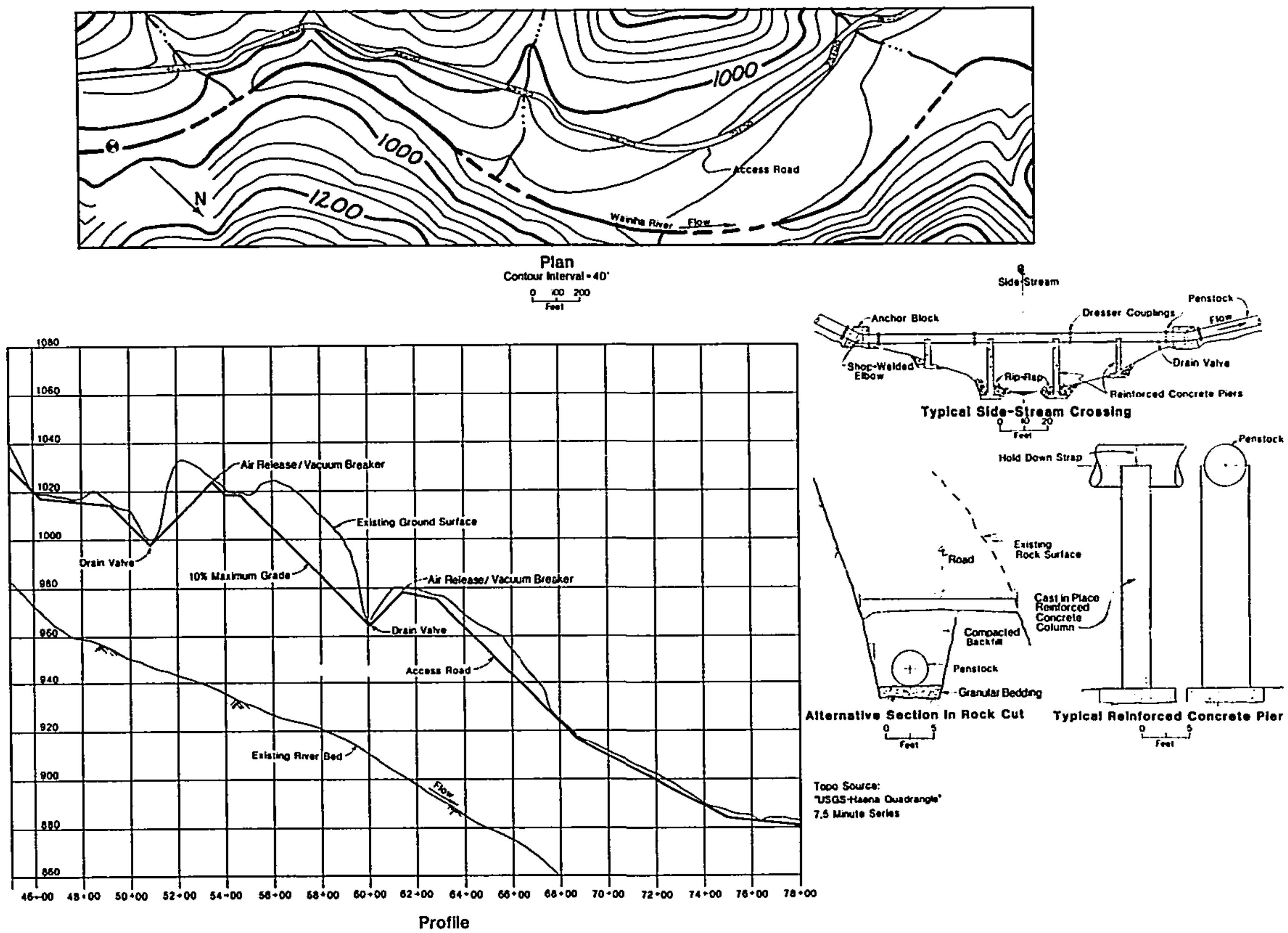


EXHIBIT II-7
PROPOSED PENSTOCK AND ROAD - Section 2

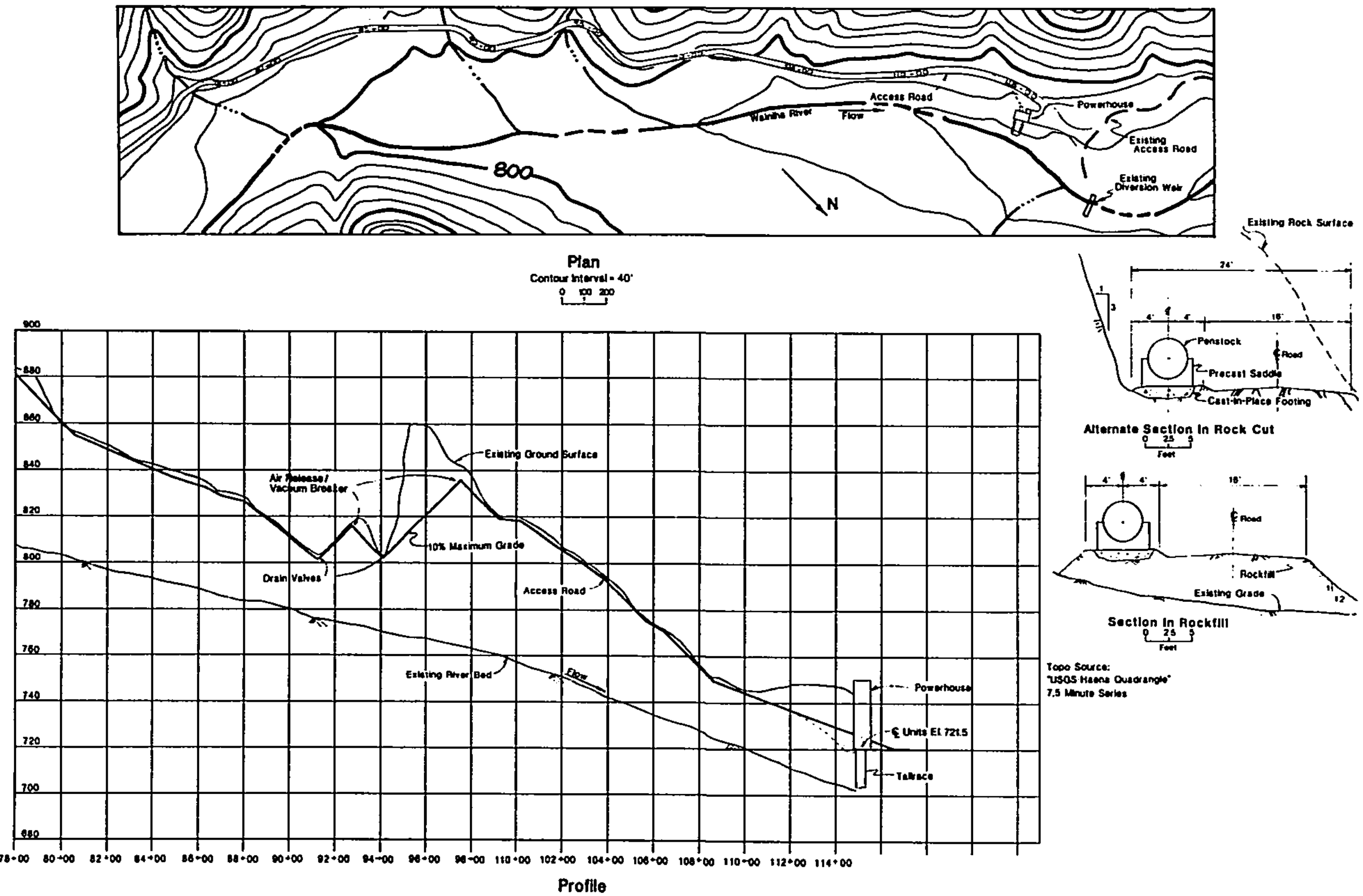


EXHIBIT II-7
PROPOSED PENSTOCK AND ROAD - Section 3

The routing of the penstock will minimize the number and degree of bends and turns in order to minimize cost and preserve the maximum head possible. For most of its length, the penstock will be set on 4-foot high concrete saddles. These supports will elevate the penstock above grade at the side of the access road. In steep and rugged terrain, the penstock will be buried in the road to minimize the cut and fill entailed in road construction. At stream crossings, columns will support the penstock across the channels. The columns will be placed away from the stream channel. Anchor blocks of mass concrete will be placed at pipe bends and at every 600 feet along straight runs.

Air release and vacuum breaker valves will be placed at hydraulic high points along the penstock. The valves will allow entrapped air to escape and prevent collapse of the pipe in the event of penstock blockage.

The powerhouse will be sited immediately upstream of the existing weir and headworks and set back approximately 200 feet from the stream channel. The powerhouse substructure will be of reinforced concrete. Sufficient mass of concrete will be provided to dampen the vibrations of the rotating machinery. The operating floor will be above the design flood elevation.

The powerhouse superstructure, 45 feet by 75 feet in plan, will be of conventional design and construction, using structural steel for the building framework. (See Exhibit II-8.) The height from floor to roof ridgeline will be about 35 feet. The siding and roof will be of metal panels colored in earth-tones to blend in with the surrounding landscape. The structure will be vented at the roof peak. (See Exhibit II-9.)

In addition to personnel access doors, there will be a 15 ft by 20 ft rollup steel door for vehicular access. Windows will be provided for natural light to enter. Three interior partitions will be installed; one for a control room and office, one for a washroom, and the third for a battery room.

There will be one generating unit in the powerhouse, consisting of two overhung Pelton hydraulic turbines connected to a single generator by a horizontal shaft. Each turbine will have two nozzles and will be rated to provide approximately 2,740 horsepower (hp) at a flow of 75 cubic feet per second (cfs) at a net 357 feet of head. The generator will be rated at 4,800 kilovolt-amperes (kva) at a 0.85 power factor. The unit will operate at 257 revolutions per minute (rpm).

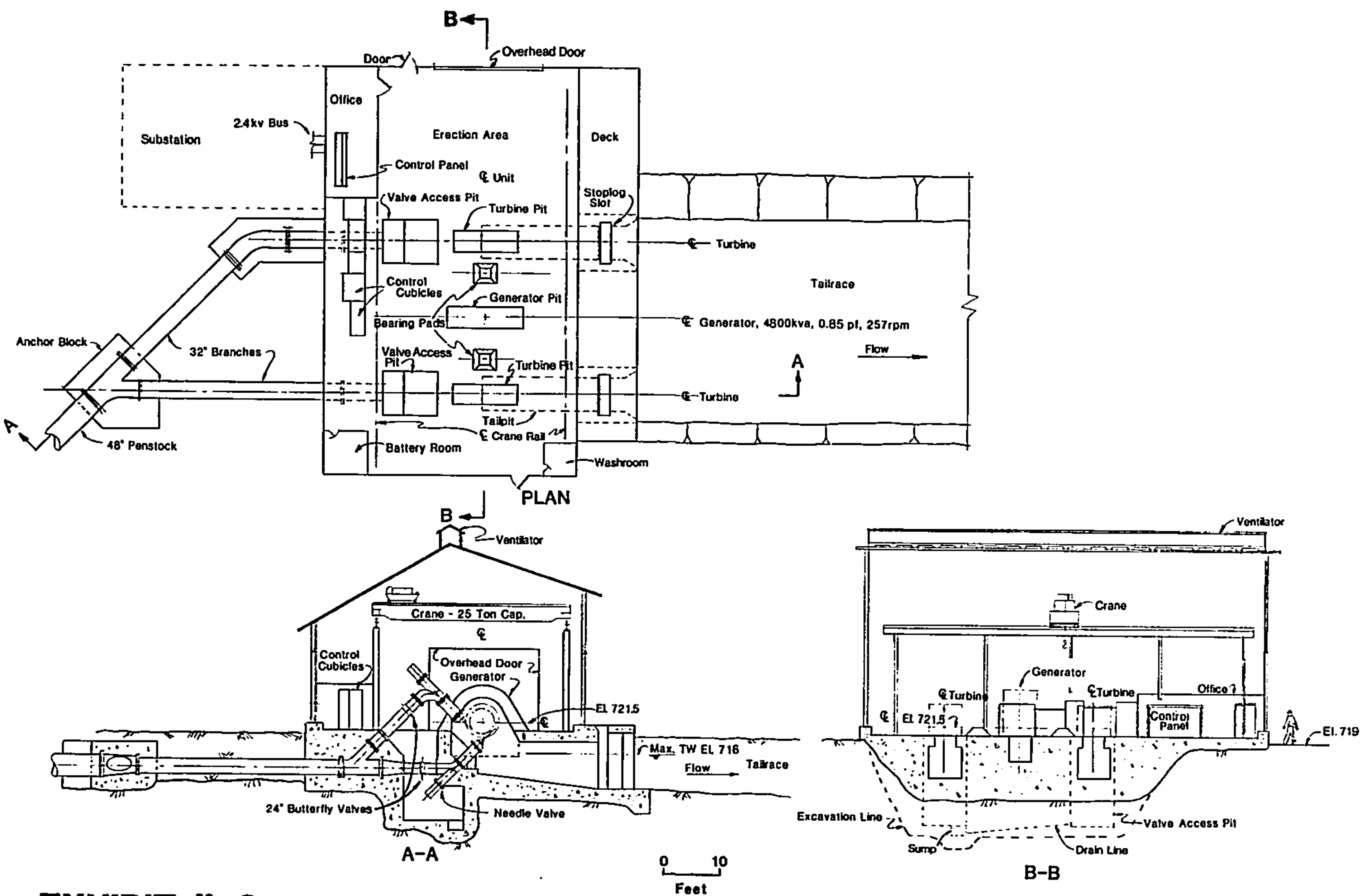


EXHIBIT II-8
PROPOSED POWERHOUSE - PLAN AND SECTIONS

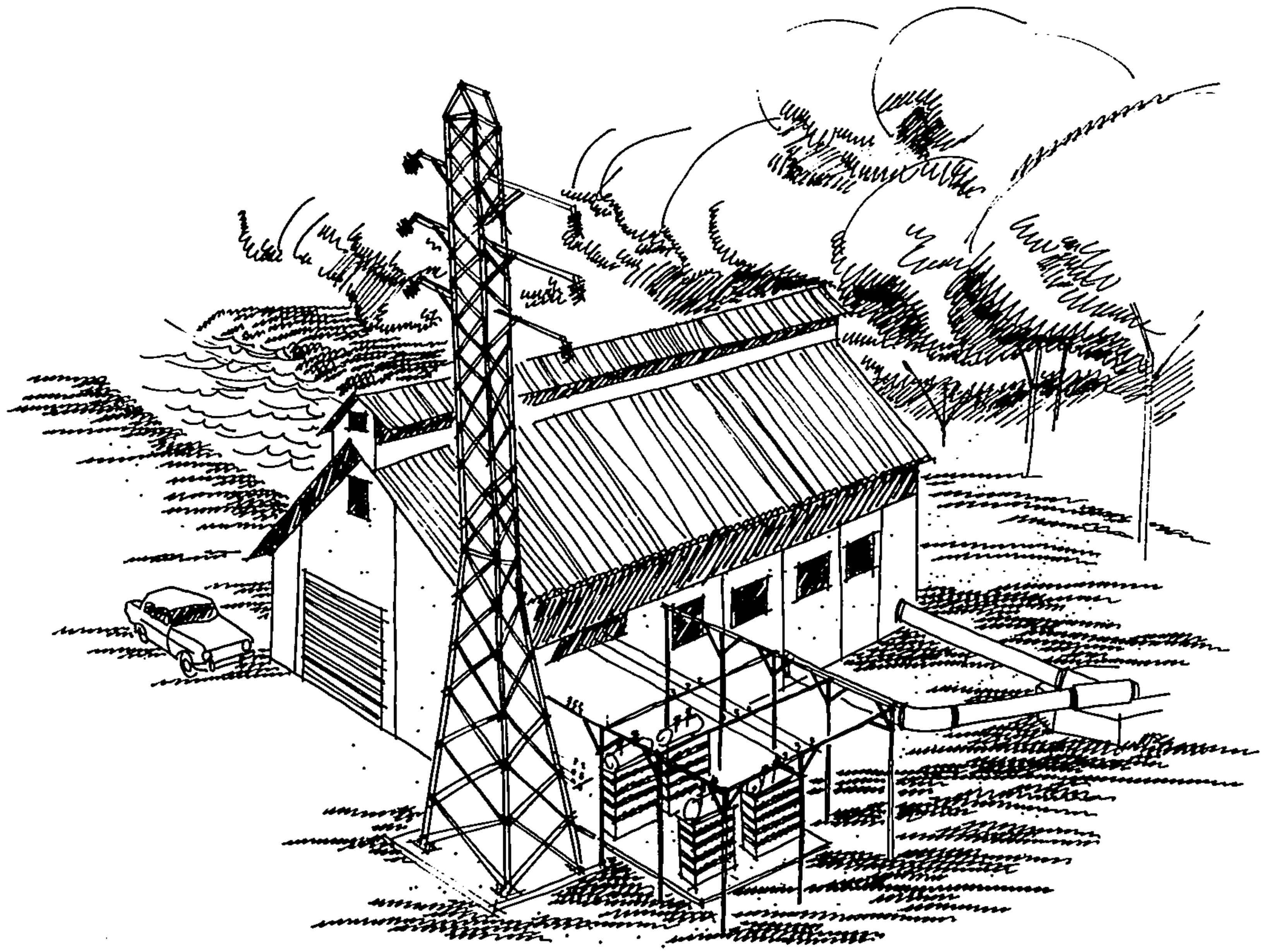


EXHIBIT II-9
PROPOSED POWERHOUSE - SKETCH

A 25-ton traveling crane will be installed within the powerhouse. It will be capable of lifting the heaviest single component and will be used for both construction and maintenance of equipment.

A substation will be built next to the proposed powerhouse to transform the generation voltage to transmission voltage, and a switchyard will be required at the existing powerhouse to tie the proposed project into the Kauai Electric Company (KE) system. Presently, the KE transmission system operates at 57.1 kv. There are plans to upgrade the system to operate at 69 kv. To accommodate this eventuality, the proposed project will provide dual-tap transformers and a transmission line that will allow conversion to higher voltage. Four single-phase transformers, one a spare, will be provided. The transformers will be rated at 1600 kva each. Other substation equipment will include generator voltage bus, circuit breakers, disconnect switches, potential transformers, relays and meters, lightning arrestors and grounding system. The substation and switchyard will be fenced and surfaced with gravel.

The transmission line design will allow initial operation at 57.1 kv and future conversion to 69 kv. The line supports will be single-pole construction, using fully treated wood poles and stand-off insulators. Supervisory and communication lines will be suspended from cross arms below the transmission line. It will follow the alignment of the existing access road in order to facilitate construction and maintenance. (See Exhibit II-10.) Deadend structures at the substation and switchyard will be steel lattice towers. An overhead ground wire will extend all along the line.

A 2400 v line will extend in a conduit alongside the penstock between the proposed powerhouse and headworks to provide power for the operation of the screen and tainter gate. Telephone and control lines will also be carried through conduit from the proposed powerhouse to the headworks.

A new access road will be constructed from the end of the existing access road to the proposed weir. (See Exhibit II-7.) This road will be 2.1 miles long, approximately 12 feet wide and surfaced with gravel. The maximum grade will be 10%. It will be constructed not less than 20 feet from the river's edge and above the design flood elevation. The road will follow the alignment of the penstock except at stream crossings, where the penstock will take a more direct route. Corrugated metal pipe culverts with concrete headwalls will be used for road crossings of drainage courses which support no fish life. Concrete box culverts or bridges will be used for streams with fish life.

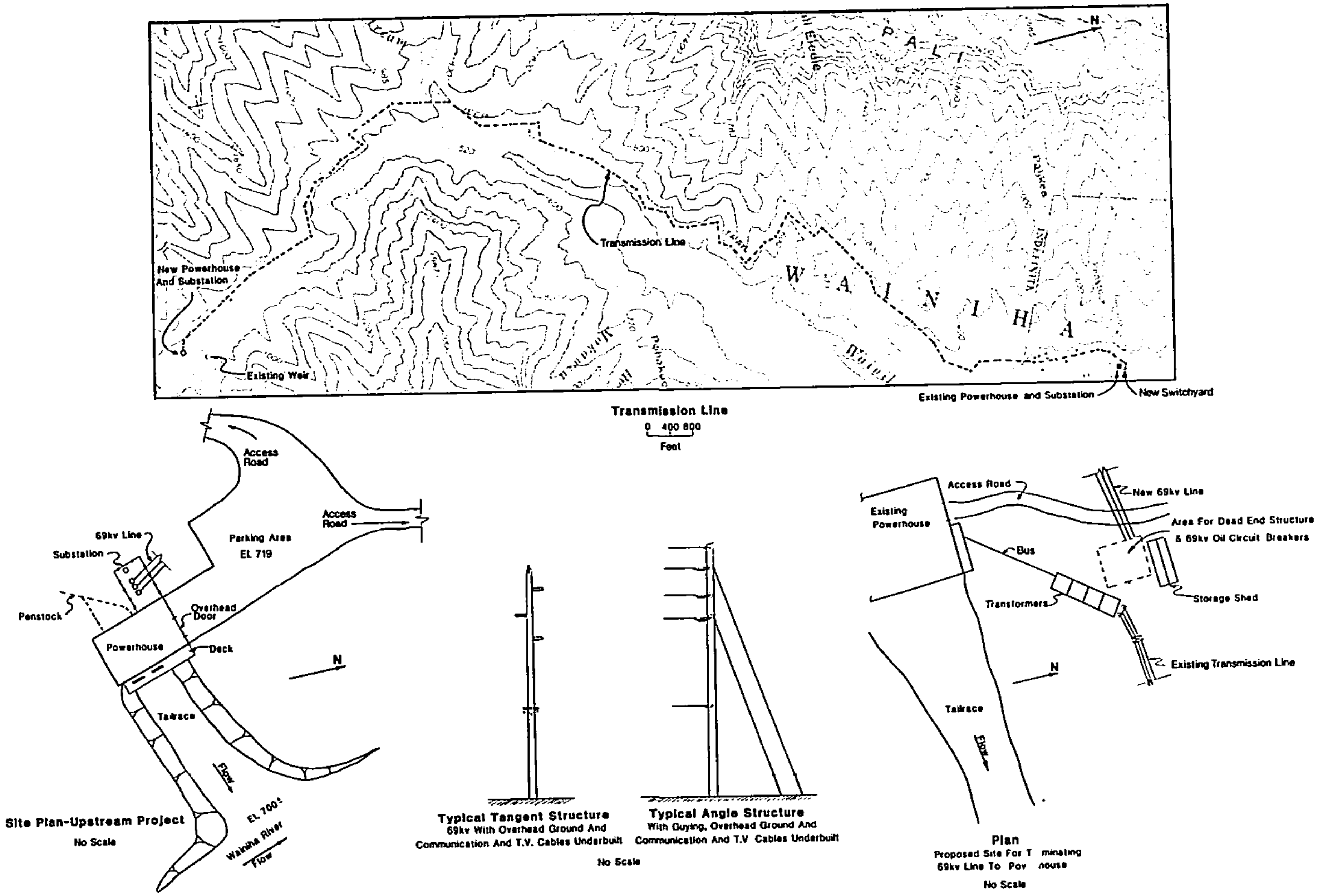


EXHIBIT II-10
PROPOSED TRANSMISSION LINE

Although much of the road will be in cut, a substantial amount of the materials from required excavation will be used in engineered fills. The excess of cut over fill, about 24,000 cu yds (bank), will be spoiled along the road alignment but away from stream valleys and above normal high water. Spoil piles will be graded to blend with natural slopes to hasten revegetation.

The project will also include improvements to the existing access road in order to permit the passage of construction equipment. These proposed road improvements are discussed in the following section.

D. Construction

Construction of the proposed project is anticipated to require the equipment listed in Exhibit II-11.

In addition to this equipment, oversized and heavy loads will be brought into the project site, including the 40-foot long sections of penstock, cement, aggregate, powerhouse equipment and structural members, and utility poles and conductors. Hauling equipment and supplies is limited by bridges along Kuhio Highway. The highway is a two-lane roadway with a paved width of 24 feet and narrow shoulders for long stretches. Limiting features are several old one-lane bridges with capacities of 8 to 12 tons. The single-lane bridge over Hanalei River has a vertical clearance of only

EXHIBIT II-11

CONSTRUCTION EQUIPMENT SPREAD

CONSTRUCTION EQUIPMENT:

2 ea. Crawler tractors, with angle blade and ripper Caterpillar D-9 or Equivalent

1 ea. Hydraulic Backhoe

1 ea. Grader, with slope dressing blade

2 ea. Front End Loaders

1 ea. Track Drill

2 ea. Air Compressors
- a. 1250 cfm
- b. 250 cfm with hand tools

2 ea. Dump Trucks 10 T

2 ea. Flat Bed Trucks 10 T

1 ea. 35 TPH Rock Crusher

1 ea. Concrete Batch Plant

1 ea. Transit Mix Truck

1 ea. Concrete Pump

1 ea. Truck Crane 20 T

1 ea. Pole-Setting Truck and Trailer

1 ea. Cherrypicker with Basket

2 ea. 10 Kw Generators

2 ea. Light Sets

1 ea. Fuel Truck, with gas and diesel pods

1 ea. Lube and Service Trailer

4 ea. Dewatering Pumps

1 ea. Tool Trailer

1 ea. Office Trailer

2 ea. Storage Trailers

6 ea. Pickup Trucks

13.5 feet. In order to reduce hauling requirements, crushed rock may be produced in the project area from rock removed during construction.

Due to restrictions of width, weight and vertical clearance along Kuhio Highway, some of the heavier and larger equipment and material may be transported by barge or landing craft to the beach at Wainiha. If a landing craft is used, the only support requirement will be a beach ramp. If a barge is used, a temporary ramp to shore will be graded with a bulldozer. In either case, the ramp will be surfaced with steel or aluminum matting or timber which is trafficable for wheeled vehicles. Ramping materials will be stored when not in use to protect them from loss due to tidal changes and high surf conditions. With the completion of the project or when beach landings are no longer needed, the beach will be restored to its natural condition.

The existing access road, 4.3 miles long from the end of the pavement of the Powerhouse Road to the existing weir, will be improved as the first construction activity. Currently, the surface is very rough and several of the curves are of short radius. Also, several grades are excessively steep, and the travelled way is narrow. The County's bridge over the Tunnel 26 wasteway is badly deteriorated and needs replacement.

The traveled way will be widened to 12 feet and surfaced with 6 inches of crushed rock. Grades will be rebuilt to a maximum of 14%, and curves to a minimum 150-foot radius. Since the road will be one-lane, a minimum line-of-sight distance of 200 feet will be provided to the greatest extent possible. Turnouts will be provided at frequent intervals. Temporary reinforcement will be placed over the deteriorated span of the Tunnel 26 wasteway bridge until it can be replaced.

For most of the improvement of the existing road and construction of the new road, a grader and bulldozers with rippers and angle blades will be used. Drilling and blasting will be required for excavation in rock in some portions of the project area.

In order to construct the weir and headworks, it will be necessary to temporarily divert the flow of the Wainiha River for a length of about 275 feet. Both upstream and downstream cofferdams about 15 feet high will be necessary. Water can be diverted through tunnel, flume, pipe, or the headworks. Of these a flume or pipe scheme appears most feasible. A tunnel scheme is the only one which would not require rebuilding the cofferdam in order to work the right bank; it would, however, be the most costly. For purposes of estimating, a flume system is used. (See Exhibit II-12.) Design flow for the temporary diversion is 400 cfs. Due to the

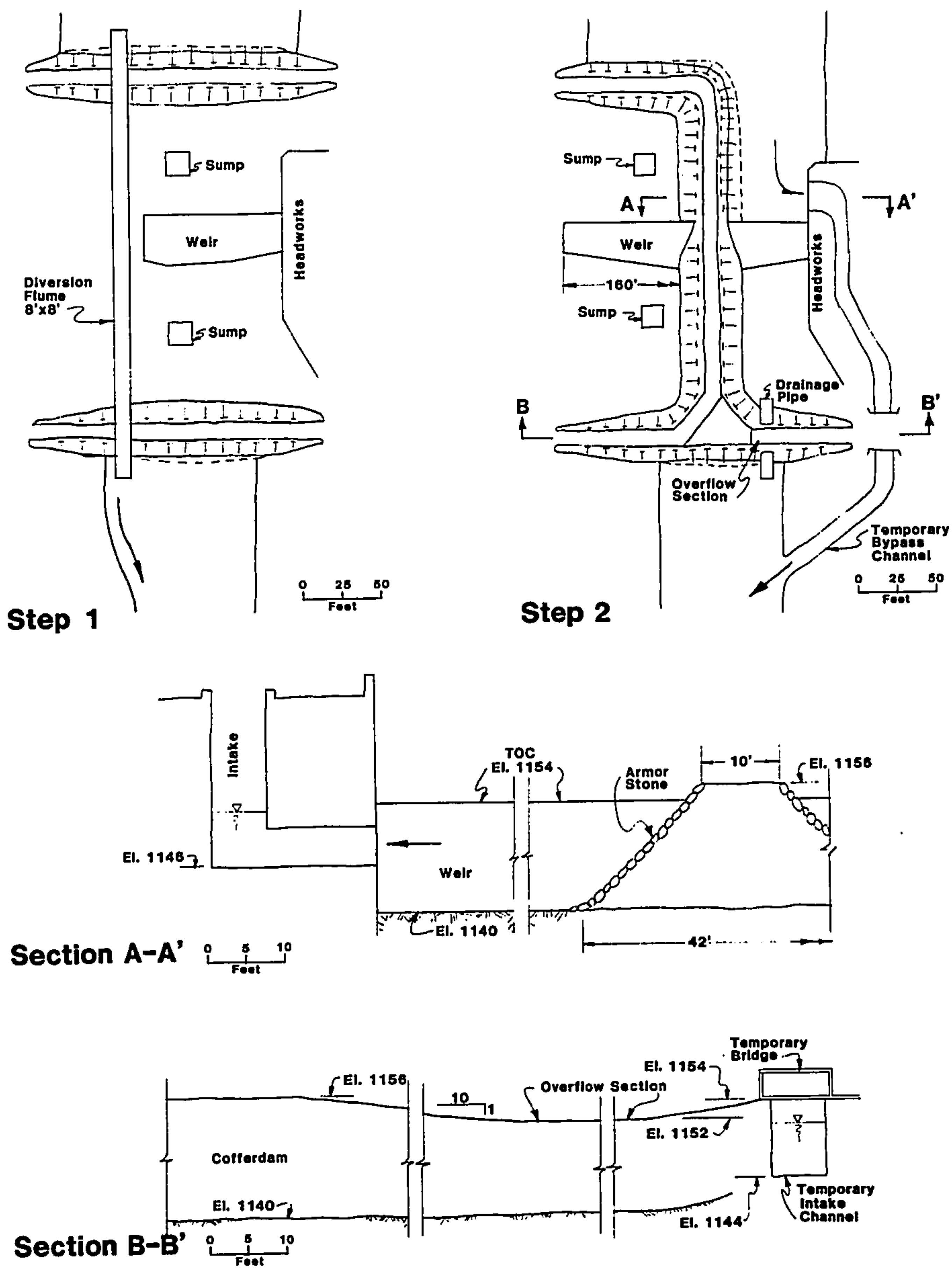


EXHIBIT II-12
CARE OF WATER DURING WEIR CONSTRUCTION

flashy nature of the stream, it is possible that the work will be flooded one or more times. The cofferdams will be constructed of locally available material and will not have impervious cores. Both upstream and downstream faces will be armored with cobble-to-boulder sized material. Pumping will be required. The weir will be constructed in two sections working from the left bank toward the right bank. Once the flow of the river is successfully diverted, the bed of the river will be cleaned of loose material. When competent material is reached, the surface will be prepared so that a solid and geometric foundation is achieved. This will be done by cutting high spots and filling low spots with dental concrete. Some light blasting may be required in the river bottom to achieve this; however, all required excavation will be made in the dry in the dewatered area. No blasting will be done in water. About 3,800 cu yd of spoil from the excavation will be used to grade the deck and access road. Dredging of streambed materials is not planned. Grouting will be done to a depth of 25 feet if the foundation shows evidence of producing unacceptable seepage.

Excavation of the powerhouse tailrace will be made by proceeding from the tailpit riverward with the outlet to the river saved until last. Light blasting may be required. Spoil from the excavation, about 8,000 cu yd, will be used for parking lot and substation grading. Again, all blasting is planned to be done in the dry, and dredging of streambed materials is not foreseen.

E. Schedule

The entire project, from initial planning to plant operation, is scheduled to proceed as follows:

1. Preliminary planning - This has been completed and is documented in a report.*

2. Feasibility study - This phase, which is presently underway, includes preliminary engineering design, cost analysis, field studies, environmental analysis and applications for permits and approvals required to build the project. The products of this phase are a Feasibility Report, permit applications and an Environmental Impact Statement. The phase will conclude when McBryde decides whether to proceed with the project and major required permits and approvals are obtained.

3. Design - This phase includes preparing contract documents and specifications and ends when building and grading permits have been obtained and contracts are placed.

4. Construction - This entails the actual building of the project. Plant operation marks the end of the construction phase.

The approximate schedule, by phase, for this project is depicted in Exhibit II-13.

*EDAW inc., op. cit.

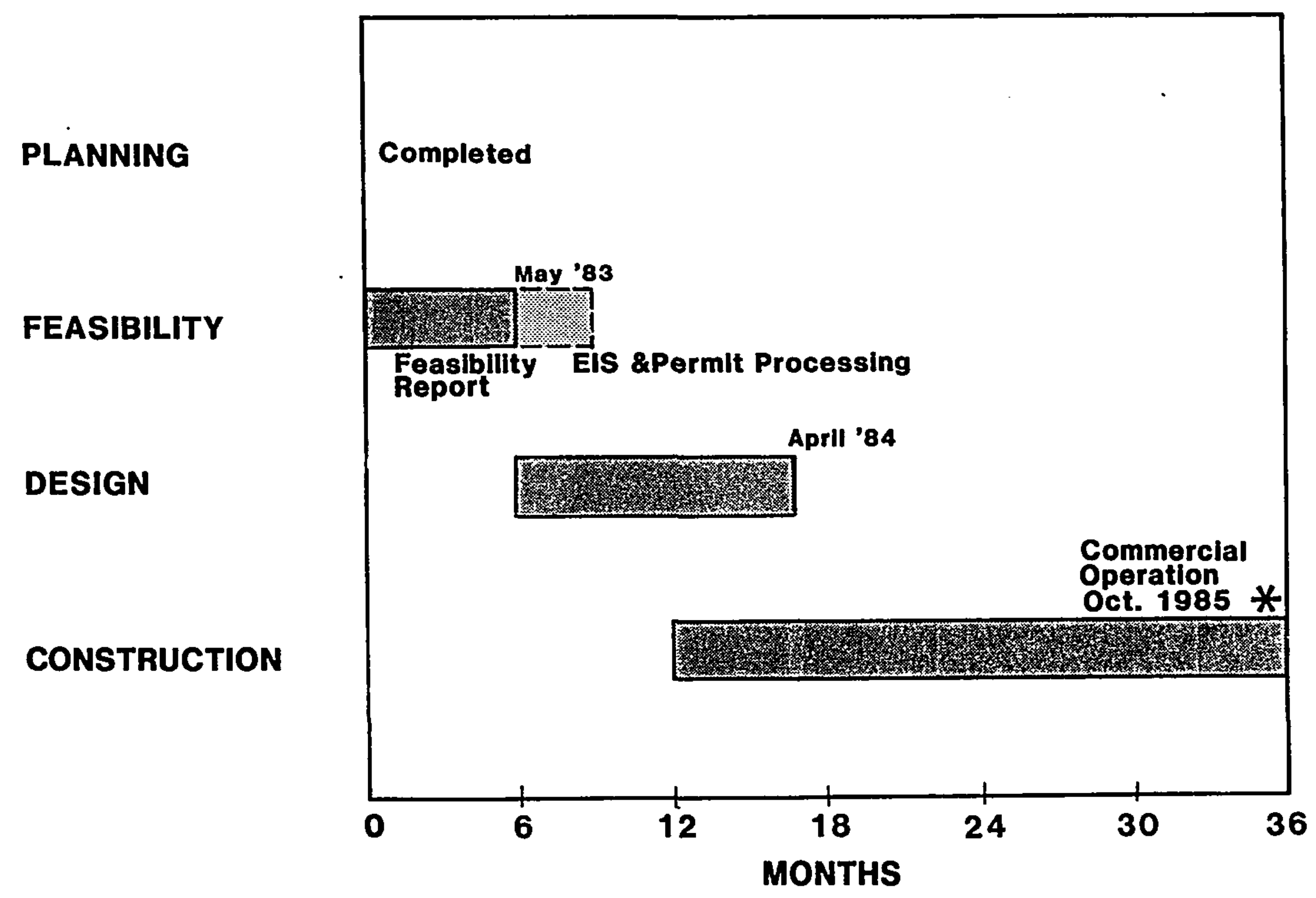


EXHIBIT II-13
PROJECT TIMETABLE

Chapter III

CHAPTER III: ENVIRONMENTAL SETTING AND PROBABLE IMPACTS OF PROPOSED ACTION

A. Existing Conditions

Much of the Wainiha River's flow derives from Mount Wai'ale'ale and portions of the Alakai Swamp, which lie above the valley to the west and south. Two forks of the river rise above the 3000-foot elevation and join near elevation 1500 feet. The river empties into Wainiha Bay.

With its densely vegetated steep slopes, Wainiha Valley is typical of the valleys of the North Shore region of Kauai. The valley is about 11 miles long, with a distinct bend about midway along its length. Its alluvial plain is 2,000 to 3,000 feet wide along much of the reach below the bend. In the upper reaches, the valley becomes quite narrow.

Existing structural improvements along the first two miles of the river above the bay include Kuhio Highway, a County road, approximately 50 houses, taro patches, McBryde's existing powerhouse and five McBryde plantation houses.* An unpaved access road with two locked gates, 4.5 miles of ditches and tunnels and 1,250 feet of penstock lie between the powerhouse and the weir. The existing diversion weir is approximately 6.5 miles above the bay. The only structural improvement

*Wilson, Okamoto & Associates, Inc., for County of Kauai, North Shore Development Plan Update, December, 1980.

above the weir is a U.S. Geological Survey (USGS) Stream Gaging Station located about 1.5 miles upstream of the existing weir.

1. Geology and soils

The Island of Kauai, one of the oldest and structurally the most complicated of the Hawaiian Islands, was formed by the activity of one large shield-type volcano. The rocks of the proposed project area are part of the Olokele formation of the Waimea Volcanic Series. (See Exhibit III-1.) The Olokele is a series of thick and massive lava flows of low permeability.

A few individual basalt dikes, which strike northeast-southwest, dipping 60 degrees or more towards the north-west, outcrop in the proposed project area. The site of the proposed diversion weir, near elevation 1140 feet, is on exposed bedrock between two dikes which cross Wainiha River. This section of the valley is quite narrow with steep side walls. The site of the proposed powerhouse, at elevation 720 feet, is a bouldery alluvial terrace approximately 15 to 20 feet above the river bottom.*

*Walter Lum Associates, Inc., for McBryde Sugar Company, Ltd., Wainiha Hydroelectric Project Soil Reconnaissance Report, December, 1982.

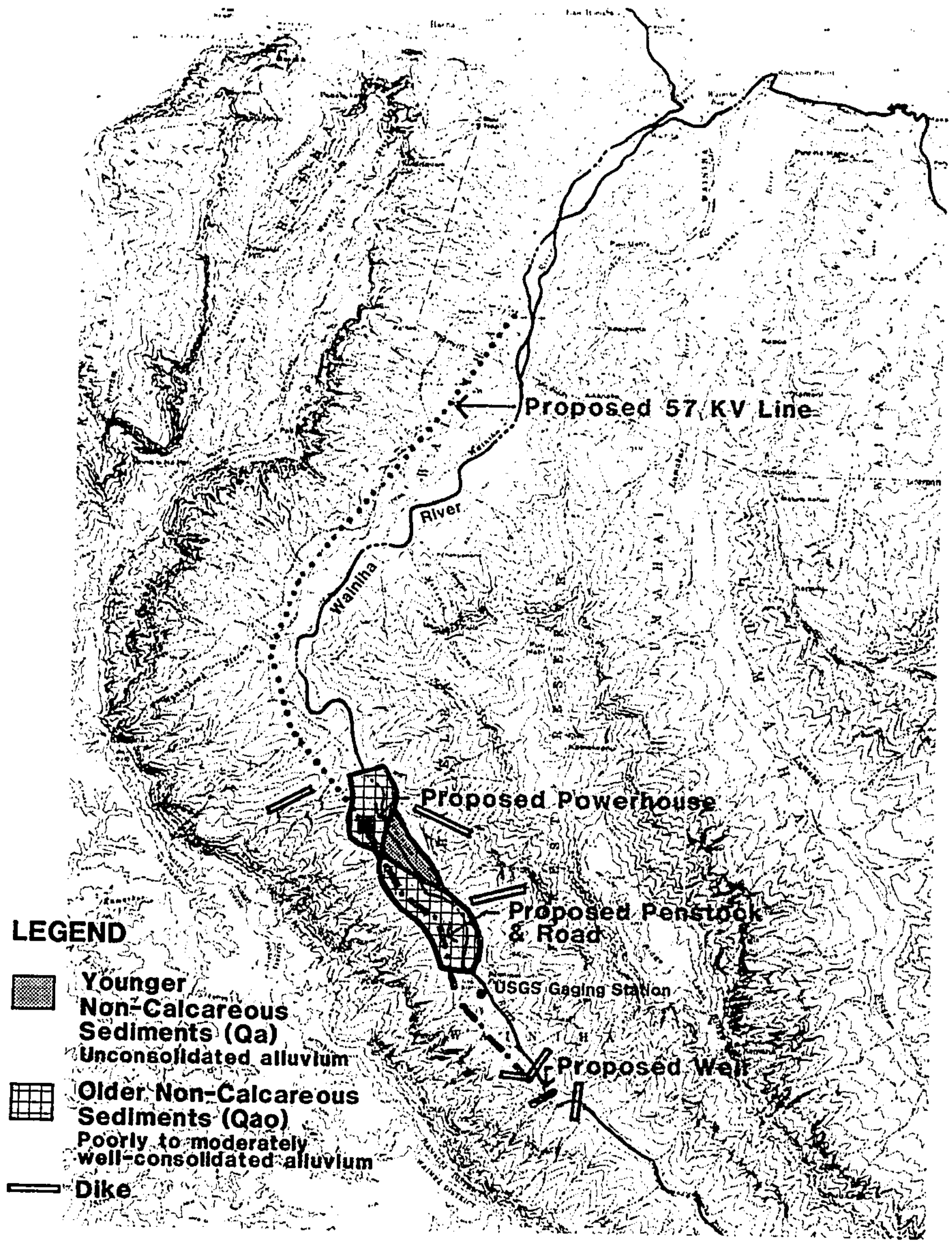


EXHIBIT III-1
GEOLOGIC FEATURES OF PROJECT AREA

Soils on the upper slopes of Wainiha Valley have a high landslide potential, according to a DPED study.* (See Exhibit III-2.) Major areas of Wainiha Valley have slopes which are 40% or greater. A soil reconnaissance of this area also found breccias and conglomerates formed by rock falls, soil avalanches and mudflows.** (See Report, Appendix G)

The U.S. Soil Conservation Service has classified soils of the alluvial plain of the river between the proposed powerhouse and the USGS Gaging Station, along the alignment of the proposed penstock and access road, in the Kolokolo Series.*** These soils are described as extremely stony clay loam with slopes of 12 percent or less. The area above the Gaging Station, where the valley walls steepen, is classified as Rough Mountainous Land, where the soil mantle is very thin, ranging from 1 to 10 inches in thickness over saprolite. In most places, the saprolite is relatively soft and permeable to roots and water.

*State of Hawaii, Department of Planning and Economic Development (DPED), Hawaii Resources: Inventory and Policies, 1978.

**Walter Lum Associates, Inc., op. cit.. See also, State of Hawaii, Department of Land and Natural Resources (DLNR), Conservation District Inventory of Kauai, 1977.

***U.S. Department of Agriculture, Soil Conservation, Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii; (Washington, D.C.: U.S. Government Printing Office), August, 1972.

As illustrated in the seismic probability map in Exhibit III-3, Kauai is not as susceptible to earthquake activity and damage as are the other large islands of the Hawaiian chain. This map, compiled by the U.S. Coast and Geodetic Survey in 1949, appears in the Uniform Building Code and is used as a guide for structural standards. The four risk zones for Hawaii were determined on the basis of the amount of damage caused by past earthquakes, measured by the Abridged Modified-Mercalli Intensity (MM) Scale.

2. Climate and hydrology

Wainiha Valley is somewhat wetter and cooler than many other areas of the Hawaiian Islands, with an average annual rainfall of 100 inches measured at the existing powerhouse and between 150 and 200 inches in the vicinity of the proposed project. Mount Wai'ale'ale, which lies above the project area to the southeast, is said to be the wettest spot on earth, with an average annual rainfall of about 450 inches. Temperatures average 70 degrees and are rather uniform throughout the year. Like most other areas of the Hawaiian Islands, the rainiest and coolest months at Wainiha are December to March; the driest and hottest are June and July. (See Exhibit III-4.)

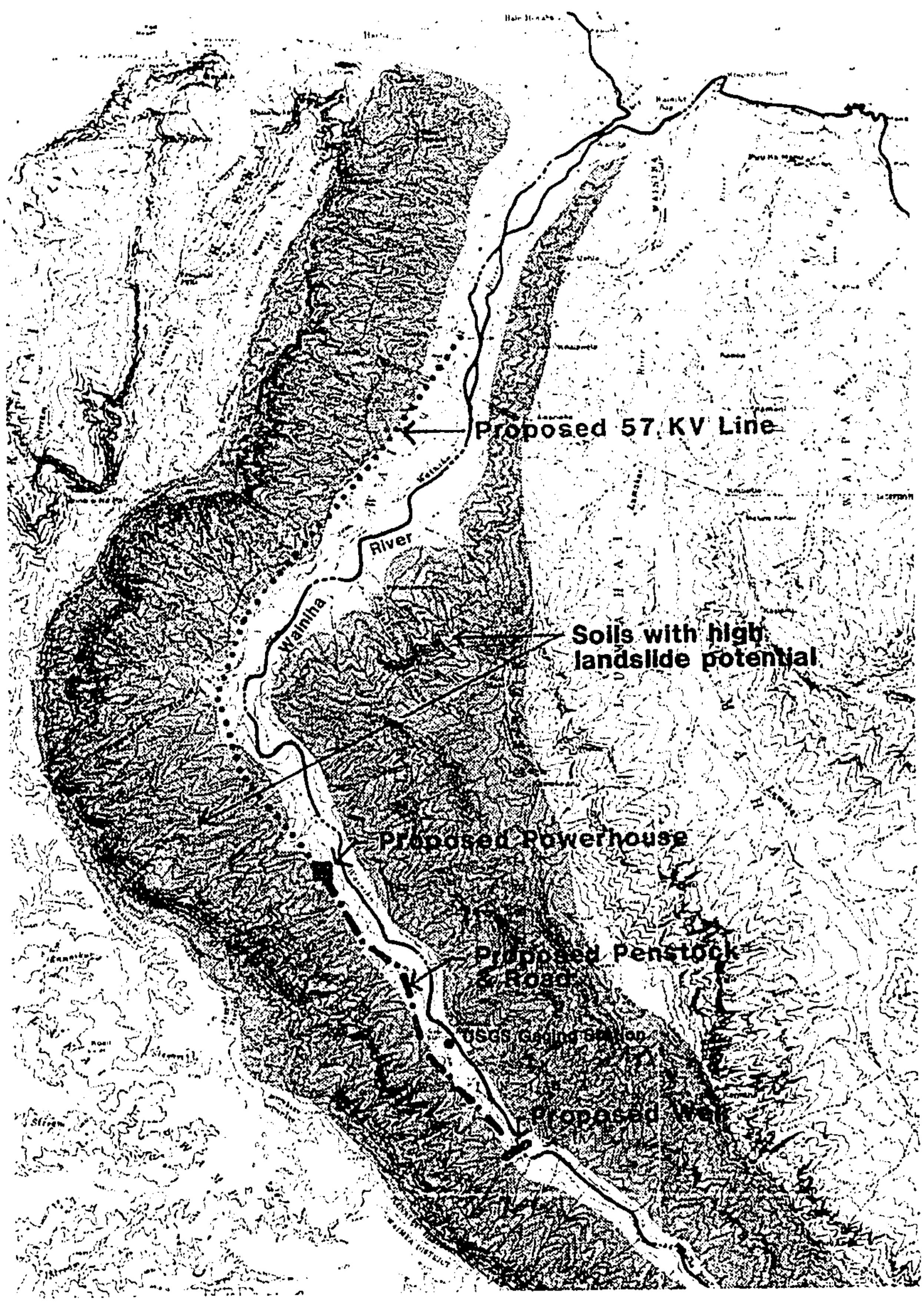
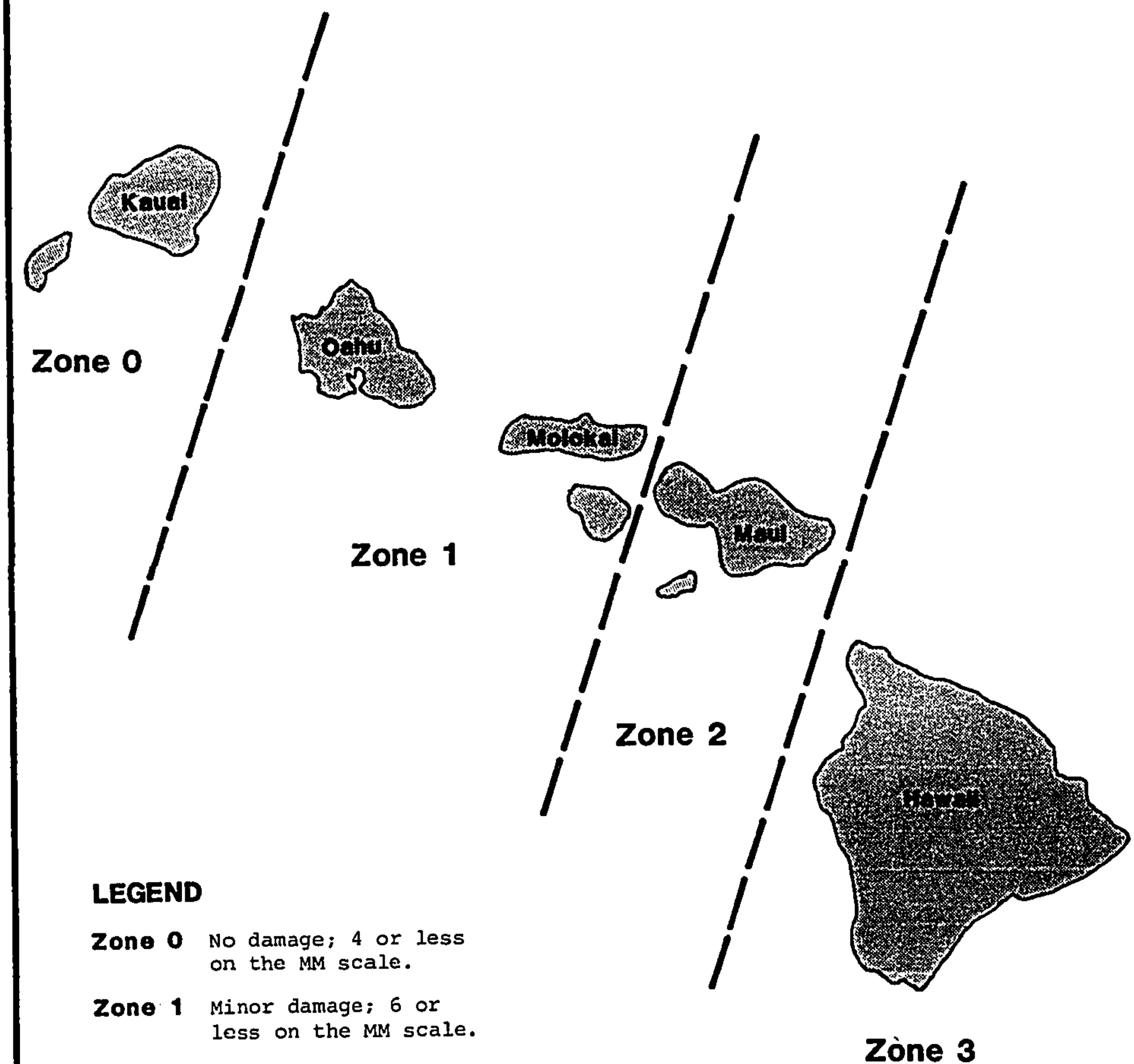


EXHIBIT III-2
SOILS WITH HIGH LANDSLIDE POTENTIAL



LEGEND

Zone 0 No damage; 4 or less on the MM scale.

Zone 1 Minor damage; 6 or less on the MM scale.

Zone 2 Moderate damage; 7 or less on the MM scale.

Zone 3 Major damage; 7 or greater on the MM scale.

EXHIBIT III-3
SEISMIC RISK ZONES

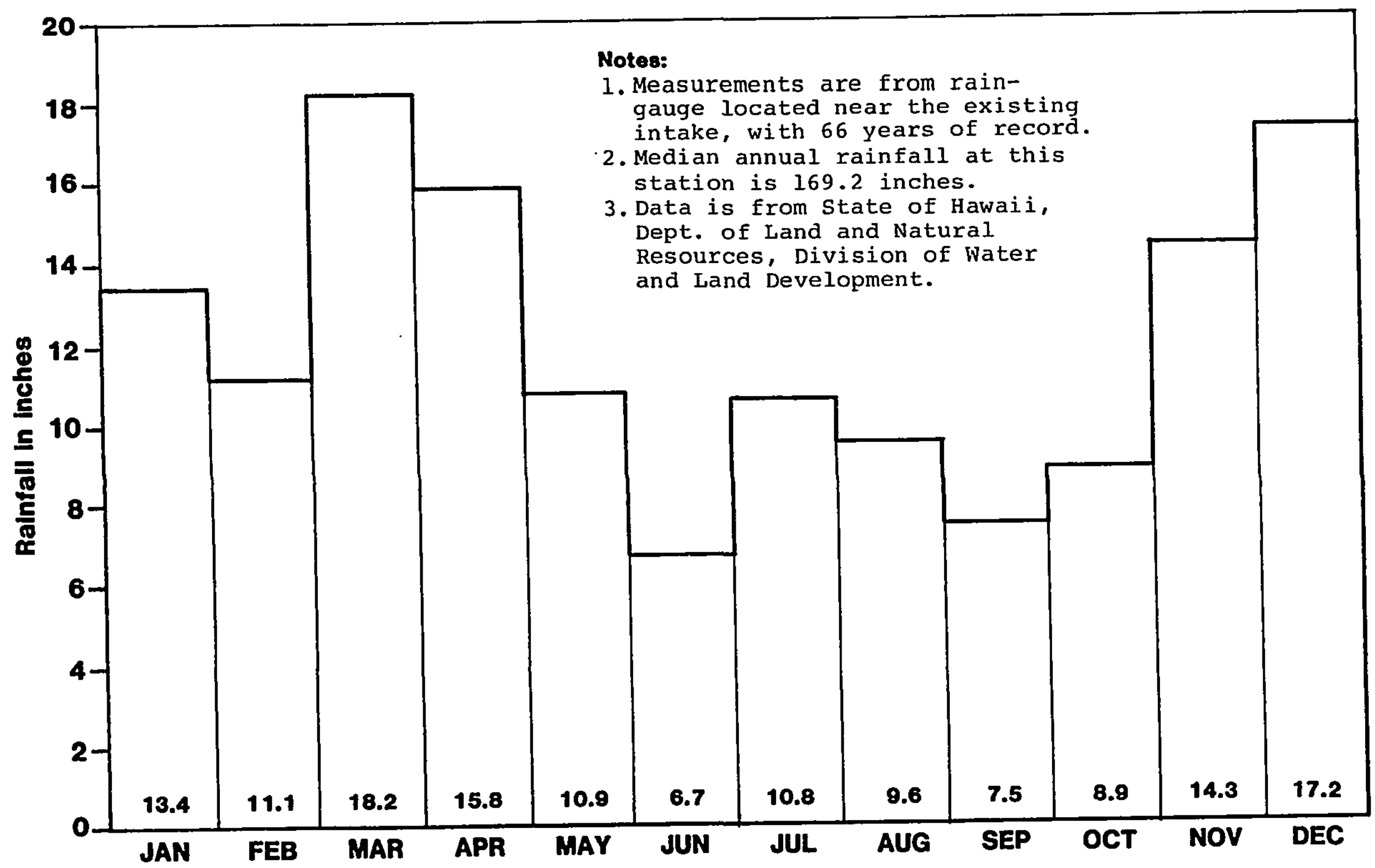


EXHIBIT III-4
MEDIAN MONTHLY RAINFALL, WAINIHA VALLEY

Rain gages are located at Mount Wai'ale'ale, Kilohana, the existing weir, and the existing powerhouse. Daily records are available from the Mount Wai'ale'ale gage; hourly records (periodic) are available from the powerhouse gage.

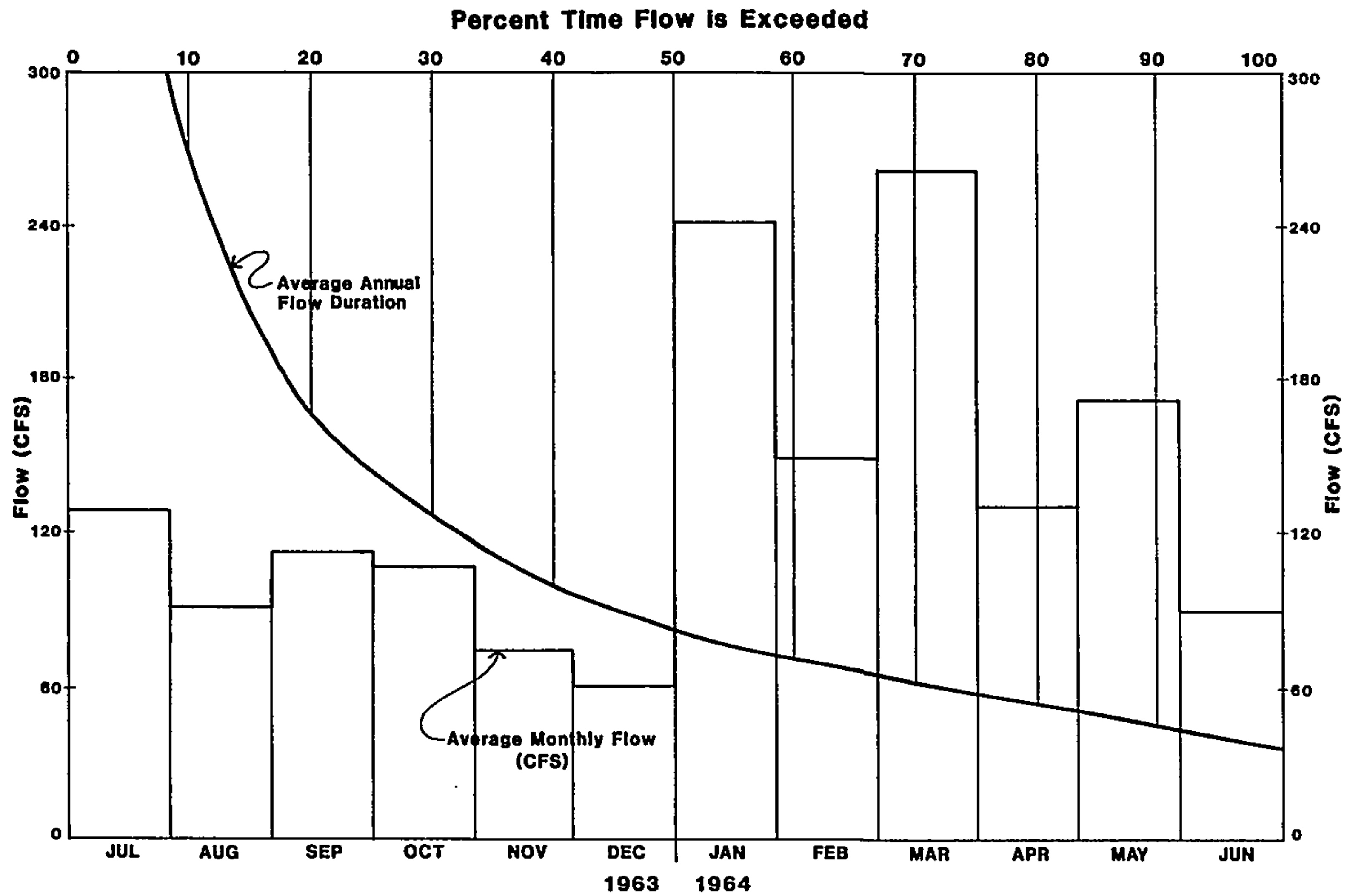
The Wainiha River is the second largest river, based upon flows, on the North Shore of Kauai. The Hanalei River is the largest. The Wainiha has a mean annual flow of 139 cfs, as measured at the USGS Stream Gaging Station. Drainage area at the gage is about 10.2 square miles, while the drainage area at the proposed weir site is 8.6 square miles. Drainage area at the proposed powerhouse is 13.2 square miles.

The Stream Gaging Station (No. 16108000), is located about one and a half miles upstream of the present intake. It was installed in 1952 and commenced operation in September of that year. The gage has operated virtually continuously since that time except for a break in the record from February 1956 when it was destroyed by the flood of record to October 1957 when it was rebuilt. The flood of record occurred on February 17, 1956, and had a calculated discharge of 40,000 cfs. The low flow of record, 33 cfs, occurred on February 11 and 12, 1978.

Flows of the river derive from two general sources. The first is a series of waterfalls and springs, the largest of which is Hinalele Falls. These waterfalls and springs occur at and near the upper end of the valley and constitute drainage mainly from Mount Wai'ale'ale and to lesser extent from Alakai Swamp. The second source is direct runoff from precipitation.

Within the reach of river encompassed by the proposed project, there are seven intermittent and perennial streams along the west (left) bank and four similar streams along the east (right) bank. The right bank streams are lesser in number and yield than those of the left bank because the former drain the La'au Ridge, a relatively narrow ridge separating the Wainiha and Lumaha'i River valleys, while the left bank streams drain a portion of the Alakai Swamp and the Wainiha Pali. None of these streams will be diverted by the proposed project.

The flow duration curve, Exhibit III-5, illustrates the flow characteristics of the river on an average annual basis. There is a substantial base flow provided by the falls and springs. This flow amounts to 45 cfs, defined as the flow equalled or exceeded 95 percent of the time. The base flow is further illustrated by the plot of low flow recurrence intervals which appears as



NOTES

1. Flows from record of USGS Gage No. 16108000, Wainiha River.
2. Period of record of gage is 1952-56 and 1957 - current year.
3. Average discharge for period of record is 139 cfs.
4. The 1963-64 water year is the actual year during which discharge most closely approximates the average for the period of record. The hydrograph is of this period.

EXHIBIT III-5
AVERAGE ANNUAL AND MONTHLY STREAM FLOW IN WAINIHA RIVER

Exhibit III-6. A series of low flow durations, 1, 3, 7, 15, 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. The reliability of the base flow is indicated by the record low flow of 33 cfs. The general increment of flow above base flow is provided by runoff from precipitation. The flow duration curve (Exhibit III-5) also illustrates that there is a flow of 50 cfs or more ninety percent of the time and a flow of 80 cfs or more fifty percent of the time.

River flows are highly variable due to the variability of precipitation. There is little seasonal pattern to runoff. This is demonstrated by the occurrence of both the high and low flows of record in February.

Storms create a rapid runoff response in the river. 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-2 hours and recision period of 24 to 36 hours during which the rainfall drains out of the valley. It is relatively common for the flows to vary from base flow to thousands of cfs in 1 to 2 hours. This characteristic response is due to the shape, size, and slope (40 ft/1,000 ft) of the valley.

The Wainiha River, throughout its length, consists of a series of pools and riffles, as dictated by geologic conditions. Volcanic dikes and other materials resistant to erosion form the hydraulic controls which define the pools. The riffles, in particular, are characterized by the presence of large boulders which create quiet areas adjacent to turbulent flows. In the reach of river affected by the existing project, none of the riffles have been observed to completely dry up during prolonged periods of no rainfall. During times when no flow passes the existing weir, flow in the stream channel is detectable within about 100 feet below the weir. From that point, flow continues to increase downstream.

The flood of record, 40,000 cfs, has a recurrence interval of about 35 years. The 100-year storm has peak flows of about 50,000 cfs. According to the Flood Insurance Rate Map (FIRM) prepared by the Federal Insurance Administration, U.S. Department of Housing and Urban Development, the area along the river east of the road to the powerhouse is in the 100-year flood area; or Zone A. Base flood elevations and flood hazard factors

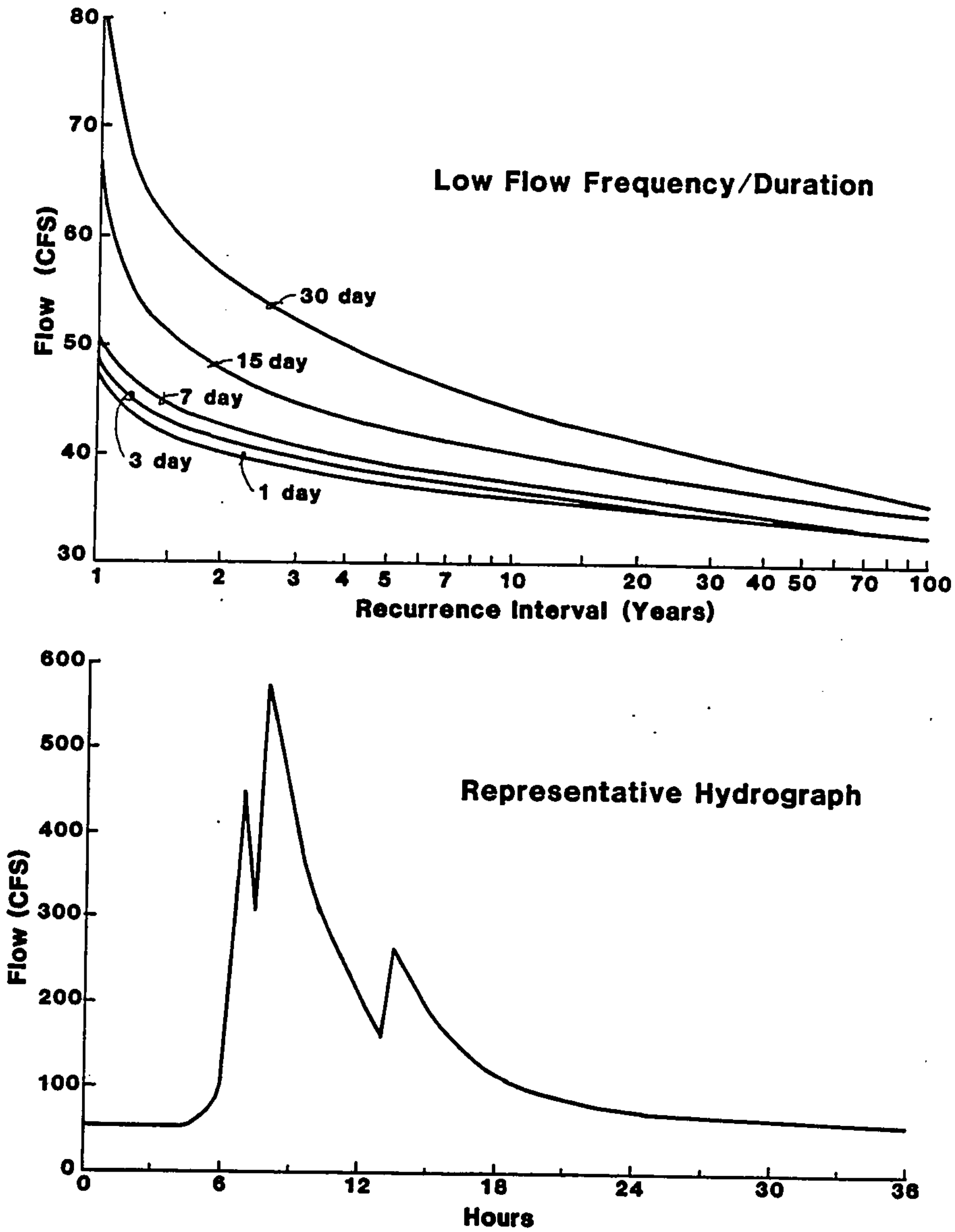


EXHIBIT III-6
FLOW CHARACTERISTICS OF WAINIHA RIVER

were not determined, and the study was limited to approximately the first 2.5 miles of the valley. The project area itself is in Zone C, defined as an area of minimal flooding.

The river empties into the Class AA coastal waters along the North Shore. Although the land along the river is classified in a State study as "lands adequately treated by a conservation program or otherwise naturally protected," the same study indicates that coastal waters off Wainiha are part of "areas with red water after storms."* This phenomenon occurs along the entire North Shore, where high rainfall runoff and numerous streams erode natural and disturbed slopes.

Existing water quality in the river has not been studied systematically. The only data available are readings taken incidental to stream gaging and biological studies. These data show that water quality in the river is good. One observer noted that pH increases during extended periods of dry weather but approaches

*State of Hawaii, Department of Land and Natural Resources, Division of Water and Land Development, Statewide Silt Basin Investigation, Report No. R66, December, 1980.

neutrality during rainy weather.* Rainy weather also increases turbidity to the point that the river looks "chocolaty" near its mouth. The river is not considered to be physically "pristine" but rather "limited consumptive" because it has 19 existing diversions and 9 stream crossings.** Most, but not all, of these diversions and stream crossings result from the existing project. Water quality data are presented in Exhibit III-7.

3. Stream fauna

Data on the stream fauna of Wainiha are available from four different studies. From 1951 to 1956, Ego used the Wainiha River to study the goby fishery to obtain information upon which efficient management measures could be based for the protection and development of the fishery.*** In 1970, Ego surveyed several streams on Kauai, among which the Wainiha was included.**** The river was included in Timbol's 1977 report on stream macrofauna in connection with a statewide hydroelectric

*Kenji Ego, for the Territory of Hawaii Division of Fish and Game, "Life History of Fresh Water Gobies," Project No. F-4-R, (mimeo), 1956.

**Timbol, Amadeo S., and John Maciolek, Hawaii Cooperative Fishery Research Unit, for U.S. Fish and Wildlife Service, Stream Channel Modification in Hawaii; Part A: Statewide Inventory of Streams; Habitat Factors and Associated Biota, April, 1978.

***Kenji Ego. op. cit.

****State of Hawaii, Ego, "Survey of Goby ('O'opu Nakea) Populations in the Waimea River, Hanalei River, Wainiha River and Hanakaipai Stream, Kauai, March 9-11, 1970." Unpublished data.

EXHIBIT III-7

WATER QUALITY DATA FOR WAINIHA RIVER

(1) Statistical record of partial record analyses:

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
P00410	ALKALINITY FIELD (MG/L AS CACO3)	13	21.154	4.432	11.000	27.000
P00915	CALCIUM DISSOLVED (MG/L AS CA)	13	3.485	0.764	2.200	4.500
P00940	CHLORIDE, DISSOLVED (MG/L AS CL)	13	4.908	1.429	0.500	6.100
P00080	COLOR (PLATINUMCOBALT UNITS)	11	9.000	7.950	3.000	25.000
P01042	COPPER, TOTAL RECOVERABLE (UG/L AS CU)	1	0.000	.	0.000	0.000
P00950	FLUORIDE, DISSOLVED (MG/L AS F)	13	0.085	0.038	0.000	0.100
P00900	HARDNESS (MG/L AS CACO3)	13	19.462	3.282	13.000	23.000
P00902	HARDNESS, NONCARBONATE (MG/L CACO3)	13	0.154	0.555	0.000	2.000
P01046	IRON, DISSOLVED (UG/L AS FE)	9	43.333	18.708	20.000	80.000
P01045	IRON, TOTAL RECOVERABLE (UG/L AS FE)	1	90.000	.	90.000	90.000
P00925	MAGNESIUM, DISSOLVED (MG/L AS MG)	13	2.623	0.457	1.900	3.300
P01056	MANGANESE, DISSOLVED (UG/L AS MN)	9	9.444	1.667	5.000	10.000
P01055	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN	1	0.000	.	0.000	0.000
P00631	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	9	0.058	0.050	0.010	0.120
P00300	OXYGEN, DISSOLVED (MG/L)	4	9.375	1.150	8.300	11.000
P00400	PH (UNITS)	27	7.052	0.503	5.900	7.800
P70507	PHOSPHORUS, ORTHO, TOTAL (MG/L AS P)	1	0.003	.	0.003	0.003
P00935	POTASSIUM, DISSOLVED (MG/L AS K)	13	0.523	0.417	0.200	1.800
P00955	SILICA, DISSOLVED (MG/L AS SIO2)	13	15.392	3.510	8.900	20.000
P00931	SODIUM ADSORPTION RATIO	13	0.408	0.028	0.400	0.500
P00930	SODIUM, DISSOLVED (MG/L AS NA)	13	4.031	0.325	3.400	4.600
P00932	SODIUM PERCENT	13	30.538	2.602	28.000	35.000
P70301	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (	13	45.385	6.838	32.000	55.000
P00095	SPECIFIC CONDUCTANCE (MICROMHOS)	27	60.370	13.423	30.000	100.000
P00061	STREAMFLOW, INSTANTANEOUS (CFS)	27	89.996	97.747	37.000	540.000
P00945	SULFATE DISSOLVED (MG/L AS SO4)	13	1.369	0.742	0.000	2.400
P00010	TEMPERATURE (DEG C)	27	18.741	1.625	16.000	23.000
P00070	TURBIDITY (JTU)	13	1.154	1.573	0.000	6.000
P01092	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)	1	10.000	.	10.000	10.000

(2) Physical parameters:

DATE OF SAMPLE	TIME	STREAMFLOW, INSTANTANEOUS (CFS)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH FIELD (UNITS)	TEMPERATURE, WATER (DEG C)	COLOR (PLATINUM COBALT UNITS)	TURBIDITY (JTU)
71-08-19	0855	86	58	6.9	18.0	--	1
72-03-31	1245	42	70	7.2	17.0	4	0
72-11-30	1630	46	66	6.9	16.5	4	0
73-06-21	1530	58	64	7.3	23.0	--	1
73-11-16	0905	100	48	7.0	19.0	20	1
74-05-06	1300	60	100	6.6	19.5	3	2
74-08-13	1200	76	65	6.7	22.0	7	0
75-01-15	1130	104	50	7.2	17.0	5	1
75-05-23	1145	63	65	7.2	19.5	3	1
76-02-12	1200	57	60	6.1	18.0	5	0
76-05-17	1100	70	56	6.8	16.0	18	6
76-07-23	1130	137	58	5.9	18.0	--	--
76-10-05	1300	51	66	7.2	20.0	5	1
77-01-06	1000	45	75	7.1	17.5	--	--
77-03-30	1600	210	46	6.8	19.5	25	1
77-06-16	1205	127	36	6.5	20.0	--	--
77-10-21	1140	52	60	7.6	20.0	--	--
77-12-15	1245	40	74	6.9	19.0	--	--
78-02-15	1230	37	68	7.6	19.0	--	--
78-05-10	1215	59	54	7.4	19.0	--	--
78-07-17	1025	109	50	7.8	18.0	--	--
78-10-18	1210	43	68	7.8	18.0	--	--
79-01-02	1245	52	67	7.7	16.0	--	--
79-03-07	1250	54	60	7.1	19.0	--	--
79-05-18	1230	64	56	7.1	19.5	--	--
79-07-02	1215	540	30	6.7	18.0	--	--
79-08-23	1230	47	68	7.8	20.0	--	--

Source: U.S. Department of the Interior, Geological Survey, Summary of Available Data on Surface Water, State of Hawaii: Volume I, Island of Kauai, Open File Report 81-1056; November, 1981.

EXHIBIT III-7
(continued)

(3) Common ions, metals, and general organic parameters:

DATE OF SAMPLE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	TEMPERA-TURE, WATER (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM PERCENT
71-08-19	0855	86	18.0	--	16	0	2.8	2.1	4.0	35
72-03-31	1245	42	17.0	9.2	23	0	4.5	2.9	4.3	28
72-11-30	1630	46	16.5	11.0	20	0	3.7	2.7	4.3	31
73-06-21	1530	58	23.0	9.0	22	0	4.4	2.7	4.0	28
73-11-16	0905	100	19.0	--	15	0	2.8	1.9	4.1	34
74-05-06	1300	60	19.5	8.3	23	0	4.0	3.1	4.6	30
74-08-13	1200	76	22.0	--	21	0	4.0	2.6	4.0	29
75-01-15	1130	104	17.0	--	19	0	3.3	2.6	3.8	30
75-05-23	1145	63	19.5	--	23	0	4.5	2.9	4.2	28
76-02-12	1700	57	18.0	--	21	0	3.3	3.1	4.0	28
76-05-17	1100	70	16.0	--	17	0	3.2	2.3	3.5	30
76-10-05	1300	51	20.0	--	20	0	2.6	3.3	4.2	31
77-03-30	1600	210	19.5	--	13	2	2.2	1.9	3.4	35

DATE OF SAMPLE	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	ALKA-LINITY (MG/L AS CACO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, ORTHOPH-OSPHATE TOTAL (MG/L AS P)	COPPER, TOTAL (UG/L AS CU)	IRON, TOTAL (UG/L AS FE)
71-08-19	.4	.4	16	.0	5.5	.0	8.9	34	--	--	0	90
72-03-31	.4	.6	27	.0	6.0	.0	20	55	--	--	--	--
72-11-30	.4	.2	24	<1.0	5.0	.1	18	48	--	.003	--	--
73-06-21	.4	.2	25	<1.0	5.0	.1	19	50	--	--	--	--
73-11-16	.5	1.8	18	2.0	5.1	<.1	13	45	.02	--	--	--
74-05-06	.4	.5	25	2.4	5.7	.1	19	55	.03	--	--	--
74-08-13	.4	.4	21	1.6	4.7	<.1	15	45	.12	--	--	--
75-01-15	.4	.3	20	1.6	6.1	<.1	15	45	.01	--	--	--
75-05-23	.4	.5	25	<1.0	4.7	<.1	17	50	.01	--	--	--
76-02-12	.4	.8	23	1.5	4.4	<.1	15	46	<.10	--	--	--
76-05-17	.4	.4	19	1.8	5.2	.1	14	42	<.10	--	--	--
76-10-05	.4	.4	21	2.0	.5	<.1	17	43	.12	--	--	--
77-03-30	.4	.3	11	1.9	5.9	<.1	9.2	32	.01	--	--	--

DATE OF SAMPLE	IRON, DIS-SOLVED (UG/L AS FE)	MANGA-NESE, TOTAL (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	ZINC, TOTAL (UG/L AS ZN)
71-08-19	--	0	--	<10
72-03-31	--	--	--	--
72-11-30	--	--	--	--
73-06-21	--	--	--	--
73-11-16	50	--	<10	--
74-05-06	20	--	<10	--
74-08-13	50	--	<10	--
75-01-15	40	--	<10	--
75-05-23	30	--	5	--
76-02-12	30	--	<10	--
76-05-17	60	--	<10	--
76-10-05	30	--	<10	--
77-03-30	80	--	<10	--

power study.* Timbol again studied the Wainiha's stream fauna in 1982-1983 as part of the scope of work to prepare this EIS using methods and locations he used in his previous study.** (See Exhibit III-8.)

Data from the above studies are presented in Exhibit III-9. Since actual counts are not available for Timbol's 1977 study, other studies were normalized to this study in order to provide comparability. The report of Timbol's 1982 study appears as Appendix C to this EIS. The unpublished results of Ego's 1970 survey appears as Appendix H.

Although the studies varied in season and technique, they provide information on the composition and relative abundance of species in Wainiha. At least 17 species of mollusks, crustaceans and fishes inhabit the river. (See Exhibit III-10.) None of these species is listed as endangered or threatened pursuant to the Endangered Species Act of 1973 (16 USG 1531-1543) or pursuant to Chapter 195D, Hawaii Revised Statutes. However, one species, 'o'opu alamo'o (Lentipes concolor) has been recommended for listing by Dr. John Maciolek. A high

*Environmental Impact Study Corporation, with Amadeo S. Timbol, for the U.S. Army Corps of Engineers, Aquatic Survey of Stream Macrofauna for the Hydroelectric Power Study for Hawaii, 1977.

**Amadeo S. Timbol, for EDAW inc., "A Survey of Aquatic Macrofauna in Wainiha River, Kauai," February, 1983.

proportion of the stream fauna is endemic; that is, they are unique to Hawaii. Nevertheless, the river is not biologically pristine, as evidenced by the presence of exotic (or introduced) species.

The physical habitat value of the river throughout its length is roughly the same, a series of pools and riffles. Ego in his 1951-1956 study stated that:*

> "... observations were conducted up to the base of the Hinalele Falls located 10 1/2 miles above the river mouth at an elevation of 2,200 feet. Up to the base of the falls no physical barrier which could interfere with the upstream movement of the gobies was encountered; however, progressively upstream, the density of 'o'opu nakea showed a continued decrease and the last 'o'opu nakea was observed about 8 miles above the river mouth at elevation of about 1,500 feet."
>
> "A marked decrease in the number of 'o'opu nopili was also noticed above Station #8 (elevation 850). ... The last nopili was seen about 9 miles above the river mouth.
>
> The temperature of the water which was decidedly colder in the upper reaches of the stream may be the principal factor limiting the upper distribution of both the nakea and nopili for the other physical environmental characteristics as well as the food available for both species near the head end of the stream did not seem to be substantially different from those of the lower section."

*Kenji Ego, op. cit., p. 10.

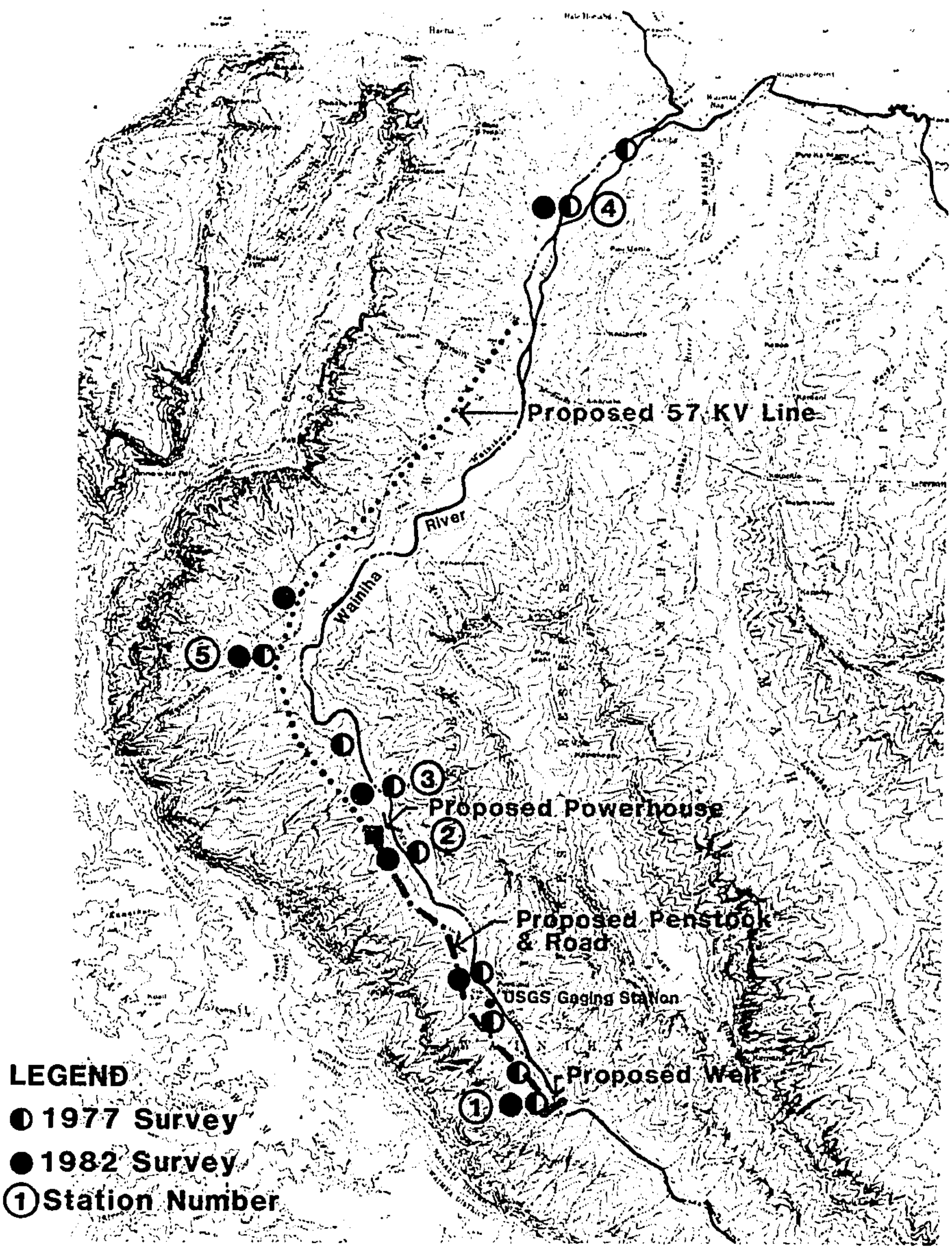


EXHIBIT III-8
STREAM FAUNA SAMPLING STATIONS

EXHIBIT III-9

RESULTS OF PREVIOUS STREAM FAUNA STUDIES

DATA PRESENTED IN TIMBOL 1977 STANDARD

Elevation	Ego 1953 Nakea	Ego 1953 Nopili	Ego 1970 Nakea	Timbol 1977 Nakea	Timbol 1977 Nopili	Timbol 1982 Nakea	Timbol 1982 Nopili
1120				◒	○	●	●
1060				○	○		
1000				○	◒	●	●
960				○	◒		
850	◒	◒	○				
720				○	○		
700	◒	◒	-				
680				◒	◒	●	●
550	◒	◒	◒				
300	●	◒	◒				
150	●	○	●				
75	●	○	●				
25	◒	○					
10				●	●	◒	●
2	●	-	○	◒	-		

●	abundant	6 to 100
◒	common	2 to 5
○	uncommmon	1 collected or sighted
-		None collected or sighted

EXHIBIT III-10

STREAM FAUNA IN WAINIHA RIVER

Species	Common Name	Range	Relative Abundance	Remarks
Mollusks				
Native				
Erinna aulacospira	-	midstream	abundant	microfauna
Erinna newcombi	-	midstream	abundant	microfauna
Neritina granosa	hihiwai	lower reaches	abundant	endemic
Pseudisidora rubella	-	midstream to lower reaches	abundant	microfauna
Crustaceans				
Native				
Atya bisulcata	'opae-kala'ole	throughout	abundant	endemic
Macrobrachium grandimanus	'opae-'oeha'a	lower reaches	abundant	endemic
Exotic				
Macrobrachium lar	Tahitian prawn	lower reaches	abundant	-
Procambarus clarkii	Crayfish	lower reaches	uncommon	-
Fishes				
Native				
Awaous genivittatus	'o'opu-naniha	lower reaches	abundant	indigenous
Awaous stamineus	'o'opu-nakea	throughout	common	possibly endemic
Eleotris sandvicensis	'o'opu-'okuhe	lower reaches	uncommon	possibly endemic
Kuhlia sandvicensis	aholehole	lower reaches	abundant	endemic
Lentipes concolor	'o'opu-alamo'o	throughout	uncommon	endemic
Sicyopterus stimpsoni	'o'opu-nopili	throughout	abundant	endemic
Exotic				
Clarias fuscus	Chinese catfish	lower reaches	uncommon	-
Gambusia affinis	Mosquito fish	lower reaches	common	-
Xiphophorus helleri	Green swordtail	lower reaches	common	-

Timbol summarizes the life cycles of the river's fauna as follows:*

> "Some animals are permanent residents at a particular stream site. Others migrate as a necessary part of their life cycle. Diadromy refers to an animal that resides in a stream but whose larvae must reach the ocean to develop and re-enter streams as post-larvae. With the exception of insects, all of the conspicuous native stream animals are diadromous. Thus eggs of the 'o'opu (goby), 'opae kala'ole and hihiwai hatch in freshwater, spend their larval life as marine plankton and migrate upstream as fry."

Diadromous behavior can be seen in the life-cycle of the 'o'opu nakea:**

> "During the spawning season which extends from August through December, the fish descends downstream in mass migration to spawn in the lower section of the stream. The eggs which are laid attached to rocks hatch within 24 to 28 hours. Immediately after hatching the larvae are swept out to sea by the river current. The fry re-enter the streams and begin migrating upstream after spending 4 to 7 months in a marine habitat. After re-entry into fresh water habitat the fish attain sexual maturity in a year's time."

The 'o'opu's journey upstream is remarkable:***

> "The appearance of fry at any given stream mouth and subsequent recruitment of individuals into the stream's population is a matter of chance. We also believe that,

*Environmental Impact Study Corporation, _op. cit._, pp. 12-13.

**Kenji Ego, _op. cit._, p. 1.

***John I. Ford and Robert A. Kinzie, III, "Life Crawls Upstream," _Natural History_; Vol. 91, No. 12; December, 1982; pp. 60-67.

unlike anadromous salmon, which return to the stream of their birth as strongly swimming adults, the gobies move into the nearest stream when it is time for them to metamorphose into their freshwater form.

... tiny fry must surmount steep gradients and cascading water if they are to reach their adult habitat.

Our observations indicate that at least two goby species make this upstream journey when they are very young (less than three centimeters in length). The secret? The "suction cup" pelvic fins...have been put to a new use. By alternately clinging tightly with their fins and squirming forward using their tail, the gobies are able to climb the waterfalls. 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."

Comparison of Ego's 1970 and 1953 surveys (see Exhibit III-9) show lower populations of nakea in 1970. The difference may be attributed to differences in season (March 1970 vs. July and December 1953), the very low water condition of all of the Kauai streams during the 1970 survey, or the population may have declined.

Timbol compared his 1982 and 1977 studies and reported the following:*

"Probably the most significant difference between the two studies is the presence of _Lentipes_ in 1982 but not collected in 1977. An explanation regarding this

*Amadeo S. Timbol, _op. cit._, p. 10.

feature has been made in an earlier section. On the other hand, three species were present in 1977 but not collected in 1982. It is strongly possible that all three species are still in Wainiha but in very low abundances. This could be the result of the heavy winter freshets in the previous month (i.e. Hurricane Iwa)."

"There is no decline in relative abundances in those species with economic and biological values (A. stamineus, S. stimpsoni, A. bisulcata, N. granosa). However, two native species, A. genivittatus and E. sandvicensis, appear to have declined in abundance. This apparent decline could be due to a variation in collecting methods. The backpack electroshocker in 1977 was more powerful than the model used in this study. It appears, therefore, that there are no real differences in relative abundances between the animal populations in 1982 and 1977."

While direct comparison of studies done by Ego and Timbol, or even comparison of studies done by each at different times, is complicated by variations in season, water conditions, sampling equipment and sampling locations; the fact that in each case species were either sighted or collected cannot be overlooked. The variation in counts indicates that the population densities are dynamic as can be expected of species having diadromous life cycles. Diversion practices of the Wainiha have not appreciably changed since the existing project was built in 1906, but seasonal climate, introduction of new species, and patterns in wind and coastal currents, as well as fishing methods have changed and may affect not only the short term but also the long term diversity and abundance of species in the river.

Timbol states in his 1983 study that "... Wainiha harbors a good, healthy on-going nopili population" and "the nakea population appears to be a healthy, thriving population."*

Samples taken by Timbol in 1982 (see Exhibit III-11) show that the nakea and nopili are at times equally, if not more, abundant above the existing diversion weir as they are below it. Data indicate that although populations may vary, the river is capable of supporting abundant populations both above and below the existing diversion weir.

Several of the river's species are fished. Ego stated "... 'o'opu nakea is the only species for which a fishery of any importance is being conducted. Although the 'o'opu occasionally appear in the fresh fish market, fishing for this species today is primarily for sport

*Amadeo S. Timbol, op. cit., pp. 7 and 9.

EXHIBIT III-11

'O'OPU NAKEA AND 'O'OPU NOPILI
ABUNDANCE AND DISTRIBUTION, DECEMBER, 1982*

Sampling Station	Elevation ft	Nakea per $20m^2$	Nopili per $20m^2$
I	1120	7	23
IIA	920	11	26
IIB	720	14	13
III	680	9	29
IV	10	3	30

Elevation of existing diversion weir is 700 ft.

*Amadeo S. Timbol *op. cit.*, Scientific Collecting Permit No. SCP 83-24 and letter Amadeo S. Timbol to Robert P. Kitchell, July 18, 1983.

and for home consumption."* Timbol recently observed that this situation has not changed.** In the 1950's the Wainiha was reported to be not as heavily fished as the Hanalei, Waimea and Hanapepe Rivers on Kauai, which are generally more accessible to the fishing population.*** Fishing pressure may have increased over the years, but there are no creel census data for Wainiha to either confirm or quantify this.

Data necessary to survey the extent of the fishery are not available from the agencies responsible for its management. In the absence of these data, McBryde conducted a brief survey to determine the extent of the fishery. This revealed that although more people fished the lower reaches of the Wainiha in the past, only a few people now regularly fish the river, primarily with the use of nets. Several local residents and people who are employed by McBryde occasionally fish the middle and upper reaches of the river using poles. In the past, net fishermen regularly caught a thousand pounds of 'o'opu per night. Current catches are reportedly lower.

*Kenji Ego, op. cit., p. 1.

**Amadeo S. Timbol, op. cit., pp. 2, 10.

***Kenji Ego, op. cit., p. 7.

Some data are available for other North Shore streams on Kauai. Ego included the Hanalei and Hanakapiai in his 1970 survey.* (See Appendix H.) As part of the scope of work for the Summary Report for Hydroelectric Power, State of Hawaii, the Corps of Engineers contracted Timbol in 1977 to study the following streams: Wainiha (Kauai), Hanalei (Kauai), Wailua North (Kauai), Wailoa (Hawaii).** In 1978, the USFWS conducted a survey of the Lumahai (Kauai) and the Waihee (Maui) streams to supplement Timbol's work for the Corps' report.***

In general, Ego's studies show that population distribution patterns for the Hanalei and Hanakapiai are similar to the Wainiha in that the middle reaches of the streams have higher population densities.

Based on faunal inventory, species distribution and abundance, and species composition and diversity data provided by Timbol, plus data from their own studies, the USFWS prepared a "Stream Quality Ranking." They ranked the streams with a possible high quality score of 8 and a low score of 48. The Wainiha ranked the highest with 18 and was followed by the Lumahai, Hanalei,

*State of Hawaii, unpublished data, Ego, op. cit.

**Environmental Impact Study Corporation, op. cit.

***U.S. Army Engineer District, Honolulu, Hawaii, Summary Report for Hydroelectric Power, State of Hawaii, October 1978.

Waihee, Wailoa, and Wailua North Rivers with scores of 23, 24, 26, 26 and 39. (See Exhibit III-12.) All the rivers were identified as possessing relatively large populations of the native gobies, 'o'opu nakea and 'o'pu nopili, except for the Wailua North River. Of all the rivers studied, in the 1978 report by the Corps, the Lumahai is the only one not diverted at the present time.

The above studies show that in spite of the diversion and operation of a hydroelectric plant since 1906, the Wainiha River remains as the highest in quality for stream fauna on the North Shore of Kauai.

4. <u>Terrestrial and avian wildlife</u>

Feral pigs are found in abundance in the upper reaches of the valley and they range throughout Wainiha. Field surveys of the area also indicate the presence of other introduced mammals, such as the roof or black rat, Polynesian rat, and feral cat and dog.* (See report, attached as Appendix D)

Native forest birds can be found in the upper reaches of the valley. Along the west ridge of Wainiha, in the officially designated Alakai Wilderness Preserve, birds

*Andrew J. Berger, "Proposed Wainiha Hydroelectric Project, Kauai Bird and Mammal Report," December 22, 1982.

EXHIBIT III-12

STREAM QUALITY RANKING

Note: Stream Quality Ranking using selected, unweighted criteria where 1 is the highest rank per/factor possible and 6 the lowest. The total score is the sum of Individual Factor Rankings 1, 3, 4, 6-11. (*)indicates a category not included in the total score and ( ) is a score based on U.S. Fish and Wildlife findings only.

	RANKING CRITERIA														
River/Island	FAUNAL INVENTORY	1. Species Number	2. Percent Native Species (Total)*	3. Percent Native Species (Excluding Amphibians)	4. Rare and/or Depleted Species	5. Quantity Rare and Depleted Species*	DISTRIBUTION AND ABUNDANCE	6. X opae kala'ole / sample station	7. X o'opu nakea and o'opu nopili / sample station*	COMPOSITION AND DIVERSITY	8. % Number Native Species	9. % Biomass Native Species	10. Diversity (Number)	11. Diversity (Biomass)	TOTAL SCORE
Waihee River, Maui		6	4	4	1	(2)		1	(2)		1	1	6	6	26+
Lumahai River, Kauai		5	3	2	1	(1)		2	(1)		6	2	1	5	24+
Hanalei River, Kauai		3	1	1	1			3			3	5	4	3	23+
Wainiha River, Kauai		1	2	3	2			4			2	3	2	1	18+
Wailua North Fork River, Kauai		4	6	6	3			6			5	6	5	4	39+
Wailoa River, Hawaii		2	5	5	1			5			4	4	3	2	26+

threatened with extinction exist in significant numbers. (See Exhibit III-13.) These habitats, separated in elevation from the proposed project area by about 3,000 feet, may be considered critical to the survival of several endemic species of birds belonging to the thrush (Phaeornis) and honeycreeper (Drepanididae) families. Some of these species are found only on Kauai.*

Near the mouth of the river, well out of the range of the project area, is a wetland, consisting partly of taro fields, which serves as a habitat for rare and endangered waterbirds, including the Hawaiian stilt, the gallinule, the coot and the koloa. This area appears to be mostly a feeding rather than nesting habitat.**

Two indigenous birds, which range throughout the Pacific Basin, and three birds endemic to Hawaii have been sighted in the area of the proposed project. Both indigenous birds, the wandering tattler and the Pacific golden plover, reside in Hawaii during the winter months. The tattler breeds in Alaska and northwest British Columbia. Although it is usually a shorebird,

*U.S. Department of the Interior, Fish and Wildlife Service, Hawaii's Endangered Forest Birds, no date.

**Ahuimanu Productions, for U.S. Army Corps of Engineers, An Ornithological Survey of Hawaiian Wetlands, December, 1977.

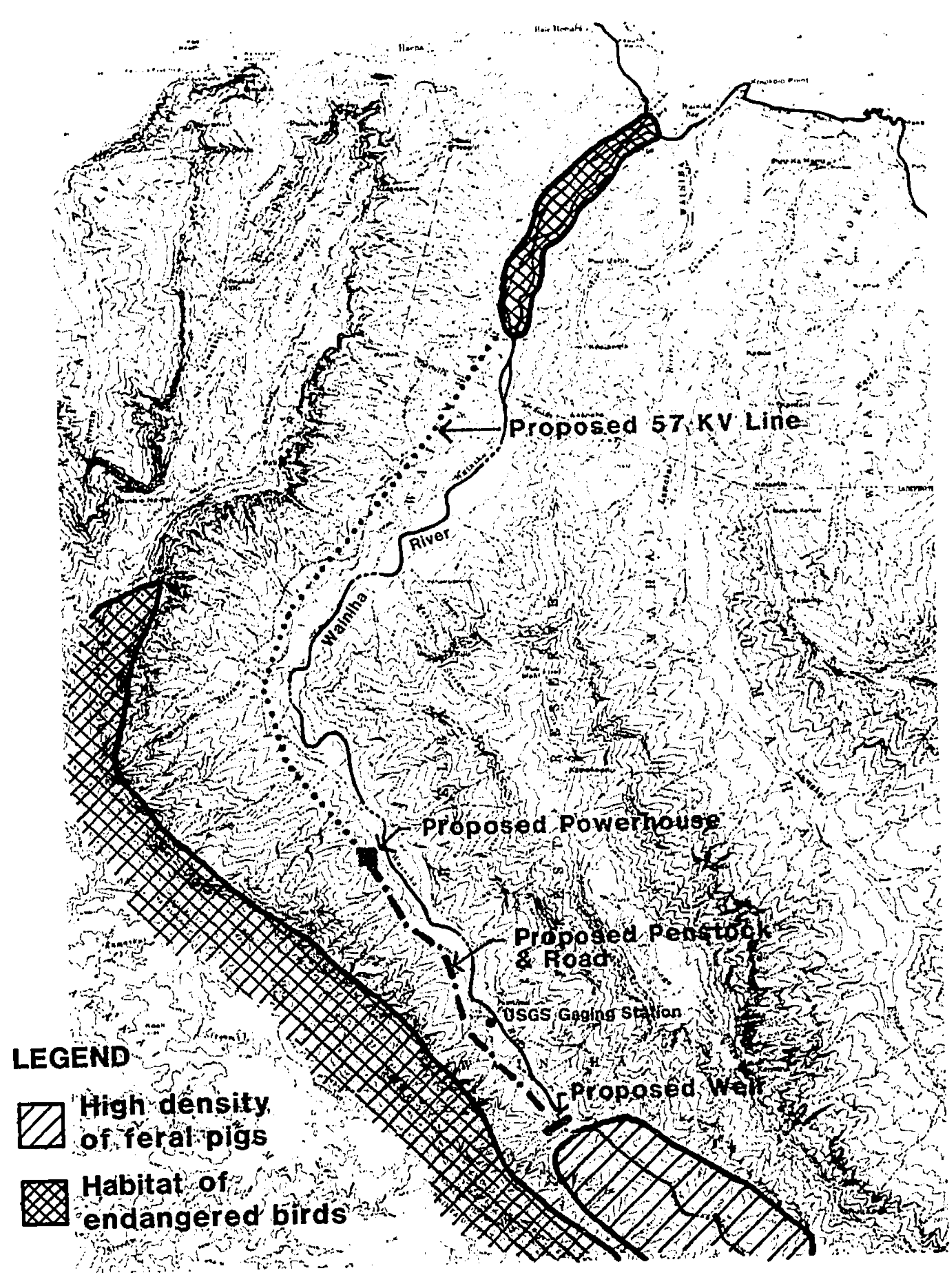


EXHIBIT III-13
WILDLIFE HABITATS

it was observed throughout the proposed project site. The plover nests in Siberia and Arctic America and was seen at about the 800 foot elevation along the river.

Although only three endemic birds - koloa, amakihi and apapane - were seen in the project area, ornithologists are certain that the Hawaiian owl (pueo) also is a denizen of the valley.* Of these endemic birds, only the Hawaiian duck (koloa) is on the Federal list of endangered species. The pueo is on the State list of endangered species for Oahu, but not for Kauai. The koloa disappeared from all Hawaiian islands except Kauai by about 1960 due to a combination of excessive game hunting and a shrinking supply of suitable wetland habitats. Since that time, small populations have been restored on Oahu and the Big Island. The koloa has been found all along the Wainiha River. Its preferred habitat, however, is in the wetland area near the river mouth and at elevations along the stream above 1,000 feet. Amakihi and apapane, the two most common of the honeycreeper family, typically nest in 'ohi'a trees and were sighted in the project area between the 800 to 1,000 foot elevations.

*Andrew J. Berger, for EDAW inc., "Proposed Wainiha Hydroelectric Project, Kauai Bird and Mammal Report," December 22, 1982.

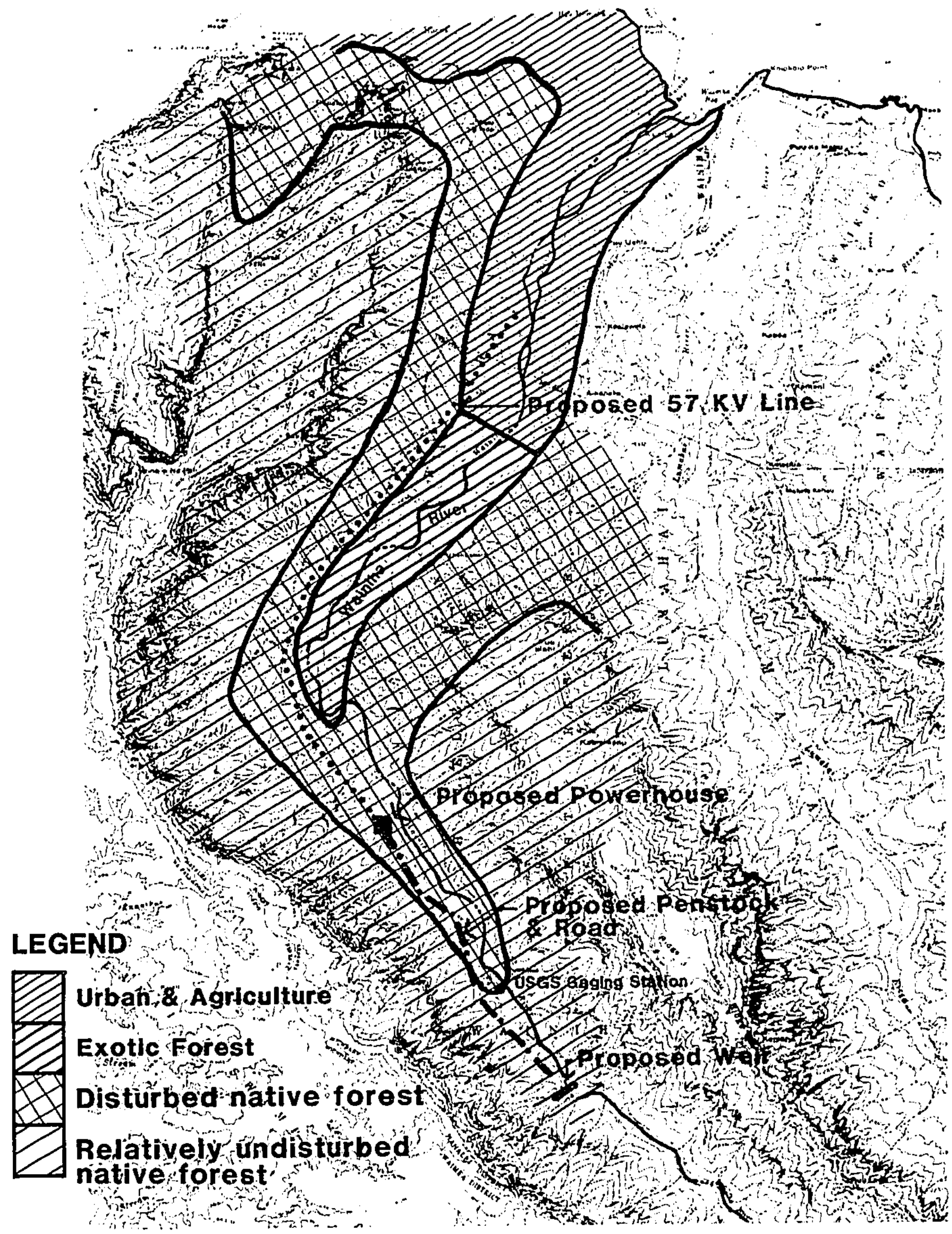


EXHIBIT III-14
VEGETATION ZONES

A list of plants along the proposed alignment of the access road and penstock was developed by a botanist during a field survey.* (See report, attached as Appendix F) The survey revealed a mixture of endemic, indigenous, and introduced plant species. Between the proposed powerhouse site and the Gaging Station, the valley bottom shows evidence of previous cultivation including scattered taro, ti, banana and 'awa plants. Cultivation was abandoned sometime within the 19th century and most of the taro patches are covered by a mixed forest dominated by 'ohi'a lehua, guava and kukui. The survey found that native species are predominant upstream of this area.

Although none of the plant species in the project vicinity are listed on official rare and endangered lists, two of the plants which were encountered are of particular interest. One lo'ulu palm (Pritchardia sp.), found beside the trail at the Gaging Station at elevation 960, seems to belong to a species which has not yet been formally described in scientific literature. A lobelia (Cyanea sp.), found within 50 feet of the lo'ulu palm, could not be precisely identified.

*Charles H. Lamoureux, for EDAW inc., "Report on the Vegetation and Flora of the Proposed Project Site at Wainiha, Kauai." January, 1983.

6. History and archaeology

Six archaeological sites along Wainiha River have been reported in published literature.* (See Exhibit III-15.) Four of the sites are located within a mile or two of the shoreline on slopes well above the river. The fifth site, taro terraces located approximately one mile above the existing powerhouse, was previously placed on the State Register of Historic Places in 1974. However, the site was removed from the Register because of procedural irregularities. Redesignation of the site is currently pending. The sixth site is located near Maunahina Stream and consists of house sites and terraces. All six sites are outside of the project area.

Written accounts of Wainiha indicate that the entire valley, up to approximately where the Gaging Station is now located, was used for agriculture before 1850.** After that date, only the lower portion of the valley was used to cultivate taro and rice. A poi mill once operated near the mouth of the valley.

*Wendell Clark Bennett, Archaeology of Kauai, Bernice P. Bishop Museum Bulletin 80, 1931.

**Earl (1978), Hardy (1940) as reported in William Barrera, Jr., for EDAW inc., "Upper Wainiha Valley, Kauai: Archaeological Reconnaissance."

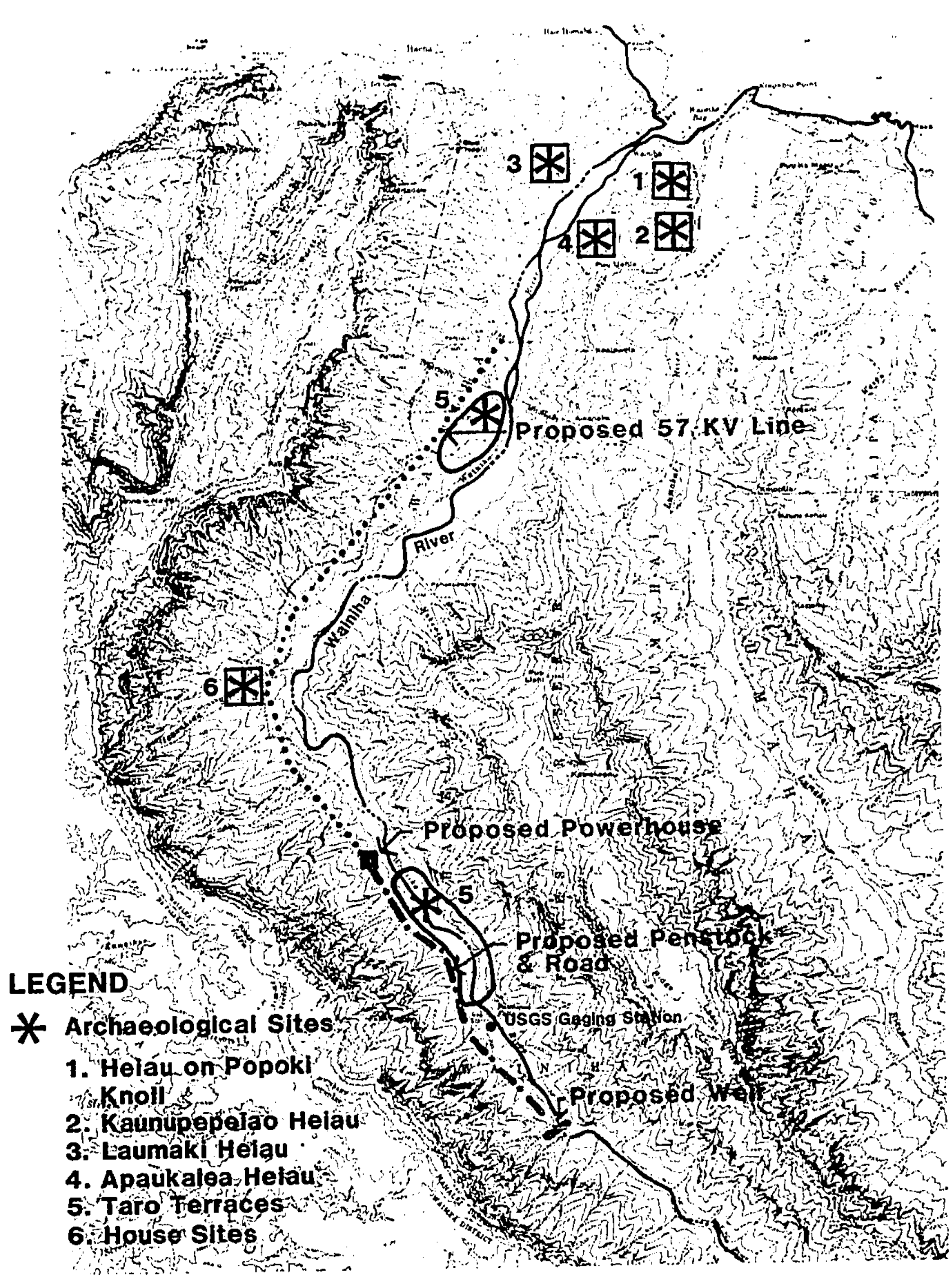


EXHIBIT III - 15
ARCHAEOLOGICAL RESOURCES

A recent reconnaissance confirms these observations regarding the nature and extent of archaeological remains in the valley.* (See report, attached as Appendix E) Specifically, taro terraces were identified in the project area in the alluvial plain of the river between the proposed powerhouse site and the USGS Gaging Station. The terraces consist of rock walls standing between 1 and 5 feet in height and covered with heavy vegetation, some of which is scattered taro and ti, indicating the previous agricultural use. Possible house sites in this area are located on a low bluff above the river. No evidence of burial grounds, heiau or other sacred sites was found in the project area. The sites are agricultural and possibly habitational in nature.

The existing powerhouse is not a historic site.

7. Public services and facilities

Electricity and telephone utilities are provided up to the McBryde houses at the end of the County road. These utilities do not currently extend beyond this point.

*William Barrera, Jr., op. cit.

Water to the McBryde houses is supplied from the Powerhouse penstock. The river is not a source of domestic water for other residents. Water for the other residences in the valley is supplied by County wells in the Wainiha-Ha'ena area. The Wainiha Well, with a capacity of 25 gallons per minute, is a back-up to the larger well in Ha'ena, and is located outside the project area. Improvements planned for the system include an additional well near the existing Ha'ena well.

There are no public education, health or safety facilities in Wainiha. Limited facilities for such services are available in Princeville and Hanalei, located a few miles from Wainiha along Kuhio Highway. There is no public sewer system in Wainiha Valley or the surrounding area. Cesspools serve all the houses, including the existing powerhouse. The County-owned 24-acre Wainiha Beach Park is situated near the mouth of the river. It is a passive park without any structural improvements.

Kuhio Highway and Powerhouse Road are public roads that provide access to the project area. Kuhio Highway, which is owned by the State, is a two-lane highway throughout the North Shore with a pavement width of 18 feet from Wainiha Bay to the end of the road at Ha'ena. In other areas of the North Shore Kuhio Highway is 24 feet wide. There are several narrow bridges along the North Shore with weight limits in the 8 to 12 ton range. A series of three such bridges cross Wainiha River, leading to the entrance of Powerhouse Road. Powerhouse Road is County-owned and extends from Kuhio Highway southward to a point approximately 1/4 mile south of the existing powerhouse. The road is paved, narrow, and not in good repair. It has two lanes and extends into the area of McBryde plantation houses. Beyond this point, the road is on private land and is secured by a locked gate.

Average 24-hour traffic volume on Kuhio Highway where it intersects Powerhouse Road was 1,854 vehicles in 1981. Peak morning traffic along this section of Kuhio Highway occurred between 10:30 and 11:30 with a count of 165 vehicles in both directions. Peak afternoon traffic between 1:00 and 2:00 was measured at 216 vehicles, which is only 35% of the total 625 vehicles/hour design capacity of the highway.* The light traffic is mainly due to the rural nature of the area and Wainiha's location near the terminus of the highway.

*State of Hawaii, Department of Transportation, Highway Planning Branch, departmental records.

8. <u>Socio-economic characteristics</u>

Population grew at a faster rate in the North Shore region than did the general island population from 1970 to 1980. (See Exhibit III-16.) In 1970 the North Shore, census tract 401, comprised 4.0% of Kauai's population. Ten years later, the area accounted for 6.9% of the island's population. The development of the Princeville resort and residential area largely accounts for this growth.

North Shore residents tend to be older than the average Kauai resident, and the average household size is smaller. Four ethnic groups comprise approximately 95% of the North Shore's total population, which follows the islandwide pattern. However, in the North Shore there are proportionately more Caucasians and Hawaiians and fewer Japanese and Filipinos than on the rest of the island.

The median household income in the North Shore is higher than on the island as a whole. A 1980 survey indicates that approximately half of the North Shore work force is employed within the region. About 12% of the working population is employed in construction, 11% in tourism,

EXHIBIT III-16

SOCIO-ECONOMIC DATA

	Kauai	North Shore	North Shore as % of Kauai
1970 population*	29,524	1,182	4.0%
1980 population**	38,891	2,668	6.9%
median age**	27.1	28.5	
average household size**	3.5	3.0	
median household income***	$10,750	$11,600	

Population Composition**		
Caucasian	28.5%	51.9%
Filipino	26.2%	14.5%
Japanese	25.0%	10.9%
Hawaiian	14.6%	17.7%
Other	6.7%	5.0%

*1970 U.S. Census

**1980 U.S. Census

***Robert N. Anderson, University of Hawaii Agricultural Experiment Station, 1975 Kauai Socio-Economic Profile, 1975.

and 8% in agriculture.* Over 15% is associated with various other businesses and retail sales, and 13% is retired. No recent data on unemployment for the region are available. However, approximately 6% of the island-wide work force was unemployed in 1981.** Statewide unemployment figures indicate that unemployment tends to be higher in the construction trades than in most other occupations.

Along Wainiha River itself, the primary commercial activity is hydroelectric production. Other activities include taro farming and fresh water fishing, particularly for the 'o'opu nakea described in an earlier section of this chapter. Much of the agricultural and fishing harvest, appears to be for local and home consumption rather than commercial sale. Kauai's largest and most productive taro farming area is located in Hanalei Valley.***

*Wilson Okamoto and Associates, Inc., op. cit.

**State of Hawaii, Department of Planning and Economic Development, The State of Hawaii Data Book: 1982, November, 1982.

***Wilson Okamoto and Associates, Inc., op. cit.

B. Potential Impacts and Proposed Mitigation

1. Slope stability

According to McBryde's records, landslides have occurred in the vicinity of the existing project during periods of heavy and prolonged rainfall. Minor slides wiped out some of the original flumes, which were made of redwood. The flumes were replaced with tunnels, and the problem was solved. Since construction of the existing project access road, minor landslides have required local maintenance. Over the history of the existing project, there has never been a large landslide; i.e., one involving more than a few hundred cubic yards of material. Examination of the airphotos of the proposed project site reveals that no recent major landslides have occurred, but that minor landslides have occurred and continue to occur during rainy periods. For the most part, slides which have occurred and which are expected in the future are shallow sloughs, less than about 5 ft deep, involving the thin soil cover and weathered rock overlying unweathered rock. Steeper natural slopes with old alluvium or clinker beds appear to be the slopes most prone to sliding.

One criterion adopted for the design of the proposed project is the location of as much of the access road and penstock as possible either on natural ground or in cut. Fills will be avoided to the extent possible as a way of reducing slope stability problems. The policy of using cuts may invite some potential slope stability problems, but these can be mitigated by adjusting cut slope angles, insuring adequate drainage, providing berms, and reinforcing the slope materials as required. The intent of the project design will be to provide the most economical alignment of road and penstock consistent with the long-term stability of slopes. Minor slides unrelated to construction of the proposed project are expected to occur and these may, from time to time, wipe out portions of the road and penstock. Should they occur, these slides will be viewed as anticipated risks, and repairs will be made. Large or catastrophic landslides arising from construction of the proposed project or from natural causes are not anticipated.

2. Water quality

Construction of the proposed project will 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 river 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 capacity of the construction diversion will be about 400 cfs. The risk that this capacity will be exceeded during the period of exposure, about 90 days, is about 5%. Should overtopping occur, turbidity will increase for the duration of high flow and until the cofferdams can be repaired. This increase is not expected to be significant compared to the high turbidity which occurs naturally during periods of high flow. Another source of short term change in water quality will be road and penstock construction. Stream crossing will require culvert and penstock support construction. These activities also will temporarily increase the fine sediment load entering the river. Excavation of cut sections and fill placement are not expected to contribute to long term changes in water quality because engineered cuts and fills in erodable materials will revegetate rapidly. Further, erodable spoil piles will be placed above normal high water and away from stream valleys. Tailrace excavation also may produce a minor temporary increase in turbidity. Throughout the construction period, it is unlikely that an observer at the Kuhio Highway bridge across the river would be able to detect any change in water quality as a result of construction.

Over the long term, there may be temporary periods when the proposed project will affect water quality. The reach of river between the diversion weir and the tailrace of the powerhouse will receive reduced flow by the amount diverted for power production. The consequences to water quality of the reduction in flow may be noticeable during protracted dry periods, but would be limited to moderate increases in water temperature and pH and a decrease in dissolved oxygen. These possible impacts will be mitigated by maintaining a continuous release to augment flow in the affected reach during protracted dry periods. (See following section on stream flows.) No significant adverse change in water quality of the river is expected as a result of the proposed project. An adverse change would be one that altered water quality to the point of loss of biota. This is not expected to happen for three reasons. One, the water quality of the river has remained good and a diversity of stream fauna has survived similar conditions during the operational history of the existing project. In fact, river water is used by McBryde for limited domestic consumption without treatment. Two, the proposed project will not capture tributary streams entering the affected reach. And three, a continuous flow will be maintained.

3. <u>Stream flows</u>

Diversion of flow for power production by the existing 100 cfs project results in the weir's being dry for periods of time. Unless continuous flow is maintained, this would be true also for the proposed 150 cfs project. Based upon the flow duration curve, the existing project diverts all of the natural flow of the river 62 percent of the time, without considering an annual outage for maintenance. (See Exhibit III-17.) On an equivalent basis (without providing for continuous flow) the proposed project would divert all of the natural flow for 77 percent of the time. Considering the necessary two-week maintenance outage, these percentages drop to 58 and 73 percent, respectively. Another way of stating the foregoing is that water flows over the existing weir an average of 153 days a year and would flow over the proposed weir an average of 99 days per year if continuous flows were not maintained. These figures are based upon daily average flows, the basis upon which the gaging station records are presented.

Each year of record has had extended periods during which the flows have remained below 100 cfs or 150 cfs. The minimum number of maximum consecutive days between average daily flows is as follows:

100 cfs: 15 days (December 1974)
150 cfs: 22 days (September 1974)

The maximum number of maximum consecutive days between average daily flows is as follows:

100 cfs: 73 days (March 1978)

150 cfs: 103 days (June 1966)

The average number of maximum consecutive days between average daily flows is as follows:

100 cfs: 29 days

150 cfs: 45 days

The number of years of record the longest low flow period ended in a particular month is as follows:

	O	N	D	J	F	M	A	M	J	J	A	S
100 cfs:	5	1	3	3	2	6	1	3	2	-	-	3
150 cfs:	7	2	-	2	2	4	-	-	3	1	1	3

From the above it is apparent that low flow periods are relatively evenly distributed throughout the year.

Because of the rapid response of the stream to rainfall, data presented on a daily average basis may not accurately represent phenomena measured in hours. As indicated previously, the hydrographs from precipitation

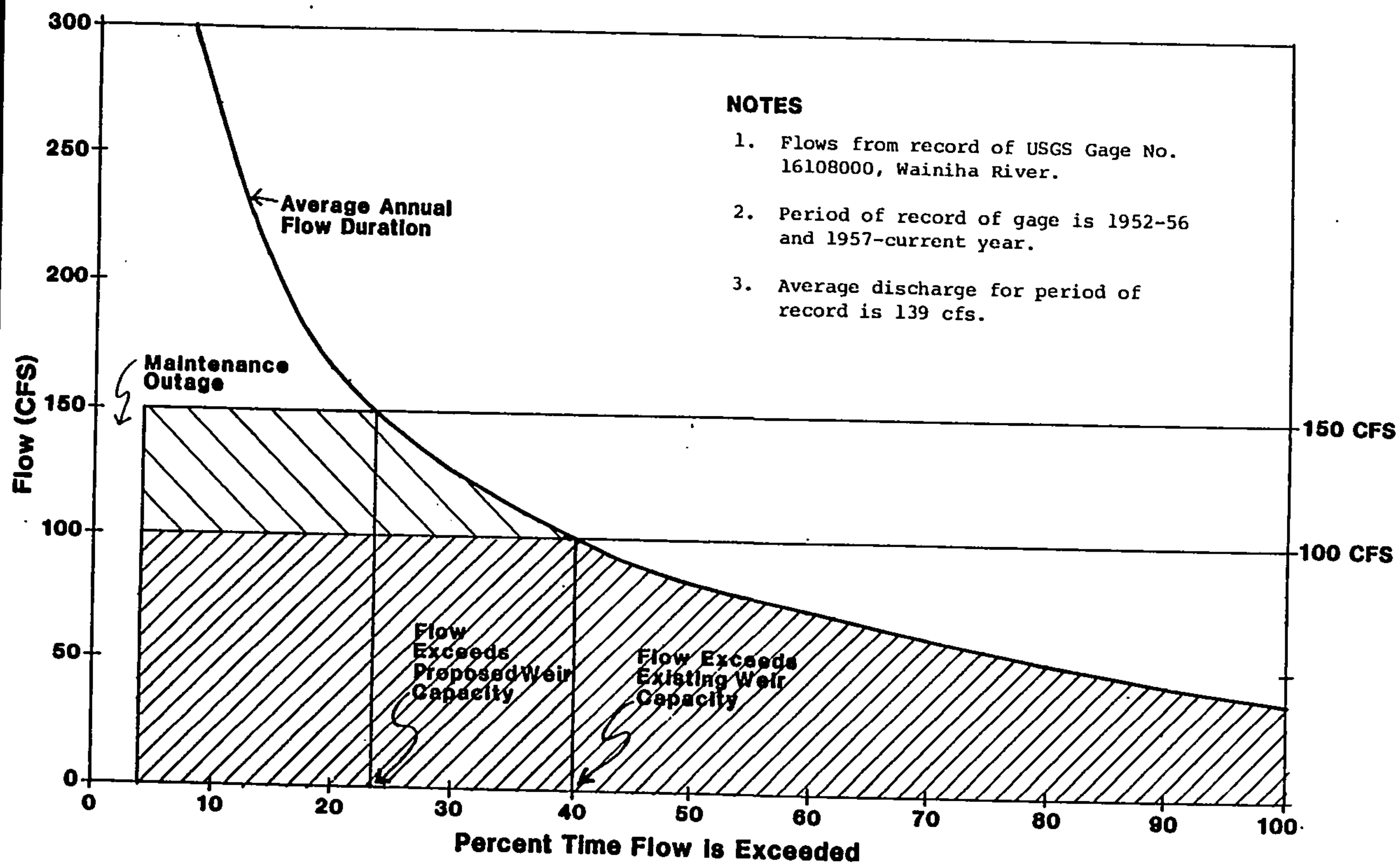


EXHIBIT III-17
EXTENT OF STREAM FLOW DIVERSION BY EXISTING AND PROPOSED WEIRS

events have similar characteristics due to the relatively small drainage area and steep river slope. An example of such a hydrograph is presented on Exhibit III-6. The rise time is rapid and the recision limb is consistent in shape.

Several hydrographs were analyzed to determine their characteristics. The time base of the hydrograph divided by the rise time is typically 10. Of more significance is the relationship between the peak flow and the average flow. This ratio averages from 5 to 10, depending upon the distribution of precipitation. For example, an average flow of 100 cfs during the runoff from a storm would have an associated peak flow of 500 to 1000 cfs. Since Gaging Station records are presented on a daily average basis, peak flows during a day are not reflected in the records.

For example the published daily average flow data for the 1981 water year indicate that flows of 100 and 150 cfs were exceeded 102 and 57 days, respectively. An examination of the analog strip chart records indicates that instantaneous flows of 100 and 150 cfs were in fact exceeded 158 and 137 times, respectively.

During periods of prolonged low flows, a very short reach of river below the existing weir has no perceptible flow. Small amounts of seepage contribute flows to the plunge pool just downstream of the weir. Flows then increase in a downstream direction as a result of inflow from small springs and seeps. Streams on the right bank are not captured and also contribute to these flows. Appreciable flows are again present within one-quarter mile downstream of the weir. Due to the pool and riffle nature of the streambed, pools remain even during dry weather.

The length of stream channel which will be affected by the proposed project during low flow periods will be shorter than the portion affected by the existing project. First, the length of the proposed diversion system is 2.1 miles, compared to the 4.5-mile length of the existing system. Moreover, the proposed penstock will not capture any of the side streams between the sites for the new intake and powerhouse, so they will continue to feed the river channel along the length of the penstock. In contrast, the open ditches and tunnels of the existing diversion system capture most of the flows from side streams along the left bank of the river. Average annual rainfall is about 20 to 30 inches greater in the project area than in the vicinity of the existing diversion system, so this should also help replenish the stream flow.

To further assist in maintaining good water quality and stream fauna migratory pathway and habitat, continuous flow will be maintained across the proposed weir. Flow will be maintained through a self-regulating notch in the weir crest. The notch will be near the right bank, away from the intake.

4. Stream fauna

Although Wainiha's stream fauna are not entitled to special protection under the provisions of existing threatened and endangered species regulations, practically every student of Hawaiian stream ecology has urged prudence in the development of water projects and in the modification of stream channels. Concern has focused on proposals which might deplete the compositions or number of the endemic species in Hawaii's streams.

The existing conditions offer valuable clues as to the potential impacts of the proposed project. Data are available on stream fauna in the river for the past 30 years. These data show that the abundance of nakea and nopili are dynamic and at times, are equally abundant above and below the existing diversion weir. Over this period, the existence of a diversion weir in the river and the diversion of up to 100 cfs along a 4.5 mile reach of river has not served to deplete the composition or number of 'o'opu in the river. Less is known about other species of 'o'opu, mollusks and crustaceans, as they were not counted in the 1950's. But since 1977, their abundance and diversity has not changed.*

The existing conditions include a 17 ft high concrete diversion weir which historically has been dry for extended periods of time. During the 29-year period of record of the USGS gage, the weir has been dry each year an average of 212 days on a daily average basis. The longest period that no flow passed the weir was about 73 days from January 1 through March 4, 1978. The existing project diverts all but one of the 18 streams which enter the river on the left bank. Six streams enter from the right bank undiverted. The existing project is unscreened and 'o'opu have been observed in the ditch and tunnel system.

*Amadeo S. Timbol, op. cit.

During times when no flow passes the weir, flow in the stream channel from springs and seepage is detectable within about 100 feet below the weir. From that point, flow continues to increase downstream. As described in the previous section, freshets periodically "flush" the river, providing adequate flow for both downstream and upstream travels of migrating stream fauna. If the diversion weir had been an insurmountable barrier and if natural flows after diversions had not been adequate to maintain the migratory pathway, then diadromous stream fauna above and below the weir should be depleted. Studies show evidence that healthy and thriving populations exist both above and below the weir.* The driest spell in the period of record occurred in 1978, between samples. The stress of the record dry spell had no evident effect on the composition or number of species. Two conclusions concerning the existing conditions can be made:

- The existing diversion weir is not a barrier to migration, and

*Amadeo S. Timbol, op. cit.

- Natural flows in excess of diversion capacity (100 cfs) maintain adequate habitat to sustain a diversity and abundance of species of stream fauna. Minimum required stream flows are being maintained naturally.

The principal features of the proposed project can be compared to the existing project in a number of important ways. The diversion weirs will be similar. The existing project diverts all but one left bank stream. The proposed project will divert none of the 7 streams which enter on the left bank between the weir and powerhouse. Six right bank streams enter the affected reach of the existing project, and 4 will enter the affected reach of the proposed project. The affected reaches of existing and proposed projects are 4.5 and 2.1 miles in length, respectively. The existing project diverts a maximum of 100 cfs; whereas, the proposed project will divert a maximum of 150 cfs.

The relative potential impacts to stream fauna of the proposed versus the existing project which can be estimated from the comparison of their principal features are:

- Diversion weirs - nearly identical, no differential impact to migration path.

- Side stream diversions - proposed project will have less impact because it will not divert any side streams.

- Length of affected reach - proposed project will have less impact because it will affect two miles less of the stream bed.

- Amount of diversion - the proposed project, without continuous flows over the weir, would divert all of the natural flow of the river an average of 55 more days per year than does the existing plant, due to the difference in capacity. This is contrasted to the existing plant wherein the average maximum period that all of the natural flow is diverted is 29 days per year.

The proposed project is anticipated to have the following impacts relative to three concerns for stream fauna (migratory passage, entrainment, and habitat maintenance):

(1) Migratory passage: The proposed project diversion weir may be an obstacle but will not be a physical barrier to migration of stream fauna because the existing project diversion weir has not been a barrier to migration; and the construction of the two weirs will be nearly identical. Natural flow over the proposed diversion weir and in the affected reach is expected to be adequate to maintain the migratory pathway, but recognizing the impact of increased diversion and other potential incremental cumulative effects of the proposed project, it is proposed to maintain continuous flow over the diversion weir.

(2) Entrainment: 'O'opu have been observed in the existing project's ditch and tunnel system, and it is likely that some have entered the penstock and been destroyed by the pressure increase. To prevent such losses from occurring in the proposed project, suitable fish screens are proposed to be installed at the headworks. Further, to prevent such losses from continuing at the existing project, suitable fish screens are proposed to be installed at the headworks there, as well. This action will improve upon the existing conditions and serve to mitigate any incremental effects of

the proposed project. The estimated cost of installing fish screens at the existing and proposed projects is in excess of $300,000.

(3) Habitat maintenance: The affected reach of the proposed project will be life-cycle habitat for resident stream fauna and rearing habitat for diadromous species. Riffles and pools are special aquatic sites (Clean Water Act, Section 404(b)). The riffle and pool nature in the reach of river affected by the proposed project may change during periods of low flow. The riffles will diminish, but the pools will remain. In the affected reach of the existing project, pools have provided suitable habitat during dry spells. Their suitability is evidenced by the diversity and number of species surviving extended dry spells during which pools provide almost all of the habitat. None of the riffles and pools will be eliminated by discharge of dredged or filled materials. A small pool will be formed by the weir. No sedimentation arising from the proposed project will clog riffle and pool areas. The affected reach of the proposed project is expected to provide suitable habitat because the affected reach of the existing project has provided suitable habitat, and the two are very similar.

In the affected reach of the existing project, freshets have flushed the pools, maintaining water quality well within the tolerance levels of the stream fauna. There is no evidence to suggest that the proposed project will affect water quality adversely. 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.* It has also been noted that slightly elevated water temperatures are conducive to growth of 'o'opu.** In any event, the changes to water quality resulting from increased diversion may have some positive aspects to balance effects on the habitat. In conclusion, habitat has been maintained in the affected reach of the existing project adequate to sustain viable populations of diverse stream fauna and since the proposed project will be constructed and operated similarly, it is believed that although the proposed project may reduce habitat, viable populations of diverse stream fauna will be maintained.

*Kenji Ego, op. cit., p. 24.

**Charles B. Hathaway, Jr., Stream Channel Modification in Hawaii; Part C: Tolerance of Native Stream Species to Observed Levels of Environmental Variability, U.S. Department of the Interior, Fish and Wildlife Service, October, 1978.

No data are available to evaluate the impact that the existing project had on stream fauna when it was built in 1906. Studies over the past 30 years show no adverse changes and indicate that conditions in Wainiha are favorable to the continued support of the stream fauna. Since the proposed project will have characteristics similar to the existing project, it is reasonable to conclude that the proposed project's effects on stream fauna will be similar, but cumulative. There may be a reduction in habitat in the affected reach of the proposed project. This reduction is the only potentially significant adverse impact which may be unavoidable. The reduction in habitat will be mitigated, at least in part, by maintaining continuous flow of one cfs, or about 650,000 gallons per day, in the affected reach. This flow will augment that provided by the uncaptured tributaries and groundwater inflow.

Further opportunities in fishery management may benefit the endemic species. Ego, in his 1951 to 1956 study, stated that his objective was to gather information on the goby fishery and to study various aspects of the ecology and the life history of the goby in order to obtain the necessary background of information upon which efficient management measures may be based for the protection and development of the fishery.* As a result of his study, Ego recommended that commercial fishing for 'o'opu be prohibited. To date, the State of Hawaii has not prohibited the commercial sale of the 'o'opu. Typical practice for the past 30 years has been to net the 'o'opu during its spawning migration, and yields of a thousand pounds per night per fisherman were not uncommon. Current yields are reportedly lower. The capture of large quantities of 'o'opu prior to spawning undoubtedly has and continues to reduce the gene pool necessary for specie regeneration. Since Ego's studies in 1950's, very little has been done to assess the fishery. No data on harvest quantities or even the number of fisherman are available from State or Federal fishery agencies. While improvements in fishery management can benefit the species, such management measures are not alternatives to the proposed project because they are beyond McBryde's jurisdiction.

5. Vegetation, birds and mammals

Impact on vegetation, birds and mammals 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

*Kenji Ego, op. cit., p. 2.

to exist in the area. Wildlife is expected to retreat from the area while construction is taking place but return after the project is 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.*

The mammals found in this area are all introduced and are generally considered pests. The feral pig is hunted on a limited basis.

The 13 species of introduced birds identified in the project area are abundant species and highly adaptable to varying ecological habitats. The amakihi and apapane which were observed in the valley are the two most common species of the extant native honeycreepers. Both are dependent primarily on 'ohi'a and koa trees, which are dominant on the slopes of the valley. The construction of the access road and penstock will probably remove some of these trees. A very small fraction of the total coverage on the slopes, which are protected from human encroachment by steepness and inaccessibility, will be affected. The abundance of amakihi and apapane in Koke'e State Park, which is frequented by many tourists, attests to the adaptability

*Andrew J. Berger, op. cit.

of these species. The level of human activity in the project area would not approach that of Koke'e State Park. Similiarly unaffected will be the pueo which is thought to be present from time to time in the project area. It is adaptable to many different habitats, ranging from native forests to introduced lowland vegetation.

The impact on waterbirds and their habitat is also expected to be negligible.* Koloa can be found in the project area, as well as other sections along the river, since they regularly move to different sites during the day to satisfy one or more of their requirements. Their preferred habitats are the wetlands near the mouth of the river and the stream banks above the project area, particularly the former. Waterbirds such as the koloa are sensitive to changes in the feeding potential of lowland mud flats, which this project would not affect.

To protect the integrity of the native ecosystem, efforts will be made to avoid unnecessary or excessive disturbance to the area upstream of the Gaging Station.** As a practical matter, the rugged topography severely constrains construction activity. In the

*Andrew J. Berger, op. cit.

**Charles H. Lamoureux, op. cit.

upstream area there will be no extensive staging areas. The alignments for the access road and penstock will be joined, unlike the existing project, and the road width and construction equipment sizes will be the minimum possible.

While no rare or endangered species of plants were found in the project area, two plants, a lobelia and a lo'ulu, will be protected. This will be accomplished by having a botanist identify the two plants on site for the topographic survey crew doing the detailed mapping for construction drawings. The plants will be marked in the field and located on the topographic map. The road alignment will avoid these two plants and temporary fencing or other suitable protective device will be installed.

6. Visual quality

None of the project features, including the proposed transmission line, will be visible from Kuhio Highway, the residential area in the downstream portion of the valley, Koke'e State Park or any other area where public views would be possible. Except for the transmission line, which will parallel the existing access road between the existing and proposed powerhouses traversing Robinson Estate land, the proposed project will probably not be visible anywhere from land areas outside of

McBryde property. Heavy vegetative growth will screen views of the transmission line and powerhouse from the ridgetops on either side of the valley. At no time will transmission poles or conductors be silhouetted prominently against the sky.

The primary potential for view exposure to the project area is by means of helicopter overflights. Commercial helicopter services on Kauai do offer scenic tours, and Wainiha Valley probably can 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. Such is the case for the existing project when it is seen from above.

7. Air quality and noise

During the construction period, air quality and noise levels will be temporarily affected. Vehicles transporting equipment and personnel will create dust and emissions and raise noise levels. The effects will be noticeable in the residential areas along Powerhouse Road. At no time will State or Federal ambient noise or air quality standards be exceeded.

Grading and limited blasting in the upstream area will also temporarily degrade air quality and increase noise levels in the vicinity. Under normal atmospheric conditions, these construction effects will probably not be noticed by anyone other than workers on the construction site because the primary location of activity is at least 4.5 miles from the nearest residence.

Noise levels in the valley will be unaffected by the operation of the project. The proposed powerhouse, like the existing one, will not produce a sound audible enough to interfere with normal conversation just outside of the building when the doors are closed.

The operation of the project will also have no effect on the air quality in the valley. By displacing fossil fuel generation; the plant will have a beneficial effect on air quality elsewhere on Kauai.

8. Archaeological resources

Abandoned taro terraces and possible house sites were found in the project area. No remains of great significance, such as heiaus, are expected.* However, a five-step plan to avoid any adverse impact and to minimize construction delays will be followed during design and construction.

*William Barrera, Jr., op. cit.

(1) An archaeologist will work with the topographic survey crew to identify and locate probable sites on a detailed topographic map of the proposed project area.

(2) The archaeologist will indicate the scientific significance of each site, rank them in order of archaeological sensitivity and estimate the cost of mitigation through salvage excavations. Consultation with the State Historic Preservation Office will ensure that appropriate mitigative actions are employed.

(3) Project engineers may make adjustments to the siting of project features, in consultation with the archaeologist, to avoid areas of greater archaeological sensitivity.

(4) The archaeologist will inspect the final locations for the road and penstock alignment, the powerhouse and the transmission line poles to verify the initial assessment. The archaeologist will monitor construction work in areas which he indicates are particularly sensitive.

(5) Salvage excavations will be carried out in sites or portions of sites which will be affected by construction activities.

This approach will avoid the destruction of significant archaeological resources. The salvage of resources which are unavoidably affected by construction will enable archaeologists and historians to gather useful information about the cultural practices of early Hawaiians. This project offers an opportunity to do this kind of research on a site which until now had not been surveyed.

9. <u>Public facilities and services</u>

Construction personnel moving to Kauai for construction of the project will create a temporary and minor increase in demand for State and County services, such as schools, parks, water, sewer and health care. The peak work force of 40 persons could hypothetically add a maximum of that many households to the island's population. The maximum, however, will almost certainly not be realized. First, it is likely that many workers will already be Kauai residents. Second, some of the imported workers will be on the project for a short duration and will not relocate their families to Kauai. The average daily work force for the 20-month construction period is expected to be about 25 persons. The capacity of public services on Kauai would appear to be adequate to accommodate any temporary population increase resulting from project construction. Other than during the construction phase, the project will not require public facilities or services.

The additional stream diversion will not affect either the quantity or quality of the water supply in the County well near the mouth of Wainiha Valley. The well draws from ground water above the stream level. Moreover, the diversion would not be for a consumptive use, so the flows in this downstream portion of the river will remain unchanged.

Construction equipment and passenger vehicles transporting workers to and from the site will affect traffic conditions along Kuhio Highway and the County road to the powerhouse. Workers will be transported twice daily, except weekends, along these public roads for most of the construction period. This will be the most frequent and regular type of vehicle trip. Traffic will be limited to weekday daylight hours except for possible overtime or additional shifts. The County road to the powerhouse will generally be more affected than Kuhio Highway by the traffic of construction equipment and vehicles hauling materials to the site. The width and weight limitations of several of the bridges along Kuhio

Highway, as previously noted, prohibit the passage of large and heavy equipment, such as bulldozers, aggregate haulers, penstock pipe and transformers. After being transported via a marine route, the larger equipment will be hauled over the County road from a landing spot near the mouth of Wainiha River.

The increased traffic will be noticeable along the County road, which is normally lightly travelled. Other drivers will be delayed, from time to time, where large loads are being moved. Residents will be kept advised of construction use of the road and every effort will be made to minimize the nuisance.

10. Socio-economic conditions

The socio-economic consequences of the proposed project will be beneficial. In the short term, the $10 million investment in construction will generate tax revenues and jobs, both directly and indirectly.

Construction will create temporary employment for electricians, pipefitters, equipment operators, carpenters, painters, iron workers, masons, general laborers and millwrights. Contractors will be encouraged to employ qualified Kauai residents. In any event, contractors would probably prefer to employ locally-available workers with requisite skills because of the savings to them in travel and subsistence costs for off-island workers. If skilled workers are not available on Kauai for certain specialized tasks, then qualified personnel will have to be brought in from outside.

After completion of construction, it is anticipated that the plant will be supervised by the operator of the existing plant. However, additional part-time or temporary employment may be necessary for maintenance tasks.

Workers brought in from outside Kauai will make their own arrangements for housing. Since they will be residing on Kauai for a relatively short time, it is likely that they will rent quarters rather than build or buy a house. There are presently many vacant rental units available nearby.

In addition to direct employment, the project will stimulate the job market on Kauai in two indirect ways. First, the project's expenditures on goods, services and wages will infuse more capital into the local economy, which in turn will support jobs in retail trades and other service sectors. Second, the project will strengthen the financial condition of McBryde Sugar Company, one of the island's major employers. The increased revenues from power sales will help McBryde to survive the instabilities that afflict the Hawaiian sugar industry. The sugar industry remains as one of Kauai's principal employers, and it is an important aspect of the Island's and State's economy. Studies show that, for every job held by a sugar worker, 2.29 non-sugar jobs are created or supported.* McBryde, which currently employs about 540 people, therefore indirectly supports 1,780 jobs within the State.

The proposed project is not expected to have a significant adverse effect on present subsistence or recreational activities in Wainiha Valley. The water supply available to taro farmers will continue as before, since the diverted water will be returned to the stream well above the taro patches. For reasons explained in the previous section on stream fauna impacts, recreational and subsistence fishing is not expected to be seriously affected.

The proposed plant will, on an annual basis, replace electrical energy currently being produced by burning 50,000 barrels of oil. Air quality will be improved by reducing sulfur dioxide emissions by 306 tons annually and carbon dioxide emissions by 27,440 tons annually.

*Thomas K. Hitch, Research Division, First Hawaiian Bank, "How the Collapse of the Sugar Industry Would Impact on Hawaii's Economy," (unpublished monograph), December 4, 1981.

The long term effects of the project on the island and state economies will be beneficial. The replacement of 50,000 barrels of imported fuel oil represents a savings of over $1.5 million annually, much of which will remain in the Kauai economy. This will contribute substantially to improving the State's balance of trade.

Electric power consumers on Kauai are expected to benefit in a number of ways. Kauai Electric (KE) estimate that the proposed project will provide a direct cost savings benefit of $339,000 per year to the utility company's customers. The average annual savings per customer would be $19.00, which is equivalent to a 2.5% reduction in the typical customer's bill.

Savings will be realized in the following areas:

(1) Reduction in rates

The rate negotiated with McBryde for the purchase of energy is less than KE's avoided cost. KE's customers will derive an immediate economic benefit through the operation of KE's energy rate adjustment clause. A conservative estimate of the annual benefit is $216,000.

(2) Capacity Addition

The purchase power agreement obligates McBryde to make available firm power to KE as required. The rate negotiated for the capacity charge is less than what KE would bear if it had to install base load capacity at Port Allen. The annual value of the firm capacity is estimated to be $37,000.

(3) North Shore Reliability

The additional installed capacity provided by the project will forestall KE's planned second transmission line to the North Shore which is intended to improve service reliability to the area. The annual benefit of deferral of the second transmission line is estimated to be $84,000.

(4) Line Losses

The proposed project will reduce the amount of energy generated at Port Allen and transmitted over transmission lines to the Kapa'a area. The annual reduction of line losses would be valued at $2,000.

Improving the reliability of electric power service to the North Shore has more than a direct dollar value. The rapid restoration or maintenance of service to the area after a major system outage is a clear benefit to public safety and welfare. After the disruption caused by Hurricane Iwa last year, for example, the existing plant made it possible to restore service to the North Shore several days sooner than would have been possible without the plant. Since the Wainiha plant is directly tied to KE's transmission lines, service restoration could benefit other areas on Kauai, as well.

C. Adverse Environmental Effects Which Cannot Be Avoided

Construction of the project will create localized and temporary adverse impacts on noise levels and air and water quality. The movement of construction equipment, grading and blasting activities will increase the amount of air-borne dust and particulate emissions. These same activities, particularly the blasting, will increase ambient noise levels in Wainiha Valley. Water quality will be affected by increased turbidity in the river, particularly during construction of the weir.

The passage of construction equipment and the road improvements along the Powerhouse Road are the only construction activities which are expected to have an adverse effect on the residential area in the lower part of the valley. The beach and nearshore areas at the mouth of Wainiha River will be temporarily disturbed by the landing of construction equipment and supplies brought in by barge.

Grading in upstream areas will destroy native vegetation, disturb soil regimes and perhaps cause the removal of some archaeological remains. None of these construction activities are expected to have a significant, long-term adverse effect on the physical or cultural assets of Wainiha Valley or off-shore areas.

Habitat for stream fauna may be reduced, but the survival of any species is not expected to be threatened because a normal distribution of species is found at the existing project. However, a reduction in habitat may adversely affect the relative abundance of species. Or it may not. State-of-the-art methods do not allow for a clear answer to this question at Wainiha. The best evidence, existing conditions, suggests that the long term unavoidable adverse impacts of reduced habitat to stream fauna, which may occur, will be minor. The release of a continuous flow will, at least in part, mitigate these impacts, and the installation of fish screens in the existing project may improve the existing conditions.

D. <u>Irreversible and Irretrievable Commitments of Resources</u>

Construction of the proposed project will require an irreversible commitment of investment capital, labor, construction materials and fossil fuels. The facilities, once installed, will remain there for the life of the project and will require periodic maintenance.

In the future, the project could be demolished. The river would adjust itself to a natural state similar to that prevailing now. The land could be regraded and reclaimed. 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.

E. Unresolved Issues

Appendices A and I contain all of the comments received from agencies, organizations and individuals possessing jurisdiction, expertise, and/or interest in the proposed project. The substantive issues concerning this proposal are clearly enumerated in the comments. McBryde believes that its responses to these comments resolve the issues.

Chapter IV

CHAPTER IV: RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS

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 U.S. If the Corps finds that the project is in the public interest, a permit will be issued. (See Exhibit IV-1.) The Corps' permit application review triggers the four 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.

EXHIBIT IV-1

LIST OF NECESSARY PERMITS

Issuing Agency	Approval/ Permit	Review Project Criteria	Status
U.S. Army Corps of Engineers	Section 404	Consistency of project with public interest.	Application filed 1/83.
Hawaii State Board of Land and Natural Resources	Conservation District Use	Consistency of project with the objectives of the Protective and Resource subzones of the Conservation District. This Environmental Impact Statement was required as part of the application review.	Application filed and accepted 2/15/83.
Hawaii State Board of Land and Natural Resources	Temporary Variance	Purpose and method of geological explorations, topographic surveying and other activities in the planning and design phases of the project.	Variance issued 4/22/83.
Hawaii State Department of Land and Natural Resources	Scientific Collection	Purpose and method of stream fauna sampling in Wainiha River.	Permit issued 12/9/82.
Kauai County Department of Public Works	Building	Structural stability of project features; plumbing and electricity.	Application to be filed after CDUA and Section 404 approval.
Kauai County Department of Public Works	Grading	Contours, slopes and erosion control.	Application to be filed after CDUA and Section 404 approval.
Federal Energy Regulatory Commission	Declaration of Intention	Effects of navigability, interstate commerce, federal land and use of discharge from federal dam.	Application filed 5/83.

- <u>Endangered Species Act and Fish and Wildlife Coordination Act</u>

  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. One such species (the koloa) can be found in the project area, but the proposed project is not expected to have any adverse effect on this species or its habitat.

- <u>Coastal Zone Management Act</u>

  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 State Department of Planning and Economic Development, 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 such program. The Hawaii CZM Program assessment form is contained in Appendix B.

2. Federal Flood Insurance Program

The Federal Flood Insurance Program does not specifically pertain to hydroelectric projects. However, project features will be within the 100-year floodplain of Wainiha River. The Federal Flood Insurance Rate Map prepared by Federal Insurance Administration limited its study to the first 2.5 miles of the Wainiha Valley, which is outside the project area. In the absence of regulatory flood boundaries, the project's design flood was established based upon a statistical analysis of historic floods. The finished floor elevation of the powerhouse and the elevation of the access road and penstock will be above the inundation level of this design flood.

3. Federal Power Act

A Declaration of Intention will be filed with the Federal Energy Regulatory Commission (FERC). FERC will review the proposed project to determine whether licensing is required.

B. State

1. State Land Use Laws (Chapters 183 and 205, HRS)

The entire project area is in the State Conservation District and is therefore under the jursidiction of the Hawaii State Board of Land and Natural Resources (BLNR). BLNR's Regulation No. 4 establishes controls for designated subzones of the Conservation District. Most of the project site is in the Resource subzone and the remainder is in the Protective subzone. (See Exhibit IV-2.)

The Protective subzone is the most restrictive of the four Conservation District subzones as to permitted uses. Studies of alternative project designs conclude that it is not feasible to develop an additional hydro-electric facility on Wainiha River without placing the weir and a portion of the access road and penstock in the Protective subzone. (See Chapter V, Section A.) Location of the weir farther downstream, in the more permissive Resource subzone, would not reduce potential impacts on the resources which the Protective subzone is intended to protect. The boundary between these two subzones appears to have been established to coincide with the 1000 foot contour interval for ease of identification, but it does not necessarily demarcate a significant transition from a disturbed to a pristine natural environment. In fact, there are indications that locating the weir farther downstream, within the Resource subzone, might exacerbate impacts on stream fauna habitat as the result of reduced potential for stream recharge from groundwater seepage, side stream contributions and rainfall.

Although hydroelectric systems are not expressly permitted in either the Resource or Protective subzones, the BLNR may approve a Conservation District Use Application (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. (See Exhibit IV-1.) The CDUA review triggers the State environmental assessment requirement described below.

2. Environmental Impact Statements (Chapter 343, HRS)

Proposed actions within the State Conservation District require a determination by the Department of Land and Natural Resources (DLNR), at the time a CDUA is accepted for processing, 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 requirements before the CDUA can be approved by the BLNR.

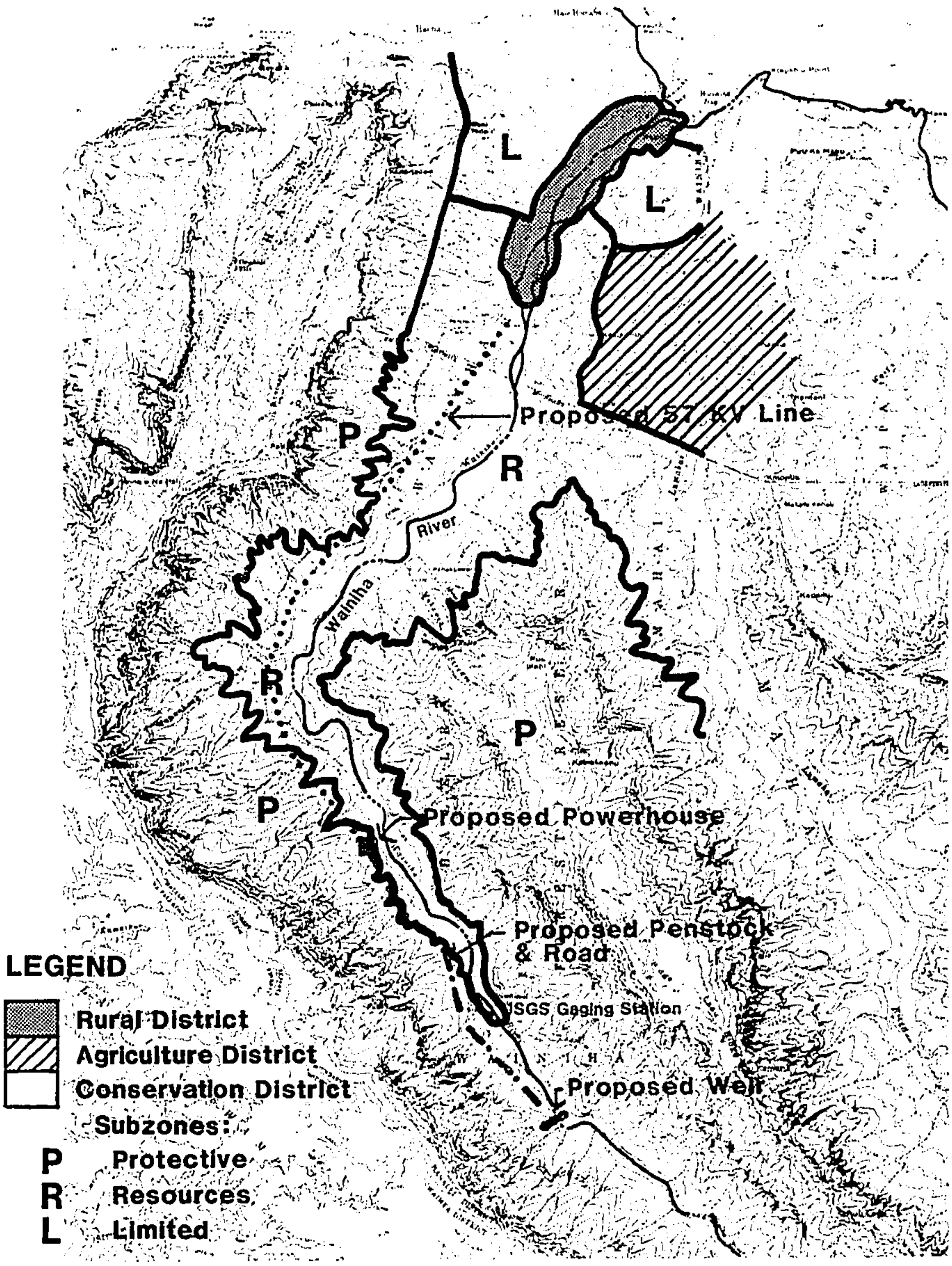


EXHIBIT IV-2
STATE LAND USE DISTRICTS AND SUBZONES

3. <u>State Conservation Lands Plan</u>

This Plan, prepared in October, 1981, has not been adopted by the State Legislature but is used as a policy guide by the State Administration. The proposed project does not conflict with the policy to preserve unique native plant species and habitats of rare and endangered wildlife.

4. <u>State Energy Plan</u>

This Plan was prepared concurrently with the above and shares the same status. The proposed project complies with the Plan's objective to accelerate the transition of the State's energy generation base to indigenous renewable resources.

5. <u>State Water Resources Development Plan</u>

This Plan was also prepared concurrently with the two above Plans and shares their status. The proposed project supports the Plan's objective to develop water sources for the generation of hydroelectric power.

6. <u>State Historic Preservation Plan</u>

The date and status of this Plan are the same as that of the above Plans. Proposed mitigation measures for the development of the project are consistent with the County's objective to promote a systematic method for historic and archaeological surveys of private lands.

C. County

1. General Plan

The County has a General Plan which was adopted in 1971 and an update which was completed in 1982 but not adopted. The proposed project is consistent with the policies of both versions. Specifically, it "promotes the improvement and expansion of the island's economy by recognizing and carefully utilizing land and water resources." Also, it supports "efforts to approach self sufficiency in food production and energy." Proposed mitigation measures will comply with policies relating to water resources, historic sites and critical ecological systems.

2. North Shore Development Plan

This Plan was prepared in 1972; an update was prepared in 1980. The proposed project is consistent with the land use concept for Wainiha Valley and with the policy to "permit surface water diversions if it can be clearly demonstrated that any adverse impacts will be adequately mitigated." Also, the policy to "manage those wildlife resources significant to traditional recreational and dietary habits of local residents to assure their availability in the future" will be respected.

3. Other Controls

Kauai County has no direct zoning jurisdiction over the project area since it is entirely within the State Conservation District, which is under the authority of the Board of Land and Natural Resources. However, permit applications for grading and building will be submitted to the County after the CDUA and Section 404 applications are approved and detailed construction design plans are prepared. (See Exhibit IV-1.)

D. Private

The project will be built on 18.5 acres of land owned in fee by McBryde Sugar Company. (See Exhibit IV-3.) The breakdown by project feature is as follows:

Transmission line	.5 acre (pole sites)
Powerhouse	2 acres
Headworks	1 acre
Road	15 acres (2.5 miles with rights-of-way approximately 50-feet wide)

Although McBryde owns 10,120 acres of land in the valley, the company signed a surrender agreement with the State in 1969 permitting the use of this land by the State for forestry purposes in return for tax benefits for 20 years. McBryde retains all rights to develop and utilize the water resources on its land.

Approximately 5.5 acres of land owned by the Lester Robinson Estate will be needed as an easement for a portion of the proposed transmission line. The Robinsons granted a perpetual easement to McBryde for access from the powerhouse to the diversion weir and for a stretch of tunnels and ditches that cross through Robinson land. McBryde and Robinson are currently negotiating terms to allow the proposed transmission line within this easement to connect the existing and proposed powerhouses.

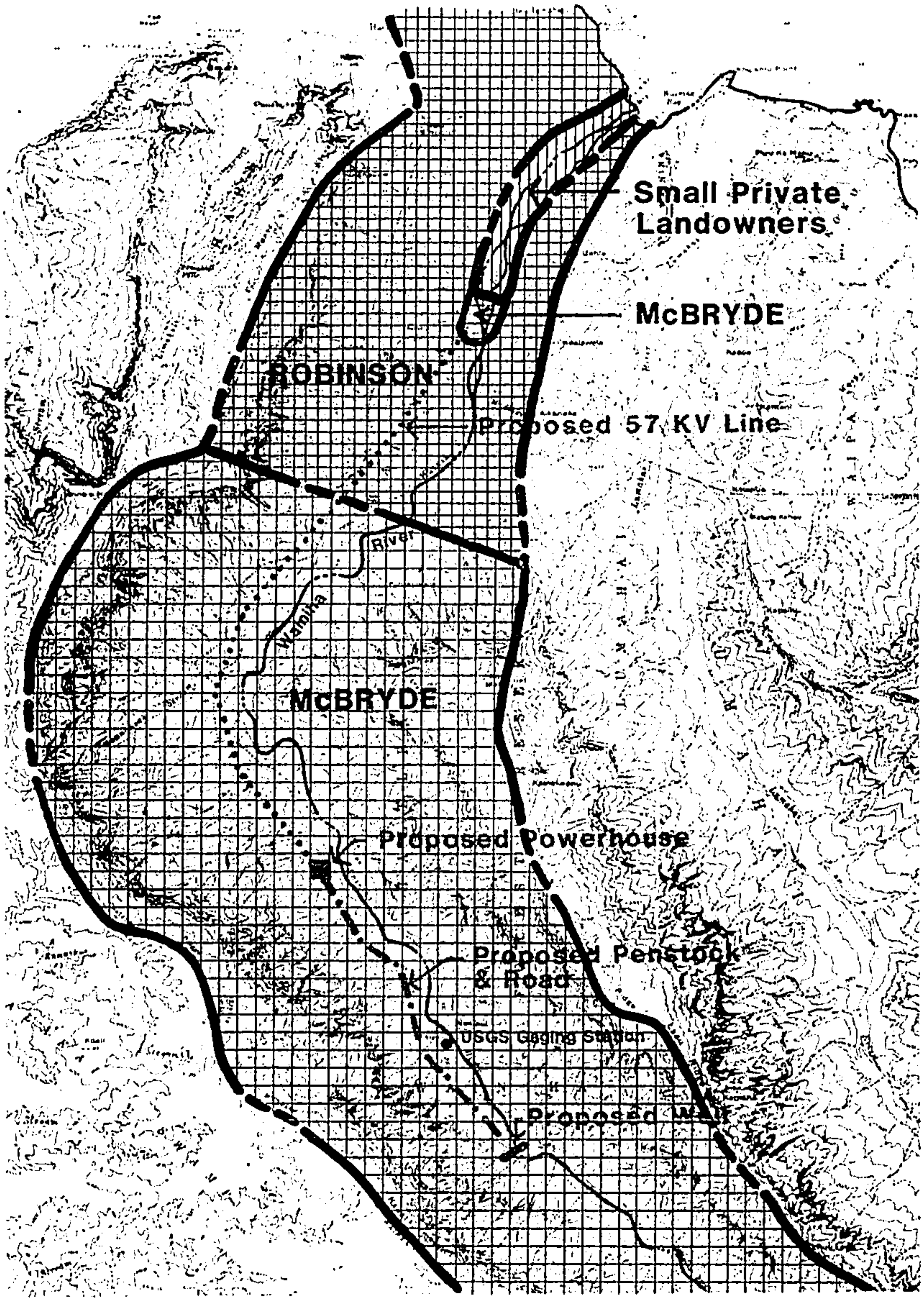


EXHIBIT IV -3
LAND OWNERSHIP

Chapter V

CHAPTER V: ALTERNATIVES TO THE PROPOSED ACTION

A. Project Alternatives

Several alternatives were considered in planning the proposed project.

First, the basic type of project was examined. Projects with storage dams were compared with run-of-the river projects. A run-of-the river project was selected because a storage dam is neither technically nor economically attractive. Technically, there is a high level of uncertainty about the potential watertightness of the foundation and the reservoir. The valley is narrow, and a very high dam would be required to store enough water to justify its cost.

Next, the water to be used for power was evaluated. There are several potential ways to augment the natural streamflow; i.e. the run of river. The possibility of diverting additional water by tunneling under the La'au Ridge from the Lumahai was discarded because the costs of the tunnel would not be recovered in the added benefits of increased diversion. During the late 1940's, Doak Cox examined augmenting stream flow by tapping groundwater trapped between the finely crystalline basalt dikes which crisscross the valley and cut more pervious volcanic rocks.* This scheme was reconsidered but deferred because of the high level of technical and economic uncertainty surrounding its use. The existing project diverts a significant amount of water below the diversion weir in the ditch and tunnel system by intercepting the side streams on the left bank of the river. A layout was made of a scheme to intercept the side streams of the proposed project, and its costs and benefits were compared with the costs and benefits of a closed penstock. A penstock scheme was chosen on the basis of overall economic merit. So, it was decided to plan the proposed project to use only the natural flow of the river conveyed through a penstock.

Projects below the existing project were examined and rejected because of limited head, property ownership, and high levels of impact in changing the existing land uses.

Projects above the existing project were examined, and the proposed project was selected on the basis of overall technical and economic merit.

*Doak C. Cox, for Hawaii Sugar Planters' Association Experiment Station, "A Preliminary Report on Ground Water Development and Storage at Wainiha, Kauai," October, 1948.

To allow for the greatest range of project head, the proposed powerhouse location was set just upstream from the existing diversion weir. The centerline of units was set at elevation 721.5 to provide adequate freeboard during flood flows. Placing the powerhouse farther upstream would achieve no advantage technically, environmentally, or economically and would result in the loss of available head.

The location of the diversion weir determines the project head. The maximum head considered was constrained by the forks in the river at elevation 1500. To divert above this point would require construction of two diversion weirs and splitting the penstock at the forks.

In the reach considered, the gradient of the river is fairly uniform, and there are no natural flows or drops in the river that offer unusual advantage as diversion sites. Project head increases by 40 ft for every 1,000 ft that the diversion is sited upstream of the powerhouse.

River flow decreases as the diversion site is placed farther upstream because of the decreasing drainage area contributing to flow. At the forks of the river (elevation 1500), flow is estimated to be 78% of the flow at the stream gage (elevation 960). Flow uncertainty also increases as distance from the gage increases.

Proceeding upstream from the proposed powerhouse site, three distinct terrains are encountered. From the powerhouse site up to about elevation 1000, the terrain is moderately steep, and few construction difficulties are anticipated. Between elevations 1000 and 1200, the terrain on both banks steepens, resulting in higher costs and more difficulty in constructing the access road and penstock. Below elevation 1200, the river runs in a series of pools and riffles in cobble to boulder sized material. Above elevation 1200 to the forks, the terrain becomes very steep; the river runs in pools and riffles but almost entirely on hard rock; and the costs to construct an access road and penstock are higher.

Three alternative diversion sites were selected to typify terrain, head and flow conditions. These sites were located at elevations 1040, 1140 and 1500. (See Exhibit V-1.) Each site was analyzed to determine its energy potential and cost of construction. Results showed that both annual energy production and construction costs increased with increased head.

Economic analysis showed that the lowest site did not yield enough energy to justify the construction cost. The additional energy produced by the intermediate project compensates for the additional cost. The 1500 ft project produces the highest energy but its relatively high construction cost results in marginal economic feasibility.

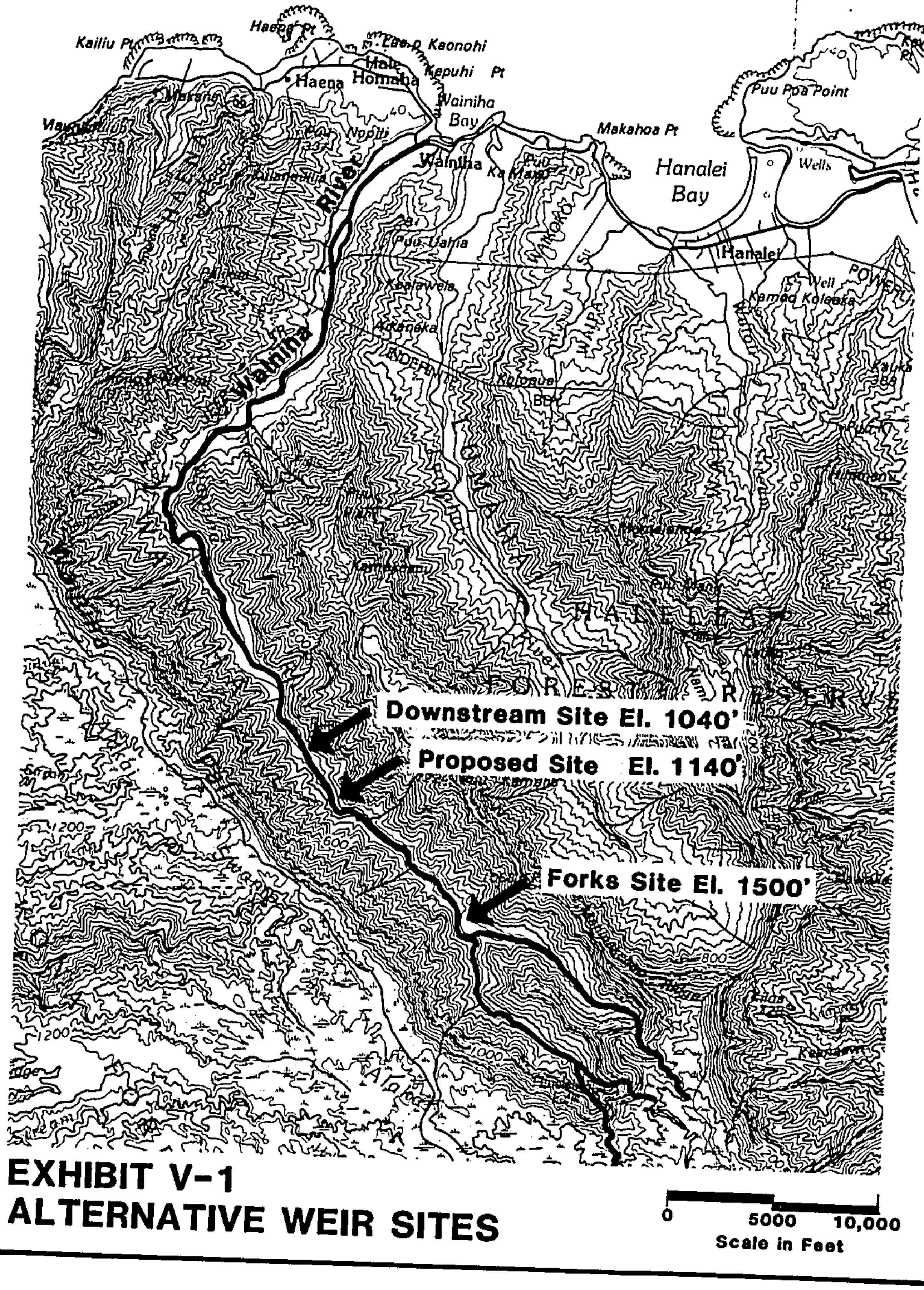


EXHIBIT V-1
ALTERNATIVE WEIR SITES

USFWS suggested studying an alternative with diversion near elevation 1400 with a design flow of 84 cfs. The Service suggested that "accretion of flow from 5 intermittent and 7 perennial tributaries (between 1400' and 1100' elevation), aquifer discharge and subsurface flows may ameliorate losses of important 'o'opu habitat in this reach." This suggestion was evaluated on the same basis as diverting at elevation 1500 because of the physical proximity of the two alternatives. Without offering any clear environmental advantage over other alternatives, diversions high in the river, between elevations 1400 and 1500, are at a distinct economic disadvantage compared with diversion at or near elevation 1140.

USFWS also suggested reducing the proposed project's rated flow from 150 cfs to a lesser amount. About 70% of the proposed project's estimated costs are for items largely independent of rated flow, and these costs must be borne regardless of the amount of power the project can generate. The proposed rated flow was chosen to take advantage of the water available for power and represents a balance between the cost of the power machinery and the value of the power generated. Best economic use of the resource will occur at the project's rated flow. Reducing that flow would result in less power being generated without proportionate reductions in project cost.

USFWS further suggested a number of alternative project designs and mitigation measures. Some of the suggestions have been incorporated into this Final EIS. Others have not. All USFWS suggestions are evaluated in Appendix A.

Comparison of the economics of the alternative diversion sites resulted in selection of the diversion weir site at elevation 1140. By examining incremental costs and benefits of various capacities for a project diverting at elevation 1140 and unit setting at elevation 720, a hydraulic capacity of 150 cfs was chosen as best meeting economic objectives. This results in a proposed installed capacity of 3800 kw.

The existing project has interrupted the natural flow of the river for almost 80 years. As mentioned previously, the existing weir has been dry for periods up to 73 days. The average maximum dry spell each year interrupts flow over the weir flow 29 consecutive days.

Early in the planning process, during the first agency meeting, the subject of "conservation" flows was raised. The representatives of the agencies with expertise in freshwater fish were asked whether there exists an accepted method for determining "conservation" flows in the Wainiha River, and they responded that there is not. Although continuous flow has not been maintained in the river and although freshwater fish survive the interrupted flow , USFWS has suggested maintaining continuous conservation flow. Water released continuously will not be available for power. Project costs will increase slightly if continuous release of water is made because a self regulating release structure must be built into the diversion weir, then maintained. Potential project benefits will be diminished by the power and energy values of the continuous release. Following are the estimated power, annual energy, and first year market values for various continuous releases.

Continuous flow maintained (cfs)	Power (kw)	Energy (kwhr)	Value of Power and Energy ($)
0.5	15	124,400	8,000
1.0	30	248,800	16,700
3.0	90	748,980	50,100
5.0	150	1,244,070	83,500
10.0	300	2,488,140	167,000

It is proposed to continuously release one cfs. This is the equivalent of about 650,000 gallons per day.

B. <u>No Action</u>

If the project proposed in this document is not built, neither the environmental impacts nor the benefits described herein will occur.

McBryde may seek to develop other energy projects; however, each project will be evaluated on its own merit and will not be considered an alternative to this proposed project. The alternative to the proposed project is no action.

Chapter VI

CHAPTER VI: ORGANIZATIONS AND PERSONS CONSULTED

McBryde invited Federal and State agencies to attend a meeting held in Honolulu on November 8, 1982 for the purpose of consulting with these agencies to determine the scope of studies to be performed in preparing this Environmental Impact Statement. The invited agencies and those expressing a desire to cooperate in project planning are listed in Exhibit VI-1. Fourteen people, representing the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the U.S. Soil Conservation Service, the State Department of Planning and Economic Development, the State Office of Environmental Quality Control, the University of Hawaii Natural Energy Institute and several divisions of the State Department of Land and Natural Resources, attended the meeting. Written responses to a questionnaire distributed at the meeting indicated that most participants had received sufficient information about the project at that preliminary stage and felt that the proposed scope of study addressed their concerns. A copy of the earlier planning report for this project, containing more detailed background information, was sent to two of the respondents at their request. Representatives from the U.S. Fish and Wildlife Service raised questions regarding the proposed wildlife and botanical impact analyses. A detailed, written scope of work for these studies was sent to them for review after the meeting to assure that their concerns regarding rare and endangered species and stream fauna would be adequately addressed. The representative from the Aquatic Resources Division of the Department of Land and Natural Resources was also provided with a copy of this scope of work. A representative from the U.S. Corps of Engineers asked that the engineering feasibility report discuss alternative sites for the diversion weir, powerhouse and other project features and that conservation flows over the diversion weir be considered as a mitigative measure. The representative from the U.S. Geological Survey requested that McBryde reconstruct the Gaging Station upstream of the proposed weir.

Two public meetings subsequently were held for the same purposes. The first was held in Lihue on November 9, 1982. Approximately 35 people attended this meeting, including representatives from the State Division of Aquatic Resources and the County of Kauai Planning Department. Participants raised several questions regarding stream flows and project design features, including the design and maintenance of the access road. There were also questions regarding the possible effects on 'o'opu and active and historic taro patches. One person asked why McBryde prefers to proceed with this project rather than improve its hydroelectric facility at Kalaheo. Six persons responded in writing to the questionnaire distributed at the meeting. They requested that the feasibility and environmental studies evaluate this project against other potential alternate energy sources, the benefits to consumers, the possible effects on taro farming downstream, historic taro terraces upstream, and the abundance of 'o'opu in the stream.

The second meeting in Hanalei on November 10, 1982 drew over 40 people, mostly residents of the area. Diverse concerns and questions were raised, but most clustered around the issue of utility rates and McBryde's right to develop the water resources of Wainiha River for a profit. A representative of Kauai Electric was present at the meeting and responded to many of the questions in this area. Other questions related to permit review requirements, effects on traditional gathering rights for Native Hawaiians, employment opportunities for local residents and construction procedures, particularly the hauling of material and equipment to the project site. Three persons submitted written responses to the questionnaire which was distributed at the meeting. One respondent asked what the alternative of enlarging the existing dam, rather than building a new weir upstream, be evaluated. Another respondent asked that the relationship betwen the proposed project and utility rates be studied.

From the comments received both from the agencies and from the public, a scope of work was prepared, then executed. A second round of meetings was held to explain to the agencies and the public what was found out during the studies and to discuss how the findings were interpreted. Again, Federal and State agencies were invited to attend the meeting held in Honolulu on March 1, 1983. Thirteen people attended this meeting, most of them representing the same public agencies that participated in the November session. Most written and oral comments dealt with the potential impact of the project on native stream fauna. Biologists from the U.S. Fish and Wildlife Service (USFWS) and the State Division of Aquatic Resources (DAR/DLNR) wanted an opportunity to review the stream fauna survey and impact analysis in more detail and to discuss possible mitigation measures with project engineers. Copies of the draft report on the stream fauna impact assessment and additional hydrologic data on Wainiha River were made available to them for their review.

Two more public meetings were held, the first one in Hanalei on March 2, 1983. Twenty-five people attended. Some of them had attended the November session. Generally, the questions and comments dealt with the proposed project operation and tended to be supportive of the project. No questions were asked about the environmental surveys and impact analyses. One person requested that McBryde require contractors to comply with preferential hiring practices for local residents. Another individual requested that McBryde repair the County road to the powerhouse as part of the project.

Ten people attended the second meeting in Lihue, including representatives from the Sierra Club, the State Department of Health and the County of Kauai's Planning Department and Energy Office. One questioner asked what impact the outside labor force will have on the local housing market and whether detailed archaeological surveys and salvage work will be carried out in later phases of the project. Other questions dealt with the project's relationship to Kauai Electric's grid system and the availability of power from the project to the North Shore area when transmission lines are downed in other areas, such as during Hurricane Iwa. As in Hanalei, the oral and written responses were very supportive of the project.

Since it was apparent that no agreement had been reached concerning interpretation of the results of the stream fauna studies and the effect of the interpretation on project planning, a meeting was sought with USFWS and DAR/DLNR. A meeting was held on April 12, 1983 in Honolulu. The results of the studies were reviewed, and suggestions for project planning were solicited. The suggestions received are included in Appendix A.

After review comments on the Draft EIS were received (Appendix I), McBryde made several additional contacts with government agency representatives to supplement the discussion of potential stream fauna impacts and attept to resolve this issue. McBryde arranged a meeting with representatives of the COE, USFWS and DAR/DLNR on July 7, 1983, to discuss methodology for stream fauna impact assessment, the results of stream fauna surveys and their interpretation, and possible mitigation measures or project alternatives. There was no agreement among the State and Federal fishery resource biologists present as to an acceptable methodology for assessing stream fauna impacts from the proposed project. Both believed, however, that the project as proposed would have an adverse impact on the nakea fishery in

Wainiha River. Both stated that continuous stream flow would be essential to maintain adequate habitat to sustain the fishery, but they could not quantify the amount of continuous flow which would be required. As a result of this meeting and subsequent investigations, McBryde modified the proposed project to include the provision of continuous release of stream flows.

During the consultation and EIS review process, a total of 111 agency consultations were made by McBryde. These are summarized in Exhibit VI-1.

EXHIBIT VI-1

CHRONOLOGY OF CONSULTATION WITH GOVERNMENT AGENCIES

KEY:

USFWS	=	U.S. Fish and Wildlife Service
COE	=	U.S. Army Corps of Engineers
USGS	=	U.S. Geologic Survey
USSCS	=	U.S. Soil Conservation Service
DLNR	=	State of Hawaii Department of Land and Natural Resources
DPED	=	State of Hawaii Department of Planning and Economic Development
DOH	=	State of Hawaii Department of Health
DOE	=	State of Hawaii Department of Education
OEQC	=	State of Hawaii Office of Environmental Control
OHA	=	State of Hawaii Office of Hawaiian Affairs
KCED	=	Kauai County Office of Economic Development
KCPD	=	Kauai County Planning Department
KCPWD	=	Kauai County Public Works Department
KCWD	=	Kauai County Water Department
UHEC	=	University of Hawaii, Environmental Center
UHHNEI	=	University of Hawaii, Hawaii Natural Energy Institute

Date	Contact	Agency
9/24/82	Telephoned Buddy Neller regarding presence of historic sites in Wainiha Valley	DLNR (Historic Sites)
9/24	Met with John Ford to obtain information on wildlife studies and stream fauna concerns	USFWS
9/28	Met Stan Shima to obtain information on freshwater fisheries and minimum stream flow studies	DLNR (Aquatic Resources)
9/28	Telephoned Paul Mizue regarding regulatory requirements	COE (Planning)
10/1	Telephoned Richard Yamamoto regarding Section 404 permit regulations	COE (Planning)
10/4	Telephoned John Ford, Derral Herbst and John Embring regarding possibility of rare and endangered species in Wainiha Valley	USFWS

Date	Contact	Agency
10/6	Met with Gordon Shibas to obtain information on county parks plans and concerns	KCDPW (Parks)
10/6	Met with Bill Blanchard to discuss County energy development plans and policies	KCED
10/6	Obtained County General Plan and regional development plans	KCPD
10/6	Sent written invitations to first round of information workshops	DLNR, USFWS, USGS, DOH, COE, OEQC, USSCS, UHEC, DPED, KCPD, KCDPW, KCED, UHHNEI
10/26	Met with Sherrie Samuels regarding CDUA submittal and processing and first round of workshops	DLNR (Planning)
11/8	Held information workshop for government agency representatives based in Honolulu	DLNR, USFWS, USGS, COE, DPED
11/9	Held information workshop for general public and government agency representatives in Lihue, Kauai	DLNR (Aquatic Resources) KCPD KCED
11/10	Met with Don Heacock regarding scope of work for stream fauna impact assessment	DLNR (Aquatic Resources)
11/10	Held information workshop for general public and government agencies representative in in Hanalei, Kauai	DLNR (Aquatic Resources) KCED OHA
11/12	Telephoned Stan Shima regarding stream fauna collection permit	DLNR (Aquatic Resources)
11/12	Telephoned John Ford to set up meeting for 11/19	USFWS
11/12	Picked up stream fauna collection permit	DLNR (Aquatic Resources)

Date	Contact	Agency
11/15	Met with Sherrie Samuels regarding CDUA and Temporary Variance application submittals	DLNR (Planning)
11/19	Met with John Ford and Derral Herbst to submit and discuss scopes of work for botanical, wildlife and stream fauna impact assessments	USFWS
12/9	Telephoned John Ford regarding use of electroshocker for stream fauna survey	USFWS
12/13	Telephoned John Ford regarding his participation in stream fauna survey	USFWS
12/17	Telephoned John Ford regarding his participation in stream fauna survey	USFWS
12/27-12/31	Met with John Ford and Don Heacock during field survey of river	USFWS, DLNR (Aquatic Resources)
1/3/83	Telephoned John Ford regarding outcome of stream fauna survey	USFWS
1/17	Sent written invitations to second round of information workshops	DLNR, DPED, OEQC, USFWS, USSCS, USGS, COE, KCED, UHEC, UHHNEI, KCDPW, KCPD, KCWD, DOH
1/31	Telephoned to request copy of Kauai County grading ordinance	KCPWD
1/31	Telephoned Paul Mizue and John Emmerson regarding Section 404 application	COE (Operations)
2/7	Telephoned John Emmerson to set up meeting for 2/9	COE (Operations)
2/9	Met with John Emmerson and Marge Elliot regarding Section 404 application submittal and review requirements	COE (Operations and Environmental)
2/10	Telephoned Ann Lo-Shimazu regarding status of CDUA and Temporary Variance	DLNR (Planning)

Date	Contact	Agency
2/25	Telephoned John Ford to remind him of upcoming information workshop	USFWS
2/25	Telephoned Stan Shima, Sherrie Samuels and Roger Evans to remind them of upcoming information workshop	DLNR (Aquatic Resources and Planning)
2/25	Telephoned John Emmerson and Marge Elliot to remind them of upcoming information workshop	COE (Operations and Environmental)
3/1	Held second information workshop for government agency representatives based in Honolulu	DLNR, USFWS, DPED, COE, UHEC, USGS, DOT, USSCS
3/2	Held second information workshop in Hanalei, Kauai, for general public and agency representatives	KCED
3/3	Held second information workshop in Lihue, Kauai, for general public and agency representatives	KCED, KCPD, DOH
3/4	Met with Nori Kojiri to obtain stream flow data	USGS
3/7	Telephoned Ann Lo-Shimazu regarding processing of Temporary Variance application	DLNR (Planning)
3/8	Telephoned Ann Lo-Shimazu regarding additional information to be submitted for Temporary Variance application	DLNR (Planning)
3/8	Met with Stan Shima to discuss stream fauna issues and submit second draft of stream fauna impact assessment report	DLNR (Aquatic Resources)
3/10	Telephoned Jackie Parnell regarding consultation period for the EIS	OEQC
3/19	Met with John Ford, Don Heacock, Robert Kinzie and Mainland USFWS official regarding stream flow study methodologies	USFWS, DLNR, (Aquatic Resources), USFWS (Fort Collins), HIMB

Date	Contact	Agency
3/24	Met with Ann Lo-Shimazu to go over written comments received to date on CDUA	DLNR (comments from others)
3/30	Telephoned Ann Lo-Shimazu regarding status of Temporary Variance	DLNR (Planning)
3/31	Telephoned John Ford and Stan Shima to set up meeting for 4/12 on stream fauna issues	USFWS, DLNR (Aquatic Resources)
4/1	Met with Selwyn Chin to review stream flow data	USGS (Honolulu)
4/4	Met with Nori Kojiri to obtain additional hourly stream flow data	USGS (Kauai)
4/5	Met with DOWALD official to obtain rainfall data for Wainiha Valley	DLNR (DOWALD)
4/5	Met with Ann Lo-Shimazu regarding exhibits and procedures for CDUA public hearing and submittal of EIS	DLNR (Planning)
4/12	Met with John Ford and Stan Shima regarding findings of stream fauna impact analysis and possible mitigation measures	USFWS, DLNR, (Aquatic Resources)
4/19	Telephoned John Ford regarding his written comments on mitigation measures	USFWS
4/21	Met with John Ford regarding his written comments on mitigation measures	USFWS
4/21	Public hearing on CDUA held in Lihue, Kauai	DLNR
5/4	Met with John Emmerson, Jim Maragos and Marge Elliot of Corps of Engineers about the Section 404 application	COE (Operations & Planning)
6/29	Met with John Emmerson and Marge Elliot regarding environmental assessment for Section 404 application	COE (Operations & Planning)
6/29	Met with Stan Shima and Ann Lo-Shimazu to obtain additional stream fauna survey data and detailed review comments on Draft EIS	DLNR (Aquatic Resources & Planning)

Date	Contact	Agency
6/30	Met with John Ford to discuss his review comments on Draft EIS	USFWS
7/1	Telephoned Roger Evans and Faith Miyamoto regarding extension of the response to comment period for the Draft EIS	DLNR (Planning)
7/6	Telephoned Faith Miyamoto regarding the length of the response period	OEQC
7/7	Met with John Emmerson, Marge Elliot, Stan Shima and John Ford with respect to the assessment of stream fauna impacts	COE (Operations & Planning) DLNR Aquatic Resources) USFWS
7/18	Met with John Emmerson during his field trip to Wainiha River	COE (Operations)

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LIST OF PREPARERS

	Background/Experience
McBRYDE SUGAR COMPANY, LTD.:	
Randall J. Hee, Engineering Superintendent	Ten years as mechanical engineer. B.S. (Mechanical Engineering, Oregon State)
EDAW INC. (Prime Consultant):	
Kim de Rubertis, Principal-in-charge	Twenty-two years as geological and civil engineer; 18 years in hydropower development; 9 years in environmental impact studies. Diploma (Geological Engineering, Colorado School of Mines)
Robert P. Kitchell, Project Manager	Twenty-one years as geological and civil engineer; 18 years in hydraulic engineering and project management. Diploma (Geological Engineering, Colorado School of Mines); M.S. (Mechanics and Hydraulics, Iowa); M.S.C.E. (Environmental Engineering, Northeastern)
John P. Whalen, Senior Environmental Planner	Twelve years as urban planner; 9 years in environmental impact studies in Hawaii. B.A. (Pre-Architecture, Rutgers); M.A. (Public Law, Columbia); M.S. (Urban Planning, Columbia)
Wendy R. Hee, Environmental Planner	Three years as urban and environmental planner in Hawaii. B.A. (Government, Wesleyan); M.C.P. (City Planning, Harvard)

	Background/Experience
TECHNICAL SUBCONSULTANTS:	
William Barrera, Jr., Archaeology	Fourteen years in archaeological studies in Hawaii. B.A. (Anthropology, Arizona); M.A. (Anthropology, Arizona)
Andrew J. Berger, Birds, Mammals and Stream Fauna	Forty-three years in zoological studies, 10 years in environmental impact studies in Hawaii. B.A. (Zoology, Oberlin); M.S. (Zoology, Michigan); Ph.D. (Zoology, Michigan)
Amadeo S. Timbol, Stream Fauna	Seven years in stream fauna studies in Hawaii. B.S.; Ph.D. (Zoology, Hawaii)
Charles H. Lamoureux Botany	Thirty years as botanist; 29 years field work in Hawaii. B.S. (Botany, Rhode Island); M.S. (Botany, Hawaii); Ph.D. (Botany, California-Davis)
Jerald Shumaker, Geology and Soils	Twenty-four years in geological studies; 14 years in Hawaii. B.S. (Geology, Idaho)

REVIEWERS:

Alexander & Baldwin, Inc.
Richard Cox, Vice President, Engineering
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McBryde Sugar Company, Ltd.
Phil Scott, Vice President and General Manager
William Dux, Jr., Engineering Department Head

EDAW inc.
Duk Hee Murabayashi, Vice President

Appendix A

COMMENTS AND RESPONSES DURING CONSULTATION PERIOD

Comment letters from the following agencies and organizations were received during the consultation period prior to the issuance of the Draft Environmental Impact Statement:

1. County of Kauai Planning Department
2. Life of the Land
3. U.S. Fish and Wildlife Service
4. Citizens Utilities Company, Kauai Electric Division

They are printed on the following pages in the sequence noted above. Where appropriate, responses were sent to the commenters. The responses follow each comment letter.

TONY T. KUNIMURA
MAYOR

BRIAN K. NISHIMOTO
PLANNING DIRECTOR
AVERY H. YOUN
DEPUTY PLANNING DIRECTOR
TELEPHONE 245-3919

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

March 14, 1983

Mr. Susumu Ono, Chairman
Board of Land & Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Subject: Conservation District Use Application
Second Wainiha Hydroelectric Plant
File No.: KA-1/10/83-1545
TMK: 5-8-01:1, 5-8-02:2
McBryde Sugar Company, Ltd.

We have no objections to the proposed hydroelectric plant and add that we support the proposal for an alternate energy source. We further offer the following comments:

1. The subject proposal is exempt from the Special Management Area (SMA) Rules and Regulations of the County of Kauai as the project falls outside the SMA.

2. Although the proposed powerhouse and penstock should not be visible from the lower portion of the valley, the new power lines are proposed to span from ridge to ridge. We would request that the supporting poles or towers be as unobtrusive as possible if visible from the lower portion of Wainiha Valley.

3. It is suggested that flood studies be conducted to determine floodway limits and base flood heights for the penstock and new powerhouse areas. In conformance with Ordinance No. 416 (Flood Control Ordinance), the powerhouse should be sited outside of the floodway and elevated above base flood elevations. We suggest that the County Public Works Department (245-4751) be contacted for more information concerning standards for construction within flood areas.

4. Although the new powerhouse is proposed further up the valley, we request that noise factors associated with the new powerhouse be addressed in the EIS.

5. We would also ask that a copy of the draft EIS be sent to our office for review.

Thank you for this opportunity to comment.

Brian Nishimoto

BRIAN NISHIMOTO
Planning Director

cc: Sam Lee
Takeo Yamamoto
Randall J. Hee

McBryde
SUGAR COMPANY, LIMITED

March 18, 1983

Mr. Brian Nishimoto
County of Kauai
Planning Department
4280 Rice Street
Lihue, Hawaii 96766

Dear Mr. Nishimoto:

CONSERVATION DISTRICT USE APPLICATION
SECOND WAINIHA HYDROELECTRIC PLANT
FILE NO.: KA-1/10/83-1545
TMK: 5-8-01:1, 5-8-02:2

Thank you for your interest and support on the proposed Wainiha Project.

The comments offered in your letter to Mr. Susumu Ono, Chairman, Department of Land & Natural Resources, have been noted and will be addressed in the Environmental Impact Statement. A copy of the draft EIS will be sent to your office for review when it is filed with the Environmental Quality Commission.

Please contact me if you have any questions.

Very truly yours,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RJH:jm

cc: John Whalen, EDAW, Inc.
Wainiha Project File
Randall J. Hee
William A. Dux, Jr.

#0171A
Diskette #0002A

LIFE OF THE LAND

Mr. Randall J. Hee
Engineering Superintendent
McBryde Sugar Co., Ltd.
P.O. Box 8
Eleele, Hawaii 96705

April 6, 1983

Subject: EIS Preparation Notice for Second Hydroelectric Plant on Wainiha River

Dear Mr. Hee:

Life of the Land would like to be a consulted party on the subject EIS. Please send us a copy of the Draft EIS and Revised EIS when they become available.

According to the Summary Report for Hydroelectric Power State of Hawaii prepared by the U.S. Army Engineer District in October 1978, of the streams examined in detail, Wainiha River ranked first in overall environmental quality. We would strongly recommend that you use this report and referenced aquatic fauna studies as a basis for assessing potential environmental impacts from a second power plant on Wainiha River as well as potential mitigation measures.

Given the fact that you will need a Corps permit to construct another hydro-electric power plant, we would suggest that you prepare a joint Federal/State EIS meeting both the requirements of NEPA and Chapter 343, HRS. Given the environmental quality of Wainiha River, a NEPA EIS is an inevitable requirement.

Lastly, we would request that your EIS address the price of power from the proposed project to consumers on Kauai. Will they be any better off?

Yours,

for

Arthur Mori
President

Enclosure

cc: OEQC

SUMMARY REPORT
FOR
HYDROELECTRIC POWER

STATE OF HAWAII

US ARMY ENGINEER DISTRICT
HONOLULU, HAWAII
OCTOBER 1978

ENVIRONMENTAL RECONNAISSANCE CONDUCTED

GENERAL

8. Baseline environmental investigations of aquatic fauna, terrestrial flora and fauna, and historic and archeological resources were conducted for Waihee Valley, Maui and Lumahai Valley, Kauai. Of the six candidate hydroelectric power drainage areas evaluated in this study, these were considered the most promising on the basis of preliminary hydrologic, economic and topographic/site adequacy criteria. In addition, surveys of aquatic fauna were conducted for Wainiha and Hanalei Rivers on Kauai and Wailoa Stream in Waipio Valley, Hawaii. No surveys of any nature were conducted for Pelekunu Stream, Molokai.

AQUATIC SURVEY

9. A survey of aquatic macrofauna of four streams was conducted under a contract administered by the Corps of Engineers.[1/] Of the streams surveyed, three were included among those considered for hydropower development: Wainiha and Hanalei on Kauai, and Wailoa on Hawaii. The U.S. Fish and Wildlife Service conducted an aquatic survey of Lumahai and the Waihee rivers in July 1978 to supplement the information and analysis of the earlier survey (Appendix 2). Both surveys were a one-time, one-season assessment of the stream macrofauna of these waterways. Although they do not present a complete picture of the biological potential of these streams, they do provide sufficient information to make a preliminary evaluation of their intrinsic biological value. The streams were ranked according to their relative ecological quality on the basis of three parameters: faunal inventory, species distribution and abundance, and species composition and diversity. The faunal inventory included the total number of species present, the number of native species present and the presence of depleted or rare species. Distribution and abundance ratings were based on the abundance of the native mountain shrimp, opae kala'ole, bacause this species occurred in all streams sampled. Species composition values included the percent number of native species and percent biomass of native species. Diversity indices were calculated for species number and species biomass. Wainiha River ranked first in overall quality followed by Lumahai, Hanalei, Waihee, and Wailoa rivers. All five rivers possessed relatively large populations of the native gobies, o'opu nakea (depleted) and o'opu nopili (rare). Waihee River also contained concentrations of juvenile o'opu alamo'o, a species recommended for federal endangered species status.

1/ Timbol, Amadeo; and Environment Impact Study Corp., A Report on the Aquatic Survey of Stream Macrofauna for the Hydroelectric Power Study for Hawaii, September 1977.

CORRECTION

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

ENVIRONMENTAL RECONNAISSANCE CONDUCTED

GENERAL

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1/ Timbol, Amadeo; and Environment Impact Study Corp., A Report on the Aquatic Survey of Stream Macrofauna for the Hydroelectric Power Study for Hawaii, September 1977.

McBryde
SUGAR COMPANY, LIMITED

April 8, 1983

Mr. Arthur Mori, President
Life of the Land
250 S. Hotel St., Room 211
Honolulu, Hawaii 96813

Dear Mr. Mori:

Thank you for your interest in the Wainiha Hydroelectric Project. Your request to be a consulted party on the subject EIS is acknowledged.

A draft EIS is currently being prepared and should be available for your review soon. A copy of the draft EIS and revised EIS will be sent to you when they become available.

We have studied the Summary Report for Hydroelectric Power - State of Hawaii prepared by the U.S. Army Engineer District. Use of the referenced aquatic fauna studies have aided us in assessing the potential environmental impacts. In our studies of the aquatic fauna, we employed Mr. Amadeo Timbol who did the studies referenced in the U.S. Army report. Many of the sampling transect locations used in 1977 were replicated in our 1982 study. Methods and procedures used by Mr. Timbol in 1977 were also used in 1982 as well. The results of the studies will be included in the draft EIS.

We believe that the project will provide benefits to the people on Kauai. A major portion of the energy used by the public is currently generated from oil. The installation of another hydroelectric plant will reduce the quantity of oil consumed. It should be noted that McBryde is a small power producer. Energy prices are set by the utility company and regulated by the Public Utility Commission. We cannot guarantee that energy prices will be reduced. We do feel that the use of renewable energy sources will benefit consumers by stabilizing and reducing the rate of increase of electrical energy costs.

Please feel free to contact me if you have any questions.

Very truly yours,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RJH:jm

cc: Wainiha File; William A. Dux, Jr.; Randall J. Hee

#0197A/Diskette #0002A

P. O. BOX 8 • ELEELE, KAUAI, HAWAII 96705 • TELEPHONE (808) 335-5111

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96950

IN REPLY REFER TO:
ES
Room 6307

APR 21 1983

Mr. Randall J. Hee
Engineering Superintendent
McBryde Sugar Company, Ltd.
P.O. Box 8
Eleele, Kauai 96705

Dear Randy:

I'm glad we had the chance last week to get together with EDAW and DLNR representatives for a discussion of the Wainiha hydropower project. Please extend my appreciation to Bob Kitchell for preparing the supplement on low flow hydrology. I've reviewed Bob's report for information which will help evaluate project impacts and identify effective mitigation.

First of all, let me summarize my feelings about Wainiha. Based upon observations made during my two field visits with you, it is clear to me that population densities of o'opu are greater below the existing weir than above it. My knowledge of other Hawaiian and Pacific streams leads me to conclude that the weir is impeding passage of o'opu, particularly during prolonged low flow conditions. I recognize that some o'opu and opae are migrating beyond the weir; however, I cannot agree that the existing facility has had "no effect". It is unfortunate that o'opu population estimates prior to 1900 are not available. With only contemporary observations and circumstantial evidence to work with, I can't quantify the "significance" of the intake on o'opu populations.

Bob's report implies that the downstream face of the proposed weir will be dry approximately 22 to 103 days/year. This will reduce important o'opu habitat downstream over the long term, and I anticipate that secondary adverse effects to the traditional o'opu fishery in lower Wainiha Valley will occur. The significance of the new intake as a passage barrier cannot be determined without making observations in the stream above the site of the proposed weir at el. 1100'. Clearly, if the diversion were to be placed at or near the upper boundary of the o'opu's distribution in Wainiha, the question of passage would probably be moot. Impacts in this instance would be limited to reductions in downstream habitat.

The most effective method of mitigating reduction in aquatic habitat would be to adjust flows to accommodate specific life requirements of the important species of interest. Waters in excess of instream needs would be available for development and export. As you know, the Service has identified and applied appropriate technology to determine these requirements and to utilize them in concert with accurate hydraulic simulations. The Instream Flow Incremental Methodology (IFIM) allows decision makers to compare losses of aquatic habitat for individual species with incremental gains and losses in flow. However, species specific models for Hawaiian o'opu have not yet been developed and tested.

Lacking the necessary data to quantify the relationship between flow and habitat, I must assume a "worst case" scenario (40 CFR 1504.22) if McBryde intends to proceed with their project as proposed. If errors are to be made at this time, they should be made in favor of resource conservation. When IFIM data (or data derived from another method accepatable to the Service) becomes available, application of the method to evaluate effects of flows on habitat in Wainiha, albeit ex post facto, may reveal that additional surface waters can be developed during the year without jeopardizing the fishery values of the stream.

Compensation for or mitigation of fish and wildlife habitat losses associated with water development projects is specified in the National Environmental Policy Act, the Fish and Wildlife Coordination Act, Clean Water Act, and the Regulatory Program of the U.S. Army Corps of Engineers (33 CFR 320.4(c)). Failure to provide adequate mitigation for the anticipated adverse effects of the proposed Wainiha hydropower project will result in a Service recommendation of denial for Federal and State permits necessary for project authorization. Throughout the course of the Service's involvement in project planning, I have asked that provisions be made to allow continuous flows downstream of the weir. We have also discussed a number of other alternatives, although none appear to have been evaluated in detail.

I recommend that the alternative measures presented in the following paragraphs be fully evaluated in the Environmental Impact Statement (EIS) for the proposed action. Normally, an EIS is a full disclosure document. We ask that details of construction and operating costs, power development and benefits be described for each of the alternatives. If McBryde does not wish to release some of this information, I would appreciate being notified as early as possible so that other arrangements can be made for Service review.

<u>Alternative Mitigation Measures</u>

1. Develop hydroelectric power in areas other than Wainiha where McBryde has water rights (e.g. Kalaheo, Koloa).

2. Incrementally develop power by first improving the efficiency of the existing (three) systems. This will allow adequate time

to develop and test a suitable IFIM methodology for application in Hawaii so that future mainstream diversions can be appropriately evaluated.

3. Evaluate location of the new intake near an elevation of 1400' on the mainstream. An intake situated at this elevation would increase head to 680'. Assuming 62% efficiency, the flow required for a 3MW plant would be reduced to 84 cfs. Accretion of flow from 5 intermittent and 7 perennial tributaries (between 1400' and 1100' elevation), aquifer discharge and subsurface flows may ameliorate losses of important o'opu habitat in this reach. (This alternative assumes that populations of o'opu do not exist above 1400'; Shima, personal communication.) Evaluation of this alternative will require some additional field measurements and synthesis of hydrographs for ungauged portions of the stream.

4. Reduce the design capacity of the proposed system in conjunction with improvements to the existing system(s). Improvements which should be evaluated include enhancing the mechanical efficiency of the systems, and reducing water losses due to blockage at intakes and portals and leakage from ditches and tunnels.

5. For any alternative involving construction of a weir (other than no. 3 above), provide for the passage of 80 cfs downstream of the weir at all times during power development. Turbine operating range may be increased to 81-231 cfs (150 cfs capacity). Weirs should have valves which will allow passage of flows required to accommodate downstream ecological needs at various times during the year.

6. Consideration should be given to allow low flows (80 cfs) to circumvent the weir in a graded, side channel constructed of boulders, cobbles and gravel. Stepped, hydraulic controls made of concrete may be utilized between areas of natural substratum to allocate flows with a greater degree of accuracy.

The following measures are recommended for incorporation in plans and specifications for construction to minimize adverse impacts during construction and operation of a new hydropower facility.

- Allowance must be made for continuous downstream flow during construction.

- Dredged or excavated materials should be removed from the stream channel, and not stockpiled in the water.

- Fish screens should be installed at the intake to minimize mortality and maintenance problems.

- Appropriate ramping rates must be set to prevent dewaterment during rapid start-up and shut down.

- Installation of automatic flow continuation valves should be considered to protect stream flows below the dam in the event of sudden flow rejection at the powerhouse.

- Installation of automatic shutoff valves should be considered to prevent extensive soil erosion in the event of penstock failure.

- Appropriate measures should be taken to prevent excessive total gas pressures in tailwaters.

These alternatives are forwarded for your consideration in finalizing the engineering and design of the proposed project. I appreciate your enthusiasm and willingness to include us in your project planning, Randy. I trust that you will give our recommendations serious consideration. Please continue to consult with me as the project progresses; I will do all I can to provide technical assistance concerning fish and wildlife resources.

Sincerely,

John I. Ford

John I. Ford
Acting Project Leader
Office of Environmental Services

cc: EDAW
DLNR
PODCO-O
PODED-PV
RO, FWS, Portland, OR (AE)

McBryde
SUGAR COMPANY, LIMITED

April 26, 1983

Mr. John I. Ford,
Acting Project Leader
Office of Environmental Services
U.S. Fish and Wildlife Service
P. O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Ford:

We are in receipt of your letter of April 21, 1983, discussing the alternative mitigation measures that you propose for evaluation. We are currently studying these measures and will consult with you further on our evaluation. We will also include our evaluation in the EIS.

At the hearing for the Wainiha project held by the Board of Land and Natural Resources on April 21, the Board expressed interest in our filing the draft EIS as soon as possible. With this in mind, we are proceeding to complete the draft EIS and intend to file it in May. That will then provide the basis for specific agency and public comment.

Thank you for your comments on mitigation.

Sincerely,

Randall J. Hee

Randall J. Hee
Engineering Superintendent

P O BOX 8 • ELEELE, KAUAI, HAWAII 96705 • TELEPHONE (808) 33[illegible]

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CITIZENS UTILITIES

COMPANY

P.O. BOX 278 · ELEELE, KAUAI, HAWAII 96705

May 3, 1983

Mr. Bill Dux
Engineering Department Head
McBryde Sugar Company, Ltd.
P. O. Box 8
Eleele, HI 96705

Dear Bill:

During the course of our meeting on April 28, 1983, you requested that we provide you with an estimate of the benefits our consumers would derive assuming that McBryde Sugar Company proceeds with the construction of the upper Wainiha hydroelectric project.

Listed below by categories are the tangible benefits:

1. Reduction In Rates

   The rate negotiated with McBryde for the purchase of energy from McBryde is less than our avoided cost. As such our consumers will derive an immediate economic benefit through the operation of our energy rate adjustment clause. Our calculation indicates that a conservative estimate of this annual benefit would be $216,000.

2. Capacity Addition

   Our purchase power agreement obliges McBryde to make available firm power to Kauai Electric as required. The rate negotiated for the capacity charge is less than what Kauai Electric would bear if it had to install base load capacity at Port Allen.

The annual value of the firm capacity is estimated to be $37,000.

3. North Shore Reliability

The additional installed capacity contemplated by the Wainiha Hydroelectric Project will forestall our planned second transmission line to the north shore which is intended to improve reliability to the area.

The annual benefit of deferral of the second transmission line is estimated to be $84,000.

4. Line Losses

By virtue of the increased generation at Wainiha, less energy will be generated at Port Allen and transmitted over transmission lines to the Kapaa area, reducing our system line losses. The annual reduction of reduced line losses would be valued at $6,000.

Summary

The four (4) listed items would provide a direct annual economic benefit to our customers of $343,000. The annual savings per customer would total $19.23 which is equivalent to a 2.5% reduction in the customer's bill.

Another factor which we have not attempted to value is the restoration of service to the north shore after a major system outage such as a downed line or more recently the disruption caused by Hurricane Iwa.

The Wainiha plant made it possible to restore service to the north shore days sooner than would have been possible absent the plant. The benefit to customers is immeasurable.

Since the Wainiha complex will be tied directly to the Kauai Electric transmission system, the restoration of service to other areas on the island of Kauai translates to still another benefit to our customers.

Mr. Bill Dux
Engineering Department Head
McBryde Sugar Company, Ltd.

We trust that the foregoing is responsive to the questions you raised.

Very truly yours,

Boyd T. Townsley
Vice President
Kauai Electric Division

BTT:ey

Appendix B

FEDERAL CONSISTENCY
SUPPLEMENTAL INFORMATION FORM

Date: ____________

Project/Activity Title or Description: WAINIHA HYDROELECTRIC PROJECT

Location: Island Kauai District North Shore

Tax Map Key No. 5-8-01:1 and 5-8-02:2

Other applicable area(s), if appropriate Wainiha

Est. Start Date: April, 1984 Est. Duration: 18 months

APPLICANT

Name & Title Randall J. Hee, Superintendent of Engineering

Agency/Organization McBryde Sugar Company, Ltd.

Address P. O. Box 8

Eleele, Kauai, HI Zip 96705

Telephone No. during business hours:

A/C (808) 335-5111

A/C (808) 335-5313

AGENT

Name & Title Robert P. Kitchell or John P. Whalen

Agency/Organization EDAW inc.

Address 1121 Nuuanu Avenue, Suite 203

Honolulu, HI Zip 96817

Telephone No. during business hours:

A/C (808) 536-1074

A/C ( ) ____________

CATEGORY OF APPLICATION (check one only)

[ ] I. Federal Activity

[x] II. Permit or License

[ ] III. OCS Plan/Permit

[ ] IV. Grants & Assistance

TYPE OF STATEMENT (check one only)

[x] Consistency

[ ] General Consistency (Category I only)

[ ] Negative Determination (Category I only)

[ ] Non-Consistency (Category I only)

APPROVING FEDERAL AGENCY (Categories II, III, & IV only)

Agency U.S. Army Corps of Engineers

Contact Person John Emmerson

Telephone No. during business hours:

A/C (808) 438-9258

A/C ( ) ____________

FEDERAL AUTHORITY FOR ACTIVITY

Title of Law Coastal Zone Management

Section ____________

OTHER STATE AND COUNTY APPROVALS REQUIRED

Agency	Type of Approval	Date of Applic.	Status
Dept. of Land & Natural Resources	CDUA	2/15/83	pending
" "	Temporary Variance	2/22/83	approved
" "	Scientific Collection	12/9/83	approved
Kauai County	Grading		
Kauai County	Building		

CZM 9/79

HAWAII CZM PROGRAM
ASSESSMENT FORMAT

RECREATIONAL RESOURCES

Objective: Provide coastal recreational opportunities accessible to the public.

Policies

1) Improve coordination and funding of coastal recreation planning and management.

2) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

   a) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

   b) Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites and sandy beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

   c) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

   e) Encouraging expanded public recreational use of County, State, and Federally owned or controlled shoreline lands and waters having recreational value;

   f) Adopting water quality standards and regulating point and non-point sources of pollution to protect and where feasible, restore the recreational value of coastal waters;

   g) Developing new shoreline recreational opportunities, where appropriate, such as artificial reefs for surfing and fishing; and

   h) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, county planning commissions; and crediting such dedication against the requirements of section 46-6.

The proposed project will not have a significant adverse effect on the coastal recreational opportunities. The project is located several miles from the shoreline, mostly in the forest reserve. During construction it may be necessary to use part of Wainiha beach to land equipment and materials too large and/or heavy for the old, small bridges that connect North Shore Kauai communities. If so, a barge will be grounded at the shore and the equipment will be brought on-shore via matting that will be laid on the beach. Disruption to the beach area will be temporary and is not anticipated to occur more than four to six times during the 18 month construction period.

In the long term, the project is not expected to have a significant adverse effect on sport and subsistence fishing activities near the mouth of Wainiha River because of design and operational measures which are proposed to protect the existing population of native amphidromous stream fauna, some of which are fished. A detailed discussion of potential impacts on the fishery is contained in Chapter III of the Environmental Impact Statement for the project. No changes in the quality or quantity of river's flow downstream of the proposed project are anticipated.

COASTAL HAZARDS

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

Policies

1) Develop and communicate adequate information on storm wave, tsunami, flood, erosion, and subsidence hazard;

2) Control development in areas subject to storm wave, tsunami, flood, erosion, and subsidence hazard;

3) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

4) Prevent coastal flooding from inland projects.

Discussion:

No flood boundaries or design inundation levels for the project area have been determined by the Federal Flood Insurance Program, although visual observations indicate that flooding has occurred in the project area. The flood of record occurred on February 17, 1956, when instantaneous stream flows in Wainiha River swelled to 40,000 cfs. The finished floor elevation for the powerhouse will be above this design inundation level.

The area of inundation above the proposed weir will not be significantly increased because the weir is not designed to store water. When the design capacity of the hydraulic turbines (150 cfs) is exceeded, the additional flow will overtop the weir and continue downstream.

MANAGING DEVELOPMENT

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies

1) Effectively utilize and implement existing law to the maximum extent possible in managing present and future coastal zone development;

2) Facilitate timely processing of application for development permits and resolve conflicting permit requirements; and

3) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the general public to facilitate public participation in the planning and review process.

Discussion:

The applicant has undertaken several forms of consultation with government agencies and the public prior to applying for permits and preparing the Environmental Impact Statement. A series of workshops was held to inform agency representatives and the public of the project and to solicit ideas to improve its planning and design. Summaries of these workshops are found in Chapter VI of the Environmental Impact Statement.

ECONOMIC USES

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

Policies

1) Concentrate in appropriate areas the location of coastal dependent development necessary to the State's economy.

2) Insure that coastal dependent development such as harbors and ports, visitor industry facilities, and energy generating facilities are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

3) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such development and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

   a) Utilization of presently designated locations is not feasible;

   b) Adverse environmental effects are minimized; and

   c) Important to the State's economy.

Discussion:

The hydroelectric project will provide Hawaii with a means to reduce its dependence on fossil fuels and to improve its balance of trade. A review of other potential hydroelectric and alternate energy developments in Chapter V of the Environmental Impact Statement suggests that the proposed project represents the best opportunity for making a significant contribution to Kauai's renewable energy production base. The project will be designed, constructed and maintained to minimize adverse social and physical environmental effects in the project area. There is a detailed discussion of economic benefits and various environmental aspects of the project in Chapter III of the Environmental Impact Statement.

HISTORIC RESOURCES

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

Policies

1) Identify and analyze significant archaeological resources;

2) Maximize information retention through preservation of remains and artifacts or salvage operations; and

3) Support State goals for protection, restoration, interpretation, and display of historic resources.

Discussion:

An archaeological reconnaissance survey, identifying and analyzing archaeological resources, has been completed. In accordance with the recommendations of that survey, the applicant intends to retain an archaeologist to assist the project engineers in delineating the access road and penstock alignment, monitor construction activities, and salvage any remains and artifacts deemed appropriate for recovery from the site. A detailed discussion of potential archaeological impacts and proposed mitigation measures is provided in Chapter III of the Environmental Impact Statement for this project.

SCENIC AND OPEN SPACE RESOURCES

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

Policies

1) Identify valued scenic resources in the coastal zone management area;

2) Insure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

3) Preserve, maintain and, where desirable, improve and restore shoreline open space and scenic resources; and

4) Encourage those developments which are not coastal dependent to locate in inland areas.

Discussion:

Project activities will not affect any coastal scenic and open space resources. Most of the project is in forest reserve, several miles from the shoreline. No project features will be visible at ground level from any areas where public access is normally permitted due to a combination of vegetative screens, topographic barriers and distance from public lands and roadways. (Note: In order to gain access to the project site by land it is necessary to cross land owned by the Lester Robinson Estate.) A view of the site is made possible by helicopter overflight, but the project features in this case would appear quite small in relation to the scale of the steep valley walls and other natural features.

COASTAL ECOSYSTEMS

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

Policies

1) Improve the technical basis for natural resource management;

2) Preserve valuable coastal ecosystems of significant biological or economic importance;

3) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

4) Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate State water quality standards.

Discussion:

Construction of the project, particularly the proposed diversion weir, will have a short-term effect on water quality in Wainiha River in the form of increased turbidity. It is unlikely, however, that an observer near the shoreline would be able to detect any change in water quality as a result of construction.

Over the long-term, there will be no change to water quality or quantity downstream of the proposed project. All of the water diverted from Wainiha River will be returned to the natural stream channel at the proposed powerhouse tailrace about 6.5 miles above the shoreline. There will be no thermal discharge or any other pollutant.

Potential impacts on water quality, stream flows and aquatic fauna habitat from the proposed project are discussed in detail in Chapter III of the Environmental Impact Statement.

Appendix C

A SURVEY OF AQUATIC MACROFAUNA IN WAINIHA RIVER, KAUAI

Submitted To: EDAW Inc.

by

Amadeo S. Timbol, Ph.D.

1. INTRODUCTION

Hawaii's streams are mostly rocky and precipitous, especially in their upper and middle reaches. The indigenous Hawaiian freshwater macrofauna is characterized by a high degree of endemism (78%, Hathaway 1979). Because of the migratory behavior of some forms, there are certain times of the year when a continuous stream flow to the ocean will be necessary. The proposed additional hydropower unit in Wainiha presents three potential dangers to the resident fauna. The first is possible thermal pollution (elevation of water temperature) in dewatered channels, as well as that of the water diverted to drive the turbines. The second is that at present, when all of the stream flow is diverted, a stretch of channel immediately downstream of the existing weir is almost totally dewatered. A second unit will result in two separate stretches of "dry" channels. This could seriously impede the migrating postlarvae 'o'opu (native gobies) and 'opae (native crustaceans). The third refers to the spawning (downstream) migration of the 'o'opu-nakea (Awaous stamineus) which occurs from August through December and the 'o'opu-nopili (Sicydium stimpsoni) (Ego 1956, Tomihama 1972). A third native goby, the 'o'opu-alamo'o (Lentipes concolor) may also be affected although its spawning season has yet to be determined.

1.1 PURPOSE OF STUDY

The objectives of this survey are as follows: 1) to determine what aquatic macrofaunal species live in Wainiha and to establish their relative abundances; 2) to assess the potential impact of activities connected with the construction and operation of the proposed hydroelectric plant; and 3) to suggest ways to mitigate the adverse impacts of stream alteration on the stream macrofauna.

1.2 DRAINAGE BASIN CHARACTERISTICS

Wainiha River drains the Wainiha Valley on Kauai. The extent of its drainage area is delineated in Appendix A. Its headwaters originate approximately at 1540-meter elevation and flows a distance of about 24 km before emptying into Wainiha Bay. On the east, the river is bordered by the Laau Ridge and on the west by the Wainiha Pali. The total drainage area so formed comprise about 26 km^2. Several tributaries, named and unnamed, on both Laau Ridge and Wainiha Pali contribute to the mainstream flow. In addition, a substantial amount of seepage is received from the Alakai Swamp. The river's (26-yr) mean annual discharge is 137 cfs (3.9 m^3/s), a maximum daily discharge of 28,100 cfs (796 m^3/s), and a minimum of 33 cfs (0.93 m^3/s) (USGS 1981). For the water year 1981, the maximum daily discharge is 3,920 cfs (110 m^3/s), the minimum daily discharge is 42 cfs (1.18 m^3/s) and has an average daily discharge of 110.9 cfs (3.11 m^3/s) (USGS 1981). During extended periods of dry weather, it appears that seepage from the Alakai Swamp offers the principal source of water supply to the Wainiha River (Ego 1956; Roger Hee, McBryde Sugar Engineer, personal communication). Additional information can be found in Timbol (1977).

1.3 REVIEW OF LITERATURE

Wainiha River has been studied at least twice before. Ego (1956) did the biology of the _Awaous stamineus_ ('o'opu-nakea) and the ethnic fishery it supported. He found the nakea from sea level near the river mouth to about 13 km inland (elev. 1500 ft). The bulk of the 'o'opu-nakea population was found in the first 8 km of stream. In 1956, the 'o'opu-nakea measuring 12 and 30 cm long were being caught for home consumption. The excess catch was sold for between \$0.75 and \$1.00/lb in the local markets. Ego did not cite creel census data from anglers in Wainiha but cites data from nearby Hanalei River from 0 to 21.6 fish/hr with an average of 4.3 fish/hr.

Timbol (1977) studied the species richness in Wainiha River. Twenty-two species, belonging both to microfauna and macrofauna, were identified. The mountain shrimp, _Atya bisulcata_ ('opae-kala-ole), averaged 348 individuals per 20 x 1 m sampling quadrat. The 'o'opu-nakea was found to be of high abundance (between 6 and 100 or more per sampling quadrat). On the basis of faunal composition, Wainiha was found with a high percentage of native animals (70%

by number and 78% by biomass. Wainiha was also found to have a greater diversity of life as compared with nine other Hawaii streams of comparable size.

2. METHODS AND MATERIALS

2.1 SAMPLING STATIONS

Five sampling areas were studied; four on the mainstream, one on tributaries and a diversion ditch. Their approximate locations are shown in the accompanying map (Appendix A).

Station I. Wainiha upper mainstream, elev. 1,120'

Located at the upper reaches of the river in the immediate area of the proposed weir. Electroshocking and visual survey were conducted.

Station II. Wainiha middle mainstream, elev.: II-A=1000'; II-B=760'

Two areas were sampled for this station. These are located downstream of the proposed weir, an area which would be dewatered if the proposed weir is built. Both areas are upstream of the existing weir. Electroshocking and visual survey were conducted.

Station III. Wainiha middle mainstream, elev. 680'

Located within half a mile downstream of the existing weir. It is in an area that has been and still is subject to dewaterment due to the existing weir. Electroshocking and visual survey were conducted.

Station IV. Wainiha mainstream, lower reaches, elev. 10'

This is about 2 miles from the Kuhio Highway bridge. Electroshocking and visual survey were conducted.

Station V. Maunahina tributary and diversion ditch, elev. bet. 750' and 1,000'

Maunahina tributary was surveyed at both upstream and downstream of the diversion ditch, both areas are marked V-A. An open diversion ditch plus upstream and downstream of an unnamed tributary near the open diversion ditch were surveyed and designated V-B in Appendix A. Both electroshocking and visual survey were conducted.

2.2 BIOLOGICAL

Sampling was conducted with a Coffelt BP-3 backpack electroshocker and two opae nets. The nets were set at the lower limits of the 20 m length of stream, extending over a width of about one meter to catch specimens missed by the electroshocker operator. The specimens obtained by this method were identified in the field, counted and released live.

Fishes and crustaceans are reported in a semi-quantitative basis. For purposes of this report, very abundant (++++) means 11-100 or more specimens were obtained in a 20 x 1 m site. Abundant (+++) signifies between six and 10 were obtained and common (++) is interpreted as between two and five were captured, while uncommon (+) means that only one specimen was collected or sighted in the visual survey. Absent (0) indicates that none was obtained in the collecting site nor was sighted in the general area.

Terms used in this report include endangered species which means a species or a subspecies which is in danger of extinction throughout all or a significant portion of its range (Deacon, et. al. 1979). A threatened species is a species or a subspecies which is likely to become an endangered species within the foreseable future throughout all or a significant portion of its range (Deacon, et. al. 1979). To the special concern group belongs species that could become threatened or endangered by relatively minor disturbances to their habitat or that require additional information to determine their status (Deacon, et. al. 1979). It should be noted at this point, that these definitions do not have any legal status under the Federal Rare and Endangered Species Law.

A species is endemic if it is found naturally in Hawaii only. Indigenous means it is found naturally in Hawaii and also elsewhere. Introduced or exotic means that it was brought to Hawaii either intentionally or accidentally by man. A species has economic value if it has sport, recreational, subsistence or commercial value. Amphidromous species are those which engage in completely free movement between fresh and marine water, not for the purpose of breeding (Myers 1949). This behavior involves the passive downstream passage of eggs or larvae to the ocean during freshet flow with later active upstream migration.

The list of biota was checked for endangered and threatened species using the following list and scientific publications: USFWS List of Endangered and Threatened Species (1977), Deacon, et. al. (1979) and Maciolek (1978).

2.3 PHYSICOCHEMICAL

Water temperature was measured with a laboratory thermometer at subsurface levels upstream of the existing weir (Station II) and downstream of the hydroelectric plant as the water comes out of the plant.

3. RESULTS AND DISCUSSIONS

Field work was done on November 24 and December 27-30, 1982. Results in this section are on a one-collection only basis. Thus, results should be considered preliminary. Messrs. Randy Hee and Jack Hashimoto of MacBryde Sugar Co. provided access transportation and excellent field assistance.

3.1 BIOLOGICAL

3.1.1 Species Inventory

The aquatic animals in Wainiha River may be divided into two major size groups. The microfauna are those too small to be easily seen and identified with the naked eye; macrofauna are the larger animals. This field work concerns the latter group, particularly its two most prominent components, fish and decapod crustaceans. All macrofaunal species found in Wainiha River are listed in Table 1. There are only five fish, three crustacean and one mollusk species. Another two, one fish and one mollusk, are most probably also present.

The fauna in Wainiha, like most Hawaiian streams in a reasonably natural state, is characterized by a high diversity of life and high degree of endemism. It · usually inhabit middle and lower stream reaches. All animals are freshwater residents.

During this survey, the Lentipes concolor ('o'opu-alamo'o) was found in Wainiha. This species was not listed in previous studies (Ego 1956, Timbol 1977). I am quite sure that this goby has always been a Wainiha resident but in low abundance. That we have been able to find this goby at this time is due to our increased awareness of its gross morphology, behavior, and habitat preference. Additional information regarding Lentipes is found in Timbol, Sutter and Parrish (1980) and Ford and Kinzie (1982).

The L. concolor is found in the Deacon, et. al. (1979) list of threatened species. It is considered extinct on Oahu (Miller 1972, Maciolek 1977). The A. stamineus ('o'opu-nakea) is considered depleted on Oahu (Miller 1972) although this goby supports a minor fishery on Kauai. Lastly, the S. stimpsoni ('o'opu-nopili) is also listed as rare on Oahu (Miller 1972) but as

Table 1. Aquatic Macrofauna in Wainiha River, Kauai

Scientific Name	Common Name	Origin	Listing[1]
FISH[2]			
1. Awaous genivittatus	'o'opu-naniha	indigenous	none
2. Awaous stamineus	'o'opu-nakea	endemic	Special concern (Deacon, et. al. 1979)
3. Eleotris sandwicensis	'o'opu-'okuhe	endemic	none
4. Lentipes concolor	'o'opu-alamo'o	endemic	Threatened (Deacon, at. al. 1979)
5. Sicydium stimpsoni	'o'opu-nopili	endemic	Special concern (Deacon, et. al 1979)
CRUSTACEAN			
1. Atya bisulcata	'opae-kala'ole	endemic	none
2. Macrobrachium grandimanus	'opae-'oeha'a	endemic	none
3. Macrobrachium lar	Tahitian prawn	introduced	none
MOLLUSK[3]			
1. Neritina granosa	hi-hiwai	endemic	Depleted on Oahu (Maciolek 1978)

[1]Considered as endangered or threatened in official register or scientific publications. Refer to Methods.

[2]Kuhlia sandvicensis (aholehole) an endemic kuhliid fish is most probably present in the lower reaches of Wainiha.

[3]The brown wi mollusk, Theodoxus vespertinus, is also probably present at the river mouth.

indicated in Table 2, it still is very abundant in Wainiha. In addition, at least four species (A. stamineus, A. bisulcata, M. lar, N. granosa) are sometimes sold commercially. Big Save Supermarket in Kapaa had 'o'opu-nakea (A. stamineus) for sale at $7.99/lb on November 12, 1982 (Don Heacock, State Aquatic Biologist, verbal communication). The mollusk, hihiwai (N. granosa) was sold at $5.99/lb at the same store on August or September 1982 (Don Heacock, verbal communication).

3.1.2 Other Species

Juvenile and adult bullfrogs (Rana catesbeiana) were found to be abundant in the lower reaches of the river (Stn IV, Table 2). Bufo tadpoles (Bufo marinus) were seen in the fringes of the mainstream channel by Stn II and III.

3.2 DISTRIBUTION AND RELATIVE ABUNDANCE

Of the nine species (Table 2) only three were collected or seen in all the stations. The same three species were also ubiquitous in a previous study (Timbol 1977). Present in the upper elevations (Stn I on the mainstream and Stn V on the tributary) are four amphidromous species. These species, (A. stamineus, L. concolor, S. stimpsoni, and A. bisulcata) all need access to the sea and back from the sea to the upper elevations. Stream diversion, construction of barrier (weir) and feeder roads could affect the abundances of these species by not allowing easy access of these species to the sea for the completion of life cycles and replenishing the resident populations.

The endemic goby, S. stimpsoni ('o'opu-nopili) was found very abundant in all five sampling stations. A major portion of the specimens caught were measured for (total) length, sexed and determined whether gravid or not. The 72 specimens averaged 7 cm total length ranging between 4 and 15 cm. Forty four were female, and most of those at least 6 cm were probably gravid based on their body contours. Four specimens were too young to be sexed. The rest were males. The males were generally larger than the females. These data indicate that Wainiha harbors a good, healthy on-going nopili population.

The meristic data for the economically valuable endemic goby, A. stamineus ('o'opu-nakea) caught with the electroshocker were of the smaller size groups (fingerlings, juveniles, young adults). Larger specimens were

Table 2. Distribution and relative abundances of macrofauna in Wainiha River, Kauai

Species	Sampling Station				
	I	II	III	IV	V
FISH					
1. *Awaous genivittatus*	0	0	0	+	0
2. *Awaous stamineus*	+++	++++	+++	++	++
3. *Eleotris sandwicensis*	0	0	0	++	0
4. *Lentipes concolor*	+	0	+	0	+
5. *Sicydium stimpsoni*	++++	++++	++++	++++	+++
CRUSTACEAN					
1. *Atya bisulcata*	++++	++++	++++	++++	++++
2. *Macrobrachium grandimanus*	0	0	0	+++	0
3. *Macrobrachium lar*	0	0	0	+++	0
MOLLUSK					
1. *Neritina granosa*	0	0	0	++++	0

seen in the visual survey phase of the work. The nakea population appears to be a healthy, thriving population. No creel census data is available for Wainiha.

There were very few L. concolor ('o'opu-alamo'o) collected and these were juveniles. Large adults, however, were seen during visual surveys. Based on these meager observations, it appears that there are healthy but small Lentipes populations scattered throughout Wainiha.

The endemic mountain shrimp, A. bisulcata ('opae-kala'ole) which was in great abundance was found in all sizes. This indicates that there is a large, very healthy population of A. bisulcata in Wainiha.

The mollusk, N. granosa (hihiwai) has been utilized for food since early Hawaiian days and is still harvested commercially. It still occurs in substantial numbers in some streams on all the major islands except Oahu. In pristine or almost pristine streams the juvenile and adult hihiwai are found from sea level to elevations of at least 400 m, even upstream of steep waterfalls (e.g. Akaka Falls, Kolekole Stream, Hawaii Is.). In Wainiha, the hihiwai is found only downstream of the hydroelectric plant.

Results from Stn V represent Wainiha tributaries and diversion ditches. The presence of the L. 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. The 'o'opu-nopili and 'o'opu-nakea were abundant downstream of the ditch but decreased in abundances upstream of the ditch. It appears that the ditch system has a filtering effect on the animal population.

Our attempt to sample an open ditch was not very successful. The ditch was flowing too fast for the electroshocking technique to be effective. Visual survey revealed the presence of 'o'opu-nopili and 'opae-kala'ole. Our field guide, Jack Hashimoto, mentioned that nakea, nopili and kala'ole are found in the diversion ditches in about the same abundance as they are in stream channels below and above the ditches.

3.3 COMPARISON BETWEEN THIS STUDY AND THAT OF 1977

The sampling sites in both studies are shown in Appendix A. All five sites in this study were also studied earlier (Timbol 1977). The earlier study was done in summer while the present work was done in winter. The 1977 data were re-evaluated for direct comparison with the present data. The results are shown in Table 3.

Probably the most significant difference between the two studies is the presence of Lentipes in 1982 but not collected in 1977. An explanation regarding this feature has been made in an earlier section. On the other hand, three species were present in 1977 but not collected in 1982. It is strongly possible that all three species are still in Wainiha but in very low abundances. This could be the result of the heavy winter freshets in the previous month (i. e. Hurricane Iwa).

There is no decline in relative abundances in those species with economic and biological values (A. stamineus, S. stimpsoni, A. bisulcata, N. granosa). However, two native species, A. genivittatus and E. sandvicensis, appear to have declined in abundance. This apparent decline could be due to a variation in collecting methods. The backpack electroshocker in 1977 was more powerful than the model used in this study. It appears, therefore, that there are no real differences in relative abundances between the animal populations in 1982 and 1977.

3.4 PHYSICOCHEMICAL

Existing records show the water temperature in winter at 19.0°C and 22.0°C in summer (USGS 1981). In this December field study, subsurface water was about 0.5°C warmer downstream of the hydroelectric plant (18.7°C vs. 18.2°C) than the water in Wainiha mainstream at upstream of the diversion weir. Not too much temperature difference between these two points is expected since the diversion ditches are covered and that the exposed surface per unit volume is lower in the ditches than in the river itself. The river is exposed to insolation. Observations of specific conductance, pH, and other physicochemical data are available for Wainiha in USGS Water Data reports (USGS 1981 and earlier).

4. POTENTIAL IMPACTS

The hydroelectric plant use of water, unlike the use of water for sugarcane irrigation, is not consumptive. Diverted water is returned to the same river at a lower elevation. The proposed additional hydroelectric unit will include the construction of additional miles of feeder road, a weir and generating and support facilities. An additional length of about two miles of mainstream channel will be dewatered. Adverse effects are potentially there

Table 3. Comparison of relative abundances of aquatic macrofauna in Wainiha between this study and that in 1977.

Species	1982	1977
FISH		
1. *Awaous genivittatus*	+	++
2. *Awaous stamineus*	+++	+++
3. *Clarias fuscus*	0	+
4. *Eleotris sandwicensis*	+	++
5. *Gambusia affinis*	0	++
6. *Kuhlia sandvicensis*	0	+++
7. *Lentipes concolor*	+	0
8. *Sicydium stimpsoni*	++++	++++
9. *Xiphophorus helleri*	0	++
CRUSTACEAN		
1. *Atya bisulcata*	++++	++++
2. *Macrobrachium grandimanus*	+++	+++
3. *Macrobrachium lar*	+++	+++
4. *Procambarus clarkii*	0	+
MOLLUSK		
1. *Erinna aulacospira*[1]	?	++
2. *Erinna newcombi*[1]		
3. *Neritina granosa*	+++	+++
4. *Pseudosidora rubella*[1]	?	+++

[1]Microfauna, not studied in 1982

during construction of these facilities and in their operations.

Much information is available on adverse environmental impacts regarding these activities on mainland environment. Almost none have been developed for Hawaii's island-type environment.

4.1 EFFECT ON STREAM MACROFAUNA

4.1.1 Loss of Migratory Pathway and Habitat Space and Shelter

Due to the migratory behavior of Hawaiian stream fauna, diversion is particularly detrimental to the prominent native stream fauna which requires access to the ocean as well as migratory pathways to habitat above diversion points.

Partial diversion may result in some deterioration of stream quality below the diversion point, such as decreases in habitat space and shelter, oxygen-carrying of the water, and water temperature.

There are several examples in the State of Hawaii demonstrating the adverse effects of such disruptions to migratory fauna. In West Maui, Honokowai, Kahoma, Kauaula, and Waikapu streams do not have any amphidromous fishes and crustaceans above their diversions (Timbol and Maciolek 1978, p. 93, 95-97). Lau (1977) attributed lower Lentipes abundance in Piinau Stream, East Maui, to a partial diversion of stream flow.

4.1.2 Elevated Temperatures

The effects of elevated temperatures on the Wainiha aquatic macrofauna is behavioral. A motile animal will leave an area when conditions become unfavorable. Thus, there will be a decrease in numbers as those that can leave, will leave. For example, altered streams have higher temperatures than unaltered ones (Timbol and Maciolek 1978). It was found that native species (e.g. A. stamineus or 'o'opu-nakea) were the dominant animals in unaltered streams while exotic species were the dominant animals in altered streams. Hathaway (1979) found that in Hawaii, the exotic species were considerably more tolerant to high temperatures than any of the indigenous and endemic species. A summary of Hathaway's (1979) data for native species is as follows: 'o'opu-nakea adults (lethal temperature = 37.2 - 38.8° C, TL_{50} = 38.1); 'o'opu-nakea post-larvae (lethal temperature = 39.0 - 39.3° C, TL_{50} = 39.3); 'opae-kala'ole adults (lethal temperature = 34.0 - 34.5°C, no TL_{50} taken). Temperature at Wainiha is between 18.5° C (this study) and 22° C (USGS 1981), values lower than the lethal temperatures obtained by Hathaway (1979). McAda (1977) attributed decline in native catastomid populations in the Colorado River basin to high temperatures in damned and altered rivers, among other factors. However, the ambient temperatures in the Colorado studies would be much higher than those recorded along the Wainiha river.

4.1.3 Loss of Fauna to Diversion Ditches and Penstocks

A. stamineus or 'o'opu-nakea spawners migrate downstream to near the mouth. It is possible that most of these spawners enter the diversion ditches to the penstocks and die. Ego (1956) who studied the 'o'opu-nakea fishery in Wainiha reported that "during downstream spawning descent, appreciable quantities of gobies are being funneled into ... ditches, destroying the reproductive potential of these fishes."

5. RECOMMENDATIONS

Some mitigative actions should be taken to diminish the adverse effects on the stream and its biota.

5.1 LOSS OF MIGRATORY PASSAGEWAY

Minimum instream flows have been adopted for some mainland water projects, ranging between 5 cfs at Angostura Dam, South Dakota, to 5,000 cfs at Hells Canyon on the Idaho-Oregon border (Nelson, et al., 1978), a very wide range, indeed. In Hawaii, however, there has been no definitive study establishing minimum stream flow for any stream; the nearest study being a short-term one on Kahana Stream, Oahu (Timbol, 1979). For the Wainiha River, provisions must be made to provide stream flow to the ocean at those times of year when upstream migration of amphidromous post-larvae and downstream passage of spawners and/or their larvae are taking place.

5.2 TEMPERATURE ELEVATION

Under present conditions, preliminary results indicate that temperature elevation has not been a problem with the Wainiha hydroelectric unit now in operation. However, it is highly desirable that streamside vegetation be maintained as pristine as it is now. Feeder roads should be constructed as far away from the mainstream as feasible to maintain present streamside vegetative cover. Trees and shrubs adjacent to the stream provide both direct and indirect cover for fish and wildlife. Tall vegetation makes shade which lowers water temperature. In addition, riparian ground cover prevents excessive siltation. White and Brynildsor (1967) may provide general ideas regarding this matter.

5.3 LOSS OF FAUNA TO DIVERSION DITCHES

The loss of fish due to the diversion is a waste. For example, 'o'opunakea that are entrained in the penstock perish. That quantity of fish is made unavailable to people who could use the 'o'opu for food. The genes of those fish which perish are lost from the gene pool.

It is desirable that self-cleaning fish screens be installed at intakes whenever it is feasible to do so. Fish screens are used to reduce the numbers of fish entering water intakes, i. e. power generating plants. Screening is particularly important in amphidromous fish such as the 'o'opunakea which is of both commercial and biological importance and the 'o'opualamo'o because of its biological value. There are several references which could be consulted (e.g. Burns 1966, Prentice and Ossiander 1974) before a fish screen suitable for Hawaii could be designed.

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Original sent to Fish & Game
4/11/83

SCIENTIFIC
COLLECTING Permit No. SCP 83-24

PERMITTEE'S REPORT OF COLLECTING DONE UNDER THIS PERMIT

(This form or a facsimile thereof must be submitted to the Division of Aquatic Resources no later than one month after expiration date.)

Common Name	Date Collected	Number Collected*	Location	Disposition of Specimens
Wainiha River mainstream, elev. 1,120' (Stn 1), Dec. 28, 1982				
'o'opu-nakea		7		released live, same area
'o'opu-alamo'o		4		visual survey, not caught
'o'opu-nopili		23		released live, same area
'opae-kala'ole		339		released live, same area
Wainiha River mainstream, elev. 1,000' & 760' (Stn 2) Dec. 28, 29, 1982				
'o'opu-nakea		11		released live, same area
'o'opu-nopili		26		released live, same area
'opae-kala'ole		868		released live, same area
Wainiha River mainstream, elev. 680' (below weir) (Stn 3) Dec. 29, 1982				
'o'opu-nakea		9		released live, same area
'o'opu-alamo'o		1		released live, same area
'o'opu-nopili		29		released live, same area
'opae-kala'ole		420		released live, same area
Wainiha mainstream, elev. 10' (Stn 4) Dec. 29, 1982				
'o'opu-naniha		1		visual survey, not caught
'o'opu-nakea		3		released live, same area
'o'opu-okuhe		2		released live, same area
'o'opu-nopili		30		released live, same area
'opae-kala'ole		18		released live, same area
'opae-o'eha'a		6		released live, same area
Tahitian prawn		6		released live, same area
hihiwai		16		released live, same area
Maunahina tributary to Wainiha, elev. 1,000' and 750' (Stn 5) Dec. 30, 1982				
'o'opu-nakea		4		released live, same area
'o'opu-alamo'o		1		visual survey, not caught
'o'opu-nopili		6		released live, same area
'opae-kala'ole		838		released live, same area

[signature] 4/6/83
Signature of Permittee Date

*If salvaged, dead or injured, give circumstances (how killed or injured, from whom obtained, how obtained).

July 18, 1983

Mr. Robert P. Kitchell
Project Manager, Wainiha Hydropower
EDAW, Inc.
1121 Nuuanu Avenue, Suite 203
Honolulu, Hawaii 96817

Dear Bob,

The stream channel between stations 2A (920+ ft elev.) and station 2B (720+ ft elev.) will be subject to dewatering after the additional hydropower unit is built. I wanted as much baseline data as possible for future use. Thus, I sampled two stations instead of one as proposed.

The discrepancy between my report to EDAW and the collecting permit is due to an oversight. The collecting permit does not include data from 2B. (Note that the collecting permit report was made on April 6, 1983, some months after the field work.) Field data for the two stations are:

Sta 2A (12/29/82, 10:20 AM)

Atya	868
nakea	11
nopili	26

Sta 2B (12/28/82, 11:30 AM)

Atya	605
nakea	14
nopili	13

Relative Abundance for Station II

Atya	=	1473/2	=	++++
nakea	=	25/2	=	++++
nopili	=	39/2	=	++++

I trust that this answers your questions. Please call me if you have additional questions.

Yours very truly,

Amadeo S. Timbol

Appendix D

Proposed Wainiha Hydroelectric Project, Kauai
Bird and Mammal Report
By Andrew J. Berger

This study was conducted in accordance with the Scope of Work information sent to me by Mr. John Whalen on October 13, 1982. The project site was studied on December 11, 1982, in accompany with Dr. Charles Lamoureux and Mr. Jack Hashimoto. Mr. Hashimoto deserves high commendation for his efforts in our behalf by breaking trail all the way to the proposed new weir. Because of downed trees, branches, ferns, bananas, and other vegetation as a result of hurricane Iwa, it is doubtful that we could have followed the faint trail to the highest site (including two crossings of the Wainiha river) without Mr. Hashimoto's assistance. Even so, on our return we did not reach the present power station until nearly 7:00 p.m., well after darkness had fallen.

I have entitled this a Bird and Mammal report because there are no endemic amphibians or land reptiles in Hawaii; all have been introduced by man. I was surprised, however, to find the giant neotropical toad (Bufo marinus) at the site of the proposed new weir, an elevation of approximately 1,000 feet. This toad was introduced to the Hawaiian Islands from Puerto Rico in 1932 in the hopes that it would aid in controlling insect pests of sugar cane (McKeown, 1978). The fishes and aquatic invertebrate animals will be discussed in a separate report.

Birds of Lower Wainiha Valley

There are three general groups of birds in the Hawaiian Islands: 1) Introduced or exotic birds, those brought to the islands by man; 2) Indigenous birds, those whose total range in the Pacific Basin includes the Hawaiian Islands; and 3) Endemic birds, those that are unique to Hawaii and occur nowhere else in the world (Berger, 1981). I will discuss here 13 species of exotic birds, two indigenous species, and four endemic species. I refer to "Lower Wainiha Valley" because our observations were conducted only to an elevation of approximately 1,000 feet. It rained during much of the day, and the Melodious Laughing-thrush was the only species heard singing.

There is some change in the birdlife as one ascends Wainiha Valley and a more obvious change in the vegetation. For example, both the vegetation and the birdlife around the existing powerhouse are introduced species. Dr. Lamoureux will present a complete report on the vegetation, and I comment here only that even at an elevation of approximately 1,000 feet the forest is a mixture of endemic plants and introduced species, especially along the valley floor, where such introduced species as guava, banana, ti, and ginger are common. Koa (*Acacia koa*) and ohia (*Metrosideros collina*) are dominant on the steeper walls of the valley.

I. *Introduced birds*.

A. Order Ciconiiformes

a. Family Ardeidae, Herons and Egrets

1. Cattle Egret, *Bubulcus ibis*.

The Cattle Egret is native to Spain, Africa, and Asia. The birds apparently colonized British Guiana about 1930, presumably after having been wind-borne from Africa. The birds have since moved northward into North America (Van Tyne and Berger, 1976). Cattle Egrets were imported from Florida and released on Kauai and other islands in 1959. Byrd, *et al*. (1980) report that Cattle Egrets on

Kauai had increased from the 25 released in 1959 to at least 6,800 by January 1980. I saw several egrets in the lower reaches of the valley.

B. Order Galliformes

b. Family Phasianidae, Pheasants, Quails, and Francolins.

2. Ring-necked Pheasant, Phasianus colchicus.

This pheasant has a wide distribution in temperate Asia. It is a highly variable species and many subspecies or geographical races have been described by taxonomists. Several of these have been introduced to Hawaii. Phasianus colchicus torquatus, a native of eastern China, was introduced to the Hawaiian Islands at an unknown date, but perhaps as early as 1865 (Caum, 1933). The pheasant is a popular game bird on Kauai and 333 birds were reported shot during the hunting season that ended on January 17, 1982 (Department of Land and Natural Resources monthly report for January 1982). I was, however, surprised to find a hen pheasant along the jeep road about one mile above the existing power house because there appears to be no "prime" pheasant habitat in the valley.

C. Order Columbiformes

c. Family Columbidae, Doves and Pigeons

3. Lace-necked or Spotted Dove, Streptopelia chinensis.

This Asian dove was introduced to the Hawaiian Islands at an early date; the exact date is unknown, but the birds are said to have been very common on Oahu by 1879. The species is now common to abundant on all main islands and, like the other doves in Hawaii, is classified as a game bird. Although this dove occurs where rainfall exceeds 100 inches per year, the highest densities are found in drier areas where the introduced kiawe is one of the dominant plants. Schwartz and Schwartz (1949), for example, estimated densities as great as 200 birds per square mile in dry areas on Molokai.

The diet, as determined by examining crop contents of 91 birds, was found by the Schwartzes to consist of 77 percent weed seeds and about 23 percent fruits; animal matter was "almost negligible." Tape worm parasitism, however, was found to be heavy, indicating that the small amount of animal matter eaten by the doves was important in contracting the parasites.

The Lace-necked Dove is common in residential areas, in kiawe habitat, and in pasture and agricultural land. It also occurs along jeep trails in wooded areas and along streams. I saw several doves in the lower part of the valley.

4. Barred Dove, Geopelia striata.

This species is called the Zebra Dove in its native range in the Orient and Australia. This dove is said to have been introduced to Hawaii sometime after 1922

(Bryan, 1958). It has been a remarkably successful introduction and it is now abundant on all of the main islands. The Barred Dove also prefers the drier areas where seeds are abundant. Schwartz and Schwartz (1949) estimated densities as great as 400 to 800 birds per square mile in some areas on Oahu (e.g., from Barber's Point to Makaha) and on Molokai. One study of the food habits of this dove 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.

Doves avoid dense forests; they are common in residential areas, cutover fields, pastures, and along jeep trails wherever there is a supply of weed seeds. The Barred Dove is less common in the upper part of the valley.

D. Order Strigiformes

d. Family Tytonidae, Barn Owls.

5. Barn Owl, _Tyto alba pratincola_.

Barn Owls were released in Hawaii for the same reason that the mongoose was released during the last century: to prey upon the rats that were causing damage to sugar cane. Food habits studies conducted thus far, however, have suggested that Barn Owls prey largely on house mice and, on Kauai, on birds (Tomich, 1971; Baker and Russell, 1980; Byrd and Telfer, 1980). Moreover, the owls have spread over much of each island rather than remaining in sugarcane areas. Au and Swedberg (1966) summarized the status from the first release of 18 owls at Kilohana in 1959 through June 30, 1965. By the latter date, the owls had spread nearly around the island of Kauai, especially in the lowland areas. Barn Owls in Hawaii often roost and nest in small caves on steep cliffs. The owls are strictly nocturnal in behavior and I did not see any during my field work in Wainiha Valley. I would be surprised, however if this species does not occur there.

E. Order Passeriformes

e. Family Timaliidae, Babblers and Laughing-thrushes.

6. Melodious Laughing-thrush, Garrulax canorus.

Although it is a babbler, this bird has long been called the Chinese Thrush (Hwa-mei) in Hawaii. It is native to the Yangtze Valley in China and southward to Laos, and it occurs in Formosa. It was a favorite cage bird 80 years ago. Birds were sent from Oahu for release on Kauai in 1918. Richardson and Bowles (1964) found this laughing-thrush to be a common resident on Kauai. They found the species to be "present from the coast to the highest forests (over 4,500 feet), and from humid forested valleys to dry, barren canyons of the southern Na Pali coast." I found this species at all elevations studied, from the existing power house to the proposed new weir.

f. Family Turdidae, Thrushes

7. Shama, Copsychus malabaricus.

There are 17 subspecies of this thrush. These are native to Sri Lanka, India, Nepal, Burma, Malaysia, Vietnam, Laos, Java, and throughout Indonesia. Shama is the Hindi name for this species. It was released on Kauai in 1931. Richardson and Bowles (1964) found the Shama a "moderately common resident locally, usually in inhabited lowland areas" on Kauai in 1960. They found it at Haena, Lihue, and Waimea, and in a mixed Albizia forest, a casuarina grove, and in kiawe, "thus showing much adaptability to habitats varying widely in vegetation and aridity." I found the Shama to be a common species in the lower half of our route from the present power station to the dam and existing weir.

g. Family Zosteropidae, White-eyes and Silver-eyes

8. Japanese White-eye, Zosterops japonicus japonicus. This race of the 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 (Mejiro) were released on Oahu by the Territorial Board of Agriculture and Forestry in 1929 (Caum, 1933). Caum thought that the species was "possibly established" on Kauai by 1933. The White-eye presents an example par excellence of the success of introduced birds. It now occurs on all of the main islands, is found from sea

level to tree line on Maui and Hawaii, and inhabits very dry areas (e.g., Kawaihae) and those having 300 or more inches of rainfall per year. There is virtually no habitat in Hawaii that is not occupied by white-eyes and I believe it to be the most abundant song bird in the islands. White-eyes eat insects, nectar, soft fruits, the pulp of berries, and buds, so that they can be a serious threat to farmers. The California State Department of Agriculture is greatly concerned about the accidental release of a related species (Gray-backed White-eyes, Z. palpebrosa) at San Diego. Two pairs escaped in 1973 or 1974; 150 offspring have been captured since then. "Estimates of the potential loss in soft-fruit crops, should white-eyes ever begin to multiply rapidly and establish large populations, run as high as $2 million a year" (Audubon Magazine, September 1982).

h. Family Sturnidae, Starlings and Mynas

9. Common Indian Myna, Acridotheres tristis.

The Myna is native to Sri Lanka, India, West Pakistan, Nepal, and adjacent regions. The Myna was introduced 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 the inhabited islands, being most common in residential areas and in the vicinity of houses and barns in outlying districts. Richardson and Bowles (1964) also found Mynas roosting in fire trees behind Waiale cabin in the Alakai swamp at an elevation of 3,650 feet. Mynas are common in the lower part of Wainiha Valley.

i. Family Ploceidae, Weaverbirds and Allies

10. Spotted Munia or Ricebird, Lonchura punctulata. This Asian species was brought to Hawaii by Dr. William Hillebrand about 1865 (Caum, 1933). Caum wrote that the Ricebird "feeds on the seeds of weeds and grasses and does considerable damage to green rice." Rice is no longer grown in Hawaii, but the Ricebird has recently become a serious pest by eating the seeds of sorghum. The Spotted Munia is another abundant species on all of the islands, and it is tolerant of both very dry and very wet habitats. The birds tend to be nomadic during the nonbreeding season, moving over large areas in search of seeds. The birds are prolific, some nesting in every month of the year. The birds occur from sea level to the mountains and, in the past, I have found it at Barking Sands and at Kokee State Park. The birds do not inhabit dense forests but are found along jeep trails and streams in the valley.

11. House Sparrow, Passer domesticus.

Also called the English Sparrow, the House Sparrow was first imported to Oahu in 1871, when nine birds were brought from New Zealand (where the species had previously been introduced from England). Caum (1933) wrote that "whether or not there were further introductions is not known, but the species was reported to be numerous in Honolulu in 1879." The House Sparrow in North America (first introduced in Brooklyn in 1852) became a serious pest, and tens of thousands of dollars were spent in attempting to control the population. The House Sparrow apparently never became a serious 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 and I did not happen to see any above the existing power house.

j. Family Fringillidae, American Sparrows and Buntings

12. Cardinal, Cardinalis cardinalis.

The Kentucky Cardinal or Virginia Cardinal was released on Kauai several times between 1929 and 1931. By the 1960s, Richardson and Bowles (1964) found Cardinals in the very dry coastal areas of the Na Pali coast and in the very wet forests in the Alakai Swamp at elevations of nearly 4,000 feet. I found Cardinals at all levels in the valley that we surveyed.

13. House Finch, Carpodacus mexicanus frontalis.

This finch is native to western North America. Birds were first brought to Hawaii "prior to 1870" (Caum, 1933). It is now an abundant species in residential and urban areas, in both wet and dry rural areas, and in the high ranch and open forest lands on Kauai, Maui, and Hawaii. Because of their fondness for papaya, the bird is called the Papayabird in Hawaii. Despite their liking for soft fruits, however, House Finches are primarily seed eaters, frequently also eating flower buds. When experimental crops of sorghum were planted in former sugarcane land on Kauai, the Chairman of the Board of Agriculture reported to the State senate in 1972 that a study of the "bird problem in sorghum fields at Kilauea reveals that Metcalf Farms, Inc., is experiencing 30% to 50% losses due to feeding by large flocks of ricebirds and linnets" [House Finches]. This loss was significant because of the implications for the success--or failure--of small grain crops in Hawaii, and the resultant effects on the cattle industry in the state.

II. Indigenous Birds.

F. Order Charadriiformes

a. Family Scolopacidae, Sandpipers, Curlews, and Snipe

1. Wandering Tattler, Heteroscelus incanus.

This shorebird nests in Alaska and northwestern British

Columbia. This species is a regular winter resident in the Hawaiian Islands. The birds usually are seen along beaches and reef flats, and I was surprised to find tattlers along the Wainiha River at all levels of our observations, including the site for the proposed new weir at an elevation of about 1,000 feet.

b. Family Charadriidae, Plovers

2. Pacific Golden Plover, Pluvialis dominica fulva.

This subspecies nests in Siberia and arctic America. It, too, is a very common winter resident, being found from sea level to at least 10,000 feet elevation on Hawaii. During their stay in Hawaii, they inhabit lawns in residential areas (and even the lawn around the State capitol in Honolulu), golf courses, pastures, shorelines, and open mountain areas. Several plovers were flushed as we drove along the jeep road as well as along the river from the existing dam site and upward above 800 feet elevation.

III. Endemic Birds.

G. Order Anseriformes

a. Family Anatidae, Ducks, Geese, and Swans

1. Koloa or Hawaiian Duck, Anas wyvilliana.

This endangered species occurred on all main islands except Lanai and Kahoolawe into the 1940s. Man may well have been the most serious predator on the Koloa because the birds could be hunted legally during the early 1920s, when the bag limit was 25 ducks per day. The decline in taro farming, the cessation of commercial rice growing, and the draining of marshland for development also led to the decline in 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 project at Pohakuloa, Hawaii, in 1972, and captive-reared ducks have since been liberated on Hawaii and Oahu.

Swedberg (1967) described the range and life history of the Koloa on Kauai. Birds inhabit both lowland areas and mountain streams. Swedberg did not have any records of nesting of the Koloa along the Wainiha River but he did report their nesting along the Lumahai River; I assume that they also nest along the Wainiha River. Dr. Lamoureux flushed one Koloa from the river at an elevation above the existing dam.

H. Order Strigiformes

b. Family Strigidae, Typical Owls

2. Pueo or Hawaiian Short-eared Owl, *Asio flammeus sandwichensis*.

The Pueo is a permanent resident on all main islands. It is not classified as an endangered species. Unlike most owls, the Pueo is a diurnal species and, therefore, is much more conspicuous than the nocturnal Barn Owl. On Kauai it has been found in relatively dry areas as well as in the ohia rain forest at Kokee and the upper reaches of the Waialae stream. Hence, even though I did not see this owl during our rainy field trip, it undoubtedly occurs in Wainiha Valley.

I. Order Passeriformes

c. Family Drepanididae, Hawaiian Honeycreepers.

This is Hawaii's unique bird family. However, nearly 40 percent of the species are extinct and nearly another 40 percent are classified as threatened or endangered. The two species that I saw in Wainiha Valley are the two most common of the surviving species.

3. Amakihi, Hemignathus virens stejnegeri.

The Amakihi was described scientifically in 1782, but the first nest of the Kauai race was not found until 1964 (Berger, 1981). The species is most common in the ohia forests of the Kokee and Alakai Swamp regions, and nothing has been published to date on its occurrence in other regions of Kauai. I saw my first Amakihi at an elevation of approximately 880 feet along the trail to the proposed new weir, and saw and heard several other birds in the mixed forest above that elevation.

4. Apapane, Himatione sanguinea.

This undoubtedly is the most abundant of the surviving species of honeycreepers. It typically inhabits ohia-koa forests, and all nests found to date on Kauai have been built in ohia trees (Berger, 1981). I found the first Apapane in Wainiha Valley at an elevation of 1,000 feet. The birds were giving callnotes only; there was no singing, which suggests that the breeding season had not yet begun.

Mammals of Lower Wainiha Valley

I. Endemic Mammals.

The only endemic Hawaiian land mammal is the Hawaiian bat (*Lasiurus cinereus semotus*), a subspecies of the American hoary bat. The Hawaiian bat occurs primarily on the island of Hawaii, where it has been seen from sea level to 13,200 feet elevation (Tomich, 1969; Kramer, 1971). Bats have been seen along the road to Kokee State Park but no published studies of the distribution or behavior of this bat on Kauai have been published. I can see no way that the proposed dam and new weir would have any effect on any bats that live in the valley.

II. Introduced Mammals.

All of these introduced species have proven highly detrimental to man, his buildings, products, and to some of his agricultural products, as well as to the native forests and their birdlife. None, therefore, are of concern as far as detrimental effects resulting from the proposed construction.

Some of these mammals were first brought to the Hawaiian Islands by Captains Cook and Vancouver. Feral cattle, goats (*Capra hircus*), sheep (*Ovis aries*), and pigs (*Sus scrofa*) have been destroying the Hawaiian endemic forests since 1800, and they continue to cause damage to this day.

With the exception of the House mouse (*Mus musculus*), all of the smaller introduced mammals prey on birds and their nests and eggs.

These small mammals include the roof or black rat (*Rattus rattus*), Polynesian rat (*Rattus exulans*), Norway rat (*Rattus norvegicus*), small Indian mongoose (*Herpestes auropunctatus*), feral cat (*Felis catus*), and feral dog (*Canis familiaris*). All except the Norway rat undoubtedly occur in the upper levels of the valley. Unfortunately, the construction and operation of the new power facilities will have no adverse effects on these pestiferous mammals.

Conclusions Regarding Birds and Mammals

It is my considered opinion that the construction and operation of the proposed new power plant and penstock would have a very minimal impact on the birds, mammals, or their habitat.

We can dismiss all of the mammals immediately because all are pests in one way or another. The 13 species of introduced birds are abundant species and also are highly adaptable to varying ecological habitats. The new power house and penstock would have no adverse impact on any of these introduced birds; moreover, the construction and maintenance of the new access road (approximately two miles upslope from the existing dam and weir) would simply provide more "edge effect" for these species. Similarly, there would be no impact on the two indigeneous species that now inhabit the river during their winter stay in Hawaii.

The only endangered Hawaiian bird found in the valley was the Koloa or Hawaiian Duck. Inasmuch as there would be no significant effect on the river due to construction and operation of the new dam and power house, there also would be no significant impact on the Koloa. In other parts of Kauai, this duck is found in the lowlands, where, however, they are sensitive to changes in feeding potential of mud flats or reservoirs. The Koloa regularly moves to different sites during the day in order to satisfy "one or more of its requirements, such as food, loafing area, nesting cover or others" (Swedberg, 1967). The best upland habitats consist of streams and rivers "generally located above 1,000 feet elevation." Hence, the proposed project should have no adverse impact on the Koloa.

The Pueo or Hawaiian Owl is adaptable to many different habitats, ranging from native forests to lowland introduced vegetation, and I have seen it in Kailua-Kona, Hawaii, and in Manoa Valley on Oahu. The proposed project would have no adverse impact on this native owl.

The Amakihi and the Apapane are the two most common species of the extant honeycreepers. On other islands, the Amakihi is the more adaptable to the two species in that it feeds in areas where introduced plant species grow along with ohia and koa. In past studies on Kauai (Eddinger, 1970; Berger, 1981), all nests of both species have been found only in ohia trees. The nesting season had not begun at the time of our field work, so that we cannot say whether these two species were breeding species in the lower Wainiha Valley (that is, above 880 feet elevation), or whether they were only feeding in this area. If the Apapane does nest as low as 1,000 feet in Wainiha Valley, this would be the lowest nesting elevation recorded for this species on Kauai. Even in that event, however, the construction and operation of the proposed new dam and weir would have no effect on either species because both species depend primarily on ohia and koa trees, which are dominant on the slopes of the valley. The new access road would have no effect on the birds; both species are common at Kokee State Park where there are roads and many tourists.

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Appendix E

UPPER WAINIHA VALLEY, KAUAI:
ARCHAEOLOGICAL RECONNAISSANCE

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INTRODUCTION

This report presents the results of a literature search and archaeological reconnaissance survey of the proposed location of a hydroelectric powerhouse and its associated access road, water conductor, weir and transmission line in upper Wainiha Valley, Kauai [Figure 1]. The project was intended to determine the general nature and extent of the sites and to be of sufficient detail to make a determination of the likely impact of the hydroelectric project on the sites. The overall purpose was to provide EDAW Inc. with information which would allow them to determine whether a feasible design solution for the project could be worked out in light of archaeological and/or historical remains.

The literature search was undertaken with three specific purposes in mind:

1. To gather information about previously recorded archaeological and historical sites in the valley,

2. To find out if Wainiha River had ever been used for commercial transportation, and

3. To locate old maps of Wainiha Valley at the State Survey Office, as these are often valuable sources of historic information.

The field studies involved two major foci of investigation. Because the construction of a new transmission line on or immediately adjacent to the jeep trail which connects the existing powerhouse with the existing weir would be required, the first task was a brief inspection of this right-of-way. The second assignment was to inspect the locations of the proposed powerhouse, access road, water conductor and weir. As precise siting of the intended locations of these features has not been done, the field inspection considered the entire alluvial flood plain between the Wainiha River and the western base of the steep cliffs. Heavy rain and rising streams hindered the survey, primarily by preventing inspection of the southernmost half-mile of the project area, which was not a significant omission. Photography was also made impossible by the heavy rain.

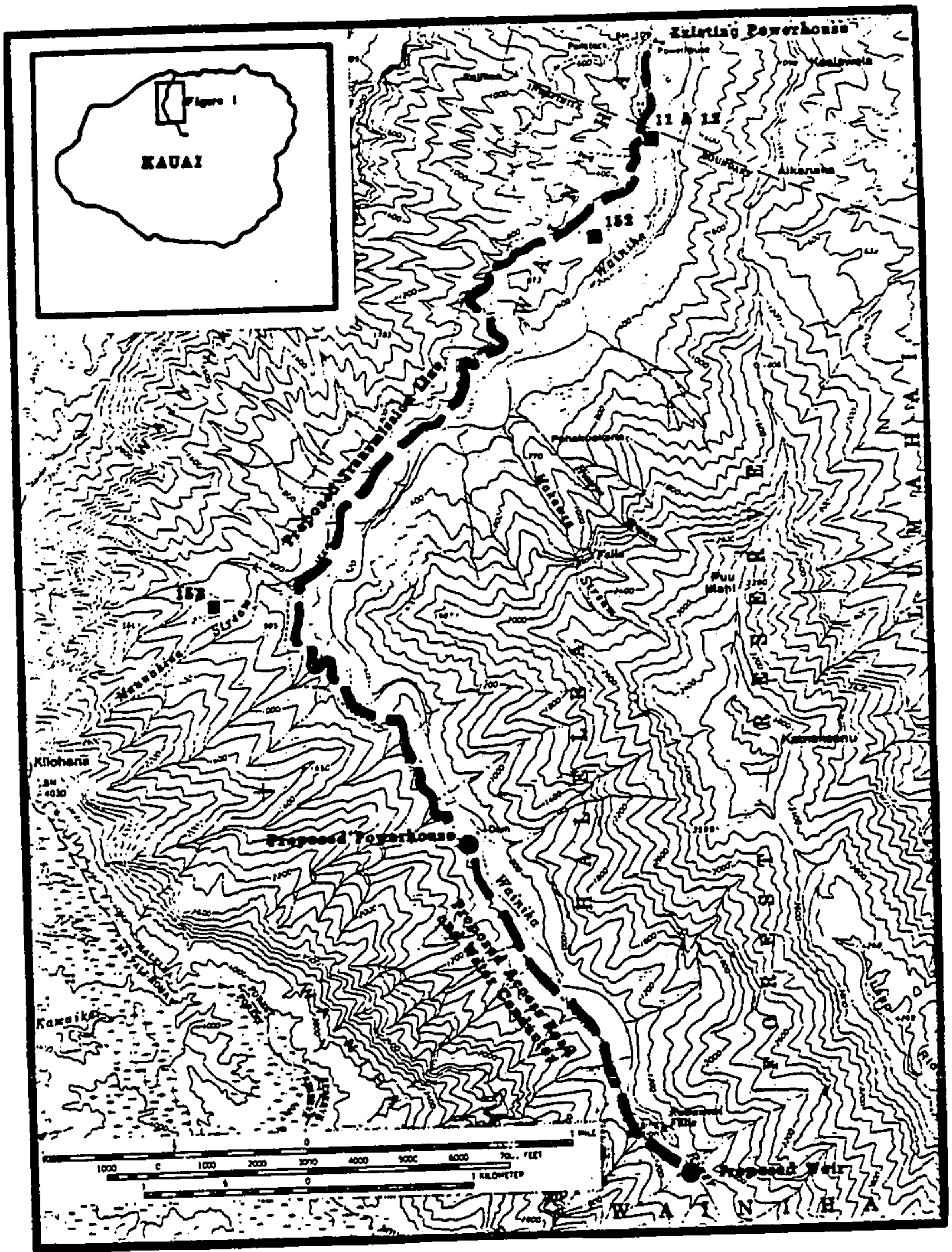

Figure 1. Map of Project Area.

LITERATURE SEARCH

Timothy Earle (1978:32) provided a description of the valley and the relationship between geography and irrigated terrace sites:

> "Wainiha is the second largest ahupua'a (43.5 km^2) in the Halelea district. It includes the catchment area of the Wainiha stream which runs about 20 km from Mt. Wai'ale'ale to the sea. The coast is 2.9 km long and includes a small bay and two coral reefs. The boundary separating Ha'ena and Wainiha is interesting beause it appears to divide equitably two major coral reefs between the ahupua'a. The Wainiha stream itself begins in a narrow mountain valley with many small tributary streams. About 3 km from the sea, the valley widens somewhat and the stream becomes braided with numerous islands. There are alluvial areas along the stream and on the islands, but there is no alluvial plain at the valley's mouth. An alluvial plain has, however, developed to the west of the Wainiha stream in an area fed by several periodic streams.
>
> "Presently, there are three irrigation systems in the lower valley, and in 1850 this area was extensively developed in irrigation systems on the islands in the stream and along the stream banks. In the interior of Wainiha, many small irrigation systems utilized alluvial pockets along the central stream and its many tributaries, but most of these were apparently abandoned by 1850. Six small irrigated terrace sites were located between 4.5 and 10.0 km from the sea by Bennett [1931:136] and by this present project. Other terraced areas have been described by hunters farther inland. The separate alluvial plain to the west of the central valley was apparently not farmed aboriginally by irrigation due to the lack of a convenient water source."

Two of the three irrigation systems [Sites 11 and 12 in Earle's report] in the lower valley are located within the present project area, and are indicated to the south of the existing powerhouse on Figure 1.

In 1931 Wendell Bennett published the results of an archaeological survey of Kauai, listing six sites in Wainiha. Of these, only Sites 152 and 153 are located near the present project area [Figure 1]. All are described here for the background information they provide about the prehistoric utilization of the general valley environment. The site numbers used were assigned serially by Bennett, and have no other significance than to identify the sites.

"Site 148. Heiau on Popoki knoll. Popoki knoll is located next to the road [inland side] in front of Site 149 near the Wainiha river. It is said to have been a heiau site, but nothing remains to mark it.

"Site 149. Kaunupepeiau heiau, back of the first house on the first pali east of the mouth of the Wainiha river. A flat place about 30 feet wide and 20 feet deep with stones along the front edge meet the description given by Thrum: 'A 12-foot open-paved heiau of husbandry class; probably simply a place of offering.'

"Site 150. Laumaki heiau, on a knoll west of the "Power House" road, about one mile from the government road, in Wainiha valley. Thrum describes this heiau as "A small, open platform, paved heiau, 2 feet high, of husbandry class." The platform measures 20 feet wide and 10 feet deep and faces the sea. It is paved with river stone.

"Site 151. Apaukalea heiau, adjoining the "Power House" road on the east side, inland from Site 150 in Wainiha valley.

> "The remains of recent occupation together with modern stone platforms, walks, graves with tombstones, and other such work, make the distinction of this heiau difficult. The heiau consists of a small, square, paved area about 35 feet on a side. The east wall is 15 feet wide, and badly tumbled on the outside, though 3 feet high on the inside. The north wall is irregular, about 15 feet wide, and 2 feet high. A projection inwards forms a platform 10 by 15 feet. The west wall is just a trace of stone, but seems to have been 15 feet wide. The south wall is of varying width and runs from the road to the bluff, a distance of 130 feet. It is about 3 feet high. To the west of this enclosure is a flat space with two lines of stone traversing it, while on the east are two paved house sites about 10 feet square.

"Site 152. Taro terraces, about one mile above the Wainiha power house on the intake trail.

> "This interesting taro section is high on the side of the valley utilizing a little stream and a small flat area. The hill is on one side and the stream and a bluff on the other, leaving a fairly steep section in between. At one place above the terraces stones are built across the stream as an intake, which could, with the addition of a few more stones, shunt the water into a ditch which runs between large rocks and dirt walls. All along the edge of the stream is a wall built to keep the water from running back. The terraces are from 6 inches to 3 feet high.

"Site 153. House sites, on Mauna Hina ridge in Wainiha Valley. Remains of many old house sites and much irrigated land. The house sites are mostly of the terraced type and 10 to 15 feet wide."

Handy [1940:73] discussed Wainiha in his study of Hawaiian agricultural techniques:

> "In upper Wainiha, I am told, there are terraces wherever there is suitable ground along the stream. About one quarter of the larger terraces in the flatlands of lower Wainiha are now in use. Just below the power house, which is about 1.5 miles inland, some dozen large terraces are under taro cultivation. Half a mile below this, in the large area of flatland between the two branches of the stream, there are several sizable plantations intensively cultivated in taro. Just above the highway on the northwest side of the stream there are about 40 old terraces planted in rice and about a dozen small terraces in taro. On the southeast side of the stream close to the highway a number of terraces are being plowed. A quarter of a mile inland near the poi mill, a large section of terraces southeast of the the stream is filled with taro. Bennett saw old terraces about a mile above the Wainiha power house on the intake trail; he says: 'This interesting taro section is

high on the side of the valley utilizing a little stream and a small flat area.' He also mentions many house sites and terraces in the upper valley."

Handy also provides a relevant quote from Lydgate [1913]:

"At a time as late as the reign of Kaumualii, the local konihiki making a careful census of the valley by villages from the sea mauka returned upward of 2,000 souls. Enumerating in detail all the communities, he gave the exact quota from each--Naue, Pa-ie-ie, Maunaloa, Pali-eleele, Maunahina, Pohakuloa, Opaikea, Homai-ka-lani and ending with Laau, the hamlet farthest mauka in the depths of the mountains, where the valley contracts to a narrow gorge, with a brawling stream running white in the bottom......All along up the river, wherever the encroaching palis on either side leave the least available space, the land has been terraced and walled up to make 'lois.' And so the whole valley is a slowly ascending stairway of steps, broad in the tread and low in the rise, all the way to Laau, where the last available space was won, if not by the dwarfs, at least by someone who understood this kind of agricultural engineering. These artificial lands have long since reverted to the wilderness from which they came, and it is only by chance that the traveler stumbles upon them, beating his way through the jungle. But they bear witness to a large population; and so perhaps we do not need to discredit the old chronicler by more than the '65 men of Laau' (listed as Menehunes)" [Handy 1940:73].

None of the literary sources consulted indicated that Wainiha River had ever been used for commercial transport, and this same conclusion was confirmed by Donald Hibbard, Historic Sites Director for the Division of State Parks, Department of Land and Natural Resources [personal communication]. The narrow, shallow and winding nature of this stream would not allow the use of barges or large power craft, such as steamboats, had there been commerical reasons for doing so, which there were not. As the project area had apparently been abandoned prior to A.D. 1850 (Earle 1978:32), there would have been no need for passenger transport on the river and major agricultural or industrial operations such as logging never took place. During aboriginal times, dugout canoes were used in ocean and estuarine waters, and in rivers where gradients were low. It is likely that such use was made of Wainiha in the lower reaches of the river within about one-half mile of the ocean.

Unfortunately, the search for old maps with useful cultural information turned up nothing.

SURVEY RESULTS

The walk-through reconnaissance confirmed the observations of prior researchers regarding the nature and extent of archaeological remains in the upper valley. Virtually every available place on the alluvial plains of both the main stream and the sidestreams between the proposed powerhouse and the proposed weir has been modified by man. The almost continuous archaeological remains noted consist primarily of finely built and well-preserved irrigated agricultural terraces standng between 20 to 30 centimeters and 1.5 meters in height. The systems are similar to those found elsewhere in Hawaii, as for example, Oahu's Kahana Valley:

> "Most of the 120 wet terraces in Kahana valley were built on gently sloping alluvial areas along permanent streams to form series of earthen steps for retention of irrigation water. Most terraces consisted of a stone retaining wall and the relatively flat land behind it; many terraces included stone walls on one or both sides of the flat terrace surface" [Hommon and Barrera 1971:43].

Possible house sites, consisting of square to rectangular basalt-rock structures measuring approximately 3 meters on a side and standing to 50 centimeters in height, were located on a low bluff formed by a stream-cut natural terrace. Detailed inspection of the vicinity of these features was prevented by the dense vegetation and inclement weather.

Smaller terrace systems were also seen in small flat areas along the route of the existing jeep trail [the proposed location of the new transmission line], as indicated by Bennett's survey.

CONCLUSIONS AND RECOMMENDATIONS

Based on the direct observations made in the field and on prior experience in similar areas elsewhere in Hawaii, and in consideration of the lack of mention of important religious sites in the upper valley by Bennett, there appears to be no justification for prohibitive archaeological or historical constraints on the construction of the hydroelectric system as proposed. It is highly unlikely that sites of other than agricultural or habitational nature [i.e., heiau, adze quarries, shrines, etc.] will be found in the project area, as these sorts of sites would be more likely to be found on hill- or ridge-tops above the valley floor. It is true that most of the area through which the proposed access road and water conductor would be built is eligible to both the National and State of Hawaii Registers of Historic Places on the basis of its potential for providing information relevant to the study of prehistoric Hawaii. However, there is nothing of such great significance that construction should not be able to proceed once any adverse effects of the project have been mitigated through archaeological salvage excavations in those areas directly afeccted by that construction.

To ensure that the final route of the proposed construction will present the least threat to the sites, as well as the least expense to the builder, we suggest that the following approach be taken.

1. Once the right-of-way has been determined and marked in the field an archaeologist should conduct a survey of the proposed route of the access road and water conductor, and of the proposed locations of the powerhouse and weir.

2. The archaeologist should designate and mark the areas which are scientifically significant and rank them in order of archaeological sensitivity as well as in order of the estimated cost for mitigation of adverse effects through salvage excavations. The client should then be given the opportunity to relocate the right-of-way or alternatively to contract an archaeologist to conduct salvage excavations prior to construction.

3. The archaeologist should inspect the final right-of-way of the transmission line with particular attention to the specific locations of the powerline poles, so as to minimize the adverse effects of its construction on archaeological sites.

4. The archaeologist should, on a continuing basis, work in conjunction with the engineers and other appropriate representatives of the client to design the final construction route so as to best balance the client's interest in producing eco-

nomical electrical power with the requirements of applicable Federal, State and local statutes protecting significant archaeological and historical remains. Regular monitoring of the progress of the work should be an integral part of this conjunctive approach.

5. Archaeological excavations should be carried out in those sites or portions of sites which will be adversely impacted by construction activities.

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Appendix F

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REPORT ON THE VEGETATION AND FLORA OF THE PROPOSED PROJECT SITE AT WAINIHA, KAUAI

INTRODUCTION

This report is based on a walk-through survey of the site conducted on December 11, 1982. During this survey I was accompanied by Dr. A. J. Berger and Jack Hashimoto. Mr. Hashimoto's skills as a guide and his knowledge of the area made it much easier for me to conduct a thorough site survey in the time available. We walked from the site of the present dam at 700 feet along the floor of Wainiha Valley to the site of the proposed dam at about 1050 or 1100 feet elevation, and returned along the same route. In the process I made a fairly thorough survey of the valley floor, and was also able to survey the lower slopes of the valley sides using binoculars to aid in plant identification.

Our visit to the site was made 18 days after Hurricane Iwa, and the plants still showed the effects of wind damage. Some trees had been uprooted or broken, but the main damage in most species seemed to be loss or damage to leaves. This did open up the forest to some extent, and made observation of the lower slopes considerably easier. It is possible though not probable that we missed recording some of the less common species which may have been temporarily defoliated.

The report includes both a description of the vegetation types encountered, and a flora, or list of the plants found (Table 1).

VEGETATION

The valley bottom in all parts of the project area where there is a relatively flat or gently sloping floor shows evidence of having been used in the past for taro cultivation. The remains of rock walls defining the individual lo'i are clearly visible, and the vegetation is typical of what one would expect to find in such disturbed areas as abandoned taro patches in wet windward valleys. The vegetation on the lower slopes also suggests some past disturbance. This observation is consistent with recent archaeological studies which suggest that development of extensive field systems for taro cultivation often involved using fire as a land clearing tool. Consequently, the original vegetation was often destroyed or heavily disturbed on the slopes above the areas where the taro was actually grown. In any case, except for some of the steeper slopes in the southeast part of the site, upstream of the Gaging Station near Puwainui Falls, the entire project site seems to have undergone considerable disturbance and forest clearing in the past. This was at some later time followed by development of a new forest after cultivation of taro was abandoned, probably at some time during the 19th century.

Most of the old taro patches are covered today by a mixed forest dominated by 'ōhi'a lehua, guava, and kukui. Other scattered trees include pāpala, pāpala kepau, kalia, and kopiko. Vines of 'ie'ie, pi'oi, pi'ia, and koali 'awania are common. The ground cover is dominated by the hō'ī'o fern and a number of other ferns, grasses, and weedy herbs are present. The forest is basically a closed one, with a nearly continuous tree canopy. Throughout the area such formerly cultivated plants as taro, ti, banana, and 'awa still persist and are often encountered.

In some old taro patches, which apparently retain more water and are swampy, the forest is not developed. Instead there is an open low vegetation dominated by various grasses with honohono, kāmole, and the fern neke.

The lower slopes, extending some 200 to 500 feet above the valley floor, support a very open forest, dominated by scattered 'ōhi'a lehua and guava trees. The tree cover is typically 10% to 20%, and the other 80% to 90% of the slope is covered with the weedy fern uluhe. Along with the dominant trees, there are a few other widely scattered, less common trees, including sandalwood and lama.

Above the Gaging Station the valley narrows considerably. There seems to have been much less disturbance here. There is very little valley floor area, but what there is has a higher proportion of native species than the valley floor downstream. The forest on the slopes is more closed, as tree cover increases and the area occupied by uluhe fern decreases.

FLORA

Analysis of Table 1 shows that of the 88 species of higher plants (33 ferns and 55 flowering plants) found on the site, 47 (or 53%) are native to Hawaii while 41 (or 47%) were introduced to Hawaii by man. The high proportion of introduced species is an indication of past disturbance in the area. In such heavily disturbed areas one seldom encounters rare, threatened, or endangered plant species, and such is the case here.

SENSITIVE SPECIES

There are two sensitive plant species which should be considered in designing the project:

a) one lo'ulu palm (Pritchardia sp.) was found beside the trail at the Gaging Station at 960 feet elevation. It seems to belong to a species which has not yet been formally described in the scientific literature, but which was first discovered by scientists a few years ago in the neighboring Limahuli Valley. Until more is known about the distribution and numbers of plants in the species, I would suggest that it be treated as a sensitive species, and that any construction activities avoid the immediate vicinity of this tree.

b) one plant of an endemic Hawaiian lobelia (Cyanea sp.) was found within about 50 feet of the lo'ulu palm. The lobelia was not in flower, so the species to which it belongs could not be determined. Until it can be precisely identified it would be well to treat the lobelia, like the lo'ulu, as a sensitive species and to avoid damaging the single plant known in this area.

MITIGATION

With the two possible exceptions noted above, the flora was not found to contain any sensitive or rare species, or those likely to be considered for listing as endangered or threatened species in the near future. However, the integrity of the native ecosystem on the valley floor and slopes is greater above the Gaging Station than below it. In designing the project efforts should be made to avoid unnecessary or excessive disturbance in this upper area. Downstream of the Gaging Station both valley floor and lower slopes have been more greatly disturbed in the past, and the project design would not need to take into account the protection of any specific individual plants or species. However, it is assumed that construction of roads, penstocks, powerhouses, etc.,in this area would take into account the potential for soil erosion which would follow removal of vegetation in this area of steep slopes and high rainfall. In these downstream areas the greatest environmental effects of the project, as far as plants are concerned, would be the increased potential for soil erosion, and the probable increase of weedy plant species which well may spread into the area along access roads and other cleared areas.

TABLE 1. LIST OF PLANTS FROM PROJECT SITE, WAINIHA, KAUAI

BOTANICAL NAME	COMMON NAME	STATUS	ABUNDANCE
FERNS AND FERN ALLIES			
PSILOTACEAE			
Psilotum nudum (L.) Beauv.	moa	I	R
LYCOPODIACEAE			
Lycopodium phyllanthum H. & A.		I	R
SELAGINELLACEAE			
Selaginella arbuscula (Kaulf.) Spring		E	O
ADIANTACEAE			
Adiantum raddianum Presl	maidenhair fern	X	O
ASPLENIACEAE			
Asplenium contiguum Kaulf.		I	O
Asplenium nidus L.	birdsnest fern	I	R
ATHYRIACEAE			
Athyriopsis japonica (Thunb.) Ching		X	O
Athyrium macraei (H. & G.) Copel.		E	O
Diplazium sandwichianum (Presl) Diels	hō'ī'o	E	A
BLECHNACEAE			
Blechnum occidentale L.		X	O
Sadleria cyatheoides Kaulf.	ama'u	E	C
DENNSTAEDTIACEAE			
Microlepia strigosa (Thunb.) Presl	palapalai	I	O
DICKSONIACEAE			
Cibotium glaucum (J. Sm.) H. & A.	hapu'u	E	C
ELAPHOGLOSSACEAE			
Elaphoglossum aemulum (Kaulf.) Brack.	'ēkaha	E	C
Elaphoglossum alatum Gaud. var. crassicaule (Skottsb.) Anders. & Crosby	'ēkaha	E	C
Elaphoglossum crassifolium (Gaud.) Anders. & Crosby	'ēkaha	E	C

GLEICHENIACEAE			
Dicranopteris linearis (Burm.) Underw.	uluhe	I	A
GRAMMITACEAE			
Adenophorus tamariscinus (Kaulf.) H. & G.	wahine noho mauna	E	R
Grammitis tenella Kaulf.	kolokolo	E	O
HYMENOPHYLLACEAE			
Gonocormus minutus (Blume) van den Bosch		I	O
Mecodium recurvum (Gaud.) Copel.	'ōhi'a ku	E	O
LINDSAEACEAE			
Sphenomeris chinensis (L.) Maxon	pala'a	I	C
NEPHROLEPIDACEAE			
Nephrolepis exaltata (L.) Schott	'ōkupukupu	I	C
OPHIOGLOSSACEAE			
Ophioglossum pendulum L. ssp. falcatum (Presl) Clausen	lau kāhi	I	O
POLYPODIACEAE			
Microsorum spectrum (Kaulf.) Copel.	pe'ahi	E	C
Phlebodium aureum (L.) J. Sm.	lau'ae haole	X	O
Pleopeltis thunbergiana Kaulf.	'ēkaha'ākōlea	I	C
THELYPTERIDACEAE			
Christella cyatheoides (Kaulf.) Holtt.	kikawaiō	E	C
Christella dentata (Forsk.) Br. & Jer.	oak fern	X	C
Christella parasitica (L.) Lévl.	oak fern	X	O
Cyclosorus interruptus (Willd.) H. Ito	neke	I	C
Macrothelypteris torresiana (Gaud.) Ching		X	O
Pneumatopteris sandwicensis (Brack.) Holtt.	hō'ī'o kula	E	O
FLOWERING PLANTS - MONOCOTYLEDONS			
ARACEAE			
Colocasia esculenta (L.) Schott	taro	X-cult	C
COMMELINACEAE			
Commelina diffusa Burm. f.	honohono	X	C

CYPERACEAE			
Cyperus haspan L.		X	C
Cyperus polystachyus Rottb.		I	C
Machaerina angustifolia (Gaud.) Koyama	'uki	I	O
Scirpus sp.	bulrush	X(?)	R
DIOSCOREACEAE			
Dioscorea bulbifera L.	pi'oi	X	C
Dioscorea pentaphylla L.	pi'ia	X	C
GRAMINEAE			
Andropogon virginicus L.	broomsedge	X	O
Bambusa sp.	bamboo	X-cult	R
Brachiaria mutica (Forsk.) Stapf.	californiagrass	X	C
Coix lachryma-jobi L.	Job's tears	X	C
Oplismenus hirtellus (L.) Beauv.	basketgrass	X	C
Paspalum conjugatum Berg.	hilograss	X	C
Paspalum dilatatum Poir.	dallisgrass	X	O
Paspalum orbiculare Forst. f.	ricegrass	X	O
Sacciolepis indica (L.) Chase	glenwoodgrass	X	O
Setaria geniculata (Poir.) Beauv.	perennial foxtail	X	O
LILIACEAE			
Cordyline terminalis (L.) Kunth	ti	X	C
MUSACEAE			
Musa sp.	banana	X-cult	O
ORCHIDACEAE			
Spathoglottis plicata Bl.	Philippine ground orchid	X	O
PALMAE			
Pritchardia sp. (probably the still undescribed new species also known from Limahuli valley)	lo'ulu	E	R
PANDANACEAE			
Freycinetia arborea Gaud.	'ie'ie	E	C
ZINGIBERACEAE			
Hedychium sp.	white or yellow ginger	X	C
Zingiber zerumbet (L.) Roscoe in Sm.	'awapuhi kuahiwi	X	O

FLOWERING PLANTS - DICOTYLEDONS

AMARANTHACEAE			
Charpentiera ovata Gaud.	pāpala	E	R
COMPOSITAE			
Adenostemma lavenia (L.) Ktze.	kāmanamana	I	O
Ageratum conyzoides L.	ageratum	X	O
Erechtites valerianaefolia (Wolf)DC.	fireweed	X	O
CARYOPHYLLACEAE			
Drymaria cordata (L.) Willd. ex R.&S.	drymaria	X	C
CONVOLVULACEAE			
Ipomoea congesta R. Br.	koali'awania	I	C
EBENACEAE			
Diospyros ferrea (Willd.) Bakh. ssp. sandwicensis (A. DC.) Fosb.	lama	E	R
ELAEOCARPACEAE			
Elaeocarpus bifidus H. & A.	kalia	E	O
EUPHORBIACEAE			
Aleurites moluccana (L.) Willd.	kukui	X	A
Antidesma platyphyllum Mann	hame	E	O
GESNERIACEAE			
Cyrtandra sp.	cyrtandra	E	O
LOBELIACEAE			
Cyanea sp.		E	R
MORACEAE			
Morus sp.	mulberry	X-cult	R
MYRTACEAE			
Metrosideros collina (J.R. & G. Forst.) Gray ssp. polymorpha (Gaud.) Rock	'ōhi'a lehua	E	A
Psidium guajava L.	guava	X	A

NYCTAGINACEAE			
Pisonia umbellifera (J. R. & G. Forst.) Seem.	pāpala kēpau	I	C
ONAGRACEAE			
Ludwigia octivalvis (Jacq.) Raven	kāmole	X	O
PIPERACEAE			
Piper methysticum Forst. f.	'awa	X-cult	R
RUBIACEAE			
Gouldia terminalis (H. & A.) Hbd.	manono	E	O
Hedyotis sp.		E	R
Psychotria kaduana (C. & S.) Fosb.	kopiko	E	C
RUTACEAE			
Citrus sinensis (L.) Osbeck	orange	X-cult	R
SANTALACEAE			
Santalum pyrularium Gray	'ili ahi, sandalwood	E	O
UMBELLIFERAE			
Cryptotaenia canadensis (L.) DC.	honeywort	X	O
URTICACEAE			
Boehmeria grandis (H. & A.) Heller	akoka	E	O
Pipturus kauaiensis Heller	mamaki	E	O
Touchardia latifolia Gaud.	olonā	E	O
VERBENACEAE			
Lantana camara L.	lantana	X	O
Stachytarpheta jamaicensis (L.) Vahl	Jamaica vervain	X	O
ROSACEAE			
Rubus rosaefolius Sm.	thimbleberry	X	C

Plant names in this list are in accordance with H. St.John's 1973 "List and summary of the flowering plants in the Hawaiian Islands " (for flowering plants only), and with an unpublished checklist of Hawaiian ferns and fern allies prepared by C. H. Lamoureux.

Names are listed in three major plant groups:

- ferns and fern allies
- flowering plants - monocoty edons
- flowering plants - dicotyledons

Within each group names are listed by family, and within each family alphabetically by genus.

The biogeographic status of each species is indicated as follows:

E = endemic = native to the Hawaiian Islands only, not occurring naturally elsewhere

I = indigenous = native to the Hawaiian Islands and also to one or more other geographic areas

X = exotic or introduced = not native to the Hawaiian Islands; brought here by man, either intentionally or unintentionally

cult = cultivated = plants which grow in Hawaii only in cultivation or which have persisted after cultivation

The abundance of each species is indicated as follows:

A = abundant = dominant species, a major structural element of the vegetation

C = common = widespread and common, but not a dominant species in the community

O = occasional = here and there, often widely scattered, not forming a major component of the vegetation

R = rare = only a few individuals(or clumps) encountered (In this study, rare indicates that fewer than 10 individuals or clumps were seen)

Appendix G

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

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December 1, 1982

EDAW, INC.
1121 Nuuanu Avenue
Honolulu, Hawaii 96813

ATTENTION: Mr. Robert Kitchell

Gentlemen:

Subject: Wainiha Hydroelectric Project
Soil Reconnaissance Report
Wainiha Valley, Kauai, Hawaii

Transmitted herewith is our soil reconnaissance report for preliminary studies for the proposed Wainiha Hydroelectric project at Wainiha Valley, Kauai, Hawaii.

This report includes a preliminary review of the geology and soils of the area, geotechnical problems, drilling exploration methods, surficial mapping and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

By
Jerald W. Shumaker
Engineering Geologist

JWS:vl

WAINIHA HYDROELECTRIC PROJECT
SOIL RECONNAISSANCE REPORT

WAINIHA VALLEY, KAUAI, HAWAII

To:
EDAW, INC.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DECEMBER 1, 1982

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WAINIHA HYDROELECTRIC PROJECT
SOIL RECONNAISSANCE REPORT

WAINIHA VALLEY, KAUAI, HAWAII

SCOPE OF RECONNAISSANCE

The purpose of this reconnaissance study is to study the engineering feasibility of constructing a diversion dam on Wainiha River above Elev. 1,000 ft, a powerhouse site at about Elev. 740 ft, and an access road and water conductor system between the dam and powerhouse.

The scope of the study included a review and evaluation of available geologic, soil and topographic data and reports by others. This report includes a discussion of geotechnical problems such as site location, dam foundations, dam leakage, tunneling, slope excavations and drilling exploration methods for the dam and powerhouse sites.

The cost for surficial mapping of the sites are included in the costs for Task 3 which is given in a letter dated October 14, 1982.

DESCRIPTION OF PROJECT

The proposed plan is to construct a low diversion weir that will be located somewhere between Elev. 1,050 ft and Elev. 1,230 ft that will collect the water at its intake structure and conduct the flow through a penstock or tunnel along the westerly side of the river to the proposed powerhouse site which will be located about 2-1/2 miles downstream at about Elev. 740 ft.

An access road along the water conductor from the proposed powerhouse site to the diversion weir is also planned.

REGIONAL GEOLOGY

Kauai, the fourth largest of the eight major islands of the Hawaiian Archipelago, covers approximately 555 square miles. The island was formed by the activity of one large shield-shaped volcano. Kauai is one of the oldest and structurally the most complicated of the Hawaiian Islands.

Toward the end of the growth of the shield, its summit collapsed and formed a broad depression or caldera. Subsequent faulting and lava filling caused other collapses on the mountain. The well-defined, central depression of the Kauai caldera was approximately 10 to 12 miles across. The caldera-filling lavas are much thicker and more massive as a result of ponding than those flank flows that built the major portion of the shield.

The rocks of the major shield volcano are known as the Waimea Canyon Volcanic Series. The thin flows that accumulated on the flanks of the mountain are named the Napali formation of the Waimea Canyon Volcanic Series. The rocks that accumulated in the big summit caldera are named the Olokele formation of the Waimea Canyon Volcanic Series (see Figure 1).

After the completion of the great Kauai shield, during which no volcanic activity occurred, a long period of erosion formed thick soil over much of the mountain. Then, a new period of volcanism began that rests on the erosional unconformity. The eruptions occurred from a series of about 40 minor vents consisting of cinder cones, a tuff cone and some lava cones. This period of volcanism is known as the Koloa Volcanic Series.

Just before and during eruptions of the Koloa Volcanics, voluminous landslides and mudflows brought down large amounts of rock debris and soils from the steep slopes of the central uplands and deposited as breccias at the foot of steep slopes in the Valley Heads. The breccias and conglomerates thus formed are named the Palikea formation of the Koloa Volcanic Series which later buried the Palikea conglomerates.

Later, the stream valleys were eroded to base levels governed by different stands of the sea. As the sea rose inland around the island, the valley mouths were alluviated to as high as 250 ft above the present sea level.

SITE GEOLOGY

The Olokele formation of the Waimea Volcanic Series, that accumulated within the boundaries of the major caldera of the Kauai Shield Volcanic, ponded lavas to 4,000 ft or more above the present sea level.

Erosion has since destroyed the original surface but remnants are occupied by surrounding topographic features.

One of the most spectacular valleys in north-central Kauai is the Wainiha River gorge which is about 11 miles long, up to 3 miles wide and 2,000 to 3,000 ft deep along much of its length. The valley trends northwestward in the upper reaches but bends to the northeast where it crosses the north boundary of the main caldera (see Figure 2).

The Olokele formation pertains to the project site in this study.

The individual flows within the Olokele formation are much thicker and more massive than other lava flows of the Waimea Canyon Volcanic Series. The dips are low because of the ponding effect of the caldera walls. The dip may only be about 2 degrees northward in contrast to other flows which may dip 10 degrees to 15 degrees northward.

Only a few dikes intrude the Olokele formation but they are numerous in the Napali formation which accumulated on the flanks of the big caldera.

No well-developed dike complexes have been recognized but the few that have been found trend in a northwest-southwest strike with steep dips of 60 degrees or more towards the northeast. Near the center of the volcanic mass, the dikes may dip at low angles.

Many of the valley-filling flows show columnar jointing that are nearly vertical that may display a fan-like arrangement of the columns.

Some well-cemented conglomerates are probably correlative with the conglomerates of the Palikea formation. The breccias are angular to subangular rock fragments with an earthy matrix. They are so cemented that hammer blows break through the fragments that are composed of basalt rock derived from the Waimea Canyon Volcanic Series. Many of the conglomerates are well-founded cobbles and pebbles and restricted to narrow bands that represent old stream channels.

The breccias and conglomerates were of fluviatile origin and formed by rock falls, soil avalanches and mudflows rushing down the steep slopes of the central highlands.

The Olokele formation is generally poorly to moderately permeable, whereas, the lavas of the Napali formation are highly permeable. The thick-bedded flows of the Olokele formation have less clinker and other openings than the thinner lava flows so that their water bearing capacity is fairly low.

Locally, some perched water in flows of the Olokele formation may be held up by ash beds at high levels where it appears in small springs in the valley walls.

Dike cutting lava flows may form compartments to impound high-level ground water. The overflow is commonly seen in seeps and small springs that appear at notches cut in the dikes by streams. The capacity of an individual dike compartment is probably small.

GEOTECHNICAL PROBLEMS

Proposed Diversion Weir Sites

1. Water leakage and water storage

   In general, dams built on basalt flows experience high leakage because basaltic flows are generally very permeable. The exception to this is the massive flows like the caldera filling flows which are present in this section of Wainiha Valley. The Olokele formation is probably poorly permeable and leakage through the massive flows does not appear to be a serious problem when a dam is founded on rock and the dam is not designed for water storage of large volumes.

   If the dam is located partly on rock and partly on alluvial deposits of cobbles and boulders, leakage can be a factor if the bouldery material is very permeable.

   A few dikes appear to be located near some of the proposed dam sites. A dike may form a compartment to confine the ground water and lessen the possibility of ground water leakage.

   The dam site near Elev. 1,230± ft will be located upstream of at least two dikes and in a narrow valley bottom that has steep-walled sides. The water retention for this site could be very good because this site is probably all on exposed bedrock.

The dam site at Elev. 1,130± ft will be located between two dikes located in a narrow, steep-walled valley, and also, the water retention could be good if the bouldery material on the river bottom is grouted or removed and the dam founded on the bedrock surface.

The dam site at Elev. 1,060± ft will be located downstream of a dike and the valley bottom is not as narrow and has a flatter east side slope. The water retention is not expected to be as good as that for the two upstream sites.

For all of the above sites, we suggest that water packer tests be conducted during the drilling exploration phase to determine if water seepage is a problem above and below the normal stream level.

2. Dam foundation

A 12-ft high dam founded on the basalt bedrock will have a suitable foundation. A dam founded partly on rock and partly on bouldery alluvium would probably require grouting for the foundation support and to limit the seepage under the foundation.

A dam at Elev. 1,230± ft will probably be on hard rock.

A dam at Elev. 1,130± ft will have both abutments on hard rock and the rest of the dam on shallow(?) boulders in the river bottom.

A dam at Elev. 1,060± ft will probably have the west abutment on hard rock and the remainder of the dam on shallow to fairly deep alluvial deposits.

Foundation grouting of the boulder deposits may be required along the river bottom and some of the abutments.

A grouted rock-filled dam is suggested for the three dam sites. A concrete surface membrane could be used to create a watertight condition for the dam. Rock-fill material is available in the vicinity of the three dam sites.

3. <u>Dam width and storage requirements</u>

Because the width of the valley bottom is fairly narrow (generally less than 100 ft) and a low dam (generally less than 20 ft) is proposed, the volume for water storage may be a consideration to maintain any appreciable yield for the power requirement.

4. <u>Diversion of water during construction</u>

The valley bottoms at the three sites are narrow with relatively steep side walls. During construction, the low water flows can be diverted by some of the following methods:

   a. The two upper dam sites at Elev. 1,130 ft and Elev. 1,230 ft would probably need a tunnel through the west abutment that would act as a diversion conduit during construction and as an intake structure after the dam is completed.

b. At the lower dam site (Elev. 1,060 ft), the water may be diverted by a temporary cofferdam located along the east abutment and the water diverted into a closed or open conduit along the west abutment.

Also, a tunnel through the west abutment may be considered similar to that discussed above.

During high flood flows, the construction site would probably be flooded over.

Proposed Powerhouse Site

The proposed power plant site at about Elev. 740 ft is located near the existing dam and intake structure for the Wainiha Hydroelectric Plant.

The site is a bouldery alluvial terrace and situated approximately 15 to 20 ft above the river bottom.

Previous floods have probably inundated this area and consideration should be given to designing some kind of protection for the stream bank and the channelization of high river flows away from the site. The finished elevation of the site should be reviewed for possible flood damage.

The plant building foundations may require some grouting depending on the results of the drilling exploration.

SLOPE MAPPING AND EXCAVATION

Along the river bottom at the dam sites, the rock and boulders are well exposed. The access road and water conductor alignments are generally covered by dense tropical vegetation. Portions of the alignment are inaccessible due to dense vegetation and steep slopes. The powerhouse site has some grass and dense brush cover but the river bank along the site is exposed.

Natural side slopes of about 0.8:1, 1:1 and 1-1/2:1 were estimated from a U.S.G.S. Quadrangle Map of the area. Most of the slopes would probably average about 1:1 (1 horizontal to 1 vertical).

Slopes of 1:1 or steeper probably are indicative of rock or rocky material in the valley walls. This should be favorable for tunneling or designing fairly steep slopes where sidehill excavations are proposed.

Where the slopes are flatter, say 1-1/2:1, the rock is probably weathered or interbedded with ash or clinkery materials. Talus slopes will probably exist at slopes of 1-1/2:1 or flatter. Sidehill cuts and tunneling in these formations may be more prone to sliding and caving problems than in the dense massive flows.

More detailed mapping should be done after the color stereographic aerial photos and the topographic mapping have been completed (see Figure 3 for a preliminary soils map of the area).

For the preliminary deqign studies and cost estimates, the cuts in dense hard rock may be at 1/4:1 with 8-ft wide benches at about a height interval of 40 ft which would give an average overall slope of 1/2:1.

Cuts in weathered or stratified rock may be at 3/4:1 with 8-ft wide benches at 40-ft intervals which would make an overall slope of about 1:1.

Cuts in talus may be at 1:1 or flatter with 8-ft wide benches and an overall slope of 1-1/2:1.

Localized slumping, sliding or rock falls should be expected in the steep cut slopes given above during the first few years after construction and particularly during rainstorms.

Maintenance and repairs should be a design consideration.

TUNNELING

Because of the steep-walled sides of the river valley, tunnels will be mostly through hard dense rock or rocky material. Also, the tunneling may, in some cases, cross through stratified deposits of basaltic rock and clinker with some sections entirely through clinker, ash or conglomerate deposits.

Some water seepage problems are anticipated during construction, but should not be of major concern since only a few scattered dikes to confine the water are known between the dam sites and the powerhouse site. Wet tunneling conditions should be expected and the water problem will probably be greatest where the tunnel crosses upstream of a dike formation.

Water seepage and losses through the floor of the water conductor tunnel could be a concern if the basaltic rock formation or conglomerate deposits are porous. Some tunnel lining with shotcrete should be considered at the portals and also for short sections of tunnel where rockfalls from the roof could interrupt water flows in the tunnel.

EXISTING WAINIHA INTAKE AT DIVERSION WEIR

After reviewing some of Doak Cox's data, the following is a general summary of his work which is downstream from the general area where the new powerhouse is proposed at about Elev. 740 ft.

He defines three types of gravels in Wainiha Valley: namely; the oldest, the Palikea conglomerate, later deposition of an older gravel and the recent younger gravel. Each of the three types varies greatly in degree of consolidation and weathering and may be hard to distinguish between each other.

The latter two are evident at the proposed new powerhouse site and the Palikea conglomerate is probably a few hundred feet downstream (see Figure 4).

The older gravel probably extends about 50 ft from the westerly bank of the river and about 25 ft above the present stream level to the Pali at the southwest side of the valley.

The older gravel is about 40 ft thick as indicated from a drill hole made through the gravel into underlying lava rock.

Two holes drilled near the river penetrated the younger surface gravel for about 32 ft before entering the lava rock formation.

The water level in the older gravel terrace is several feet higher than the river level with a saturated width of about 170 ft and an average thickness of about 20 ft.

Cox's study indicated very little water flow through the older gravel but large amounts could flow through the recent gravel deposits.

He also believes a large fault may cross Wainiha River near Elev. 500 ft. The proposed powerhouse site is located about 1 mile south of the area at Elev. 740 ft.

DRILLING EXPLORATION

Powerhouse Site (About Elev. 740 Ft)

We propose to drill the alluvial terrace site with a truck-mounted drill to a depth of about 60 ft. From previous explorations in the area, the dense lava rock is anticipated at about 40 to 50-ft depths. We would core drill into the hard rock a minimum of 15 ft.

Estimated drilling rates for the powerhouse site are:

Unconsolidated and consolidated
cobbles and boulders . . . . 10 to 15 ft per day.

Basalt flows . . . . 25 ft per day.

For a 60-ft boring, we estimate about 3-1/2 days per hole.

Diversion Weir

Three possible sites are under consideration. All of these sites would require helicopter lifts for the men and equipment (see Figure 5).

Site No. 1

Site near Elev. 1,200 ft where lava rock is exposed along the entire length of the dam foundation.

A small portable Concore drill rig or a slightly larger skid mounted Acker drill rig would be airlifted and set-up where a fairly level surface can be located or a level platform built to work from.

Drilling at this site is assumed to be rock coring.

A drilling rate of about 15 ft per day is estimated. For 2 holes to about 30 ft each, the drilling would be about 5 days which includes the set-up time.

Also, some refraction seismic velocity curves could be done on the banks of the river to supplement the borings. Another day should be added for this work.

Site No. 2

Site near Elev. 1,130 ft where hard rock is exposed on both steep banks and the river bottom is covered with cobbles and large boulders.

If the banks are drilled, the same drill requirements as discussed for Site No. 1 would apply. The borings would be deeper, say 50 ft, so each boring would require about 3 days.

The only feasible method to adequately explore the river bottom would be to mount the small Concore drill on a portable floating raft platform. A 30-ft boring should be sufficient to explore the unconsolidated material and locate the rock surface by coring about 15 ft into the basalt flows.

Estimated drill rates from a floating raft for Site No. 2 are:

Unconsolidated cobbles and boulders . . . . 10 ft per day.

Basalt flows . . . . 15 ft per day.

For a 30-ft boring, we estimate the drilling and set-up time, about 4 days.

Also, refraction seismic velocity curves could be done behind the steep rock banks to correlate with the borings.

About 1-1/2 days should be added for the seismic work.

Site No. 3

Site near Elev. 1,060 ft where hard rock is exposed on one bank of the river and cobbles and large boulders cover the other bank and river bottom.

The bank and river bottom in alluvium would probably be each drilled to about 40-ft depths or a minimum of 15 ft into hard rock. The Acker drill would probably be used at this site. A scaffold or drill platform could probably be located over the boulders in the river.

The west bank where hard rock is exposed could be explored with the refraction seismic method.

Estimated drill rates for Site No. 3 are:

Unconsolidated cobbles and boulders	10 ft per day.
Basalt flows	15 ft per day.

For each 40-ft boring in alluvium and hard rock, we estimate about 3 days per hole.

The refraction seismic work would take an additional day.

Mapping

The mapping of the diversion weir and powerhouse sites would be done in the field after the color stereographic photographs and topographic maps are available.

The access road and water conductor alignment between the weir and the powerhouse sites would be mapped both from aerial photographs and spot field checks depending on the access over the steep terrain and the ability to visually observe surface features in the dense vegetative cover.

SEISMICITY

The strongest earthquake in historic times in the islands occurred April 2, 1968 and was centered along the Big Island's south coast. This earthquake had a Richter magnitude of about 7.5 and caused serious damage across the entire island even stopping clocks as far away as Honolulu. Practically all earthquakes on the islands of Hawaii and Maui are associated with intermittent volcanic activity. Potential earthquakes on Kauai can be caused by deep-seated tectonic forces and not from the indirect action of volcanic activity. Recent explorations by geophysical methods show that faults and rift zones cut through the major islands and that these faults are branches of a gigantic fracture system known as the Molokai Fracture Zone.

The magnitude of Hawaiian earthquakes was not routinely determined locally until 1958. Prior to that, magnitudes of large earthquakes were measured by seismograph stations on continental United States, usually by those at the University of California at Berkeley and Columbia University, from their own seismograms.

The Uniform Building Code and the Corps of Engineers Manual EM 1110-2-106 assign a Zone 0 seismic risk rating for Kauai for design consideration. Zone 0 is described as no damage resulting from an intensity earthquake on the abridged Modified-Mercalli scale of three. The equivalent Richter scale is a magnitude of 3.5 to 4.2.

The earthquake potential in the area may be insignificant. For this study, seismic coefficients of 0 for Zone 0 and 0.025 for Zone 1 could be a consideration.

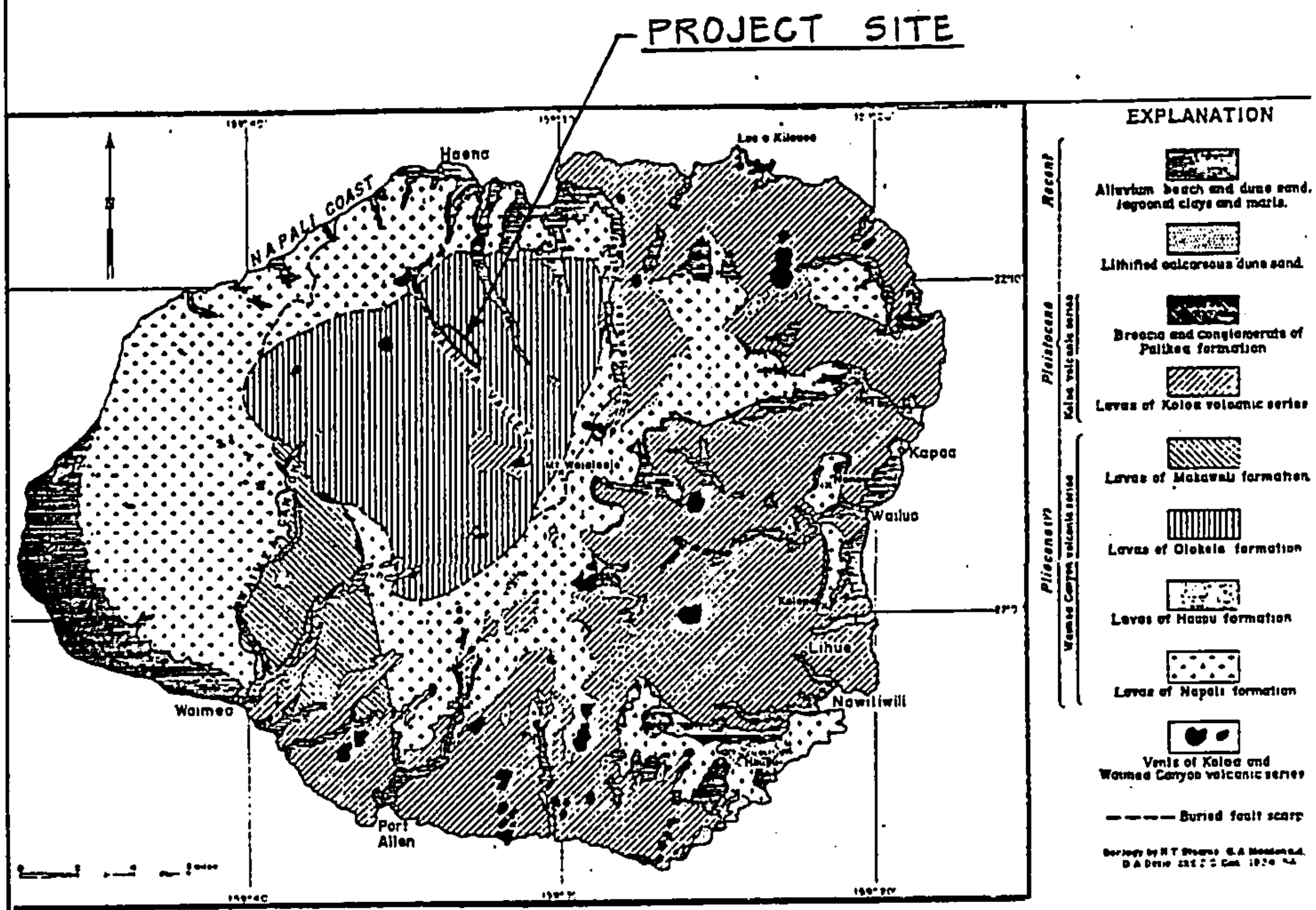


FIGURE 1

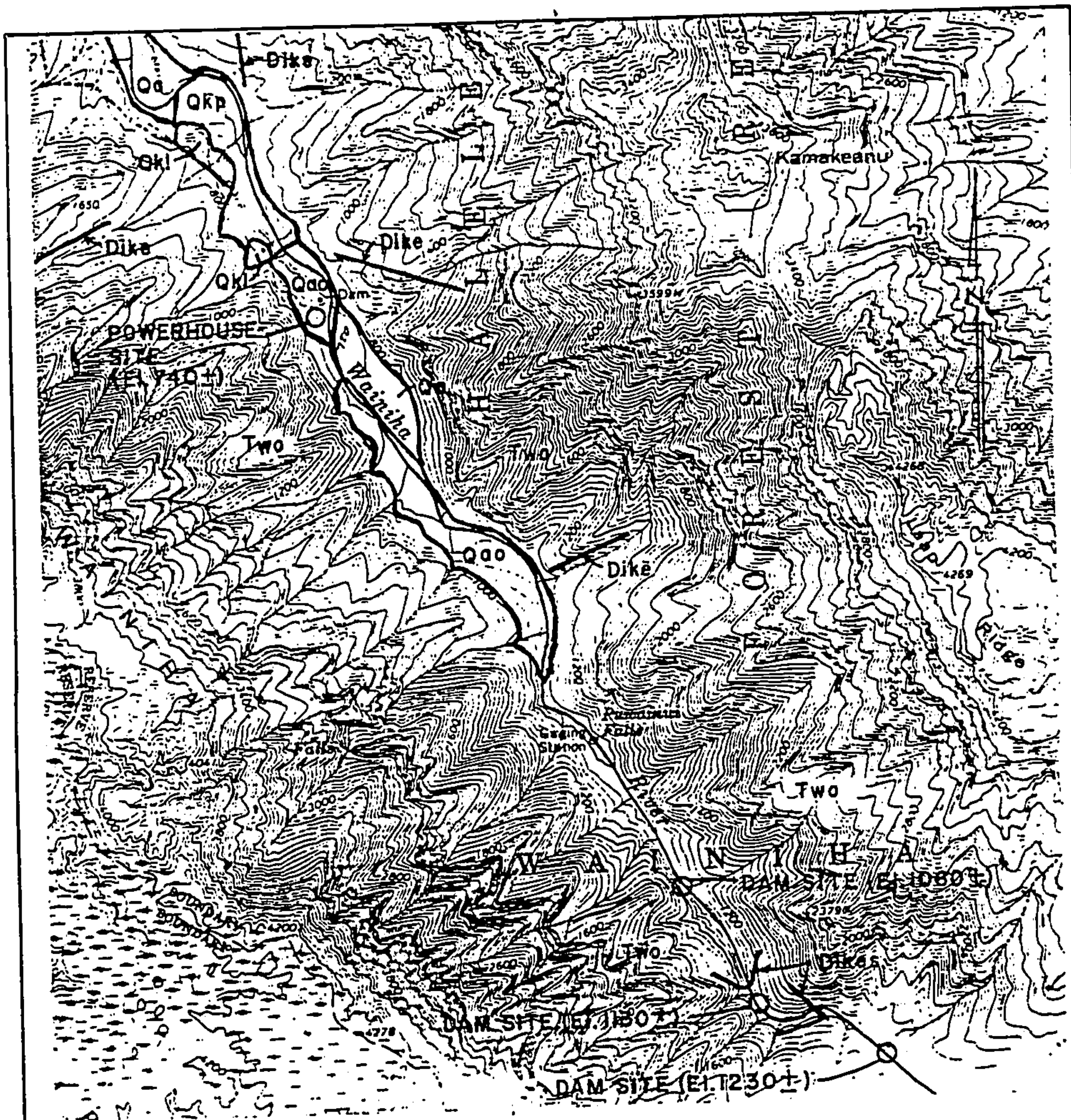
REGIONAL GEOLOGY MAP

WAINIHA HYDROELECTRIC PROJECT

WAINIHA VALLEY, KAUAI, HAWAII

WALTER LUM ASSOCIATES, INC.

CIVIL, STRUCTURAL, SOILS ENGINEERS



LEGEND

Qa ☐ YOUNGER NON-CALCAREOUS SEDIMENTS
Unconsolidated alluvium

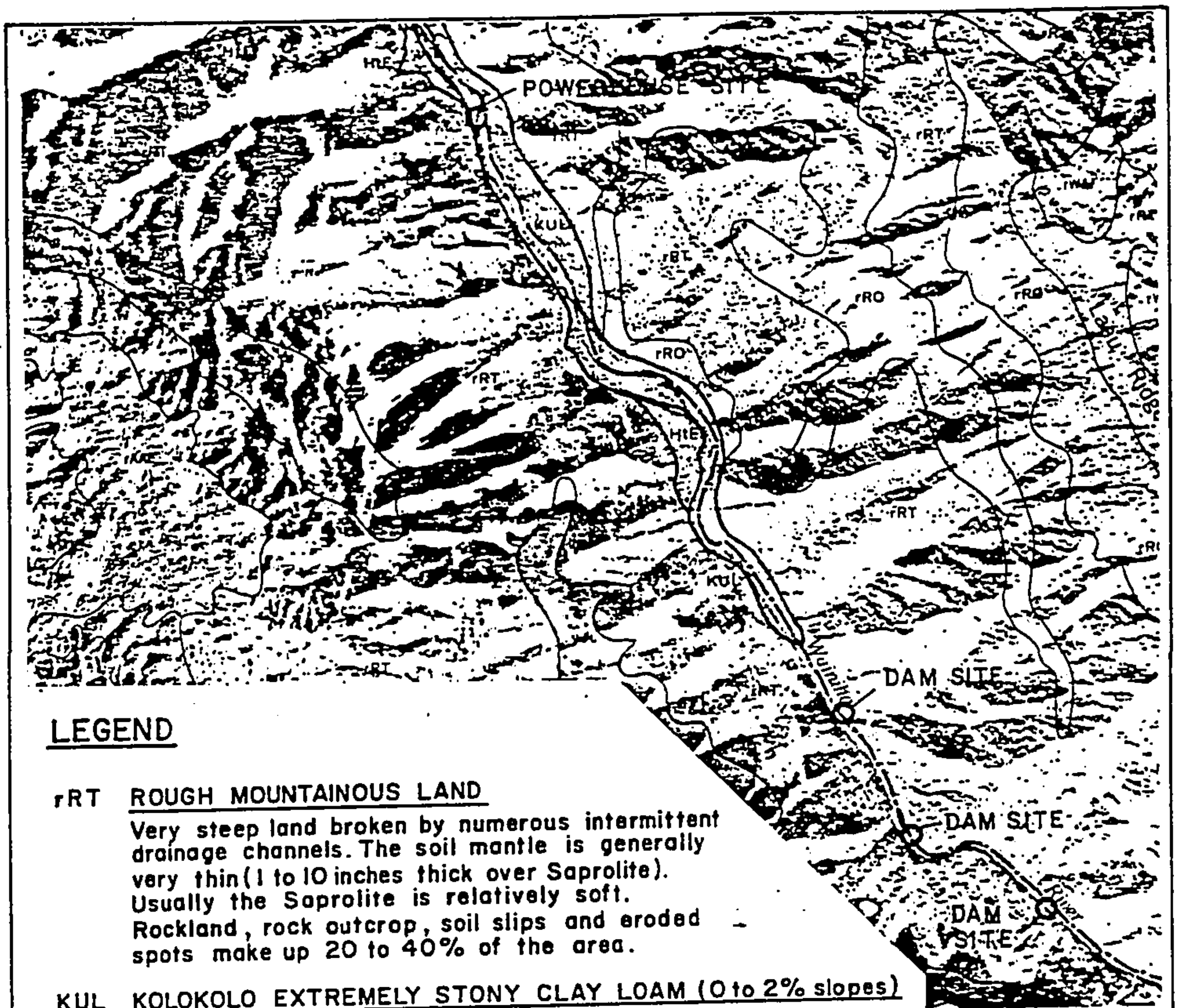
Qao ☐ OLDER NON-CALCAREOUS SEDIMENTS
Poorly to moderately well consolidated alluvium

Qkl ☐ KOLOA VOLCANIC SERIES
Lava flows erupted from vents

Qkp ☐ KOLOA VOLCANIC SERIES
Palikea formation - masses of breccia and beds of conglomerate

Two ☐ WAIMEA VOLCANIC SERIES
Olokele formation - consists of thick flows of basalt accumulated in a broad caldera at the summit of the shield

FIGURE 2
SITE GEOLOGY MAP
WAINIHA HYDRO-ELECTRIC PROJECT
WAINIHA VALLEY, KAUAI, HAWAII
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS



LEGEND

rRT ROUGH MOUNTAINOUS LAND

Very steep land broken by numerous intermittent drainage channels. The soil mantle is generally very thin (1 to 10 inches thick over Saprolite). Usually the Saprolite is relatively soft. Rockland, rock outcrop, soil slips and eroded spots make up 20 to 40% of the area.

KUL KOLOKOLO EXTREMELY STONY CLAY LOAM (0 to 2% slopes)

Well-drained soils on stream bottoms. The soils developed in alluvium washed from upland soils the soil is extremely stony and subject to damaging overflow. Some areas are very bouldery. The surface layers are about 60 inches thick over stratified alluvium.
Shrink-Swell potential - Moderate
USC - MH

HtE HANAMAULU STONY SILTY CLAY (10 to 35% slopes)

Well-drained soils on stream terraces and steep terrace breaks. The soils developed in alluvium washed from upland soils. The sub soil is about 60 inches thick over a substratum consisting of weathered pebbles, stones and boulders.
Erosion hazard - Moderate to severe
Shrink-Swell potential - Low
USC - MH

* MAP REPRODUCED FROM THE "SOIL SURVEY OF ISLANDS OF KAUAI, OAHU, MAUI, MOLOKAI AND LANAI, STATE OF HAWAII BY USDA, SOIL CONSERVATION SERVICE, AUG., 1972

FIGURE 3
SOILS RECONNAISSANCE MAP*
WAINIHA HYDROELECTRIC PROJECT
WAINIHA VALLEY, KAUAI, HAWAII

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

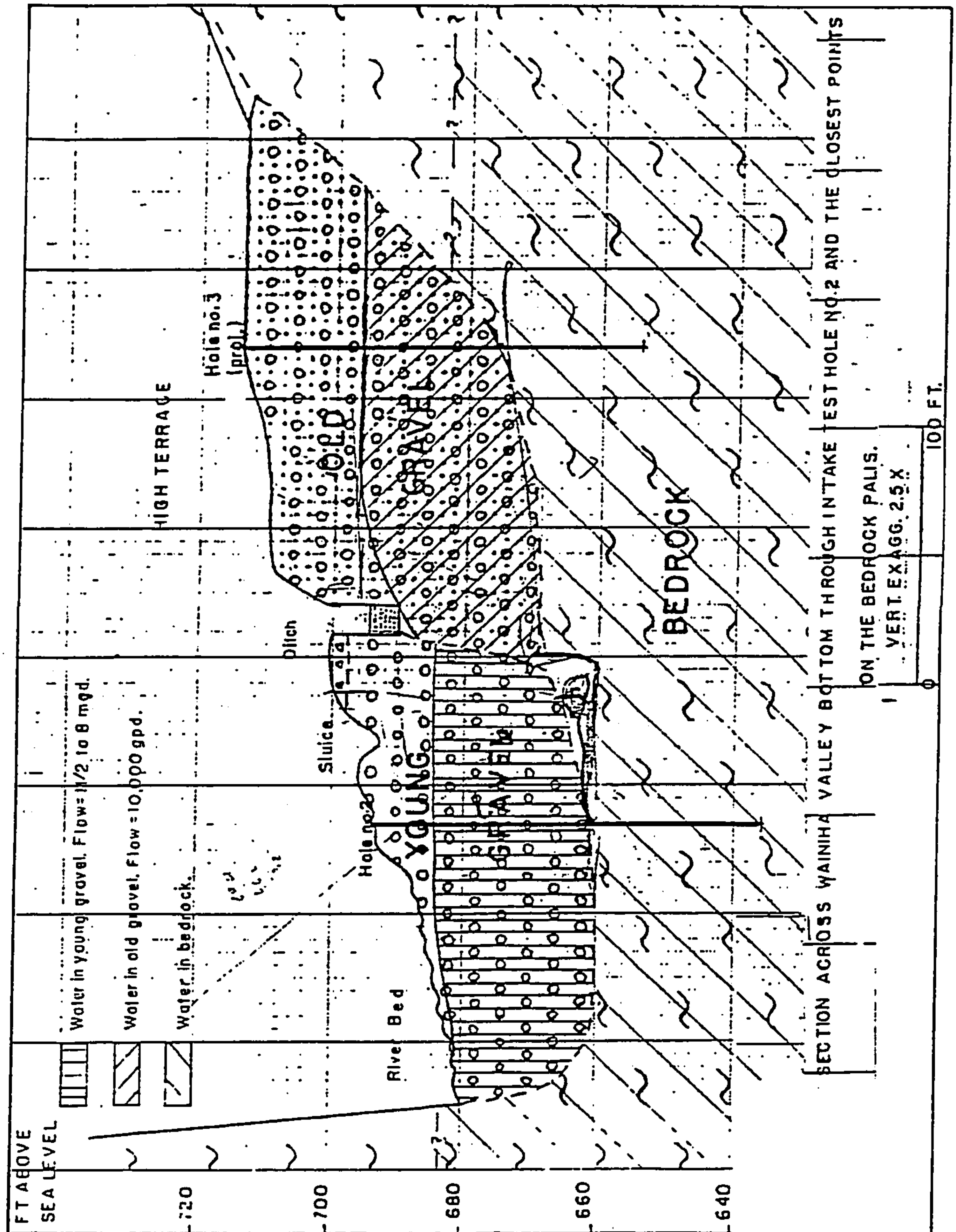


FIGURE 4

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

CROSS-SECTION FROM DOAK COX'S "WAINIHA INTAKE UNDERFLOW" REPORT, SEPT. '52
WAINIHA HYDROELECTRIC PROJECT
WAINIHA VALLEY, KAUAI, HAWAII

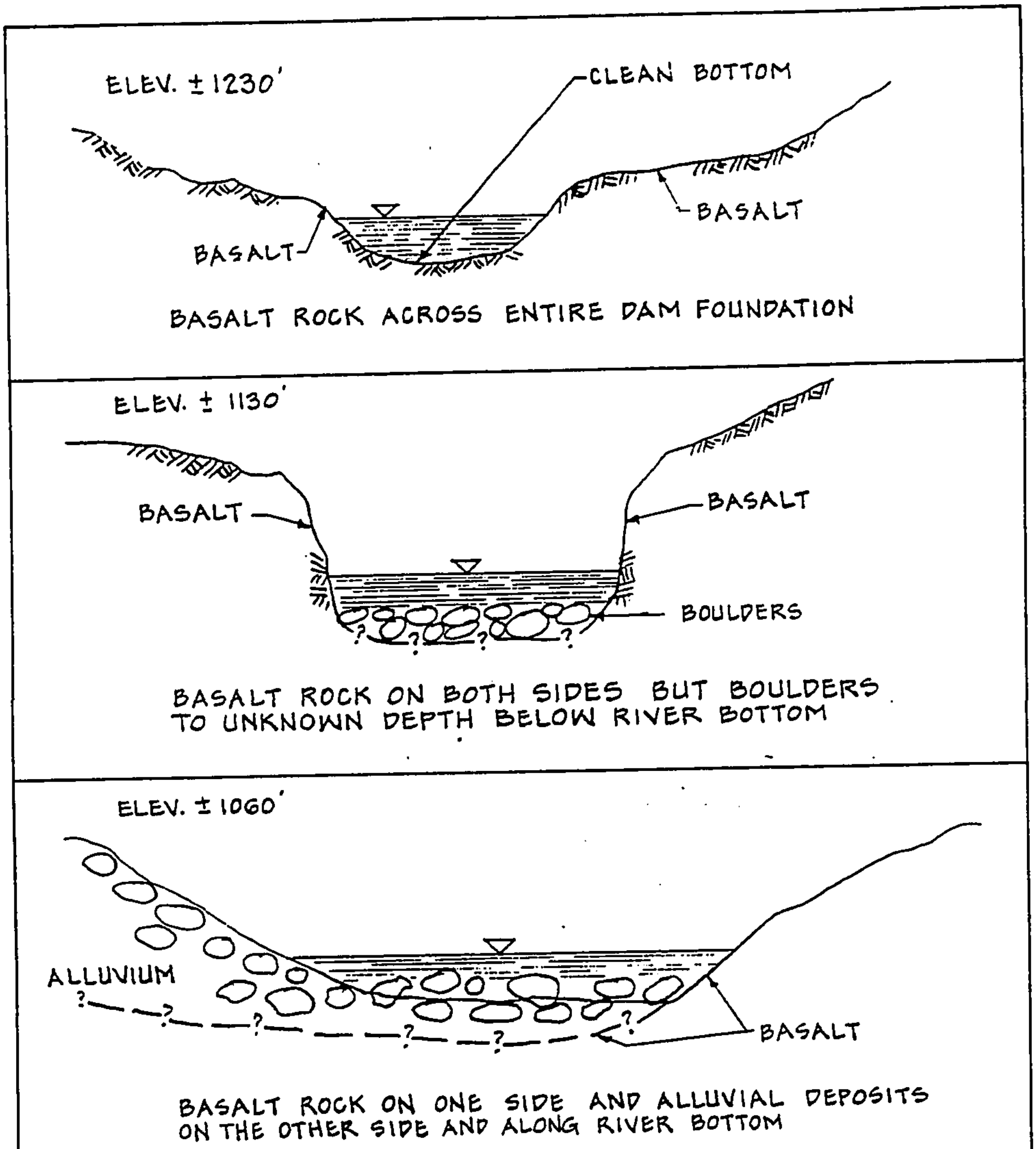


FIGURE 5
ESTIMATED WEIR SITE CONDITIONS
WAINIHA HYDROELECTIC PROJECT
WAINIHA VALLEY, KAUAI, HAWAII
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The estimated soil conditions are based on visual observations at the site at about the time of this report and may not represent conditions at other locations, or at other dates. Soil conditions and water levels may change with the weather, passage of time, construction methods, improvements or changes at the site.

Should soil conditions much different from our estimates be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

This soil reconnaissance report was prepared only for preliminary studies of the site. If there is a substantial lapse of time between the submission of this report and the start of design studies at the site, or if conditions have changed due to natural causes, plan changes, or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the recommendations considering the time lapse, changed conditions, and changes in the practice of soil engineering.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted soil engineering practices. This is in lieu of all other warranties expressed or implied.

Appendix H

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF. NO.: CPO-2295
FILE NO.: KA-1/10/83-1545

Mr. Randall J. Hee,
Engineering Superintendent
McBryde Sugar Company, Ltd.
P. O. Box 8
Eleele, Kauai, HI 96705

Dear Mr. Hee:

Thank you for your letter of June 27, 1983 relating to the Draft Environmental Impact Statement for the Wainiha Hydroelectric Project and in particular the concerns raised in our response dated June 22, 1983.

While the Department does not have any specific programs for the continuous monitoring of stream fauna in the State, the Department however is mandated under Chapter 171-3 of the Hawaii Revised Statutes to "manage, administer and exercise control over public lands, the water resource, and minerals... The Department shall also manage and administer the State parks, historic sites, forest, fish and game reserves of the State, ...".

Although we have in our hands some unpublished data of a survey of Goby populations of various streams on Kauai, a review of our files does not indicate any formal request made by McBryde Sugar Company or EDAW, your consultant to the department for such information. We understand the concerns government agencies have regarding the impact your project may have on stream fauna and we are more than happy to share our knowledge and information with you.

Enclosed please find a copy of the unpublished data mentioned entitled "Survey of Goby (O'opu Nakea) Populations in the Waimea River, Hanalei River, Wainiha River and Hanakapiai Stream, Kauai, March 9-11, 1970." I hope that the additional information will help you to evaluate the environmental impact and preparation of the Final Environmental Impact Statement. Should you have any questions, please don't hesitate to contact Anne Lo-Shimazu at 548-7837.

Yours very truly,

SUSUMU ONO, Chairman
Board of Land and Natural Resources

Attachments

cc: Div. of Aquatic Resources

Survey of Goby (O'opu Nakea) Populations in the Waimea River, Hanalei River, Wainiha River and Hanakapiai Stream, Kauai, March 9-11, 1970

WAIMEA RIVER - 3/9/70, Stream condition very low

Station 1. Kekaha Ditch crossing: Pool: 50' x 104' (T.L.= 500')

Nakea as follows:
0-3"---33 fish
3-6"---35 "
6-9"--- 6 "
74 fish/5,200 sq. ft.
or 14.2 fish/1000 sq. ft.

Other Species:
1) swordtail ---many
2) tilapia -----6 (7")

Station 2. 1½ mile below Powerhouse. Pool: 25' x 118'

Nakea as follows:
0-3"---80 fish
3-6"---44 "
6-9"--- 8 "
132 fish/2,950 sq. ft.
or 44.7 fish/1000 sq. ft.

Other Species:
1) swordtail---12 large

Station 3. Foot of Kukui Trail. Pool: 30' x 134'

Nakea as follows:
0-3"---3 fish
3-6"---2 "
6-9"---3 "
9-12"--1 "
9 fish/4,020 sq. ft.
or 2.2 fish/1000 sq. ft.

Other Species:
1) dojo---(2=8"
(3=very large

Station 4. Upper USGS gaging station. Pool: 30' x 128'

Nakea as follows:
0-3"---9 fish
3-6"---4 "
6-9"---4 "
9-12"--1 "
18 fish/3,840 sq. ft.
or 4.6 fish/1000 sq. ft.

Other Species:
None

Station 5. Above Poomau Falls. Pool: 18' x 86'

No Fish

HANALEI RIVER - 3/9/70, Stream condition very low

Station 1. Lower USGS gaging station. Pool: 40' x 230'

Nakea as follows:
0-3"---4 fish
3-6"--11 "
15 fish/9,200 sq. ft.
or 1.6 fish/1000 sq. ft.

Other species:
1) M. lar---fair
2) swordtail--fair
3) aholehole--few
4) akupa--few
5) anihaniha--abundant
6) tilapia--few (very lge.)

Station 2. Midway between stations 1 and 3. Pool: 50' x 260'

Nakea as follows:
0-3"---42 fish
3-6"---58 "
6-9"---37 "
137 fish/13,000 sq. ft.
or 10.5 fish/sq. ft.

Other species:
1) M. lar---many

Station 3. 1/2 mile below Kaapoko Stream. Pool: 24' x 164'

Nakea as follows:
0-3"---6 fish
3-6"--17 "
6-9"--12 "
35 fish/3,936 sq. ft.
or 8.8 fish/1000 sq. ft.

Other species:
1) nopili--few
2) M. lar--many; all sizes

WAINIHA RIVER - 3/10/70, Stream condition very low

Station 1. Head of estuary. 40' x 100' section

Nakea as follows:
0-3"---6 fish
3-6"--12 "
6-9"---2 "
20 fish/4,000 sq. ft.
or 5.0 fish/1000 sq. ft.

Other species:
1) anihaniha---few
2) nopili---few
3) hinana (aniha)--few
4) aholehole--few
5) mullet--1 fish
6) swordtail--few

Station 2.

Not Surveyed

Station 3. Pool: 25' x 195'

Nakea as follows:	Other species:
0-3"---82 fish	1) akupa---few
3-6"---72 "	2) anihaniha--few
6-9"---33 "	3) nopili--few
9-12"-- 1 "	4) swordtail--abundant
188 fish/4,875 sq. ft.	
or 38.5 fish/1000 sq. ft.	

Station 4. Pool: 24' x 82' (Pali Pool)

Nakea as follows:	Other species:
0-3"---14 fish	1) nopili---few
3-6"---48 "	
6-9"---22 "	
9-12"-- 1 "	
85 fish/1,968 sq. ft.	
or 43.1 fish/1000 sq. ft.	

Station 5. Pool: 20' x 124' (Mauna Hina)

Nakea as follows:	Other species:
3-6"---11 fish	1) nopili---few
6-9"---20 "	
9-12"-- 1 "	
32 fish/2,480 sq. ft.	
or 12.9 fish/1000 sq. ft.	

Station 6. Pool: 20' x 164', 1/2 mile below upper intake

Nakea as follows:	Other species:
0-3"---2 fish	1) nopili---few
3-6"---4 "	
6-9"--11 "	
9-12"-13 "	
12-15"- 1 "	
31 fish/3,280 sq. ft.	
or 9.4 fish/1000 sq. ft.	

Station 7. Pool: 20' x 62', 1/2 mile above upper intake

Nakea as follows:	Other species:
9-12"---1 fish	1) nopili---few
1 fish/1,240 sq. ft.	
or 0.8 fish/1000 sq. ft.	

Station 8. Pool: 30' x 135', USGS gaging station

Nakea as follows:
0-3"---2 fish
3-6"---4 "
6-9"---4 "
9-12"--6 "
16 fish/4,050 sq. ft.
or 3.9 fish/1000 sq. ft.

Other species:
1) nopili---few

HANAKAPIAI STREAM - 3/11/70, moderately low water condition

Station 1. Pool: 15' x 98', 300 yards from mouth

Nakea as follows:
0-3"---26 fish
3-6"---18 "
6-9"---12 "
9-12"-- 1 "
12-15"-- 1 "
58 fish/1,470 sq. ft.
or 39.4 fish/1000 sq. ft.

Other species:
1) nopili---abundant
2) wi---abundant
3) grandimanus---abundant

Station 2. Pool: 18' x 62', Loop Trail crossing

Nakea as follows:
0-3"---40 fish
3-6"---10 "
6-9"--- 2 "
52 fish/1,116 sq. ft.
or 46.5 fish/1000 sq. ft.

Other species:
1) nopili---abundant
2) wi---fair

Station 3. Pool: 25' x 100', 1½ mile from stream mouth

Nakea as follows:
0-3"---30 fish
3-6"---13 "
6-9"--- 6 "
49 fish/2,500 sq. ft.
or 19.6 fish/1000 sq. ft.

Other species:
1) nopili---abundant

1970 KAUAI GOBY (NAKEA) SURVEY

RIVER AND DATE	STATION NUMBER	DISTANCE ABOVE RIVER MOUTH (MILES)	ELEVATION ABOVE SEA LEVEL (FEET)	NO. NAKED PER 1000 SQ FT.
WAIMEA 3/9/70	1	4 1/4	40	14.2
	2	7 1/4	400	44.7
	3	10	650	2.2
	4	11 1/2	840	4.6
	5	13 3/4	1380	NO FISH
HANALEI 3/9/70	1	5	35	1.6
	2	8	240	10.5
	3	10 3/4	600	8.8
HANAKAPIAI 3/11/70	1	1/8	60	39.4
	2	1	400	46.5
	3	1 1/2	600	19.6

Comparison of the O'opu Nakea Population in Wainiha River
1953 and 1970

Station Number	1953 (July and December) Distance Above River Mouth (Miles)	Elevation Above Sea Level (Feet)	Number O'opu Nakea Per 1000 Sq. Ft.	1970 (March) Number O'opu Nakea Per 1000 Sq. Ft.	Percent Increase or Decrease
1	0	2	1.8	5.0	+ 277.7
2	3/4	25	~~25.1~~	--	--
3	1-1/2	75	54.6	38.5	- 29.5
4	2-1/4	150	68.3	43.1	- 36.9
5	3	300	31.3	12.9	- 58.8
6	3-3/4	550	23.3	9.4	- 59.7
7	4-1/2	700	9.6	0.8	- 91.7
8	5-1/4	850	8.2	3.9	- 52.5
		TOTALS:	197.1	113.6	

(Sta. #2 omitted)
Net Decrease: 82.5 fish or 42.4%

Summarized Results of Goby (O'opu Nakea) Survey
in the Waimea River, Hanalei River and
Hanakapiai Stream, Kauai, March 9-11, 1970

River and Date	Station Number	Distance Above River Mouth (Miles)	Elevation Above Sea Level (Feet)	No. Nakea Per 1000 Sq. Ft.
Waimea 3/9/70	1	4-1/4	40	14.2
	2	7-1/4	400	44.7
	3	10	650	2.2
	4	11-1/2	840	4.6
	5	13-3/4	1380	No Fish
Hanalei 3/9/70	1	5	35	1.6
	2	8	240	10.5
	3	10-3/4	600	8.8
Hanakapiai 3/11/70	1	1/8	60	39.4
	2	1	400	46.5
	3	1-1/2	600	19.6

Appendix

COMMENTS AND RESPONSES DURING REVIEW PERIOD

The comment letters and responses are in the following sequence:

1. U.S. Coast Guard
2. State of Hawaii Department of Defense
3. State of Hawaii Department of Agriculture
4. U.S. Air Force
5. U.S. Army, Directorate of Facilities Engineering
6. County of Kauai Department of Water
7. U.S. Navy
8. State of Hawaii Department of Accounting and General Services
9. Kekaha Sugar Company, Ltd.
10. University of Hawaii Water Resources Research Center
11. U.S. Geological Survey
12. State of Hawaii Office of Environmental Quality Control
13. U.S. Soil Conservation Service
14. State of Hawaii Department of Health
15. State of Hawaii Department of Transportation
16. U.S. Fish and Wildlife Service
17. University of Hawaii Environmental Center
18. Life of the Land
19. State of Hawaii Department of Land and Natural Resources
20. U.S. Army Corps of Engineers
21. State of Hawaii Department of Planning and Economic Development
22. Citizens Utilities Company, Kauai Electric Division

Note that there is more than one correspondence for some of the agencies and organizations listed above.

U.S. Department of Transportation
United States Coast Guard

Commander (dpl)
Fourteenth Coast Guard District

Prince Kalanianaole Federal Building
300 Ala Moana Blvd.
Honolulu, Hawaii 96850
Phone: 546-2861

11000
Serial 551
26 May 1983

Susumu Ono, Chariman
Board of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

The Fourteenth Coast Guard District has reviewed the Environmental Impact Statement on the Wainiha Hydroelectric Project in Kauai and has no objection or constructive comments to offer at the present time.

Sincerely,

J. E. SCHWARTZ
Commander, U. S. Coast Guard
District Planning Officer
By direction of
Commander, Fourteenth Coast Guard District

Copy: Mr. Randall J. Hee

McBryde
SUGAR COMPANY, LIMITED

June 3, 1983

J. E. Schwartz
Commander, U.S. Coast Guard
District Planning Officer
Prince Kalaniaole Federal Building
300 Ala Moana Blvd.
Honolulu, Hawaii 96850

Dear Commander Schwartz:

This acknowledges receipt of a copy of your letter dated 26 May 1983 to Mr. Susumo Ono concerning our Wainiha Hydroelectric Project.

Thank you for reviewing our Environmental Impact Statement and your interest in our project.

Please feel free to contact me if you have any questions concerning the project.

Sincerely,

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RJH:jm

cc: EDAW, Inc.
1121 Nuuanu Avenue
Suite 203
Honolulu, Hawaii 96817

#0321A
Diskette #0002A

RECEIVED
JUN 2 1983
EDAW Inc.

State of Hawaii
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 Diamond Head Road
Honolulu, Hawaii 96816

3 1 MAY 1983

HIENG

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Wainiha Hydroelectric Project

Thank you for providing us the opportunity to review your proposed project, "Wainiha Hydroelectric Project" Environmental Impact Statement.

We have completed our review and have no comments to offer at this time.

Yours truly,

JERRY M. MATSUDA
Captain, HANG
Contr & Engr Officer

cc: Mr. Randall J. Hee
c/o EDAW, Inc.
Env Quality Commission w/EIS

RECEIVED

JUN 1 3 1983

EDAW Inc.

McBryde
SUGAR COMPANY, LIMITED

June 7, 1983

Jerry M. Matsuda, Captain, HANG
State of Hawaii
Department of Defense
Office of the Adjutant General
3949 Diamond Head Road
Honolulu, Hawaii 96816

Dear Captain Matsuda:

I have recieved a copy of your letter to Mr. Susumu Ono dated 31 May 1983 regarding the draft EIS for our Wainiha Hydroelectric Project.

Thank you for reviewing the draft Environmental Impact Statement. Please feel free to contact me if you have any questions about the proposed project.

Sincerely,

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RJH:jm

cc: EDAW, Inc.
1121 Nuuanu Avenue
Suite 203
Honolulu, Hawaii 96817

#0332A
Diskette #0002A

GEORGE R. ARIYOSHI
GOVERNOR

JACK K. SUWA
CHAIRMAN, BOARD OF AGRICULTURE

RECEIVED
JUN 6 1983
EDAW Inc.

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
P. O. Box 22159
Honolulu, Hawaii 96822

June 1, 1983

MEMORANDUM

TO: Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
State of Hawaii

SUBJECT: Draft Environmental Impact Statement (EIS) for
Wainiha Hydroelectric Project
McBryde Sugar Company
TMK: 5-8-01: 1 and 5-8-02: 2
Wainiha Valley, Kauai

The Department of Agriculture has reviewed the subject EIS and offers the following comments.

According to the EIS, there are several taro and watercress patches situated within Wainiha Valley, the production from which appears to be "...for local and home consumption rather than commercial sale" (EIS, pages 60, 70). These uses are downstream of the proposed project. It is further stated that "The water supply available to taro farmers will continue as before, since the diverted water will be returned to the stream above the taro patches" (EIS, page 99).

We suggest that the EIS identify any other agricultural activities mauka or makai of the taro/watercress patches that currently utilize stream water and that may be affected by the proposed project. Furthermore, if such activities exist, the EIS should indicate measures that may be taken to ensure adequate stream flow of these activities.

Thank you for the opportunity to comment.

Jack K. Suwa
JACK K. SUWA
Chairman, Board of Agriculture

cc: Mr. Randall J. Hee
c/o EDAW, Inc.

"Support Hawaiian Agricultural Products"

McBryde
SUGAR COMPANY, LIMITED

June 6, 1983

Mr. Jack K. Suwa
Chairman, Board of Agriculture
State of Hawaii
Department of Agriculture
P. O. Box 22159
Honolulu, Hawaii 96822

Dear Mr. Suwa:

Thank you for your review comment on the Environmental Impact Statement EIS for the proposed Wainiha Hydroelectric Project.

Agricultural activities in Wainiha Valley are confined to the Rural District, as indicated on the map in Exhibit IV-2 of the EIS. This area is at least 4.5 miles downstream of the point at which all water diverted by the proposed project would be returned to the stream. Therefore, the proposed hydroelectric project will not affect water availability for any agricultural activities.

Very truly yours,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

cc: Department of Land and Natural Resources

P. O BOX 8 • ELEELE, KAUAI, HAWAII 96705 • TELEPHONE (808) 335-5111

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 15TH AIR BASE WING (PACAF)
HICKAM AIR FORCE BASE, HAWAII 96853

REPLY TO ATTN OF: DEEV (Mr Yamada, 449-1831)

1 JUN 1983

SUBJECT: Environmental Impact Statement for the Wainiha Hydroelectric Project

TO: Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, HI 96813

1. This office has reviewed the subject EIS and has no comment relative to the proposed project.

2. We greatly appreciate your cooperative efforts in keeping the Air Force apprised of your project and thank you for the opportunity to review the document. We are returning the draft EIS.

ROBERT M. OKAZAKI
Chief, Engrg & Envmtl Plng Div
Directorate of Civil Engineering

1 Atch
Draft EIS

Cy to: Mr Susumu Ono, Chairman
Board of Land & Natural Resources
P. O. Box 621
Honolulu, HI 96809

Mr Randall J. Hee
c/o EDAW, Inc.
1121 Nuuanu Ave., Suite 203
Honolulu, HI 96817

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JUN 13 1983

EDAW Inc.

McBryde
SUGAR COMPANY, LIMITED

June 7, 1983

Mr. Robert M. Okazaki
Chief, Engineering
and Environmental Planning Division
Department of the Air Force
Headquarters 15th Air Base Wing (PACAF)
Hickam Air Force Base, Hawaii 96853

Attention DEEV (Mr. Yamada)

Dear Mr. Okazaki:

I have received a copy of your letter to the Office of Environmental Quality Control dated 1 June 1983 concerning the draft EIS for our Wainiha Hydroelectric Project.

Thank you for reviewing the draft Environmental Impact Statement. Please feel free to contact me if you have any questions about the proposed project.

Sincerely,

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RJH:jm

cc: EDAW,Inc.
1121 Nuuanu Avenue
Suite 203
Honolulu, Hawaii 96817

#0331A
Diskette #0002A

RECEIVED
JUN 3 1983
EDAW Inc.

June 1, 1983

Directorate of Facilities Engineering

Mr. Susumu Ono, Chairman
Board of Land & Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

The Draft Environmental Impact Statement (DEIS) for the Wainiha Hydroelectric Project, Kauai, has been reviewed and we have no comments to offer. There are no Army installations or activities in the vicinity of the proposed project.

Thank you for the opportunity to comment on the DEIS.

Sincerely,

Original signed
a. Char
Ronald A. Borrello
Colonel, Corps of Engineers
Director of Facilities
Engineering

Copy Furnished:
Mr. Randall J. Hee
c/o EDAW, Inc.
1121 Nuuanu Avenue, Suite 203
Honolulu, Hawaii 96817

McBryde
SUGAR COMPANY, LIMITED

June 6, 1983

Mr. Ronald A. Borrello
Colonel, Corps of Engineers
Director of Facilities Engineering
Pacific Ocean Division
Bldg 230
Fort Shafter, HI 96858

Dear Mr. Borrello:

Thank you for your review of the Environmental Impact Statement on the proposed Wainiha Hydroelectric Project.

Very truly yours,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

JPW:lt

cc: Department of Land and Natural Resources

P. O. BOX 8 • ELEELE, KAUAI, HAWAII 96705 • TELEPHONE (808) 335-5111

DEPARTMENT OF WATER
COUNTY OF KAUAI
P. O. BOX 1706
LIHUE, HAWAII 96766

RECEIVED
JUN '. 1983
EDAW Inc.

June 6, 1983

Honorable Susumu Ono, Chairman
Board of Land & Natural Resources
P. O. Box 621
Honolulu, HI 96809

Re: Wainiha Hydroelectric Project

We have reviewed the Environmental Impact Statement for the Wainiha Hydroelectric Project and have no comments to offer at this time.

Thank you for the opportunity to comment.

Raymond H. Sato

Raymond H. Sato
Manager and Chief Engineer

WH:rs

✓cc: Mr. Randall J. Hee

McBryde
SUGAR COMPANY, LIMITED

June 7, 1983

Mr. Raymond H. Sato
Manager and Chief Engineer
Department of Water
County of Kauai
P. O. Box 1706
Lihue, Kauai, HI 96766

Dear Mr. Sato:

Thank you for your review of the Environmental Impact Statement on the proposed Wainiha Hydroelectric Project.

Very truly yours,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

JPW:lt

cc: Department of Land and Natural Resources

P. O. BOX 8 • ELEELE, KAUAI, HAWAII 96705 • TELEPHONE (808) 335-5111

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HEADQUARTERS
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860

IN REPLY REFER TO:
002A:QLB:jam
Ser 1182

6 JUN 1983

RECEIVED
JUN 7 1983
EDAW Inc.

Mr. Susumu Ono, Chairman
Board of Land & Natural Resources
Department of Land & Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Environmental Impact Statement
Wainiha Hydroelectric Project

The EIS for the Wainiha Hydroelectric Project has been reviewed and the Navy has no comments to offer. As this command has no further use for the EIS, the EIS is being returned to the Environmental Quality Commission, by copy of this letter.

Thank you for the opportunity to review the EIS.

Sincerely,

M. M. DALLAM
CAPTAIN, CEC, U. S. NAVY
FACILITIES ENGINEER
BY DIRECTION OF THE COMMANDER

Enclosure

Copy to:
Mr. Randall J. Hee, c/o EDAW, Inc.
Environmental Quality Commission

McBryde
SUGAR COMPANY, LIMITED

June 7, 1983

Mr. M. M. Dallam
Captain, CEC, U. S. Navy
Facilities Engineer
Headquarters
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860

Dear Mr. Dallam:

Thank you for your review of the Environmental Impact Statement on the proposed Wainiha Hydroelectric Project.

Very truly yours,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

JPW:lt

cc: Department of Land and Natural Resources

BOX 8 • ELEELE, KAUAI, HAWAII 96705 • TELEPHONE (808) 335-5111
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JUN 9 1983
EDAW Inc.

(P)1505.3

JUN 8 1983

Honorable Susumu Ono
Chairman
Department of Land and
Natural Resources
State of Hawaii
Honolulu, Hawaii

Dear Mr. Ono:

Subject: Wainiha Hydroelectric Project
Wainiha Valley, Kauai
Environmental Impact Statement

We have reviewed the subject environmental impact statement and have no comments to offer.

Thank you for the opportunity for the review.

Very truly yours,

HIDEO MURAKAMI
State Comptroller

HI:jm
cc: Mr. Randall J. Hee, EDAW, Inc.

RECEIVED
JUN 23 1983
EDAW Inc.

McBryde
SUGAR COMPANY, LIMITED

June 22, 1983

State of Hawaii
Dept. of Accounting and General Services
Division of Public Works
P. O. Box 119
Honolulu, Hawaii 96810

Attention Mr. Hideo Murakami
State Comptroller

Dear Mr. Murakami:

Thank you for your review of the Environmental Impact Statement on the proposed Wainiha Hydroelectric Project.

Sincerely,

Randall J. Hee

Randall J. Hee
Engineering Superintendent

JPW:RJH:jm

cc: Mr. Susumu Ono, Chairman
Dept. of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

#0360A
Diskette #00012A

KEKAHA SUGAR COMPANY, LIMITED

P. O. BOX AA
KEKAHA, HAWAII 96752
TELEPHONE: (808) 337-1472

AN Amfac COMPANY

June 13, 1983

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JUN 1 4 1983
EDAW Inc.

Mr. Susumu Ono, Chairman
Board of Land & Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

SUBJECT: Wainiha Hydroelectric Project

We have nothing to add to this very fine report. The project is environmentally sound and should be allowed to proceed.

Respectfully submitted,

L. A. FAYE JR.,
President and Manager

LAF/ls

cc: Mr. Randall J. Hee

McBryde
SUGAR COMPANY, LIMITED

RECEIVED
JUN 2 4 1983
EDAW Inc.

June 24, 1983

Kekaha Sugar Company, Limited
P. O. Box AA
Kekaha, Hawaii 96752

Attention Mr. L. A. Faye, Jr.
President and Manager

Dear Mr. Faye:

Thank you for your review of the Environmental Impact Statement for the proposed Wainiha Hydroelectric Project. We appreciate your support of the project.

Sincerely,

Randall J. Hee

Randall J. Hee
Engineering Superintendent

JPW:RJH:jm

cc: Mr. Susumu Ono, Chairman
Dept. of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

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Diskette #0002A

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83 JUN 22 A 8 : 25

STATE OF HAWAII

University of Hawaii at Manoa

Water Resources Research Center
Holmes Hall 283 • 2540 Dole Street
Honolulu, Hawaii 96822

16 June 1983

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Subject: Draft EIS Wainiha Hydroelectric Project, Kauai, May 1983

We have reviewed the subject DEIS and have no comment to offer. Thank you for the opportunity to comment. This material was reviewed by WRRC personnel.

Sincerely,

Edwin T. Murabayashi

Edwin T. Murabayashi
EIS Coordinator

ETM:jm

RECEIVED

EDAW Inc.

McBryde
SUGAR COMPANY, LIMITED

July 5, 1983

Mr. Edwin T. Murabayashi, EIS Coordinator
Water Resources Research Center
University of Hawaii at Manoa
Holmes Hall, Room 283
2540 Dole Street
Honolulu, Hawaii 96822

Dear Mr. Murabayashi:

WAINIHA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

This is to thank you for your letter to Mr. Susumu Ono, Chairman, Board of Land and Natural Resources, in regard to the WRRC review of the draft EIS for the Wainiha Hydroelectric Project.

If you have comments or questions, please do not hesitate to contact me.

Sincerely,

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RJH:jm

cc: Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

#0398A
Diskette #0002A

1207

United States Department of the Interior

GEOLOGICAL SURVEY
Water Resources Division
P.O. Box 50166
Honolulu, Hawaii

A8:24

& NATURAL RESOURCES
STATE OF HAWAII

June 20, 1983

Mr. Susumu Ono, Chairman
Board of Land & Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

The Hawaii District Office of the U.S. Geological Survey, Water Resources Division, has reviewed the Wainiha Hydroelectric Project and has no comment at this time.

As requested in the cover letter, we are returning the environmental impact statement. Thank you for allowing us to review the environmental impact statement.

Sincerely,

Reuben Lee

Reuben Lee
Acting District Chief

Enclosure

McBryde
SUGAR COMPANY, LIMITED

RECEIVED
JUL 6 1983
EDAW Inc.

July 5, 1983

Mr. Reuben Lee, Acting Director
Water Resources Division
U.S. Geological Survey
P. O. Box 50166
Honolulu, Hawaii 96850

Dear Mr. Lee:

WAINIHA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

This is to thank you for your letter response to Mr. Susumu Ono, Chairman, Board of Land and Natural Resources, on the draft EIS for the Wainiha Hydroelectric Project. I wish to also thank you for the cooperation of your Division, particularly Mr. Nori Kojiri, during our hydrologic investigations for the project.

We will consult with your office on the disposition of stream gage No. 16108000 on the Wainiha River at a future date, prior to the operation of the proposed power plant.

Please feel free to contact me if you have questions or comments.

Sincerely,

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RJH:jm

cc: Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

#0397A
Diskette #0002A

1213

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

550 HALEKAUWILA ST.
ROOM 301
HONOLULU, HAWAII 96813

Jacqueline Parnell
DIRECTOR

TELEPHONE NO.
548-6915

RECEIVED
83 JUN 22 P2:21
STATE OF HAWAII

June 21, 1983

JUN 23 1983

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Subject: Draft Environmental Impact Statement for the Wainiha Hydroelectric Project, Wainiha Valley, Kauai

Please note that the proposed penstock by-passes an existing U.S.G.S. gaging station and will affect it if the gaging station still is in use. We suggest that the U.S. Geological Survey be contacted in this regard.

Sincerely,

Jacqueline Parnell

Jacqueline Parnell
Director

cc: Mr. Randall J. Hee
c/o EDAW, Inc.

McBryde
SUGAR COMPANY, LIMITED

July 1, 1983

Ms. Jacqueline Parnell, Director
Office of Environmental Quality Control
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Ms. Parnell:

Thank you for your comment on the Wainiha Hydroelectric Project's draft EIS. As you suggest, U.S.G.S. Gage No. 16108000 is located along a reach of the Wainiha River which will be affected by operation of the proposed power plant. We recognize that disposition arrangements will need to be made for the gaging station and have had preliminary discussions with Messrs. Selwin Chin and Nori Kojiri of the USGS to that end. These arrangements will be implemented before the present flow regime is altered, currently scheduled for late 1985.

Please feel free to contact me if you have further questions or comments.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RJH:lt

cc: Mr. Susumu Ono, Chairman
Board of Land and Natural Resources

P. O. BOX 8 • ELEELE, KAUAI, HAWAII 96705 • TELEPHONE (808) 335-5111

Hee

United States
Department of
Agriculture

Soil
Conservation
Service

P.O. Box 50004
Honolulu, Hawaii
96850

June 21, 1983

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JUN 23 1983
EDAW Inc.

Mr. Susumu Ono, Chairman
Board of Land & Natural Resources
Department of Land & Natural Resources
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Ono:

Subject: Draft EIS for the Wainiha Hydroelectric Project
Wainiha Valley, Kauai

We reviewed the subject environmental impact statement and have no comments to make.

Thank you for the opportunity to review this document.

Sincerely,

FRANCIS C.H. LUM
State Conservationist

cc:
Mr. Randall J. Hee
c/o EDAW, Inc.
1121 Nuuanu Ave., Suite 203
Honolulu, HI 96817

Ms. Jacqueline Parnell, Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, HI 96813

McBryde
SUGAR COMPANY, LIMITED

August 4, 1983

Mr. Francis C.H. Lum,
State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
P. O. Box 50004
Honolulu, Hawaii 96850

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Mr. Lum:

Thank you for your review of the Environmental Impact Statement on the proposed Wainiha Hydroelectric Project.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RPK:lt

cc: Mr. Susumu Ono, BLNR

RECEIVED

JUN 29 1983

EDAW Inc.

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

CHARLES G. CLARK
DIRECTOR OF HEALTH

JOHN F. CHALMERS, M.D.
DEPUTY DIRECTOR OF HEALTH

HENRY N. THOMPSON, M.A.
DEPUTY DIRECTOR OF HEALTH

MELVIN K. KOIZUMI
DEPUTY DIRECTOR OF HEALTH

ABELINA MADRID SHAW, M.A., J.D.
DEPUTY DIRECTOR OF HEALTH

June 24, 1983

In reply, please refer to:
File: EPHS-SS

MEMORANDUM

To: Mr. Susumu Ono, Chairman
Board of Land & Natural Resources

From: Director of Health

Subject: Environmental Impact Statement (EIS) for Wainiha Hydroelectric Project, Wainiha Valley, Kauai

Thank you for allowing us to review and comment on the subject EIS. On the basis that the project will comply with all applicable Public Health Regulations, please be informed that we do not have any objections to this project.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

Melvin Koizumi
CHARLES G. CLARK

cc: OEQC
Mr. Randall Hee

McBryde
SUGAR COMPANY, LIMITED

August 4, 1983

Mr. Charles G. Clark,
Director of Health
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Mr. Clark:

Thank you for your review of the Environmental Impact Statement on the proposed Wainiha Hydroelectric Project.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RPK:lt

cc: Mr. Susumu Ono, BLNR

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GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

June 21, 1983

RYOKICHI HIGASHIONNA, Ph.D.
DIRECTOR

DEPUTY DIRECTORS
WAYNE J. YAMASAKI
Cheryl D. Soon
JAMES B. McCORMICK
JONATHAN K. SHIMADA, Ph.D.

IN REPLY REFER TO:

STP
8.9146

JUN 24 1983

MEMORANDUM

TO: The Honorable Susumu Ono, Chairman
Board of Land & Natural Resources

FROM: Director of Transportation

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR WAINIHA HYDROELECTRIC PROJECT

Thank you for the opportunity to review and comment on the subject EIS.

The proposed hydroelectric plant is not anticipated to affect the programs or operations of the Department of Transportation.

A permit will be required, however, for any oversized or overweight loads on the State highway facilities.

for Wayne Yamasaki
Ryokichi Higashionna

RECEIVED
JUL 6 1983
EDAW Inc.

McBryde
SUGAR COMPANY, LIMITED

July 5, 1983

Mr. Ryokichi Higashionna, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Higashionna:

WAINIHA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your comments (Ref. STP 8.9146) on our draft EIS for the Wainiha Hydroelectic Project. In regard to permits for oversized and overweight loads, we have spoken to Mr. Demitrio Ricarme of the Department's Lihue office who provided us information on the requirements and procedures. We will comply with these at the appropriate time.

If you have questions or further comments, please do not hesitate to contact me.

Sincerely,

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RJH:jm

cc: Mr. Susumu Ono, Chairman
Board of Land & Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

#0396A
Diskette #0002A

P O BOX 8 • ELEELE, KAUAI, HAWAII 96705 • TELEPHONE (808) 335-5111

R.E.

1208

United States Department of the Interior

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

IN REPLY REFER TO:
ES
Room 6307

JUN 21 1983

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

The Service has reviewed the Environmental Impact Statement (EIS) for the Wainiha Hydroelectric Project, prepared by McBryde Sugar Company, Ltd. We believe the EIS is deficient on several important points which are essential to providing a clear understanding of the environmental impacts that would result from implementation of the project as proposed. Specifically, McBryde has not adequately responded to comments and recommendations expressed in the Service's letter of April 21, 1983 (Appendix A, page 146).

The Service is not opposed to development of hydroelectric power in Hawaii provided that significant habitat resources are maintained. We acknowledge that McBryde has incorporated some measures to minimize adverse impacts associated with its proposed hydropower facility (i.e. fish screens, downstream flow diversion during construction, automatic shutoff valves and similar features). Contrary to our advice, McBryde has not made an allowance continuous donwstream flow below the proposed diversion structure.

McBryde's refusal to consider instream flows for the maintenance of valuable fish habitat is unacceptable to the Service. Should a proposal to allow a continuous downstream flow acceptable to the Service not be forthcoming, we will recommend denial of State permits necessary for project authorization. Issuance of a Federal permit under authority of Section 404 of the Clean Water Act in this instance would constitute a major Federal action having a significant effect upon the quality of the human environment; therefore, we would recommend preparation of a Federal EIS for the proposed action.

McBryde's case against maintenance of flows is founded in their premise that the existing hydropower project has not had any impact on the abundance or distribution of stream animals. The EIS cites three principal biological surveys in Wainiha Stream over the past 30 years to support their position. Unfortunately,

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there is no baseline scientific information available which quantifies stream resources prior to construction of the the existing impoundment (circa 1906). Therefore, subsequent observations in Wainiha were made in a disturbed stream, and cannot be compared with "before" conditions.

Evidence collected by Couret (1976), Ford (1979), Kinzie and Ford (1977), and Maciolek (1975; 1979) documents the restricted longitudinal distribution of native stream animals inhabiting streams which have been partially dewatered. This evidence, along with our recent observations in Wainiha (December 1982; March 1983), leads us to conclude that the existing impoundment does influence the population densities of native goby fishes. We believe that the proposed impoundment will similarly lead to a reduction in important goby habitat, in goby population densities, and in sport and commercial fishing success for gobies in lower Wainiha Stream.

We recommend that the following Service comments be fully addressed in the Final EIS:

1. Alternatives 1, 2, 3, 4, and 6 which appear in our letter of April 21, 1983 (Appendix A, page 146) need to be addressed in the EIS.

2. On page 16, Exhibit II-7 should illustrate a typical cross section of the access road as it crosses a tributary. Piers used for the penstock should be kept well back from the natural stream bed at all crossings.

3. Evidence available to us suggests that corrugated metal pipe culverts restrict the migration of native stream animals. We strongly recommend that open box culverts or bridges which preserve the natural stream bed (as existing access road culverts do) be used in lieu of pipe culverts (page 23).

4. On page 50, the EIS erroneously states that the principal studies of population biology in Wainiha Stream over the past 30 years have "minor differences of season and technique". Ego (1956) made population estimates based upon direct visual enumeration of fishes. Relative abundance estimates of gobies in Timbol's studies were based exclusively upon fishes collected by electroshocking. Our experience with both methods has led us to conclude that direct visual surveys result in better estimates of population density and size when performed on a "one time" basis than electroshocking. This is because the catching efficiency of electroshocking varies widely according to water conductivity, temperature and velocity; sensitivity of target species to an electric field; the cross-sectional area and substratum of the stream; the skill of the operator; the capacity of the particular shocker unit and the charge of the battery at the time; and how well illumination, turbidity, and depth allow the operator to see and capture the specimens (White and Brynildson 1967; Maciolek and Timbol 1980). Electroshocking may yield comparable population estimates only when it is used in conjunction with mark-and-

recapture experiments over an extended period of time (Vincent 1971; Kinzie and Ford, in press).

Thus, attempts to compare "one time" electroshocking surveys taken several years or months apart, even if repeated at the same station, are meaningless. With respect to Wainiha, we do not feel that the results of Ego's and Timbol's data on the abundance of stream animals can be compared with any degree of accuracy or reliability.

5. What do the station numbers refer to in Exhibit III-8, on page 52?

6. Exhibit III-9 on page 53 should be corrected:

Macrobrachium grandimanus
Awaous stamineus
Kuhlia sandvicensis
Sicydium stimpsoni, should now be Sicyopterus stimpsoni

7. The statement on page 55 that native, diadromous species are "equally, if not more, abundant above the existing diversion weir as thay are below it" is not supported by our observations in Wainiha. We have not been provided with a copy of Dr. Timbol's 1983 Wainiha survey final report for review.

8. McBryde's proposal to release 10 cfs below the proposed diversion wier on the 30th day of prolonged no-flow conditions is not acceptable to the Service. Removal of 150 cfs from the 2.1 mile reach of stream between the proposed wier and powerhouse over 73% of the time will result in significant reduction of important stream habitat (Pages 79 and 123).

9. We caution against comparing the results of previous surveys in Wainiha (page 82).

10. The arguement advanced on page 83 which suggests that no decline in stream animals has occured because of a barrier to migration cannot be based in fact. As we have stated earlier, no data exists prior to construction of the existing wier; therefore, no comparison with natural conditions can be made (pages 82 and 83).

11. Although no diversion of tributaries (side streams) is proposed, their habitat value will be significantly reduced if corrugated metal pipe culverts are used under road crossings (page 84).

12. The Service does not concur with the conclusion that the proposed diversion weir will have no impact (page 85).

13. Although some stream animals are known to move across the existing wier when flows exceed 100 cfs, significant habitat is lost during periods of no overflow (page 86). A continuous flow

must be provided for future hydropower developments to avoid the continued loss of stream habitat and fishery resources.

14. On page 87, "adequate habitat" and "sufficient habitat" should both be changed to "some habitat"; otherwise, the EIS should explain how habitat values were assessed.

15. The Service does not concur with the conclusion at the top of page 88 for reasons already discussed in this letter.

16. Mitigation opportunities within the reach affected by the proposed action is within Mc Bryde's jurisdiction. McBryde should therefore be held responsible to provide continuous stream flows throughout the affected reach to maintain habitat resource values (page 88).

17. State-of-the-art methods do, in fact, allow for the quantification of habitat reduction (see Department of Land and Natural Resources (1983) for a review). Additional biological and hydraulic data are required before these methods can be applied in Hawaiian situations (page 103).

18. Again, the Service does not concur with the conclusion of no effect expressed at the bottom of page 103.

19. Chapter V of the EIS does not devote sufficient detail to alternatives (refer to our comment no. 1, above).

20. On page 123, the EIS erroneously states that the Fish and Wildlife Service has required that a continuos flow of 80 cfs be provided. In our April 21, 1983 letter (Appendix A, page 146), the Service recommended that "alternative measures presented in the following paragraphs be fully evaluated in the EIS". We acknowledge that McBryde has demonstrated the impact of an 80 cfs continuous flow on its proposed project (page 124).

It is the Service's opinion that an allowance must be made for continuous stream flow below the proposed diversion wier. We are willing to review and discuss any additional alternatives which may provide for adequate habitat protection. Furthermore, we recommend that a public hearing be held on this action to allow local fishermen to express their experiences and views with regard to the sport and commercial fishery in Wainiha. Please do not hesitate to contact us if you have any questions or comments regarding our position.

Sincerely yours,

William R. Kramer

William R. Kramer
Project Leader
Environmental Services

Attachment: Bibliography

cc: RD, FWS, Portland, OR (AHR)
NMFS-WPPO
EPA, San Franscisco
PODCO-O
OEQC

BIBLIOGRAPHY

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McBryde
SUGAR COMPANY, LIMITED

June 27, 1983

Mr. John I. Ford
Acting Project Leader
Office of Environmental Services
U.S. Fish and Wildlife Service
P. O. Box 50167
Honolulu, Hawaii 96850

Dear John:

We are currently preparing responses to comments on the draft Environmental Impact Statement for the proposed Wainiha Hydroelectric Project. In their review comments, DLNR referenced an unpublished assessment conducted in 1970 by Ego, et al. We have since requested copies of the 1970 data and any additional data that DLNR might have on stream fauna in the Wainiha River.

It occurred to us that the U.S. Fish and Wildlife Service may have additional data that could be useful in the analysis of the Wainiha River stream fauna.

We would appreciate copies of any data that you might have on Wainiha Stream fauna. Please note that we have copies of Ego (1956), Timbol (1977) and Timbol (1982).

If you have any data, we would like to have them as soon as possible so that we can provide responses to comments on the draft EIS by July 7, 1983.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RJH:lt

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P. O. BOX 50167
HONOLULU, HAWAII 96350

IN REPLY REFER TO:
ES
Room 6307

JUN 29 1983

Randall J. Hee
Engineering Superintendent
McBryde Sugar Company, Ltd.
P.O. Box 8
Eleele, Hawaii 96705

Dear Mr. Hee:

We have received your request for additional data pertaining to stream fauna in Wainiha River, Kauai. All the information which we are aware of has already been made available to EDAW, Inc. or Dr. Timbol. However, we have written to Dr. John A. Maciolek, past Leader, Hawaii Cooperative Fishery Research Unit, for any field notes and observations from Wainiha that he may have. Unfortunately, he and his family are presently moving from Seattle to Reno, and he may not be able to locate his notes for several weeks. We will let you know as soon as we receive word from him.

Enclosed is a copy of our response to the Chairman, Board of Land and Natural Resources concerning the draft Environmental Impact Statement for the proposed Wainiha Hydroelectric Project. We believe as you do that hydroelectric power can be developed on Wainiha without seriously disrupting the habitat, sport and commercial fishery values of the stream. The most significant difference in our positions lies in our interpretations of the degree of protection that is necessary. Therefore, I suggest that we meet again at your convenience to review the information developed during your evaluation of alternatives, to discuss other practicable alternatives, and to identify an acceptable stream flow to avoid unnecessary habitat loss. We look forward to hearing from you again.

Sincerely,

Derral Herbst

Derral Herbst
Acting Project Leader
Environmental Services

McBryde
SUGAR COMPANY, LIMITED

June 29, 1983

Mr. John I. Ford
Acting Project Leader
Office of Environmental Services
U.S. Fish and Wildife Service
P. O. Box 50167
Honolulu, Hawaii 96850

RESPONSES TO U.S. FISH AND WILDLIFE SERVICE
RECOMMENDATIONS ON ALTERNATIVE MITIGATION MEASURES
WAINIHA HYDROELECTRIC PROJECT

Dear John:

This letter is to forward the attached memo, subject as above, which provides specific responses to each of the mitigation measures recommended for consideration by your letter of April 21, 1983. The memo, dated May 9, 1983, was prepared shortly after receipt of your letter. We did not forward it to you at the time because we had decided to provide the responses in the EIS, as you suggested. Also, the memo does not address McBryde's proposed plan of flow release. The EIS, submitted May 20, 1983, does discuss the flow release program.

In that the responses are in an indirect form in the EIS, we thought it prudent to furnish the memo at this time in order to provide direct responses to your recommendations.

Please do not hesitate to contact me if you have comments or questions.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

Attachment

cc: J. Emerson, Corps of Engineers
with attachment

May 9, 1983

RESPONSES TO U.S. FISH AND WILDLIFE SERVICE
RECOMMENDATIONS ON ALTERNATING
MITIGATION MEASURES
WAINIHA HYDROELECTRIC PROJECT

The following provides a specific response to each of the alternative mitigation measures recommended for consideration for the Wainiha Hydroelectric Project by the U.S. Fish and Wildlife Service. These recommendations are contained in the letter, dated April 21, 1983, from Mr. John J. Ford, Acting Project Leader, U.S. Fish and Wildlife Service, to Mr. Randall J. Hee, Engineering Superintendent, McBryde Sugar Co., Ltd.

1. Develop hydroelectric power in areas other than Wainiha where McBryde has water rights (e.g. Kalaheo, Koloa).

   Response:

   McBryde Sugar Company is studying the feasibility of increasing or developing hydroelectric power in areas other than Wainiha. The studies include increasing generation of the Kalaheo plant, installing a third generation unit in the existing Wainiha Powerhouse, installing a hydraulic turbine/generator on the Alexander Reservoir outlet, and reactivating a plant at mauka reservoir near Koloa.

   Each project is being studied for technical, environmental, economic and financial feasibility. If any project meets all of the requirements for feasibility, McBryde would likely pursue its installation. Of all the projects studied, Wainiha would produce the most energy and has the highest potential to be feasible.

2. Incrementally develop power by first improving the efficiency of the existing (three) systems. This will allow adequate time to develop and test a suitable IFIM methodology for application in Hawaii so that future mainstream diversions can be appropriately evaluated.

   Response:

   It will require several years to develop and test a suitable IFIM method. There is no certainty that the method is applicable to Hawaiian streams. If the project must depend on IFIM development, it will no doubt be delayed.

Delaying the Wainiha project will result in irretrievable loss of the benefits that the project offers.

The delay may affect economic feasibility by extending the project past the deadline for energy tax credits. Loss of the energy tax credits will result in the project not being built.

If the studies of other projects demonstrate their feasibility, they may be installed concurrently with the Wainiha project.

3. Evaluate location of the new intake near an elevation of 1400' on the mainstream. An intake situated at this elevation would increase head to 680'. Assuming 62% efficiency, the flow required for a 3MW plant would be reduced to 84 cfs. Accretion of flow from 5 intermittent and 7 perennial tributaries (between 1400' and 1100' elevation), aquifer discharge and subsurface flows may ameliorate losses of important o'opu habitat in this reach. (This alternative assumes that populations of o'opu do not exist above 1400'; Shima, personal communication.) Evaluation of this alternative will require some additional field measurements and synthesis of hydrographs for ungauged portions of the stream.

Response:

As a part of the studies of alternative locations for the diversion weir, McBryde investigated the feasibility of a site just below the forks of the Wainiha River. This site would be at 1500 ft elevation, about 1600 ft upstream of a site at 1400 ft elevation. The "Forks" site would have a powerhouse in the same location as that of the proposed project. The most economically attractive project at the Forks site would have a capacity of 6865 kw, produce approximately 34 million kwhr/yr, and cost approximately $16.2 million. As with the Black Canyon project, peak flow would be 150 cfs; gross head would be 800 ft.

Since the diversion would have a drainage area about 61 percent of that of the Black Canyon site, there would be a reduction in available flows. The actual reduction in flows would not be as great as the drainage area reduction, due to the reliable base flow and the greater precipitation at the head end of the valley. These factors led to the conclusion that an average of 78 percent of the flow available at the gage would be available at the Forks site.

McBryde studied a series of projects of varying capacities at the Forks site, including one having a design flow of 80 cfs. This project would have a capacity of 4316 kw, produce approximately 29 million kwhr/yr, and cost approximately $15.3 million. The reason that the cost does not reduce in proportion to the decrease in energy production is that about

60-70 percent of the cost of the plant does not change with a change in capacity. Into this category fall the access road, diversion weir, a portion of the powerhouse, and the transmission line. Also, unit costs for hydroelectric machinery are higher for lower capacity units.

As indicated, the optimum project for the Forks site is one having a design flow of 150 cfs. The reduced energy output from an 80 cfs plant would create a penalty of approximately $300,000 per year, while the construction cost is only approximately $0.9 million less. Economic plant life is 30 years.

Although a 150 cfs project at the Forks is the most economically attractive project for that diversion weir site, it is not as economically attractive as a project at the Black Canyon site. This is due to the higher costs of access road and penstock construction above Black Canyon. These costs appear to outweigh the benefits of the increased output, relative to Black Canyon. Also, there is greater uncertainty in regard to engineering feasibility and costs because of the steep and rugged terrain above Black Canyon. There is also a relative lack of environmental information.

As a final item, overall plant efficiency in the range of 80-85 percent is expected from this project, rather than 62 percent.

4. Reduce the design capacity of the proposed system in conjunction with improvements to the existing system(s). Improvements which should be evaluated include enhancing the mechanical efficiency of the systems, and reducing water losses due to blockage at intakes and portals and leakage from ditches and tunnels.

<u>Response</u>:

As discussed previously, each project, be it a new plant or improvements to an existing system, must be judged on its own economic merits. Another way of viewing this is that a project which is attractive will proceed on its own merits. Coupling a project which is economically unattractive with one that is economically attractive will not increase the attractiveness of the former and will certainly cast doubt upon the latter.

Also, as previously indicated, a project with a significantly reduced capacity which is less than optimum from an economic standpoint will probably not be attractive for development.

A project which would upgrade the existing power plant is under consideration; however, this activity is not a part of the current application.

5. For any alternative involving construction of a weir (other than no. 3 above) provide for the passage of 80 cfs downstream of the weir at all times during power development. Turbine operating range may be increased to 81-231 cfs (150 cfs capacity). Weirs should have valves which will allow passage of flows required to accommodate downstream ecological needs at various times during the year.

Response:

Based upon gaging station records, flows of 80 cfs are equalled or exceeded about 50 percent of the time on a daily average basis. Flows which do not exceed 80 cfs on a daily average basis provide an average of 25,320 cfs days of volume per year. The total average volume is about 50,700 cfs days per year.

A project with a peak design flow of 231 cfs which would operate down to 81 cfs would be able to utilitize about 13,320 cfs days of volume in an average year. This project would have a capacity of about 6100 kw and produce about 9.1 million kwhr of energy per year if the intake were placed at the Black Canyon site. A 60-in. diameter penstock would be used, instead of the planned 48-in. diameter penstock. The cost of this project would be about $11.6 million.

By contrast, the proposed project at Black Canyon has a design flow of 150 cfs, a capacity of 3812 kw, and energy production of about 22 million kwhr per year. Cost is projected to be about $10 million. The plant would utilize an average of 31,640 cfs days per year.

The differences stem from the fact that the 231 cfs plant would only skim peak flows, while the proposed plant would utilize nearly all but peak flows. The former plant would produce about 12.9 million kwhr per year less than the latter plant, a decrease in revenue of $774,000 per year, while costing $2.1 million more to construct. The 231 cfs plant would clearly not be economical.

The weir for the 231 cfs plant would be constructed and the plant controls set so that 80 cfs could pass continuously, when that flow was available.

6. Consideration should be given to allow low flows (80 cfs) to circumvent the weir in a graded, side channel constructed of boulders, cobbles and gravel. Stepped, hydraulic controls made of concrete may be utilized between areas of natural substratum to allocate flows with a greater degree of accuracy.

Response:

The purpose of a weir is to provide effective control of the water surface elevation at the intake. For a run-of-river plant such as the one proposed, this allows for effective control of the flow through the units and provides for submergence of the penstock. Any bypass arrangement must allow for these functions and must not be subject to damage and degredation during periods of high flow.

It is possible to construct a side channel overflow section in the manner suggested. It would, however, have to provide for the above functions. Due to width and cost considerations, it would probably be necessary to make the weir itself of the form described.

A hydroelectric project which would continuously maintain instream flows of up to 80 cfs, as available, would need to be of the type described in the response to paragraph 5.

The following measures are recommended for incorporation in plans and specifications for construction to minimize adverse impacts during construction and operation of a new hydropower facility.

- Allowance must be made for continuous downstream flow during construction.

  Response:

  The project is designed so that there will be no storage of water at any time during construction or operation. Diversion of flows during construction will be such that unimpeded fish passage will be maintained at all times.

- Dredged or excavated materials should be removed from the stream channel, and not stockpiled in the water.

  Response:

  Dredged or excavated materials will be removed from the stream channel, and not stockpiled in the water. This material will either be used as fill in construction of the headworks or road or stockpiled in an area or areas where erosion and damage will be minimized.

- Fish screens should be installed at the intake to minimize mortality and maintenance problems.

  Response:

  McBryde will install fish screens at the intakes to the new project and the existing plant. These fish screens will primarily serve to prohibit the entry of downstream migrating spawning fish into the penstock, or ditch and tunnel system, as appropriate. The screens will be travelling water screens, placed downstream of the trashracks. These screens will be rotated periodically or on an as-needed basis so that the screen panels can be cleaned of their debris by water sprays. The debris will be sluiced back to the river downstream of the weir.

Approach velocity to the screens will be two feet per second. This is below the escape swimming speed of the fish; i.e.: a fish in good condition that approaches the screen would be able to swim back out the intake.

The mesh panels of the screens will be sized to exclude fish of the lowest size expected. The smallest spawner recorded during studies had a length of 3 in. This translates into a width of about 3/4 in., thus making a 1/2-in. mesh size appropriate.

A problem with travelling water screens is that they tend to accumulate trash and debris, such as leaves, to such an extent that a high differential water level is achieved across the screen. This water pressure can collapse the screen. It will be necessary to install differential water level sensors which will operate the screens when a pre-set differential is achieved. Because of the number of moving parts, they are a high maintenance item.

- Appropriate ramping rates must be set to prevent dewaterment during rapid start-up and shut down.

Response:

"Ramping rates," as related to fish considerations, concern the rate of change of flow through the intake system. This, in turn, is governed by flow through the nozzles to the turbines, which is a function of generating unit operation.

In the case of shutdown of the generating unit for any reason, such as load shedding, less water would be required, therefore making more available. The most rapid rate of change on shutdown would be under the condition of a unit trip. This is generally done automatically to protect the machinery from an electrical or mechanical fault. The deceleration of flow in the penstock is limited to a rate which will avoid destructive water hammer.

Unit startup provides an increase in the rate of flow through the system. The most rapid rate of increase is provided by a condition known as "dead load pickup." This is a situation, such as happened during Hurricane Iwa, wherein the load served by the unit is isolated from the rest of the system. The unit is required to assume a portion of the load, starting from a total outage, without assistance. The requirement to do this is governed by a provision in the contract with Kauai Electric Co., the power purchaser. This is, in fact, one of the most significant advantages of hydroelectric power.

- Installation of automatic flow continuation valves should be considered to protect stream flows below the dam in the event of sudden flow rejection at the powerhouse.

Response:

As discussed above, flow rejection occurs upon unit shutdown. This makes more flow available for instream uses. In this manner it would be the equivalent of a freshet in terms of providing additional flows.

If flow rejection is construed to be an increase in flow required by the unit, the most rapid rate of increase is governed by contract requirements, again as discussed above. The water available for release at this time would depend upon the amount of flow in the river. Besides the amount of flow demanded by the unit, the limiting condition is that the penstock cannot be sucked dry, in order to protect it. Although the penstock has protective devices to prevent damage under this condition, they are subject to malfunction and it is unwise to design penstock dewatering as an operating condition.

- Installation of automatic shutoff valves should be considered to prevent extensive soil erosion in the event of penstock failure.

Response:

This is a planned design feature of the penstock.

- Appropriate measures should be taken to prevent excessive total gas pressures in tailwaters.

Response:

"Excessive total gas pressures in tailwaters" is the supersaturation of nitrogen and oxygen in the tailwaters of a dam. This occurs as a result of flows over a spillway entraining air (primarily nitrogen and oxygen) and then plunging into the tailwaters. The gas content of the waters can then be above saturation concentrations at the existing pressures and temperatures. This can create embolisms and physiological damage to fish in the tailwaters.

This effect has been primarily noted in the tailwaters of Columbia River dams while those dams are spilling water. Since the planned weir is much smaller and the flow path while spilling much shorter, we do not anticipate that air entrainment will be a problem for the Wainiha Hydroelectric Project.

The water used for power production is discharged at high velocity and atmospheric pressure from the nozzles. The kinetic energy of the flow is translated into mechanical energy by the hydraulic turbines. After being relieved of most of its kinetic energy by the turbine buckets, the water falls by gravity a few feet into the tailwater. There is nothing in this process that would promote supersaturation of the tailwater.

McBryde
SUGAR COMPANY, LIMITED

July 8, 1983

Mr. William R. Kramer,
Project Leader
Environmental Services
U.S. Fish and Wildlife Services
P. O. Box 50167
Honolulu, Hawaii 96850

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Mr. Kramer:

This is to thank you for your letter of June 21, 1983, to Mr. Susumu Ono, Chairman, BLNR, commenting on the draft EIS for McBryde's Wainiha Hydroelectric Project. We are currently reviewing your comments and will prepare a specific response to each one.

As discussed with Mr. John I. Ford of your office, McBryde has requested that the DLNR grant a thirty-day extension to the comment and response period.

If you have further comments or questions please do not hesitate to contact me.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RPK:lt

cc: Mr. Susumu Ono

P. O. BOX 8 • ELEELE, KAUAI HAWAII 96705 • TELEPHONE (808) 335-5111

McBryde
SUGAR COMPANY, LIMITED

August 4, 1983

Mr. William R. Kramer, Project Leader
Environmental Services, Room 6307
U.S. Fish and Wildlife Service
P. O. Box 50167
Honolulu, Hawaii 96850

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Mr. Kramer:

The purpose of this letter is to respond to the comments contained in your letter of June 21, 1983 to Mr. Susumu Ono, Chairman, BLNR.

Upon receipt of the Service's letter of April 21, 1983, McBryde prepared responses to each of the suggested mitigation measures. The responses were included both directly and indirectly in the Draft EIS. On June 29, 1983, McBryde forwarded direct responses to the Service, and these are included in the Final EIS.

Acting upon the advice of the Service and other agencies and organizations possessing expertise, the proposed project has been modified to maintain continuous flow in the affected reach of river. A continuous flow of one cfs, about 650,000 gallons per day, is proposed to be maintained through a self-regulating notch in the weir near the right bank.

Data from previous stream fauna surveys, including the full text of Timbol's 1983 report, are included in the Final EIS. There are no data prior to construction of the existing plant. However, Timbol (1983) concluded that "the nakea population appears to be a healthy, thriving population" and "that Wainiha harbors a good, healthy on-going nopili population." In any case, the environmental impacts of the proposed plant must be judged against existing conditions, which include the presence of the existing project.

Alternatives 1, 2, 3, 4, and 6 of the Service's April 21 letter are addressed in McBryde's letter of June 29 to the Service.

Exhibit II-7 has been modified to include the requested section. Piers for the pipeline crossings will be kept back from the stream beds.

In regard to access road crossings of streams, most of these crossings are of intermittent streams that support no fish populations. These crossings will use corrugated metal pipe with concrete headwalls. Crossings of perennial streams that support fish life will utilize concrete box culverts or bridges as suggested by the Service.

The aquatic surveys over the past thirty years have had differences in technique, season, and location of stations. Although these differences complicate comparing the data from the surveys, the differences do not invalidate the surveys. Nor do the differences preclude drawing the general conclusions expressed in the EIS. For example, Ego used visual counts, and Timbol used electroshocking techniques. The latter probably is relatively conservative in terms of counts. Yet, the numbers of fish counted were greater in Timbol's 1982 survey than in Ego's 1970 survey.

Using the available data to predict potential impacts is further complicated because the existing project is by no means the only factor influencing fish populations in the river. Increased fishing pressure by increasingly sophisticated fishing methods has probably accounted more for any changes in 'o'opu nakea and nopili diversity and density than any other factor. Nightly harvests per fisherman of more than 1,000 pounds of 'o'opu which have not spawned is a pressure which cannot be overlooked. Predation from introduced species, and cyclical changes in ocean currents also may contribute to stress on aquatic fauna. There are no data to suggest that the existing project has threatened or endangered any species of aquatic fauna.

The station numbers on Exhibit III-8 refer to the stations of Timbol's 1982 survey.

Exhibit III-9 on page 53 has been corrected.

The Service has been provided with a copy of Timbol's 1983 report. That report supports the conclusions presented in the draft EIS.

Mr. William R. Kramer
Re: Wainiha Hydroelectric Project
August 4, 1983

Page 3

The statement on page 83 of the draft EIS in regard to the diversion weir not being a barrier to migration does not rely upon any assumptions about conditions prevailing before the existing project was constucted. It is based upon Timbol's findings and conclusions from the 1982 survey that there are healthy populations of nakea and nopili both above and below the weir. Further, the proposed weir will be of the same type and general size as the existing weir, a factor which supports the conclusion regarding to impact of the weir itself.

Several meetings and consultations were held since scoping. During these meetings, the subject of stream sampling was discussed. Consensus between the agencies with expertise and jurisdiction for fish protection has not been achieved in regard to the value of methods that could be applied in the future. McBryde believes that the surveys done over the past thirty years are adequate to form the basis for predicting potential impacts.

Thank you for your comments on the Draft EIS. We hope that you will find the above reply responsive to your concerns for the environment.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RPK:lt

cc: Mr. Susumu Ono

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

June 7, 1983

Mr. Susumo Ono, Chairman
Board of Land and Natural Resources
Kalanimoku Building
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Wainiha Hydroelectric Project EIS

In beginning our review of the draft environmental impact statement on this project we note that it supports its statements on various environmental impacts by reference to the following five consultant reports:

Report	Citation on page
Lum, & Assoc., Dec 1982	36
Timbol, A.S., Feb 1983	50
Berger, A.J., Dec 1982	59
Lamoureaux, C.H., Jan 1983	62
Barrera, W., Jr., Dec 1982	63

In our opinion it is unnecessary that an EIS include all of the pertinent information that is available in cited reports if they are available to the public. However, it is impossible to verify the validity of the information in the EIS that is based on these consultant reports or to evaluate the thoroughness of the studies on which the reports are based unless the reports are made available.

We have arranged to get copies of the reports from EDAW, Inc., for whom the studies were made. We suggest that DLNR also should have access to the reports for its own evaluation of the draft EIS.

Sincerely,

Doak C. Cox

cc: EDAW, Inc.
McBryde Sugar Co.

RECEIVED
JUN 23 1983
EDAW Inc.

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

June 22, 1983

RE:0377

Mr. Susumu Ono, Chair
Board of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Draft Environmental Impact Statement
Wainiha Hydroelectric Project
Wainiha Valley, Kauai

The Environmental Center review of the above cited document has been prepared with the assistance of Sheila Conant, General Science; Bion Griffin and Bertell Davis, Anthropology; Marshall Mock, Kauai Community College; James Parrish, Hawaii Cooperative Fishery Research Unit; Jacquelin Miller and Pamela Bahnsen, Environmental Center.

We consider that an environmental impact statement (EIS) on a proposed project cannot be expected to include all of the background information on which its estimates of the environmental impacts of the project are based. It is sufficient that the EIS cite other publicly available documents as sources of such background information, and to include as appendices, or make available as supplementary documents, reports on detailed studies whose results are summarized in the EIS itself. The Wainiha draft EIS cites five reports on special studies that were made on aspects of the environment that may be subject to significant impact by the proposed hydropower project:

Barrera, W., Jr., Dec 1982	Archaeology
Berger, A.J., Dec 1982	Land fauna
Timbol, A.S., Feb 1983	Stream fauna
Lamoureux, C.H., Jan 1983	Botany
Lum, W., & Assoc., Dec 1982	Soils

We requested and received copies of each of these reports. However, they did not become available to us in time to be reviewed by one of the archaeologist-contributors to our review.

Geology, Soils, Climate and Hydrology--Miscellaneous Comments

The Olokele formation of the Waimea Canyon volcanic series is not a single lava flow as stated (p. 34), but a series of lava flows that, because they were ponded in the Kauai caldera are much thicker and more massive than most of the flank flows of the Napali formation of the Waimea Canyon series and hence of much lower permeability.

The average annual rainfall rate at Waialeale is not "over 500 inches" as stated (p. 38), but by latest estimate 451 inches.

It is misleading to state (as on p. 42) that the flow of waterfalls and springs feeding the upper part of Wainiha River represent drainage from Alakai Swamp and Waialeale. It is possible that there is some ground-water contribution to the River, but in the upper part this is probably relatively unimportant, and the extent to which it represents recharge from the Alakai Swamp is problematic. The major part of the flow of the river, other than direct runoff of rainfall in the valley itself, represents surface drainage from that part of the upland swamp of Kauai in the vicinity of Waialeale, about 1 square mile in area. The Alakai Swamp portion of that upland swamp drains southwest to tributaries of the Waimea River.

The errors or misleading statements referred to above are of no significance in relation to the environmental impacts of the proposed project but are called to your attention in the interest of increasing the accuracy of the revised document.

Stream Fauna

An issue recognized in the draft EIS as unresolved (p. 104) is the extent of "effects of the proposed project on the native stream fauna." The new project will add an additional stress to animals already affected by the stress of the present project. John Ford of the U.S. Fish and Wildlife Service has recommended (pp. 146-149) that at least 80 cfs be allowed to pass down the stream, undiverted by the weir, at all times to avoid detrimental effects on the stream fauna. However, it is estimated (p. 124) that the energy production of the proposed powerhouse would be reduced 75 percent if continuous bypass of at least 80 cfs were required. It is proposed instead (pp. 79-80, 123) that the project be operated so that there will be no periods exceeding 30 days in duration in which there will be no flow over the weir, and that after any 30-day no-overflow period, 10 cfs will be released to the stream until the streamflow again exceeds the 150 cfs intake capacity. It is estimated (p. 81) that, with this proposal, the production of the powerhouse would be reduced about 133,000 kwhr per year (or about 0.6 percent of the estimated total).

The duration/discharge curve in exhibit III-5 (p. 43) indicates that the flow of the river (at the USGS gage) exceeds 150 cfs (the capacity of the proposed intake) only about 23 percent of the time, and that the flow of the river is 80 cfs or less about 49 percent of the time. The low-flow duration/discharge diagram in exhibit III-6 (p. 45) indicates that flows averaging as little as 80 cfs may be expected, on the average, for one 30-day period a year.

The base of the latter diagram appears to represent a flow rate of 30 cfs, not zero flow rate as labeled. If correction is made, the diagram indicates that, on the average once a year, there is a 7-day period in which the average flow at the gaging station is only about 50 cfs and a 1-day period in which the average is only about 48 cfs; and that on the average once in a century, the 7-day and 1-day average flows are only about 33 cfs, and the 30-day average flow only about 35 cfs. We note that, if the river flow drops to as little as 35 cfs, after 30 days of flow less than 150 cfs, the diversion by the weir will be decreased to 25 cfs with the release of 10 cfs.

What effect the diversion, operated as proposed or in any other similar manner, would actually have on the stream fauna cannot be determined with certainty. The EIS states (p. 85-86) that the proposed diversion weir "will not be a physical barrier to migration of stream fauna because the existing project diversion weir has not been a barrier to migration." It may be true that the proposed weir will not be a complete barrier to migration. However, it cannot be considered that the weir will be no barrier whatsoever, nor that with its construction and operation as proposed there will be no reduction in either the faunal species present in the upper part of the river nor their populations. We note that Ego reported that, in 1956, 'o'opu fishing in Wainiha was concentrated in the lower 8 km of the river, in other words the part below the present intake. This concentration probably resulted from the spawning behavior of the 'o'opu as well as the relative ease of access to the lower part of the river. We assume that at present there is little fishing in the part of the river above the present intake. The principal concern should be with preservation of sufficient populations to assure retention of the species, maintenance of the fishery, and an aquatic environment of high natural quality.

The EIS claims (p. 82) that during the past 30 years "the diversity and abundance of the stream fauna have not changed much," and that over this period the present weir and diversion "has not served to deplete the composition or number of the 'o'opu in the river." These claims, probably relating to the 27-year period since Ego's (1956) study was made, of course, do not indicate that the present weir is not a barrier nor that it has not reduced the diversity and abundance of aquatic life, because diversion at that weir began in 1906.

More pertinent is the casual claim (p. 82) that the density and abundance of the fauna "are about the same above and below the existing diversion weir." Most of the differences in species abundances above and below the weir reported by Timbol (1983) may be explained either by factors other than the diversion or by the small probability of catching individuals of uncommon species. Timbol's report that oopu-nopili was "very abundant" at all stations on the main stream suggests that the weir does not restrict the migration of that species. However, Timbol's "very abundant" category refers to any number of specimens exceeding 10 per 20m^2, and his report does not prove that there is no significant difference between the abundances of this species above and below the weir. Furthermore, even if there were no differences in the abundances of the diadromous species above and below the weir, this would not prove that the weir had no effect on the population, because it is possible that the populations in the parts of the river below the weir as well as above the weir were affected by the construction of the weir. By the same logic, damage to habitat above the present weir could reduce populations below the present weir since those populations now have access to the space resources above the present weir part of the time.

More pertinent are comparisons between weir dimensions and by-pass flows for the present weir and proposed weir:

	Present project	Proposed project
Weir height, ft.	17 (p. 82)	14 (p. 9)
Average days of no bypass per year	212 (p. 76) 223 (p. 82) ?	266 (p. 76)
Maximum continuous days of no bypass	73 (p. 82)	30 (p. 80)
Percentage of time with no bypass	58 (p. 76)	73 (p. 76)

At least as pertinent would be comparisons between the present project and the proposed project with respect to the length of the stream reach that will be without flow during periods of no bypass and the rates of flow in other reaches of the stream affected. Although an effort was made to reduce groundwater bypass of the existing weir, there is flow in the river within about 100 feet below the weir when there is no weir overflow, and the rate of flow increases downstream as is recognized in the EIS (p. 83). It is unlikely that a reliable estimate can be made of the rate of groundwater bypass of the proposed weir, or the distance below the weir at which such bypass might reappear in the stream, but these may be critical values. According to the EIS there are seven left-bank tributaries and four right-bank tributaries that enter the reach of the river between the proposed weir and proposed powerplant (p. 84), and some of the seven left-bank tributaries are perennial (p. 42). Presumably some estimates were made of the flows of the left-bank tributaries in connection with the consideration of the alternative to the proposed project that would have involved diversions from these tributaries (p. 119). However, the flow estimates are not presented and the locations of the perennial tributaries, which are the only ones that would contribute to the flow of the river in dry periods, are not indicated. This information should be provided in the revised EIS.

Presumably also estimates were made of the natural-flow regime of the river at elevation 1040 feet as well as that at the proposed weir site at elevation 1140, in connection with the consideration of alternative locations of the proposed weir (p. 121). By comparison with the regime at the USGS gage, the regimes at these locations would also provide information on the rate of gain of the stream downstream from the proposed weir. The actual differences between the streamflow regimes at various elevations would have to be available to estimate differences in the effects of the diversion on the stream fauna associated with alternative locations for the weir, as well as the differences in power-generating capacity associated with the alternative weir locations.

Among the water quality effects of the proposed project that must be considered is turbidity. In the long term the proposed project may result in no significant increase in turbidity, but in the short term there will certainly be increases. The turbidity of the river during high water periods may be of no significance because the turbidity is naturally very high then. However, during the construction period, the turbidity of the stream even during low-water periods when it is normally clear, is likely to be considerably increased. The effects of the increase in turbidity on the fauna during these periods are uncertain, but unnaturally low light levels, high suspended solids, and fine sediment accumulating will persist for extended periods. These all have negative influences on stream fauna.

Associated with reduction in stream flow, in the reach of the river from the proposed weir to the proposed power plant, there will be effects on the pH and temperature of the water and on the dissolved oxygen. The EIS cites evidence suggesting that some of these changes may be beneficial to the aquatic fauna. However, it is certain that large increases in temperature and pH and large decreases in dissolved O_2 are detrimental to aquatic animals. The EIS does not predict the levels that will occur, and it may not be possible to make useful estimates. Thus, although it probably cannot be proved conclusively that, in the net, the effects of these changes will be seriously detrimental, it is doubtful that they will be, in the net beneficial. In any case the claim that "there is no evidence to suggest that the proposed project will affect water quality adversely" (p. 87, emphasis added) is invalid. This is a major issue, because if the conditions that persist in much of the stream below the new weir are not suitable for diadromous aquatic fauna during much of the year, successful passage over the weir seems much less likely.

To reduce the additional stress on the stream fauna, the weir could be designed with a "fishway" -- a shape at one side to facilitate fish passage. With respect to the design of the traveling screen proposed to bar fish from the penstock (p. 12), we suggest reference to Fritz, E.S., 1980, "Cooling Water Intake Screening Devices Used to Reduce Entrainment and Impingement, U.S. Department of the Interior, Fish and Wildlife Service," Fish and Wildlife Resources and Electric Power Generation, no. 9.

Avian Wildlife

We note on page 58 of the DEIS that Ahuimanu Productions' An Ornithological Survey of Hawaiian Wetlands cites the following birds as occuring downstream from the proposed project: the Hawaiian Stilt (Ae'o), the Hawaiian Coot ('Alae Ke'oke'o), the Hawaiian Gallinule ('Alae 'Ula), the Hawaiian Duck (Koloa Maoli). We further note that all four of these birds are currently listed on the Federal List of Endangered Species (1980). Per the above cited report, Volume II, page 145, the Black-Crowned Night-Heron ('Auku'u), an indigenous bird to the islands, was also sighted "searching for food along the stream, in taro fields and in the tall grass of the valley."

Although the wetland, where these birds were sighted in this particular report, may be "well out of the range of the (proposed) project area," (p. 58, DEIS) it does not necessarily follow that their habitats, which exist below the proposed project, will not be affected by what occurs at the higher elevations of the Wainiha Stream. There needs to be discussion on how the impacts of the upstream activity will affect the lower stream, along with a discussion of mitigative measures. The maintenance of continuous stream flows and the present water quality are of primary concern.

With reference to this last point, the Ornithological Survey of Hawaiian Wetlands, mentioned above, had the following summary statement regarding the "potential impact of dredge/fill activities":

> Emphasis in evaluating such projects should be placed on means to insure maintenance of stream flow throughout its course and methods to avoid excessive siltation of stream water. Any use of chemicals that may have deleterious effects in aquatic ecosystems, particularly upstream in the valley, should be avoided. (p. 145)

We realize that there will be no dredging or fill activities but nevertheless there exists a potential for a great amount of turbidity as a result of the construction activities, specifically from the road, penstock and stockpiling activities. There needs to be discussion on the control measures, such as revegetation of the stockpiled materials, that will be initiated to prevent the soil from going into the stream. We note that the road will be 2.1 miles long, approximately 12 feet wide, within 20 feet of the stream, and surfaced with gravel, (p. 23).

Archaeology

One of our archaeologist-contributors who did not have available the report by Barrera (1982), cited in the draft EIS, considered that the draft reflects inadequately Earl's (1978) report (cited on p. 63 as taken into account in the Barrera report). He has pointed out that Wainiha and its sites, are very important archaeologically, especially its relatively undisturbed wet taro cultivation system. In addition to the sites and clusters of sites indicated in exhibit III-12, he has information suggesting that there are house sites up-slope from the valley bottom and farther up the valley than the USGS gaging station, although the draft EIS (p. 63 and exhibit III-12) suggests agricultural sites are limited to parts of the valley makai of the gaging station. Our other archaeologist-contributor agrees and considers that there may be taro terraces farther up the valley as well.

Barrera quotes from Handy (1940) a discussion by Lydgate (1913) indicating the existence of nine settlements in Wainiha at the time of Kaumualii, three of them mauka of Maunahina. The farthest mauka, Laau is described as being "where the valley contracts to a narrow gorge, with a brawling stream running white on the bottom," and "where the last available space was won" for taro patches "if not by the dwarfs, at least by someone who understood this kind of agricultural engineering." (Upper Wainiha Valley, Kauai: Archaeological Reconnaissance, p. 6)

The description of the situation at Laau might fit almost any part of the valley mauka of Maunahina, and even at the time of Lydgate's study the locations of these settlements were unknown. It is possible that all three of the upper settlements to which Lydgate referred were located between Maunahina and the gaging station. It is also possible that one, two, or possibly all three of them, were adjacent to the taro terrace area identified as site 5 on exhibit III-12. However, it is also possible that at least Laau was located mauka of the USGS gaging station. In the light of this possibility, the adequacy of Barrera's survey, which he characterized as a "walk-through reconnaissance" hampered by weather, seems questionable, even though he characterized his failure to inspect the southernmost half-mile of the project area because of heavy rain and rising streams as "not a significant omission." (op cit, p.1)

Both Barrera (op.cit. pp. 9-10) and the draft EIS (p. 94) propose 5-step plans for the identification of possible archaeological sites that might be disturbed by the proposed project and for minimizing the archaeological damages of the project. Barrera proposes, as a first step, that an archaeologist conduct a survey of the proposed intake and powerhouse areas and the proposed route of the access road and penstock. The draft EIS proposes that the archaeologist assist a topographic survey crew in identifying archaeological sites in the proposed construction areas and locating them on a detailed topographic map. The identification and location will be accomplished best if the archaeologist and topographers work together, but with respect to the identification and location of the archaeological sites, it is the topographic crew that should assist the archaeologist rather than the reverse.

Both Barrera and the draft EIS propose that the archaeologist then rank the sites in order of archaeological sensitivity and in order of cost of mitigation of damage by salvage operations, but neither provides criteria for the sensitivity ranking. We consider that the establishment of the importance of the sites in relation to the information they may yield on the pre-contact utilization of the valley, their importance as examples worthy of preservation, and the cost of revising the proposed locations of project features to avoid sites worthy of preservation are all of at least equal importance.

Both Barrera and the draft EIS propose that excavations be made to salvage such information as may be obtained from those sites that will be affected by the project. The salvage operations should be conducted under the direct oversight of an archaeologist, as suggested by Barrera.

Barrera recommends, in addition, that the archaeologist work on a continuing basis with project personnel as the project proceeds. Because additional archaeological sites may be discovered in the course of the project, adoption of his recommendation for monitoring should be indicated in the revised EIS.

The development of alternate energy sources is certainly to be commended and we appreciate the opportunity to assist in identifying areas of possible concern to be addressed in the revised EIS.

Sincerely,

Doak C. Cox
Director

cc: OEQC
Randall J. Hee, EDAW, Inc.
Sheila Conant
Bion Griffin
Bertell Davis
Marshall Mock
James Parrish
Jacquelin Miller
Pamela Bahnsen

McBryde
SUGAR COMPANY, LIMITED

July 8, 1983

Mr. Doak C. Cox, Director
Environmental Center
University of Hawaii at Manoa
Crawford 317, 2550 Campus Road
Honolulu, Hawaii 96822

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Mr. Cox:

This is to thank you for your letter of June 22, 1983 to Mr. Susumu Ono, Chairman, BLNR, commenting on the draft EIS for McBryde's Wainiha Hydroelectric Project. We are currently reviewing your comments and will provide a specific response to each one.

This is also to inform you that McBryde has requested that the DLNR grant a thirty day extension to the comment and response period to allow us to prepare our responses.

If you have further comments or questions, please do not hesitate to contact me.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RPK:lt

cc: Mr. Susumu Ono

McBryde
SUGAR COMPANY, LIMITED

August 4, 1983

Dr. Doak C. Cox, Director
Environmental Center
University of Hawaii at Manoa
Crawford 317, 2550 Campus Road
Honolulu, Hawaii 96822

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Dr. Cox:

The purpose of this letter is to respond to the comments contained in your letter of June 22, 1983 to Mr. Susumu Ono, Chairman, BLNR.

Technical reports prepared to identify baseline conditions and evaluate potential impacts are appended to the Final EIS.

Geology, Soils, Climate and Hydrology

The description of the Olokele formation of the Waimea Canyon volcanic series is modified in the Final EIS.

The average annual rainfall rate of Mt. Waialeale is corrected to 451 in. per year.

Surface drainage from the Alakai Swamp is to the southwest into tributaries of the Waimea River. However, USGS maps identify a portion of the Alakai Swamp which lies near Mt. Waialeale as draining into the Wainiha River.

Stream Fauna:

The Final EIS contains a revised discussion of stream fauna.

The base of the Low Flow Frequency/Duration diagram, Exhibit III-6, is 30 cfs and has been corrected in the Final EIS.

There is no reason to believe that the proposed weir will be a barrier to migratory passage, because the existing weir has not been a barrier to migratory passage; and the two are nearly identical. During long dry spells, the proposed weir will be an obstacle to migratory passage, a condition which will be mitigated, at least in part, by allowing one cfs (650,000 gal/day) continuous flow of water to cross it.

The stream conditions which existed prior to construction of the existing plant are not known. These would have little relevance anyway, given the changes which have occurred from all causes over this span of time. Among the changes are those precipitated by commercial, subsistence, and sport fishing. The currently existing conditions are those which must be used as the basis for judging the potential impacts of the proposal. What can be said (Timbol, 1982) is "that Wainiha harbors a good, healthy on-going nopili population" and "that the nakea population appears to be a healthy, thriving population."

The contention that the density and abundance of the fauna "are about the same above and below the diversion weir" is supported by Timbol's 1982 data.

Timbol's 1982 counts for nakea and nopili are as follows:

Station	Elevation	'O'opu Nakea	'O'opu Nopili
1	1,140 ft	7	23
2A	920	11	26
2B	720	14	13
3	680	9	29
4	10	3	30

The existing diversion site is located at Elevation 700 and lies between Stations 2B and 3. The counts are per twenty square meter areas.

Flows entering the river downstream of the proposed weir will be from tributaries and groundwater inflow. Estimates of these contributions were made as a part of design studies for the project. Given the difficulty of defining groundwater inflow and the considerable variability of tributary flows, the estimated flows were based upon an analysis of historical flows and rainfall distribution, intensity, and duration. The incremental contribution was estimated to average 3 cfs per 1,000 ft. The first perennial tributary is about 1,500 ft downstream of the weir location.

In regard to turbidity, there is little that can be added to the discussion in paragraph B.2., Chapter III of the EIS. There will be turbidity increases as a result of cofferdam construction and installation of fills and culverts at stream crossings. Excess soil and rock material will be spoiled in areas away from water courses. Spoil piles will be graded and drained to minimize erosion and encourage revegetation. All of these impacts will be temporary.

Data on water temperature in the Wainiha River are meager. The highest temperature recorded by the USGS at the stream gage was 73.4°F (23°C) in June, 1973. Ego also recorded the temperature at the gage. The highest temperature he recorded at that location was 65°F (18.3°C) in June 1952. The highest temperature in the affected reach of the existing project was recorded by Ego (1956) as 71°F (21.7°C) in August, 1953 on a day when the river's flow at the gage was 46.5 cfs and there had been no freshets for several days. The highest recorded temperature in the entire Wainiha River was 76°F (24.4°C), near the mouth in July, 1953 by Ego. These temperatures are below those which are known to be harmful to 'o'opu. There will be elevated water temperatures in the affected reach of the proposed project during prolonged dry periods. These temperatures will not be lethal to aquatic fauna, but they may degrade the habitat. This impact will be mitigated by maintaining continuous flow in the affected reach.

As stated in the EIS, increases in pH and decreases in dissolved oxygen will be moderate. The latter is, of course, partly a function of temperature. Again, impacts to water quality will be mitigated to some extent by maintaining continuous flow in the affected reach.

To maintain continuous flow, a self regulating notch will be built into the top of the weir near the right bank. The notch will concentrate flow into a narrow area to provide a continuously wet path.

<u>Avian Wildlife:</u>

There will be no effect on downstream habitat caused by operation of the proposed project. This is because all of the water diverted for power production will be returned to the river upstream of the existing weir. During construction there will be minor temporary increases in turbidity. These are unavoidable. It must be emphasized that this project does not embody a "dredge and fill" operation. Stream flow will not be interrupted during construction. Erosion control measures are discussed in paragraph B.1. of Chapter III of the Final EIS.

The access road and penstock will be several hundred feet from the river in most places. Where they must approach the river, they will be at least 20 ft from the river's edge and above the design flood elevation.

Archaeology:

The archaeological mitigation plan is specifically designed to permit the early identification of significant sites, to allow the road and penstock to be laid out while preserving archaeological values where possible, and to permit the recovery of information and artifacts during construction. Supervision by an archaeologist is the cornerstone of the program. This will bridge the gap between early reconnaissance studies, actual field conditions, and the needs of the project.

The criteria for the archaeological sensitivity ranking will be developed prior to the commencement of work at the site.

Thank you for taking the time to review the Draft EIS. Your comments have been most helpful and constructive in preparing the Final EIS.

If you or the Environmental Center staff have further questions or comments, please do not hesitate to contact me.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RPK:lt

cc: Mr. Susumu Ono

LIFE OF THE LAND

June 19, 1983

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Subject: Draft Environmental Impact Statement for Wainiha Hydroelectric Project, Prepared Pursuant to Chapter 343, HRS

Dear Mr. Ono:

We have only reviewed the subject EIS in terms of stream fauna. Unfortunately, it seems to be the case that McBryde Sugar Company, Limited has chosen to substitute deliberate lies and half-truths in place of an adequate biological analysis. Consequently, we are going to insist on a NEPA EIS.

To begin with, the Draft EIS does not include the results of either Amadeo Timbol's 1977 or 1983 surveys of aquatic macrofauna in Wainiha River as a technical appendix. Allegedly based upon Timbol's research, the Draft EIS asserts on page 123 that despite removal of water from Wainiha River for the existing hydroelectric powerhouse, "... freshwater fish survive the interrupted flow with undiminished diversity and number...." However, Timbol's 1977 stream fauna survey has been made available for public use by the Corps of Engineers. And in Table 3, it quite unequivocally shows that there are more o'opu nakea (Awaous stamineous) and o'opu nopili (Scydium stimpsoni) at low elevations in Wainiha River where flow has not been diminished than at mid elevation sampling stations where flow has been diverted.

On page 84, the Draft EIS indicates that because the Wainiha River gains in flow below the existing diversion, "minimum required stream flows are being maintained naturally" in the 4.5 mile length of stream in which flow is diminished. The Draft EIS alleges that the same will be true for the 2.1 mile length of stream which would be affected by the proposed hydroelectric

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project. However, no evidence is presented in the EIS to show how much stream gain occurs below the proposed diversion weir as compared to how much stream gain occurs below the existing diversion weir. In fact, USGS Gaging Station 16108000, which is about 1.5 miles above the existing diversion weir and 0.6 miles below the proposed diversion weir, is used in the Draft EIS to estimate what percent of the year the existing and proposed diversion weirs will intercept all flow of the Wainiha River. This would not be a reasonable approach unless stream gain between the existing and proposed diversion weirs was relatively insignificant.

On page 54, the Draft EIS links Kenji Ego's description of the life cycle of o'opu nakea with John Ford's description of the upstream migration of o'opu alamo'o (Lentipes concolor) as if they were a single species. The reader is left with the deliberately incorrect impression that o'opu nakea can climb up the undercut faces of waterfalls (and presumably even vertical weirs). Unfortunately, if the proposed diversion weir is designed like a waterfall, it will totally block upstream migration of o'opu nakea.

On page 87, the Draft EIS indicates that "slightly elevated water temperatures are conducive to growth of 'o'opu." This also is true for species that compete with o'opu. Ultimately, if a stream becomes warm enough, o'opu cannot compete with exotic species. Cold water is essential for a Hawaiian stream to maintain a high proportion of endemic stream fauna.

In our judgement, if the Final EIS for the Wainiha Hydroelectric Project does not adequately address these points, then it will be legally deficient. We suspect that if an honest job had been done on the Draft EIS, then it would indicate a need to maintain a minimum flow of at least 10 cfs past the proposed diversion weir.

Sincerely,

D.T.
for

Arthur Mori
President

cc: Randall J. Hee
OEQC
Colonel Alfred Thiede

McBryde
SUGAR COMPANY, LIMITED

July 8, 1983

Mr. Arthur Mori, President
Life of the Land
250 South Hotel Street, Room 211
Honolulu, Hawaii 96813

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Mr. Mori:

This is to thank you for your letter of June 19, 1983 to Mr. Susumu Ono, Chairman, BLNR, commenting on the draft EIS for McBryde's Wainiha Hydroelectric Project. We are currently reviewing your comments and will provide a specific response to each one.

This is also to inform you that McBryde has requested that the DLNR grant a thirty day extension to the comment and response period to allow us to prepare our responses.

If you have further comments or questions, please do not hesitate to contact me.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RPK:lt

cc: Mr. Susumu Ono

McBryde
SUGAR COMPANY, LIMITED

August 4, 1983

Mr. Arthur Mori
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Honolulu, Hawaii 96813

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Mr. Mori:

The purpose of this letter is to respond to the comments contained in your letter of June 19, 1983, to Mr. Susumu Ono, Chairman, BLNR.

The Final EIS includes Timbol's report of his 1982 studies. Data summaries from the 1951-1956 and 1970 studies of Wainiha by Ego and the 1977 study of Timbol also are included in the Final EIS.

Timbol's 1977 study found higher concentrations of 'o'opu nakea and 'o'opu nopili within a mile of the mouth of the river than at upstream sampling locations. Other than near the mouth, the concentrations of these two species were in the "common" to "uncommon" range, both above and below the weir. In contrast, Timbol in 1982 found nopili "very abundant" at each of the river stations he sampled, including two above the existing weir. Nakea were "abundant" to "very abundant" above the weir and "common" to "abundant" below the weir. The studies were done in July and December, respectively. In March, 1970 Ego found considerably greater densities of nakea below the weir than above. Ego's studies of 1951-1956 also found this distribution. From the above, it is apparent that the distributions of 'o'opu vary seasonally and annually.

Flows are influenced by three basic factors: a base flow (the most significant component of which is contributed at or near the headwaters), rainfall, and diversions for power. Base flow is relatively constant, being about 45 cfs at the stream gage. The rainfall component is highly variable, depending upon the distribution, intensity, and duration of precipitation.

Long-term data do not exist to demonstrate the incremental flow gains below the existing weir or along the reach above it. For this reason, gaging station records were used directly for the analysis referred to. This method is justified for this purpose because relatively small increments of flow are involved, as compared to the total flows in the river. For estimates of power

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generation provided by various alternative weir locations, flows were adjusted to reflect the differing drainage areas. This was done on the basis of precipitation, drainage area, and base flow. The estimated gain in the affected reach averages 3 cfs per 1,000 ft.

The proposed weir is designed with an ogee crest shape. This provides a rounded sloping surface, nearly identical to that of the existing weir. It is not designed like a "waterfall." The height of the proposed weir is also similar to that of the existing weir. Because the present weir is not a barrier to migration, there is no reason to believe that the proposed weir will be, either.

In regard to thermal effects, the highest recorded temperature is 24.4°C (Ego, 1956). This was at a station near the mouth. The highest recorded temperature in the affected reach of the existing project is 21.1°C. Both these temperatures are below those known to be harmful to 'o'opu.

Following consultations with agencies possessing jurisdiction and expertise in the area of stream fauna, McBryde has modified its proposed project to release one cfs, about 650,000 gallons per day, on a continuous basis. This flow will be released through a self-regulating notch in the top of the diversion weir near the right bank. The continuous flow will help to mitigate the effects of the unwatered reach by providing a migratory pathway and improving water quality during dry periods. The released flows will augment those provided by the uncaptured sidestreams and groundwater inflow.

Thank you for your review of the Draft EIS. If you have further questions or comments, please do not hesitate to contact me.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RPK:lt

cc: Susumu Ono

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

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FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

May 27, 1983

Mr. Randall J. Hee
EDAW, Inc.
1121 Nuuanu Avenue, Suite 203
Honolulu, Hawaii 96817

Dear Mr. Hee:

We would like to request a copy of the complete archaeological reconnaissance report for the Wainiha Hydroelectric Project on Kauai for our office. In further review of the project and for an evaluation of the impact of the project on the archaeological resources, this report will be useful.

Although the Draft EIS presents the recommendations, it would be valuable to have the complete report and any future reports regarding the archaeological resources in the Wainiha project area for our archaeological reviews. Thank you for your attention in this matter.

Sincerely yours,

for Roy K. Cy Sue
State Parks Administrator

RECEIVED
JUN 13 1983
EDAW Inc.

McBryde
SUGAR COMPANY, LIMITED

June 7, 1983

Mr. Roy K. Sue, State Parks Administrator
State of Hawaii
Department of Land and Natural Resources
Division of State Parks
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Sue:

WAINIHA HYDROELECTRIC PROJECT

EDAW, Inc. has sent you a copy of the complete archeological reconnaissance report for the Wainiha Hydroelectic Project as requested in your letter of May 27, 1983.

Thank you for your interest in our project. Please contact me or John Whalen of EDAW, Inc. (536-1074) if you have any questions regarding the project.

Sincerely,

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RJH:jm

cc: EDAW, Inc.
1121 Nuuanu Avenue
Suite 203
Honolulu, Hawaii 96817

#0333A
Diskette #0002A

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

REF. NO.: CPO-2265
FILE NO.: KA-1/10/83-1545

June 22, 1983

Mr. Randall Hee
Engineering Superintendent
McBryde Sugar Co., Ltd.
P. O. Box 8
Eleele, Kauai, HI 96705

Dear Mr. Hee:

We have completed our review of the Draft Environmental Impact Statement submitted to Environmental Quality Commission on May 23, 1983 relating to the proposed second Wainiha Hydroelectric Facility. Our comments and response are as follows:

1. We concur that it is important for an archaeologist to be involved in the planning and field survey for this project and to be able to evaluate any possible impacts on the historical and archaeological resources. The presence of agricultural terraces in close proximity to construction features makes monitoring during construction by an archaeologist another needed step as indicated. Because the agricultural terraces (State Site #30-02-152) were previously on the Hawaii Register of Historic Places, it is felt that this site is significant and measures should be first taken to avoid the site during construction.

   We would request that our Department be consulted should there be any adverse effect to the archaeological sites and that we have input on proposed mitigative actions. At this time, there has been no surveying or mapping of the agricultural terraces or house sites, so we concur with the need to map these sites on the topographic map as this will also aid in determining the impact potential on the archaeological resources.

2. On p. 94, a five-step plan to be implemented to avoid any adverse archaeological impact during construction was enumerated. Since each site will be ranked according to their archaeological sensitivity, what is the probability of a site being impact unavoidably due to a lack of alternatives.

3. Although the impact statement adequately covers the potential effects on wildlife that would result from the hydro project at Wainiha, a few comments are in order to clarify some statements made in the text that are not true, or misleading:

   a. Page 59, line 6, the pueo is on the State list of endangered birds only on Oahu (not on Kauai). Page 59, line 8: Probably one of the most important reasons for koloa having disappeared from other islands besides hunting and habitat destruction is predation: Specifically mongooses.

   b. Page 89, paragraph 2, the statement that mammals in this area are generally considered "pests" is not too accurate. Feral pigs, even though pests to some, are valuable game animals, and provide considerable recreation for the hunting segment of the population. Some statement that the project will not interfere with feral pigs or hunting in the long term should be made. The Hawaiian Bat, an endangered mammal very likely is found in Wainiha Valley. No mention is made of it, although I can see no adverse impact to it as a result of the proposed hydro project. It should; however be mentioned.

   We believe that there will be some adverse impact to the Koloa caused by the de-watering of a portion of Wainiha River. This should be acknowledged, even though it affects a very small number of birds.

4. The statement can be improved if the actual listing of plants developed by the botanist be included and the location of occurrence of the sensitive species be noted.

5. On page 27, you indicated the need for drilling and in particular, blasting as construction methods. What impact will blasting have on stream fauna and wildlife. What is/are the intended mitigative measures and what alternatives have been considered?

6. We note the proposal to bring large, heavy equipment and materials to Wainiha by barge or landing craft and the need to construct either a graded ramp to the beach or provide a landing mat structure at the beach.

   The location and extent of this activity are not indicated in the EIS and information on beach restoration is not mentioned.

The applicant should recognize that permits from U.S. Army Corps of Engineers, the Department of Land and Natural Resources and the County of Kauai are necessary.

7. Access road improvements and construction of a new 2.1-mile long access road to the proposed weir will be required. The new road will be cut except for occasional fill areas. A grader and bulldozers will be used; drilling and blasting will be required, as well as stockpiling of materials removed.

In our initial review, we indicated that information on the location of cuts and fills and tunneling should be provided, as well as information on the quantity of material to be removed, filled and/or stockpiled. None of the requested information is provided.

8. Insofar as aquatic resources, we are especially concerned with the impact of the project on the local population of oopu nakea, an endemic freshwater goby that supports a subsistence fishery on Kauai. In this regard, the document presents conclusions that we question, such as:

a. Over a 30-year period, the composition or number of oopu have remained unchanged in spite of the existing diversion weir.

b. Data over the past 30 years show that the diversity and abundance of species in the river have not changed much and are about the same both above and below the existing diversion weir.

c. The existing diversion weir is not a barrier to migrating stream fauna.

d. Minimum stream flows required for stream fauna existence are being maintained naturally.

e. The proposed diversion weir will not impact stream fauna.

f. The proposed project will have even less impact (on stream fauna) than the existing project.

g. The proposed diversion (seventeen feet high) will not be a barrier to migration.

h. Continuous flow over the proposed diversion is unnecessary for migration.

i. Water quality will not be adversely affected by the proposed project.

j. Modest increases in pH, temperature and in dissolved oxygen of stream water during dry periods often lead to growth of filamentous green algae which are prominent in the oopu diet; elevated water temperatures are conducive to growth of oopu.

k. The proposed project will not adversely affect the oopu habitat.

l. The freshwater fish have survived in the existing interrupted stream flow condition with undiminished diversity and number.

We contend that the document does not present adequate data to support these conclusions.

9. Under the existing withdrawal of water for the present Wainiha hydroelectric power plant, it is our understanding that there is occasionally a dry reach of the stream due to the withdrawal of water from the stream for hydro purposes. This has been going on during the life of the existing power plant which we understand was installed in 1906.

The data presented regarding the proposed new hydroelectric power plant indicates that a quarter mile stream section below the proposed weir will be dry a maximum of 29 days after which water will be released. Statements presented in the document compare existing and proposed hydroelectric facilities on Wainiha River and conclude that stream fauna have migrated successfully without continuous flow since the construction of the existing facility. Statements further indicate that habitat below the existing weir has been adequately maintained.

Since the proposed project covers a shorter distance, receives greater rainfall than the existing facility, and captures no side streams, less impact is anticipated. Nonetheless, as stated in the Draft EIS, a quarter mile section downstream of the proposed weir will remain dry for periods of 29 days after which 10 cfs of stream water will be released.

However, the hydrologic investigations appear to be limited to data extrapolated from stream discharge records from USGS Stream Gaging Station No. 16108000, Wainiha River. Seemingly on this basis alone, determinations were projected on the impact of existing and proposed altered flows on the physical habitat, water quality conditions, flow regimes and the biology of the stream biota. As indicated, a no adverse impact conclusion was reached.

Since the proposed 29 days of maximum dry period may pose possible significant impact on existing resources, a clarification and derivation of the figure of 29 days should be demonstrated.

10. According to the Draft EIS, data available for the past 30 years show that the diversity and abundance of stream fauna have not changed much and are about the same above and below the existing weir; that the existence of a diversion weir in the river and the diversion of up to 100 cfs along a 4.5 mile reach of river has not served to deplete the composition or number of oopu in the river. However, in reviewing the three references cited on these points (Ego, 1956; Timbol, 1977; Timbol, 1982) and other unpublished data from our files, we find results to the contrary especially in reference to the distribution and abundance of oopu nakea.

Ego (1956) found significantly less oopu nakea in each of two sampling (transect) stations (#8 and #7) above the existing diversion weir than in two sampling stations (#6 and #5) immediately downstream of the weir. Additionally, the greatest number of oopu nakea were recorded from two sampling stations (#4 and #3) downstream of the latter two stations. The relative abundance of oopu nakea at these stations (in downstream order, Station #8-#1) expressed as numbers of fish per 1000 square feet was as follows: 8.2, 9.6, 23.3, 31.3, 68.3, 54.6, 25.1 and 1.8. A similar assessment was again conducted in 1970 (unpublished date) by Ego et al. Using the same transect methods (snorkeling) at the same stream sampling stations. The results showed similar patterns of oopu nakea distribution. However, there were significant declines in the numbers of oopu nakea recorded from each transect station.

Timbol (1977) showed that significantly less oopu nakea occurred above the existing diversion weir than below. Macrofauna samples were collected with an electroshocker from ten stations, five above and five below the weir. Relative abundance of oopu nakea above the weir was rated uncommon (1 specimen collected/sighted) at four stations and common (2-5 specimens collected) at one station. At five stations below the weir, oopu nakea was abundant (6-100 specimens collected) at one station common at two stations, uncommon at one station and absent from one station.

Timbol (1982) however indicates the opposite that oopu nakea may be equally abundant above and below the existing weir with no change in relative abuncance having occurred over the six year period since the 1977 study. We question Timbol's findings and disagree with the interpretation of his data on the basis that the oopu nakea counts at certain stations may be biased by combining the number of fish counted by snorkeling transects with those collected by electroshocking. It also appears that the Station 2 fish counts included data collected from two sampling quadrat locations, at elevation 1,000 feet and 760 feet respectively. In addition we point out other serious deficiencies in the procedures used to conduct and evaluate the results of the two (1977 and 1982) studies: there were ten sampling stations but only five of these were selected for sampling in 1982; different electroshocker models were used for the two studies; different sets of standards (index of relative abundance) were used to report numbers of specimens collected.

We hope that the foregoing will enable you to revise where appropriate, areas of inaccuracies and insufficiencies. We further hope that our suggestions will be reflected in the revised document.

Very truly yours,

SUSUMU ONO, Chairman
Board of Land and Natural Resources

cc: EDAW, Inc.
1121 Nuuanu Avenue, Suite 203
Honolulu, HI 96817

McBryde
SUGAR COMPANY, LIMITED

June 27, 1983

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

Subject: Draft Environmental Impact Statement
Wainiha Hydroelectric Project

Dear Mr. Ono:

We have received your comments and responses to the subject draft EIS. We are currently reviewing our data in order to address concerns raised by the Department of Land and Natural Resources.

We note with surprise that the Division of Aquatic Resources has made reference to unpublished data that they have in their files. We have asked the Division of Aquatic Resources on several occasions for any data that they may have on stream fauna in the Wainiha River. To date, we have not received any such data.

We request copies of the assessment conducted in 1970 by Ego et al, as referenced in Item 10 of your letter dated June 22, 1983. We also request any other data that the Division of Aquatic Resources may have that is relevant to stream fauna in the Wainiha River, including any creel census data. Please note that we have copies of Ego (1956), Timbol (1977) and Timbol (1982).

We would appreciate receiving the data as soon as possible so that we can provide a response to your comments by July 7, 1983.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RJH:lt

P O BOX 8 • ELEELE, KAUAI, HAWAII 96705 • TELEPHONE (808) 335-5111

McBryde
SUGAR COMPANY, LIMITED

July 1, 1983

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

Subject: Draft Environmental Impact Statement
Wainiha Hydroelectric Project

Dear Mr. Ono:

We are currently preparing responses to comments from DLNR as well as other agencies and organizations on the subject Draft EIS. Some of the letters of comment have arrived as late as June 29, 1983.

The dead line date of July 6, 1983 for response to comments will not allow enough time for us to respond adequately to the comments. I have contacted Faith Miyamoto, Executive Secretary, of the Environmental Quality Commission and discussed the matter with her. According to EQC EIS regulations, Subpart G, Section 1:62, "the approving agency or accepting authority need not consider response at their discretion received after the 14 day period."

In view of the fact that we will require more time to adequately respond to comments, we respectfully request an extension of up to 30 days for the response period.

We realize that the extension may cause some difficulty with the Conservation District Use Application deadline. The deadline has already been extended 60 days. We would like to extend the Conservation District Use Application deadline up to an additional 30 days. Total extension would be up to 90 days beyond the original 180 day period.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

cc: Ms. Faith Miyamoto
OEQC

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

RECEIVED
JUL 2 1983
EDAW Inc.

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
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LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

JUL 20 1983

REF. NO.: CPO-035
FILE NO.: KA-1/10/83-1545

Mr. Randall Hee
Engineering Superintendent
McBryde Sugar Company, Ltd.
P. O. Box 8
Eleele, Hawaii 96705

Dear Mr. Hee:

We are in receipt of your correspondence of July 1, 1983, requesting a 30-day extension to the Draft EIS response period.

We understand that the proposed Wainiha Hydroelectric Project involves many complex environmental issues which needs a substantial amount of time to address. The present deadline for responding which ended on July 6, 1983, did not allow you adequate time to address concerns expressed during the review period.

In view of the volume and the comprehensive reviews received, your request for an extension of the response period to August 5, 1983, is hereby granted. Your request for a further 30-day extension to the Conservation District Use Application 180-day deadline is also granted. The 180-day deadline will now stand as October 7, 1983.

If you need further assistance, please don't hesitate to contact Ms. Anne Lo-Shimazu at 548-7837.

Very truly yours,

SUSUMU ONO, Chairperson
Board of Land and Natural Resources

xc: EDAW
EQC

McBryde
SUGAR COMPANY, LIMITED

August 4, 1983

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

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Mr. Ono:

The purpose of this letter is to respond to the comments and questions contained in your letter of June 22, 1983.

1. Monitoring by an archaeologist during construction is part of the proposed mitigation program. The archaeologist will monitor work in the areas which he indicates are particularly sensitive. SHPO will be consulted if there will be any adverse impact on archaeological sites so that appropriate mitigation actions can be determined.

   That construction of the project will disturb the agricultural terraces identified as Site #30-02-152 is an apparent misimpression. This site is outside of the proposed construction area and will not be affected. The archaeological reconnaissance survey identified additional terraces upstream which will probably be affected by the project. These terraces have not been surveyed in detail and do not have a site identification number. They have never been listed on the Hawaii Register of Historic Places.

2. It would be too speculative and premature to estimate the probability of impact on archaeological sites at this time. Very little is presently known about the characteristics of the sites, which is why the 5-step mitigation plan is proposed. There are limitations of topography and engineering design in considering alternatives for the alignment of the access road and penstock. The potential impacts to affected portions of the site will not be known until the more detailed survey work is done.

3.a. Clarifications regarding the listing of the pueo and the reasons for the decline of the koloa are noted. Predation by mongooses, however, has not been a threat to koloa on Kauai because there are no mongooses on that island.

b. Feral pigs are considered by hunters to be valuable game animals. Nevertheless, they are introduced animals which are destructive to native habitat and in that sense are considered by many conservationists to be "pests." In any event, the project will not interfere with feral pigs or the hunting of them. It should be noted, however, that access to areas in the mauka portion of the valley is presently restricted by Robinson Estate.

The possible presence of the Hawaiian bat (Lasiurus cinereus semotus) is mentioned in the report by Dr. Andrew J. Berger of his bird and mammal survey of the project area. He concludes that the proposed project will not have any adverse effect on bats which live in the valley.

Dr. Berger concludes that there would also be no adverse impact on the Koloa (Anas wyvilliana), which differs from your opinion. We assume from your comment, however, that you would agree that the potential adverse effect on kòloa is not expected to be significant.

4. A list of plant species found in a survey of the project area is included in Dr. Charles Lamoureux's botanical impact assessment report. The location of the two sensitive plant species encountered in the survey was described as accurately as possible on page 62 of the Draft EIS. Part of the proposed mitigation for the protection of these two plants would be the determination of their precise location on a detailed topographic map, as described on page 91 of the Draft EIS.

5. Drilling and blasting activities will not take place within the run of the river itself. There may be some blasting in the portion of the stream bed temporarily dewatered by the cofferdams. Drilling and blasting will not be done in water. There will be some blasting on the slopes above the river to create cuts for the proposed access road and penstock. The use of explosives will be limited to only what is absolutely necessary to cut through hard material. It is not expected that controlled blasting will cause large rocks or other debris to tumble into the river.

Blasting will startle birds and mammals within hearing range. It is probable that wildlife will retreat from the construction area anyway because of the presence of humans and construction equipment, so the startle effect will be correspondingly reduced. Displacement of the birds and mammals from this part of their habitat will be temporary; after construction they will gradually re-establish themselves in the area. It is likely that the new road will provide more "edge effect" for introduced species of birds.

Because of the characteristics of the terrain and the material to be excavated, there are no alternatives to drilling and blasting in certain areas. A bulldozer and grader will be used where slopes and materials permit. No additional mitigation, other than the careful control of blasting, is contemplated and none is believed to be necessary.

6. The precise location of the beach landing area for heavy construction equipment and materials has not been determined. It will, however, be located west of the mouth of the Wainiha River. More information on the landing site and landing methods will be developed during the construction design phase for the project, which has not yet begun. Permits will be required for the beach landing, but they are not described in the EIS because the types of permits will depend upon the exact nature of the activity in the beach area. It is expected that the activity will not fit within the definition of "development" in the Special Management Area and will therefore not require a Use Permit from the County of Kauai. The laying of a mat across the beach for the passage of vehicles, for example, would create little, if any, disturbance to the area. At most, the activity in the beach area may require a Temporary Variance from the Board of Land and Natural Resources and a Minor Permit from the County of Kauai. The Corps of Engineers has been informed of the proposed beach landing.

7. The profile of the access road is shown on Exhibit II-7, Sections 1, 2, and 3 of the EIS. Cut areas are indicated on the figures at locations where the access road dips below the existing ground surface. Total estimated volume of cut is about 41,000 cy, bank measure. Fill areas will be localized at drainage crossings. The road will be in cut to the extent possible in order to minimize soil stability problems. Fills will be located at the following stations:

1+50	51+00
12+00	61+00
15+00	76+00
27+00	88+00
31+00	94+00
33+00	104+00
45+00	113+00

Total estimated volume of fill is about 17,000 cy, bank measure. Thus, the total volume to be disposed of is 24,000 cy. There will be no tunneling.

8. No data are available to evaluate the impact that the existing project had on stream fauna when it was built in 1906. Studies over the past 30 years show no adverse change and indicate that conditions in Wainiha are favorable to the continued support of the stream fauna.

   Since the proposed project will have characteristics similar to the existing project, it is reasonable to conclude that the proposed project's effects on stream fauna will be similar, but cumulative. There may be a reduction in habitat in the affected reach of the proposed project. This reduction is the only potentially significant adverse impact which cannot be avoided. Entrainment will be avoided by screening the intake. Migratory passage will be maintained by constructing the proposed weir similar to the existing weir. The reduction in habitat will be mitigated, at least in part, by maintaining continuous flow in the affected reach and by screening the intake of the existing project. To the extent that these measures may not entirely mitigate the potential for loss resulting from the reduction in habitat, then that potential loss must be weighed against the benefits of the proposed project.

9. Acting upon the advice of USFWS and other agencies and organizations possessing expertise, the proposed project has been modified to maintain continuous flow in the affected reach of river. A continuous flow of one cfs, or about 650,000 gallons per day, is proposed to be maintained through a self-regulating notch in the weir near the right bank. This flow will be supplemented by the contributions from tributaries, which will be uncaptured, and by groundwater. The downstream gain in flow is estimated to average 3 cfs per 1,000 ft.

Hydrologic studies were based on data from the U.S.G.S. stream gage 16108000. As appropriate, the gaging station records were adjusted to account for drainage area, base flow, and precipitation intensity, distribution, and duration.

10. The unpublished data of Ego (1970) were not made available to McBryde until after the Draft EIS was published. These data show reductions in the numbers of 'o'opu nakea and 'o'opu nopili observed between the studies of Ego in the early 1950's and those in 1970. However, the counts of Timbol in 1982 show considerable increases over those in 1970, in spite of Timbol using a method which probably results in relatively conservative counts. The distribution of 'o'opu nakea also varied between the earlier studies and Timbol's 1982 study. The earlier distributions showed greater relative abundances of 'o'opu nakea in the lower reaches of the river. It is evident that the weir and the reduced habitat in the affected reach are not barriers to migration. Influences beyond the existing project probably have significantly affected the diversity and number of stream fauna. These outside influences are discussed in the Final EIS.

The data from Timbol's 1982 Stations 2A and 2B were averaged, not combined. Actual counts are as follows:

Station 2A (Elevation 920+)		Station 2B (Elevation 720+)	
Atya	868	Atya	605
nakea	11	nakea	14
nopili	26	nopili	13

Note that the elevation for Station 2A was previously reported incorrectly.

Relative abundance for Station II was as follows:

Atya	1473/2	=	++++
nakea	25/2	=	++++
nopili	39/2	=	++++

Timbol did not include individual fish observed during snorkeling in the counts recorded during electroshocking. Snorkeling observations were used to support his conclusions regarding the general health and viability of the populations.

Five sampling stations were selected for the 1982 survey in order to provide a check and update the more comprehensive 1977 survey.

The electroshockers used in the 1982 study were less powerful than those used in 1977. This, if anything, would tend to depress 1982 counts.

The different standards for reporting relative abundance are of no significance. The categories are the same except that in 1982 Timbol added a "very abundant" category from 11 to 100 individuals. This was to reflect higher numbers of 'o'opu recorded. In fact, the 1977 survey recorded numbers in the "abundant" (6-100+ individuals) category at only one station, No. 9, halfway between the existing powerhouse and the mouth of the river.

Social Benefits of Proposed Project

The proposed project offers real social benefits to offset any potential adverse impacts which cannot be entirely avoided or mitigated. These benefits are summarized as follows:

- The $10 million project will generate tax revenues for the State and the County of Kauai.

- The project will create construction jobs and also support jobs in retail trades and other service sectors.

- McBryde's revenues will be increased by the sale of energy resulting from the project. The project will, therefore, enable McBryde to better survive the instabilities that afflict the Hawaiian sugar industry. Studies by Dr. Thomas Hitch in 1981, show that for every sugar worker, 2.29 non-sugar jobs are created or supported. McBryde currently employs about 540 people, therefore, the future viability of McBryde affects about 1,780 people within the State.

- Annually, the project will replace the burning of 50,000 barrels of imported fuel oil, thus reducing atmospheric pollution by 306 tons of sulfur dioxide and 27,440 tons of carbon dioxide. The 50,000 barrels of imported oil also represents over $1.5 million per year that is paid to suppliers outside of Hawaii. The replacement of oil by hydroelectric power will keep the $1.5 million within the State's economy.

- The proposed project will provide a direct cost savings benefit of $339,000 per year to Kauai Electric's customers. The average annual savings per customer will be $19.00, which is a reduction of 2.5% in the typical customer's bill.

- The project will also increase the reliability of Kauai's electrical system.

Thank you for your comments on the Draft EIS. We hope that you will find the final EIS responsive to your concerns for the environment.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RPK:lt

1314

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT. SHAFTER, HAWAII 96858

83 JUN June 21 1983

DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
P. O. Box 621
Honolulu, HI 96809

Dear Mr. Ono:

Thank you for the opportunity to review the draft environmental impact statement for Wainiha Hydroelectric Project. The following comments are offered for your consideration:

a. A Department of Army permit is required for the project. The applicant has filed a permit application, PODCO-O 1714-S, which is being evaluated for completeness.

b. Page 105. The term "navigable" should be deleted.

c. Page 124. The relative effect on the financial feasibility was not specified in the table of discharge/energy production. For example, if 5 of 10 cfs were allowed continuous flow, what is the net effect on the financial feasibility? There will be a loss but what are the remaining benefits? This may be an important consideration in assessing the monetary versus the ecological tradeoffs.

d. Page 130. The 9/28/82 line should read under agency "COE (Planning)."

e. An itemization of pertinent project features should be included on a single page for quick reference, e.g. penstock size/length, diversion dam height/crest length, design discharge, powerplant capacity/annual energy/plant feeder, cost, relative benefits, etc.

f. Statements regarding the minimal or "barely discernible" impacts of the existing plant on stream biota should be modified or supported by technical data.

g. Recommend that the technical reports relating to stream biota cited in the EIS be attached as technical appendices.

JUN 29 1983

h. The proposed project's impacts on stream biota cannot be evaluated based on the information provided. If additional studies are required to make this evaluation these should be completed prior to preparation of the Final EIS. A decision on the DA permit application cannot be made without this evaluation.

i. Riffle and pool complexes are considered "special aquatic sites" under the Clean Water Act Section 404(b) Guidelines.

j. A more detailed and comprehensive evaluation of alternatives should be provided in the Final EIS. All concerns raised in the US Fish and Wildlife Service letter of April 21, 1983 should be addressed completely. In particular, an analysis should be shown for locating the project upstream (1400' elevation).

Sincerely,

Kisuk Cheung
Chief, Engineering Division

McBryde
SUGAR COMPANY, LIMITED

July 8, 1983

Mr. Kisuk Cheung, Chief
Engineering Division
Pacific Ocean Division
Corps of Engineers
Ft. Shafter, Hawaii 96858

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Mr. Cheung:

This is to thank you for your letter of June 21, 1983, to Mr. Susumu Ono, Chairman, Board of Land and Natural Resources, providing comments on the Wainiha Hydroelectric Project draft EIS. We are in the process of reviewing the Corps' comments and will provide a specific response in the final EIS to each comment.

As discussed with the Division's Mr. John Emmerson and Ms. Marge Elliott during our meeting on July 6, McBryde has requested that the Department of Land and Natural Resources grant a thirty-day extension to the draft EIS comment and response period.

Please do not hesitate to contact me if you have further questions or comments.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RPK:lt

cc: Mr. Susumu Ono

P O BOX 8 • ELEELE, KAUAI HAWAII 96705 • TELEPHONE (808) 335-5111

McBryde
SUGAR COMPANY, LIMITED

August 4, 1983

Mr. Kisuk Cheung, Chief
Engineering Division
Pacific Ocean Division
Corps of Engineers
Ft. Shafter, Hawaii 96858

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Mr. Cheung:

The purpose of this letter is to respond to the comments contained in your letter to Mr. Susumu Ono, Chairman, BLNR, dated June 21, 1983.

a. Additional information requested by the Corps as a result of reviewing McBryde's Section 404 permit application is incorporated in the Final EIS.

b. The term "navigable" has been deleted from line 2, paragraph A.1., page 105 of the EIS.

c. Releases of 5 or 10 cfs would have a significant effect on economic feasibility. Potential project benefits will be diminished by the power and energy values of the continuous release. Following are the estimated power, annual energy, and first year market values for various continuous releases.

Continuous flow maintained (cfs)	Power (kw)	Energy (kwhr)	Value of Power and Energy ($)
0.5	15	124,400	8,000
1.0	30	248,800	16,700
3.0	90	748,980	50,100
5.0	150	1,244,070	83,500
10.0	300	2,488,140	167,000

Acting upon the advice of USFWS and other agencies and organizations possessing expertise, the proposed project has been modified to maintain continuous flow in the affected reach of the river. A continuous flow of one cfs, about 650,000 gallons per day, is proposed to be maintained through a self-regulating notch in the weir near the right bank.

d. The 9/28/82 line on page 130 of the Draft EIS has been changed to read "COE (Planning)."

e. A summary table of pertinent project features is attached.

f. The conclusions expressed in the Draft EIS regarding the impact on fish populations of the existing plant are based upon McBryde's interpretation of available data. For example, Timbol (1982) found 'o'opu nakea, the species of primary concern, "abundant" to "very abundant" both above and below the weir. He also stated that "the nakea population appears to be a healthy, thriving population."

   Four stream fauna studies are known to have been conducted in the Wainiha River over the past 30 years. There are no data available prior to construction of the existing project. McBryde acknowledges that it is possible to derive differing interpretations from the data gathered during these studies. Differences in technique, season, and sampling locations complicate comparing the data, but these differences do not invalidate the studies. Nor do the differences preclude drawing the general conclusions presented in the EIS. Stream fauna data are summarized in the Final EIS in paragraph A.3., Chapter III.

g. All technical reports done for the project, including Timbol's report on the 1982 sampling program, are appended to the Final EIS.

h. All available information on stream studies has been provided to the Corps in conjunction with the environmental analysis of the Section 404 permit application. Subsequent consultations with the Corps, USFWS, and DAR/DLNR concluded that further studies of the type previously conducted will not materially assist the evaluation of potential impacts to stream fauna.

In contemplating other methods of studying habitat maintenance, the USFWS expects to study adapting the IFIM methodology to Hawaiian streams. These studies may take several years and may ultimately be unsucccessful due to differences between Hawaiian and mainland streams.

Existing conditions, the base from which potential impacts of the proposed project must be judged, include the existing project. While Timbol found a relatively abundant population of nakea in the Wainiha River in 1982, it is difficult to extrapolate those results to predict the impacts of the new project. Studies over the past 30 years show no adverse change and indicate that conditions in Wainiha are favorable to the continued support of the stream fauna. Adjacent rivers furnish little correlative information. Timbol (1977) found comparable 'o'opu populations in the neighboring Hanalei River. The Hanalei River is similar to the Wainiha River, except that the former has only irrigation diversions. These diversions occur at approximately elevation 1250 and in the lower, taro-growing area of the valley.

Since the proposed project will have characteristics similar to those of the existing project, it is reasonable to conclude that the proposed project's effects on stream fauna will be similar, but cumulative. There may be a reduction in habitat in the affected reach of the proposed project. This reduction is the only potentially significant adverse impact which may be unavoidable. Entrainment will be avoided by screening the intake. Migratory passage will be maintained by constructing the proposed weir similar to the existing weir. The reduction in habitat will be mitigated, at least in part, by maintaining continuous flow in the affected reach and by screening the intake at the existing project. To the extent that these measures may not entirely mitigate the potential for loss resulting from the reduction in habitat, then that potential loss must be weighed against the benefits of the proposed project.

i. Virtually the entire Wainiha River consists of pools and riffles, thus qualifying for consideration as "special aquatic sites" under the Section 404(b) guidelines. In regard to alternate locations for the diversion weir and intake, there are none on the river that do not fall within this definition. There will be only minor excavation below normal high water; this will be to remove loose material and to achieve a geometrically sensible foundation for the diversion weir and headworks. Another activity which will receive special care is the placement and removal of the temporary cofferdams. All of the material from the cofferdams will be removed and either used as fill or wasted at a site away from the river. No spoil will be disposed of below normal high water.

j. A more detailed and comprehensive evaluation of alternatives appears in the Final EIS. Also appended to the EIS is the April 21, 1983 letter from the USFWS and our responses to that letter.

Social Benefits of Proposed Project

The proposed project offers real social benefits to offset any potential adverse impacts which cannot be entirely avoided or mitigated. These benefits are summarized as follows:

- The $10 million project will generate tax revenues for the State and the County of Kauai.

- The project will create construction jobs and also support jobs in retail trades and other service sectors.

- McBryde's revenues will be increased by the sale of energy resulting from the project. These revenues will better enable McBryde to survive the instabilities that afflict the Hawaiian sugar industry. Studies by Dr. Thomas Hitch in 1981, show that for every sugar worker, 2.29 non-sugar jobs are created or supported. McBryde currently employs about 540 people, therefore the future viability of McBryde affects about 1,780 people within the State.

- Annually, the project will replace the burning of 50,000 barrels of imported fuel oil, thus reducing atmospheric pollution by 306 tons of sulfur dioxide and 27,440 tons of carbon dioxide. The 50,000 barrels of imported oil also represents over $1.5 million per year that is paid to suppliers outside of Hawaii. The replacement of oil by hydroelectric power will keep the $1.5 million within the State's economy.

Mr. Kisuk Cheung
Re: Wainiha Hydroelectric Project
August 4, 1983

- The proposed project will provide a direct cost savings benefit of $339,000 per year to Kauai Electric's customers. The average annual savings per customer will be $19.00, which is a reduction of 2.5% in the typical customer's bill.

- The project will also increase the reliability of Kauai's electrical system.

Thank you for your thoughtful and constructive review of the Draft EIS. Your comments were helpful in making many of the revisions in the Final EIS. If you have further comments or questions, please do not hesitate to contact me.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RPK:lt

cc: Mr. Susumu Ono

Attachment No. 1

PERTINENT PROJECT FEATURES
WAINIHA HYDROELECTRIC PROJECT

The following is a summary of pertinent features for the subject project:

a. Capacity: 3,800 kw

b. Average annual energy production: 21.92×10^6 kwhr

c. Plant factor: 66 percent

d. Diversion weir:

Crest length:	160 ft
Height above streambed:	14 ft
Crest elevation:	1,154 ft

e. Penstock:

Length:	11,200 ft
Diameter:	48 in.

f. Project flows:

Design flow:	150 cfs
Annual average power flow:	87 cfs

g. Project heads:

Gross:	440 ft
Design:	420 ft
Rated:	357 ft

h. Elevations at powerhouse:

Unit centerline:	721.5 ft
Maximum tailwater:	716 ft

i. Hydraulic machinery:

Two overhung Pelton hydraulic turbines direct connected to a 4,800 kva synchronous generator.

j. Transmission line: 4.5 mi long at 57.1/69 kv

k. Access road: 2.1 mi long, single lane.

l. Benefits:

The proposed plant will replace 50,000 bbl of imported oil per year.

There will be a direct economic benefit of $339,000 per year to customers.

m. Cost: Approximately $10 million.

n. Commercial operation: October 1985.

1298

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

GEORGE R. ARIYOSHI
GOVERNOR
Kent M. Keith
DIRECTOR
FRANK SKRIVANEK
DEPUTY DIRECTOR

KAMAMALU BUILDING, 250 SOUTH KING ST., HONOLULU, HAWAII • MAILING ADDRESS: P.O. BOX 2359, HONOLULU, HAWAII 96804

JUN 27 1983

June 23, 1983

2 : 53

STATE OF HAWAII

Ref. No. 7607

MEMORANDUM

TO: The Honorable Susumu Ono, Chairman
Board of Land and Natural Resources

FROM: Kent M. Keith, Director

SUBJECT: Wainiha Hydroelectric Project Draft Environmental Impact Statement (EIS)

We have reviewed the subject draft EIS and offer the following comments for your consideration.

The pursuit of energy development projects such as the proposed second hydroelectric facility on the Wainiha River is strongly supported to lessen Hawaii's dependence on imported fossil fuels and to promote energy self-sufficiency.

At the same time, however, Hawaii Coastal Zone Management (CZM) Program objectives and policies related to coastal ecosystems require us to assure that the biological integrity of the Wainiha River will not be excessively compromised.

> Coastal Ecosystem Objective: Preserve valuable coastal ecosystems of significant biological or economic importance.
>
> Coastal Ecosystem Policies: Minimize disruption of degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing needs.
>
> Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate State water quality standards.

Perennial streams of moderate to high natural quality such as the Wainiha River, are considered valuable coastal ecosystems under the program objective. A major intent of the policies is to maintain the water flow necessary to ensure ecosystem integrity in such streams. The attention devoted in the EIS to the protection of stream fauna is commendable. There are two points, however, which we feel warrant additional clarification.

First, the EIS on page 55, states that diadromous species which would be expected to range throughout the river are equally, if not more, abundant above the existing weir than they are below it. In Appendix A of the EIS, however, the U.S. Fish and Wildlife Service provides a conflicting observation that population densities of o'opu are greater below the existing weir than above it.

Inasmuch as the impact of the existing weir upon ecosystem functioning serves as a basis for assessing the impact of the proposed project, this apparent discrepancy should be clarified.

Second, the EIS mentions the diadromous nature of the endemic and indigenous stream fauna and the seasonal migration of at least one species, the recreationally valuable o'opu nakea. Inasmuch as this suggests stream flow requirements that could vary seasonally according to different stages of species' life cycles, further discussion of any known relationships would be appropriate.

Thank you for this opportunity to comment. Should any questions arise regarding this matter, please feel free to contact us at any time.

cc: Mr. Randall J. Hee
Office of Environmental Quality Control

McBryde
SUGAR COMPANY, LIMITED

July 8, 1983

Mr. Kent M. Keith, Director
Department of Planning and
Economic Development
Honolulu, Hawaii 96804

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Mr. Keith:

This is to thank you for your letter of June 23, 1983 to Mr. Susumu Ono, Chairman, BLNR, commenting on the draft EIS for McBryde's Wainiha Hydroelectric Project. We are currently reviewing your comments and will provide a specific response to each one.

This is also to inform you that McBryde has requested that the DLNR grant a thirty day extension to the comment and response period to allow us to prepare our responses.

If you have further comments or questions, please do not hesitate to contact me.

Sincerely,

MCBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RPK:lt

cc: Mr. Susumu Ono

P O BOX 8 • ELEELE, KAUAI, HAWAII 96705 • TELEPHONE (808) 335-5111

McBryde
SUGAR COMPANY, LIMITED

August 4, 1983

Mr. Kent M. Keith, Director
Department of Planning and
Economic Development
State of Hawaii
P. O. Box 2359
Honolulu, Hawaii 96804

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAINIHA HYDROELECTRIC PROJECT

Dear Mr. Keith:

The purpose of this letter is to respond to the comments contained in your letter of June 23, 1983 to Mr. Susumu Ono, Chairman, BLNR.

In regard to your comment concerning the distribution of diadromous species in the Wainiha River, Timbol (1982) found that 'o'opu nakea were "abundant" to "very abundant" both above and below the weir. 'O'opu nopili were "very abundant" in both areas. Although the data are subject to interpretation, Timbol found that "the nakea population appears to be healthy, thriving population." In 1977, Timbol found 'o'opu about equally distributed above and below the weir, except for higher concentrations near the mouth. Ego, in 1970, found greater densities below the weir. In his earliest published work, Ego (1956) found that "the first five miles of the stream contain the bulk of the 'o'opu nakea population with the area of maximum density situated about 2-1/2 miles above the river mouth." This was the same relative distribution that he found in 1970, although fewer fish were found in the 1970 survey. Greater densities of nakea were found in 1982 than in 1970, although this may be a function of the different sampling methods used. It is apparent that the populations of 'o'opu are dynamic, both in their density and distribution. It is also apparent, based upon the distributions of nakea found by Timbol in 1977 and 1982, that the existing weir and the affected reach of the existing project are not barriers to migration because 'o'opu were found in abundance above the weir during both surveys.

The conflicting observation of the USFWS was provided by Mr. John I. Ford, who was present during Timbol's survey. Mr. Ford participated by making underwater observations using a face mask and snorkel. Timbol's counts of 'o'opu nakea and 'o'opu nopili were made using an electroshocker. The underwater observations included larger fish than the electroshocker was able to stun. Timbol's conclusions are supported by his data, which tend to be conservative in that larger individuals were excluded. In that the sample populations were different, it is possible that both conclusions are correct.

In order to allow independent analysis and interpretation, Timbol's 1982 report is appended to the Final EIS. All available stream fauna data are included in paragraph A.3., Chapter III, of the Final EIS.

The 'o'opu nakea's life cycle has been studied and described by Ego (1956) and by Ford and Kinzie (1982). Ego indicates that adult nakea spawn in the lower reaches of the river between August and December. Freshets apparently facilitate their spawning migration. In four to seven months, the fry return from salt water to complete their life cycle. This places upstream migration from December to July, thus encompassing the full year.

Monthly average flows in the Wainiha River exhibit some variability, with April, July, and November having relatively higher average flows than other months. Of more significance is the extreme short-term variability which appears to provide the required migratory pathway. Further information on flows may be found in paragraph A.2. and B.3., Chapter III, of the EIS.

Thank you for your review of the Draft EIS. If you desire further information or have additional comments, please do not hesitate to contact me.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee

Randall J. Hee
Engineering Superintendent

RPK:lt

cc: Mr. Susumu Ono

RANDALL J. HEE

CITIZENS UTILITIES COMPANY

P.O. BOX 278 · ELEELE, KAUAI, HAWAII 96705

June 6, 1983

Mr. Susumu Ono, Chairman
Board of Land & Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, HI 96809

Dear Mr. Ono:

Thank you for the opportunity to comment on the Draft Environmental Impact Statement (EIS) prepared by McBryde Sugar Company titled "Wainiha Hydroelectric Project."

By way of introduction, we are the electric utility providing power service to the island of Kauai and as such have a vital interest in energy developments such as the Wainiha Hydroelectric project.

Our review of the EIS suggests that a thoughtful, factual in-depth analysis has been prepared by McBryde of the multi-faceted aspects of the Wainiha project.

Kauai Electric strongly supports the Wainiha project and calls your attention to our letter to McBryde dated May 3, 1983 which was included in Appendix A of the EIS. Our letter developed our estimate of some of the benefits our consumers would derive assuming that McBryde proceeds with the construction of the project. These direct benefits flowed from savings to Kauai Electric in the following areas:

1. The rates for the energy from the project are less than Kauai Electric's avoided cost. These savings would flow to our customers through the operation of our Energy Rate Adjustment Clause.

2. The rates negotiated for capacity charge will be less than what Kauai Electric would pay if it had to install base load capacity at Port Allen to meet future growth.

3. The installation of capacity on the north shore will increase the reliability of power to the area and help delay the construction (and cost) of a second transmission line to the north shore.

4. There will be a reduction in system line losses due to the installation of the new plant on the north shore.

We are supportive of the concept that a balancing must exist between the environmental quality of our island and the benefits to be derived from a project such as the Wainiha project. It is our conviction that this balancing has been demonstrated.

McBryde has a genuine concern for the environment of Wainiha Valley. This has been evident over the last three quarters of a century in its operation of the existing hydroelectric facility and in its concerns candidly addressed in the EIS. We perceive that the new hydro project will not adversely impact the existing environmental quality of the area over the long term.

Further, we feel that the benefits which accrue to the people of Kauai as a result of this project far outweigh any potential short term deterioration of the Wainiha Valley. Such benefits are not only those mentioned previously but also include strengthening McBryde's ability to weather erratic fluctuation of sugar prices. With McBryde's current employment at 890 people, its strength is vital to Kauai.

Proceeding with this project will allow us to make a significant contribution to each of our customers on Kauai. We trust that this project will proceed in order that we can assure that those benefits will accrue to our customers for, at least, the next twenty years.

The project complies with the Hawaii State Energy Plan's objective to accelerate the transition of the State's energy generation from fossil fuel sources to indigenous renewable resources. The proposed project, on completion,

Mr. Susumu Ono, Chairman
Board of Land & Natural Resources

will produce at least 22 million additional kwh annually, which is approximately 12% of Kauai's public energy requirements. The proposed hydroelectric plant will generate enough energy to displace approximately 50,000 barrels of oil derived energy.

We urge you to act favorably on McBryde's application. We firmly believe that such action is in the public interest and will assist us in continuing the quality of life found on Kauai.

Very truly yours,

Boyd T. Townsley
Vice President
Kauai Electric Division

BTT:ey

cc: Randall J. Hee

McBryde
SUGAR COMPANY, LIMITED

June 10, 1983

Mr. Boyd T. Townsley
Vice President
Kauai Electric Division
Citizens Utilities Company
P. O. Box 278
Eleele, Kauai, HI 96705

Dear Mr. Townsley:

Thank you for your review comments on the Environmental Impact Statement for the proposed Wainiha Hydroelectric Project and your strong statement of support for the project to Mr. Susumu Ono of the Board of Land and Natural Resources.

Sincerely,

McBRYDE SUGAR COMPANY, LIMITED

Randall J. Hee
Engineering Superintendent

JPW:lt

cc: Department of Land and Natural Resources