DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-7109

December 9, 1991

Office of Environmental Quality Control
Central Pacific Plaza
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

Subject: **MAHINAHINA WATER TREATMENT PLANT** **PN 92-1**
TMK 4-6-18:12 Lahaina, Maui, Hawaii

Gentlemen:

In accordance with the requirements of Chapter 343, HRS and Chapter 200 to Title 11, Administrative Rules, we hereby notify you that an Environmental Impact Statement will not be required for the subject project.

As the proposing agency, we are forwarding herewith one copy of OEQC Form 89-01 and for (4) copies of an Environmental Assessment (Negative Declaration) for the subject project showing that there will be no significant impact on the environment as a result of this project. These are respectfully submitted for your consideration.

Sincerely,

Rae M. Shikuma
Director

Encl: Publication Form
Four (4) Environmental Assessments

cip/hc

1991-12-23-MA-FEA

Proposed Mahinahina Water Treatment Plant

ENVIRONMENTAL ASSESSMENT

Prepared for:

County of Maui,
Department of Water Supply

December 1991

Michael T. Munekiyo Consulting, Inc.

Proposed Mahinahina Water Treatment Plant

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Preface

The County of Maui, Department of Water Supply proposes to construct new water treatment facilities at Mahinahina, Lahaina, Maui (TMK 4-4-02:por.15, por. 18, 4-3-01:por.31). Pursuant to Chapter 343, Hawaii Revised Statutes, and Chapter 200 of Title 11, Administrative Rules, Environmental Impact Statement Rules, this Environmental Assessment documents the project's technical characteristics and environmental impacts, and advances findings and conclusions relative to the significance of the project.

Summary

Applicant and Landowner

The Applicant for the proposed project is the County of Maui, Department of Water Supply (DWS). The landowners of the affected property are the State of Hawaii and Maui Land & Pineapple Company, Ltd.

Contact Person

For further information, contact Ms. Rae Shikuma, Director, County of Maui, Department of Water Supply, 200 S. High Street, Wailuku, Hawaii 96793, or at telephone (808) 243-7616.

Property Location and Description

The proposed project site encompasses approximately twelve (12) acres and is located in Mahinahina, Lahaina, Maui, Hawaii (TMK 4-3-01:por. 31, 4-4-02:por. 15 and por. 18).

The site is part of a vast expanse of pineapple fields which cover the West Maui foothills between Honokowai and Kapalua. The Honokohau Ditch borders the property to the east with the Mahinahina Gulch bordering the site's northern extent. The Honokowai Stream lies to the south of the project site. The proposed water treatment plant and attendant storage and transmission facilities will be located on lands which are presently used for pineapple cultivation.

The site is relatively isolated from existing urbanized areas, with Honoapiilani Highway and its adjacent multi-family and single-family residential corridor located approximately 1.7 miles west of the site. The Kapalua-West Maui Airport is located approximately 1.0 mile northwest of the site.

Proposed Action

The proposed Mahinahina Water Treatment Plant (WTP) and associated, diversion, storage and transmission facilities are designed to meet the water quality requirements

of the Surface Water Treatment Rule. The location and elevation of the proposed improvements will also improve the operating characteristics of the Northern Subsystem of the Lahaina-Alaeloa System.

The 2.5 million gallon per day (MGD) WTP will be contained within a twelve (12) acre site and will include a two-story concrete masonry unit operations and chemical building. The operations and chemical building will house the chlorinator/ammoniator units, the control room, chemical facilities, laboratory, and the administrative office area.

A separate filter and flocculation structure located next to the operations and chemical building will contain water treatment filters and flocculation basins. Backwash water from the filters will be conveyed to recovery ponds located within the site to allow for the separation of settleable solids (sludge). A 2.0 million gallon (MG) clearwell will serve as a disinfectant chamber and store the finished (treated) water.

In addition to the treatment building and appurtenant facilities described above, a new 20 MG presedimentation/equalization reservoir will be constructed within the twelve (12) acre site. The presedimentation/flow equalization reservoir will be designed to store raw water diverted from the Honokohau Ditch and will help to maintain flows through the treatment plant during drought conditions.

Other construction improvements to be provided within the proposed WTP site include the following items:

a. A paved driveway (from the agricultural haul road) and 6 paved parking stalls.

b. A backwash tank to store water for backwashing of filters.

c. Site preparation for a future sedimentation basin.

d. A six (6) foot high chain link fence along the perimeter of the site for security purposes.

e. Septic tank and leach field for wastewater disposal from the WTP's restroom.

f. Site landscaping.

g. Desilting basin for storm runoff.

In addition to the construction of the WTP within the twelve (12) acre site, the DWS also proposes to construct the following "off-site" improvements:

a. A new diversion structure at the interface of the Honokohau Tunnel and Ditch.

b. Approximately 880 lineal feet of 36-inch transmission line and 570 lineal feet of 24-inch transmission line to convey raw water from the intake to the presedimentation/ equalization reservoir.

c. Approximately 5,850 lineal feet of pipeline (16-inch diameter) to convey treated water from the WTP to the 2.0 MG Honokowai Reservoir.

Determination

The proposed WTP is intended to address water treatment requirements set forth by the EPA's Surface Water Treatment Rule. The benefits derived from the project are significant in terms of the public health and welfare, as treated water provided by the facility will meet the highest standards of water quality for surface source domestic consumption.

The proposed project will involve earthwork and building construction activities. In the short-term, these activities may create temporary nuisances normally associated with construction activities.

From a long-term perspective, the use of the site for the proposed water treatment facilities is not anticipated to result in adverse environmental impacts. There are no surface archaeological features or rare/threatened species of fauna and flora at the site and the construction of the WTP will not affect these environmental parameters. Ambient air and noise characteristics will not be altered as a result of the proposed WTP.

In light of the foregoing findings, it is concluded that the proposed action will not have any significant impacts. Accordingly, this Environmental Assessment will be filed as a Negative Declaration pursuant to Chapter 200 of Title 11, Administrative Rules, Environmental Impact Statement Rules.

Chapter I

Introduction and Background

I. INTRODUCTION AND BACKGROUND

The County of Maui Department of Water Supply (DWS) proposes to develop a new water treatment plant with related storage and transmission facilities at Mahinahina, Maui, Hawaii. To provide the context within which the proposed project is to be undertaken, this Chapter describes existing water system characteristics and reviews the regulatory framework which establishes the impetus for the proposed project.

A. EXISTING WATER SYSTEM

Water systems within the 296-square mile Lahaina Judicial District include agricultural water systems and private and public domestic water systems.

Agricultural water systems have been developed by Pioneer Mill Company, Ltd. and Maui Land & Pineapple Company, Inc. to meet irrigation needs of their respective sugar cane and pineapple cultivation operations. These systems utilize surface water, high-level dike water and basal groundwater sources, and include transmission and storage facilities consisting of ditches, flumes, siphons, and reservoirs. The most notable component of the agricultural system in the Lahaina District is the Honokohau Ditch, which is owned and operated by Maui Land and Pineapple Company. The Ditch begins with a diversion at Honokohau Stream and winds through the mid-slopes of the West Maui foothills for a distance of about 12 miles, terminating near Lahaina Town. Both Pioneer Mill Company, Ltd. and Maui Land & Pineapple Company, Inc. divert water from the ditch for irrigation purposes. In addition, the DWS diverts 1.5 million gallons per day (MGD) from the Honokohau Ditch (at Alaeloa) to serve its two domestic systems.

The average withdrawal rate from the Honokohau Ditch by the major users is estimated to be 13.5 MGD, as presented in Table 1. With an average daily flow of 25 MGD, the Ditch's residual or undiverted flow is approximately 12.0 MGD, which is conveyed to an irrigation reservoir at the end of the Honokohau Ditch system.

Table 1

HONOKOHAU DITCH AVERAGE WITHDRAWAL RATES	
User	**Average Withdrawal Rate (MGD)**
Maui Land and Pineapple Company	5.5
Kapalua Land Company	4.5
Kapalua Water Company	2.0
County of Maui	1.5
Total Average Daily Withdrawal	**13.5 MGD[a]**
[a] Residual ditch flows are conveyed to a Pioneer Mill Company reservoir.	

An Agreement for Water Purchase, between the DWS and Maui Land & Pineapple Company, Inc. provides for the withdrawal of water from the Honokohau Ditch (by DWS) at an average rate of 2.5 MGD.

1. *DWS Domestic Systems*

The County's DWS operates the Honokohau and Lahaina-Alaeloa Water Systems within the Lahaina District. The Lahaina-Alaeloa Water System is the larger of the two DWS systems, and is divided into two subsystems, referred to as the "Northern Subsystem" and the "Southern Subsystem". These subsystems are interconnected, but currently operate independently through the closure of selected system valves. The proposed Mahinahina Water Treatment Plant (WTP) will become an integral part of the Lahaina-Alaeloa System's Northern Subsystem.

In 1989, the number of service connections to the Lahaina-Alaeloa system was 2,816, of which 2,459 connections were designated as active (paying)

customers by the DWS. The average consumption for the entire Lahaina-Alaeloa system was 4,280,350 gallons per day (GPD).

Northern Subsystem: The Northern Subsystem serves the area between Wahikuli and Alaeloa. See Figure 1. Water for this subsystem is derived from the Honokohau Ditch through a diversion at Alaeloa, and from four (4) high-level basal wells in upper Napili. Reservoirs associated with this subsystem are located in Alaeloa (1.0 million gallons (MG), Honokowai (2.0 MG), and Wahikuli (1.5 MG)). Approximately 36,000 lineal feet of 16-inch main along Honoapiilani Highway connect these reservoirs between Alaeloa and Wahikuli.

Southern Subsystem: The other component of the Lahaina-Alaeloa System, the Southern Subsystem, serves Lahaina Town, between Wahikuli and Puamana. See Figure 2. This system obtains its water from surface water originating in Kanaha Valley and four basal wells.

Water from the Kanaha Intake is shared under a three-party agreement among the State of Hawaii, the DWS and Pioneer Mill Company, Ltd. Elements of the Southern Subsystem include the intake at Kanaha Stream, about three (3) miles inland at elevation 1,035 feet; a screen box at elevation 800 feet; and about 2,065 lineal feet of 10-inch galvanized steel pipe from the intake to the screen box. The screen box, located above Lahainaluna High School, is the point of water distribution to the respective water users.

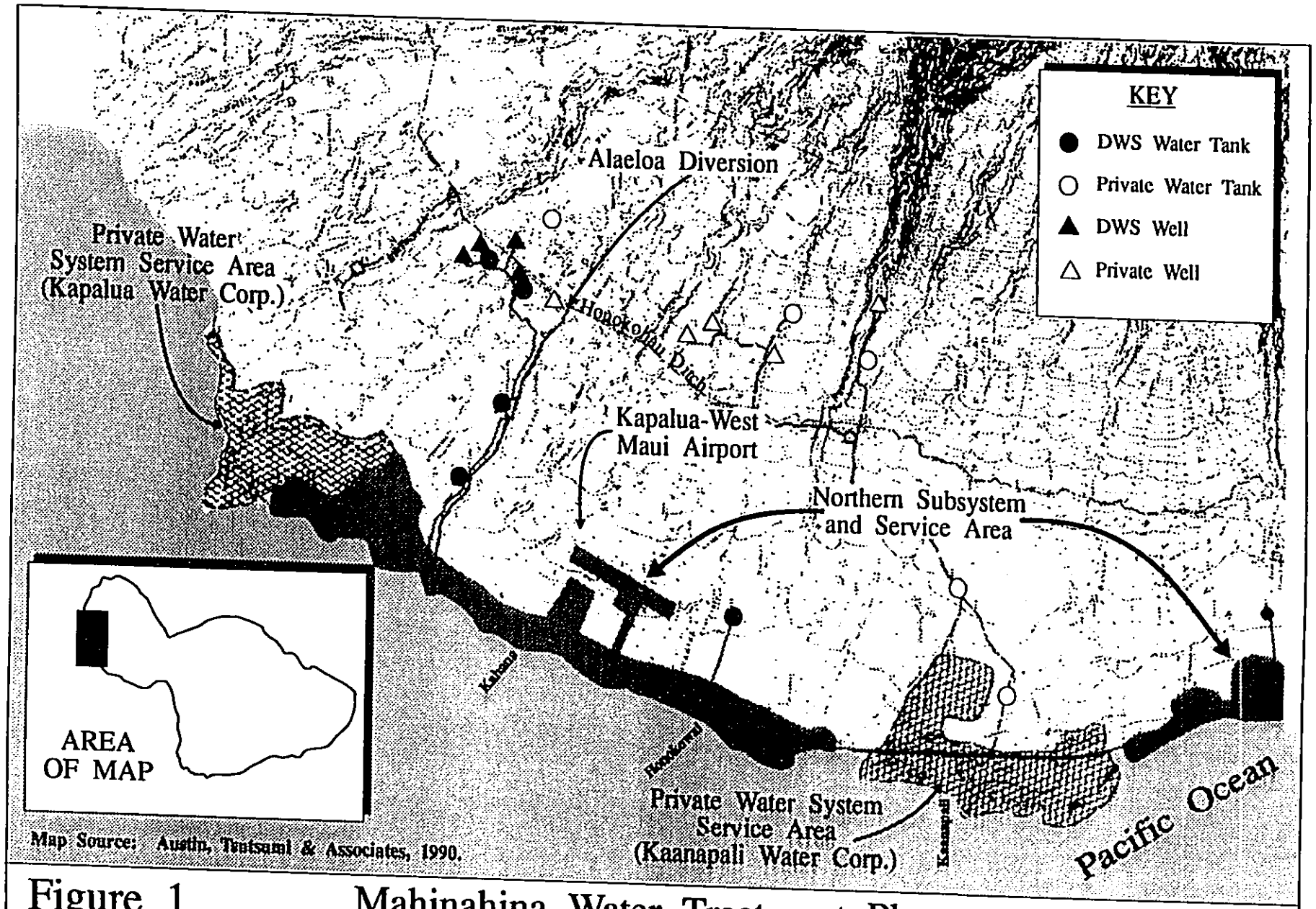


Figure 1 Mahinahina Water Treatment Plant
Existing Northern Subsystem and Service Area

Michael T. Munekiyo Consulting, Inc.

Prepared for: County of Maui, Department of Water Supply

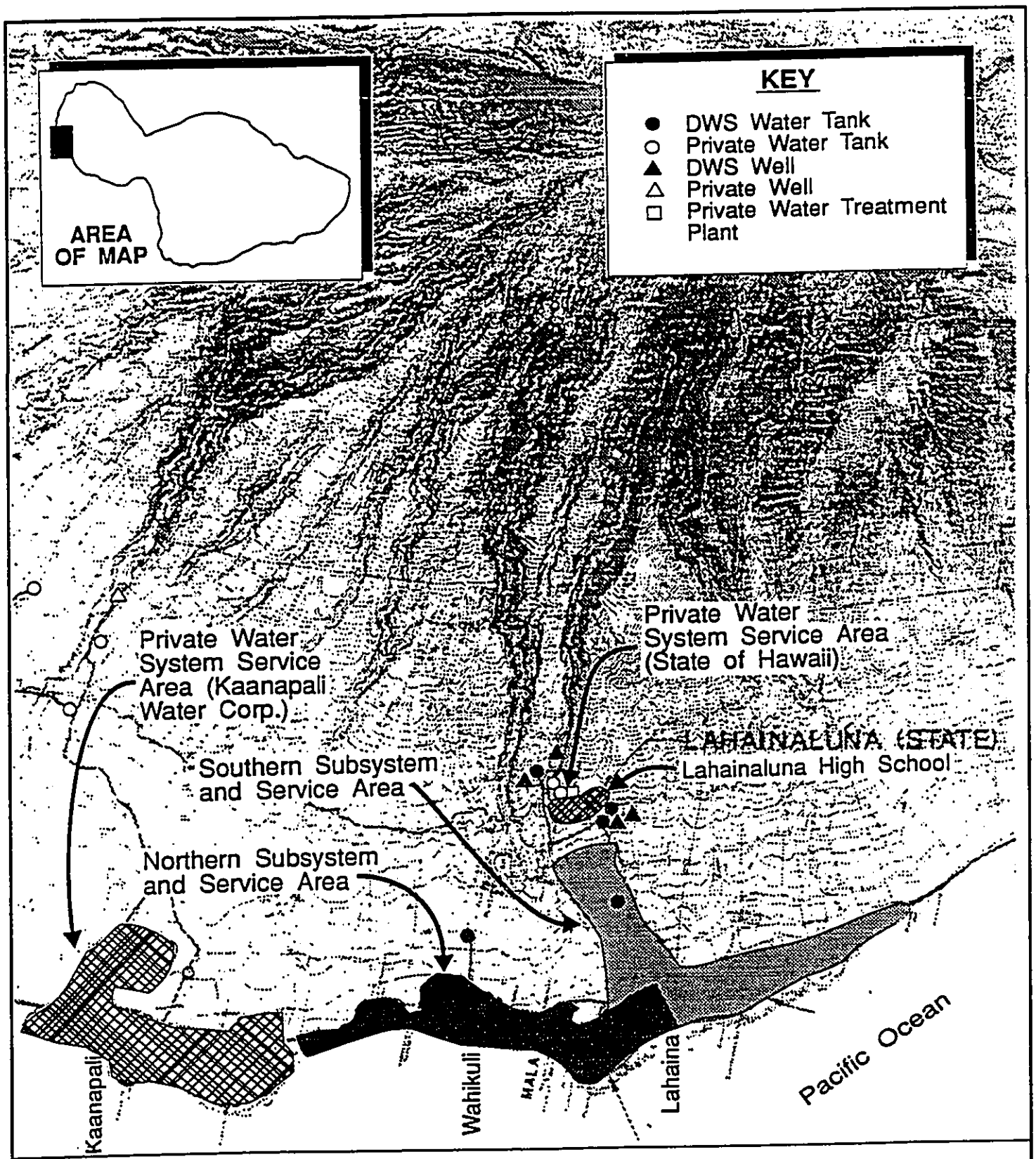


Figure 2 Mahinahina Water Treatment Plant
Existing Southern Subsystem and Service Area

Michael T. Munekiyo Consulting, Inc.

Prepared for: County of Maui, Department of Water Supply

B. REGULATORY CONTEXT

Direct regulation of water systems and water quality are governed by the following laws and regulations: (1) Safe Drinking Water Act of 1974 (P.L. 93-523); (2) Chapter 340E, Hawaii Revised Statutes, Safe Drinking Water; (3) State Department of Health, Chapter 20 of Title 11, Administrative Rules, Potable Water Systems; and (4) Environmental Protection Agency Surface Water Treatment Rule (SWTR).

1. Safe Drinking Water Act

The Safe Drinking Water Act (42 USC 300) regulates public providers of drinking water. (Public systems are defined as those providing piped water for human consumption that has at least fifteen (15) service connections, or regularly serves at least twenty five (25) people at least sixty (60) days a year.) The Act ensures that public systems providing drinking water are not detrimental to the public health by providing for:

a. The establishment of primary regulations for the protection of the public health;

b. Secondary regulations relating to the taste, odor and appearance of drinking water; and

c. Measures to protect underground drinking water sources.

Any proposed water treatment plant must comply with the provisions of the regulations mandated by the Safe Drinking Water Act.

2. Chapter 340E, Hawaii Revised Statutes, Safe Drinking Water

Chapter 340E, Hawaii Revised Statutes, relating to Safe Drinking Water, is the enabling legislation implementing the Federal Safe Drinking Water Act. Chapter 340E provides for the establishment and enforcement of primary

and secondary drinking water regulations for public water systems. These regulations are contained within Chapter 20 of Title 11, Administrative Rules, Potable Water Systems, which are summarized in the next section.

3. *State Department of Health, Chapter 20 of Title 11, Administrative Rules, Potable Water Systems*

Chapter 20 of Title 11, Administrative Rules, establishes drinking water quality standards for the State of Hawaii in accordance with the Federal Safe Drinking Water Act. Maximum contaminant levels (MCL) for inorganic and organic chemicals, turbidity, coliform bacteria and radionuclides are established by Chapter 20.

In addition, Chapter 20 establishes sampling, analytical and reporting requirements for each contaminant parameter.

4. *Surface Water Treatment Rule*

The U.S. Environmental Protection Agency's (EPA) Surface Water Treatment Rule (SWTR) (40 CFR Part 141, Sub-part H) became effective on December 31, 1990, and is designed to regulate surface domestic water sources. Under the SWTR, all surface water sources, unfiltered or filtered, must meet the SWTR's filtration and disinfection criteria and monitoring and reporting requirements by June 29, 1993. In general, the filtration and disinfection criteria provide for the control of Giardia cysts, viruses, turbidity, heterotrophic plate count bacteria, and Legionnella. The State Department of Health (DOH) is in the process of promulgating rules to implement the requirements of the SWTR. The DOH proposed rules is scheduled for review, public hearing and adoption in calendar year 1991. The proposed WTP project is designed to ensure full compliance with criteria established by the SWTR.

Chapter II

Description of the Proposed Project

II. DESCRIPTION OF THE PROPOSED PROJECT

A. PROJECT LOCATION AND LANDOWNERSHIP

The proposed WTP project site encompasses approximately twelve (12) acres and is located in Mahinahina, Lahaina, Maui, Hawaii (TMK 4-3-01:por. 31, 4-4-02:por. 15 and por. 18). See Figure 3.

The site is part of a vast expanse of pineapple fields which cover the West Maui foothills between Honokowai and Kapalua. The Honokohau Ditch borders the property to the east with the Mahinahina Gulch bordering the site's northern extent. The Honokowai Stream lies to the south of the project site. The proposed water treatment plant and attendant diversion, storage and transmission facilities will be located on lands which are presently used for pineapple cultivation.

The site is relatively isolated from existing urbanized areas, with Honoapiilani Highway and its adjacent multi-family and single-family residential corridor located approximately 1.7 miles west of the site. The Kapalua-West Maui Airport is located approximately 1.0 mile northwest of the site.

The property is owned by Maui Land & Pineapple Company and the State of Hawaii.

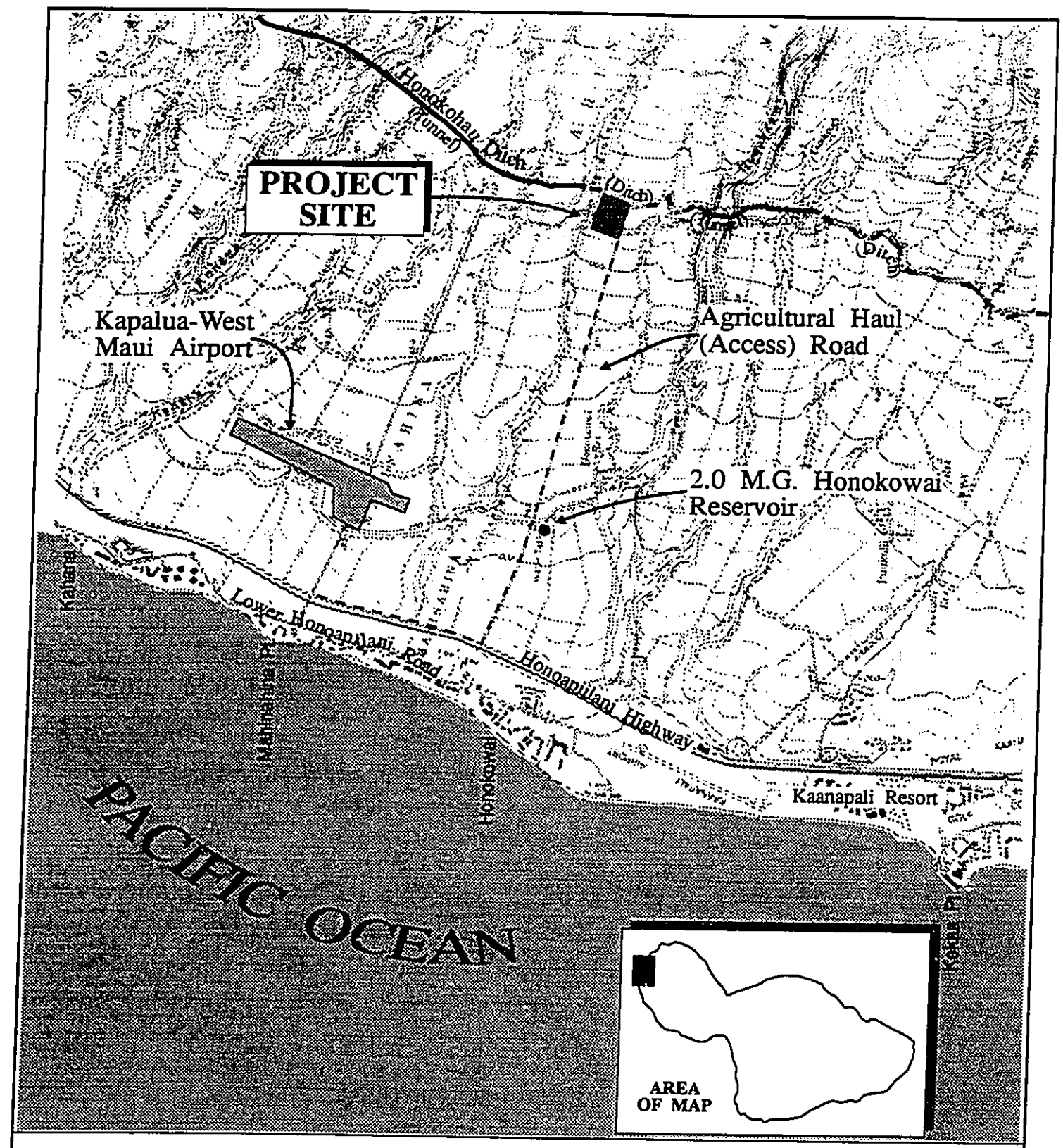


Figure 3 Mahinahina Water Treatment Plant
Regional Location Map

Michael T. Munekiyo Consulting, Inc.
Prepared for: County of Maui, Department of Water Supply

B. PROJECT NEED

The proposed Mahinahina Water Treatment Plant (WTP) and associated diversion, storage and transmission facilities are designed to meet the water quality requirements of the SWTR and to improve the operating characteristics of the Northern Subsystem of the Lahaina-Alaeloa System. Problems attributed to the existing system include inadequate surface water supply during drought periods and excessive turbidity during high rainfall periods. In addition to the foregoing source-related problems, the system is faced with operational constraints. Specifically, the existing 2.0 MG Honokowai Reservoir and the 1.5 MG Wahikuli Reservoir are out-of service as existing system pressures are insufficient to fill the reservoirs. As a result, the storage requirements for the Northern Subsystem is deficient by approximately 4.3 MG. The proposed project, therefore, will enhance the public health and welfare and increase system capacities by increasing source availabilty. In addition, the project will improve the overall operating efficiencies of the Northern Subsystem by providing water pressures needed to fully utilize existing storage facilities.

The proposed project, in improving system capacities and efficiencies, will also help to meet the long-term water needs of the Northern Subsystem service area. The projected water demand for this service area is expected to increase from its present demand of 3.7 MGD to 8.2 MGD in the year 2010. See Figure 4. In this regard, the project is considered an integral component of West Maui's long-range water master plan.

C. PROPOSED IMPROVEMENTS

1. Improvement within the Water Treatment Plant Site

The proposed 2.5 MG WTP will be contained within a twelve (12) acre site. See Figure 5 and Figure 6.

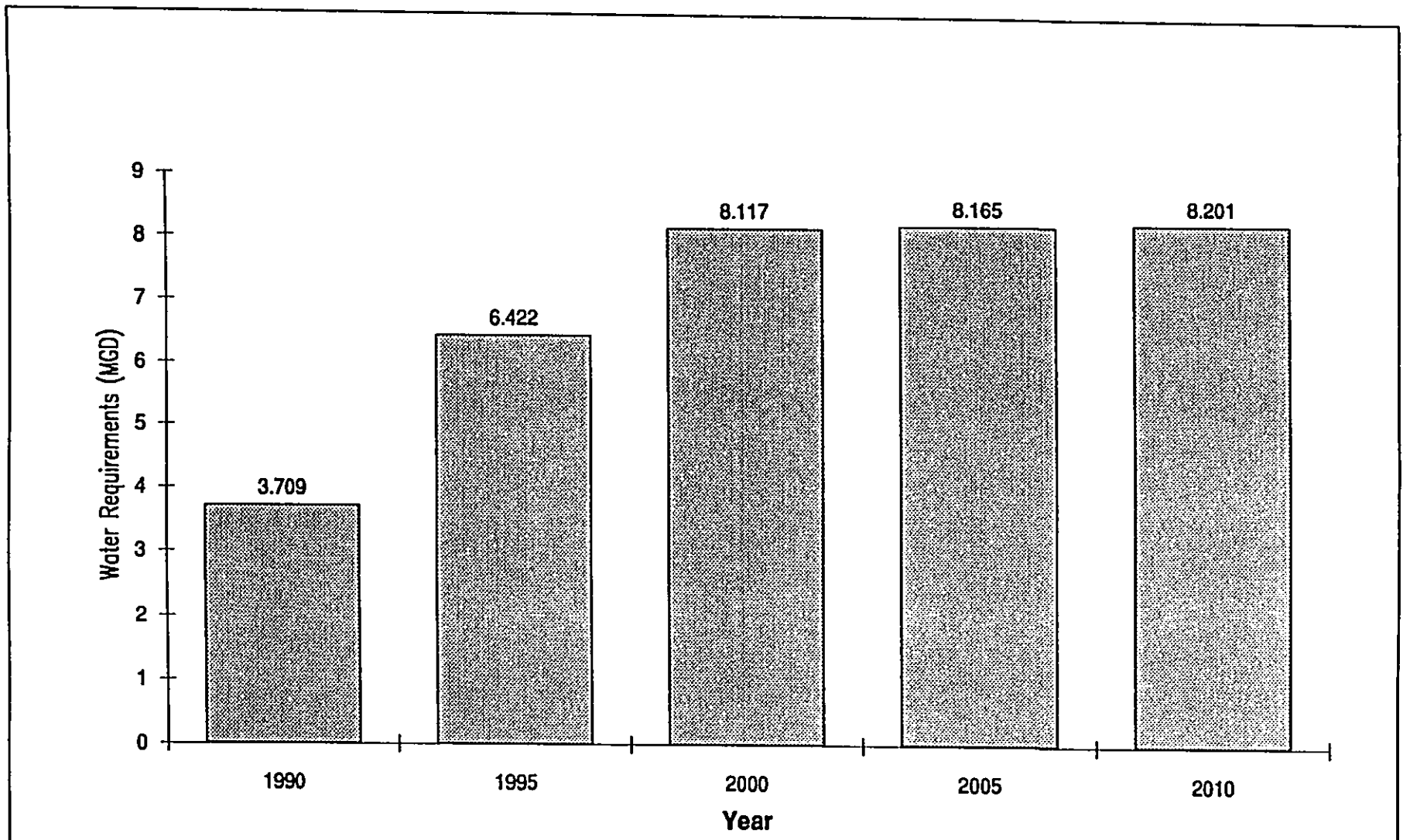
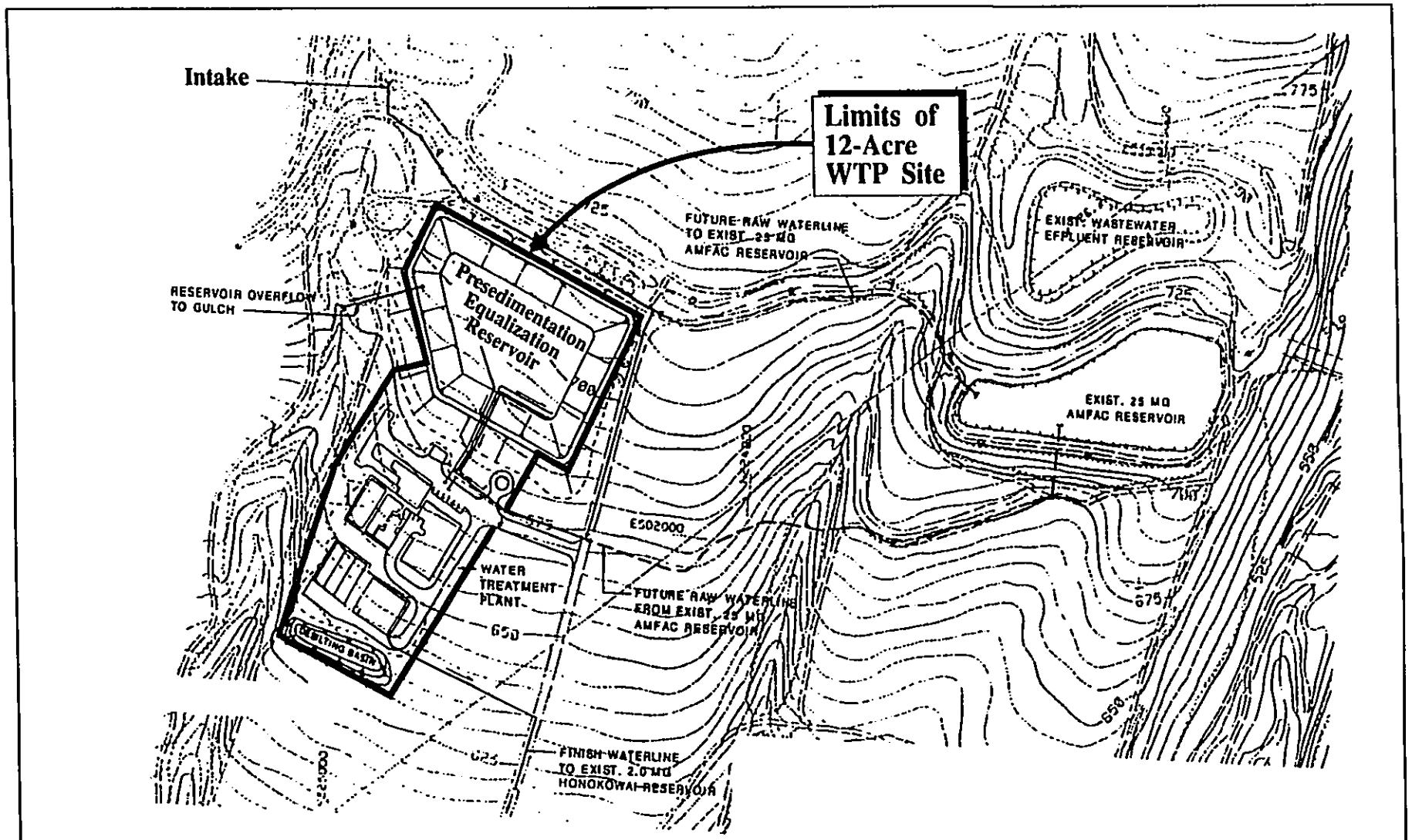


Figure 4

Mahinahina Water Treatment Plant
Projected Water Demand for Northern Subsystem

Michael T. Munekiyo Consulting, Inc.

Prepared for: County of Maui, Department of Water Supply



Map Source: Austin, Tsutsumi & Assoc., Inc.

Figure 5 Mahinahina Water Treatment Plant

Overall Site Plan

180 720

0 Feet

360

Michael T. Munekiyo Consulting, Inc.

Prepared for: County of Maui, Department of Water Supply

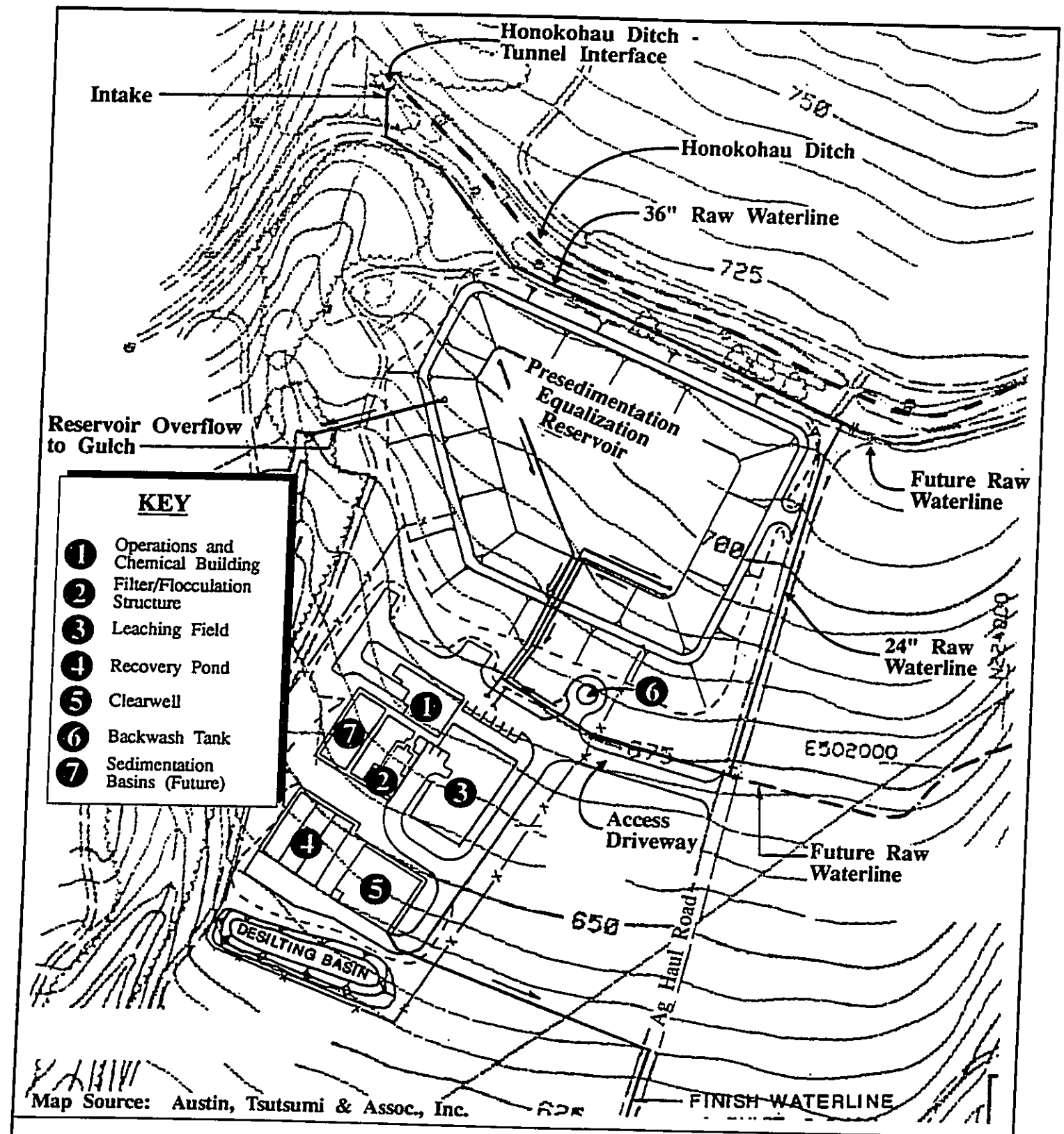


Figure 6 Mahinahina Water Treatment Plant

Detailed Site Plan

Michael T. Munekiyo Consulting, Inc.

Prepared for: County of Maui, Department of Water Supply

An operations and chemical building will house the chlorinator/ammoniator units, the control room, chemical facilities, laboratory, and the administrative office area. This two-story building will be approximately 30 feet in height, with about 8,900 square feet of total floor area.

The treatment process will also require the construction of a separate filter and flocculation structure, recovery ponds, and a 2.0 MG clearwell. A detailed description of the treatment process is described in the Preliminary Engineering Report attached hereto as Appendix A.

The filter and flocculation structure will contain water treatment filters and flocculation basins. Backwash water from the filters will be conveyed to the recovery ponds to allow for the separation of settleable solids (sludge). The 2.0 MG clearwell will serve as a disinfectant chamber and store the finished (treated) water.

In addition to the treatment building and appurtenant facilities described above, a new 20 MG presedimentation/equalization reservoir will be constructed within the twelve (12) acre site. The presedimentation/ equalization reservoir is designed to store raw water diverted from the Honokohau Ditch and will help to maintain flows through the treatment plant during drought conditions. In addition, the reservoir will serve to remove silt (by gravity settlement) from the raw water to optimize the treatment efficiency of the WTP. The reservoir will be covered with a floating cover to prevent algae growth; protect the stored water from pesticide aerosol contamination; protect the reservoir lining from degradation; and maintain consistent pH levels in the stored water.

Other construction improvements to be provided within the proposed WTP site include the following items:

a. A paved driveway (from the agricultural haul road) and six (6) paved parking stalls;

b. A backwash tank to store water for backwashing of filters;

c. Site preparation for a future sedimentation basin;

d. A six (6) foot high chain link fence along the perimeter of the site for security purposes;

e. Septic tank and leaching field for wastewater generated by the WTP's restroom facility;

f. Site landscaping; and

g. Desilting basin for storm runoff.

The estimated cost of the WTP improvements (i.e., improvements within the 12-acre WTP site) is approximately $12.4 million.

Once the new treatment plant and related facilities are completed and become operational, the existing Alaeloa diversion will be abandoned. The total capacity of 2.5 MGD for the new system will mean that the County will have an additional supply of 1.0 MGD over its present withdrawal at Alaeloa.

2. ***Improvements Beyond the Water Treatment Plant Site***

In addition to the construction of the WTP within the twelve (12) acre site, the DWS will also construct a new intake and screening structure at the Honokohau Ditch tunnel interface and transmission lines to convey raw and treated water to the WTP and storage reservoir, respectively. See Figure 7. A detailed description of the "off-site" improvements is presented in

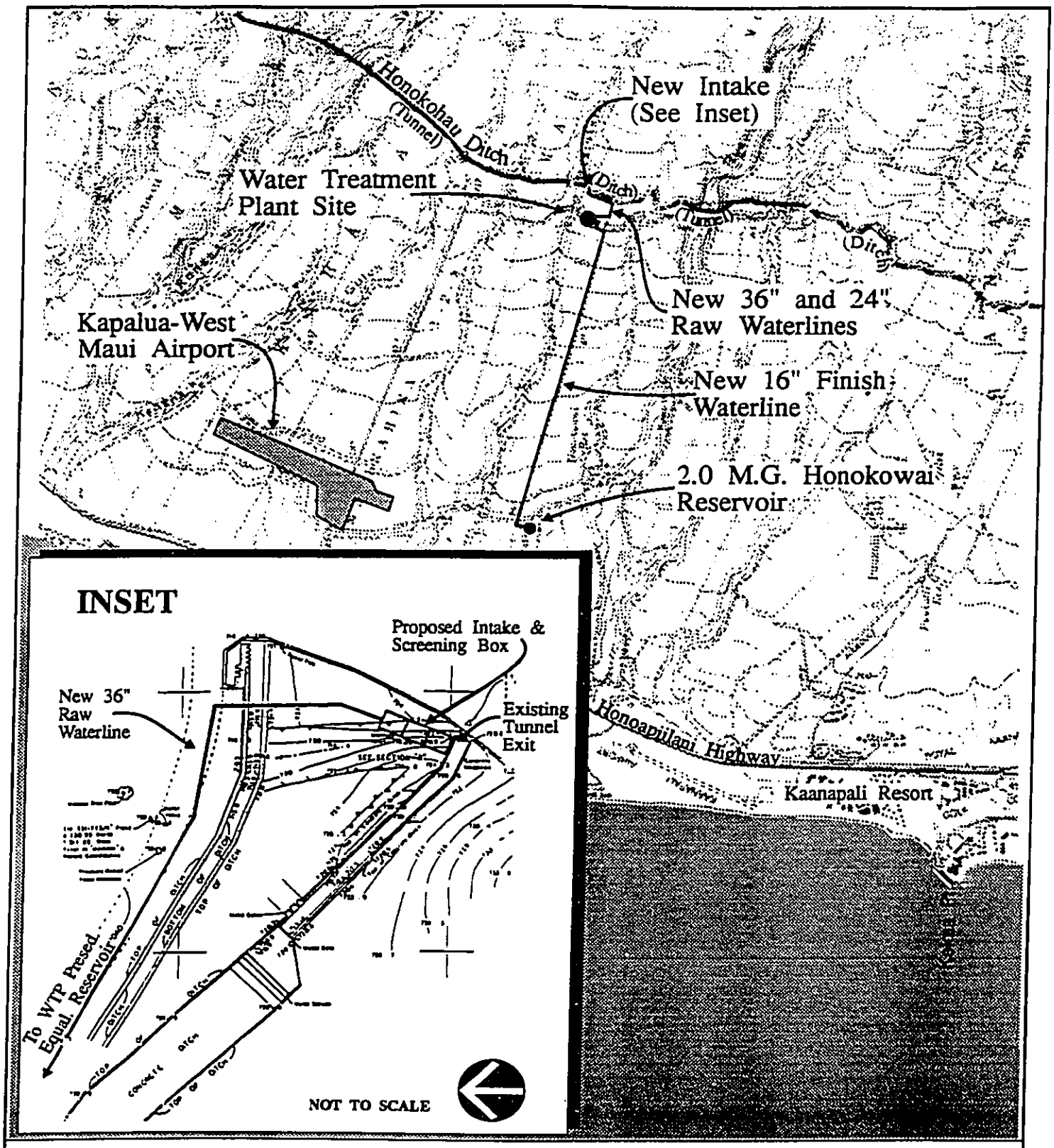


Figure 7 Mahinahina Water Treatment Plant
Intake and Transmission Line Improvements

Michael T. Munekiyo Consulting, Inc.

Prepared for: County of Maui, Department of Water Supply

Appendix B.

The new intake and screening structure will be designed to prevent debris contamination. The structure will be fully enclosed to prevent introduction of external contaminants such as pesticides, fertilizers and dust. The intake structure will be of reinforced concrete construction and measure approximately 28 feet by 7 feet in dimension. The depth of the structure will be approximately 12 feet.

New 36-inch and 24-inch raw water intake lines will be installed to convey water from the intake and screening structure to the 20 MG presedimentation/equalization reservoir located within the WTP site. Approximately 1,450 lineal feet of waterline will be installed for raw water transmission.

In addition to the raw water intake line, a new 16-inch transmission line will be installed to convey treated water from the WTP to the 2.0 MG Honokowai Reservoir located approximately 5,800 feet to the west of the WTP site. The 16-inch transmission line will be aligned within the existing agricultural haul road which provides access to the WTP. Minimum cover over this transmission line will be 5 to 6 feet to minimize damage by agricultural operations.

The total estimated cost for the intake and screening structure, 36-inch raw water line and 16-inch treated water transmission line is $1.36 million.

3. *Staffing Requirements*

While the proposed WTP will be fully automated, the plant will be staffed by two (2) DWS staff members. Work hours for the DWS staff will be based on a 40-hour per week, day-shift operation.

4. *Preliminary Development Schedule*

In order to meet the EPA's June 1993 implementation deadline for SWTR standards, project construction is targeted to begin in April, 1992. Construction of the WTP would be completed by May, 1993. Testing of the WTP would follow completion of construction.

Chapter III

Description of the Existing Environment

III. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. PHYSICAL SETTING

1. Existing Land Use

The project site is located in the midst of pineapple fields cultivated by Maui Land & Pineapple Company, Inc. The proposed improvements will displace approximately twelve (12) acres of pineapple fields.

2. Climate

Like most areas of Hawaii, West Maui's climate is relatively uniform year-round. The region's tropical latitude, its position relative to storm tracts and the Pacific anticyclone, and the surrounding ocean combine to produce this stable climate. Variations in climate among different regions, then, is largely left to local terrain.

Average temperatures at the project site are approximately two (2) degrees Fahrenheit lower than at Lahaina. Temperatures for the site have been estimated by using the Lahaina Station as a base, and assuming that temperature decreases 3.3 degrees with every 1,000 feet of elevation (Environment Study Corp., 1979). August is historically the warmest month, while January and February are the coolest.

Rainfall at Lahaina is highly seasonal, with most precipitation occurring between October and April when winter storms hit the area. Situated on the leeward side of the West Maui Mountains, this region receives most of its rainfall in late afternoon and early evening, after seabreezes take moisture upslope during the day. Precipitation data collected at the Wahikuli Station (#364) show that on average January is the wettest month, with 3.31 inches of precipitation, while June is the driest, with just 0.25 inches. The average annual total is 18.5 inches.

The winds in the region area are also seasonal. The northeasterly tradewind occurs ninety (90) percent of the time during the summer, and just fifty (50) percent of the time in the winter. Wind patterns also vary on a daily basis, with tradewinds generally being stronger in the afternoon. During the day, winds blow onshore toward the warmer land mass. In the evening, the reverse occurs, as breezes blow toward the relatively warm ocean.

3. *Topography and Soils*

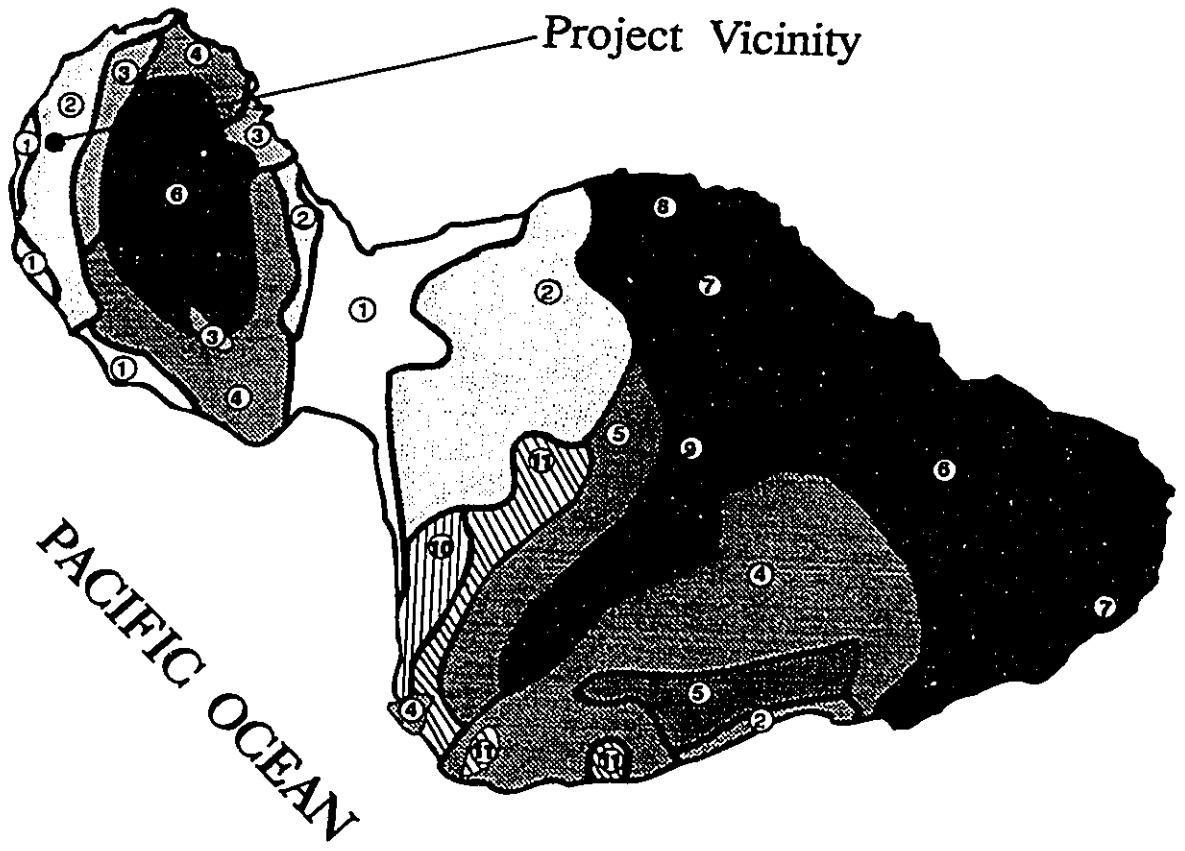
The proposed site is situated on moderately sloping lands at approximately 700-feet elevation. The Mahinahina Gulch runs in an east to west direction, adjacent to the site proper. With the exception of drainage gulches which traverse the pineapple fields, the cultivated lands are generally uniformly sloping in an east to west direction. Slopes in the vicinity of the project site average approximately eight (8) percent.

At a regional scale, the topography of West Maui ranges from the gently sloping coastal areas to steep ridges and large amphitheater valleys. The maximum elevation of the West Maui Mountains is 5,788 feet at Puu Kukui. From the summit, streams flow in a radial pattern, indicating that the lava surface of the volcano set the original stream course.

Underlying the proposed site and surrounding lands is the Waiakoa-Keahua-Molokai soil association. See Figure 8. The soils belonging to this association are well-drained, moderately fine textured and are located on low uplands. They were formed in material weathered from basic igneous rocks and make up roughly fifteen (15) percent of the Island.

LEGEND

- ① Pulehu-Ewa-Jaucas association
- ② Waiakoa-Keahua-Molokai association
- ③ Honolua-Olelo association
- ④ Rock land-Rough mountainous land association
- ⑤ Puu Pa-Kula-Pane association
- ⑥ Hydrandepts-Tropaquods association
- ⑦ Hana-Makaalae-Kailua association
- ⑧ Pauwela-Haiku association
- ⑨ Laumaia-Kaipoipoi-Olinda association
- ⑩ Keawakapu-Makena association
- ⑪ Kamaole-Oanapuka association



Map Source: USDA Soil Conservation Service

Figure 8 Mahinahina Water Treatment Plant
Soil Association Map

Prepared for: County of Maui, Departme

Michael T. Munekiyo Consulting, Inc.
iates, Inc.

The soil types at the proposed project site consists of Kahana Silty Clay (KbB and KbC). See Figure 9. These Kahana Series soils consist of well-drained soils located on gentle to moderately steep slopes (U.S. Dept. of Agriculture Soil Conservation Service, 1972).

Lands underlying the project site are designated "A" lands by the University of Hawaii Land Study Bureau. This classification system rates lands on a scale of "A" to "E", reflecting land productivity characteristics. Lands designated "A" are considered to be of highest productivity, with "E" rated lands ranked lowest.

4. ***Flood and Tsunami Hazard***

The project site lies in an area of minimal flood and tsunami hazard as determined by the Flood Insurance Rate Map for this region. In particular, the site is located along the foothills of the West Maui Mountains, well beyond the coastal tsunami inundation areas. Moreover, the elevation and local terrain of the site provide for adequate drainage to preclude flooding from storm runoff.

5. ***Geology***

The Lahaina District lies on the west side of a dome-shaped volcano referred to as the West Maui Mountains. The dome has been reduced by erosion -- from a summit altitude estimated to have been 7,000 feet -- to 5,788 feet at Puu Kukui.

The volcanic dome of the West Maui Mountains include several long, narrow valleys created by stream erosion. The sloping plains between valleys are eroded volcanic remnants which form valuable agricultural lands. Along the coastline and at the foot of the valley are relatively level lands created by sediment deposition.

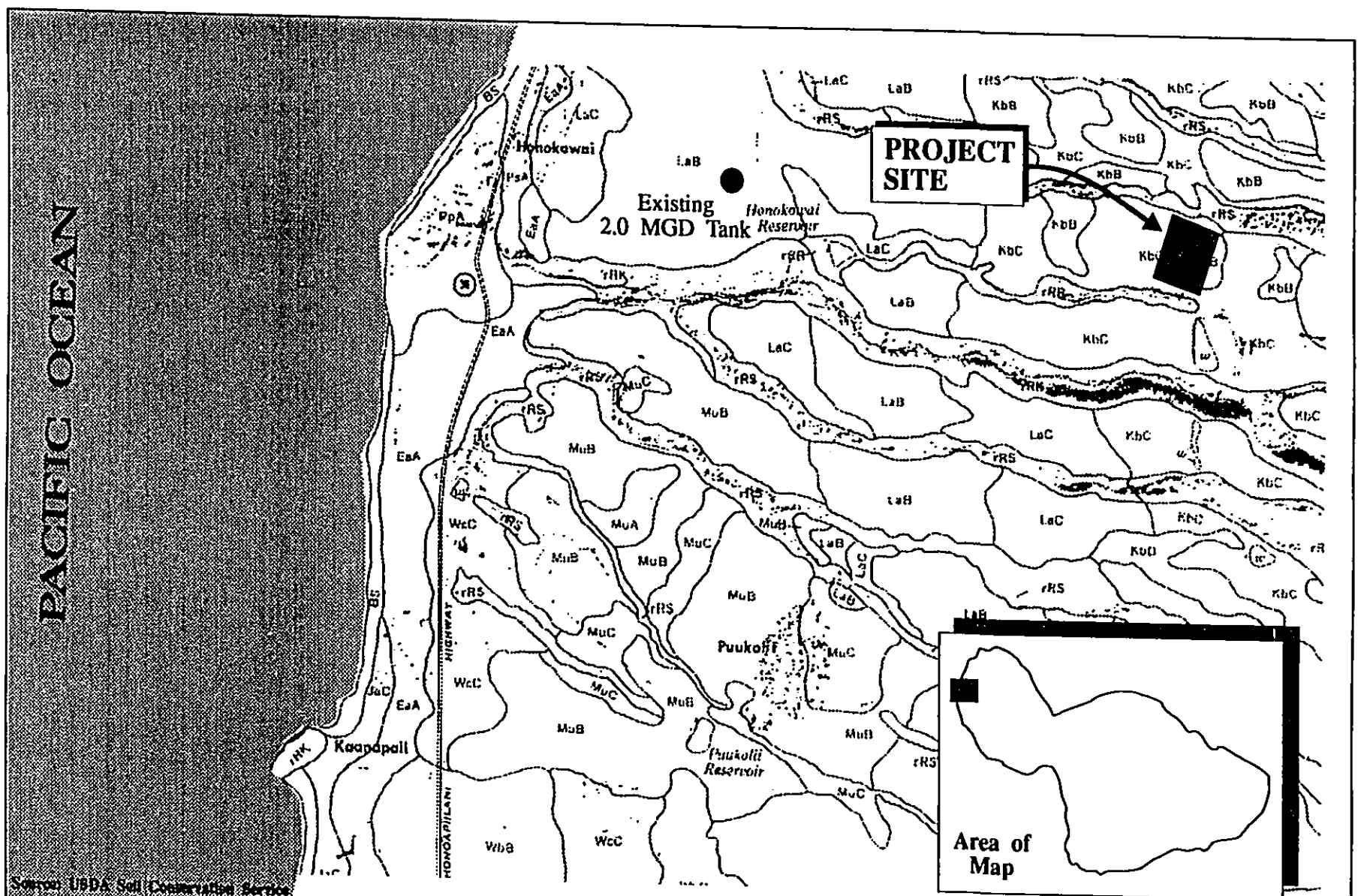


Figure 9

Mahinahina Water Treatment Plant
Soil Classifications at Project Site

Michael T. Munekiyo Consulting, Inc.
Prepared for: County of Maui, Department of Water Supply

Volcanic formations in the West Maui area are classified into three (3) stratigraphic units known as the Wailuku Basalt, Honolua Volcanics, and Lahaina Volcanics (Austin, Tsutsumi & Associates, 1991).

The bulk of the exposed lava belong to the Wailuku Basalt. Principal aquifers are located within the Wailuku Basalts because of the rock type's high permeability and numerous dikes. These aquifers are the source of domestic water for the West Maui area. Of the three stratigraphic units, the Wailuku Basalt is the oldest, with an estimated dated age of 1.58 to 1.97 million years.

Following a short period of volcanic inactivity, lava of the Honolua Volcanics emerged to form a 50 to 500 feet thick stratigraphic layer over most of the Wailuku dome. The massive rock formations of the Honolua series are much less permeable and are generally too discontinuous to function as aquifers. Age data places the occurrence of the Honolua Volcanics at about 1.5 million years ago. Following the period of the Honolua Volcanics, small periodic eruptions occurred, building isolated cones and forming short flows along the western shoreline. These formations are attributed to the Lahaina Volcanics whose distribution is limited to the Lahaina vicinity. The deposits of the Lahaina series are not extensive enough to be used as water-bearing formations.

In addition to the three stratigraphic units described above, the region includes sedimentary alluvial deposits that cover the low coastal plain from Ukumehame to Lahaina Town. These sediments form a caprock which confine the basal aquifer underlying the coastal plains.

6. Hydrology

a. Groundwater

The hydrologic region of West Maui is referred to as the Lahaina Sector, which encompasses six (6) aquifer systems (Mink, 1990). See Table 2. The Lahaina District includes the region from Honokohau Valley in the north to Ukumehame Valley in the south. Each of the aquifer systems encompass coastal basal and high-level dike-impounded waters.

Most of the shafts and drilled wells of the region are located on or near the coastal plain, tapping the underlying basal lens. The basal lens in the Lahaina Sector is not very thick due to the lack of an effective confining caprock. Maximum groundwater heights, in fact, are around five (5) feet above mean sea level. These Maui and Lanai type shafts were designed to keep chloride contents at reasonable levels by just skimming the surface of the lens.

Dike impounded aquifers can be found approximately 18,000 feet inland from shore in the Lahaina region. Dike-confined waters in the Lahaina Sector are tapped by tunnels in many of the larger valleys. Generally, the aquifers connect, though the connection may be very weak in some cases. Much water is stored in these compartments, and excess volumes escape either to other dike compartments or to streams.

Minor perched aquifers also exist in the region in the Honolua Volcanics. These waters seep into streams, contributing, for example, to the perennial flow of Honokohau Stream.

Table 2

WEST MAUI AQUIFER SYSTEMS	
Aquifer System	Area (square mile)
Honokohau	13.23
Honolua	17.61
Honokowai	22.67
Launiupoko	18.29
Olowalu	6.81
Ukumehame	10.61
Source: Mink, John, 1990.	

In 1987, 39 MGD of groundwater was available while 27.9 MGD were in use. By 2010, projections indicate a slight decrease to 25.7 MGD of groundwater in use due to reduction in use by Pioneer Mill Company, Ltd. (Maui County Departments of Planning and Water Supply, 1990).

b. ***Surface Water***

In 1987, all 56.2 MGD of available surface water in the Lahaina District was in use. Pioneer Mill was by far the heaviest user, consuming 45.2 MGD. Other users are Maui Pineapple Co., Ltd. (4.5 MGD), Kapalua (3.6 MGD), Department of Water Supply (2.5 MGD), and other domestic users (0.4 MGD) (Maui County Departments of Planning and Water Supply, 1990).

Surface water in the region originates in the West Maui Mountains. Because of the region's location on the leeward side of the mountains, streamflows are mostly confined to the higher elevations.

The Honokohau Ditch is the area's primary surface water source averaging 25 MGD.

Stream diversions make up the largest source of water supply in the region. Unlike ten (10) years ago, groundwater is used only sparingly for irrigation, though it still is the source of most domestic supply. Increasingly, however, surface water from Honokohau Ditch is being diverted for potable use.

Other surface water sources are the Honolua Stream (2.8 MGD) and Kanaha Stream (2.5 MGD).

As previously noted, the proposed project will address water quality problems associated with surface water domestic sources. Because of periods of heavy rainfall, turbidity is a primary concern in West Maui. Data from 1978 and 1979 show that Honokohau Stream had an average turbidity of 2.3 Nephelometric Turbidity Units (NTU) with peaks up to 40 NTU. In recent years, turbidities over 100 NTU have been documented (Camp Dresser & McKee, Inc., 1990). State Department of Health standards set the mean tolerance level for turbidity at 5.0 NTU during the west season, and at 2.0 NTU during the dry season (Department of Health, 1988).

The color of Honokohau waters was also tested. Of the eighteen (18) samples from Honokohau, six (6) were in excess of the Maximum Contaminant Level (MCL) of 15 color units (CU). Total dissolved solids at Honokohau were in the 13 to 51 MG/L range.

Among inorganic contaminants, cadium and lead have been recorded in excess of MCL at Honokohau. Biological data show an average of 136 total coliform/100 ML and 44.5 fecal coliform/100 ML at Honokohau.

7. Flora and Fauna

With the exception of the nearby Mahinahina Gulch and the Honokohau Ditch, the project site and surrounding areas are cultivated in pineapple. The Gulch and Ditch corridors include kukui and ironwood trees, along with common shrubs and weeds (e.g., koa-haole) typical of this agricultural area. Given the project site's current agricultural use, the area is not considered significant in terms of its vegetative resources.

The region's wildlife include a host of introduced species, including the Japanese White-eye, Zebra Dove, Spotted Dove, and Common Myna. Other mammals common to this region include rats, mice, and mongoose. The project site is not considered a significant habitat for avifauna or wildlife.

8. Archaeological Resources

The site has been actively cultivated for many years, both for sugar cane and pineapple production. From an archaeological standpoint surface disturbance (e.g., mass grading and continuous plowing) has been extensive, and there are no undisturbed areas remaining within the WTP site and transmission line corridors.

9. Air Quality

There are no point sources of airborne emissions in the immediate vicinity and the air quality at the property is considered good. The parcel is a part

of a larger pineapple agricultural operation with lands to the south of Honokowai Stream, utilized for sugar cane cultivation by Pioneer Mill. As such, the area is subject to dust and equipment emissions associated with agricultural activities. The burning of sugar cane in the nearby sugar fields may create temporary increases in airborne particulates, although this occurrence is intermittent and of temporary duration.

10. Noise Characteristics

The parcel is surrounded by agricultural lands, with Honoapiilani Highway and the Kapalua-West Maui Airport located 1.7 miles west and 1.0 mile northwest of the site, respectively. Background noises are, therefore, attributed to natural (e.g., wind) conditions. The operation of agricultural equipment, such as pineapple harvesters, sprayers and trucks, also contribute to noise levels on an intermittent and temporary basis. Noise generated by agricultural operations are considered normal and acceptable for such activities and do not adversely affect surrounding lands. In addition, arrival and departure flight tracks for the Kapalua-West Maui Airport lie to the west of the project site, placing the project area well beyond the limits of airport noise exposure.

B. COMMUNITY SETTING

1. Land Use and Community Character

The vast majority of lands in West Maui are either State designated "Conservation" or "Agricultural". Generally, "Conservation" lands occupy the higher elevations, while the "Agricultural" district spans the middle ground. Major exceptions to this trend are the Honolua Stream and Pohakupule Gulch areas where the "Conservation" district extends down to sea level.

"Urban" designated lands, then, are left to occupy the lower elevations along the coast. The communities of Kahana-Napili-Kapalua and Kaanapali contain Community Plan designations reflective of their resort nature. Lahaina, meanwhile, is more typical of a residential community. Single family, business, light industrial, and agricultural zones prevail in Lahaina.

Mahinahina is located approximately six (6) miles north of Lahaina Town between Kaanapali and Kahana. In a regional context, Mahinahina is part of the Lahaina-West Maui urban/agricultural fabric. The urbanized portions of the Mahinahina-Honokowai areas, makai of the Honoapiilani Highway, are typified by condominium apartments interspersed with single-family residential neighborhoods.

A key feature of the region is the town of Lahaina, which is designated a National Historic District as the one-time whaling capital of Hawaii. Today, it is the visitor industry that defines Lahaina Town and other coastal resort communities of West Maui.

Part of West Maui's attraction can be attributed to its year-round dry and warm climate, complemented by many white-sand beaches and scenic landscape. Most all of the visitor accommodations are located in Lahaina and the resort communities of Kaanapali, Kahana, Napili, and Kapalua. The privately owned and operated Kapalua-West Maui Airport at Mahinahina conveniently links the region to Oahu and other neighbor islands.

Sugar cane and pineapple fields occupy much of the land in the area. Pioneer Mill, a vital part of the region's economy, is the State's smallest sugar plantation with approximately 6,800 acres in cultivation. Maui Land

and Pineapple Company's fields sprawl along the slopes of the West Maui Mountains north of Lahaina.

2. *Population*

Just as the visitor count has grown, the resident population of the region surrounding the project site has increased dramatically in the last two decades. Population gains were especially pronounced in the 1970s as the rapidly developing visitor industry attracted many new residents. The current resident population of the Lahaina District is estimated at 14,620. The current de facto population (resident plus non-resident) is estimated at 23,190 (Austin, Tsutsumi & Associates, 1991). The projected resident and de facto populations for the years 2000 and 2010 are 22,800 and 38,040, respectively.

Growth patterns at the County level exhibit a similar pattern. The County's 1980 resident population of 71,000 has since grown to the present 100,000. The estimated County population for the year 2010 is 145,200 (DBED, 1989).

3. *Economy*

The economy of Maui is heavily dependent upon the visitor industry. In 1989, for example, total visitor expenditures equalled $2.3 billion. The dependency on the visitor industry is especially evident in West Maui, which has emerged as one of the State's major resort destination areas. Hotels in West Maui typically boast higher occupancy rates than the rest of the Island, with Kaanapali hotels doing especially well.

Agriculture is another vital component of the West Maui economy. Sugar operations are handled by the Pioneer Mill Co., Ltd. In 1988, it produced

47,500 tons (16.2 percent of Maui's total) and employed 324 people. Given the declining fiscal viability of sugar cane production, Pioneer Mill is also testing other crops to supplement its sugar production, including cocoa and coffee (Maui News Supplement, 1990).

Maui Land and Pineapple Company's fields remain an important component of the region's agricultural base. In 1988, Maui Land and Pineapple Company entered the fresh fruit market, air shipping pineapples to the mainland in an effort to diversify its operations.

The availability of jobs, primarily in the service sector, has resulted in a labor shortage on Maui. During the first quarter of 1991, the County was fully employed (First Hawaiian Bank Research Dept., 1991). The opening of several new, large hotels is expected to prolong the labor supply imbalance.

4. Housing

As with other regions of the Island, lack of affordable housing is considered a major issue in West Maui. The current unmet Island demand is estimated at 7,500 units. The development of the 3,900 unit Lahaina Master Planned Project will relieve the housing market to some extent, though demand will still not be satisfied (PBR Hawaii, 1990).

5. Police and Fire Protection

The project site is within the Lahaina Police Station service area, which services all of the Lahaina district. The Lahaina Station is located in the Lahaina Civic Center complex at Wahikuli, and was built in the early 1970s. See Figure 10. The Lahaina Patrol includes 47 full-time personnel, including one (1) captain, one (1) lieutenant, police officers, public safety

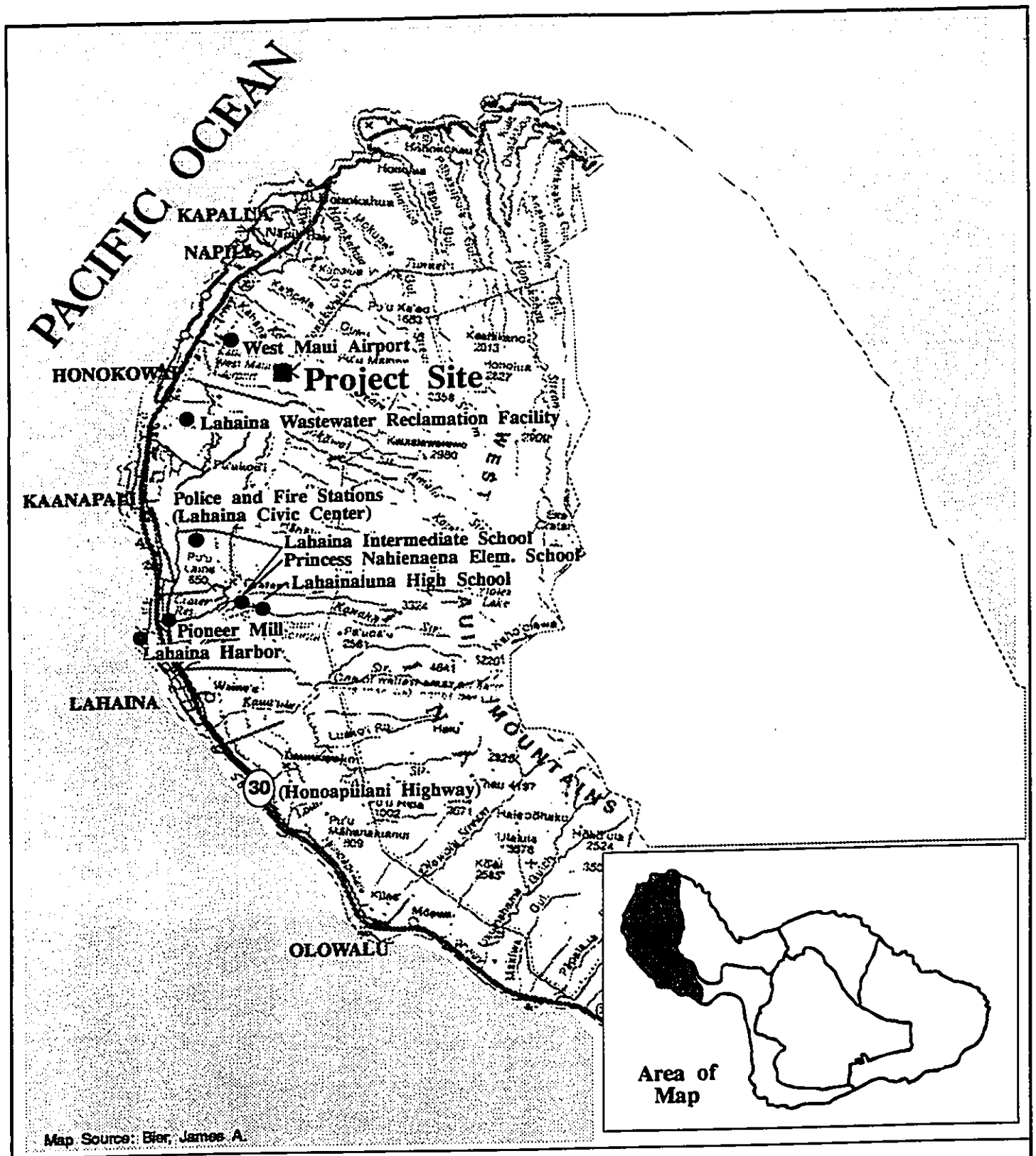


Figure 10 Mahinahina Water Treatment Plant
Community Facilities Map

0 1 2 4 Miles
Approximate Scale

Michael T. Munekiyo Consulting, Inc.
Prepared for: County of Maui, Department of Water Supply

aides, and administrative support staff (County of Maui, 1990).

Fire prevention, suppression and protection services for the Lahaina District is provided by the Lahaina Fire Station, also located in the Lahaina Civic Center. The Station is staffed with nine (9) firefighters per 24-hour shift.

6. Medical Facilities

The only major medical facility on the Island is Maui Memorial Hospital, located approximately twenty (20) miles from Lahaina, midway between Wailuku and Kahului. The 145-bed facility provides general, acute, and emergency care services.

Private medical offices, however, are found in West Maui. For example, regular hours are offered by the Maui Medical Group, Lahaina Physicians, West Maui Healthcare Center, and Kaiser Permanente Lahaina Clinic.

7. Recreational Facilities

West Maui is served by numerous recreational facilities offering diverse opportunities for the region's residents. See Table 3. There are seventeen (17) County parks and three (3) State beach parks in West Maui. Approximately one-third of the County parks are situated along the shoreline and are excellent swimming, diving, and snorkeling areas.

In addition, Kaanapali and Kapalua Resorts operate world-class golf courses which are available for public use.

8. Schools

The State of Hawaii, Department of Education operates four (4) public schools in West Maui. They are (with 1991 projected enrollment in

Table 3

WEST MAUI RECREATIONAL RESOURCES		
State Beaches	**County Beaches**	**Other Facilities**
Papalaua State Wayside Park	Puamana Beach Park, Lahaina	Lahaina Civic Center
Launiupoko State Wayside Park	Lahaina Beach, Lahaina	Mala Boat Ramp
Wahikuli State Wayside Park	Puunoa Beach, Lahaina	Kelawea Park
	Hanakaoo Beach, Kaanapali	Paunau Park
	Kaanapali Beach, Kaanapali	Lahaina Boat Harbor
	Honokowai Beach Park, Honokowai	Lahaina Recreation Center
	Kahana Beach, Kahana	Maluulu O Lele Park
	Keonenui Beach, Alaeloa	
	Alaeloa Beach, Alaeloa	
	Honokeana, Honokeana	
	Napili Beach, Napili	
	Kapalua Beach, Kapalua	
	D.T. Fleming Beach Park, Honokahua	

Source: Helber, Hastert & Kimura, Planners.

parenthesis): Lahainaluna High School (769); Lahaina Intermediate School (517); King Kamehameha Elementary School (691); and Princess Nahienaena Elementary School (401). All of the public schools are located within the Lahaina Town area.

The region is also served by privately operated pre-elementary and elementary schools.

C. INFRASTRUCTURE

1. Roadway System

Honoapiilani Highway (State Highway 30) is the main roadway serving the West Maui region. This highway is the only link between West Maui and the rest of the Island (although an unimproved segment of highway extends around the north coast of the Island to Waihee, providing limited access).

Regionally, Honoapiilani Highway is the main arterial connecting Lahaina, Kaanapali, and Kapalua. The State of Hawaii is proposing a bypass highway to run mauka of the existing Honoapiilani Highway from Launiupoko to Honokowai in an effort to relieve congestion on Honoapiilani Highway.

Access to the project site will be via an existing unpaved agricultural haul road which extends from the project site in an east-west direction toward Honoapiilani Highway. Access to the agricultural haul road is from the Kapalua-West Maui Airport Access Road.

2. Wastewater Systems

The County's wastewater collection and transmission system and the Lahaina Wastewater Reclamation Facility (LWRF) accommodate the region's wastewater needs. The LWRF, located along Honoapiilani Highway just north of Kaanapali Resort, has a design capacity of 6.7 MGD. Currently, usage is at 5.2 MGD. With the proposed 3,900-unit HFDC project in Wahikuli and the proposed Kaanapali North Beach project,

however, plant expansion will be necessary. The County is thus proposing to expand the LWRF to 9.0 MGD capacity.

3. Solid Waste Disposal

With the closing of the Olowalu Landfill, all solid wastes generated in the Lahaina region are transported to the Central Maui Landfill in Puunene. In 1988, West Maui was the source of approximately twenty (20) percent of the volume entering the landfill.

4. Drainage

There are no drainage improvements in the vicinity of the project site. In its current agricultural use, a large proportion of the on-site generated runoff percolates into the ground. See Appendix C, Preliminary Grading and Drainage Report. Rainfall which does not percolate into the ground, sheet-flows into the Mahinahina Gulch, or downslope toward the Honokowai Reservoir. Diversion swales within the pineapple fields ultimately direct these flows to the Mahinahina Gulch.

5. Electrical Service

Electrical service to the WTP will be provided by Maui Electric Company. Existing power lines are located in proximity to the WTP site.

Chapter IV

Potential Impacts and Mitigation Measures

IV. POTENTIAL IMPACTS AND MITIGATION MEASURES

A. IMPACTS TO THE PHYSICAL ENVIRONMENT

1. Topography/Landform

The proposed project will involve the clearing, grubbing and grading of approximately ten (10) acres of land presently being used for pineapple cultivation. Excavation and filling will be required for the construction of the 20 MG presedimentation/equalization reservoir, treatment plant building, transmission lines, and appurtenant improvements. In general, however, finished contours will follow existing grades to minimize earthwork costs and maintain existing drainage patterns which tie into the immediate surrounding lands.

While terrain within the site will be locally modified to meet design requirements for the presedimentation/equalization reservoir, treatment plant and accessory facilities, overall site development will not disturb the smooth and uniform east to west slopes, characteristic of the foothill region of the West Maui Mountains.

2. Drainage and Erosion Control

On-site runoff will be directed to a desilting basin located at the west (makai) end of the WTP site. See Appendix C. Runoff collected in the desilting basin will be released into the Mahinahina Gulch.

Off-site runoff will be diverted around the WTP site. A portion of the off-site flows will be directed to the desilting basin, with remaining flows allowed to follow existing surface drainage patterns.

The proposed grading and drainage scheme for the WTP will result in no adverse impacts to adjacent and downstream properties.

Appropriate temporary and permanent erosion control measures will be utilized during construction to minimize soil erosion from the site. See Appendix D, Erosion Control Plan.

3. *Flora and Fauna*

The entire project site is presently in pineapple cultivation. There are no known rare, endangered or threatened species of flora within or surrounding the project site. As such, the removal of existing vegetation is not considered an adverse impact to this component of the natural environment.

Similarly, there are no known rare, endangered or threatened species of avifauna and wildlife in the project vicinity. The displacement of approximately twelve (12) acres of pineapple fields is not anticipated to adversely impact to the area's fauna and avifauna population.

4. *Air Quality and Noise*

Air quality and noise parameters in the immediate vicinity of the project are anticipated to be affected by short-term construction activities. Earthwork operations, for example, will result in fugitive dust being generated. Similarly, noise will be generated from construction equipment such as bulldozers, loaders, and semi-trailers. Inasmuch as the project site sits in the midst of active agricultural lands, construction impacts are not considered adverse.

On a long-term basis, the project will not generate adverse air quality or noise conditions. Treatment plant operations will not result in the release of noxious gases, particulates or odors.

Offsite noise attributed to the Kapalua-West Maui Airport will not impinge upon the project site. Arrival and departure flight tracks for the Airport are located to the north of the project site (Y. Ebisu and Associates, 1989).

5. ***Scenic and Open Space Resources***

The proposed project will displace approximately twelve (12) acres of land currently in pineapple cultivation. The treatment plant building will measure approximately 30 feet in height, encompassing 8,900 square feet of floor area. The presedimentation/equalization reservoir will be covered with a floating cover which will be maintained at the reservoir's water surface elevation. These facilities will not adversely impact the scenic and visual character of the surrounding open agricultural lands. The project site is located approximately 1.7 miles from the Honoapiilani Highway, and will not be visible from this primary roadway arterial serving the region between Kaanapali and Kapalua. The project site is located mauka of existing urbanized areas and does not encroach into scenic coastal view corridors.

6. ***Archaeological Resources***

The site has been extensively graded to accommodate agricultural uses. The ground at and surrounding the project site has been graded and shaped to implement past furrow irrigation methods (for sugar cane). In addition, plowing and ground preparation during each crop cycle for both sugar cane and pineapple have fully altered the surface character at the site. Accordingly, the project is not anticipated to have adverse impacts to archaeological resources.

B. IMPACTS TO COMMUNITY SETTING

1. Population and Local Economy

The proposed improvements will provide capacity to treat 2.5 MGD of water which will be used for domestic purposes. This treatment capacity represents an increase of 1.0 MGD over the existing withdrawal rate from the Alaeloa Intake which is the source of the Northern Subsystem. This additional source will help meet projected growth in domestic water consumption in the West Maui Region.

In this regard, the proposed improvements will help to preserve the long-term economic vitality of the region by ensuring the integrity of the water delivery system. Additionally, improved drinking water quality resulting from the proposed project will promote the public health and welfare of the residents of the Lahaina district.

2. Agriculture

The proposed project will require the removal of approximately twelve (12) acres of pineapple lands from production. This acreage represents 0.2% of Maui Land & Pineapple's 4,300 acres actively cultivated at the Honolua Plantation. The removal of this productive acreage is not anticipated to adversely impact operational and production characteristics of Maui Land & Pineapple Company, Inc.

3. Public Services

The project will require two (2) full-time staff persons to handle plant operations and maintenance. At this staffing level, the employment-related impacts of the project upon public service needs, such as police and fire protection, medical facilities, recreational facilities and schools, are not considered significant.

C. *IMPACTS TO DWS WATER SYSTEMS*

In assuring that water delivered by the Northern Subsystem complies with the requirements of the SWTR, the proposed WTP will improve the quality of water provided to service area customers. Specifically, the new plant will provide for filtration and disinfection to meet technical criteria for Giardia cysts, viruses, turbidity and bacteria. In addition to improving water quality, the new facilities will improve system efficiencies by providing for the maximum use of the existing 2.0 MG Honokowai Reservoir. Under existing conditions, the Reservoir cannot be filled because of inadequate system pressure. Operationally then, the proposed improvements will result in an increase in storage capacity for the Northern Subsystem.

Over the long-term, the proposed improvements will provide additional source capacity by providing a treatment capacity of 2.5 MGD, an increase of 1.0 MGD over existing withdrawals from the Honokohau Ditch. The increase source will support the long-term economic vitality of the West Maui region.

D. *IMPACTS TO OTHER INFRASTRUCTURE SYSTEMS*

1. *Roadways*

Access to the project site will be via an existing agricultural haul road which is accessed through the Kapalua-West Maui Airport Access Road. The proposed 16-inch treated water transmission main will be located within the agricultural haul road corridor. Accordingly, agricultural vehicles may need to be temporarily diverted to other field roads during the installation of the waterline. The agricultural haul road will continue to operate as an unpaved roadway.

With two (2) employees assigned to the WTP, the proposed project's impacts upon the pubiic roadway system is expected to be negligible.

2. ***Wastewater System***

The WTP will be equipped with restroom facilities for use by DWS maintenance personnel. A septic tank/leaching field system will be provided to receive wastewater from these facilities.

3. ***Solid Waste Disposal***

Dewatered sludge will be generated by the WTP. Based on a conservative raw water turbidity of 5 NTU and an average flow of 2.5 MGD, the annual sludge volume estimated to be generated by the WTP is approximately 74 cubic yards. Disposal of the sludge will be coordinated with the Solid Waste Management Division of the Department of Public Works.

Chapter V

Relationship to Land Use Plans, Policies, and Controls

V. RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

A. STATE LAND USE DISTRICTS

Chapter 205, Hawaii Revised Statutes, relating to the Land Use Commission, establishes the four major land use districts in which all lands in the State are placed -- "Urban", "Rural", "Agricultural", and "Conservation". The subject property is located within the "Agricultural" district. See Figure 11.

Water treatment facilities are not a permitted use within the "Agricultural" district and, as such, the DWS will be required to obtain a Special Use Permit pursuant to Section 15-15-95 of the Hawaii Land Use Commission Rules. The LUC Rules provide that certain "unusual and reasonable" uses may be permitted within the "Agricultural" district. The proposed water treatment plant is consistent with the guidelines for determining an "unusual and reasonable" use as follows:

Guideline: The use shall not be contrary to the objectives sought to be accomplished by Chapters 205 and 205A, HRS, and the rules of the Commission.

Response: The general intent of the State Land Use law is "to preserve, protect and encourage the development of land in the State for those uses to which they are best suited in the interest of the public health and welfare of the State of Hawaii". Furthermore, pursuant to Chapter 205A, HRS, it is an objective of the State Coastal Zone Management Program to "provide public or private facilities and improvements important to the State's economy in suitable locations". As a facility deemed essential to maintaining the public health and welfare of the residents of West Maui, the siting of the proposed improvements is suitable in terms of its relationship to the surrounding environment.

Guideline: The desired use would not adversely affect surrounding property.

Response: The project site is located within a vast expanse of agricultural lands used for pineapple and sugar cultivation. The proposed WTP is compatible with the surrounding agricultural operations.

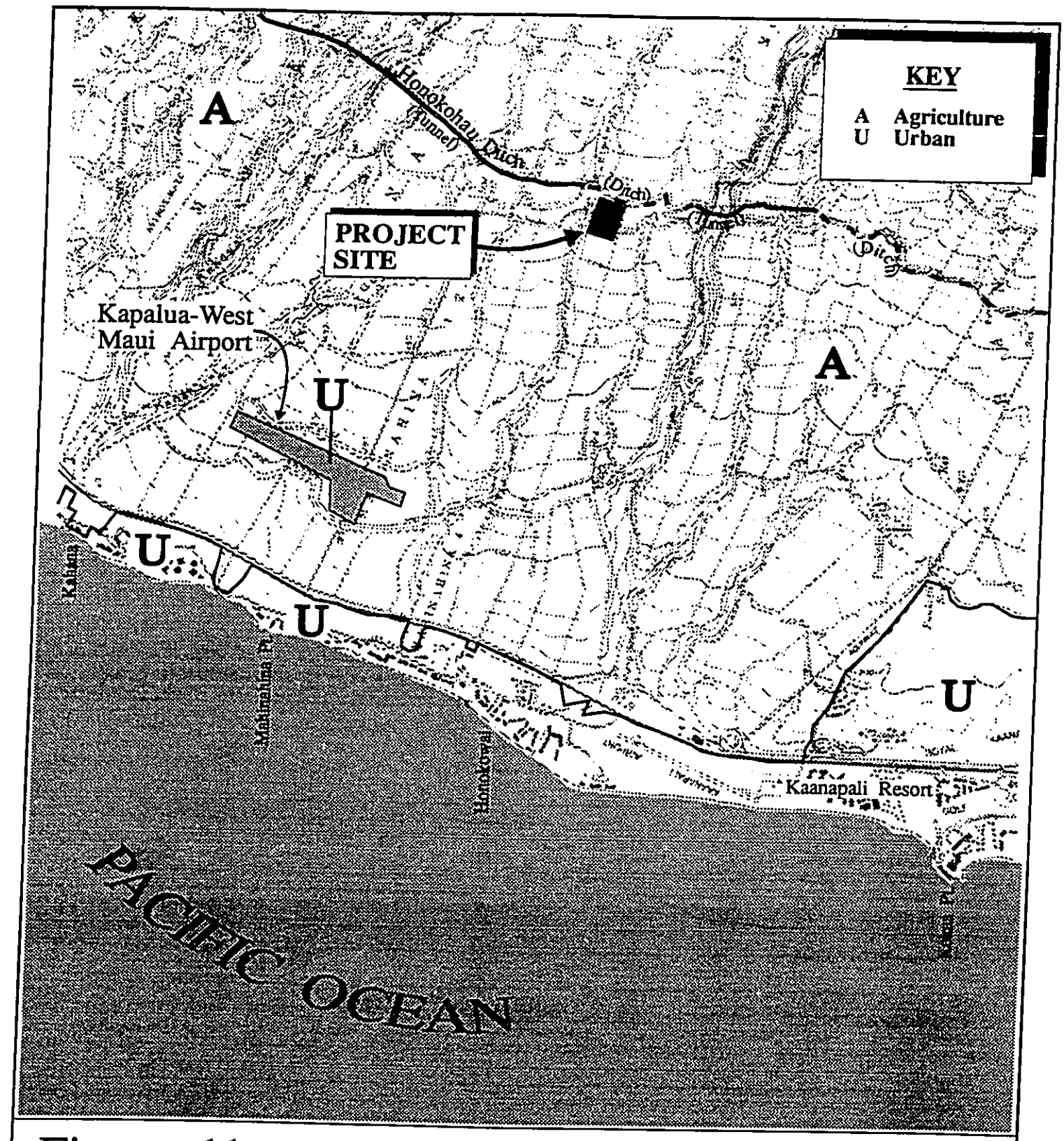


Figure 11 Mahinahina Water Treatment Plant
State Land Use Classification

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Prepared for: County of Maui, Department of Water Supply

Guidelines: The use would not unreasonably burden public agencies to provide roads and streets, sewers, water drainage and school improvements, and police and fire protection.

Response: The proposed water treatment plant will be staffed by two (2) employees. In this regard, the project will not impact public services and infrastructure in the vicinity of the project site.

Guideline: Unusual conditions, trends and needs have arisen since the district boundaries and rules were established.

Response: The SWTR requires the DWS to take appropriate measures to meet new surface water quality standards. The proposed site of the water treatment plant is considered the optimum location from a water system's engineering standpoint. Moreover, the siting of the plant at this location is compatible with the surrounding agricultural use and will not generate adverse environmental impacts.

Guideline: The land upon which the proposed use is sought is unsuited for the uses permitted within the district.

Response: The site selected for the WTP is classified as "A" lands by the University of Hawaii Land Study Bureau. This designation indicates that the project site and the surrounding State "Agricultural" lands possess a high agricultural productivity value. However, the removal of twelve (12) acres from pineapple cultivation is not anticipated to impact the viability of Maui Land & Pineapple Company's pineapple operations.

The Special Use Permit request will be reviewed and acted upon by the Maui Planning Commission.

B. *HAWAII STATE PLAN*

The Hawaii State Plan (HRS, Chapter 226) is a guide for the long-term development of the State. It identifies goals, objectives, policies, and priorities which have been established as a basis for making decisions affecting the quality of life in Hawaii. The proposed treatment plant is consistent with and supports the following Hawaii State Plan objectives and policies (HRS, 1989 Supplement):

a. ***Facility systems -- water (Section 226-16)***

Objective:
Planning for the state's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capabilities.

Policies:
(i) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.

(ii) Support water supply services to areas experiencing critical water problems.

b. ***Socio-cultural advancement -- health (Section 226-20)***

Objective:
Planning for the state's socio-cultural advancement with regard to health shall be directed towards achievement of the following objectives: (1) Fulfillment of basic individual health needs of the general public, and (2) Maintenance of sanitary and environmentally healthful conditions in Hawaii's communities.

Policies:
(i) Provide services and activities that ensure sanitary conditions.

C. WATER RESOURCES FUNCTIONAL PLAN

The Water Resources Functional Plan is one of nine (9) functional plans intended to elaborate on the Hawaii State Plan (HRS, Chapter 226), providing the link between the goals of the Plan and actual implementation. This functional plan is designed to provide guidelines for managing Hawaii's water resources to meet present and future needs and to improve the quality of life.

The proposed treatment plant supports and is consistent with the following Water Resources Functional Plan objectives and policies:

a. ***Municipal water***

Objective: Improve drinking water quality

Policies: (i) Ensure a satisfactory level of drinking water quality throughout the State.

(ii) Adopt and enforce drinking water standards for all domestic water systems, public and private.

The recommended actions regarding this objective include establishing State drinking water standards "no less stringent than those mandated under the Federal Safe Drinking Water Act", with provision for adequate enforcement.

D. *GENERAL PLAN OF THE COUNTY OF MAUI*

The General Plan of the County of Maui (1990 Update) provides long-term goals, objectives and policies directed toward the betterment of living conditions in the County. Addressed are social, environmental, and economic issues which influence both the quantity and quality of growth in Maui County.

Implementation of the General Plan would be facilitated by the proposed water treatment plant. The following General Plan objective and policy are addressed by this project:

Objective:
To provide an adequate supply of domestic and irrigation water to meet the needs of Maui County's residents.

Policy:
Meet or exceed Federal quality standards in our potable water.

E. *LAHAINA COMMUNITY PLAN*

Nine (9) community plan regions have been established in Maui County. Each region's growth and development is guided by a Community Plan, which contain objectives and policies drafted in accordance with the County General Plan. The purpose of the Community Plan is to outline a relatively detailed agenda for carrying out these objectives.

The proposed project falls within the jurisdiction of the Lahaina Community Plan, adopted in 1983. The proposed project would facilitate implementation of the Lahaina Community Plan by addressing the objective to "implement and expand the West Maui water development program projected by the County to meet future residential expansion needs and establish water treatment facilities where necessary...."

Maps are included within each Community Plan in order to capture spatially the intent of the plan. The project site is designated "Agriculture" by the Lahaina Community Plan Land Use map. See Figure 12.

F. *COUNTY WATER USE AND DEVELOPMENT PLAN*

The Maui County Water Use and Development Plan consists of a technical report and an executive summary. The Plan is based on the County's nine (9) Community Plans, and is to be used for guiding future land use planning, water source development, resource protection, and water quality goals (Department of Planning and Department of Water Supply, 1990).

Insofar as the proposed project's intent is to meet the new water quality standards established by the Federal government, the project is consistent with the Water Use and Development Plan.

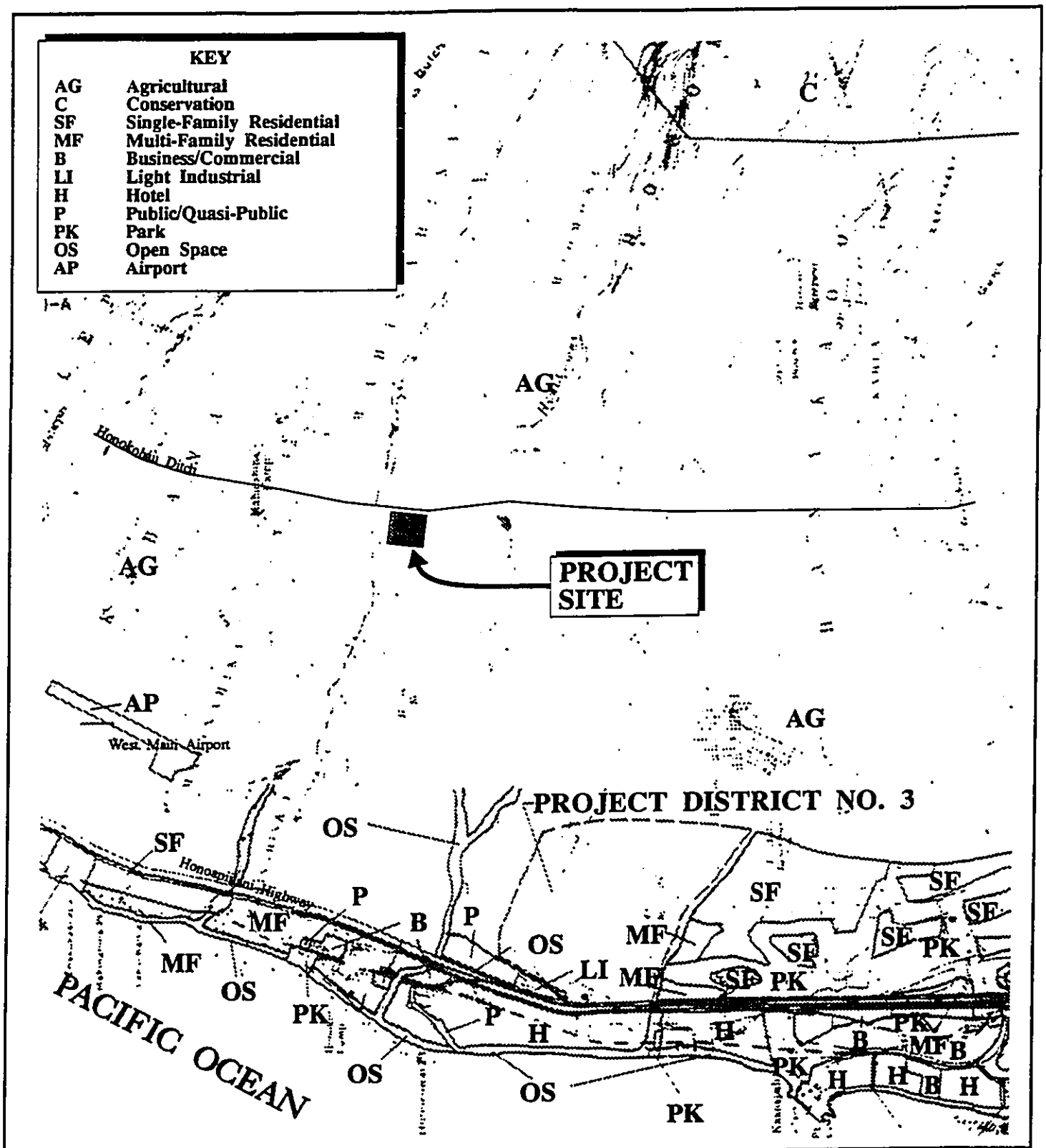

Figure 12 Mahinahina Water Treatment Plant
Community Plan Land Use Designations

0 1000 4000
Feet
2000

Michael T. Munekiyo Consulting, Inc.

Prepared for: County of Maui, Department of Water Supply

G. *COASTAL ZONE MANAGEMENT (CZM) PROGRAM*

The Coastal Zone Management Program (HRS, Chapter 205A) is a comprehensive statement describing the objectives and policies for regulating public and private uses in the coastal zone management area. The CZM area is defined as "the waters from the shoreline to the seaward limit of the state's jurisdiction and all land areas excluding those lands designated as state forest reserves" (HRS Supp., Section 205A-1). The Hawaii CZM program is approved by the Federal government pursuant to Public Law No. 92-583.

The objectives of the Hawaii CZM program are as follows:

A. Provide coastal recreational opportunities accessible to the public;

B. Protect, preserve, and where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture;

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

D. Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems;

E. Provide public or private facilities and improvements important to the state's economy in suitable locations;

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

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

The proposed WTP is in keeping with the foregoing objectives.

The County of Maui's Special Management Area (SMA) permit procedures have been established within the framework of the CZM program. The subject parcel is not within the County SMA boundaries.

Chapter VI

Findings and Conclusion

VI. FINDINGS AND CONCLUSION

The proposed WTP is intended to address water treatment requirements set forth by the EPA's Surface Water Treatment Rule. The benefits derived from this project are significant in terms of the public health and welfare, as treated water provided by the facility will meet the highest standards of water quality for surface source domestic consumption.

The proposed project will involve earthwork, transmission line, and building construction activities. In the short-term, these activities may create temporary nuisances normally associated with construction activities. However, in the context of the surrounding agricultural land uses, the impacts of construction are not considered significant.

From a long-term perspective, the use of the site for the proposed water treatment facilities is not anticipated to result in adverse environmental impacts. There are no surface archaeological features or rare/threatened species of fauna and flora at the site and the replacement of existing pineapple lands with the WTP will not affect these environmental parameters. Ambient air and noise characteristics will not be altered as a result of the proposed WTP.

The removal of twelve (12) acres of pineapple lands will not impact the operational characteristics of Maui Land & Pineapple Company's pineapple growing activities.

The proposed WTP will be fully automated and will be staffed by two (2) full-time employees. In this regard, the project is not considered significant in terms of its impacts to public services and other infrastructure systems.

In light of the foregoing findings, it is concluded that the proposed action will not result in any significant impacts.

Chapter VII

Agencies Contacted in the Preparation of the Environmental Assessment

VII. AGENCIES CONTACTED IN THE PREPARATION OF THE ENVIRONMENTAL ASSESSMENT

The following agencies were contacted during the preparation of the Environmental Assessment:

1. U.S. Department of Agriculture
   Soil Conservation Service
2. U.S. Army Corps of Engineers
3. U.S. Department of the Interior
   Water Resources Division
4. State of Hawaii
   Department of Accounting and General Services
5. State of Hawaii
   Department of Agriculture
6. State of Hawaii
   Department of Health
7. State of Hawaii
   Department of Land and Natural Resources
8. State of Hawaii
   Office of Environmental Quality Control
9. University of Hawaii
   Water Resources Research Center
10. County of Maui
    Department of Public Works
11. County of Maui
    Department of Planning
12. Maui Electric Company, Ltd.
13. Maui Land & Pineapple Co.

14. Pioneer Mill Company

15. West Maui Taxpayers Association

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Appendices

Appendix A

Mahinahina Water Treatment Plant
Preliminary Engineering Report

AUSTIN, TSUTSUMI & ASSOCIATES, INC
CIVIL ENGINEERS • SURVEYORS

#M-90-507

November 27, 1991

MAHINAHINA WATER TREATMENT PLANT

The objective of this project is to construct a new Mahinahina Water Treatment Plant (M-WTP) to treat the water from the Honokohau Ditch System for potable purposes. Treatment must conform to the State's new surface water treatment rule to be enforced in June of 1993.

The Honokohau Ditch System conveys surface water from the Honokohau Stream Intake, at elevation 870 feet, to an irrigation reservoir in Upper Lahaina. The system, some 12 miles long, consists of tunnels, siphons across narrow valleys and open ditches. The system is fed by three intakes: two intakes in the Honokohau Valley and the other in the Honolua Valley. The tunnel section of the system begins at the Honokohau Intake and ends at the tunnel/ditch interface in Mahinahina. The proposed intake for the M-WTP would be at this interface, thereby minimizing surface intrusion along any open channel way.

The Honokohau Ditch System is owned and operated by Maui Pineapple Company, Ltd. (MPCo). MPCo and Kapalua Land Company, Ltd. are the two major subsidiaries of Maui Land and Pineapple Company, Inc. (MLPCo). Users of water from this ditch system, under agreement with MLPCo, include MPCo, Kapalua Water Company, Ltd., Kapalua Land Company, Ltd., County of Maui, a private hydrosystem and Pioneer Mill Company. The County has an agreement with MLPCo to divert an average flow of 2.5 million gallons per day (MGD) from the Honokohau Ditch.

The proposed M-WTP will be located below the Honokohau Tunnel/Ditch Interface in upper Mahinahina. A new intake structure, at approximate elevation 715 feet, will tap

into the existing ditch, and a new water line installed to convey raw water to the proposed 20 million gallon (MG) presedimentation/equalization (P/E) reservoir for the M-WTP.

The initial 900± lineal feet (l.f.) of this raw water line - from the intake to the southeast corner of the P/E reservoir - will be 36 inches in diameter. This large pipe size is required for future incorporation of the full capacity of the existing 25 MG Amfac Reservoir into the system for additional raw water storage. The differential head between the intake and the desired reservoir high water level in the Amfac Reservoir is less than two feet. Therefore, a pipe size smaller than 36 inches would not allow for conveyance of a reasonable flow rate, due to higher frictional losses within smaller pipes. A future additional waterline would convey water from the Amfac Reservoir to the M-WTP. (Refer to Exhibit 1 for Project Site Plan.)

The reason for raw water storage within the initially proposed 20 MG P/E reservoir - and in the future, within the existing 25 MG Amfac Reservoir - is to assure an adequate flow to the M-WTP during drought conditions. This flow may be less than the design average capacity of the M-WTP, depending on the severity of the drought and the volume of raw water storage capacity available. The large volume of stored water within the reservoirs would be gradually depleted until such time that the inflow to the reservoirs from the ditch source consistently exceeds the outflow from the reservoir to the M-WTP.

Another important function of the P/E reservoir is to remove silt, by gravity settlement within the reservoir, to optimize the treatment efficiency of the M-WTP and, resultantly, meet turbidity level requirements for the finished water. This capability is especially important during the rainy season when the turbidity level of the ditch water is known to increase by over a hundred-fold over levels experienced during the dry season.

The P/E reservoir will be covered, which provides for the following benefits:

1. Prevents algae growth within the stored water and, consequently, minimizes trihalomethane formation upon chlorination;

2. Prevents inconsistent pH levels of the stored water;

3. Protects the stored water from pesticide aerosol contamination; and

4. Protects the reservoir lining from degradation.

A floating cover of Hypalon - which will be the same material used for the bottom and wall lining for the earth reservoir - would be installed.

The P/E reservoir will have a bottom elevation of 680.0 feet and an overflow elevation of 703.0 feet. The 15-foot wide peripheral road will be at elevation 706.0 feet, providing for 3 feet of free board. A spillway for the P/E reservoir will allow for emergency overflow into the adjacent Mahinahina Gulch. The P/E reservoir washout pipeline, for removal of settled silt, will be directed to a stormwater desilting basin located along the western boundary of the M-WTP site.

The P/E reservoir will be contiguous with the M-WTP. The total fenced area will be approximately 12 acres, with the P/E reservoir and M-WTP encompassing about 5 and 7 acres, respectively. (Refer to Exhibit 2 for M-WTP and P/E Reservoir Site Plan.)

The M-WTP will be a "custom-built" direct filtration plant. The basic components will be a two-story concrete masonry unit Operations and Chemical (O/C) Building, a filters/flocculation structure, recovery ponds, a 2.0 MG clearwell and a septic tank/leaching field. The filters/flocculation structure will also include the flash/rapid mixing basin. An area for future sedimentation basins will also be provided. (Refer to Exhibit 3 for Process Flow Diagram and Exhibit 4 for Hydraulic Profile.)

The site will be landscaped for erosion control. Storm water runoff, which currently sheet flows across the site, will be diverted around the site to the bottom corners of the M-WTP. The runoff will then be diverted to a desilting basin prior to discharging into Mahinahina Gulch.

The design average capacity of the M-WTP will be 2.5 MGD. The entire volume of treated water will be conveyed to the County's existing 2.0 MG Honokowai Reservoir.

The O/C Building will house the chlorinator/ammoniator units, the control room, chemical facilities, laboratory, and the administrative office area. The two-story building will

have a first floor finish elevation of 665.5 feet and a second floor elevation of 676.2 feet. The O/C building will be approximately 30 feet high, with about 8,900 square feet of total floor area. A standby generator system will be installed to provide standby power for the M-WTP. (Refer to Exhibits 5 through 10 for floor plans, sections and elevations of the O/C Building.)

The recovery ponds will be a triple cell system with common walls. These ponds will receive backwash water from the filters and allow for separation of the settleable solids (sludge) from the liquid portion (decant) under quiescent conditions. The triple cell concept is to allow for dewatering of the sludge within the inactive cells by evaporation. The decant will be pumped back to the P/E reservoir for recycling through the treatment process. The dewatered sludge would be hauled to a sanitary landfill for disposal.

The septic tank/leaching field system will receive wastewater from the restroom, shower, laboratory and washdown facilities within the O/C Building. It is anticipated that the wastewater flow will be less than 200 gallons per day.

The M-WTP will be fully automated. However, personnel will be present at the M-WTP based on a 40-hour week day-shift operation schedule.

The 2.0 MG clearwell will serve as a disinfectant contact chamber in addition to its function of finished water storage. The finished water will be conveyed from the clearwell to the existing 2.0 MG Honokowai Reservoir via approximately 6,800 feet of pipeline. This waterline would traverse the main agricultural haul road, which would also serve as the access road to the M-WTP. This existing road would not be improved.

A portion of the finished water will be pumped from the clearwell to the backwash tank with an overflow elevation of 690.3 feet. Water from this tank will flow to the filters/flocculation structure for backwashing of the filter media.

The estimated mid-1992 construction cost for the proposed facilities within the fenced site of the M-WTP is 12.4 million. (Refer to Table 1 for cost itemization.) The cost for

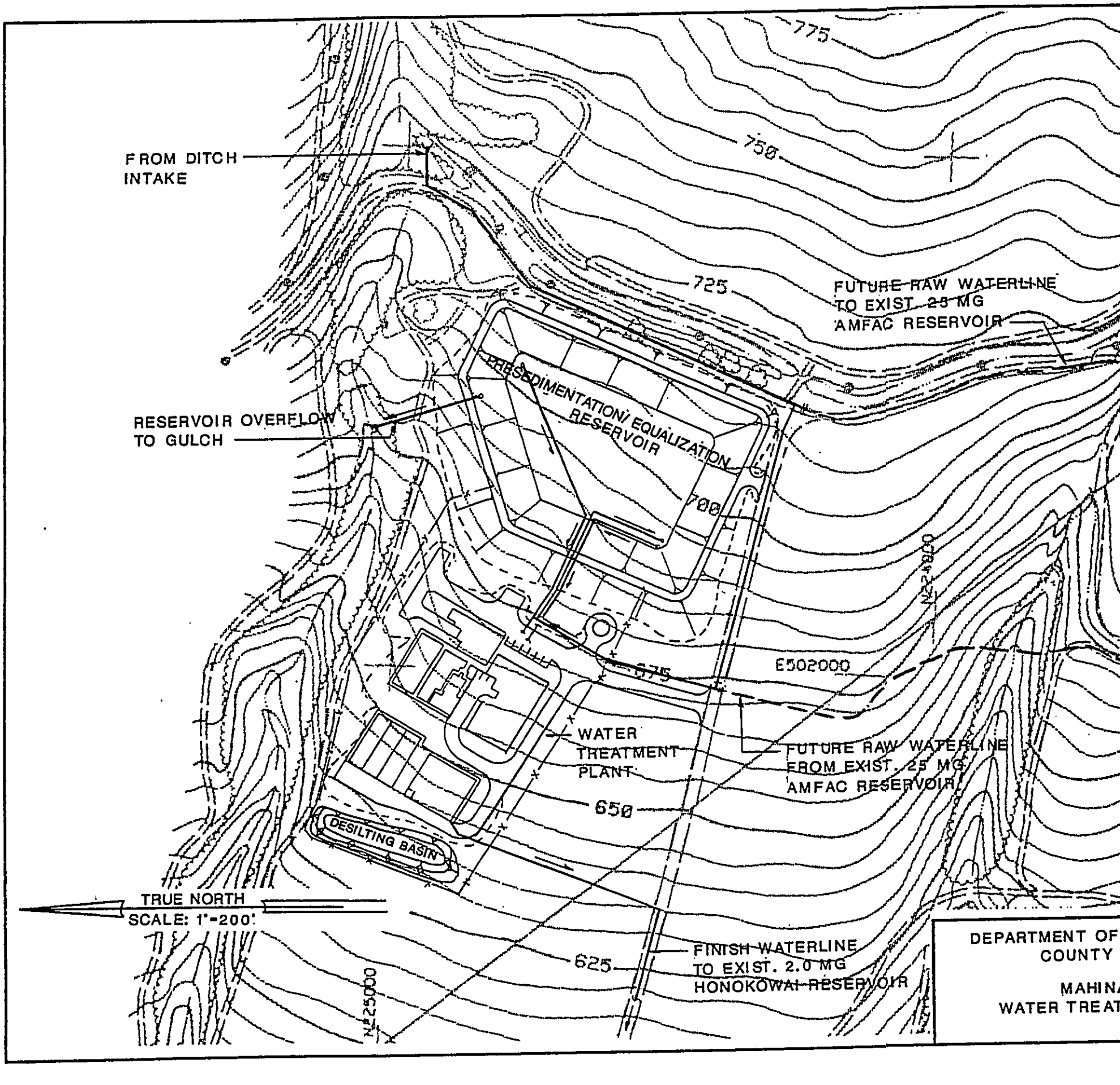
pipelines outside of the fenced site (i.e., from ditch to M-WTP and from M-WTP to Honokowai Reservoir) and land acquisition are not included in this cost.

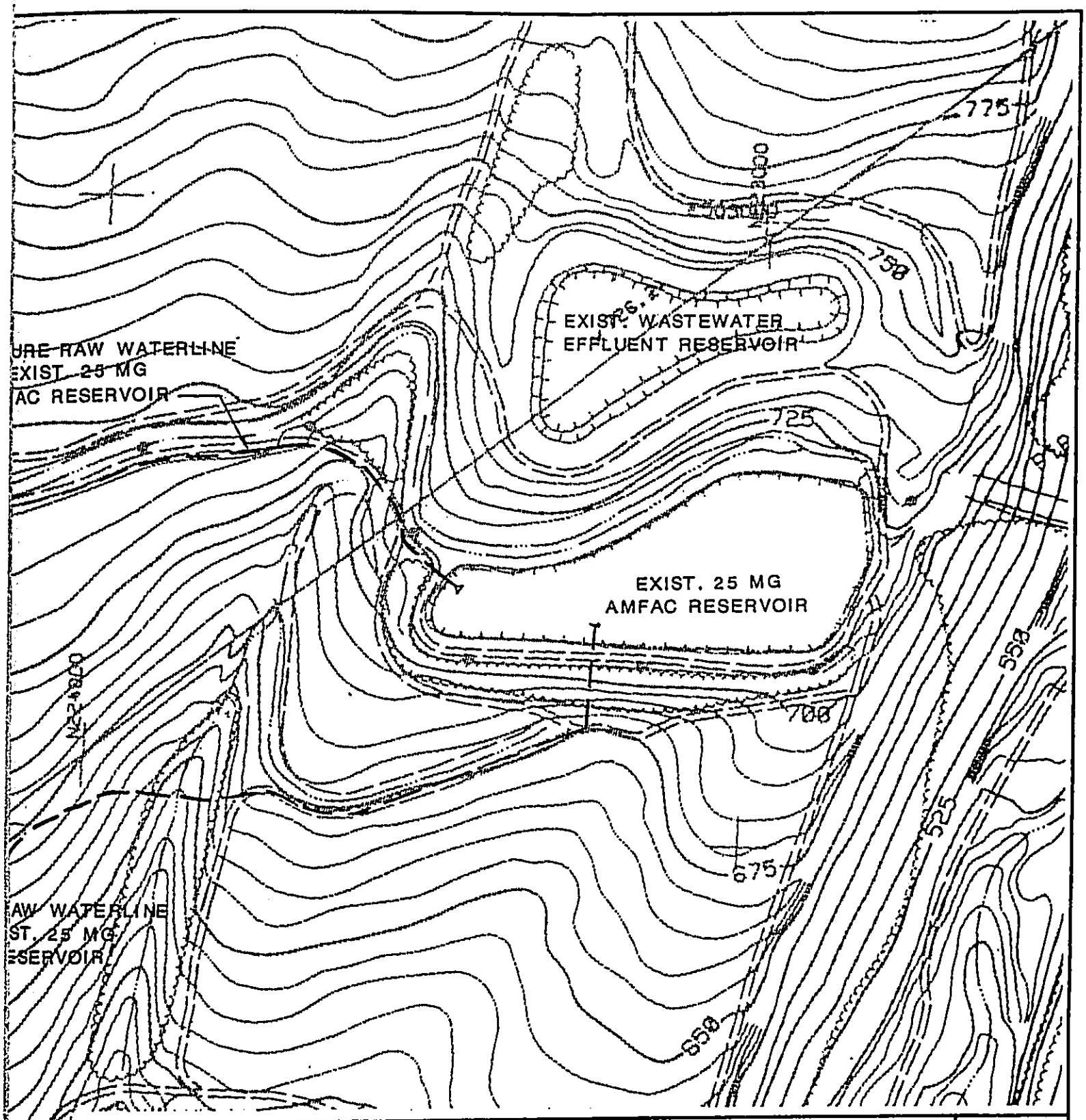
The proposed facilities and pipelines will be within MPCo and State lands. Therefore, the County would have to acquire land and easements from MPCo and the State for these facilities.

ATA AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

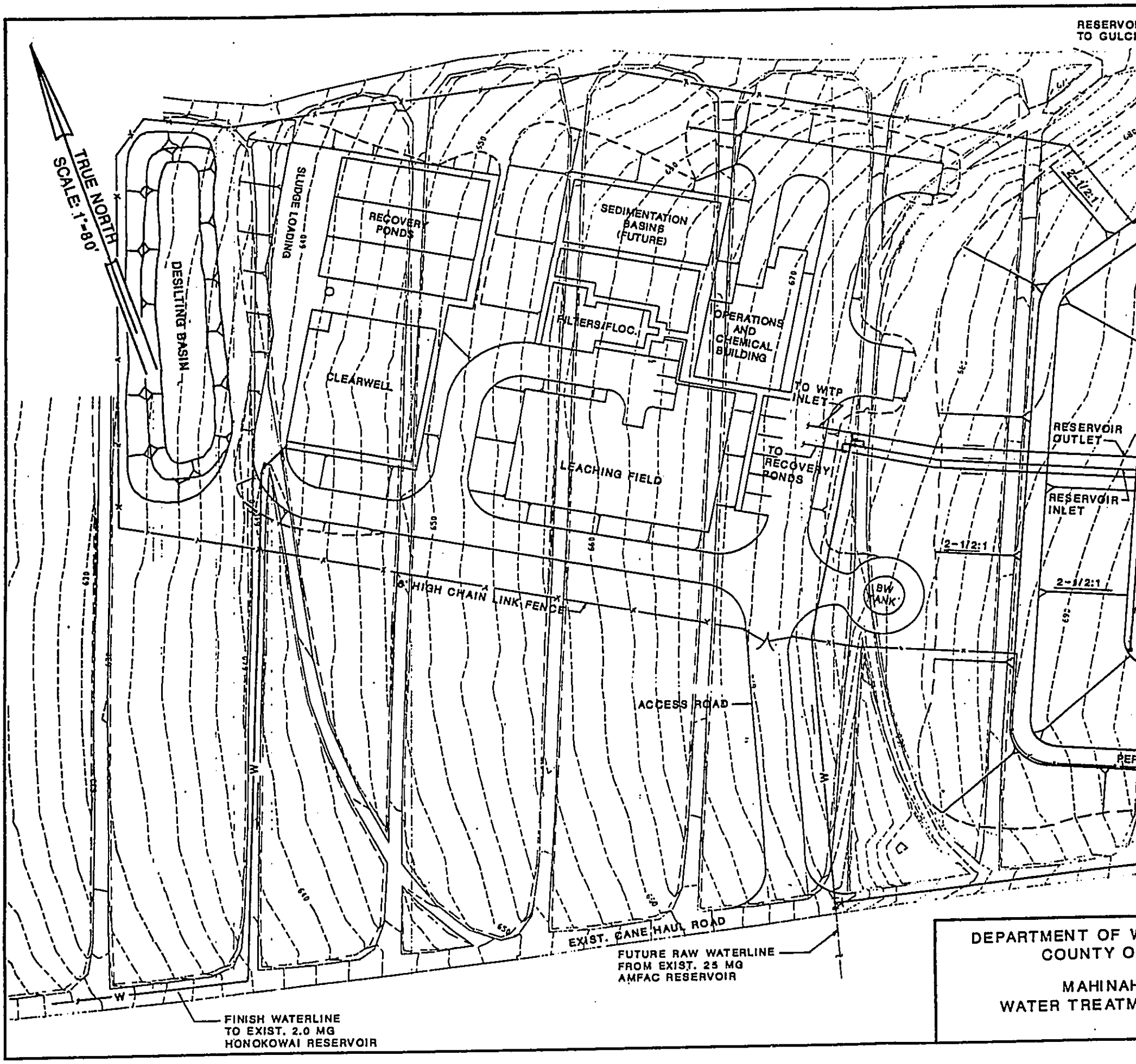
MAHINAHINA WATER TREATMENT PLANT (M-WTP)
TABLE 1. CONSTRUCTION COST ESTIMATE

Clearing and Grubbing for P/E Reservoir and M-WTP (12 acres @ $5,000/acre)		$ 60,000
Fencing for P/E Reservoir and M-WTP (3,500 LF @ $30/LF)		105,000
20 MG P/E Reservoir		
Reservoir Exc (93,000 CY @ $12/CY)		1,116,000
Reservoir Emb (50,000 CY @ $3/CY)		150,000
Reservoir Fine Grading (340,000 SF @ $0.25/SF)		85,000
Reservoir Lining (210,000 SF @ $1/SF)		210,000
Reservoir Road (1,900 LF @ $20/LF)		38,000
Reservoir Piping		200,000
Reservoir Miscellaneous Items		20,000
Grassing (150,000 SF @ $0.20/SF)		30,000
Baffles		100,000
Hypalon Floating Cover (180,000 SF @ $3.50/SF)		630,000
	Subtotal	$2,579,000
M-WTP		
Site Work		$ 900,000
Operations and Chemical Building		1,500,000
Filters/Flocculation Structure		1,500,000
Recovery Ponds		400,000
Clearwell		2,400,000
Backwash Tank		150,000
Chemical Systems		550,000
Yard Piping		100,000
Desilting Basin		100,000
Electrical/Telemetry Work		1,000,000
Miscellaneous		100,000
	Subtotal	$ 8,700,000
Total (January 1991 Cost)		$11,279,000
Escalation to Mid-Year 1992 @ 6% Per Year = 10%		1,127,900
Estimated Construction Cost (Mid-Year 1992)		$12,406,900
	SAY	$12,400,000


775
750
725
700
675
650
625
FROM DITCH INTAKE
RESERVOIR OVERFLOW TO GULCH
PRESEDIMENTATION/ EQUALIZATION RESERVOIR
FUTURE RAW WATERLINE TO EXIST 25 MG AMFAC RESERVOIR
E502000
N425000
WATER TREATMENT PLANT
DESILTING BASIN
FUTURE RAW WATERLINE FROM EXIST. 25 MG AMFAC RESERVOIR
FINISH WATERLINE TO EXIST. 2.0 MG HONOKOWAI RESERVOIR
TRUE NORTH
SCALE: 1"=200'
DEPARTMENT OF
COUNTY
MAHINA
WATER TREAT



DEPARTMENT OF WATER SUPPLY COUNTY OF MAUI MAHINAHINA WATER TREATMENT PLANT	AUSTIN, TSUTSUMI, & ASSOC., INC. ENGINEERS. SURVEYORS • HAWAII PROJECT SITE PLAN	EXHIBIT 1


TRUE NORTH
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DESILTING BASIN
SLUDGE LOADING
RECOVERY PONDS
SEDIMENTATION BASINS (FUTURE)
FILTERS/FLOC.
OPERATIONS AND CHEMICAL BUILDING
CLEARWELL
LEACHING FIELD
TO WTP INLET
TO RECOVERY PONDS
RESERVOIR OUTLET
RESERVOIR INLET
2-1/2:1
BW TANK
6' HIGH CHAIN LINK FENCE
ACCESS ROAD
EXIST. CANE HAUL ROAD
FUTURE RAW WATERLINE FROM EXIST. 25 MG AMFAC RESERVOIR
FINISH WATERLINE TO EXIST. 2.0 MG HONOKOWAI RESERVOIR
DEPARTMENT OF W
COUNTY O
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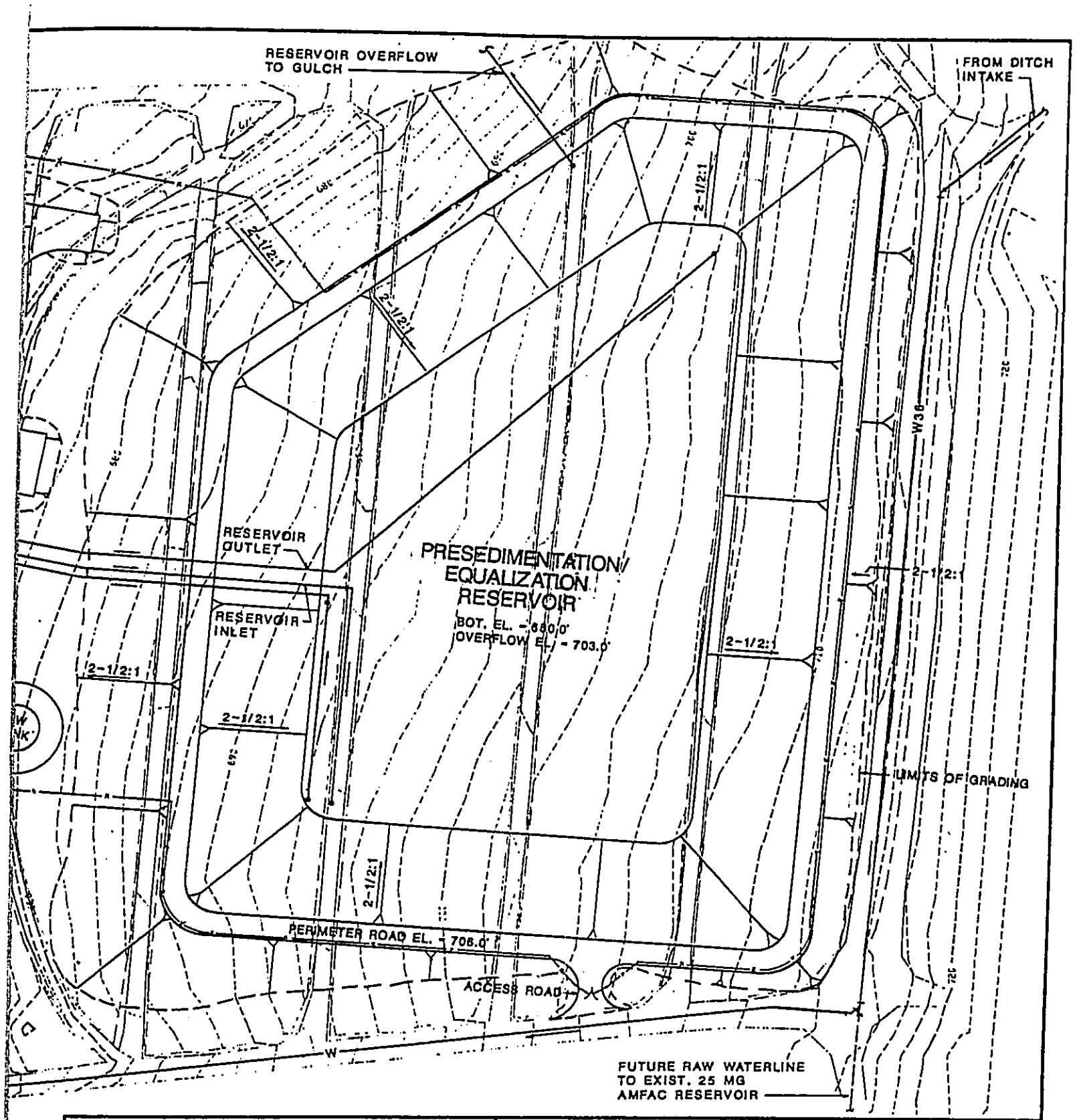
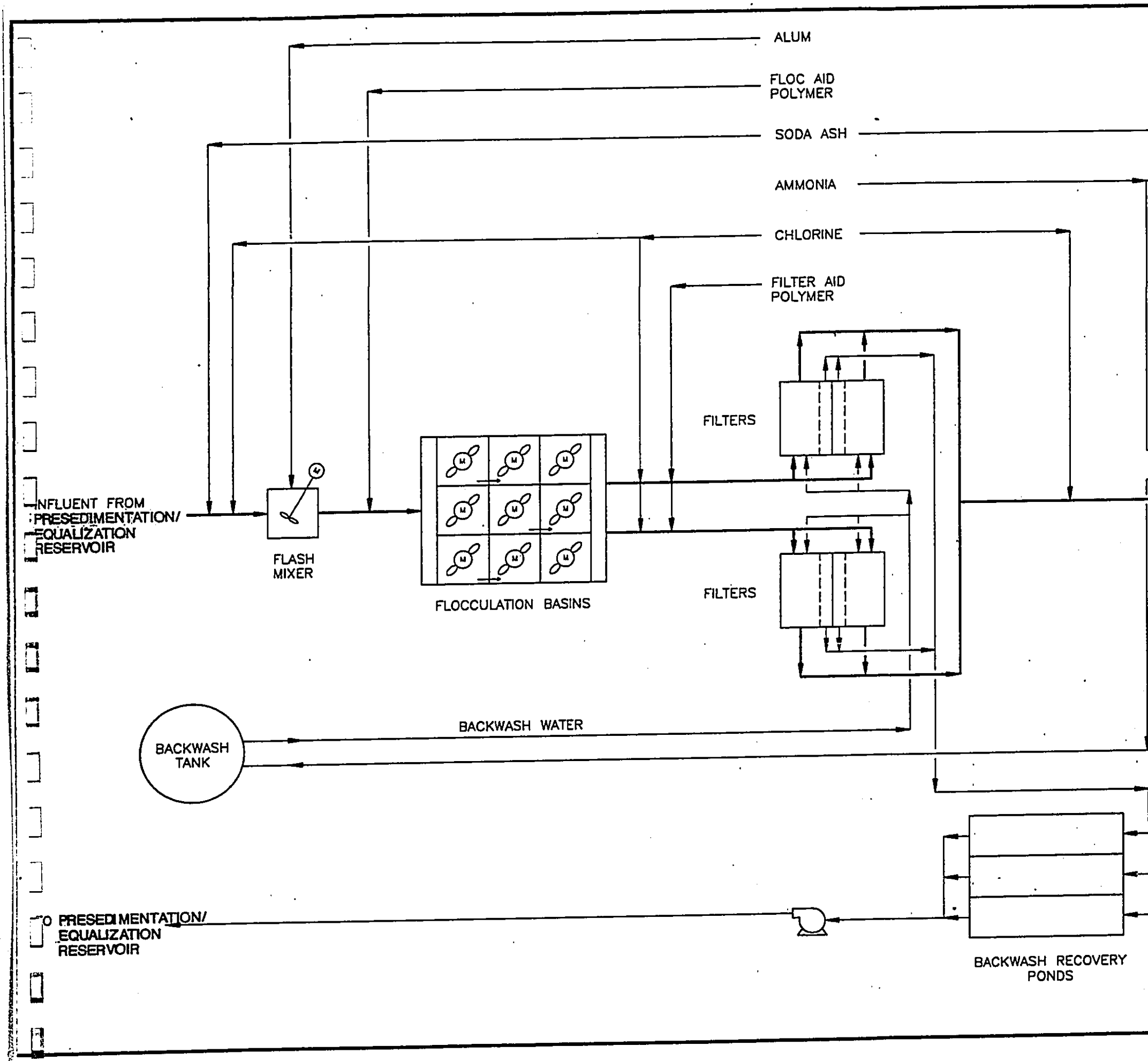
WATER TREATM



DEPARTMENT OF WATER SUPPLY COUNTY OF MAUI MAHINAHINA WATER TREATMENT PLANT	AUSTIN, TSUTSUMI, & ASSOC., INC. ENGINEERS · SURVEYORS · HAWAII WATER TREATMENT PLANT AND PRESEDIMENTATION/ EQUALIZATION RESERVOIR SITE PLAN	EXHIBIT 2



JOB NO. M-90-507

LEGEND

FLOCCULATOR

PUMP

MIXER

2.0 MG CLEARWELL

FINISHED WATER

CLEARWELL SUMP

BACKWASH RECOVERY PONDS

EXHIBIT

3

REVISION	DATE	BRIEF	MADE BY	APPROVED

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
WAILUKU, MAUI, HAWAII

MAHINAHINA WATER TREATMENT PLANT
HONOKOWAI, MAUI, HAWAII

PROCESS FLOW DIAGRAM

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Carlsbad, California
CDM

AYA AUSTIN, TSUTSUMI & ASSOCIATES, INC.

DESIGNED BY: | DRAWN BY: | CHECKED BY:

SUBMITTED BY:

FIRM MEMBER DATE

DWG. NO.
M-20

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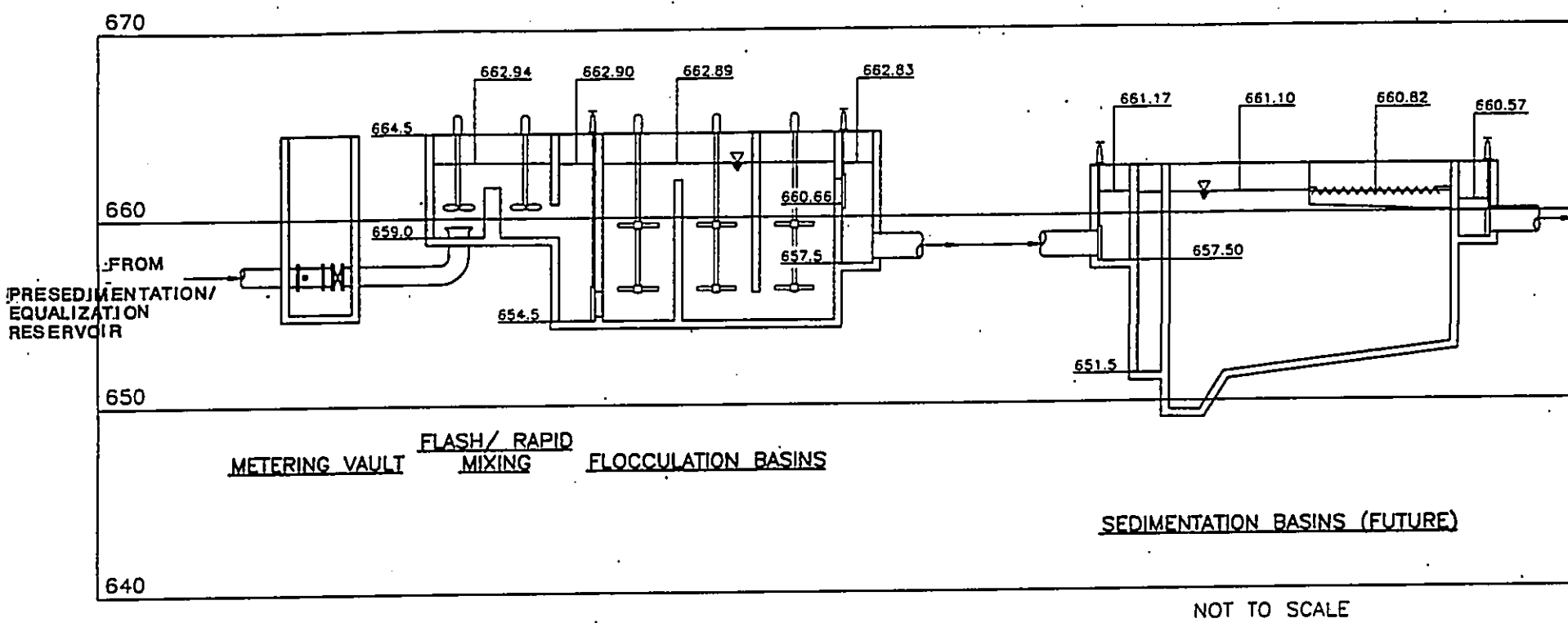

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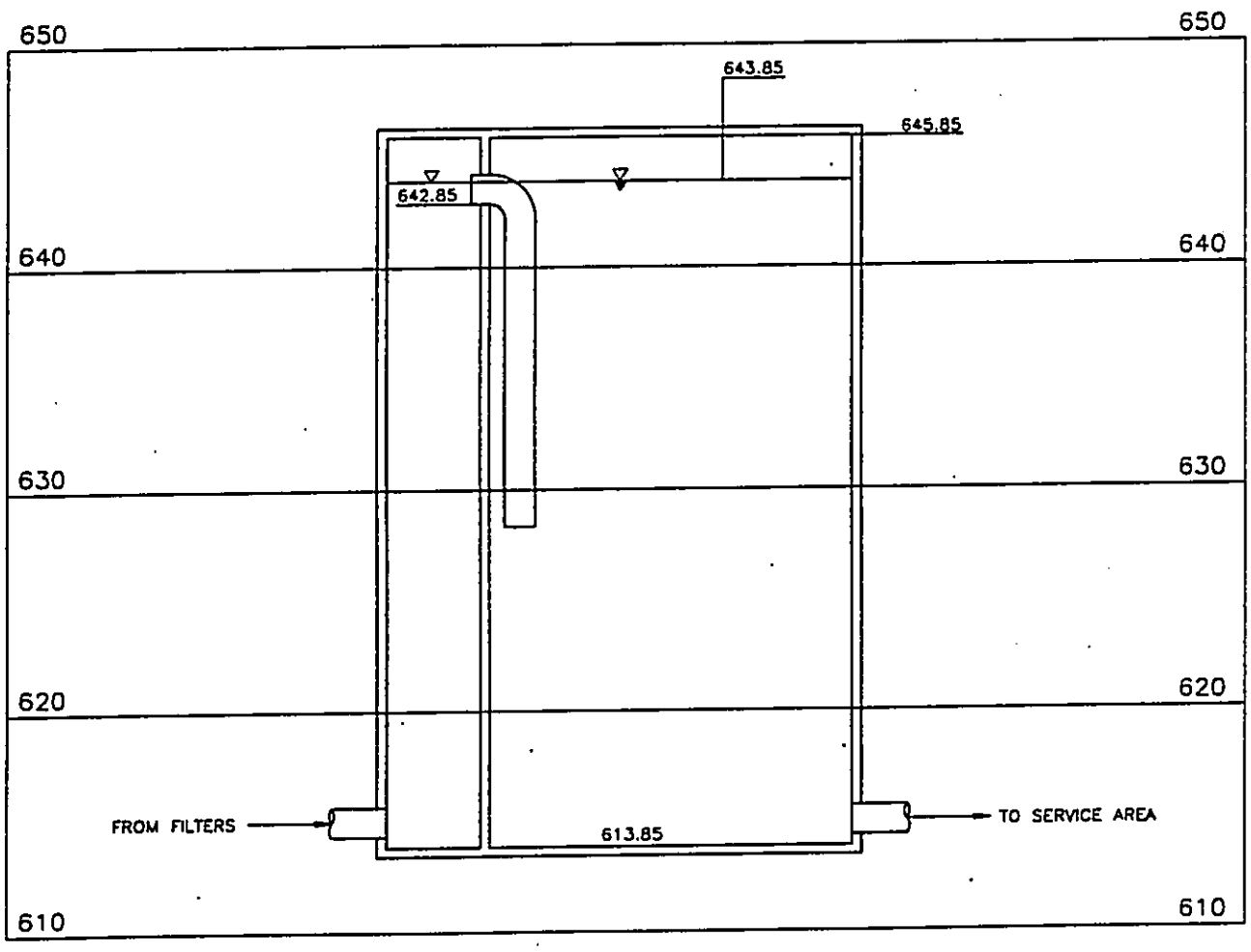

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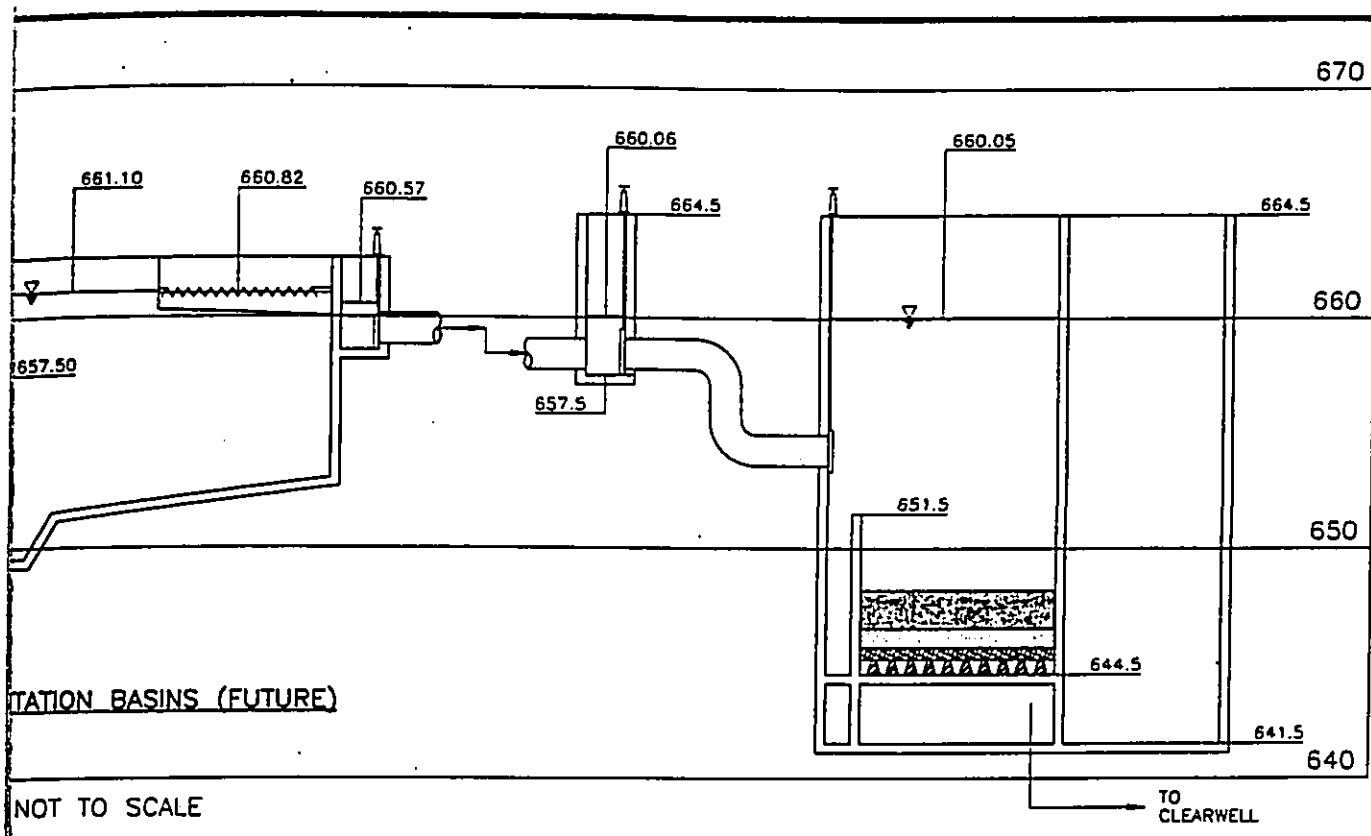

TATION BASINS (FUTURE)

NOT TO SCALE

FILTERS

EXHIBIT

4

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ENGINEERS • SURVEYORS • HONOLULU, HAWAII

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
WAILUKU, MAUI, HAWAII

MAHINAHINA WATER TREATMENT PLANT
HONOKOWAI, MAUI, HAWAII

HYDRAULIC PROFILE

DESIGNED BY:	DRAWN BY:	CHECKED BY:

SUBMITTED BY:

FIRM MEMBER DATE:

DWG. NO.
M-23

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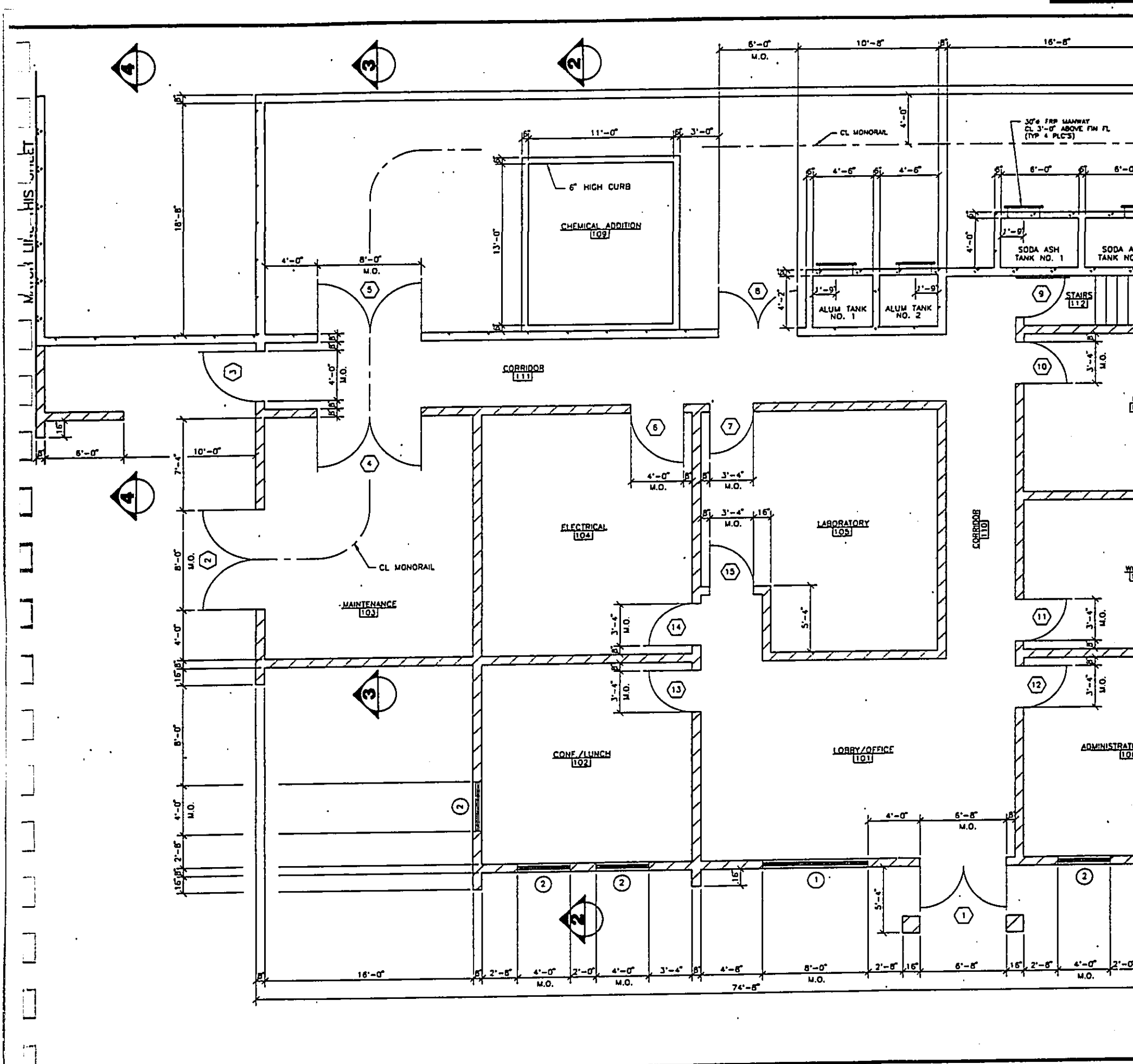

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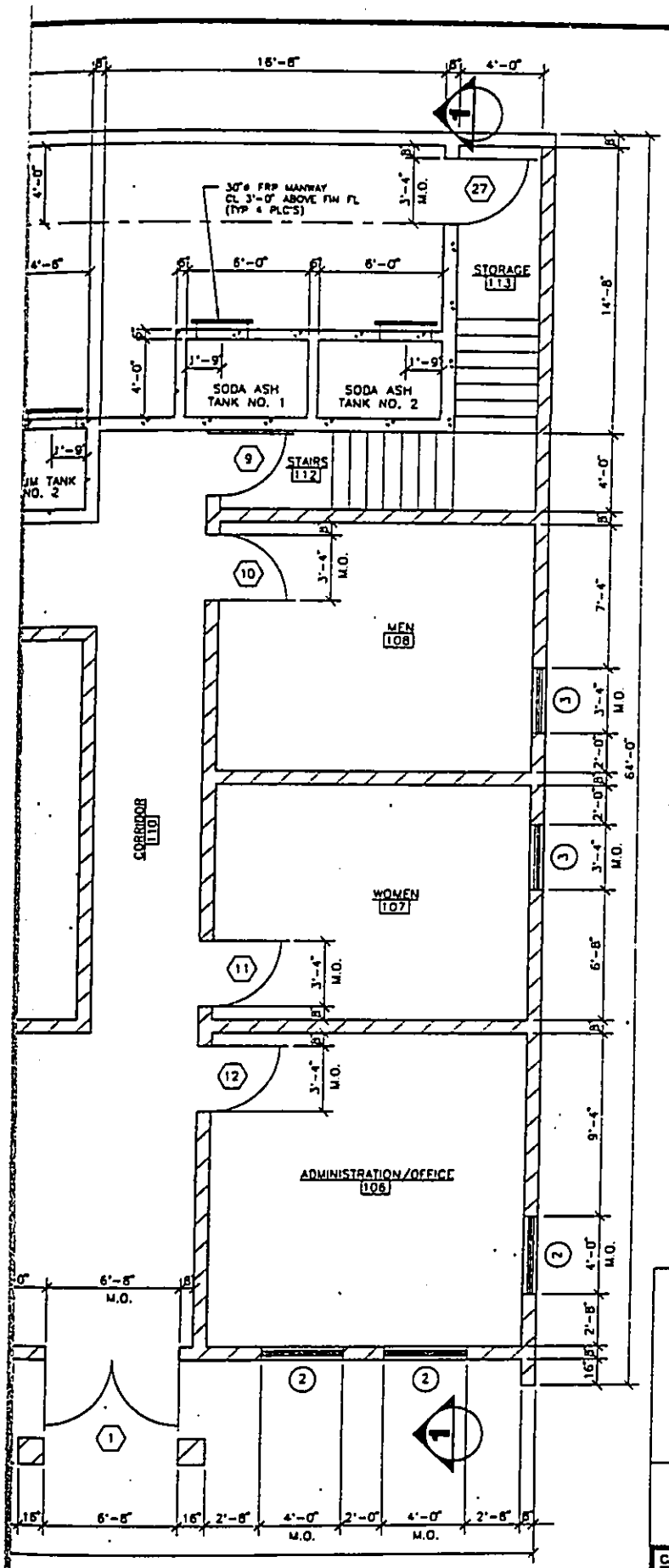

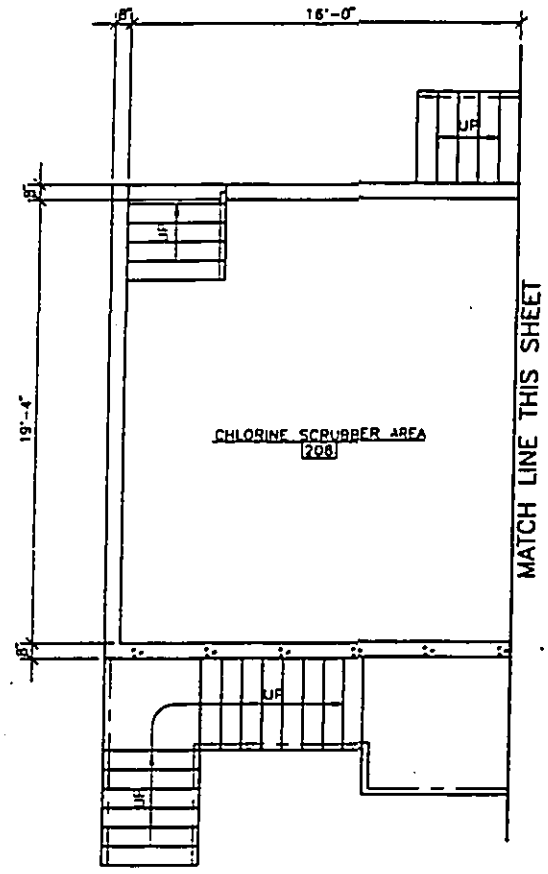

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Carlsbad, California
CDM

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS & SURVEYORS

REVISION	DATE	BRIEF	MADE BY	APPROVED

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
WAILUKU, MAUI, HAWAII

MAHINAHINA WATER TREATMENT PLANT
HONOKOWAI, MAUI, HAWAII

OPERATIONS AND CHEMICAL BUILDING

GENERAL ROOM PLAN, MAIN FLOOR

DESIGNED BY:	DRAWN BY:	CHECKED BY:

SUBMITTED BY:

FIRM MEMBER DATE:

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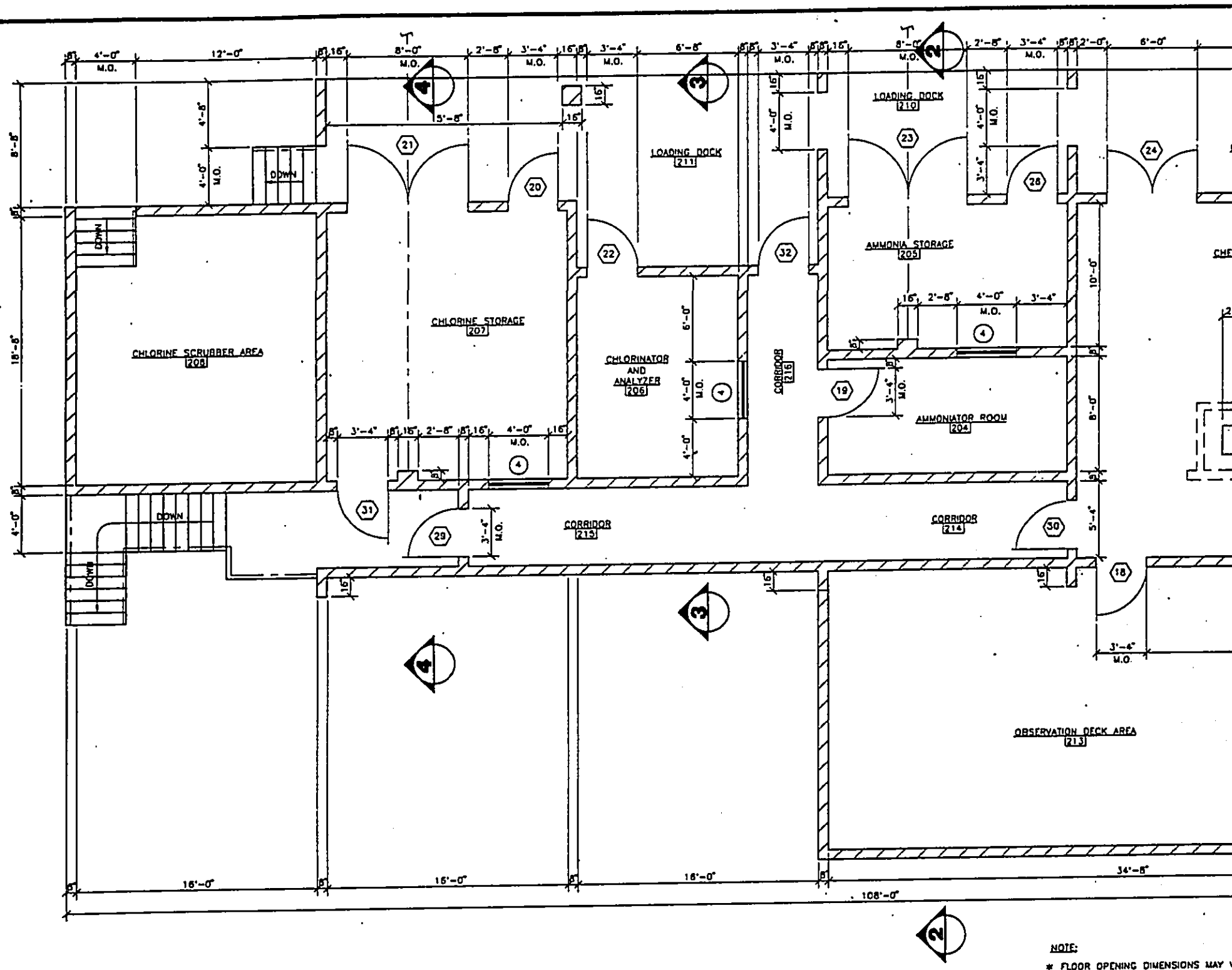

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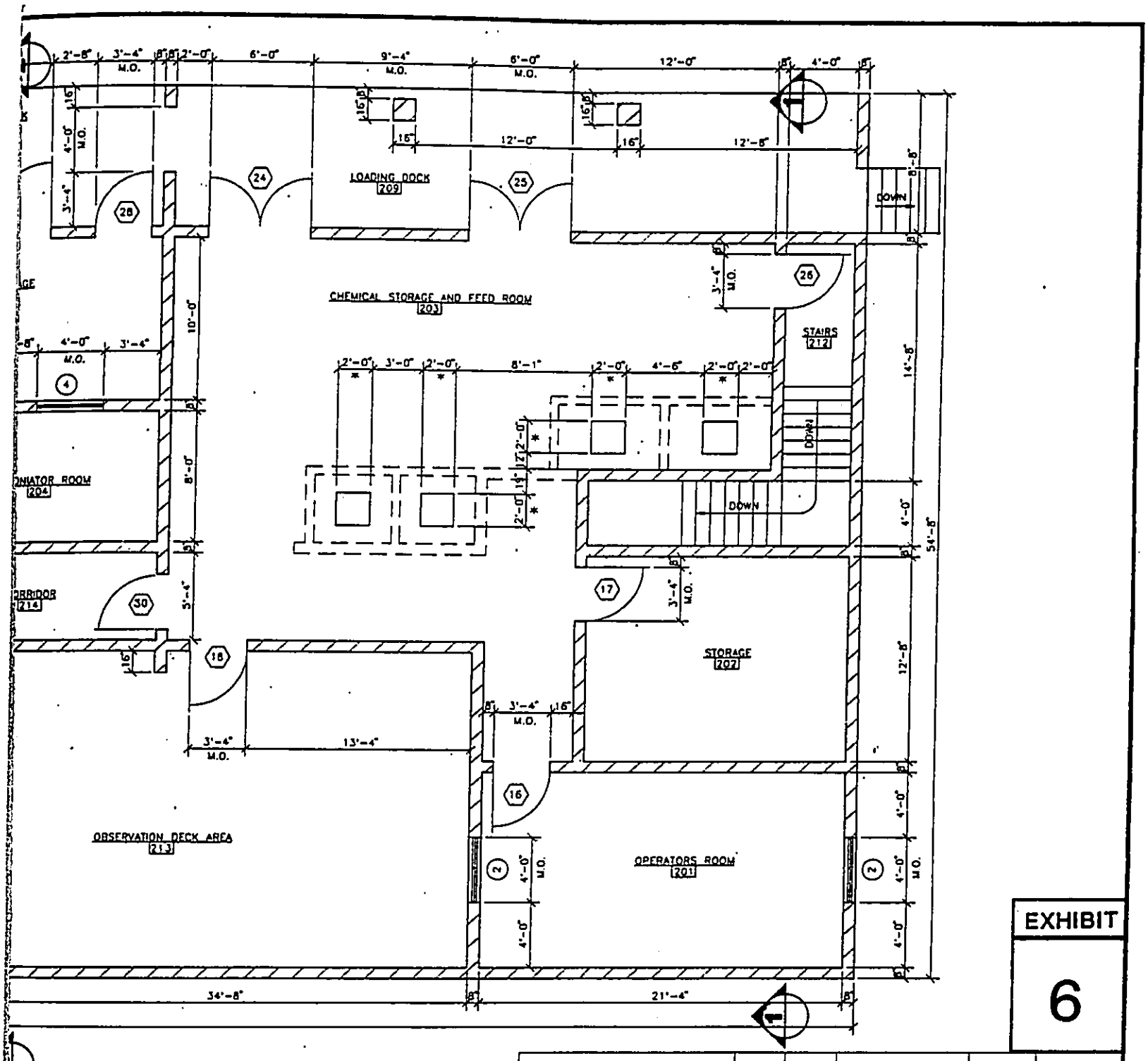

NOTE:

* FLOOR OPENING DIMENSIONS MAY VARY AS REQUIRED BY EQUIPMENT FURNISHED.

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ENGINEERS/SURVEYORS • HONOLULU, HAWAII

REVISION	DATE	BRIEF	MADE BY	APPROVED

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
WAILUKU, MAUI, HAWAII

MAHINAHINA WATER TREATMENT PLANT
HONOKOWAI, MAUI, HAWAII

OPERATIONS AND CHEMICAL BUILDING

GENERAL ROOM PLAN, UPPER FLOOR

DESIGNED BY	DRAWN BY	CHECKED BY

SUBMITTED BY:

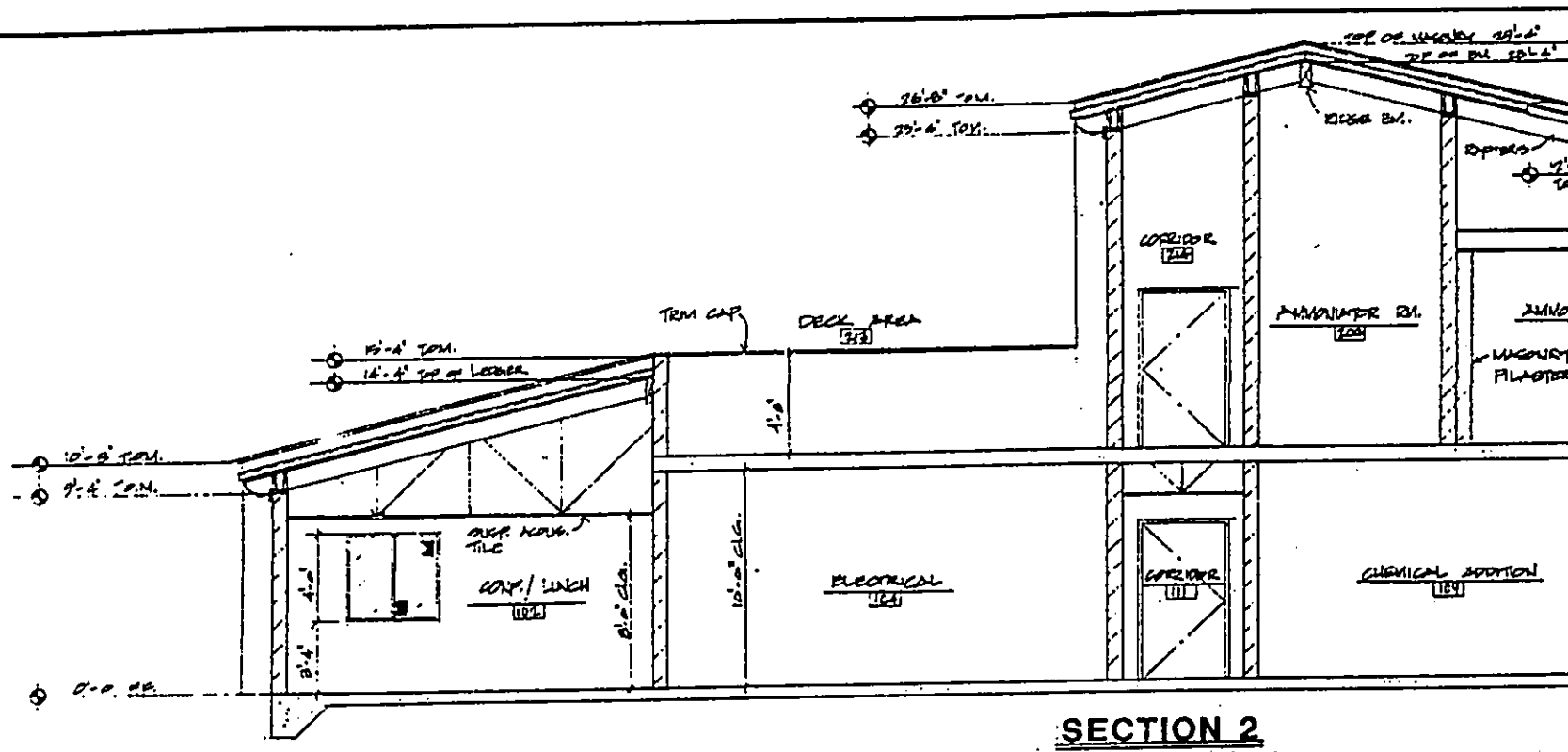
FIRM MEMBER DATE:

DWG. NO. A-2

SHEET OF

FILE	POCKET	FOLDER	NO.

EXHIBIT 6



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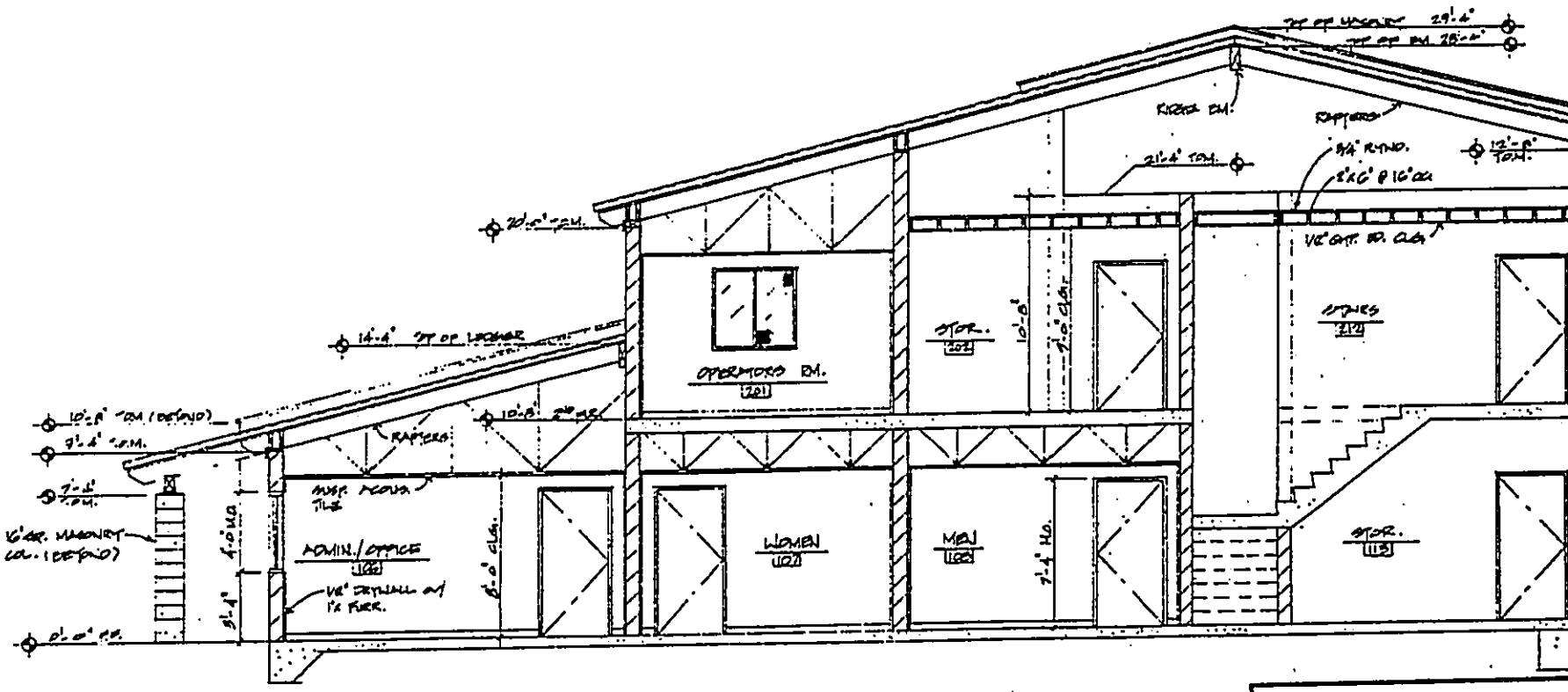

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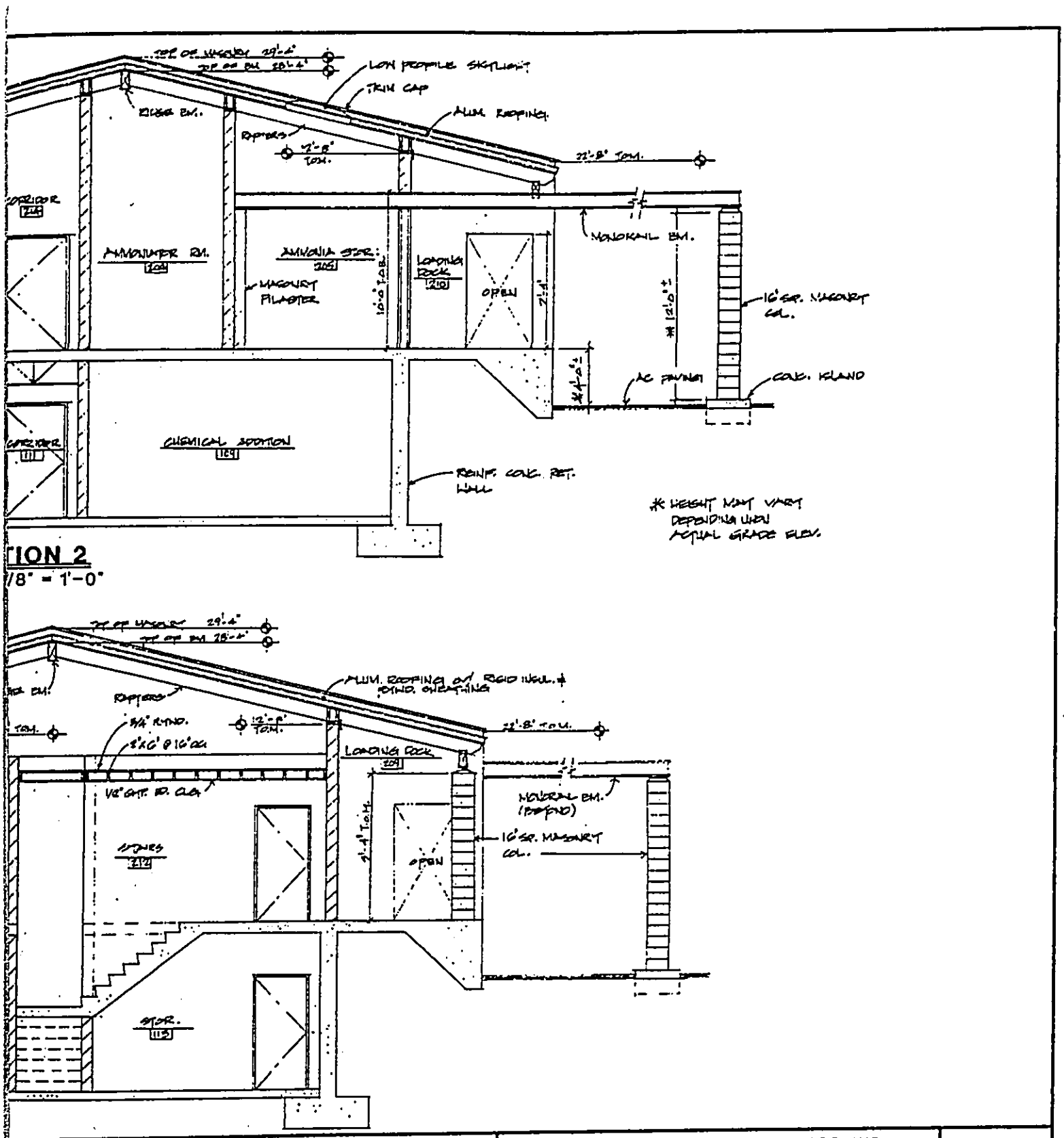
DEPARTMENT OF W
COUNTY O

MAHINAH
WATER TREATM



TION 2

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DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI

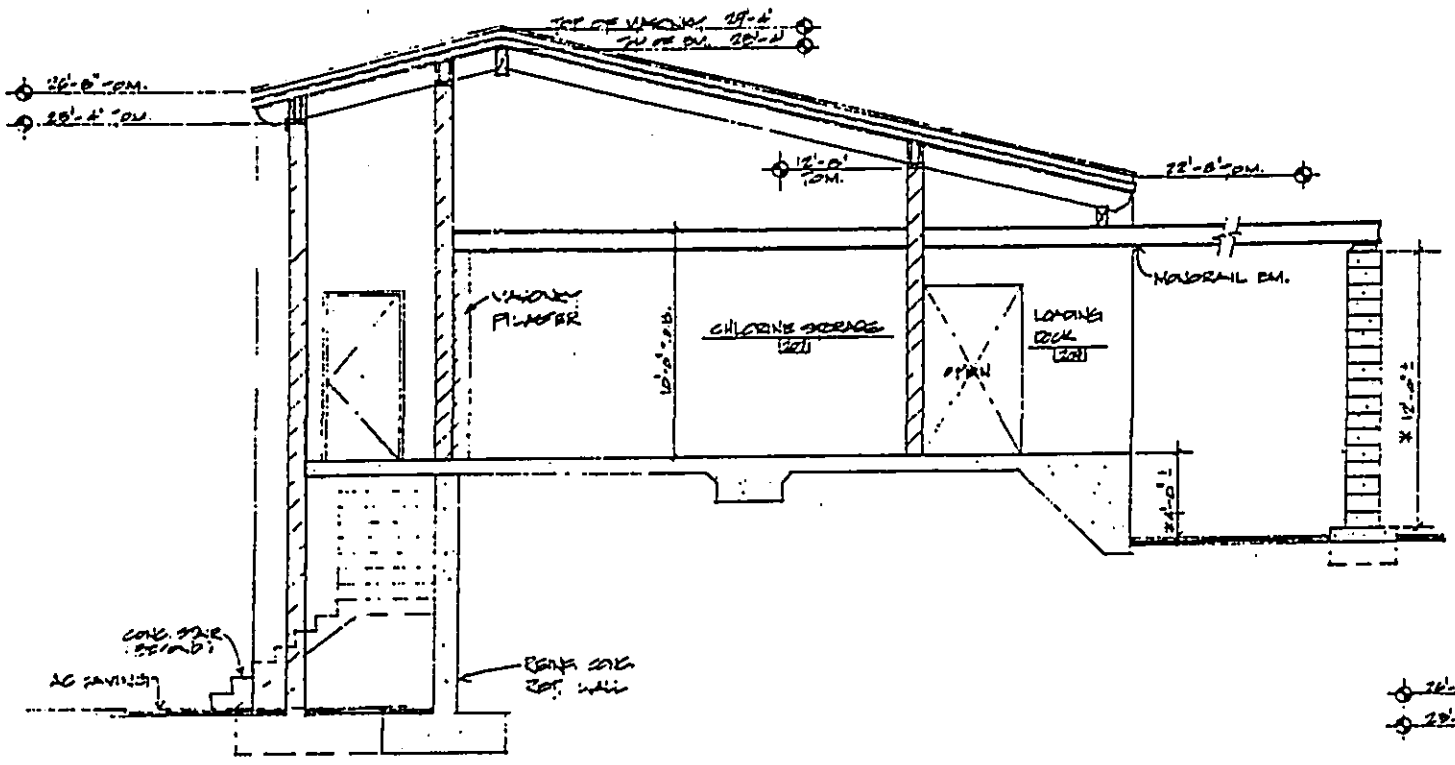
MAHINAHINA
WATER TREATMENT PLANT

AUSTIN, TSUTSUMI, & ASSOC., INC.
ENGINEERS. SURVEYORS • HAWAII

OPERATIONS AND CHEMICAL BUILDING SECTIONS

EXHIBIT

7



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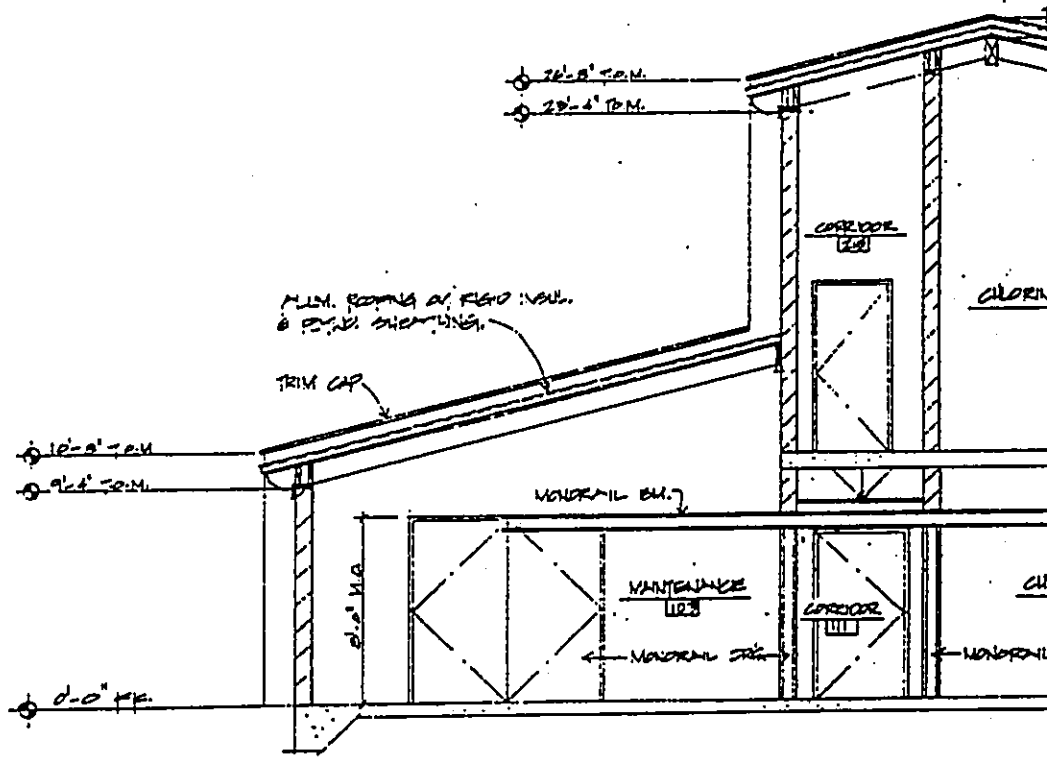

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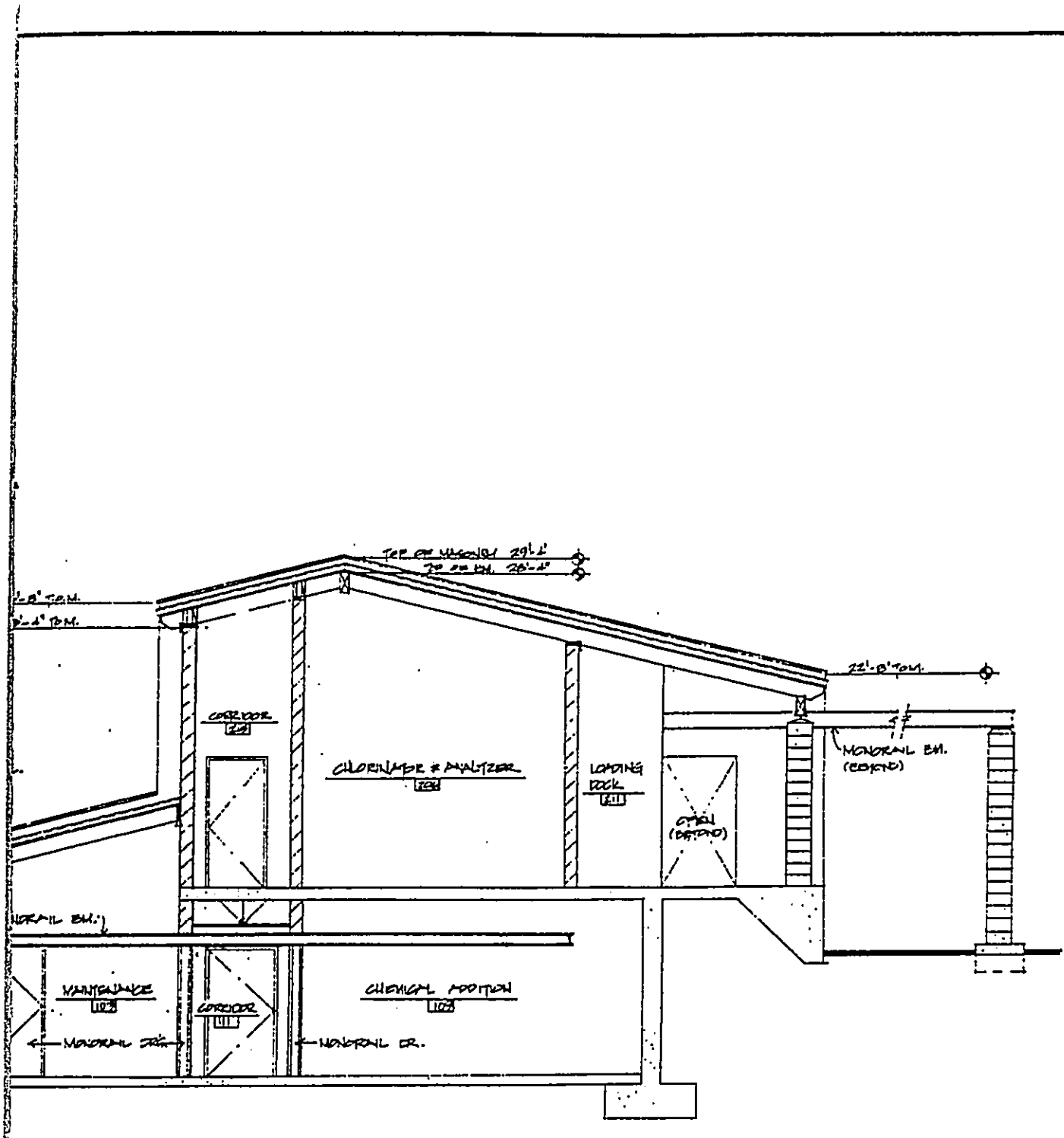
DEPARTMENT OF WA
COUNTY OF

MAHINAHIN
WATER TREATME



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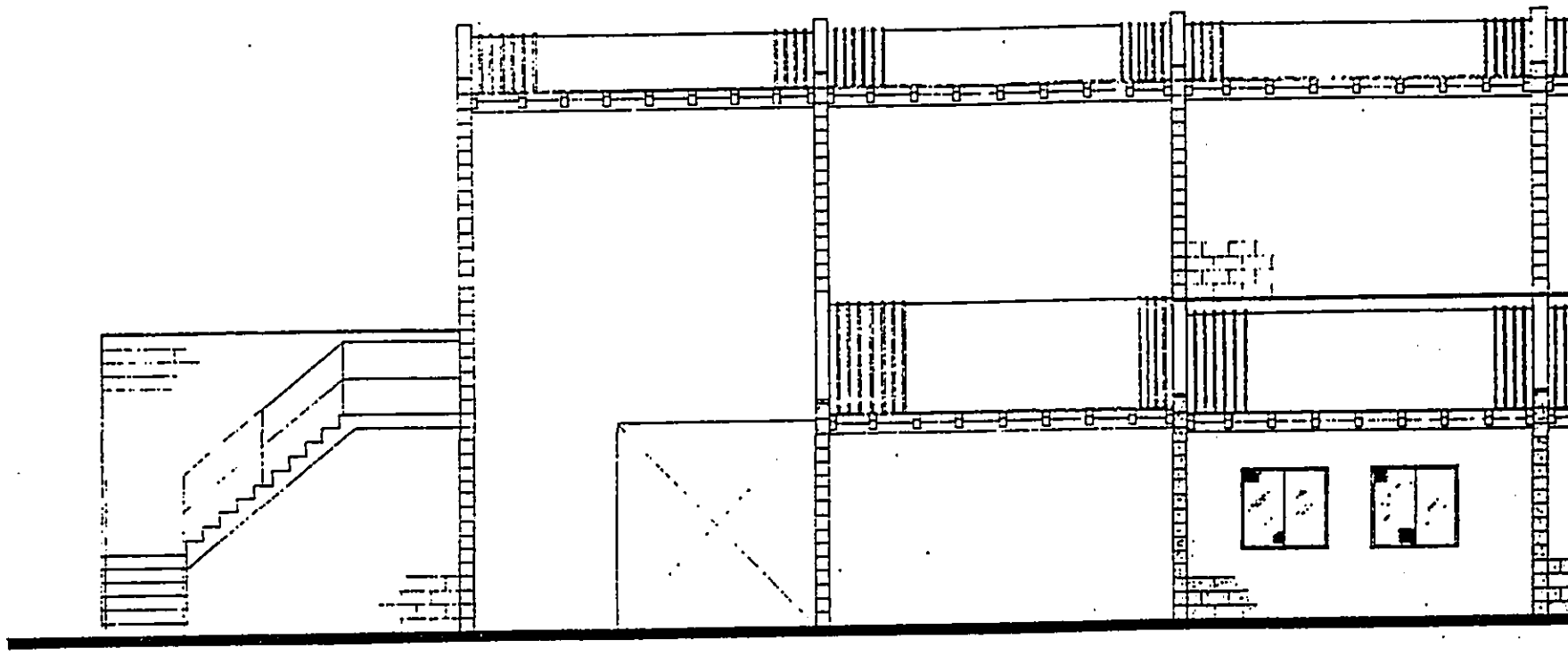
DEPARTMENT OF WATER SUPPLY COUNTY OF MAUI MAHINAHINA WATER TREATMENT PLANT	AUSTIN, TSUTSUMI, & ASSOC., INC. ENGINEERS. SURVEYORS · HAWAII OPERATIONS AND CHEMICAL BUILDING SECTIONS	EXHIBIT 8



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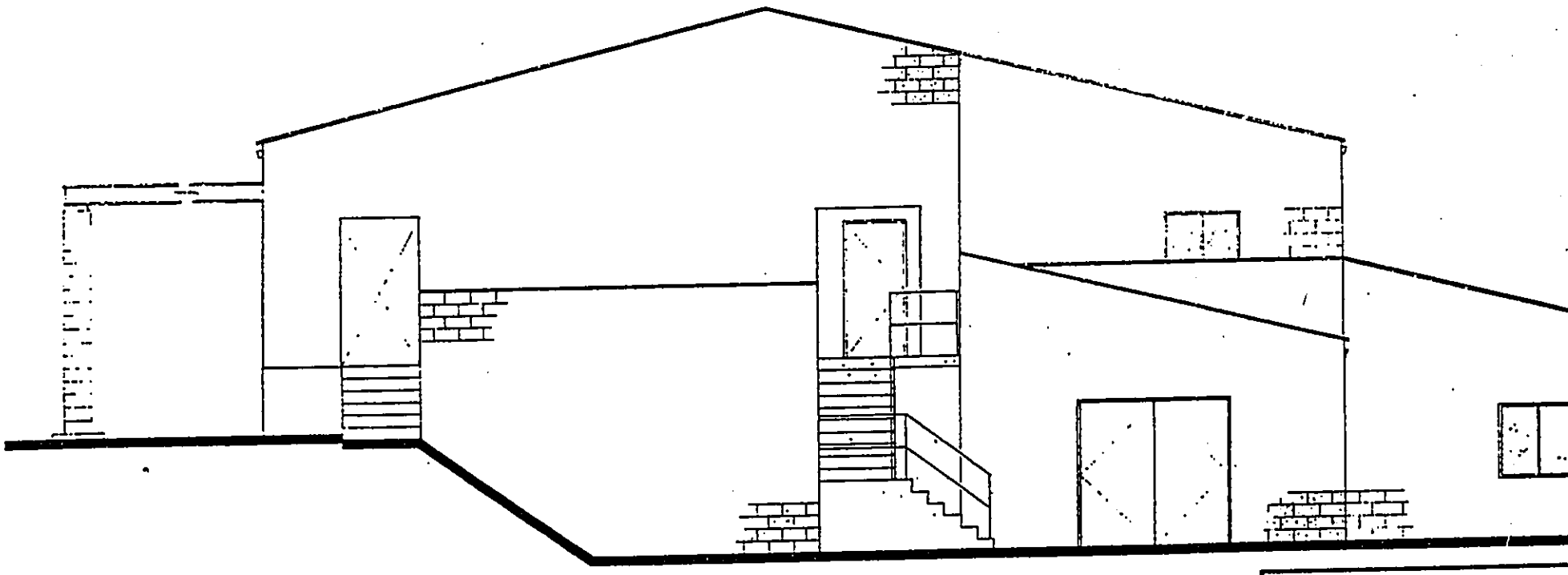

NORTH ELEVATION

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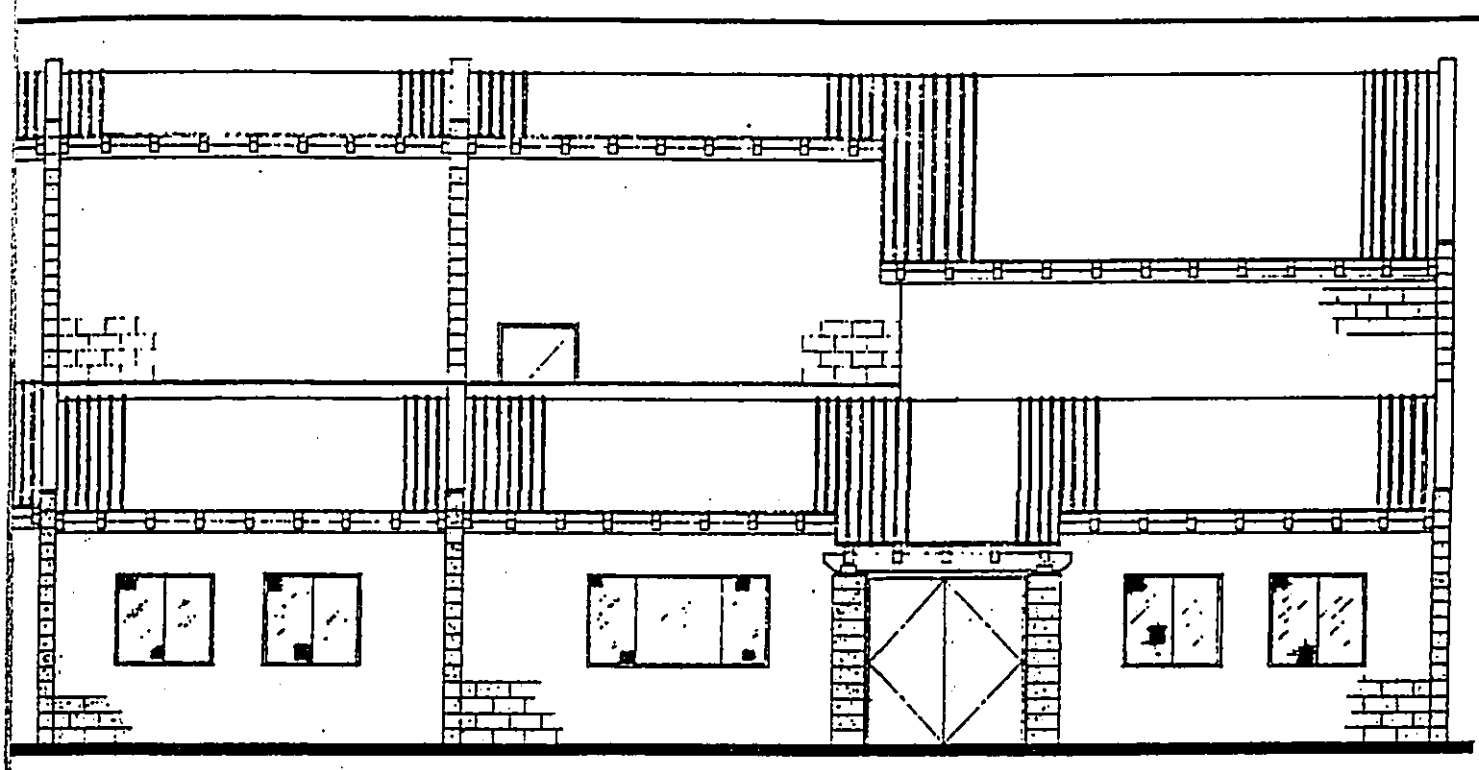
DEPARTMENT OF WA
COUNTY OF

MAHINAHI
WATER TREATME



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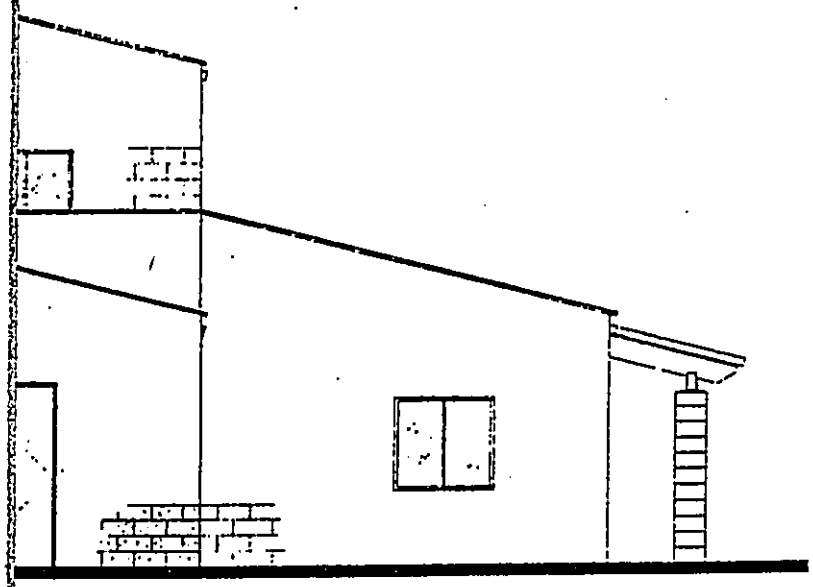


ON

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI

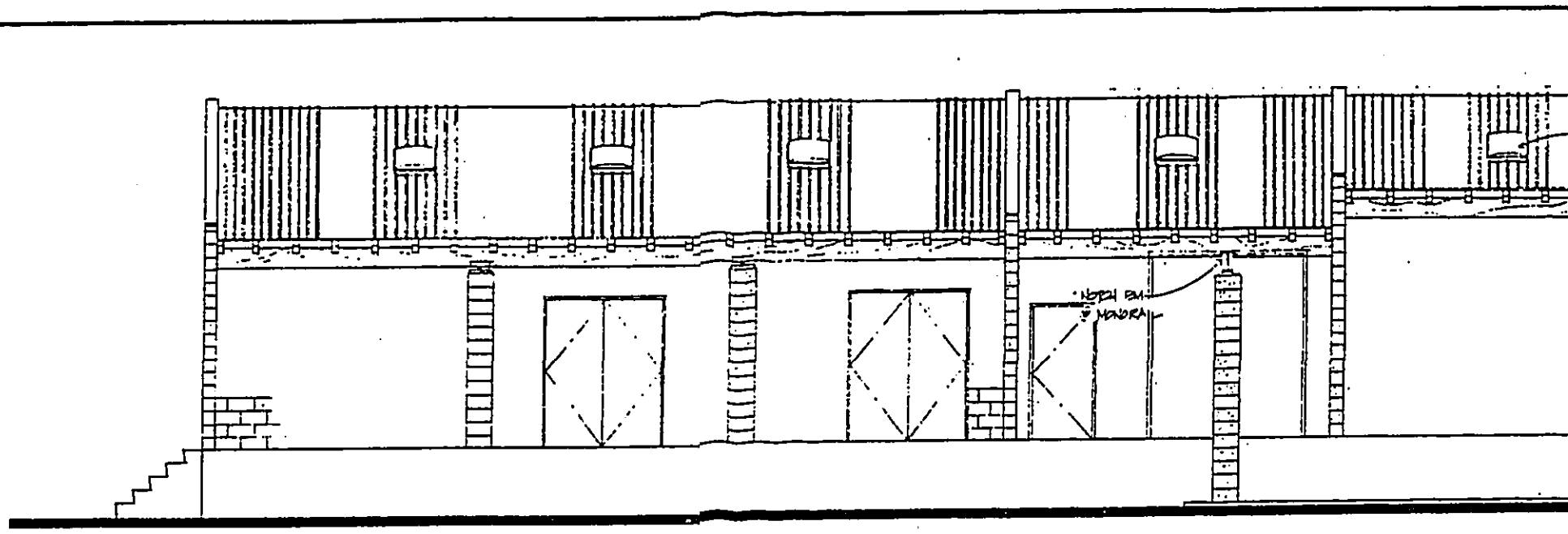
MAHINAHINA
WATER TREATMENT PLANT

AUSTIN, TSUTSUMI, & ASSOC., INC.
ENGINEERS, SURVEYORS • HAWAII

OPERATIONS AND CHEMICAL
BUILDING ELEVATIONS

EXHIBIT

9



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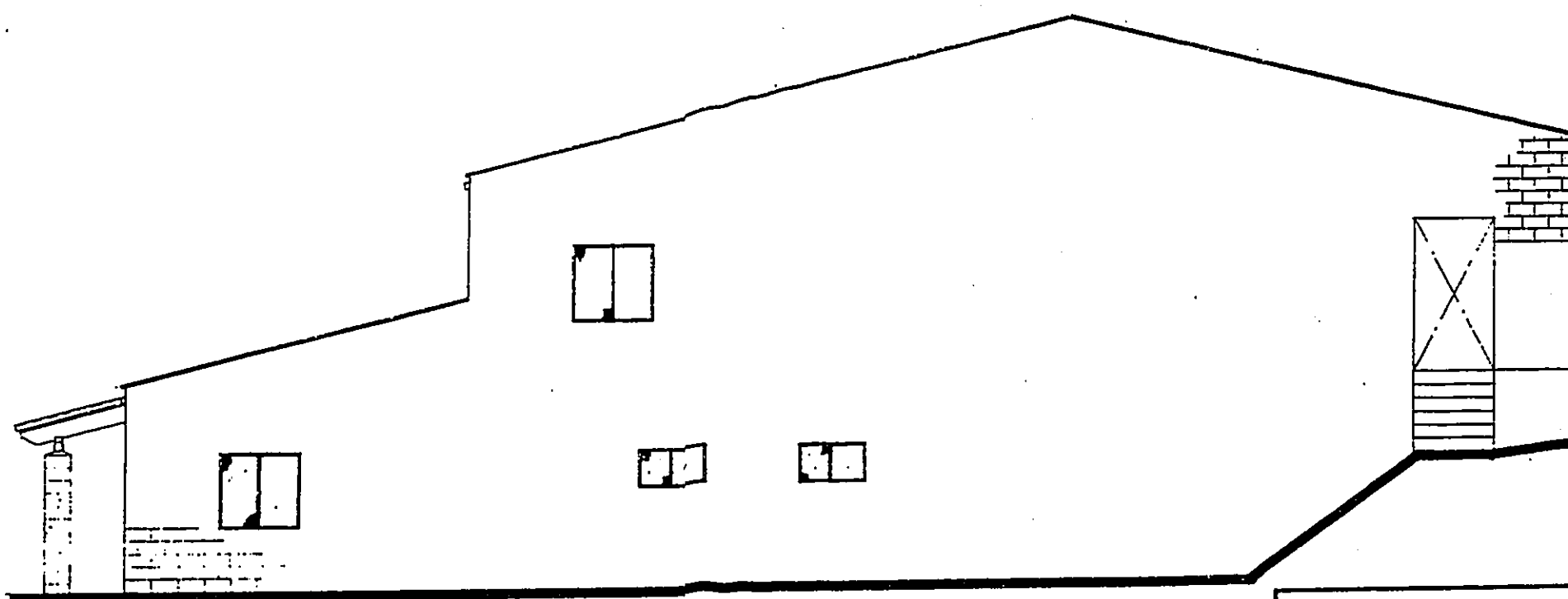
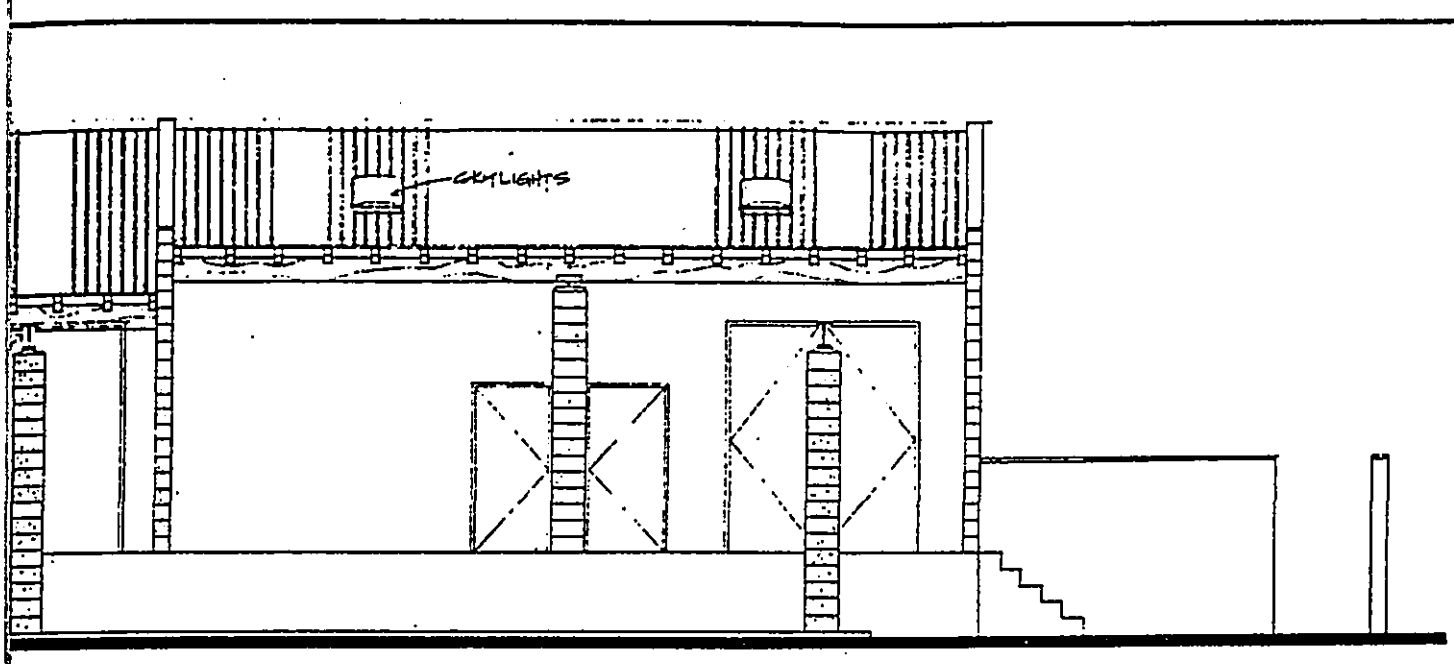


SOUTH ELEVATION

SCALE: 1/8" = 1'-0"

DEPARTMENT OF W
COUNTY O

MAHINAH
WATER TREATM



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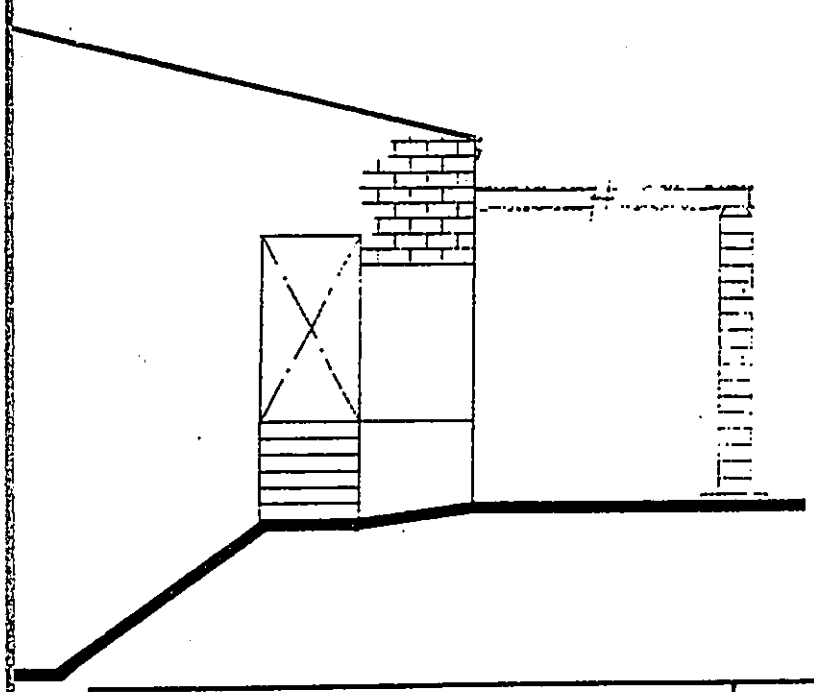


DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI

MAHINAHINA
WATER TREATMENT PLANT

AUSTIN, TSUTSUMI, & ASSOC., INC.
ENGINEERS · SURVEYORS · HAWAII

OPERATIONS AND CHEMICAL BUILDING ELEVATIONS

EXHIBIT 10

Appendix B

Intake and Transmission Line Preliminary Engineering Report

PRELIMINARY

ENGINEERING REPORT

FOR THE

MAHINAHINA/HONOKOWAI INTAKE AND

TRANSMISSION WATERLINE

PREPARED FOR

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI

PREPARED BY

RICHARD M. SATO & ASSOCIATES, INC.

OCTOBER 18, 1991

TABLE OF CONTENTS

I. INTRODUCTION

A. Purpose and Scope

The purpose of this study is to provide recommendations for the design and construction of the Mahinahina-Honokowai Intake and Transmission Waterline project. The recommendations will be based on the following items of work:

1. A collection intake, at the present exit (elevation = 715 feet) of the Honokohau Tunnel, which will be protected from external debris, dust and some air-borne contaminants by cover plates.

2. A settling and/or screening box.

3. A transmission pipeline betwen the intake and the proposed 20 MG presedimentation/flow equalization reservoir.

4. A transmission pipeline with necessary controls, valves and appurtenances, from the proposed DWS water treatment plant (WTP) to the existing 2.0 MG Honokowai Reservoir, at approximate elevation = 250 feet.

Recommendations will include criteria for design, preliminary design, waterline alignment and intake siting, type and class of materials to be used, and budget cost estimates.

The recommendations will take into consideration a proposed water treatment plant (WTP) at an estimated elevation of 660 feet and a presedimentation/flow equalization reservoir (estimate overflow elevation = 703.0 feet) to be located between the proposed intake and existing 2.0 MG Honokowai Reservoir. See Exhibit No.1, Project Site Plan.

B. Survey Data

Aerial survey was provided by R. M. Towill Corporation (date flown: 7/31/89) and ground survey at the intake location was provided by George Newcomer, Land Surveyors, Inc. (date surveyed: August 3, 1989).

II. EXISTING SYSTEM

The Honokohau Ditch system originates at the Honokohau Stream intake (elevation = 870 feet) in the Lahaina District. The system ends some 12 miles downstream above Lahaina Town.

The major users of the ditch system include Maui Land & Pineapple Company (MLPCo.); Kapalua Land Company; Kapalua Water Company; and the County of Maui, Department of Water Supply (DWS). Approximately 13.5 MGD (average) is withdrawn from the ditch by these four major users. An additional averafge flow of approximately 12 MGD, ends up at the irrigation reservoir at the end of the Honokohau Ditch system in upper Lahaina.

The upper end of the project site, specifically the new intake structure, is located where the Honokohau Ditch system transitions from tunnel to open concrete channel in Mahinahina (approximate elevation = 715 feet).

The lower end of the project site (16-inch D.I. waterline) will tie into the existing 2.0 MG Honokowai Reservoir located downstream of the proposed intake site, at an approximate elevation of 250 feet.

III. PROPOSED WATER TREATMENT PLANT (DESIGN BY OTHERS)

The water treatment facility is projected to have a 2.5 MGD average operating capacity. Siting and descriptions of the new water treatment plant will be provided by others.

IV. PROPOSED WATERLINE

Approximately 1,450 feet of 36-inch and 24-inch diameter ductile iron, Class 52, waterlines will be used to convey water diverted from the new intake structure to the new 20 MG presedimentation/flow equalization reservoir.

The 36-inch waterline was sized to maintain sufficient flow from the proposed intake to a future connection at an existing 25 MG Amfac reservoir (estimated W.S.L. = 707.0) located south of the proposed intake. Due to the larger pipeline size, friction losses will be minimized. However, velocities of less than 2.0 FPS during normal flow conditions may cause silt buildup in the 36-inch line. Therefore, provisions to "blow off" the flatter portions of the line may be necessary.

A 36-inch by 24-inch tee, with the necessary valving controls, will be provided at the future connection to the 25 MG Amfac Reservoir (see Exhibit 1). A 24-inch waterline will continue down the existing cane haul road to the proposed 20 MG presedimentation/flow equalization reservoir. The steeper slope (6 - 7 percent) of this portion of the alignment permits downsizing the raw waterline from a 36-inch diameter to a more economical 24-inch diameter without sacrificing flow capacity.

Following treatment, another 5,850 feet of 16-inch diameter ductile iron, Class 52, pipe will continue down the slope to the existing 2.0 MG Honokowai reservoir.

The 16-inch waterline is sized to accommodate projected flows from the treatment plant and minimize friction losses through the almost one mile long length of pipeline.

The design and construction of the waterlines shall conform to the "Standards Details for Water System Construction, 1985 (revised 1989), the plans and specifications to be produced by Richard M. Sato & Associates, Inc., and all other requirements imposed by the Department of Water Supply (DWS).

The alignment of the 36-inch, 24-inch and 16-inch waterlines is highly dependent on the location of the proposed treatment plant and 20 MG equalization reservoir. Tie-in locations provided by the treatment plant design consultant, Austin Tsutsumi & Associates, Inc. (ATA), indicate an alignment as shown in Exhibit 1.

The alignment itself follows the main haul road located south of Mahinahina Stream. Locating the new waterline in the dirt roadway should minimize crop damage during construction and prevent planting over of the new waterline in the future. Minimum cover over new waterlines shall be 5'-6' to minimize the possibility of heavy agricultural equipment damaging it.

A pressure break/flow control device will be necessary at the Honokowai reservoir inlet line in the event that the reservoir is bypassed and the high pressure in the line is fed into the downstream distribution system.

Reservoir level controls required for the existing Honokowai Reservoir may be incorporated through telemetry, into a central control station at the new WTP.

V. PROPOSED INTAKE & SCREENING STRUCTURE

The proposed intake and screening will be located approximately as shown in Exhibit No. 2. The design, (see Exhibit No. 3) will provide provisions to completely enclose the intake and screening structures to prevent debris and airborne pesticide contamination.

Because the proposed presedimentation/flow equalization reservoir downstream will reduce the water velocities so that fine particulates will settle out, the intake structure only needs to provide gross screening. This will be accomplished by installing 3" x 3" grid stainless steel (SS) round bar grating at the 6'-0"W x 5'-6"H connection to the existing concrete ditch. Any debris which passes through this grating will either drop into the debris sump or continue onto the 30 mesh screen assembly. Cleaning of the debris sump is accomplished by opening a manually operated sluice gate which will discharge into an adjacent swale. The screen assembly consists of a primary and secondary set of three 2'W x 6'L screens so as to maintain the screening capacity of the intake structure when either set of screens are removed for cleaning.

Upon passing through the screen assemblies, the water will enter the 36" D.I. transmission line by means of a 36"W x 36"L motorized sluice gate. The sluice gate is a modulating type which may be remotely controlled by the WTP operators to adjust the flow rate into the 20 MG presedimentation/flow equalization reservoir. The system variables and their impact on the sequencing of this valve have not been established at this writing and will be described at a later date.

The dimensions of the reinforced concrete intake assembly are 28'-6"L x 7'-4"W x 12'-2"D overall. All metal components are to be fabricated from 316 SS with the exception of the debris cover plates which will be fabricated from 1/4" thick aluminum checker plate. The use of dowels and epoxy grout will be the means of interfacing the intake assembly to the existing concrete ditch. Upon completion of the intake structure the 5'-6"H x 6'-0"W opening in the existing concrete ditch will be made. Extra caution must be taken at this point so as not to propagate or create any cracking in the adjacent ditch walls.

It should be noted that it may be necessary to install a redwood board wier assembly in the existing concrete ditch downstream of the intake/ditch interface if it becomes necessary to maximize the extraction from the ditch in periods of low flows through the Honokohau Ditch system.

VI. PRELIMINARY COST ESTIMATE

Preliminary construction cost estimate for the intake/screening box is $150,000.

Preliminary construction cost estimate for the 36-inch and 24-inch transmission mains between the intake and the 20 MG presedimentation/flow equalization reservoir, including all valving, controls, tie-ins, and appurtenances, is $410,000.

Preliminary construction cost estimate for the 16-inch transmission main between the WTP and the existing 2.0 MG Honokowai Reservoir, including all valving, controls, tie-ins, and appurtenances, is $800,000.

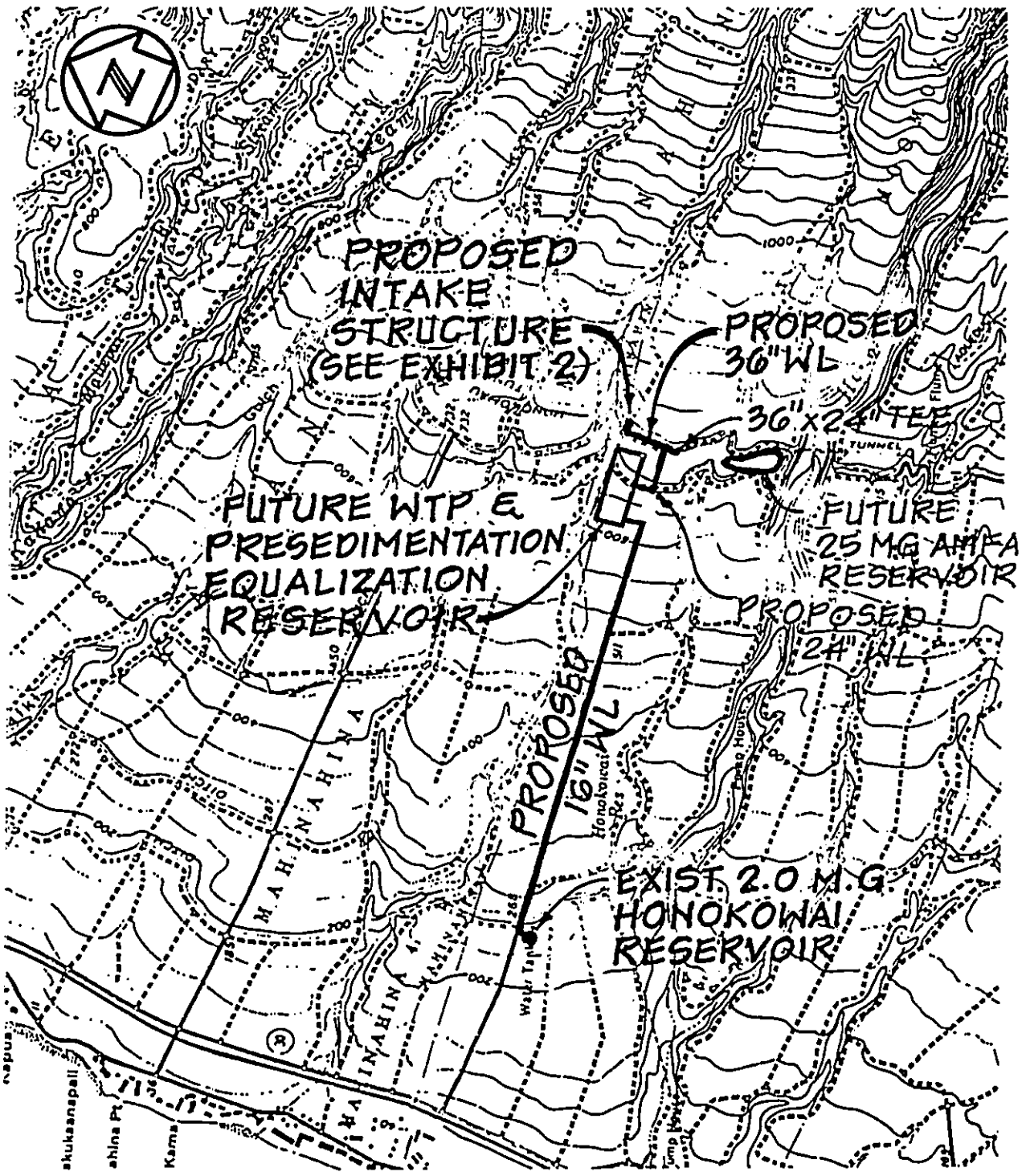
The total of these three items is $1,360,000.

REFERENCES

1. Engineering Report for the Honokohau Water System Improvements, M&E Pacific, Inc., January 1989.

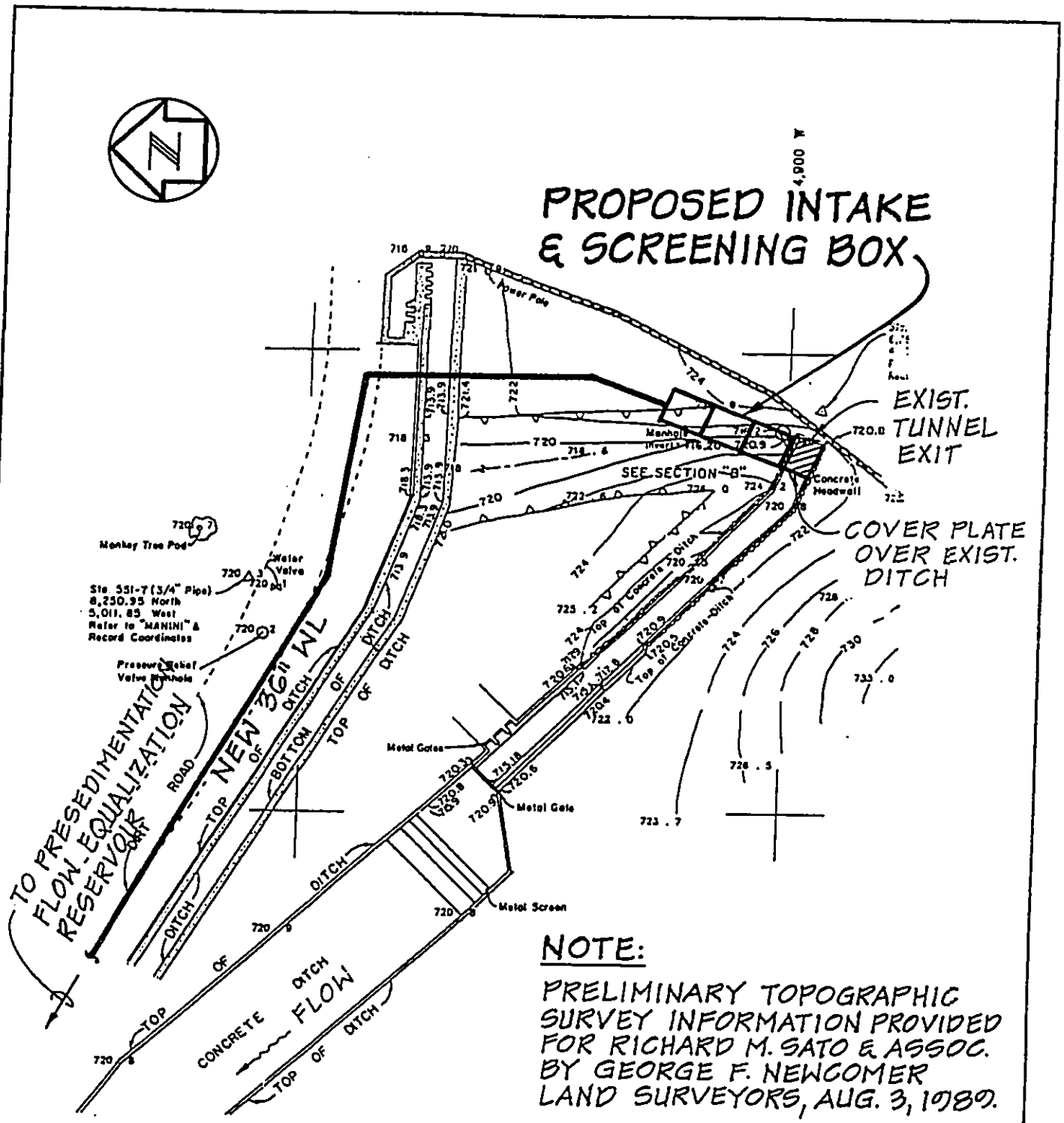
2. Standard Details for Water System Construction, Department of Water Supply, County of Maui, 1985 (revised 1989).

EXHIBITS



DEPARTMENT OF WATER SUPPLY COUNTY OF MAUI MAHINAHINA–HONOKOWAI INTAKE AND TRANSMISSION WATERLINE	EXHIBIT 1	PROJECT SITE PLAN

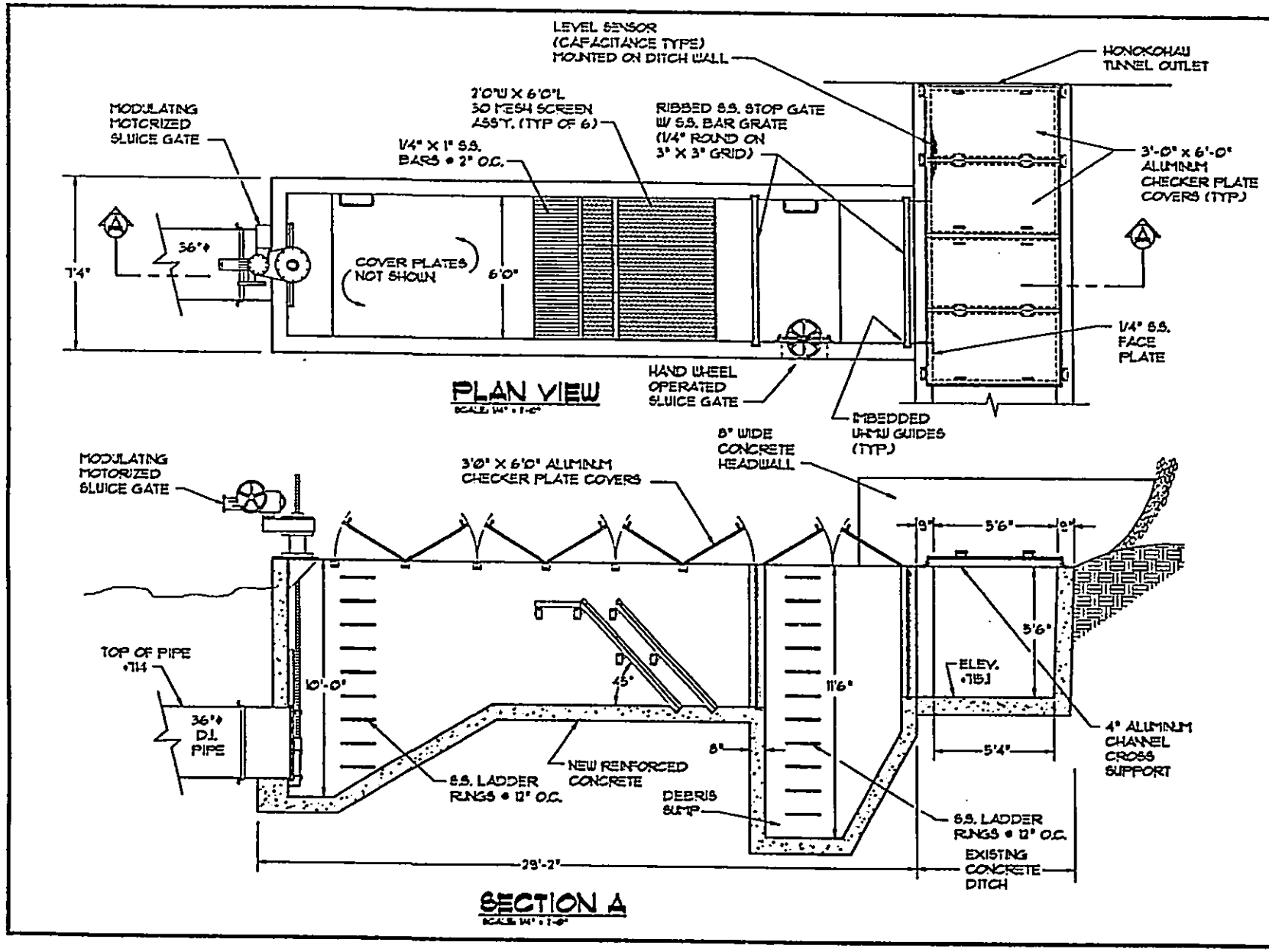
RICHARD M. SATO & ASSOCIATES, INC.
CONSULTING ENGINEERS • CIVIL & STRUCTURAL
HONOLULU, OAHU, HAWAII • WAILUKU, MAUI, HAWAII



NOTE:

PRELIMINARY TOPOGRAPHIC SURVEY INFORMATION PROVIDED FOR RICHARD M. SATO & ASSOC. BY GEORGE F. NEWCOMER LAND SURVEYORS, AUG. 3, 1080.

DEPARTMENT OF WATER SUPPLY COUNTY OF MAUI MAHINAHINA–HONOKOWAI INTAKE AND TRANSMISSION WATERLINE	EXHIBIT 2	INTAKE LOCATION MAP
		RICHARD M. SATO & ASSOCIATES, INC. CONSULTING ENGINEERS • CIVIL & STRUCTURAL HONOLULU, OAHU, HAWAII • WAILUKU, MAUI, HAWAII



PRELIMINARY DESIGN FOR
MAHINAHINA HONOKAWAI
INTAKE STRUCTURE

M-1

ELECTRICAL, MECHANICAL, CIVIL
and ENERGY CONSULTANTS

E-I-E INC.

EXHIBIT 3

Appendix C

Preliminary Grading and Drainage Report

PRELIMINARY GRADING AND DRAINAGE REPORT

FOR THE

MAHINAHINA WATER TREATMENT PLANT

HONOKOWAI, MAUI, HAWAII

Prepared for

Department of Water Supply

County of Maui

Prepared By
Austin, Tsutsumi & Associates, Inc.
Engineers • Surveyors
Honolulu • Wailuku • Hilo, Hawaii

PRELIMINARY GRADING AND DRAINAGE REPORT

FOR THE

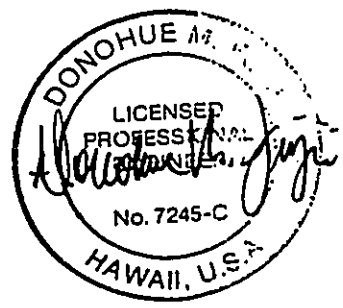
MAHINAHINA WATER TREATMENT PLANT

HONOKOWAI, MAUI, HAWAII

Prepared for

Department of Water Supply

County of Maui



Prepared By
Austin, Tsutsumi & Associates, Inc.
Engineers • Surveyors
Honolulu • Wailuku • Hilo, Hawaii

November 1991

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

CONTENTS

AUSTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS • SURVEYORS
CONTINUING THE ENGINEERING PRACTICE FOUNDED BY H. A. R. AUSTIN IN 1934

TED S. KAWAHIGASHI, P.E.
GEORGE M. NEUFFER, P.E.
KENNETH K. KUROKAWA, P.E.
THOMAS S. OTAGURO
IVAN K. NAKATSUKA, P.E.

PRELIMINARY GRADING AND DRAINAGE REPORT

FOR THE

MAHINAHINA WATER TREATMENT PLANT

HONOKOWAI, MAUI, HAWAII

TMK: 4-3-01:31; 4-4-02:15 and 18

I. INTRODUCTION

The purpose of this report is to present an evaluation of the proposed grading and drainage scheme for the proposed Mahinahina Water Treatment Plant, and to set forth the hydrologic criteria that will be used in the design of the drainage system. In addition to the proposed grading and drainage plan, descriptions of the project and of the existing site conditions are also provided.

II. PROPOSED PROJECT

A. Location

The proposed project is located in Upper Mahinahina within the district of West Maui on the island of Maui. (See Exhibit 1.) The project site, designated by Tax Map Key Nos. 4-3-01, Parcel 31 and 4-4-02, Parcels 15 and 18 is within the State "Agricultural" Zone. The Lahaina Community Plan designates the project site as "Agriculture".

REPLY TO:
501 SUMNER STREET, SUITE 521 • HONOLULU, HAWAII 96817-5031
PHONE 808/533-3646 • FAX NO. 526-1267

OFFICES IN:
HONOLULU, HAWAII
WAILUKU, MAUI, HAWAII • HILO, HAWAII

The 12.0 acre project site is bordered by Maui Pineapple Company's (MPCo) agricultural (pineapple) fields to the west, the Mahinahina Stream to the north and the MPCo Honokohau Ditch to the east.

B. Project Description

The proposed Mahinahina Water Treatment Plant (M-WTP) is a domestic water treatment plant constructed to treat water from the Honokohau Tunnel/Ditch System surface water source. Treatment must conform to the State's new surface water treatment rule to be enforced in June of 1993.

The basic components within the M-WTP fenced site will be a 20 million gallon (MG) Presedimentation/Equalization (P/E) reservoir, a two-story concrete masonry unit Operations and Chemical (O/C) building, a flocculation/filter structure, recovery ponds, a 2.0 MG clearwell, a septic tank/leaching field wastewater system and an access driveway. An area for future sedimentation basins will also be provided. Access to the project will be provided by an existing 15-foot wide main agricultural haul road to the existing pineapple fields. This existing road will not be improved. (See Exhibit 2.)

The finish water from the M-WTP will be stored within the 2.0 MG clearwell with an overflow elevation of 642.9 feet.

The design average capacity of the M-WTP will be 2.5 MGD. The entire volume of treated water will be conveyed to the County's existing 2.0 MG Honokowai Reservoir.

III. EXISTING CONDITIONS

A. Topography and Soil Conditions

The project site is presently used for pineapple cultivation. The site has an approximate existing slope of 7 percent with elevations ranging from 630 feet to 710 feet above mean sea level.

The soil series for the general area, as identified in the Soil Survey by the U.S. Department of Agriculture Soil Conservation Service, is the Kahana Series. Two soil types of the Kahana Series are found at the site: Kahana silty clay, with slopes of 3 to 7 percent (KbB) and Kahana silty clay, with slopes of 7 to 15 percent (KbC). This soil series is consistent with other well-drained soils located along the uplands of the island of Maui. Runoff is slow to medium, permeability is moderately rapid and water erosion is light to moderate.

B. Climate and Rainfall

Upper Mahinahina is generally sunny and warm throughout the year. The temperature averages 71 degrees, with a median annual rainfall of 35-45 inches. The Mahinahina area has a climate typical of areas in the Hawaiian Islands sheltered from the prevailing northeasterly tradewinds. As is the case with many leeward areas, Mahinahina is subject to diurnal wind variations resulting from temperature changes over the land mass and the ocean plane. During the rainy season, October to April, the wind condition will vary with occasional strong southerly winds accompanying cyclonic "Kona" storms.

C. Drainage

With the project site being used for pineapple cultivation, the majority of the off-site and on-site runoff percolates into the existing ground. The

remaining runoff, if any, sheet flows into the Mahinahina Stream Gulch or across the main haul road toward the Honokowai Irrigation Reservoir.

IV. HYDROLOGIC ANALYSIS

The storm water runoff quantity was computed by using the Rational Formula:

$$Q = CIA$$

Where:

Q = storm runoff quantity, cfs

C = runoff coefficient

I = rainfall intensity in inches per hour for a duration equal to the time of concentration (Tc)

A = drainage (watershed) area, acres

Applicable sections of the "Storm Drainage Standards", City and County of Honolulu, May 1988, were used as a reference. The rainfall intensity for a 10-year recurrence interval was interpolated from the "Rainfall Frequency Atlas of the Hawaiian Islands", by the U.S. Department of Commerce, Weather Bureau.

The project area was divided into nine tributary areas. (See Exhibit 3 for Drainage Runoff Plan.)

Factors used in the calculation of the runoff for the Mahinahina Water Treatment Plant were as follows:

Factors	Undeveloped								
Drain Area No.	1	2	3	4	5	6	7	8	9
C	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
i (Intensity of 1-hour rainfall, inches, Tm=10 years)	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
A (acres)	3.20	3.60	1.34	1.97	0.57	0.44	0.59	1.15	0.61
Tc (min)	18	18	18	18	18	18	18	18	18
Correction factor	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	18
I (in./hr., Tm = 10 years)	4.86	4.86	4.86	4.86	4.86	4.86	4.86	4.86	4.86
Storm Runoff Quantity									
Q (cfs)	5.44	6.12	2.28	3.35	0.97	0.75	1.00	1.96	1.04
Total Q (cfs)	22.91								
Say (cfs)	23								

Factors	Developed								
Drain Area No.	1	2	3	4	5	6	7	8	9
C	0.78	0.71	0.68	0.66	0.45	0.85	0.35	0.65	0.40
i (Intensity of 1-hour rainfall, inches, Tm=10 years)	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
A (acres)	3.20	3.60	1.34	1.97	0.57	0.44	0.59	1.15	0.61
Tc (min)	12	12	12	8	10	10	16	10	16
Correction factor	2.2	2.2	2.2	2.5	2.3	2.3	1.9	2.3	1.9
I (in./hr., Tm = 10 years)	5.94	5.94	5.94	6.75	6.21	6.21	5.13	6.21	5.13

Storm Runoff Quantity									
Factors	Developed								
Drain Area No.	1	2	3	4	5	6	7	8	9
Q (cfs)	14.83	15.18	5.41	8.78	1.59	2.32	1.06	4.64	1.25
Total Q (cfs)	55.06								
Say (cfs)	55								

Based upon a 10-year design storm, the proposed project will generate approximately 55 cubic feet per second (cfs) of storm runoff, which is an increase of 32 cfs over the runoff presently generated at the site.

V. GRADING AND DRAINAGE PLAN

The proposed grading plan for the Mahinahina Water Treatment Plant will require cutting and filling sections of the existing site approximately 10 to 12 feet to satisfy proposed finish floor elevations. The finish first floor elevation of the proposed O/C building will be 665.5 feet above mean sea level and the second floor some 11 feet higher. The bottom floor elevation of the finish water clearwell will be 622.9 feet above sea level. Approximately 12.0 acres of existing pineapple land will be graded. Proposed earth swales, concrete curbs and drain inlets positioned around the site will direct the storm runoff around and away from the treatment facilities. Storm runoff will discharge at the two bottom corners of the graded area into a large desilting basin. Ultimate runoff disposal will be into the adjacent Mahinahina Gulch.

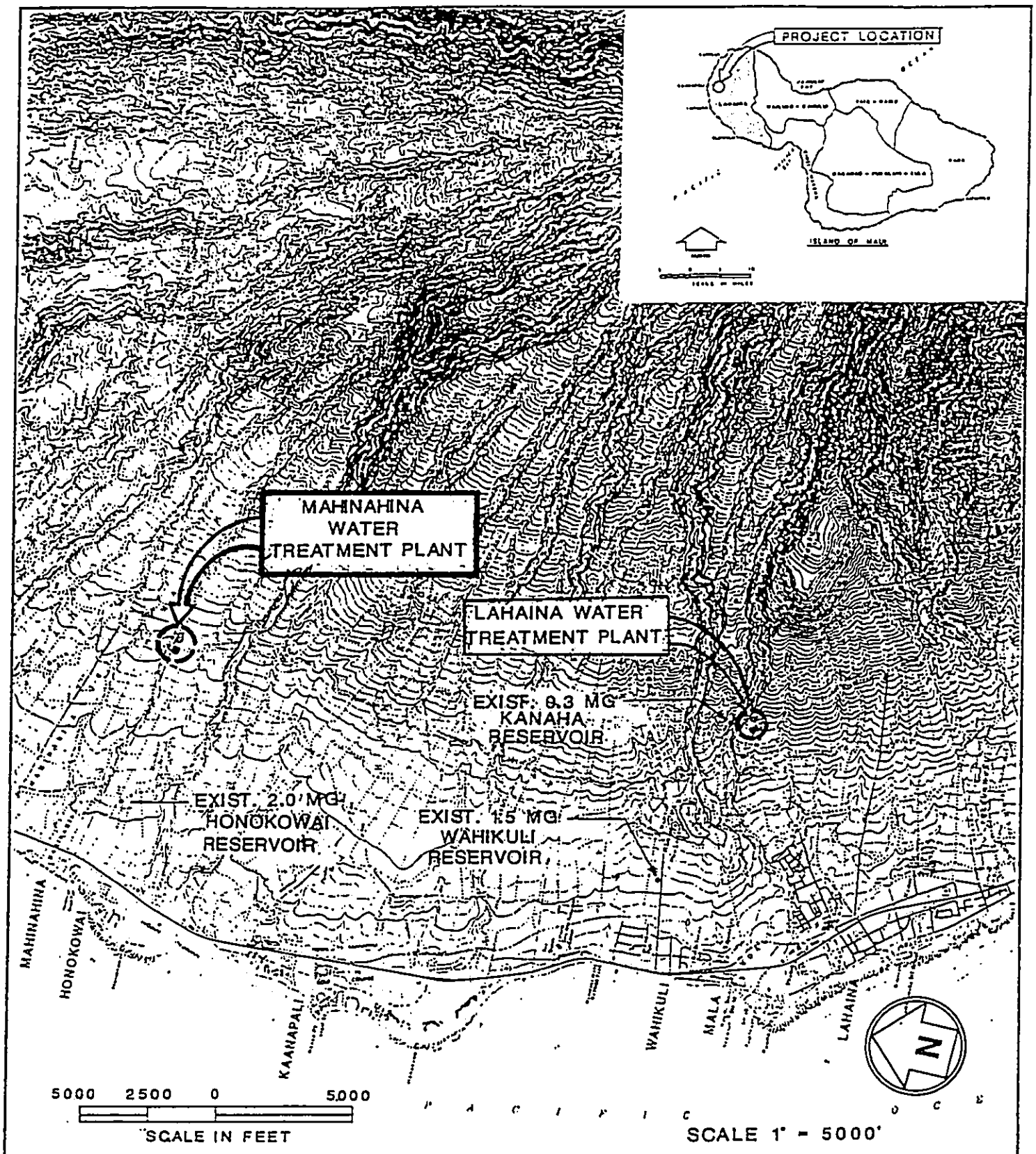
Off-site runoff will be diverted around the proposed site by earth swales. A portion of the off-site runoff will discharge into the desilting basin. Remaining runoff will follow existing surface drainage patterns. (See Exhibit 3 for Drainage Runoff Plan.)

VI. EROSION CONTROL

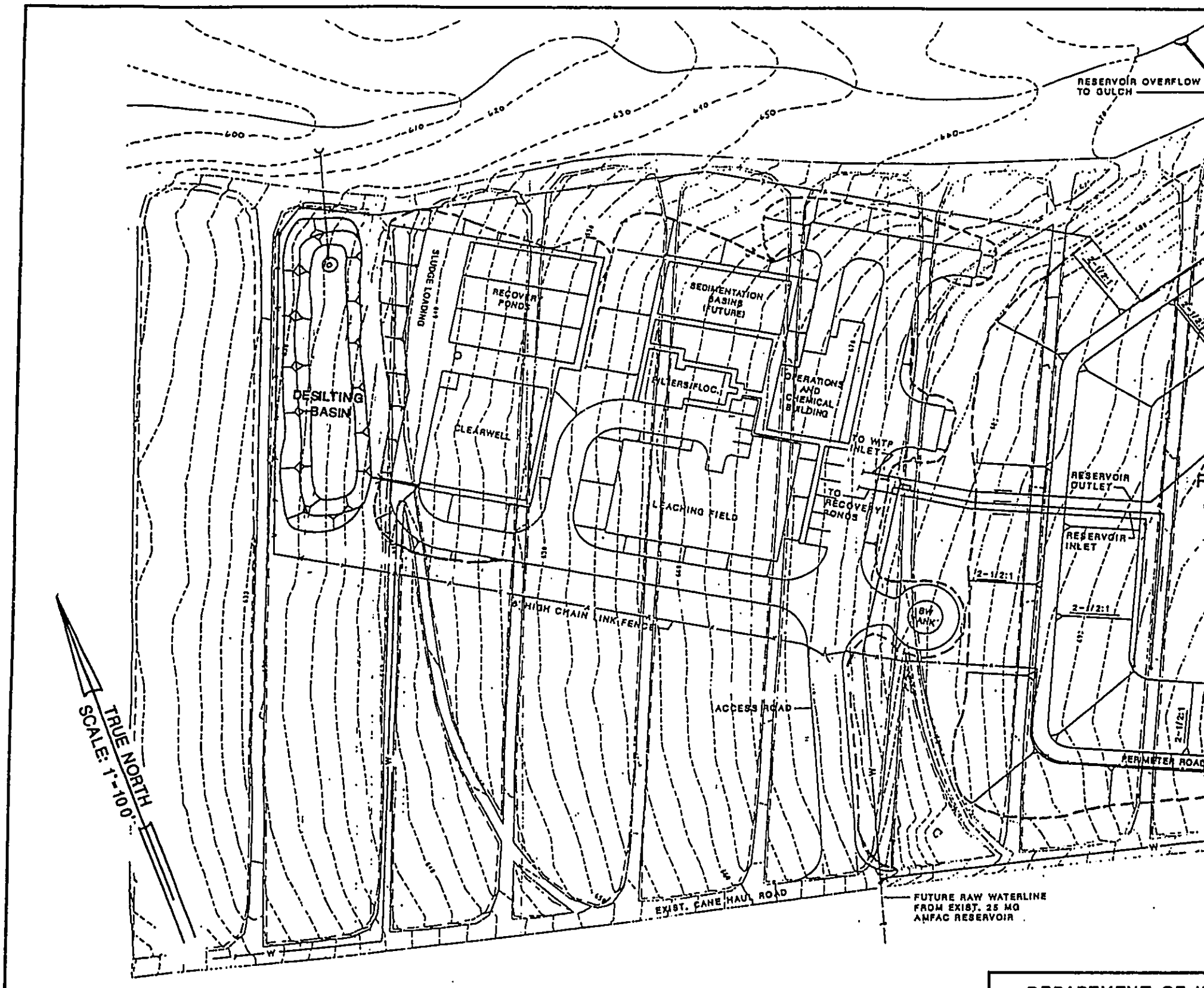
Severe erosion hazards are not expected during construction, due to the size of the project area and the highly overgrown adjacent areas. However, erosion control measures, such as providing a large desilting basin, will be implemented for storage of sediment contained in runoff water created by possible heavy rain storms. Should construction be delayed for an extended length of time, protective vegetative cover will be established to minimize soil loss.

VII. *CONCLUSION*

The proposed grading and drainage scheme for the Mahinahina Water Treatment Plant will be designed to produce no adverse effect by storm runoff to adjacent downstream properties. Soil loss will be minimized during the construction period by implementing appropriate erosion control measures. Dust will also be minimized during construction by the implementation of water sprinkling. All drainage improvements will conform to County Standards and will be coordinated with the Department of Public Works, County of Maui.



DEPARTMENT OF WATER SUPPLY COUNTY OF MAUI MAHINAHINA WATER TREATMENT PLANT PRELIMINARY GRADING AND DRAINAGE REPORT	AUSTIN, TSUTSUMI, & ASSOC., INC. ENGINEERS SURVEYORS • HAWAII **LOCATION MAP**	EXHIBIT **1**



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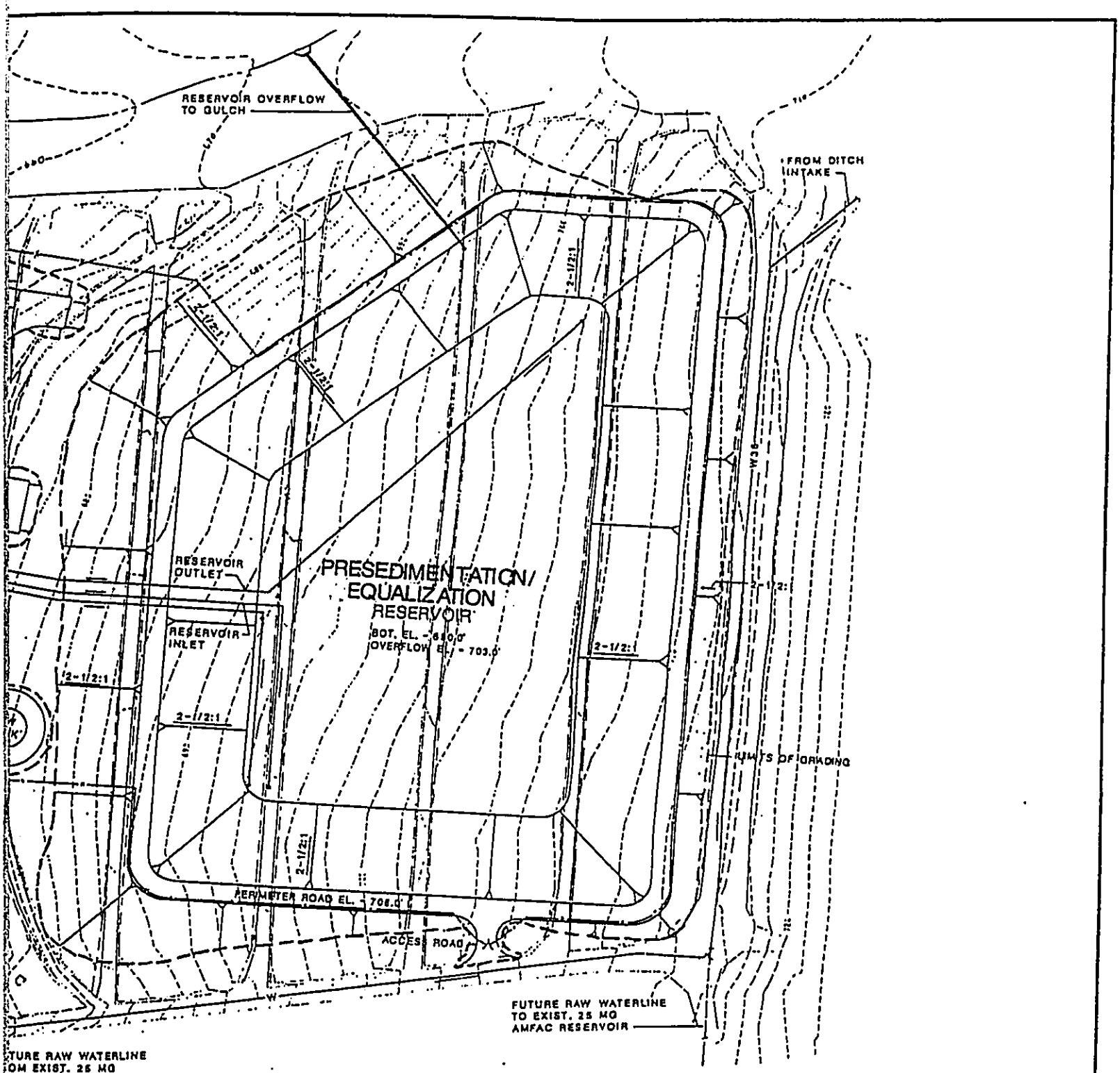
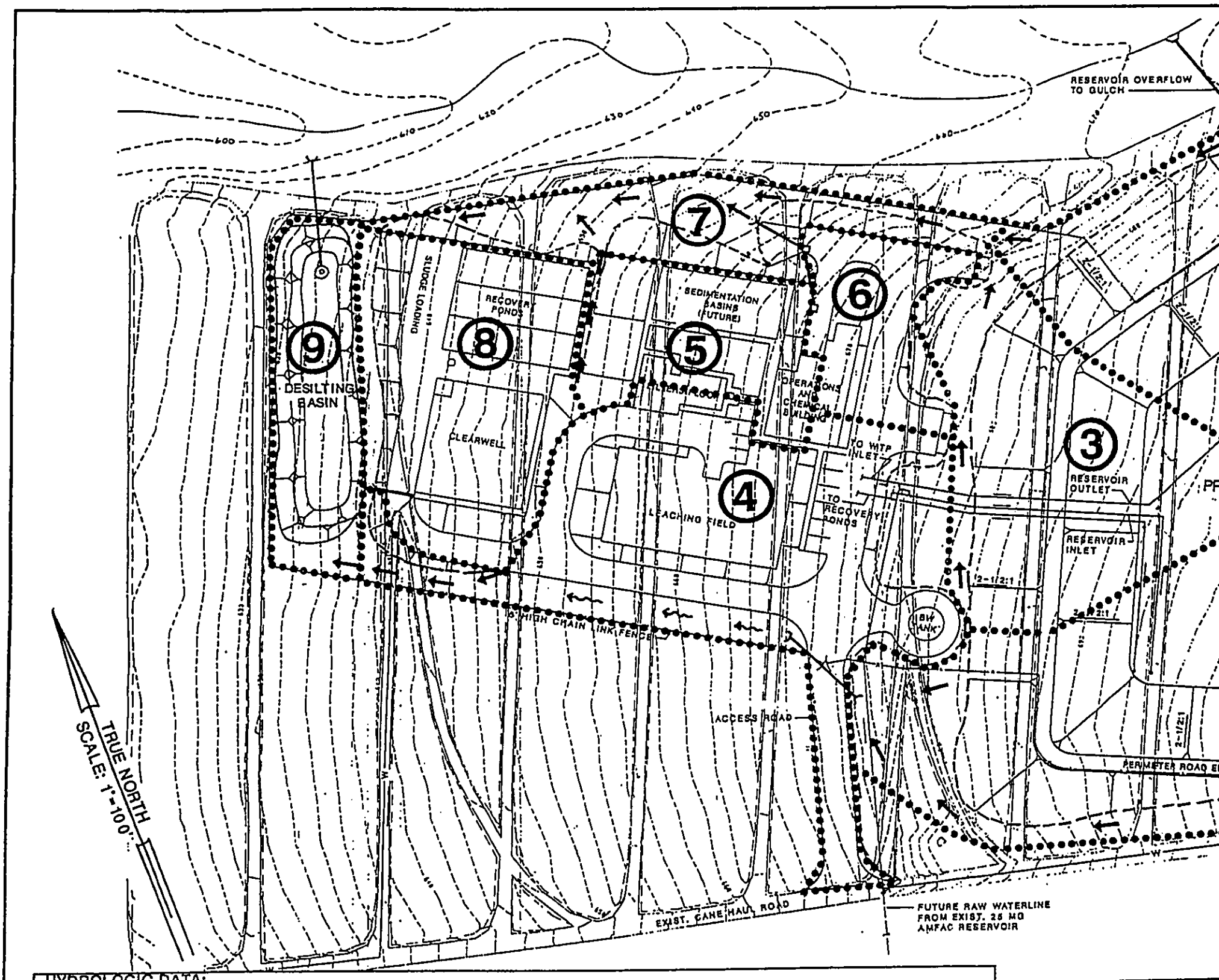


DEPARTMENT OF WATER SUPPLY COUNTY OF MAUI MAHINAHINA WATER TREATMENT PLANT PRELIMINARY GRADING AND DRAINAGE REPORT	AUSTIN, TSUTSUMI, & ASSOC., INC. ENGINEERS. SURVEYORS · HAWAII PROJECT SITE PLAN	EXHIBIT 2



HYDROLOGIC DATA:									
AREA NO.	1	2	3	4	5	6	7	8	9
UNDEVELOPED $CI_{10UNDEV}$	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
DEVELOPED									
CI_{100DEV}	4.63	4.22	4.04	4.45	2.79	5.28	1.80	4.04	2.05
AREA (AC)	3.20	3.60	1.34	1.97	0.57	0.44	0.59	1.15	0.61
Q_{100DEV}(CFS)	14.83	15.18	5.41	8.78	1.59	2.32	1.06	4.64	1.25

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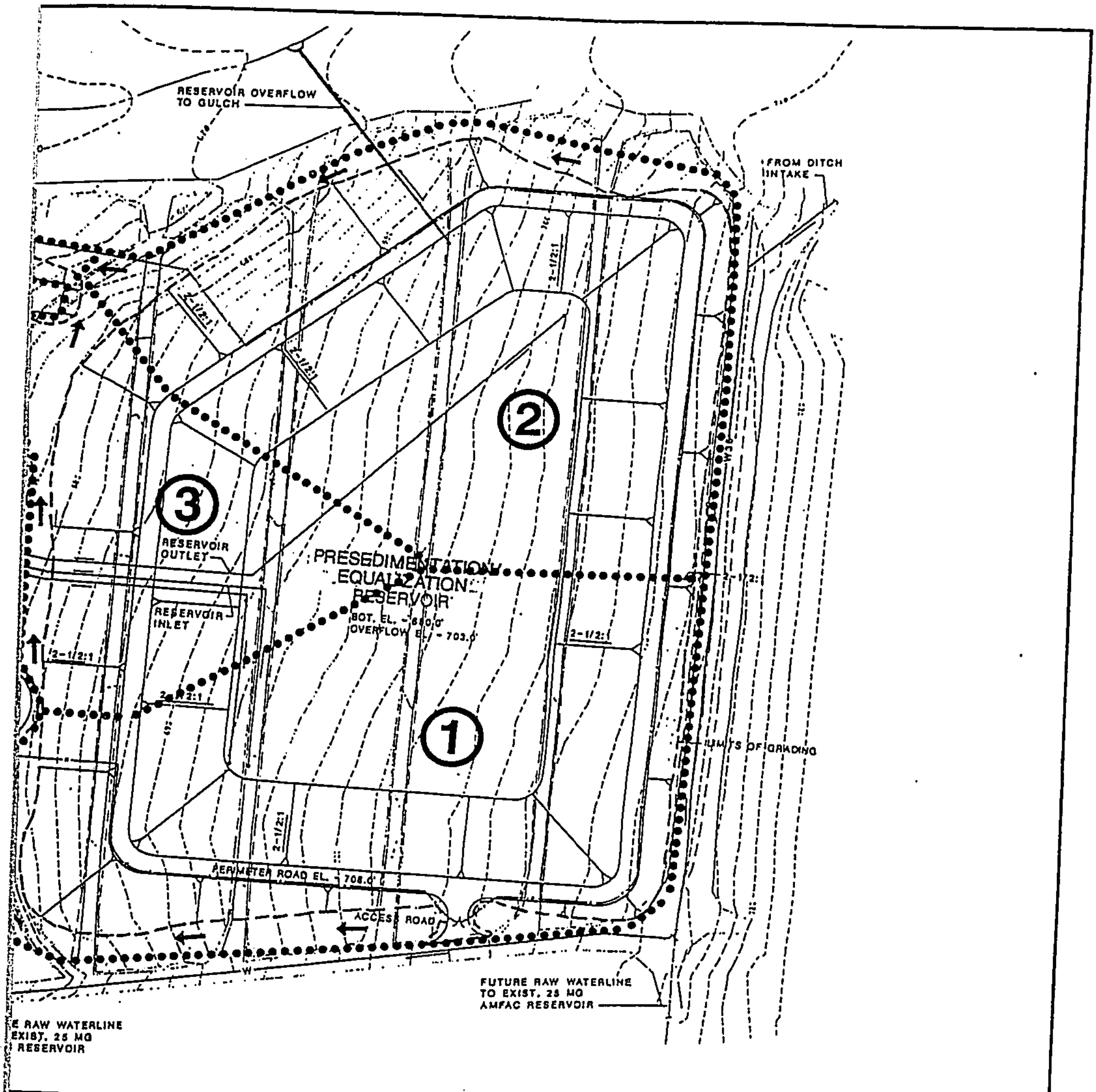


DEPARTMENT OF WATER SUPPLY COUNTY OF MAUI MAHINAHINA WATER TREATMENT PLANT PRELIMINARY GRADING AND DRAINAGE REPORT	AUSTIN, TSUTSUMI, & ASSOC., INC. ENGINEERS, SURVEYORS • HAWAII DRAINAGE RUNOFF PLAN	EXHIBIT 3

Appendix D

Erosion Control Plan

EROSION CONTROL PLAN

FOR THE

MAHINAHINA WATER TREATMENT PLANT

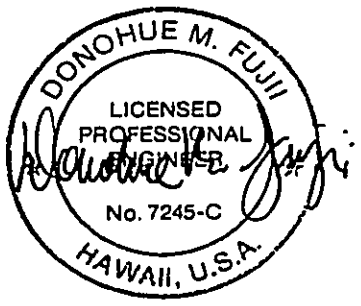
HONOKOWAI, MAUI, HAWAII

TAX MAP KEY: 4-3-01:31; 4-4-02:15 AND 18

PREPARED FOR

DEPARTMENT OF WATER SUPPLY

COUNTY OF MAUI



Prepared By

Austin, Tsutsumi & Associates, Inc.
Engineers • Surveyors
Honolulu • Wailuku • Hilo, Hawaii

November 1991

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

EROSION CONTROL PLAN

NAME OF DEVELOPMENT: MAHINAHINA WATER TREATMENT PLANT

DEVELOPER:	DEPARTMENT OF WATER SUPPLY COUNTY OF MAUI
ENGINEER:	AUSTIN, TSUTSUMI & ASSOCIATES, INC.
LOCATION:	HONOKOWAI, MAUI, HAWAII
TAX MAP KEY:	4-3-01:31; 4-4-02:15 AND 18
AREA:	12.0 ACRES
DATE:	November 22, 1991

SOILS: The particular soil series at the project site is the Kahana Series. Two soil types of Kahana Series are found at the site: Kahana silty clay, with slopes of 3 to 7 percent (KbB) and Kahana silty clay, with slopes of 7 to 15 percent (KbC). This soil series is consistent with other well-drained soils located along the uplands of the island of Maui.

EROSION HAZARD: Light to moderate. Rainfall Erosion Index is 250. Runoff is slow to medium; permeability is moderately rapid, as described by the USDA Soil Conservation Service "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii".

The project site is presently used for pineapple cultivation. The site is moderately sloping land with elevations ranging from 630 feet to 710 feet above mean sea level.

With the project site being used for pineapple cultivation, the majority of the off-site and on-site runoff percolates into the existing ground. The remaining runoff, if any, sheet flows into the Mahinahina Stream Gulch or toward the Honokowai Reservoir.

CONSTRUCTION SCHEDULE:

1. Clear and grub project site - May 1-15, 1992.

2. Mass grade site. Construct the presedimentation/equalization reservoir and storm runoff desilting basin. Grass all slopes, exposed areas and pads as soon as final grades have been established - May 18 -July 17, 1992.

3. Cut water treatment plant access road, water treatment plant clearwell and backwash recovery/sludge drying beds - July 20 - August 28, 1992.

4. Improve off-site access road and install off-site water lines - August 31 - September 25, 1992.

5. Install permanent utilities. Provide base course for access roads and water treatment plant parking area - September 28 - November 13, 1992.

6. Complete construction of 20 million gallon (MG) presedimentation/equalization reservoir, water treatment plant and all other improvements. Install permanent vegetative cover in open space areas - November 16, 1992 - May 1, 1993.

7. Clean up, treatment plant testing and inspection - May 1 - June 15, 1993.

TEMPORARY EROSION CONTROL MEASURES:

1. Grass all exposed areas and slopes.

PERMANENT EROSION CONTROL MEASURES:

1. Permanent drainage system.

2. Construction of A.C. paved roads, loading area and parking areas.

3. Permanent landscaping of slopes and exposed areas.

SEVERITY RATING CALCULATIONS:

1. Values of Equation Factors

F = 1
T = 12 months, 1.0 year
D = 2 Class A
A = 12.0 Acres
E = RK (LS) (CP)
R = 250

Soil Erodibility Factor:

K = 0.17; Soil Symbol: KbB, KbC

(LS): S = 6.8%; L = 440'
LS = 1.6

Cover and Management Factor, C and Erosion Control Practice Factor, P:

(CP): Grading in Summer Months: C = (0.4) (6 mo.) = 2.4
Grading in Winter Months: C = (0.75) (6 mo.) = 4.5

$$C = \frac{2.4 + 4.5}{12 \text{ mo.}}$$

C = 0.58

Erosion Control Measures:
Incremental Grading, P = 0.7

(CP) = 0.58 (0.7) = 0.41

2. CALCULATIONS

E = RK (LS) (CP)
= 250 (0.17) (1.6) (0.41)
E = 27.88

H = (2 FT + 3D) AE
= [2(1)(1.0) + 3(2)] [(12.0) (27.88)]
H = 2676.5 < 50,000 (Maximum Allowable) Severity Rating

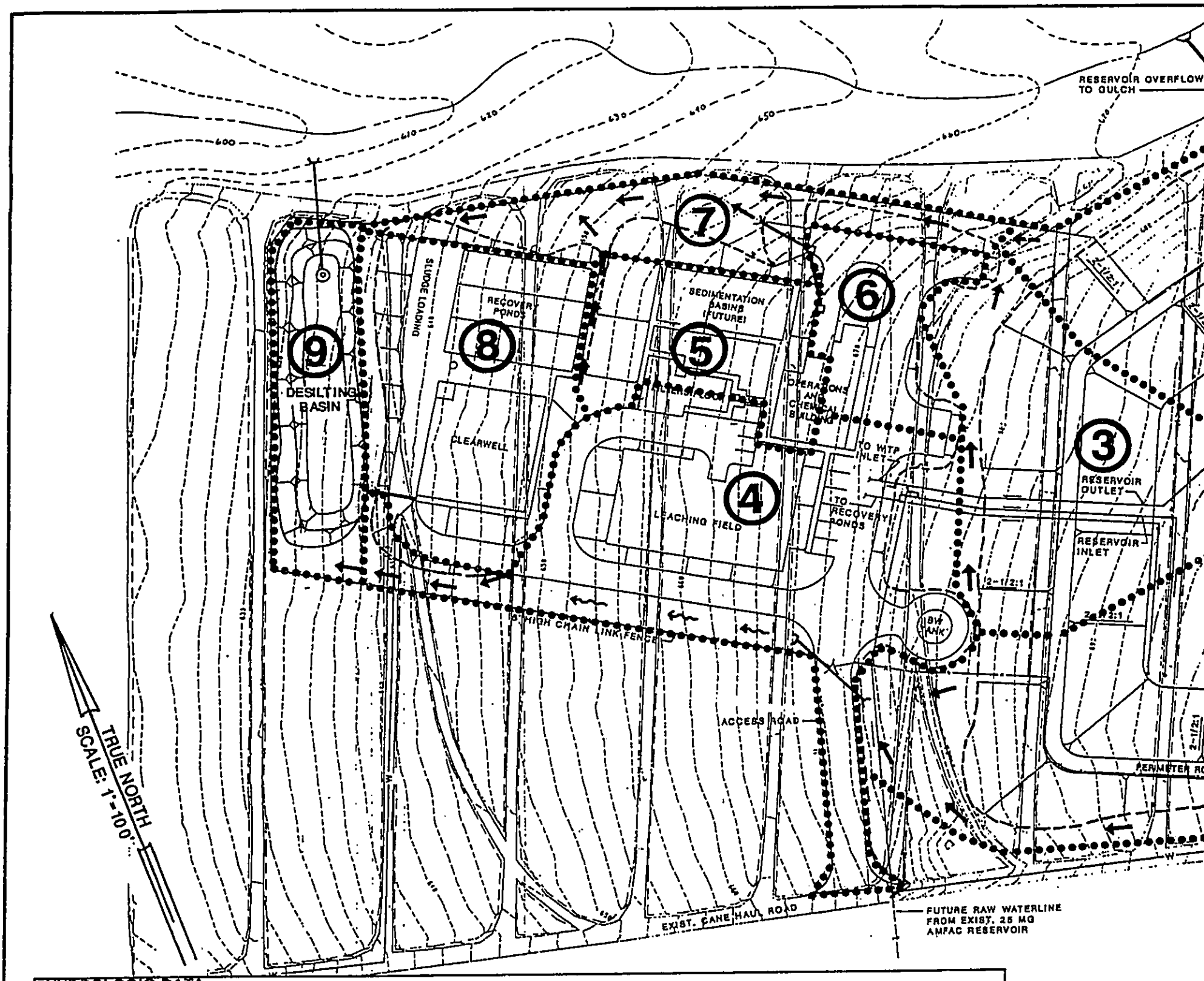
REFERENCES: "Erosion and Sediment Control - Guide for Hawaii", USDA Soil Conservation Service, March 1981.

"Soil Erosion Standards and Guidelines", Department of Public Works, City and County of Honolulu, November 1975.

APPROVED:

_____ _____
Director and Chief Engineer Date
Department of Public Works

_____ _____
Chief, Division of Engineering Date
Department of Public Works



HYDROLOGIC DATA: AREA NO.	1	2	3	4	5	6	7	8	9
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DEVELOPED									
CI_{100EV}	4.63	4.22	4.04	4.45	2.79	5.28	1.80	4.04	2.05
AREA (AC)	3.20	3.60	1.34	1.97	0.57	0.44	0.59	1.15	0.61
Q_{100EV}(CFS)	14.83	15.18	5.41	8.78	1.59	2.32	1.06	4.64	1.25

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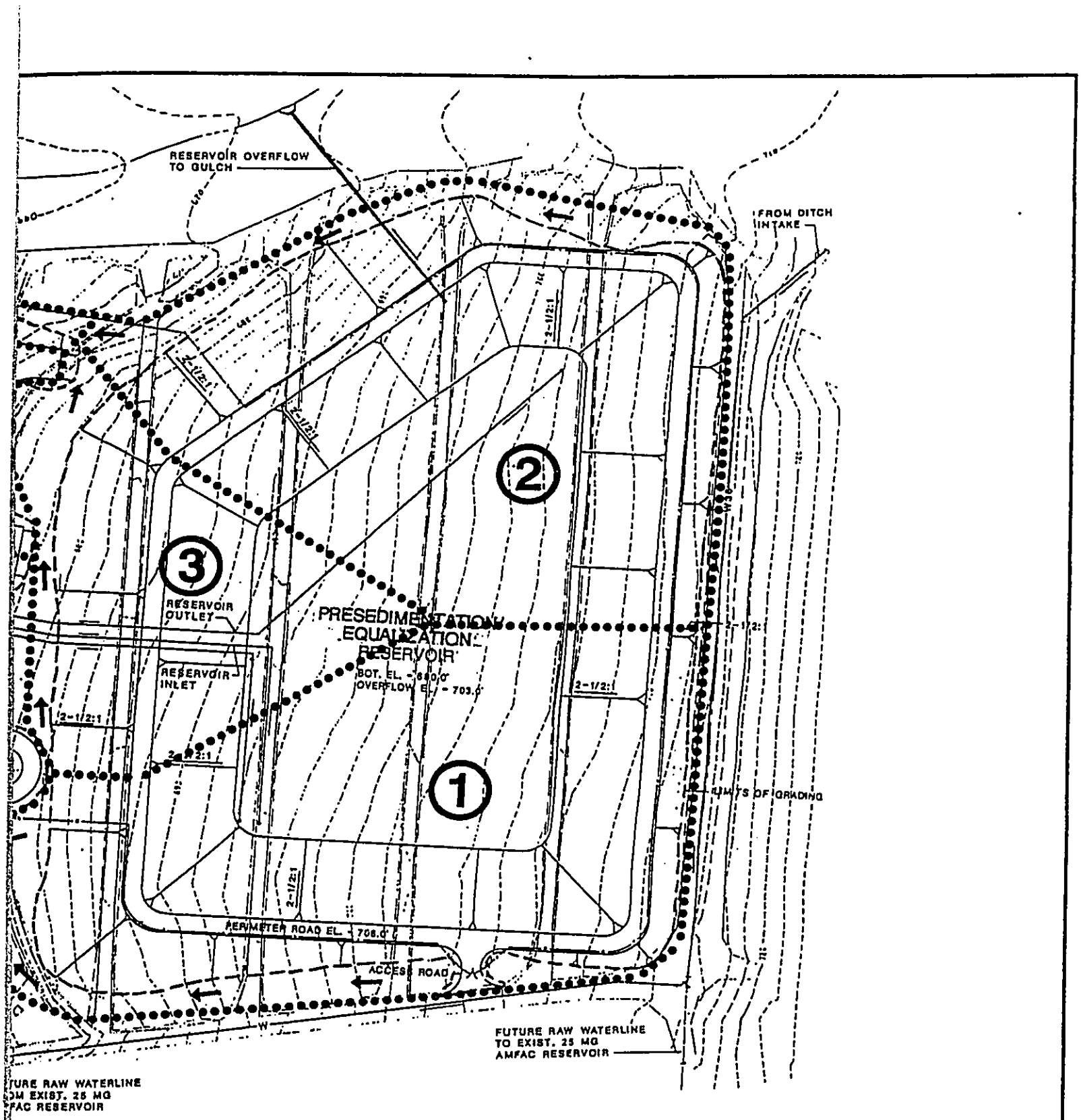

9 .70 .05 .61 .25	DEPARTMENT OF WATER SUPPLY COUNTY OF MAUI MAHINAHINA WATER TREATMENT PLANT EROSION CONTROL PLAN	AUSTIN, TSUTSUMI, & ASSOC., INC. ENGINEERS. SURVEYORS · HAWAII DRAINAGE RUNOFF PLAN	EXHIBIT 1