1996- Oahu - FEIS-
Makaha 242 Reservoir No. 2

FILE COPY

FINAL

ENVIRONMENTAL IMPACT STATEMENT

FOR THE

MAKAHA 242 RESERVOIR NO. 2

Gray · Hong · Bills & Associates, Inc.
CONSULTING ENGINEERS

119 Merchant Street, Suite 607, Honolulu, Hawaii 96813, Tel: (808) 521 0306, Fax: (808) 531 8018

FINAL

ENVIRONMENTAL IMPACT STATEMENT

FOR THE

MAKAHA 242 RESERVOIR NO. 2

MAKAHA, OAHU, HAWAII
TMK: 8-4-02:11 & PORTION 14

Proposing Agency:

HONOLULU BOARD OF WATER SUPPLY
City & County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

April, 1996

Prepared By:

GRAY, HONG, BILLS & ASSOCIATES, INC.
119 Merchant Street, Suite 607
Honolulu, Hawaii 96813
Phone: 521-0306 Fax: 531-8018

FINAL

ENVIRONMENTAL IMPACT STATEMENT

FOR THE

MAKAHA 242 RESERVOIR NO. 2

MAKAHA, OAHU, HAWAII
TMK: 8-4-2:11 & Portion 14

Proposing Agency

HONOLULU BOARD OF WATER SUPPLY
City & County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843
Contact: Barry Usagawa, Phone: 527-5235

Accepting Authority

OFFICE OF THE MAYOR
CITY AND COUNTY OF HONOLULU

Board Members:

Walter O. Watson
Maurice H. Yamasato
Sister M. Davilyn Ah Chick
Melissa Y. J. Lum
Forrest C. Murphy
Kenneth E. Sprague

Prepared by

GRAY, HONG, BILLS & ASSOCIATES, INC.
119 Merchant Street, Suite 607
Honolulu, Hawaii 96813
Phone 521-0306 - Fax 531-8018

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

April 17, 1996

TO: THE HONORABLE JEREMY HARRIS, MAYOR
CITY AND COUNTY OF HONOLULU

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: FORMAL ACCEPTANCE OF THE FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS) FOR THE BOARD OF WATER SUPPLY'S (BWS) MAKAHA 242' RESERVOIR NO. 2, MAKAHA, OAHU, TMK: 8-4-02: 11, PORTION 14

We transmit the FEIS for the Makaha 242' Reservoir No. 2 project and request your acceptance.

BWS has completed the FEIS in accordance with the requirements of Chapter 343, HRS, and finds that the document fulfills the definition of an Environmental Impact Statement and adequately discloses and describes all identifiable environmental impacts. In addition, all comments submitted during the public review period have received satisfactory responses and have been appended to the FEIS. The acceptance of the statement is an affirmation of the adequacy of the statement under applicable laws and does not constitute an endorsement of the proposed action.

Therefore, as the accepting authority specified in Chapter 343-5, (b), (2), HRS, and in compliance with City and County Directive No. 89-2, dated May 25, 1989, we respectfully request your acceptance of the FEIS for the Makaha 242' Reservoir No. 2.

If you have any questions, please contact me at 527-6180.

ACCEPTANCE/~~NON-ACCEPTANCE~~:

Acting Mayor / 4/26/96
JEREMY HARRIS, MAYOR Date
City and County of Honolulu

TABLE OF CONTENTS

1. **INTRODUCTION AND SUMMARY** 1
   - 1.1 APPLICANT 1
   - 1.2 BRIEF PROJECT SUMMARY 1
   - 1.3 SIGNIFICANT BENEFICIAL AND ADVERSE IMPACTS 1
     - 1.3.1 Beneficial Impacts 1
     - 1.3.2 Adverse Impacts and Proposed Mitigative Measures 1
     - 1.3.3 Alternatives Considered 5
     - 1.3.4 Summary of Unresolved Issues 5
     - 1.3.5 Compatibility with Land Use Plans and Policies 6
     - 1.3.6 Necessary Approval and Permits Required 6

2. **STATEMENT OF PURPOSE AND NEED FOR ACTION** 7
   - 2.1 STATEMENT OF PURPOSE 7
   - 2.2 NEED FOR THE PROJECT 7
     - 2.2.1 Background 7
     - 2.2.2 Need for Additional Reservoir Capacity 8
     - 2.2.3 Excess Additional Reservoir Capacity 8

3. **PROJECT DESCRIPTION** 9
   - 3.1 LOCATION 9
   - 3.2 STATEMENT OF OBJECTIVES 9
   - 3.3 GENERAL DESCRIPTION OF THE ACTION'S TECHNICAL, ECONOMIC, SOCIAL AND ENVIRONMENTAL CHARACTERISTICS 10
     - 3.3.1 Technical Characteristics 10
       - 3.3.1.1 Storage Reservoir 10
       - 3.3.1.2 Transmission Line 15
       - 3.3.1.3 Telemetry System 15
       - 3.3.1.4 Asphaltic Concrete Pavement 15
       - 3.3.1.5 Landscaping 15
       - 3.3.1.6 Grading 15
     - 3.3.2 Economic Characteristics 16
     - 3.3.3 Social Characteristics 17
       - 3.3.3.1 Land Ownership 17
       - 3.3.3.2 Land Use Designations 17
       - 3.3.3.3 Existing Use 17
       - 3.3.3.4 Surface Water Patterns 17
       - 3.3.3.5 Groundwater Usage 20
       - 3.3.3.6 Wastewater Treatment and Disposal 20
       - 3.3.3.7 Solid Waste 20
       - 3.3.3.8 Noise 20
       - 3.3.3.9 Air Quality 21

3.4 DISCLOSURE OF PUBLIC FUNDS OR LANDS FOR THE ACTION 21
3.5 PHASING AND TIMING OF ACTION 21
3.6 HISTORICAL PERSPECTIVE 21

4. DESCRIPTION OF ANY KNOWN ALTERNATIVES TO THE PROJECT 21
4.1 "NO ACTION" ALTERNATIVE 21
4.2 ALTERNATIVE LOCATION 21
4.3 REPLACE EXISTING RESERVOIR 22
4.4 SMALLER SIZE RESERVOIR 22

5. DESCRIPTION OF THE ENVIRONMENTAL SETTINGS, IMPACTS AND MITIGATION MEASURES 22
5.1 PROJECT SITE 22
5.2 PHYSICAL ENVIRONMENT 22
5.2.1 Geology and Soils 22
5.2.2 Climate 23
5.2.3 Topography 23
5.2.4 Visual Impacts 24
5.2.5 Drainage and Erosion 25
5.2.5.1 Drainage Improvements 25
5.2.5.2 Grading Work 25
5.2.5.3 Erosion Control Measures 28
5.2.5.4 Best Management Practices Plan 28
5.2.6 Flora and Fauna 29
5.2.7 Historic and Archaeological Resources 30
5.2.8 Groundwater 31
5.2.9 Agricultural Resources 31
5.2.10 Air Quality 31
5.2.11 Noise 32
5.2.12 Cultural Resources 32
5.2.13 Population 33
5.3 MAN-MADE ENVIRONMENT 33
5.3.1 Housing 33
5.3.2 Commercial and Industrial Areas 33
5.4 Public Facilities and Services 34
5.4.1 Roadway System 34
5.4.2 Water Systems 34
5.4.3 Wastewater and Solid Waste Management 34
5.4.4 Fire Protection 35
5.4.5 Drainage System 35
5.4.6 Electric and Telephone Service 36

6. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS OF THE AFFECTED AREA 36
6.1 FEDERAL 36
6.2 STATE LAND USE PLAN 36
6.3 HAWAII STATE PLAN 37
6.3.1 State Goals, H.R.S. Section 226-4 37
6.3.2 Physical Environment - Land-based, Shoreline, and Marine Resources, H.R.S. Section 226-11 37
6.3.3 Physical Environment - Scenic, Natural Beauty, and Historic Resources, H.R.S. Section 226-12 37
6.3.4 Physical Environment - Land, Air, and Water Quality, H.R.S. Section 226-13 38
6.3.5 Facility Systems - Water, H.R.S. Section 226-16 38
6.4 STATE FUNCTIONAL PLANS 38
6.5 HAWAII COASTAL ZONE MANAGEMENT (CZM) PROGRAM 39
6.5.1 Recreational Resources 39
6.5.2 Historic Resources 39
6.5.3 Scenic and Open Space Resources 39
6.5.4 Coastal Ecosystems 39
6.5.5 Economic Uses 40
6.5.6 Coastal Hazards 40
6.5.7 Managing Development 40
6.5.8 Public Participation 40
6.5.9 Beach Protection 40
6.6 OAHU GENERAL PLAN 41
6.6.1 Natural Environment 41
6.6.2 Transportation and Utilities 41
6.6.3 Physical Development and Urban Design 41
6.6.4 Government Operations and Fiscal Management 41
6.7 LAND USE ORDINANCE 41
6.8 LIST OF NECESSARY APPROVALS 42

7. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF HUMANITIES ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY 43
7.1 SHORT-TERM 43
7.2 LONG-TERM 43

8. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES THAT WOULD BE INVOLVED IN THE PROJECT SHOULD IT BE IMPLEMENTED . 43

9. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED 44
9.1 UNAVOIDABLE EFFECTS 44
9.2 RATIONALE FOR PROCEEDING WITH THE ACTION 44

9.3 ACHIEVEMENT OF COUNTERVAILING BENEFITS THROUGH ALTERNATIVES WHICH AVOID ADVERSE EFFECTS 44

10. SUMMARY OF UNRESOLVED ISSUES 45

11. LIST OF PARTIES CONSULTED IN PREPARATION OF THE STATEMENT 45

12. LIST OF PERSONS INVOLVED IN PREPARATION OF THE STATEMENT 48

13. BIBLIOGRAPHY 48

14. COMMENTS AND RESPONSES DURING THE DRAFT ENVIRONMENTAL IMPACT STATEMENT PREPARATION 49

15. COMMENTS AND RESPONSES TO THE DRAFT ENVIRONMENTAL IMPACT STATEMENT 70

LIST OF TABLES

Table 1: Current Makaha 242 System Requirements 7

Table 2: List of Necessary Approvals 42

Table 3: List of Consulted Parties During Preparation of the EIS 46

Table 4: List of Persons Involved in Preparation of the EIS 48

Table 5: List of Reviewers to the Draft EIS 71

LIST OF FIGURES

Figure 1: Vicinity Map & Location Map 2

Figure 2: Preliminary Layout of Proposed 2.0-Mg Reservoir 3

Figure 2A: Preliminary Layout with Grading 4

Figure 3: Site Section 11

Figure 3A: Site Section with Boulder Basin Option 12

Figure 4: Preliminary Site Selection 13

Figure 5: 3.0-MG Alternative 14

Figure 6: City Development Plan 18
Figure 7: City Zoning Map 19
Figure 8: FIRM Map 26
Figure 9: Drainage Plan 27

LIST OF APPENDICES

APPENDIX A - VISUAL IMPACT ANALYSIS
APPENDIX B - FINAL SUBSURFACE INVESTIGATION
APPENDIX C - BOTANICAL SURVEY
APPENDIX D - ARCHAEOLOGICAL INVESTIGATION

ENVIRONMENTAL IMPACT STATEMENT
FOR THE
MAKAHA 242 RESERVOIR NO. 2
MAKAHA, OAHU, HAWAII

1. INTRODUCTION AND SUMMARY

1.1 APPLICANT

The applicant for the proposed reservoir project is the City and County of Honolulu Board of Water Supply. Its place of business and mailing address are:

Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, HI 96843

1.2 BRIEF PROJECT SUMMARY

It is proposed to construct a 2.0-million gallon (MG) storage reservoir on the slopes of the Waianae mountain range at Makaha as shown on Figures 1 and 2 (TMK 8-4-02:11 & Portion 14). In addition to the reservoir, a 16-inch influent/effluent line, a telemetry system, asphaltic concrete pavement around the reservoir and landscaping will be installed to facilitate the operation of the proposed reservoir. Approximately 30,000 cubic yards of rock will be excavated to allow construction of a level reservoir foundation area. Reservoir construction will consist of the erection of a concrete tank which would have an outside diameter of approximately 140 feet and have a height of approximately 20 feet. The spillway of the new 2.0-MG reservoir would match the spillway of the existing 0.5-MG reservoir which is 242' ± (MSL).

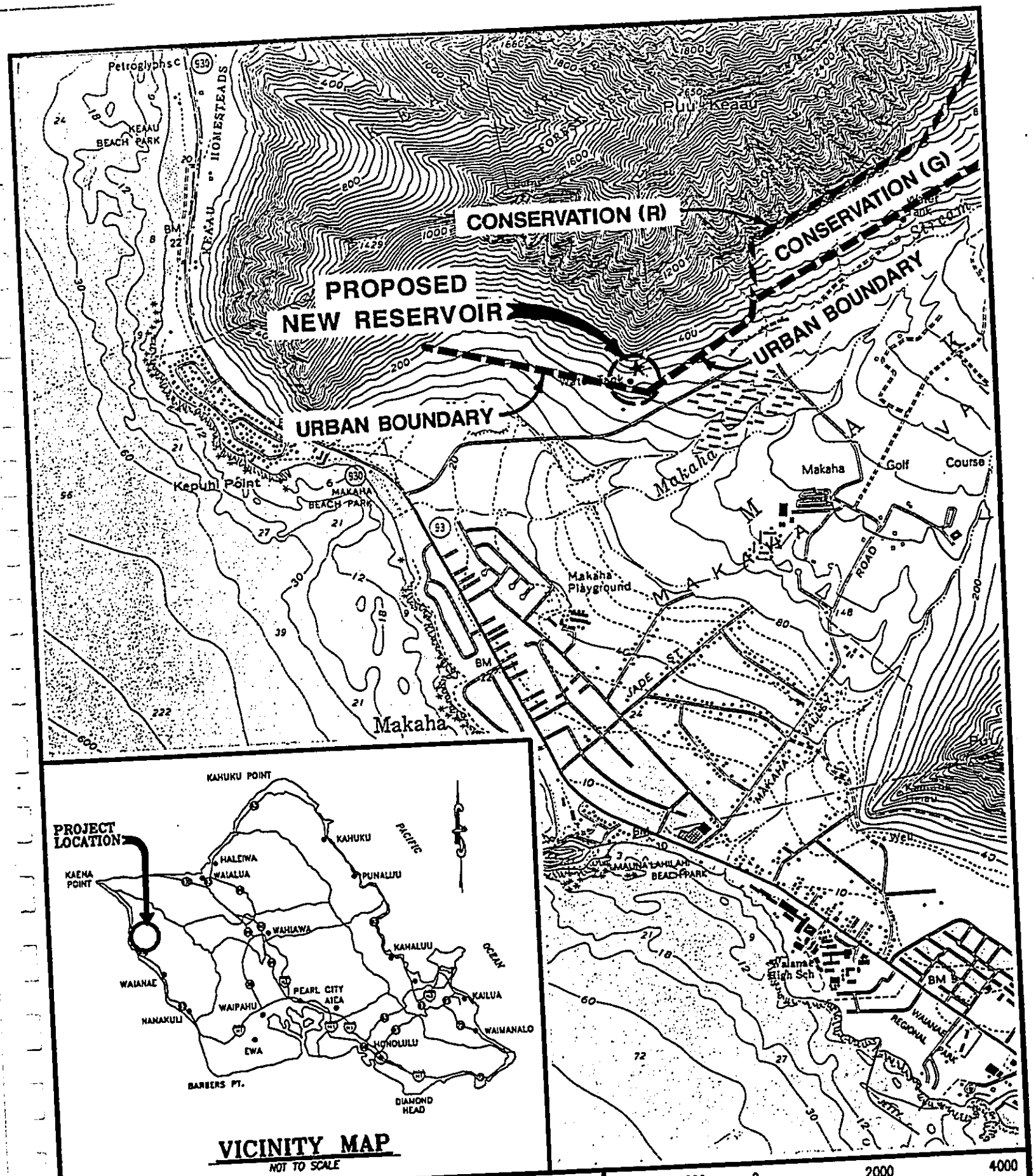
1.3 SIGNIFICANT BENEFICIAL AND ADVERSE IMPACTS

1.3.1 Beneficial Impacts

Construction of the proposed reservoir will significantly increase the storage capacity in the Makaha area to comply with BWS standards, provide uninterrupted service to BWS customers, stabilize pressure and provide water during peak demand periods for potable and fire fighting purposes.

1.3.2 Adverse Impacts and Proposed Mitigative Measures

a. Rock excavation and grading activities will result in permanent change to the existing topography within the project site. This change in the topography will be mitigated by implementing an approved landscaping plan to reduce the visual scar created by the excavation.



PREPARED BY:
GRAY, HONG, BILLS, & ASSOC.
CONSULTING ENGINEERS
119 MERCHANT ST. STE. 607
HONOLULU, HAWAII 96815
MAY 26, 1994

FIGURE 1
LOCATION MAP
MAKAHA 242 RESERVOIR

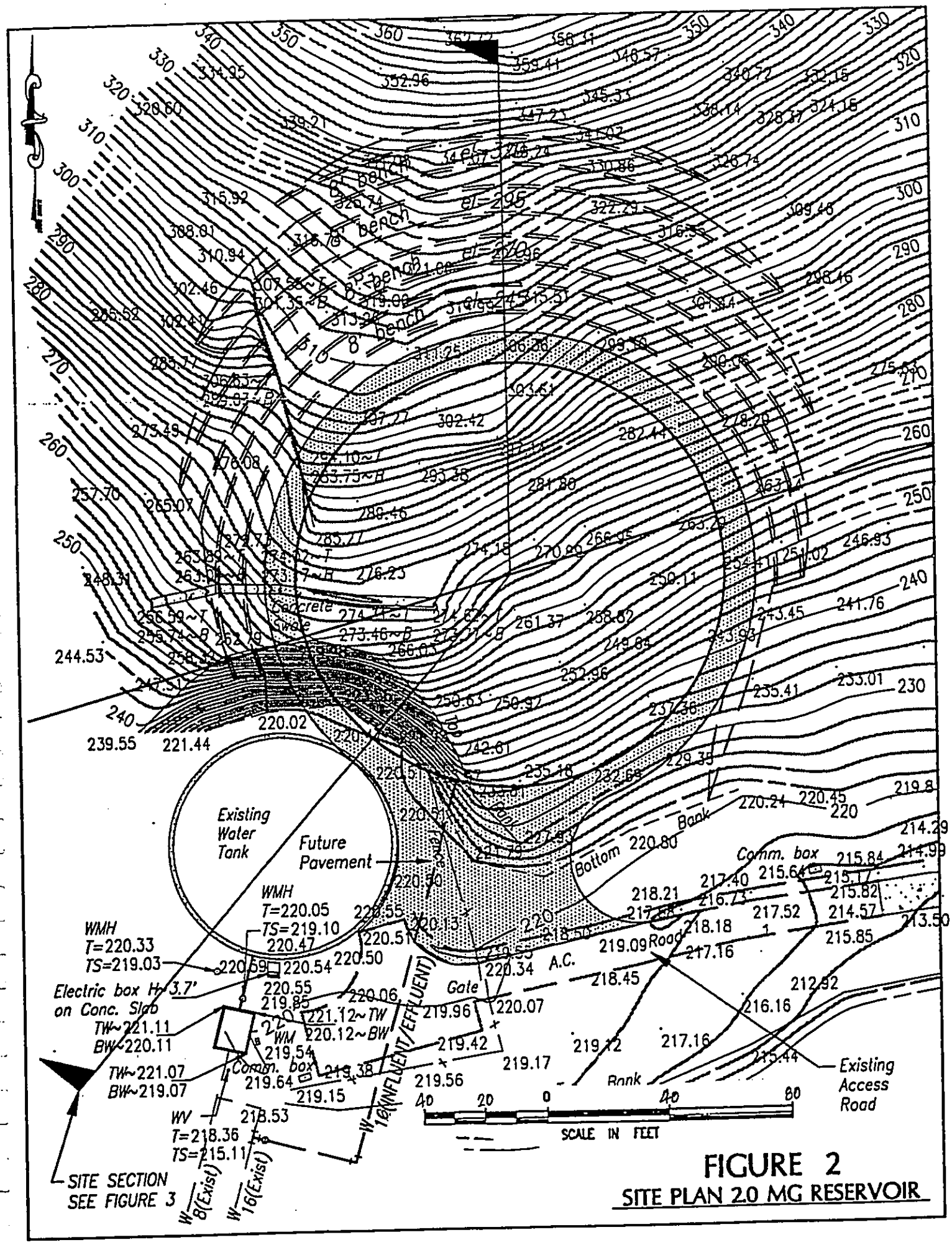


FIGURE 2
SITE PLAN 2.0 MG RESERVOIR

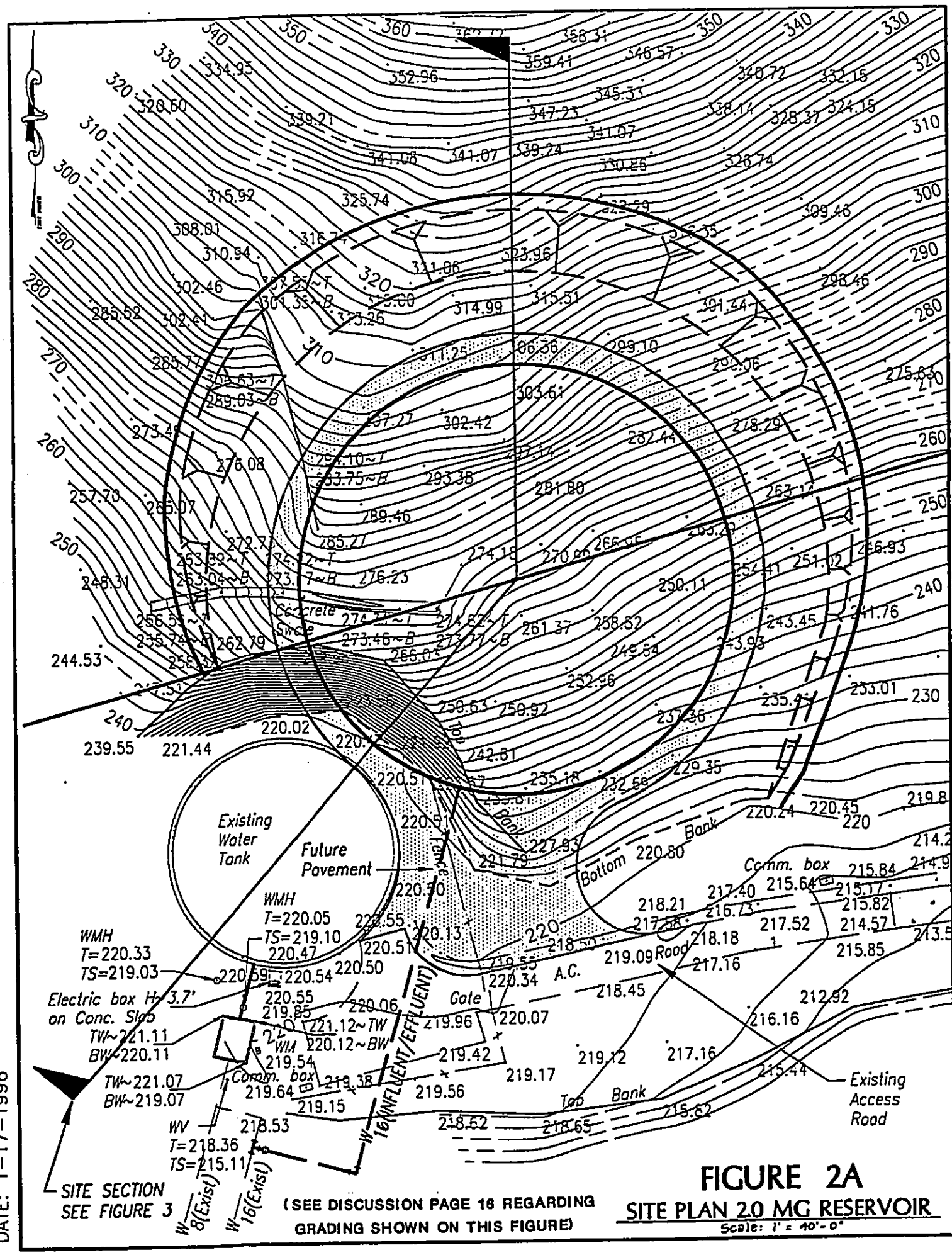


FIGURE 2A

SITE PLAN 2.0 MG RESERVOIR

Scale: 1" = 40'-0"

CAD FILE: 2394G2A
DATE: 1-17-1996

JOB NO. 2394

Also, a visual analysis (see Appendix A) has been performed to show the visual site conditions before and after the installation of the BWS reservoir.

b. Due to steep slopes exposed to rain and runoff, soil erosion may be a concern during grading activities. Soil erosion will be minimized by interceptor swales which will divert runoff around the edges of the cut slopes. In addition, site grading will be designed to divert surface water away from the reservoir foundation.

c. There will be short-term impacts in the form of fugitive dust from activities such as grading and emission from construction vehicles. The majority of the fugitive dust will be controlled by spraying water on soils during excavation activities. All construction vehicles will comply with the applicable State and Federal emission standards to minimize air quality deterioration.

d. There will be short-term impacts on the existing noise levels *particularly during rock excavation. Also, there will be an increase in* noise level as a result of movement of construction vehicles. In order to minimize the impact of noise, the majority of the earthwork activities will be performed during the hours as permitted by the City and County of Honolulu grading ordinance. There will be no rock excavation during weekends or holidays. All construction vehicles will be equipped with suitable mufflers meeting or exceeding applicable State and Federal regulations.

e. During the construction period, there will be additional vehicles on Kili Drive, as well as the existing BWS driveway. Traffic to the project site will be controlled in accordance with applicable City and County regulations including preparation of a traffic control plan. Most of the construction vehicular traffic is anticipated during non-peak hours such as after 9 a.m. and before 4 p.m. Increased traffic will primarily consist of the construction crew and material supplies. The construction crew will be 20 or less people.

1.3.3 Alternatives Considered

Four alternatives are being considered for the proposed project and these include "no action", an alternative location, replacement of the existing reservoir, and installation of a smaller size reservoir. All of the above alternatives are unacceptable since they do not provide the benefits realized as a result of installation of a 2.0-MG reservoir at the proposed location.

1.3.4 Summary of Unresolved Issues

There are no known unresolved issues.

1.3.5 Compatibility with Land Use Plans and Policies

It is proposed to install a storage reservoir on the hillside on a vacant lot. Installation of a storage reservoir is compatible with the existing land use policies. From both State and County perspectives, there is an objective to improve the reliability of public utility systems. Also, the Board of Water Supply's objective is to provide uninterrupted water service to its customers. Adequate storage capacity and sufficient pressure are required to achieve the above objective. Therefore, the proposed project is consistent with these objectives.

1.3.6 Necessary Approvals and Permits Requirements

(1) Temporary Variance (exploratory borings to examine geography)	- State of Hawaii Dept. of Land & Natural Resources
(2) Conservation District Use Permit	- State of Hawaii Dept. of Land & Natural Resources
(3) Construction Plan Approval	- City & County of Honolulu Board of Water Supply - City & County of Honolulu Department of Public Works - City & County of Honolulu Department of Land Utilization - State of Hawaii Department of Health - Hawaiian Telephone Company - Hawaiian Electric Company
(4) Grading Permit	- City & County of Honolulu Department of Public Works
(5) Noise Permit	- State of Hawaii Department of Health
(6) NPDES Permit for Hydrotesting	- State of Hawaii Department of Health
(7) Building Permit	- City & County of Honolulu Building Department
(8) Waianae Neighborhood Board	- (Informational presentation made on March 5, 1996)

2. STATEMENT OF PURPOSE AND NEED FOR ACTION

2.1 STATEMENT OF PURPOSE

The purpose of the proposed action is to construct a 2.0-million gallon (MG) capacity storage reservoir. In addition to the storage reservoir, the following supporting facilities will be provided:

- A 16-inch transmission line connecting the existing reservoir to the new reservoir
- Installation of a telemetry system between the existing 0.5-MG reservoir and the proposed reservoir
- Installation of asphaltic concrete pavement around the proposed reservoir
- Landscaping and a landscape irrigation system

2.2 NEED FOR THE PROJECT

2.2.1 Background

The Honolulu Board of Water Supply (BWS) presently owns and operates a 0.5-million gallon (MG) water storage reservoir at the subject project site. The reservoir is part of the Makaha 242 System which provides water to BWS customers. Based on existing system calculations and metered consumption as shown on Table 1, there is a storage deficit in the Makaha area of approximately 1.7 MG. Therefore, storage capacity for the Makaha area is deficient and the Board is currently planning to provide additional storage capacity adjacent to the existing 0.5-MG storage tank.

MAKAHA 242 DISTRIBUTION AREA		
Water Zone	**Consumption**	**Time Period**
51821	1.148 MGD	July 1994 - June 1995
51822	0.322 MGD	July 1994 - June 1995
Total 242' Consumption:	1.470 MGD	
Required storage for max. day = 1.470 MGD x 1.5	= 2.205 MGD	
Existing storage 242' capacity	= 0.500 MGD	
Required storage to meet BWS standards	= 1.705 MGD	
Excess storage available for Waianae w/addition of 2.0-MG reservoir	0.295 MGD	

TABLE 1. CURRENT MAKAHA 242 SYSTEM REQUIREMENTS

In addition to meeting the Board of Water Supply standards for domestic water needs, the proposed project will provide storage to meet fire protection requirements. With the provision of adequate storage, fire fighting needs can be met without relying solely on source pumpage. This adds reliability to the area water system, minimizes potential disruption of service in the event of a power outage and provides stabilized main pressures.

2.2.2 Need for Additional Reservoir Capacity

The Makaha 242 Reservoir No. 2 project will enable the Board of Water Supply to achieve its objective of operating and maintaining its systems in a manner which is economically sound and to public benefit. The following are the objectives of the proposed project:

- to significantly increase storage capacity in the Makaha area to comply with BWS standards
- to provide uninterrupted service to BWS customers
- to stabilize pressure and supply water during peak demand periods and for fire fighting purposes.

The existing Board of Water Supply standards call for reservoir capacity equal to 1.5 times the average daily demand. Because of limited reservoir capacity in the Makaha area, the BWS is heavily dependent on supply wells rather than reservoir storage to meet daily demand. This is not consistent with the BWS standards for reservoir capacity. Therefore, the proposed project is needed to stabilize pressure, supply water during peak demand periods, and to meet fire fighting requirements.

2.2.3 Excess Additional Reservoir Capacity

Based on the data provided in Table 1, the addition of the new 2.00 MG storage facility will meet BWS requirements for the Makaha 242 system. An excess of 0.3 MG of storage will be available for future Makaha Valley growth and immediately available for storage deficiencies on the Waianae Coast.

The current Waianae Coast 242 System storage requirement is 11.5 MG. The total existing Waianae Coast volume is 4.00 MG. Upon completion of the new 2.00 MG reservoir, a storage deficit of 5.5 MG will still exist for the Waianae Coast 242 system. The deficit will be met by the addition of future storage facilities elsewhere.

3. PROJECT DESCRIPTION

3.1 LOCATION

The proposed 1.5 acre reservoir site is located adjacent to an existing 0.5-million gallon storage reservoir (spillway elevation = 242 ft.) located approximately 1 mile from Farrington Highway as shown on Figure 1 (TMK 8-4-02:11 & Portion 14). A preliminary layout of the proposed 2.0-MG reservoir is shown on Figure 2. There is an existing A.C. driveway which provides access to the existing storage reservoir via Kili Drive. Access to the proposed reservoir will be provided using the existing driveway. A chain link fence has been used to provide security to the existing storage reservoir. The proposed storage reservoir will have a security fence similar to the existing fence.

3.2 STATEMENT OF OBJECTIVES

The objective of the City and County of Honolulu Board of Water Supply is to provide a suitable quantity of potable water to the residents of the Island of Oahu. Also, the existing water distribution system provides water for fire fighting purposes. In order to provide the required quantity of water, the Board of Water Supply needs to develop water sources which can supply potable water. In addition, the Board needs to provide adequate storage and a distribution system to supply water to the residents.

Since all of Oahu's potable water demand is met using underground water sources, there is greater demand for storage capacity. This is essential during peak demand periods. Therefore, construction of a storage reservoir allows the Board of Water Supply to meet its objective of supplying an adequate quantity of water for potable and fire fighting needs of the residents.

The following are the specific objectives of the proposed project:

- To significantly increase storage capacity in the Makaha area to meet BWS standards
- To provide uninterrupted water service to BWS customers
- To stabilize pressure
- To supply water for potable and fire protection needs during peak demand periods and power outages

3.3 GENERAL DESCRIPTION OF THE ACTION'S TECHNICAL, ECONOMIC, SOCIAL AND ENVIRONMENTAL CHARACTERISTICS

3.3.1 Technical Characteristics

The proposed project consists of the following elements:

- One 2.0-million gallon (MG) capacity concrete storage reservoir
- A 16-inch transmission line connecting the existing reservoir to the proposed reservoir
- Installation of a telemetry system between the existing 0.5-MG reservoir and the proposed reservoir
- Installation of an asphaltic concrete pavement around the proposed reservoir to minimize erosion
- Landscaping and a landscape irrigation system

3.3.1.1 Storage Reservoir

Reservoir construction consisting of a concrete tank which would have an outside diameter of approximately 140 feet and a height of approximately 20 feet. The spillway of the new 2.0-MG reservoir would match the spillway of the existing 0.5-MG reservoir which is 242' ± (MSL). Because the reservoir will be constructed on a steep slope, rock excavation and grading work have been proposed. The reservoir excavation will create a cut slope in the existing rock hillside. A section has been created showing the existing reservoir and the proposed reservoir as shown on Figure 3. The proposed reservoir will be painted similar to the existing reservoir such that it will blend in with the surroundings.

Several alternate locations were considered for the proposed reservoir as shown on Figure 4. These locations were originally considered based on evaluation of aerial topography. However, visual observation immediately eliminated consideration of any reservoir east of the existing 242 Reservoir, due to evidence of boulder fill and actively moving slopes. All subsequent evaluation had to be limited to sites immediately adjacent to the existing reservoir where sound basaltic foundations would be encountered. The original scope of work indicated that a 3.0-MG reservoir would be considered to meet existing and future Waianae Coast storage deficiencies. However, the only way to fit a larger reservoir in the stable foundation zone would

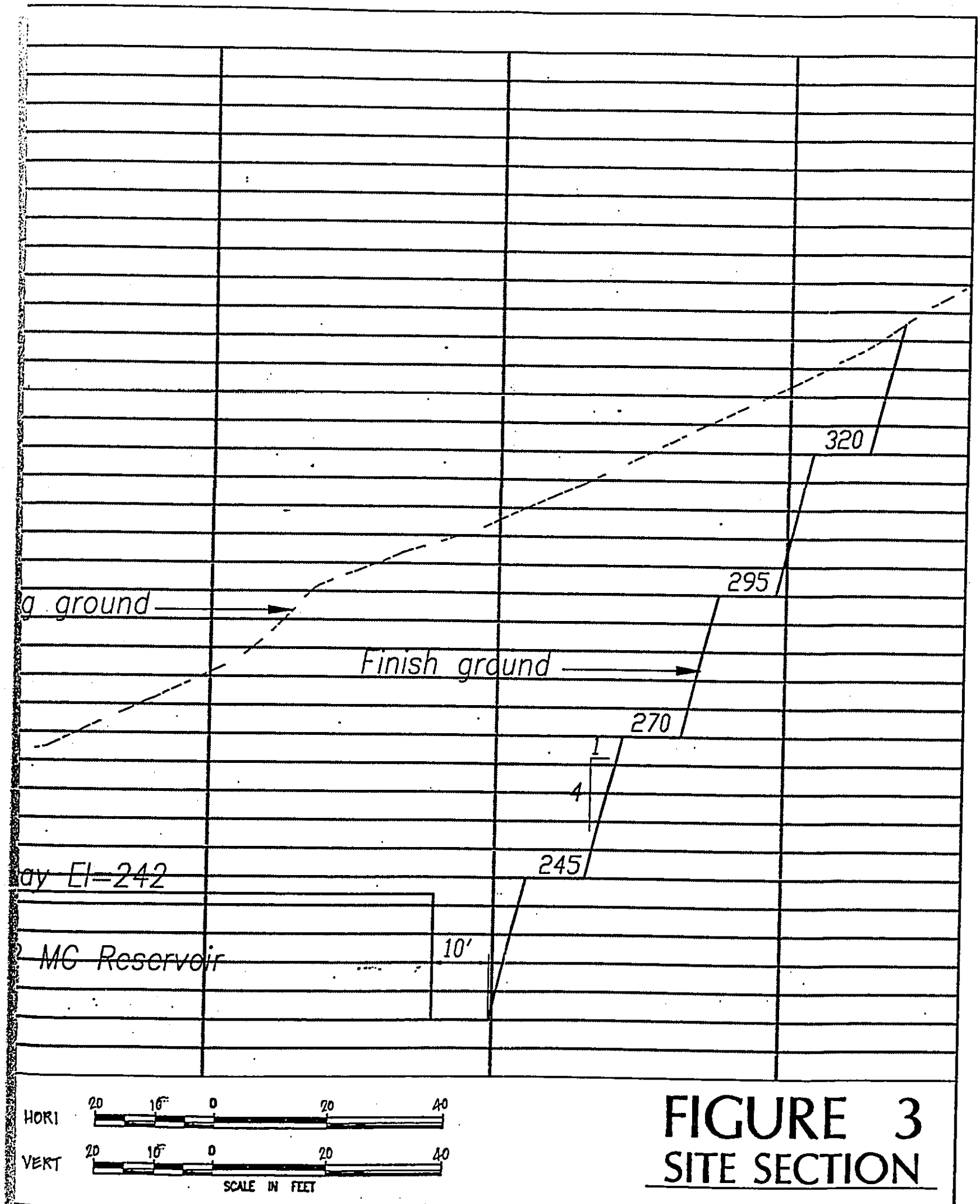
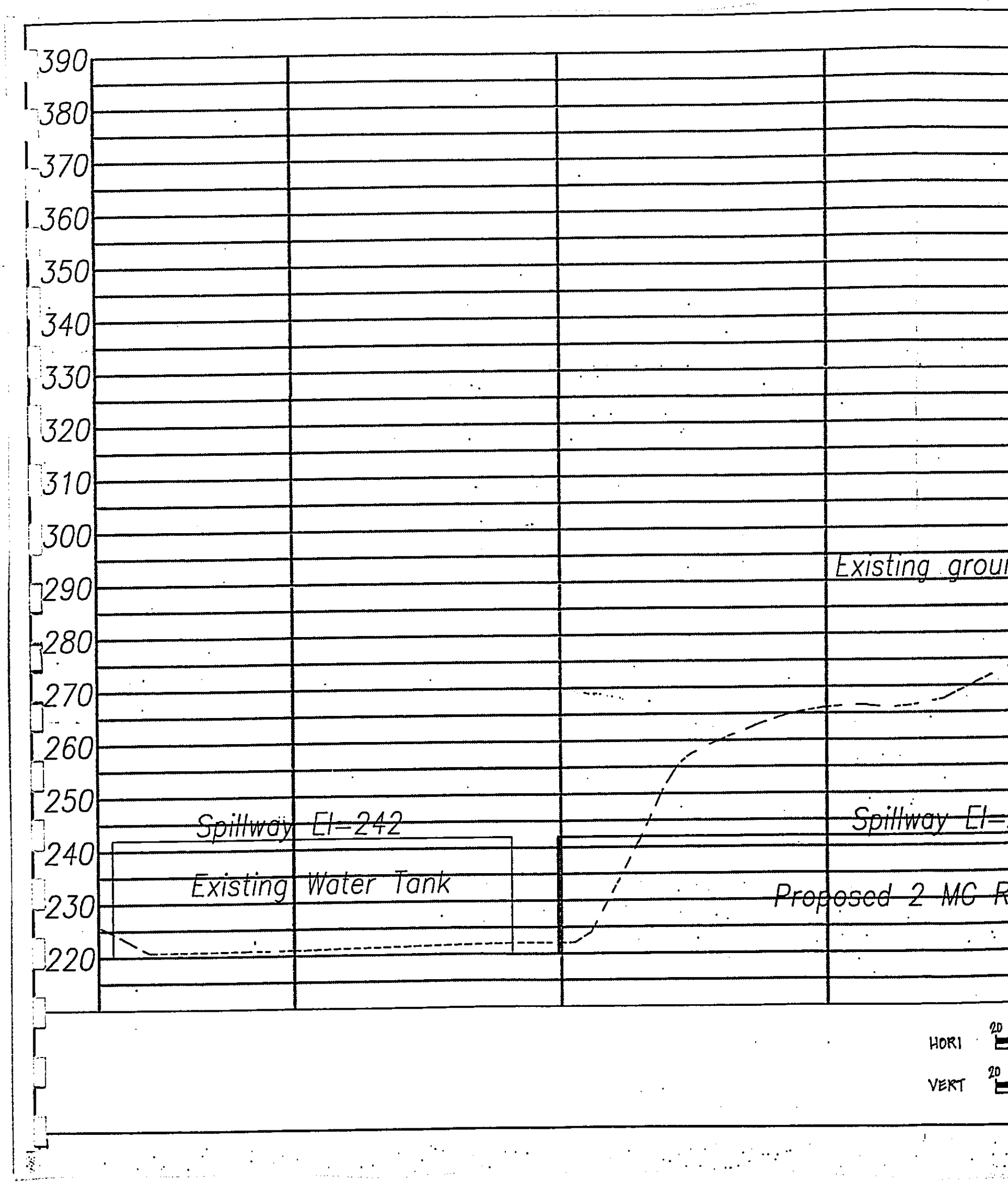


FIGURE 3
SITE SECTION


390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
Spillway El=242
Existing Water Tank
Existing grou
Spillway El=
Proposed 2 MG R
HORI 20
VERT 20

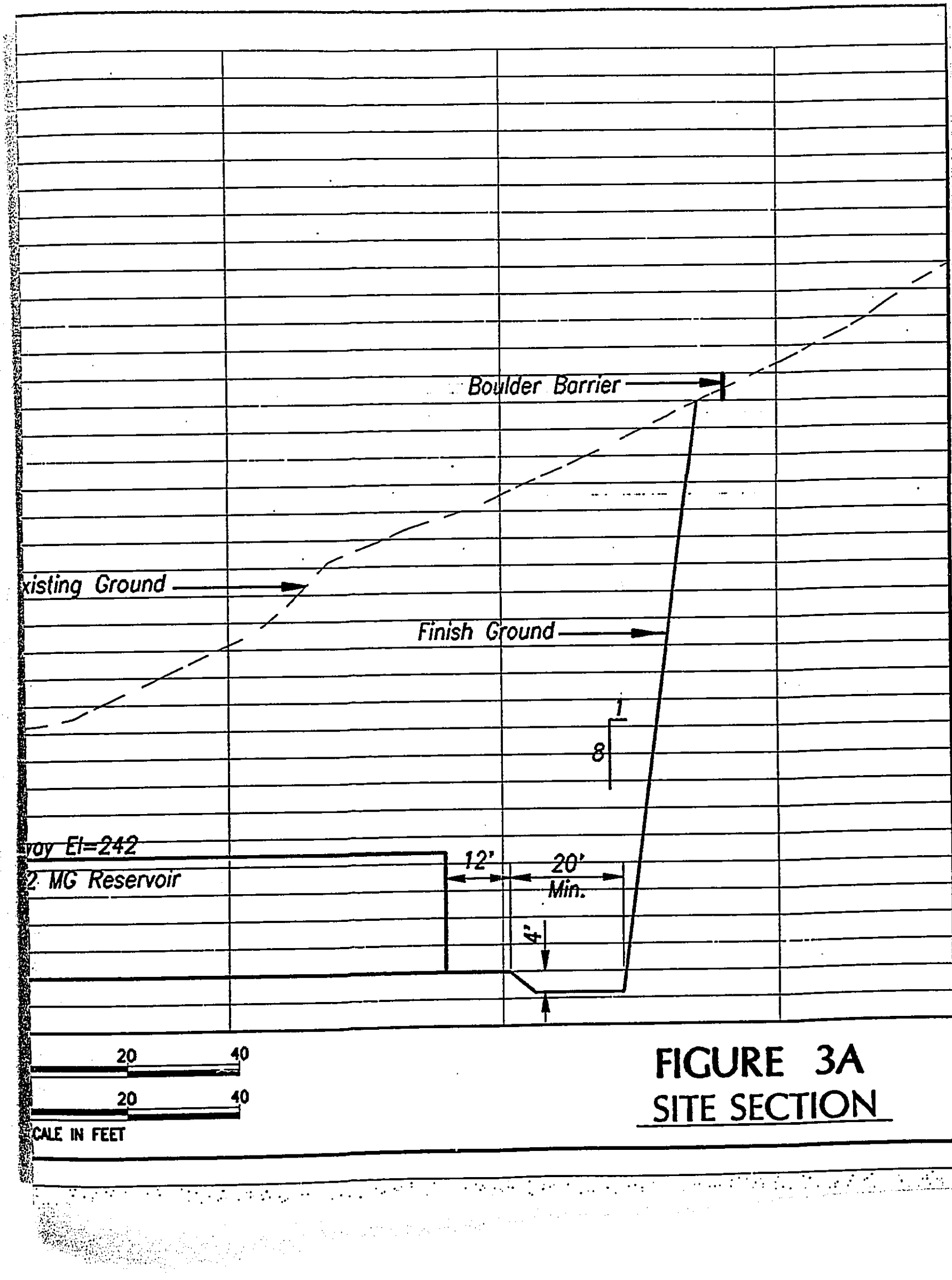
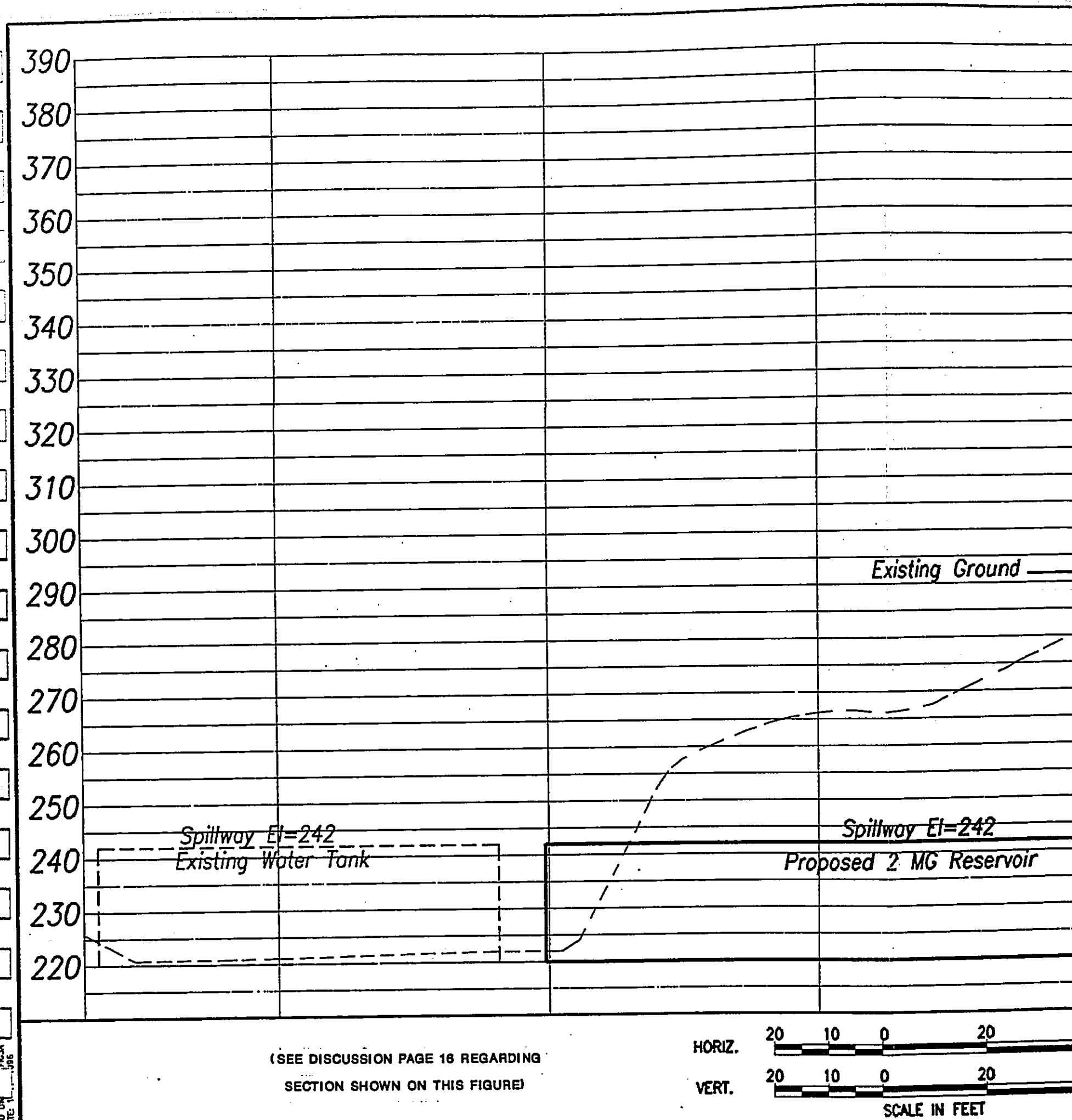


FIGURE 3A
SITE SECTION



(SEE DISCUSSION PAGE 16 REGARDING SECTION SHOWN ON THIS FIGURE)

JOB NO. 2394

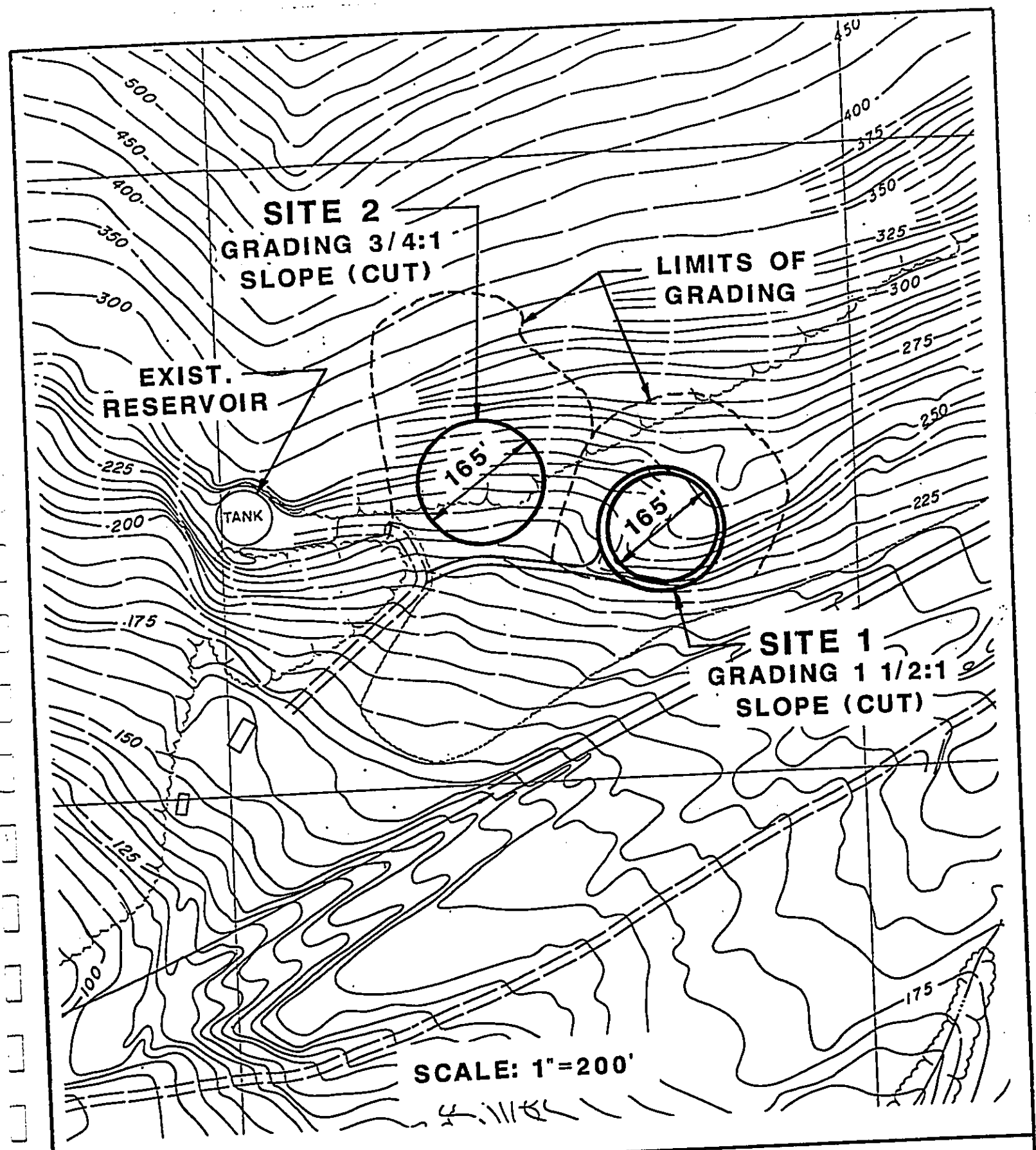


Figure 4
Makaha 242 Reservoir No. 2 Preliminary Siting
(Rejected Due To Poor Soil)

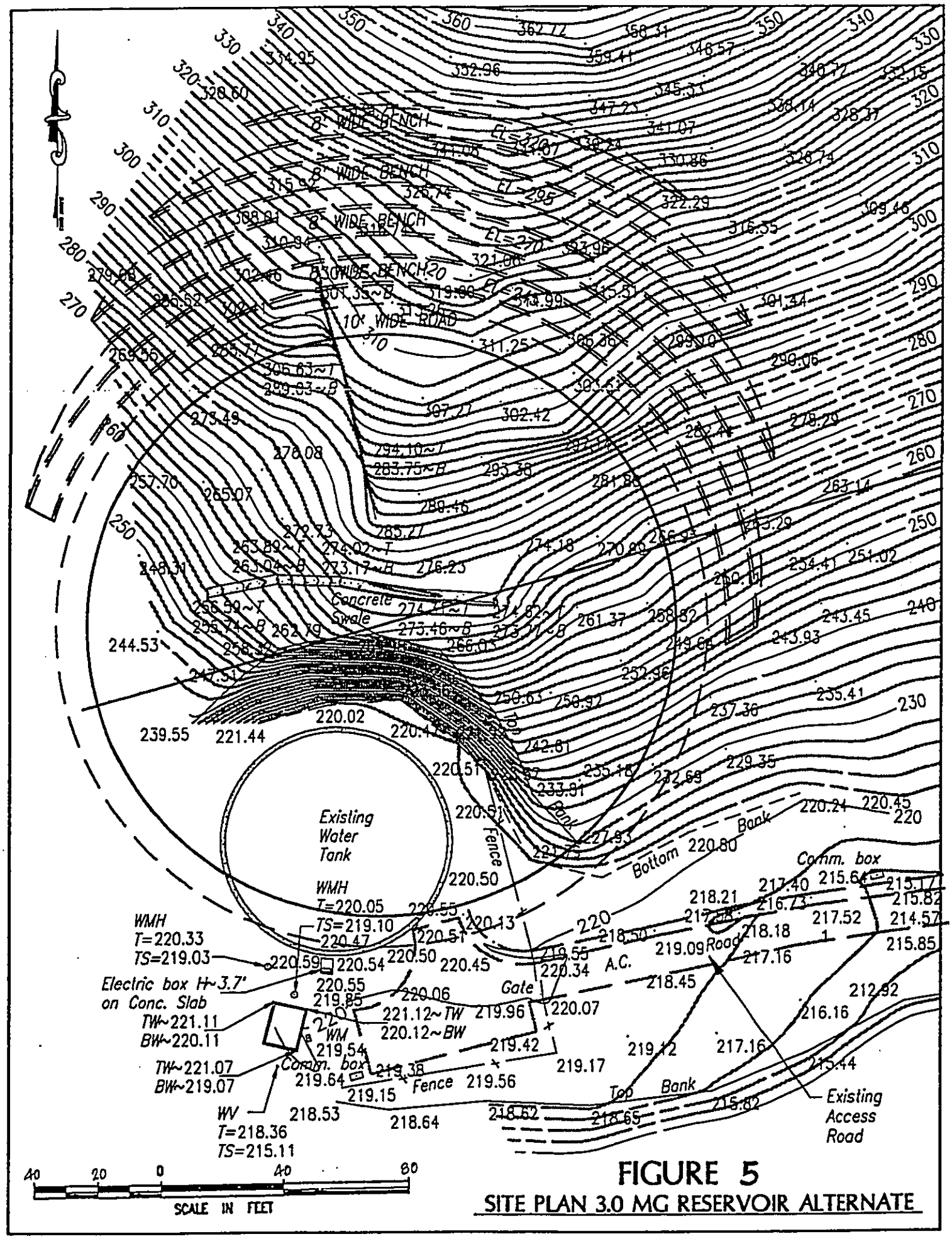


FIGURE 5

SITE PLAN 3.0 MG RESERVOIR ALTERNATE

be to demolish the existing 0.5-MG reservoir and replace it with a 3.0-MG reservoir (see Figure 5). The loss of the existing 0.5-MG reservoir during the construction period is unacceptable from an operation's perspective.

3.3.1.2 Transmission Line

It is proposed to install a 16-inch transmission line to connect the existing reservoir to the proposed reservoir. Based on velocity considerations, a 16-inch diameter water line was selected. Approximately 160 linear feet of 16-inch ductile iron pipe will be installed as shown on Figure 2.

3.3.1.3 Telemetry System

A telemetry system will be installed between the existing 0.5-MG reservoir and the new 2.0-MG reservoir. Various signals will be transmitted from the proposed reservoir to a control panel which will be located in the existing booster pump station building. This is required to increase the reliability of the system and to collect information on operating conditions of the system.

3.3.1.4 Asphaltic Concrete Pavement

It is proposed to install a 2½-inch thick asphaltic concrete pavement around the proposed storage reservoir to divert storm water away from the reservoir; to prevent soil erosion and to provide access to maintenance vehicles. An asphaltic concrete pavement has been selected due to its reliability to provide long-term benefits without additional maintenance requirements.

3.3.1.5 Landscaping

Landscaping will be planted around the reservoir and on the cut slopes, and an irrigation system will be installed. Due to the Board of Water Supply's policy of promoting water conservation, it is anticipated that landscaping will feature drought tolerant plant species.

3.3.1.6 Grading

Extensive grading will be required to prepare the site for the proposed storage reservoir. Prior to earthmoving activities, the area within the grading limits (approximately 0.9-acre) will be cleared and grubbed of all vegetation, organic material, and debris. All grading activities will comply with applicable City, State and Federal requirements.

Based on the recommendations of the soils engineer, site grading work for the storage reservoir will require cuts of approximately 120 feet in height. The slopes will be cut at 0.5:1 (horizontal:vertical), with an 8-foot wide bench every 25 feet in vertical direction as shown on Figure 3. There will be a 10-foot setback between the bottom of the cut portion and the reservoir. Approximately 30,000 cubic yards of material will be removed to create a level area for the reservoir foundation. All excavated material will be transported to an approved off-site location for disposal. The contractor will inform the City about the disposal site location prior to obtaining the grading permit from the City.

Between the distribution of the Draft EIS and Final EIS the final soils report was completed. The conclusions of this report offered another grading solution utilizing a boulder basin and cut slope of 0.125:1 (H:V) with no benches. The Final EIS contains Figures 2A and 3A representing the modified site plan and section, respectively. The boulder basin option with a 0.125:1 cut slope reduces the height of cut by 15 ± feet.

Storm water runoff from areas above the cut slope will be collected by an interceptor swale and diverted away from the cut slope. Site grading and concrete pavement will be designed to divert surface runoff away from the storage reservoir. No fill placement is anticipated for this project. All excavated material will be hauled off-site and disposed of in accordance with the County approved grading plan. Rock excavation can be accomplished using blasting and non-blasting techniques. Any blasting operation will result in vibrations and possible damage to the adjacent Makaha shaft water source. Therefore, it is proposed that no blasting be allowed on the project to ensure the integrity of the Makaha Shaft and the existing reservoir. It is proposed to use non-blasting techniques such as a hoe-ram to accomplish excavation work. Although excavation using a hoe-ram will require additional time to complete the grading work (compared to the blasting option), it is anticipated that the benefits derived will offset the delay.

3.3.2 Economic Characteristics

The estimated construction cost of the proposed reservoir project is $4.9 million. Implementation of the proposed project will provide improved water storage capacity in the Makaha area.

3.3.3 Social Characteristics

3.3.3.1 Land Ownership

All of the land to be occupied by the proposed storage reservoir is owned by the City and County of Honolulu Board of Water Supply.

3.3.3.2 Land Use Designations

The proposed project site is located within the State Conservation land use district (see Figure 1), and the City's Development Plan Land Use Map identifies the project site as preservation district (see Figure 6). The State Conservation District land use controls supersede County land use controls. However, upon obtaining a CDUP, the reservoir will be added to the City and County Development Plan Public Facilities Map (see Figure 7). All activities within the State Conservation District are administered by the Department of Land and Natural Resources. A separate application will be processed through the State Department of Land and Natural Resources to obtain a Conservation District Use Permit (CDUP).

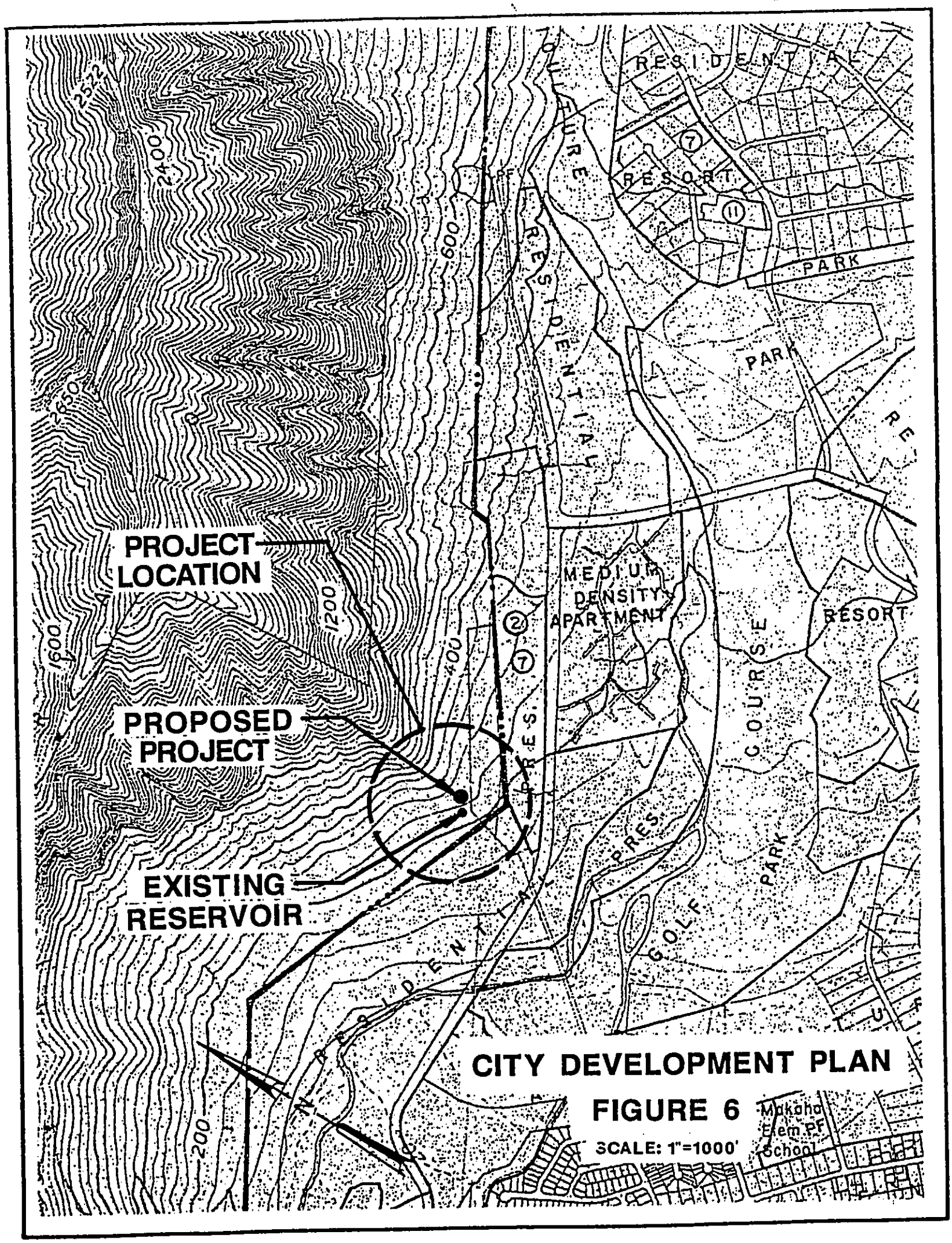
The proposed reservoir site is located in an area zoned P-1 (Preservation) by the City and County of Honolulu as shown on Figure 7. Public uses such as storage reservoirs are "Permitted Uses" within the preservation district.

3.3.3.3 Existing Use

Currently, the proposed project site is vacant. There are no existing structures or facilities. The proposed project site is located adjacent to the existing 0.5-MG storage reservoir. After completion of this project, the site will be changed from a vacant lot to a storage reservoir area similar to the existing storage reservoir site.

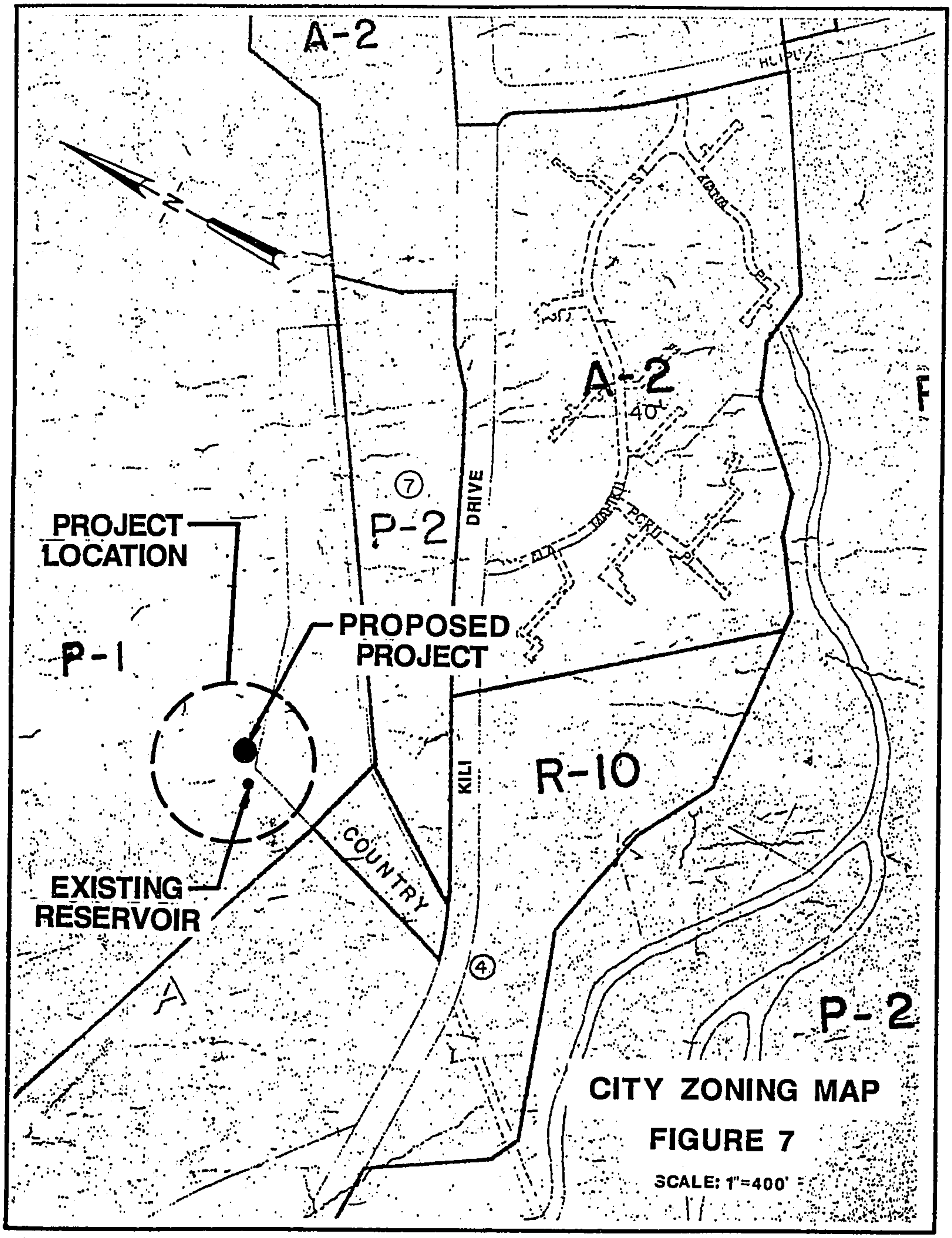
3.3.3.4 Surface Water Patterns

There will not be any major changes in the existing surface water patterns since the project site is not located within any drainageway. After development, the surface water runoff will continue in the existing pattern except at the top of the cut slope. A drainage swale will be installed at the top of the cut slope to divert any surface water flowing towards the cut slope. Storm water collected in the drainage swale will be diverted towards the existing access road. During construction plan



CITY DEVELOPMENT PLAN

FIGURE 6


A-2
HULIPU
A-2
40'
P-2
DRIVE
PROJECT LOCATION
PROPOSED PROJECT
P-1
KILI
R-10
COUNTRY
EXISTING RESERVOIR
P-2
CITY ZONING MAP
FIGURE 7
SCALE: 1"=400'

preparation, a drainage and erosion control plan will be prepared meeting the requirements of the City and County's Drainage Standards and the State of Hawaii's NPDES requirements. There are no City and County drain lines in the area and Makaha Stream is slightly less than ½-mile away from the reservoir site.

3.3.3.5 Groundwater Usage

There will not be any change in the existing groundwater usage as a result of this project. The proposed project involves construction of a storage reservoir to improve the water storage capacity of potable water. Therefore, it is concluded that there is no effect on existing groundwater resources.

3.3.3.6 Wastewater Treatment and Disposal

It is anticipated that the support facilities for the new reservoir will be provided using the existing pump station facility located adjacent to the proposed reservoir site. There is no need to provide additional restrooms or buildings. Therefore, it is concluded that there is no effect on existing wastewater treatment and disposal facilities.

3.3.3.7 Solid Waste

It is anticipated that the support facilities for the new reservoir will be provided using the existing pump station facility located adjacent to the proposed reservoir site. There is no need to provide additional facilities. Therefore, it is concluded that there is no effect on the existing solid waste collection and disposal facilities.

3.3.3.8 Noise

There will not be any change in the existing noise level at the project site except during construction. During construction, various mitigative measures including prohibition of blasting are proposed to minimize the impact on the existing environment. After completion of the project, there will be no change in the existing noise level since no pump station is proposed.

3.3.3.9 Air Quality

The project will only have an effect on air quality during construction. Fugitive dust from earth-moving activities will occur. The use of water trucks and/or construction hoses to keep the work area damp will be the primary mitigation method. After construction, the completed project will have no impact on air quality.

3.4 DISCLOSURE OF PUBLIC FUNDS OR LANDS FOR THE ACTION

Installation of the proposed reservoir will be on a lot owned by the City and County of Honolulu Board of Water Supply. The total estimated construction cost is $4.9 million. Planning and engineering work are anticipated to be completed in 1996-1997. Construction of the proposed Makaha 242 Reservoir No. 2 project has been included in the Board of Water Supply's Six-Year Capital Improvement Program (CIP) for 1998.

3.5 PHASING AND TIMING OF ACTION

It is anticipated that the reservoir construction will begin in 1999 and be completed in 18 months after the start of construction. However, this schedule is tentative and subject to change.

3.6 HISTORICAL PERSPECTIVE

From a historical perspective, there is no significance to the proposed project site since it is a vacant lot. Also, archaeological investigations concluded that the project site does not contain any archaeological resources.

4. DESCRIPTION OF ANY KNOWN ALTERNATIVES TO THE PROJECT

4.1 "NO ACTION" ALTERNATIVE

The "no action" alternative was considered but deemed unacceptable since the Board of Water Supply system remains inadequate with respect to design standards to meet necessary storage requirements.

4.2 ALTERNATIVE LOCATION

The original scope of work indicated that a 3.0-MG reservoir was desired to meet the deficiencies of the Makaha 242 System requirements. A 3.0-MG reservoir would also provide additional storage for the Waianae Coast. Due to the fact that the proposed reservoir needed to be located in close proximity to the existing infrastructure, the number of alternative locations were limited. Figure 4 shows potential locations originally considered based on evaluation of aerial topography.

However, visual observation immediately eliminated consideration of any reservoir east of the existing 242 Reservoir, due to evidence of boulder fill and actively moving slopes. All subsequent evaluation had to be limited to sites immediately adjacent to the existing reservoir where sound basaltic foundations would be encountered. This limitation ultimately will lead to the selected project calling for a 2.0-MG reservoir. This reservoir site has met the current system deficiencies but does not provide for "future" requirements.

4.3 REPLACE EXISTING RESERVOIR

A single 3.0-MG reservoir was considered. However, the only way to fit a larger reservoir in the stable foundation zone is to demolish the existing 0.5-MG reservoir and replace it with a 3.0-MG reservoir (see Figure 5). This would leave the Makaha 242 System with no storage during the construction period. A 3.0-MG reservoir construction period could take 18 months, and lack of storage for any period of time is unacceptable.

4.4 SMALLER SIZE RESERVOIR

A reservoir smaller than 2.0-MG was considered, but deemed unacceptable since construction of a reservoir that would provide storage requirements that would not meet the system standards would only be considered a partial solution and would still leave the system inadequate.

5. DESCRIPTION OF THE ENVIRONMENTAL SETTINGS, IMPACTS AND MITIGATION MEASURES

5.1 PROJECT SITE

The proposed project site is located approximately 1 mile from Farrington Highway and 1/4-mile from Kili Drive as shown on Figure 7. The nearest residence is approximately 1000 feet from the project area. There are no commercial or industrial activities in the vicinity of the project site.

5.2 PHYSICAL ENVIRONMENT

5.2.1 Geology and Soils

Makaha Valley was developed as a result of heavy erosion of the Waianae Mountain Range, which was formed by a basaltic volcano. The erosion has created a valley with varying soil characteristics. Generally speaking, the steep walls of the valley are characterized as rock lands and stony lands, and have exposed rock over nearly 90 percent of the surface, while the valley floor contains heavy soil deposits. These deposits are described as "Ewa" or "Waianae" silty clays.

Three test pits were excavated in the vicinity of the proposed reservoir site to determine the subsurface conditions. The test pits indicate that the lower, southern perimeter of the reservoir site is overlain by between 1 to 4 feet of surface colluvium (gravity deposited soil) over intact basalt. The surface material consisted of moderately to highly plastic clayey silts which contained numerous cobble and boulders. Except for thin seams of highly weathered basalt which were encountered at the rock surface in two of the test pits, the basalt was generally hard and appeared fresh to slightly weathered. The trackhoe used for the test pits had considerable difficulty in removing the fresh to slightly weathered basalt and the test pits were terminated after the hard basalt was encountered. Refer to Appendix B for a detailed discussion on subsurface investigation.

Impacts: The proposed project will not create any impact on geology and soils.

Mitigation: No mitigation measures are proposed.

5.2.2 Climate

Average annual rainfall at the proposed reservoir site is 25 inches. Temperature ranges from mid-60s to mid-80s. Weather in the Makaha area is generally constant and relatively dry. The prevailing northeasterly tradewinds blow at an average of approximately 14 knots and are generally constant throughout the year.

Impacts: The proposed project will not create any impact on climate.

Mitigation: No mitigation measures are proposed.

5.2.3 Topography

The proposed reservoir site is located on the slopes of the Waianae mountain range and the elevation varies between 242 and 340 feet MSL. The existing slope varies from 25 to 45 percent at the project site.

Impacts: Grading activities will result in permanent change to the existing topography within the project site. A cut slope of approximately 105 feet in height will be formed on the northern side of the reservoir.

Mitigation: A cut slope of 0.125:1 (horizontal:vertical) will be created by excavating the existing basalt rock. Any increase in the cut slope would reduce the limits of excavation. The soils engineer recommended a cut slope of 0.125:1 (horizontal:vertical) based on stability considerations. It is proposed to retain the natural look of the basalt rock such that it will blend in with the existing surroundings. Also,

a visual impacts analysis (see the following section and Appendix A) has been performed to show the conditions before and after installation of the BWS reservoir. An approved landscaping plan will be implemented to reduce the visual scar created by the excavation. In addition, it is recommended that a soils engineer be retained to review construction plans and to provide observations during the excavation and foundation activities. The purpose of this construction monitoring is to assure compliance with design concepts, the soils engineer's recommendations and to allow design changes in the event that subsurface conditions differ from those found during the soils investigation.

5.2.4 Visual Impacts

The proposed project site is located on the slopes of the Waianae mountain range and is located adjacent to the existing 0.5-MG storage reservoir. Both existing and proposed reservoirs are visible from a number of locations along Farrington Highway. There are a number of rock ledges and outcrops in the vicinity of the project site. Vegetation is limited to brush and small kiawe trees. The basaltic rock of the Waianae range will be graded to form a shelf on which the proposed 2.0-MG reservoir will sit. A section has been created showing the existing reservoir and the proposed reservoir. (See Figure 3.)

Impacts: The major impact to the project site will be rock excavation and grading to create the reservoir site. The reservoir excavation will create a cut slope in the existing rock hillside and visual impacts will be of primary concern. This excavation will produce a visual scar on the side of the valley.

Mitigation: A visual impact analysis has been prepared to analyze the site. Views of the proposed reservoir from various angles are presented in Appendix A (Visual Impact Analysis). The views are presented under existing and proposed conditions. Appendix A shows in detail the proposed site section of the before-and-after conditions for the cut slope. The visual appearance of the cut slope will be minimized by blending the colors in with the surrounding mountainside. It is proposed to paint the reservoir to match the existing hillside. Visual impacts will be minimized by the use of landscaping around the tank to soften the effect of the structure. The landscaping material will attempt to match that of the natural conditions so as to not create a landscape scene out of character. It is proposed to landscape the horizontal benches using plants adapted to arid conditions. All

proposed alternatives for visual aesthetics will be coordinated with the Outdoor Circle and the Waianae Neighborhood Board.

5.2.5 Drainage and Erosion

According to the National Flood Insurance Rate Map (see Figure 8), the proposed reservoir site is located in Zone X which is the area outside the 500-year flood plain. The existing drainage area contributing storm water flow is shown on Figure 9. Storm water runoff will be diverted at the top of the cut slope using an interceptor swale meeting the City and County of Honolulu drainage standards.

Impacts: Due to steep slope exposed to rain and runoff, soil erosion may be a concern during grading activities. There will be an increase of 0.6 cfs in storm water runoff as a result of installation of asphaltic pavement around the proposed reservoir. The small amount of water that is diverted will continue to sheet flow down the hillside over natural terrain. There are no man-made drainage systems in the area and Makaha Stream is slightly less than ½-mile away.

Mitigation: The following mitigation measures are proposed:

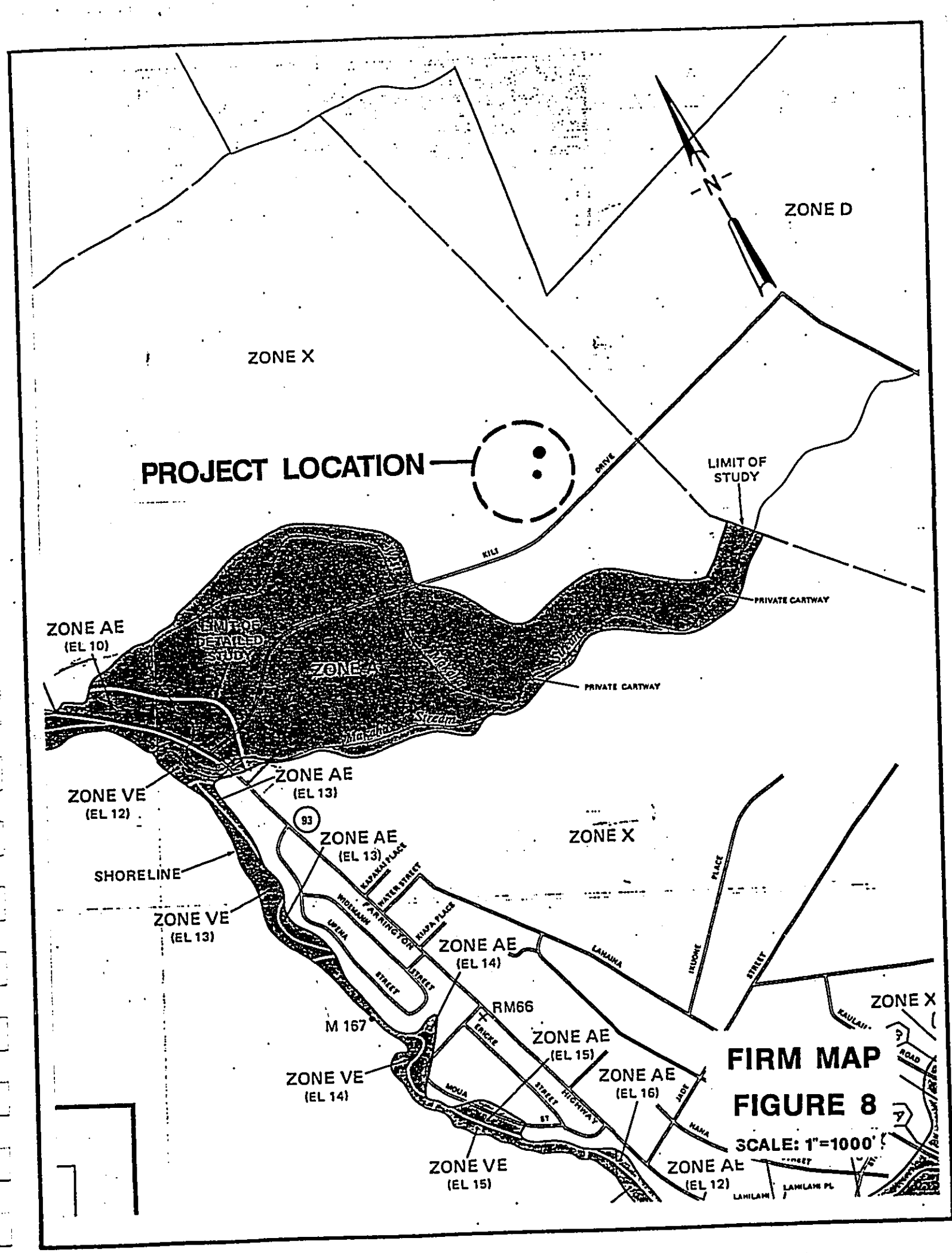
5.2.5.1 Drainage Improvements

- Site grading will be designed to divert surface water away from the reservoir foundation.
- Drainage swales will be provided around reservoir site perimeter to divert runoff around the edges of the cut slopes as shown on Figure 9.

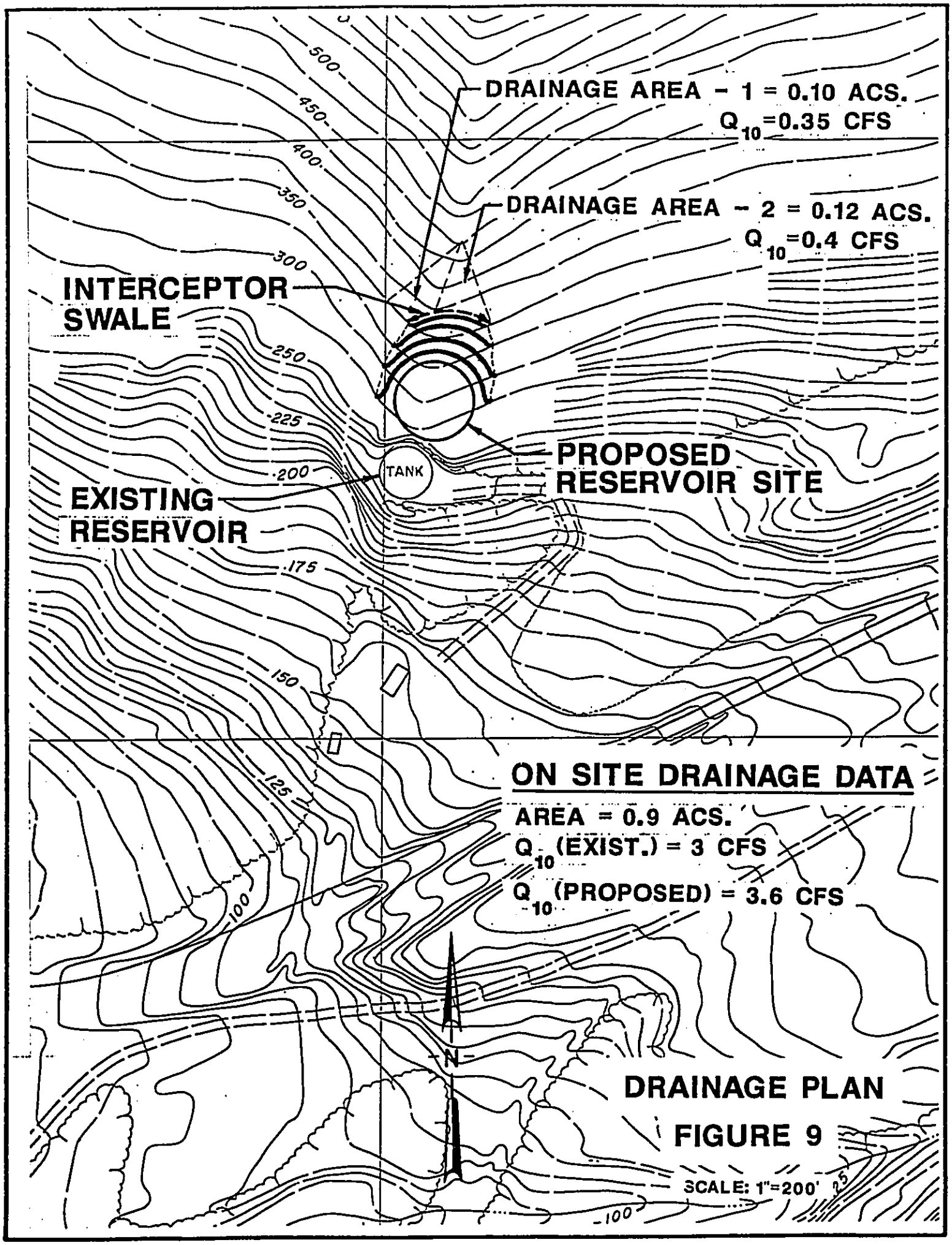
A minor increase of 0.6 cfs is not anticipated to have any negative impact. All drainage sheet flows over natural ground and/or seeps into the porous rock.

5.2.5.2 Grading Work

All grading work will be performed in accordance with the County approved grading and erosion control plans. A soils engineer will monitor all grading activities. The total project site is 1.5 ± acres. The area of grading is less than 5 acres and no NPDES permit is required. However, an Erosion Control Plan and Procedures is required and must be approved by the City and County Department of Public Works.


ZONE D
N
ZONE X
PROJECT LOCATION
LIMIT OF STUDY
PRIVATE CARTWAY
ZONE AE
(EL 10)
LIMIT OF DETAILED STUDY
ZONE A
PRIVATE CARTWAY
ZONE AE
(EL 13)
ZONE VE
(EL 12)
93
ZONE AE
(EL 13)
ZONE X
SHORELINE
ZONE VE
(EL 13)
ZONE AE
(EL 14)
RM66
M 167
ZONE AE
(EL 15)
ZONE VE
(EL 14)
ZONE AE
(EL 16)
ZONE VE
(EL 15)
ZONE AE
(EL 12)
ZONE X
FIRM MAP
FIGURE 8
SCALE: 1"=1000'

Job No. 2394


500
450
400
350
300
250
225
200
175
150
125
100
DRAINAGE AREA - 1 = 0.10 ACS.
Q_{10}=0.35 CFS
DRAINAGE AREA - 2 = 0.12 ACS.
Q_{10}=0.4 CFS
INTERCEPTOR SWALE
TANK
PROPOSED RESERVOIR SITE
EXISTING RESERVOIR
ON SITE DRAINAGE DATA
AREA = 0.9 ACS.
Q_{10}(EXIST.) = 3 CFS
Q_{10}(PROPOSED) = 3.6 CFS
N
DRAINAGE PLAN
FIGURE 9
SCALE: 1"=200'
100

5.2.5.3 Erosion Control Measures

The following erosion control measures will be implemented.

- Installation of silt screen, temporary swale, temporary berm and a sedimentation basin prior to grubbing and grading.
- During excavation, erosion will be minimized by diverting surface water away from the areas above the cut slope and preventing water from flowing across the slope face.
- If seepage is encountered in cut faces, horizontal drains or toe drains will be installed to stabilize the slopes.
- The contractor will be required to follow Best Management Practices as described in the following section.

5.2.5.4 Best Management Practices Plan

The contractor will be required to comply with the following Best Management Practices plan:

a. Whenever feasible, natural vegetation should be retained. If it is necessary to be removed, such vegetation shall be disposed of at a County approved landfill.

b. On-site burning of grub material is prohibited.

c. The graded or project site that is cleared of vegetation shall be kept damp for seven days a week. At the end of each day, the site shall be sufficiently dampened so that the site will remain moistened during the night.

d. All loose rocks and boulders on the slopes shall be carefully removed and disposed of.

e. Falling rocks, soils or debris are not allowed to fall, slide or flow onto the adjoining properties.

f. Do not disturb an area until it is necessary for construction to proceed.

g. Cover, revegetate or stabilize disturbed areas as soon as possible.

h. All workers on the construction site shall be made aware of the erosion controls so that they do not inadvertently disturb or remove them.

i. All erosion control measures shall be inspected at least once each week and following any storm event of 0.5 inches or greater.

j. The contractor shall not permit any silt and/or debris from his work to be deposited in drainage facilities, roadways or other areas.

k. The contractor shall keep the project area and surrounding area free from dust nuisance.

l. The Soils Engineer shall conduct inspections during construction to verify subsurface conditions and adequacy of slopes.

m. Pre-construction vegetative ground cover shall not be destroyed, removed or disturbed more than 20 calendar days prior to site disturbance.

n. The silt fence shall be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground.

o. Built-up sediment shall be removed from silt fence when it has reached one-third the height of the fence.

p. Temporary and permanent seeding and planting shall be inspected for bare spots, washouts, and healthy growth.

q. All erosion control measures shall be maintained in good working order; if a repair is necessary, it shall be initiated within 24 hours of inspection by the contractor.

5.2.6 Flora and Fauna

A botanical survey was conducted in November 1993 to document the existing flora and fauna. The project area has been described as Lowland Dry Mixed Community Zone by Gagne and Cuddihy (1990). Before the introduction of grazing animals, this area was probably covered with wiliwili trees, drought tolerant shrubs and other summer deciduous plants. There are frequent rock outcrops, scant soil and the area is often subjected to wild fires in the dry season.

A single vegetation type, Scant Kiawe with an Understory of Mixed Grasses, is found in the vicinity of the proposed reservoir site. Kiawe trees (*Prosopis pallida*), 5 to 7 meters in height, cover less than thirty-five percent of the area. In November 1993, these trees appeared to have recently been burned due to wild fire and half of the tree skeleton showed regrowth. The understory is principally buffel grass (*Cenchrus ciliaris L.*) and green panic grass (*Panicum maxinum*), both of which have fully recovered from an earlier fire. Because of the many rock outcrops found on the site, vegetation is limited to small pockets of soil distributed among the rock outcrops. These small pockets support significant communities of weedy, introduced, wayside plants. Refer to Appendix C for a detailed discussion of botanical survey and the list of all taxa found on the project site.

Because of the fact that the proposed project site is subjected to frequent wild fires during the dry season, it is unlikely that the site provides habitat for any significant bird or other wildlife species.

Impacts: Based on the botanical survey, it is evident that the project site does not contain any of the listed threatened or endangered plant species as set forth by the U.S. Department of Fish and Wildlife Service (Endangered Species Act of 1973, [16 U.S.C. 1531-1543]). Therefore, it is anticipated that there will be no negative impact on the existing flora. Also, it is expected that there will be no impact on existing fauna since the project site does not contain any endangered or significant wildlife species.

Mitigation: No mitigation measures are proposed.

5.2.7 Historic and Archaeological Resources

An archaeological investigation was conducted on November 24, 1993 by Archaeological Consultants of Hawaii, Inc. to document any existing archaeological resources. A 100 percent surface survey of the parcel was undertaken. No sites of historic or archaeological significance were identified on the property. Based on the findings of the above investigation, Archaeological Consultants of Hawaii concluded that future construction activities will have "no effect" on the existing archaeological or historic resources. Refer to Appendix D for a detailed discussion on the archaeological investigation.

Impacts: Since the archaeological investigation concluded that there will be no impact on the existing conditions, it was determined that no further archaeological work of any kind is required.

Mitigation: No mitigation measures are proposed. However, during the excavation activities, if unknown or unexpected subsurface cultural features or deposits are encountered, the work will be halted and the State Historic Preservation Office will be notified.

5.2.8 Groundwater

Most of the groundwater resources are located in the basaltic Waianae volcanic series. These aquifers are fed by rainfall occurring in the Waianae mountain range, which infiltrates into surface soils to supply the basal groundwater. The coraline caprock acts as a barrier between the ground surface and the basaltic aquifer.

Impacts: The proposed project will not create any impact on existing groundwater sources. Construction of the reservoir will benefit the existing groundwater sources since the available water can be pumped and distributed in an efficient manner.

Mitigation: No mitigation measures are proposed.

5.2.9 Agricultural Resources

There are no agricultural resources at the project site since the site is vacant, contains rock outcrops and is subjected to frequent wild fires. Also, water resources are not available in the vicinity of the project site to make it feasible for any agricultural activities.

Impacts: The proposed project will not create any impact on present or future agricultural resources.

Mitigation: No mitigation measures are proposed.

5.2.10 Air Quality

At present, the air quality in the vicinity of the project site is generally good since there are no commercial or industrial activities.

Impacts: The proposed project will not create any long-term impact on existing air quality. However, there will be short-term impacts in the form of fugitive dust from activities such as grading and emissions from construction vehicles. Installation of this reservoir will not create any additional demand for power. Therefore, there will be no additional emissions from power generation facilities as a result of this project.

Mitigation: No mitigation measures are proposed. However, during the excavation activities, if unknown or unexpected subsurface cultural features or deposits are encountered, the work will be halted and the State Historic Preservation Office will be notified.

5.2.8 Groundwater

Most of the groundwater resources are located in the basaltic Waianae volcanic series. These aquifers are fed by rainfall occurring in the Waianae mountain range, which infiltrates into surface soils to supply the basal groundwater. The coraline caprock acts as a barrier between the ground surface and the basaltic aquifer.

Impacts: The proposed project will not create any impact on existing groundwater sources. Construction of the reservoir will benefit the existing groundwater sources since the available water can be pumped and distributed in an efficient manner.

Mitigation: No mitigation measures are proposed.

5.2.9 Agricultural Resources

There are no agricultural resources at the project site since the site is vacant, contains rock outcrops and is subjected to frequent wild fires. Also, water resources are not available in the vicinity of the project site to make it feasible for any agricultural activities.

Impacts: The proposed project will not create any impact on present or future agricultural resources.

Mitigation: No mitigation measures are proposed.

5.2.10 Air Quality

At present, the air quality in the vicinity of the project site is generally good since there are no commercial or industrial activities.

Impacts: The proposed project will not create any long-term impact on existing air quality. However, there will be short-term impacts in the form of fugitive dust from activities such as grading and emissions from construction vehicles. Installation of this reservoir will not create any additional demand for power. Therefore, there will be no additional emissions from power generation facilities as a result of this project.

Mitigation: The majority of fugitive dust will be controlled by spraying water on soils during excavation activities. Temporary erosion control measures as identified in the "Drainage and Erosion" section will be implemented. Temporary and/or permanent landscaping will be implemented as soon as practicable. All construction vehicles will comply with the applicable State and Federal emission standards to minimize air quality deterioration. Also, the project site is 1000 feet away from the nearest residence and this separation minimizes any short-term impacts.

5.2.11 Noise

At present, the noise level in the vicinity of the project site is similar to the noise level in the residential area since there are no commercial or industrial activities. In order to protect the integrity of the Makaha Tunnel and the existing reservoir, no blasting will be allowed. Therefore, rock excavation must be performed using non-blasting methods such as a hoe-ram or ripper.

Impacts: The proposed project will not create any long-term impact on existing noise levels. However, there will be short-term impacts on the existing noise levels particularly during rock excavation. Also, there will be an increase in noise levels as a result of movement of construction vehicles.

Mitigation: The majority of the earthwork activities will be performed during the hours as permitted by the City and County of Honolulu grading ordinance. There will be no rock excavation during weekends or holidays. All construction vehicles will be equipped with suitable mufflers meeting or exceeding applicable State and Federal regulations. Also, the project site is 1000 feet away from the nearest residence and this separation minimizes any short-term impacts.

5.2.12 Cultural Resources

Based on archaeological investigations, the project site does not contain any artifacts and does not have any significance from a historical perspective. At present, the project site is vacant, contains rock outcrops and is not suitable for agricultural activities. Also, the site was subjected to frequent wild fires. Therefore, it is concluded that the site does not have any significance from both a historical perspective, as well as a socioeconomic perspective.

Impacts: No impacts on cultural resources are anticipated.

Mitigation: No mitigation measures are proposed.

5.2.13 Population

The population of the Waianae Coast was approximately 37,500 in 1990. This population will gradually increase to an estimated 46,000 in 2010. However, the population of Makaha itself will increase from approximately 8,200 in 1990 to only approximately 8,400 in 2010.

Impacts: There will be no direct impact on population as a result of this project. However, any improvements to the existing utilities will partially support future development.

Mitigation: No mitigation measures are proposed.

5.3 MAN-MADE ENVIRONMENT

5.3.1 Housing

Housing in the Makaha region consists primarily of single-family housing, housing related to small and larger scale agricultural operations and vacation rental properties near the shoreline and at the Makaha Resort.

Impacts: The proposed project will not have any direct impact on existing housing. However, any improvements to the existing utilities will partially support future development. A benefit to existing housing will be increased fire protection capabilities.

Mitigation: No mitigation measures are proposed.

5.3.2 Commercial and Industrial Areas

The Makaha area has commercial activity (variety and grocery stores) adjacent to Farrington Highway. The Makaha Resort can also be considered a commercial activity. This represents a majority of the commercial/industrial activity in the Makaha region.

Impacts: There will be no impact on existing commercial and industrial facilities. It is not possible to predict the extent of any future development at this point in time. There will be benefits to the existing commercial facilities as a result of this project and increased fire protection capabilities. These benefits include, better water distribution system and storage capacity for fire fighting needs.

Mitigation: No mitigation measures are proposed.

5.4 Public Facilities and Services

5.4.1 Roadway System

After construction of the storage reservoir, access to the reservoir will be provided using an existing driveway from Kili Drive. At present, the BWS uses the existing driveway to provide supporting services to the existing 0.5-MG reservoir.

Impacts: It is anticipated that there will no impact on the existing roadway system since the number of service vehicles using the driveway will be essentially the same. During the construction period, there will be additional vehicles on Kili Drive. Increased traffic will primarily consist of the construction crew and material supplies. The construction crew will be 20 or less people.

Mitigation: Traffic to the project site will be controlled in accordance with the applicable City and County regulations including preparation of a traffic control plan. Most of the delivery vehicles are anticipated during non-peak hours such as after 9 am and before 4 pm.

5.4.2 Water Systems

After completion of this project, the proposed reservoir will become part of the Makaha 242 System to provide potable water to the residents of the Makaha area.

Impacts: There will be positive impacts on the existing water distribution system since the proposed system:

- significantly increases storage capacity in the Makaha area to comply with BWS standards
- provides uninterrupted service to BWS customers
- stabilizes pressures and supplies water during peak demand periods and for fire fighting purposes.

Mitigation: No mitigation measures are proposed.

5.4.3 Wastewater and Solid Waste Management

It is anticipated that the proposed reservoir will use the existing pump station building to provide support services such as the telemetry system

and other maintenance facilities. Therefore, there will be no additional wastewater or solid waste generation as a result of this project.

Impacts: There will be no increase in wastewater or solid waste generation or impact on existing solid waste handling and disposal facilities. However, during the construction period, there will be solid waste generation as a result of grubbing and other construction activities. Also, there will be on-site generation of wastewater during construction activities.

Mitigation: All solid waste generated during the construction period will be disposed of in a County approved landfill in accordance with the applicable City and State regulations. The contractor will be required to provide portable toilets during construction in accordance with the applicable City and State regulations. All septage will be transported to a County approved wastewater treatment facility for septage treatment and disposal. No additional mitigation measures are proposed.

5.4.4 Fire Protection

After installation, the proposed reservoir will provide the required storage capacity for the Makaha 242 system particularly during peak demand periods.

Impacts: Installation of the proposed storage reservoir will have a positive impact on the existing water distribution system which supports the City's fire protection services. There may be periods when access to the existing distribution system is limited particularly during connection of the new line to the existing water line.

Mitigation: To avoid any inconvenience to the existing system, all connection work will be done during non-peak periods such as night time when water demand is very low. In addition, advance notification will be provided by the Board of Water Supply to the general public and the Fire Department before water service is temporarily disrupted to connect the new line to the existing line.

5.4.5 Drainage System

The proposed project site is located on the slopes of the Waianae mountain range. Storm water runoff will be collected at the top of the cut slope and diverted using County approved drainage plans.

Impacts: There will be a minor increase of storm water runoff as a result of the installation of the reservoir. In addition, it is anticipated that there will be no impact on existing drainage flow patterns since the excavation site is located at the peak of a hill where drainage is limited to rainfall that directly falls on the property.

Mitigation: A minor increase of 0.6 cfs is anticipated to have negligible impact on the existing drainage swale adjacent to the existing driveway since it has sufficient capacity to transmit additional flow.

5.4.6 Electric and Telephone Service

The proposed project does not involve installation of any pumps or other equipment which require additional power. Lights will be installed around the storage reservoir for ease of maintenance at night. The existing telephone system will be used to provide telemetry services for the proposed reservoir.

Impacts: There is no impact on existing electric and telephone services. However, during construction activities, coordination is required to ensure that the proposed reservoir project does not conflict with existing and planned utility lines and facilities.

Mitigation: The Board of Water Supply will coordinate with utility companies during the construction plan preparation phase to ensure that the proposed reservoir project does not conflict with existing and planned utility lines and facilities.

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

6.1 FEDERAL

There are no known federal controls affecting the construction of the proposed reservoir.

6.2 STATE LAND USE PLAN

The proposed project site is located within the State Conservation District as shown on Figure 1. The subzone for the conservation area at the project site is resource. It is the objective of resource subzone to develop, with proper management, areas to ensure sustained use of the natural resources of conservation areas (HAR 13-5-13.a). The State of Hawaii Department of Land and Natural Resources administers land uses in all conservation areas. Therefore,

reservoir construction requires Land Board approval in the form of a Conservation District Use Permit (CDUP). Installation of the proposed reservoir is consistent with the identified land uses in the resource subzone since HAR 13-5-22 (page 5-14) specifically allows the installation of water systems. During the construction plan preparation phase, a CDUP application form will be submitted to the State Department of Land and Natural Resources for approval.

6.3 HAWAII STATE PLAN

The Hawaii State Plan's long-range goals, objectives and policies are set forth in the Hawaii State Planning Act, Hawaii Revised Statutes (H.R.S.) Chapter 226. The goal of this plan is to achieve a strong, viable economy and viable physical environment that will promote the physical, social and economic well-being of the State's individuals, families and social communities (H.R.S. Section 226-1). In general, the proposed Makaha 242 Reservoir project is consistent with the overall intent of the Hawaii State Plan. Applicable sections of the Hawaii State Plan are as follows:

6.3.1 State Goals, H.R.S. Section 226-4

The proposed Makaha 242 Reservoir project is consistent with the overall intent of the Hawaii State Plan since the reservoir will be located in the Makaha area to enhance the mental and physical well-being of the people by providing adequate water for potable and fire fighting needs.

6.3.2 Physical Environment - Land-based, Shoreline, and Marine Resources, H.R.S. Section 226-11

The construction of the proposed Makaha 242 Reservoir is compatible with the existing activities since another 0.5-MG reservoir is presently located adjacent to the project site. After completion of the reservoir, there will be no noise, air quality or traffic impacts. There will not be any impact on archaeological, cultural or historic resources. The physical characteristics of the project site make it a good location for the proposed reservoir since it is vacant and located at a suitable elevation. Construction of this reservoir will not prohibit any other development in the vicinity. There are no shoreline or marine-based resources applicable to this project. Therefore, it is concluded that the proposed project is consistent with the objectives of effectively managing land-based resources.

6.3.3 Physical Environment - Scenic, Natural Beauty, and Historic Resources, H.R.S. Section 226-12

It is proposed to minimize any visual impact on the existing physical environment using view analysis, landscaping and blending in with the existing surrounding. Several mitigation measures have been proposed as

explained in the section "Visual Impacts" to preserve and enhance the views after completion of the project. There are no historic resources applicable to this project.

6.3.4 Physical Environment - Land, Air, and Water Quality, H.R.S. Section 226-13

The proposed reservoir will be located on City owned property and the site is an unused hillside. Construction of the reservoir is consistent with the State's policy of proper management of Hawaii's land and water resources. Installation of the storage reservoir is a benefit to the Island of Oahu in general and the Makaha community in particular, since the Board of Water Supply will be able to distribute existing water sources in an effective and efficient manner. Various measures as identified in Section 5 will be implemented to protect and preserve the existing air and water quality.

6.3.5 Facility Systems - Water, H.R.S. Section 226-16

One of the objectives of H.R.S. Section 226-16 is to assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic use. Construction of the Makaha 242 Reservoir No. 2 project will add 2.0 MG of storage capacity to the existing water distribution system which is deficient in its storage capacity. This added capacity will reduce the possibility of interrupted service during periods of peak demand or power outage, increases the overall reliability of the system, and provides adequate water for fire protection needs.

6.4 STATE FUNCTIONAL PLANS

The State of Hawaii functional plans are intended to provide more detail to the Hawaii State Plan in 12 specific areas of concern. Of the 12 specific plans prepared by various state agencies, only the State Water Resources Development Functional Plan was found to be relevant to this project. The above functional plan's objective is to "assure adequate municipal water supplies for planned urban growth". The proposed project is consistent with the above objective since construction of the Makaha storage reservoir will assure sufficient water for both potable and fire protection needs of the community.

6.5 HAWAII COASTAL ZONE MANAGEMENT (CZM) PROGRAM

The Hawaii Coastal Zone Management Act (Act 188, SLH 1977), which became Chapter 205A, Hawaii Revised Statutes, established State policies for any actions affecting the coastal zone. Objectives and policies in seven broad categories are specified, and the relationship of the proposed project to two of these categories is presented below:

6.5.1 Recreational Resources

The CZM program seeks to "protect coastal resources uniquely suited for recreational activities that cannot be provided in other areas". The proposed project site is located approximately one mile from the nearest shoreline. There are no recreational activities or resources at the project site since the project site is vacant and located on the slopes of the Waianae mountain range. Therefore, it is concluded that there is no impact on recreational resources.

6.5.2 Historic Resources

One of the objectives of the CZM program is to "identify and analyze archaeological resources and to support State goals for protection, restoration and display of historic resources." From a historical perspective, there is no significance to the proposed project site since it is a vacant lot. Also, archaeological investigations concluded that the project site does not contain any archaeological resources.

6.5.3 Scenic and Open Space Resources

The CZM program seeks to "protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources." The proposed project site is located on a hillside which is visible from various points along Farrington Highway. A detailed visual impact analysis has been conducted (see Section 5.2.4). Also, various mitigation measures such as landscaping and blending in with the surrounding environment have been proposed.

6.5.4 Coastal Ecosystems

Another CZM objective is to "protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems." There is a potential concern regarding sediment runoff into streams and offshore waters due to erosion from the project site during excavation. Various mitigation measures have been proposed (see Section 5) and it is anticipated that the above measures will minimize any impact on the existing coastal ecosystem.

6.5.5 Economic Uses

This CZM objective is to "concentrate coastal dependent development in appropriate areas and to ensure that coastal dependent development such as harbors and ports are located and constructed to minimize adverse social, visual and environmental impacts in the coastal zone management areas". The proposed project site is a non-coastal dependent development and there are no adverse social or environmental impacts on the existing

coastal developments. There will be beneficial impacts on economic uses, since the proposed project will provide job opportunities during construction.

6.5.6 Coastal Hazards

Another CZM objective is to "develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and non-point source pollution hazards". Since the proposed project site is located at an elevation of 220 ft. MSL, it is concluded that there is no impact from coastal hazards.

6.5.7 Managing Development

One of the CZM objectives is to "use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development". This objective supports timely processing of applications for development permits and resolves overlapping or conflicting permit requirements. There are no known overlapping or conflicting permit requirements for the proposed project. Therefore, it is concluded that the subject project is consistent with the above CZM objective.

6.5.8 Public Participation

Another CZM objective is to "disseminate information on coastal management issues by means of educational materials, published reports and public workshops for persons or organizations concerned with coastal-related issues, developments and government activities." It is concluded that the proposed project meets the above requirements since an environmental impact statement has been prepared with extensive input from various government and private organizations.

6.5.9 Beach Protection

This CZM objective is not applicable to the proposed project since the subject project is located approximately one mile from the nearest beach.

6.6 OAHU GENERAL PLAN

The General Plan of the City and County of Honolulu is a statement of long-range social, economic, environmental, and design objectives and broad policies to facilitate the attainment of the stated objectives. The General Plan provisions which are relevant to the proposed action include the following:

6.6.1 Natural Environment

This section of the General Plan endeavors to preserve and enhance the natural environment of Oahu. In order to meet the objectives of the natural environment, due consideration will be given to surface runoff and impacts from noise, air quality and erosion. All drainage facilities will be designed to minimize the impact of runoff. Review of the botanical survey indicates the project site does not contain any endemic species. Various mitigation measures (see Section 5) have been proposed to minimize the impact of air, water, and noise problems. Based on the above, it is concluded that the proposed project will protect the natural environment from damaging levels of air, water and noise pollution.

6.6.2 Transportation and Utilities

This section of the General Plan emphasizes cost-effective transportation, as well as adequate utilities for the service area. High levels of service for water supply and distribution are emphasized. In the Makaha area, the BWS is dependent on supply wells rather than storage capacity to meet daily peak demand. According to BWS standards, reservoir capacity should be 1.5 times the average daily use and the above storage capacity is not available in the Makaha area. Implementation of this project will add reservoir storage capacity to help stabilize pressures and supply water during peak demand periods and for fire fighting purposes.

6.6.3 Physical Development and Urban Design

The proposed reservoir will be located adjacent to the existing 0.5-MG storage reservoir. Therefore, installation of the new reservoir is appropriate for the proposed site and is consistent with the surrounding physical environment. The proposed facilities will be designed to meet high aesthetic and functional standards. Landscaping and other mitigation measures will be implemented to ensure that the reservoir and the cut slope are compatible with the existing environment.

6.6.4 Government Operations and Fiscal Management

It is the overall objective of the Board of Water Supply to operate and maintain the water supply systems in a manner which is economically sound and to public advantage. This project is intended to assure reliable service to present and future BWS customers.

6.7 LAND USE ORDINANCE

The Zoning Map of the City and County of Honolulu specifically identifies detailed land uses allowed on various properties. These uses are further identified within the County's Land Use Ordinance. The current County zoning for the proposed

project site is shown on Figure 7. Current zoning is P-1 Preservation and reservoir is a "Principal Use" in accordance with the Land Use Ordinance. Therefore, it is concluded the installation of the proposed reservoir is consistent with the County's Zoning and Land Use policies.

6.8 LIST OF NECESSARY APPROVALS

Table 2 contains a listing of necessary approvals and approving agencies.

APPROVAL REQUIRED	APPROVING AGENCY	STATUS OF APPROVAL
Temporary Variance (exploratory borings to examine geography)	State of Hawaii Board of Land and Natural Resources	Application was submitted in February 1995
Conservation District Use Permit	State of Hawaii Board of Land and Natural Resources	Not obtained
Construction Plan Approval	City & County of Honolulu Board of Water Supply City & County of Honolulu Department of Public Works City & County of Honolulu Department of Land Utilization State of Hawaii Department of Health Hawaiian Telephone Company Hawaiian Electric Company	Not obtained
Grading Permit with Erosion Control Plan	City & County of Honolulu Department of Public Works	Not obtained
Noise Permit	State of Hawaii Department of Health	Not obtained
NPDES Permit for Hydrotesting	State of Hawaii Department of Health	Not obtained
Building Permit	City & County of Honolulu Building Department	Not obtained

TABLE 2. LIST OF NECESSARY APPROVALS

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

The proposed action consists of constructing a water storage reservoir on a vacant lot. Short-term impacts include degradation of the environment (air and noise pollution) during construction activities only. However, the long-term benefits clearly outweigh the short-term impacts. Specifically, long-term benefits improve the storage and distribution of water for potable and fire fighting needs in the Makaha area. A discussion of short-term and long-term considerations is as follows:

7.1 SHORT-TERM

Construction-related activities will create dust, noise, air pollution, traffic circulation disruption and increased erosion. Although specific mitigation measures are proposed for each concern, these physical actions will result in short-term impacts with respect to the environment.

Short-term impacts will also be positive to the human environment by creating construction-related employment opportunities.

7.2 LONG-TERM

Long-term impacts with respect to the environment will include a permanent change in the existing topography due to the creation of a deep cut. Long-term productivity, however, will be enhanced through meeting BWS standards for water supply, increased reliability and meeting potable and fire fighting needs particularly during peak demand periods.

8. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES THAT WOULD BE INVOLVED IN THE PROJECT SHOULD IT BE IMPLEMENTED

Unavoidable impacts of the proposed project include the following:

- The visual impact of the project, based on a larger reservoir and cut slopes, will be irreversible and irretrievable. Landscaped property and color selections are proposed as mitigation.

The proposed action of constructing a storage reservoir to improve water distribution reliability is not anticipated to have any major adverse impact on the existing environment since several mitigation measures have been proposed. It is perceived that the overall benefits derived from this project offsets any minor impacts.

9. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

9.1 UNAVOIDABLE EFFECTS

Disruption caused by physical transformation of the topography within the project site will affect air quality, ambient noise levels and surface water quality. In addition, construction-related activities will also generate corresponding traffic congestion.

The existing view of the mountain slope will be slightly altered due to the presence of a deep cut which is required to provide a level foundation site.

9.2 RATIONALE FOR PROCEEDING WITH THE ACTION

In light of the identified unavoidable adverse environmental effects, it is still proposed to proceed with the project. Although, all adverse effects have been identified, the magnitude of each adverse effect is minor. Also, the cumulative effects will not create an unacceptable environmental situation. Specifically, all short-term adverse effects can be controlled and impacts can be minimized by following various mitigative measures identified earlier. Long-term environmental effects such as the minor change in the topography and the existing view of the mountain slope are within acceptable limits considering the fact that the proposed project will improve the overall quality of life in the Makaha area.

In summary, it is evident that the benefits derived, both short-term and long-term, are in the best interest of the public since the proposed project will provide adequate water service to Makaha area residents.

9.3 ACHIEVEMENT OF COUNTERVAILING BENEFITS THROUGH ALTERNATIVES WHICH AVOID ADVERSE EFFECTS

The countervailing benefits to the proposed action are primarily providing reliability to the existing water system. The alternatives presented in this document include "no action", an alternative location, replacement of the existing storage reservoir, and installation of a smaller size reservoir. "No action" would not provide any countervailing benefits, but all of the adverse environmental effects will be eliminated. An alternative location on the eastern side of the existing reservoir is unsuitable due to evidence of boulder fill and actively moving slopes. Replacement of the existing reservoir will provide a reduced level of impact on the existing environment, particularly the mountain slope. However, this alternative is unacceptable since the existing water distribution system will be without storage capacity during the construction period. A smaller reservoir will not achieve the overall objectives of providing stable water pressure, improving the system's reliability and providing adequate water storage for potable and fire fighting needs.

10. SUMMARY OF UNRESOLVED ISSUES

There are no known unresolved issues.

11. LIST OF PARTIES CONSULTED IN PREPARATION OF THE STATEMENT

Table 3 identifies all consulted parties in preparing this Draft Environmental Impact Statement. Eight parties out of thirty-six (36) consulted provided substantive comments.

TABLE 3. LIST OF CONSULTED PARTIES DURING PREPARATION OF THE EIS

Entity Receiving Request for Consultation Comments	Response (Substantive comments)	Response (No comment)	No Response
City and County of Honolulu Agencies			
Planning Department	X		
Department of Housing and Community Development	X		
Department of Land Utilization	X		
Department of Parks and Recreation		X	
Department of Public Works	X		
Department of Transportation Services		X	
Building Department		X	
City Council - John DeSoto			X
Fire Department	X		
Police Department			X
Department of Wastewater Management		X	
State Agencies			
District 21 Senator - Sen. James H. Aki			X
District 44 Representative - Rep. Peter K. Apo			X
Department of Accounting and General		X	
Department of Agriculture			X
Department of Business, Economic Development and Tourism		X	
Department of Education		X	
Department of Health, Environmental Management Division			X
Department of Land and Natural Resources	X		
Department of Land and Natural Resources, State Historic Preservation Division		X	
Department of Transportation		X	
Office of Environmental Quality Control			X
Office of State Planning	X		
University of Hawaii Environmental Center			X

TABLE 3. LIST OF CONSULTED PARTIES DURING PREPARATION OF THE EIS (cont'd.)

Entity Receiving Request for Consultation Comments	Response (Substantive comments)	Response (No comment)	No Response
Federal Agencies			
Department of Agriculture, Soil and Conservation Service			X
Department of the Army, U. S. Army Engineer District, Honolulu	X		
Department of the Interior, Fish and Wildlife Service			X
Department of the Interior, Geological Survey			X
Private Agencies			
Hawaiian Telephone Company		X	
Hawaiian Electric Company			X
Waianae Coast Neighborhood Board No. 24			X
American Lung Association			X
Sierra Club			X
Outdoor Circle			X
Makaha Valley, Inc.			X
Makaha Plantation/Towers			X
Sheraton Makaha			X

12. LIST OF PERSONS INVOLVED IN PREPARATION OF THE STATEMENT

Table 4 identifies those parties involved in preparation of the EIS.

Name	Position/Company	Highest Education	Expertise
David B. Bills	Vice President Gray, Hong, Bills & Associates, Inc.	M.S., Civil Engineering	Environmental Engineering
Vijay C. Kumar	Project Engineer Gray, Hong, Bills & Associates, Inc.	M.S., Civil Engineering	Environmental Engineering
Timothy Cavanaugh	Senior Engineer Fewell Geotechnical Engineering, Ltd.	M.S., Civil Engineering	Soil Mechanics
Evangeline Funk	President Botanical Consultants	Ph.D.	Flora/Fauna
Joseph Kennedy	President Archaeological Consultants of Hawaii	M.A., Anthropology	Archaeology
James Hogarty	Partner HONCAD		Computer Graphics

TABLE 4. LIST OF PERSONS INVOLVED IN PREPARATION OF THE EIS

13. BIBLIOGRAPHY

1) Phase I Subsurface Investigation Report, Proposed BWS Makaha 242 Reservoir No. 2, Makaha, Oahu, Hawaii, prepared by Fewell Geotechnical Engineering, Ltd., February 28, 1994.

2) Botanical Survey Report for the Proposed Reservoir Site, Makaha, Hawaii, prepared by Evangeline Funk, Ph.D., Botanical Consultants, Honolulu, Hawaii.

3) Archaeological Investigations for the Board of Water Supply's Proposed Makaha 242 Reservoir Site, prepared by Archaeological Consultants of Hawaii, Inc., April 1994.

14. COMMENTS AND RESPONSES DURING THE DRAFT ENVIRONMENTAL IMPACT STATEMENT PREPARATION

The following pages show comment letters and responses received during the Environmental Impact Statement Preparation Notice period. The Preparation Notice Publication date in the OEQC Bulletin was November 23, 1994. The 30-day comment period ended on December 23, 1994.

P

RECEIVED
BD OF WATER SUPPLY
Nov 15 10 38 AM '94

BUILDING DEPARTMENT
CITY AND COUNTY OF HONOLULU
HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

943049

JEREMY HARRIS
MAYOR

WILLIAM F. REMULAR
ACTING DIRECTOR AND BUILDING SUPERINTENDENT

PB 94-1203

November 14, 1994

MEMO TO: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: W. F. REMULAR
ACTING DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: FINAL ENVIRONMENTAL ASSESSMENT (EA), ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN) FOR THE MAKAHA 242 RESERVOIR NO. 2, TMK: 8-4-02:11 POR. 14

We have reviewed the subject EA/EISPN and have no comments to offer. Thank you for allowing us to review the document.

W. F. REMULAR
Acting Director and
Building Superintendent

cc: G. Tamashiro

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

Date Received APR 2 1 1995
File
To: DH DB VJ
Action:

TO: RANDALL FUJIKI, DIRECTOR AND BUILDING SUPERINTENDENT
BUILDING DEPARTMENT

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF NOVEMBER 14, 1994 REGARDING THE MAKAHA 242 RESERVOIR NO. 2 ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN), TMK: 8-4-02: 11 AND POR. 14

Thank you for commenting on the EISPN for the subject project.

If you have any questions, please call Barry Usagawa at 527-5235.

cc: Gray Hong Bills & Associates

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 5TH FLOOR
HONOLULU, HAWAII 96813
PHONE: (808) 523-4427 • FAX: (808) 527-5488

RECEIVED
BOARD OF WATER SUPPLY
Nov 9 11 29 AM '94

943009

JEREMY HARRIS
MAYOR

GAIL M. KAITO
Acting Director
RONALD S. LIM
Acting Deputy Director

November 4, 1994

Mr. Kazu Hayashida
Manager and Chief Engineer
Honolulu Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

Subject: Makaha 242 Reservoir No. 2
Environmental Assessment
TMK: 8-4-02:11, 8-4-02:Por. 14

This is in response to the letter submitted to us on November 1, 1994 by Gray, Hong, Bills and Associates, Inc., requesting our comments on the Environmental Assessment for the Board of Water Supply's Makaha 242 Reservoir No. 2 project.

The proposed development does not conflict with any current or proposed City projects. The Department of Housing and Community Development supports the proposed development which will add to and improve our water storage reservoir capacity in the area.

Should you have any questions, please contact Charlotte Yoshioka of our Planning and Analysis Division at 527-5090.

Thank you for the opportunity to comment.

Sincerely,

Gail Kaito

GAIL M. KAITO
Acting Director

cc: Mr. David B. Bills
Gray, Hong, Bills and Associates, Inc.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

TO: RONALD S. LIM, DIRECTOR
DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF NOVEMBER 4, 1994 REGARDING THE MAKAHA 242 RESERVOIR NO. 2 ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN), TMK: 8-4-02: 11 AND POR. 14

Thank you for commenting on the EISPN for the subject project.

We appreciate your support for the proposed project which will improve the water distribution system in the Makaha area.

If you have any questions, please call Barry Usagawa at 527-5235.

cc: Gray Hong Bills & Associates

P

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

JEREMY HARRIS
MAYOR

KENNETH E. SPRAGUE
DIRECTOR AND CHIEF ENGINEER

RECEIVED
BD OF WATER SUPPLY
943050
Nov 15 10 38 AM '94

ENV 94-273

November 14, 1994

PE

MEMORANDUM:

TO: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: for KENNETH E. SPRAGUE
DIRECTOR AND CHIEF ENGINEER

SUBJECT: FINAL ENVIRONMENTAL ASSESSMENT (FEA)
MAKAHA 242 RESERVOIR NO. 2
TMK: 8-4-02: 11, AND PORTION OF 14

We have reviewed the subject FEA and have the following comments:

1. How does development of the new reservoir affect current drainage pattern on Kili Drive?

2. Because of the cuts in the slopes, mitigation measures through the use of best management practices (BMPs) and other engineering controls should be considered to minimize erosions caused by runoff during and after construction.

Should you have any questions, please contact Mr. Alex Ho, Environmental Engineer, at 523-4150.

cc: Gray, Hong, Bills & Assoc., Inc.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

TO: KENNETH E. SPRAGUE, PH.D., DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF NOVEMBER 14, 1994 REGARDING THE MAKAHA 242 RESERVOIR NO. 2 ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN), TMK: 8-4-02: 11 AND POR. 14

Thank you for commenting on the EISPN for the subject project. We provide the following responses to your comments:

1. No adverse impact is anticipated on the current drainage pattern on Kili Drive since there will be a negligible increase of 0.6 cfs.

2. Various mitigation measures including the Best Management Practices Plan will be included in the Environmental Impact Statement, design, construction, and maintenance of the facility.

If you have any questions, please call Barry Usagawa at 527-5235.

cc: Gray Hong Bills & Associates

RECEIVED
BD OF WATER SUPPLY
Dec 9 2 42 PM '94

PLANNING DEPARTMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

943280

JEREMY HARRIS
MAYOR

CHERYL D. SOON
ACTING CHIEF PLANNING OFFICER
CAROLL TAKAHASHI
DEPUTY CHIEF PLANNING OFFICER

MH 11/94-4570

December 6, 1994

MEMORANDUM

TO: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: CHERYL D. SOON, ACTING CHIEF PLANNING OFFICER
PLANNING DEPARTMENT

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN) FOR THE MAKAHA 242 RESERVOIR NO. 2, TAX MAP KEY: 8-4-02: 11 AND 8-4-02: POR. 14

We have reviewed the subject EISPN and have the following comments to offer:

1. The subject site is currently designated for Preservation use on the Waianae Development Plan Land Use Map.

2. The proposal is consistent with the Waianae Development Plan Public Facilities Map, which shows a symbol for a publicly funded reservoir, site determined, within six years, in the vicinity of the subject site.

3. The "Coastal View Study" (Department of Land Utilization, 1987), specifically mentions mauka views into Makaha Valley as being noteworthy relative to visual unity. Accordingly, the Draft Environmental Impact Statement should elaborate on the specific procedures being considered, and its impact on views.

Should you have any questions, please contact Matthew Higashida of our staff at 527-6056.

Cheryl D. Soon
CHERYL D. SOON
Acting Chief Planning Officer

CDS:ft

cc: Gray, Hong, Bills & Associates, Inc.
Office of Environmental Quality Control

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

TO: CHERYL D. SOON, CHIEF PLANNING OFFICER
PLANNING DEPARTMENT

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF DECEMBER 6, 1994 REGARDING THE MAKAHA 242 RESERVOIR NO. 2 ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN), TMK: 8-4-02: 11 AND POR. 14

Thank you for commenting on the EISPN for the subject project. We provide the following responses to your comments:

1. Thank you for confirming that the project site is designated for Preservation Use on the Waianae Development Plan Land Use Map.

2. We concur with your determination that the proposal is consistent with the Waianae Development Plan Public Facilities Land Use Map.

3. Your concerns regarding the mauka views will be addressed in the visual impacts and mitigation sections of the Draft and Final EIS. The visual mitigative measures will be included in the design and construction of the reservoir.

If you have any questions, please call Barry Usagawa at 527-5235.

cc: Gray Hong Bills & Associates

RECEIVED
BD OF WATER SUPPLY

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

943181

Nov 29 3 17 PM '94

JEREMY HARRIS
MAYOR

DONALD A. CLEGG
DIRECTOR

LORETTA K.C. CHEE
DEPUTY DIRECTOR

94-08161(DT)

November 29, 1994

MEMORANDUM

TO: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: DONALD A. CLEGG, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

SUBJECT: ENVIRONMENTAL ASSESSMENT (EA) FOR THE MAKAHA 242 RESERVOIR NO. 2

We have reviewed the above-referenced EA and have the following comments:

1. What will happen to the approximately 30,000 cubic yards of excavated rock? Will it be disposed of at another site?

2. The section titled "Vegetation Types" in Appendix C of the Botanical Survey is incomplete. There are some incomplete sentences in this section.

2. The proposed project site is not within the Special Management Area.

Thank you for the opportunity to comment. If you have any questions regarding this letter, please call Dana Teramoto of our staff at 523-4648.

DONALD A. CLEGG
Director of Land Utilization

DAC:dt
94081e1.djt

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

TO: PATRICK ONISHI, DIRECTOR OF LAND UTILIZATION
DEPARTMENT OF LAND UTILIZATION

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF NOVEMBER 29, 1994 REGARDING THE MAKAHA 242 RESERVOIR NO. 2 ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN), TMK: 8-4-02: 11 AND POR. 14

Thank you for commenting on the EISPN for the subject project. We provide the following responses to your comments:

1. Approximately 30,000 cubic yards of excavated material will be transported to an off-site location for disposal. All excavation and disposal activities will be performed in accordance with the City and County Grading Ordinance. The contractor will determine the disposal site and inform the City prior to excavation activities.

2. Appendix C, Vegetation Types, has been revised for thoroughness and grammatical corrections.

3. Thank you for determining that the proposed project site is outside the Special Management Area.

If you have any questions, please call Barry Usagawa at 527-5235.

cc: Gray Hong Bills & Associates

943133

DEPARTMENT OF WASTEWATER MANAGEMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

RECEIVED
BD OF WATER SUPPLY
Nov 23 2 52 PM '94

JEREMY HARRIS
MAYOR

FELIX B. LIMTIACO
ACTING DIRECTOR

WPP 94-499

November 21, 1994

MEMORANDUM

TO: MR. KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: FELIX B. LIMTIACO, ACTING DIRECTOR
DEPARTMENT OF WASTEWATER MANAGEMENT

SUBJECT: FINAL ENVIRONMENTAL ASSESSMENT - MAKAHA 242 RESERVOIR NO. 2, TAX MAP KEY: 8-4-02: 11 AND POR. 14

Thank you for the opportunity to review the subject document.

The proposed Makaha 242 Reservoir No. 2 will not have any impact on the municipal wastewater system because there are no wastewater facilities located in the vicinity of the subject site and the project does not require any wastewater services.

Should there be any questions, please call Thomas Tamanaha at 523-4671.

FELIX B. LIMTIACO
Acting Director

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

TO: FELIX LIMTIACO, DIRECTOR
DEPARTMENT OF WASTEWATER MANAGEMENT

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF NOVEMBER 21, 1994 REGARDING THE MAKAHA 242 RESERVOIR NO. 2 ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN), TMK:8-4-02: 11 AND POR. 14

Thank you for commenting on the EISPN for the subject project.

If you have any questions, please call Barry Usagawa at 527-5235.

cc: Gray Hong Bills & Associates

RECEIVED
BD OF WATER SUPPLY
Nov 10 2 37 PM '94

FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
3375 KOAPAKA STREET, SUITE H425
HONOLULU, HAWAII 96819-1689

943022

JEREMY HARRIS
MAYOR

RICHARD R. SETO-MOOK
FIRE CHIEF

ERNEST Y. SUEMOTO
FIRE DEPUTY CHIEF

November 9, 1994

Mr. Kazu Hayashida
Manager and Chief Engineer
Honolulu Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

SUBJECT: Final Environmental Assessment (EA) Environmental Impact Statement Preparation Notice (EISPN) for the Makaha 242 Reservoir No. 2
TMK: 8-4-02:121, 8-4-02:Por. 14

We have reviewed the subject material provided and foresee no adverse impact in Fire Department facilities or services.

Access for fire apparatus, water supply and building construction shall be in conformance to existing codes and standards.

Should you have any questions, please call Assistant Chief Attilio Leonardi of our Administrative Services Bureau at 831-7775.

Sincerely,

Richard R. Seto-Mook
RICHARD R. SETO-MOOK
Fire Chief

AKL:ny

cc: Gray, Hong, Bills & Associates (Environmental Assessment report attached)

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

TO: JACOB KALEIKINI, ACTING FIRE CHIEF
FIRE DEPARTMENT

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF NOVEMBER 9, 1994 REGARDING THE MAKAHA 242 RESERVOIR NO. 2 ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN), TMK: 8-4-02: 11 AND POR. 14

Thank you for commenting on the EISPN for the subject project.

During the design and construction phase, we will ensure that the access for fire apparatus, water supply and building construction will be in accordance with the building codes and standards.

If you have any questions, please call Barry Usagawa at 527-5235.

cc: Gray Hong Bills & Associates

P

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU

RECEIVED
BD OF WATER SUPPLY
Nov 16 3 05 PM '94

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

943074
PE

JEREMY HARRIS
MAYOR

WALTER M. OZAWA
DIRECTOR

ALVIN K.C. AU
DEPUTY DIRECTOR

November 14, 1994

TO: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: WALTER M. OZAWA, DIRECTOR

SUBJECT: FINAL ENVIRONMENTAL ASSESSMENT (EA) AND ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN) FOR THE MAKAHA 242 RESERVOIR NO. 2 TAX MAP KEYS 8-4-02: 11 & 8-4-02: POR. 14

The proposed action will not have any negative impact on existing or planned recreation facilities in proximity to the project site.

Thank you for the opportunity to review the final EA and EISPN.

For WALTER M. OZAWA, Director

WHO:ei

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

TO: DONA HANAIKE, DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF NOVEMBER 14, 1994 REGARDING THE MAKAHA 242 RESERVOIR NO. 2 ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN), TMK: 8-4-02: 11 AND POR. 14

Thank you for commenting on the EISPN for the subject project.

If you have any questions, please call Barry Usagawa at 527-5235.

cc: Gray Hong Bills & Associates

JOHN WAIHEE
GOVERNOR

ESTHER UEDA
EXECUTIVE OFFICER

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
Room 104, Old Federal Building
335 Merchant Street
Honolulu, Hawaii 96813
Telephone: 587-3822

November 8, 1994

SUBJECT: Director's Referral No. 94-332-U
Final Environmental Assessment (EA) and
Environmental Impact Statement Preparation
Notice (EISPN) for the Makaha 242 Reservoir
No. 2, TMK No.: 8-4-02: 11 and por. 14

We have reviewed the EA and EISPN for the subject project and confirm that the project site, as shown on Figure 1, is located within the State Land Use Conservation District.

We have no other comments to offer at this time.

EU:BS:th

P

943046

JOHN WAIHEE
GOVERNOR

JEANNE K. SCHULTZ
DIRECTOR

RICK EGGED
DEPUTY DIRECTOR

TAKESHI YOSHIHARA
DEPUTY DIRECTOR

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

Central Pacific Plaza, 220 South King Street, 11th Floor, Honolulu, Hawaii
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804 Telephone: (808) 586-2423 Fax: (808) 586-2377

RECEIVED
BD OF WATER SUPPLY
Nov 15 8 43 AM '94

November 9, 1994

PE

Mr. Kazu Hayashida
Manager and Chief Engineer
Honolulu Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

The Department of Business, Economic Development & Tourism is pleased to submit the enclosed comments on the Final Environmental Assessment and Environmental Impact Statement Preparation Notice for the Makaha 242 Reservoir No. 2.

The comments were provided by the Land Use Commission. Questions regarding these comments may be directed to Esther Ueda, LUC Executive Officer at, 587-3826.

Thank you for the opportunity to comment.

Sincerely,

Jeanne K. Schultz

Enclosure

cc: Mr. David B. Bills

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

Seiji F. Naya, Ph.D., Director
Department of Business, Economic
Development and Tourism
State of Hawaii
P.O. Box 2359
Honolulu, Hawaii 96804

Dear Dr. Naya:

Subject: Your Letter of November 9, 1994 Regarding the Makaha 242 Reservoir No. 2 Environmental Impact Statement Preparation Notice (EISPN), TMK: 8-4-02: 11 and Por. 14

Thank you for commenting on the EISPN for the subject project and providing Land Use Commission determination that the proposed project site is located within the State Land Use Conservation District.

If you have any questions, please call Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray Hong Bills & Associates

9

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

RECEIVED
BD OF WATER SUPPLY
Jan 24 1 53 PM '95

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96801

950194

LAWRENCE MIKE
DIRECTOR OF HEALTH

RH Dep PE
JAN 24 1995

In reply, please refer to:
94-252

January 13, 1995

Manager & Chief Engineer
Honolulu Board of Water Supply
City & County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Sir:

Subject: Final Environmental Assessment and Environmental Impact Statement Preparation Notice

Makaha 242 Reservoir No. 2
Makaha, Hawaii
TMK: 8-4-02: 11 & 8-4-02: por. 14

Thank you for allowing us to review and comment on the subject project. We have the following comments to offer:

Fugitive Dust Concerns

The information submitted to the Department of Health for the proposed Honolulu Board of Water Supply Makaha 242 Reservoir No. 2 project, has mentioned some construction activities where potential dust problems may arise. Due to the characteristics of the soil in the area, there is a significant potential for fugitive dust to be generated during clearing and removal of debris, grading, excavation, and construction activities for this project. In addition to the arid climatic conditions, the construction of the access road and the construction of the proposed cement water tank may add to the potential dust problems. Implementation of adequate dust control measures during all phases of construction is warranted. Construction activities must comply with provisions of Chapter 11-60.1, Hawaii Administrative Rules, Section 11-60.1-33, "Air Pollution Control".

The contractor should provide adequate means to control dust during the various phases of construction activities, including but not limited to:

a. planning the different phases of construction, focusing on minimizing the amount of dust generating materials and activities, centralizing material transfer points and onsite

vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact;

b. providing an adequate water source at site prior to startup of construction activities;

c. landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;

d. control of dust from shoulders, project entrances, and access roads;

e. providing adequate dust control measures during weekends, after hours, and prior to daily startup of construction activities.

If you have any questions, please call Mr. Wilfred Nagamine, Manager, Clean Air Branch at 586-4200.

Sincerely,

Lawrence Miike
Director of Health

c: CAB
Gray, Hong, Bills & Associates

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

Lawrence Miike, M.D.
Director
Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Miike:

Subject: Your Letter of January 13, 1995 Regarding the Makaha 242 Reservoir No. 2 Environmental Impact Statement Preparation Notice (EISPN), TMK: 8-4-02: 11 and Por. 14

Thank you for commenting on the EISPN for the subject project. We provide the following responses to your comments:

Fugitive Dust Concerns: All construction activities will be performed in accordance with the City and County approved grading plans and Hawaii Administrative Rules Chapter 60 "Air Pollution Control."

1. Construction activities will be performed in phases such as grubbing, excavation, and concrete tank construction. Vehicular traffic will be controlled in accordance with the City approved traffic control plan. Measures will be taken to minimize dust by spraying water and installing temporary and/or permanent vegetation cover.

2. Adequate water supply is available from the existing BWS water tank located approximately 200 ft. from the proposed project site.

3. Temporary and/or permanent vegetation cover will be installed as soon as it is practicable.

4. Water will be sprayed within the limits of construction area.

5. Suitable dust control measures will be provided at all times in accordance with the applicable City and State regulations.

If you have any questions, please call Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray Hong Bills & Associates

JOHN WAIHEE
GOVERNOR

943021

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

REX D. JOHNSON
DIRECTOR

DEPUTY DIRECTORS
KAHANU HOLT
GLENN M. OKIMOTO
JOYCE T. OMINE
CALVIN M. TSUDA

IN REPLY REFER TO:

STP 8.6453

RECEIVED
BD OF WATER SUPPLY
Nov 10 11 52 AM '94

November 7, 1994

PE

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
930 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

Subject: Final Environmental Assessment, Environmental Impact Statement Preparation Notice for the Makaha 242 Reservoir No. 2, Makaha
TMK: 8-4-02: 11, por. 14

The proposed construction of a the Makaha 242 Reservoir No. 2 at Makaha not have a significant impact on our transportation facilities.

We appreciate the opportunity to provide comments.

Sincerely,

Rex D. Johnson
Director of Transportation

c: Gray, Hong, Bill & Associates, Inc.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

Mr. Kazu Hayashida, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Hayashida:

Subject: Your Letter of November 7, 1994 Regarding the Makaha 242 Reservoir No. 2 Environmental Impact Statement Preparation Notice (EISPN), TMK: 8-4-02: 11 and Por. 14

Thank you for commenting on the EISPN for the subject project.

If you have any questions, please call Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray Hong Bills & Associates

JOHN WAIHEE
GOVERNOR

RECEIVED
BD OF WATER SUPPLY
Dec 6 5 40 AM '94

HERMAN M. AIZAWA, Ph.D.
SUPERINTENDENT

943264

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

December 1, 1994

Mr. Kazu Hayashida
Manager and Chief Engineer
Honolulu Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

SUBJECT: Final Environmental Assessment (EA), Environmental Impact Statement Preparation Notice (EISPN) for the Makaha 242 Reservoir No. 2
TMK: 8-4-02: 11, 8-4-02: Por. 14

We have reviewed the subject assessment and have determined that the proposed Makaha 242 reservoir project will have no impact on the schools in the area.

Thank you for the opportunity to comment.

Sincerely,

Herman M. Aizawa, Ph.D.
Superintendent

HMA:hy

cc: A. Suga, OBS
A. Maeda, LDO

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

Herman Aizawa, Ph.D.
Superintendent
Department of Education
State of Hawaii
P.O. Box 2360
Honolulu, Hawaii 96804

Dear Dr. Aizawa:

Subject: Your Letter of December 1, 1994 Regarding the Makaha 242 Reservoir No. 2 Environmental Impact Statement Preparation Notice (EISPN), TMK:8-4-02: 11 and Por. 14

Thank you for commenting on the EISPN for the subject project.

If you have any questions, please call Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray Hong Bills & Associates

P

RECEIVED
BD OF WATER SUPPLY
Nov 16 11 29 AM '94

JOHN WAIHEE
GOVERNOR

943072

ROBERT P. TAKUSHI
COMPTROLLER

LLOYD I. UNEBASAMI
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO. (P)1969.4

NOV 15 1994

Dep
PE
NOV 16 1994

Board of Water Supply
City and County of Honolulu
630 S. Beretania Street
Honolulu, Hawaii---96843

Attention: Mr. Kazu Hayashida

Gentlemen:

Subject: Makaha "242" Reservoir
Makaha, Oahu, Hawaii
Environmental Assessment and EISPN

Thank you for the opportunity to review the subject document. We have no comments to offer.

If there are any questions, please have your staff contact Mr. Ralph Yukumoto of the Planning Branch at 586-0488.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

RY:jy
cc: Gray, Hong Bills & Associates, Inc.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

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

Dear Mr. Matsuoka:

Subject: Your Letter of November 15, 1994 Regarding the Makaha 242 Reservoir No. 2 Environmental Impact Statement Preparation Notice (EISPN), TMK: 8-4-02: 11 and Por. 14

Thank you for commenting on the EISPN for the subject project.

If you have any questions, please call Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray Hong Bills & Associates

P.

GTE Hawaiian Tel

Beyond the call

RECEIVED
BD OF WATER SUPPLY
DEC 13 8 4= AM '94

GTE Hawaiian Telephone Company Incorporated
P.O. Box 2200 • Honolulu, HI 96841 • (808) 546-4511

943306

PB

December 8, 1994

Mr. Kazu Hayashida
Manager and Chief Engineer
Honolulu Board of Water Supply
City and County of Honolulu
630 S. Beretania Street
Honolulu, Hawaii 96843

Subject: Final Environmental Assessment (EA), Environmental Impact Statement Preparation Notice (EISPN) for the Makaha 242 Reservoir No. 2

Thank you for the opportunity to comment on the above subject project. HTC has no concerns at this time.

If you have any questions, please call Nils Ito at 483-8047.

Sincerely,

Steve Shimamoto
Acting Operations Manager

cc: Gray, Hong, Bills & Associates, Inc.
File

12/13 w.f. 0:01 1K

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

Mr. Steve Shimamoto
GTE Hawaiian Telephone Company, Inc.
P.O. Box 2200
Honolulu, Hawaii 96814

Dear Mr. Shimamoto:

Subject: Your Letter of December 8, 1994 Regarding the Makaha 242 Reservoir No. 2 Environmental Impact Statement Preparation Notice (EISPN), TMK: 8-4-02: 11 and Por. 14

Thank you for commenting on the EISPN for the subject project.

If you have any questions, please call Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray Hong Bills & Associates

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU

943245

RECEIVED
BD OF WATER SUPPLY
Dec 6 12 41 PM '94

DEC 6 1994

PACIFIC PARK PLAZA
711 KAPIOLANI BOULEVARD, SUITE 1200
HONOLULU, HAWAII 96813

JEREMY HARRIS
MAYOR

JOSEPH M. MAGALDI, JR.
DIRECTOR

AMAR SAPPAL
DEPUTY DIRECTOR

TE-4906
PL94.1.346

December 1, 1994

Dec 8 4 11 PM '94

MEMORANDUM

TO: KAZU HAYASHIDA, DIRECTOR AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: JOSEPH M. MAGALDI, JR., DIRECTOR

SUBJECT: MAKAHA 242 RESERVOIR NO. 2
FINAL ENVIRONMENTAL ASSESSMENT (EA) AND
ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE
TMK: 8-4-02: 11 AND POR. 14

This is in response to a letter from Gray, Hong, Bills and Associates, Inc., dated November 1, 1994 requesting our comments on the subject project.

Based on our review, we have no objections or comments to offer at this time.

Should you have any questions, please contact Lance Watanabe of my staff at local 4199.

JOSEPH M. MAGALDI, JR.

cc: Gray, Hong, Bills & Associates, Inc.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

TO: CHARLES O. SWANSON, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF DECEMBER 1, 1994 REGARDING THE MAKAHA 242 RESERVOIR NO. 2 ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN), TMK: 8-4-02: 11 AND POR. 14

Thank you for commenting on the EISPN for the subject project.

If you have any questions, please call Barry Usagawa at 527-5235.

cc: Gray Hong Bills & Associates

OFFICE OF STATE PLANNING
Office of the Governor

Ref. No. C-948

December 1, 1994

Date Received DEC 5 1994
File: 2394
DH DB VJ

Mr. David B. Bills
Gray, Hong, Bills & Associates, Inc.
119 Merchant Street, Suite 607
Honolulu, Hawaii 96813

Dear Mr. Bills:

Subject: Review of Final Environmental Assessment and Environmental Impact Statement Preparation Notice for Makaha Reservoir No. 2

We have reviewed the referenced document and have the following comments:

Although the project site is not within the Special Management Area, the project site is located within the Coastal Zone Management Area (CZMA). With the passage of Act 91 in 1993, the CZMA is now the entire state. Chapter 205A was also amended (by Act 258) to add two more objectives with supporting policies. The nine objectives and their supporting policies that should be addressed by the project are recreational resources, historic resources, scenic and open space resources, coastal ecosystems, economic uses, coastal hazards, managing development, public participation, and beach protection. In preparing the environmental impact statement, you may wish to consult the updated CZM statute.

We agree that the visual impact of the project is one of the most significant impacts of the project. However, in addition to blending the color of the concrete reservoir with the surroundings, consideration should also be given to vegetative cover and/or rock or earthen berms as possible solutions to mitigate visual impacts, as well as their respective costs and feasibility.

We appreciate very much the opportunity to review the proposal. If you have any questions, please contact Terry Hildebrand at 587-2881.

Sincerely,

Norma Wong
Director

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

Gregory G. Y. Pai, Ph.D.
Director
Office of State Planning
P.O. Box 3540
Honolulu, Hawaii 96811-3540

Dear Dr. Pai:

Subject: Your Letter of December 1, 1994 Regarding the Makaha 242 Reservoir No. 2 Environmental Impact Statement Preparation Notice (EISPN), TMK: 8-4-02: 11 and Por. 14

Thank you for commenting on the EISPN for the subject project.

We will identify all nine objectives of the Chapter 205A in the Environmental Impact Statement (EIS). Your concerns regarding visual impacts will also be addressed in the EIS, and mitigative actions will be implemented in the design and construction of the reservoir.

If you have any questions, please call Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray Hong Bills & Associates

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

REPLY TO ATTENTION OF

November 30, 1994

Planning Division

Date Received DEC. 1 1994
File:
To: DLF DB VS
Action:

Mr. David B. Bills
Gray, Hong, Bills and Associates, Inc.
119 Merchant Street, Suite 607
Honolulu, Hawaii 96813

Dear Mr. Bills:

Thank you for the opportunity to review and comment on the Final Environmental Assessment for the Makaha 242 Reservoir No. 2, Makaha, Oahu (TMK 8-4-2: 11, 14). The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. A DA permit will not be required for the project.

b. According to the enclosed Federal Emergency Management Agency's Flood Insurance Rate Map, panel number 150001 065B dated September 4, 1987, the project site is located in Zone X (unshaded; areas determined to be outside of the 500-year floodplain).

Sincerely,

Ray H. Jyo, P.E.
Director of Engineering

Enclosure

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 11, 1995

Mr. Ray H. Jyo
Director of Engineering
Department of the Army
Fort Shafter, Hawaii 96858-5440

Attn: Planning Division

Dear Mr. Jyo:

Subject: Your Letter of November 30, 1994 Regarding the Makaha 242 Reservoir No. 2 Environmental Impact Statement Preparation Notice (EISPN), TMK: 8-4-02: 11 and Por. 14

Thank you for commenting on the EISPN for the subject project and for confirming that a Department of the Army Permit is not required for the subject project.

We concur with your determination that the project site is located in Zone X (areas determined to be outside of the 500-year floodplain).

If you have any questions, please call Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray Hong Bills & Associates

15. COMMENTS AND RESPONSES TO THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

The following pages show comment letters and responses received during the Draft Environmental Impact Statement review period. The publication date in the OEQC Bulletin was October 23, 1995. The 45-day comment period ended on December 7, 1995. Table 5 identifies all entities receiving the DEIS and the characteristics of their responses.

TABLE 5. LIST OF REVIEWERS TO THE DRAFT EIS

Entity Receiving Draft EIS	Response (Substantive comments)	Response (No comment)	No Response
City and County of Honolulu Agencies			
Board of Water Supply			X
Building Department		X	
Department of Housing and Community Development			X
Department of Land Utilization		X	
Department of Parks and Recreation		X	
Department of Public Works		X	
Department of Transportation Services		X	
Fire Department		X	
Municipal Reference and Records Center			X
Planning Department		X	
Police Department			X
State Agencies			
Office of Environmental Quality Control			X
Department of Agriculture			X
Department of Accounting and General Services		X	
Department of Defense			X
Department of Education			X
Department of Hawaiian Home Lands		X	
Department of Health		X	
Department of Land and Natural Resources (DLNR)	X		
DLNR State Historic Preservation Division		X	
Department of Business, Economic Development and Tourism (DBEDT)			X
DBEDT Library			X
Housing Finance and Development Corporation		X	
Department of Transportation		X	
State Archives			X
DBEDT State Energy Office		X	
Office of Hawaiian Affairs		X	
Office of State Planning			X

TABLE 5. LIST OF REVIEWERS TO THE DRAFT EIS (cont'd.)

Entity Receiving Draft EIS	Response (Substantive comments)	Response (No comment)	No Response
Federal Agencies			
Regional Division U.S. Environmental Protection Agency			X
Army Directorate of Facilities Engineer			X
Naval Base, Pearl Harbor		X	
Soil Conservation Service			X
U.S. Army Corps of Engineers		X	
U.S. Coast Guard			X
U.S. Fish and Wildlife Service			X
U.S. Geological Survey		X	
University of Hawaii			
Environmental Center	X		
Water Resources Research Center			X
News Media			
Honolulu Star Bulletin			X
Honolulu Advertiser			X
Sun Press			X
Non-Governmental Agencies			
American Lung Association			X
Hawaiian Electric Company, Inc.		X	
Libraries			
University of Hawaii, Hamilton Library			X
Legislative Reference Bureau			X
State Main Library			X

TABLE 5. LIST OF REVIEWERS TO THE DRAFT EIS (cont'd.)

Entity Receiving Draft EIS	Response (Substantive comments)	Response (No comment)	No Response
Regional Libraries			
Kaimuki Regional Library			X
Kaneohe Regional Library			X
Pearl City Regional Library			X
Hilo Regional Library			X
Kahului Regional Library			X
Kauai Regional Library			X
Oahu Library			
Waianae Public Library			X
Other Consulted Parties			
District 21 Senator - Sen. James H. Aki			X
District 44 Representative - Rep. Merwyn S. Jones			X
Outdoor Circle			X
Makaha Valley Plantation	X		
Sierra Club			X
Waianae Coast Neighborhood Board No. 4			X
GTE Hawaiian Telephone			X
Sheraton Makaha			X
City Council Chairman John DeSoto			X

953590
P6

BUILDING DEPARTMENT
CITY AND COUNTY OF HONOLULU
HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

JEREMY HARRIS
MAYOR

RANDALL K. FUJIKI
DIRECTOR AND BUILDING SUPERINTENDENT

ISIDRO M. BAQUILAR
DEPUTY DIRECTOR AND BUILDING SUPERINTENDENT

PB 95-872

November 21, 1995

MEMO TO: BOARD OF WATER SUPPLY

ATTN: BARRY USAGAWA

FROM: RANDALL K. FUJIKI
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: MAKAHA 242 RESERVOIR NO. 2
DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)

We have reviewed the subject DEIS and have no comments to offer. Thank you for allowing us to review the document.

RANDALL K. FUJIKI
Director and Building Superintendent

cc: G. Tamashiro
Gray, Hong, Bills & Associates, Inc.
(Attn: David Bills)

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 18, 1996

JEREMY HARRIS, Mayor
WALTER O. WATSON, JR., Chairman
MAURICE H. YAMASATO, Vice Chairman
KAZU HAYASHIDA
MELISSA Y.J. LUM
FORREST C. MURPHY
KENNETH E. SPRAGUE
BARBARA KIM STANTON

RAYMOND H. SATO
Manager and Chief Engineer

TO: RANDALL K. FUJIKI, DIRECTOR AND BUILDING SUPERINTENDENT
BUILDING DEPARTMENT

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF NOVEMBER 21, 1995 REGARDING THE MAKAHA 242 RESERVOIR NO. 2 DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS), TMK: 8-4-02:11 & POR. 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

cc: Gray, Hong, Bills & Associates, Inc.

Pure Water . . . our greatest need – use it wisely

P

RECE
BD OF W

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

953690
PE

Dec 1 12 35 PM '95

JEREMY HARRIS
MAYOR

PATRICK T. ONISHI
DIRECTOR

LORETTA K.C. CHEE
DEPUTY DIRECTOR

95-07386 (DT)

November 30, 1995

Mr. David Bills
Gray, Hong, Bills & Associates, Inc.
119 Merchant Street, Suite 607
Honolulu, Hawaii 96813

Dear Mr. Bills:

Draft Environmental Impact Statement (EIS)
Makaha 242 Reservoir No. 2
Tax Map Keys: 8-4-02: 11 and 14

We have reviewed the above-referenced Draft EIS and noticed that the Department of Land and Natural Resources (DLNR) comment letter was not included in the agency response section. DLNR's letter should be included in the Final EIS as Table 3 (List of Consulted Parties During Preparation of the EIS) indicates that DLNR had substantive comments.

Thank you for the opportunity to comment. If you have any questions regarding this letter, please contact Dana Teramoto of our staff at 523-4648.

Very truly yours,

PATRICK T. ONISHI
Director of Land Utilization

PTO:am

✓cc: City & County of Honolulu,
Board of Water Supply

9507386.dja

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6160
FAX (808) 533-2714

January 18, 1996

JEREMY HARRIS Mayor

WALTER O WATSON JR Chairman
MAURICE H YAMASATO Vice Chairman
KAZU HAYASHIDA
MELISSA Y J LUM
FORREST C MURPHY
KENNETH E SPRAGUE
BARBARA KIM STANTON

RAYMOND H SATO
Manager and Chief Engineer

TO: PATRICK T. ONISHI, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF NOVEMBER 30, 1995 TO GRAY, HONG, BILLS & ASSOCIATES, INC. REGARDING THE MAKAHA 242 RESERVOIR NO. 2 DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS), TMK: 8-4-02:11 AND POR. 14

Thank you for reviewing the DEIS for the subject project.

The Department of Land and Natural Resources (DLNR) comment letter was inadvertently excluded from the agency response section of the DEIS. A copy of the letter and our response will be included in the Final EIS.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

cc: Gray, Hong, Bills & Associates, Inc.

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

JEREMY HARRIS
MAYOR

DONA L. HANAIKE
DIRECTOR

ALVIN K.C. AU
DEPUTY DIRECTOR

PLN-187/95

November 16, 1995

Nov 20 9 55 AM '95

TO: THE HONORABLE JEREMY HARRIS, MAYOR

FROM: DONA L. HANAIKE, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
MAKAHA 242 RESERVOIR NO. 2
TAX MAP KEYS 8-4-02: 11 AND 8-4-02: POR. 14
WAIANAE, OAHU, HAWAII

This responds to the DEIS preparation document for the subject project.

Based on our review of the DEIS, we have no comments to offer at this time.

Thank you for the opportunity to comment on the subject document.

Should you have any questions, please contact Brian Suzuki of our Advance Planning Branch at extension 6316.

For DONA L. HANAIKE
Director

DLH:ei

cc: Office of Environmental Quality Control
Board of Water Supply (Barry Usagawa)
Gray, Hong, Bills & Associates, Inc. (David Bills)

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 18, 1996

JEREMY HARRIS, Mayor
WALTER D. WATSON JR. Chairman
MAURICE H. YAMASATO, Vice Chairman
KAZU HAYASHIDA
MELISSA Y.J. LUM
FORREST C. MURPHY
KENNETH E. SPRAGUE
BARBARA KIM STANTON

RAYMOND H. SATO
Manager and Chief Engineer

TO: DONA L. HANAIKE, DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF NOVEMBER 16, 1995 TO MAYOR JEREMY HARRIS REGARDING THE MAKAHA 242 RESERVOIR NO. 2 DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS), TMK: 8-4-02: 11 AND PORTION 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

cc: Gray, Hong, Bills & Associates, Inc.

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

953347

PE

Oct 31 12 59 PM '95

JEREMY HARRIS
Mayor

KENNETH E. SPRAGUE
DIRECTOR AND CHIEF ENGINEER

DARWIN J. HANAMOTO
DEPUTY DIRECTOR

ENV 95-300

October 30, 1995

HEMORANDUM:

TO: CHERYL SOON, CHIEF PLANNING OFFICER
PLANNING DEPARTMENT

FROM: for KENNETH E. SPRAGUE
DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
MAKAHA 242 RESERVOIR NO. 2
TMK: 8-4-02: 11 AND POR. 14

We have reviewed the subject DEIS and have the following comments:

1. The DEIS should address the implementation of best management practices (BMPs) during hydrotesting to mitigate potential discharge of pollutants.

2. The DEIS should also address permit requirement for hydrotesting (State General Permit and City effluent discharge permit if necessary).

Should you have any questions, please contact Mr. Alex Ho, Environmental Engineer, at 523-4150.

cc: BWS (Barry Usagawa)
Gray, Hong, Bills & Assoc.,Inc. (David Bills)

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-5180
FAX (808) 533-2714

January 18, 1996

JEREMY HARRIS Mayor
WALTER O. WATSON, JR., Chairman
MAURICE H. YAMASATO, Vice Chairman
KAZU HAYASHIDA
MELISSA Y.J. LUM
FORREST C. MURPHY
KENNETH E. SPRAGUE
BARBARA KIM STANTON

RAYMOND H. SATO
Manager and Chief Engineer

TO: KENNETH E. SPRAGUE, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF OCTOBER 30, 1995 TO PLANNING DEPARTMENT REGARDING THE MAKAHA 242 RESERVOIR NO. 2 DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS), TMK: 8-4-02:11 AND POR. 14

Thank you for reviewing the DEIS for the subject project. We provide the following responses to your comments:

1. Best Management Practice (BMP) will be implemented during hydrotesting operations to mitigate the discharge of pollutants. BMP's will be determined by the contractor and submitted to the Department of Health for their approval.

2. We will address the objectives and requirements of the NPDES regulations for hydrotesting with the State of Hawaii, Department of Health. A City effluent discharge permit application will also be submitted before discharging the effluent into the City storm sewer system.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

cc: Gray, Hong, Bills & Associates, Inc.

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU

953784

PACIFIC PARK PLAZA
711 KAPIOLANI BOULEVARD, SUITE 1200
HONOLULU, HAWAII 96813

Dec 8 4 00 PM '95

PE

JEREMY HARRIS
MAYOR

CHARLES O SWANSON
DIRECTOR

10/95-04935R

December 7, 1995

MEMORANDUM

TO: THE HONORABLE JEREMY HARRIS, MAYOR
OFFICE OF THE MAYOR

FROM: CHARLES O. SWANSON, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR MAKAHA 242 RESERVOIR NO. 2

We have reviewed the subject draft environmental impact statement. In regards to transportation and traffic impacts, we have no comments or objections to the project.

Should you have any questions regarding this matter, please call Faith Miyamoto at Local 6976.

for CHARLES O. SWANSON

cc: Office of Environmental
Quality Control
Barry Usagawa, Board of Water Supply
David Bills, Gray, Hong, Bills & Associates

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 18, 1996

JEREMY HARRIS Mayor
WALTER O WATSON, JR Chairman
MAURICE H YAMASATO Vice Chairman
KAZU HAYASHIDA
MELISSA Y J LUU
FORREST C MURPHY
KENNETH E SPRAGUE
BARBARA KIM STANTON

RAYMOND H SATO
Manager and Chief Engineer

TO: CHARLES O. SWANSON, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF DECEMBER 7, 1995 TO MAYOR JEREMY HARRIS REGARDING THE MAKAHA 242 RESERVOIR NO. 2 DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS), TMK: 8-4-02:11 & POR. 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

cc: Gray, Hong, Bills & Associates, Inc.

Pure Water . . . our greatest need – use it wisely

95-359

PE

RECEIVED
BD OF WATER

'95 JAN 17 12 40 PM

FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
3375 KOAPAKA STREET, SUITE H428
HONOLULU, HAWAII 96819-1869

JEREMY HARRIS
MAYOR

ANTHONY J. LOPEZ, JR.
FIRE CHIEF

ATTILIO K. LEONARDI
FIRE DEPUTY CHIEF

November 15, 1995

TO: HONORABLE JEREMY HARRIS, MAYOR

FROM: ANTHONY J. LOPEZ, JR., FIRE CHIEF

SUBJECT: MAKAHA 242 RESERVOIR NO.2

We have reviewed the subject material provided and have no additional comments.

Should you have any questions, please call Assistant Chief Arthur Ugalde of our Administrative Services Bureau at 831-7774.

Attilio K. Leonardi
for ANTHONY J. LOPEZ, JR.
Fire Chief

PHG:ny

cc: Board of Water Supply (Barry Usagawa)
Gray, Hong, Bills & Associates, Inc. (David Bills)
Office of Environmental Quality Control w/EIS draft

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 18, 1996

JEREMY HARRIS Mayor

WALTER D. WATSON, JR., Chairman
MAURICE H. YAMASATO, Vice Chairman
KAZU HAYASHIDA
MELISSA Y.J. LUM
FORREST C. MURPHY
KENNETH E. SPRAGUE
BARBARA KIM STANTON

RAYMOND H. SATO
Manager and Chief Engineer

TO: ANTHONY J. LOPEZ, JR., FIRE CHIEF
FIRE DEPARTMENT

FROM: Raymond H. Sato
RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF NOVEMBER 15, 1995 TO MAYOR JEREMY HARRIS REGARDING THE MAKAHA 242 RESERVOIR NO. 2 DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS), TMK: 8-4-02:11 & POR. 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

cc: Gray, Hong, Bills & Associates, Inc.

PLN-190/95

PLANNING DEPARTMENT
CITY AND COUNTY OF HONOLULU
630 SOUTH KING STREET
HONOLULU, HAWAII 96813

JEREMY HARRIS
MAYOR

CHERYL D SOON
CHIEF PLANNING OFFICER

CAROLL TAKAHASHI
DEPUTY CHIEF PLANNING OFFICER

ET 10/95-2167

November 27, 1995

Mr. David Bills
Gray, Hong, Bills & Associates, Inc.
119 Merchant Street, Suite 607
Honolulu, Hawaii 96813

Dear Mr. Bills:

Draft Environmental Impact Statement
(DEIS) for Makaha 242 Reservoir No. 2

Thank you for the opportunity to review the Draft Environmental Impact Statement (DEIS) for the proposed 242 Water Reservoir No. 2. We have reviewed the subject document and offer the following comment:

- Section 3.3.3.2 of the DEIS should be revised to indicate that the proposed reservoir is already identified on the Waianae Development Plan Public Facilities Map as a publicly funded reservoir, site determined, within six years.

We have no additional comments to offer at this time. Should you have any questions, please contact Eugene Takahashi of our staff at 527-6022.

Sincerely,

CHERYL D. SOON
Chief Planning Officer

CDS:lh

cc: ✓Board of Water Supply
Attn: Barry Usagawa
OEQC

RECEIVED
NOV 30 2:16 PM '95

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 18, 1996

JEREMY HARRIS Mayor
WALTER O. WATSON, JR., Chairman
MAURICE H. YAMASATO, Vice Chairman
KAZU HAYASHIDA
MELISSA Y.J. LUAI
FORREST C. MURPHY
KENNETH E. SPRAGUE
BARBARA KIM STANTON

RAYMOND H. SATO
Manager and Chief Engineer

TO: CHERYL D. SOON, CHIEF PLANNING OFFICER
PLANNING DEPARTMENT

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF NOVEMBER 27, 1995 TO GRAY, HONG, BILLS & ASSOCIATES, INC. REGARDING THE MAKAHA 242 RESERVOIR NO. 2 DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS), TMK: 8-4-02:11 AND POR. 14

Thank you for reviewing the DEIS for the subject project.

We concur with your comment regarding identification of the reservoir on the Waianae Development Plan Public Facilities Map as a publicly funded reservoir. Your letter will be appended to the Final EIS.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

cc: Gray, Hong, Bills & Associates, Inc.

P

BENJAMIN J. CAYETANO
GOVERNOR

BD OF WATER S... RECEI...

Nov 6 10 18 AM '95

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

MAYOR'S OFFICE
CITY & COUNTY
HONOLULU

'95 NOV -1 A9:34

OCT 31 1995

953405

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. (P)1754.5

The Honorable Jeremy Harris
Mayor, City and County of Honolulu
City Hall, 530 South King Street
Honolulu, Hawaii 96813

Dear Mayor Harris:

Subject: Makaha 242 Reservoir No. 2
Waianae, Oahu, Hawaii
Draft Environmental Impact Statement

Thank you for the opportunity to review the subject document. The proposed project will have no impact on our facilities. Therefore, we have no comments to offer.

If there are any questions, please have your staff contact Mr. Ralph Yukumoto of the Public Works Division at 586-0488.

Sincerely,

SAM CALLEJO
State Comptroller

cc: Gray, Hong, Bills & Associates, Inc.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 18, 1996

Mr. Sam Callejo, State Comptroller
Department of Accounting and General Services
State of Hawaii
P. O. Box 119
Honolulu, Hawaii 96810

Dear Mr. Callejo:

Subject: Your Letter of October 31, 1995 to Mayor Jeremy Harris Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS), TMK: 8-4-02:11 and Por. 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

P

BD OF WATER...

BENJAMIN J. CAYETANO
GOVERNOR
STATE OF HAWAII

Dec 5 12 47 PM '95

953743

KALI WATSON
CHAIRMAN
HAWAIIAN HOMES COMMISSION

JOBIE M. K. M. YAMAGUCHI
DEPUTY TO THE CHAIRMAN

PE

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96805

December 1, 1995

The Honorable Jeremy Harris
Mayor, City and County of Honolulu
Honolulu Hale
530 South King Street
Honolulu, Hawaii 96813

Dear Mayor Harris:

Subject: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE MAKAHA 242 RESERVOIR NO. 2

The Department of Hawaiian Home Lands anticipates no adverse impacts on our programs and projects from construction of the proposed reservoir.

Thank you for the opportunity to review the subject draft EIS.

Warmest aloha,

Kali Watson

Kali Watson, Chairman
Hawaiian Homes Commission

c: OEQC
Honolulu Board of Water Supply
Gray, Hong, Bills & Associates, Inc.

3878L*

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 18, 1996

JEREMY HARRIS, Mayor
WALTER O. WATSON JR., Chairman
MAURICE H. YAMASATO, Vice Chairman
KAZU HAYASHIDA
MELISSA Y.J. LUU
FORREST C. MURPHY
KENNETH E. SPRAGUE
BARBARA KIM STANTON

RAYMOND H. SATO
Manager and Chief Engineer

Mr. Kali Watson, Chairman
Hawaiian Homes Commission
Department of Hawaiian Home Lands
State of Hawaii
P.O. Box 1879
Honolulu, Hawaii 96805

Dear Mr. Watson:

Subject: Your Letter of December 1, 1995 to Mayor Jeremy Harris Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS), TMK: 8-4-02:11 and Por. 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

Raymond H. Sato

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray, Hong, Bills & Associates, Inc.

Pure Water . . . our greatest need – use it wisely

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

PLN-188/95

LAWRENCE MIIKE
DIRECTOR OF HEALTH

In reply, please refer to

November 20, 1995

94-252A/epo

NOV 20 12 35 PM '95

The Honorable Jeremy Harris
Mayor, City & County of Honolulu
City Hall, 530 South King Street
Honolulu, Hawaii 96813

Dear Mayor Harris:

Subject: Draft Environmental Impact Statement
Makaha 242 Reservoir No. 2
Waianae, Oahu
TMK: 8-4-02: 11, por. 14

Thank you for allowing us to review and comment on the subject document. Our fugitive dust concerns have been addressed in the subject document.

Sincerely,

Lawrence Miike
Director of Health

c: Honolulu Board of Water Supply ✓
Gray, Hong, Bills & Associates, Inc.
OEQC

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

JEREMY HARRIS, Mayor

WALTER O. WATSON, JR., Chairman
MAURICE H. YAMASATO, Vice Chairman
KAZU HAYASHIDA
MELISSA Y.J. LUM
FORREST C. MURPHY
KENNETH E. SPRAGUE
BARBARA KIM STANTON

RAYMOND H. SATO
Manager and Chief Engineer

January 18, 1996

Lawrence Miike, M.D.
Director
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Miike:

Subject: Your Letter of November 20, 1995 to Mayor Jeremy Harris Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS), TMK: 8-4-02: 11 and Portion 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray, Hong, Bills & Associates, Inc.

BENJAMIN J. CAYETANO
Governor of Hawaii

Chairperson
MICHAEL D. WILSON
Board of Land and Natural Resources

Deputy Director
GILBERT COLOMA-AGARAN

Aquaculture Development
Aquatic Resources
Boating and Ocean Recreation
Bureau of Conveyances
Conservation and Environmental Affairs
Conservation and Resources Enforcement
Forestry and Wildlife
Historic Preservation
Land Management
State Parks
Water and Land Development

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

P. O. Box 621
Honolulu, Hawaii 96809

REF:OCEA:SL

DEC -1 1995

File No.: 96-173

The Honorable Raymond H. Sato
Manager and Chief Engineer
City and County of Honolulu
Board of Water Supply
630 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Sato:

Subject: Draft Environmental Impact Statement for the Makaha 242 Reservoir No. 2, Makaha, Oahu, Hawaii, TMK: 8-4-02: 11 & por. 14

Thank you for giving our Department the opportunity to comment on this matter. We have reviewed the materials you submitted and have the following comments:

Land Division:

The Draft Environmental Impact Statement (EIS) included a list of consulted parties during the preparation of the EIS. Although the DLNR has been listed as an agency that provided comments on the project during the preparation of the EIS, a copy of our comments was not included in the draft EIS.

A major concern with this project is the visual impact of a 120 foot high cut in the top of the ridge. BWS must consider and find how this project would be designed to be compatible with the visual qualities of the surrounding environment.

The reservoir appears to be sited on the top of a ridge-line which is similar to a situation near the town of Waianae where a reservoir was placed in the middle of the Pahaahee Ridge. This reservoir has a major negative impact on the entire landscape of that area.

We understand that the elevation is needed to achieve the required water pressure, but greater consideration should be given to the visual impacts of the facility on Hawaii's scenic landscape.

There needs to be some awareness and respect of the older generations who have walked this ridge-line to bury their dead and to its historic features and its significance in the prior history of this area.

A Conservation District Use Application is required for the project.

Commission on Water Resource Management:

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas which are important for the maintenance of streams and the replenishment of aquifers.

1) We recommend coordination with the county government to incorporate this project into the County's Water Use and Development Plan.

2) Based on the information provided, it does not appear that a Stream Channel Alteration Permit pursuant to Section 13-169-50, HAR will be required before the project can be implemented.

Division of Forestry and Wildlife:

The draft EA for the subject matter adequately addresses our concerns in relation to flora, fauna, wildfires, and erosion control. The construction of the reservoir will serve as a larger water source for the Honolulu Fire Department in their efforts in suppressing wildfires in the wildland/urban interface along the Leeward Coast.

We commend the applicant's use of Best Management Practices in abating the movement of soil into the ocean as well as controlling the dust during construction. We have no objections to the proposed request except that we do require a fire contingency plan prior to the construction of the reservoir.

Division of Aquatic Resource:

The proposed project is not expected to have significant adverse impact on aquatic resource values in the area. However, the Division is concerned because the project site is located within the vicinity of an unnamed intermittent stream and Makaha Stream. Makaha Stream is known to harbor a few native and exotic freshwater fauna. Therefore, construction activities could have potential

short-term impacts on aquatic resources such as temporary turbidity, biota displacement and disturbance. We would suggest the following measures to minimize erosion and siltation during construction:

1) Site work be scheduled for periods of minimal rainfall;

2) Lands denuded of vegetation be replanted or covered as quickly as possible to control erosion;

3) Construction materials, petroleum products, and debris should be prevented from falling, blowing, or leaching into the aquatic environment.

We have no other comments at this time. Should you have any questions, please call Sam Lemmo at the Office of Conservation and Environmental Affairs at 587-0377.

Aloha,

for MICHAEL D. WILSON

bxc: DAR, DOFAW, CWRM

SL:skk

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 17, 1996

COPY
JAN 16 1996
2394
DH DB PT ✓

Mr. Michael D. Wilson, Chairperson
Board of Land and Natural Resources
Department of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Wilson:

Subject: Your Letter of December 1, 1995 Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS) TMK: 8-4-02: 11 and Portion 14

Thank you for reviewing the DEIS for the subject project. We provide the following responses to your comments:

1. Land Division

The Department of Land and Natural Resources' (DLNR) letter was inadvertently excluded from the agency response section of the DEIS. A copy of the letter and our response will be included in the Final Environmental Impact Statement (FEIS).

We understand your concerns and consulted with your staff regarding the visual impact of the proposed project. A visual impact analysis showing both the existing and proposed project setting is included in the DEIS. Computerized graphics, utilizing a grading plan input feature, have provided realistic views of the finished product from three different angles. The proposed cut for the reservoir will not have a large visual impact as compared to the view of the existing Makaha 242 reservoir.

The Historic Preservation Division has also determined that there will be no effect on historic sites. We will address the objectives and requirements of the Conservation District Use Application that is required for the project.

2. Commission on Water Resource Management

The project has been incorporated in the Oahu Water Management Plan, Appendix E, BWS Capital Improvements Program. We concur with your comment that a Stream Alteration Permit will not be required for the project. There will be no direct connection to any stream channel under the jurisdiction of the Stream Channel Alteration Permit processing.

3. Division of Forestry and Wildlife

We agree that the additional water reservoir will serve as a larger water source for firefighting efforts with respect to wildfires.

A fire contingency plan will be submitted for review and approval prior to construction.

4. Division of Aquatic Resources

We agree that the project will not have significant adverse impacts on aquatic resource values in the area. Your suggestions to minimize erosion and siltation during construction will be addressed as part of the Best Management Practice Plan for the project.

You may view the FEIS at the State Main Library or any regional library.

If you have any questions, contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray, Hong, Bills & Associates, Inc.

Pure Water . . . our greatest need – use it wisely

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

RECEIVED
BD OF WATER SUPPLY

Oct 30 12 55 PM '95

953322

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

OCT 27 P3:03

MAYOR'S OFFICE
CITY & COUNTY
HONOLULU

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY
GILBERT COLOMA-AGARAN

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

October 24, 1995

Mayor Jeremy Harris
City and County of Honolulu
City Hall
530 South King Street
Honolulu, Hawaii 96813

LOG NO: 15758
DOC NO: 9510TD18

Dear Mr. Harris:

SUBJECT: Draft Environmental Impact Statement (DEIS) for the Makaha 242 Reservoir No. 2
Makaha, Wai`anae, O`ahu
TMK: 8-4-7: 11 and por. 14

Thank you for the opportunity to review this DEIS. The archaeological report (Moore and Kennedy, April 1994) attached as Appendix D of the DEIS acceptably documents the fact that there are no historic sites in the c. 11 acre proposed project area. We believe this project will have "no effect" on historic sites.

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

TD:jk

cc: Barry Usagawa, Honolulu Borad of Water Supply, 639 South Beretania Street, Honolulu, HI 96813
David Bills, Gray, Hong, Bills & Associates, Inc., 119 Merchant Street, Suite 607, Honolulu, HI 96813

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

JEREMY HARRIS Mayor
WALTER D. WATSON, JR., Chairman
MAURICE H. YAMASATO, Vice Chairman
KAZU HAYASHIDA
MELISSA Y.J. LUM
FORREST C. MURPHY
KENNETH E. SPRAGUE
BARBARA KIM STANTON

RAYMOND H. SATO
Manager and Chief Engineer

January 18, 1996

Mr. Don Hibbard, Administrator
Historic Preservation Division
Department Land and Natural Resources
State of Hawaii
33 South King Street, 6th Floor
Honolulu, Hawaii 96813

Dear Mr. Hibbard:

Subject: Your Letter of October 24, 1995 to Mayor Jeremy Harris Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS), TMK: 8-4-02:11 and Por. 14

Thank you for reviewing the DEIS and the determination of "no effect" on historic sites for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray, Hong, Bills & Associates, Inc.

PLN-167/95

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
HOUSING FINANCE AND DEVELOPMENT CORPORATION
677 QUEEN STREET, SUITE 300
HONOLULU, HAWAII 96813
FAX (808) 587-0600

ROY S. OSHIRO
EXECUTIVE DIRECTOR

IN REPLY REFER TO:
95:PPE/6301

October 26, 1995

PLANNING BRANCH
Nov 1 12 35 PM '95

TO: Mayor Jeremy Harris

FROM: Roy S. Oshiro
Executive Director

SUBJECT: Draft Environmental Impact Statement for Makaha 242 Reservoir No. 2

We have reviewed the subject draft EIS and have no comments to offer.

Thank you for the opportunity to comment.

c: OEQC
Barry Usagawa, BWS
David Bills, Gray, Hong, Bills & Assoc.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

JEREMY HARRIS Mayor

WALTER O. WATSON, JR., Chairman
MAURICE H. YAMASATO, Vice Chairman
KAZU HAYASHIDA
MELISSA Y.J. LUM
FORREST C. MURPHY
KENNETH E. SPRAGUE
BARBARA KIM STANTON

RAYMOND H. SATO
Manager and Chief Engineer

January 18, 1996

Mr. Roy S. Oshiro, Executive Director
Housing Finance and Development Corporation
Department of Budget and Finance
State of Hawaii
677 Queen Street, Suite 300
Honolulu, Hawaii 96813

Dear Mr. Oshiro:

Subject: Your Letter of October 26, 1995 to Mayor Jeremy Harris Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS), TMK: 8-4-02: 11 and Portion 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray, Hong, Bills & Associates, Inc.

HFDC

Pure Water . . . our greatest need – use it wisely

BENJAMIN J. CAYETANO
GOVERNOR

RECEIVED
BD OF WATER SUPPLY

Oct 30 12 55 PM '95

953321

cc: BWS
10/21

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
JERRY M. MATSUDA
GLENN M. OKIMOTO

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

MAYOR'S OFFICE
CITY & COUNTY
HONOLULU

'95 OCT 27 P2:20

IN REPLY REFER TO:
STP 8.7064

PE

October 23, 1995

The Honorable Jeremy Harris
Mayor
City and County of Honolulu
City Hall, 530 South King Street
Honolulu, Hawaii 96813

Dear Mayor Harris:

Subject: Draft Environmental Impact Statement (DEIS)
for Makaha 242 Reservoir No. 2
Waianae, Oahu
TMK: 8-4-02: 11 & por. 14

Thank you for your transmittal requesting our review of the subject DEIS.

The proposed construction is not anticipated to have an adverse impact on our State transportation facilities.

We appreciate the opportunity to provide comments.

Very truly yours,

Kazu Hayashida
Director of Transportation

c: Mr. Barry Usagawa, Honolulu Board of Water Supply
Mr. David Bills, Gray, Hong, Bills & Associates, Inc.
Office of Environmental Quality Control (OEQC)

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 18, 1996

Mr. Kazu Hayashida, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Hayashida:

Subject: Your Letter of October 23, 1995 to Mayor Jeremy Harris Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS), TMK: 8-4-02: 11 and Por. 14

Thank you for reviewing the DEIS for the subject project.

We concur with your determination that the proposed construction is not anticipated to have an adverse impact on State transportation facilities.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray, Hong, Bills & Associates, Inc.

PLN-163/95

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT, AND TOURISM

ENERGY DIVISION, 335 MERCHANT ST., RM. 110, HONOLULU, HAWAII 96813 PHONE: (808) 587-3800 FAX: (808) 587-3820

073 Harris

October 19, 1995

95 OCT 26 9 56 AM

The Honorable Jeremy Harris
Mayor
City & County of Honolulu
City Hall, 530 South King Street
Honolulu, Hawaii 96813

Dear Mayor Harris:

SUBJECT: Draft-Environmental Impact Statement for the Makaha 242 Reservoir No. 2

We wish to inform you that we have no comments regarding the Makaha 242 Reservoir No. 2.

Thank you for the opportunity to submit any comments or recommendations.

Sincerely,

Maurice H. Kaya
Energy Program Administrator

MHK:aw

c Barry Usagawa, Honolulu Board of Water Supply
David Bills, Gray, Hong, Bills & Associates, Inc.

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU

630 SOUTH BERETANIA STREET

HONOLULU, HAWAII 96843

PHONE (808) 527-6180

FAX (808) 533-2714

January 18, 1996

JEREMY HARRIS, Mayor

WALTER O. WATSON JR., Chairman
MAURICE H. YAMASATO, Vice Chairman
KAZU HAYASHIDA
MELISSA Y.J. LUM
FORREST C. MURPHY
KENNETH E. SPRAGUE
BARBARA KIM STANTON

RAYMOND H. SATO
Manager and Chief Engineer

Mr. Maurice H. Kaya, Energy Program Administrator
Energy Division
Department of Business, Economic
Development and Tourism
State of Hawaii
335 Merchant Street, Rm. 110
Honolulu, HI 96813

Dear Mr. Kaya:

Subject: Your Letter of October 19, 1995 to Mayor Jeremy Harris Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS) TMK: 8-4-02:11 and Por. 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray, Hong, Bills & Associates, Inc.

Pure Water . . . our greatest need – use it wisely

P

953407

PE
FONS
cc: 11/3

RECEIVED OF WATER...

'95 6 10 15 AM '95

MAYOR'S OFFICE
CITY & COUNTY
HONOLULU

STATE OF HAWAI'I '95 NOV -2 P12:37

OFFICE OF HAWAIIAN AFFAIRS
711 KAPIOLANI BOULEVARD, SUITE 500
HONOLULU, HAWAII 96813-5249
PHONE (808) 594-1888
FAX (808) 594-1865

October 31, 1995

Mayor Jeremy Harris
City & County of Honolulu
City Hall, 530 South King St.
Honolulu, HI 96813

Dear Mr. Mayor:

Thank you for the opportunity to review the Draft Environmental Impact Statement (DEIS) for the Makaha 242 Reservoir No. 2, Makaha, Island of Oahu.

We find the DEIS and supporting information sufficient and have no objections to the proposed construction of a water reservoir for the Makaha area. Please contact me or LNR Division Officer Linda Delaney (594-1938) or Luis Manrique, should you have any questions on this matter.

Sincerely yours,

Linda M. Colburn
Acting Administrator

LM:lm
cc BOT

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 18, 1996

Ms. Linda M. Colburn, Acting Administrator
Office of Hawaiian Affairs
State of Hawaii
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813-5249

Dear Ms. Colburn:

Subject: Your Letter of October 31, 1995 to Mayor Jeremy Harris Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS), TMK: 8-4-02:11 and Por. 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray, Hong, Bills & Associates, Inc.

PLR-195/95

DEPARTMENT OF THE NAVY
COMMANDER
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860-5020

IN REPLY REFER TO
11010
Ser N4(23)/ 6853
07 Dec 95

Mayor Jeremy Harris
City and County of Honolulu
City Hall
530 South King Street
Honolulu, HI 96813

Dear Mayor Harris:

Subj: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE MAKAHA 242 RESERVOIR NO. 2 OF SEPTEMBER 1995

Thank you for the opportunity to review the Draft Environmental Impact Statement for the Makaha 242 Reservoir No. 2 of September 1995.

The Navy has no comments to offer at this time and appreciates the opportunity to participate in your review process.

The Navy's point of contact is Mr. Stanford Yuen at 474-0439.

Sincerely,

Stanford B.C. Yuen, P.E.
By direction

Copy to:
Mr. Barry Usagawa
Honolulu Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, HI 96813

Mr. David Bills
Gray, Hong, Bills and Associates, Inc.
119 Merchant Street, Suite 607
Honolulu, HI 96813

95 DEC 13 PM 3:33

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 18, 1996

JEREMY HARRIS Mayor
WALTER O. WATSON JR. Chairman
MAURICE H. YAMASATO Vice Chairman
KAZU HAYASHIDA
MELISSA Y.J. LUAI
FORREST C. MURPHY
KENNETH E. SPRAGUE
BARBARA KIM STANTON

RAYMOND H. SATO
Manager and Chief Engineer

Mr. Stanford B. C. Yuen, P.E.
Department of the Navy
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860-5020

Dear Mr. Yuen:

Subject: Your Letter of December 7, 1995 to Mayor Jeremy Harris Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS), TMK: 8-4-02: 11 and Portion 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray, Hong, Bills & Associates, Inc.

PLN-1162/95

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

October 18, 1995

Planning and Operations Division

Mr. Gary Gill, Director
Office of Environmental Quality Control
State of Hawaii
220 South King Street, Fourth Floor
Honolulu, Hawaii 96813

Dear Mr. Gill:

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement for the Makaha 242 Reservoir No. 2 Project, Waianae, Oahu (TMK 8-4-2: 11 and 14). We do not have any additional comments to offer beyond those provided in our previous letter dated November 30, 1994.

Sincerely,

/original signed/
Paul Mizue, P.E.
Acting Chief, Planning
and Operations Division

Copies Furnished:

Mr. Barry Usagawa
Honolulu Board of Water Supply
City and County of Honolulu
530 South King Street
Honolulu, Hawaii 96813

Mr. David Bills
Gray, Hong, Bills and Associates
119 Merchant Street, Suite 607
Honolulu, Hawaii 96813

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 18, 1996

Mr. Paul Mizue, P.E., Acting Chief
Planning and Operations Division
Department of the Army
Fort Shafter, Hawaii 96858-5440

Dear Mr. Mizue:

Subject: Your Letter of October 18, 1995 to the Office of Environmental Quality Control Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS), TMK: 8-4-02:11 and Por. 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray, Hong, Bills & Associates, Inc.

PLN-164/95

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
WATER RESOURCES DIVSION
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawaii 96813

October 19, 1995

Oct 26 9 56 AM '95

Mayor Jeremy Harris
City and County of Honolulu
City Hall
530 South King St.
Honolulu, Hawaii 96813

Dear Mayor Harris:

Subject: Draft Environmental Impact Statement,
Makaha 242, Reservoir No. 2
Oahu, Waianae
TMK: 8-4-02: 11 & 8-4-02: Por. 14

The staff of the U.S. Geological Survey, Water Resources Division, Hawaii District, has reviewed the Draft Environmental Impact Statement, and we have no comments to offer at this time.

We are returning the report for your future use. Thank you for allowing us to review the DEIS.

Sincerely,

William Meyer
District Chief

cc: Office of Environmental Quality Control
Barry Usagawa, Honolulu Board of Water Supply
David Bills, Gray, Hong, Bills & Associates, Inc.

Enc.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 18, 1996

Mr. William Meyer, District Chief
U. S. Geological Survey
Department of the Interior
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawaii 96813

Dear Mr. Meyer:

Subject: Your Letter of October 19, 1995 to Mayor Jeremy Harris Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS), TMK: 8-4-02: 11 and Portion 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray, Hong, Bills & Associates, Inc.

PLN-1/96

University of Hawai'i at Mānoa

Environmental Center
A Unit of Water Resources Research Center
Crawford 317 • 2550 Campus Road • Honolulu, Hawai'i 96822
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

December 7, 1995
RE:0668

Mr. Barry Usagawa
City and County of Hawaii
Board of Water Supply
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Usagawa:

Draft Environmental Impact Statement
Makaha 242 Reservoir
Makaha, Oahu

The applicant proposes to construct a 2.0 million gallon (MG) reservoir, an influent/effluent main, and appurtenances. The proposed project is located directly adjacent to an existing Board of Water Supply (BWS) 0.5 MG reservoir on the hillside behind Makaha. The additional storage will be used to meet domestic and fire protection needs.

We have reviewed this Draft Environmental Impact Statement (EIS) with the assistance of Frank Peterson, Geology and Geophysics; Roger Babcock, Civil Engineering; and Paul Berkowitz of the Environmental Center.

Traffic Impacts

Section 5.4.1. which describes potential impacts to the roadway system, fails to consider the impact of removing excavation debris. If 30,000 cubic yards are to be excavated, debris removal will require many round trips, resulting in increased traffic and damage to the roadway due to the size and weight of the vehicles. Assuming a volume of 50 to 75 cubic yards per load, between 429 and 600 round trips will be required. In light of presently ongoing road construction and traffic delays along the Waianae coast, this document needs to provide more detail about how the proposed project will affect traffic patterns. As stipulated in Section 11-200-12, Hawaii Administrative Rules, these potential

traffic impacts need to be analyzed cumulatively, taking into consideration how the proposed action will interact with nearby projects.

Visual Impacts and Alternatives

Although the BWS is taking steps to mitigate visual impacts, the fact remains that a highly visible concrete structure will be placed at the base of a cliffed hillside. Simulated graphic representations provided in Appendix A are useful, but the quality of the graphics somewhat understates the visual impact. In addition, the simulation fails to represent the terracing of the excavated slope recommended by the engineers, nor does it include netting recommended by consulting geotechnical engineers to protect the tank from loosened boulders rolling downslope. Also, a view looking east from the vicinity of Makaha Beach Park and the Kepuhi Point community is omitted, despite the fact that such a perspective would be arguably among the most visually disrupted by the proposed construction. Given the history of previous BWS reservoirs (such as the recent one in lower St. Louis Heights), we have no doubt but that the proposed Makaha reservoir will be visually obtrusive. Location of the site at the apex of the ridgeline creates perhaps the most visually disruptive installation with regard to topography that could be construed.

Alternative locations east of the existing reservoir reportedly were immediately eliminated due to evidence of boulder fill and actively moving slopes. However, the depth to competent basaltic underlayers in these areas apparently was not investigated, even though a moderately to highly plastic colluvial overburden containing numerous cobbles and boulders was described even in the vicinity of the existing tank. The ridgeline offers empirical physiographic evidence of competent basalt in close proximity to the surface; however, other locations may exist which might prove less visually intrusive and which also might require less excavation. The possibility that suitable foundation underlayers do exist in nearby locations would seem to justify the relatively minor costs of specific investigations to evaluate the thickness of the overlying mantle.

As another alternative, it appears by examining the site section in Figure 3 that a much smaller cut could be made if the tank were located at a higher elevation such as 265 feet for the foundation. In addition to reducing the visual impacts of the cut, this alternative would greatly reduce the amount of rock and soil debris that would need to be transported off-site. Were any alternative sites at higher elevations considered?

Conclusion

In terms of technical details, the proposed project seems relatively benign. However, in the areas of traffic impacts and aesthetics, the proposed action has the potential to have significant impacts. Before continuing further with the project, the applicant needs to more adequately address these two concerns.

Thank you for the opportunity to review this draft EIS.

Sincerely,

John T. Harrison
Environmental Coordinator

cc: OEQC
Gray, Hong, Bills & Assoc.
Jeremy Harris
Roger Fujioka
Frank Peterson
Roger Babcock
Paul Berkowitz

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 16, 1996

Mr. John T. Harrison
Environmental Coordinator
Environmental Center
University of Hawaii - Manoa
2550 Campus Road, Crawford 317A
Honolulu, Hawaii 96822

Dear Mr. Harrison:

Subject: Your Letter of December 7, 1995 Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS) TMK: 8-4-02: 11 and Portion 14

Thank you for reviewing the DEIS for the subject project. We provide the following responses to your comments:

1. Traffic Impacts

The contractor will have the responsibility to remove all excavated material from the site and to locate the most efficient spot to transport excavated material which may be to another job site where imported material is required. This reduces the cost of the project for the contractor. Should there be an available site within Makaha Valley, the contractor will obtain a stockpile permit or utilize the grading permit of another project to allow installation of the excavated material. Under this scenario, there would be no traffic impact on Farrington Highway.

However, should the use of Farrington Highway be necessary, the additional amount of traffic caused by trucks will not be significant. Excavation work will require approximately 60 to 90 days. Assuming the work takes 60 days, approximately seven to 10 vehicle trips will generate 14 to 20 total trips per day. By comparison, the average daily traffic on Farrington Highway through the Waianae area is in excess of 33,000 vehicle trips per day. It is believed that the additional amount of traffic caused by trucks resulting from the subject project will not be significant in terms of the cumulative effect on Farrington Highway.

2. Visual Impacts and Alternatives

We understand your concerns regarding the visual impact of the proposed project. Computer graphics, utilizing a grading plan input feature, have provided realistic views of the finished product from three different angles. Being that the location of the excavation will be at the base of the northerly ridge surrounding Makaha Valley, it was determined that the excavation would not be visible from the view plane of Makaha Beach Park.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

Alternative sites east of the existing reservoir, which would require less excavation, are not as stable and would require use of thick concrete pedestals to provide a firm foundation down to basalt. There is also significant visual evidence of hillside creep in this area.

Alternative sites at higher elevations are not possible because hydraulic conditions require a matching spillway elevation of 242 feet to allow compatibility with existing 242 feet reservoirs within the Makaha-Waianae low service water system. A spillway of higher elevation would create a different system head and lock out lower elevation reservoirs, thus, preventing them from being utilized. Therefore, an elevation other than 242 feet has not been considered.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray, Hong, Bills & Associates, Inc.

Pure Water . . . man's greatest need – use it wisely

Hawaiian Electric Company, Inc. • PO Box 2750 • Honolulu, HI 96840-0001

BD OF WATER SUPPLY
Nov 21 12 41 PM '95

953381

CITY & COUNTY HONOLULU

'95 NOV 17 P1:28

William A. Bonnet
Manager
Environmental Department

November 14, 1995

The Honorable Jeremy Harris
Mayor, City & County of Honolulu
City Hall, 530 South King Street
Honolulu, Hawaii 96813

Dear Mayor Harris:

Subject: Draft Environmental Impact Statement
Makaha 242 Reservoir No. 2

Thank you for the opportunity to comment on your DEIS report for the Makaha reservoir project, as proposed by the Board of Water Supply of the City & County of Honolulu. We have reviewed the subject document and have no comments at this time on the proposed project. HECO shall reserve further comments pertaining to the protection of existing powerlines bordering the project area until construction plans are finalized. Again, thank you for the opportunity to comment on this report.

Sincerely,

Dan T. Fukuda
for WBB

An HEI Company

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714

January 18, 1996

Mr. William A. Bonnet, Manager
Environmental Department
Hawaiian Electric Company, Inc.
P. O. Box 2750
Honolulu, Hawaii 96840-0001

Dear Mr. Bonnet:

Subject: Your Letter of November 14, 1995 to Mayor Jeremy Harris Regarding the Makaha 242 Reservoir No. 2 Draft Environmental Impact Statement (DEIS), TMK: 8-4-02: 11 and Portion 14

Thank you for reviewing the DEIS for the subject project.

You may view the Final EIS at the state main library or any regional library.

If you have any questions, please call Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Gray, Hong, Bills & Associates, Inc.

Pure Water . . . our greatest need – use it wisely

THE BOARD OF DIRECTORS
MAKAHA VALLEY PLANTATION
ASSOCIATION OF APARTMENT OWNERS
84-786 ALA MAHIKU DR., WAI'ANAE, HI. 96792

NOVEMBER 30, 1995

Mayor Jeremy Harris
City & County of Honolulu
City Hall, 530 South King Street
Honolulu, Hawaii 96813

'95 DEC -5 A11:56

Subject: Makaha 242 Reservoir No. 2.

Dear Mayor Harris,

The Board of Directors of the Association of Apartment Owners for the Makaha Valley Plantation have formulated the following opinion on the proposed 2.0-MG Reservoir for the Makaha Valley area.

The Board agrees that an expansion of the current water reserve capacity for the valley is needed to cover the current capacity deficit that the Board of Water Supply is experiencing in the 242 Reservoir distribution area. We also agree that the new reservoir should be located within close proximity to the existing reservoir to limit the impact within the valley. However, the currently proposed site is unacceptable for the following reasons;

1. The permanent scaring of the hillside should never be acceptable especially in Hawaii. People have done too much scaring of Hawaii already in other locations. We should not be destroying what took thousands of years for nature to build. Hawaii is known for its natural beauty so why do we continue to destroy it? Removing 30,000 cubic feet of rock and leaving behind a scar 200 feet wide and 120 feet high above ground level is not acceptable.

2. The amount of excavating would be enormous and would cause a lot of dust in the air. Using water to keep the dust down is a waste of our precious water that we are told to conserve. Although not recommended, explosives may be required to assist in the excavation that may cause foundation problems for the nearby Makaha Towers and Makaha Valley Plantation.

3. The deficit calculations are based on consumptions from July 1992 to June 1993. Therefore, the current deficit should be much higher than the stated 1.5-MG. By the time proposed construction is completed in the year 2001, the stated deficit will be eight years old. Our capacity will still be insufficient especially if proposed developments are approved.

In closing, we request that the City & County of Honolulu seriously reconsider the current site for one that will be a lot less destructive to our environment and to replan the project so that it will not be inadequate to meet the demands of the future.

Sincerely,

CECIL BINDEL.
President, Board of Directors, Makaha Valley Plantation

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

December 28, 1995

Mr. Cecil Bindel, President
Board of Directors
Makaha Valley Plantation
Association of Apartment Owners
84-786 Ala Mahiku Drive
Waianae, Hawaii 96792

Dear Mr. Bindel:

I appreciate the time you have taken to comment on the proposed 2.0 Million Gallon (MG) Makaha 242 Reservoir.

I understand your concerns regarding the visual impacts to the existing hillside. However, after assessing the area's maximum day demand and fire protection requirements, a determination was made that the proposed reservoir is needed. Therefore, the Board of Water Supply (BWS) undertook a site feasibility study and soil investigation of the Makaha Valley area, and identified the best site for a 2.0 MG Reservoir to be immediately adjacent to the existing reservoir because of the sound basaltic foundation.

The visual appearance of the project will be minimized by blending the landscaping with the surrounding hillside. The construction of the new reservoir directly behind an existing reservoir will also obstruct visibility of the new reservoir and minimize detrimental effects of its appearance. As an additional mitigation measure, the final soils report has recommended reducing the extent of excavation because of more stable soils. This will allow the height of the cut slope to decrease from approximately 120 feet to 105 feet.

The amount of water used for dust control will be minimal and is not a wasteful use of water when considering that dust control is necessary and has a beneficial purpose. Explosives will not be used during excavation to protect the adjacent 0.5 MG reservoir and the Makaha water shaft facility under the parcel. The Makaha Towers and Makaha Valley Plantation are further away from the reservoir, and therefore, will not be affected.

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU

COPY

The water storage deficit of the Makaha 242 water system is 1.7 million gallons per day, which is based on current water consumption data from July 1994 to June 1995. The City Planning Department's forecast indicates that the 2010 population projection of the Makaha area does not indicate a significant increase. Therefore, the proposed reservoir size is adequate to address Makaha's storage deficit and provide additional capacity for future growth well past 2010. The proposed reservoir will meet the existing and future needs of the Makaha area with a minimal impact to the environment.

Your comments will be included in the Final Environmental Impact Statement for the project.

Thank you for communicating your concerns to me. Your thoughts are important because citizen concerns are my number one priority.

Sincerely,

JEREMY HARRIS
Mayor

JH:rk

cc: Gray, Hong, Bills and Associates

APPENDICES

APPENDIX A - VISUAL IMPACT ANALYSIS

APPENDIX B - FINAL SUBSURFACE INVESTIGATION

APPENDIX C - BOTANICAL SURVEY

APPENDIX D - ARCHAEOLOGICAL INVESTIGATION

APPENDIX A

VISUAL IMPACT ANALYSIS

APPENDIX A
VISUAL IMPACT ANALYSIS
FOR THE
MAKAHA 242 RESERVOIR NO. 2

I. INTRODUCTION

One of the primary potential impacts of the Makaha 242 Reservoir No. 2 project is considered to be the visual impact for the long term after construction is completed. The reasons for this consideration are based on the size of the structure and the required excavation into the slopes of the ridge at the reservoir site.

II. DESCRIPTION OF EXHIBITS

In an attempt to provide a realistic visual presentation of the completed project, computer graphics have been utilized to create a likeness of the reservoir site after construction. The View Orientation Exhibit contained in this appendix identifies three view planes oriented toward the reservoir site. For each view, a visual representation of the site, before and after construction, is provided. In all three views, the "existing conditions" is based on a three-dimensional presentation of existing contours generated based on ground topographic survey combined with aerial topographic survey. The "future" conditions have been generated based on an engineered grading plan modifying the ground survey to accommodate the 2.0-MG reservoir. (It should be understood that the foreground of all views appears distorted since the contours in non-critical view areas were not generated in three-dimension.)

Colorization of all views has been created based on photographs of the existing hillside. A darker "hue" has been assigned to affected areas in the ridge, resulting from excavations (in finished views) and the color of the existing tank has been matted (for "future" views).

III. ALTERNATIVES/ADDITIONAL MITIGATION

The following alternatives will provide additional mitigation to visual impacts of the finished Makaha 242 Reservoir No. 2. Each alternative has positive and negative aspects. A discussion of each is as follows:

A. MATCH RESERVOIR PAINT TO RIDGE LINE -

Positive Aspects: The use of a darker (brown) cover can provide a better blend to match the existing hillside.

Negative Aspects: Darker colors absorb heat and can generate higher temperatures in the potable water supply.

B. LANDSCAPING

Positive Aspects: The use of high aspect vegetation (i.e., norfolk pine, pannox) could provide screening.

Negative Aspects: The existing hillside is characterized by dark rock outcropping and scrub vegetation. The use of high aspect plantings may be visually out of character for the environment.

C. BURYING THE RESERVOIR

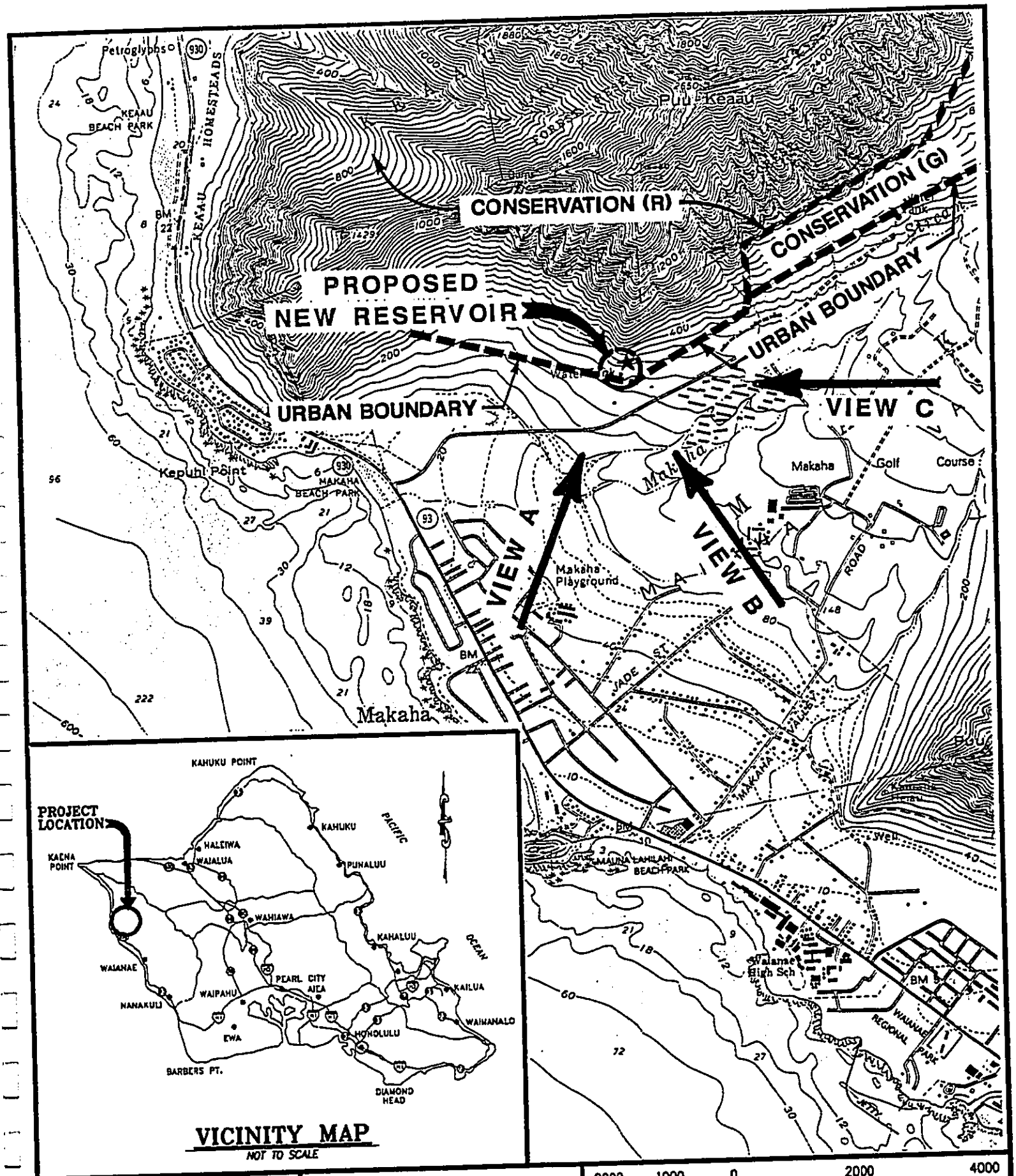
This alternative was considered; however, a larger amount of excavation (scarring the hillside) would be required and the reservoir would be subject to sanitary contamination from infiltration which could not be readily controlled.

IV. CONCLUSIONS AND FINDINGS

The representations shown through the visual impact analysis is that the "future" views will not create a significant and/or negative impact. However, it is also recognized that this conclusion is subjective in nature and the public review process will provide necessary confirmation or disagreement with the document's conclusion. The recommendation resulting from this analysis is as follows:

1. Construct a 2.0-MG reservoir based on the excavation shown in the visual analysis (the visual analysis conforms to Figures 2 and 3 at the beginning of this report).

2. Use a tank color that matches the color of the rock resulting from excavation.

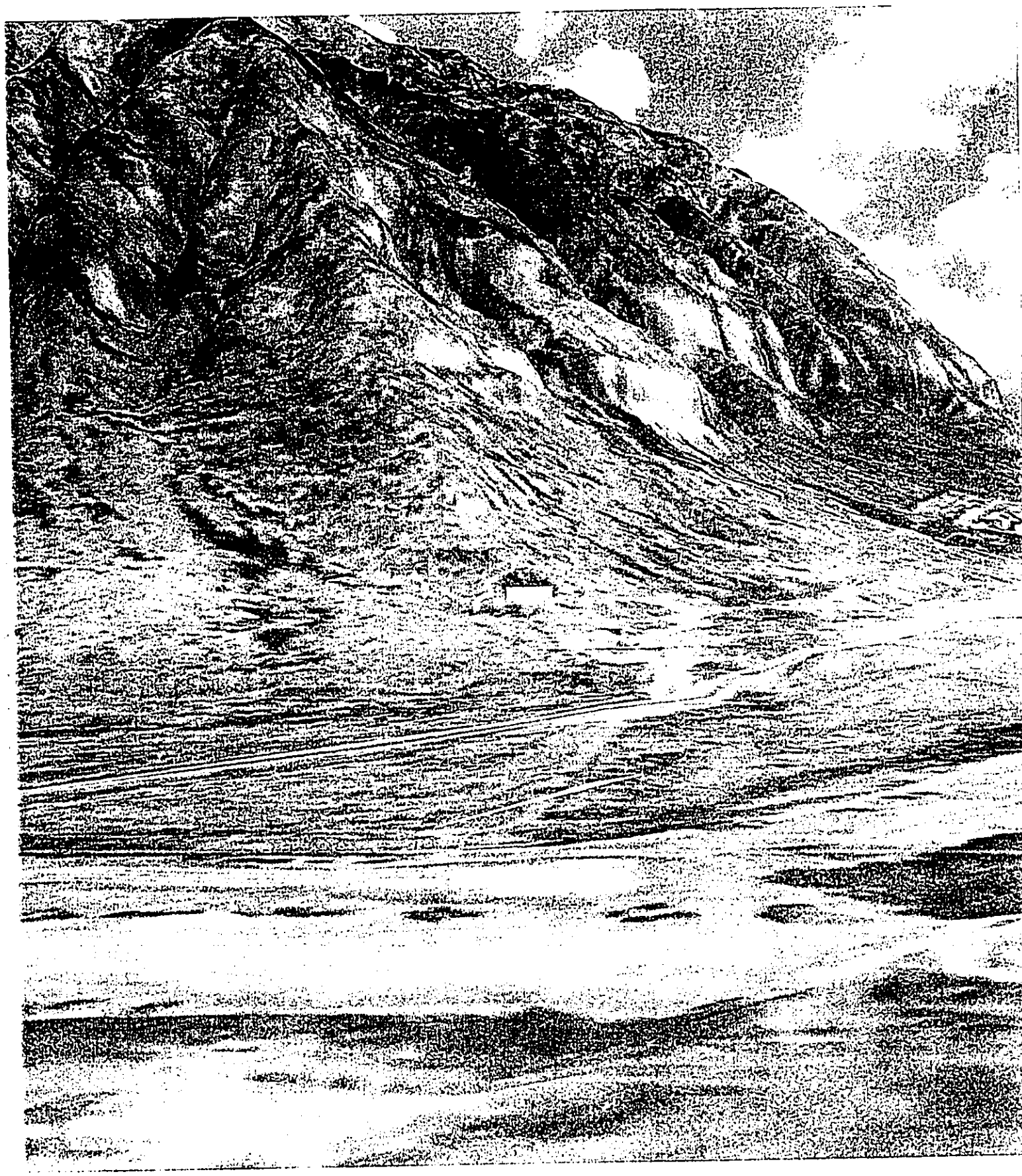


PREPARED BY:
GRAY, HONG, BILLS, & ASSOC.
CONSULTING ENGINEERS
119 MERCHANT ST. STE. 607
HONOLULU, HAWAII 96815
MAY 26, 1994

VIEW ORIENTATION MAP

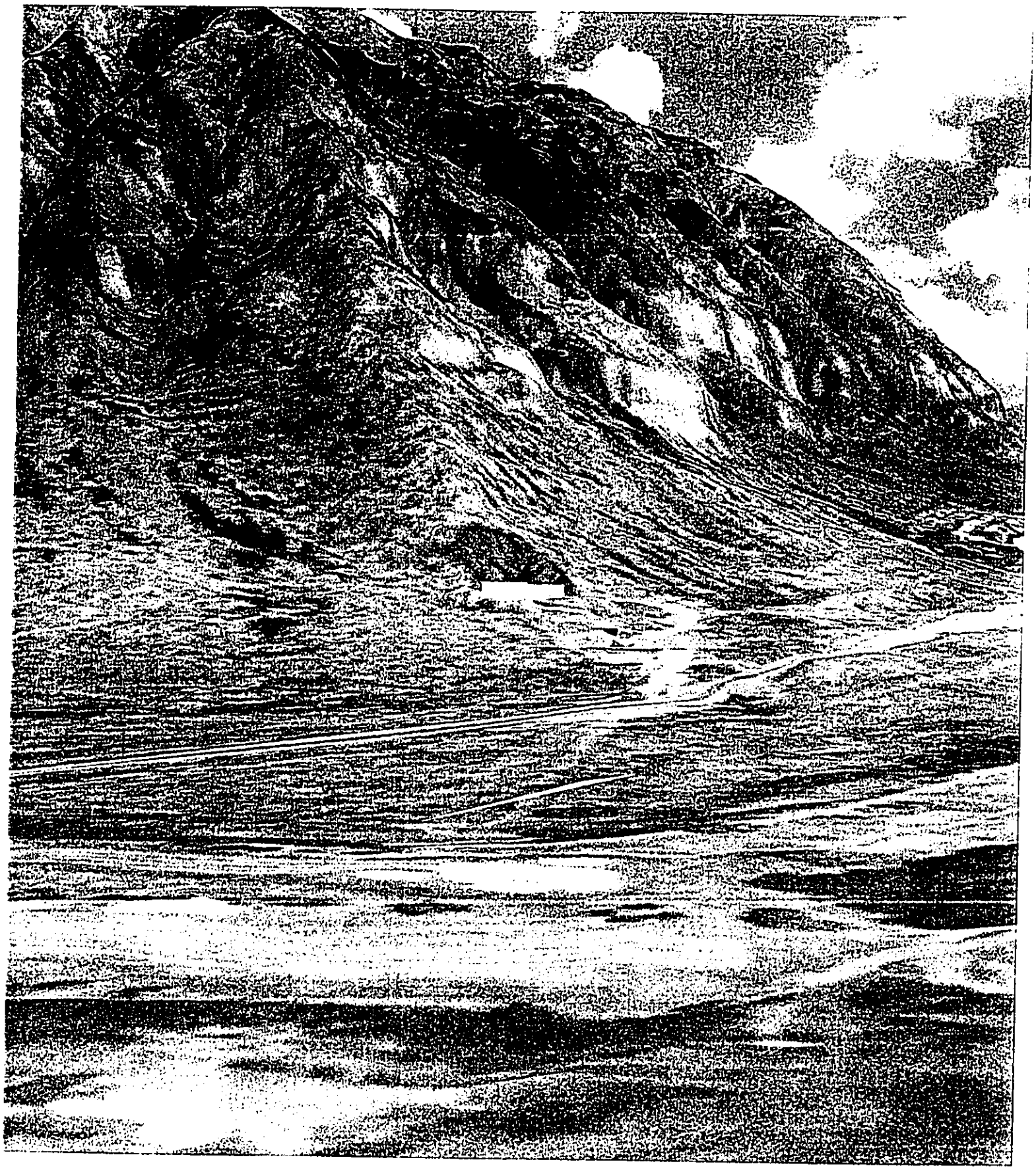
MAKAHA 242 RESERVOIR

JOB NO. 2594



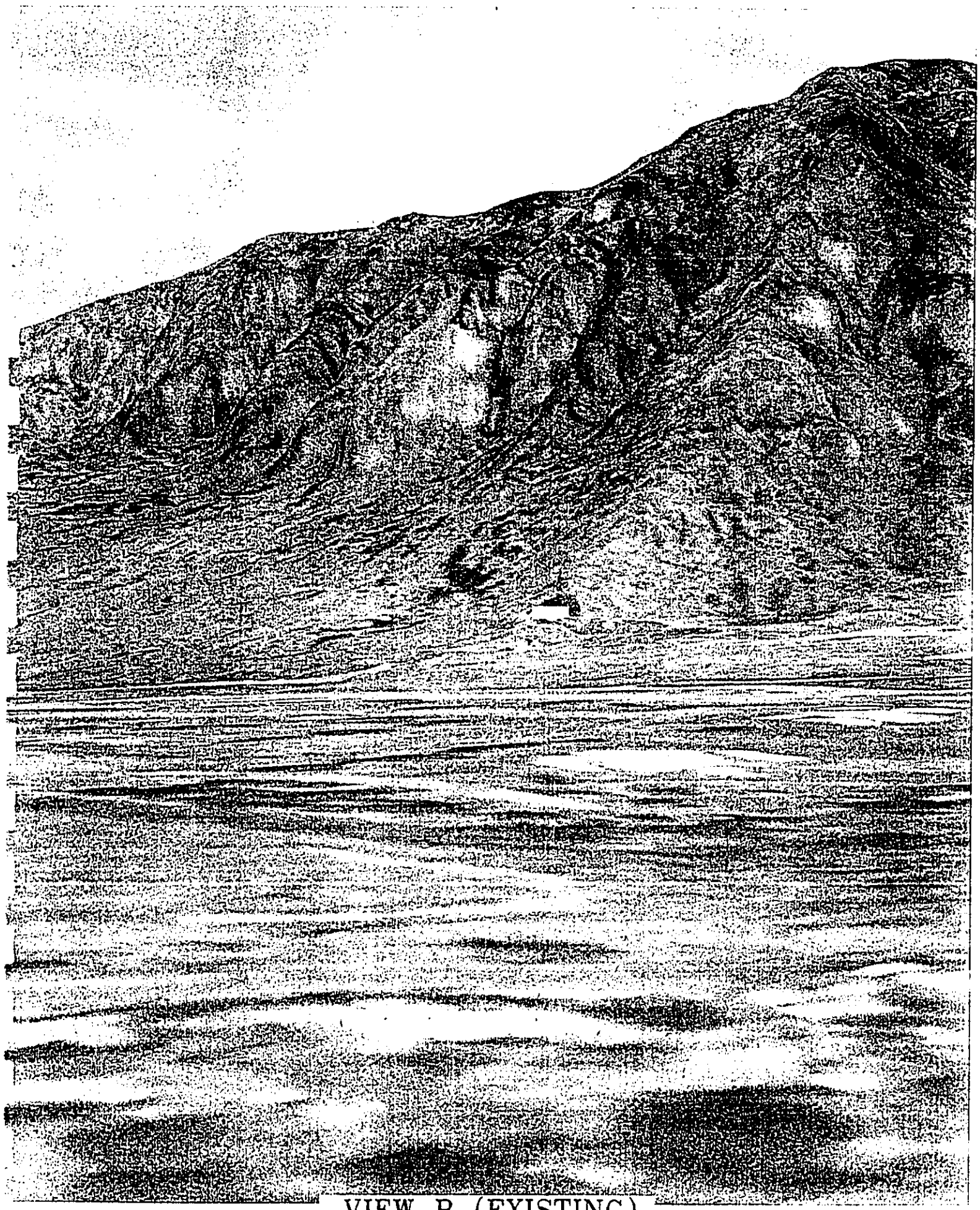
VIEW A (EXISTING)

0.5 MG RESERVOIR



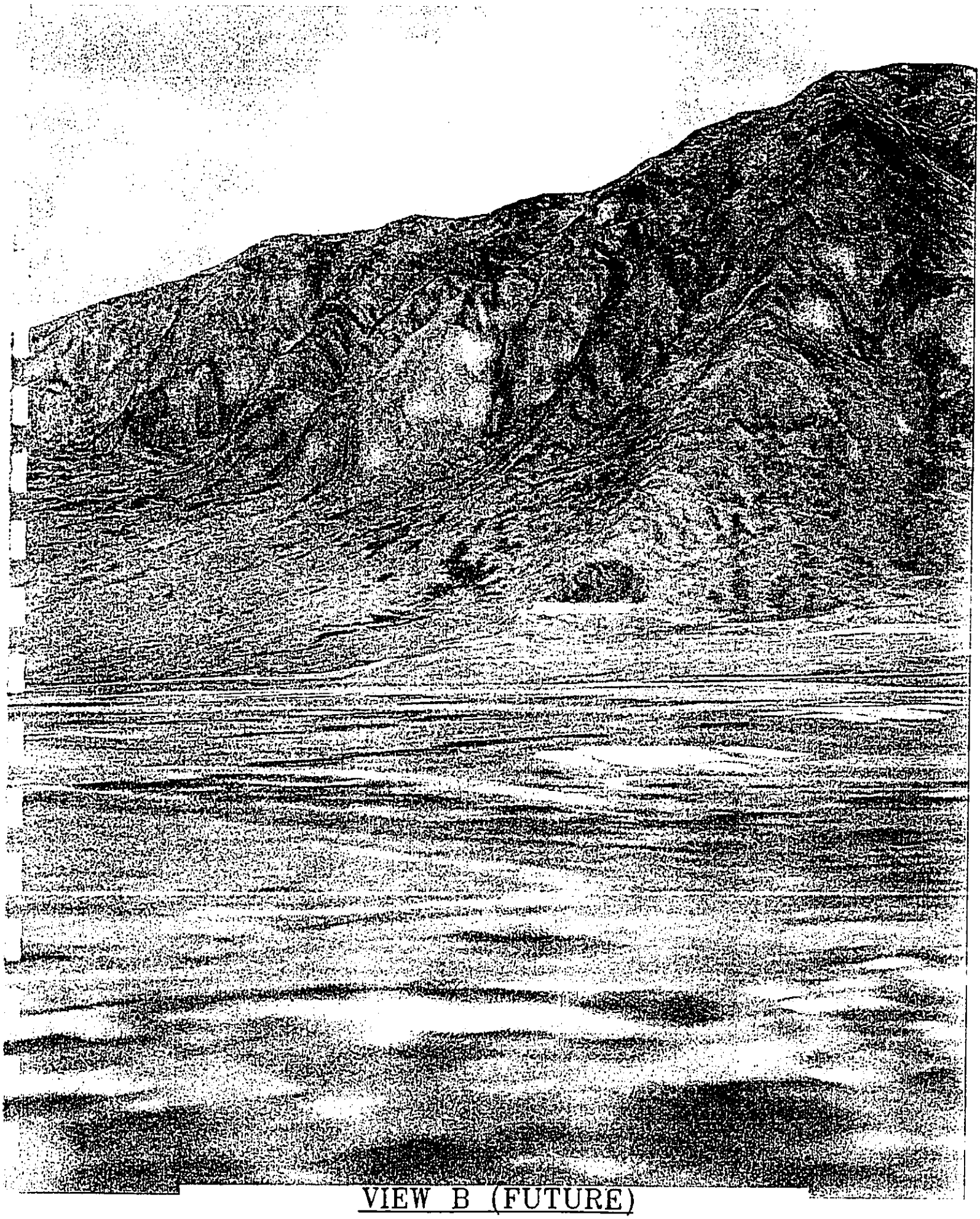
VIEW A (FUTURE)

0.5 MG RESERVOIR & 2.0 MG RESERVOIR



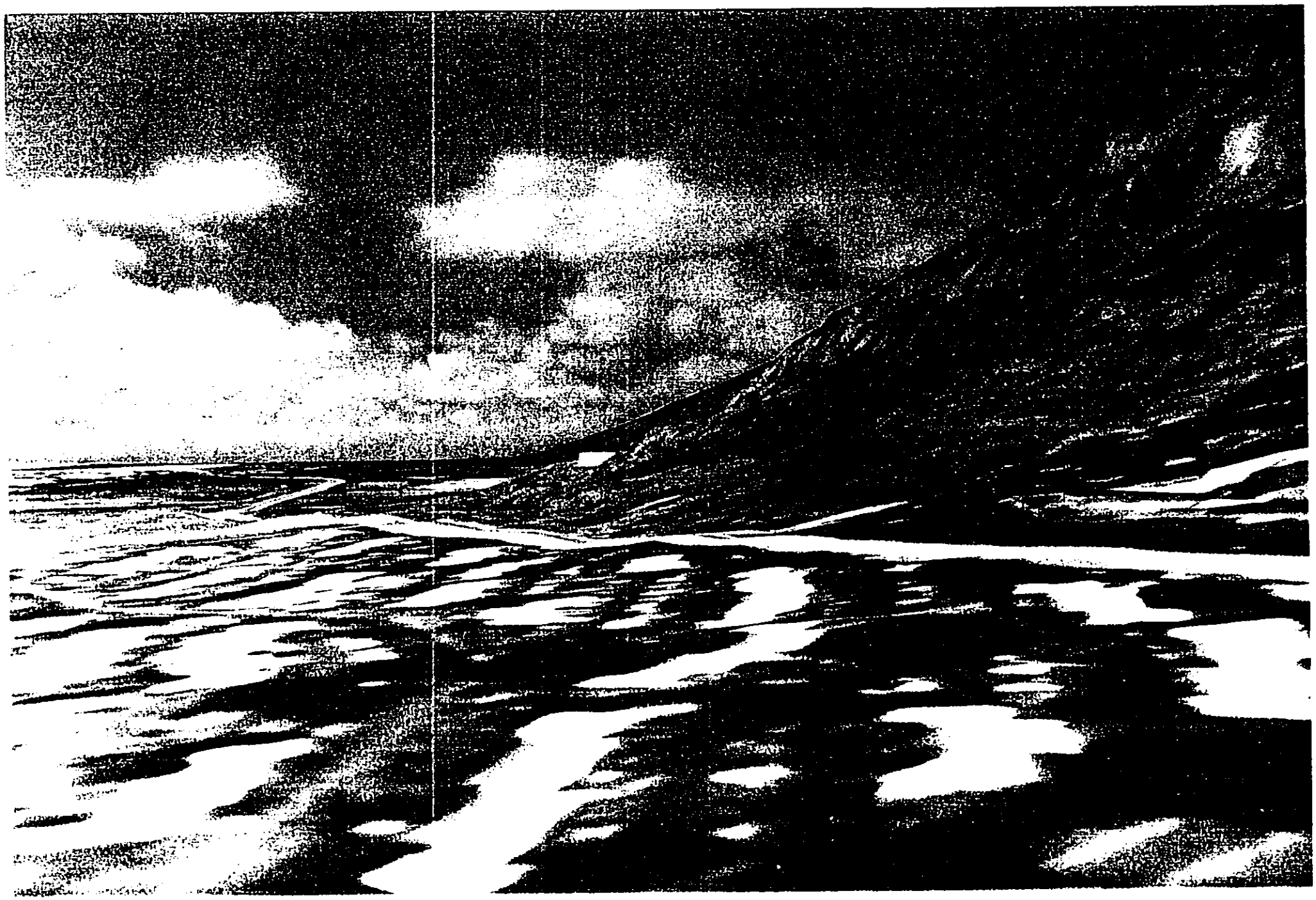
VIEW B (EXISTING)

0.5 MG RESERVOIR



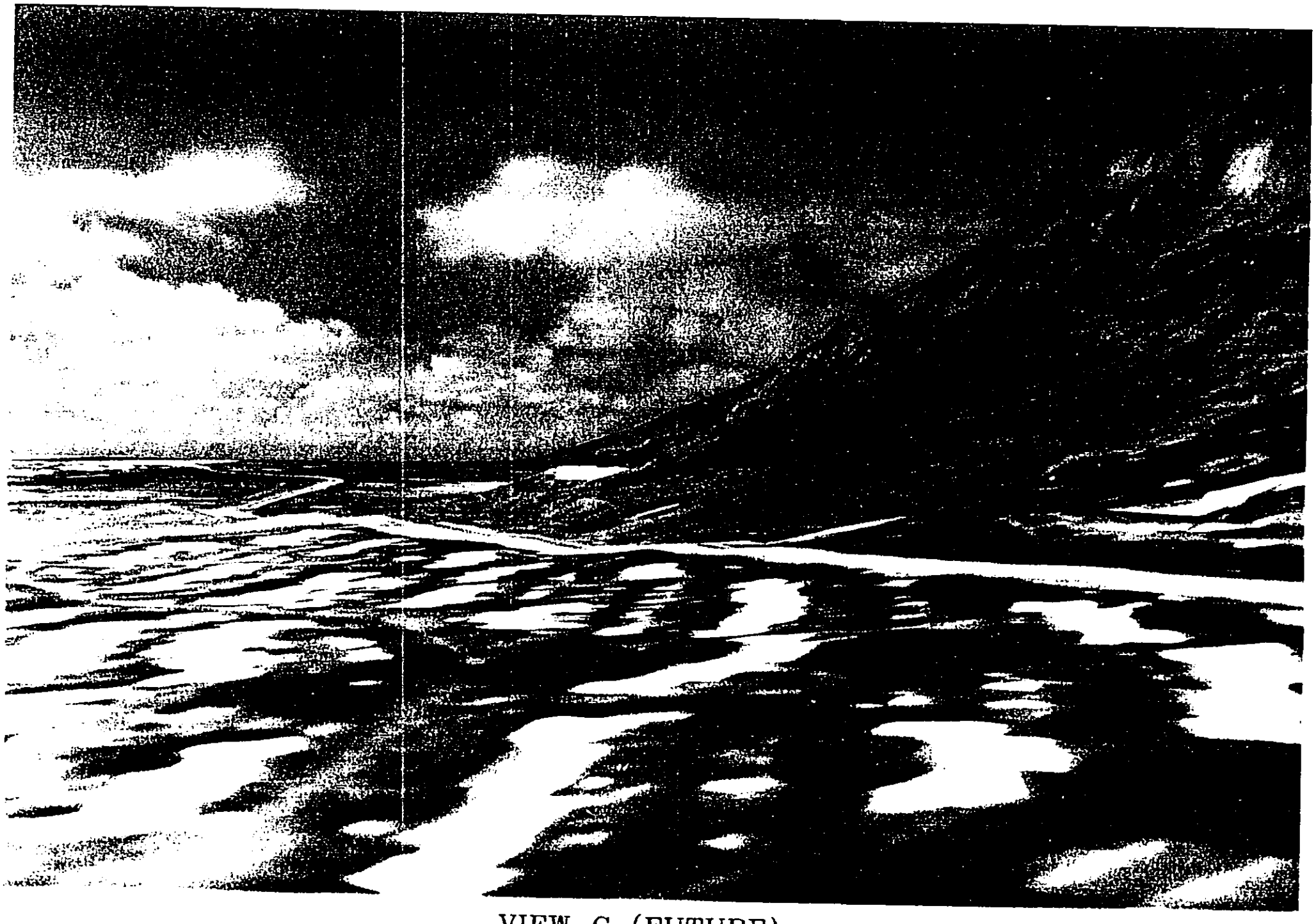
VIEW B (FUTURE)

0.5 MG RESERVOIR & 2.0 MG RESERVOIR



VIEW C (EXISTING)

0.5 MG RESERVOIR



VIEW C (FUTURE)

0.5 MG RESERVOIR & 2.0 MG RESERVOIR

APPENDIX B

FINAL SUBSURFACE INVESTIGATION

FEWELL
GEOTECHNICAL
ENGINEERING, LTD.

Oahu Office
96-1416 Waihona Place
Pearl City, Hawaii 96782-1973
(808) 455-6569
FAX (808) 456-7062

Maui Office
251 Lalo Place, Unit G-2
Kahului, Maui 96732
(808) 873-0110
FAX (808) 873-0906

Kauai Office
4180 Rice Street, #106B
Lihue, Kauai 96766
(808) 245-8982
FAX (808) 245-8982

File 1345.01
December 8, 1995

Gray, Hong, Bills & Associates, Inc.
119 Merchant Street, Suite 607
Honolulu, Hawaii 96813

Attention: Mr. David Bills

Subject: **Subsurface Investigation Report**
Proposed BWS Makaha "242" Reservoir No. 2
Makaha, Oahu, Hawaii

We have completed a subsurface investigation for the proposed BWS Makaha "242" Reservoir No. 2 Site in Makaha, Oahu, Hawaii. This report summarizes our findings and conclusions and presents geotechnical recommendations for the design and construction of the proposed reservoir. This work was completed in general accordance with our April 21, 1993 Proposal, as amended by our February 3, 1994 memorandum, and your February 4, 1994 verbal authorization to proceed.

In February, 1994, a preliminary subsurface investigation was completed to assist in determining the feasibility of constructing the new reservoir at the proposed site. The scope of the preliminary investigation included excavating three test pits around the downslope perimeter of the reservoir to determine whether rock would be encountered above or near the planned finish grade of the tank at the proposed tank site. The preliminary study indicated that basalt was generally present within about 4 feet of the existing ground surface and should be encountered above the finish pad level throughout the tank pad.

Once the final selection of the tank site was made, this final investigation was undertaken to develop geotechnical recommendations for the design and construction of the tank and the related site grading. The recommendations of this report, which incorporates the findings of the February 28, 1994 preliminary report, supersede the recommendations of the 1994 report in their entirety.

Project Description - The preliminary project information indicates that the proposed reservoir will be constructed immediately northeast of the existing 0.5 Million Gallon (M.G.) BWS reservoir. The general project area is shown on the attached Project Location Map, Figure 1.

The overall site topography slopes down steeply toward the south at an average slope of about 2 Horizontal to 1 Vertical (2H:1V). A steep, 30-foot high cut slope, estimated between 0.25H:1V and 0.5H:1V, drops down to the existing 0.5 M.G reservoir (a 75-foot diameter concrete-walled tank), in the southwestern corner of the new reservoir site. In addition to the existing tank, we understand that a tunnel, less than 8 feet in diameter, runs beneath the site at around Elev. 140, or about 80 feet below the existing tank pad.

We understand that the construction will include either a 2.0 M.G. or a 3.0 M.G. reservoir along with the necessary piping. The 2.0 M.G. reservoir will be a 140-foot diameter by 20-foot high concrete tank with a bottom of tank elevation at Elev. 220. The 3.0 M.G. reservoir will be a 165-foot diameter by 20-foot high concrete tank with the same bottom of tank elevation. Although no tank loading information is currently available, we have assumed maximum 100 kip column loads, maximum wall loads of 5 kips per foot and a maximum floor load of about 1,500 pounds per square foot (p.s.f.).

Extensive site grading, with cuts of up to 90 feet in depth, will be required to attain the currently planned finish pad level for either the 2.0 or 3.0 M.G. reservoir. Due to the site's sloping topography, the proposed excavations will result in cut slopes of up to 120 feet in height. One-Quarter Horizontal to One Vertical (0.25H:1V) cut slopes, with 8-foot wide horizontal benches at 25-foot vertical intervals, are currently proposed to accommodate the grade differences.

General Subsurface Conditions - One test boring was drilled between October 23 and November 1, 1995 at the approximate location shown on the attached Site, Boring, and Test Pit Location Plan, Figure 2. The boring was drilled near the top of the planned cut slope using a Simco SK2400 skid-mounted drilling rig which was transported to the boring location by helicopter. The boring was extended to a depth of 94 feet below the existing ground surface using HQ coring equipment. The materials encountered in the boring are shown in the Boring Log, Figure 3.

The approximate locations of the three test pits which were excavated on February 11, 1994 during the preliminary investigation, are also shown on Figure 2. The test pits were excavated to depths of up to 6 feet below the existing ground surface using a Komatsu EL200B trackhoe. The Test Pit Logs are included as Figures 4 through 6. A Boring and Test Pit Log Legend is included as Figure 7.

The boring and test pits indicate that the proposed tank site is overlain by a relatively thin mantle of surface colluvium (gravity deposited material) over intact basalt which should be encountered above the finish pad grade throughout the tank site.

The test pits indicate that the lower, southern perimeter of the tank site is overlain by between 1 to 4 feet of surface colluvium (gravity deposited soils) over intact basalt. The surface colluvium consisted of moderately to highly plastic clayey silts which contained numerous cobbles and boulders. Except for thin seams of highly weathered basalt which were encountered at the rock surface in two of the test pits, the basalt encountered in the test pits was generally hard and appeared fresh to slightly weathered. The trackhoe used for the test pits excavations had considerable difficulty removing the fresh to slightly weathered basalt and the test pits were terminated after the hard basalt was encountered.

The boring encountered 3.5 feet of surface colluvium over intact basalt which extended to the bottom of the boring at a depth of 94 feet below the existing ground surface. The basalt encountered in the boring was generally hard and slightly weathered, with occasional seams exhibiting moderate weathering. The core runs within the basalt encountered in the test boring generally had high recoveries of 95 to 100 percent and high Rock Quality Designations (RQDs) of between 50 and 90 percent, indicating that the rock is only occasionally broken with few natural fractures.

Groundwater was not encountered in either the boring or the test pits during this investigation.

Discussion - The subsurface investigation indicates that the proposed Reservoir No. 2 site is underlain by a thin mantle of surface colluvium over competent basalt which should provide excellent support for the proposed reservoir. The test boring indicates that the basalt extends to the bottom of the large cut planned at the rear of the tank site. The depth to, and inclination of, the basalt encountered in the test pits indicates that the rock will be encountered above the currently proposed bottom of tank level at Elev. 220. Overexcavation, and subsequent replacement, of weak colluvial soil and boulder deposits over the basalt is not anticipated.

Based on the invert level of the existing tunnel, we believe that it is at a sufficient depth beneath the planned finish grade of the new reservoir that the tunnel should have no adverse effects on the design of the new reservoir. However, the new reservoir construction can affect the structural integrity of the tunnel depending on the type of rock excavation methods used in the construction. Should the function of the tunnel be of a critical nature, its condition should be reviewed by the Project Engineers prior to construction so that any adverse effects of the new construction can be minimized.

The main concerns associated with the proposed construction are the anticipated difficulties in excavating the rock and the high, cut slope planned north of the new reservoir. The rock encountered in both the boring and the test pits, and exposed within the cut slope for the existing reservoir, is generally hard and slightly weathered. The use of heavy rock excavating equipment, such as large ripper-equipped dozers or track-mounted hoerams, will be necessary to facilitate the rock removal.

Although blasting would greatly facilitate the rock removal, the existing water tank could potentially be damaged by the blasting operations unless the blasting is tightly controlled. The vibrations induced by the blasting could also damage both the existing reservoir and the tunnel beneath the site, and can result in a weakened and fractured finish slope face which could be prone to raveling and sloughing.

To minimize potential damages to the existing structures and reduce the potential for future raveling of the cut rock face, we believe that blasting should not be allowed unless the contractor can demonstrate that his blasting program would not result in damage to the existing structures and will result in a relatively clean slope face. If blasting is considered, it should be controlled blasting, including either pre-splitting and line blasting techniques to provide a neat, intact slope face, and would need an experienced blasting contractor to minimize potential damages.

An alternative to the use of standard manual rock excavation or blasting would be to use chemical expanders to break up the rock. Chemical expanders would minimize potential vibration and flying rock damage as well as construction noise during the rock excavation. Although we understand that the use of chemical expanders is considerably more expensive than blasting, the costs associated with their use may be more economical than excavating the rock using only manual excavation procedures.

Our analysis indicates that the proposed 0.25H:1V cut slope should possess adequate overall stability against slope failure, however, recent rockfall hazard mitigation studies performed by the Federal Highways Administration (FHWA) indicate that the currently planned slope steepness would require a rockfall catchment ditch measuring at least 25 feet wide by 6 feet deep to reduce the potential for loosened rock fragments from rolling down the slope and possibly damaging the new reservoir. To reduce the size of the required

rockfall catchment ditch, we recommend that the currently planned 0.25H:1V slope be steepened to 0.125H:1V and that the horizontal benches originally planned within the slope face be deleted. For the steeper 0.125H:1V cut slope without benches, the FHWA Rockfall Hazard Mitigation Manual indicates that the rockfall catchment ditch need only measure 20 feet wide by 4 feet deep. Considering the additional excavation required to provide the rockfall catchment ditch at the toe of the cut, the steeper 0.125H:1V without benches should result in a smaller amount of overall rock excavation than would be required based under the currently proposed grading scheme.

The 0.125H:1V slope without benches should exhibit adequate overall slope stability while reducing the amount of rock excavation as well as potential hazards due to falling rocks. Localized weak zones or layers containing broken basalt which may be encountered should be grouted or gunited to minimize raveling.

In addition to the rockfall catchment ditch at the toe of the cut slope, a retaining wall or a permanent boulder barrier such as a heavy gauge chainlink fence reinforced with steel cables should be provided at the top of the cut to contain any surface boulders which could roll down the existing slopes above the cut. A temporary boulder barrier will also likely be required during construction to provide adequate worker safeguards. The surface colluvial soils at the top of the proposed slope will also need to be removed for a horizontal distance of at least 5 feet from the top of the slope and sloped back to minimize any sloughing off of the surface soils.

Although not encountered within the test boring of this investigation, voids or cavities often exist in basalt formations similar to those encountered at the site. Foundation probes should be drilled after the completion of the mass excavation, to investigate the presence of voids beneath the new tank. Any voids detected should be filled with grout.

Recommendations

Site Preparation - Prior to the start of actual grading operations, the site should be cleared and grubbed in accordance with Section 10 of the Standard Specifications for Public Works Construction of the City and County of Honolulu (Standard Specifications). All organics, rubbish and other deleterious materials should be wasted off-site.

Grading - Once the site has been properly prepared, site grading may commence to generate the finish design grades. The excavation for the tank pad should extend a sufficient depth below the finish grades to allow placement of at least 6 inches of Select Borrow beneath the tank slab and the perimeter road.

The borings and test pits indicate that basalt in various stages of weathering will be encountered within depths of 1 to 5 feet below the original ground surface and will likely extend to the bottom of the planned excavation. The extensive use of rock excavating equipment, such as hoerams or large ripper-equipped dozers, should be anticipated to facilitate the removal of the hard, slightly weathered basalt anticipated beneath the site. Chemical expanders pumped into pre-drilled holes may also be used to facilitate the rock excavation.

In general, blasting of the basalt is not recommended unless it is performed by a licensed, qualified blasting contractor in accordance with the applicable government safety regulations who can demonstrate that the blasting will not adversely affect the existing 0.5 M.G. reservoir and the tunnel crossing beneath the site.

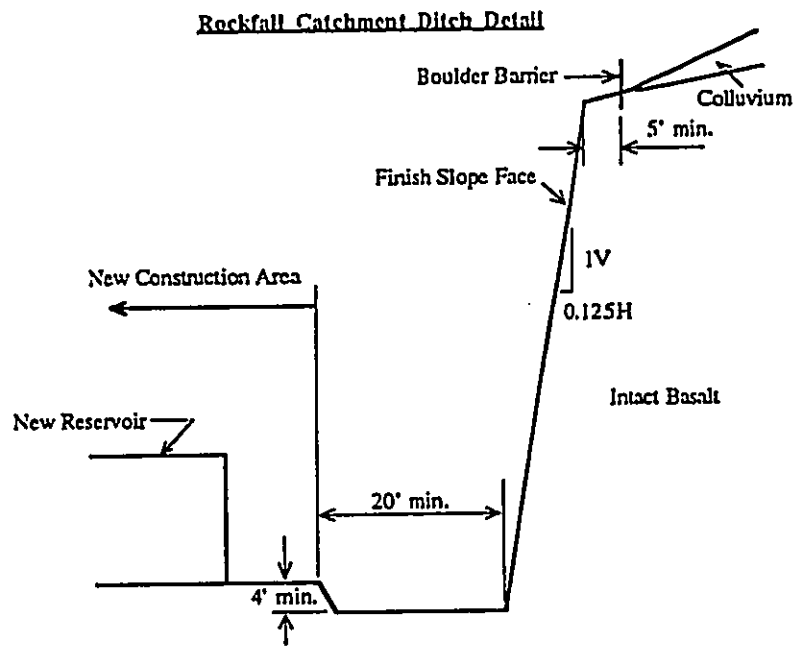
Prior to the start of the rock excavation, the loose surface material should be removed down to intact rock within a horizontal distance of 10 feet from the top of slope. A boulder barrier or similar rock protection system should be installed during construction to reduce the potential for loosened boulders or rock fragments cascading down the existing slopes, and harming workmen.

The excavated soil and rock are not suitable for use as fill beneath the tank or other structural units. The near-surface soils are highly plastic and may be stockpiled for use in landscaped areas where they would not affect any structural items. The excavations in the moderately weathered basalt in the deeper cut areas will likely generate large cobble- and boulder-sized rock fragments which are unsuitable for use in the shallow fills planned at the site.

Imported fill should consist of non-expansive granular soil, free of organics, rocks and soil clods greater than 3 inches in diameter with less than 15 percent passing the No. 200 sieve. The plasticity index (PI) of the material passing the No. 200 sieve should be less than 20. Imported fill used within 2 feet of pavement subgrades, i.e., within 2 feet of the bottom of Base Course layer, should also exhibit a California Bearing Ratio (CBR) greater than 12.

Fill and backfill should be placed in relatively level lifts, no greater than 8 inches in loose thickness, moisture-conditioned to within 3 percent of the soil's optimum moisture content and uniformly compacted to at least 95 percent relative compaction as determined by Laboratory Compaction Test ASTM D1557. Any soft spots, soil-filled voids, or small cavities encountered should be removed and the resulting depression backfilled in accordance with these recommendations.

The cut slopes within the intact basalt should be sloped as steep as 0.125H:1V to reduce potential rockfall hazards. A rockfall catchment ditch should be provided at the bottom of the slope, and a permanent boulder barrier constructed at the top of the slope, to reduce the potential for surface boulders or rock fragments falling down the slope face. A typical cut slope and catchment ditch is shown below.



The toe of the cut slope should be setback at least 25 feet from the perimeter of the new construction to allow the construction of a rockfall catchment ditch and not affect the foundations of the new reservoir. The rockfall catchment ditch should be at least 20 feet wide and be excavated to a depth of at least 4 feet below the finish grade in the new construction area.

Foundations - We believe that the proposed reservoir can be adequately supported on a foundation system consisting of individual spread footings and a continuous ring foundation integrated with the tank's concrete floor slab.

Footings should be founded in the basalt where they may be designed for an allowable bearing capacity of 10,000 p.s.f. This value may be increased by one-third for short-term transient loads. All foundations should have a minimum base width of 2 feet and should be embedded at least 6 inches below the lowest adjacent ground surface on level ground.

The bottom of all foundation excavations should be probed to a minimum depth of 10 feet to evaluate the presence of voids beneath the foundation bearing level. Probes should be drilled near the center of each spread footing and at 10-foot linear intervals along the perimeter ring foundation. Any voids detected during the probing operations should be filled with grout.

Localized soft spots encountered during the foundation trenching should be overexcavated and cleaned out to basalt and the resulting depression backfilled with concrete. Loose material should be completely removed from the bottom of the footing excavations prior to the placement of steel and concrete. Steel reinforcement of the foundations should be provided in accordance with the recommendations of the Project Structural Engineer.

Total and differential settlements of less than 1/4 inch are anticipated for the tank loading conditions indicated under the Project Considerations section of this report. The tank and its foundations and slabs should be designed to accommodate the anticipated settlements. Should the actual loads exceed those currently anticipated, FGE, Ltd. should be notified so that these recommendations can be reviewed and additional recommendations can be provided, if necessary.

Concrete Slabs-on-Grade - A concrete slabs-on-grade floor may be used for the tank provided the grading recommendations of this report are followed. This will assure that the slabs are underlain by a subgrade consisting of hard, weathered basalt.

The intact basalt anticipated at the slab subgrade level should be overexcavated below the bottom of the slab to allow placement of at least 6 inches of Select Borrow to eliminate point loads on the slab and provide uniform slab support. The Select Borrow should conform to Section 30 of the Standard Specifications and should be compacted to at least 95 percent relative compaction as determined by ASTM D1557.

The tank floor slab should be designed for a Modulus of Subgrade Reaction of 600 pounds per square inch per inch. This value is estimated for the anticipated subgrade materials and the current tank dimensions and loading and will need to be adjusted if the tank plans are revised from those currently anticipated.

The steel reinforcement of the concrete slabs should be provided as recommended by the Project Structural Engineer.

Miscellaneous - The intact basalt anticipated at the tank subgrade level should be sufficiently free-draining such that subdrains beneath the tank are not warranted.

Utility, or similar deep temporary construction excavations, should be either sloped back or shored in accordance with the applicable DOSH safety regulations. For preliminary construction estimating purposes, the boring and test pits indicate that intact basalt, which DOSH regulations allow to be excavated vertically, is present immediately beneath the tank subgrade level.

Utility trenches should be overexcavated at least 6 inches below the pipe invert level to allow placement of a pipe cushion to minimize point loads on the pipes. Utility backfills should be placed and compacted in accordance with the Standard Specifications, the Standard Details for Public Works Construction of the City and County of Honolulu (Standard Details), the applicable BWS requirements, and the grading recommendations of this report, using the appropriate mechanical compactors above and around the pipes. If jetting and ponding of the backfill is allowed as a method of compaction, the trench backfill material should be a clean, granular material in accordance with BWS requirements.

Quality Control - The site preparation and grading operations should be observed by FGE, Ltd. to determine whether the anticipated materials are encountered. Intermittent density tests should be taken to determine whether the specified levels of compaction are consistently attained. Samples of the proposed fill materials should be submitted to FGE, Ltd. no less than 7 working days prior to their intended jobsite delivery to allow adequate time for testing, evaluation and approval.

The foundation excavations and foundation probing operations should be monitored by FGE, Ltd. prior to the placement of concrete and reinforcing steel to verify that the anticipated bearing materials have been encountered. The recommendations contained herein are contingent on adequate construction monitoring by FGE, Ltd.

Limitations - This report has been prepared for the exclusive use of Gray, Hong, Bills & Associates, Inc. for the proposed BWS Makaha "242" Reservoir No. 2, in Makaha, Oahu, Hawaii. No warranty, expressed or implied, is made.

The analysis, conclusions and recommendations of this report are based in part upon the data obtained in the test borings and test pits and upon the assumption that the soil conditions do not deviate from those observed. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that planned at the present time, FGE, Ltd. should be notified so that supplemental recommendations can be given. The conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing.

Unanticipated soil conditions are commonly encountered and cannot be fully determined by soil samples, test borings, or test pits. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. Some contingency funds are recommended to accommodate such potential extra costs.

The scope-of-work for this investigation was limited to conventional geotechnical services and did not include any environmental evaluations or assessments. Silence in the report

regarding any environmental aspects of the site does not indicate the absence of potential environmental problems.

The boring and test pit locations were determined by tape measurements from existing physical features. Elevations were estimated from the available topographic plans. The locations and elevations of the borings and test pits should be considered accurate only to the degree implied by the methods used.

Groundwater was not encountered in the boring during this investigation, nor in any of the test pits excavated during the 1994 Phase I investigation. It must be noted, however, that fluctuations in the level of the groundwater may occur due to variations in rainfall, tides, temperature and other factors not present at the time the measurements were made.

FGE, Ltd. should be provided the opportunity for general review of the final design drawings and specifications in order to verify that the earthwork and foundation recommendations have been properly interpreted and implemented in the design and specifications. If FGE, Ltd. is not accorded the privilege of making this recommended review, it can assume no responsibility for misinterpretations of the recommendations.

FGE, Ltd. should also be retained to provide periodic soil engineering services during construction. This is to observe compliance of the design concepts, specifications and recommendations and to allow design changes in the event the subsurface conditions differ from that anticipated prior to construction. The recommendations given herein are contingent upon adequate construction monitoring by FGE, Ltd.

Should you have any questions pertaining to any aspect of this report, or if we can be of further assistance to you, please do not hesitate to contact us.

Respectfully submitted,

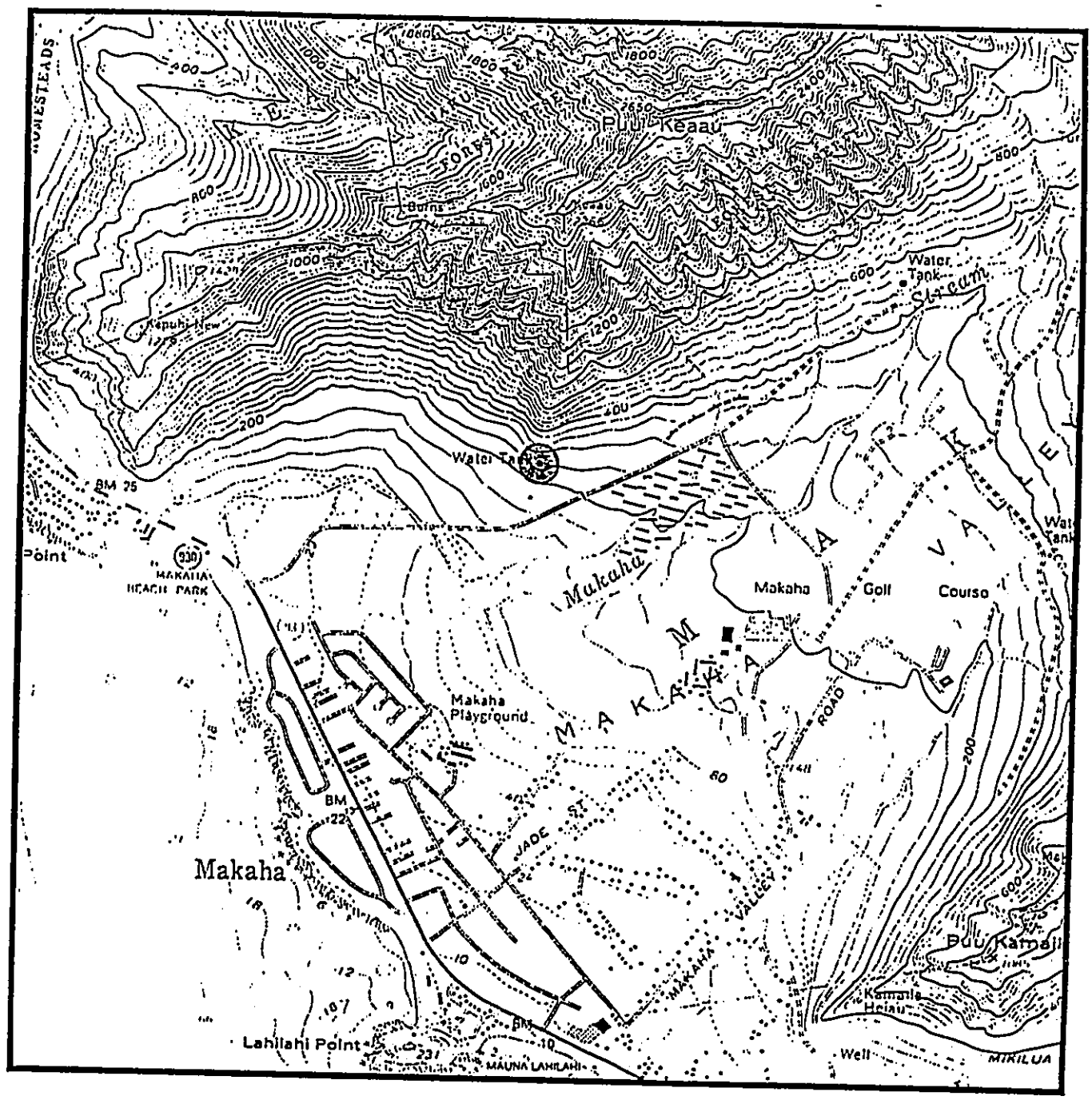
FEWELL GEOTECHNICAL ENGINEERING, LTD.

By Timothy J. Cavanaugh, P.E.

TJC/ajs:ami

Attachments

TIMOTHY J. CAVANAUGH
LICENSED PROFESSIONAL ENGINEER
No. 6619-C
HAWAII, U.S.A.



LEGEND:

PROJECT LOCATION

SCALE: 1"=2000'

GENERAL AREA:

MAKAHA, OAHU, HAWAII

REFERENCE:

WAIANAE QUADRANGLE
U.S.G.S. TOPOGRAPHIC MAP

F.G.E. Ltd.

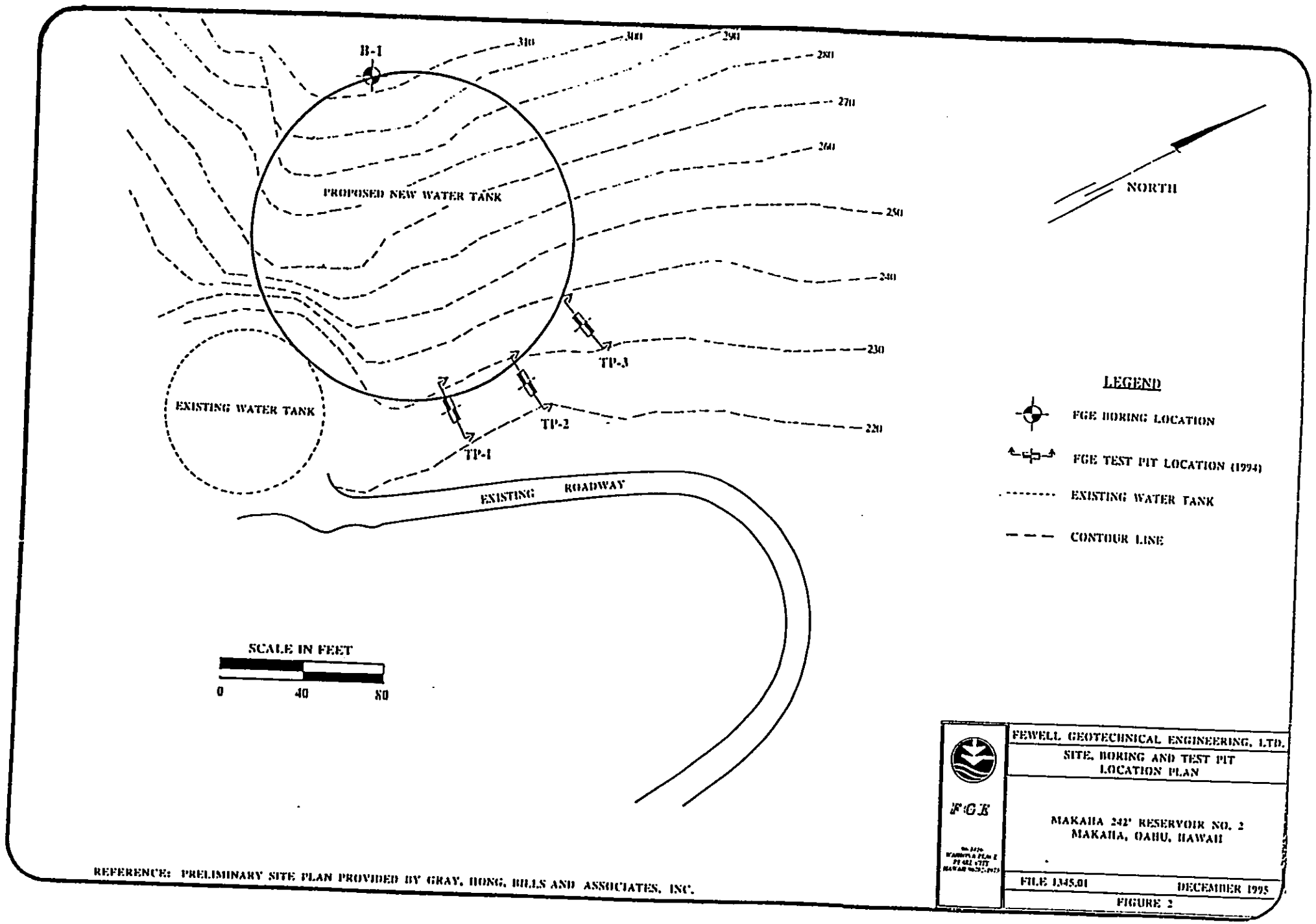
PROJECT LOCATION MAP

Makaha 242' Reservoir No. 2
Makaha, Oahu, Hawaii

File: 1345.01

Date: December 1995

Figure 1



REFERENCE: PRELIMINARY SITE PLAN PROVIDED BY GRAY, HONG, BILLS AND ASSOCIATES, INC.

FEWELL GEOTECHNICAL ENGINEERING, LTD.

SITE, BORING AND TEST PIT LOCATION PLAN

MAKAHA 242' RESERVOIR NO. 2
MAKAHA, OAHU, HAWAII

FILE 1345.01 DECEMBER 1995

FIGURE 2

F.G.E. Ltd.
96-1416 Waihona Place
Pearl City, Hawaii

Boring: 1
Project: Makaha 242' Reservoir No. 2
Location: Makaha, Oahu, Hawaii
Surface Elevation: 310.0' ±
Depth to Water: None Encountered
Date Completed: 10-23-95

File: 1345.01

Project Engineer: TC
Field Engineer: JA
Drafted by: LB
Date of Drawing: December 1995

LAB TEST RESULTS	MOIST CONT. %	DRY DEN. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
					0	Brown Clayey SILT (MH) with cobbles and boulders, *loose*, *dry* (COLLUVIUM)
			100%REC 30%RQD	HQ CORE	5	Grayish Brown Slightly Weathered BASALT (WS), hard, broken
			75%REC 37%RQD	HQ CORE	10	
			100%REC 70%RQD	HQ CORE	15	Gray Slightly Weathered Vesicular BASALT (WS), hard, massive
			100%REC 90%RQD	HQ CORE	20	
			100%REC 52%RQD	HQ CORE	25	grades to occasionally broken between 24' and 30'
			100%REC 50%RQD	HQ CORE	30	
			100%REC 65%RQD	HQ CORE	35	

Figure 3 a

P.G.E. Ltd.
96-1416 Waihona Place
Pearl City, Hawaii

Boring: 1
Project: Makaha 242' Reservoir No. 2
Location: Makaha, Oahu, Hawaii
Surface Elevation: 310.0' ±
Depth to Water: None Encountered
Date Completed: 10-23-95

File: 1345.01
Project Engineer: TC
Field Engineer: JA
Drafted by: LB
Date of Drawing: December 1995

LAB TEST RESULTS	MOIST CONT. %	DRY DEN. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
			100%REC 80%RQD	HQ CORE	40	Gray Slightly Weathered Vesicular BASALT (WS), hard,, massive
			100%REC 80%RQD	HQ CORE	45	
			100%REC 54%RQD	HQ CORE	50	grades to occasionally broken between 48' and 60'
			95%REC 33%RQD	HQ CORE	55	
			100%REC 81%RQD	HQ CORE	60	
			100%REC 75%RQD	HQ CORE	65	Gray Slightly Weathered BASALT (WS), hard, massive
			95%REC 63%RQD	HQ CORE	70	

Figure 3 b

F.G.E. Ltd.
96-1416 Waihona Place
Pearl City, Hawaii

Boring: 1
Project: Makaha 242' Reservoir No. 2
Location: Makaha, Oahu, Hawaii
Surface Elevation: 310.0' ±
Depth to Water: None Encountered
Date Completed: 10-23-95

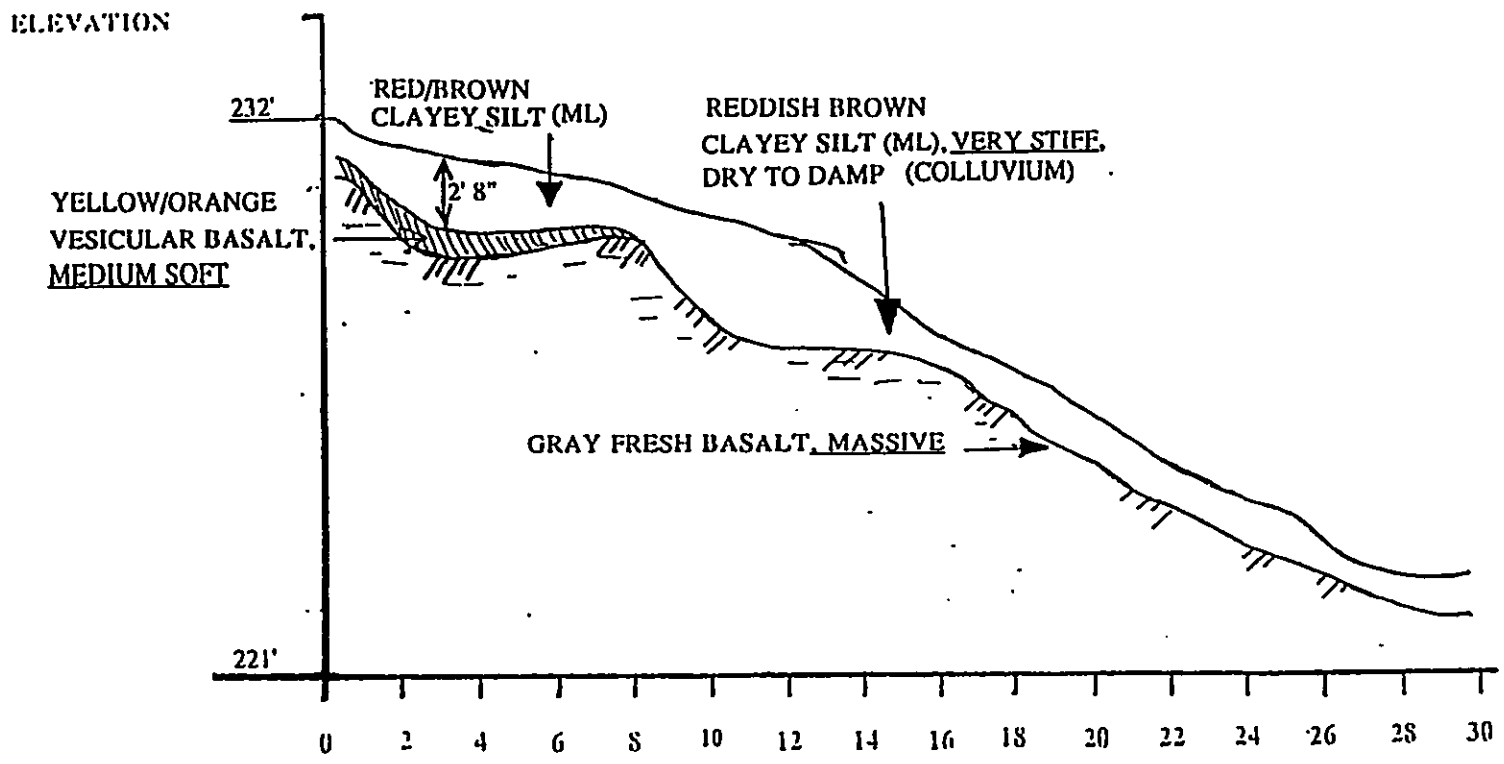
File: 1345.01

Project Engineer: TC
Field Engineer: JA
Drafted by: LB
Date of Drawing: December 1995

LAB TEST RESULTS	MOIST CONT. %	DRY DEN. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
			100%REC 50%RQD	HQ CORE	75	Gray/Brown Slightly to Moderately Weathered Vesicular BASALT (WS-WM), medium hard to hard, occasionally broken
			97%REC 81%RQD	HQ CORE	80	Gray/Brown Moderately Weathered Vesicular BASALT (WM), medium hard, broken
			95%REC 83%RQD	HQ CORE	85	Gray Slightly Weathered Vesicular BASALT (WS), hard, massive
			100%REC 85%RQD	HQ CORE	90	
			75%REC 38%RQD	HQ CORE	95	grades to occasionally broken at 91'
					100	BOH @ 94.0'
					105	

Figure 3 c

(LONGITUDINAL SECTION)



HORIZONTAL SCALE
(In Feet)

0 2 4

FEWELL GEOTECHNICAL ENGINEERING, LTD.

TEST PIT NO. 1

FGE

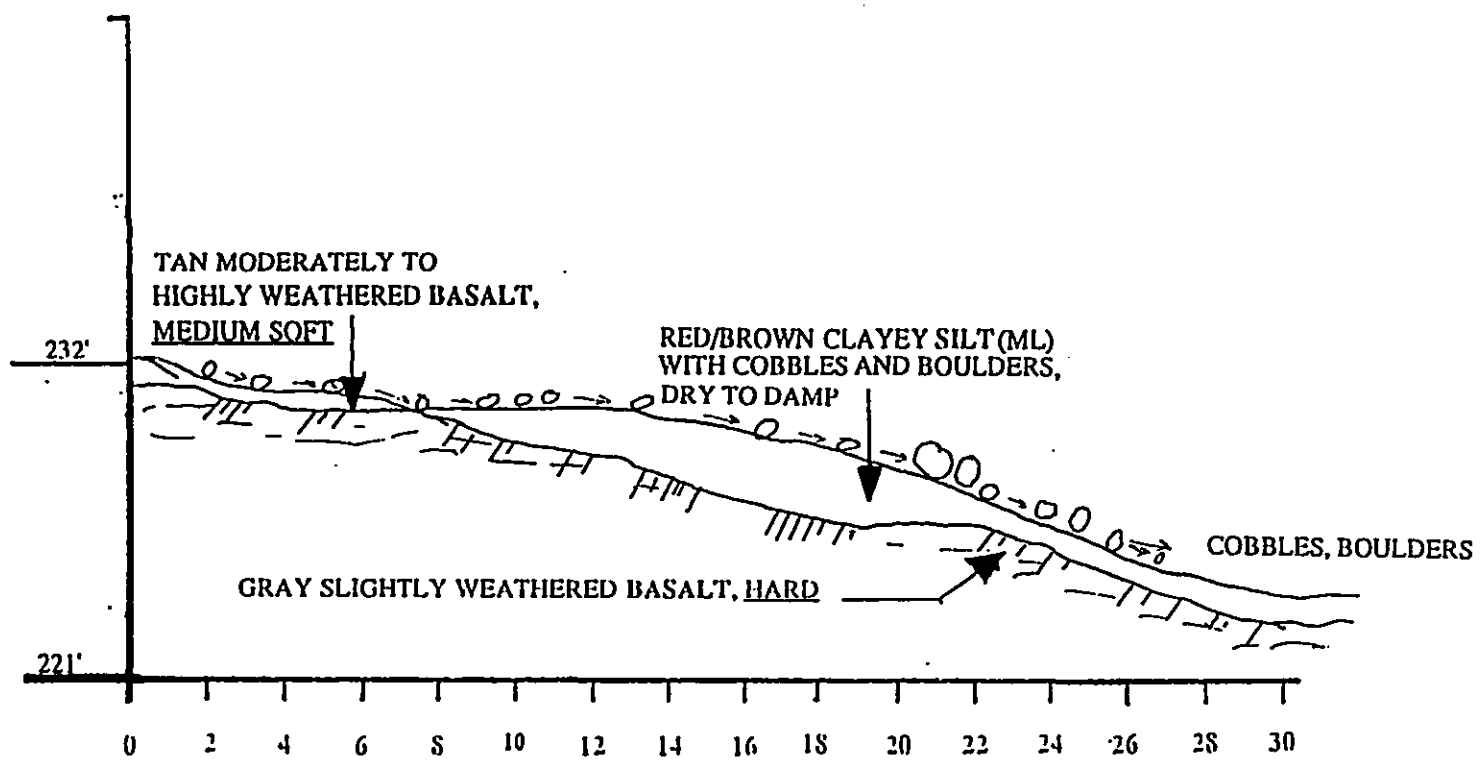
96-1416
WAIKONA PLACE
PEARL CITY
HAWAII 96782-1971

MAKAHA 242' RESERVOIR NO. 2
MAKAHA, OAHU, HAWAII

FILE 1345.01 DECEMBER 1995

FIGURE 4

(LONGITUDINAL SECTION)



HORIZONTAL SCALE
(In Feet)

0 2 4

FGE

96-1416
WAIHONA PLACE
PEARL CITY
HAWAII 96782-1971

FEWELL GEOTECHNICAL ENGINEERING, LTD.

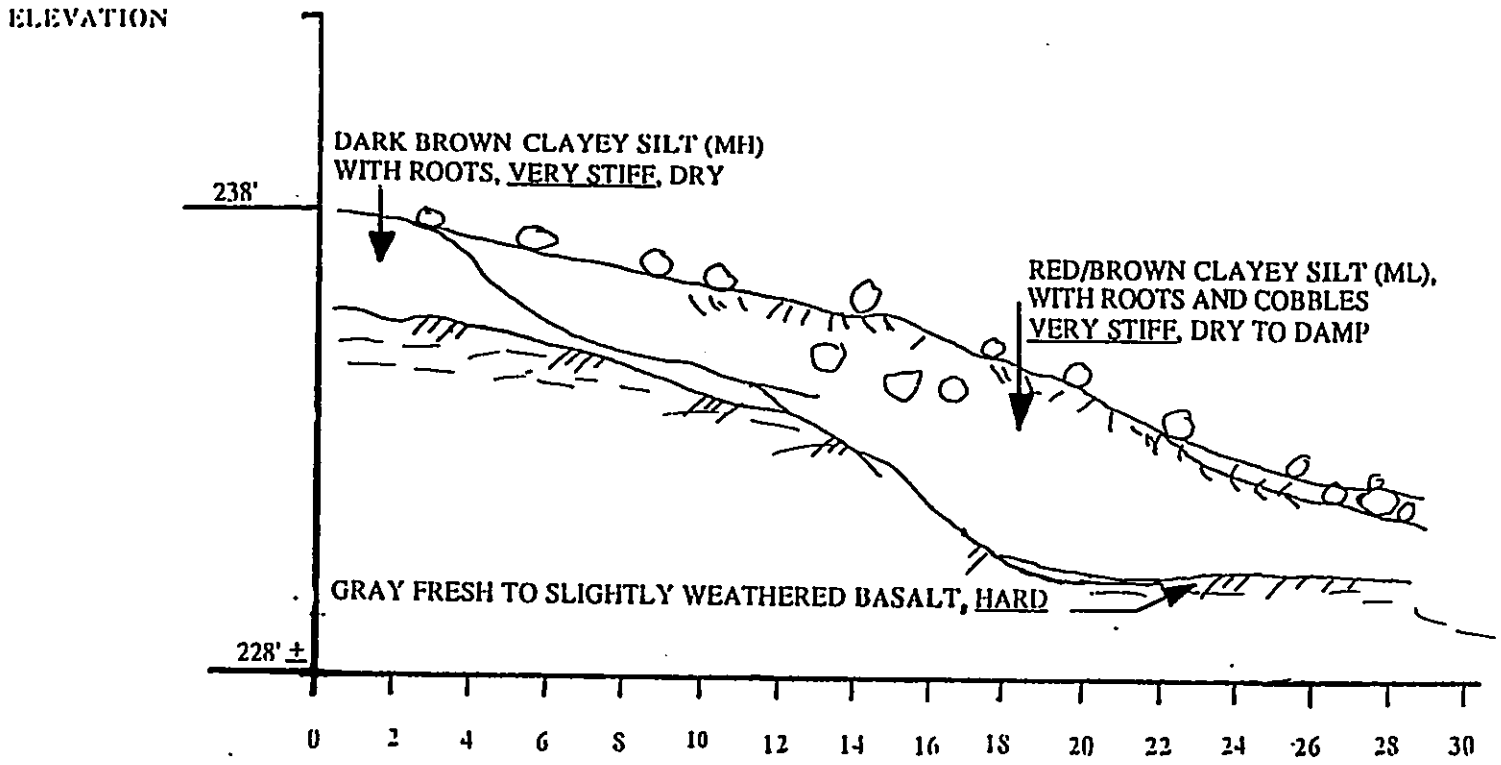
TEST PIT NO. 2

MAKAHA 242' RESERVOIR NO. 2
MAKAHA, OAHU, HAWAII

FILE 1345.01 DECEMBER 1995

FIGURE 5

(LONGITUDINAL SECTION)



HORIZONTAL SCALE
(In Feet)

0 2 4

FGE

94-1516
WAIKONA PLACE
PEARL CITY
HAWAII 96782-1971

FEWELL GEOTECHNICAL ENGINEERING, LTD.

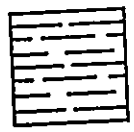
TEST PIT NO. 3

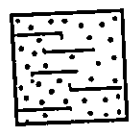
MAKAHA 242' RESERVOIR NO. 2
MAKAHA, OAHU, HAWAII

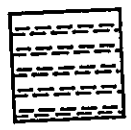
FILE 1345.01 DECEMBER 1995

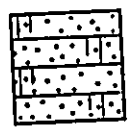
FIGURE 6

MAJOR ROCK TYPES

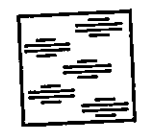

BASALT

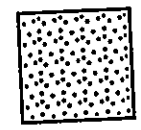

TUFF

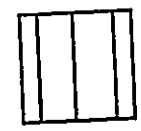

DECOMPOSED ROCK

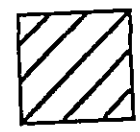

CORAL

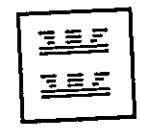
MAJOR SOIL TYPES


GRAVEL

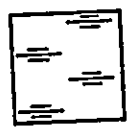

SAND

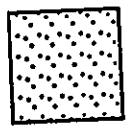

SILT

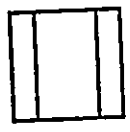

CLAY

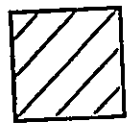

PEAT/ORGANICS

SECONDARY CLASSIFICATION


GRAVELLY


SANDY


SILTY


CLAYEY

SAMPLING SYMBOLS


3" O.D. UNDISTURBED SAMPLE

3" O.D. DISTURBED SAMPLE

2" O.D. STANDARD PENETRATION SAMPLE

NO RECOVERY

SHELBY TUBE

BAG SAMPLE


NX-CORE

WATER LEVEL 

F.G.E. Ltd.

BORING AND TEST PIT LOG LEGEND

Makaha 242' Reservoir No. 2
Makaha, Oahu, Hawaii

File: 1345.01

Date: December 1995

Figure 7

APPENDIX C

BOTANICAL SURVEY

BOTANICAL SURVEY REPORT FOR THE PROPOSED RESERVOIR SITE, MAKAHA, HAWAII

BY
EVANGELINE J. FUNK, PHD.
BOTANICAL CONSULTANTS
HONOLULU, HAWAII

FOR
GRAY HONG BILLS & ASSOCIATES, INC.
119 MERCHANT STREET, SUITE 607
HONOLULU, HAWAII 96813

TABLE OF CONTENTS

page

INTRODUCTION.....1

METHODS.....1

VEGETATION TYPES.....1

ENDANGERED SPECIES.....2

BIBLIOGRAPHY.....2

SPECIES LIST.....2

INTRODUCTION

The proposed water reservoir and access roadway study site is located in Makaha Valley, northwest of Kili Street between 200 and 300 feet elevation. This part of the island was classified as Lowland Zone by Hillebrand (1888) and the A or Xerophytic Zone by Ripperton and Hosaka (1942). In more recent years, Gagne' and Cuddihy (1990) included the area in their Lowland Dry Mixed Community Zone where annual rainfall averages between 500 mm and 1,200 mm. Before the introduction of grazing animals, this area was probably covered with wiliwili trees, drought tolerant shrubs and other summer deciduous plants. Today, November 1993, the vegetation of this part of the lowlands is mostly introduced. There are frequent rock outcrops, there is scant soil, and the area is often subjected to wild fires during the dry season. A botanical survey of this approximately four acre site was completed in November 1993.

METHODS

The walk through method was used to collect data on the existing vegetation of the site, to ascertain if endangered species were found in the area and to describe the present vegetation. A two man team of investigators covered the entire study site.

VEGETATION TYPES

A single vegetation type, Scant Kiawe with an Understory of Mixed Grasses, is found both along the proposed access road and on the proposed reservoir site. Kiawe trees (*Prosopis pallida* (Humb. & Bonpl. ex Willd.) Kunth) 5 to 7 m in height cover less that thirtyfive percent of the area. These trees have recently been burned and about half of the tree skeletons show signs of

rejuvenation. The understory is principally buffel grass (*Cenchrus ciliaris* L.) and green panic grass (*Panicum maxinum* var. trichoglume Eyles ex Robyns), both of which have fully recovered from the last fire. Because of the many rock outcrops found on the site, vegetation is limited to small pockets of soil distributed among the rock outcrops. These small pockets support insignificant communities of weedy, introduced, wayside plants. A list of all taxa found on the site is provided.

ENDANGERED SPECIES

No proposed or listed threatened or endangered plant species as set forth by the U. S. Department of the Interior Fish and Wildlife Service (Endangered Species Act of 1973, [16 U.S.C. 1531 - 1543] as amended. USFWS 1992) were encountered.

Bibliography

Neal, M. C. 1965. In Gardens of Hawaii. Bernice P. Bishop Museum. Special Publication 50. Bishop Museum Press.

Ripperton, J. C. & E. Y. Hosaka. 1942. Vegetation Zones of Hawaii. Bull. 89 University of Hawaii.

St. John, H. 1973. List and Summary of the Flowering Plants of the Hawaiian Islands. PTBG. Lawai, Kauai, Hawaii.

USFWS. 1992. Endangered and Threatened Wildlife and Plants. 50 CFR & 17.12

Wagner, W. L., D. R. Herbst and S. H. Sohmer. 1990. Manual of the Flowering Plants of Hawaii. Bishop Museum Special Publication #83. Univer. Hawaii Press. Vols. 1 & 2.

SPECIES LIST

The plant families in the following species list have been alphabetically arranged within two groups, Monocotyledons, and Dicotyledons. The genera and species are arranged alphabetically within families. The taxonomy and nomenclature follow that of St. John (1973) and Wagner, Herbst and Sohmer (1990). For each taxon the following information is provided:

1. An asterisk before the plant name indicates a plant introduced to The Hawaiian Islands since Cook or by the aborigines.
2. The scientific name.
3. The Hawaiian name and or the most widely used common name.
4. Abundance ratings are for this site only and they have the following meanings:

   Uncommon = a plant that was found less than five times.

   Occasional = a plant that was found between five to ten times.

   Common = a plant considered an important part of the vegetation.

   Locally abundant = plants found in large numbers over a limited area. For example the plants found in grassy patches.

This species list is the result of an extensive survey of this site at the beginning of the rainy season (November 1993) and it reflects the vegetative composition of the flora during a single growing season. Minor changes in the vegetation will occur due to introductions and losses and a slightly different species list would result from a survey conducted during a different growing season.

CHECKLIST OF ALL PLANTS FOUND ON THE PROPOSED WELL SITE, MAKAHA

Scientific Name	Common Name	Abundance
MONOCOTYLEDONES		
COMMELINACEAE - Spiderwort Family		
**Commelina benghalensis* L.	Hairy honohono	Common
GRAMINEAE - Grass Family		
**Cenchrus ciliaris* L.	Buffel grass	Locally abundant
**Cenchrus echinatus* L.	Sandbur grass	Locally abundant
**Chloris barbata* Swartz	Swollen fingergrass	Locally abundant
**Chloris divaricata* R. Br.	Stargrass	Common
**Cynodon dactylon* (L.) Pers.	Bermuda grass	Common
**Digitaria adscendens* (HBK) Henr.	Henry's crabgrass	Occasional
**Panicum maximum* Jacq.	Guinea grass	Common
**Panicum maximum* var. trichoglume Eyles ex Robyns	Green panicgrass	Common
**Rhynchelytrum repens* C.E.Hubb	Natal redtop	Common
**Tricachne insularis* (L.) Ness	Sourgrass	Occasional
DICOTYLEDONES		
ACANTHACEAE - Acanthus Family		
**Asystasia gangetica* (L.) T. Anderson	Chinese violet	Occasional
AMARANTHACEAE - Amaranth Family		
**Achyranthes aspera* L.		Occasional
**Alternanthera pungens* Kunth	Kahki weed	Occasional
ASTERACEAE - Sunflower Family		
**Bidens pilosa* L.	Spanish needle	Common
**Tridax procumbens* L.	Coat buttons	Locally abundant
BORAGINACEAE - Borage Family		
**Heliotropium procumbens* Mill.		Occasional
CONVOLVULACEAE - Moringglory Family		
**Ipomoea obscura* (L.) Ker-Gawl		Occasional
**Ipomoea triloba* L.	Little Bell	Occasional
**Ipomoea cairica* (L.) Sweet	Koali 'ai	Common
**Merremia aegyptia* (L.) Urb.	Hairy merremia	Common

Scientific Name	Common Name	Abundance
CUCURBITACEAE - Cucumber Family		
**Momordica charantia* Crantz	Balsam apple	Occasional
EUPHORBIACEAE - Spurge Family		
**Chamaesyce hirta* L.	Hairy spurge	Common
**Chamaesyce hypericifolia* (L.) Millsp.		
**Euphorbia cyathophora* J. A. Murray	Graceful spurge	Occasional
**Ricinus communis* L.	Mexican fire plant Castor bean	Common Occasional
LAMIACEAE - Mint Family		
**Leonotis nepetifolia* (L.) R. Br.		Occasional
LEGUMINOSAE - Bean Family		
**Acacia farnesiana* L.	Klu	Occasional
**Alysicarpus vaginalis* (L.) DC.	One-leaved Clover	Locally abundant
**Desmanthus virgatus* Willd.	Virgate mimosa	Occasional
**Indigofera spicata* Frosk.	Creeping indigo	Occasional
**Leucaena leucocephala* deWit	Koa-haole	Common
**Macroptilium lathyroides* (L.) Urb.	Wild pea	Occasional
**Medicago polymorpha* L.	Bur clover	Locally abundant
**Prosopis pallida* (Humb. & Bonpl. ex Willd.) Kunth	Kiawe	Occasional
**Senna occidentalis* (L.) Link	Coffee senna	Occasional
MALVACEAE - Hibiscus Family		
**Malva parviflora* L.	Cheese weed	Occasional
**Malvastrum coromandelianum* Garcke	False marrow	Common
**Sida fallax* Walp.	'Ilima	Occasional
**Sida rhombifolia* L.	Cuba jute	Occasional
**Sida spinosa* L.	Prickly sida	Occasional
NYCTAGINACEAE - Four o'clock Family		
**Boerhavia coccinea* Mill.		Locally abundant
Boerhavia repens L.	Alena	Occasional
PORTULACACEAE - Purslane Family		
**Portulaca pilosa* L.	'Akulikuli	Locally abundant
SOLANACEAE - Tomato Family		
**Nicandra physalodes* (L.) Gaertn.	Apple of Peru	Occasional
**Solanum seaforthianum* Andr.		Occasional

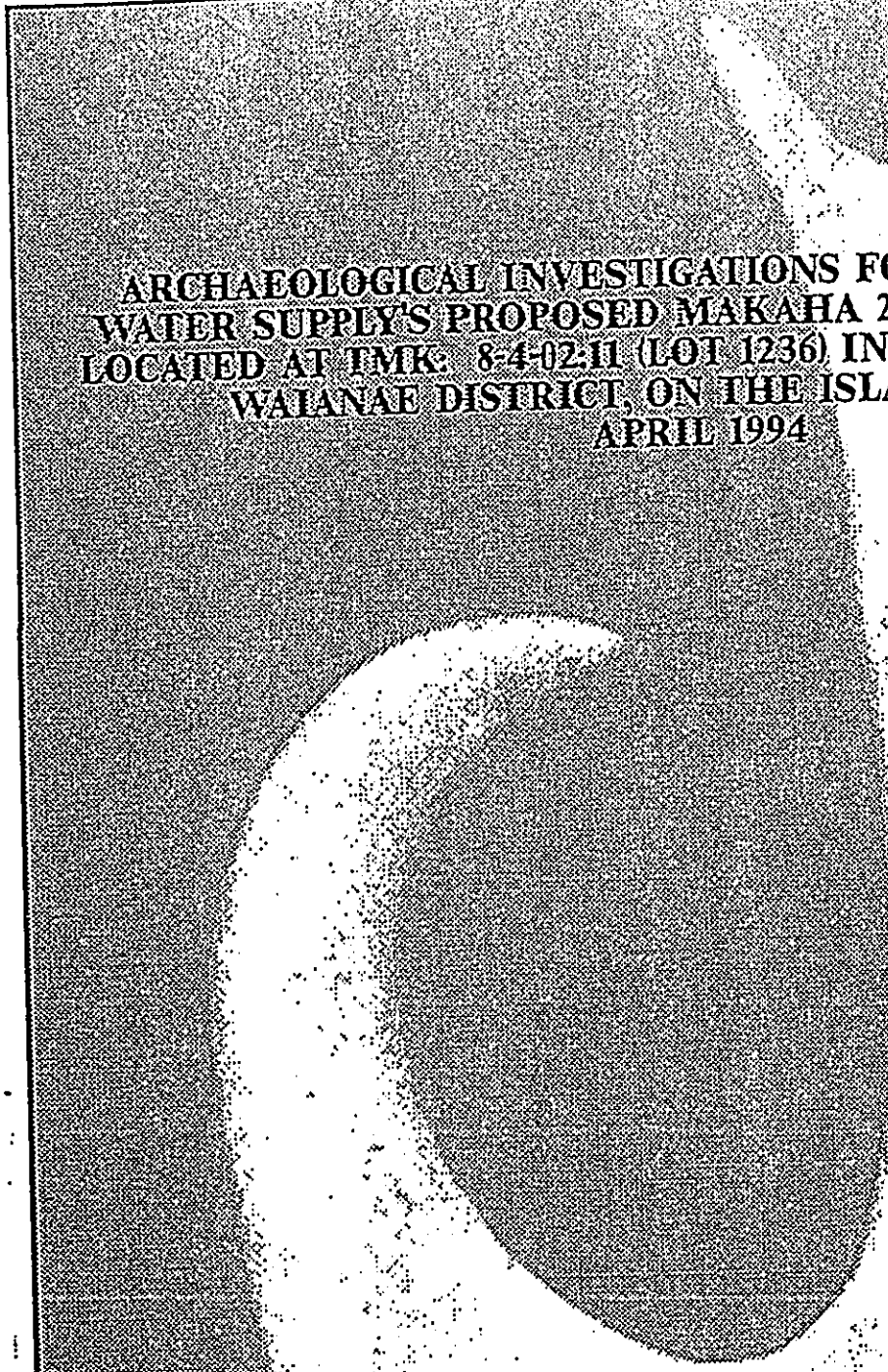
Scientific Name	Common Name	Abundance
STERCULIACEAE - Stink tree Family		
**Waltheria indica* L.	Hi'aloa, uha-loa	Locally abundant
VERBENACEAE - Verbena Family		
**Lantana camara* L.	Lantana	Occasional
**Stachytarpheta jamaicensis* Vahl.	Vervain	Common
ZYGOPHYLLACEAE - Tribulus Family		
**Tribulus terrestris* L.	Puncture vine	Occasional

APPENDIX D

ARCHAEOLOGICAL INVESTIGATION

ARCHAEOLOGICAL INVESTIGATIONS FOR THE BOARD OF WATER SUPPLY'S PROPOSED MAKAHA 242 RESERVOIR SITE LOCATED AT TMK: 8-4-02:11 (LOT 1236) IN MAKAHA AHUPUA'A, WAIANAE DISTRICT, ON THE ISLAND OF OAHU

APRIL 1994



Prepared for: David Bills
Gray, Hong, Bills and Associates
119 Merchant Street, Suite 607
Honolulu, Hawaii 96813

Prepared by: Archaeological Consultants of Hawaii, Inc.
James R. Moore, B.A.
Joseph Kennedy, M.A.
59-624 Papukea Road
Haleiwa, Hawaii 96712

Table of Contents

Abstract..... 1

Section 1: Introduction..... 2

Section 2: Physical Setting..... 2

Map 1: Project Location on a Map of Oahu..... 3

Map 2: Subject Property on a U.S.G.S. Map..... 4

Map 3: Topographic Map of the Subject Property..... 5

Section 3: Historic Background..... 6

Map 4: Green's Depiction of Makaha, 1855-1884..... 7

Section 4: Archaeological Methods..... 8

Section 5: Results of Archaeological Investigations..... 8

Map 5: Green's Survey Area Map..... 9

Conclusion..... 10

Bibliography..... 11

Archaeological Investigations for the Board of Water Supply's Proposed Makaha 242 Reservoir Site Located at TMK: 8-4-02:11 (Lot 1236) in Makaha Ahupua'a, Waianae District, on the Island of Oahu

Abstract

Archaeological investigations were conducted on the subject property, the location of the Board of Water Supply's Proposed Makaha 242 Reservoir Site. A 100% surface survey of the parcel was undertaken. This survey determined that no historic features are located on the subject property and that future construction activities will have "no effect" upon significant historic sites.

Section 1: Introduction

At the request of Mr. David Bills of Gray, Hong, Bills and Associates, Inc., Archaeological Consultants of Hawaii, Inc. (ACH) conducted an archaeological inspection of a property located at TMK: 8-4-02:11 (Lot 1236), in the ahupua'a of Makaha, the district of Waianae, on the island of Oahu (see Map 1). The City and County of Honolulu is the current owner of the property. The purpose of this investigation was to evaluate the significance of historic resources located on a property and to make recommendations concerning the mitigation of future construction activities upon possibly significant historic resources.

Section 2: Physical Setting

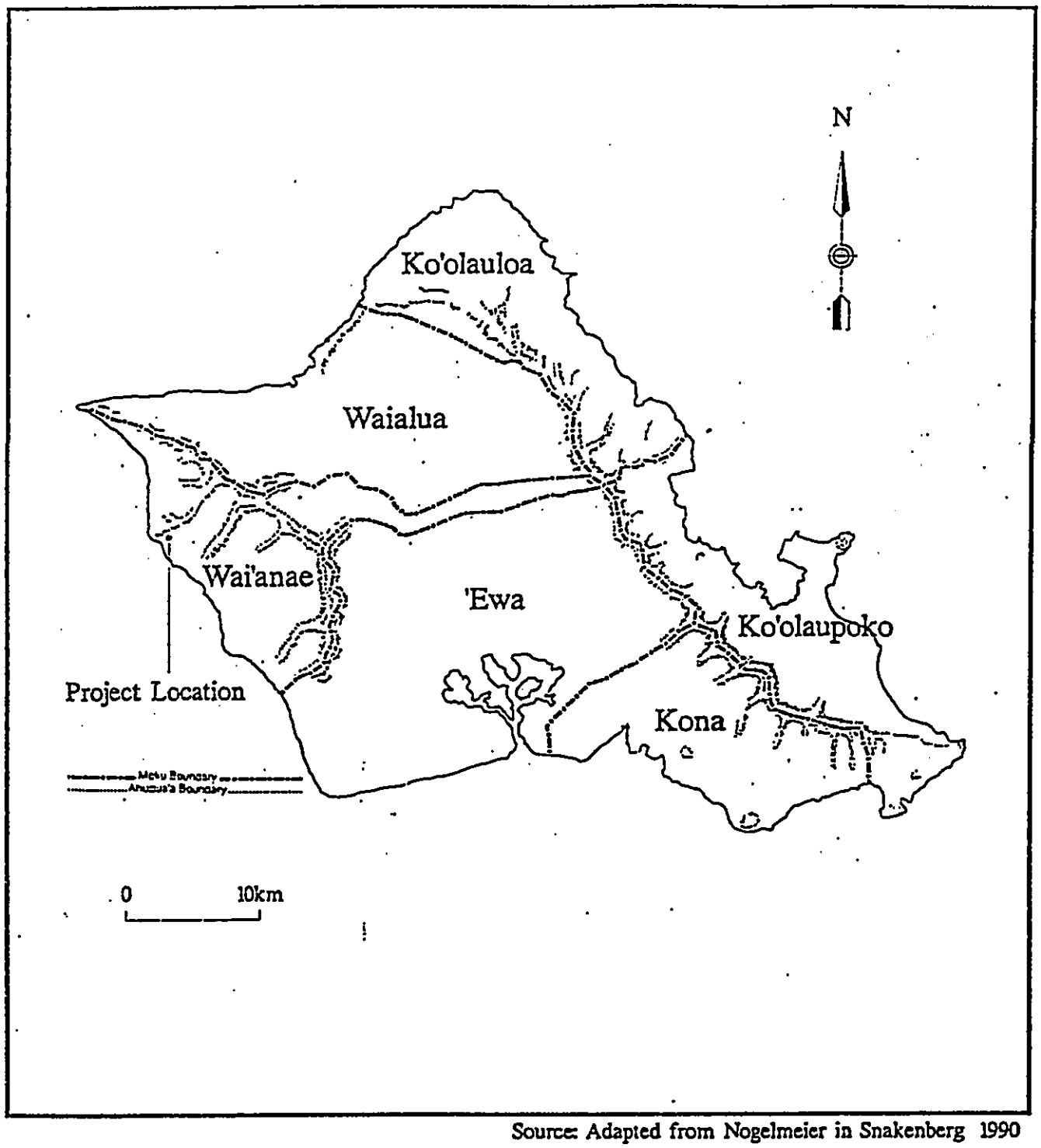
The subject property is located at geographic grid coordinates 158°12'41.5"W by 21°29'04.5"N and at UTM coordinates 581750mE by 2376000mN (see Map 2). The subject property ranges in elevation from approximately 150ft above mean sea level (AMSL) on its southern side (where the access corridor meets the road) to approximately 360ft AMSL along its northern-most boundary. The property, excluding the access corridor, measures approximately 210m wide (east-west) by 215m long (north-south; see Map 3).

The subject property is located within Makaha Valley, approximately 1km from the coast along the base of the Makaha-Kea'au Ridge. The area of the parcel totals 10.921 acres. The property is adjacent to a currently utilized water tank at the base of a talus slope.

Foote et al. show the soils on the subject property to be "stony land" (1972:Sheet 35). These lands are described as having 15 to 90 percent of the surface covered in stones or boulders with clays and silty clay loams similar to the Ewa and Lualualei Series' interspersed between the rocks, (1972:120-121).

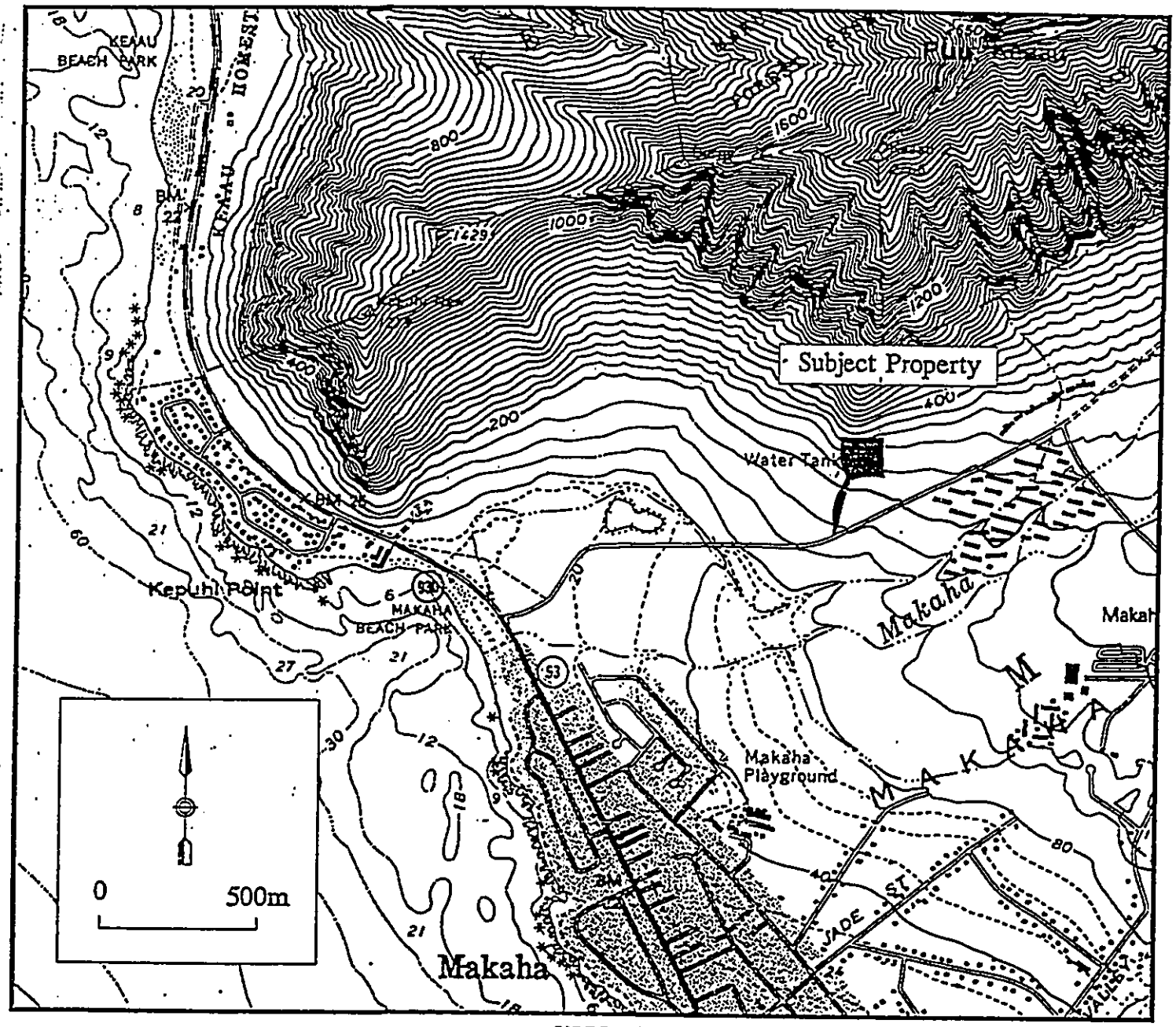
The rainfall on the subject property averages between 20 and 30 inches a year (Armstrong 1973). Vegetation on the subject property, including the proposed access corridor, was surveyed by Botanical Consultants and consists of a single vegetation type described as "Scant Kiawe with an Understory of Mixed Grasses", (Funk 1993). The dominant floral species identified included kiawe (Prosopis pallida), buffel grass (Cenchrus ciliaris), and green panic grass (Panicum maxinum) although individuals of many other species were also encountered.

Map 1: Project Location on a Map of Oahu



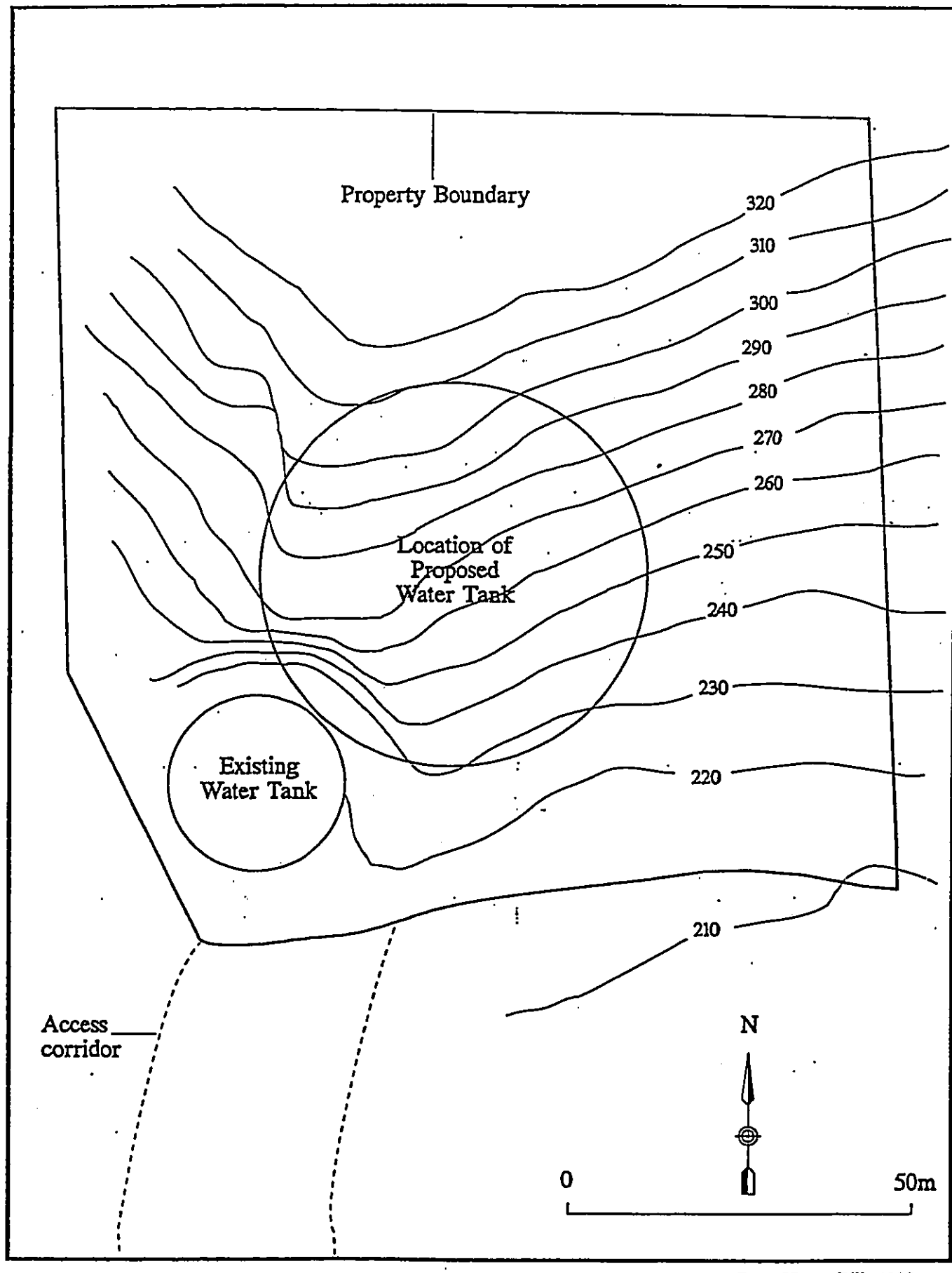
Source: Adapted from Nogelmeier in Snakenberg 1990

Map 2: Subject Property on a USGS Map



source: USGS 7.5 Minute Series (Topogaphic) Waianae Quadrangle, 1983

Map 3: Topographic Map of Subject Property



source: Gray, Hong, Bills 1993

Section 3: Historic Background

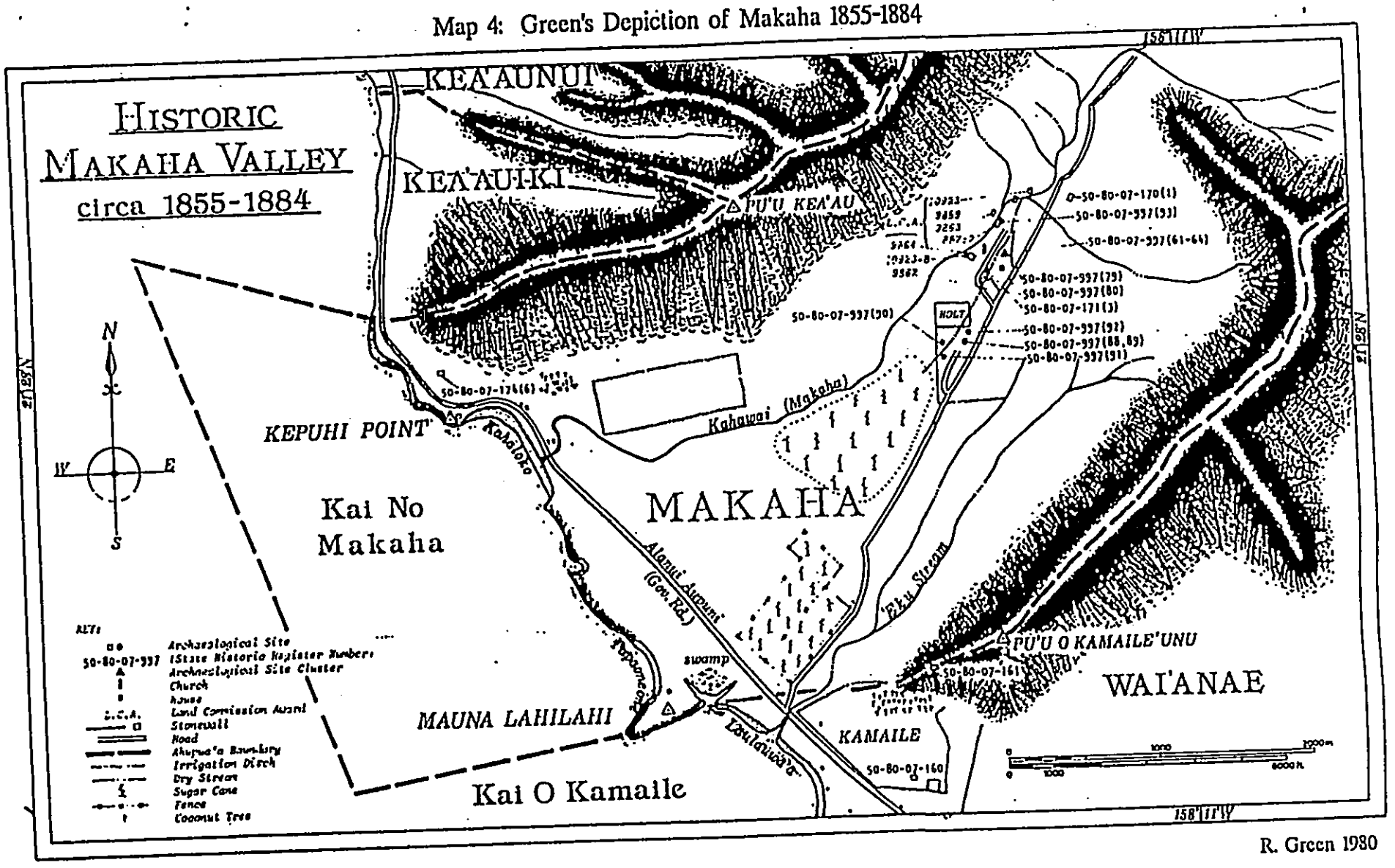
The project area is located in the ahupua'a of Makaha, in the district of Waianae, on Oahu's western shore. Makaha literally means "fierce" and in traditional accounts the area was home to the 'Olohe, wrestlers and bone-breakers, said to have robbed passing travellers (Pukui, Elbert & Mookini 1974 and Green 1980:5). The history of Makaha Valley has been comprehensively documented for the Makaha Valley Historical Project and has been thoroughly summarized in Makaha Before 1880 A.D. (Green 1980)(see Map 4). That work will not be repeated in this paper.

The most significant archaeological study within Makaha Ahupua'a was conducted by Bishop Museum between July of 1968 and June of 1970 as an integral part of the Makaha Valley Historical Project, mentioned above. This project included an intensive archaeological survey of a large portion of the valley floor in which thousands of individual features were identified. Again, this work has been well documented, being published in four volumes (Green 1969 & 1970, Ladd and Yen 1972, and Ladd 1973), and will not be repeated in this work.

Based upon the historic and archaeological studies mentioned above, tentative settlement patterns for the ahupua'a of Makaha have been detailed. Settlement of the valley began with a small coastal population utilizing the resources of the coastal zone. By the 13th century, the population had begun ultilizing the inland portions of the ahupua'a as evidenced by fireplaces found within field shelters (Green 1980:74). A change in the distribution of the population of Makaha occurred in the 15th and early 16th centuries when inhabitants moved from the coast to a population center in the interior of the valley. Several factors are cited as influencing this shift in the center of population the most compelling of which is its proximity to agriculturally productive areas. The final stage of development in prehistoric Makaha Valley, involving the social stratification of the population as well as its integration into the complex rank social system typical of the islands, occured between 1650 A.D. and the time of contact (Green 1980:76).

From this information, the expected finds for the subject property can be surmised. The property is located in a portion of the valley in which habitation, either permanent or temporary, would not be expected. Agriculturally, the area would have been extremely difficult to irrigate and, due to the low amount of annual rainfall expected, only minimal dryland crops could be expected to survive. Therefore, minimal agriculturally related structures, such as mounds used for gourds and/or sweet potatoes, could be found although the abundance of fertile lands nearby make this possibility unlikely as well.

Map 4: Green's Depiction of Makaha 1855-1884



R. Green 1980

Section 4: Archaeological Methods

Joseph Kennedy, M.A. was the Principal Investigator for the project. Investigations were conducted on November 24, 1993 by Field Archaeologists Tim Lawrence, B.A. and Thomas Kille.

Investigations consisted of a surface survey in which 100% of the parcel was covered. The surface of the property was systematically swept using north-south transects with the two man field crew spaced in approximate 5m (meter) intervals. At some points the distance between team members varied slightly due to vegetation. In all instances the team members moved closer together to minimize the interval distance.

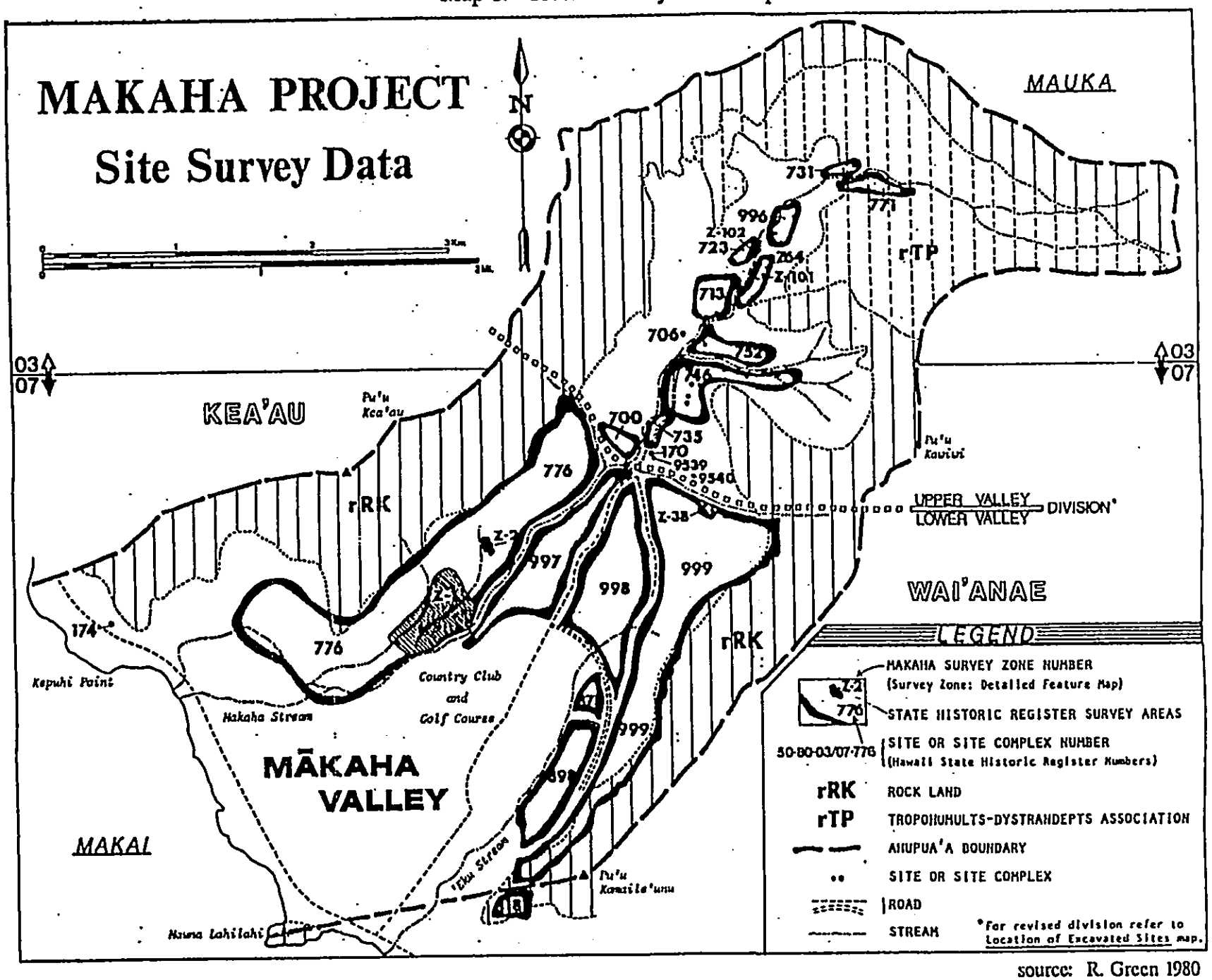
Section 5: Results of Archaeological Investigations

The subject property is located within the boundaries of the archaeological area assigned State Site #50-80-07-776 during the Makaha Valley Historical Project conducted by Bishop Museum in the late 1960's and early 1970's (see Map 5). This project, however, did not identify any features of historic significance within the boundaries of the property investigated during the current study.

Archaeological investigations conducted by ACH systematically surveyed the entire subject property. This survey determined that no sites of historic significance are located on the parcel. A currently utilized water tank sits in the corner of the main portion of the property and two modern buildings which provide functional support for the current tank are located within the access corridor of the property (see Map 3).

The subject property is located at the base of a talus slope where the grade of the land steepens. This area is also considerably rocky, containing only enough soils for hardy plants to take root. As Green notes, "... there was an abundance of land suitable for wet taro in the lower valley" (1980:28). In addition, un-used areas in the upper valley which would have provided a much greater capacity for agricultural productivity were available. It is therefore unlikely that environmental pressures would induce the cultivation of this portion of the valley. Similarly, habitation of this marginal fringe of the valley would not likely occur. The results of the current study, therefore, are not unexpected.

Map 5: Green's Survey Area Map



source: R. Green 1980

Conclusion

Archaeological Consultants of Hawaii, Inc. has conducted archaeological investigations consisting of a 100% surface survey on the subject property. These investigations were necessary in order to assess the potential impact of future construction activities on the parcel. No sites of historic significance were identified on the property. Based upon the findings of the current investigations, ACH concludes that future construction activities will have "no effect" on the subject property.

Bibliography

Armstrong, R. Warwick

1973 Atlas of Hawaii. University of Hawaii Press, Honolulu.

Foote, Donald E., Elmer L. Hill, S. Nakamura, and F. Stephans

1972 Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii. U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C.

Funk, Evangeline J.

1993 "Botanical Survey Report for the Proposed Reservoir Site, Makaha, Hawaii". Botanical Consultants, Honolulu.

Green, Roger C.

1980 Makaha Before 1880 A.D.: Makaha Valley Historical Project - Summary, Report No. 5. Pacific Anthropological Records, No. 31. B.P. Bishop Museum, Honolulu.

Pukui, Mary K., Samuel H. Elbert, and Esther T. Mookini

1974 Place Names of Hawaii. University of Hawaii Press, Honolulu.