COUNTY OF MAUI
DEPARTMENT OF WATER SUPPLY

REVISED
ENVIRONMENTAL IMPACT STATEMENT
FOR THE
LAHAINA WATER TREATMENT PLANT
Lahaina, Maui, Hawaii
TMK: 4-6-18:12

Job No. 35-MW-33

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Honolulu, Hawaii

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summary
SUMMARY

LAHAINA WATER TREATMENT PLANT
Lahaina, Maui, Hawaii

PROPOSING AGENCY: County of Maui
Department of Water Supply

ACCEPTING AUTHORITY: Governor, State of Hawaii

CONTACT: Department of Land and Natural Resources
Division of Water and Land Development
P.O. Box 373
Honolulu, Hawaii 96809

I. DESCRIPTION OF THE PROPOSED PROJECT

The Department of Water Supply, County of Maui, proposes development of a water treatment plant in Lahaina, Maui, Hawaii, above the grounds of the Lahainaluna High School (TMK 4-6-18:12). The proposed plant will be constructed by the State Department of Land and Natural Resources, Division of Water and Land Development, and will be operated and maintained by the County of Maui Department of Water Supply. The plant will be designed to treat water from the surface water source, Kanaha Stream, primarily for turbidity, to comply with the Federal Safe Drinking Water Act of 1974, PL 93-523. Kanaha Stream is an essential potable water source currently serving Lahaina town.

The Department of Water Supply proposes construction of a factory-built modular plant consisting of four 0.5 MGD modules, providing a functional capacity of 1.5 MGD,
with a 0.5 MGD module as an emergency backup. Of the 1.5 MGD functional capacity, however, the average operating capacity will be 1.2 MGD. With this agreement, the Department of Water Supply will provide water to Lahainaluna High School and to Lahaina town and will maintain the plant. Pioneer Mill Company will have use of the remainder of the water. Division of this water source is being negotiated between Pioneer Mill Company and the Department of Water Supply.

The proposed design of the plant includes four factory-built 0.5 MGD modules. One 0.5 MGD module will be used for backup during maintenance or failure of a unit, leaving a functional capacity of 1.5 MGD, but an average operating capacity of 1.2 MGD. These modules will be housed in a building, which will also house the chemical feed equipment, air compressors, motor control center, plant control panel, and storage for chemicals used in the treatment process.

The plant will be automated, requiring only brief daily checks to assure proper functioning. The modules have been designed to treat turbidity up to 500 NTU without difficulty, and at these conditions, filter run lengths can be reduced to 6 to 8 hours from the normal 24-hour length. This will not affect the volume output, only the frequency of backwash cycles. Backwash water will be disposed directly into Pioneer Mill Company's irrigation system for cane irrigation.
Preliminary access improvements and sitework during construction is estimated at 3-5 months. Building, plant module assembly, and final procedures for operation are estimated at an additional 3 months. Estimated total contract time is 1 year.

Construction of the proposed treatment plant is estimated at $1,400,000.00, to be funded by the State and administered through the Department of Land and Natural Resources, Division of Water and Land Development. Funds were provided through Act 226, SLH 1976, Item 88A-A-4; Act 10, First Special Session 1977 as amended by Act 243, SLH 1978, Item A-19; and Act 243, SLH 1978, Item A-19. Estimated operation and maintenance costs of the proposed plant design is $51,500.00 per year, to be borne by the County of Maui.

II. DESCRIPTION OF THE AFFECTED ENVIRONMENT

A. Site Description

The proposed site is located on land owned by the State of Hawaii, and under E.O. to the Department of Education for Lahainaluna High School. The site is 1,000-1,500 feet mauka and to the east of the school complex and is separated from the school complex by orchards. The north edge of the site is the top of a cliff, which drops to the bed of Kanaha Stream, and the eastern and southern sides are bounded by pastures.
The site is presently being used as the intended purpose. The site has a screen box which screens water from Kanaha Stream. From the screen box, water is diverted to a 0.1 million gallon storage tank for use by Lahainaluna High School and the remainder to the County system and to Pioneer Mill Company.

B. Hydrology

Median flow of Kanaha Stream is 3.2 MGD. The diversion capacity is 3.0 MGD, with actual diversion averaging 2.66 MGD. The actual 3.0 MGD diversion capacity is attained 55 percent of the time and flow is greater than 2.0 MGD approximately 95 percent of the time.

Basically, the water quality of Kanaha Stream is very good; therefore, turbidity is primarily the only factor which must be treated to meet current Federal regulations for potable water. Tests conducted from 1966 through 1978 show that the concentrations of various chemicals from the stream are well below maximum standards set by the Environmental Protection Agency, except for turbidity.

C. Biological

The only endemic species of terrestrial flora encountered at the site is Erythrina sandwicensis (wiliwili), which is growing along the cliffs of
the Kanaha Stream gulch. During construction and maintenance of the facility, the contractor and the Department of Water Supply will assure that these specimens are not damaged. The only endemic bird expected at the site is the Hawaiian owl, or pueo (Asio flammeus sandwichensis), since rodents are believed present at the site. However, the site is bounded by pastures, open fields, and orchards, which appear to provide better habitat for rodents than the site itself. Consequently, the pueo would probably be more likely to frequent surrounding areas than the proposed site.

Kanaha Stream was surveyed in 1963 for aquatic fauna. A few gobies, damselflies and diptera larvae were present. A more recent survey in 1979 encountered guppies, chironomids, caddisfly and mosquito larvae, waterstriders, waterboatmen, dragonflies and damselflies. Above the diversion structure, only insects represented the aquatic macrofaunal community. No diadromous species were encountered.

D. Socioeconomic Characteristics

The Lahaina District represents 15 percent of the island's population and represents the greatest growth rate from 1970 to 1977. This district also had a greater growth rate than either the County or
the State averages. Construction rates, simultaneously, are quite high for Maui County and for this area.

E. Infrastructure

Electrical and telephone services will be required for the proposed project. Plans for the development will be coordinated with the appropriate utility companies prior to application and approvals of necessary permits.

Fire, medical and police services are available for the Lahaina area and should be adequate for the requirements of the proposed project. The plant will only require brief daily checks and will not be occupied throughout the entire day. Building security will be provided for the structure so the facility should not require routine police service to the site.

Existing roadways from Honoapiilani Highway through the grounds of Lahainaluna High School are adequate. A roadway from the upper grounds of the school to the site will be provided and will be approximately 1,000 – 1,200 feet long. Existing and proposed improvements are adequate since only a brief daily visit by one individual is anticipated.
F. **Archaeological/Historical Characteristics**

The proposed site has been previously disturbed so there are no sites of archaeological or historical significance.

Hale Pa'i is a two-story building located on the grounds of the high school and is a registered site. The contractor will assure that no damage to the structure will occur during transport of equipment to the site.

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

A. **State Land Use**

The project site is on land designated Agriculture by the State Land Use Commission. Because of this, a Special Use Permit must be filed through the Maui County Planning Commission for approval.

Although the intake is in a State land use Conservation District, a Conservation District Use Application is not required since the proposed project will not entail construction in this land use designation.

B. **General Plan for the Lahaina District**

The proposed project is in an area designated by this plan for public use and would be compatible with that intent.
C. **Proposed Maui County General Plan**

According to the objectives and policies set forth in this draft document, the proposed project will be compatible with the proposed General Plan.

D. **Safe Drinking Water Act, 1974**

This act designated the Federal Government with the responsibility of establishing national standards for drinking water. The states are responsible for enforcing standards and supervising public water supply systems and sources of drinking water.

Primary standards are designed to provide maximum feasible protection of the public health to include maximum contaminant levels, treatment techniques, and criteria for operation, maintenance, siting, and intake of public water supply systems.

Secondary standards will be prescribed for taste, odor, and appearance of drinking water, including sodium and total dissolved solids. These standards are to be enforced at the discretion of individual states.

The proposed water treatment plant is being designed to comply with necessary provisions of regulations mandated by the Safe Drinking Water Act.

E. **State Department of Health, Chapter 49, Potable Water Systems**

These regulations were adopted to establish drinking water quality standards, standards which
are based on the Safe Drinking Water Act. It sets parameters for organic and inorganic chemicals such as coliforms and turbidity. Inorganic and organic chemicals and coliforms are monitored by the State Department of Health and turbidity is monitored by the County. The proposed plant is being constructed to comply with State and Federal regulations relating to drinking water.

F. Coastal Zone Management Program

The Coastal Zone Management Area includes all lands except for those in State forest reserves and Federal lands. Coastal zone lands are further divided into shoreline areas (Special Management Area) regulated at the County level and inland areas (Administrative Coastal Management Area) regulated by State agencies.

The proposed project site is outside the Special Management Area but is in State Land Use Designation, Agriculture. As previously stated, since the project site is in an Agriculture designation, a Special Use Permit must be filed through the Maui County Planning Department, which will coordinate a hearing with the Maui County Planning Commission for approval.
This program recognizes policies of national interest, among those being siting of regional water treatment plants. Those policies are presented in Appendix E.

IV. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATIVE MEASURES TO MINIMIZE ADVERSE IMPACTS

A. Primary Impacts of the Proposed Project

1. Short-term

These impacts involve construction-related impacts and are of short duration, lasting only for the construction period.

Dust will be generated during clearing and grubbing of the land, but this can be easily mitigated in the field with water sprinkling. Exhaust emissions from construction equipment should be minimal and will be readily dissipated so adverse impacts on ambient air quality are not anticipated.

Proper site grading during construction should not contribute sediment into Kanaha Stream. Besides site grading, care will be taken to discourage drainage from the site in the direction of Kanaha Stream.

Noise will increase during construction, but pile drivers, jack hammers, or rock drills
are not anticipated. The contractor will ensure that mufflers are in proper operating condition on equipment and will limit the hours of construction.

Vegetation which will be cleared from the site are all common and found throughout the State. Specimens of *Erythrina sandwicensis* (wiliwili), which is an endemic species, are found along the wall of the gulch and up into the valley. These do not appear in danger of damage or destruction during construction, but precautions will be taken by the contractor to assure that these specimens are not harmed.

The site does not offer suitable habitat for fauna so critical wildlife habitats would not be in danger with implementation of the proposed project. Since construction activities should not affect stream water quality, adverse impacts on stream biota are not expected.

Since the site was previously disturbed, a discussion on adverse impacts to archaeological sites is precluded. Hale Pa'i, located on the grounds of Lahainaluna High School, is on the State and the Federal registers of historic places. During construction, the contractor
will assure that this building is not damaged during transport of equipment to the site.

Chemical toilets will be provided during construction for proper disposal of liquid wastes. Solid waste generated during construction will not be allowed to accumulate and will be regularly disposed at the nearest sanitary landfill.

The only anticipated adverse impact associated with traffic related to the proposed project is transport of construction equipment. This will be done during off hours and, if necessary, a police escort will be requested. This disruption will be temporary. There will be some daily construction worker traffic through the site, but it should not have a significant adverse impact on school activities.

2. Long-term

These impacts are those anticipated to result directly from the proposed project, for the duration of the project.

This plant will require an initial expenditure of public funds in the approximate amount of 1.4 million dollars and will require an estimated 51.5 thousand dollars annually for maintenance. This cost is necessary if
the Kanaha Stream water source is to receive proper water treatment in accordance to the Federal mandate for drinking water.

Emissions from equipment should be negligible and should not affect ambient air quality. Chlorine tanks must be routinely provided on site for treatment, but a chlorine detection system will be provided in the plant design and gas masks provided should leakage occur.

There will be a long-term positive impact on the water quality of this potable water source. Treated water will meet current Environmental Protection Agency standards for potable water. Routine operations will not endanger existing stream water quality and backwash water will be disposed in the Pioneer Mill Company's irrigation system to be used for sugar cane irrigation.

Two air compressors will be provided as part of the treatment plant, only one of these operating at a given time with the other as back-up. The air compressor will operate about 20 - 40 percent of the time at a noise level of 85 dB adjacent to the compressor. Approximately 70 - 75 feet away from the compressor, the estimated noise level will be 70 - 75 dB.
Since sensitive wildlife habitats and rare and endangered species are not expected in the area, adverse impacts to those species from noise are not expected. The site is about 1,200 feet from the nearest school building and this, combined with the attenuating effects of vegetation and orchards located between the site and the school, should have a negligible impact on school activities.

Adverse impacts to local emergency services are not anticipated. The building housing plant components will be secured and fencing will be provided around diversion structures to alleviate potential security problems.

B. Secondary Impacts

During construction there will be infusion of cash into the local economy, which will be a short-term positive impact.

The proposed project will preclude land uses incompatible with the intended purpose. Since the proposed action is similar to the existing use, adverse impacts to and conflicts with the site and surrounding land uses are not expected.

V. ALTERNATIVES TO THE PROPOSED ACTION

A. No Action

A no action alternative would not meet the Federal mandate for potable water to meet EPA standards.
This alternative would also not accomplish the objective of the Department of Water Supply to develop a treatment plant to treat water from this source, which is an integral part of necessary water resource development plans for the Lahaina area.

B. Alternative Sites

Since the proposed treatment plant is proposed at the present screen box and reservoir site, alternative sites were not considered a factor. Other sites would only incur greater construction costs with no additional benefits or decrease in adverse impacts.

C. Alternative Designs

Several alternative plant designs are presented, but these are less desirable either because of greater long-term cost and/or because of less flexibility in operations and maintenance.

Alternative IA is the same as the proposed design, except it has a reduced capacity of 1.5 MGD. This option would not allow for a backup of 0.5 MD should any of the modules require maintenance.

Alternative I is identical to the proposed design, except it proposes two 1.0 MGD modules rather than four 0.5 MGD modules. The advantages of this design are not different from the proposed design, but there
are some disadvantages compared to the proposed design. In the event of equipment failure, one-half of the water treatment plant is out of service. The 1.0 MGD factory-built water treatment plant modules may be too large for convenient transport to the plant site.

Alternative II requires on-site construction of a conventional 2.0 MGD water treatment plant using concrete gravity filter construction. All tankage will be of concrete and will be housed in a prefabricated building. Reducing the capacity to 1.5 MGD will only reduce the project cost by about 15 percent. The advantage of the concrete construction is that it does not require painting and requires less maintenance of structures. The disadvantages of this type of construction is that it requires more sophisticated construction techniques than factory-built units, it is difficult to get concrete trucks on site, and there are more equipment manufacturers and vendors to deal with when maintaining the plant.

Alternative III is essentially the same as Alternative II, except pressure filters (steel construction) are substituted for gravity filters. This would require a higher cost and because pressure
filters are not required to meet system operating constraints, this alternative was not considered further.

D. Alternative Backwash Disposal

Various alternatives to handling backwash water are:

1. returning the wastewater directly to the water source (Kanaha Stream);
2. removing most of the settleable solids in settling ponds before discharging the wastewater into Kanaha Stream;
3. remove settleable solids and discharge the clarified backwash water into the Pioneer Mill Company mill system;
4. removing the solids in the backwash through settling ponds and releasing the clarified backwash water to the Pioneer Mill Company irrigation system; or
5. removing the solids in settling ponds and recycling the water through the treatment plant.

Since it is the goal of the Environmental Protection Agency to have "no discharge" by 1985, the alternatives 1 and 2 of discharging backwash water into the water source are not considered viable alternatives.

The most economical method of backwash disposal is that which is being proposed. An alternative to this would be to clarify the backwash through settling ponds prior to discharge into the Pioneer Mill Company's irrigation system. This involves
greater cost and larger land area because of the ponds. It is also possible to remove solids in a settling pond and recycling the backwash water, but this would make controlling the operations more difficult and more costly.

The alum sludge is gelatinous and does not dewater readily. By natural evaporation, several warm, dry months are required to dry the sludge to a manageable consistency. Methods of dewatering alum sludge include: (1) scroll centrifuge; (2) precoated vacuum filter; (3) pressure filtration (filter press); and (4) alum recovery. These mechanical processes are usually proposed where land value is high or large land areas are unavailable. If large land area is available, other dewatering processes include freezing, spray irrigation, shallow-bed drying, and transformation of topsoil by mixing soil with sludge and shredded leaves for landfill.

Capital cost of mechanical methods will be prohibitively high for small treatment plants such as that being proposed. Shallow-bed drying will not be as economical as wash water settling ponds. The estimated cost of wash water settling ponds is $11.00 per ton of dry solids, exclusive of land cost.
VI. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The proposed action will enable treatment of Kanaha Stream water to meet Federal and State regulations for potable water. This water source already is and will be an important source for the Lahaina area.

The proposed amount of water to be removed from Kanaha Stream will not be greater than what is presently being drawn, used by the school, and distributed throughout the Lahaina water system. Wastewater from the treatment plant will be diverted into Pioneer Mill's irrigation ditches for sugar cane irrigation.

The proposed action will not involve trade-offs between short-term losses, foreclose future options, narrow the range of beneficial use of of the environment, or pose long-term risks to health and safety. In fact, the treatment plant will treat existing water from Kanaha Stream to a level higher than what is being distributed to the Lahaina area.

VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

State and County funds, labor, construction and building materials, and fuel will be committed to the project. Additional operation and maintenance funds and minimal manpower will be required. The proposed plant will have an average operating capacity of 1.2 MGD and
should not affect the draw at the intake located further upstream into the valley. Wastewater generated by the treatment process will be routed directly into Pioneer Mill Company's irrigation system for sugar cane cultivation.

VIII. AN INDICATION OF WHAT OTHER INTERESTS AND CONSIDERATIONS OF GOVERNMENTAL POLICIES ARE THOUGHT TO OFFSET THE ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

Most of the adverse impacts related to the proposed project are short-term, anticipated during construction. The Kanaha Stream water source is a vital source for the Lahaina area and is a portion of the long-range plans to provide sufficient water to the Lahaina area.

IX. APPROVALS

The proposed project will require coordination and general approval of plans from the Department of Education, Hawaiian Telephone Company, and Maui Electric Company. Specific approvals and/or permits will be required from the State Department of Health and from the County of Maui Department of Public Works. In addition, a Special Use Permit will be required for the project from the Maui Planning Commission.
project description 1
SECTION 1
DESCRIPTION OF THE PROPOSED PROJECT

I. INTRODUCTION

The Department of Water Supply, County of Maui, proposes construction of a 2.0 MGD water treatment plant in Lahaina, details of which are discussed later in this section.

The project site is located in the Lahaina District of Maui (Figure 1-1) and approximately 2 miles northeast of Lahaina town (Figure 1-2). It is west of Wailuku by about 20 miles via Honoapiilani Highway and access to the site from the Highway is by way of Lahainaluna Road, which leads through the grounds of Lahainaluna High School.

II. BACKGROUND AND OBJECTIVES

A. History

In October, 1904 the Territory of Hawaii and Pioneer Mill Company entered into an agreement for use of water from Kanaha Stream. With this agreement, Lahainaluna High School would have continuous and uninterrupted use of the water for 4.25 hours daily and Pioneer Mill Company and kuleana owners below the school with rights for the remainder of the day [1.1].
Figure 1-1
LOCATION MAP
LAHAINA WATER TREATMENT PLANT
SCALE
0 5 10 miles
NORTH
Environment Impact Study Corp.
FIGURE 1-2
VICINITY MAP
Scale: 1"=2,000 feet
During July, 1906 and modified in July, 1912, Pioneer Mill Company conveyed to the Territory and the County of Maui perpetual rights to 500,000 GPD from Kanaha Stream, for a price of $300,000. By a separate agreement, the County may purchase additional water at $0.05 per thousand gallons from Pioneer Mill Company. After requirements of the school and the County are met, Pioneer Mill Company has use of the remainder of the water. Maintenance of the facilities is shared by all three parties [1.2].

B. Background and Objectives of Proposed Project

Kanaha Stream is one of several water sources presently supplying water to Lahaina and areas north to Napili (Table 1-1). Waipuka Well No. 1, Waipuka Well No. 2, Kanaha Well A, Kanaha Well B and Kanaha Stream supply Lahaina town proper, while Napili Well No. 1, Napili Well No. 2 and Alaeloa Surface Intake supply the area from Wahikuli to Napili [1.3].

The Department of Water Supply has free rights to 0.5 MGD from Kanaha Stream and purchases additional amounts from Pioneer Mill. Table 1-2 illustrates estimated draw from this source over the past few years.

Records of previous water consumption are shown in Table 1-3. The average annual compound growth
### TABLE 1-1

**PRESENT WATER SOURCES AND YIELD (MGD)** [1.3]

<table>
<thead>
<tr>
<th>Source</th>
<th>Yield (MGD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waipuka Well Number 1 (5339-01)</td>
<td>0.20(^1/)</td>
</tr>
<tr>
<td>Waipuka Well Number 2 (5339-02)</td>
<td>0.20(^1/)</td>
</tr>
<tr>
<td>Kanaha Stream Surface Intake</td>
<td>1.25(^2/)</td>
</tr>
<tr>
<td>Kanaha Well &quot;A&quot; (5339-03)</td>
<td>0.50</td>
</tr>
<tr>
<td>Kanaha Well &quot;B&quot; (5339-04)</td>
<td>0.50</td>
</tr>
<tr>
<td>Napili Well Number 1 (5838-01)</td>
<td>1.00</td>
</tr>
<tr>
<td>Napili Well Number 2 (5838-02)</td>
<td>1.00</td>
</tr>
<tr>
<td>Alaeloa Surface Intake</td>
<td>1.60</td>
</tr>
<tr>
<td><strong>TOTAL YIELD:</strong></td>
<td>6.25</td>
</tr>
<tr>
<td>Minus the largest pump source (Napili Well)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>PRESENT SAFE YIELD OF SYSTEM (July, 1978)</strong></td>
<td>5.25</td>
</tr>
</tbody>
</table>

---

1/ 1977 average-day Waipuka pumpage (both wells) = 0.34 MGD. The pumps are capable of 0.50 MGD each (1.0 MGD total); however, rising salinity forces reduction of safe yield to 0.20 MGD each (0.40 MGD total). In the case of an emergency, the yield can be increased to 1.00 MGD total. Mixing of the Waipuka water with Kanaha surface water will reduce salinity to acceptable levels.

2/ The Department of Water Supply has free water rights to the 0.50 MGD Kanaha Stream intake water. 1977 Kanaha intake average-day use by the Department of Water Supply was approximately 1.25 MGD (0.75 MGD purchased from Pioneer Mill Company).
<table>
<thead>
<tr>
<th>Year</th>
<th>Total Diversion</th>
<th>County</th>
<th>L.H.S.</th>
<th>County + L.H.S.</th>
<th>Remainder</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>2.60 MGD</td>
<td>1.12 MGD</td>
<td>0.22 MGD</td>
<td>1.34 MGD</td>
<td>1.26 MGD</td>
</tr>
<tr>
<td>1975</td>
<td>2.62</td>
<td>0.93</td>
<td>0.17 MGD</td>
<td>1.10 MGD</td>
<td>1.52</td>
</tr>
<tr>
<td>1976</td>
<td>2.42</td>
<td>1.52</td>
<td>0.21 MGD</td>
<td>1.73 MGD</td>
<td>0.69</td>
</tr>
<tr>
<td>1978</td>
<td>1.98</td>
<td>1.37</td>
<td>0.32 MGD</td>
<td>1.69 MGD</td>
<td>0.29</td>
</tr>
<tr>
<td>Average</td>
<td>2.43</td>
<td>1.24</td>
<td>0.22 MGD</td>
<td>1.46 MGD</td>
<td>0.98</td>
</tr>
</tbody>
</table>

1 Calendar year: calculations done by Norman Saito Engineering Consultants, Inc.

2 Fiscal year: data from the 1978 County of Maui Department of Water Supply Annual Report and represents the sum of "free" and "purchased" water.
<table>
<thead>
<tr>
<th>Year</th>
<th>Average-Day Consumption (MGD)</th>
<th>Maximum-Day Consumption (MGD)</th>
<th>% Annual Increase *</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>0.97</td>
<td>1.45</td>
<td>17.2</td>
</tr>
<tr>
<td>1970</td>
<td>1.13</td>
<td>1.70</td>
<td>14.7</td>
</tr>
<tr>
<td>1971</td>
<td>1.30</td>
<td>1.95</td>
<td>16.9</td>
</tr>
<tr>
<td>1972</td>
<td>1.52</td>
<td>2.28</td>
<td>14.9</td>
</tr>
<tr>
<td>1973</td>
<td>1.75</td>
<td>2.62</td>
<td>12.6</td>
</tr>
<tr>
<td>1974</td>
<td>1.97</td>
<td>2.95</td>
<td>15.9</td>
</tr>
<tr>
<td>1975</td>
<td>2.28</td>
<td>3.42</td>
<td>19.2</td>
</tr>
<tr>
<td>1976</td>
<td>2.72</td>
<td>4.08</td>
<td>15.7</td>
</tr>
<tr>
<td>1977</td>
<td>3.14</td>
<td>4.72</td>
<td></td>
</tr>
</tbody>
</table>

* Average annual compound growth rate = 16%.
rate over a period of eight years was 16 percent, but this rate should decrease because of current land zoning constraints [1.4].

The method used to primarily project future water requirements is based on current estimated consumption by land use designation contained in the Lahaina General Plan. Water requirements in the Water Master Plan for the County of Maui were based on land development of 35% by 1980, 70% by 1990, and maximum development by 2000 [1.5; 1.6].

The results of the Water Master Plan for the County of Maui, shown in Table 1-4, have been revised to exclude Kaanapali and Kapalua, since they are private systems, to show use in maximum-day consumption, including 10 percent loss factor [1.7].

The method to predict future growth by compounding growth rate based on the past eight years would reflect increases at 16% per year which appears unrealistically rapid. The compromise growth rate projected by An Assessment of the Future Source Water Requirements of the Lahaina Area System, West Maui assumes maximum growth by 1993. (Refer to Figure 1-3) [1.8].

Based on these projections, the maximum-day consumption curve shows an annual increase of 0.65 MGD per year; therefore, new sources should be planned at 0.65 MGD every year until 1993.
### TABLE 1-4

ESTIMATED WATER CONSUMPTION, LAHAINA AREA, FROM WATER MASTER PLAN FOR THE COUNTY OF MAUI (1971). MAXIMUM-DAY CONSUMPTION, INCLUDING 10% LOSS FACTOR

<table>
<thead>
<tr>
<th>Year</th>
<th>Maximum-Day Consumption (MGD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980 (35% of maximum development)</td>
<td>5.26</td>
</tr>
<tr>
<td>1990 (70% of maximum development)</td>
<td>10.52</td>
</tr>
<tr>
<td>2000 (100% -- full development)</td>
<td>15.03</td>
</tr>
</tbody>
</table>

Source: [1.5]
For the system to operate in the safe range, safe yield must exceed maximum-day consumption. Figure 1-4 illustrates that the system is operating in a danger area, with safe yield falling short of consumption.

Construction of the proposed Lahaina Water Treatment Plant will be designed for a functional capacity of 1.5 MGD, with an average operating capacity of 1.2 MGD. A 0.5 MGD module is provided for emergency backup. The location of the proposed treatment plant in relation to the existing water system is presented in Figure 1-5.

The treatment plant must be built to comply with the Federal Safe Drinking Water Act of 1974, PL 93-523, which mandated turbidity levels to be less than 1.0 turbidity unit, necessitating treatment of surface water. Refer to Table 2-4 on page 2-24 and to Appendix A for further details.

III. PROPOSED PROJECT [1.9]

The proposed design includes a factory-built modular water treatment plant consisting of four 0.5 MGD modules, providing a plant functional capacity of 1.5 MGD, with a 0.5 MGD module for emergency backup. Of the 1.5 MGD functional capacity, however, the average operating capacity will be 1.2 MGD. These modules would be housed in building,
JANUARY, 1980 PROJECTED SAFE YIELD OF 6.9 MGD UPON COMPLETION OF LAHAINA TREATMENT PLANT AND HONOLUA WELLS 81 & 82

SAFE YIELD CURVE

JULY, 1978 = 5.25 MGD
WITH COMPLETION OF LAHAINA WELLS A & B (0.5 MGD EACH)
AND NAPILI WELL 82 (1.0 MGD)

1977 SAFE YIELD = 3.25 MGD

YEAR


FIGURE 1-4
FIGURE 1-5
LAHAINA WATER TREATMENT PLANT
EXISTING WATER SYSTEM

SCALE: 1 INCH = 2,000 FEET
which would also house the chemical feed equipment, air compressors, motor control center, plant control panel, and storage for chemicals used in the treatment process (Figure 1-6). For further details refer to Appendix B.

Figure 1-7 shows a site layout of the building adjacent to the existing flow splitting weirs and 100,000 gallon storage tank. The estimated project cost for a plant with this concept is $1,400,000. Operation and maintenance costs are summarized in Table 1-5.

An economic analysis of the capital and operation and maintenance costs over a 20-year period using a discount rate of 7 percent and depreciating the factory-built modular water treatment plant at 3 percent per year yielded a $1,800,000 present worth for this alternative. Details on assumptions used for economic analysis are presented in Section 6 under "Alternative Plant Design".

Advantages of the Proposed Design:

1. Standard factory-built water treatment plants (WTP) used in many other locations on a variety of water qualities minimizes start-up time and operator training requirements.

2. Four WTP modules provide plant operating flexibility.

3. In the event of equipment failure, a large percentage of the WTP remains in service.

4. Factory-built plants minimize on-site construction requirements.
### TABLE 1-5

PROPOSED PLANT
OPERATION AND MAINTENANCE COSTS

<table>
<thead>
<tr>
<th>Item</th>
<th>Factory-Built Plant</th>
<th>Plant Constructed on-site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemicals</td>
<td>$29.53/MG</td>
<td>$29.53/MG</td>
</tr>
<tr>
<td>Power</td>
<td>6.71</td>
<td>6.71</td>
</tr>
<tr>
<td>Labor</td>
<td>15.00</td>
<td>15.00</td>
</tr>
<tr>
<td>Maintenance</td>
<td>19.18</td>
<td>9.60</td>
</tr>
<tr>
<td>TOTAL:</td>
<td>$70.42/MG</td>
<td>$60.84/MG</td>
</tr>
<tr>
<td>ANNUAL COST:</td>
<td>$51,500.00</td>
<td>$44,500.00</td>
</tr>
</tbody>
</table>
5. Factory-built plants minimize the number of vendors that owner must interface with after taking over plant operations.

6. Settling compartment automatically drains each time filter is backwashed. Operator attention is minimized.

7. Use of factory-built plants results in less concrete being used in plant construction. Cement is presently in short supply.

Disadvantages of the Proposed Design:

1. Steel tank requires periodic maintenance to prevent corrosion.

IV. OPERATION AND MAINTENANCE

The plant will be automated, requiring only brief daily checks to assure proper functioning. The modules are designed to handle turbidity up to 500 NTU without difficulty, and at these conditions, filter run lengths can be reduced to 6 to 8 hours from the normal 24-hour length. This will not affect the volume of output, only the frequency of backwash cycles.

Backwash water will be disposed directly into Pioneer Mill Company's irrigation system for cane irrigation. The solids contained in the backwash will be those turbidity components originally present in the untreated water and chemical precipitate resulting from addition of alum and...
soda ash for coagulation and pH control. Average concentration of solids is estimated at 500 milligrams solids/liter of wastewater. Volume of backwash water varies with water quality, but the estimated average volume is 25,000 GPD containing 100-125 pounds of solids.

Chlorinators will be housed in a separate room and gas masks will be provided. A chlorine detection system will be provided.

V. PHASING AND FUNDING

A. Phasing

Road improvements, foundation sitework, electricity and telephone will be provided prior to construction and assembly of the plant. A temporary construction road will be provided, later improved by development of an asphalt pavement access road. Estimated time for preliminary improvements and sitework is 3-5 months. Building, plant module assembly, and final procedures for operation are estimated at an additional 3 months. Estimated total contract time is 1 year.

Modular units are about 9 feet high, 10 feet wide, and 33 feet long and may require transport with a low boy trailer. Transport will be done during off-hour traffic times. Installation of the units probably will require a hydraulic crane. Significant problems
in getting components to the site are not anticipated.

Upon completion of construction some landscaping will be provided to revegetate denuded areas.

B. **Funding**

State funds will be used in the construction of the proposed facility, to be administered through the Department of Land and Natural Resources, Division of Water and Land Development. Funds were provided through Act 226, SLH 1976, Item 88A-A-4; Act 10, First Special Session 1977 as amended by Act 243, SLH 1978, Item A-19; and Act 243, SLH 1978, Item A-19. The County of Maui will be responsible for the operation and maintenance of the facility.
REFERENCES FOR SECTION 1


[1.2] Ibid [1.1]


[1.4] Ibid [1.3]


[1.8] Op. Cit. [1.3]

existing environment 2
SECTION 2
DESCRIPTION OF THE AFFECTED ENVIRONMENT

I. EXISTING USES OF THE SITE

The proposed water treatment plant is to be located on land owned by the State of Hawaii, and under E.O. to the Department of Education at Lahainaluna High School (TMK 4-6-18:12). The site is 1,000-1,500 feet mauka and to the east of the school complex. Separating the school complex and the proposed treatment plant are orchards. The north edge of the site is the top of a cliff, which drops to the bed of Kanaha Stream. Pastures bound the eastern and southern sides. [2.1].

The existing water facilities on site include a screen box through which water from Kanaha Stream is screened. The screened water is then split and Lahainaluna School water stored in a 0.1 million gallon storage tank and distributed for school use. The remaining screened water drops to another splitter box which splits the water to the County supply and to Pioneer Mill Company. The proposed water treatment plant will be constructed between the existing screen box and the existing tank (refer to Figure 1-6 in Section 1). The site is presently used for water storage and is part of the Lahaina potable water system. The proposed treatment plant will be constructed to treat the existing potable water as required by the Safe Drinking Water Act.

2-1
II. PHYSICAL CHARACTERISTICS

A. Geology [2.2]

The island of Maui consists of two major volcanoes; the older one, West Maui, may be extinct. The volcanic rocks of West Maui have been divided into three series (Figure 2-1). The oldest series is the Wailuku Volcanic Series, which is the basaltic flows that built the major shield. The Honolua Volcanic Series covered this series with thin, discontinuous andesitic and trachytic flows, domes and pyroclastic deposits. After a long period of erosion came the flows and cones of the Lahaina Volcanic Series (Figure 2-1).

The Wailuku Volcanic Series is predominantly thin pahoehoe and aa lava flows of tholeiite, olivine tholeiite, and oceanite, with the uppermost part of these grading into alkalic olivine basalt. This shield reached a height of about 7,000 feet above sea level before the top collapsed, forming a caldera about two miles in diameter.

Rift zones of West Maui are less pronounced than most other Hawaiian volcanoes. The tendency was for dikes to radiate in all directions from the summit, which is responsible for the nearly circular ground plan of the volcano. There is some concen-

FIGURE 2-1
GEOLOGY
dration of dikes in two zones, one crossing the moun-
tain in a north-south direction and the other trend-
ing northeast in the northeast part of the mountain
(Figure 2-2).

Lavas of the Honolua Series are mostly mugearite,
with less abundant trachyte and a little hawaiite.
Some of the flows are pahoehoe but most are aa, com-
monly transitional to block lava. Dikes of this
series follow the general trends as the earlier dikes
and the vent lie mostly on the same major rift zones.
Mugearite dikes are generally thin, but trachyte
dikes range up to 25 feet in thickness, some having
been traced to two miles.

There was a long period of erosion after the
last Honolua eruptions, and then came the rocks of
the Lahaina Volcanic Series. The flow was picrite-
basalt containing moderately abundant phenocrysts
of brownish-green olivine. The largest of these
eruptions occurred on the alluvial fan of Kahoma
and Kanaha Streams, 1.5 miles northeast of Lahaina,
forming Puu Laina. It blocked the mouth of Kahoma
Valley and displaced Kahoma Stream southward more
than half a mile.

B. Soils [2.3]

The soils at the project site fall under the
PRINCIPAL RIFT ZONES, DIKES AND VENTS OF HONOLUA VOLCANIC SERIES

(DIKES OF WAILUKU SERIES MORE ABUNDANT THAN HONOLUA SERIES)


FIGURE 2-2
general classification of the Waiakoa-Keahua-Molokai Association, which consist of well-drained, moderately fine-textured soils on low uplands on Central Maui. The soils are nearly level to moderately steep. They are formed in material weathered from basic igneous rocks. The association makes up about 15 percent of the island.

Waiakoa soils make up about 30 percent of the association, Keahua soils about 20 percent and Molokai soils about 10 percent. The rest of the association consists of Alaeloa, Haliimaile, Kahana, Koele, Lahaina, Paia, Wahikuli, Wailuku, and Wainee soils.

Waiakoa soils have a surface layer of dark reddish-brown, friable silty clay loam. Their subsoil is dark reddish-brown and very dark grayish-brown, friable silty clay loam. They have a substratum of hard, basic igneous rock at a depth of 20 to 40 inches. Keahua soils have a surface layer of dark reddish-brown, friable silty clay loam. Their subsoil is dark reddish-brown, firm silty clay loam. The substratum is soft, weathered basic igneous rock. Molokai soils have a surface layer of dark reddish-brown, friable silty clay loam. Their subsoil is dark-red and dusky-red, friable silty clay loam and clay loam. The substratum is soft, weathered basic igneous rock.
This association is used for sugarcane, pineapple, pasture, wildlife habitat, and homesites. Upland game birds make up most of the wildlife population.

The specific soil types at the proposed site are as follows (Refer to Figure 2-3):

1. **Rock Outcrop (rRO)**

   Rock outcrop consists of areas where exposed bedrock covers more than 90 percent of the surface, and it occurs on all five islands. The rock outcrops are mainly basalt and andesite. This land type is gently sloping to precipitous. Elevations range from nearly sea level to 10,000 feet. This land type is not suited to farming. It is used for water supply, wildlife habitat, and recreation.

2. **Lahaina Silty Clay, 15 to 25% slopes, (LaD)**

   The Lahaina Series consists of well-drained soils on uplands on the islands of Lanai, Maui, Molokai and Oahu. These soils developed in material weathered from basic igneous rock. They are nearly level to steep, and elevations range from 10 to 1,500 feet. The mean annual soil temperature is 72°F. Lahaina soils are geographically associated with Helemano, Hoolehua, Kahana, Molokai, Pamoa and Wahiawa soils.
LAHAINA WATER TREATMENT PLANT

SOILS MAP  SCALE: 1 inch = 2,000 feet

FIGURE 2-3
These soils are used for sugarcane and pineapple. Small acreages are used for truck crops, pasture, homesites, and wildlife habitat.

The specific soil type at the project site is Lahaina silty clay, 15 to 25% slopes. On this soil, runoff is medium and the erosion hazard is moderate. This soil is used for sugarcane and could also be used for pineapple, pasture and woodland.

3. Rock Land (rRK)

Rock land is made of areas where exposed rock covers 25 to 90% of the surface and occurs on all five islands. The rock outcrops and very shallow soils are the main characteristics. The rock outcrops are mainly basalt and andesite. This land type is nearly level to very steep, and elevations range from nearly sea level to more than 6,000 feet.

Rock land is used for pasture, wildlife habitat, and water supply. This land type is also used for urban development. In many areas, the soil material associated with the rock crops is very sticky and plastic. It also has a high shrink-swell potential. Buildings on the steep slopes are susceptible to sliding.
when the soil is saturated. Foundations and retaining walls are susceptible to cracking.

C. Climate

The majority of Hawaii exhibits only two seasons: the summer, which occurs between May and October when the weather is warmer and drier and the trade-winds are most persistent; and the winter, which is between October and April when the weather is cooler and the tradewinds are more often interrupted by other winds and by intervals of widespread clouds and rain. Hawaii's general climate is reflected by four factors: latitude, the surrounding ocean, Hawaii's location relative to the storm tracts and the Pacific anticyclone, and terrain. [2.4].

The latitude of Hawaii puts the state well within the tropics, which accounts for a relatively uniform day length throughout the year. This results in a relatively uniform amount of solar energy received and, therefore, temperature. The surrounding ocean supplies moisture to the air, and acts as a thermostat. Because the ocean's temperature varies little compared to large land masses, the temperature varies only 1 to 2 degrees from day to night and only about 6 degrees at the sea's surface on a seasonal basis. [2.5].

The Pacific High or anticyclone is a large, subtropical high pressure system which generally
lies northeast of Hawaii. The air, moving outward from this anti-cyclone, streams past the islands and is the source of the northeasterly tradewinds. Along with its associated storm tracts, this anti-cyclone follows the seasonal shift in the sun, moving northward in the summer and southward in the winter and tending to be stronger and more persistent in the summer than in the winter. Since the anti-cyclone weakens and is occasionally absent in the winter, the tradewinds may be interrupted by northerly fronts or by Kona storms; therefore, winter is exhibited by more frequent cloudiness and rain storms and southerly and westerly winds. [2.6].

Terrain has profound effects on weather and climate. Mountains tend to obstruct, deflect, and accelerate air flow. As warm, moist winds rise over windward coasts and slopes, cloudiness and rainfall are more prevalent than over the open sea. Leeward areas, where air descends, as in the case of the project site, tend to be sunny and dry. Terrain can also account for orographic (mountain-caused) which is formed when moist tradewind air moves from the sea and is forced up the steep and high terrain of the island. Rainfall distribution, therefore, is usually greatest over the upper slopes and
crests and least along the leeward lowlands. [2.7].

1. **Rainfall:**

The heaviest rains in Hawaii are usually brought about by winter storms. Lowland lee areas and other dry areas obtain most of their rainfall by winter storms, so the rainfall is strongly seasonal, with summers being arid. Leeward areas also tend to have rainfall maximums in late afternoon and evening from showers forming within sea breezes, which move onshore and upslope during the day. Drought may also occur when either winter storms or tradewinds fail, and usually dry, leeward areas are the hardest hit. [2.8].

Specific rainfall information for the proposed site is not available, but the Wahikuli (Station 364) is within the general vicinity of the proposed site and at approximately similar elevations so records for this station would be representative of the rainfall that can be expected at the proposed site (refer to Table 2-1) [2.9]. The data for this particular station, which is on the leeward side of the island, supports the characteristic of most of the rainfall occurring during the winter months.
<table>
<thead>
<tr>
<th>MONTH</th>
<th>AVERAGE (INCHES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>3.31</td>
</tr>
<tr>
<td>February</td>
<td>2.87</td>
</tr>
<tr>
<td>March</td>
<td>2.33</td>
</tr>
<tr>
<td>April</td>
<td>1.66</td>
</tr>
<tr>
<td>May</td>
<td>.49</td>
</tr>
<tr>
<td>June</td>
<td>.25</td>
</tr>
<tr>
<td>July</td>
<td>.33</td>
</tr>
<tr>
<td>August</td>
<td>.80</td>
</tr>
<tr>
<td>September</td>
<td>.52</td>
</tr>
<tr>
<td>October</td>
<td>1.15</td>
</tr>
<tr>
<td>November</td>
<td>1.60</td>
</tr>
<tr>
<td>December</td>
<td>3.09</td>
</tr>
</tbody>
</table>

**ANNUAL:** 18.50
2. **Temperature:**

Hawaii's equable temperatures result from the small seasonal variations of energy received from the sun and the tempering effect of the surrounding ocean. Throughout Hawaii the warmest and coolest months differ, on the average, by 9 degrees or less. The daily variation between day and night are greater than the variations between seasons. On the leeward coasts, as at the proposed site, the daily variation in temperature is higher than would be expected of windward coasts [2.11].

Table 2-2 illustrates average monthly temperatures at two different sites in the general vicinity of the project site. Both the Kaanapali and the Lahaina sites are at sea level, Kaanapali being a few miles to the north of Lahaina. Although most of these sites are within a few miles of the other, there appears to be a small variation in average monthly temperature, Lahaina being slightly cooler than Kaanapali. The temperatures given for the proposed site are theoretical temperatures based on temperatures given at the Lahaina station and based on the assumption
### TABLE 2-2

**AVERAGE TEMPERATURE**

<table>
<thead>
<tr>
<th>MONTH</th>
<th>KAANAPALI (453)</th>
<th>LAHAINA (361)</th>
<th>PROPOSED SITE</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>72.4</td>
<td>71.2</td>
<td>69.2</td>
</tr>
<tr>
<td>February</td>
<td>72.1</td>
<td>71.2</td>
<td>69.2</td>
</tr>
<tr>
<td>March</td>
<td>72.7</td>
<td>71.4</td>
<td>69.4</td>
</tr>
<tr>
<td>April</td>
<td>74.1</td>
<td>72.9</td>
<td>70.9</td>
</tr>
<tr>
<td>May</td>
<td>75.8</td>
<td>74.4</td>
<td>72.4</td>
</tr>
<tr>
<td>June</td>
<td>77.8</td>
<td>76.1</td>
<td>74.1</td>
</tr>
<tr>
<td>July</td>
<td>78.6</td>
<td>77.4</td>
<td>75.4</td>
</tr>
<tr>
<td>August</td>
<td>79.3</td>
<td>77.8</td>
<td>75.8</td>
</tr>
<tr>
<td>September</td>
<td>79.5</td>
<td>77.2</td>
<td>75.2</td>
</tr>
<tr>
<td>October</td>
<td>78.0</td>
<td>76.6</td>
<td>74.6</td>
</tr>
<tr>
<td>November</td>
<td>75.8</td>
<td>75.0</td>
<td>73.0</td>
</tr>
<tr>
<td>December</td>
<td>73.4</td>
<td>72.8</td>
<td>70.8</td>
</tr>
</tbody>
</table>

**ANNUAL**

|          | 75.8 | 74.5 | 72.5 |

1 [2.12]  
2 [2.13]  
3 [2.14]
that the temperature in a given area, subject
to similar climatic conditions, will decrease
at a rate of 3.3 degrees for every increase in
1,000 feet of elevation. [2.15]. Since the
project site is in an elevation of approximately
600 feet, it is anticipated that average tem­
peratures at the proposed site will be approx­
imately 2 degrees cooler than at Lahaina.

3. Wind:

The northeasterly tradewind prevails through­
out the year in Hawaii, and is more persistent
in the summer (90%) than in the winter (50%),
and tend to be stronger in the afternoon than
at night. During the winter months, Hawaii may
be under the influence of southerly winds from
Kona storms or of southwesterly winds preceding
the northeasterly winds that follow cold
fronts. [2.16].

Terrain has a varied and profound effect
on wind and neighboring localities and can differ
widely under the effects of wind. Winds moving
over crests, around headlands, or through sadd­
les or narrow gorges become stronger and more
turbulent, while areas sheltered by high moun­
tains may be more affected by land and sea

2-16
breezes or other local winds in the immediate vicinity [2.17].

Surface wind circulation in West Maui is very complex because of the alignment of the West Maui mountains and the presence of several major gulches through the range. Of the sites for which wind data has been recorded, the one at Wahikuli is probably best representative of what can be expected at the proposed project site. Wahikuli is five miles directly downwind from Puu Kukui, and a two-year record at this site shows the existence of a combined land-sea and mountain-valley breeze circulation in that area. Of the 672 days recorded, only 125 days showed a significant departure from the land-sea breeze circulation, and on only 63 days were there tradewinds; yet, nearby unobstructed areas exhibited tradewinds 65% of the time [2.18].

Table 2-3 is a summary of the two-year wind record taken at Wahikuli. A few miles to the north of Lahaina is predominated by the tradewinds (see Figure 2-4). The Kaanapali resort, for example, lies within the narrow wedge formed by the tradewind limits, and wind there is characterized by frequent shift from
<table>
<thead>
<tr>
<th>Direction</th>
<th>N</th>
<th>NE</th>
<th>E</th>
<th>SE</th>
<th>S</th>
<th>SW</th>
<th>W</th>
<th>NW</th>
<th>CALM</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occurrences %</td>
<td>6</td>
<td>12</td>
<td>39</td>
<td>4</td>
<td>15</td>
<td>13</td>
<td>10</td>
<td>1-</td>
<td>1-</td>
<td>100</td>
</tr>
<tr>
<td>Average Speed</td>
<td>7.0</td>
<td>6.5</td>
<td>4.4</td>
<td>4.8</td>
<td>6.8</td>
<td>6.4</td>
<td>5.4</td>
<td>4.6</td>
<td>0.0</td>
<td>5.8</td>
</tr>
</tbody>
</table>

2-18
- The area between dotted lines in West Maui represents the limit of oscillation of the southern extremity of the trade-winds in this area.

- The triangle of dashed lines in West Maui represents the area which lies in the wind-shadow of terrain 1,000 feet and higher; a highly prevalent land-sea, mountain-valley breeze prevails here.

the tradewinds (northeast) to sea-breeze (southwest). The project site, however, lies in a triangular-shaped area downwind of Puu Kukui, within which a highly persistent land-sea breeze circulation prevails. Figure 2-5 illustrates the general surface wind streamlines during the night hours [2.19].

D. **Drainage and Hydrology**

The intake from Kanaha Stream is at the 1,140 foot elevation. Above this intake, Kanaha Stream drains an area of about 1.6 square miles, rainfall on this area being 7.5 MGD. Kanaha is the southernmost of the long narrow valleys of this district [2.20].

Records for 1916-1924 and 1926-1932 indicate that flow averaged 5.0 MGD, ranging from 1.1 to 206 MGD. Refer to Figure 2-6 for graphic analysis of the data. Measurements during 1967 were 2.29 MGD discharge for Kahama Stream at the diversion point and 2.29 MGD discharge for Kanaha Stream 100 feet upstream from the intake. The total yields of the two streams are not equal, because Kanaha Stream, unlike Kahama Stream, is usually dry below its diversion point since it is near the boundary of the high-level water zone [2.21].

2-20
FIGURE 2-6
DURATION-DISCHARGE CURVES

2-22
Further analysis of the data revealed that the median flow of the stream was 3.2 MGD. Diversion capacity is 3.0 MGD and actual diversion from the stream averaged 2.66 MGD. Actual capacity of the diversion, at 3.0 MGD, is attained 55 percent of the time and flow is greater than 2.0 MGD 95 percent of the time \[2.22\].

The proposed site is not located in a flood hazard area \[2.23\].

E. Water Quality

The water quality at Kanaha Stream is very good. Table 2-4 illustrates parameters that have been set up for potable water. Tests conducted from 1966 through 1978 show that the concentrations of the various chemicals from the stream are well below maximum standards set by the Environmental Protection Agency (EPA), except for turbidity \[2.24\]. During the April 17, 1978 testing, organic parameters from the source were below maximum EPA standards (refer to Appendix A for those chemicals and standards).

The proposed treatment plant will primarily treat for turbidity. The County will monitor turbidity and the State will monitor inorganic and organic chemicals and coliforms. Coliforms will be monitored
TABLE 2-4
SOURCE WATER QUALITY

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>-</td>
<td>7.08</td>
<td>7.44</td>
<td>7.13</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Color</td>
<td>--</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>&lt;5</td>
<td>35</td>
<td>7</td>
<td>--</td>
</tr>
<tr>
<td>Odor</td>
<td>--</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>&lt;0.05</td>
<td>16</td>
<td>7</td>
<td>--</td>
</tr>
<tr>
<td>Turbidity (TU)</td>
<td>1.0</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0.16</td>
<td>7.2</td>
<td>&lt;0.05</td>
<td>--</td>
</tr>
<tr>
<td>Total Dissolved Solids</td>
<td>--</td>
<td>100</td>
<td>80</td>
<td>80</td>
<td>140</td>
<td>16</td>
<td>64</td>
<td>61</td>
</tr>
<tr>
<td>Alkalinity (as CaCO₃)</td>
<td>--</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>--</td>
</tr>
<tr>
<td>Carbonate</td>
<td>--</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>--</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>--</td>
<td>20.8</td>
<td>25.0</td>
<td>38</td>
<td>25</td>
<td>19</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Hardness (as CaCO₃)</td>
<td>--</td>
<td>25.4</td>
<td>21.7</td>
<td>26.1</td>
<td>44</td>
<td>8.0</td>
<td>22</td>
<td>--</td>
</tr>
<tr>
<td>SiO₂</td>
<td>--</td>
<td>31</td>
<td>24.5</td>
<td>19.0</td>
<td>26.4</td>
<td>13.0</td>
<td>27.6</td>
<td>--</td>
</tr>
<tr>
<td>Arsenic (As)</td>
<td>&lt;0.05</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.001</td>
<td>&lt;0.003</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.02</td>
</tr>
<tr>
<td>Barium (Ba)</td>
<td>1</td>
<td>--</td>
<td>--</td>
<td>&lt;3</td>
<td>&lt;10</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;0.8</td>
</tr>
<tr>
<td>Cadmium (Cd)</td>
<td>0.010</td>
<td>--</td>
<td>--</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.008</td>
</tr>
<tr>
<td>Chromium, Total (Cr)</td>
<td>&lt;0.05</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.01</td>
<td>&lt;0.02</td>
<td>&lt;0.02</td>
<td>&lt;0.02</td>
<td>&lt;0.02</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>&lt;0.1</td>
<td>&lt;0.02</td>
<td>&lt;0.02</td>
<td>&lt;0.14</td>
<td>&lt;0.05</td>
<td>&lt;0.37</td>
<td>1.8</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Iron, Total (Fe)</td>
<td>&lt;0.02</td>
<td>&lt;0.02</td>
<td>&lt;0.14</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.008</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.03</td>
<td>&lt;0.03</td>
<td>&lt;0.04</td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>&lt;0.02</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>&lt;0.002</td>
<td>--</td>
<td>--</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.008</td>
</tr>
<tr>
<td>Selenium (Se)</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Silver (Ag)</td>
<td>&lt;0.05</td>
<td>--</td>
<td>--</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.03</td>
</tr>
<tr>
<td>Sodium (Na)</td>
<td>9.0</td>
<td>9.0</td>
<td>10</td>
<td>15</td>
<td>5.0</td>
<td>5</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Cyanide (CN)</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Fluoride (F)</td>
<td>&lt;0.04</td>
<td>&lt;0.04</td>
<td>&lt;0.04</td>
<td>&lt;0.04</td>
<td>&lt;0.04</td>
<td>0.1</td>
<td>&lt;0.05</td>
<td>--</td>
</tr>
<tr>
<td>Nitrate (as N)</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Phenols</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

* 1982 Public Health Service Drinking Water Standards recommend maximum limit of 0.3 mg/l iron and 0.05 mg/l manganese for aesthetic reasons, primarily to limit staining of laundry and plumbing fixtures.

2-24
monthly and inorganic and organic chemicals yearly [2.25]. These chemicals and respective standards are presented in Appendix A.

Turbidity of Kanaha Stream water varies throughout the year. During summer months turbidity averages 1 to 2 NTU. From November or December through February, turbidity averages less than 10 NTU, although there are peaks that exceed 100 NTU. The module units are designed to handle turbidity of 500 NTU without difficulty.

Secondary treatment is not required by the Department of Health in the foreseeable future; however, some of the secondary requirements are inherently provided by the package plant. The Department of Health will continuously monitor the water to ascertain compliance with regulations.

III. BIOLOGICAL CHARACTERISTICS

A. Flora

The site is already disturbed and plants on the site are commonly found throughout the State [2.26]. The only endemic species encountered was Erythrina sandwicensis (wiliwili), which is growing along the cliffs of the gulch. During construction and maintenance of the facility, these plants should not be in danger since they are along the gulch walls
and up into the valley and not on the site proper. Areas along the route to the site are in urban use or in agriculture and do not represent areas where endangered species are likely. For a detailed listing of plants encountered during the reconnaissance, refer to Appendix C.

B. Fauna

Terrestrial Fauna

A site reconnaissance was conducted during March, 1979. The site and vegetated areas between the site and the grounds of Lahainaluna High School do not represent critical wildlife habitats [2.27].

The site and location of the proposed water treatment plant has been previously disturbed. Much of the area along the road leading from the school grounds to the site is under cultivation by the school, and much of it is orchard.

Fauna observed during the reconnaissance were predominantly birds. A list of avifauna observed and fauna believed to be likely in the area is presented in Appendix C. All the birds seen are common throughout the island and the State. The only endemic bird expected at the site is the Hawaiian owl, or pueo (Asio flammeus sandwichensis). The owl is believed to be present in the area because of the likelihood of rats and mice inhabiting the
area. Adjacent to the site are open pastures, agricultural plantings, and sugar cane fields, all areas likely to support rodents.

At the edge of the site is a sheer drop to the bottom of the gulch and Kanaha Stream. Along the cliff are several wiliwili trees. There is a small taro farm along the bottom of the gulch. Looking up the gulch and into the higher elevations is undisturbed forest. The site itself and adjacent areas would be unlikely habitats for endangered forest birds (see Figure 2-7) [2.28; 2.29].

From the site there is a straight-line view of Crater Reservoir and Waihukuli Reservoir. These reservoirs are on Pioneer Mill Company's land and are included in an ornithological survey report prepared by the Corps of Engineers. During the survey, six indigenous Black-crowned Night Herons (Nycticorax nycticorax hoactli) were seen at Crater Reservoir and eight herons at Waihukuli Reservoir. One endemic Hawaiian stilt (Himantopus mexicanus knudseni) was observed at Waihukuli, and both species are seen regularly at these sites, as well as some migratory ducks. [2.30].

These reservoirs are being considered as possible areas for future habitat management for associated wildlife. [2.31]. Although these reservoirs
Figure 2-7

Island of Maui

* Extinct
* Endangered
* Not Endangered

Maui

Maui Amakini
Maui Creeper
Maui Akepa
Poouli
Maui Nukupulu
Maui Parrotbill
Ou
Apapane
Crested Honeycreeper

Iiwi
Dark-rumped Petrel (Uaui)

Newell's Shearwater (Ao)

Source: Hawaii's Endangered Forest Birds

Prepared by the State of Hawaii, Department of Land & Natural Resources and the United States Department of the Interior, Fish and Wildlife Service

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can be seen from the site, they are over 3,000 feet away. Potential adverse effects on endemic species, therefore, are not expected as a result of the proposed facility.

**Aquatic Fauna**

According to a previous study, Kahoma/Kanaha streams are of a biological class rated of "low natural quality (degraded severely), native species absent or present in low diversity and abundance." [2.32]. Kanaha Stream is one of the West Maui streams tapped for domestic use and for agricultural purposes by the Pioneer Mill Company Ltd. The intake is deep in the valley and efficiently diverts stream flow into irrigation ditches, leaving stretches of dry stream beds between the intake and the coastline. [2.33].

A survey of streams in Hawaii during 1962-1963 included Kanaha, Kahoma and Kapuloa Streams along West Maui. As a whole, aquatic fauna in these streams were meager. The damselfly nymph was dominant, followed by atyid shrimps and chironomid larvae. A few gobies were the only fish encountered in Kanaha Stream [2.34].

Although the survey report did not specify exactly which species of gobies were present, they could have represented one or more of the following species:
Chonophorus stamineus, C. genivittatus, Sicydium stimpsoni, or Lentipes concolor. [2.35]. Kanaha Stream was surveyed on April 29, 1963. Damselflies and diptera larvae were abundant and only a few gobies were observed. Kahoma Stream, surveyed on May 1, 1963, had a moderate amount of atyids (Atya bisculata or Ortmannia henshawi) and damselflies [2.36].

A letter report prepared by the U.S. Fish and Wildlife Service for the U.S. Army Corps of Engineers provides some additional and updated information. At the lower diversion structure located behind Lahainaluna High School, the only vertebrates collected by electroshocking were guppies and the only invertebrates collected were chironomids, densities of which were 15-20/square inch in some locations. Some caddisfly and mosquito larvae, waterstriders, waterboatmen, dragonflies and damselflies were observed. The stream above the diversion structure was also sampled with an electroshocker. Only insects represented the aquatic macrofaunal community. No diadromous species were collected in either the Kahoma or Kanaha streams' upper reaches. [2.37].

IV. SOCIOECONOMIC CHARACTERISTICS
A. Population

Although the Lahaina District represents 15 percent of the island's population, from 1970 to 1977
the Lahaina District exhibited the greatest population growth rate of the island. In terms of growth rate compared to the County and the State, Lahaina District is much greater (Refer to Table 2-5). [2.38]. From the period July, 1977 to July, 1978, Maui County, as a whole, showed a population increase of 4.9 percent compared to 1.4 percent for the City and County of Honolulu, 2.5 percent for the County of Hawaii, 2.1 percent for the County of Kauai, and 1.7 percent for the State total. [2.39].

B. Economic

Table 2-6 illustrates changes in construction for the period January - December, 1978 compared to the period January - December, 1977. Residential private permits for Maui County were second only to Kauai County, in percent increase of applications in 1978 compared to 1977. Maui County has shown a decrease in permits for single family units and an increase for multiple family units. [2.40].

For the same period Maui County has shown a significant rate of increase of authorized non-residential private permits. Maui County also leads in public contracts awarded for the State as a whole. [2.41].
### TABLE 2-5 [2.38]

**RESIDENT POPULATION OF THE STATE AND OF MAUI COUNTY**

**BY DISTRICT: 1960 TO 1977**

<table>
<thead>
<tr>
<th>County and district</th>
<th>April 1, 1960</th>
<th>April 1, 1970</th>
<th>July 1, 1976 1/</th>
<th>July 1, 1977 1/</th>
<th>Percent change 1970-1977 2/</th>
</tr>
</thead>
<tbody>
<tr>
<td>The State</td>
<td>632,772</td>
<td>769,913</td>
<td>883,500</td>
<td>894,700</td>
<td>16.2</td>
</tr>
<tr>
<td>Maui and Kalawao</td>
<td>42,855</td>
<td>46,156</td>
<td>58,200</td>
<td>59,400</td>
<td>28.6</td>
</tr>
<tr>
<td>Hana</td>
<td>1,073</td>
<td>969</td>
<td>1,200</td>
<td>1,200</td>
<td>22.1</td>
</tr>
<tr>
<td>Makawao</td>
<td>10,409</td>
<td>9,979</td>
<td>13,100</td>
<td>13,600</td>
<td>36.1</td>
</tr>
<tr>
<td>Wailuku</td>
<td>19,391</td>
<td>22,219</td>
<td>28,300</td>
<td>28,900</td>
<td>30.0</td>
</tr>
<tr>
<td>Lahaina</td>
<td>4,844</td>
<td>5,524</td>
<td>8,000</td>
<td>8,200</td>
<td>47.9</td>
</tr>
<tr>
<td>Lanai</td>
<td>2,115</td>
<td>2,204</td>
<td>2,100</td>
<td>2,000</td>
<td>-8.5</td>
</tr>
<tr>
<td>Molokai</td>
<td>4,744</td>
<td>5,089</td>
<td>5,300</td>
<td>5,300</td>
<td>5.1</td>
</tr>
<tr>
<td>Kalawao</td>
<td>279</td>
<td>172</td>
<td>200</td>
<td>200</td>
<td>2.3</td>
</tr>
</tbody>
</table>

1/ Estimates for 1976 and 1977 have been independently rounded to the nearest 100, and may not add exactly to the indicated totals and subtotals. The 1976 estimates are revisions from those in Report CTC-37; the 1977 estimates are provisional.

2/ Computed from unrounded data.


### TABLE 2-6 [2.39]

**CONSTRUCTION IN HAWAII**  
**COMPARISON OF YEARS 1977 AND 1978**

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>NUMBER</th>
<th>PERCENT CHANGE 1978 FROM 1977</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRIVATE PERMITS AUTHORIZED</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RESIDENTIAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STATE</td>
<td>437,601</td>
<td>40.6</td>
</tr>
<tr>
<td>C &amp; C of Honolulu</td>
<td>223,539</td>
<td>16.2</td>
</tr>
<tr>
<td>Maui County</td>
<td>104,094</td>
<td>78.6</td>
</tr>
<tr>
<td>Hawaii County</td>
<td>60,963</td>
<td>54.3</td>
</tr>
<tr>
<td>Kauai County</td>
<td>49,005</td>
<td>131.2</td>
</tr>
<tr>
<td><strong>SINGLE FAMILY UNITS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STATE</td>
<td>5,005</td>
<td>4.3</td>
</tr>
<tr>
<td>C &amp; C of Honolulu</td>
<td>2,074</td>
<td>-5.8</td>
</tr>
<tr>
<td>Maui County</td>
<td>994</td>
<td>-8.0</td>
</tr>
<tr>
<td>Hawaii County</td>
<td>1,382</td>
<td>29.2</td>
</tr>
<tr>
<td>Kauai County</td>
<td>555</td>
<td>24.7</td>
</tr>
<tr>
<td><strong>MULTIPLE FAMILY UNITS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STATE</td>
<td>4,465</td>
<td>40.3</td>
</tr>
<tr>
<td>C &amp; C of Honolulu</td>
<td>2,178</td>
<td>-11.8</td>
</tr>
<tr>
<td>Maui County</td>
<td>1,330</td>
<td>167.6</td>
</tr>
<tr>
<td>Hawaii County</td>
<td>334</td>
<td>151.1</td>
</tr>
<tr>
<td>Kauai County</td>
<td>623</td>
<td>650.6</td>
</tr>
<tr>
<td><strong>NONRESIDENTIAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STATE</td>
<td>223,006</td>
<td>51.7</td>
</tr>
<tr>
<td>C &amp; C of Honolulu</td>
<td>147,059</td>
<td>24.2</td>
</tr>
<tr>
<td>Maui County</td>
<td>64,829</td>
<td>293.6</td>
</tr>
<tr>
<td>Hawaii County</td>
<td>13,408</td>
<td>13.1</td>
</tr>
<tr>
<td>Kauai County</td>
<td>7,711</td>
<td>13.0</td>
</tr>
<tr>
<td><strong>PUBLIC CONTRACTS AWARDED</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL GOVERNMENT PROJECTS</strong></td>
<td>302,069</td>
<td>5.5</td>
</tr>
<tr>
<td>C &amp; C of Honolulu</td>
<td>232,286</td>
<td>5.0</td>
</tr>
<tr>
<td>Maui County</td>
<td>33,364</td>
<td>24.2</td>
</tr>
<tr>
<td>Hawaii County</td>
<td>26,263</td>
<td>-2.3</td>
</tr>
<tr>
<td>Kauai County</td>
<td>10,156</td>
<td>-10.6</td>
</tr>
</tbody>
</table>
V. **INFRASTRUCTURE**

A. **Utilities**

Electricity will be required and approvals obtained from Maui Electric Company prior to final approval of the plans. Telephone service will also be required and approvals obtained from Hawaiian Telephone Company.

B. **Emergency Facilities**

1. **Fire**

The project site is approximately 6 miles from the fire station. Response time to the site is about 8 minutes, with no problems anticipated as a result of the project. [2.42].

2. **Medical** [2.43]

Emergency medical care for the area is by Physicians Ambulance Service, a private company on contract with the State of Hawaii. There is 1 ambulance that services the West Maui area and the approximate response time to the site is 10 minutes.

Technicians in the ambulance are in direct communication with a physician at Maui Memorial Hospital. If the case can be treated and discharged, they are usually taken either to Kaiser Foundation Health Clinic or to Maui Medical Group. Approximate response time to these groups is 5-10 minutes.
If there is a serious case, the patient would be stabilized in the field by the technician under direct communication with the physician at Maui Memorial Hospital. After stabilization the patient would be transported to Maui Memorial Hospital, with an approximate transport time of 40 minutes.

Problems on services of the proposed project are not anticipated.

The following medical facilities are available in Lahaina:

Island Medical
840 Wainee Street

Kaiser Foundation Health Plan
502 Pauoa Road

Maui Medical Group
130 Prison Street

3. Police

Patrols for the Lahaina area are usually comprised of 3 officers on duty. If necessary, 2 officers could be dispatched to the project site in 5 minutes, or sooner if the officers are closer to the site at the time. Problems on their service are not anticipated due to the proposed project. [2.44].

4. Building Security

A prefabricated metal building will house all plant equipment. Aside from a brief daily
check of the plant, the building will be unoccupied. Chain-link fencing may be desirable to limit access to diversion structures.

C. Transportation

During December, 1978 a 24-hour count was taken at the intersection of Honoapiilani Highway and Lahainaluna Road. Figures 2-8 and 2-9 illustrate the results of the count over a 24-hour period and during peak hour traffic. [2.45]. The capacity for Honoapiilani Highway, in both directions, is 1,830 vehicles per hour (vph). [2.46].

The proposed facility will be automated and will not require a full time crew. For a short period after completion, there will have to be a daily check of the plant but this will probably entail one person, i.e. one car.

D. Access

Lahainaluna Road from Honoapiilani Highway is paved, and the road through the school grounds is paved. From the school road to the site is an unimproved dirt road which will be improved during construction. This will entail improvements for approximately 1,000-1,500 feet.

VI. ARCHAEOLOGICAL/HISTORICAL CHARACTERISTICS [2.47]

According to the State of Hawaii Historic Preservation Office, there are no sites on the proposed water treatment
TRAFFIC VOLUME (24 HOUR COUNT)

FIGURE 2-8

KAANAPALI

7330

LAHAINALUNA RD.

3497

3780

3796

3720

HONOAPIILANI HWY.

6367

LAHAINALUNA HIGH SCHOOL

6637

2-37
PEAK HOUR TRAFFIC
7:15-8:15 AM 3:30-4:30 PM
FIGURE 2-9
plant site that are on the State Historic Register or the National Historic Register. The nearest significant historic site is on the grounds of the Lahainaluna High School.

Hale Pa'i (Hawaii Site No. 50-03-1596) is a two-story building located on the grounds of the Lahainaluna High School. It is considered an excellent sample of New England architecture representing the early 1800's, adapting the use of Hawaiian building materials. It is considered one of the most significant structures associated with missionary history in the Islands. The grounds of the Lahainaluna High School were once the Lahainaluna Seminary, established in Maui in 1831, the purpose of which was to educate and to train future preachers and teachers.

The significance of Hale Pa'i was that the first newspaper, Ka Lama Hawaii (the Hawaiian luminary), ever printed in the Hawaiian Islands was published in 1834 and was the first newspaper published anywhere in the United States or its territories west of the Rocky Mountains. Many portions of the first Hawaiian translation of the Bible, the first English translation of the first Hawaiian Declaration of Rights, the first Hawaiian Constitution, the first set of Hawaiian laws on property and taxation, the first Hawaiian school laws, the first paper money engraved and printed in Hawaii, the first history of Hawaii printed in Hawaiian and the first history
of Hawaii printed in English appearing in the Islands are examples of the many firsts published at Hale Pa'i. From its inception to 1846, printing was done at Hale Pa'i until labor expenses became too great for the small operation to continue.

Hale Pa'i became a museum in 1956. Lahainaluna is the only public school with a Hawaiian school song and is also the only public school with a boarding program and is the oldest public school west of the Rocky Mountains.
REFERENCES TO SECTION 2


[2.5] Ibid. [2.4].

[2.6] Ibid. [2.4].

[2.7] Ibid. [2.4].

[2.8] Ibid. [2.4].

[2.9] State of Hawaii, Department of Land and Natural Resources, Division of Water and Land Development. Personal Communication, March 20, 1979 and specific data provided from "Climotography of the United States No. 81-4, Decennial Census of U.S. Climate".

[2.10] Ibid. [2.9].


References to Section 2, cont'd.


[2.19] Ibid. [2.18].


[2.21] Ibid. [2.20].


References to Section 2, cont'd.


[2.31] Ibid. [2.30].


[2.34] Ibid. [2.33].

[2.35] Ibid. [2.33].

[2.36] Ibid. [2.33].


[2.40] Ibid. [2.39].

[2.41] Ibid. [2.39].


References to Section 2, cont'd.


land use plans
SECTION 3
THE RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR THE AFFECTED AREA

I. LAND USE PLANS AND POLICIES
A. State Land Use

The project site is in State Land Use designation Agriculture. The grounds of Lahainaluna High School where the buildings are located are designated Urban. The intake is in a Conservation designation. Please refer to Figure 3-1 for clarification [3.1].

If not under permitted use according to the State Land Use Commission's rules and regulations for an Agriculture designation, a Land Use Commission Special Use Permit must be filed through the Maui County Planning Department. The Planning Department will coordinate a hearing with the Maui County Planning Commission. After the hearing, the Commission has a waiting period of not less than 15 days in which to make a decision. If the request is approved, it is then referred to the State Land Use Commission for concurrence [3.2 & 3.3]. There is a provision of Act 221 which permits the County Planning Commission to approve a Special Use Permit for applications under 15 acres [3.4].

The existing intake is in a Conservation District and will continue to serve in providing potable
water to Lahaina. There will be no alteration in its use and purpose and no construction will occur in the Conservation designation so a Conservation District Use Application should not be required [3.5].

B. County General Plan

1. A General Plan for the Lahaina District

This general plan for the Lahaina District was created in 1968, basically "to conserve the priceless, natural heritage and the rich historical tradition, while a new community ... comprised not only of local residents but of thousands of visitors ... is created by responsible private initiative and thoughtful public action." [3.6].

Figure 3-2 illustrates the proposed land use patterns presented in this general plan for the area. This figure was adapted from the original proposed land use plan and incorporates amendments made to that plan in 1972 [3.7]. The proposed project is in an area planned for public use.

2. Proposed Goals and Objectives for a Long Range Comprehensive Plan for Maui County

This document is the basic document used in the formulation of the proposed Maui County General Plan. The County Charter, which became
effective January 1, 1977, ordered the Administration and the County Council to devise and adopt a County-wide General Plan [3.8].

This document on proposed goals and objectives was developed by the County Office of Economic Development and the Planning Department. Using this document regional groups devised a general plan for the County [3.9].

According to this document the proposed project would be consistent with long range plans: [3.10]

"With the enactment of the Safe Drinking Water Act, the Federal Government has promulgated minimum primary and secondary water quality standards for all domestic water systems. Deficiencies in the quality of our water supply will be corrected to comply with the act. Treatment plants will be built to upgrade the domestic water quality for the Kula, Makawao, Lahaina, Kaunakakai, and Hana systems."

3. The Maui County General Plan (Proposed)

As previously stated, a County-wide Comprehensive General Plan was mandated by adoption of the Maui County Charter: [3.11]

Sec. 8-8.4 GENERAL PLAN

The purpose of preparing a general plan is to recognize and state the major problems
and opportunities concerning the needs and the development of the county and the social, economic and environmental effects of such development and to set forth the desired sequence, patterns and characteristics of future development.

The general plan shall set forth the county's broad policies for long-range development of the county. It shall contain statements of the general, social, economic, environmental and design objectives to be achieved for the general welfare and prosperity of the people of the county through government action, county, state or federal. The statements shall include, but not be limited to, policy and development objectives to be achieved with respect to distribution of social benefits, the more desirable uses of land within the county and the most desirable population densities with the county.

As a result of the Charter and subsequent document "Proposed Goals and Objectives for a Long Range Comprehensive Plan for Maui County," nine regional groups submitted a proposed General Plan for the County. This plan supports the goals and objectives of Mayor Cravalho's administration and was approved by the County Planning Commission [3.12].

According to the proposed General Plan, the proposed project would be compatible with
its objective and some of the policies regarding water, as stated: [3.13]

**OBJECTIVE:**

1. Adequate water supply to meet the needs of the people of Maui County.

**POLICIES:**

1. Explore and develop new sources of water to meet present and future needs.

2. Improve and replace inadequate water systems for domestic use and fire protection and agricultural purposes.

3. Encourage the use of recycled water including "gray water" for irrigation.

4. Provide for a separate water system, where feasible, for major agricultural producing areas in order to reduce the cost of treating domestic water.

5. Encourage the consolidation and integration of water systems, where feasible.


7. Provide appropriate incentives for the efficient use of water.
The plan, operating budget for 1978-1979, and long-term capital improvements budget was transmitted to the Council in January, 1978 [3.14]. The General Plan is still under study by the Council's committee on Planning and Economic Development [3.15].

C. Zoning

In as much as the site is in State agricultural use district, those zoning requirements apply. [3.16].

II. OTHER GOVERNING PLANS AND POLICIES

A. Safe Drinking Water Act, 1974: [3.17; 3.18; 3.19; 3.20]

The Safe Drinking Water Act of 1974 (P.L. 93-523) designates the Federal Government (Environmental Protection Agency or EPA) with the primary responsibility of establishing national standards. The states are responsible for enforcing the standards and otherwise supervising public water supply systems and sources of drinking water. A public water system is defined as providing piped water for human consumption and that it has at least 15 service connections or regularly serves at least 25 people.

This Act provides for:

- Establishment of primary regulations for the protection of the public health;
- Establishment of secondary regulations relating to the taste, odor, and appearance of drinking water;
- Measures to protect underground drinking water sources;
- Research and studies regarding health, economic, and technological problems of drinking water supplies. Specifically required are studies of viruses in drinking water and contamination by cancer-causing chemicals;
- A survey of the quality and availability of rural water supplies;
- Aid to the States to improve drinking water programs through technical assistance, training of personnel, and grant support;
- Citizen suits against any party believed to be in violation of the Act;
- Record-keeping, inspection, issuance of regulations, and judicial review;
- A 15-member National Drinking Water Advisory Council to advise the EPA Administrator on scientific and other responsibilities under the Act;
- A requirement that the Secretary of Health, Education, and Welfare ensure that standards for bottled drinking water conform to the primary regulations established under the Act - or to publish reasons for not doing so;

Primary standards were designed to provide maximum feasible protection of the public health, utilizing
the best treatment methods generally available, with cost as a consideration. The standards are ultimately to include maximum contaminant levels, treatment techniques, and criteria for operation, maintenance, siting, and intake of public water supply systems.

Secondary standards will also be prescribed for taste, odor, and appearance of drinking water, including sodium and total dissolved solids in the water. Secondary standards are to be enforced by the discretion of the individual states.


B. State Department of Health, Chapter 49, Potable Water Systems [3.21]

These regulations were adopted by virtue of Chapter 340E, Hawaii Revised Statutes, the purpose being to establish drinking water quality standards. These standards are based on standards and guidelines developed due to enactment of the Safe Drinking Water Act (P.L. 93-523). It sets the parameters for inorganic and organic chemicals and for such factors

3-10
as turbidity and coliforms. Inorganic and organic chemicals and coliforms are monitored by the State Department of Health and turbidity is monitored by the County. Refer to Section 2 of this document, "Water Quality," for additional information on standards and source water quality.

C. Coastal Zone Management Program [3.22]

The proposed project site is within the Hawaii coastal zone management (CZM) area (see Figure 3-3). Hawaii's Zone Management Act of 1977 (Act 188, SLH 1977) was enacted as a result of the Federal Coastal Zone Management Act (CZMA), P.L. 92-583, which became law on October 27, 1972.

The Act authorized a Federal grant-in-aid program to be administered by the Secretary of Commerce, who in turn delegated this responsibility to the National Oceanic and Atmospheric Administration's (NOAA) Office of Coastal Zone Management (OCZM). The Coastal Zone Management Act of 1972 was substantially amended on July 26, 1976 (P.L. 94-370). The Act and the 1976 amendments affirm a national interest in the effective protection and development of the coastal zone, by providing assistance and encouragement to coastal States to develop and implement rational plans for managing their coastal zones.

3-11
LEGEND

- COASTAL ZONE MANAGEMENT PROGRAM ADMINISTRATIVE AREA
- ALL LAND EXCEPT FOREST RESERVES.
- SPECIAL MANAGEMENT AREA (SMA)
- FOREST RESERVE (OUTSIDE OF SMA)

NOTES:
1. Lands owned, leased, held in trust, or whose use is otherwise by law subject solely to the discretion of the Federal Government, are excluded from the CZM area.
2. While Shoreline Setback areas (20 to 40 feet inland from the upper wave wash) are not shown, they are nonetheless designated as APCs.

SOURCE: [3.22]
When the State Legislature enacted the Hawaii Coastal Zone Management Act in 1977, it established basic policy to Guide State and County agencies in all actions affecting the State's coastal zone. Specially, the Act establishes objectives and policies for:

1. Provision and protection of recreational opportunities;
2. Protection and restoration of historic resources;
3. Improvement of scenic and open-space areas;
4. Protection of coastal ecosystems;
5. Provision for coastal-dependent economic uses;
6. Reduction of coastal hazards; and
7. Improvement of the review process involving development activities, including permit coordination and opportunities for public participation.

Act 188 stipulates the counties to amend existing shoreline special management areas (SMA's) to assure the counties' abilities to protect coastal ecosystems, to reduce coastal hazards, etc. But because the present SMA does not include all land areas required under the CZMA, the State has established an inland
administrative coastal management area (ACMA) boundary for the interim period. This area includes the present SMA and all other land areas in the State, except those in State forest reserves and Federal lands.

Those lands in the SMA will be regulated by county-administered SMA permit system and those in the ACMA will be regulated by State agencies. The State system supplements the SMA permit system and will continue to do so upon revision of the existing SMA. Principal State agencies and authorities involved in the Hawaii Coastal Zone Management Program (HCMP) are in Appendix D.

As previously stated in the discussion under State Land Use, the proposed action is in an Agriculture designation and will require a special permit from the County Planning Commission. The HCMP basically utilizes existing State and County regulations, requires necessary revision to comply with the Federal CZMA and the State CZM, and sets priority directions in management.

The Hawaii CZM recognizes policies of national interest. Among those included under National interests in land and water use and facilities siting are regional water treatment plants. The most applicable Hawaii CZM objectives and policies that would
apply to water treatment plants are under Coastal Ecosystems and Economic Uses. These policies and applicable authorities are presented in Appendix E.
REFERENCES TO SECTION 3


[3.7] Ibid. [3.6].


[3.9] Ibid. [3.8].


environmental impacts 4
I. PRIMARY IMPACTS OF THE PROPOSED PROJECT

A. Short-term Impacts

Short-term impacts, beneficial and adverse, generally result from construction-related activities. Consequently, these impacts are of short duration and should not last longer than the construction period.

1. Air Quality

Dust will be generated during construction, primarily because of road improvements and site preparation. If dust is a significant problem, it will be mitigated in the field through appropriate water sprinkling methods. To minimize dust and potential erosion, only those areas necessary for a particular construction phase should be cleared.

Exhaust emissions from construction equipment are expected to have an insignificant impact on ambient air quality. These emissions will be of short duration, lasting only for the construction period.
2. **Water Quality**

With the distance from the stream and with proper grading during construction, site preparation should not contribute sediment to Kanaha Stream. Care should be taken, however, to assure that drainage from the site will not enter Kanaha Stream nor the valley. Precautions also should be taken by covering the screen box and trough to prevent dust generated during construction from entering the water system.

3. **Noise**

During site preparation and construction of buildings, an increase of ambient noise is inevitable. Noise levels (generated by construction machinery) which can be expected during construction are presented in Figure 4-1. Use of pile drivers, jack hammers, or rock drills are not anticipated.

Impacts of construction noise can be mitigated. The contractor will ensure that mufflers on equipment are in proper operating condition and will limit the hours of construction. The increase in noise will be temporary and should last only for the duration of the construction period.
### FIGURE 4-1

CONSTRUCTION EQUIPMENT NOISE RANGES

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Noise Level (dB) at 50 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stationary</strong></td>
<td></td>
</tr>
<tr>
<td>Compactors (Rollers)</td>
<td>H</td>
</tr>
<tr>
<td>Front Loaders</td>
<td></td>
</tr>
<tr>
<td>Backhoes</td>
<td></td>
</tr>
<tr>
<td>Tractors</td>
<td></td>
</tr>
<tr>
<td>Scrapers, Graders</td>
<td></td>
</tr>
<tr>
<td>Pavers</td>
<td>H</td>
</tr>
<tr>
<td>Trucks</td>
<td></td>
</tr>
<tr>
<td><strong>Equipment Powered by Internal Combustion Engines</strong></td>
<td></td>
</tr>
<tr>
<td>Concrete Mixers</td>
<td></td>
</tr>
<tr>
<td>Concrete Pumps</td>
<td>H</td>
</tr>
<tr>
<td>Cranes (Movable)</td>
<td></td>
</tr>
<tr>
<td>Cranes (Derrick)</td>
<td>H</td>
</tr>
<tr>
<td>Pumps</td>
<td>H</td>
</tr>
<tr>
<td>Generators</td>
<td></td>
</tr>
<tr>
<td>Compressors</td>
<td></td>
</tr>
<tr>
<td><strong>Impact Equipment</strong></td>
<td></td>
</tr>
<tr>
<td>Pneumatic Wrenches</td>
<td></td>
</tr>
<tr>
<td>Jack Hammers and Rock Drills</td>
<td></td>
</tr>
<tr>
<td>Pile Drivers (Peaks)</td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
</tr>
<tr>
<td>Vibrator</td>
<td></td>
</tr>
<tr>
<td>Saws</td>
<td></td>
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</tbody>
</table>

*Note: Based on Limited Available Data Samples*

*Source: Noise From Construction Equipment and Operations Building Equipment, and Home Appliances, EPA, 1971*
4. Biological

Vegetation on the site are not considered rare or endangered by State or Federal agencies. All are common species found throughout the State. Specimens of the one endemic species, *Erythrina sandwicensis*, or wiliwili, are found along the wall of the gulch and up into the valley. These specimens do not appear in potential danger during construction.

Terrestrial fauna in the project area are primarily introduced species associated with urbanized areas. Native birds and mammals may visit the area, but the site does not offer suitable habitat. During construction, fauna in the immediate vicinity of construction activities may relocate into adjacent areas, but would be able to return to the site upon completion of construction.

Since existing stream water quality and habitat are expected to be unaffected by construction, impacts to existing aquatic biota are not anticipated.

5. Archaeological

Since this site was previously disturbed, there are no significant archaeological sites present on the site. However, since Hale Pa'i is both on the State Historic Register and the
National Register of Historic Sites, and since this building is located adjacent to the narrow access road through the school grounds, care should be taken to ascertain that potential damage to the structure is not a factor when plant components and construction equipment are transported to the site.

6. **Waste Disposal**

Solid waste generated during construction will be regularly disposed at the nearest landfill and should not be allowed to accumulate. Care should be particularly taken to prevent wastes from entering the valley. Chemical toilets will be provided during construction for construction workers.

7. **Traffic**

During transport of plant components and construction equipment, there may be some disruption of normal traffic patterns. Transport should be done during hours of lightest traffic and, if necessary, a police escort could be requested. Any disruption will be temporary, lasting only for the duration of that transport period.

There will be some additional construction worker traffic through the school grounds, but
the expected amount of traffic should not adversely affect school activities.

8. **Security**

Additional security may be required during construction and assembly of the plant. A fence should be constructed around the site or plant components to alleviate potential damage by vandalism. Periodic police visits may be required if potential vandalism appears a significant problem during construction.

**B. Long-term Impacts**

Primary long-term impacts, beneficial and adverse, are those anticipated to result directly because of the action.

1. **Economic**

The proposed plant is estimated to cost $1,400,000 initially. It will then require an estimated $51,500 annually for operation and maintenance of the plant.

This cost, however, is necessary since the Safe Drinking Water Act mandates specific standards for potable water. To comply with these standards, a plant must be constructed to treat this essential water source.
2. **Air Quality**

The estimated fuel emissions from the equipment are expected to be insignificant and are not expected to adversely affect ambient air quality.

As an integral part of the treatment plant, about ten 150 pound chlorine tanks may be on site. A chlorine detection system will be provided should leakage occur and mandatory gas masks also will be provided. Potential of leakage is anticipated to be minimal and significant adverse impacts are not expected.

3. **Water Quality**

There will be a long-term positive impact on potable water quality with the proposed water treatment plant. By treatment, water from Kanaha Stream will be within standards established by the Environmental Protection Agency. Water quality of the source will be unaffected.

Routine operations will not endanger existing water quality. Backwash water generated through treatment will be directed into Pioneer Mill Company's irrigation system to be used for cane irrigation. Potential impacts to surrounding surface waters are, therefore, not expected.
Solids contained in the backwash water will be components of stream water that cause turbidity plus the gelatinous alum floc resulting from the coagulation process. The amount of solids is estimated at 100-125 pounds of solids in 25,000 GPD backwash water. Because of the gelatinous nature of the solids, much of this weight will be water. Since most of the solids will be silt and clay particles and since the alum floc is basically inert, adverse impacts to sugarcane are not expected. Details of the chemical reactions involved are provided in Section 11, pages 11-17 and 11-18, in a letter addressed to Dr. Yu-Si Fok of the University of Hawaii's Water Resources Research Center.

After construction, some landscaping will be provided to minimize erosion from the site. The site will also be graded to minimize erosion.

4. Noise

The air compressors are the only equipment expected to generate significant noise levels. Two compressors will be provided, one functioning 20 - 40 percent of the time, the other as back-up. When operating, the noise level adjacent to the compressor will be 85 dB. Approximately 70 - 75 feet away, the noise level will be about
70 - 75 dB.

Adverse impacts from noise generated by the proposed plant are not expected. The site is about 1,200 feet from the nearest school building and this, combined with the attenuating effect of the vegetation and orchards located between the site and school, should result in little, if any, impact to school activities.

Since sensitive wildlife habitats and rare and endangered species are not expected in the area, adverse impacts to those species from noise are not anticipated. Wildlife species present are common and found throughout the State. Displacement of wildlife into adjacent areas is expected to be minimal, if any.

5. Biological

As previously stated in the discussion on noise impacts, adverse impacts to fauna communities are not expected. Rare and endangered wildlife are not expected at the site and there are no sensitive wildlife habitats. Fauna species found or expected at the site are common throughout the State. Since the site is already
disturbed and being used in a purpose similar to what is being proposed, displacement of any fauna into adjacent areas is expected to be minimal.

Flora species found at the site are common exotic species, populations of which will not be adversely impacted by the proposed project. The only endemic species found was the wiliwili. Those specimens, however, are along the gulch walls and do not appear to be in danger of damage during construction or as a result of the proposed project.

There are no controls at the existing intake. However, since the proposed action will not involve additional draw of water, there should be no impact to existing conditions. As stated previously in Section 2 in the discussion of aquatic life, Kanaha Stream is considered to be of low natural quality for native species. Adverse impacts to the species are not expected with the proposed project.

6. Archaeological

The lack of significant archaeological features at the proposed site precludes impacts.
7. **Infrastructure**
   
a. **Utilities**
   Adverse impacts to existing utility systems are not expected with the proposed project.

b. **Emergency Facilities**
   Existing fire, police, and medical services should be able to handle potential problems which may arise. Adverse impacts to these services are not anticipated. The building housing plant components will be secured and fencing will be provided around diversion structures to alleviate potential security problems.

c. **Traffic**
   Since only one person will make a daily check on the facility, adverse impacts to existing traffic patterns are not expected.

II. **SECONDARY IMPACTS OF THE PROPOSED PROJECT**

A. **Short-term Impact**
   During construction there will be infusion of cash into the local economy. This will be a short-term positive impact for the local economy.
B. Long-Term Impact

The proposed project will preclude land uses incompatible with the intended purpose. Since the proposed action is similar to the existing use, adverse impacts to and conflicts with the site and surrounding land uses are not expected.
adverse environmental effects
SECTION 5
PROBABLE ADVERSE ENVIRONMENTAL IMPACTS
WHICH CANNOT BE AVOIDED

This section summarizes adverse impacts presented in the previous section entitled, "Anticipated Environmental Impacts and Mitigative Measures to Minimize Adverse Impacts," and presents mitigative measures to minimize these impacts.

I. PRIMARY IMPACTS OF THE PROPOSED PROJECT

A. Short-term Adverse Impacts

Short-term adverse impacts anticipated because of the proposed project are construction-related and, therefore, are of short duration and should last only for the construction period. Although dust will be generated during site preparation, this should not create significant problems since it can be effectively mitigated in the field through water sprinkling. Exhaust emissions from construction equipment should be quite insignificant and should not adversely affect ambient air quality.

Because of the distance of the site from the stream, erosion and sedimentation into stream waters during construction are not expected. Precautions will be taken to assure that drainage from the site will not enter Kanaha Stream and that the existing...
screen box and trough are covered to prevent dust from entering the water system.

During construction increased noise would probably be the most prominent compared to other anticipated impacts. This will be temporary and the contractor will ensure that mufflers on equipment are in proper operating condition and will limit the hours of construction.

Vegetation which will be cleared and grubbed from the site are not rare or endangered and none are native. There is one native species, *Erythrina sandwicensis* (wiliwili), present off the immediate site along the gulch walls and up further into the valley. Although these specimens should not be in danger during construction, the contractor will assure that these specimens are not affected.

Although native species of birds and mammals may visit the area, the site itself does not provide suitable habitat. Fauna may relocate to adjacent areas during construction but could return upon completion of the project. Construction activities should not affect existing aquatic biota.

Although there are no significant archaeological sites on the site, Hale Pa'i is located along a narrow access road to the site. This site is both on the State Historic Register and the National Register.
of Historic Sites. Precautions will be taken during transport of construction equipment to prevent damage to this building.

Solid waste generated during construction should not be a significant problem and will be regularly transported to the nearest landfill. Liquid waste will be disposed in portable chemical toilets so this is not anticipated to be a significant problem.

Transport of construction equipment should be done during hours of lightest traffic to minimize disruption to existing traffic patterns. If necessary, police assistance during this phase may be requested. Construction worker traffic should not adversely affect school activities.

B. **Long-term Adverse Impacts**

1. **Air Quality:**

   Although fuel emissions will be generated by plant equipment, these emissions are insignificant and should not adversely affect ambient air quality.

   Part of the treatment plant will store about ten 150-pound chlorine tanks. A chlorine detection system will be provided should leakage occur and mandatory gas masks provided. Potential for leakage is minimal and significant adverse impacts are not expected.
2. **Water Quality:**

Operations of the proposed water treatment plant will not affect water quality of Kanaha Stream. Backwash water generated by the plant will be directed into Pioneer Mill Company's irrigation system to be used for cane irrigation. Solids in the backwash water will be primarily silt and clay from the stream water and a gelatinous alum floc from the coagulation process. The amount of solids is estimated at 100-125 pounds of solids in 25,000 GPD backwash water. Since the alum floc is basically inert, adverse impacts to sugarcane are not expected. Details of the chemical reactions involved are provided in Section 11, pages 11-17 and 11-18, in a letter addressed to Dr. Yu-Si Fok of the University of Hawaii's Water Resources Research Center.

3. **Noise:**

Noise additional to ambient levels will be generated primarily by the air compressors, which will be about 85 dB adjacent to the compressor. Only one compressor will be operating at a time and will be operating about 20 - 40 percent of the time. Approximately 70 - 75 feet away, the noise level will be about 70 - 75 dB.
Since sensitive wildlife habitats and rare and endangered species are not expected in the area, adverse impacts to those species are not anticipated.

The distance of the site from school buildings, combined with the attenuating effect of the vegetation and orchards between the site and the school, should result in little, if any, impact to school activities.

4. Biological:

This site is already being utilized for a purpose similar to that being proposed and potential displacement of fauna on the site is expected to be minimal. The flora species at the site are common exotic species found throughout the State and do not provide sensitive wildlife habitat.

The proposed project is not expected to draw more water from the intake located further upstream into the valley. Therefore, adverse impacts to aquatic species are not expected as a result of the proposed project.

II. SECONDARY ADVERSE IMPACTS OF THE PROPOSED PROJECT

The proposed project will preclude land uses incompatible with the intended purpose. Since the proposed
action is similar to the existing use, adverse impacts to and conflicts with the site and surrounding land uses are not expected.

III. REASONS FOR PROCEEDING

Adverse impacts anticipated because of the proposed project have been evaluated and are considered minimal, particularly compared to the benefits which will accrue as a result of the proposed action. These adverse impacts can be mitigated and should not constitute significant adverse impacts.

The proposed treatment plant must be built to comply with the Federal Safe Drinking Water Act of 1974, PL 93-523, which mandated turbidity levels to be less than 1.0 turbidity unit. This necessitates treatment of Kanaha Stream water, which is an important source for existing and future requirements.
alternatives 6
SECTION 6

ALTERNATIVES TO THE PROPOSED ACTION

I.  NO ACTION

A no action alternative would not accomplish the objective of the Department of Water Supply to develop this water treatment plant, which is an integral part of continued and necessary development plans for water resources for the Lahaina area. Plans including this treatment facility are based on providing safe yield requirements until November, 1980. [6.1] As of February, 1978 the total yield for the area was 4.25 MGD, Kanaha Stream contributing approximately 1.25 MGD of that amount. With the water treatment plant, Kanaha Stream will continue to contribute about the same amount of potable water to the system.

More important, a no action alternative also would mean water from Kanaha Stream would not meet State and Federal requirements for potable water, as mandated by the Safe Drinking Water Act, PL93-523.

II.  ALTERNATIVE SITES

Since the water source under consideration is Kanaha Stream, alternative sites are not considered a factor. Sites for a treatment plant in a location farther away from the water source would incur significantly greater costs.
III. ALTERNATIVE PLANT DESIGN

This section will present descriptions of alternative designs, capital costs, operation and maintenance costs, economic analysis on the most economically feasible alternative, and a listing of advantages and disadvantages of each alternative.

Costs are based on cost-capacity curves developed for water treatment plants utilizing similar treatment processes. Current costs for some major equipment were obtained from manufacturers.

A budget estimate in this case applies to the owner's budget and not to the budget as a project-control document. A budget estimate is prepared with the use of flow sheets, layouts, and equipment details. It is normally expected that an estimate of this type would be accurate within +30 percent and -15 percent.

Since all alternatives are subject to the same procedure, relative costs should not vary significantly and should allow valid cost comparisons between alternatives. The costs estimated in this report are not as detailed as costs estimated in later stages of a construction project.

A. Alternative IA:

Reducing the plant capacity to 1.5 MGD by eliminating one of the 0.5 MGD treatment plant modules
and reducing the building size accordingly results in an estimated project cost of $1,250,000. The present worth of this option is $1,530,000 based on an economic analysis of the capital and operation and maintenance costs over a 20-year period using a discount rate of 7 percent and depreciating the factory-built modular water treatment plant at 3 percent per year.

B. Alternative I:

This concept is identical to the proposed treatment plant except two 1.0 MGD factory-built modules would be used instead of four 0.5 MGD units (Figure 6-1). The plant siting will be essentially the same as illustrated for the proposed treatment plant.

The estimated project cost for this 2.0 MGD water treatment plant is $1,300,000 and its present worth is $1,705,000.

Advantages of Alternative I:

Standard factory-built WTP used in many other locations on a variety of water qualities minimizes startup time and operator training requirements.

Factory-built plants minimize on-site construction requirements.

Factory-built plants minimize the number of vendors owner must interface with after taking over plant operations.

Settling compartment automatically drains each time filter is backwashed. Operator attention is minimized.
Filtered water to reservoir.

Air compressor/receiver (Typ).

Backwash drainline to wash water settling ponds.

MCC & Plant control panel.

Chlorination room.

Lab sink & cabinets.

Hot water heater.

Drain sump (Typ).

Effluent pump (Typ).

Backwash pump.

Chemical storage.

Polymer.

Polymer.

Alum.

Soda ash.

Flocculation chamber (Typ).

Settling chamber (Typ).

Filter chamber (Typ).

1.0 MGD treatment unit (Typ. of 2).

Raw water from distribution box.

Lahaina Water Treatment Plant-Predesign
Lahaina, Maui, Hawaii

Alternative 1

Figure 8-1

Norman Saito Engineering Consultants, Inc.
Use of factory-built plants results in less concrete being used in plant construction. Cement is presently in short supply.

Disadvantages of Alternative I:

Steel tankage requires periodic maintenance to prevent corrosion.

In the event of equipment failure one-half of the WTP is out of service.

1.0 mgd factory-built water treatment plant modules may be too large to conveniently transport to the plant site.

C. Alternative II:

Alternative II will require on-site construction of a 2.0 MGD conventional water treatment plant utilizing concrete gravity filter construction. All treatment unit tankage would be concrete. The treatment plant would be housed in a prefabricated building which would also house chemical feed units, motor controls, and air compressors. Figure 6-2 illustrates the plant layout and plant siting adjacent to the existing weirs and 100,000 gallon storage tank.

The estimated project cost is $1,950,000. Analysis of the costs over a 20-year period at a 7 percent discount rate and depreciation allowed at 2 percent per year yields a present worth value of $2,120,000.
FILTERED WATER TO RESERVOIR → BACKWASH TO WASH WATER PONDS → 104' → SLUDGE DRAINLINE TO WASH WATER PONDS

24' → 20' → 20' → 20' → 20'

AIR COMPRESSOR/RECEIVER (TYP) → BACKWASH PUMP

FILTER CHAMBER

EFFLUENT PUMP (TYP)

MCC & PLANT CONTROL PANEL

CHLORINATION ROOM

HOT WATER HEATER

LAB SINK & CABINETS

LOADING DOCK

RAW WATER FROM DISTRIBUTION BOX

2.0 MGD TREATMENT UNIT

CHEMICAL STORAGE

POLYMER

ALUM

LAHAINA WATER TREATMENT PLANT-PREDISEIGN
LAHAINA, MAUI, HAWAII

ALTERNATIVE II

FIGURE 8-2
Reducing the capacity of this alternative to 1.5 MGD will only reduce the project cost about 15 percent or $290,000. This project cost would then be $1,660,000, which is still significantly greater than for the 1.5 MGD proposed plant. The present worth value of the 1.5 MGD on-site constructed plant is $1,815,000.

**Advantages of Alternative II:**
WTP of concrete construction does not require painting. Minimizes maintenance of structures.

**Disadvantages of Alternative II:**
On-site construction requires more sophisticated construction techniques than for plant with factory-built units.

Difficult to get concrete trucks to site.

More equipment manufacturers and vendors for owner to deal with when maintaining the plant.

**D. Alternative III:**
This alternative is essentially the same as Alternative II except pressure filters (steel construction) are substituted for the gravity filters. The resulting project cost estimated for this alternative is $2,000,000. Because pressure filters are not required to meet system operating constraints and the cost is greater than that developed for Alternative II, Alternative III was not considered further. The present worth analysis is $2,125,000 for this alternative.
Advantages of Alternative III:

WTP of concrete construction does not require painting. Minimizes maintenance of structures.

Disadvantages of Alternative III:

On-site construction requires more sophisticated construction techniques than for plant with factory-built units.

Difficult to get concrete trucks to site.

Cement presently in short supply due to volume of construction work underway.

More equipment manufacturers and vendors for owner to deal with when maintaining the plant.

E. Summary of Alternatives and Recommendations:

Table 6-1 provides a summary of the alternative project costs considered in this study. The cost analysis shows Alternative I, a 2.0 MGD plant using two 1.0 MGD factory-built modular units, providing the least costs of all the alternatives. The two on-site constructed 2.0 MGD plant alternatives, II and III, have present worth values of $2,120,000 and $2,125,000, respectively.

A 1.5 mgd factory-built modular water treatment plant (Alternative IA) can be constructed for an estimated cost of $1,250,000 versus $1,660,000 for a 1.5 MGD plant constructed on-site. The 1.5 MGD initial capacity factory-built plant could easily be expanded to a 2.0 MGD plant, if desired.
### Table 6-1

**Summary of Alternative Cost Analyses**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Project Cost</th>
<th>Present Worth Value</th>
<th>Annualized Cost</th>
</tr>
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<tbody>
<tr>
<td>IA (1.5 MGD)</td>
<td>$1,250,000</td>
<td>$1,530,000</td>
<td>$145,000</td>
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<td>I (2.0 MGD)</td>
<td>1,300,000</td>
<td>1,705,000</td>
<td>160,000</td>
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<tr>
<td>II (2.0 MGD)</td>
<td>1,950,000</td>
<td>2,120,000</td>
<td>200,000</td>
</tr>
<tr>
<td>III (2.0 MGD)</td>
<td>2,000,000</td>
<td>2,125,000</td>
<td>200,500</td>
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</table>

6-9
IV. ALTERNATIVE BACKWASH DISPOSAL [6.4]

The various alternatives to handling the backwash water are:

1. returning the wastewater directly to the water source (Kanaha Stream);
2. removing most of the settleable solids in settling ponds before discharging the wastewater into Kanaha Stream;
3. remove settleable solids and discharge the clarified backwash water into the Pioneer Mill Company mill system;
4. removing the solids in the backwash through settling ponds and releasing the clarified backwash water to the Pioneer Mill Company irrigation system and;
5. removing the solids in settling ponds and recycling the water through the treatment plant.

Since it is the goal of the Environmental Protection Agency to have "no discharge" by 1985, the alternatives in discharging the backwash water into the water source are not considered viable alternatives. Refer to Figure 6-3. The most economical method of backwash disposal is that being proposed, discharge of the backwash water directly into Pioneer Mill Company's irrigation system. An alternative to direct disposal would be to remove the
solids in a settling pond and releasing the clarified backwash water into the Pioneer Mill system or the irrigation system. This alternative will entail a greater cost, both in operations and maintenance and increased land costs because of the needs of the area required for settling ponds. Another alternative to remove the solids in a settling pond and recycling this backwash water would make controlling the operations more difficult as well as more costly.

The alum sludge, which consists of silt and clay particles and alum floc (aluminum hydroxide) is gelatinous and does not dewater or compact readily. When the sludge accumulates in settling ponds, a 15 percent solids content is often the maximum concentration which can be expected. When this sludge is dried by natural evaporation, several warm, dry months are required to dry the sludge to a manageable consistency (approximately 25 to 30 percent solids content).

Numerous methods of dewatering alum sludge have been investigated. These include:

1. scroll centrifuge
2. precoated vacuum filter
3. pressure filtration (filter press)
4. alum recovery

These are mechanical processes proposed for water treatment
plants where land value is high or large land areas are impossible to acquire. If large land area is available and climate favorable, other dewatering processes include freezing, spray irrigation, shallow-bed drying, and transformation of topsoil by mixing soil with sewage sludge and shredded leaves.

The cost of mechanical dewatering is estimated at $150 to $200 per ton of dry solids, including capital and operational costs; the cost of non-mechanical methods depends mostly on the land cost.

If land cost is low and the dry season long, an economic solution is shallow drying beds with an underdrain. Sixty to seventy tons per acre of dry solids can be applied to the drying beds with thickened sludge at an average of 5 percent solids content. The sludge can be dried to 50 percent moisture content for easy handling and disposal. Estimated cost is approximately $40 per ton for dry solids, exclusive of land cost.

The capital cost of mechanical methods will be prohibitively high for small treatment plants, such as the proposed plant because of the small amount of sludge to be dewatered. The shallow bed drying will not be as economical as wash water settling ponds because of construction required for drying beds, thickening and storage facilities. The estimated cost for wash water settling
ponds is $11 per ton of dry solids, exclusive of land cost. The dried sludge from the ponds is then removed to landfill for final disposal. The estimated drying time will be 2-3 months before the sludge can be transported to the landfill for disposal.
REFERENCES TO SECTION 6


[6.4] Ibid. [6.3].
SECTION 7

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

State and County funds, labor, construction and building materials, and fuel will be committed to the project. Additional maintenance and operation funds and manpower will be required. Although the proposed plant will have a functional capacity of 1.5 MGD, its average operating capacity will be 1.2 MGD of water diverted from Kanaha Stream into the treatment plant. Extraction of this amount of water should not alter existing stream conditions since the proposed diversion will not be greater than the amount of water presently being extracted from this source to serve the Lahaina area.
short term uses
long term productivity
SECTION 8

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES
OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND
ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The proposed action has considered environmental
characteristics of the area and water requirements of
the Lahaina area. The proposed action, if implemented,
will enable treatment of Kanaha Stream water to meet Federal
and State regulations for potable water, water necessary
to meet current requirements for the Lahaina area.

The amount of water to be removed from Kanaha Stream
will not be greater than what is presently being drawn.
Wastewater from the treatment plant will be diverted into
Pioneer Mill's irrigation conduits for sugarcane irrigation.

The proposed action will not involve trade-offs
between short-term losses, foreclose future options, narrow
the range of beneficial use of the environment, or pose
long-term risks to health and safety. In fact, the treat­
ment plant will treat existing water from Kanaha Stream
to a level higher than what is being distributed to the
Lahaina area.
government policy 9 offsetting adverse effects
SECTION 9

AN INDICATION OF WHAT OTHER INTERESTS AND CONSIDERATIONS OF GOVERNMENTAL POLICIES ARE THOUGHT TO OFFSET THE ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

As indicated in Section 4, Anticipated Environmental Impacts and Mitigative Measures to Minimize Adverse Impacts, most of the adverse impacts are short-term and related to construction activities. Kanaha Stream is an important water source for the Lahaina area and to conform to State and Federal regulations for drinking water, this plant must be constructed. Water for this area is already reaching its limits for safe yield and continued utilization of this source is an integral portion of a plan to provide water for the area.
approvals 10
SECTION 10
LIST OF NECESSARY APPROVALS

State of Hawaii
Department of Education approval.

Department of Health approval by authorities:
- HRS Chapter 340E, Safe Drinking Water Act, Act 84, 1976 Legislature
- Public Health Regulations, Chapter 49, Potable Water Systems

County of Maui
Department of Public Works
1. Building permit through Land Use and Codes Administration.

2. Grading permit by authority of the Permanent Ordinances of the County of Maui, Ordinance No. 639 (Bill No. 39, 1969).


Maui County Planning Commission
- Land Use Commission Special Use Permit in accordance to Act 221.

Other
Hawaiian Telephone Company - approval of plans.

Maui Electric Company - approval of plans.

notice of preparation consultation period 11
**SECTION 11**

**ORGANIZATIONS AND PERSONS CONSULTED**

**DURING NOTICE OF PREPARATION CONSULTATION PERIOD**

The following list includes those agencies and organizations to whom Preparation Notices were sent. Those with an asterisk sent written comments which, along with corresponding responses, have been included in this Section on the indicated pages.

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<td>Senator Yamasaki</td>
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<td>* University of Hawaii, Water Resources Research Center</td>
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<td>* Maui Electric</td>
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</tbody>
</table>
Mr. Robert T. Chuck
Manager-Chief Engineer
Division of Water & Land Development
Department of Land & Natural Resources
P.O. Box 373
Honolulu, Hawaii 96809

Dear Mr. Chuck:

Subject: Lahaina Water Treatment Plant - Lahaina, Maui, Hawaii

We have reviewed the subject environmental impact statement and have no comments to offer.

Thank you for the opportunity to review this document.

Sincerely,

[Signature]
Jack P. Kanalz
State Conservationist

cc:
Mr. Tatsumi Imada
Director, Department of Water Supply
County of Maui
P.O. Box 1109
Wailuku, Maui, Hawaii 96793

---

January 2, 1980

Mr. Jack P. Kanalz
State Conservationist
Soil Conservation Service
United States Department of Agriculture
P.O. Box 50084
Honolulu, Hawaii 96850

Dear Mr. Kanalz:

SUBJECT: LAHAINA WATER TREATMENT PLANT
EIS NOTICE OF PREPARATION

Thank you for reviewing the subject document.

Sincerely,

[Signature]
Eric Soto, Director
June 15, 1979

Division of Water and Land Development
Department of Land and Natural Resources
P. O. Box 373
Honolulu, Hawaii 96809

RE: Lahaina Water Treatment Plant
Lahaina, Maui, Hawaii

Dear Sir:

We have reviewed the referenced Conservation District Use Application dated June 8, 1979 concerning the Lahaina Water Treatment Plant and provide the following comments.

We have found the application quite thorough although the assessment of Kanaha Stream resources should have been more current than 1963. The changes that have occurred in the stream since that time unfortunately appear to have been detrimental, including the loss of some of the aquatic species mentioned in the report as being present in the upper reaches of the stream.

If, as stated in the last paragraph of Section 4, page 9, there will not be additional water being drawn from stream at the inlet to the pipeline, we concur with the statements that adverse impacts should not be expected.

We would like to emphasize that the precautions against affecting the cliff vegetation adjacent to the site should be strictly adhered to.

We do not object to the issuance of the permit provided that additional water is not drawn from the stream and that measures to control erosion during and after construction are undertaken.

We appreciate this opportunity to comment.

Sincerely yours,

Maurice H. Taylor
Field Supervisor
Division of Ecological Services

c c: MA
BHFS
HDPAC
EPA, San Francisco

Save Energy and You Serve America!
January 2, 1980

Mr. Maurice H. Taylor
Field Supervisor
Fish and Wildlife Service,
Division of Ecological Services
United States Department of the Interior
P.O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Taylor:

SUBJECT: LAMAINA WATER TREATMENT PLANT
EIS NOTICE OF PREPARATION

Thank you for reviewing the document and for your comments. After receiving your comments regarding stream resources of Kanaha Stream, we contacted your office and received a report prepared by your office and addressed to Colonel Peter D. Stearns dated April 19, 1979. We will incorporate information from that report into the Environmental Impact Statement.

Since additional water at the inlet will not be drawn, we appreciate your concurrence that adverse impacts should not be expected.

Construction specifications to the contractor will emphasize that strict precautions must be taken not to affect cliff vegetation adjacent to the site and that erosion control during construction and design measures taken to minimize erosion after construction are adhered to.

Thank you for your thorough review of the document and for your participation in this phase of the review process.

Sincerely,

Eric Solo, Director

"By Water All Things Find Life"
JUN 28, 1979

Division of Water and Land Development
Department of Land and Natural Resources
P. O. Box 373
Honolulu, Hawaii 96803

Gentlemen:

Subject: Proposed Lahaina Water Treatment Plant
Lahaina, Maui, Hawaii

Thank you for this opportunity to review and comment on the subject project.

The project will not have any adverse environmental effect on existing or planned facilities serviced by our department.

Very truly yours,

Rikio Nishioka
State Public Works Engineer

Mr. Rikio Nishioka
State Public Works Engineer
Division of Public Works
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaii 96810

Dear Mr. Nishioka:

SUBJECT: LAHAINA WATER TREATMENT PLANT
EIS NOTICE OF PREPARATION

Thank you for reviewing the document and for your concurrence that the proposed project will not have any adverse impacts on your department.

Sincerely,

Eric Soto, Director

“By Water All Things Flow and Life”

11-6
June 8, 1979

Mr. John Farias, Jr.
Chairman, Board of Agriculture
State of Hawaii
Department of Agriculture
1420 South King Street
Honolulu, Hawaii 96814

Subject: LAHAINA WATER TREATMENT PLANT
Lahaina, Maui, Hawaii

We have enclosed a copy of the Notice of Preparation for the subject project, TMR: 4-6-80: I2, for your information and review.

We would appreciate receiving any concerns regarding this project for consideration during preparation of the environmental impact statement. Specific concerns should be transmitted in writing to:

Division of Water and Land Development
Department of Land and Natural Resources
P. O. Box 373
Honolulu, Hawaii 96809

Sincerely,

[Signature]

Tatsuna Imada
Director

"By Water All Things Find Life"

January 2, 1980

Mr. John Farias, Jr.
Chairman
Board of Agriculture
Department of Agriculture
State of Hawaii
1420 South King Street
Honolulu, Hawaii 96814

Dear Mr. Farias:

SUBJECT: LAHAINA WATER TREATMENT PLANT
EIS NOTICE OF PREPARATION

Thank you for reviewing the subject document.

Sincerely,

[Signature]

Eric Soto, Director

"By Water All Things Find Life"
Mr. Tsuzuki Iwama, Director
Department of Water Supply
County of Maui
P.O. Box 1109
Wailuku, Hawaii 96793

Dear Mr. Iwama:

Subject: Lahaina Water Treatment Plant
Lahaina, Maui, Hawaii

Thank you for giving the DOE an opportunity to review the subject document. We have no comments to add to your EIS document.

Sincerely,

CHARLES G. CLARK
Superintendent

CC: RE: EIS

cc: Div. of Water & Land, DOE
Maui District

January 2, 1980

Mr. Charles G. Clark
Superintendent
Department of Education
State of Hawaii
P.O. Box 2360
Honolulu, Hawaii 96804

Dear Mr. Clark:

SUBJECT: LAHAINA WATER TREATMENT PLANT
EIS NOTICE OF PREPARATION

Thank you for reviewing the document.

Sincerely,

ERIC SOTO, Director

"By Water, All Things Find Life"
Division of Water & Land Development
Department of Land & Natural Resources
P.O. Box 371
Hilo, Hawaii 96720

Dear Sirs:

Subject: Request for Comments on Proposed Environmental Impact Statement (EIS) for Lahaina Water Treatment Plant, Lahaina, Maui, Hawaii

Thank you for allowing us to review and comment on the subject proposed EIS.

In addition to compliance with maximum contaminant levels as set forth in Public Health Regulations, Chapter 49, Section 30 of Chapter 49 requires certification of new or substantially modified systems prior to use for water consumption. Responsibility for such certification must be given by the Department of Health or may be designated to a county water department as appropriate.

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.

Sincerely,

[Signature]

James S. King, Ph.D.
Deputy Director for Environmental Health

CC: DEED, Maui

January 2, 1980

Dr. James S. King, Ph.D.
Deputy Director for Environmental Health
Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Kumagai:

SUBJECT: LAHAINA WATER TREATMENT PLANT
EIS NOTICE OF PREPARATION

Thank you for reviewing the document.

Regarding Section 30 of Chapter 49 of the Public Health Regulations on certification of new or substantially modified systems prior to use for water consumption, our department will coordinate this with the State Department of Health and will comply with any regulations prior to use of treated water for consumption.

Sincerely,

[Signature]

Eric Soto, Director

"By Water All Things Find Life"
The Honorable Susumu Ono  
Chairman  
Department of Land and  
Natural Resources  
State of Hawaii  
Honolulu, Hawaii  

Attention: Division of Water and Land Development  

Dear Mr. Ono:  

Subject: Environmental Impact Statement - Notice of Preparation for the Lahaina Water Treatment Plant, Lahaina, Maui, Hawaii  

Thank you for the opportunity to review the above document.  

We have no comments to offer on the subject matter at this time.  

Sincerely,  

[Signature]  

Eric Soto, Director  

CC: Mr. Tatsumi Imada  
Maui Department of Water Supply
Mr. Tatsumi Imada  
Director  
Department of Water Supply  
County of Maui  
P. O. Box 1109  
Wailuku, Hawaii 96793  

Dear Mr. Imada:  

Subject: Notice of EIS Preparation  
Lahaina Water Treatment Plant  
Lahaina, Maui, Hawaii  

Thank you for giving us the opportunity to review the above-captioned notice. We have the following comments which would help in preparing the EIS:  

1. The traffic data on pages 2-35, 2-36, and 2-37 are outdated. We are enclosing a more recent traffic count data which may be used in the EIS;  

2. In our judgment, the two-way capacity stated on page 2-35 for Honoapiilani Highway is too high. We have calculated the capacity for this highway to be 1830; and  

3. We agree with your conclusion on page 4-10 that the impacts to the highways from the traffic to be generated by the above subject action will be negligible.  

Yours very truly,  

[Signature]  

Ryokichi Higashionna  

---  

January 2, 1980  

Dr. Ryokichi Higashionna, Ph.D.  
Director  
Department of Transportation  
State of Hawaii  
869 Punchbowl Street  
Honolulu, Hawaii 96813  

Dear Dr. Higashionna:  

SUBJECT: Lahaina Water Treatment Plant  
EIS NOTICE OF PREPARATION  

Thank you for reviewing the document and for the additional information provided in your transmittal. We will make these changes to correspond with your current data. We appreciate your concurrence that the proposed project will have a negligible impact on existing highway traffic.  

Sincerely,  

[Signature]  

Eric Soto, Director  

"By Water All Things Flow Life"
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- 11/02 - 11/10: 38
- 11/11 - 11/20: 38
- 11/21 - 11/30: 34
- 12/01 - 12/10: 30
- 12/11 - 12/20: 26
- 12/21 - 12/30: 22
- 1/01 - 1/10: 18
- 1/01 - 1/30: 11
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- 2/21 - 2/28: 4
- 3/01 - 3/10: 4
- 3/11 - 3/31: 4

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January 2, 1980

Dr. Yu-Si Fok, Ph.D.
EIS Coordinator
Water Resources Research Center
University of Hawaii
State of Hawaii
2540 Dole Street
Honolulu, Hawaii 96822

Dear Dr. Fok:

SUBJECT: LAHAINA WATER TREATMENT PLANT
EIS NOTICE OF PREPARATION

Thank you for reviewing the document. We will present our responses in the order of your comments.

1. "The EIS should also address the water quality after treatment, such as increased SO4 hardness, aluminum, and CO2 concentration resulting from aluminum and soda ash precipitation."

Response:

As noted in the EIS Notice of Preparation, page 2-23, the proposed water treatment plant will primarily treat for turbidity. Coagulation of turbidity particles results in formation of a gelatinous precipitate of aluminum hydroxide [Al(OH)3]. Addition of alum for the coagulation process will also result in precipitation of color. Settling and filtration removes the precipitated material.

The coagulation reaction is as follows:

\[ \text{Al}_2(\text{SO}_4)_{3} \cdot 14 \text{H}_2\text{O} + 3 \text{Na}_2\text{CO}_3 \rightarrow 2 \text{Al(OH)}_3 + 3 \text{Na}_2\text{SO}_4 + 3 \text{CO}_2 + 11 \text{H}_2\text{O} \] (alum)  (soda ash)  (foam)

This reaction yields floc material, non-carbonate hardness (Na2SO4), carbon dioxide and water. The reaction produces 0.16 mg/l sulfate ion (SO4) for...

Sincerely,

Yu-Si Fok
EIS Coordinator

cc: H. Chun
E. Chen
R. Young
each mg/l of alum fed to the raw water. At an average dosage of 15 mg/l alum, sulfate hardness produced would be 2.4 mg/l as SO₄²⁻ or 2.3 mg/l as CaCO₃. Limiting the level of SO₄²⁻ primarily hinges on taste and laxative properties of the water. Total hardness would increase from about 29 mg/l to 31 mg/l, still very soft water. EPA standards have not set limits on sulfate. The 1962 Public Health Service Standards suggested that a maximum sulfate concentration of 250 mg/l at a level of 2.4 mg/l SO₄²⁻, sulfate present in the treated water will not be significant.

Excess soda ash will be required to react with the carbon dioxide produced in the coagulation reaction:

\[ \text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O} \rightarrow 2\text{NaHCO}_3 \] (soda ash) (sodium bicarbonate)

2.4 mg/l soda ash reacts with 1 mg/l CO₂. At a normal alum dosage of 15 mg/l, a total of 16 mg/l soda ash is required (includes 7.9 mg/l soda ash to react with CO₂). Feeding excess soda ash results in complete reaction of alum; therefore, aluminum is only present at the precipitate.

2. "There is no mention of color removal in water treatment."

Response:

Color removal is discussed in the response given for the previous comment.

3. "p 2-25, para. 1. Please clarify "secondary treatment"."

Response:

Although not specified on this page, secondary treatment is described in Section 3 under "11A. Safe Drinking Water Act, 1974." Secondary standards relate to taste, odor, and appearance of drinking water, including sodium and total dissolved solids in the water. Secondary standards are to be enforced by the discretion of the individual states.
June 16, 1979

Mr. Tatsumi Inada, Director
Department of Water Supply
County of Maui
Wailuku, Hawaii 96793

Subject: LAHAINA WATER TREATMENT PLANT
Lahaina, Maui, Hawaii

We have received your department’s Notice of Preparation for the above subject project, TMK: 4-6-18:12, and have no comments to make at this time.

Sincerely,

Helen Luuwai
Director

January 2, 1980

Ms. Helen Luuwai
Director
Department of Parks and Recreation
County of Maui
Wailuku, Maui, Hawaii 96793

Dear Ms. Luuwai:

SUBJECT: LAHAINA WATER TREATMENT PLANT
EIS NOTICE OF PREPARATION

Thank you for reviewing the document.

Sincerely,

Eric Soto, Director
COUNTY OF MAUI
PLANNING DEPARTMENT
200 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793

June 20, 1979

Mr. Robert Chuck
Manager & Chief Engineer
Div. of Water & Land Development
Dept. of Land & Natural Resources
State of Hawaii
P. O. Box 373
Honolulu, Hawaii 96809

Dear Mr. Chuck:

Re: Notice of Preparation for Environmental Impact Statement, Lahaina Water Treatment Plant

Our office has reviewed the above-referenced document and our comments are as follows:

1. We suggest that clarification be made relative to the "method used to project future water requirements" (paragraph 1, p. 1-7).

2. We recommend that additional clarification be made relative to the "growth rate of 16 percent." (paragraph 3, p. 1-7)

3. We suggest a review and clarification as to the precise State Land Use District designation of the proposed project site. There appears to be a contradiction between statements contained in page 3-1 and page 3-8.

4. The procedure for approval of a State Land Use Commission Special Permit relative to the 15-day decision making should be corrected (p. 3-1). It should be noted that the Planning Commission has a waiting period of not less than 15 days after the public hearing before a decision can be rendered.

5. We are supportive of the proposed project and that it should be processed for approval with expedition.

Thank you for this opportunity to review the referenced document. Please contact my office, should you have any questions.

Very truly yours,

TOSHI OISHIKAWA
Planning Director

CC: Tatsuyuki Imada

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P. O. BOX 1119
WAILUKU, MAUI, HAWAII 96793

January 2, 1980

Mr. Toshio Ishikawa
Director
Planning Department
County of Maui
200 South High Street
Wailuku, Maui, Hawaii 96793

Dear Mr. Ishikawa:

SUBJECT: LABAINA WATER TREATMENT PLANT
EIS NOTICE OF PREPARATION

Thank you for reviewing the document and for the comments provided. We have taken your comments into consideration and have clarified those points brought out in the EIS.

We appreciate your participation in the review process and appreciate your support of the proposed project.

Sincerely,

Eric Soto, Director

"By Water, All Things Flow Life"
June 5, 1979

Mr. Robert T. Chuck
Manager-Chief Engineer
Division of Water and Land Development
State Dept. of Land and Natural Resources
P. O. Box 372
Honolulu, Hawaii 96803

Dear Bob:

Thank you for allowing me to review and comment on the proposed Lahaina water treatment plant. I have no objections and my comments are similar to those expressed by Mr. Vorfeld, Manager of Pioneer Hill.

My concern is the serious problem over division and use of the Kanaha stream water. As I understand it, the state installed the divider box and the county controls the amounts to the three users. We cannot agree to such an arrangement and feel this problem must be resolved. Pioneer Hill will soon contact your office in hopes of working out a satisfactory solution.

We have always enjoyed working with you and look forward to continue this good relationship.

Very truly yours,

AMFAC SUGAR

David W. Ballie
President

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P. O. BOX 1101
MAUNA LANI, MAUI, HAWAII 96778

January 2, 1980

Mr. David W. Ballie
President
Amfac Sugar
P. O. Box 3230
Honolulu, Hawaii 96801

Dear Mr. Ballie:

SUBJECT: LAHAINA WATER TREATMENT PLANT
FEE NOTICE OF PREPARATION

Thank you for reviewing the document and for your comment regarding the division and use of Kanaha Stream water. As you are well aware, we will continue to meet with Pioneer Hill to achieve a satisfactory agreement between both parties.

We appreciate your careful review of the document and your participation in this review process. We will maintain close coordination with Pioneer Hill during negotiations on water use.

Sincerely,

Eric Soto, Director

“By water, all things flow a life.”
June 15, 1979

Department of Land and Natural Resources
Division of Water and Land Development
P.O. Box 373
Honolulu, Hawaii 96809

Gentlemen:

Life of the Land would like to be a consulted party on the EIS being prepared for the Lahaina water treatment plant.

Please send us a copy of the draft EIS when it becomes available.

Sincerely,

Douglas Meller
Staff Supervisor

January 2, 1980

Mr. Douglas Meller
Staff Supervisor
Life of the Land
404 Pilikoi Street
Honolulu, Hawaii 96814

Dear Mr. Meller:

SUBJECT: LAMAHA WATR TREATMENT PLANT EIS NOTICE OF PREPARATION

Thank you for your interest in the proposed project. We will send you a copy of the environmental impact statement when it is officially submitted to the Environmental Quality Commission.

Sincerely,

Eric Soto, Director
DEPARTMENT OF LAND & NATURAL RESOURCES
Division of Water & Land Development
Box 373
Honolulu, Hawaii 96809

Subject: Lahaina Water Treatment Plant, Lahaina, Maui

We appreciate the opportunity to review the Notice of Preparation of Environmental Impact Statement for subject project.

We do not foresee any major difficulties at this time in providing electrical service to this project. A portion of the existing facilities within the Lahainaluna High School complex will require upgrading and a new overhead line extension will be required to extend the electrical facilities to the proposed treatment plant. We will require the necessary easements, permits, road access, etc.

Should you have any questions please call Donald Chai at 671-8461, extension 240.

T. H. SATO
Manager, Engineering

cc: Timada, Maui DOWS

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MAUI ELECTRIC COMPANY, LIMITED

Tuesday/June 19, 1979

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
KAANAPALI, MAUI, HAWAII 96761

January 2, 1980

Mr. T. M. Sato
Manager, Engineering
Maul Electric Company, Limited
P.O. Box 398
Kahului, Maui, Hawaii 96732

Dear Mr. Sato:

SUBJECT: LAHAINA WATER TREATMENT PLANT EIS NOTICE OF PREPARATION

Thank you for reviewing the document. We appreciate your concurrence that there should not be any major difficulties in providing electrical service to the proposed project. We assure you that close coordination will be maintained with your company during final design and construction of the project.

Sincerely,

Eric Soto, Director

"By Water, All Things Flow"
e.i.s. review period comments & responses
SECTION 12
ORGANIZATIONS AND PERSONS TO BE CONSULTED
DURING EIS REVIEW PERIOD

The following list includes those agencies, organizations, and individuals who were sent an EIS during the review process. Those with an asterisk sent in written comments during the review period. Those comments and corresponding responses are presented on the pages indicated.

**Federal Government**

United States Air Force, Headquarters 15th Air Base Wing

United States Department of Agriculture, Soil Conservation Service

United States Army, Director of Facilities Engineering

* United States Army, Engineer District, Honolulu 12-4

* United States Army Support Command, Hawaii, Headquarters 12-6

* United States Department of the Interior, Fish and Wildlife Service, Division of Ecological Services 12-7

* United States Navy, Headquarters, Fourteenth Naval District 12-8

* United States Department of Transportation, Coast Guard 12-9

**State of Hawaii**

* Office of Environmental Quality Control, Office of the Governor 12-10

Senator Gerald Machida
State of Hawaii, Continued

Senator Mamoru Yamasaki

Representative Chris Crozier (East Maui)

Representative Herbert Honda (West Maui; Molokai; Lanai)

Representative Mark Andrews (East Maui)

Representative Anthony Takitani (West Maui; Molokai; Lanai)

* Department of Accounting and General Services

* Department of Agriculture

* Department of Defense

Department of Education

Department of Land and Natural Resources

Department of Land and Natural Resources, Historic Preservation Office

* Department of Health

* Department of Planning and Economic Development

* Department of Social Services and Housing

* Department of Transportation

* University of Hawaii, Environmental Center

University of Hawaii, Water Resources Research Center

County of Maui

Office of the Mayor

County Council

Page 12-2
County of Maui, Continued

* Department of Parks and Recreation 12-21
  Department of Public Works
  Economic Development Agency
  Fire Department
* Planning Department, Federal Programs Coordinator 12-22
  Police Department

Others
  Pioneer Mill Company
  * Hawaiian Telephone Company 12-23
    Life of the Land
  * Maui Electric Company 12-24
Mr. Richard L. O'Connell, Director
Office of Environmental Quality Control
550 Halekamulu Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

We have reviewed the Environmental Impact Statement for the proposed Lahaina Water Treatment Plant, Lahaina, Maui, Hawaii, and we provide the following comments. There are no U.S. Army Corps of Engineers requirements that are applicable to your proposed project. According to the flood insurance study for the Island of Maui, prepared by the U.S. Federal Emergency Management Agency, Federal Insurance Program, the proposed agricultural park site is not located in any flood plain. The particular site is designated an area of minimal flooding (Zone C).

Page 5-4 states that the median flow of Kamahe Stream is 3.2 mgd, and 3.0 mgd is presently diverted leaving a remainder of 0.2 mgd. In this sufficient minimum stream flow for environmental needs? The report provides only limited description or discussion of the intake structures and line to the proposed water treatment plant. Apparently the existing intake structures and line are being used for irrigation and are situated on land designated as conservation. Is there a need to address protection of potable water to minimize possible contamination of the system?

Sincerely,

KISUK CHEUNG
Chief, Engineering Division

Copy Furnished:
Division of Water and Land Development
P.O. Box 373
Honolulu, Hawaii 96809

March 4, 1980

Mr. Kinsuk Cheung
Chief, Engineering Division
17th Street, Building 230
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: LAHAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document. Our comments are presented in the order of your comments:

Comment:

"According to the flood insurance study for the Island of Maui, prepared by the U.S. Federal Emergency Management Agency, Federal Insurance Program, the proposed agricultural park site is not located in any flood plain. The particular site is designated an area of minimal flooding (Zone C)."

Response:

Apparently, there is an error above regarding "the proposed agricultural park." We assume that to be an oversight and that the comment that the proposed project is in an area of minimal flooding (Zone C) is still applicable.

Comment:

"Page 5-4 states that the median flow of Kamahe Stream is 3.2 mgd, and 3.0 mgd is presently diverted leaving a remainder of 0.2 mgd. Is this sufficient minimum stream flow for environmental needs? The report provides only limited description or discussion of the intake structures and line to the proposed water treatment plant. Apparently the existing intake structures..."
structures and line are being used for irrigation and are situated on land designated as conservation. Is there a need to address protection of potable water to minimize possible contamination of the system?"

Response:

Pages 3-4 and 2-23 of the EIS state that the median flow of the stream is 3.2 MGD and that the diversion capacity of 3.0 MGD is attained 56 percent of the time, that flow is greater than 2.0 MGD 85 percent of the time, and that the average diversion is 2.68 MGD. This has been the situation for many years and the proposed project will not draw any more water than what has been drawn over these years. The average operating flow through the water treatment plant will be 1.2 MGD, which is comparable to current usage. Please refer to the Notice of Preparation consultation period comment letter received and subsequent response transmitted to the U. S. Fish and Wildlife Service on pages 11-4 and 11-5 of the EIS regarding anticipated impacts of the proposed project.

Details of the existing intake and structures are not necessary since no alterations to existing structures are planned in the proposed project. The intake is far into the valley and is an uncontrolled intake, from which a 3.0 MGD capacity pipeline extends down the valley to the diversion point located in the valley from the project site. From this point, the County of Maui has been withdrawing about 1.2 MGD to serve Lahaina. Lahainaluna High School has been withdrawing about 0.4 MGD for their use, and the remainder is used by Pioneer Mill Company. Basically, the existing County of Maui diversion from the main pipeline in Kamaha Valley will continue to be used as part of the proposed water treatment plant facility, with only minor modifications to the design of the distribution box.

This water source has been used for many years to serve Lahaina. As stated on pages 2-23 through 2-25 of the EIS, the water quality of the source is very good, except for turbidity, the treatment of which

in the primary reason why the treatment plant is being proposed. The County will monitor turbidity and the State will monitor inorganic and organic chemicals and coliforms. There have not been problems with this source so specific protective measures are not necessary.

We appreciate your thoughtful review of the document.

Sincerely,

William S. Holmes, Director
Department of Water Supply

cc: Division of Water and Land Department
Department of Land and Natural Resources
Norman Saito Engineering Consultants, Inc.
Dear Col. Stearns:

SUBJECT: LAHAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document.

Sincerely,

Peter D. Stearns
COL, EN
Director, Engineering and Housing

February 25, 1980

Colonel Peter D. Stearns, EN
Director of Engineering and Housing
Department of the Army
Headquarters, United States Army Support Command, Hawaii
Fort Shafter, Hawaii 96858

February 25, 1980

William S. Haines, Director
Department of Water Supply

"By Water All Things Flow Life"
February 14, 1980

Office of Environmental Quality Control
Office of the Governor
550 Kalakaua Street, Room 301
Honolulu, Hawaii 96813

Re: Lahaina Water Treatment Plant
Lahaina, Maui

Dear Sirs:

This provides comments on referenced environmental impact statement concerning treatment of surface water from Kanaha Stream primarily for turbidity, to comply with the Federal Safe Drinking Water Act of 1974, PL 93-523.

We do not anticipate that the proposed water treatment project will have any significant adverse impacts on fish and wildlife resources.

We understand that no additional water above that currently being diverted, will be diverted. However, we would like to continue to point out that the water diversion from this stream system has contributed to the decline of aquatic wildlife in the area.

We appreciate this opportunity to comment.

Sincerely yours,

[Signature]

Maurice H. Taylor
Field Supervisor
Division of Ecological Services

cc: [Other names and titles]

February 25, 1980

Mr. Maurice H. Taylor
Field Supervisor
Division of Ecological Services
Fish and Wildlife Service
U. S. Department of the Interior
P. O. Box 60167
Honolulu, Hawaii 96850

Dear Mr. Taylor:

SUBJECT: LAHAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document and for your concurrence that the proposed project should not have a significant adverse impact on fish and wildlife resources.

Sincerely,

[Signature]

William S. Haines, Director
Department of Water Supply

cc: Division of Water and Land Development
Department of Land and Natural Resources

"By Water All Things Find Life"
Office of Environmental Quality Control
550 Mainkaua Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

Lahaina Water Treatment Plant
Environmental Impact Statement

The Environmental Impact Statement for the Lahaina Water Treatment Plant has been reviewed and the Navy has no comments to offer.

As requested by the Commission, the subject EIS is returned.

Thank you for the opportunity to review the EIS.

Sincerely,

[Signature]

Encl

Copy to: (w/o encl)

Division of Water & Land Development
Department of Land & Natural Resources

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P. O. BOX 110
MAILIUA, MAUI, HAWAII 96740

February 25, 1980

Lieutenant Commander J. W. Carl, CEC
Deputy Facilities Engineer
Headquarters, Naval Base, Pearl Harbor
P. O. Box 110
Pearl Harbor, Hawaii 96860

Dear Lt. Cmdr. Carl:

SUBJECT: LAHAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document.

Sincerely,

[Signature]

William H. Haines, Director
Department of Water Supply

xc: Division of Water and Land Development,
Department of Land and Natural Resources
March 4, 1980

Commander J. F. Otranto
District Planning Officer
Fourteenth Coast Guard District
U. S. Department of Transportation
Coast Guard
300 Ala Moana Boulevard
Honolulu, Hawaii 96813

Dear Commander Otranto:

Subject: LABAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document.

Sincerely,

[Signature]

William S. Haines, Director
Department of Water Supply

cc: Division of Water and Land Development
Department of Land and Natural Resources
Norman Saito Engineering Consultants, Inc.

"By Water All Things Find Life"
MEMORANDUM

TO: Mr. Robert Chuck, Director
Division of Water and Land Development
Department of Land and Natural Resources

FROM: Richard L. O'Connell, Director
Office of Environmental Quality Control

SUBJECT: Environmental Impact Statement for Lahaina Water Treatment Plant, Lahaina, Maui

We have reviewed the subject document and offer the following comments:

1. Page 1-4. Is the agreement referred to the same as that mentioned on page 12-1 under unresolved issues? Has Pioneer Mill agreed to the discharge of backwash water into their water system?

2. Page 1-17. Details on the height and color of the building should be given. Will the building be visible from Lahaina? Will it blend in with the landscape?

3. A scale and north orientation should be included on all the maps such as figure 1-2 and 3-1. Also, a figure showing the relationship of the proposed treatment plant to the Lahaina water system should be shown.

Thirteen (13) sets of comments as indicated on the attached list have been received to date. We trust that these comments will be helpful in the preparation of the revised statement.

The EIS Regulations allow the accepting authority or his authorized representative to consider responses received after the fourteen day response period. This Office will exercise that option and will consider responses received after the fourteen day period.

List of Commentors on the EIS for Lahaina Water Treatment Plant

STATE AGENCIES

*Dept. of Agriculture
*Dept. of Accounting & General Services
*Dept. of Defense
*Dept. of Transportation
*Dept. of Planning & Economic Development
*Hawaii Housing Authority
*University of Hawaii-Environmental Center

COUNTY OF MAUI

*Dept. of Parks & Recreation

FEDERAL AGENCIES

*U.S. Army Support Command
U.S. Coast Guard
*Naval Base Pearl Harbor

OTHERS

*Hawaiian Telephone
Haul Electric Co.

*denotes comment previously forwarded

COMMENT DATE
January 31, 1980
January 31, 1980
January 29, 1980
February 1, 1980
February 4, 1980
February 4, 1980
February 5, 1980
February 5, 1980
January 29, 1980
January 29, 1980
Thank you for reviewing the document. Our responses are presented in the order of your comments:

1. "Page 1-4: Is the agreement referred to the same as that mentioned on page 13-1 under unresolved issues? Has Pioneer Mill agreed to the discharge of backwash water into their water systems?"

Response:

The agreement referred to on pages 1-1 and 1-4 is different from that mentioned on page 13-1. The October 1964 agreement provided Lahainaluna High School with 4.25 hours of uninterrupted water flow per day and Pioneer Mill and Kuleana owners below the right to the remainder of the water. The July 1966 and July 1912 modification agreement provided the County of Maui perpetual rights to 500,000 GPD from the Kauha Stream source. A separate agreement provided the County of Maui the option to purchase additional water at $0.05 per thousand gallons from Pioneer Mill Company.

With the proposed project, the County of Maui proposes to construct (with state funds) and to maintain (with County funds) the water treatment plant which will have an average operating flow of 1.2 MGD. With this capacity, the County of Maui will continue to provide water to its existing users and will provide water to Lahainaluna High School.

Current negotiations between the County of Maui and Pioneer Mill Company involve the design of the water distribution system before water enters the water treatment plant. The County has free rights to 0.5 MGD and has concurrence of the Department of Education to free rights provided to Lahainaluna High School which is approximately 0.4 MGD. The current design proposed to Pioneer Mill Company is to guarantee Pioneer Mill Company 0.8 MGD at the diversion point, to divert the free rights of 0.9 MGD into the water treatment plant, and to obtain additional water needed from Pioneer Mill to not exceed the average operating flow of 1.2 MGD. The County of Maui will withdraw only the amount needed to maintain existing demands and needs for Lahainaluna High School. Any excess water will be returned to Pioneer Mill Company before treatment. The final design will be agreed upon by both parties before construction commences.

Yes, Pioneer Mill has agreed to accept the backwash water into their irrigation system.

2. "Page 1-17: Details on the height and color of the building should be given. Will the building be visible from Lahaina? Will it blend in with the landscaping?"

Response:

The building will be about 10 feet in height. Because of the site's elevation and nature of topography between Lahaina and the site, the building will not be visible from Lahaina. It may be visible from portions of Honoapiilani Highway and from some residential areas toward Kamapali; however, because of its size and distance of this facility from those areas and because the building will be painted to blend with the surrounding areas, significant visual impacts are not anticipated.
3. "A scale and north orientation should be included on all the maps such as figure 1-2 and 3-1. Also, a figure showing the relationship of the proposed treatment plant to the Lahaina water system should be shown."

Response:
A scale and north orientation will be provided on the figures.
A schematic of the proposed project showing its relationship with the Lahaina water system will be provided in Section 1.

Thank you for transmitting comments received by your office and for extending the fourteen day response period.

Sincerely,

William S. Haines, Director
Department of Water Supply

cc: Division of Water and Land Development
Department of Land and Natural Resources
Norman Salto Engineering Consultants, Inc.
March 7, 1980

Mr. Bikio Nishioka
State Public Works Engineer
Department of Accounting and General Services
State of Hawaii
P. O. Box 110
Honolulu, Hawaii 96810

Dear Mr. Nishioka:

Subject: Lahaina Water Treatment Plant Environment Impact Statement

Thank you for reviewing the document and for your concurrence that the proposed project will not have any adverse environmental effect on any existing or planned facilities serviced by your department.

Sincerely,

William J. Haines, Director
Department of Water Supply

cc: Division of Water & Land Development
    State Department of Land & Natural Resources
    Norman Saltz Engineering Consultant, Inc.

"By Water All Things Flow Like"
January 31, 1980

To: Office of Environmental Quality Control

Subject: EIS for Lahaina Water Treatment Plant
Lahaina, Maui, Hawaii

The Department of Agriculture has reviewed the subject environment impact statement and has no comments at this time.

We appreciate the opportunity to comment. The document is returned herewith for your courtesy.

JOHN FARIS, JR.
Chairman, Board of Agriculture

cc: Department of Land and Natural Resources

DEPARTMENT OF AGRICULTURE
1590 HOHONUI STREET
HONOLULU, HAWAII 96814

February 25, 1980

Mr. John Farias, Jr.
Chairman of the Board
Department of Agriculture
State of Hawaii
1428 South King Street
Honolulu, Hawaii 96814

Dear Mr. Farias:

SUBJECT: LAHAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document.

Sincerely,

WILLIAM S. NELSON, Director
Department of Water Supply

xc: Division of Water and Land Development,
Department of Land and Natural Resources

"By Water All Things Find Life."

12-14
February 25, 1980

Major Wayne R. Tomoyasu, CE, HABNG
Contracting and Engineering Officer
Office of the Adjutant General
Department of Defense
State of Hawaii
3848 Diamond Head Road
Honolulu, Hawaii 96816

Dear Major Tomoyasu:

SUBJECT: LAHAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document.

Sincerely,

[Signature]

William E. Haines, Director
Department of Water Supply

cc: Division of Water and Land Development,
Department of Land and Natural Resources

"By Water All Things Find Life"
MEMORANDUM

To: Land Management Administrator, Division of Water & Land Development, Department of Land & Natural Resources

From: Deputy Director for Environmental Health

Subject: Environmental Impact Statement (EIS) for Lahaina Water Treatment Plant

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 have no 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.

cc: Office of Environmental Quality Control

February 14, 1980
DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P. O. BOX 1153
WAILUKU, MAUI, HAWAII 96793

February 25, 1980

Mr. Hideto Kono
Director
Department of Planning and Economic Development
State of Hawaii
P. O. Box 3359
Honolulu, Hawaii 96804

Dear Mr. Kono:

SUBJECT: LAHAINA WATER TREATMENT PLANT ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document and for your concurrence that the proposed project complies with the HCZM Coastal Ecosystem Objectives and Policies.

Sincerely,

William H. Hainey, Director
Department of Water Supply

Cc: Division of Water and Land Development, Department of Land and Natural Resources

"By Water All Things Find Life"
Office of Environmental Quality Control
550 Nailekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

SUBJECT: Lahaina Water Treatment Plant
Lahaina, Maui
Environmental Impact Statement

Thank you for giving the Hawaii Housing Authority an
opportunity to review the subject document. We have
no comment to add to your EIS document.

Sincerely,

WILLIAM S. HAINES
Executive Director

CC: Department of Land & Natural Resources
Division of Water & Land Development
P.O. Box 373
Honolulu, HI 96809

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P. O. BOX 17907
MAUNA LINO, MAUI, HAWAII 96720

February 25, 1980

Mr. Franklin Y. K. Sunn
Executive Director
Department of Social Services
and Housing
Hawaii Housing Authority
State of Hawaii
P. O. Box 17907
Honolulu, Hawaii 96817

Dear Mr. Sunn:

SUBJECT: LAHAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document.

Sincerely,

WILLIAM S. HAINES
Director
Department of Water Supply

"By Water All Things Find Life"
Dr. Richard O'Connell
Director
Office of Environmental Quality Control
550 Hakeakauila Street, Rm. 301
Honolulu, Hawaii 96813

Dear Dr. O'Connell:

Subject: Environmental Impact Statement
Lahaina Water Treatment Plant

Thank you for giving us the opportunity to review and comment on the above-captioned EIS. We have no substantive comments to offer which could improve the statement.

Very truly yours,

Ryokichi Higashionna
Director of Transportation

February 25, 1980

Ryokichi Higashionna, Ph.D.
Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Dr. Higashionna:

SUBJECT: LAHAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document.

Sincerely,

William S. Haines, Director
Department of Water Supply

sei: Division of Water and Land Development,
Department of Land and Natural Resources

"By Water All Things Flow"
February 5, 1980

Dr. Richard O'Connor
Office of Environmental Quality Control
551 Kalakaua Avenue
Honolulu, Hawaii 96814

Dear Dr. O'Connor:

The Environmental Center has reviewed the above-cited Environmental Impact Statement. We find the statement adequately addresses the potential environmental impacts of the project.

Sincerely,

[Signature]

Bill Haines
Director

CC: DHWP, Division of Water and Land Development
John Sorensen

February 25, 1980

Dr. Doak C. Cox
Director
Environmental Center
University of Hawaii
Crawford 317
2550 Campus Road
Honolulu, Hawaii 96822

Dear Dr. Cox:

SUBJECT: LAHAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document.

Sincerely,

[Signature]

William S. Haines, Director
Department of Water Supply

xc: Division of Water and Land Development,
   Department of Land and Natural Resources

"By Water All Things Find Life"
January 25, 1980

Office of Environmental Quality Control
550 Naileaswilla Street, Room 301
Honolulu, Hawaii 96811

Gentlemen:

Re: Lahaina Water Treatment Plant
Environmental Impact Statement

Thank you for providing us the opportunity to review the above Environmental Impact Statement.

We have no comments to make at this time.

Very sincerely yours,

Helen Lauwai
Director of Parks

cc: Division of Water and Land Development
Department of Land and Natural Resources
P. O. Box 371
Honolulu, Hawaii 96809

February 25, 1980

Ms. Helen Lauwai
Director of Parks
Department of Parks and Recreation
County of Maui
200 South High Street
Wailuku, Maui, Hawaii 96793

Dear Ms. Lauwai:

SUBJECT: LAHAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document.

Sincerely,

William S. Malinau, Director
Department of Water Supply

cc: Division of Water and Land Development,
Department of Land and Natural Resources

"By Water All Things Flow Life"
February 19, 1980

Office of Environmental
Quality Control
580 HakoHakaula Street
PO Box 301
Hilo, Hawaii
96720

Gentlemen:

Re: FIS Lahaina Water Treatment Plant

I've have reviewed the FIS for the subject project and conclude that it adequately addresses the concerns of our department.

Thank you for the opportunity to review the subject document.

Very truly yours,

RALPH MASUDA
Federal Programs Coordinator

cc: DONALD

March 4, 1980

Mr. Ralph Masuda
Federal Programs Coordinator
County of Maui
200 South High Street
Wailuku, Maui, Hawaii 96783

Dear Mr. Masuda:

Subject: LAHAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document.

Sincerely,

WILLIAM S. HAINES, Director
Department of Water Supply

cc: Division of Water and Land Development
Department of Land and Natural Resources
Norman Saito Engineering Consultants, Inc.

“By Water All Things Flow…”
STATE OF HAWAII
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, HI 96813

SUBJECT: Lahaina Water Treatment Plant.

We acknowledge receipt of the Environmental Impact Statement for the subject project and appreciate the opportunity to review it.

No major problems are foreseen to provide telephone facilities if proper coordination is maintained with Maui Electric Company, Ltd., the Department of Water Supply and our company.

We are returning the EIS enclosed.

Sincerely,

[Signature]
John J. Wilcox, Island Manager

cc: Division of Water and Land Development
Dept. of Water Supply - County of Maui

March 7, 1980

Mr. John J. Wilson
Island Manager
Hawaiian Telephone Company
P. O. Box 300
Wailuku, Maui, Hawaii 96793

Dear Mr. Wilson:

SUBJECT: LAHAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document. Coordination of plans and construction will be maintained between our department, Maui Electric Company, and your company.

Sincerely,

[Signature]
William S. Haines, Director
Department of Water Supply

cc: Division of Water & Land Development
State Department of Land & Natural Resources
Norman Salt Engineering Consultants, Inc.

"By Water All Things Find Life."
April 29, 1980

OFFICE OF ENVIRONMENTAL QUALITY CONTROL
State of Hawai‘i
520 Mailekukui Street, Room 301
Honolulu, Hawai‘i 96813

Subject: EIS - Lahaina Water Treatment Plant

We have reviewed subject statement and have no further comments other than those listed in our June 19, 1979 letter submitted previously during our review of the notice of preparation of EIS.

Design coordination is presently in progress with the customer's electrical consultant. No major difficulties are foreseen at this time.

The EIS is returned herewith for your file as we have no need to retain it.

T. H. SATO
Manager, Engineering

Enc.

March 4, 1980

Mr. T. M. Sato
Manager, Engineering
M aul Electric Company, Limited
P. O. Box 308
Kahului, Maui, Hawai‘i 96732

Dear Mr. Sato:

Subject: LABAINA WATER TREATMENT PLANT
ENVIRONMENTAL IMPACT STATEMENT

Thank you for reviewing the document.

Sincerely,

William S. Haines, Director
Department of Water Supply

cc: Division of Water and Land Development
Department of Land and Natural Resources
Norman Sato Engineering Consultants, Inc.
unresolved issues 13
SECTION 13

UNRESOLVED ISSUES

Negotiations between the Department of Water Supply and Pioneer Mill Company regarding distribution of water drawn from Kanaha Stream are in their final phases. Agreements will be finalized before construction of the treatment plant.
appendices
APPENDIX A
APPENDIX A

INTERIM PRIMARY DRINKING WATER STANDARDS

The Interim Primary Drinking Water Standards (Safe Drinking Water Act - PL93-523) set maximum contaminant levels for inorganic chemicals, organic chemicals, turbidity, and microbiological organisms for water supplies serving more than a few customers. The standards require that the contaminants be monitored and also establish sampling and analytical procedures. Microbiological sampling frequency is determined by the population the water district serves. The finished water turbidity readings are required on a daily basis; the remaining constituents in the drinking water must be analyzed on a yearly basis. The following paragraphs summarize the maximum levels for several constituents.

Turbidity

The maximum allowable turbidity level in drinking water is one turbidity unit; five or fewer turbidity units may be present if it can be shown that such turbidity units may not interfere with disinfection or microbiological determinations. A variance allowing turbidity in excess of one may be difficult to obtain.

Microbiological Contaminants

Coliform density measurements are required at regular intervals throughout each month of plant operation. The
number of samples shall be proportional to the population served by the water system.

**Inorganic Chemicals**

Maximum allowable concentrations of inorganic chemicals are:

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Concentration (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>0.05</td>
</tr>
<tr>
<td>Barium</td>
<td>1</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.010</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.05</td>
</tr>
<tr>
<td>Lead</td>
<td>0.05</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrate (as N)</td>
<td>10</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.01</td>
</tr>
<tr>
<td>Silver</td>
<td>0.05</td>
</tr>
</tbody>
</table>

In addition, when the annual average of the maximum daily air temperatures for the location is as indicated below, the corresponding fluoride concentration shall not be exceeded.

<table>
<thead>
<tr>
<th>Temperature, °F</th>
<th>Fluoride Concentration mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>53.7° and below</td>
<td>2.4</td>
</tr>
<tr>
<td>53.8 to 58.3</td>
<td>2.2</td>
</tr>
<tr>
<td>58.4 to 63.8</td>
<td>2.0</td>
</tr>
<tr>
<td>63.9 to 70.6</td>
<td>1.8</td>
</tr>
<tr>
<td>70.7 to 79.2</td>
<td>1.6</td>
</tr>
<tr>
<td>79.3 to 90.2</td>
<td>1.4</td>
</tr>
</tbody>
</table>
Organic Chemicals

The maximum concentration levels for organic chemicals are:

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Concentration mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endrin</td>
<td>0.0002</td>
</tr>
<tr>
<td>Lindane</td>
<td>0.004</td>
</tr>
<tr>
<td>Methoxychlor</td>
<td>0.1</td>
</tr>
<tr>
<td>Toxaphene</td>
<td>0.005</td>
</tr>
<tr>
<td>2, 4-D</td>
<td>0.1</td>
</tr>
<tr>
<td>2,4,5 TP Silvex</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Analytical Requirements

The analytical methodology for each contaminant prescribed in the Interim Primary Drinking Water Standards is in general to be in accordance with recommendations set forth in "Standard Methods for the Examination of Water and Wastewater," American Public Health Association, 13th Edition. Certain inorganic toxic metals are to be analyzed according to procedures described in "Methods for Chemical Analysis of Water and Wastes," EPA.

Pesticides and herbicides shall be determined in accordance with "Method for Organo-Chlorine Pesticides in Industrial Effluents," Methods Development and Quality Assurance Research Laboratories (MDQARL), EOA; and "Methods for Chlorinated Phenoxy Acid Herbicides in Industrial Effluents," MDQARL, EPA.
APPENDIX B
# APPENDIX B

## WATER TREATMENT PLANT DESIGN CRITERIA

### GENERAL DESIGN CRITERIA

**Plant Capacity, gpm**

<table>
<thead>
<tr>
<th>Nominal</th>
<th>1,400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic</td>
<td>1,600</td>
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</tbody>
</table>

### PRIMARY WATER TREATMENT GOALS

<table>
<thead>
<tr>
<th>Suspended Residue, mg/l</th>
<th>0.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbidity, Units</td>
<td>0.2</td>
</tr>
<tr>
<td>Color, Units</td>
<td>3</td>
</tr>
<tr>
<td>Taste</td>
<td>0</td>
</tr>
<tr>
<td>Odor</td>
<td>0</td>
</tr>
<tr>
<td>Iron, mg/l</td>
<td>0.3</td>
</tr>
<tr>
<td>Manganese, mg/l</td>
<td>0.05</td>
</tr>
</tbody>
</table>

### PACKAGE WATER TREATMENT PLANT

**Number of Package Plant Units**

| Nominal Capacity, gpm | 350 |

**Flocculation Compartment**

| Detention Time, min. | 17  |

**Settling Compartment**

| Detention Time, min. | 26  |
| Tube Settler OFR, gpd/ft² | 100 |

**Filter Compartment**

| Filter Area, ft² | 300 |
| Filtration Rate, gpm/ft² | 5    |
| Surface Wash Rate, gpm | 48   |
| Backwash Rate, gpm | 1,125 |

B-1
APPENDIX B, cont'd.
WATER TREATMENT PLANT
DESIGN CRITERIA

Media Type:
Mixed Media or Dual Media (1)

Chemical Food Gear

Alum - Dry $\text{Al}_2\{(\text{SO}_4)_3 \times 14.3 \text{H}_2\text{O}}$
Feed Tank - 500 gallon with mixer
Diaphragm Type Metering Pump

Soda Ash - Dry $\text{Na}_2\text{CO}_3$
Feed Tank - 400 gallon with mixer
Diaphragm Type Metering Pump

Polymer - Dry high molecular anionic or non-ionic polymer
Feed Tank - TWO 200 gallon with mixer
Diaphragm Type Metering Pumps (2)

Chlorine - Gaseous chlorinator feeding from 100 or 150 lb. cylinders. Provide auto switch-over of tanks and standby chlorination units.

Controls

Automatic controls will control the sequencing of valves and pumps during backwash of the filters. High raw water turbidity will signal an alarm contact. High finished water turbidity will provide secondary initiation of a backwash cycle (filter head loss is the primary initiation). If the turbidity does not decrease within a pre-set time period following the backwash, the plant would shut down and close an alarm contact. The plant controls will automatically stop the plant and intake pumps upon high water surface level in the existing reservoir. Appropriate telemetry equipment will be included to provide alarm signals.

(1) Depending upon manufacturer successfully bidding the project.
### APPENDIX B, cont'd.

**ESTIMATED AVERAGE CHEMICAL REQUIREMENTS**

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Average Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mg/l</td>
</tr>
<tr>
<td>Alum</td>
<td>15</td>
</tr>
<tr>
<td>Soda Ash</td>
<td>8</td>
</tr>
<tr>
<td>Polymer</td>
<td>0.03</td>
</tr>
<tr>
<td>Pre-chlorination (oxidation of iron)</td>
<td>1.25</td>
</tr>
<tr>
<td>Post-chlorination (disinfection)</td>
<td>1.5</td>
</tr>
</tbody>
</table>

All these chemicals would be fed continuously to ensure sufficient operation of the treatment plant.
APPENDIX C

FLORA/FAUNA CHECKLISTS

For each species, the following information is provided:

1. Family
2. Scientific name
3. Vernacular name
3. Status of the species. The following symbols are employed.

E  endemic to the Hawaiian Islands, i.e., occurring naturally nowhere else in the world.
I  indigenous, i.e., native to the Hawaiian Islands, but also occurring naturally (without the aid of man) elsewhere.
X  exotic, i.e., species of accidental or deliberate introduction after the western discovery of the islands.
P  Polynesian introduction; includes those species brought by the Polynesian immigrants previous to Captain Cook’s discovery of the islands.

NOTE: No species of flora or fauna observed during the reconnaissance or believed present are considered rare or endangered.
APPENDIX C, cont'd.

FLORA/FAUNA CHECKLISTS

Flora References


Fauna References


State of Hawaii, Department of Land and Natural Resources, Division of Fish and Game, Wildlife Branch. Annotated Checklists of the Birds and Mammals of Hawaii.

State of Hawaii, Department of Land and Natural Resources, Division of Fish and Game, Wildlife Branch. Personal communication, March 20, 1979.
# CHECK LIST OF PLANTS

<table>
<thead>
<tr>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
<th>STATUS</th>
</tr>
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<tbody>
<tr>
<td><strong>MONOCOTYLEDONAE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>COMMELINACEAE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commelina diffusa Burm. f.</td>
<td>Honohono</td>
<td>X</td>
</tr>
<tr>
<td><strong>GRAMINEAE</strong></td>
<td></td>
<td></td>
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<tr>
<td>Cenchrus ciliaris L.</td>
<td>Buffelgrass</td>
<td>X</td>
</tr>
<tr>
<td>Chloris virgata Sw.</td>
<td>Feather fingergrass</td>
<td>X</td>
</tr>
<tr>
<td>Coix lachryma-jobi L.</td>
<td>Job's tears</td>
<td>X</td>
</tr>
<tr>
<td>Cynodon dactylon (L.) Pers.</td>
<td>Kukae-kolea</td>
<td>X</td>
</tr>
<tr>
<td>Melinis minutiflora Beauv.</td>
<td>Bermuda grass</td>
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</tr>
<tr>
<td>Panicum maximum Jacq. ex Chiov.</td>
<td>manienie</td>
<td>X</td>
</tr>
<tr>
<td>Pennisetum clandestinum Hochst.</td>
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<td></td>
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<tr>
<td>Rhynchelytrum repens (Willd.) C.E. Hubb</td>
<td>Natal Redtop</td>
<td>X</td>
</tr>
<tr>
<td><strong>DICOTYLEDONAE</strong></td>
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<tr>
<td><strong>AMARANTHACEAE</strong></td>
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<tr>
<td>Amaranthus spinosus L.</td>
<td>spiny amaranth:</td>
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<tr>
<td></td>
<td>Pakai-kuku</td>
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<td><strong>ASCLEPIADACEAE</strong></td>
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<tr>
<td>Asclepias curassavica L.</td>
<td>milkweed. Butterfly weed.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>blood flower. Lau-ole</td>
<td>X</td>
</tr>
<tr>
<td><strong>COMPOSITAE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bidens pilosa L. var. pilosa</td>
<td>Spanish Needle</td>
<td>X</td>
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<tr>
<td>Emilia sonchifolia</td>
<td>Flora's Paintbrush</td>
<td>X</td>
</tr>
<tr>
<td>Helianthus annus var. macrocarpus (DC) Cockerell</td>
<td>sunflower</td>
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<tr>
<td>Zinnia paciflora L.</td>
<td>Wild Zinnia</td>
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<tr>
<td><strong>CONVOLVULACEAE</strong></td>
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<tr>
<td>Ipomoea batatas (L.) Poir.</td>
<td>Sweet potato</td>
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<tr>
<td>Ipomoea bona-nox (L.)</td>
<td>Moonflower</td>
<td>X</td>
</tr>
<tr>
<td><strong>EUPHORBIACEAE</strong></td>
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<tr>
<td>Aleurites moluccana (L.) Willd.</td>
<td>Kukui</td>
<td>P</td>
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<tr>
<td>Ricinus communis (L.)</td>
<td>Castor Bean: Koli</td>
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<tr>
<td><strong>LEGUMINOSAE</strong></td>
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<tr>
<td>Acacia farnesiana (L.) Willd. klu. kolu</td>
<td>X</td>
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<tr>
<td>Cassia leschenaultiana DC.</td>
<td>Virgate mimosa</td>
<td>X</td>
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<tr>
<td>Erythrina sandwicensis Deg.</td>
<td>Wiliwili</td>
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<tr>
<td>Leucaena leucocephala (Lam.) de Wit koa-haole</td>
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C-3
<table>
<thead>
<tr>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
<th>STATUS</th>
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</thead>
<tbody>
<tr>
<td><strong>LEGUMINOSAE, continued</strong></td>
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<td></td>
</tr>
<tr>
<td>Mimosa pudica var. unijuga (Duchass. &amp; Walp) Griseb.</td>
<td>Sensitive Plant; Pua-hilahila</td>
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<tr>
<td><strong>MALVACEAE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sida fallax Walp</td>
<td>'Ilima</td>
<td>I</td>
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<tr>
<td><strong>PROTEACEAE</strong></td>
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</tr>
<tr>
<td>Grevillea robusta A. Cunn.</td>
<td>Silk oak, Silver oak X</td>
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<tr>
<td><strong>STERCULIACEAE</strong></td>
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<tr>
<td>Waltheria americana L.</td>
<td>Hi’aloa, 'Uhaloa</td>
<td>I</td>
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<tr>
<td><strong>VERBENACEAE</strong></td>
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<tr>
<td>Lantana camara L.</td>
<td>Lantana; Lakana</td>
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<td>Stachytarpheta jamaicensis (L.) Vahl</td>
<td>Jamaica Vervain; Oi; Owi</td>
<td>X</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
<td>Status</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>* Asio flammeus sandwichensis</td>
<td>short-eared owl, pueo</td>
<td>E</td>
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<tr>
<td>** COLUMBIDAE **</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Stretopelia chinensis</td>
<td>spotted dove</td>
<td>X</td>
</tr>
<tr>
<td>* Geapelia striata</td>
<td>barred dove</td>
<td>X</td>
</tr>
<tr>
<td>* Acridotheres tristis</td>
<td>common mynah</td>
<td>X</td>
</tr>
<tr>
<td>** ZOSTEORPIDAE **</td>
<td></td>
<td></td>
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<tr>
<td>* Zosterops japonica</td>
<td>Japanese white-eye</td>
<td>X</td>
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<tr>
<td>** PLOCEIDAE **</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Carpodacus mexicanus</td>
<td>house finch, linnet</td>
<td>X</td>
</tr>
<tr>
<td>* Lonchura punctulata</td>
<td>spotted munia, ricebird</td>
<td>X</td>
</tr>
<tr>
<td>* Passer domesticus</td>
<td>house sparrow</td>
<td>X</td>
</tr>
<tr>
<td>** PRINCILLIDAE **</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Richmondena cardinalis</td>
<td>cardinal</td>
<td>X</td>
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<td>** CHARADRIIDAE **</td>
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<tr>
<td>Pluvialis dominica fulva</td>
<td>Pacific golden plover</td>
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<tr>
<td>** ARDEIDAE **</td>
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<tr>
<td>Nycticorax nycticorax hoactli</td>
<td>Black-crowned night heron, Aukuu</td>
<td>I</td>
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<tr>
<td>** ALAUDIDAE **</td>
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<tr>
<td>Alauda arvensis arvensis</td>
<td>European skylark</td>
<td>X</td>
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<tr>
<td>** MIMIDAE **</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mimus polyglottos</td>
<td>mockingbird</td>
<td>X</td>
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<tr>
<td>** PHASIANIDAE **</td>
<td></td>
<td></td>
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<tr>
<td>Coturnix coturnix japonica</td>
<td>Japanese quail</td>
<td>X</td>
</tr>
<tr>
<td>Phasianus colchicus torquatus</td>
<td>ring-necked pheasant</td>
<td>X</td>
</tr>
<tr>
<td>Francolinus pondicerianus</td>
<td>Indian grey francolin</td>
<td>X</td>
</tr>
<tr>
<td>Francolinus francolinus</td>
<td>Indian black francolin</td>
<td>X</td>
</tr>
</tbody>
</table>

* Observed during field reconnaissance March, 1979.
# Check List of Fauna
Observd or Possibly Present at the Site

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
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<tbody>
<tr>
<td><strong>Class Mammalia</strong></td>
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<td></td>
</tr>
<tr>
<td>Vespertilionidae</td>
<td><strong>Lasiurus cinereus semotus</strong></td>
<td>hoary bat</td>
</tr>
<tr>
<td>Muridae</td>
<td><strong>Rattus norvegicus</strong></td>
<td>Norway rat</td>
</tr>
<tr>
<td></td>
<td><strong>Rattus exulans</strong></td>
<td>Polynesian rat</td>
</tr>
<tr>
<td></td>
<td><strong>Mus musculus</strong></td>
<td>house mouse</td>
</tr>
<tr>
<td>Canidae</td>
<td><strong>Canis familiaris</strong></td>
<td>dog</td>
</tr>
<tr>
<td>Viverridae</td>
<td>* <strong>Herpestes auropunctatus</strong></td>
<td>mongoose</td>
</tr>
<tr>
<td>Felidae</td>
<td><strong>Felis catus</strong></td>
<td>cat</td>
</tr>
<tr>
<td>Suidae</td>
<td><strong>Sus scrofa</strong></td>
<td>pig</td>
</tr>
</tbody>
</table>

* Observed during field reconnaissance March, 1979.
APPENDIX D

APPENDIX D

HAWAII COASTAL ZONE MANAGEMENT PROGRAM

ORGANIZATIONAL STRUCTURE

Lead Agency

The Department of Planning and Economic Development (DPED) has been the lead agency ever since Hawaii entered the CZM Program. Both the Governor and the Legislature so designated the DPED by executive order and by statute in 1973. The DPED was further designated as a permanent lead agency for the CZM Program in the Hawaii CZM Act of 1977.

As lead agency for Hawaii's CZM Program, the DPED assumes both general functions as an administrative agency and statutory functions mandated specifically in the Hawaii CZM Act of 1977, as shown in Table 7. These mandates, which are reflective of functions required by the National CZM Act, include not only fiscal and administrative responsibilities, but also call for coordinating the organizational network and reviewing State and County agency compliance with Hawaii's CZM Program.

These additional responsibilities are further specified by the requirements in the Hawaii CZM Act of 1977 that all State and County agencies review their regulations and amend them as necessary to comply with the CZM objectives and policies, and that the Counties review and amend as necessary their SMA boundaries.
In addition to responsibilities associated with CZM lead agency functions, the DPED directs the State's comprehensive planning process, including the preparation of the State Plan, administers the Capital Improvements Program, coordinates tourism planning, houses the State Energy Office, and develops the technology assessment programs on aquaculture, alternative energy sources, and manganese nodules. The Hawaii Community Development Authority, which manages the Kakaako APC, is also part of the DPED.

State Land Use Commission (LUC)

Although the Commission has its own staff, it is placed in the DPED for administrative purposes. The DPED Land Use Division represents the State's position before the Commission. The LUC implements HRS 205, making it responsible for classifying all land in Hawaii into one of the four land use districts as either urban, rural, agricultural or conservation. Certain uses are permitted if consistent with the district designations and attendant Commission regulations. The LUC administers requests for changes in those districts boundaries and approves special use permission in the agricultural and rural districts. In addition, the LUC may place conditions on the amendment of a district boundary or land classification.
**Department of Land and Natural Resources**

The DLNR is the State's principal agency for management of State-owned lands, regulations of uses in conservation district lands, and administration of the Federal Land and Water Conservation Fund Act, which provides funding assistance for acquisition and development of recreation areas. Through its five divisions, DLNR manages programs in water development, commercial and recreational fishing, forestry, fish and wildlife, recreation, threatened and endangered species, open space, State coastal waters, and mineral resources management. Included in DLNR is the State Historic Preservation Office which is responsible for the protection of cultural, archaeological and historic resources. In addition, the DLNR is responsible for preparing and updating the State Comprehensive Outdoor Recreation Plan and administering two programs of particular concern, the Natural Area Reserve System and the Marine Life Conservation District.

**Department of Health**

The DOH is the primary implementer of pollution controls relating the Hawaii CZM Program by administering the State's programs for air and water quality, solid waste management, public health, and sewage treatment. Development of Hawaii's 208 Areawide Waste Treatment Management program by the DOH is being conducted in close
cooperation with the CZM Program. Besides regulations of the Department of Land and Natural Resources and the Department of Transportation, relevant regulations of the Department of Health establish permissible uses in the State's coastal waters (to the limit of the U.S. territorial sea).

Office of Environmental Quality Control (OEQC) and the Environmental Quality Commission (EQC)

The OEQC coordinates and directs State agencies in matters concerning environmental quality. Its functions include recommending programs for long-range implementation of environmental quality control, initiating public educational programs, reporting on environmental conditions, and providing staff support for the Environmental Quality Commission.

Department of Transportation (DOT)

The DOT regulates activities in the shorewaters, including recreation, and issues licenses and permits for construction under authorities granted in Chapter 266, HRS. Transportation facilities, including highways, airports and harbors, are maintained and operated by the DOT. The DOT equips and regulates the State's system of harbors and related facilities, designs, acquires and constructs new and expanded harbors and facilities, encourages and assists in the development water transportation in the
State, promotes safety in navigation, controls all ocean shores below mean high water, shore waters, and navigable streams, and administers the State's recreational boating program. Finally, the DOT responsibilities also include the determination of statewide transportation needs and the creation of statewide, inter- and intra-island water transportation, and airports located in proximity to the shoreline, will be developed in concert with the Hawaii CZM Program.

**Department of Agriculture (DOA)**

This department carries out programs to conserve, develop, and utilize the agricultural resources of the State. It enforces laws and formulates and enforces rules and regulations to further and control the management of these resources. The DOA also administers control activities to protect agricultural industries and natural resources against insects, diseases and pests, provides inspection and quarantine services to prevent introduction of plant and animal pests and diseases, controls all eradication services directed against weed and insect pests, and controls the sale and use of pesticide. In keeping with the State's CZM objectives to preserve open space and to accommodate coastal dependent development, the DOA has established a State agricultural park program to assure that the State's limited agricultural land resources are protected from urban encroachment. State
promotion of aquaculture projects are also supported by the DOA in cooperation with the DLNR.

University of Hawaii

Research, technical assistance, and educational activities of the University which relate to CZM are conducted primarily through five programs. The Curriculum Research and Development Group of the University's College of Education has formulated a Coastal Studies program used in schools throughout the State. This program, which has greatly increased public coastal awareness, is being adapted for use in mainland coastal schools. The Hawaii Institute of Marine Biology studies the ecology, physiology, and behavior of marine plants and animals; aquaculture; water quality modeling and pollution; and the interrelationships of marine organisms and their environment. The Environmental Center provides technical assistance in EIS review and engages in public services and educational activities regarding the determination and maintenance of Hawaii's environmental quality. The Water Resources Research Center works closely with the DLNR in both basic and applied research related to Hawaii's water resources. Their areas of concern include hydrology and hydraulic engineering, geology, geophysics, geochemistry, sanitary engineering and public health, agricultural engineering, and forestry. The Sea Grant Program conducts research
HAWAII CZM OBJECTIVES AND POLICIES

POLICY 4: Promote water quantity or 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.

ECONOMIC USES

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

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

POLICY 2: Insure that coastal dependent development such as harbors and ports, visitor industry facilities, and energy generating facilities are located, designed and constructed so as to minimize adverse social, visual, and environmental impacts in the coastal zone.

TABLE E, cont'd.

AUTHORITIES MATRIX

<table>
<thead>
<tr>
<th>HAWAII CZM OBJECTIVES AND POLICIES</th>
<th>STATE AUTHORITIES</th>
<th>STATE-MANDATED AUTHORITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLICY 4: Promote water quantity or 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.</td>
<td>DLNR: HRS 183, Reg 4</td>
<td>HRS 180C &amp; Relevant County Regs</td>
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<td></td>
<td>DOH: HRS 180C, 342, Reg. 37A</td>
<td>HRS 205, Part II &amp; Relevant County Regs</td>
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<td>LUC: HRS 205</td>
<td>HRS 205A &amp; Relevant County Regs</td>
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<td>DPED: HRS 225</td>
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<td>DOT: HRS 266</td>
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<td>OBQC: HRS 341</td>
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<td>ECONOMIC USES</td>
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<td>OBJECTIVE</td>
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<tr>
<td>Provide public or private facilities and improvements important to the State's economy in suitable locations.</td>
<td>DLNR: HRS 171, 174, 176, 183</td>
<td>HRS 205 &amp; Relevant County Regs</td>
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<td>DPED: HRS 225, 206E, 196</td>
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<td>DOT: HRS 279A</td>
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<td></td>
<td>All Agencies: HRS 344, 101</td>
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</tr>
</tbody>
</table>
HAWAII CZM OBJECTIVES AND POLICIES

COASTAL ECOSYSTEMS

OBJECTIVE
Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal systems.

POLICY 1: Improve the technical basis for natural resources management.

POLICY 2: Preserve valuable coastal ecosystems of significant biological or economic importance.

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

<table>
<thead>
<tr>
<th>TABLE E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AUTHORITIES MATRIX</strong></td>
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<table>
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<th>STATE-MANDATED AUTHORITIES</th>
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<td>Constitution – Article X-1</td>
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</tr>
<tr>
<td>DOH/DOA: HRS 149A</td>
<td>HRS 205A &amp; Relevant County Regs</td>
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<td>DLNR: HRS 173A, 183, 187, 191, Reg 4, 190, 195, 195D</td>
<td>HRS 180C &amp; Relevant County Regs</td>
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<td>LUC: HRS 205</td>
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<td>DPED: HRS 225</td>
<td>HRS 205, Part II &amp; Relevant County Regs</td>
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<td>DOT: HRS 266 All Agencies:</td>
<td>HRS 205A &amp; Relevant County Regs</td>
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<td>OEQC: HRS 341 HRS 101, 343</td>
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<td>DOH: HRS 180C, 342</td>
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<td>DLNR: HRS 195</td>
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<td>OEQC: HRS 341</td>
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<td>DLNR: HRS 173A, 183, 187, 188, 189, 190, 195, 195D Reg 6, 7, 32, 33, 40, 42</td>
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<td>DOH: HRS 180C, 342</td>
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<td>DOT: HRS 266</td>
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</table>
in marine-oriented education, advisory services, fisheries, aquaculture, ocean bottom research and ocean engineering, and coastal environmental management. The Sea Grant Program has also contributed to the public awareness and involvement component of Hawaii's CZM Program development.

County Agencies

The Counties of Hawaii, Maui, Kauai, and the City and County of Honolulu serve an extremely important role in the management of the coastal zone and have done so for the past several years. Some of their responsibilities are:

1. Delineating the boundary of the SMA of the County which becomes the CZM area after it has been amended to comply with the objectives and policies of the Hawaii CZM Act of 1977. Counties are statutorily required to amend their SMA boundaries by June 7, 1979.

2. Within the SMA, and subsequently the permanent CZM area, the major direct method of land and water use controls for assuring consistency with the CZM objectives and policies is through the issuance of development permits. The permit authority must review all developments in the SMA (with some minor exceptions) on a comprehensive basis with all CZM policies, whereas many other permits or means of control often have a single focus.
3. The Counties have additional responsibilities and authorities both in the SMA and the Administrative CZM area and later in the permanent CZM area, including State-mandated County regulatory programs dealing with erosion control, urban design, beach access, park dedication and the administration and enforcement of the shoreline setback laws. They also have important responsibilities for planning and zoning in the urban districts, local transportation, solid waste disposal, subdivision and grading regulation, recreation, and water supply and development.

4. The Counties have adopted guidelines for the review of developments proposed in the SMA, and are designated as major participants along with the public in assisting the DPED in preparing any additional guidelines for legislative enactment.
HAWAII CZM OBJECTIVES AND POLICIES

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

(i) Utilizing currently designated locations for such uses is not feasible;

(ii) Adverse environmental effect are minimized; and

(iii) It is important to the State's economy.

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<thead>
<tr>
<th>STATE AUTHORITIES</th>
<th>STATE-MANDATED AUTHORITIES</th>
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<tr>
<td>DLNR: HRS 171, 174, 176, 183</td>
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<td>All agencies: HRS 343, 344</td>
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FOOTNOTE

1 Existing statutes, ordinances, and regulations also provide for the protection, utilization, and development of mineral resources and living marine resources. These include, but are not limited to, the following:

Mineral Resources - HRS 181, 173A, 180C, 205, 205A, DLNR Reg. 4

Living Marine Resources - HRS 173A, 191, 195, 195D, 205, 205A

AUTHORITIES CITATION

HRS** 6 Historic Objectives and Sites; Memorials
HRS 37 Budget
HRS 46-6 Parks Dedication
HRS 46-6.5 Public Access
HRS 46-11 Federal Flood Insurance
HRS 46-18 Intergovernmental Procedures Relating to Land Use
HRS 57 Urban Design
HRS 62 General Powers of County Officers
HRS 91 Administrative Powers
HRS 92 Public Agency Meetings and Records
HRS 101 Eminent Domain
HRS 115 Public Access to Coastal and Inland Recreational Areas
HRS 149A Banning of Pesticides
HRS 171 Rights-of-Way to the Sea and Games Preserves
HRS 173A Acquisition of Resource Value Lands

* Copies of a supplement, Legal Text of Authorities Cited in the Hawaii CZM Program Document, are available at the DPED or the Office of Coastal Zone Management

** Hawaii Revised Statutes
HRS 174  Water and Land Development
HRS 177  Ground Water Use
HRS 179  Flood Control & Flood Water Conservation
HRS 180  Soil and Water Conservation Districts
HRS 180C Soil Erosion and Sediment Control
HRS 183  Forest Reservations, Water Development, Zoning
HRS 187  General Provisions Relating to Fish & Game
HRS 188  Fishing Rights and Regulations
HRS 189  Commercial Fishing
HRS 190  Marine Life Conservation Districts
HRS 191  Birds and Mammals
HRS 195  Natural Areas Reserve System
HRS 195D Conservation of Wildlife and Plants
HRS 196  Energy Resources
HRS 201  Department of Planning & Economic Development
HRS 203  Tourism Department
HRS 205  Land Use Commission
HRS 205, Part II Shoreline Setback
HRS 205A  Coastal Zone Management
HRS 206E Hawaii Community Development Authority
HRS 225  Policy Planning
HRS 266  Regulations of Shore and Water
HRS 277  Energy Corridors
HRS 279A Statewide Transportation Planning
HRS 341 Environmental Quality Control
HRS 342 Environmental Quality
HRS 343 Environmental Quality Commission and Environmental Impact Statement
HRS 344 State Environmental Policy
Act 69, SLH 1974 Statewide Trail and Access System
Act 166, SLH 1976 Council of Housing and Construction Districts
DLNR Reg. 4 Administration - Land Use Within Conservation Districts
DLNR Reg. 6 Administration - Relating to the protection, control, and use of the Waiakea 1942 Lava Flow Natural Area Reserve.
DLNR Reg. 7 Administration - Relating to the protection, control, and use of Ahihi-Kinau Natural Area Reserve, Island of Maui.
DLNR Reg. 1 State Parks Division - Relating to the regulation and control of the State Parks System.
DLNR Reg. 2 State Parks Division - Relating to historic and archaeological sites and permits to examine and excavate ruins thereon.
DLNR Reg 1-40 and 42 Fish and Game Division - Those regulations dealing with the establishment, protection, and/or regulation of hunting on public lands; wildlife refuges; game bird hunting and commercial shooting preserves; new game birds and mammals; wild deer, indigenous, endangered, and introduced birds and/or mammals; bird and wildlife sanctuaries; freshwater fishing reserves, refuges, and public fishing areas; the taking of freshwater fishes, lobsters, mullets and the use of non-portable fish traps; the licensing and sale of fish, shellfish, crustaceans, or other marine animals; the taking
of bait fish (nehu, iao, marquesan sardine, tabai, phia, and threadin shad); the taking and/or protection of native pearl oyster, samoan crab, and clams; certain introduced shellfishes, octopus, ulua, papio, omilu, moi-lii, moi, oama, and marine turtles; game mammal hunting; and refuges, experimental sites and rearing stations for aquatic fauna and flora; and marine life conservation districts.

DOH Reg. 15 Recreational Trailer Camps
DOH Reg. 37 Water Pollution Control
DOH Reg. 37A State Water Quality Standards
DOH Reg. 38 Sewage Treatment & Disposal Systems Standards

City and County of Honolulu
C&C RO 22 Subdivision
C&C RO 23 Grubbing, Grading, Stockpiling
C&C Ord 4311 Public Access Requirements
C&C Ord 4529 Shoreline Management Permit
C&C Ord 4621 Park Dedication
C&C Ord 77-73 Central Coordinating Agency

Maui County
M Ord 789 Maui County Subdivision Ordinance (1974)
M Ord 816 Soil Erosion and Sediment Control (1975)
M Ord 885 Central Coordinating Agency
M R&R Maui County Interim CZM Rules & Regulations
Kauai County
K Ord 164  Kauai County Comprehensive Zoning Ordinance
K Ord 175  Kauai County Subdivision Ordinance
K Ord 262  Kauai County Grubbing Grading, Stockpiling, and Soil Erosion and Sedimentation
K R&R     Environmental Shoreline Protection Rules and Regulations
K R&R     Kauai County Shoreline Setback Rules and Regulations

Hawaii County
H Ord 168  Grading Ordinance
H Ord 301  Parks and Playgrounds
H Ord 305  Central Coordinating Agency
H Ord 439  Hawaii County General Plan
H Ch. 9    Subdivision Code
H R&R 8    Rules and Regulations Relating to Shoreline Setback
H R&R 0    Rules and Regulations Relating to Environmental Shoreline Protection
GLOSSARY OF TERMS

SAFE YIELD: The safe yield of a water source is defined as the quantity of water in MGD (millions of gallons per day) that can consistently and safely be drawn from that source, taking into account all factors, including water quality and seasonal variations in flow.

The safe yield of a system of several interconnected water sources is defined as the sum of the individual safe yields of each water source, minus the largest pumped source. The rationale here is that any source is subject to temporary interruption (failure) and that the remainder of the system must operate safely until the source is repaired.

AVERAGE-DAY CONSUMPTION: The average daily water consumption is the annual average water use in the study area, plus a 10% system loss factor (leaks, overflow, pilferage, fire flow, etc.).

MAXIMUM-DAY CONSUMPTION: Since consumption rate varies with
the season, the maximum daily consumption is defined, through experience, as 1.5 times the average-day consumption. It is essential that the water supply system be capable of handling the variations between average-day and maximum-day consumption in order to adequately meet the flow demands at satisfactory pressures.

All source yields and system consumptions are measured in MGD (millions of gallons per day).