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

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DEPUTY CHIEF PLANNING OFFICER

KK/DGP 4/88-1524

April 29, 1988

Honorable Marvin T. Miura, Interim Director
Office of Environmental Quality Control
State of Hawaii
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Final Environmental Impact Statement (FEIS)
Ewa Gentry Development - The Gentry Companies
Tax Map Keys 9-1-10: por. 7; 9-1-14: 29, 30, por. 5

We are notifying you of our acceptance of the above as an adequate fulfillment of Chapter 343, HRS, and the EIS Rules.

The following unresolved issues are to be addressed prior to development:

1. The project will require new water source system approval from the State Department of Health, increased water allocations within the Pearl Harbor Groundwater Control Area from the Board of Land and Natural Resources and Board of Water Supply approval of a water master plan.

2. A drainage plan approved by the Department of Public Works which includes mitigation of downstream flood concerns.

3. A sewer master plan for on- and off-site sewer system improvements approved by the Department of Public Works.

4. Highway improvement plans and programs as required by the City Department of Transportation Services and the State Department of Transportation.

5. Resolution of the terms of the unilateral agreement requiring on-site and off-site facility improvements agreed to by the previous developer (Hirano Brothers, Ltd., & Associates).

6. A park and recreation plan approved by the Department of Parks and Recreation.

These issues are discussed in the attached Acceptance Report. If there are any questions, please contact Keith Kurahashi of my staff at 527-6051.

Sincerely,

Donald A. Clegg

DONALD A. CLEGG
Chief Planning Officer

Attach.

cc: Mr. David Bills, Gray, Hong, Bills & Associates
Mr. Tosh Hosoda, The Gentry Companies

DEPARTMENT OF GENERAL PLANNING (DGP)
87/CO-2

ACCEPTANCE REPORT: CHAPTER 343, HRS
ENVIRONMENTAL IMPACT STATEMENT (EIS)
EWA GENTRY DEVELOPMENT PLAN AMENDMENT
THE GENTRY COMPANIES
EWA, OAHU, HAWAII
TAX MAP KEY 9-1-10: POR. 7
9-1-14: 29, 30, POR. 5

A. Background

The proposed Ewa Gentry Development consisting of 932 acres is the subject of a City and County of Honolulu Development Plan Amendment Review. The project site is presently designated Agriculture, Residential, Low Density Apartment and Park on the Ewa Development Plan Land Use Map.

Most of the project site (857 acres) is used for sugarcane cultivation by the Oahu Sugar Company. These lands have been in sugarcane cultivation since the late 1800's when Ewa Plantation Company began cultivating and processing sugar in Ewa. The development includes single-family residential units, low density apartments, one 18-hole golf course, an elementary school, two public parks, roadways and greenbelts. The acreage for these uses are as follows:

Residential	429 acres
Apartment-Low Density	190 acres
Golf Course	180 acres
School	10 acres
Parks	29 acres
Roadways	36 acres
Greenbelts	20 acres

The proposed development would result in the creation of 7,150 single family and apartment (townhouse) units. The developer projects that the apartment units will sell at about $70,000 to $120,000 and single family homes will sell at about $120,000 to $175,000.

The proposed project will include roadway, drainage, sewer system, water system, and underground electrical and telephone improvements.

The proposed project will access Fort Weaver Road at Renton Road, Geiger Road and a planned future road. A new north-south roadway will need to be constructed, west of Fort Weaver Road between the project site and the H-1 Freeway. Traffic improvements will also be required at Fort Weaver Road's intersection with Renton Road, the new proposed roadway and Geiger Road.

At full development, the estimated demand for potable water will be approximately 3.43 MGD per day. An additional 1.03 MGD of non-potable water will be needed for golf course irrigation. The developer through participation in the Ewa Plain Water Development Corporation proposes to construct off-site water source, storage reservoirs, transmission and distribution mains and on-site transmission lines which will be designed and constructed to meet City standards. The system will be turned over to the Board of Water Supply for operation and maintenance upon completion.

The proposed Ewa Gentry development is expected to generate an average daily sewage flow of approximately 2.6 MGD when fully developed. Wastewater will be pumped to the nearby regional sewage treatment plant at Honouliuli for treatment. The developer recognizes that only 3,550 sewer hookups can be accommodated at this time. If all proposed developments in the Honouliuli Treatment Plant tributary area are eventually constructed, the capacity of the proposed plant expansion to 38 MGD will be exceeded.

The proposed project's site improvements will cost approximately $52 million.

B. Procedures

1. An EIS Preparation Notice, prepared by the applicant's consultant appeared in the "Environmental Quality Commission (EQC) Bulletin" on December 23, 1987. This was distributed to all interested Federal, State, and City and County agencies, as well as community interest groups.

2. Comments from consulted parties were received until January 28, 1988, allowing all parties greater than the required 30-day minimum consultation period. Nineteen parties submitted written comments during this period, which were responded to in writing by the applicant.

3. The Draft EIS was received and distributed by the OEQC. It appeared in the "EQC" Bulletin on February 8, 1988. The deadline for public review was then set for March 24, 1988.

4. Twenty-six (26) parties made replies to the Draft EIS. Three of these twenty-six replies were dated and received after the deadline for public review. The applicant made point-by-point responses to all substantive comments on the twenty-three replies received by the public review deadline, within the 14-day response period.

C. Content

The Final EIS for the proposed Ewa Gentry Development adequately addresses the content requirements specified in Sections 11-200-16 through 18 of the EIS Rules.

D. Responses to Comments

The applicant provided adequate point-by-point responses to all comments received within the 30-day response period established for the Draft EIS.

E. Unresolved Issues

We concur with the following summarized listing of unresolved issues, which require resolution prior to approval of an application for rezoning, found on page 4-20 to 4-22 (Section 4.7) of the Final EIS:

1. The project will require new water source system approval from the State Department of Health, increased water allocations within the Pearl Harbor Groundwater Control Area from the Board of Land and Natural Resources and Board of Water Supply approval of a water master plan.

2. A drainage plan approved by the Department of Public Works which includes mitigation of downstream flood concerns.

3. A sewer master plan for on- and off-site sewer system improvements approved by the Department of Public Works.

4. Highway improvement plans and programs as required by the City Department of Transportation Services and the State Department of Transportation.

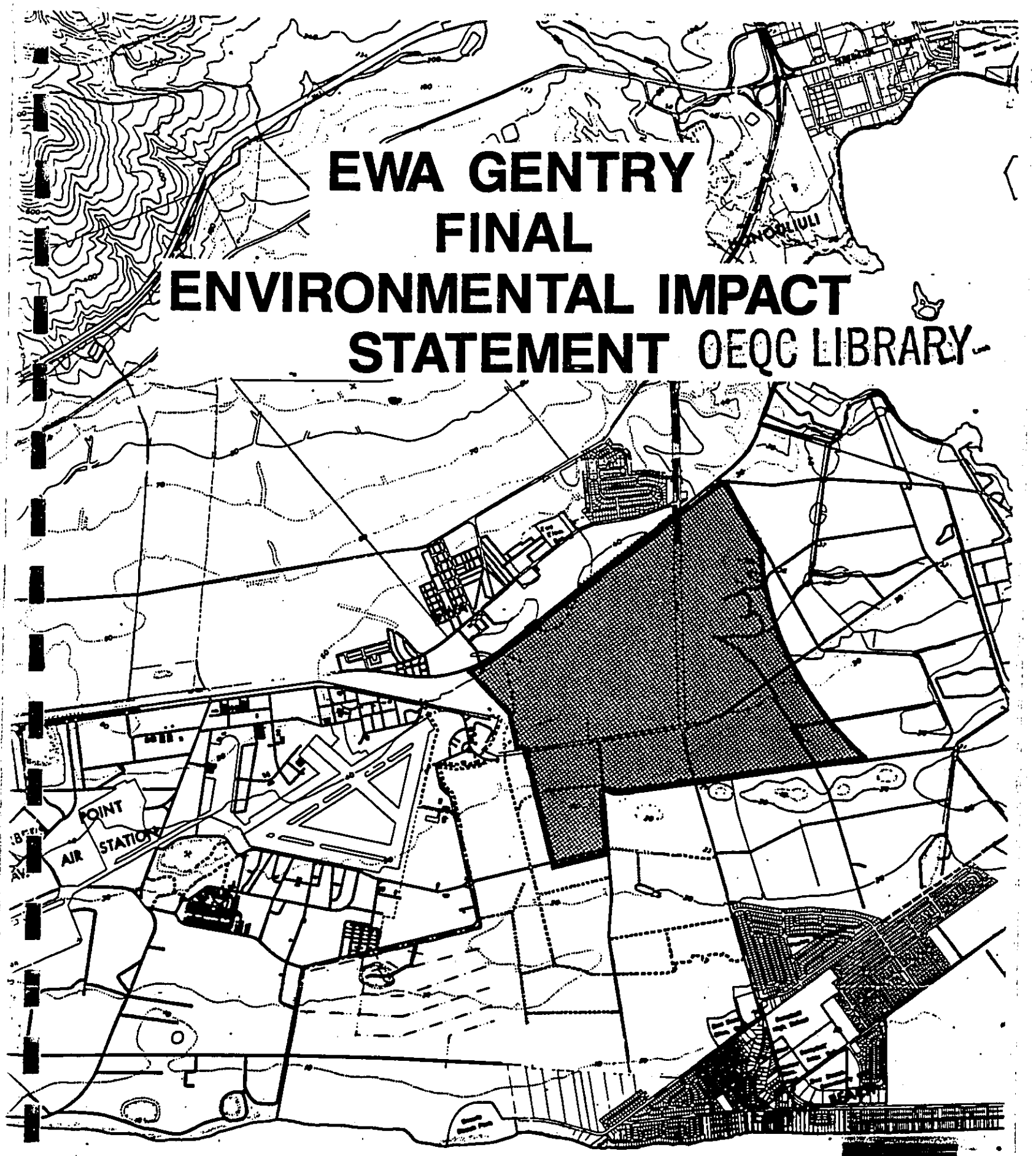
5. Resolution of the terms of the unilateral agreement requiring on-site and off-site facility improvements agreed to by the previous developer (Hirano Brothers, Ltd., & Associates).

6. A park and recreation plan approved by the Department of Parks and Recreation.

F. Determination

The Final EIS is determined to be acceptable under the procedures and requirements established in Chapter 343, HRS, and the State "EIS Rules." This determination in no way implies a favorable recommendation on the applicant's request for any approvals required by the Department of General Planning.

DONALD A. CLEGG
Chief Planning Officer



EWA GENTRY
FINAL
ENVIRONMENTAL IMPACT
STATEMENT

GRAY,HONG,BILLS & ASSOCIATES,INC

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EWA GENTRY

FINAL ENVIRONMENTAL IMPACT STATEMENT

Prepared for

THE GENTRY COMPANIES

by

GRAY, HONG, BILLS & ASSOCIATES, INC.
119 MERCHANT STREET, SUITE 607
HONOLULU, HAWAII 96813
(808) 521-0306

APRIL, 1988

DAVID B. BILLS, VICE PRESIDENT
GRAY, HONG, BILLS & ASSOCIATES, INC.

DRAFT ENVIRONMENTAL IMPACT STATEMENT
EWA GENTRY PROJECT
PROJECT SUMMARY

Prepared by:

Gray, Hong, Bills & Associates, Inc.
119 Merchant Street, Suite 607
Honolulu, Hawaii 96813
(808) 521 - 0306

Point-of-Contact: Mr. David Bills, P.E., Vice President

ABSTRACT: The Gentry Companies proposes to develop 7,150 single family and multi-family units on a 932-acre site which is situated in the Island of Oahu's Ewa district. The project is planned to be gradually developed during the CY 1988-1995 period. The developer will provide land dedications for a new elementary school, two community parks, and onsite utility systems.

Project alternatives considered included the no project option; the development of comparable housing in other Oahu planning areas; the development of a total residential community in the Ewa district; and a residential community with limited support services in the Ewa district.

The Ewa Gentry project will generate a resident population of 26,000 new residents in the Ewa district. The new resident population will impact the capacity of local schools, recreational facilities, roads, and utility systems. The project will also eliminate 857 acres of land currently in sugarcane cultivation. New impermeable building structures will reduce the amount of groundwater recharge into the local aquifer. Increased vehicular traffic will increase noise levels and decrease ambient air quality in the vicinity of the project site.

Project impacts will be mitigated by the dedication of onsite lands for a new elementary school and two community parks. Project construction will produce an estimated 630 jobs in direct employment and 1,700 additional jobs in indirect and induced employment which will create over $106.5 million of new local income. New consumer purchases within the Ewa district will also generate approximately 210 new jobs in Ewa's retail and commercial services sector which will create some $2.6 to $3.5 million of additional direct income to Ewa district households. The use of the lands for residential purposes will also significantly reduce the amount of non-potable water consumption from the local aquifer. Anticipated reductions in air quality will be mitigated somewhat by scheduled water applications during the construction period. The project is generally consistent with the plans and policies of the City and County of Honolulu, the State of Hawaii, and The Estate of James Campbell.

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CHAPTER 1.0

INTRODUCTION

1.1 PURPOSE OF THE REPORT

The purpose of this environmental impact statement is to:

1. identify, evaluate and compare reasonable project alternatives for providing additional housing in Oahu's Ewa district via a private development organization;

2. evaluate the characteristics and trends of the project area and surrounding Ewa district which influence local physical, biological, and cultural resources, and the related built environment;

3. determine the significant environmental consequences associated with the selected residential development alternative; and

4. identify practical mitigative measures which can reduce the impact of the proposed housing development.

This information is also intended to provide the City and County of Honolulu and the State Land Use Commission with the information necessary to evaluate 1) an existing development plan amendment request, and 2) a future State land use boundary change request, by Thomas H. Gentry. The EIS will also serve as a central source of information for those reviewing agencies which are responsible for the management of statewide resources and/or the evaluation of development actions which may affect natural and man-made resources in Hawaii.

1.2 SCOPE OF THE EIS

The EIS contains a combination of quantitative and qualitative anslyses which were made to meet the objectives of this report (Section 1.1). These objectives parallel the requirements outlined in Chapter 343, Hawaii Revised Statutes, and the rules and regulations of the State Office of Environmental Quality Control.

A portion of the information which is required as part of the City and County of Honolulu's Development Plan amendment process has also been incorporated into the EIS. This information supplements previous information already provided to the City and County of Honolulu, Department of General Planning, by The Gentry Companies.

1.3 REPORT ORGANIZATION

Chapter 1.0 outlines the general objectives of the EIS and the intended use of the information presented.

Chapter 2.0 identifies and compares five different project alternatives to providing additional single family and multi-unit housing in the Ewa district. The issues influencing the selection of the most desirable alternative by The Gentry Companies are also examined.

Chapter 3.0 assesses the significant characteristics and trends influencing the physical, biological, and cultural resources, and built environment, of the affected project site and the surrounding Ewa district.

Chapter 4.0 evaluates the anticipated environmental consequences of the selected project alternative. To the extent possible, significant impacts are quantified to facilitate the reviewers' assessment of project consequences. Feasible mitigation measures, which are expected to reduce anticipated project consequences, are also identified.

The relationship between the short-term use of the project area's natural and man-made resources is explored and contrasted with longer term resource management considerations. Anticipated project consequences which will require an irreversible or irretrievable commitment of natural resources are also identified.

Chapter 5.0 provides a summary of references used during the preparation of the EIS.

1.4 METHODOLOGY

Preparation of the EIS and related evaluations involved the performance of both quantitative and qualitative analyses. These analyses relied primarily upon available information from public agencies and private organizations. Available information was obtained through the use of existing technical reports and supplemented by informal discussions with selected agency representatives.

The City and County of Honolulu, Department of General Planning, provided preliminary estimates and forecasts of anticipated population, employment and housing trends for calendar years 1985 through 2005. These forecasts established a statistical basis for evaluating and quantifying the cumulative impact of the proposed project upon the local economy and built environment.

The Department of General Planning (DGP) estimates and forecasts (Tables 2-1, 3-9, and 3-11, as well as corresponding Tables 2-2, 2-4, and 2-5 of Appendix G) were developed by DGP for the City and County of Honolulu, Oahu Metropolitan Planning Office (OMPO).

OMPO is using these and other related forecasts for its ongoing update of the HALI 2000 Study.

DGP used a variety of development assumptions in the preparation of these forecasts which should not be construed as the Department's endorsement of any proposed development projects, or a desired level of urbanization, in the Ewa district. Further, since future population, employment and housing stock estimates and forecasts continue to be revised by DGP, they should be considered preliminary.

Field reconaissance surveys of the project area's biological and historical/archaeological resources were also made to obtain site specific information which was previously unavailable for the project area.

1.5 AGENCY AND PUBLIC CONSULTATION

The concerns of public agencies and private organizations were solicited via the circulation of an initial EIS preparation notice to 24 public agencies, seven utilities and private corporations, and eight community organizations and/or neighborhood boards. A complete circulation list for the draft EIS preparation notice is presented in Appendix A. Documented concerns from 23 public agencies, organizations and individuals reviewing the draft EIS report are presented in Appendix B along with responses made during the consultation process by Gray, Hong, Bills & Associates, Inc.

Selected community representatives, from community organizations contained in the circulation list, were contacted by telephone and/or personal interview to ensure a substantive response from community organizations. Community concerns expressed by community leaders were documented, evaluated, and later incorporated in the social impact analysis made for the project.

1.6 RESPONSIBILITY FOR EIS PREPARATION

This environmental impact statement was prepared by Gray, Hong, Bills & Associates, Inc. at the request of The Gentry Companies, a well-known, reputable land development organization based on the Island of Oahu.

Preparation of the EIS was under the direction of Mr. David Bills, P.E., a principal of Gray, Hong, Bills & Associates, Inc. Other subconsultants supporting his efforts included:

James Pedersen, Planning Consultant
Bruce Plasch, Decision Analysts Hawaii, Inc.
Winona Char and George Linney, Char & Associates
Andrew Berger, Biological Consultant
Julian Ng, Parsons Brinkerhoff Quade & Douglas, Inc.

The general professional background of the primary persons involved in the preparation of this EIS is provided in Table 1-1.

TABLE 1-1

PRIMARY PARTICIPANTS
ENVIRONMENTAL IMPACT STATEMENT PREPARATION
EWA GENTRY PROJECT

Participant/ Position	Educational Background	Professional Background
David Bills, Vice-President, Gray, Hong, Bills & Associates	M.S., Civil Engineering, Sanitary, Purdue Unversity; B.S., Civil Engineering, University of Hawaii	Civil engineer with 12 years of site and facility planning and design in Hawaii; engaged in civil site work and related activities for subdivisions, cluster housing, planned unit developments.
James Pedersen, Planning Consultant	Graduate Studies, Planning, University of Hawaii and University of Alaska; B.A., Political Science, Pacific Lutheran University	Planning consultant with 18 years of experience in natural resources, facilities, and site planning throughout the Pacific Basin.
Andrew Berger, bird & wildlife consultant	Ph.D., Zoology, University of Michigan	Study of wildlife in various Pacific islands for 24 years; author of Hawaiian Birdlife published by UH Press.
Winona Char, botanical consultant, Char and Associates	M.S., Botanical Sciences, Univ. of Hawaii	Consultant with 12 years of experience in plant, taxonomy; has special expertise with Hawaiian flora.
Joe Kennedy, archaeologist, Archaeologists of Hawaii, Inc.;	M.S., Anthropology, U. of Hawaii; B.A., Ancient History & Archaeology, John Pershing College	Archaeologist with 23 years experience, specializing in Polynesian Prehistory.
George Linney, botanical consultant; subconsultant to Char & Associates	M.S., Botany, University of Texas at LaMar; B.A., Chemistry, University of Texas at LaMar	Botanist with 10 years experience throughout Hawaii.

TABLE 1-1 (cont).

PRIMARY PARTICIPANTS
ENVIRONMENTAL IMPACT STATEMENT PREPARATION
EWA GENTRY PROJECT

Participant/ Position	Educational Background	Professional Background
Julian Ng, P.E. traffic engineer, Parsons, Brinckerhoff, Quade & Douglas, Inc.	B.S., Civil Engineering, University of Hawaii	15 years experience in civil engineering and traffic studies in Hawaii.
Bruce Plasch, President, Decision Analysts Hawaii, Inc.	Ph.D., Engineering Economic Systems, Stanford University	Extensive consulting experience in the economic analysis of land and resource development; has conducted numerous impact studies for private and public agencies.

CHAPTER 2.0

PROJECT ALTERNATIVES

2.1 SIGNIFICANT FACTORS INFLUENCING ALTERNATIVE SELECTION

The policy to direct urban growth to the Ewa area (Figure 2-1) was initiated by the City and County of Honolulu, Department of General Planning, when Ewa was initially designated as Oahu's Secondary Urban Center in its 1977 General Plan.

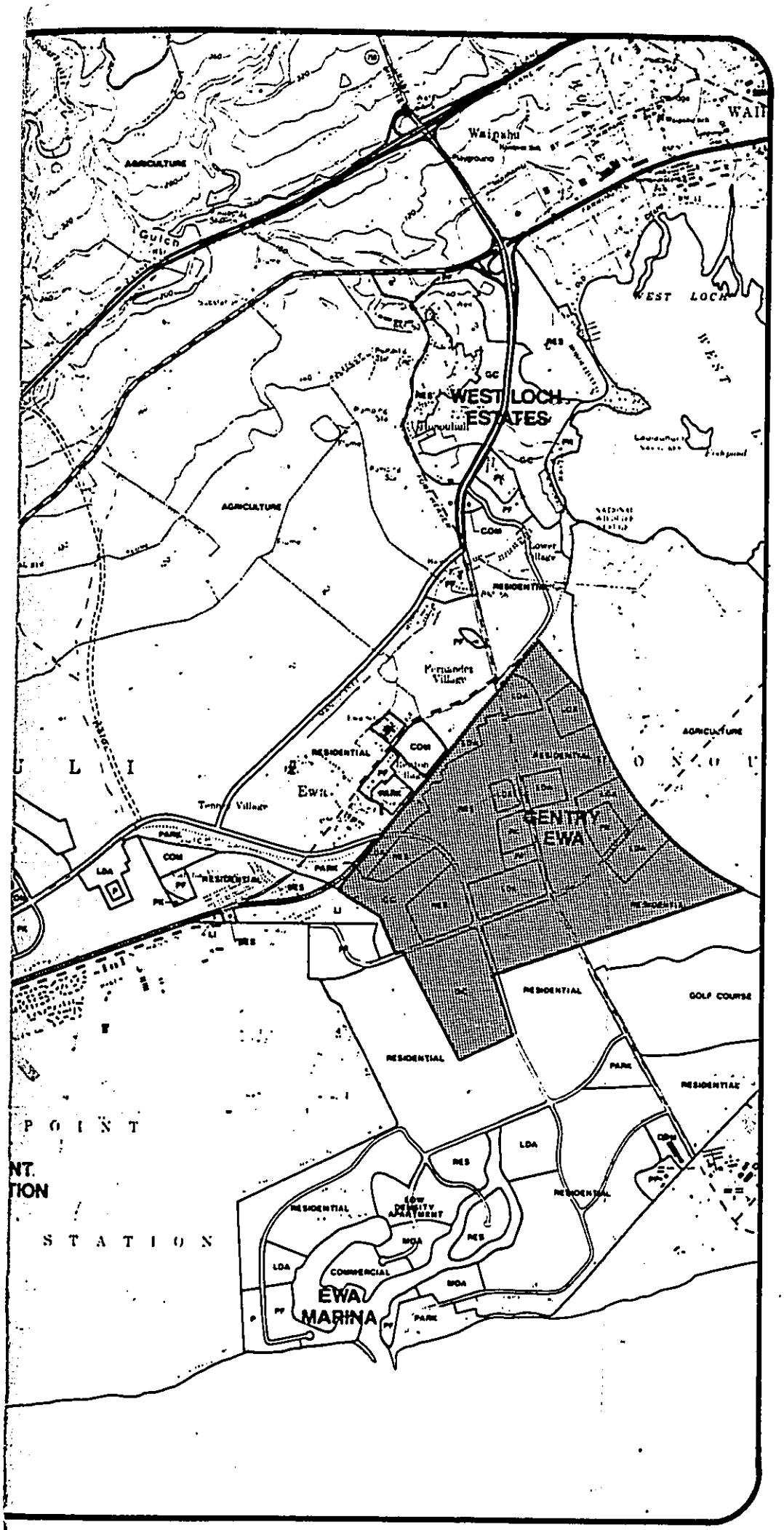
> "The policy was reaffirmed in 1982 when the location of SUC (Secondary Urban Center) was more specifically defined as being in the West Beach-Makakilo area (Helber, Hastert, Van Horn & Kimura, Planners, 1984)."

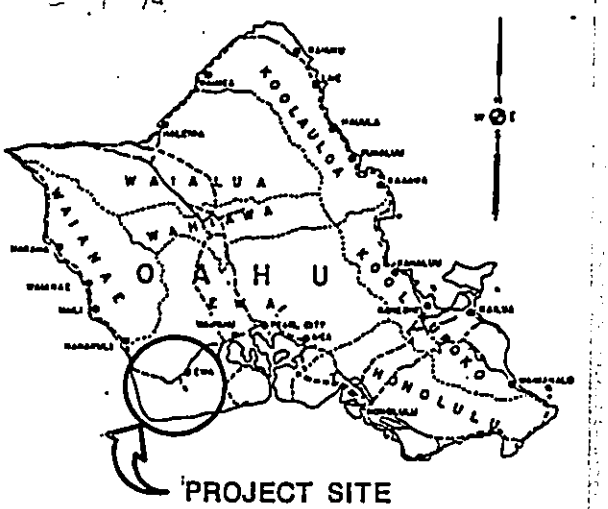
In 1985, the Gentry Companies, a local real estate development company, contracted Wesley H. Hillendahl, consulting economist, to assess the marketability of housing development in the Ewa and Central Oahu districts. This study concluded, in part, that the housing stock in these districts will grow from 50,364 units in 1980 to 107,330 units by calendar year 2005. Profiles of family purchasing power indicated that the strongest demand for family housing is a potential unit cost ranging from $75,000 to $125,000. The income profile for singles suggested a primary market for rental housing which ranges from $250 to $500 per unit per month (Hillendahl, 1985).

In June, 1987, The Gentry Companies concluded an agreement to acquire approximately 75 acres of fee-simple land from Aloha State Corporation, a subsidiary of Hirano Brothers, Ltd. The agreement with Hirano Brothers, Ltd., and concurrent negotiations with the Estate of James Campbell, also provided The Gentry Companies with the rights to acquire and develop some 857 acres of additional contiguous lands, from the Estate of James Campbell, in future years. The Gentry Companies acquired, in part, the land and development rights to Ewa properties, which had previously been slated for residential development by Aloha State Corporation, as well as additional lands on the east side of Fort Weaver Road.

The move by Gentry to acquire these lands was based upon its belief that an economically-feasible residential development opportunity existed. This conclusion was primarily based upon Gentry's recognition of: 1) a growing housing demand in the Ewa district (Hillendahl, 1985; Young, 1988); 2) the stated policy of the City and County of Honolulu to encourage residential development in the less-developed lands of the Ewa district which is destined to become Oahu's secondary urban center; 3) the availability of the former Aloha State Corporation lands at a reasonable acquisition cost and terms; 4) the expectations of potential Oahu homebuyers; and 5) the estimated cost of residential development in the Ewa area.

WEST HILLS
MAKAKILO
KO OLINA
KAPOLEI VILLAGE
KAPOLEI
BARBERS POINT HARBOR
CAMPBELL INDUSTRIAL PARK
BARBERS POINT NAVAL AIR STATION
B A R B E R S P O I N T
N A V A L A I R S T A T I O N
H O N O U L I U L I
Nanakuli
Kahe Point
Puu Kapolei
Puu Makakilo
Puu Kapuai
Barbers Point
GOLF COURSE
RESIDENTIAL
RESORT
LIGHT INDUSTRIAL
HEAVY INDUSTRIAL
COMMERCIAL
MIXED USE
VISITOR ATTRACTION
AGRICULTURE
OFFICE
PARK
LOW DENSITY APARTMENT

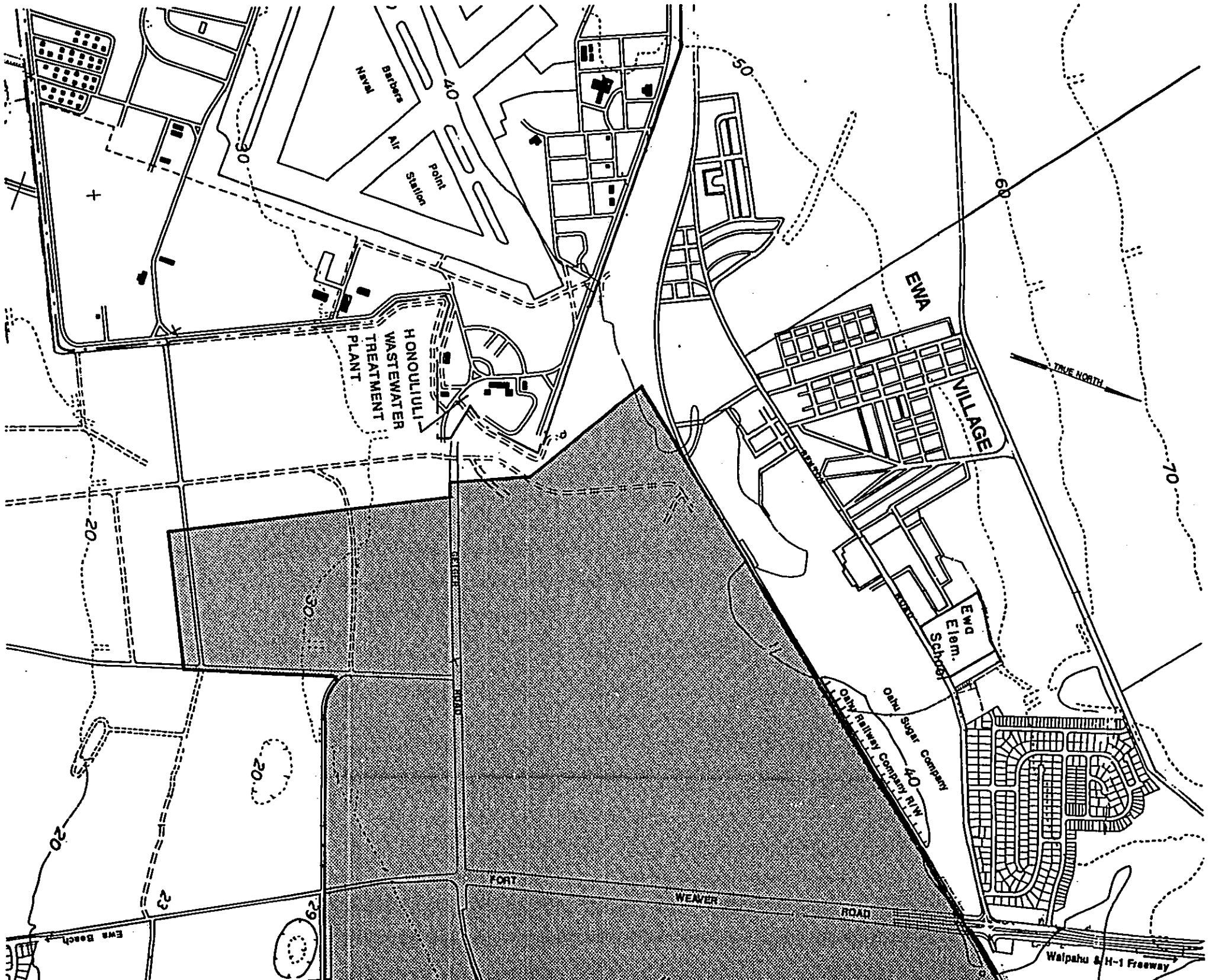




VICINITY MAP
NOT TO SCALE

RES	RESIDENTIAL
LDA	LOW DENSITY APARTMENT
MDA	MEDIUM DENSITY APARTMENT
COM	COMMERCIAL/RETAIL
OFF	OFFICE
BP	BUSINESS PARK
LI	LIGHT INDUSTRIAL
HI	HEAVY INDUSTRIAL
RST	RESORT
PK	PARK
MU	MIXED USE
PF	PUBLIC FACILITY
GC	GOLF COURSE
PR	PRESERVATION
AG	AGRICULTURE

FIGURE 2-1
EWA DISTRICT LOCATION MAP


Barbers Point Naval Air Stallon
HONOULIULI WASTEWATER TREATMENT PLANT
EWA VILLAGE
Ewa Elem. School
Oahu Sugar Company
Oahu Railway Company R/W
FORT WEAVER ROAD
Waipahu & H-1 Freeway
TRUE NORTH
Ewa Beach
0
20
30
40
50
60
70

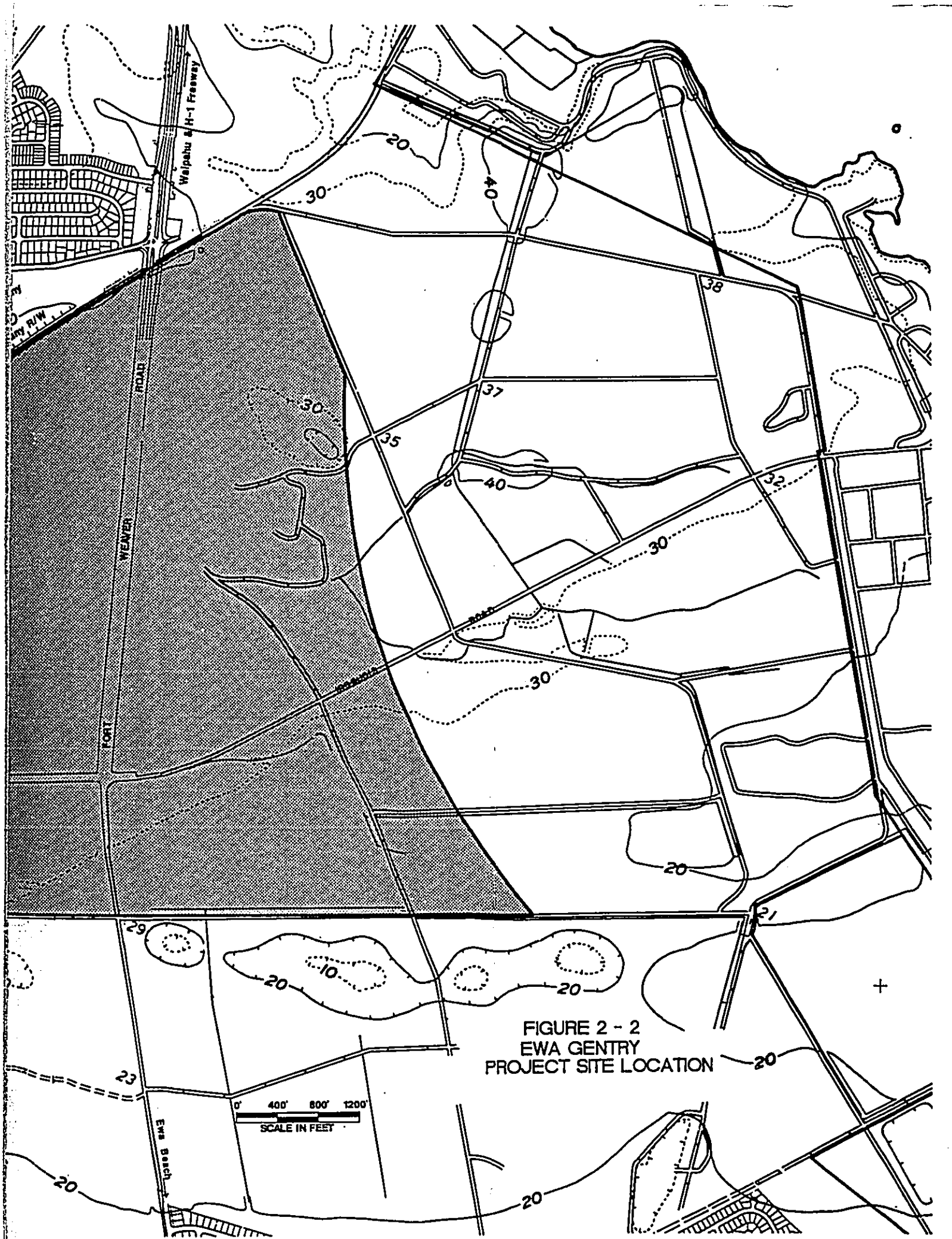


FIGURE 2 - 2
EWA GENTRY
PROJECT SITE LOCATION

Since the initial 75 acres of the 932-acre project site (Figure 2-2) are already included in the present City and County Development Plan, The Gentry Companies has already proceeded with the development of an initial increment containing 413 single family units. All of the units offered for sale were pre-sold during the first three weeks of September, 1987.

2.2 METHOD OF EVALUATION

Four project alternatives are presented in Sections 2.3 through 2.6 and are identified in terms of general project scope, location, and significant project consequences. Subsequently, development options for residential development are further evaluated on a comparative basis. Arbitrary statistical ratings and related comparisons were also made to determine the desirability and undesirability of those potential impacts which 1) may be significant and/or 2) are of concern to public agencies or community organizations coordinated with during the preparation of the EIS (Figure 2-3). Project evaluation criteria considered the following issues:

Housing demands in the Ewa district;
Future housing absorption and supply in the Ewa district;
Retail and service employment in the Ewa district;
Vehicular traffic in the Ewa district;
Increased stormwater flows in the Ewa district;
Availability of agricultural lands on Oahu;
Agricultural employment in the Ewa district;
Noise levels in the Ewa district;
Availability of public services in the Ewa district; and
Visual resource quality.

2.3 ALTERNATIVE A: THE NO PROJECT ALTERNATIVE

One approach to meeting future residential development demands in the Ewa area is to not develop the lands acquired by The Gentry Companies. The City and County of Honolulu, Department of General Planning, estimates that cumulative residential development proposals already indicate the potential construction of approximately 30,000 homes in the the Ewa District during the next 20 years. Future housing absorption in the district has been estimated to accommodate roughly 16,500 units between calendar years 1985 and 2005, or approximately 826 units/year during the same period (Young, 1988).

This project alternative, in essence, assumes that anticipated residential demands will be accommodated through the development of other proposed housing projects in the Ewa district which have already been proposed by both private enterprise and the City and County of Honolulu. For the purposes of this analysis, it is theoretically assumed that the following proposed projects would receive appropriate governmental approvals and be constructed by the year 2005:

FIGURE 2-3
SAMPLE PROJECT ALTERNATIVE EVALUATION FORM
EWA GENTRY PROJECT
PROJECT ALTERNATIVE:_____

Evaluation Criteria	Weighted Value	Rating (0 to 10)	Total Score
1. Ewa Housing Demand	1.00		
2. Future Housing Absorption and Supply in Ewa District	0.85		
3. Retail and Service Employment in Ewa District	0.90		
4. Vehicular Traffic in Ewa District	0.75		
5. Increased Stormwater Flows in Ewa District	0.50		
6. Availability of Agricultural Lands on Oahu	1.00		
7. Agricultural Employment in Ewa District	0.90		
8. Noise Levels Within Ewa District	0.50		
9. Availability of Public Services in Ewa District	0.50		
10. Visual Resources	0.20		
		TOTAL SCORE	

Source: Gray, Hong, Bills & Associates, Inc., 1988

Location	Number of Residential Units
West Beach	5,200
Makakilo	3,700
Ewa Beach	400
Ewa Village	380
Ko Olina (West Beach Expansion)	6,600
Kapolei Town Center	1,700
Kapolei Village	5,000
Ewa Marina	4,800
West Loch	1,500
Other Smaller Projects	350
Total	29,630

2.4 ALTERNATIVE B: DEVELOPMENT OF HOUSING IN OTHER PLANNING AREAS OUTSIDE THE EWA DISTRICT

A second option to meeting increasing housing demands is to develop additional housing in other planning areas outside the Ewa district. Recent discussions with the City and County of Honolulu, Department of General Planning, indicate that Ewa is the primary focus of future residential and development (Clegg, 1987). The Department recognizes that some areas on Oahu, e.g. Windward Oahu and North Shore, have already reached, or are rapidly approaching a desirable development capacity (Clegg, 1987). At the same time, the Department has also estimated that there is potential for private developers to provide some limited residential infilling given anticipated annual rates of housing absorption (Table 2-1).

Anticipated housing absorption forecasts for other Oahu planning areas indicate that private developers such as The Gentry Companies have an opportunity to develop approximately 27,000 homes in other planning areas outside the Ewa district during the 1988-1995 period. Alternative B assumes that The Gentry Companies would develop one or more projects outside the Ewa district from 1988 through 1995.

TABLE 2-1
ANTICIPATED HOUSING ABSORPTION
OAHU PLANNING AREAS
CY 1986 THROUGH 2005

YEAR	PUC	EWA	CEN OAHU	EAST HON	KPOKO	KLOA	N SHORE	WAIANAE	TOTAL
1986	2988.	846.	764.	434.	269.	82.	83.	84.	5571.
1987	1937.	392.	525.	92.	233.	10.	18.	72.	3189.
1988	1918.	995.	490.	261.	408.	224.	60.	140.	4497.
1989	2750.	767.	518.	189.	130.	56.	42.	45.	4497.
1990	2254.	852.	645.	223.	344.	67.	51.	61.	4497.
1991	1972.	995.	644.	261.	379.	72.	66.	88.	4497.
1992	2229.	833.	512.	361.	233.	120.	87.	121.	4497.
1993	1467.	848.	516.	372.	237.	119.	91.	128.	3776.
1994	1426.	864.	506.	384.	243.	122.	94.	136.	3776.
1995	1727.	783.	431.	348.	215.	60.	85.	125.	3776.
1996	1090.	1019.	572.	464.	282.	60.	115.	174.	3776.
1997	1091.	996.	596.	470.	293.	31.	117.	181.	3776.
1998	1272.	695.	429.	329.	210.	32.	83.	128.	3177.
1999	791.	854.	552.	412.	264.	33.	105.	165.	3177.
2000	789.	840.	570.	408.	264.	34.	105.	167.	3177.
2001	454.	944.	663.	465.	298.	36.	121.	196.	3177.
2002	468.	1201.	416.	597.	45.	28.	160.	261.	3177.
2003	467.	868.	402.	813.	-0.	28.	230.	371.	3177.
2004	1359.	519.	398.	334.	145.	64.	207.	151.	3177.
2005	1832.	511.	394.	94.	213.	68.	29.	35.	3177.
ALL	30281.	16529.	10543.	7333.	4728.	1348.	1950.	2829.	75542.
AVG	1514.	826.	527.	367.	236.	67.	98.	141.	3777.

Source: City and County of Honolulu, Department of General Planning, 1988

2.5 ALTERNATIVE C: DEVELOPMENT OF A TOTAL NEW COMMUNITY PROVIDING RESIDENTIAL, COMMERCIAL, AND PUBLIC SERVICES

A third project option is the development of total new community in the Ewa district which is self-supporting in terms of commercial and public services. Alternative C would ensure the availability of adequate services to support a future residential population which is somewhat distant from diversified commercial services. Onsite project amenities offered via Alternative C would include commercial and public services such as a commercial retail shopping complex; neighborhood library; elementary, intermediate and high school; public safety complex; community park; and community center.

Under this alternative, it is assumed that the private developer would dedicate lands in the project area for these purposes. However, public agencies would provide monies for the development and operation of all community services. One exception would be development of the retail shopping complex which would be constructed by the developer. Following construction, the developer would manage and lease commercial retail floor space to local business entrepreneurs.

While offering an attractive and convenient marketing concept to prospective homebuyers and home renters, this development approach would significantly reduce potential economic benefits to existing commercial retail services in the nearby Ewa Beach community. Increased private development, and associated land dedications to appropriate public agencies, would also generate higher housing costs, making homes less affordable to many prospective buyers.

This option was considered by The Gentry Companies during its evaluation of the proposed development opportunity. However, this option was eliminated from consideration because of the continued interest by the Estate of James Campbell to develop the proposed Kapolei Town Center.

2.6 ALTERNATIVE D: RESIDENTIAL DEVELOPMENT WITH LIMITED SUPPORT SERVICES

A fourth option is to develop a residential community which provides a variety of competitively-priced housing and supplements existing community and public services with the dedication of fee simple lands for a new elementary school and two community parks. Both the school and park facilities would eventually be constructed by the State Department of Education and the City and County of Honolulu, Department of Parks and Recreation.

In contrast to the alternate development of a total residential community (see Section 2.5), alternative D focuses less on the development of onsite amenities and allows existing commercial centers, e.g. Ewa Beach Shopping Center, to gain income benefits

from increased retail sales and commercial services once the project begins.

In the longer term, e.g. 10 years, this development alternative will provide a consumer market which, combined with other proposed residential projects, will help spur and support the development of the Kapolei Town Center. Limitation of the amount of supporting commercial and public services will also enable the private developer to reduce front-end development costs and, concurrently, offer new homes and rental housing at more affordable prices.

2.7 COMPARISON OF PROJECT ALTERNATIVES

2.7.1 Introduction

The alternatives presented involve the required no project alternative (Alternative A), one offsite option (Alternative B), and two residential development alternatives within the Ewa district (Alternatives C and D). The general benefits and consequences of these alternatives are more specifically compared in the context of various planning issues, e.g., retail and service employment.

An arbitrary statistical evaluation system was developed to supplement the general description and comparative discussion of project alternatives. This evaluation system was developed to further compare the overall advantages and disadvantages of the four project alternatives. This technique also provides reviewers of the impact statement with a basis for determining their own ratings of the four project alternatives.

Using a comparative matrix form (Figure 2-3) for each alternative, statistically-weighted evaluation criteria were given rated scores ranging from 0 to 10. For example, a potential criteria score of 0 represented a significant adverse impact or project disadvantage. A potential score of 5 would indicate that the alternative would produce little change from existing conditions and create no significant consequences. Conversely, a criteria score of 10 would identify an issue which is expected to generate a significant project benefit. Total scores were calculated for each alternative; the alternative having the greatest total score was considered to be the most favorable project alternative.

2.7.2 Housing Supply and Demand in the Ewa District

The difference between proposed housing units, estimated housing absorption, and actual long-term home sales in the Ewa district will not be realized for 20 years. However, despite existing statistical forecasts, the pre-sale of

units in Ewa Gentry's first project increment (Soda Creek) has already generated the sale of 360 single family units during the first three weeks of September, 1987, as well as a growing "waiting list" for prospective buyers following initial project marketing. Consequently, early signs of a significant demand for affordable, quality homes in the Ewa district are already evident.

These sales trends may, in part, reflect some early speculative investments in the proposed overall project. Discussions with local real estate salespersons indicate, however, that the majority of these sales has been to prospective owners who will likely occupy their homes immediately after construction. Future rates of annual housing absorption in the Ewa district, which have been forecasted by the Department of General Planning, will also be significantly affected by the uncertain schedule for a number of the proposed residential projects in the Ewa area.

Since development planning assumptions for the district assume the construction of several major residential development projects and various other development factors, saturation of the local housing demand in the Ewa district, via Alternatives A, C and D, is not expected. Private development organizations, having development interests in the district, will carefully monitor their investments in view of the substantive front-end development expenditures which will be necessary to construct any of the larger proposed residential projects. Consequently, the "no-project" option (Alternative A) would only create a higher demand for residential units in other proposed residential development projects within the Ewa district.

Anticipated housing absorption outside the Ewa district (Table 2-1) indicates that The Gentry Companies has an opportunity to develop and market homes throughout Oahu, particularly in Oahu's Primary Urban Center, Central Plains, and East Honolulu planning areas. Should The Gentry Companies pursue Alternative B, a large portion of the project area could potentially be used for other purposes. This alternative would, of course, be unattractive to The Gentry Companies which has already acquired land and development rights from Hirano Brothers and The Estate of James Campbell.

Recent policy actions by the State Land Use Commission, and ongoing residential development programs of the City and County of Honolulu, indicate considerable public agency concern for the development of affordable housing. Housing program efforts of the City and County of Honolulu have focused upon the development of affordable housing in the Ewa and Central Plains areas, e.g. West Loch Housing project, where land values generally offer a more economically-feasible development opportunity. The development of residential property outside the Ewa district

is likely to generate the construction of less-affordable housing to prospective Oahu home purchasers.

2.7.3 Retail, Service and Agricultural Employment

Retail, service and agricultural jobs comprise a significant portion of present employment opportunities in the Ewa district.

Some 4,000 acres of land in sugarcane production by Oahu Sugar Company are gradually being withdrawn from production to accommodate a combination of proposed resort, residential and commercial projects in the Ewa district during the next 20 years. Assuming governmental approval and full development of these proposed projects, Oahu Sugar Company lands under cultivation in Ewa and Central Oahu would decline from roughly 13,500 to 8,500 acres. This trend may require Oahu Sugar to switch to a one-mill operation to maintain economic viability.

None of the four project development alternatives are independently expected to threaten the economic viability of Oahu Sugar Company, or to reduce employment. Oahu Sugar generally decreases its labor force by not replacing retiring workers in order to accommodate the planned withdrawal of agricultural lands.

Residential development in the Ewa district will produce a greater number of retail and service jobs with increased consumer retail purchases. Such impacts will occur via Alternatives A, C and D. Alternatives C and D will generate greater retail and service employment because either of these options will induce a larger, cumulative consumer population into the Ewa district.

2.7.4 Vehicular Traffic in the Ewa District

With the exception of Alternative B, each of the project alternatives will generate increased traffic on Ewa District roads. Alternatives C and D will produce the most significant traffic impact since these alternatives will include the cumulative traffic generation of all proposed residential projects (including Ewa Gentry) in the Ewa district.

Alternatives C and D will gradually contribute significant levels of increased vehicular traffic along Fort Weaver Road, as well as intersecting Renton and Geiger Roads. This traffic will diminish the operating capacity of these primary and secondary roadways. Increased traffic levels along Fort Weaver Road may warrant the development of a new north-south roadway between Ewa and the H-1 Freeway.

The location of, and traffic generated by, the other proposed residential projects in Ewa (see Section 2.3) will

create increased traffic volumes throughout the district. Vehicular traffic increases will be most noticeable along Farrington Highway, Kalaeloa Boulevard, Barber's Point Access Road, and Fort Weaver Road. Peak morning and afternoon traffic within the Ewa district will also contribute significant levels of additional eastbound and westbound traffic along the H-1 Freeway.

2.7.5 Increased Stormwater Flows

The growing urbanization of the Ewa district, is expected to produce a significant increase in the amount and rate of stormwater flows and normal drainage runoff. Increased surface drainage flows will generally result from the development of new impermeable surfaces throughout the Ewa district.

The overall increased volume of surface discharge is expected to be mitigated through the use of un-lined drainage courses, ponds and sumps in golf courses and other recreation areas. This general approach will facilitate a groundwater discharge which will reduce surface volumes and increase fresh-water discharge into the local basaltic aquifer.

The no-project alternative (Alternative A) will not increase stormwater flows above those generated by other resort, residential and commercial development projects.

Alternative B will not affect stormwater or normal drainage flows within the Ewa district since residential construction would occur within other Oahu planning areas.

Alternative C will generate increased stormwater flows on the east and west sides of Fort Weaver Road through the development of new impermeable surfaces, e.g., homes and roadways. Similar to other proposed development projects in the Ewa district, increased stormwater flows will be reduced somewhat through golf course development, as well as the related use and alteration of an existing drainage basin, i.e., Kaloi Gulch, on the west side of Fort Weaver Road. These drainage facilities, combined with the development of sumps on the west side of Fort Weaver Road will permit the percolation of a significant portion of the increased drainage flows into the local basaltic aquifer.

2.7.6 Statistical Comparison Results

The statistical comparison of project alternatives (Tables 2-2 through 2-5) indicates the following preference for alternative desirability:

Alternative D - Residential Development with Limited Support Services

Alternative C - Development of Total New Community

Alternative B - Housing Development in Other Oahu Planning Areas

Alternative A - No Project

Alternatives D and C were statistically rated equally and represent two viable options for residential development. Alternative D was selected over alternative C in view of the expressed desire by the Estate of James Campbell to locate commercial retail public services at the proposed Kapolei Town Center.

Alternative B is not expected to significantly influence housing absorption within the Ewa District unless future residential development in the Central Plains area significantly exceeded actual housing absorption.

The future availability of agricultural lands on Oahu was assumed to be affected by all project alternatives. Agricultural lands in Ewa and the Central Plains are under intense development pressure because existing landowners can potentially derive greater economic return from the sale, or lease, of their lands for residential development.

A more detailed description of the selected development option (Alternative D) is presented in Section 2.8.

TABLE 2-2
PROJECT ALTERNATIVE EVALUATION FORM
EWA GENTRY PROJECT
PROJECT ALTERNATIVE A: NO PROJECT

	Evaluation Criteria	Weighted Value	Rating (0-to-10)	Total Score
1.	Ewa Housing Demand	1.00	5	5
2.	Future Housing Absorption and Supply in Ewa District	.85	5	4
3.	Retail and Service Employment in Ewa District	.90	6	5
4.	Vehicular Traffic in Ewa District	0.75	3	2
5.	Increased Stormwater Flows in Ewa District	0.50	4	2
6.	Availability of Agricultural Lands on Oahu	1.00	0	0
7.	Agricultural Employment in Ewa District	.90	3	3
8.	Noise Levels within Ewa District	0.50	2	1
9.	Availability of Public Services in Ewa District	0.20	5	1
10.	Visual Resources	0.20	5	1
				24

TABLE 2-3
PROJECT ALTERNATIVE EVALUATION FORM
EWA GENTRY PROJECT
PROJECT ALTERNATIVE B: HOUSING DEVELOPMENT IN OTHER OAHU PLANNING AREAS

	Evaluation-Criteria	Weighted Value	Rating (0-to-10)	Total Score
1.	Ewa Housing Demand	1.00	5	5
2.	Future Housing Absorption and Supply in Ewa District	.85	5	4
3.	Retail and Service Employment in Ewa District	.90	5	5
4.	Vehicular Traffic in Ewa District	0.75	5	4
5.	Increased Stormwater Flows in Ewa District	0.50	5	3
6.	Availability of Agricultural Lands on Oahu	1.00	3	3
7.	Agricultural Employment in Ewa District	0.90	5	5
8.	Noise Levels Within Ewa District	0.50	5	3
9.	Availability of Public Services in Ewa District	0.50	5	1
10.	Visual Resources	0.20	5	1
				34

TABLE 2-4
PROJECT ALTERNATIVE EVALUATION FORM
EWA GENTRY PROJECT
PROJECT ALTERNATIVE C: DEVELOPMENT OF TOTAL NEW COMMUNITY

	Evaluation Criteria	Weighted Value	Rating (0-to-10)	Total Score
1.	Ewa Housing Demand	1.00	10	10
2.	Future Housing Absorption and Supply in Ewa District	.85	10	09
3.	Retail and Service Employment in Ewa District	.90	10	09
4.	Vehicular Traffic in Ewa District	.75	1	1
5.	Increased Stormwater Flows in Ewa District	.50	2	1
6.	Availability of Agricultural Lands on Oahu	1.00	1	1
7.	Agricultural Employment in Ewa District	.90	3	3
8.	Noise Levels within Ewa District	.50	4	2
9.	Availability of Public Services in Ewa District	.20	7	1
10.	Visual Resources	.20	4	1
				38

TABLE 2-5
PROJECT ALTERNATIVE EVALUATION FORM
EWA GENTRY PROJECT
PROJECT ALTERNATIVE D: RESIDENTIAL DEVELOPMENT WITH LIMITED SUPPORT SERVICES

	Evaluation Criteria	Weighted Value	Rating (0-to-10)	Total Score
1.	Ewa Housing Demand	1.00	10	10
2.	Future Housing Absorption and Supply in Ewa District	.85	10	9
3.	Retail and Service Employment in Ewa District	.90	10	9
4.	Vehicular Traffic in Ewa District	.75	2	2
5.	Increased Stormwater Flows in Ewa District	.50	2	1
6.	Availability of Agricultural Lands on Oahu	1.00	1	1
7.	Agricultural Employment in Ewa District	.90	3	3
8.	Noise Levels Within Ewa District	.50	4	2
9.	Availability of Public Services in Ewa District	.20	6	1
10.	Visual Resources	.20	4	1
				39

2.8 PROJECT DESCRIPTION OF THE SELECTED PROJECT ALTERNATIVE D

2.8.1 General Scope and Project Location

The proposed Ewa Gentry project involves a phased residential development program which will be supplemented by a variety of required support facilities and public services (Figure 2-4). The development programs will be constructed and marketed by the Gentry Companies, an experienced residential developer based on the Island of Oahu.

The project will be developed on a 932-acre project site which is located on the southwest side of the Island of Oahu, approximately 20 miles of Honolulu. The project site, and adjoining project area, is situated on Oahu's Ewa Plain between Ewa Village and Ewa Beach. Vehicular access to the area is available via H-1 Freeway, or Farrington Highway, and Fort Weaver Road. The first increment of the project, Soda Creek, is already under construction since conforming City and County of Honolulu development plan designations and zoning already apply to 225 acres of the entire 932-acre site.

Subsequent development increments are expected to occur through 1996 assuming a timely review and approval of all regulatory documentation. Ultimately, the project will include construction of approximately 7,150 homes. The constructed housing stock will represent roughly equal quantities of single family and multi-family residential units (Table 2-6).

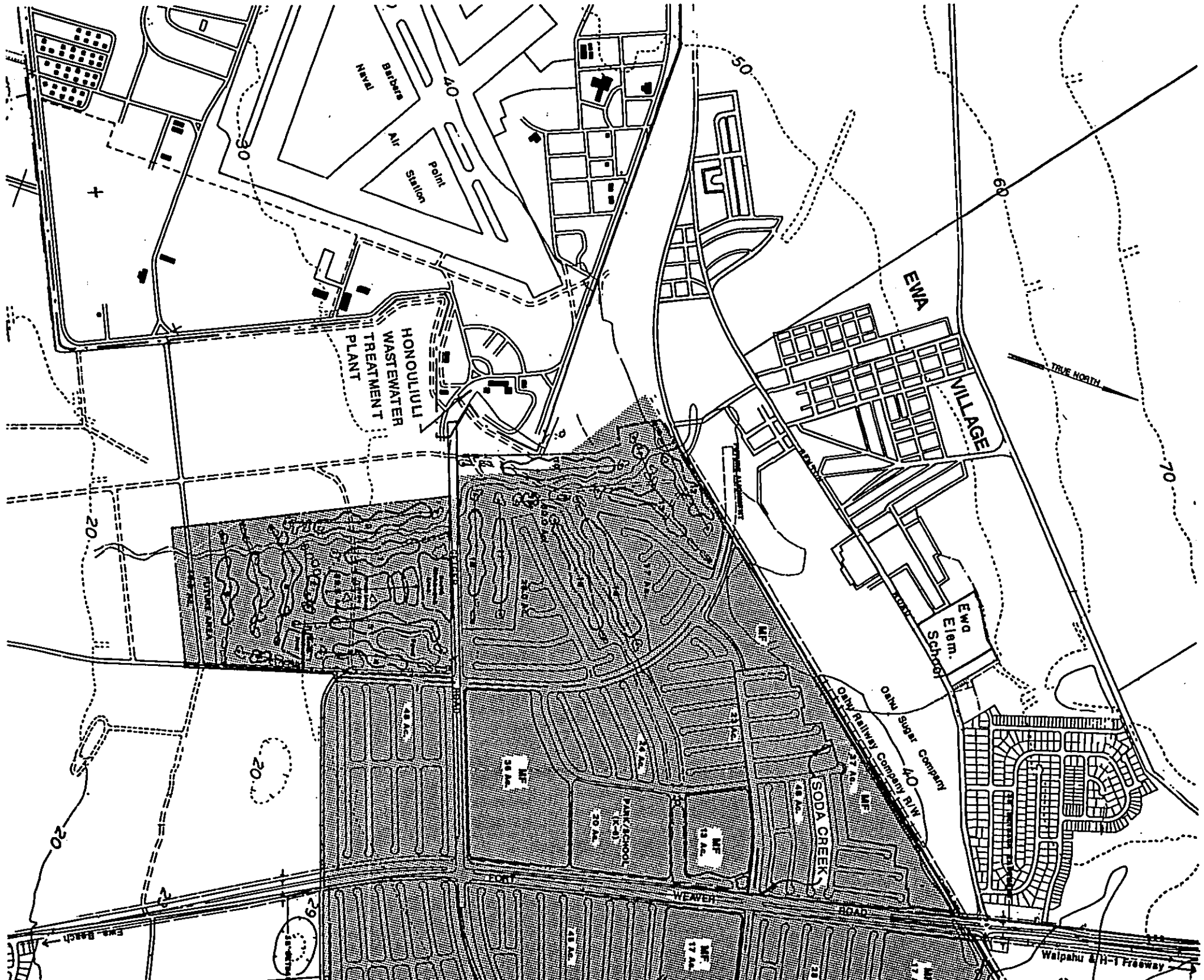
Facilities and public services required to support the new residential community will be provided through the development of new onsite roadways; power, water, wastewater, drainage, and communication systems; and an 18-hole golf course. Land dedications, which will satisfy the requirements of appropriate State, and City and County of Honolulu agencies, will be made by The Gentry Companies to accommodate public agency development of a new elementary school and two community parks.

2.8.2 Project Objectives

The objectives of The Gentry Companies is to develop and market a widely marketable residential community on an economically profitable basis. The intended market for the Ewa Gentry Project ranges from the low-moderate income category through the entire affordable housing market, as well as a small portion of the upper middle income market.

2.8.3 Residential Development

The land use plan for Ewa Gentry envisions a variety of detailed single family housing and multi-family units.


Barbers Point Naval Air Station
HONOULIULI WASTEWATER TREATMENT PLANT
EWA VILLAGE
Ewa Elem. School
Oahu Sugar Company
Oahu Railway Company R/W
SODA CREEK
WEAVER ROAD
Ewa Beach
Waipahu & H-1 Freeway
TRUE NORTH
FUTURE AIRPORT
FUTURE AVIGATION EASEMENT
MF 56 Ac.
MF 13 Ac.
MF 37 Ac.
MF 17 Ac.
PARK/SCHOOL (C-2)
20 Ac.
48 Ac.
41 Ac.
31 Ac.
34 Ac.
10
20
30
40
50
60
70

DEVELOPMENT AREA

	WEST OF FORT WEAVER RD..	EAST OF FORT WEAVER RD.
Single Family	166 Ac.	241 Ac.
Multi-Family	66 Ac.	104 Ac.
Park/School	20 Ac.	
Park		19 Ac.
Golf Course	180 Ac.	
Roadways	21 Ac.	15 Ac.
Greenways, Drainage & 35' Setback Easement	12 Ac.	8 Ac.
Total Area	507 Ac.	387 Ac.

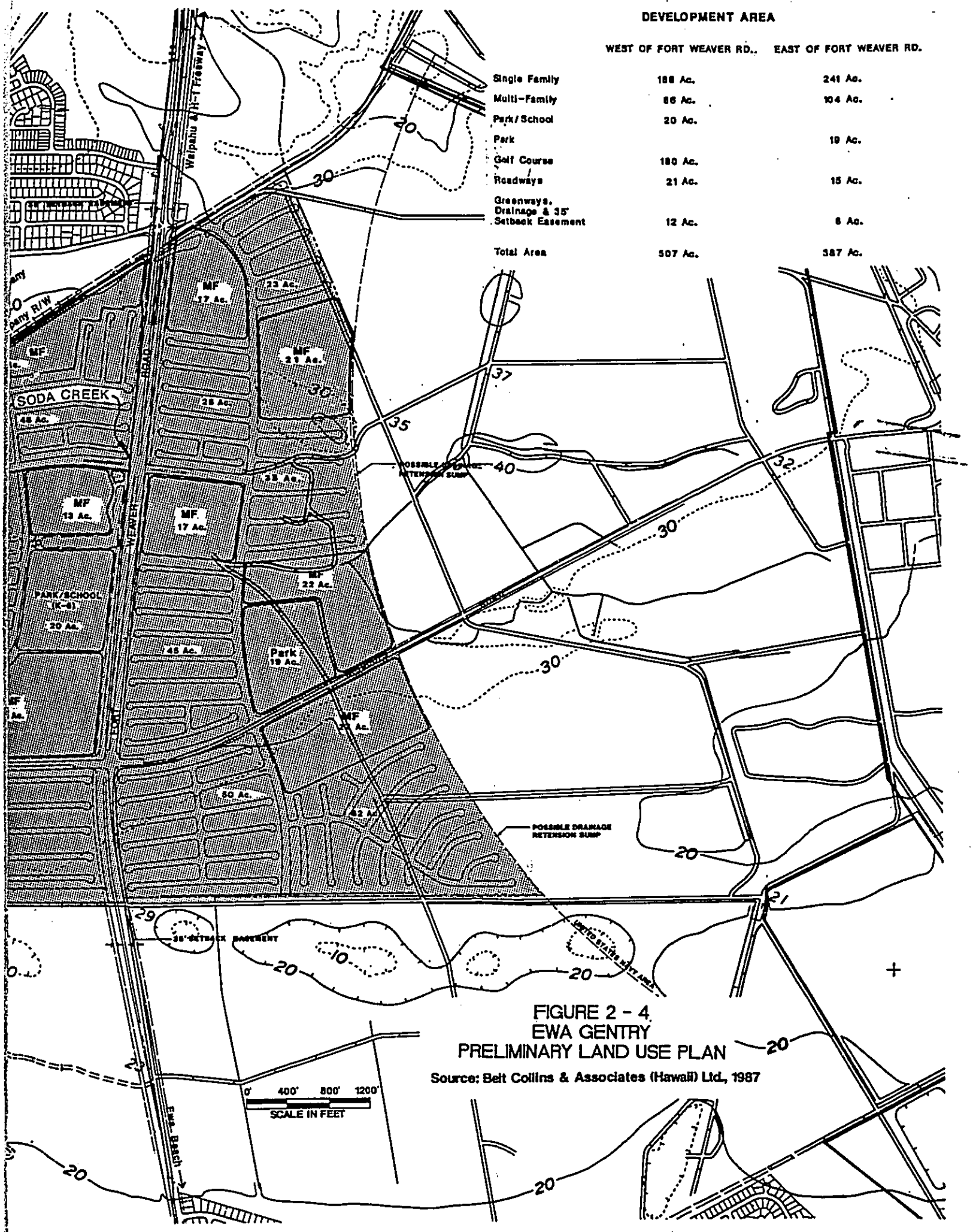


FIGURE 2 - 4
EWA GENTRY
PRELIMINARY LAND USE PLAN

Source: Belt Collins & Associates (Hawaii) Ltd., 1987

Single family units will generally consist of two, three and four-bedroom homes on 3,200 square-foot lots. A smaller number of larger single family lots, approximately 5,000 square feet in size, will be constructed along the proposed golf course boundary.

Multi-family units will primarily consist of one and two-story townhomes which will be developed at densities ranging from 15 to 25 units per acre. Dependent upon future market demands, some townhomes may include a smaller number of studio and/or 3-bedroom units. Multi-family units will, for the most part, be fee simple units; however, continuing demands for rental units may prompt the construction of one or two rental apartment projects.

TABLE 2-6
ANTICIPATED RESIDENTIAL DEVELOPMENT SCHEDULE
EWA GENTRY PROJECT
1988 - 1995

Year	Single-Family	Multi-Family	Total Units
1988	410	300	710
1989	280	440	720
1990	330	460	790
1991	510	460	970
1992	520	500	1,020
1993	530	480	1,010
1994	530	480	1,010
1995	470	450	920
TOTAL:	3,580	3,570	7,150

Source: The Gentry Companies, 1987.

Unit prices will generally reflect market conditions at the time of sale. Market conditions, development costs and available home financing trends in 1987 suggest that the average single family home in Ewa Gentry will sell at approximately $120,000 to $175,000. Larger, single family homes near the golf course will likely be sold at higher prices.

Sales of multi-family townhome units are expected to range from $70,000 to $120,000. A program for meeting the City and County of Honolulu's affordable housing requirements will be developed in consultation with the City and County of Honolulu, Department of Housing and Community Development.

2.8.4 Recreation and Open Space

A 170-acre golf course and clubhouse complex will provide the principle open space feature for the entire project site, as well as an onsite recreational opportunity for local residents and the general public. These facilities will be supplemented through the dedication of land, and required site preparation, for the subsequent development of two community parks.

The two parks will comprise an estimated 37.5 acres of park land or the amount required by the City and County Park Dedication Ordinance. Typical facility criteria for City and County of Honolulu community parks indicate that the City and County of Honolulu, Department of Parks and Recreation, will eventually develop the following types of facilities at each of the two park sites (Yuen, 1988):

Comfort station/recreation building;
3-4 basketball courts;
3-4 volleyball courts;
1-2 softball fields; and
one baseball field.

Site preparation of the two park sites, prior to park dedication, will be carried out by The Gentry Companies in accordance with appropriate City and County of Honolulu ordinances and standards.

Street trees and landscaping will also be provided to enhance overall community aesthetics. The proposed planting of selected trees, shrubs, and grassed areas will be done in accordance with the City Land Use Ordinance. Proposed landscaping plans will initially need to be approved by the City and County of Honolulu Department of Land Utilization and the Department of Parks and Recreation.

2.8.5 Educational Facilities

School enrollment forecasts, prepared by the State Department of Education, indicate that the Ewa Gentry project will gradually generate an elementary school population of some 900 to 1,450 students. Typical public elementary schools in Hawaii accommodate a student enrollment of 400 to 900 students. Recognizing these needs, the Gentry Companies propose the dedication of a 7-acre school site which will eventually be used by the State Department of Education to develop a new elementary school.

2.8.6 Support Facilities

2.8.6.1 Access and Circulation

Primary vehicular access to the Ewa Gentry project will be via Fort Weaver Road which bisects the overall

project site. The internal circulation system involves use of a parkway to access secondary streets serving the various neighborhoods and community facilities (Figure 2-4).

Future preliminary engineering studies will analyze potential signalization requirements within the project vicinity. Potential alterations to Geiger Road and Iroquois Point Road will also be evaluated.

2.8.6.2 Water Supply and Distribution

Ewa Gentry is a member of the Ewa Plain Water Development Corporation which is responsible for providing offsite water system facilities, including water source, storage, and transmission systems which will serve the entire project site as well as other projects in the Ewa area. In addition to its financial commitments to the Corporation, Ewa Gentry will also install an onsite water distribution system (Figure 2-5) consisting of water mains and fire hydrants within the project's road and street rights-of-ways. Distribution lines, mains and fire hydrants will be designed in accordance with the design standards and criteria established by the City and County of Honolulu, Board of Water Supply.

2.8.6.3 Wastewater Management

All sewage generated from the Ewa Gentry project will be transported to the Honouliuli Wastewater Treatment Plant via a new sewage collection system which will connect the existing 84-inch interceptors along Geiger Road (Figure 2-6). Prior to 1993, the present capacity of Honouliuli Treatment Plant will only permit wastewater flows from an additional 3,550 residential hookups. Subsequently, the planned expansion of the plant will accommodate the anticipated wastewater flows from the entire Ewa Gentry project.

The new sewage collection facilities within the project will be constructed by The Gentry Companies. The construction of these facilities will be based upon design and construction drawings which will reflect the use of appropriate City and County of Honolulu standards. Following construction, the new collection system will be dedicated to the City and County of Honolulu by The Gentry Companies.


Barbers Point Naval Air Station
HONOULIULI WASTEWATER TREATMENT PLANT
EWA
VILLAGE
TRUE NORTH
Ewa Elem. School
Oahu Sugar Company
Oahu Railway & Company R/W
Waipahu & H-1 Freeway
FORT WEAVER RD.
E/W16"
W12"
SCH
RGAR
30
40
50
60
70
20
29

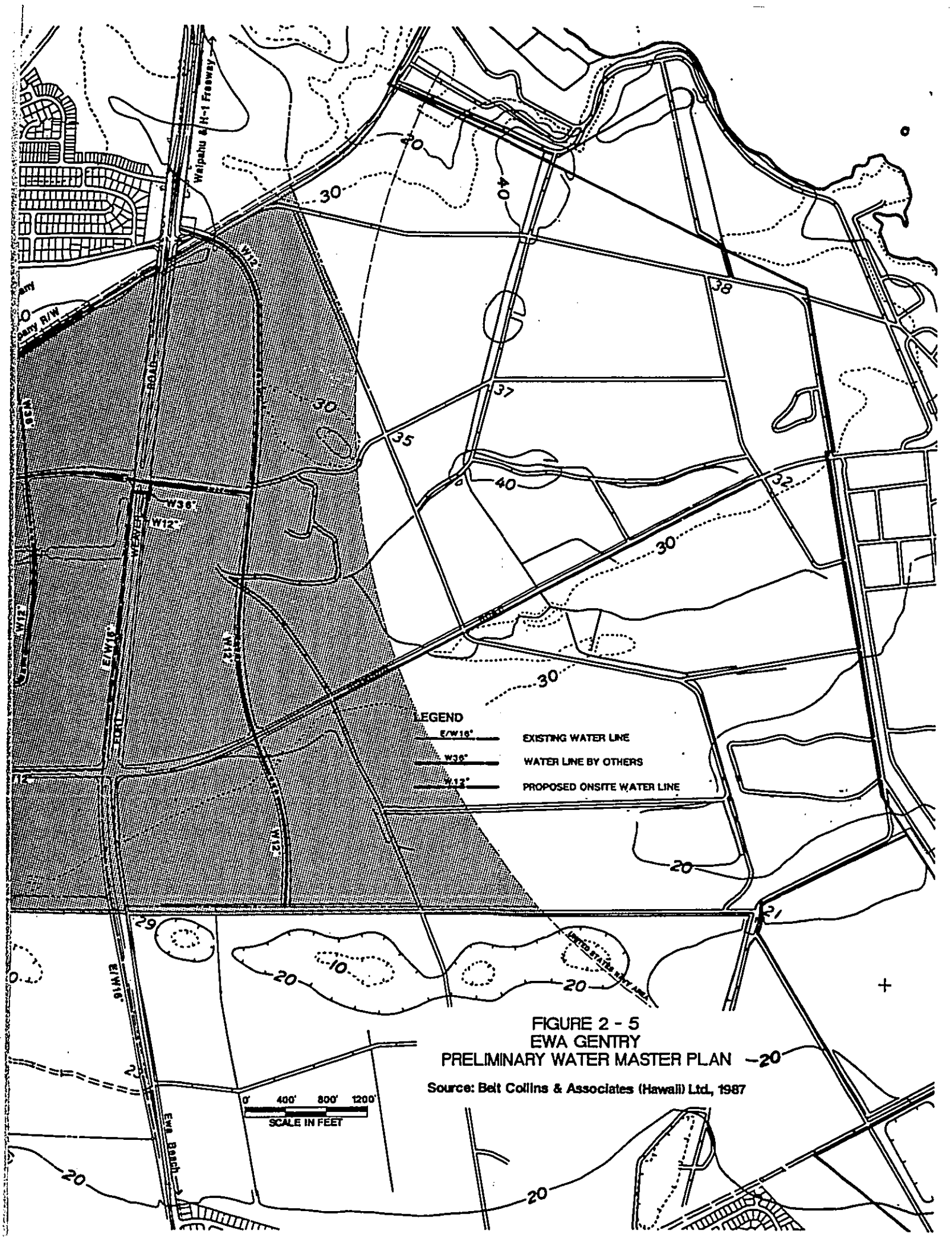


FIGURE 2 - 5
EWA GENTRY
PRELIMINARY WATER MASTER PLAN

Source: Belt Collins & Associates (Hawaii) Ltd., 1987


Waipahu & H-1 Freeway
ROAD
WEAVER
FONT
Ewa Beach
Oahu Railway & Company R/W
Oahu Sugar Company
Ewa Elem. School
VILLAGE
EWA
TIDE NORTH
FUTURE BOUNDARY OF EXPANDED HONOULIULI WWTP
HONOULIULI WASTEWATER TREATMENT PLANT
Point
Station
Air
Naval
Base
E/884'
E/838'
E/930'
E/924'
E/921'
E/918'
S18°
S10°
S12°
S8°
20
30
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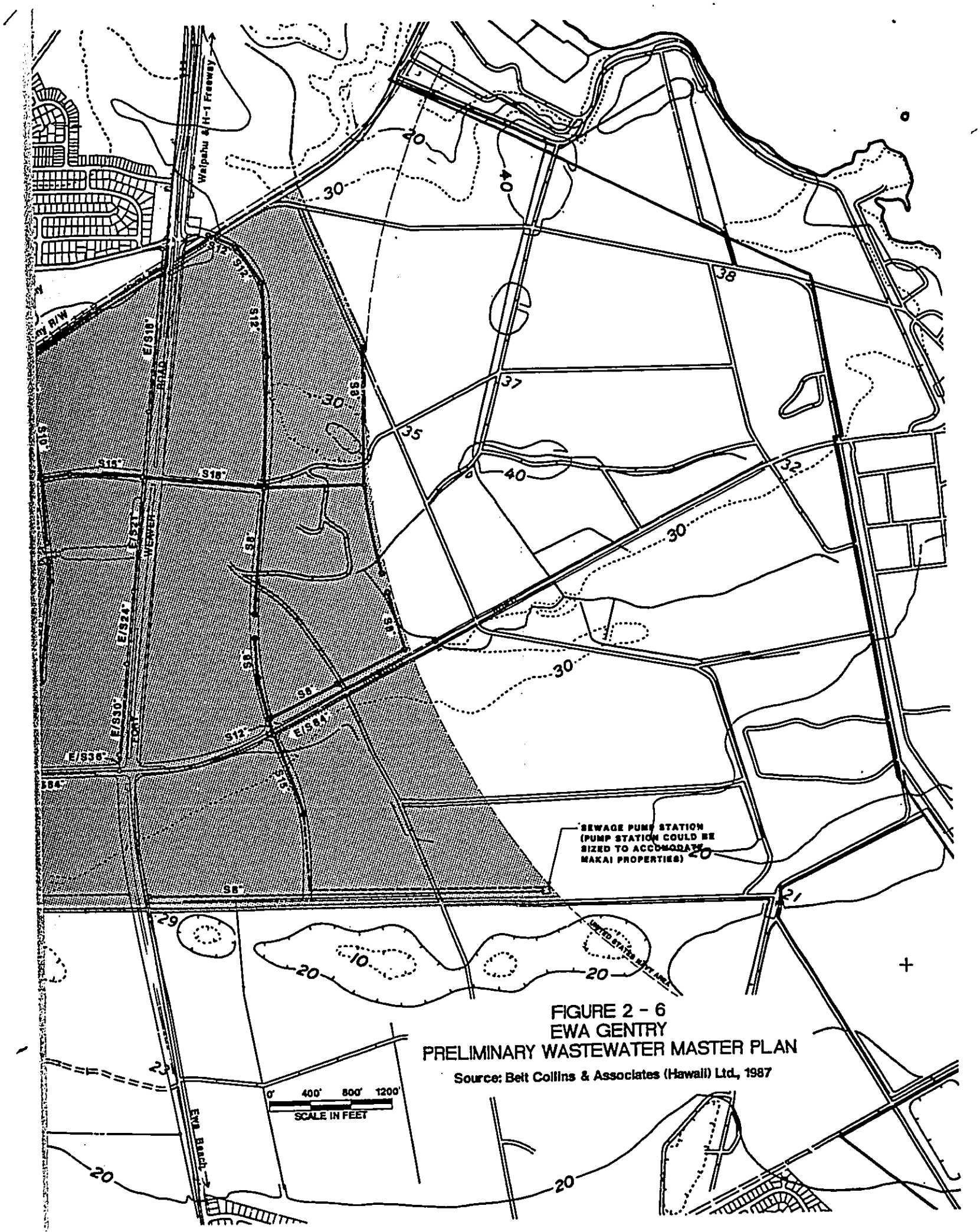


FIGURE 2 - 6
EWA GENTRY
PRELIMINARY WASTEWATER MASTER PLAN

Source: Belt Collins & Associates (Hawaii) Ltd., 1987

2.8.6.4 Solid Waste Management

The Ewa Gentry project will eventually generate a new resident population of approximately 26,385 residents. This population is expected to generate approximately 5.7 pounds of domestic solid wastes per day, or a total community generation of 75 tons/day. Regularly, scheduled collection of these wastes will be provided by the City and County of Honolulu and/or private collection services. Collected wastes will be transported by truck to the City and County of Honolulu's Waipahu Solid Waste Management facility and the Waimanalo Gulch landfill (near Kahe Power Plant). Upon completion of the proposed H-Power cogeneration facility, solid waste material will be hauled to this facility which eventually will be located at nearby Campbell Industrial Park.

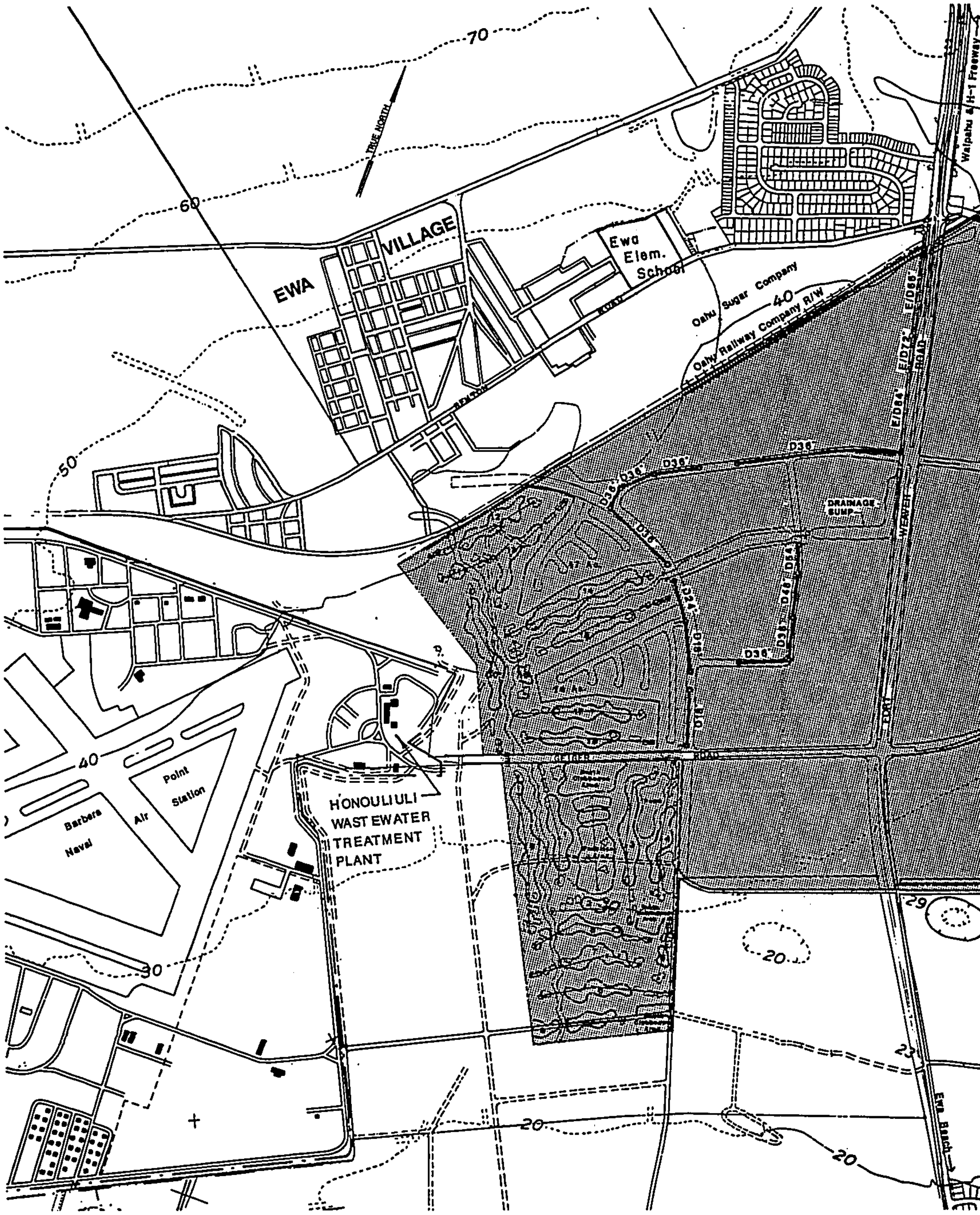
2.8.6.5 Drainage

Fort Weaver Road divides Ewa Gentry into two drainage plains (Figure 2-7). All drainage to the west of Fort Weaver Road will be directed towards the new Kaloi Channel improvements which are within the golf course. Improvements in the proposed golf course area will act as a retention element in the drainage system. In addition, a series of high-volume low headpumps will be installed within the project to control on-site drainage on the west side of Fort Weaver Road.

To the east of Fort Weaver Road, all drainage generally flows towards the West Loch of Pearl Harbor. However, sump conditions exist between the project boundary and West Loch. It is currently proposed that the detention sumps will be constructed within the property or immediately adjacent on Navy property.

2.8.6.6 Power and Telephone Systems

Each household within Ewa Gentry project is expected to have a peak electrical demand of 3 kilowatts. Given the proposed development of 7,150 houses and an assumed load factor of 0.8, the expected peak demand for the Ewa Gentry project will be approximately 18 megawatts. In order to accommodate this demand, Hawaiian Electric Company and Ewa Gentry will develop a new transformer substation which will step-down available electric power from existing transmission lines along the Oahu Railway and Land Company right-of-way (Figure 2-8). Hawaiian Electric Company representatives indicate that the future Waiua-CEIP 138 KV line may be located in the vicinity of the Ewa Gentry project. Power distribution from the onsite substation will be carried via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TRUE NORTH
EWA
VILLAGE
Ewa
Elem.
School
ROAD
Oahu Sugar Company
Oahu Railway Company R/W
Waipahu & H-1 Freeway
E/D72"
E/D66"
E/D84"
ROAD
WEAVER
D36"
D24"
D18"
D54"
D48"
DRAINAGE
SUMP
GEIGER
ROAD
Point
Station
Barbers
Air
Naval
HONOULIULI
WASTEWATER
TREATMENT
PLANT
Ewa Beach

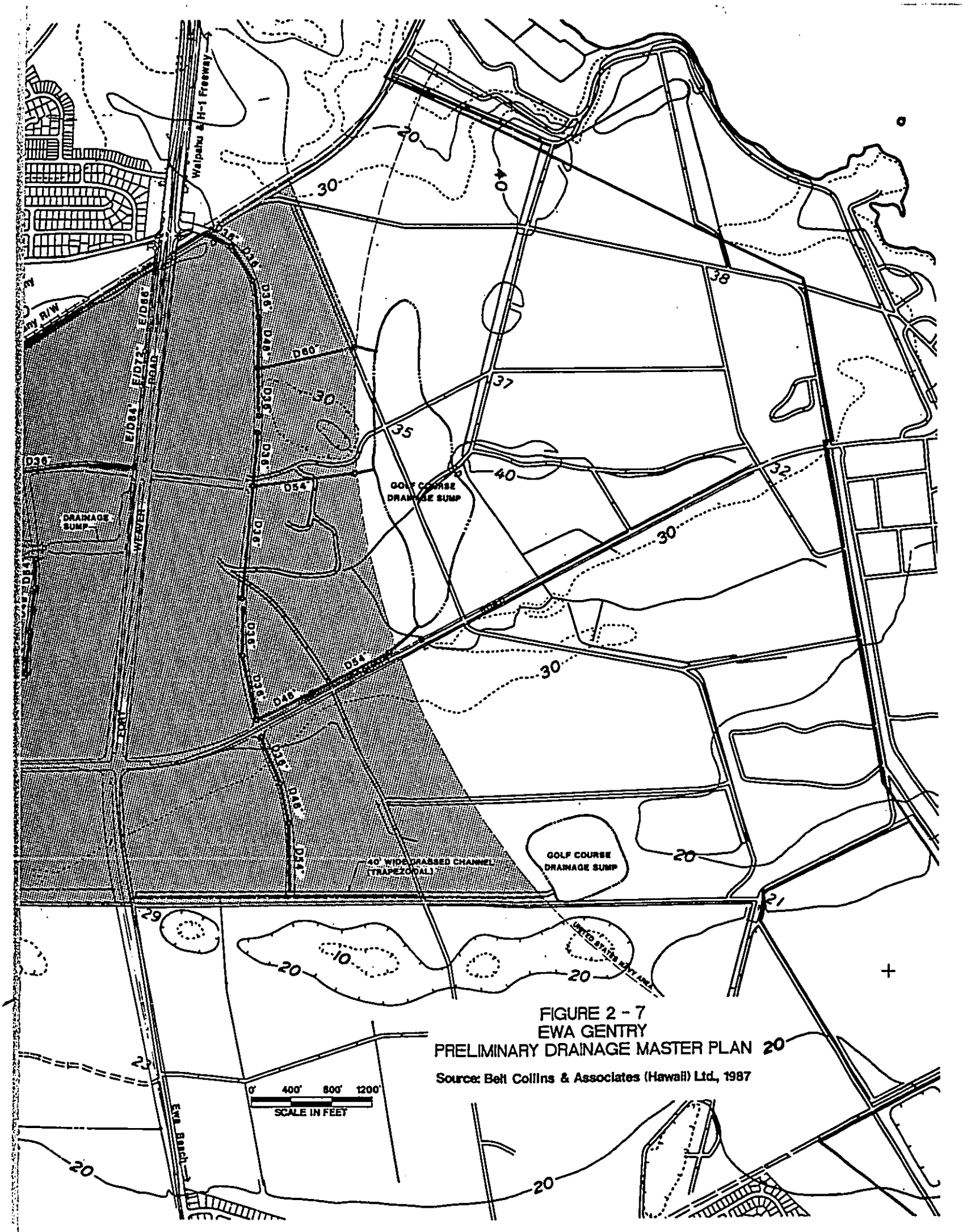
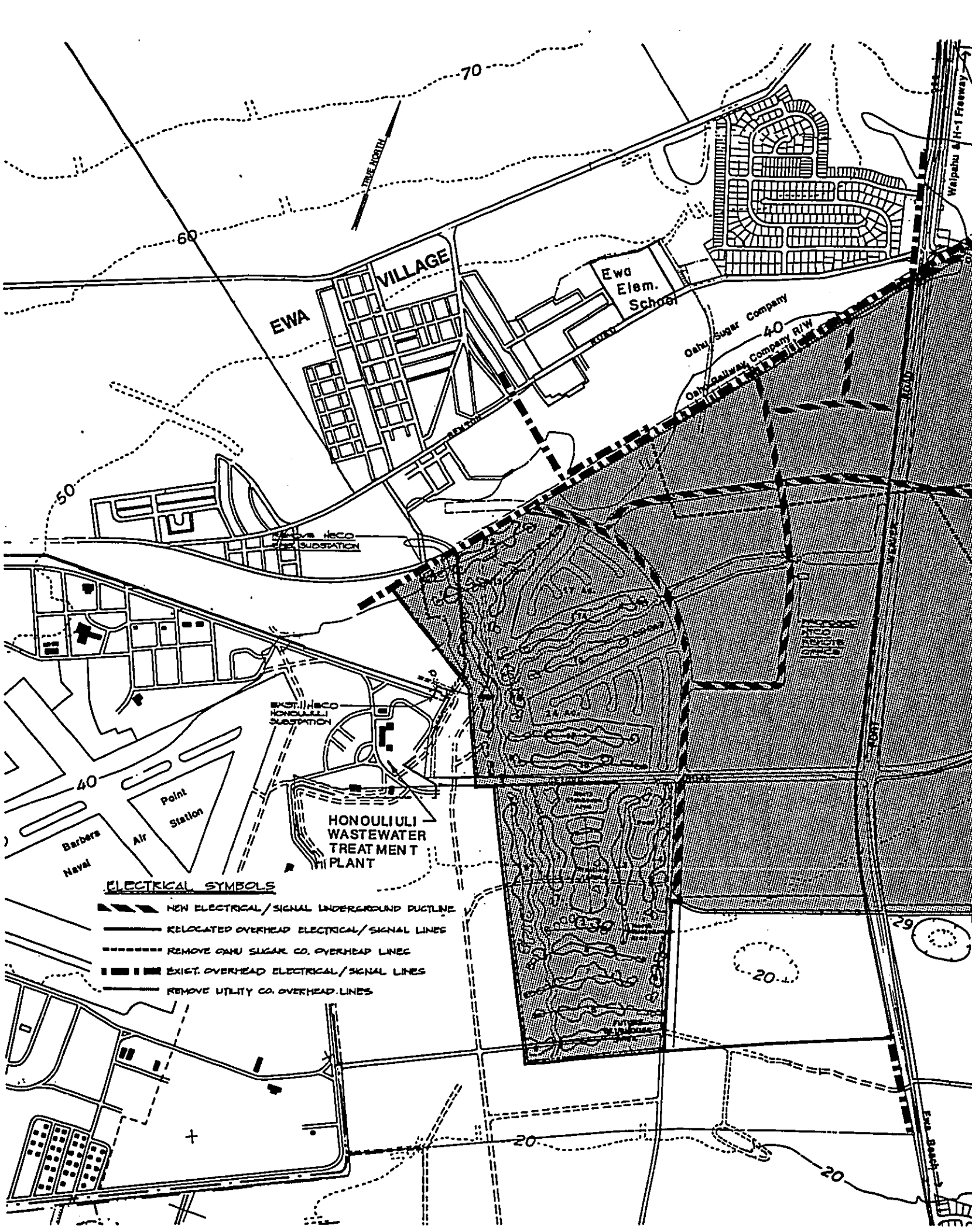


FIGURE 2 - 7
EWA GENTRY
PRELIMINARY DRAINAGE MASTER PLAN

Source: Belt Collins & Associates (Hawaii) Ltd., 1987


70
60
50
40
20
TRUE NORTH
EWA
VILLAGE
Ewa
Elem.
School
Oahu Sugar Company
Oahu Railway Company R/W
Waipahu & H-1 Freeway
EXIST. HECO SUBSTATION
EXIST. HECO HONOULIULI SUBSTATION
HECO REMOTE CONTROL
Point
Station
Barbers
Air
Naval
HONOULIULI
WASTEWATER
TREATMENT
PLANT
ELECTRICAL SYMBOLS
NEW ELECTRICAL/SIGNAL UNDERGROUND DUCTLINE
RELOCATED OVERHEAD ELECTRICAL/SIGNAL LINES
REMOVE OAHU SUGAR CO. OVERHEAD LINES
EXIST. OVERHEAD ELECTRICAL/SIGNAL LINES
REMOVE UTILITY CO. OVERHEAD LINES
29
Ewa Beach

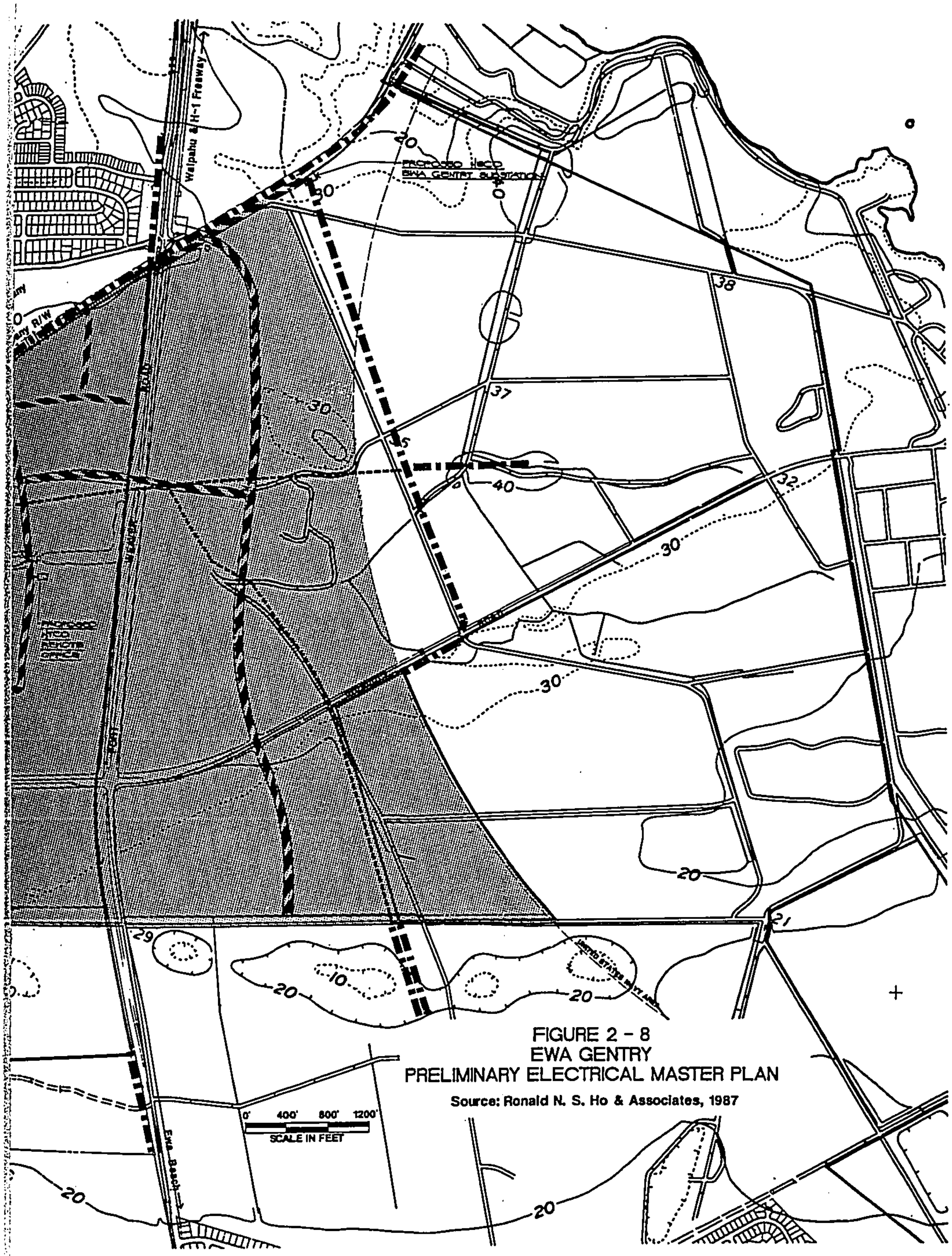


FIGURE 2 - 8
EWA GENTRY
PRELIMINARY ELECTRICAL MASTER PLAN

Source: Ronald N. S. Ho & Associates, 1987

circuits, which will be installed in underground conduits, to reduce potential visual impacts within the new neighborhoods.

The telephone system, in general, will be installed in conjunction with the power system. Existing telephone service is available via telephone service lines along Fort Weaver Road. All telephone lines within the project site will be installed in conduit and buried underground along the internal road and street rights-of-way.

2.8.7 Use of Public Funds

Public funds from the State of Hawaii and City and County of Honolulu will be used to support the Ewa Gentry project. Public funds will be to construct a public elementary school and two community parks within the project site. The Gentry Companies, however, will set aside lands for these land uses.

CHAPTER 3.0

ENVIRONMENTAL SETTING

3.1 PHYSICAL ENVIRONMENT

3.1.1 Geology and Soils

The Island of Oahu is of volcanic origin and is characterized by underlying basaltic flows. The geology of the project site, however, is principally influenced by the presence of an extensive coral shelf which covers the Ewa plain, the Honolulu plain and significant portions of Oahu's southern coastline (Macdonald, Abbott, and Peterson, 1983). The colonization of coral and algae in the Ewa plain has also been covered by alluvium which is believed to have been transported from the Waianae Mountains via gradual erosion.

The U.S. Soil Conservation Service has classified predominant soil types in the project site as Honouliuli silty clay, Mamala stony silty clay, Waipahu silty clays, Ewa silty clay loam, and Waialua silty clay. With the exception of the Ewa silty clay loam (approximately 450 acres), each of these soil types are considered to be expansive which suggests that over half of the local soils may be generally unstable, especially when wet.

The capacity of these soils to hold and percolate water is limited. One exception is the Ewa silty clay loam soil which is characterized by moderate permeability.

3.1.2 Topography

The land contours of the project site are generally level. Elevations range from approximately 40 feet above mean sea level (MSL) along the project site's northwestern boundary to approximately 20 feet MSL along the southeastern boundary. Average ground slopes are less than one percent.

3.1.3 Climate

Weather in the vicinity of Ewa village and Barbers Point Naval Air Station is constant and relatively dry. These characteristics generally typify conditions on Oahu's leeward coastline.

The most reliable climatic information for this area is available from nearby Barbers Point Naval Air Station (Table 3-1). This information, which represents a summary of some 30 years of regular observation, indicates that ambient temperatures generally range from 21 to 28 degrees Celsius.

TABLE 3-1

NORMAL CLIMATOLOGY AT BARBERS POINT

Month	Temperature (°C) Average Max	Average Min	Average Avg	Extreme Max	Extreme Min	Precipitation (cm) Avg	Max	Min	Max 24 Hrs	% Rel Hum LST[b] 04	% Rel Hum LST[b] 13	Avg Dew Pt (°C)	Bar Pres (mb)	Wind Avg Dir	Wind Speed (m/s) Avg	Wind Speed (m/s) Max	Avg Cld %	Avg Trw Days[c]
Jan	26.1	18.9	22.8	30.6	10.0	11.2	35.8	1.3	13.5	82	64	17.2	999	NE	4.1	30.9	0.5	1
Feb	26.1	18.3	22.2	30.6	11.1	6.1	25.4	T[a]	11.7	81	63	16.7	1003	NE	4.1	26.2	0.5	1
Mar	26.1	18.9	22.8	30.6	12.2	6.4	43.9	0.3	26.7	80	61	17.2	1005	NE	4.1	19.5	0.5	*[d]
Apr	26.7	20.0	23.3	30.6	12.2	3.8	30.5	T	9.9	79	60	17.2	1005	NE	4.6	20.1	0.5	1
May	27.8	20.6	24.4	32.2	16.1	2.3	21.6	T	8.1	79	59	17.8	1009	NE	4.1	19.5	0.5	*
Jun	28.9	21.7	25.0	32.2	16.1	0.8	5.1	T	3.6	77	58	18.3	999	NE	4.1	20.1	0.5	*
Jul	29.4	22.2	26.1	33.3	17.8	0.8	3.0	T	3.0	78	58	18.9	1010	NE	4.6	19.0	0.5	*
Aug	29.4	22.8	26.1	34.4	16.1	0.8	5.3	T	4.8	78	57	19.4	1009	NE	4.6	23.1	0.5	*
Sep	30.0	22.2	26.1	33.9	17.2	1.0	4.3	T	3.6	78	58	19.4	1007	NE	4.1	21.6	0.4	*
Oct	28.9	21.7	25.6	32.8	16.1	3.6	31.2	T	20.1	80	60	19.4	1007	NE	4.1	18.5	0.5	*
Nov	27.8	21.1	24.4	31.7	13.9	7.4	29.7	T	17.8	81	62	18.9	1005	NE	4.1	24.2	0.5	1
Dec	26.7	19.4	23.3	31.1	11.7	7.4	20.3	0.3	11.9	80	62	17.8	1003	NE	4.1	23.1	0.5	1
Annual	27.8	20.6	24.4	34.4	10.0	4.1	43.9	T	26.7	79	60	18.3	1005	NE	4.1	30.9	0.5	6

[a] T = Trace
[b] Relative humidity at Hawaiian standard time 0400 and 1300 hours.
[c] Average thundershower days
[d] * = Less than 0.5 days

References: U.S. Navy, 1981, 1982 Climatological, astronomical and tidal data for the Hawaiian Islands - Barbers Point climatology, compiled from data January 1949 through September 1979, Naval Oceanography Command, NAVWESTOCEANCEN.

Rainfall averages approximately 20 inches per year with most rain occurring during the months of January, February, April, November, and December.

Prevailing northeasterly tradewinds blow at an average velocity of approximately nine knots and are generally constant throughout the year. However, other historical weather information for Barbers Point Naval Air Station indicates an occurrence of southeast to southwesterly winds roughly 10 percent of the time. Consequently, the project site is also characterized by seasonal variations in both wind direction and speed.

3.1.4 Water Resources

3.1.4.1 Ground Water

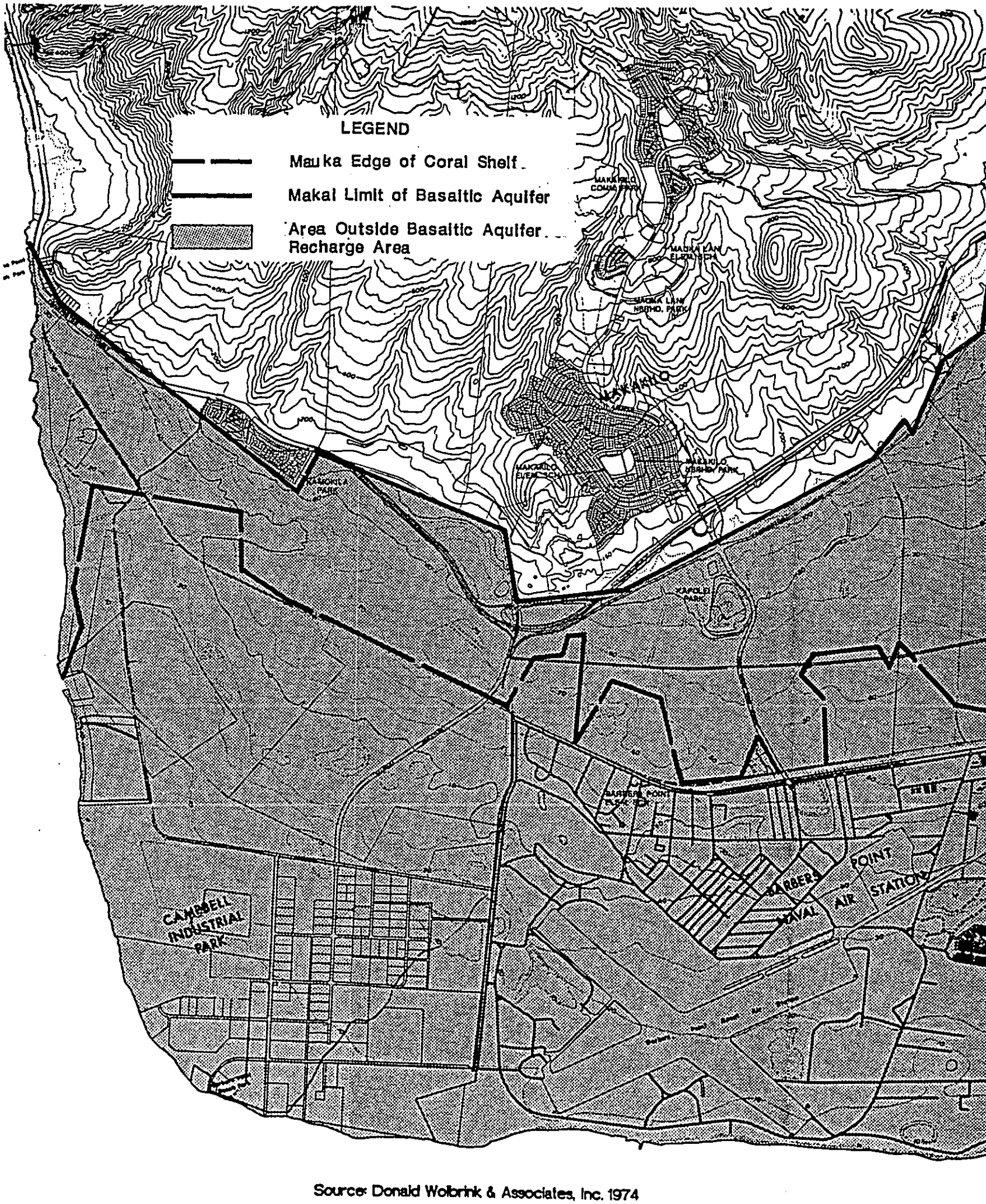
Ground water in the vicinity of the project site occurs in two aquifers. However, drainage from the project site is believed to primarily recharge the coral aquifer which is several hundred feet below the southern and southeastern portions of the project site (Donald Wolbrink & Associates, 1974).

The higher quality aquifer is the basaltic Koolau Volcanic Series. The makai boundary of this basaltic aquifer (Figure 3-1) is believed to be located north of the project site along Farrington Highway and the H-1 Freeway (Donald Wolbrink & Associates, 1974). This aquifer is fed by rainfall occurring in the Koolau Range which infiltrates surface soils and rock to supply the basal groundwater supply (Dames & Moore, 1985).

The coral aquifer, within and south of the project site (Figure 3-1), is estimated to be several hundred feet thick and is characterized by brackish to salt water.

> "The coral aquifer directly overlies the marine sediments and interfingers with the alluvium. ....(However), marine, clay, and silt sediments and alluvium separate the Koolau Volcanics from the coral aquifer" (Dames & Moore, 1985).

Consequently, a significant portion of the local soils are believed to act as a "caprock" that slows down the seaward movement of fresh water to the coral aquifer and the underlying basaltic aquifer.



Source: Donald Wolbrink & Associates, Inc. 1974

FIGURE 3-1
MAKAI BOUNDARY OF BASALTIC AQUIFER

3.1.4.2 Drainage

The project site is situated between two watersheds. The watershed draining through the west side of the project site is the 7.8-square mile basin known as Kaloi Gulch. Drainage from this watershed ultimately discharges into the ocean. The existing gulch has inadequate capacity to handle peak discharges. Storm waters presently flow over canefield land; however, a portion of existing flows percolate into the local groundwater via ground depressions. On the west side of the project site, the capacity of Kaloi Gulch is estimated to be approximately 1,050 cubic feet per second (cfs) under existing conditions.

On the east side of Fort Weaver Road, 387 acres of land, presently in sugarcane production, has no defined drainage courses other than existing sugarcane irrigation ditches.

The project site is classified as zone D by the Federal Insurance Administration. This designation indicates an area where flood hazards have not been determined.

3.1.5 Agricultural Resources

3.1.5.1 Existing Cultivation

The project site presently contains approximately 857 acres of land which are presently being cultivated for sugarcane by Oahu Sugar Company. These lands have been used for this purpose since the late 1800's when Ewa Plantation Company began the cultivation and processing of sugar in the Ewa area.

3.1.5.2 Land Suitability for Other Agricultural Uses

The suitability of the project site lands for general agricultural purposes has been evaluated through the past cumulative efforts of the University of Hawaii, Land Study Bureau (1965 through 1972); the U.S. Soil Conservation Service (1972); and the State Department of Agriculture (1977).

The Detailed Land Classification series prepared by the Land Study Bureau provided a land inventory and productivity evaluation which was based upon statewide "standards" of crop yields and the extent of agricultural management. Land Study Bureau ratings for the project site (Table 3-2) indicate that most of the project site has good to very good productivity potential for most agricultural activities if the lands can be irrigated (University of Hawaii, Land Study Bureau, 1972; Yamamoto, 1988).

The U.S. Soil Conservation Service developed a statewide soils survey, based upon 1969 infrared aerial photography and interpretation, which established a new soil classification system and provided general ranking of crop suitability for each soil type. Information contained in the survey suggests that most of the project site can be used for a variety of agricultural uses, if irrigated. Land area within the site containing coral outcrops (approximately nin acres) are considered to be unsuitable for cultivation (U.S. Soil Conservation, 1972; Yamamoto, 1988).

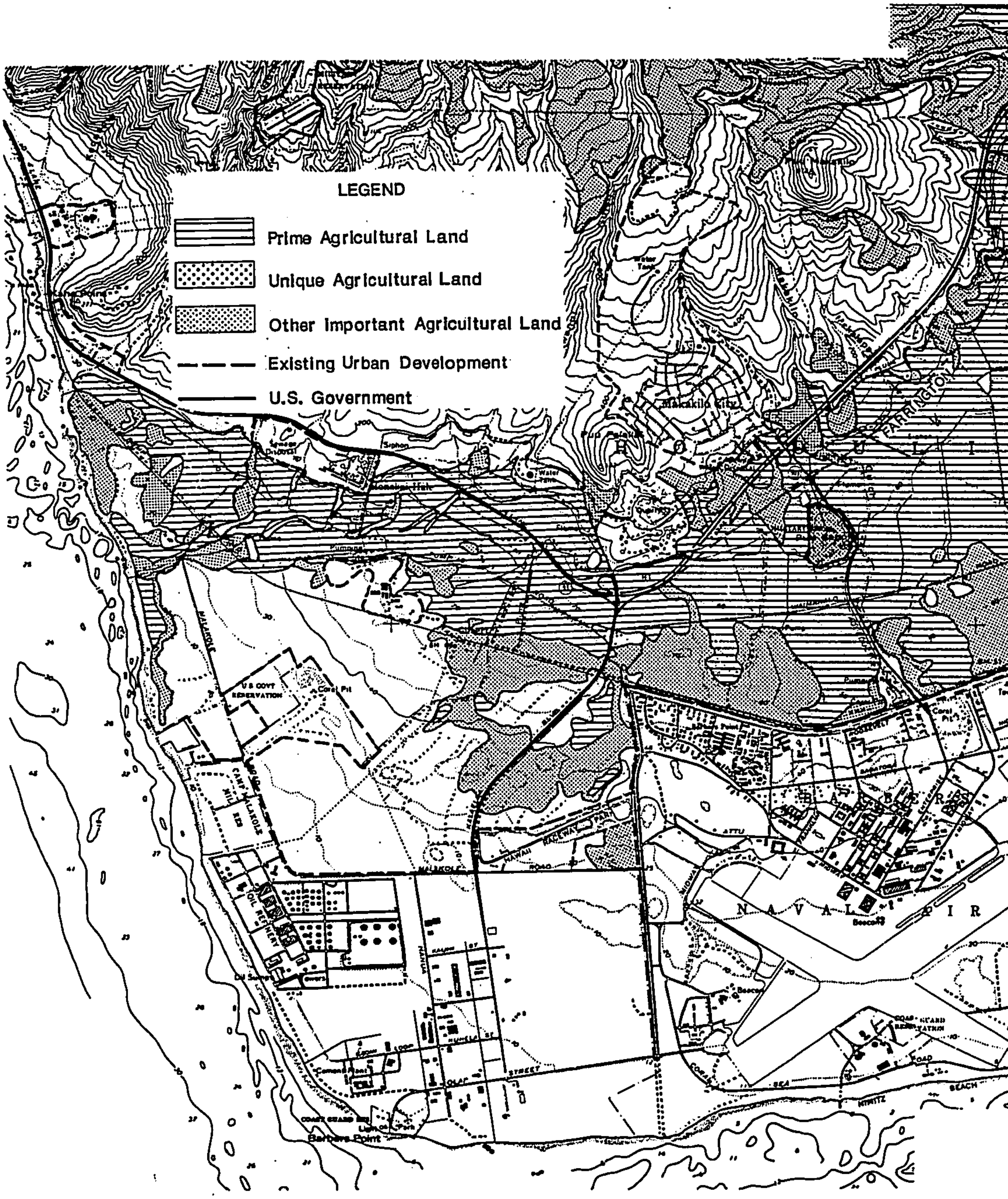
The State Department of Agriculture produced a series of maps which identifies agricultural lands of importance to the State of Hawaii (ALISH). This system was derived from the use of prior Land Study Bureau and U.S. Soil Conservation Service soil classifications. ALISH designations for the project site (Figure 3-2) classify 759 acres of the project site as "prime agricultural land" and 164 acres as "other important" land. Nine acres of the project site are not classified because of their unsuitability for cultivation. These designations again indicate the physical suitability of the project site lands to support agricultural activities, but do not reflect any consideration of the marketability of potential agricultural crops.

The LESA Commission also developed a quantitative land evaluation and site assessment system (LESA) for determining the quality of Hawaii's land for viable agricultural use. This methodology involves the quantitative rating of physical characteristics previously identified by the Land Study Bureau and the U.S. Soil and Conservation Service. The second component of the methodology, site assessment, is being redefined by the State Department of Agriculture, and will eventually include the anticipated demand for agricultural commodities. Crop productivity ratings "A" through "E" are based on a cumulative evaluation of all soil characteristics (Table 3-2) "A" represents a very good potential for successful crop production. "E" indicates a poor potential for successful crop production. (Yamamoto, 1988).

The initial land evaluation portion of the LESA system has been statistically correlated with the State's 1995 agricultural production goals for the Island of Oahu which is to have 57,661 acres of agricultural land under cultivation. In summary, the land evaluation methodology consists of a rating scale of 12 to 100. Soils having a rating of 66 or greater are believed to represent the better soils on Oahu from an agronomic perspective (Yamamoto, 1988).

TABLE 3-2
SELECTED SOIL CHARACTERISTICS AND CROP PRODUCTIVITY RATINGS
EWA GENTRY PROJECT SITE

Land Type	16i	69i	72	72i	77i	115
Overall Rating*	B	A	E	C	B	E
Selected Crop Productivity Rating						
Pineapple	E	E	E	E	B	E
Vegetable	B	A	E	C	B	E
Sugarcane	A	A	E	B	A	E
Forage	B	A	E	C	A	E
Grazing	A	A	E	B	C	E
Orchard	B	A	E	B	D	E
Timber	–	–	E	–	–	E
Machine Tillability	Moderate	Good	Moderate	Moderate	Good	Not Suited
Stoniness	Nonstony	Nonstony	Stony	Stony	Nonstony	Rocky
Depth (inches)	Deep>30	Deep>30	Mod.deep	Mod.deep	Mod.deep	Shallow
Slope (percent)	0–10	0–10	0–10	0–10	0–10	0–35
Texture	Fine	Mod.fine	Mod.fine	Mod.fine	Medium to Mod.fine	—
Clay Properties	Expanding	Non-Expanding	Non-Expanding	Non-Expanding	Variable	Non-Expanding
Drainage	Moderately Well-drained	Well-Drained	Well-Drained	Well-Drained	Well-Drained	Well-Drained
Median Annual Rainfall	15–40	15–25	15–25	15–25	25–35	<60
Elevation (feet)	15–125	0–100	1–100	0–100	0–100	0–1000
Color	Dk Brown	Dk reddish Brown	Dk reddish Brown	Dk red Brown	Brown to dark red	Dk reddish brown to lt. brown
Soil Series	Honouliuli (Poamoho)	Mamala	Mamala	Mamala	Man-made (agric.)	Rocky lands, coral
Great Groups	Chromusterts	Haplustolls	Haplustolls	Haplustolls	–	–
Existing Uses	Sugarcane, grazing	Sugarcane	Sugarcane grazing military	Sugarcane grazing military	Sugarcane	Grazing, military


LEGEND
Prime Agricultural Land
Unique Agricultural Land
Other Important Agricultural Land
Existing Urban Development
U.S. Government
Makakilo City
FARRINGTON
MALAKOLE
U S GOVT RESERVATION
Coral Pit
CAMP MALAKOLE
HAWAII RAILWAY
N A V A L A I R
Barbers Point
COAST GUARD RESERVATION

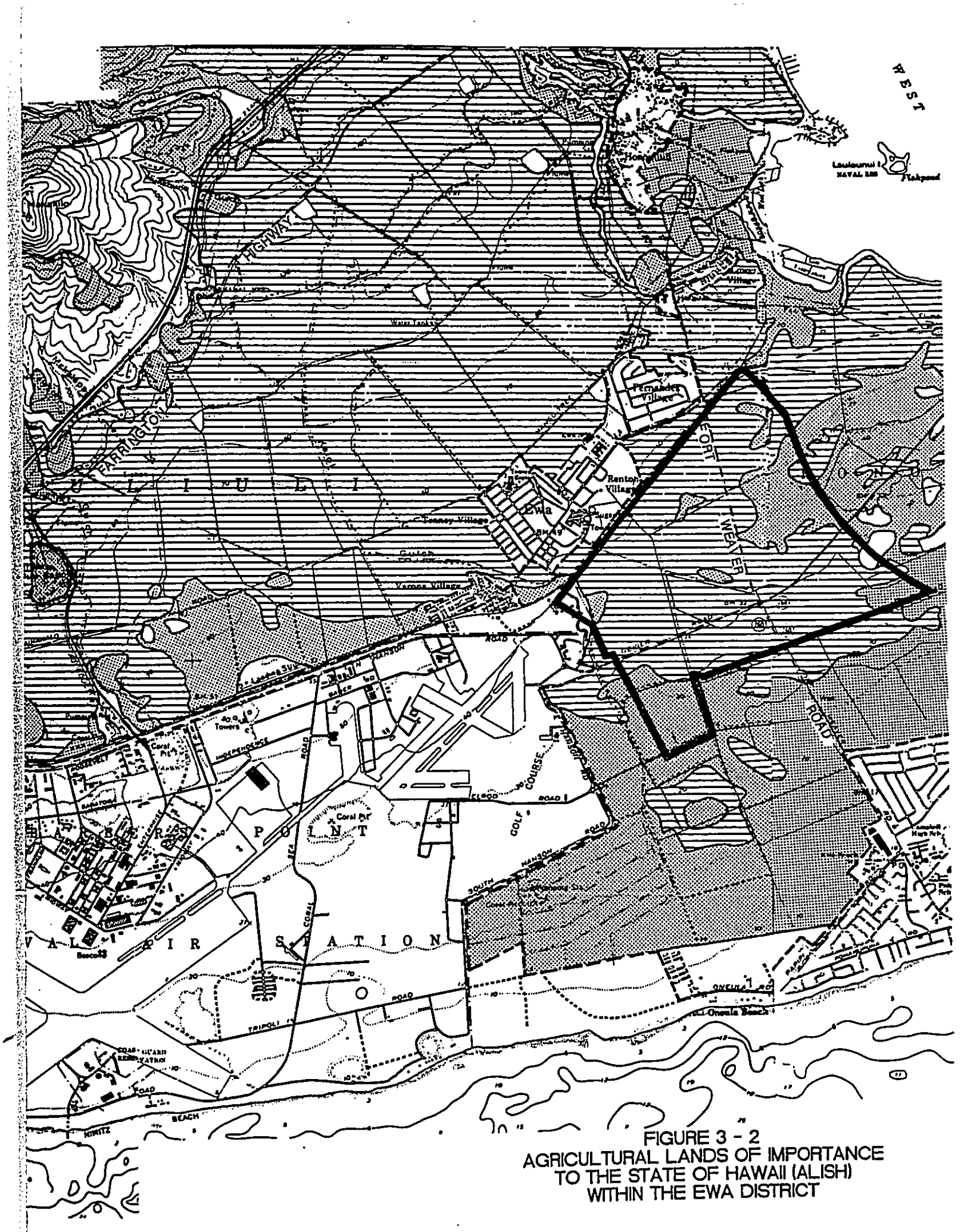


FIGURE 3 - 2
AGRICULTURAL LANDS OF IMPORTANCE
TO THE STATE OF HAWAII (ALISH)
WITHIN THE EWA DISTRICT

Application of the LESA methodology to the project site indicates that soils on the project site have land evaluation ratings ranging from 12 to 93 (Table 3-3). The average land evaluation (LE) rating for the entire project site is 77.1. These ratings again cite the general suitability of the project site lands for agricultural cultivation. The absence of economic marketability considerations presently limits the usability of this information to an assessment of soil suitability.

TABLE 3-3

AGRICULTURAL LAND EVALUATION RATINGS OF THE PROJECT SITE

Soil Type	Acreage	LE Rating
CR	009	12
EmA	450	74
Fd	007	65
HxA	172	87
HxB	012	85
MnC	153	66
WkA	027	93
WzA	098	92
WzC	004	74
Total	932	77*

Note:

* Average LE rating for overall project site.

Source: State Department of Agriculture, 1988

3.1.6 Air Quality

Air quality data for the Island of Oahu is maintained and updated by the State Department of Health. Existing information consists of ambient air concentration summaries for sulfur oxides, carbon monoxide, particulate matter, and nitrogen oxides at selected locations throughout the island. Ambient air concentrations are generally compared with federal and State of Hawaii Ambient Air Quality Standards (HAAQA) which have been established for six classes of pollutants (Table 3-4):

particulate matter (PM-10);
sulfur dioxide;
carbon monoxide;
nitrogen dioxide;
ozone; and
lead.

In general, the State ambient standards for these pollutants are generally more stringent than comparable federal standards for the same air quality indicators (Table 3-4).

Air quality information, in the vicinity of the project site, is limited to available information from Barbers Point and Pearl City. Air samples collected from these areas are limited to 24-hour samplings of particulate matter and and regular periodic sampling, i.e., one 24-hour sampling every six days, of sulfur dioxide from 1979 to present.

Historical information for these longer-term monitoring stations indicates lower levels of both particulate matter and sulfur dioxide (Tables 3-5 and 3-6). Further, more stringent ambient standards for Hawaii are rarely exceeded. This is believed to be a consequence of the limited extent of existing urban development in the Ewa area, as well as prevailing surface wind direction (from the northeast).

The project site is situated somewhat near the Campbell Industrial Park where higher levels of sulfur dioxide are occasionally generated. However, it is believed that the ambient air quality of the Ewa Gentry site is rarely affected by this potential source of sulfur dioxide since surface winds in the Barbers Point rarely blow towards the project site.

TABLE 3-4

HAWAII AND FEDERAL AMBIENT AIR QUALITY STANDARDS

Pollutant(a)	Averaging Time	Hawaii Standards	Federal Standards Primary(b)	Federal Standards Secondary(c)
Ozone	1-hour	100	235	235
PM-10(e)	24-hour	50	150	150
	Annual Arithmetic Mean	55	50	50
Sulfur Dioxide	Annual Arithmetic Mean	20	80	--
	24-hour	365	365	--
	3-hour	1300	--	1300
Carbon Monoxide	8-hour	5(d)	10(d)	
	1-hour	10(d)	40(d)	
Nitrogen Dioxide	Annual Arithmetic Mean	70	100	
Lead	Calendar Quarter	1.5	1.5	

Notes:

(a) Measured in micrograms per cubic meter unless noted otherwise.
(b) Designed to prevent against adverse effects on public health
(c) Designed to prevent against adverse effects on public welfare including effects on comfort, visibility, vegetation, animals, aesthetic values, and soiling and deterioration of materials.
(d) Measured in milligrams per cubic meter.
(e) Respirable particulate matter under 10 microns in aerodynamic diameter.

Source: State Department of Health, Environmental Protection and Heath Services Division, 1988

Pearl City is generally upwind from the project site and is clearly situated in a more urbanized environment than the Barbers point area. Fortunately, particulate and sulfur dioxide levels from the Pearl City are even lower than those monitored from Barbers Point.

Carbon monoxide is a potential pollution source from vehicular traffic along the H-1 Freeway and Fort Weaver Road; however, this potential pollutant source is not being monitored by the State Department of Health. A spot sampling of carbon monoxide levels was made by J.W. Morrow, environmental management consultant, in September, 1987 which indicated a one-hour concentration of 3.4 milligrams/cubic meter at the eastbound H-1 on-ramp of Kunia Interchange. Conditions during the sampling included morning peak vehicular traffic with northeasterly winds blowing at 3 to 5 knots.

A second measurement made during the same general period near the Fort Weaver Road/Renton Road intersection indicated a one-hour concentration of 2.8 milligrams/cubic meter (Morrow, 1987). Environmental conditions for the second sampling consisted of morning peak vehicular traffic combined with westerly winds ranging from 2 to 7 knots.

Existing land uses and limited air quality information in the vicinity of the project site and the nearby "upwind" environment, do not suggest highly contaminated air quality conditions. Temporary reductions in air quality undoubtedly occur in the vicinity of the project site, during occasional cane-burning activities which likely influence the air quality of nearby Ewa villages and Ewa Beach community. However, it is believed that the air quality of the project site and the surrounding Ewa district environment, is not significantly influenced by any existing sources of air pollutant emissions.

On the basis of longer-term available information, it is believed that the project site and surrounding Ewa district environment is presently not influenced by any significant sources of air pollutants.

TABLE 3-5

SUMMARY OF SELECTED AIR QUALITY INFORMATION
BARBERS POINT, ISLAND OF OAHU
SULFUR DIOXIDE AND PARTICULATE MATTER CONCENTRATIONS

Maximum 24-Hour Concentrations
(micrograms per cubic meter)

Year	Sulfur Dioxide	Particulate Matter
1979	27	223
1980	10	158
1981	40	188
1982	12	63
1983	95	193
1984	5	112
1985	25	138
1986	10	66
1987	13	40

NUMBER OF TIMES
HAWAII AMBIENT AIR QUALITY STANDARDS
WERE EXCEEDED

Year	Sulfur Dioxide	Particulate Matter
1979	0	10
1980	0	2
1981	0	2
1982	0	0
1983	1	2
1984	0	1
1985	0	3
1986	0	0
1987	0	0

Source: State Department of Health, 1988.

TABLE 3-6

SUMMARY OF SELECTED AIR QUALITY INFORMATION
PEARL CITY, ISLAND OF OAHU
SULFUR DIOXIDE AND PARTICULATE MATTER CONCENTRATIONS

Maximum 24-Hour Concentrations
micrograms per cubic meter)

Year	Sulfur Dioxide	Particulate Matter
1979	63	48
1980	15	93
1981	5	71
1982	10	54
1983	5	57
1984	5	45
1985	-	62
1986	-	65
1987	-	61

NUMBER OF TIMES
HAWAII AMBIENT AIR QUALITY STANDARDS
WERE EXCEEDED

Year	Sulfur Dioxide	Particulate Matter
1979	0	0
1980	0	0
1981	0	0
1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0

Note: No sulfur dioxide information available for the 1985-1987 period.

Source: State Department of Health, 1988.

3.1.7 Noise and Airfcraft Accident Potential

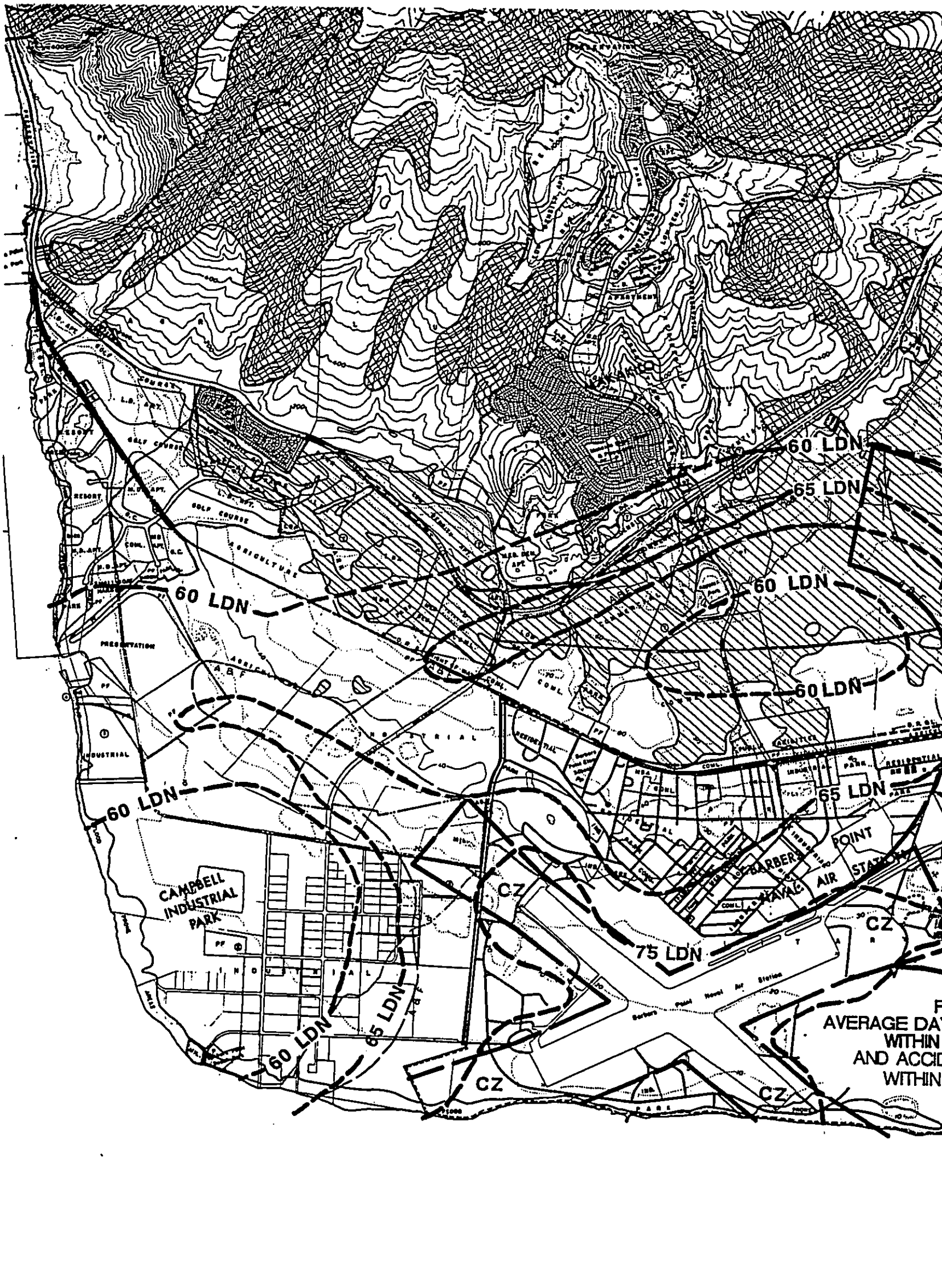
Sound levels and aircraft accident potential in the vicinity of the project site have, in recent years, been evaluated by the U.S. Navy, Y. Ebisu and Associates, and Parnell & Associates, Inc. U.S. Navy studies were made in conjunction with the preparation of its Air Installations Compatible Use Zone (AICUZ) plan for Barbers Point Naval Air Station (January, 1984).

The AICUZ plan, in part, outlines land areas beyond runway clear zones which possess a significant potential for aircraft accidents (Figure 3-3). Accident Potential Zone I (APZ I), for example, represents land areas under flight paths having 5,000 or more annual aircraft operations. In contrast, APZ II is land area beyond APZ I, or a runway clear zone which has only a measurable aircraft accident potential (Figure 3-3).

Subsequent studies of the AICUZ were undertaken by Parnell and Associates, Inc. at the request of The Estate of James Campbell in August, 1984, to re-evaluate earlier U.S. Navy conclusions. These studies refuted the earlier findings of the U.S. Navy and indicated that methodological errors had been made by the Navy in its estimation of the Barbers Point flight operations. On this basis, The Estate of James Campbell filed a lawsuit against the U.S. Navy on November 28, 1986 (Helber, Hastert, Van Horn, and Kimura, Planners, 1987).

Y. Ebisu and Associates studied noise levels along the east side of Fort Weaver Road (in the vicinity of Renton Road intersection) in August, 1987. This work was accomplished as part of the project planning for the West Loch Estates Housing project.

The recent noise surveys and evaluations by Y. Ebisu and Associates indicate that homes in the residential area of Fernandez Village (just north of the project site) are presently in the "moderate exposure, acceptable" range, as defined by present federal noise guidelines and standards (Table 3-7). In contrast, sound levels from vehicular traffic along Fort Weaver Road are in the "significant exposure, normally unacceptable" category (City and County of Honolulu, Department of Housing and Community Development, 1987).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CZ
CAMPBELL INDUSTRIAL PARK
BARBERS POINT NAVAL AIR STATION
GOLF COURSE
RESORT
AGRICULTURE
INDUSTRIAL
RESIDENTIAL
PARK
COMM.

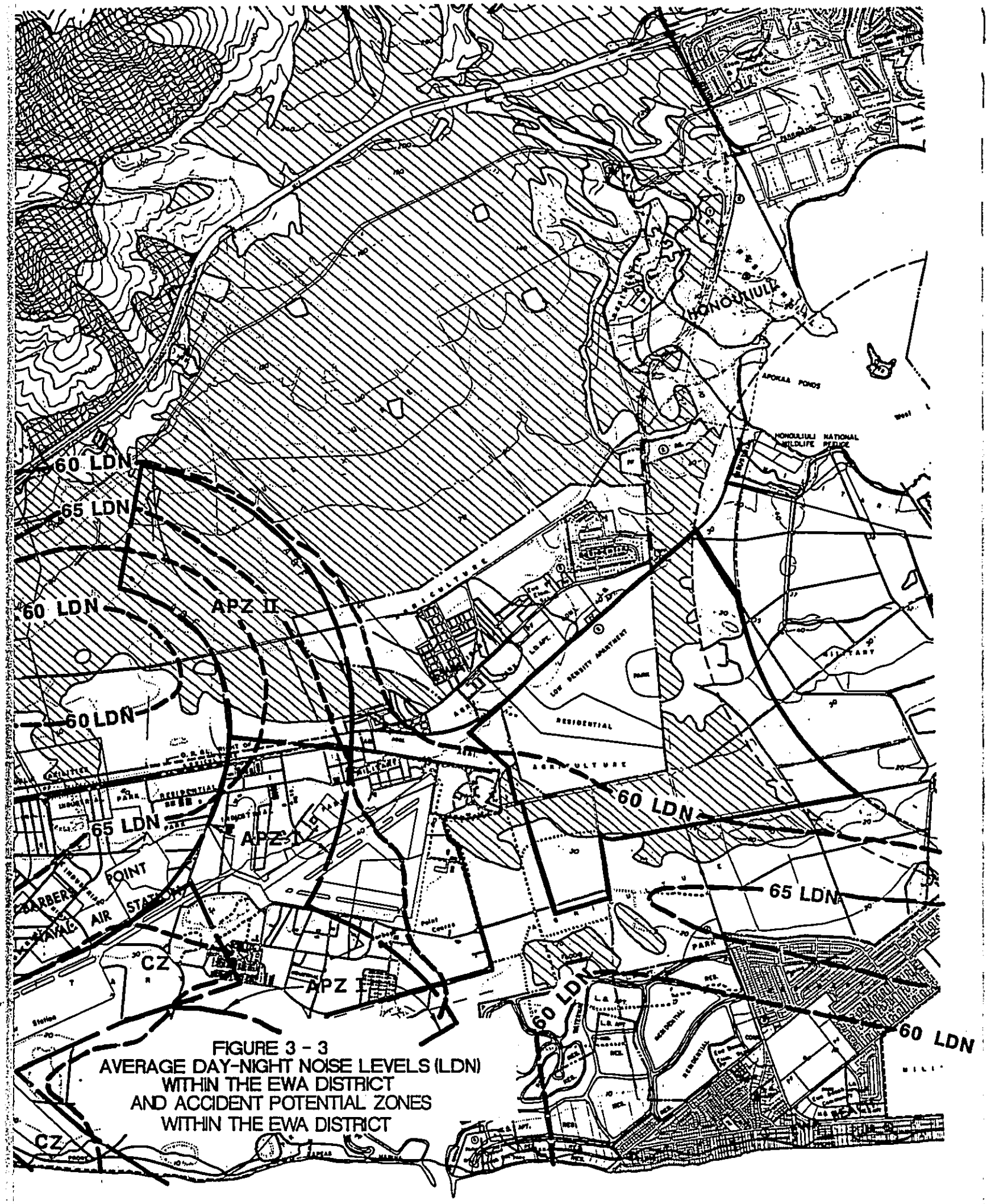


FIGURE 3 - 3
AVERAGE DAY-NIGHT NOISE LEVELS (LDN)
WITHIN THE EWA DISTRICT
AND ACCIDENT POTENTIAL ZONES
WITHIN THE EWA DISTRICT

TABLE 3-7

SUMMARY OF FEDERAL NOISE GUIDELINES AND STANDARDS

NOISE ZONE CLASSIFICATION

Noise Exposure Class	Noise Descriptor			HUD Noise Standards For New Residential Development
	DNL[1] Day-Night Average Sound Level	L_{eq}(hour)[3] Equivalent Sound Level	NEF[4] Noise exposure Forecast	
Minimal Exposure	Not Exceeding 55	Not Exceeding 55	Not Exceeding 20	"Acceptable"
Moderate Exposure	Above 55[2] But Not Exceeding 65	Above 55 But Not Exceeding 65	Above 25 But Not Exceeding 30	
Significant Exposure	Above 65 Not Exceeding 70	Above 65 Not Exceeding 70	Above 30 Not Exceeding 35	"Normally Unacceptable"
	Above 70 But Not Exceeding 75	Above 70 But Not Exceeding 75	Above 35 But Not Exceeding 40	
Severe Exposure	Above 75 But Not Exceeding 80	Above 75 But Not Exceeding 80	Not Exceeding 45	"Unacceptable"
	Above 80 But Not Exceeding 85	Above 80 But Not Exceeding 85	Above 45 But Not Exceeding 50	
	Above 85	Above 85	Above 50	

[1]CNEL - Community Noise Equivalent Level (California only) uses the same values.

[2]HUD, DOT, and EPA recognize L_{eq} = 55 dB as a goal for outdoors in residential areas in protecting the public health and welfare with an adequate margin of safety (Reference: EPA "Levels" Document.) However, it is not a regulatory goal. It is a level defined by a negotiated scientific consensus without concern for economic and technological feasibility or the needs and desires of any particular community.

[3]The Federal Highway Administration (FHWA) noise policy uses this decriptor as an alternative to L_{10} (noise level exceeded ten percent of the time) in connection with its policy for highway noise mitigation. The L_{eq}(design hour) is equivalent to DNL hours; 2) traffic between 10 p.m. and 7 a.m. does not exceed fifteen percent of the average daily traffic flow in vehicles per 24 hours. Under these conditions DNL equals L_{10} - 3 decibels.

[4]For use in airport environs only; is now being superceded by DNL.

Source: Federal Interagency Committee on Urban Noise - "Guidelines for Considering Noise in Land Use Planning and Control" - NTIS PB81-214124, June 1981.

Flight operations from Barbers Point Naval Air Station represent a source of noise throughout the Ewa district. The ongoing impact of aircraft operations was, as stated earlier, evaluated by the U.S. Navy's AICUZ program which, in part, mapped noise contours within the Ewa district (Figure 3-3). A noise contour of 60 Ldn, which represents an average day-night sound level, is indicated for a portion of the project site. Federal noise guidelines that this average day-night sound level represents an "acceptable, moderate exposure".

Subsequent studies by Parnell and Associates refuted the earlier findings of the U.S. Navy and indicated that the U.S. Navy made methodological errors in its estimation of the Barbers Point flight operations. On this basis, The Estate of James Campbell filed a lawsuit against the U.S. Navy on November 28, 1986 (Helber, Hastert, Van Horn, and Kimura, Planners, 1987).

3.2 BIOLOGICAL RESOURCES

3.2.1 Flora

The types of vegetation found in the Ewa Gentry site were identified during a recent onsite botanical survey which was made by Char & Associates in January, 1988. On the basis of this survey and a related review of available literature, Char and Associates prepared a survey report which provides a general description of the project site's vegetative resources, as well as a detailed list of plants observed during the onsite survey (Appendix D).

The following selected excerpts from Appendix D are presented to provide a brief summary of the project site's vegetative resources.

> "A number of botanical and biological surveys have been made in the 'Ewa Plain area, some of which have included portions of the project site or areas adjacent to the site. In the U.S. Fish and Wildlife Service's botanical survey (Char and Balakrishnan, 1979), vegetation on the 'Ewa Gentry site has been mapped as 'C', sugar cane fields. Smaller vegetation units (less than 5 acres) were not mapped. Recent flora surveys for a number of nearby proposed developments such as West Loch Estates (Char, 1987), Kapolei Town center (Char and Whistler, 1986), Kapolei Village (Char and Whistler, 1987), and 'Ewa Marina (Char, 1980), describe similar vegetation types.
>
> "In general, sugarcane fields cover areas which are actively cultivated, while vegetation types dominated by introduced, mostly weedy, species occur on the more or less undisturbed sites.

"Very few remnant native plant communities remain on the 'Ewa Plain area because it has been disturbed for such a long period of time, first by the early Polynesian settlers and, later, by the other immigrants. The few native plant communities are limited to areas where the limestone or karst topography has remained exposed and not covered by soil; these are areas which support kiawe forests or koa-haole/kiawe scrub. Two officially endangered plant species occur on the 'Ewa Plain: the 'Ewa Plains 'akoko (Euphorbia skottsbergii var. kalaeloana) and Achyranthes rotundata. Both species are limited in distribution to Campbell Industrial Park and Barbers Point Naval Air Station, where they occur on limestone substrate (Char and Balakrishnan, 1979; Botanical Consultants, 1984). No endangered plants were found on the nearby West Loch Naval Magazine although it too has rather large areas of exposed coralline material (Hawaiian Agronomics, 1986).

"No remnant native plant communities or rare, threatened and endangered plants have ever been recorded from the 'Ewa Gentry project site."

3.2.2 Fauna

A brief survey was made of the project site in December, 1987 to ascertain the type and quality of existing habitat, as well as the type of birds and mammals which presently reside or use the project site. The results of this survey, as well as a review of available literature, provided the basis for preparation of the report entitled "Birds and Mammals of the Ewa Gentry Region" (Appendix E).

The report, prepared by Andrew Berger, indicates that the habitat of the entire Ewa region has been disturbed for over 100 years. As a result, no endemic ecosystem is present within the project site as the site is almost entirely used for sugarcane cultivation (Berger, 1988).

Available literature and survey observations indicate that wildlife in the project site consists of approximately 20 species of introduced birds and one migratory indigenous bird, the Lesser Golden Plover. No endemic birds were sited or believed to present within the project site (Berger, 1988).

Only introduced mammals are known to inhabit the project site. These mammals include mongoose, three species of rats, feral cats, and feral dogs (Berger, 1988).

3.3 CULTURAL RESOURCES

3.3.1 Introduction

The cultural resources of the project site are primarily in Appendices F and G. Appendix F provides some background ethnohistoric and historical information for the Ewa district. Appendix G, a socio-economic evaluation of the Ewa Gentry project, includes a brief historical perspective and various socio-economic indicators for the Ewa district. Selected portions of Appendix G are presented in Section 3.3 to provide a summary description of existing cultural resources.

3.3.2 Archaeological Resources

Archaeological Consultants of Hawaii, Inc. conducted an onsite surface survey of the project site in January, 1988, as well as a literature review of archival documents relevant to the cultural history of the project site and surrounding area. No above-ground archaeological sites were located during the archaeological reconnaissance. Relevant archival documents indicate that the subsurface recovery potential is very limited, if not nonexistent.

3.3.3 Historical Perspective: The Transition of Ewa Since 1879

3.3.3.1 The Rise and Decline of Ewa's Sugarcane Industry

In 1879, development of the first artesian well near West Loch by James Campbell brought about a productive use of lands which otherwise had little use or development potential. The availability of fresh water gradually evolved into the establishment of a productive sugarcane industry, involving both crop cultivation and processing by the late 1800's. The Ewa Plantation Company, established in 1890, flourished for some 60 to 70 years.

As production and labor costs increased during the 1960's, new international production areas emerged. Eventually, increased competition from international market and rising production costs gradually reduced the profitability of Ewa Plantation Company. Ultimately, Ewa Plantation Company was sold in 1970 and was subsequently merged with Oahu Sugar Company by the end of 1971. Concurrently, Ewa Mill was closed and processing operations were combined with the nearby mill in Waipahu (Phillips, Brandt, Reddick, 1979).

Today, Oahu Sugar Company continues to cultivate approximately 13,500 acres of sugarcane in the Ewa district and employs about 450 workers (Plasch, 1988).

> "Since (its) consolidation in 1970, Oahu Sugar is the only surviving plantation in the (Ewa) district, and one of only two surviving sugar operations on Oahu. Virtually all the land now cultivated by the Amfac-owned Oahu Sugar Company is leased from Campbell Estate, and the leases expire in the early 1990's (City and County of Honolulu, Department of Housing and Community Development, 1987)."

3.3.3.2 Social and Economic Reliance

During the flourishing years of the sugar industry in Hawaii, production areas such as Ewa revolved around the plantation both socially and economically. Plantation workers and their families were provided nominal labor and wages as well as affordable housing, utility service, recreational opportunities, and other community services, e.g., medical. financial security, self-contained community services, and a clearly defined social structure provided most plantation workers and their families with a comfortable, secure lifestyle.

With the continual decline and uncertainty of Hawaii's sugar industry, the Ewa plantation villages of Varona, Tenney, Renton, C Village, Mill Village, and Fernandez have changed. The Ewa villages are no longer a plantation town which relies entirely upon the sugarcane industry and its related social structure. Rather, these and other nearby Ewa communities are now connected to new employment and social opportunities throughout the island of Oahu. Further, Ewa communities now look to public agencies for providing a variety of desired community and public services which formerly were provided by the plantation.

Despite these social and economic changes,

> "... the bulk of the (Ewa village) families have a member still working for the sugar company, which continues to provide the focal point for the community, even though its influence is not nearly as pervasive as in former decades" (Phillips, Brandt, Reddick, 1979).

In addition, many residents in the Ewa villages still maintain and enjoy most of their interpersonal relationships among relatives and friends within Ewa's closer-knit village communities (Phillips, Brandt, Reddick, 1979).

3.3.4 Present Socio-Economic Environment

The Ewa district has been, in recent years, generally regarded as a residential bedroom community supporting the housing needs of the Island of Oahu, as well as the desired public and commercial services of its residents. During the past decade, public and private development proposals aimed at creating Oahu's new secondary urban center are believed to have gradually changed Oahu residents' perceptions concerning the Ewa district.

Even though the Ewa district has no significant primary industries, there are several larger employers such as Barbers Point Naval Air Station and Oahu Sugar Company which maintain and generate new jobs within Oahu's supporting service economy. A major expansion of this type of economic environment in the Ewa district environment is already foreseen by the City and County of Honolulu. Cumulative consultant evaluations for various resort, residential and commercial development proposals (Table 3-8) in the Ewa district indicate that approximately 24,000 new jobs will be created within the district during the next 20 years (Kurahashi, 1988).

TABLE 3-8

DEVELOPMENT PROPOSALS IN THE EWA DISTRICT AND THEIR ANTICIPATED EMPLOYMENT GENERATION CALENDAR YEAR 1988 THROUGH 2005

Proposed Development Project	Anticipated Employment Generation
Campbell Industrial Park Expansion	4,000
Barbers Point Harbor	2,000
Ko Olina (West Beach) Expansion	5,100
Kapolei Town Center	12,500
Ewa Marina	800
	24,400

Source: Kurahashi, 1988.

While the status of some of these development proposals is pending or uncertain, the anticipated combination of resort, commercial and residential growth is expected to provide, at least, a greater diversity of employment opportunities, more jobs, and increased local income.

3.3.5 Population

Recent population estimates for the Ewa district suggest a 1985 regional population of approximately 37,000 residents, or roughly 4.5 percent of Oahu's total population (City and

TABLE 3-9

ESTIMATED RESIDENT POPULATION DISTRIBUTION IN THE EWA DISTRICT
CALENDAR YEARS 1985 AND 2005

Community	CY 1985	CY 2005
Iroquois Point	12,272	12,711
Ewa Beach (including project area)	7,596	24,065
Barbers Point	2,913	2,883
Makakilo	8,628	21,610
Ewa-Kapolei-West Beach Area	5,181	27,475
Totals	36,590	88,744

Note: Population distribution data for Ewa district varies slightly from existing total district population estimates and forecasts because of slight boundary differences between State Traffic Assignment Zones and the Ewa district planning area.

Source: City and County of Honolulu
Department of General Planning, 1988

County of Honolulu, Department of General Planning, 1988). Roughly one-third of Ewa's population is distributed in the Iroquois Point area where many Pearl Harbor-based military families live (Table 3-9). Some 55 percent of the population resides in Makakilo (24 percent) and Ewa Beach (21 percent). The remaining residents live in the Ewa villages (14 percent) or Barbers Point area.

Preliminary forecasts recently prepared by the City and County of Honolulu, Department of General Planning for OMPO (see Section 1.4) indicate that the future resident population of the Ewa district may increase almost 143 percent, or at an annual rate of 8 percent per year. The potential rapid growth of the district could also increase Ewa's proportional share of Oahu's total resident population. By calendar year (CY) 2005, the forecasted Ewa district population of 91,119 residents may represent almost 10 percent of Oahu's residents.

In contrast to the present population distribution within the Ewa district, the future residential population is expected to be focused in the Ewa, Ewa Beach, and Makakilo communities. Each of these areas have considerable land area which is available for housing development. A combined

total of approximately 31,000 homes are proposed for construction in these communities (Table 3-10) from CY 1988 to 2005 (Kurahashi, 1988).

TABLE 3-10

EXISTING RESIDENTIAL DEVELOPMENT PROPOSALS PLANNED FOR THE EWA DISTRICT CALENDARS YEAR 1988 THROUGH 2005

Project Location	Number of Housing Units
West Beach	5,200
Makakilo	3,700
Ewa Beach	400
Ewa Village	380
Ko Olina (West Beach Expansion)	6,600
Kapolei Town Center	1,700
Kapolei Village	5,000
Ewa Marina	4,800
West Loch	1,500
Other Smaller Projects	350
Total	29,630

Source: City and County of Honolulu
Department of General Planning, 1988

3.3.6 Employment

Preliminary employment estimates and forecasts were recently prepared for the Oahu Metropolitan Planning Office by the City and County of Honolulu, Department of General Planning (see Section 1.4). This information indicates that approximately 10,550 persons were employed within the Ewa district in Calendar Year 1985. Unfortunately, available information for CY 1985 does not distribute the estimated jobs among the Ewa district's five residential communities.

Preliminary forecasts of anticipated employment, within the Ewa district in CY 2005, indicate that the greatest number of employment opportunities will be available in the Ewa village - Kapolei area (Table 3-11). The majority of the employment opportunities in this area are expected within the services, retail, construction and industrial sectors of the local economy.

3.3.7 Recreation

Available recreational participation data indicates that the two primary outdoor recreational activities of local

residents include: 1) swimming and sunbathing at local beach parks in the Ewa district, and 2) bicycling along public roads and sidewalks (State Division of Parks, Outdoor Recreation and Historic Sites, 1987). Results from the Hawaii Opinion Inc. survey indicate that fishing, picnicking, and general City and County park use (at inland facilities) are also significant recreational activities of Ewa residents.

TABLE 3-11

ESTIMATED EMPLOYMENT WITHIN EWA DISTRICT COMMUNITIES
CALENDAR YEAR 2005

Type of Job	Iroquois Point	Ewa Beach	Barbers Point	Makakilo	Ewa	Total
Military	179	0	3777	0	0	3956
Government	130	41	567	19	545	1302
Hotel	0	0	0	0	427	427
Agriculture	0	56	42	30	275	403
Transp, Comm, Util.	0	110	20	22	70	222
Industrial	0	513	37	59	2835	3444
Finance, Ins, R.E.	0	1147	31	221	1706	3105
Services	490	3324	255	550	4783	9402
Retail	56	1976	466	344	3911	6753
Construction	20	1685	3	682	3272	5662
Total Jobs	875	8852	5198	1927	17824	34676

Source: City and County of Honolulu
Department of General Planning, 1988

3.3.8 Educational Background

Available 1980 Census information indicates that the Barbers Point and Makakilo communities contain the greatest proportion of high school graduates while the Ewa village community has the least. Similarly, a higher number of college graduates also live in the Makakilo and Barbers Point areas; the least reside in the Ewa villages and Ewa Beach areas.

More recent estimates of the September, 1988 public school enrollment in the Ewa area are presented in Table 3-12.

TABLE 3-12

ANTICIPATED PUBLIC SCHOOL ENROLLMENT
IN EWA VILLAGE AND EWA BEACH
SEPTEMBER, 1988

Enrollment Public School	Expected Sept. 1988 (Students)
Ewa Elementary	432
Ewa Beach Elementary	380
Pohakea Elementary	520
Total Elementary	1,332
Ilima Intermediate	945
Campbell High School	1,880
Total Enrollment (K-12)	4,157

Source: Matsushige, 1988.

3.4 MAN-MADE ENVIRONMENT

3.4.1 Land Status

The 932-acre project site is primarily owned by The Estate of James Campbell. However, 75 acres of the site (Soda Creek) are now owned by The Gentry Companies through their recent acquisition of land and development rights from Hirano Brothers and The Estate of James Campbell. Land status records for the project site are referenced by the State Department of Taxation as Tax Map Key 9-1-10:por.2&7 and 9-1-12:29,30,por.1&5.

Surrounding lands in the project area are also primarily owned by Campbell Estate. Exceptions include the adjacent railroad and roadway rights-of-ways which are under the ownership of the State of Hawaii and/or the City and County of Honolulu.

3.4.2 Residential Areas

The Ewa district is comprised of five primary residential areas - Iroquois Point, Ewa Beach, Barbers Point, Makakilo, and six smaller villages referred to in this report as the Ewa villages (Figure 3-4). As of CY 1985, these villages represented a total district housing stock of approximately 9,500 homes (Table 3-13).


MAKAKILO
KAMOKILA PARK
KAPOLEI PARK
BARBERS POINT HOUSING
BARBERS POINT HOUSING
BARBERS POINT HOUSING
CAMPBELL INDUSTRIAL PARK
BARBERS POINT NAVAL AIR STATION
Barbers Point Naval Air Station

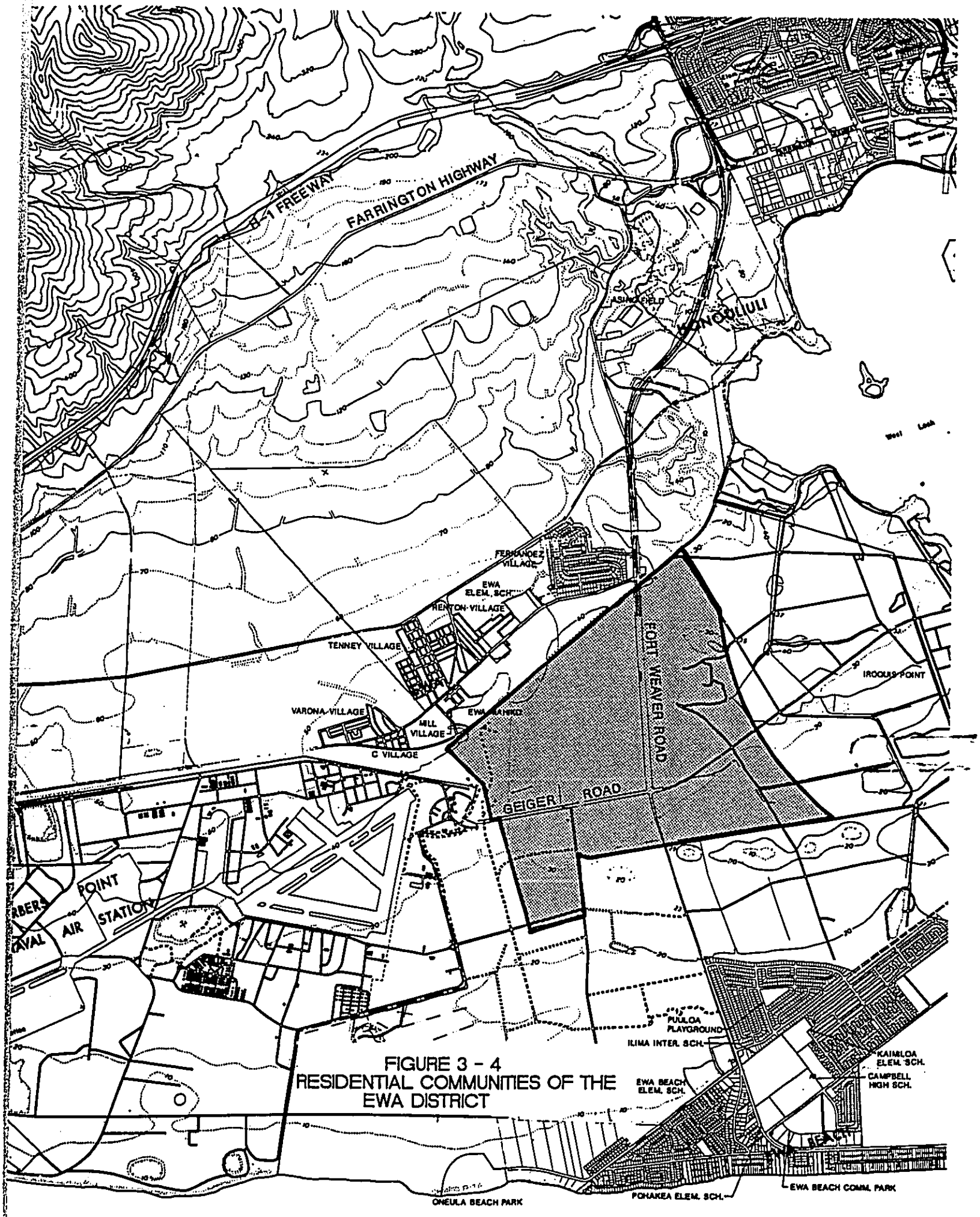


FIGURE 3 - 4
RESIDENTIAL COMMUNITIES OF THE EWA DISTRICT

TABLE 3-13

ESTIMATED HOUSING STOCK WITHIN THE EWA DISTRICT
CALENDAR YEAR 1985

Number of Housing Units					
Iroquois Point	Ewa Beach	Barbers Point	Makakilo	Ewa Villages	Total
2,896	2,039	854	2,476	1,253	9,518

Source: City and County of Honolulu, Department of General Planning, 1988

Immediately north of the project site are the six Ewa villages which are more specifically known as Fernandez, Tenney, Renton, Varona, C and Mill Village. These villages contain plantation housing which was originally constructed between 1907 and 1957.

> "Since the late 1950's there has been no major construction of new villages. Repairs and replacement of the village housing were handled by Ewa Sugar Company as part of an ongoing maintenance program for employee housing until it was sold in 1970. By late 1971, Ewa Sugar Company had merged with Oahu Sugar Company. As the parent company for the village employees, Oahu Sugar Company assumed the maintenance role for its employee housing" (Phillips, Brandt, Reddick, 1979).

3.4.3 Commercial Areas

Commercial areas within the Ewa district primarily include the Ewa Beach Shopping Center and an adjacent professional services complex. The Ewa Beach Shopping Center contains approximately 73,000 square feet of commercial retail floor space. The adjacent professional services complex consists of approximately 13,500 square feet of office space.

3.4.4 Industrial Areas

3.4.4.1 Campbell Industrial Park

The Campbell Industrial Park, which occupies 1,341 acres, is Hawaii's largest industrial park and a significant employer in the Ewa district. The park, established in the 1950's, has grown to contain 90 light to heavy industrial activities. Most of these

activities, which provide over 2,100 jobs, are related to the energy industry. Energy facilities within the park include:

Chevron USA, Inc.;
Hawaiian Independent Refinery, Inc.;
United Environmental Systems;
Texaco; and
Powerine Oil Company Fuel Storage Facility.

Also located in the park are two cement plants, a steel plant, a cattle feed lot, as well as manufacturing and storage complexes.

3.4.4.2 Barbers Point Harbor

The Barbers Point Harbor, which is currently under construction, will cover 330 acres and will represent Oahu's second deep-draft harbor. The Harbor will generally include container storage, break-bulk cargo area, and fuel storage and distribution facilities. Construction of the Harbor is expected to occur within three development phases.

> "The harbor is expected to generate over 400 direct employment opportunities by 1990 and to produce over 1,300 jobs by 2020. In addition, the harbor is expected to cause a leeward relocation of numerous businesses which currently depend on Honolulu Harbor. By the year 2030, harbor-induced expansion at the Campbell Industrial Park could double employment in the area to a total of about 4,200 jobs" (Dames and Moore, 1985).

3.4.5 Public Facilities and Services

3.4.5.1 Education

Public schools presently located in the vicinity of the project site include Ewa Beach Elementary, Ewa Elementary, Pohakea Elementary, Ilima Intermediate and Campbell High (Figure 3-5). Other schools in the Ewa district include Barbers Point, Maukalani, and Makakilo.

In view of the anticipated residential growth for the Ewa district, the State Department of Education is already planning for the potential development of additional schools within the Ewa district. At the present time, the Department of Education is considering the following general locations as potential school sites (Table 3-14):


LEGEND:
Existing Elementary School
Existing Intermediate School
Existing High School
Proposed Elementary School
Proposed Intermediate School
Proposed High School
KAPOLEI PARK
KAPOLEI INTER. SCH.
KAPOLEI HIGH SCH.
BARBERS POINT ELEM. SCH.
BARBERS POINT NAVAL AIR STATION
CAMPBELL INDUSTRIAL PARK
MAKAKILO ELEM. SCH.
MAKAKILO INTER. SCH.
MAKAKILO HIGH SCH.
MAKAKILO COMMUNITY PARK
MAKAKILO REGIONAL PARK
KAMOKILA PARK

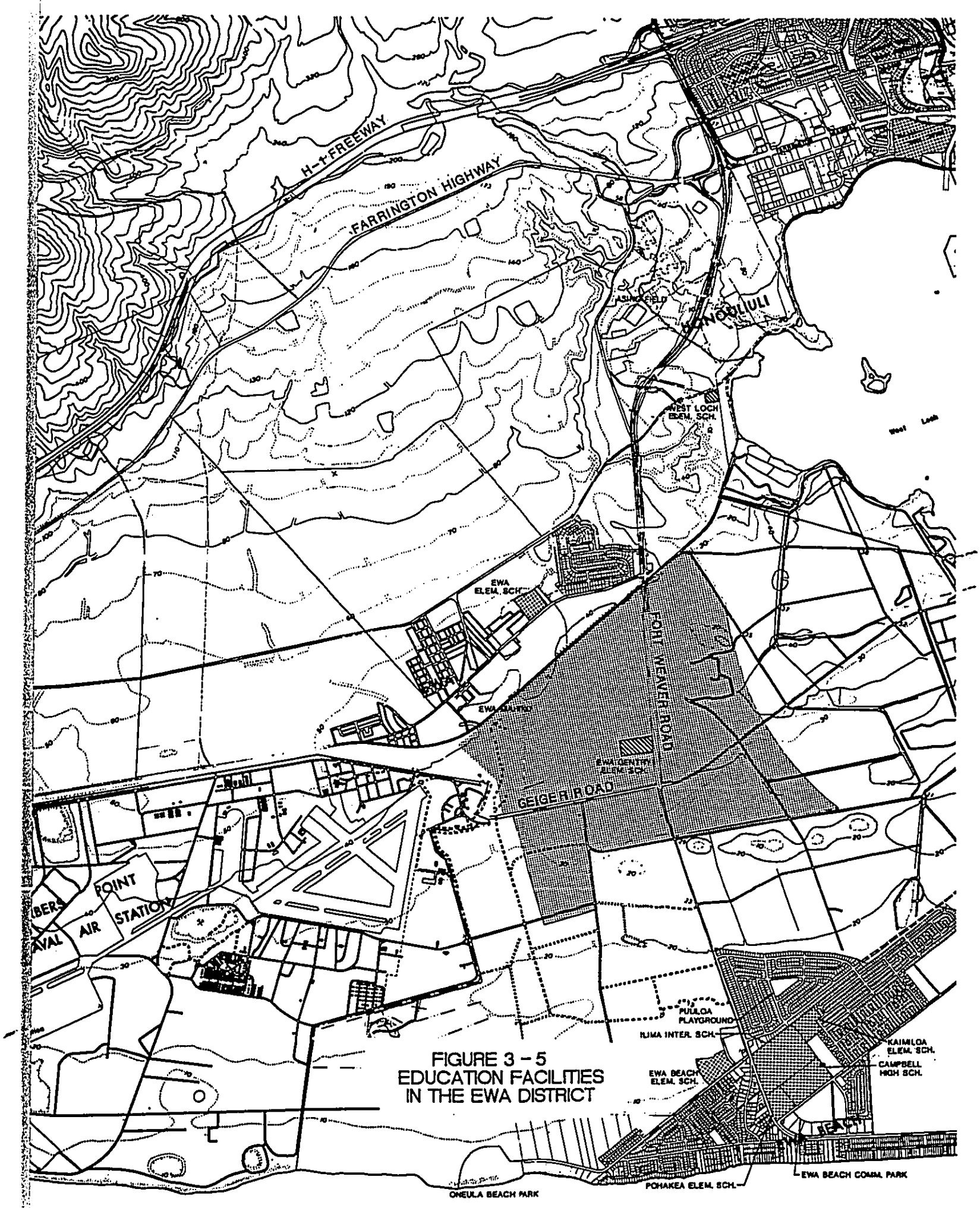


FIGURE 3 - 5
EDUCATION FACILITIES
IN THE EWA DISTRICT

TABLE 3-14

POTENTIAL PUBLIC SCHOOL SITES WITHIN EWA DISTRICT

Location	Type of School Facility
Kapolei Village	Elementary (2)
Kapolei Village	Intermediate (1)
Kapolei Village	High School (1)
West Loch	Elementary (1)
Ewa Gentry	Elementary (1)

Source: State Department of Education, 1988

In the planning of these facilities, the State Department of Education normally assumes an average classroom size of 25 students. Desirable student population sizes for each school are as follows (Okamura, 1988):

Type of Public School	Desired Student Population Range
Elementary	400 - 900
Intermediate	750 - 1,500
High School	1,000 - 2,000

3.4.5.2 Medical and Social Services

Health care facilities in the area are provided by the Waipahu Clinic and by the Moanalua Kaiser Medical Center. The Waipahu Clinic provides a variety of health services while the nearest hospital/emergency services are available at Moanalua Kaiser Medical Center.

St. Francis Hospital is presently constructing the first phase of a new medical facility near the northern end of Fort Weaver Road. The first phase, which is to be completed in late 1990, will provide a fully-equipped 100-bed facility and related health care services.

3.4.5.3 Transportation

Roadway System:

Fort Weaver Road links the town of Ewa Beach to the H-1 Freeway and Waipahu (Figure 3-6). Fort Weaver Road serves as the main collector/arterial roadway for the Ewa Beach area. The portion of Fort Weaver Road between the H-1 Freeway and Geiger Road is a divided highway. Two twelve-foot wide lanes with a ten-foot wide outside shoulder and a four-foot wide median shoulder are provided in each direction.

The intersection of Renton Road and Fort Weaver Road is a signalized cross-intersection. Each approach on Fort Weaver Road contains two lanes for through traffic and a separate left turn bay. On the southbound approach of Fort Weaver Road, a deceleration lane for right turns into Renton Road is also provided. Renton Road's eastbound approach consists of separate lanes for left turns and through movements and an acceleration/merge lane for right turns into Fort Weaver Road. East of Fort Weaver Road, Renton Road is paved for a short segment which leads to a gate which controls access to a private cane haul road (Parsons, Brinckerhoff, Quade, and Douglas, Inc., 1987).

The intersection of Geiger Road and Fort Weaver Road also forms a signalized cross-intersection. Each approach on Fort Weaver Road contains a shared lane for through and right turn movements and a separate left turn bay. A shared lane for left turns and through movements and a separate lane for right turns exist on both of the Geiger Road approaches (Parsons, Brinckerhoff, Quade and Douglas, Inc., 1987).

Existing Traffic Conditions:

The description of existing traffic conditions is based on manual counts and observations taken by Parsons, Brinckerhoff, Quade and Douglas, Inc. on a weekday in late April 1987 for the Renton Road/Fort Weaver Road and Geiger Road/Fort Weaver Road intersections. Observations were made during the morning and afternoon peak periods. Figure 3-7 depicts the existing peak hour volumes; the AM and PM peak hours are based upon total traffic volumes.

The signalized intersections were analyzed by the planning method described in the 1985 Highway Capacity Manual. Analysis of the existing traffic volumes at the Renton Road/Fort Weaver Road intersection shows that the volume-to-capacity ratio is 0.54 during both

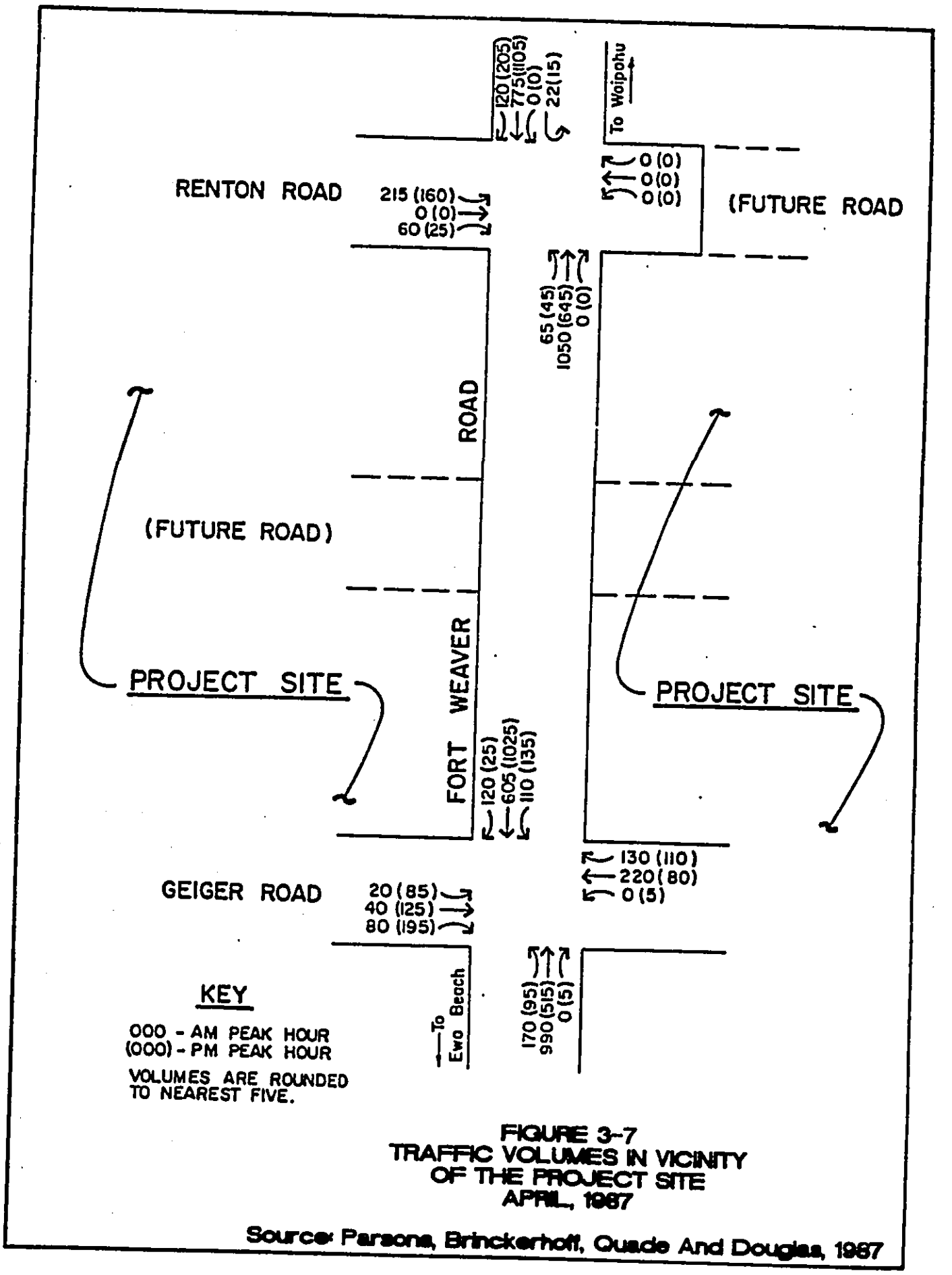


FIGURE 3-7
TRAFFIC VOLUMES IN VICINITY
OF THE PROJECT SITE
APRIL, 1987

Source: Parsons, Brinckerhoff, Quade And Douglas, 1987

the AM and PM peak hours. The intersection is considered to operate at under-capacity conditions (Parsons, Brinckerhoff, Quade and Douglas, Inc., 1987).

At the Renton Road/Fort Weaver Road intersection, the southbound left turn bay on Fort Weaver Road was observed to be used almost exclusively by drivers executing U-turns to head north during the protected left turn phase. Drivers utilized the through lane on the eastbound approach of Renton Road as a second left turn lane into Fort Weaver Road whenever the queue in the designated left turn lane became too delayed. Many of the left turns into the Fort Weaver Road were executed during the yellow, or the beginning of the red light phases.

At the Geiger Road/Fort Weaver Road intersection, the analysis of the existing traffic volumes shows that the intersection operates at near-capacity conditions during the AM and PM peak hours with volume-to-capacity ratios of 0.96 and 0.90, respectively (Parsons, Brinckerhoff, Quade and Douglas, Inc., 1987).

At the Geiger Road/Fort Weaver Road intersection, it was also observed that some drivers executed left turns from Geiger Road into Fort Weaver Road during their red phase. A few motorists on the southbound approach wishing to turn right into Geiger Road used the shoulder to execute their movements when the shared lane was occupied.

Bus Service:

Public transportation service on the Island of Oahu is supplied by the City and County of Honolulu, Department of Transportation Services. Bus service typically operates according to supply and demand, and the availability of resources. Operating bus routes in the vicinity of the project site include the Ewa and Ewa Beach system (Route 50) and the Ewa Beach Express (Route 91).

Route 50 runs daily , beginning as early as 4:35 AM in one location and ending as late as 1:01 AM in another location. In any one bus stop location along route 50, riders wait at varying intervals of 10 to 45 minutes, depending on the time of day. With an average daily count of 13,567 riders, route 50 is currently undergoing plans for route revision by the City and County of Honolulu. A future revised route 50 plan may include a routing change as well as a new shuttle service between Ewa Mill, Ewa Beach and Waipahu (Feirer, 1988).

Route 91 Express, from Ewa Beach to Honolulu, is a week-day express with two early morning runs and two evening runs for the convenience of Downtown Honolulu workers. The daily average count for route 91 is 200 riders (Feirer, 1988).

3.4.5.4 Recreation and Community Facilities

Recreational facilities of the Ewa area include neighborhood parks located in the vicinity of the Ewa villages, Ewa Beach, and Makakilo. Beach parks are located in Ewa Beach and the Barbers Point Naval Air Station. One golf course is located on the eastern boundary of the Barbers Point Naval Air Station. Presently, Ewa Beach recreational facilities receive heavy use due to shortage of facilities in other surrounding areas.

In conjunction with anticipated resort, commercial and residential development within the Ewa district, future land dedications by private development organizations will be made to the City and County of Honolulu for subsequent park development. Potential park sites currently envisioned by the City and County of Honolulu, Department of Parks and Recreation, include (Figure 3-8):

Ka Olina (West Beach) Beach Park (at two separate sites)
Kapolei Neighborhood Park
Kapolei Village Community Park
West Loch Shoreline Park
Honouliuli District Park
Ewa Gentry Community Parks (2)
Ewa District Park

City and County beach and shoreline parks generally include facilities and support services for water activities such as sunbathing, swimming and picnicking. District parks are designed to service approximately 25,000 persons by providing playfields and courts, a recreational center, a swimming pool, and passive use size; these parks and provide playfields and courts, areas. Community parks are approximately 10 acres in and a recreation building to provide recreational opportunities for about 10,000 people. Neighborhood parks generally service approximately 5,000 people with the availability of playfields and courts, and a comfort station on approximately 4 to 6 acres of parkland.


MAKAKILO COMM. PARK
MAKAKILO ELEM. SCH.
MAKAKILO NBRHD. PARK
MAKAKILO HIGH SCH.
MAKAKILO KOA NBRHD. PARK
KAMOKILA PARK
KAPOLEI PARK
PROPOSED TRANSIT
BARBERS POINT HOUSING
BARBERS POINT ELEM. SCH.
BARBERS POINT HOUSING
BARBERS POINT NAVAL AIR STATION
CAMPBELL INDUSTRIAL PARK
Barbers Point Naval Air Station

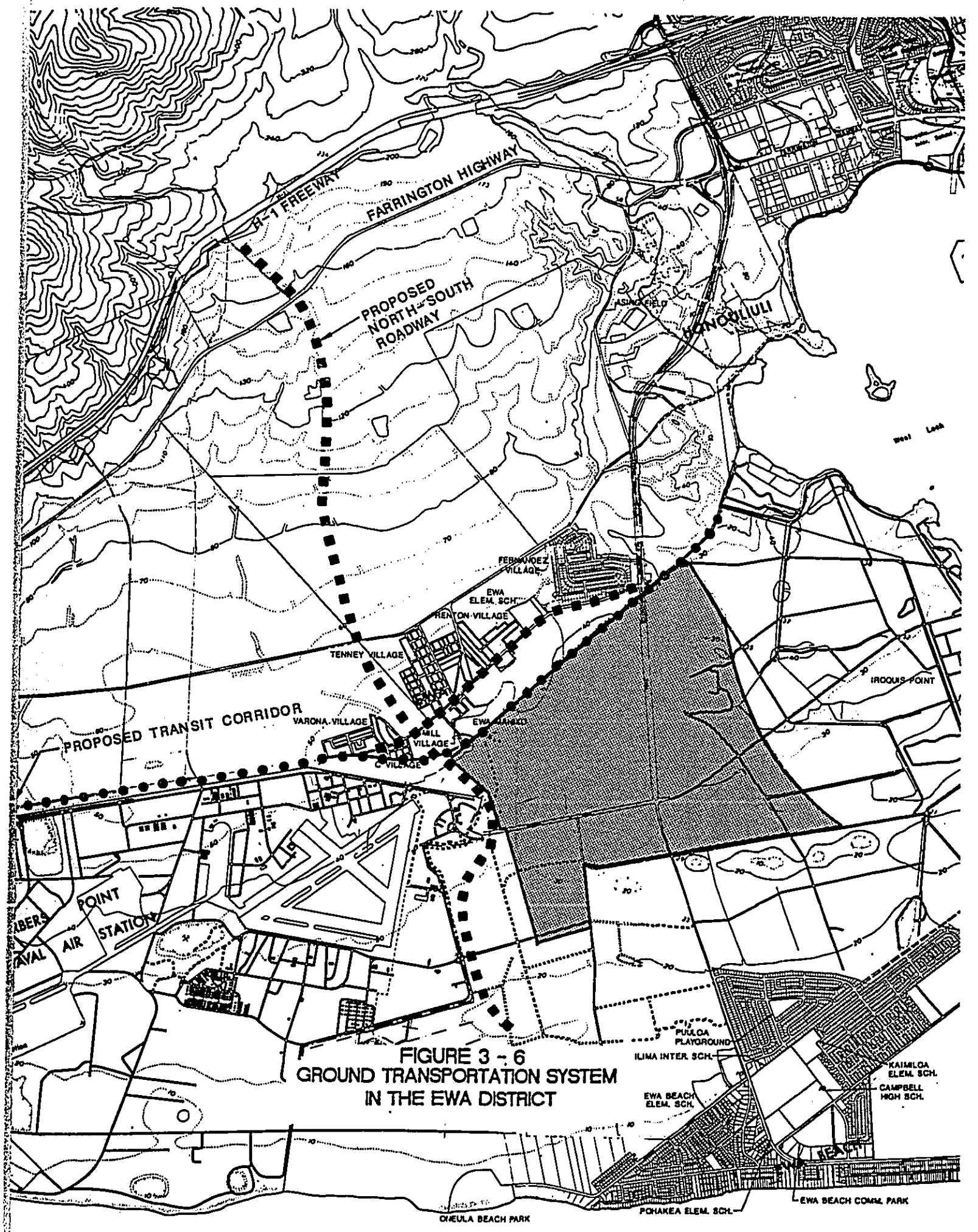


FIGURE 3 - 6
GROUND TRANSPORTATION SYSTEM
IN THE EWA DISTRICT


LEGEND:
Existing City And County Park
Proposed City And County Park
Proposed Private Facility
KA OLINA BEACH PARK #1
KA OLINA NBRHD. PARK
KAMOKILA PARK
KA OLINA BEACH PARK #2
MAKAKILO
MAKAKILO COMM. PARK
MAKAKILO ELEM. SCH.
MAKAKILO NBRHD. PARK
MAKAKILO HIGH SCH.
KAPOLEI NBRHD. PARK
KAPOLEI PARK
KAPOLEI VILLAGE COMM. PARK
BARBERS POINT ELEM. SCH.
BARBERS POINT NAVAL AIR STATION
CAMPBELL INDUSTRIAL PARK

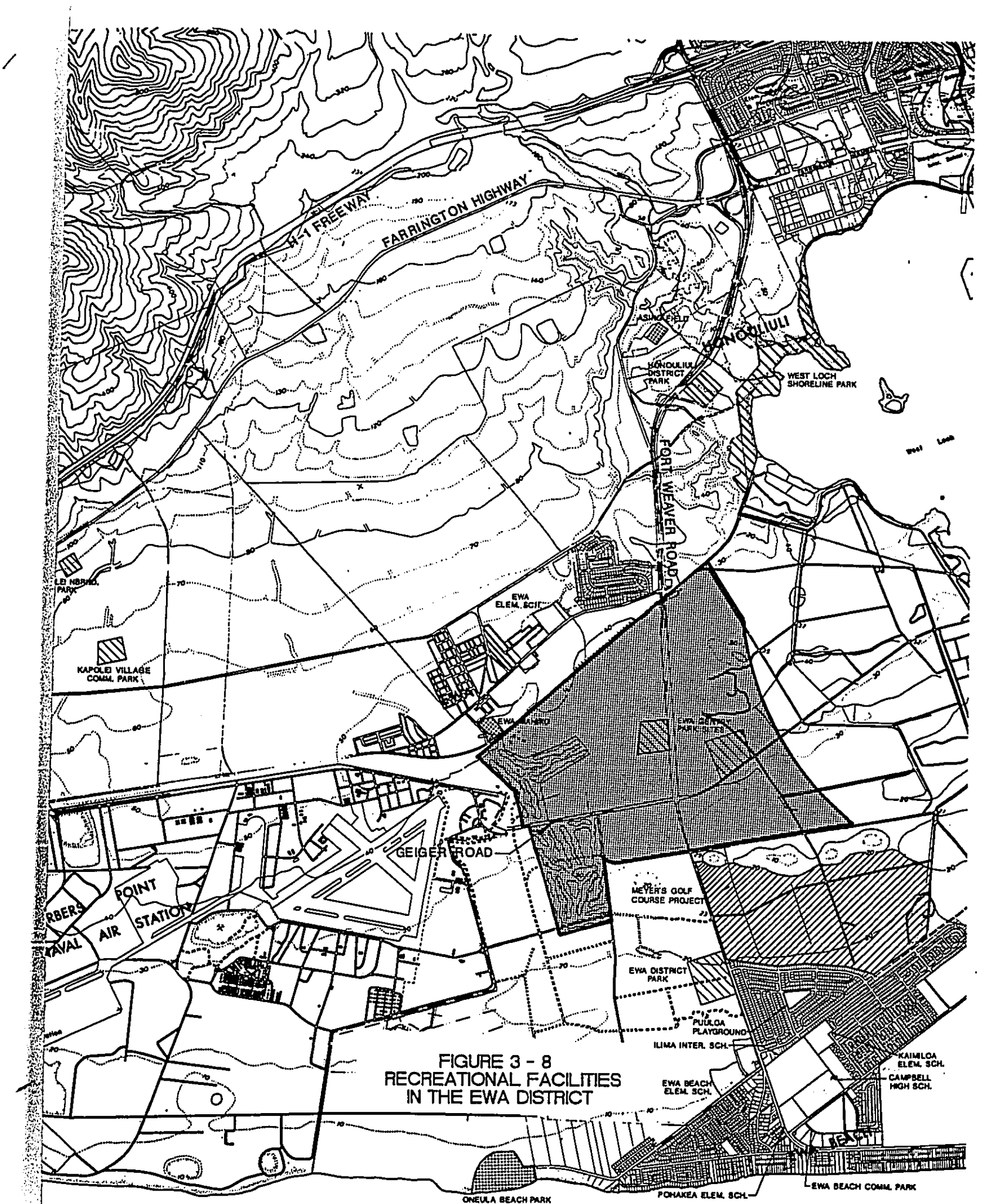


FIGURE 3 - 8
RECREATIONAL FACILITIES
IN THE EWA DISTRICT

In addition to park developments within the Ewa district, a private 27-hole golf course is proposed to be built north of Ewa Beach. An 18-hole golf course is also proposed to be built within the Ewa Gentry project site. At the present time, it has not been determined if the facility will be operated on a public or private basis.

3.4.5.5 Water Systems

The project is located within the Ewa-Waianae District of the Board of Water Supply system. The project site is primarily under sugarcane cultivation at the present time and Oahu Sugar Company's agricultural water system supplies all water. The major regional Board of Water Supply infrastructure in the area consists of a 30-inch main running along Farrington Highway between Waipahu and the Barbers Point 215-foot storage system. A 16-inch transmission main is also located in Fort Weaver Road.

Major proposed water facilities in the area include a second 30-inch main within Farrington Highway and a 42-inch main from Farrington Highway to the Ewa Gentry project which is currently under construction. In addition, new wells and storage capacity are under construction to support urban development. The wells and storage systems will be provided in the area of Honouliuli I well.

3.4.5.6 Waste Management Systems

3.4.5.6.1 Solid Waste

Refuse disposal services for residential development in the area are currently provided by the City and County of Honolulu Division of Refuse. Non-residential disposal services are provided by private refuse companies. Solid waste can be disposed of at the Palailai Landfill or Waipahu Incinerator.

3.4.5.6.2 Wastewater

Wastewater treatment plant facilities in the area are the Honouliuli Sewage Wastewater Treatment Facilities. The last sewer segment before the sewage treatment facilities is an 84-inch sewer within Geiger Road and Iroquois Point Road. The proposed Ewa Gentry project will have an on-site collector system which will transport all sewage to the 84-inch main entering to Honouliuli Plant.

3.4.5.7 Power Systems

Electric power for the area is maintained by Hawaiian Electric Company (HECO). Existing overhead systems are located adjacent to the railroad right-of-way to the north of the project site, along the eastern boundary and within Fort Weaver Road. Hawaiian Electric Company has both an Ewa substation and Honouliuli substation immediately west of the project site.

3.4.5.8 Drainage Systems

No drainage structures are present within project site. Drainage swales are present, however, along Fort Weaver Road.

North of the project site, an existing drain carries runoff into Fernandez Village, Ho'a Kea Subdivision, and the adjacent Elderly Housing facility into the project site.

3.4.5.9 Communications

Telephone communications in the area are presently provided by Hawaiian Telephone Company.

3.4.5.10 Police and Fire Protection

Police service for the Ewa area is provided by the Pearl City Station. Pearl City Station officers patrol the Waianae Coast District, Waipahu/Ewa Beach District and the Aiea/Pearl City District. In accordance with required standards, one police officer is provided for every 412 residents (Douglas, 1988).

Fire services in the Ewa area are provided from Ewa Beach Fire Station with additional fire protection from Waipahu Fire Station. Ewa Beach Fire Station has one engine and is manned by 5 firefighters. Twelve additional firefighters are also available via the dispatch of an additional engine and ladder company from Waipahu. The Ewa Beach Fire Station is currently scheduled for relocation in 1991, but site selection within the Ewa Beach area has not yet been made.

Two additional fire stations are also being planned for the Ewa district. Ewa Tenney Village Fire Station and Campbell Industrial Park Fire Station are both scheduled for 1992, depending on approval and funding availability. Specific sites within these areas have not been selected (Word, 1988).

3.5 RELATIONSHIP TO PLANS, POLICIES, AND REGULATORY CONTROLS

3.5.1 Hawaii State Plan, Hawaii Revised Statutes (HRS), Chapter 226

The Hawaii State Plan provides a guide for the short and long-term development of Hawaii. Development guidelines are presented in the form of various regional goals, objectives, policies and priorities for Hawaii's population and economy, as well as natural and man-made resources (Hawaii State Plan Policy Council, 1986).

In the following paragraphs, the relationship of these guidelines to the Ewa Gentry project is discussed, for each relevant component of the State Plan.

3.5.1.1 Population: Section 226-5

The Ewa Gentry project is consistent with this policy by encouraging population growth to Oahu's Ewa district. This policy has, in essence, been established by the City and County of Honolulu which is encouraging the development of a secondary urban center on Oahu.

3.5.1.2 Economy: Section 226-6

The proposed project will involve considerable construction activity which will create additional direct and indirect employment and diversified job opportunities for Oahu residents. In the longer term, new retail trade and commercial service employment opportunities will also be created within the Ewa district which will provide greater household income to local residents.

3.5.1.3 Agriculture: Section 226-7

The goal of this policy is to preserve the economic viability of plantation agriculture and promote the growth of diversified agriculture. While the Ewa Gentry project replaces agricultural lands with residential use, this action is not believed to reduce the economic viability of Oahu Sugar Company (Appendix I).

The Ewa Gentry project is intended to address the needs of the low-moderate income category, the entire affordable housing market, as well as a small portion of the upper middle income market.

3.5.1.4 Housing: Section 226-19

The Ewa Gentry project is intended to address the needs the conventional Oahu housing market, as well as the housing needs of low to moderate income persons.

3.5.2 State Housing Functional Plan

In order to meet the wide intended market of potential homeowners (3.5.1.4), low to moderate income units will be provided primarily in the multi-family projects where one and two-bedroom units will be priced to meet the anticipated 80% of median income category. The gap group market will also be accommodated by the multi-family units, as well as with much of the zero side yard single family cluster units priced in the $120,000 to $175,000 range (1987 dollars). Hula Mae buyers who fall in the 140 percent of median category will also be accommodated by the zero lot line units. The larger single family homes to be located adjacent to the planned golf course will be priced according to market conditions and is intended to provide an upscale opportunity not currently available within the Ewa community.

3.5.3 State Agriculture Functional Plan

This plan states, in part, that important land should not be reclassified for non-agricultural use except where economic, social or physical conditions have changed sufficiently. Clearly, the City and County of Honolulu's policies to establish a second urban center has significantly changed the social and economic direction of the Ewa district.

3.5.4 State Land Use Designations

A 300-acre parcel, located southwest of the Fort Weaver Road/Oahu Railway tracks intersection, is designated for urban use. The remaining 632 acres are situated within a State Agricultural district (Figure 3-9).

3.5.5 City and County of Honolulu, Ewa Development Plan

Most of the project site is designated for agricultural use (707 acres) and generally conforms to the State land use designations. Of the 300 acres in the State Urban district, 225 acres of the Ewa Development Plan are designated by the City for low density apartment, residential and park uses (Figure 3-10).

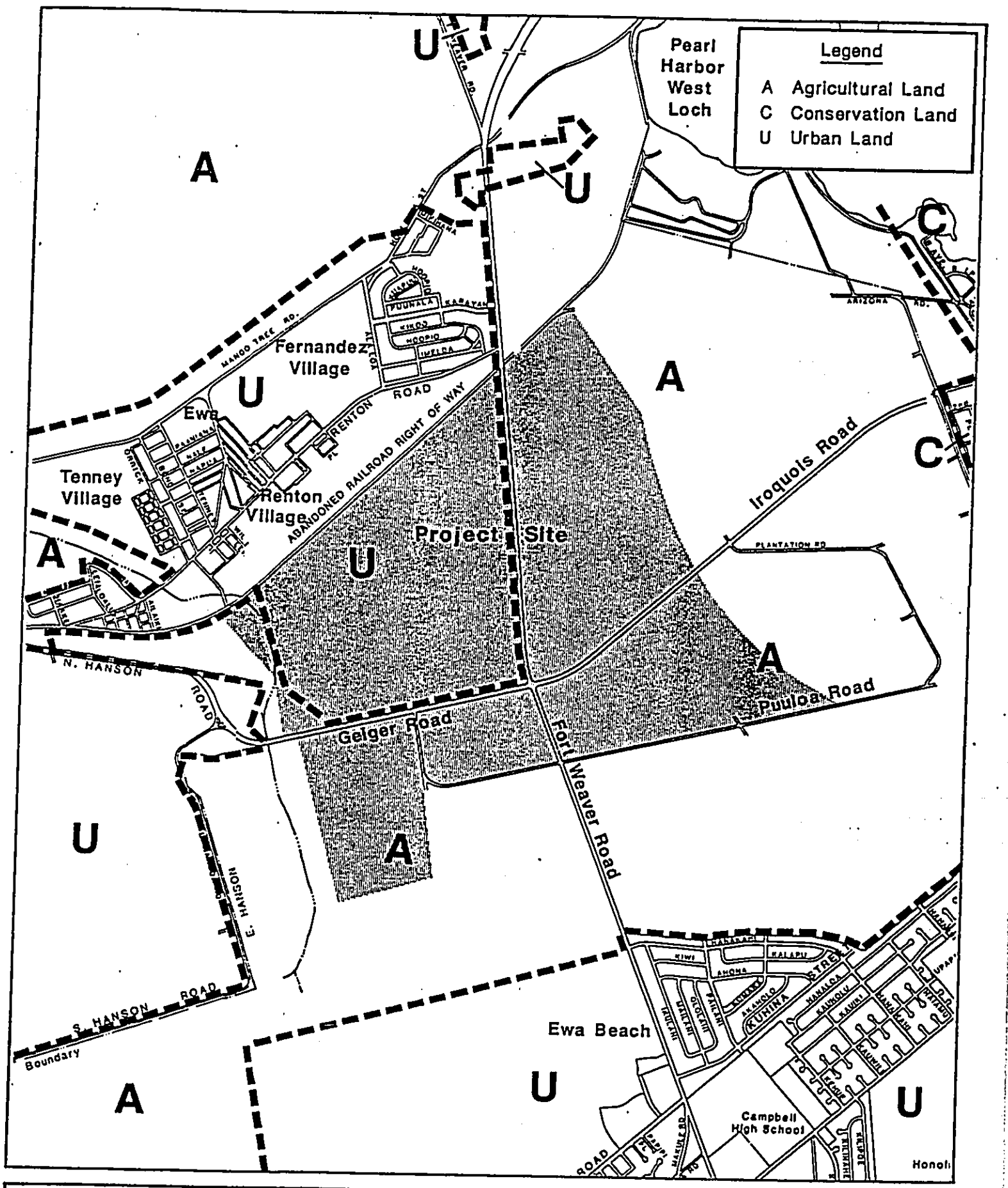
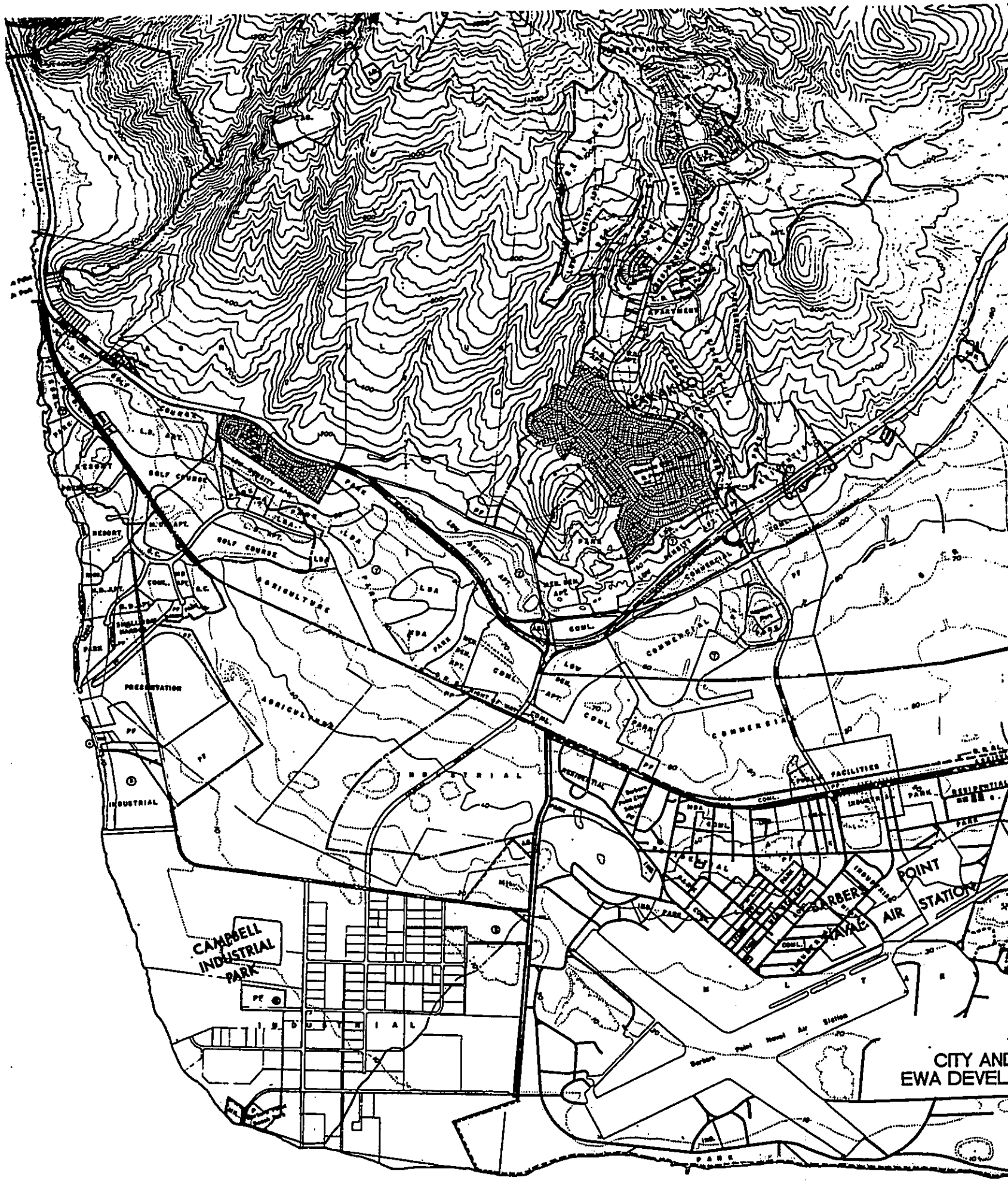


FIGURE 3-9
STATE LAND USE
DESIGNATIONS

0 1000 2000 FEET 4000

Source DHM Inc.


CAMPBELL INDUSTRIAL PARK
POINT
AIR
STATION
CITY AND
EWA DEVEL

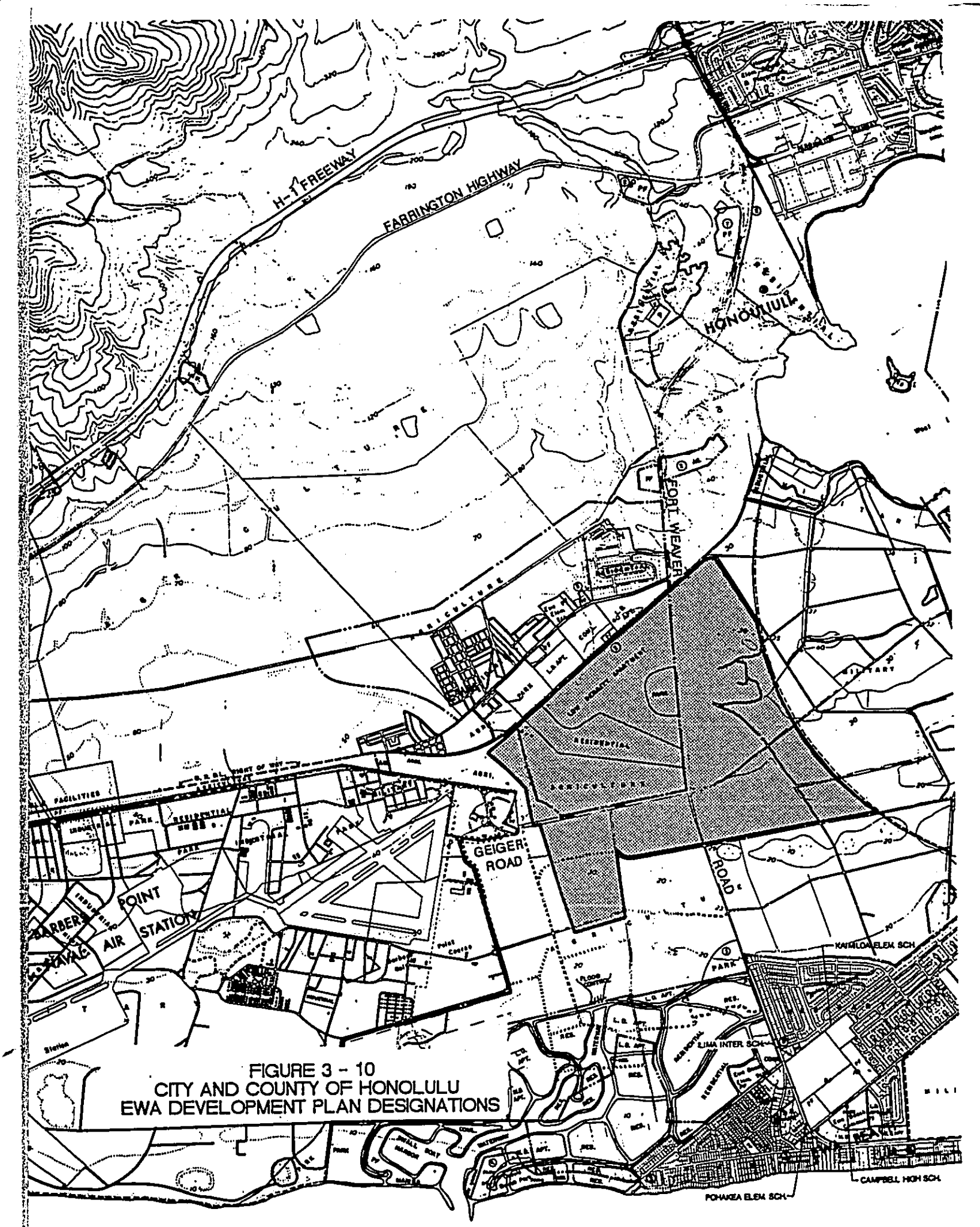
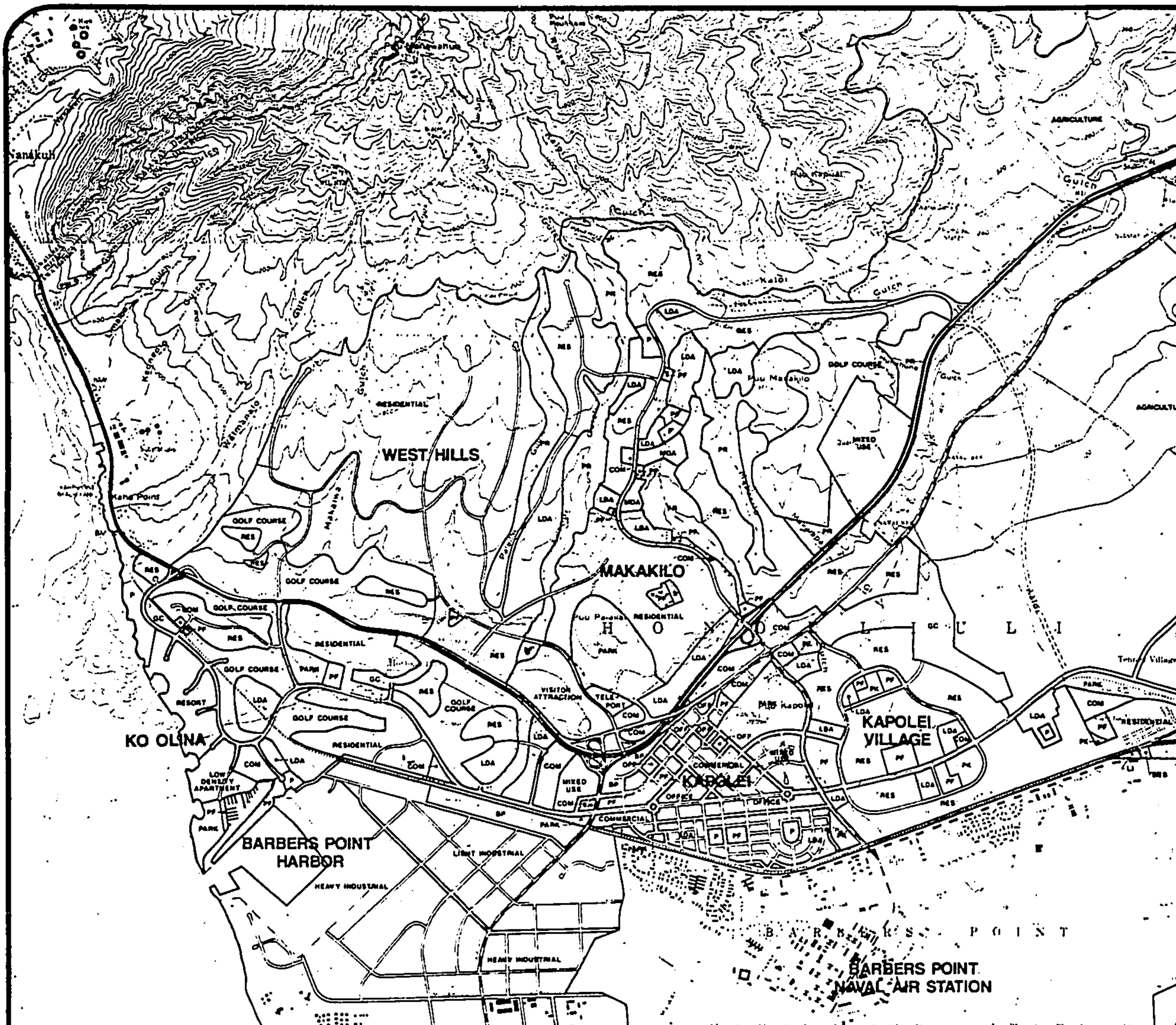
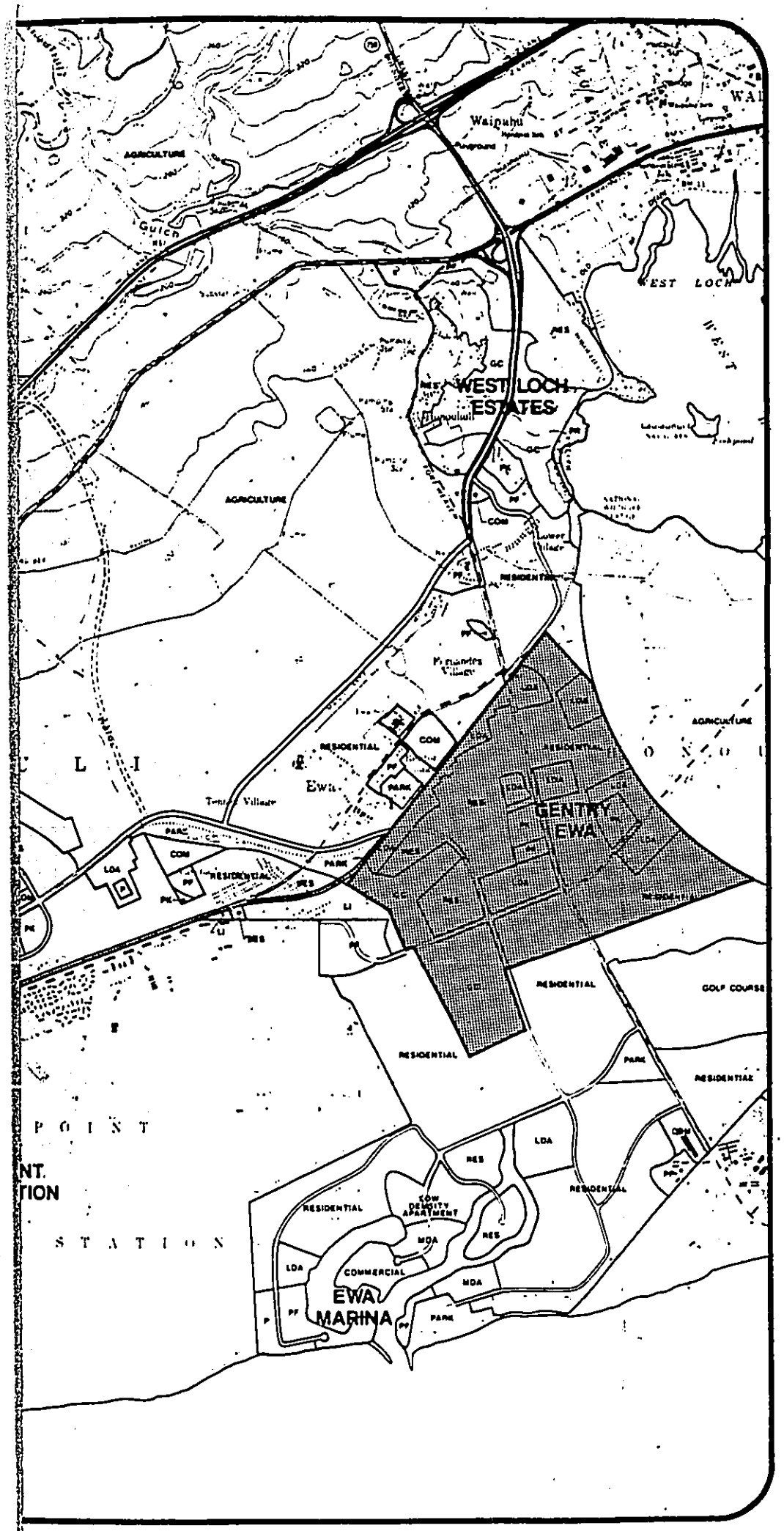


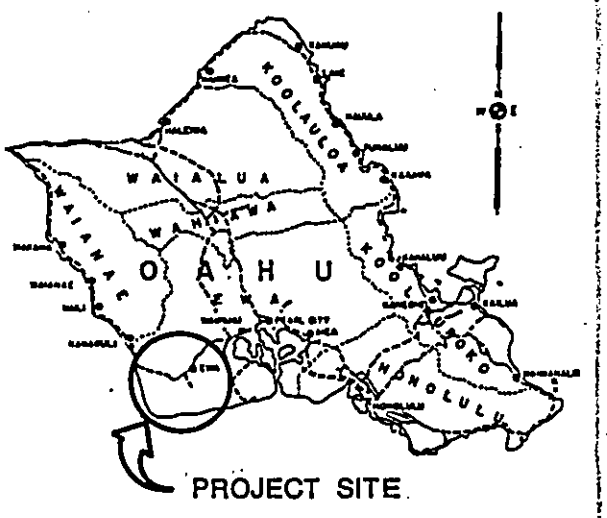
FIGURE 3 - 10
CITY AND COUNTY OF HONOLULU
EWA DEVELOPMENT PLAN DESIGNATIONS

3.5.6 The Estate of James Campbell, Ewa Long Range Master Plan

The Estate of James Campbell has, in recent years, established and maintained an Ewa Long Range Master Plan (Figure 3-11) which generally reflects the longer-term intentions of this privately-owned corporation. This plan reflects the future presence of the proposed Ewa Gentry project.


WEST HILLS
MAKAKILO
KO OLINA
BARBERS POINT HARBOR
KAPOLEI
KAPOLEI VILLAGE
BARBERS POINT NAVAL AIR STATION
CAMPBELL INDUSTRIAL PARK
GOLF COURSE
RESIDENTIAL
LIGHT INDUSTRIAL
HEAVY INDUSTRIAL
VISITOR ATTRACTION
MIXED USE
COMMERCIAL
LOW DENSITY APARTMENT
RESORT
AGRICULTURE
Barbers Point
Nanakuli





VICINITY MAP
NOT TO SCALE

RES	RESIDENTIAL
LDA	LOW DENSITY APARTMENT
MDA	MEDIUM DENSITY APARTMENT
COM	COMMERCIAL/RETAIL
OFF	OFFICE
BP	BUSINESS PARK
LI	LIGHT INDUSTRIAL
HI	HEAVY INDUSTRIAL
RST	RESORT
PK	PARK
MU	MIXED USE
PF	PUBLIC FACILITY
GC	GOLF COURSE
PR	PRESERVATION
AG	AGRICULTURE

FIGURE 3-11
EWA LONG RANGE MASTER PLAN
THE ESTATE OF JAMES CAMPBELL

SOURCE:
Helber, Hastert And Kimura, Planners, 1988

CHAPTER 4.0

ANTICIPATED ENVIRONMENTAL CONSEQUENCES AND PROPOSED MITIGATIVE MEASURES

4.1 PHYSICAL IMPACTS

4.1.1 Alteration of Topography

Existing contours of the project site will be altered through the excavation, grading and fill of lands encompassed within the 932-acre project site. Potential quantities of these activities will not be available until preliminary engineering design plans are prepared for all phases of the proposed residential project.

4.1.2 Alteration of Drainage Patterns and Flows

4.1.2.1 West of Fort Weaver Road

Kaloi Gulch and adjacent lands on the east side of the gulch will be significantly altered to accommodate Kaloi Gulch runoff and create adequate drainage ways for the flow of internal project site drainage. The proposed golf course development will be developed to actually contain the Kaloi Gulf channel. Eventual peak discharge from Kaloi Gulch is estimated to be 7,500 cubic feet per second (Belt, Collins, & Associates, 1987).

A 100-foot wide channel will be developed through the golf course to accommodate a 5-year peak flow of approximately 1,200 cubic feet per second. Sloping golf course lands, not less than 250 feet on either side of the channel, will be able to handle peak runoff flows of up to 16,000 cfs (Belt, Collins & Associates, 1987).

4.1.2.2 East Side of Fort Weaver Road

This portion of the Ewa Gentry site contains approximately 387 acres and has no practical drainage outlet to the ocean or West Loch. Consequently, drainage will be directed to two excavated sumps. Excavated material obtained from sump constructed will be used to attain adequate drainage slope. The sumps will be capable of handling runoff volumes of a 100-year, 24-hour storm with a minimum of a two-foot freeboard (Belt, Collins, & Associates, 1987).

4.1.3 Loss of Agricultural Resources

A residential development of the Ewa Gentry site will result in the loss of 857 acres of land which is presently being cultivated for sugarcane. This impact, in turn, will eliminate future opportunities to use this acreage for diversified agriculture. However, despite these losses, it is believed that 1) the economic viability of Oahu Sugar Company will not be shaken; and 2) the growth of diversified agriculture will not be adversely affected (Decision Analysts Hawaii, 1988). The background rationale supporting these conclusions are discussed more fully in Appendix I.

In summary, the Ewa Gentry project is not expected to threaten the economic viability of Oahu Sugar Company (OSCo). Economies of scale and a more compact and efficient plantation are possible by OSCo's transition to 1) a single-mill operation, or 2) retaining the existing two-mill operation. The second option is dependent upon continued urbanization proceeding at a gradual rate and yields increasing rapidly to compensate for the loss of acreage from Ewa Gentry and other development projects in the Ewa and Central Oahu districts. The one-mill alternative is believed to be a more feasible to maintain OSCo's economic viability.

> "Assuming an average yield of 18 tons per acre by the time the various projects reach full development (which is a conservative projection), a one-mill operation would require about 7,500 acres. This would provide a buffer of about 1,020 acres from which to assemble an efficient plantation; this figure is based on 8,520 acres remaining after urbanization (assuming approval and full development of all planned and proposed projects), minus the estimated 7,500 acres needed for a one-mill operation" (Decision Analysts Hawaii, Inc., 1988).

In addition, an agreement existing between the Estate of James Campbell and Oahu Sugar Company establishes an orderly withdrawal of sugar cultivation from the project site and other lands in the Ewa district.

4.1.4 Changes in Groundwater Recharge

Development of the 932-acre project site for residential purposes will result in roughly 40 percent of the project site being covered by impermeable surfaces such as roadway and housing. This will reduce the amount of recharge into the limestone and basaltic aquifers situated beneath the project site which contains brackish to saline waters unsuitable for potable use (Lowe, 1988). However, the planned use of an unlined channel (along the bottom) in Kaloi Gulch, as well as sumps on the east side of Fort

Weaver Road, are expected to facilitate a significant groundwater recharge.

More significant to future groundwater recharge is the expected change in daily water consumption of non-potable water from the local brackish aquifer. Oahu Sugar Company (OSCo) operations presently use approximately 6.9 to 8.6 million gallons per day of non-potable water from nearby brackish wells which represents a daily consumption of roughly 8,000 to 10,000 gallons per acre (Nance, 1988). In contrast, anticipated non-potable water requirements for the Ewa Gentry project will be approximately 860,000 gallons per day (Belt, Collins, & Associates, 1987).

Increased stormwater flows within the project site will be channeled to Kaloi Gulch on the west side of the project, or to sumps which will be constructed on the east side of Fort Weaver Road. Stormwater flows are not expected to transport limited quantities of pesticide residues, contaminants such as petroleum by-products, or sediment. Although a greater sediment load can be expected from infrequent stormwater flows during the erlier construction phases of the project.

Surface stormwater flows reaching the inshore waters during infrequent high rainfall conditions, may result in longer-term incremental changes in inshore water quality. Other studies have generally concluded that stormwater flows, entering inshore waters from urbanized areas, gradually decrease nitrogen concentrations and increase phosphorous concentrations within a given inshore marine environment.

4.1.5 Decreased Air Quality

Onsite sampling of ambient air concentrations for selected pollutants, and/or the use of any air quality model, were not made to support evaluations of anticipated air quality impacts. A detailed air quality impact evaluation was made for the proposed West Loch Estates project in September, 1987, by J. W. Morrow, Environmental Management Consultant. The analyses made in this report are believed to be valid for the Ewa Gentry project since this evaluation considered anticipated vehicular traffic from other existing and proposed residential areas, including the Ewa Gentry project. Further, anticipated traffic forecasts presented in the West Loch Estates EIS correlate closely to those determined by Parsons Brinckerhoff Quade & Douglas, Inc. for the Ewa Gentry project.

Assuming the full development of West Loch and Ewa Gentry projects by 1997, peak hour traffic volumes along Fort Weaver Road are expected to range from 1,700 to 3,500 vehicles per hour (Parsons Brinckerhoff Quade & Douglas, Inc. 1988). This assumes development of a new north-south roadway between the Ewa Gentry site and the H-1 Freeway.

The north-south roadway is expected to generate peak hour traffic volumes ranging from 1,500 to 1,700 vehicles per hour.

The air quality in the vicinity of the project site will, as a result, decrease with increased vehicular traffic along Fort Weaver Road, the proposed north-south roadway, primary roadway intersections, and future internal streets within the project site. Recent evaluations made by J. W. Morrow, environmental management consultant for the adjacent West Loch Estates housing project, indicate that carbon monoxide levels from future vehicular traffic will constitute the primary source of local air pollutants.

Morrow used EPA-recommended emissions and dispersion models to estimate maximum carbon monoxide emissions for the adjacent West Loch project. From these evaluations, Morrow concluded that HAAQS one-hour and eight-hour carbon monoxide standards would be exceeded within 10 to 40 meters of Fort Weaver Road. As stated earlier, these evaluations assumed other significant traffic south of the West Loch project which, in part, assumed additional vehicular traffic from the Ewa Gentry project.

Morrow also suggested various mitigation measures to reduce anticipated carbon-monoxide concentrations which, again, are directly applicable to the Ewa Gentry project. The improvement of existing roadway intersections to accommodate a greater capacity may reduce vehicular delays at primary roadway intersections. Increasing public bus service, the encouragement of car-pooling and the future development of a mass transit system will, independently or collectively, reduce the volume of vehicular traffic within the project site and the Ewa district. The staggering of business and school starting hours can reduce peak traffic volumes and the related higher concentrations of carbon monoxide.

Aside from increased carbon monoxide concentrations, the Ewa Gentry project will also indirectly generate concentrations of sulfur dioxide, nitrogen oxides, particulate matter, carbon monoxide and hydrocarbons. These emissions will be caused by the generation of electrical power at the Kahe Power Plant which will be required to produce 18 megawatts of energy to the Ewa Gentry project. The remaining emissions will be indirectly generated through combustion of approximately 20 percent of the domestic solid wastes from new residential households.

Local air quality in the vicinity of the project site will also be affected by increased levels of fugitive which will result from construction activities such as grading, excavation and fill operations. The impact of dust emissions upon homes in the existing Ewa villages and new homes within the Ewa Gentry project can be mitigated through scheduled periodic applications of non-potable water upon

unpaved areas and areas subjected to equipment mobilization or site preparation. The impact of dust emissions can be further mitigated by contractors' continual observance of higher wind conditions and increased water applications during these periods.

4.1.6 Increased Noise Levels

Sound levels in the vicinity of the project site will increase significantly with a new resident population of approximately 27,000 persons and related vehicular traffic along Fort Weaver, Geiger, Renton and Iroquois Point roads. Recent noise studies and evaluations of the proposed West Loch Estates project, which will be situated just northeast of the Ewa Gentry site, were made by Y. Ebisu and Associates.

These studies concluded that "non-project traffic," i.e., Ewa Gentry and other proposed projects south of the Ewa villages, will generate significant increases above existing levels. The West Loch project will contribute to an additional 0.3 to 0.4 Ldn of increased noise. However, the cumulative effects of increased vehicular traffic from both the West Loch Estates and Ewa Gentry projects will produce sound levels along Fort Weaver Road which may be 3 to 4 Ldn higher than existing levels of 55 to 60 Ldn (Y. Ebisu and Associates, 1987).

In order to reduce the impact of increased vehicular noise along primary roadways, it is recommended that homes along these roadways are set back from the road rights-of-way. A second option is to construct sound attenuating berms along Fort Weaver Road and to include sound attenuating windows and air conditioners for two-story homes (Y. Ebisu and Associates, 1987).

Secondary noise impacts will be generated from occasional aircraft fly-overs primarily from Barbers Point Naval Air Station; school activities and facilities, e.g. paging system; as well as the use and maintenance of proposed community parks and golf course areas. The formation of an active community association in the Ewa Gentry community can help reduce these potential impacts. In contrast to most residents, a local community association is expected to have greater capability to coordinate potential community concerns and potential solutions with the U.S. Navy, the State Department of Education, and various City and County of Honolulu agencies.

The Ewa Gentry project will require, at least, several years before construction of the overall community is completed. Consequently, homebuyers purchasing homes in the earlier phases of the project can expect to be impacted by heavy equipment operations and home construction activities.

Construction activities can be mitigated through building contractor compliance with Title 11, Administrative Rules, Chapters 42 and 43. These administrative rules represent a permit and procedure process which requires private contractors to:

1) Obtain a noise permit in noise levels from construction activity to exceed allowable noise levels;

2) equip construction equipment and onsite vehicles, requiring an exhaust of gas or air, with mufflers; and

3) construct sound barriers or berms in construction equipment baseyards or material stockpile areas if noise complaints are received from the general public.

4.2 BIOLOGICAL IMPACTS

4.2.1 Flora

The proposed Ewa Gentry project is not expected to have a significant impact on the botanical resources of the site, nor is it expected to have a significant cumulative impact on the flora of the general Ewa region. The project site and surrounding Ewa district have been disturbed for almost 100 years. The project site has been actively cultivated and, in some areas, cultivated for most of this time period. Areas containing native plant communities are few and are confined to the limestone or Karst topography along the coastal margin (Char and Associates, 1988).

The kinds of species found associated with the cultivated fields and ruderal or weedy situations on the project site can be found throughout the Ewa Plain area wherever sugarcane cultivation is practiced. Other recent botanical studies in the Ewa Plain area have produced checklists of plants and findings which were comparable to those developed by Char and Associates for the Ewa Gentry project (Appendix D).

> "As in the greater portion of the 'Ewa district, introduced or exotic species are the major components of the vegetation on the 'Ewa Gentry site. Of a total of 127 plant species inventoried, 114 or 90% are introduced species; 7 (6%) are indigenous, i.e., native to the islands and elsewhere; 1 (0.1%) is endemic, i.e., native only to the islands; and 5 (3.9%) are of early Polynesian origin. Of the native species, the indigenous taxa are found throughout the islands (and elsewhere) in similar environmental habitats.
>
> Some, like the 'uhaloa, popolo (Solanum nigrum), and koali (Ipomoea cairica) are considered rather "weedy" natives as they favor more or less

disturbed sites for establishment. The only endemic species, the 'anuanu or Sicyos microcarpus, is an annual vine which is widely distributed along the lowlands areas from 'Ewa to Mokule'ia. It is especially abundant behind the Mokule'ia coastline and along the Kealia cliffs during the rainy season" (Char and Associates, 1988).

No listed, proposed or candidate threatened and endangered plant species which have been designated by the federal and/or state governments (U.S. Fish and Wildlife Service, 1980; Herbst, 1987), are found on the project site. It is 1975), or sensitive native plant communities, occur on the project site.

4.2.2 Fauna

The Ewa Gentry project will not affect wildlife in, or in the vicinity of, the project site. The project site is highly disturbed because of historical sugar cultivation in the Ewa district. Approximately 20 species of introduced birds and one migratory indigenous bird are believed to reside or frequent the project site (Berger, 1988).

The proposed golf course may be attractive to migratory shorebirds frequenting this area. Golf course maintenance will require fertilization and the potential use of pesticides. The potential effects of golf course pesticide applications upon migratory birds is, however, expected to be insignificant in view of the availability and anticipated use of non-toxic pesticides, e.g. di-tel, and herbicides, e.g. roundup.

4.3 CULTURAL IMPACTS

4.3.1 Increase in the Ewa District Resident Population

Chapter 2 outlines a preliminary residential development schedule of 7,150 housing units during the 1988 - 1995 period. Application of the City and County of Honolulu's average household size forecasts to this development schedule indicates that the Ewa Gentry project will generate an additional resident population of approximately 26,385 persons from 1988 to 1996 (Table 4-1).

TABLE 4-1

ANTICIPATED RESIDENT POPULATION
EWA GENTRY PROJECT

Year	Single Family Units	Multi-Family Units	Total Units	Average Household Size	Anticipated Resident Population
1988	410	300	710	3.74	2,655
1989	280	440	720	3.73	2,686
1990	330	460	790	3.72	2,939
1991	510	460	970	3.70	3,589
1992	520	500	1020	3.68	3,754
1993	530	480	1010	3.67	3,707
1994	530	480	1010	3.66	3,697
1995	470	450	920	3.65	3,358
Total Units	3580	3570	7150	-	26,385

Source: The Gentry Companies, 1987
Gray Hong, Bills & Associates, 1988

From a regional perspective, the combined Ewa Gentry population (26,385) persons and potential population from other residential development projects (79,052 persons) would generate a potential Ewa distribution population of 105,437 residents during the next 16 years. Assuming a relatively constant annual rate of growth over the 17-year period, the Ewa district population would increase approximately 6,202 persons annually, or 13.9 per year.

4.3.2 General Changes in Human Behavior and Community Attitudes

The influx of an increased residential population and the related change from a more rural to urban setting will gradually impact the day-to-day behavior and attitudes of existing residents in the Ewa villages and the Ewa Beach areas. Long term residents of the Ewa area will notice and, occasionally, be sensitive to the effects of more vehicular traffic congestion along Fort Weaver Road, delayed customer service at the local shopping center, more crowded

recreational facilities, and other changes in community lifestyles and conditions. In contrast to present conditions, existing residents may also become more wary or suspicious of new residents.

Each of these potential behavioral changes are common characteristics for communities transitioning from a more rural to urban lifestyle and setting. Within a few years, most long-term residents will adjust to their new environment. Other existing residents may relocate if community changes become unacceptable. New incoming residents will initially tend to make interpersonal relationships with other new neighbors within the Ewa Gentry project. As some new residents become involved in school, community functions, the local business community, or local recreational programs, the relationships between long-term residents and new community residents will be established (James Pedersen, Planning Consultant, 1988).

4.3.3 Increase in Local School Enrollments

Local school enrollments in the Ewa - Ewa Beach community will gradually increase with growth in the local resident population. Based on historical observations of new residential developments on Oahu, the State Department of Education indicates that school enrollments in the Ewa villages and Ewa Beach communities will likely increase at the rate of approximately 20 students per every 100 single family units and 10 students per every 100 multi-family unit (Matsushige, 1988). Given these assumptions, the Ewa Gentry project is expected to generate the following additional student population by the year 2000 (Table 4-2).

4.3.4 Recreation

An increased residential population via the Ewa Gentry project will gradually affect the capacity of existing City and County parks in the Ewa and Ewa Beach communities. Existing beach parks in Ewa Beach are expected to be the most significantly affected. These facilities will likely continue to be the preferred recreational destination for both new and existing residents.

The determination of whether or not increased residential participation will saturate the capacity of existing recreational facilities cannot be estimated due to the lack of specific recreational participation information. General recreational standards, e.g., 4 acres per 1,000 population, are not believed to be specific enough to adequately assess specific facility capacity and ever-changing recreational use trends.

TABLE 4-2

ANTICIPATED NEW STUDENT POPULATION GENERATED BY EWA GENTRY

Year	Elementary	Intermediate	High School	Total
1988	112	22	38	172
1989	208	42	71	321
1990	320	64	108	492
1991	468	93	158	719
1992	622	124	209	955
1993	776	155	260	1191
1994	930	186	311	1427
1995	1069	214	358	1641
1996	1095	231	386	1712
1997	1121	248	414	1783
1998	1147	265	442	1854
1999	1173	282	470	1925
2000	1200	300	500	2000

Source: State Department of Education, 1988.

4.3.5 Oahu Sugar Company Employment

The termination of Oahu Sugar Company operations is not expected to be a consequence of the Ewa Gentry project. However, if this impact would occur, some 450 Oahu Sugar employees would lose their jobs. In addition, approximately 510 indirect jobs would also be affected (Decision Analysts Hawaii, Inc., 1988). The loss of jobs would occur over a period of time established in the OSCo/Campbell Estate agreement which withdraws land from sugarcane cultivation. These potential employment impacts would, however, be offset by concurrent new job opportunities which would be created through the anticipated expansion of Campbell Industrial Park; the construction and operation of Barber's Point Deep-Draft Harbor; and the development of Kapolei Town. Some unskilled workers may experience difficulty in securing other employment, or obtaining a new job at a comparable wage scale (Decision Analysts Hawaii, Inc., 1988).

4.3.6 Potential Employment Generation

4.3.6.1 Construction Activity

Construction of the Ewa Gentry project will generate a variety of direct employment in contract construction, and various building trades on Oahu. These jobs will, in turn, create indirect employment to other construction-related activities, e.g., building suppliers, architects, and engineers, which support the direct construction effort. Finally, the consumption of income derived from direct and indirect employment will also produce other jobs in Hawaii's retail trade and service sector which will be referred to as induced employment.

In order to estimate an order-of-magnitude estimate of the potential employment generation via construction, use was made of the employment model developed by the State Department of Business and Economic Development (DBED). Use of the model requires prior estimation of the construction labor force and the subsequent application of established statistical multipliers which have been developed by DBED (Mapes, 1988).

In 1985, the value of in-place construction projects in Hawaii totaled approximately $1.4 billion. The direct employment used to complete these 1985 construction projects involved approximately 16,950 persons (State Department of Business and Economic Development, 1986). Consequently, the average annual economic output of each construction worker in 1985 was approximately $82,600.

The Ewa Gentry project is expected to require a development cost of an estimated $52,065,000. Assuming

an average economic output of $82,600 for each construction worker, it is estimated that the Ewa Gentry project will provide roughly 630 direct jobs. Application of the direct employment estimate to the DBED employment model indicates that approximately 1,700 additional jobs would be generated in other construction-related services (indirect employment) and other jobs in retail trade and services (induced employment).

4.3.6.2 Retail Trade and Commercial Services

During and following construction of the project, new residents of Ewa Gentry will be purchasing household and convenience items from a diverse range of retail suppliers and commercial services on Oahu. This commercial trade will generate new jobs within the Ewa district community at existing shopping centers and other proposed commercial service complexes, e.g., Kapolei Town.

In order to estimate new potential employment within the Ewa district, various arbitrary assumptions were made to establish a statistical basis for subsequent employment calculations. These assumptions are presented in the following paragraphs.

New consumers from Ewa Gentry are expected to shop both within and outside the Ewa district. Prior to the proposed construction of Kapolei Town, the distribution of potential commercial sales will be somewhat greater outside the Ewa district. Following the development of Kapolei Town, consumer purchases are assumed to double (Table 4-3) and will be made primarily within the Ewa district.

TABLE 4-3

ANTICIPATED DISTRIBUTION OF RETAIL & COMMERCIAL SALES BY EWA GENTRY RESIDENTS PRIOR TO KAPOLEI TOWN DEVELOPMENT

Retail/Commercial Service Area	Proportion of Total Consumer Purchases by Ewa Gentry Residents	
	Before Kapolei	After Kapolei
Within Ewa District	40	80
Waipahu-Pearl City	35	10
Honolulu	20	05
Other Oahu Areas	05	05
Total	100	100

In the vicinity of the project site, the existing Ewa Beach Shopping Center, which contains approximately 73,000 square feet of commercial floor space, is believed to be supported by a primary consumer market of approximately 13,000 residents. From a statistical perspective, each resident presently supports approximately 6 square feet of commercial floor space.

Consumer demands by future residents of Ewa Gentry are expected to generate a concurrent demand for approximately 10 square feet of commercial floor space per resident. Retail trade and commercial service employment is assumed to represent approximately 1.1 jobs for every 1,000 square feet of commercial floor space.

Most all of the future buyers of Ewa Gentry homes will be existing residents on the Island of Oahu. Consequently, the only new employment generated will be from expanded or new commercial businesses within the Ewa district.

On the basis of these assumptions, it is estimated that a fully-developed Ewa Gentry population will support approximately 264,000 square feet of commercial floor space within the Ewa district. Since 73,000 square feet of commercial floor space are already available in the vicinity of the project site, future Ewa Gentry consumers will be able to support approximately 191,000 square feet of additional or new commercial floor space. This amount of floor space represents the amount of floor space for approximately two neighborhood shopping centers (James H. Pedersen, Planning Consultant, 1988).

The development of this amount of new commercial floor space, within a convenient distance of the project, is expected to be eventually developed by the Estate of James Campbell, or another commercial land development organization. The direct employment generated by the development of 191,000 square feet of commercial floor space would be approximately 210 jobs (James H. Pedersen, Planning Consultant, 1988).

4.3.7 Potential Income Generation

4.3.7.1 Construction - Related Income

In order to derive estimates of potential construction-related income, use was made of the Type II input/output multipliers which were developed by the State Department of Business and Economic Development in 1977. The application of the Type II output multipliers to estimated total construction costs provides a convenient statistical method for estimating

the amount of direct, indirect and induced sales (or income) which will be derived via construction activities required to develop the Ewa Gentry project (Mapes, 1988).

Based upon 1987 construction costs, the total construction value of the Ewa gentry project is estimated to be approximately $52,065,000. Application of the multiplier to this value indicates that the Ewa Gentry project is expected to generate potential direct, indirect and induced sales (or income) of approximately $106,650,000 in Hawaii. This estimated income represents a significant contribution of potential income within the State economy.

4.3.7.2 Retail Trade and Commercial Services Income

The creation of approximately 210 new jobs in the Ewa district's retail trade and commercial services sector will concurrently generate greater household income within the Ewa district. Assuming an average gross wage range of approximately $6 to $8 an hour per employee ($12,480 to $16,640 per year), this employment will create total direct household income, within the Ewa district, which will range from roughly $2.6 million to $3.5 million annually.

4.3.8 Archaeological Resources

Despite the fact that no archaeological sites or complexes were located by an onsite archaeological reconnaissance, cultural deposits and/or archaeological features may be located during actual construction. If unanticipated archaeological deposits are encountered during any construction activity, construction work will be stopped. In addition, those responsible for all construction activity will be required to contact the State Archaeologist at the State Division of Parks, Outdoor Recreation and Historic Sites.

4.4 MAN-MADE ENVIRONMENT

4.4.1 Increased Demand for Recreational Facilities

The proposed project will generate a significant demand for recreational opportunities in the vicinity of project site, as well as the Ewa district shoreline. Considerable demand is expected for the use of existing beach parks, as well as existing playfield and ballcourts.

The development of two new community parks within the Ewa Gentry site will likely satisfy most additional recreational participation demands for informal and organized activities at playfields and ballcourts. The eventual presence of the

proposed West Loch shoreline park may also alleviate some expected recreational conflicts, due to anticipated crowding, which may occur at Ewa Beach Park.

It is recommended that a recreational participation surveys and related facility capacity analyses are undertaken by the City and County of Honolulu to better ascertain future facility demands.

4.4.2 Increased Demand for Educational Facilities

The State Department of Education (DOE) has evaluated the Ewa Gentry project and calculated anticipated public school enrollments for the Calendar Year (CY) 1988 - 2000 period (Section 4.3.3). On the basis of these forecasts and other related DOE facility criteria, the DOE has subsequently determined the anticipated classroom requirements for the same period (Table 4-4).

TABLE 4-4

ANTICIPATED CLASSROOM REQUIREMENTS GENERATED BY EWA GENTRY PROJECT CALENDAR YEAR 1988 THROUGH 2000

Calendar Years	Elementary	Intermediate	High
1988	4	1	2
1989	4	1	1
1990	5	1	1
1991	6	1	2
1992	6	1	2
1993	6	1	2
1994	6	1	2
1995	6	2	2
1996	1	0	1
1997	1	1	2
1998	1	1	1
1999	1	0	1
2000	1	1	1
Total	48	12	20

Source: State Department of Education, 1988.

Recognizing these needs, the Gentry Companies has proposed the dedication of a seven-acre site for a new elementary school site within the Ewa Gentry project site.

4.4.3 Increased Demand for Commercial Retail Facilities

Statistical forecasts of anticipated direct employment in retail trade and commercial services (Section 4.3.6.2)

suggest that the new Ewa Gentry population will, in itself, create a significant demand for commercial retail floor space. Using a variety of arbitrary assumptions concerning future shopper preferences, it is estimated that Ewa Gentry residents may be capable of supporting, at least, 264,000 square feet of conveniently-located commercial floor space. Since 73,000 square feet of floor space are already available at Ewa Beach Shopping Center, this demand is reduced to approximately 191,000 square feet.

4.4.4 Increased Vehicular Traffic

The Ewa Gentry project will generate increased levels of vehicular traffic along Fort Weaver Road. Future traffic levels will significantly decrease the level of service, e.g. degree of delay, or roadway capacity along this roadway. Consequently, a second north-south roadway will need to be constructed between the project site and H-1 Freeway (see Appendix H). The alignment of this roadway will be similar to the location indicated on the City and County of Honolulu Development Plan Public Facilities Map (Figure 3-6).

4.4.5 Potable and Non-Potable Water Demands

The Ewa Gentry project is forecasted to ultimately generate an average daily demand for approximately 1.03 million gallons per day (mgd) of non-potable and 3.43 mgd of potable water (Table 4-5).

These demands will be met through use of a newly-proposed offsite water system which will be developed by the Ewa Plain Water Development Corporation (EPWDC). An Ewa Water Master Plan, recently prepared by Belt, Collins and Associates, identifies offsite wells, tanks, transmission lines for potable and non-potable improvements which will initially be developed by EPWDC and eventually dedicated to the City and County of Honolulu, Board of Water Supply.

The first phase of the offsite system development includes the establishment of Honouliuli Service Zone. Two potable water storage tanks, having a combined capacity of 6.0 mgd will be the source of supply for potable water distribution to Ewa Gentry, the Ewa villages area, Ewa Marina, Ewa Golf Course, and Gentry Hoaeae. These facilities will also transport water to the Honouliuli Booster Station for transmission to West Beach, Kapolei Town Center, Kapolei Village, and the expansion of Campbell Industrial Park and Makakilo. Current members of the EPWDC are committed to the development of these facilities and are prepared to pay their proportionate share of project costs (Belt, Collins and Associates, 1987).

TABLE 4-5

PROJECTED WATER REQUIREMENTS FOR THE GENTRY-EWA PROJECT

Year	Land Use				Average Water Use		Average Daily Demand	
	Single Family (Units)	Multi-Family (Units)	Park (Acres)	School (Acres/Students)	Potable (MGD)	Non-Potable (MGD)	Potable (MGD)	Non-Potable (MGD)
1988	413	87		=57sp.t/acre	0.2305	0.0108	0.2353	0.0130
1989	137	363	7		0.1729	0.0688	0.1937	0.0826
1990	310	190	7		0.2116	0.0474	0.2229	0.0568
Subtotals to 1990	860	640	14		0.6150	0.1270	0.6519	0.1524
1991	280	220		=1700 sp.t	0.2007	0.0273	0.2128	0.0327
1992	280	220		6/300	0.2112	0.0348	0.2254	0.0418
1993	280	220		=16sp.t/fld.	0.2007	0.0273	0.2128	0.0327
1994	255	245		≈10,000sp.t	0.1951	0.0304	0.2086	0.0365
1995	255	245		for 850	0.1951	0.0304	0.2086	0.0365
Subtotals, 1991-95	1,350	1,150		6/300	1.0028	0.1502	1.0682	0.1802
1996	255	245	15		0.2041	0.0814	0.2194	0.0977
1997	255	245			0.1951	0.0304	0.2086	0.0365
1998	255	245			0.1951	0.0304	0.2086	0.0365
1999	286	214			0.2021	0.0265	0.2138	0.0319
2000	333	167			0.2126	0.0207	0.2218	0.0249
Subtotals, 1996-00	1,384	1,116	15		1.0090	0.1894	1.0722	0.2275
2001	333	167	100		0.2726	0.3607	0.2938	0.4329
2002	333	167			0.2126	0.0207	0.2218	0.0249
2003	188	93			0.1197	0.0115	0.1248	0.0139
2004								
2005								
Subtotals, 2001-05	854	427	100		0.6049	0.3929	0.6404	0.4717
Cumulative Totals	4,448	3,333	129	6/300	3.2317	0.8595	3.4327	1.0318

Notes:

1. Development west of Fort Weaver and north of Geiger Road will begin in 1988 and be completed in 1993.
2. Development east of Fort Weaver Road and north of Iroquois Road will begin in 1994 and be completed in 1999.
3. Development south of Geiger and Iroquois Road will take place in the 1999-2003 period.
4. Cumulative water requirements would occur in 1996: this table reflects an earlier development schedule which has, more recently, been accelerated.

Source: Belt Collins and Associates, 1987.

4.4.6 Increased Wastewater Flows

Future wastewater flows from the Ewa Gentry project will be transported to the Honouliuli Wastewater Treatment Plant. Assuming a per capita flow rate of 100 gallons per day, wastewater flows from the project is expected to ultimately generate approximately 2.6 million gallons per day.

Recent correspondence from the City and County of Honolulu, Department of Public Works, indicates that the Honouliuli Wastewater Treatment Plant can only accommodate 3,550 sewer-hookups from the project until the planned treatment plant expansion is completed. However, if all proposed developments in the Honouliuli Treatment Plant tributary are eventually constructed, the capacity of the proposed 38 mgd treatment plant would be exceeded by 10 million gallons per day (Thiede, 1988). This development constraint may somewhat retard, or temporarily delay, implementation of the proposed development schedule after the first few years of construction.

4.4.7 Increased Solid Waste Quantities

The future Ewa Gentry community is expected to generate a daily solid waste quantity of approximately 75 tons. This estimate assumes a per capita waste consumption rate of approximately 5.7 pounds per person per day. The overall community waste quantity of 75 tons per day is not expected to significantly impact the capacity of the existing Waimanalo Gulch landfill (near Kahe Power Plant) or the Waipahu Incinerator facility.

4.4.8 Increased Energy Consumption

Assuming an average energy consumption of 3 kilowatts per household per day and a power demand factor of 0.85, the Ewa Gentry project is expected to produce a daily, electrical power consumption of approximately 18 megawatts.

4.4.9 Additional Police and Fire Protection Requirements

Fire protection available for the project site consists of equipment and professional firefighters which are based at the City and County of Honolulu's Ewa Beach Fire Station. This station is manned by 10 to 15 firefighters and has two engines and one ladder truck available. This station is scheduled for relocation in 1991, but the City has not yet finalized its site selection for this facility (Word, 1988).

A second fire station is scheduled for construction in Tenney Village (just north of the project site) in 1992. These facilities will be well-situated to provide fire protection for the Ewa Gentry site. Assuming that both fire

stations are situated in the vicinity of the Ewa villages, it is believed that the cumulative fire protection needs for the West Loch Estates and Ewa Gentry projects will be met.

Required public safety standards used by the City and County of Honolulu Police Department indicate that one police officer is provided for every 412 residents. It is believed that the cumulative residential projects in the Ewa district will generate a gradual relocation and/or addition of more police officers into the Ewa district.

4.5 RELATIONSHIP BETWEEN SHORT AND LONG TERM USES OF THE PROJECT AREA AND THE MAINTENANCE OF ITS RESOURCES

The Ewa Gentry will, in the short term, provide approximately 7,150 single family and multi-family homes, and related support services to meet a wide range of affordable and conventional housing market needs in the Ewa district. This residential area can be expected to serve as part of a growing longer-term residential community in southwest Oahu. This development will create short-term construction employment and income, as well as increased retail trade and commercial services employment opportunities and income.

The development of a permanent residential community will initially result in the loss of 857 acres of agricultural lands which presently are used for sugarcane cultivation. The residential development of the project site essentially eliminates the potential longer-term use of the project site for diversified agriculture.

From a natural resources perspective, the development of impermeable surfaces over, at least, 50 to 70 percent of the project site will reduce the recharge of the local basaltic and limestone aquifers which contain brackish to saline waters. While recharge is less via residential use, the elimination of sugarcane cultivation will significantly reduce the quantity of non-potable water being consumed from the local limestone and basaltic aquifers.

Air and noise quality, in the vicinity of the project site, will gradually decrease as other residential and commercial developments are constructed, and vehicular traffic increases. However, local tradewind conditions are expected to minimize the deterioration of local air quality.

4.6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS

The most significant commitment of natural resources includes the development of permanent structures and impermeable surfaces over lands having good agronomic characteristics. This loss, however, does not impair or preclude Hawaii opportunities to pursue diversified agriculture and/or economic self-sufficiency.

Hawaii's sugarcane industry is hampered more by a variety of factors such as competing international production areas which enjoy lower production costs and/or greater yields. Nevertheless, the industry can be maintained in Hawaii through increased yields per acre and economies of scale (Decision Analysts Hawaii, Inc., 1988).

Other commitments include the private development of utility systems, as well as the public construction of an elementary school and two community parks. The commitment of private and public resources to provide these facilities establishes a supporting infrastructure which will help ensure the presence of a long-term residential community.

4.7 UNRESOLVED ISSUES

The Ewa Gentry project is in the early stages of project development. Consequently, a number of planning issues will require continued coordination with various City and County of Honolulu and State agencies. A brief summary of these issues are presented in the following paragraphs.

The submittal of the present EIS represents a portion of the Gentry Companies application for a proposed General Plan amendment. This application is under the present review of the City and County Department of General Planning and will ultimately be approved, or disapproved, by the City Council.

The project site is situated within the Pearl Harbor Groundwater Control Area. Proposed uses of waters from the Pearl Harbor aquifer are presently regulated by the State Board of Land and Natural Resources. Regulatory management of water uses will soon be administered by the new Commission on Water Resource Management which will implement the State Water Code.

The Commission is in the process of adopting administrative rules and procedures. Once adopted, the Commission will require a developer application for a water allocation permit from the Pearl Harbor Groundwater Control Area. Sustainable yield will be one of the requirements addressed during this permit process.

The drainage system proposed to support the overall residential development project requires approval of the City and County of Honolulu, Department of Public Works. At the time of this report, the City Department of Public Works, Division of Engineering, continues its review of the Ewa Gentry project. If the marina portion of the proposed Ewa Marina project is not constructed, the Department of Public Works may require submission of a revised drainage master plan by the Gentry Companies.

The Honouliuli Wastewater Treatment Plant is proposed to expand within the boundaries depicted in Figure 2-6. Recent correspondence from City and County of Honolulu Director of

Public Works recommends that some of the agricultural lands surrounding the treatment plant should be retained as a buffer area between the plant and proposed residential development. The intent of The Gentry Companies is to comply with setback and buffer requirements defined in the City and County of Honolulu Land Use Ordinance. Consequently, continuing discussions between the City Division of Wastewater Management and The Gentry Companies will be required.

The Ewa Gentry project will generate significant increase in vehicular traffic along Fort Weaver Road which will influence the level of service and capacity of this primary roadway. For this reason, consideration is being given to the public development of a second north-south roadway between the project site and the H-1 Freeway. The Gentry Companies will need to continue ongoing discussions with the City and County of Honolulu, Department of Transportation Services, as well as the State Department of Transportation, to determine feasible offsite roadway options, onsite roadway requirements, and the source of funding for offsite roadway construction.

Portions of the project site are designated for agricultural uses by the City and County of Honolulu and the State Land Use Commission. The Gentry Companies are required to obtain regulatory approval from these agencies for those project increments which are situated on lands having an agricultural designation.

Section 2.8.3 provides a general indication of the type and anticipated cost of housing which will be made available to potential homebuyers. Specific unit allocations by type and anticipated sales price have not been fully developed by The Gentry Companies. However, all multi-family townhouse units will be marketed within a sales price range tht meets the affordable sales price guidelines which have been established by the State Department of Business and Economic Development, Housing Finance and Development Corporation.

A unilateral agreement between the former developer of the project site, Hirano Brothers Ltd. & Associates, and the City and County of Honolulu was made in September, 1984. The agreement required Hirano Brothers to assume responsibility for the development of various onsite and offsite facilities for roads, water, sewer, drainage, elementary school and a community park. The Gentry Companies plans to implement all facilities, directly affecting their property, which are identified in the agreement. At the same time, The Gentry Companies is considering a request to amend the unilateral agreement for facilities situated on areas that are not affected by current development plans.

The City and County park dedication ordinance requires The Gentry Companies to allocate some acreage for the development of recreational facilities and open space. Conceptual land use plans (Figure 2-4) which indicate the general size and location of two community parks. Both the size and location of the

proposed parkland dedications have been deemed unacceptable by City Department of Parks and Recreation, and are pending additional project coordination with The Gentry Companies.

Many of the preceding unresolved issues will be addressed through the ongoing regulatory process which is required to develop the Ewa Gentry project. This process will involve the securing of, at least, the following additional permits and plan approvals.

Required Permit/Plan Approval	Administering Agency
General Plan amendment	City Council
Change of zone	City Council
Land use boundary change	State Land Use Commission
Water allocation permit	Commission on Water Resource Management
Stream channel alteration permit	Commission on Water Resource Management
Plan review of potential impacts on the Southern Oahu Basal Aquifer (if HUD-financed housing program is used)	U.S. Environmental Protection Agency
Water Master Plan	Board of Water Supply
Subdivision, PDH, cluster, etc.	City and County Department of Land Utilization
Construction plans	Various City and State agencies
Park dedication plan review	City and County Department of Parks & Recreation and Department of Land Utilization
North-South roadway requirements and funding	State Department of Transportation
Plan review of drainage and other onsite utility systems	City and County Department of Public Works
Land dedication of elementary school site	State Department of Education
Review of affordable housing program	City and County Department of Housing and Community Development

CHAPTER 5.0

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APPENDIX A

EIS PREPARATION NOTICE CIRCULATION LIST

Federal Agencies

Department of Agriculture, Soil and Conservation Service
Department of the Army, U. S. Army Engineer District, Honolulu
Department of the Navy, Naval Air Station, Barber's Point
Department of the Interior, Fish and Wildlife Service
Department of Housing and Urban Development

State Agencies

Department of Accounting and General Services
Department of Agriculture
Department of Education
Department of Health
Department of Land and Natural Resources
Department of Business and Economic Development
Department of Transportation
Office of Environmental Quality Control
Land Use Commission

County Agencies and Boards

Department of General Planning
Department of Housing and Community Development
Department of Land Utilization
Department of Parks and Recreation
Department of Public Works
Department of Transportation Services
Board of Water Supply
Fire Department
Police Department
City Council

Public Utilities

Hawaiian Telephone Company
Hawaiian Electric Company

Neighborhood Boards, Community Associations, Other

Ewa Neighborhood Board No. 23
Ewa Beach Community Association
Ewa Housing Foundation
Ewa Coordinating Committee
Honokai Hale/Nanakai Gardens Community Association
Makakilo Community Association
Waianae Coast Neighborhood Board No. 24
Hawaiian Independent Refinery
Chevron USA
Estate of James Campbell
Oahu Sugar Company
Waipahu Neighborhood Board No. 22
Waipahu Community Association
State Representative Paul Oshiro
Judith Givens, Esq.

APPENDIX B

RESPONSES TO EIS PREPARATION NOTICE

JOHN WAIHEE
GOVERNOR OF HAWAII

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

LIBERT K. LANDGRAF
DEPUTY

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

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

JAN 26 1988

DOC. NO.: 2534E
FILE NO.: 88-302

RECEIVED JAN 27 1988
File:
To: DD
Action:

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

Dear Mr. Bills,

SUBJECT: Ewa Gentry Environmental Impact Statement Preparation Notice.

Thank you for the opportunity to review this EIS preparation notice. We have the following comments to offer:

The project is located within the Pearl Harbor Ground Water Control Area. Withdrawals of water from the Pearl Harbor aquifer are presently regulated by the Board of Land and Natural Resources and will eventually come under the jurisdiction of the new Commission on Water Resource Management, who will implement the State Water Code.

The draft EIS should fully address the quantity and source of water required to provide potable and non-potable water for the project, as well as permit requirements under existing statutes and compliance with the State Water Code requirements.

Very truly yours,

WILLIAM W. PATY, Chairperson
Board of Land and Natural Resources

GRAY, HONG, BILLS & ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

February 3, 1988

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

Subject: Ewa Gentry Environmental Impact Statement Consultation Comments

Dear Mr. Paty:

Thank you for your letter dated January 26, 1988 regarding subject project. Draft Environmental Impact Statement will identify that the project is located within the Pearl Harbor Ground Water Control Area. The Draft will further identify that this aquifer is regulated by the Board of Land and Natural Resources. In addition water demands as contained in the approved Water Master Plan will be identified in the draft document.

Should you have any questions regarding this matter please contact this office.

Very Truly Yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:cb
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0308 / FAX: (808) 531-8018

U.S. Department of Housing and Urban Development
Honolulu Office, Region IX
300 Ala Moana Blvd., Room 3318, Box 50007
Honolulu, Hawaii 96850-4991

88-30

January 27, 1988

Date Received JAN 29 1989
File:
To: DB, DH
Author:

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

Dear Mr. Bills:

SUBJECT: Request for Consultation Comments
Draft Environmental Impact Statement
Ewa Gentry
Ewa, Oahu, Hawaii

We have reviewed the Preparation Notice for the Draft EIS on the subject project that will provide 3,570 single family dwellings, 3,550 multifamily units, a 7-acre site for a school, a 16-acre park and an 18-hole golf course on 512 acres in the Ewa area.

We do not have any additional issues that should be addressed in the Draft EIS.

It should be pointed out, however, that should any HUD assisted program be utilized for housing units along the railroad right-of-way, the project must comply with Section 106 of the National Historic Preservation Act of 1966, as amended.

The proposed project is located within the Southern Oahu Basal Aquifer in the Pearl Harbor area. It was designated as a principal source of drinking water for the Island of Oahu by the U.S. Environmental Protection Agency pursuant to Section 1424(e) of the Safe Drinking Water Act (Public Law 93-523) on November 30, 1987.

This designation requires that any HUD assisted housing proposal be reviewed by the Regional Office of the Environmental Protection Agency for potential impacts on the aquifer prior to HUD's approval of the project.

If you have any questions you may contact Frank Johnson at 541-1326.

Very Sincerely yours,

Frank Johnson
for Calvin Lew
Director
Community Planning and
Development Division

cc:
D. James

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

February 3, 1988

Calvin Lew
Director of Community Planning and
and Development Division
U. S. Department of Housing and Urban Development
300 Ala Moana Blvd. Room 3318, Box 50007
Honolulu, Hawaii 96850-4991

SUBJECT: Ewa Gentry Enviromental Impact
Statement Consultation Comments

Dear Mr. Lew:

Thank you for your letter dated January 27, 1988 regarding the subject project. The types of housing assistance programs, if any which would be utilized for the project have not been determined. However, the railroad right-of-way adjacent to the project boundary is identified as being on the Register with the National Historic Sites. Should HUD assistance programs be used, the project will comply with the National Historic Preservation Act.

The Draft Enviromental Impact Statement identifies the project site within the Pearl Harbor Ground Water Control Area and that compliance with Safe Drinking Water Act is a necessary committment of the project.

Should you have any questions regarding this matter please contact our office.

Very Truly Yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:cb
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

JOHN WAIHEE
GOVERNOR OF HAWAII

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

JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

Date Received JAN 2 8 1988
file:
to: DP2
action:

In reply, please refer to:
EPHSO

January 21, 1988

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

Dear Mr. Bills:

Subject: Request for Consultation Comments for Draft Environmental Impact Statement (DEIS) for Ewa Gentry, Ewa, Oahu, Hawaii

Thank you for allowing us to review and comment in preparation of the DEIS. We provide the following comments:

Noise

1. Noise problems are anticipated due to the integration of various land uses within the project location. In preparation of the environmental impact statement, these concerns must be addressed, including mitigative measures to control such noise impacts.

   a. Noise from activities associated with the use of recreational facilities and sites can have adverse effects, in terms of annoyances, on residential areas. The proposed concept of situating residential units along the golf course may result in noise disturbances from ground maintenance and club activities. Other recreational areas, such as the proposed park, may also create disturbances.

   b. Activities associated with the planned school, such as paging systems and active outdoor programs, can have an adverse effect on adjacent residential areas.

2. Aircraft noise from Barbers Point Naval Air Station, Hickam Air Force Base and the Honolulu International Airport may have an adverse impact on residents of the proposed project. Homes should be designed so as to minimize noise intrusions from aircraft flyovers.

3. Areas adjacent to the proposed project location will continue to be utilized for agricultural purposes. Noise associated with these activities can have a negative impact on residential areas. Our office has received many noise complaints concerning heavy vehicles utilized to transport agricultural products, while travelling through or nearby residential developments. Mitigative measures to reduce noise from canehaul roads should be considered.

4. Through facility design, noise from equipment such as air conditioning/ventilation units and exhaust fans must be attenuated to meet the allowable noise levels of Title 11, Administrative Rules Chapter 43, Community Noise Control for Oahu.

5. Since the proposed development will utilize residential lots with structures in close proximity to each other, these homes should be designed so as to maximize the containment of noise.

6. Plans should be developed to minimize the noise impact from vehicular traffic on residential units located near Fort Weaver Road, Iroquois Point Road and Geiger Road. Also, the Ewa Gentry Preliminary Land Use Plan indicates a railroad right-of-way at the north boundary of the project. Should this railway be utilized, then noise reduction measures should be considered.

7. Construction activities must comply with the provisions of Title 11, Administrative Rules Chapter 43, Community Noise Control for Oahu.

   a. The contractor must obtain a noise permit if the noise levels from the construction activities are expected to exceed the allowable levels of the rules.

   b. Construction equipment and onsite vehicles requiring an exhaust of gas or air must be equipped with mufflers.

   c. The contractor must comply with the conditional use of the permit as specified in the rules and conditions issued with the permit.

8. Should there be any baseyard or stockpile areas located adjacent to residences of Barbers Point Naval Air Station or West Loch, Pearl Harbor, mitigative measures, such as barriers or berms, must be developed in the event that noise complaints are received.

9. Traffic noise from heavy vehicles travelling to and from the project site must be minimized in residential areas and must comply with the provisions of Title 11, Administrative Rules Chapter 42, Vehicular Noise Control for Oahu.

Vector Control

1. Prospective residents should be forewarned that this area is close to several major mosquito breeding sites and mosquito problems will be persistent.

2. This is predominantly sugarcane land and rodents harbor in these fields. Title 11, Administrative Rules Chapter 26, Section 35, "Rodents; demolishing of structure and clearing of sites and vacant lots," must be complied with.

Sincerely,

BRUCE S. ANDERSON, Ph.D.
Deputy Director for
Environmental Health

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

February 3, 1988

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

Subject: Eva Gentry Environmental Impact
Statement Consultation Comments

Dear Dr. Anderson:

We thank you for your letter dated January 21, 1988 regarding the subject project. Your letter identifies two areas for discussion within the Draft Environmental Impact Statement, and these areas are noise and vector control. Your specific noise comments are related to project-generated noise, as well as exterior noise associated with Barbers Point Naval Air Station, traffic noise and potential noise generated from sugar cane operations adjacent to residential housing. With respect to vector control, your office has identified there are potential mosquito breeding sites in the area and that all demolition and site clearing must comply with your rules and regulations with respect to rodents.

These items will be discussed in the Draft Environmental Impact Statement.

Should you have any questions regarding this matter, please contact our office.

Very Truly Yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DB/co
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

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

FRANK F. FASI
MAYOR

Date Received JAN 26 1988
File:
To: DB
Action:

HIRAM K. KAMAKA
DIRECTOR

WALTER M. OZAWA
DEPUTY DIRECTOR

January 19, 1988

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

Dear Mr. Bills:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
Ewa Gentry - Ewa
Tax Map Key 9-1-10: por. 7 and 9-1-14: 29, 30, and por. 5

We have reviewed the Environmental Impact Statement Preparation Notice (EISPN) for the Ewa Gentry development and make the following comments and recommendations.

Further assessment of the project will be necessary to establish a recreational plan for the project to meet General Plan, City standards and park dedication requirements. Additional information will be needed to determine the number, types, size and location of public parks required to serve the proposed 7,120-unit development.

The size of the Ewa Gentry development will generate a projected population of approximately 21,000 people. Based on the City's park standards of two acres per 1,000 population, 42± acres of park land would be needed to serve the Ewa Gentry development. The two parks shown on the preliminary land use plan totals only 34 acres.

We recommend that contact be made with Mr. Jason Yuen of our Advance Planning Section as soon as possible at 527-6315 to discuss the development's park requirements.

Sincerely,

HIRAM K. KAMAKA, Director

HKK:ei

Attach.

GRAY, HONG, BILLS & ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. MOMMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

January 27, 1988

Hiram K. Kamaka, Director
Department of Parks and Recreation
650 South King Street
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Gentlemen:

Thank you for your letter dated January 19, 1988, regarding the subject project. The preliminary land use plan show in the Environmental Impact Statement Preparation Notice identified 35 acres of park in the Ewa Gentry Project. Based on the Park Dedication Rules and Regulations a minimum of 37.5 acres of land needs to be set aside for park. In addition we understand your department wants to review park location as well as the drainage implications associated with the park site on the west side of Fort Weaver Road. The Draft Environmental Impact Statement will include the drainage analysis and revised land use plans identifying the proper minimum park size.

The developers also will be forwarding a copy of the preliminary drainage report for your review as well as scheduling a meeting to discuss your park requirements.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DB:mw
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

JOHN WAIHEE
GOVERNOR

SUZANNE D PETERSON
CHAIRPERSON, BOARD OF AGRICULTURE

DEPUTY TO THE CHAIRPERSON

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814-2512

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822-0159

January 22, 1988

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

Subject: Environmental Impact Statement Preparation Notice (EISPN) for Ewa Gentry Residential Development Project
The Gentry Company
TMK: 9-1-10: por. 7
9-1-14: por. 5, 29, 30
Ewa, Oahu
Area: 932 acres

Dear Mr. Bills:

The Department of Agriculture has reviewed the subject EISPN and offers the following comments.

According to the subject document, the applicant will be seeking to amend the designation of approximately 857 acres of the subject property, within the Ewa Development Plan area, from Agriculture to a number of urban uses. Approximately 857 acres of lands cultivated in sugarcane by Oahu Sugar Company (OSC) will be sequentially removed from production.

According to our records, the subject project overlaps approximately 100 acres of a proposed 270-acre, 27-hole golf course which was the subject of a zone change application in September, 1987 (City and County of Honolulu, Department of Land Utilization File No.: 87/A-16 (GU)).

Soils Information

We are providing the following information on the soil properties of the subject property. To date, there have been three soil suitability studies done for Hawaii whose principal focus has been on describing the physical attributes of land and the relative productivity of different land types. These studies and their dates of printing are as follows:

The Detailed Land Classification (1965 through 1972) series was done by the Land Study Bureau of the University of Hawaii for each island. This series of reports were produced with the intention of developing a land inventory and productivity evaluation based on statewide "standards" of crop yields and levels of management.

The Soil Conservation Service Soil Survey (1972) series for each island was done by the U. S. Department of Agriculture Soil Conservation Service and the University of Hawaii Agricultural Experiment Station. These reports are somewhat similar to those of the Land Study Bureau except that they are patterned after a soil classification procedure adopted for nationwide, uniform application. Soil types are ranked according to their suitability for most kinds of crops. Also provided are listings of crops commonly grown on the soil types and their expected productivity under present management.

The Agricultural Lands of Importance to the State of Hawaii (ALISH) (1977) system was also done for the entire state. The ALISH system consists of the mapped identification of three broad classes of agricultural land based, in part, on the criteria established by the Soil Conservation Service. "Prime Agricultural Land" is defined as "...land best suited for the production of food, feed, forage, and fiber crops. This class of land has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed (including water management) according to modern farming methods. Prime agricultural land gives the highest yields with the lowest inputs of energy or money and with the least damage to the environment." The two other classes of the ALISH are "Unique Agricultural Land" and "Other Important Agricultural Land". Both describe successively less productive soils.

The application of these studies to the subject property reveals the following information.

The Soil Conservation Service Soil Survey identifies the predominant soils as (1) Ewa silty clay loam (EmA) with 0 to 2 percent slopes which is used for sugarcane, truck crops and pasture; (2) Honouliuli clay (HxA, HxB) with 0 to 6 percent slopes which is used for sugarcane, truck crops and pasture; (3) Waialua silty clay (WkA) with 0 to 3 percent slopes which is used for sugarcane, truck crops and pasture; (4) Waipahu silty clay (WzA, WzC) with 0 to 2 and 6 to 12 percent slopes which is used for sugarcane; (5) Mamala stony silty clay loam (MnC) with 0 to 12 percent slopes which is used for sugarcane, truck crops

and pasture; (6) Fill land (Fd) which is nearly level which is used for sugarcane; and (7) Coral outcrop (CR). The majority of crop capability classifications (i.e., general suitability for most kinds of crops) for these soils range from I to IIIs, when irrigated (soils with few limitations that restrict their use to soils with severe limitations due to stoniness). As a whole, according to the Soil Survey, nearly the entire project site is suited for a variety of agricultural uses. Land areas with Coral Outcrop are not cultivable, but they represent only about 9 acres of the project site.

The property has Land Study Bureau Overall Productivity Ratings and Land Types of A69i (418 acres), B16i (298 acres), B77i (46 acres), C72i (112 acres), E72 (2 acres), E115 (19 acres) and U (37 acres). These are acreage <u>estimates</u> based upon percentages derived from maps of non-standard size. The Land Study Bureau Ratings indicate that the most of the proposed project area has good to very good productivity potential for most agricultural activities, if irrigated.

The subject property is classified "Prime" (approximately 759 acres), "Other Important" (approximately 164 acres) and a small residual not classified (9 acres) according to the ALISH system.

<u>The Land Evaluation And Site Assessment (LESA) System</u>

Providing a more comprehensive and quantitative means for determining the quality of Hawaii's land area for viable agricultural use, based on projected demand for agricultural commodities, is the methodology developed by the Land Evaluation and Site Assessment (LESAC). The LESAC was assigned the task of identifying and recommending a system for adoption by the Legislature that would comprise standards, criteria and a process to identify important agricultural lands (or IAL). The recommendations of the LESAC (contained in its Final Report of February 1986) and their approval by the Legislature would carry out the State Constitutional mandate (Article XI, Section 3) "...to conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands..."

The Land Evaluation (LE) portion of the LESA system is a quantitative rating of the physical characteristics (including irrigation) of the soil resources of Hawaii. The LE ratings are a composite of the three previously-discussed soil classification systems. The Site Assessment (SA) factors or criteria express the relative quality of a site or area based upon its non-physical characteristics or attributes. The SA

factors are criteria which indicate the agricultural viability of a parcel, site or area.

To date, only the LE ratings methodology has been developed and applied to the land area in the State. To meet the projected agricultural production goals for Oahu for the year 1995 (approximately 57,661 acres), the application of the LE methodology has resulted in a threshold or "cutoff" value of 66 on Oahu (on a rating scale of 12 to 100). Thus, soils with a LE rating of 66 or greater are among the best soils on Oahu from an agronomic standpoint.

In Exhibit A of the LESAC Final Report, LE ratings are assigned to each Soil Conservation Service Soil Survey soil type described previously. The project site has a range of LE ratings from 12 to 93, as follows:

Soil Type	Acreage	LE Rating	Soil Type	Acreage	LE Rating
HxA	172	87	WzA	98	92
HxB	12	85	WzC	4	74
EmA	450	74	MnC	153	66
WkA	27	93	CR	9	12
Fd	7	65			

The average LE rating for the entire property is <u>77.1</u>.

<u>Other Issues Which Should Be Addressed</u>

The Draft EIS should include discussion on the following issues:

- according to the EISPN, the Draft EIS will "...include information on agricultural economics of the loss of sugarcane lands" (EISPN, page 6-1). We would like the information to include the full impact on the economic viability of OSC resulting from the cessation of sugarcane production on fields 64, 66, 69, 72, 73, 74, 75, 89, and 93. This would include the loss in tons of sugar per acre, lost revenues, location and cost of replacement field preparation (if any), and any other indicators of adverse impact;

- the impact of this development on future agricultural production requirements and expansion of diversified agriculture, as identified in the Final Report of the Land Evaluation and Site Assessment (LESA) Commission (February 1986);

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

January 22, 1988
PN:0060

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

Dear Mr. Bills:

Preparation Notice
Environmental Impact Statement
Ewa Gentry
Ewa, Oahu

The document proposes the development of 7,120 housing units, an 18 hole golf course, schools, and recreational amenities on land situated northeast of Barbers Point Naval Air Station in the Ewa Plain. This review was prepared with the assistance of Yu-Si Fok, Henry Gee and Edwin Murabayashi, Water Resources Research Center; and Steven Armann, Environmental Center.

Water

The Draft Environmental Impact Statement (EIS) should include the impact of the removal of 857 acres of cane land upon the recharge of the caprock groundwater aquifer. In previous years, pumping of the aquifer for sugarcane irrigation at rates exceeding the natural recharge and seepage from the deep aquifer was possible because of irrigation return recharge from furrow irrigation. The conversion of furrow irrigation to drip in recent years has caused a water imbalance. The area being considered for development encompasses 300 acres of cane land which is still being furrow irrigated with low salinity basaltic aquifer water imported into the area. The removal of this recharge would cause a further imbalance in the water budget and will affect the salinity of the water currently pumped for irrigation in the surrounding areas. Some of the wells that may be affected include Oahu Sugar Company wells number P21, P22, P24, P25, P30 (USGS well numbers 2000.01, 1900.02, 1901.01, 1900.01, 1900.13) across Fort Weaver Road and P27 (USGS well number 1902.01) located south of Hansan Road.

Soil

The Draft EIS should include a map indicating the development plan with an overlay of the soil type. We note that on page 3-1 two soil types are listed as expansive. Any structural development on these soils will require special engineering considerations due to their horizontal and vertical instability.

Thank you for the opportunity to comment on the EIS Preparation Notice. We hope our comments will be helpful in preparing the Draft EIS.

Yours truly,

Jacquelin N. Miller

Jacquelin N. Miller
Associate Environmental Coordinator

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. MOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY C. ING, P.E.
DENNIS M. REID, P.E.

January 25, 1988

Ms. Jacquelin Miller
Associate Environmental Coordinator
University of Hawaii at Manoa
Environmental Center
Crawford 317
2550 Campus Road
Honolulu, Hawaii 96822

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Dear Ms. Miller:

Thank you for your letter dated January 22, 1988 regarding the subject project. The Draft Environmental Impact Statement will include a discussion on the impact of the project on ground water recharge with respect to the low salinity basaltic aquifer used for sugar cane irrigation. At this point in time it could generally be stated that if residential development is realized, the requirement for irrigation water will be reduced. The actual reduction will be quantified in the draft document.

Your consultation comment letter also noted that structural development on expansive soils need to be properly engineered. The draft document will identify this item. In addition, soils engineering investigations will be conducted to ensure proper foundation designs for all structures when design drawings are developed.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-4308 / FAX: (808) 521-8018

- the potential of establishing viable alternative agricultural uses on the project site;

- the broader economic and resource impact on the State from the irrevocable loss of prime agricultural lands;

- conformity to the State Agriculture Functional Plan and its objectives and policies, particularly, Implementing Action B(5)(c); and

- the relationship to the following Hawaii State Plan policies and priority guidelines:

  226-7(b)(6) "Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs."

  226-103(c)(1) "Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries."

  226-103(d)(1) "Identify, conserve and protect agricultural and aquacultural lands of importance and initiate affirmative and comprehensive programs to promote economically productive agricultural and aquacultural uses of such lands."

  226-104(b)(2) "Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district."

Thank you for the opportunity to comment. We will provide further comment upon our receipt and review of the Draft Environmental Impact Statement.

for SUZANNE D. PETERSON
Chairperson, Board of Agriculture

cc: Mr. William Balfour, President and Manager, Oahu Sugar Company
OSP (attn: LUD)
LUC
OEQC
DGP
DLU

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

January 25, 1988

Ms. Suzanne D. Peterson
Chairperson, Board of Agriculture
State of Hawaii
Department of Agriculture
1428 South King Street
Honolulu, Hawaii 96814

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Dear Ms. Peterson:

Thank you for your letter dated January 22, 1988 regarding the subject project. The majority of the factual information which you have provided regarding soil types and land use classification systems will be incorporated into the Draft Environmental Impact Statement. In addition, we have authorized an independent report covering the agricultural economics of this project and other projects on the Ewa plains. This report will include an analysis of the impact on the economic considerations of loss of Oahu Sugar Company production as well as the impact on diversified agriculture. The report will also analyze broader economic and resource impact issues regarding the irrevocable loss of prime agricultural lands.

Based on our review of your letter, the agricultural economic analysis of the Draft Environmental Impact Statement will address all points that you have identified.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt

119 MERCHANT STREET, SUITE 807, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0308 / FAX: (808) 531-8018

WAIPAHU NEIGHBORHOOD BOARD NO. 22
P.O. Box 103
WAIPAHU, HAWAII 96797

January 6, 1987

Gray, Hong & Associates, Inc.
9 North Pauahi Street, Suite 201
Honolulu, Hawaii 96813

Gentlemen:

The Waipahu Neighborhood Board Development Committee Chair has reviewed the Preparation Notice for the Ewa Gentry Environmental Impact Statement. This document contains several areas of concern.

First, in Figure 2-1, the multi-family unit placement is such that much of the view along Ft. Weaver Road would be significantly obscured by these units. The view of the Waianae Mountains will be significantly diminished by the multi-family units that are planned to be located along the Oahu Railroad and Land Company right of way. The Board takes exception to this.

Second, in section 2.3.4 under drainage, the use of sumps is discussed to control water runoff. In an area that is already subject to mosquitoes, I assume that these would be dry sumps and would be empty except during periods of inclement weather. The concern here is threefold. One, standing water could increase the mosquito population. Two, standing water could possibly cause odor problems similar to those that develops in Waipahu during certain weather conditions. Thirdly, is the question of safety. What prevents people, children or animals from being washed into or otherwise enter these sumps.

The third area of greatest concern is traffic. The statement that is made in section 6.3.1 is greatly understated. With the number of housing units proposed, the traffic impact created by the additional vehicles will have a significant adverse effect on people coming from Ewa town, the Navy Housing area at Iroquois Point and from Geiger Road. Probably, the most significant impact would be at the H-1/Kunia Road Interchange. At the present time traffic at peak hours is at or near grid lock. To alleviate some of this impact, a viable alternative would be to construct the North/South Road that is in the development plan.

The Board has no other comments to offer at this time, however, we reserve the right to offer comments as the development progresses. Also, we would like to offer an invitation to someone in your organization to discuss the EIS at the next meeting of the Board. This meeting will be held on Thursday, January 21, 1988, 7:30 p.m. at the Waipahu Cultural Gardens Park.

Sincerely,

James Gee
James Gee
Acting Chair

1-71

GRAY, HONG, BILLS & ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

January 25, 1988

Mr. James Gee
Acting Chair
Waipahu Neighborhood Board No. 2
P. O. Box 103
Waipahu, Hawaii 96797

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Dear Mr. Gee:

Thank you for your letter dated January 6, 1988 regarding the subject project. Your consultation comment letter references three points of concern which are discussed below:

__Multi-Family Housing/Viewplane__

The Draft Environmental Impact Statement will discuss the mix of housing within the proposed Ewa Gentry project. As presently proposed there are three multi-family housing areas on the Waianae side of Ft. Weaver Road. These multi-family housing areas utilize 25% of the Ft. Weaver Road frontage. All multi-family housing will be low profile and it is not anticipated that views of the Waianae mountain range will be significantly diminished. A discussion regarding this matter will be included in the Draft Environmental Impact Statement.

__Drainage__

With respect to drainage, the proposed sumps which will be utilized to dissipate storm water runoff will be free of water for a majority of the time. Therefore, it is not anticipated that there will be a significant impact on safety and/or the potential for mosquito breeding through the use of sumps. However, a discussion of the drainage systems with respect to safety and vector control will be included in the Draft Environmental Impact Statement.

__Traffic__

A separate appendix devoted to traffic analysis will be included in the Draft Environmental Impact Statement. The draft document will discuss existing conditions and traffic conditions based on Ewa Gentry development and other projects in the area.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

JOHN WAIHEE
GOVERNOR

CHARLES T. TOGUCHI
SUPERINTENDENT

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

OFFICE OF THE SUPERINTENDENT

JAN 12 1988

File: 1632

To: DE

Action:

January 6, 1988

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

Dear Mr. Bills:

Subject: Draft Environmental Impact Statement
Ewa Gentry
Ewa, Oahu, Hawaii

Our review of the planned 7,120-unit development indicates that it may have the following enrollment impact on our area schools:

School	Grade	Projected Students
Ewa Elementary/ Ewa Beach Elementary	K-6	900 - 1,450
Ilima Intermediate	7-8	200 - 300
Campbell High	9-12	350 - 500

There is a new elementary school sited within the development. The timing on the establishment of the new school will depend on the availability of surplus classrooms at the existing schools and funding for a new school.

Due to the many proposed developments in the Ewa area, it is urgent that we be kept updated on the construction timetable.

Should you have any questions, please call Wallace Okamura at 737-4743.

Sincerely,

Charles T. Toguchi

Charles T. Toguchi
Superintendent

CTT:sy

cc OBS

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NORMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

January 25, 1988

State of Hawaii
Department of Education
P. O. Box 2360
Honolulu, Hawaii 96804

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Gentlemen:

Thank you for your letter dated January 6, 1988 discussing the enrollment impact of the Ewa Gentry project on the educational system. Your information will be incorporated into the Draft Environmental Impact Statement.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE (808) 521-0306 / FAX (808) 531-8016

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843

January 6, 1988

Date Received JAN 09 1988
File: 1488
By: DD
Action:

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

Dear Mr. Bills:

Subject: Your Letter of December 18, 1987 on the EIS Preparation Notice for the Ewa Gentry Project, TMK: 9-1-10: Por. 7, 9-1-14: 29, 30, Por. 5

Thank you for the opportunity to review and comment on the proposed residential community development project.

The EIS should indicate the following:

1. The off-site water system to serve the project is included in the approved Ewa Water Master Plan submitted by Campbell Estate representing the Ewa Plains Water Development Corporation and will be constructed by the Corporation.

2. The developer will install the complete on-site water system for the project.

3. The developer will develop a dual brackish water system to irrigate the proposed golf course, parks, and other landscaped areas. A discussion on the source should be included in the EIS.

4. Basalt underlies the entire island; not portions of it as implied in Section 3.3 (p. 3-1).

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

GRAY, HONG, BILLS & ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

January 25, 1988

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

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Dear Mr. Hayashida:

We thank you for your letter dated January 6, 1988 identifying specific items which will be included in the Draft Environmental Impact Statement for the subject project.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX (808) 531-8019

HAWAIIAN TEL GTE

Hawaiian Telephone Company
P.O. Box 2200
Honolulu, Hawaii 96841
Telephone (808) 546-4511

January 8, 1988

Date Received JAN 1 - 1988
File
Ltr DK
Action

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

Attention: Mr. David B. Bills

Gentlemen:

Draft Environmental Impact Statement
Ewa Gentry, Ewa, Oahu, Hawaii

Our comments have been reflected in section 2.3.5 of the Draft Environmental Impact Statement for Ewa Gentry and we have no further comments to make at this time.

Should you have any questions, please call Nelson Yrizarry, Supervising Engineer, at 834-6222.

Sincerely,

Walter Matsumoto
Oahu Engineering &
Construction Manager

WM/LK/CF/aha

1-c

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

January 25, 1988

Mr. Walter Matsumoto
Oahu Engineering and Construction Manager
Hawaiian Telephone Company
P. O. Box 2200
Honolulu, Hawaii 96841

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Gentlemen:

Thank you for your letter dated January 8, 1988. The Draft Environmental Impact Statement will include discussion of the proposed telephone system for the project as represented in our Preparation Notice.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0308 / FAX (808) 531-8019

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

P.O. Box 50006
HONOLULU, HAWAII
96850

Date Received JAN 19 1988
File:
Cc: DJ3
Action:

January 15, 1988

David B. Bills
Gray Hong & Associates
Consulting Engineers
119 Merchant Street, Suite 607
Honolulu, HI 96813

Dear Mr. Bills:

Subject: Preparation Notice for the Ewa Gentry
Environmental Impact Statement

We want to emphasize that the irreversable loss of approximately 800 acres of prime agricultural land can have a major impact on agriculture in Hawaii.

Sincerely,

Stratford L. Whiting
STRATFORD L. WHITING
District Conservationist

IE

GRAY, HONG, BILLS & ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L GRAY, P.E
DANIEL S C HONG, P.E
DAVID B BILLS, P.E
MICHAEL H NOJIMA, P.E
ROY T AOKI, P.E
BEVERLY G ING, P.E
DENNIS W REID, P.E

January 25, 1988

Mr. Stratford L. Whiting
District Conservationist
United States Department of Agriculture
Soil Conservation Service
P. O. Box 50006
Honolulu, Hawaii 96850

SUBJECT: Ewa Gentry Environmental Impact
Statement Consultation Comments

Dear Mr. Whiting:

Thank you for your letter dated January 15, 1988 regarding the subject project. The Draft Environmental Impact Statement will include a specific appendix totally devoted to agricultural economics with respect to the subject project.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

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

FRANK F. FASI
MAYOR

ALFRED J. THIEDE
DIRECTOR AND CHIEF ENGINEER

PRO 88-3

January 6, 1988

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

Dear Mr. Bills:

Subject: EISPN for Ewa Gentry, Ewa Oahu
(TMK: 9-1-10: Portion of 7 and 9-1-14: 29, 30, Portion of 5)

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

1. A drainage master plan is presently being reviewed by Drainage Section, Division of Engineering.

2. The existing Honouliuli Wastewater Treatment Plant can accommodate only 3,550 units from Ewa Gentry. The remaining proposed units will not be allowed to connect until the treatment plant is expanded in 1993. The existing sewer line in Fort Weaver Road was designed to handle the sewage from the area west of Fort Weaver Road and north of Geiger Road. Trunk sewers for the rest of the areas will have to be designed and constructed by the developer.

Very truly yours,

ALFRED J. THIEDE
Director and Chief Engineer

Date Received JAN 08 1988
File:
To: DP
Action:

1-D

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

January 25, 1988

Mr. Alfred J. Thiede
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Dear Mr. Thiede:

Thank you for your letter dated January 6, 1988 regarding the subject project. The Draft Environmental Impact Statement will include discussion of the drainage master plan for the project. In addition, our phasing plan will be revised to reflect the time schedule indicated in your letter as to availability of sewage treatment plant capacity at the Honouliuli Wastewater Treatment Plant.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0308 / FAX (808) 531-8019

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813
PHONE 523-4191

FRANK F. FASI
MAYOR

MIKE MOON
DIRECTOR

ROBERT MIYASATO
DEPUTY DIRECTOR

Date Received JAN 15 1988
File: 1488
To: DB
Action:

January 12, 1988

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

Dear Mr. Bills:

Subject: Draft Environmental Impact Statement for Ewa Gentry Project, Ewa, Oahu

TMK:	9-1-10: por. 7; 9-1-14: 29, 30, por. 5
Area:	857 Acres
Existing Use:	Sugar Cane Cultivation
Development Plan:	Low Density Apartment, Park, Residential and Agricultural Use
Zoning Map:	A-1 Low Density Apartment; P-2 Preservation District; R-5 Residential and AG-1 Agriculture District
State Land Use:	Urban and Agriculture
Request:	A Development Plan Amendment changing 857 acres from agriculture to a variety of urban uses--7,120 housing units; an 18-hole golf course; and schools, parks and greenways.

Thank you for the opportunity to review and comment on the EIS for the Ewa Gentry Project in Ewa, Oahu. We understand that the proposed project will provide approximately 7,120 housing units (3,570 single family and 3,550 multi-family units) but no mention is made on how it will fill the need to meet affordable housing in the Ewa District.

The Department of Housing and Community Development has been requesting that ten (10) percent of all residential units be set aside for low- and moderate-income households, or an acceptable in-kind substitute be provided for all development plan amendments involving residential uses. This policy has up to now only affected residential projects, however, all developments requesting rezoning actions would be subject to some kind of requirement under a Bill for a Community Benefit Assessment Ordinance currently before the City Council. Therefore, the proposed project could be affected by the change in policy. The Department will inform the developer of any requirements should the Community Benefit Assessment bill be enacted.

Thank you for the opportunity to provide these comments.

Sincerely,

Robert Miyasato
for MIKE MOON, Director

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG P.E.
DAVID B. BILLS P.E.
MICHAEL H. MORIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

January 25, 1988

Mr. Mike Moon, Director
Department of Housing and
Community Development
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Dear Mr. Moon:

Thank you for your letter dated January 12, 1988 regarding the subject project. The Draft Environmental Impact Statement will discuss how the project plans to comply with the need for affordable housing in the Ewa district. However, in general the project is essentially geared to what the developers consider an affordable price range. The Draft Environmental Impact Statement will include specific language as to price ranges which are proposed for units in the residential district as well as multi-family housing districts.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE (808) 521-0306 / FAX (808) 531-8018

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU

1455 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96814 • AREA CODE (808) 955-3111

FRANK F. FASI
MAYOR

DOUGLAS G. GIBB
CHIEF

MARDEN FERREIRA
DEPUTY CHIEF

OUR REFERENCE: SS-LK

January 11, 1988

DATE RECEIVED JAN 14 1988
File: 1494
To: DB
Action:

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

Dear Mr. Bills:

Subject: Environmental Impact Statement Preparation Notice (EISPN) for Ewa Gentry, Ewa, Oahu, Hawaii

We have reviewed the EISPN for the above proposal and have the following concerns.

As the Ewa area develops into Oahu's secondary urban center, we can expect the traffic congestion to increase considerably. This calls for implementation of safety precautions and signals and localized roadway improvements for easing traffic flow. We understand that you will address this in the Environmental Impact Statement.

We ask that as you plan for Ewa Gentry, you consider the long-range aspects of growth in the Ewa area and address ways to mitigate the increased traffic that will develop over the next 10 years. This may involve working with government agencies, MTL Inc. and other developers to explore alternatives that will address our traffic problems. Subjects to explore and negotiate may include mass transit, express buses and Park-and-Ride sites.

Sincerely,

DOUGLAS G. GIBB
Chief of Police

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

January 25, 1988

Mr. Douglas G. Gibb
Chief of Police
Police Department
City and County of Honolulu
1455 South Beretania Street
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Dear Mr. Gibb:

Thank you for your letter dated January 11, 1988 regarding the subject project. The Draft Environmental Impact Statement will have a specific appendix devoted to the discussion of traffic and mitigation measures which are appropriate for the Ewa Gentry project as well as other projects in the area.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0308 / FAX: (808) 531-8019

1-6

United States Department of the Interior

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

Date Received JAN 20 1988
To: _____
To: DB
Action taken by: _____
ES
Room 6307

19 JAN 1988

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

Re: Draft Environmental Impact Statement Preparation Notice for the Ewa Gentry Development, Oahu, Hawaii

Dear Mr. Bills:

We have completed our review of the subject document and offer the following specific suggestions for your consideration. We anticipate that the golf course proposed for construction along the western edge of the development will be attractive to many species of migratory shorebirds, which are protected under international treaty agreements. The draft statement should therefore address the potential biological effects of pesticide application to the golf course on these species.

Additionally, we suggest that the document address the anticipated increase in the volume of stormwater runoff from the site. The draft statement should indicate which waterbody will receive this runoff, and the potential load of sediments and contaminants (particularly petroleum by-products and pesticide residues) that these waters will carry. Since limestone sinkholes harboring unique, candidate endangered shrimp species have been found in the Ewa Plain, the document should also indicate the risk of contamination of basal groundwaters by the proposed development. If a serious potential for groundwater contamination is found to exist, the document should discuss the possible effect of this contamination upon these rare aquatic animals.

Thank you for providing this opportunity to comment on the pending development of the Ewa Plains. We look forward to reviewing the draft statement in the near future.

Sincerely,

William P. Kramer

Ernest Kosaka, Field Supervisor
Environmental Services
Pacific Islands Office

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

1-11

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NORMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

January 25, 1988

Mr. Ernest Kosaka, Field Supervisor
Environmental Services
Pacific Islands Office
United States Department of the Interior
Fish and Wildlife Service
300 Ala Moana Boulevard
P. O. Box 50167
Honolulu, Hawaii 96850

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Dear Mr. Kosaka:

Thank you for your letter dated January 19, 1988 regarding the subject project. The Draft Environmental Impact Statement will discuss the possibility of the golf course being attractive to migratory shore birds and the potential impacts of pesticide application. In addition, the draft document will also discuss drainage runoff and the potential impacts of sediment loads as well as potential contaminants carried in the drainage runoff.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX. (808) 531-8018

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

FRANK F. FASI
MAYOR

JOHN P. WHALEN
DIRECTOR

LU12/87-7170(AC)

January 20, 1988

Date Received JAN 21 1988
File: 1488
To: DB
Action:

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

Dear Mr. Bills:

Environmental Impact Statement
Preparation Notice (EISPN)
Ewa Gentry, Ewa, Oahu
Tax Map Key 9-1-10: portion 7;
9-1-14: 29, 30 and portion 5

Thank you for providing the Department of Land Utilization (DLU) the opportunity to review the above-referenced EISPN. We offer the following comments for your consideration.

1. The EIS should include a traffic impact study. This study should include an assessment of the cumulative traffic impacts the proposed project would have on Ft. Weaver Road.

2. The EIS should determine if additional police & fire protection will be needed as a result of the project. In addition, the EIS should review the project impact on existing school and recreational facilities.

We hope these comments will be helpful in the preparation of the EIS. If you have any questions or if we may be of further assistance, please contact Art Challacombe of our staff at 523-4648.

Very truly yours,

Loretta Chee
JOHN P. WHALEN
Director of Land Utilization

JPW:sl
1584B

1-i

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

January 25, 1988

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Dear Mr. Whalen:

Thank you for your letter dated January 20, 1988 regarding the subject project. The Draft Environmental Impact Statement will include a specific appendix devoted to traffic. This study will address existing conditions as well as the Ewa Gentry project and cumulative impacts of other projects in the area. In addition, the draft document will discuss the impacts on police protection, fire protection, school facilities and recreational facilities.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0308 / FAX. (808) 531-8019

STATE OF HAWAII
DEPARTMENT OF BUSINESS
AND ECONOMIC DEVELOPMENT

LAND USE COMMISSION

Room 104 Old Federal Bldg 335 Merchant Street
Honolulu Hawaii 96813 Telephone 548-4811

JOHN WAIHEE
Governor

TEOFILO PHIL TACBIAN
Chairman

FREDERICK P. WHITTEMORE
Vice Chairman

COMMISSION MEMBERS:
Richard B.F. Chow
Lawrence P. Chun
Everett L. Cuskaden
Sharon R. Himeno
Toru Suwai
Robert S. Tamaru
Renton L.K. Yip

ESTHER UEDA
Executive Officer

Date Received DEC 28 1987
File: 1488
To: DB
Action:

December 23, 1987

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

Dear Mr. Bills:

Subject: EIS Preparation Notice for Ewa Gentry, Ewa, Oahu, Hawaii

We have no comments except that the proposed project site is designated within the State Land Use Urban and Agricultural Districts and a district boundary amendment may be required for the portion of the project located within the Agricultural District.

Thank you for this opportunity to comment.

Sincerely,

RAYMOND YOUNG
Staff Planner

RY:to

cc: Donald Clegg

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

January 25, 1988

Mr. Raymond Young
Staff Planner
Land Use Commission
State of Hawaii
Room 104, 335 Merchant Street
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Dear Mr. Young:

Thank you for your letter dated December 23, 1987 regarding the subject project. The Draft Environmental Impact Statement will include specific exhibits identifying the existing State land use boundaries and the proposed State land use boundaries which will be affected by implementation of the project. The draft document will also identify the boundary amendments which will be necessary to implement the project.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE (808) 521-0306 / FAX (808) 531-8015

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L GRAY, P.E.
DANIEL S C HONG, P.E.
DAVID B BILLS, P.E.
MICHAEL H NOJIMA, P.E.
ROY T ADKI, P.E.
BEVERLY G ING, P.E.
DENNIS M REID, P.E.

January 25, 1988

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Dear Mr. Clegg:

Thank you for your letter dated December 24, 1987 regarding the subject project. The Draft Environmental Impact Statement will include discussions regarding vehicular access and traffic, sewage treatment and disposal, water systems and drainage systems. The draft document will also include a discussion on agriculture, air quality and noise quality as specifically related to the Airport Noise Compatibility Program and Master Plan Update.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

119 MERCHANT STREET, SUITE 807, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0308 / FAX: (808) 531-8019

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

FRANK F. FASI
MAYOR

DONALD A. CLEGG
CHIEF PLANNING OFFICER

GENE CONNELL
DEPUTY CHIEF PLANNING OFFICER

KK/DGP 88/E-2

December 24, 1987

Date Received DEC 28 1987
File: 1468
To: DW
Action:

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

Dear Mr. Bills:

Environmental Impact Statement Preparation Notice
for the Proposed Ewa Gentry
Development Project Situated in Ewa, Oahu

This is in response to your request for comments on the Environmental Impact Statement Preparation Notice for the proposed Ewa Gentry development in Ewa.

The following points should be addressed in the preparation of the Draft Environmental Impact Statement:

1. Vehicular Access and Traffic

   The applicant should prepare a traffic study which discusses the proposed development's impact on Fort Weaver Road, Geiger Road, and Iroquois Point Road and its impact on downstream traffic on the H-1 Freeway and Farrington Highway.

2. Sewage Treatment and Disposal

   The availability of capacity at the Honouliuli Wastewater Treatment Plant to service the proposed development should be addressed.

3. Water System

   The water needs of the proposed development and its impact on the water resources in Ewa should be discussed.

4. Drainage System

   The Draft EIS should examine the project's drainage impact and proposed mitigation measures.

5. Environmental Characteristics

   A. Agriculture: The Draft EIS should address the loss of agricultural land and its impact on the agricultural industry on Oahu.

   B. Environmental Quality: The projects impact on air quality and noise levels should be evaluated.

   C. The Honolulu International Airport Noise Compatibility Program and Master Plan Update should be considered in the land use plan for the project.

Thank you for giving us an opportunity to comment on this matter.

Donald A. Clegg
DONALD A. CLEGG
Chief Planning Officer

HK

FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

1455 S BERETANIA STREET ROOM 305
HONOLULU HAWAII 96814

FRANK F FASI
MAYOR

FRANK K KAHOOHANOHANO
FIRE CHIEF

LIONEL E CAMARA
DEPUTY FIRE CHIEF

December 29, 1987

Date Received DEC 31 1987
File: 1488
To: DP
Action: _____

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

Dear Mr. Bills:

SUBJECT: Request for Consultation Comments
Draft Environmental Impact Statement
Ewa Gentry, Ewa, Oahu, Hawaii

After reviewing the materials provided, we foresee no adverse effects to the proposed development.

Fire protection in the area is provided by the Ewa Beach Fire Station which is approximately 4 minutes away. An engine and a ladder company will also respond from Waipahu on the initial call. Additional assistance, if needed, will respond from the Pearl City and the Waiau Fire Stations.

Water supply is more than adequate for the area.

Should you have any questions pertaining to the above matter, please contact Battalion Chief Kenneth Word at 943-3838.

Sincerely,

Frank K. Kahoohanohano

FRANK K. KAHOOHANOHANO
Fire Chief

FKK/LD:sb

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

January 25, 1988

Mr. Frank K. Kahoohanohano
Fire Chief
Fire Department
City and County of Honolulu
1455 South Beretania Street
Honolulu, Hawaii 96814

SUBJECT: Ewa Gentry Environmental Impact Statement Consultation Comments

Dear Mr. Kahoohanohano:

Thank you for your letter dated December 29, 1987 regarding the subject project. Your information regarding fire protection for the Ewa Gentry project area will be included in the Draft Environmental Impact Statement.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:lt
1488

HL

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX. (808) 531-8018

LIST OF AGENCIES, ORGANIZATIONS AND INDIVIDUALS COMMENTING ON THE DRAFT EIS

Federal Agencies

Department of Agriculture, Soil Conservation Service
Department of Interior, Fish and Wildlife Service
Department of the Army, Corps of Engineers

State of Hawaii

Department of Agriculture
Department of Business and Economic Development
Department of Health
Department of Business and Economic Development, Housing Financing and Development Corporation
University of Hawaii at Manoa, Environmental Center
Department of Defense
Department of Education
Land Use Commission
Department of Land and Natural Resources
Office of Hawaiian Affairs

City and County of Honolulu

Department of General Planning
Department of Land Utilization
Department of Public Works
Building Department
Department of Housing and Community Development
Fire Department
Police Department
Department of Parks and Recreation

Public Utilities

Hawaiian Electric Company, Inc.

Community Organizations

American Lung Association of Hawaii

RESPONSES TO DRAFT EIS

United States Department of the Interior

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

ES
Room 6307

MAR 23 1988

22 MAR 1988

To Received
file:
for DB
action

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Re: Draft Environmental Impact Statement, Ewa Gentry, Oahu

Dear Mr. Clegg:

We have reviewed the referenced report and have no comments to offer at this time.

We appreciate the opportunity to comment.

Sincerely,

for William R. Kramer
Ernest Kosaka, Field Supervisor
Environmental Services
Pacific Islands Office

✓ cc: Gray, Hong, Bills and Associates, Inc.

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Mr. Ernest Kosaka, Field Supervisor
Environmental Services
Pacific Islands Office
United States Department of the Interior
Fish and Wildlife Service
300 Ala Moana Boulevard
P.O. Box 50167
Honolulu, Hawaii 96850

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Kosaka:

We thank you for your letter dated March 27, 1988. We appreciate your effort in reviewing this document.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

cc: General Planning

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0308 / FAX. (808) 531-8019

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

P. O. BOX 50004
HONOLULU, HAWAII
96850

March 16, 1988

Mr. Donald A. Clegg, Chief Planning Officer
City and County of Honolulu
Department of General Planning
650 S. King Street
Honolulu, HI 96813

Date Received MAR 2 1 1988
File: 1488
To: DB
Action:

Dear Donald:

Subject: Environmental Impact Statement (EIS) -
Ewa Gentry, Ewa, Oahu, Hawaii

We have found that the soils and agricultural impact on Oahu have been adequately addressed and have no further comments for the above-mentioned document.

Thank you for the opportunity in letting us reveiw the above EIS.

Sincerely,

RICHARD N. DUNCAN
State Conservationist

cc:
Mr. David Bills, Vice President, Gray, Hong Bills & Associates, Inc.,
119 Merchant Street, Suite 607, Honolulu, HI 96813

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Mr. Richard N. Duncan
State Conservationist
United States Department of Agriculture
Soil Conservation Service
P.O. Box 50004
Honolulu, Hawaii 96850

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Duncan:

We thank you for your letter dated March 16, 1988 regarding the subject project. We appreciate your effort in reviewing this document.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

cc: General Planning

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8019

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

REPLY TO ATTENTION OF:

February 24, 1988

Planning Branch

FEB 26 1988

Mr. Donald A. Clegg
Chief, Planning Officer
City and County of Honolulu
Department of General Planning
650 South King Street
Honolulu, HI 96813

Dear Mr. Clegg:

Thank you for the opportunity to review the Ewa Gentry Draft Environmental Impact Statement (DEIS). The following comments are offered.

a. The proposed project does not involve work in waters of the United States or adjacent wetlands; therefore, a Department of the Army permit is not required.

b. According to the Flood Insurance Study for the City and County of Honolulu, the project site is located in Zone D (unstudied area with possible flood hazards).

Sincerely,

James Nakasone
Acting Chief
Engineering Division

Copy Furnished:

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

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Mr. James Nakasone, Acting Chief
Engineering Division
Department of the Army
U.S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, Hawaii 96858-5440

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Nakasone:

We thank you for your letter dated February 24, 1988 regarding the subject project. Final EIS will contain a section identifying all necessary approvals or implementation on the project. The Department of the Army permit will not be listed in this section. In addition, a draft document is being revised and that statement identifying that the project is in Zone D of the Flood Insurance Rate Maps will be added.

We appreciate your review with this subject document.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

cc: General Planning

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

JOHN WAIHEE
GOVERNOR

SUZANNE D. PETERSON
CHAIRPERSON, BOARD OF AGRICULTURE

ROBERT Y. TSUYEMURA
ACTING DEPUTY
TO THE CHAIRPERSON

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814-2512

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822-0159

March 24, 1988

COPY

Date Received MAR 2 9 1988
File:
For: DF
Action:

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Draft Environmental Impact Statement (DEIS) for
Ewa Gentry Residential Development Project
The Gentry Company
TMK: 9-1-10: por. 7
9-1-14: por. 5, 29, 30
Ewa, Oahu
Area: 932 acres

The Department of Agriculture has reviewed the subject DEIS and offers the following comments.

For the sake of clarity, our comments will be in the order of the concerns found in our letter (dated January 22, 1988) to Mr. David Bills regarding the Preparation Notice for the subject project.

Soils Information

The second paragraph on page 3.8 of the DEIS confuses the Land Study Bureau Overall Productivity Ratings ("A" through "E") with the Land Evaluation and Site Assessment (LESA) system (which was developed by the LESA Commission and not the Department of Agriculture). The third sentence appears to refer to the Site Assessment (SA) part of the LESA system which is being refined. The Agricultural Production Goals, which were referred to in our letter of January 22, are acreage estimates needed to meet the demand by agricultural interests in the State. On Oahu, it was estimated by the LESA Commission that 57,661 acres (including a 'contingency factor') will be needed to meet agricultural production requirements by 1995.

Impact on Oahu Sugar Company

The DEIS (text and Appendix I) does not include the specific impact on Oahu Sugar Company resulting from the cessation of sugarcane production on fields 64, 66, 69, 72, 73, 74, 75, 89 and 93. Indicators of this impact include the loss in tons of sugar per acre, lost revenues, location and cost of replacement field preparation (if any), and any other indicators of adverse impact.

As with the case with other proposed developments affecting Oahu Sugar Company, we have been concerned with the effect of field scatteration on OSC's economic viability. If the sugarcane-producing lands that are not proposed or planned to be urbanized are of relatively poor agronomic capability (i.e., less productive than the current average of 15 tons of sugar per acre), the increase in yields from these remaining fields must then be even greater. Therefore, we ask the question about the sugar-producing capabilities of the sugarcane fields being proposed for urbanization.

Other Issues Which Should Be Addressed

The DEIS, to varying degrees, addresses our concerns on the potential impacts of the proposed development, with the following exceptions:

- "the broader economic and resource impact on the State from the irrevocable loss of prime agricultural lands;"

Comment: This was not addressed presumably as a result of the finding in Appendix I that there is a "...vast amount of prime agricultural land and water that has been freed from sugar and pineapple production in recent years..." (Ibid., page 22). However, our emphasis on agricultural land as a resource in its own right results in a larger acreage needed for agricultural use in the future than the acreage which could immediately be put into profitable use today.

- "the relationship to the following Hawaii State Plan policies and priority guidelines:

226-103(c)(1) Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries.

226-103(d)(1) Identify, conserve and protect agricultural and aquacultural lands of importance and initiate affirmative and comprehensive programs to promote economically productive agricultural and aquacultural uses of such lands.

226-104(b)(2) Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district."

Comment: We agree with the priority guidelines which "...provide guidelines for decision-making by the State and the counties for the immediate future and set priorities for the allocation of resources" (Section 226-52, Hawaii Revised Statutes, as amended) should not be omitted.

Thank you for the opportunity to comment. We would like to receive a copy of the Final Environmental Impact Statement.

Sincerely,

Suzanne D Peterson

SUZANNE D. PETERSON
Chairperson, Board of Agriculture

cc: Mr. David Bills
Mr. William Balfour, President and Manager
Oahu Sugar Company
OSP (attn: LUD)
LUC
OEQC
DLU

GRAY, HONG, BILLS & ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S C HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H NOJIMA, P.E.
ROY T AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Suzanne D. Peterson
Chairperson, Board of Agriculture
State of Department of Agriculture
1428 South King Street
Honolulu, Hawaii 96814-2512

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Ms. Peterson:

Thank you for taking the time to review this document and to provide your comments regarding the draft EIS. We have reviewed your concerns and comments, and have prepared the following responses for your review.

1. The second paragraph on page 3-8 will be revised to reflect the appropriate reference to the LESA Commission rather than the Department of Agriculture. We may also revise our reference to the Site Assessment part of the LESA system after we have had an opportunity to clarify some related information with you or your staff.

2. Specific information concerning production yields and revenues from Oahu Sugar Company fields 64, 66, 69, 72, 73, 74, 75, 89, and 93 was not obtained for the draft EIS. This confidential information is only available from Oahu Sugar Company.

However, the impact of cessation of sugarcane production on these fields is addressed on pages 6 through 13 of Appendix I. Potential losses in production tonnage per acre, lost revenue, and field location are evaluated in this section of the draft EIS. Further, these considerations are also discussed in the context of two operational alternatives for sugarcane production in the Ewa area.

3. Lands in Hawaii, which have agricultural development capability, clearly represent a natural resource with general economic development potential. Unfortunately, the question of the future acreage needs has been scarcely addressed in terms of the specific marketability of various crops which can be feasibly cultivated in Hawaii. Consequently, we question the general conclusion that greater acreages are needed, particularly for crops such as sugar and pineapple which can clearly be produced outside of Hawaii at a more competitive cost. You are correct in suggesting that this issue was not addressed further in light of the conclusion by Decision Analysts Hawaii, Inc. that a vast amount of prime agricultural land and water has already been fed from sugar and pineapple production in recent years.

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

We appreciate the opportunity to respond to your comments and concerns, and to incorporate appropriate revision in the Final EIS for this project.

Should your have any questions regarding this matter please call our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

cc: General Planning

JOHN WAIHEE
GOVERNOR

ROGER A. ULVELING
DIRECTOR

BARBARA KIM STANTON
DEPUTY DIRECTOR

LESLIE S. MATSUBARA
DEPUTY DIRECTOR

DEPARTMENT OF BUSINESS AND ECONOMIC DEVELOPMENT

KAMAMALU BUILDING, 250 SOUTH KING ST., HONOLULU, HAWAII
MAILING ADDRESS: P.O. BOX 2359, HONOLULU, HAWAII 96804 TELEPHONE NUMBER NOTED

Ref. No. P-8171

March 10, 1988

Date Received MAR 16 1988
Doc
To: DB
Action:

The Honorable Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Draft Environmental Impact Statement (EIS) for Ewa Gentry, Ewa, Oahu

The Gentry Companies propose to develop a 932-acre site on the Ewa Plain, situated south of Ewa Village and north of Ewa Beach. Approximately 7,150 single-family and multi-family units are proposed for construction during the 1988 to 1995 project period. About one-third of the property is in the State Urban Land Use District; two-thirds are in the Agricultural District. We have reviewed the subject EIS and have the following comments:

1. The Hawaii Coastal Zone Management (CZM) law, embodied in Chapter 205A, Hawaii Revised Statutes, mandates that coastal ecosystems be protected from disruption and adverse impacts. The EIS proposes the design and construction of new drainage systems for the East and West portions of the project. The drainage system proposed for that part of the project that lies West of Fort Weaver Road would consist of a 100-foot wide grassed scale with 50 feet of bordering golf-course fairway to absorb and drain runoff from the 7.8 square mile Kaloi Gulch Basin. The EIS does not address the potential impact of pesticides, used in association with golf-course and residential landscape maintenance, upon the groundwater, nor potential impacts upon nearby ocean waters during periods of heavy rainfall. The final EIS should address this matter.

2. The proposed land use categories for the proposed project should be clearly identified. It is difficult for any reviewing agency to fully assess the impacts of a project when the land uses are not explicitly stated. Perhaps a table listing the acreages proposed for each land use category should be provided in the final EIS.

3. The final EIS should discuss in more detail the relationship of the subject project to Campbell Estate's Ewa Long Range Master Plan.

4. The EIS should identify the numbers and kinds of affordable housing units planned for the project.

5. The flood hazards of the subject property should be identified. The results of the Federal Insurance Administration's Flood Insurance study for this area would be helpful, if such information is available.

6. The final EIS should identify the proposed potable and non-potable water sources for the project and discuss their impacts on groundwater, particularly the intrusion of salt water if brackish water is utilized. The availability of sufficient amounts of water for the project, based on a comparison of allocated use and the sustainable yield, should also be discussed.

7. The final EIS should provide more detail concerning anticipated air quality impacts resulting from the proposed project, particularly those relating to increased carbon monoxide levels. Page 4-3 of the DEIS states, in reference to an air quality study conducted for West Loch Estates, that "future maximum carbon-monoxide concentrations along Fort Weaver Road are expected to be greater with the cumulative impact of additional vehicular traffic from the West Loch Estates and Ewa Gentry projects.." A comparison between the expected concentrations of carbon monoxide and State and Federal standards should be made also. Appropriate mitigation should also be identified.

8. The following statement in Section 2.8.7 of the draft EIS should be clarified, "Public funds from the State of Hawaii and City and County of Honolulu will be used to support the Ewa Gentry project." More detail should be provided to fully assess impacts of this project on the City's and State's financial resources and services.

   In addition, the final EIS should thoroughly discuss whether off-site infrastructure improvements will be funded by the developer and/or shared with other areawide departments.

9. In view of the probable need for widening Fort Weaver Road to six lanes, the final EIS should identify which traffic mitigation measures the developer will fund.

10. The impact of the proposed project on the continued operations of Oahu Sugar Company is an important issue. The apparent separation caused by the proposed project of the cane lands to the east and the cane milling operations to the west should be addressed. In addition, the major cane haul system for the region should be identified. The provision of a map would be helpful in this regard.

11. The location of the proposed project near Barbers Point Naval Air Station has raised the issue concerning aircraft noise. A better assessment of the noise conditions at the project site could be made with the provision of a land use site map overlain with the noise contours. While Figure 3-3 does show the relationship of the project area to the 60Ldn noise contour, there are some questions concerning the placement of the 55 Ldn noise contour, and the specific nature of the land uses which may be affected by these noise levels. The final EIS should also identify the mitigation measures for areas affected by noise levels in excess of 60 Ldn.

12. The final EIS should provide details on the project's phasing.

Thank you for the opportunity to review this project.

Sincerely,

Roger A. Ulveling

cc: Mr. David Bills, Vice President
Gray, Hong, Bills & Associates, Inc.

Dr. Marvin T. Miura, OEQC

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Mr. Roger A. Ulveling
Department of Business and
Economic Development
250 South King Street
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Ulveling:

We thank you for your letter dated March 10, 1988 regarding the subject project. We also received a supplemental letter dated March 16, 1988. We are providing the following responses to your comments:

1. The Draft Environmental Impact Statement identified that there were potential impacts resulting from the use of pesticides in association with golf course maintenance. This potential impact was specifically related to the effects on migratory birds and the potential impact was expected to be insignificant due to the availability of non-toxic pesticides and herbicides. With respect to groundwater, the aquifer underlying the project site is over a non-potable aquifer primarily used for sugarcane irrigation. Based on the availability of non-toxic pesticides and herbicides and based on the fact this aquifer is primarily used for irrigation, the impact on groundwater is expected to be negligible. With respect to nearby ocean waters, other studies have generally concluded that incremental changes per storm event from urbanization can result in a decrease in nitrogen concentrations entering nearshore waters. On the other hand, urbanization can increase total phosphorous concentrations entering the environment. These general conclusions will be added to the Final Environmental Impact Statement.

2. Figure 2-4 of the Environmental Impact Statement shows all the proposed Land Use categories of the project. A table currently exists in the upper righthand corner of this figure, identifying land use as well as acreage for each type of land use category. This figure will be retained in the Final Environmental Impact Statement.

3. The Draft Environmental Impact Statement discusses development to the project under Section 2.1. In addition, Section 3.5.6 identifies by exhibit the relationship of the Ewa Gentry Project to the Ewa Long Range Master Plan developed by the Estate of James Campbell. No additional discussion is planned to be incorporated into the Final environmental Impact Statement.

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

4. The Draft Environmental Impact Statement identifies the proposed sales prices for single-family homes as well as multi-family townhome units. The specifics regarding the numbers and kinds of affordable housing units have not been fully developed and are therefore being reported as an unresolved issue in the Final Environmental Impact Statement. However, please be aware that all multi-family townhome units all within a proposed sales price which meets the affordable criteria as reported by the Department of Business and Economic Development Housing Finance Development Corporation.

5. The Final Environmental Impact Statement will be revised to identify that the project is in Zone D of the Federal Insurance Administration's Flood Insurance Study. The zone is identified as an area in which flood hazards are undetermined.

6. Ewa Gentry is a member of the Ewa Plain Water Development Corporation, as reported in the Draft Environmental Impact Statement. This corporation was formed by the Estate of James Campbell to coordinate all water source, storage and transmission systems on Estate lands and in the Ewa area. Various development entities along with Ewa Gentry are members of this corporation. The Final Environmental Impact Statement will specifically state and identify the water sources proposed for development on the Ewa Plains. Further, it will be necessary for the project to obtain a water allocation permit from the Commission on Water Resource Management. The sustainable yield will be one of the requirements to be addressed during this permit process. All water development will be done in conjunction with the Ewa Plain Water Development Corporation. The Final Environmental Impact Statement will identify all approval processes which have not been completed as unresolved.

7. The Final Environmental Impact Statement will revise a section on air quality impacts to identify impacts and state potential mitigation measures. Numerous studies have been done on the Ewa Plains regarding air quality. To this date, it appears that all conclusions are essentially identical. No original work is proposed in conjunction with this document. However, the findings of previous studies is intended to be summarized.

8. Section 2.8.7 of the Draft Environmental Impact Statement identifies that public funds will be used to construct the public elementary school and two community parks within the project site. This section will be revised to state that the developer will set lands aside and the State through the Department of Education will construct a public elementary school and the City and County will construct the improvements at the two community parks. The Department of Education

as well as the City and County of Honolulu Department of Parks and Recreation concur with this assessment and no detail regarding financial resources and services is proposed to be added to the Final Environmental Impact Statement.

The cost for other off-site improvements will either be funded totally by the developer if solely serving the developer or be shared with other users if they are gaining benefits from the improvements. Specific examples of these systems are the water system being developed by the Ewa Plain Water Development Corporation.

9. The Draft Environmental Impact Statement does not identify that Fort Weaver Road will probably have to be widened to 6 lanes. However, the Draft Environmental Impact Statement as well as Final Environmental Impact Statement will identify that the issue of traffic is unresolved, and specifically unresolved with respect to funding for off-site improvements.

10. The owner of a majority of the Ewa Plains is the Estate of James Campbell. As identified in the Draft Environmental Impact Statement, sugarcane lands are to be orderly retired from agricultural activity to provide room for residential development. This is consistent with the Long Range Master Plan of the Estate of James Campbell. The impact on sugarcane lands therefore is not foreseen as a major issue since it is in conformance with the Estate's long range plan.

11. Figure 3-3 of the Draft Environmental Impact Statement provides a land use site map with the contours of the Barbers Point Naval Air Station AICUZ Study superimposed. A vast majority of the project is within areas exposed to noise levels of 60 ldn or less. Only the southwest corner project is within an area which has exposure between 60 and 65 ldn. The Final Environmental Impact Statement will identify potential mitigation measures for areas exceeding the 60 ldn noise level.

Should you have any questions regarding this matter, please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:sc
1488

cc: General Planning

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

In reply, please refer to:
EPHSD

March 3, 1988

MEMORANDUM

To: Mr. Donald A. Clegg, Chief Planning Officer, Department of General Planning
City & County of Honolulu

From: Deputy Director for Environmental Health

Subject: Draft Environmental Impact Statement (DEIS) for Ewa Gentry Project, Ewa, Oahu

Thank you for allowing us to review and comment on the subjet DEIS. We provide the following comments:

Air Pollution

The DEIS mistakenly refers to the obsolete and more restrictive Hawaii ambient air quality standards for particulates and sulfur dioxide. The state standards have been revised to more closely reflect the federal standards, including the elimination of the hydrocarbon standard.

In addressing the impact on the air quality, the DEIS refers to Jim Morrow's recent evaluations for the adjacent West Loch Estates housing project and indicates potential exceedances of the carbon monoxide state standards due to the increase in carbon monoxide emissions from the additional vehicular traffic. Since potential exceedances of the state ambient air quality standards have been determined, the DEIS should address the mitigating actions which should be implemented.

Noise

1. Our concerns toward this proposed project regarding possible noise impacts were addressed in a memorandum to your office dated January 8, 1988.

   a. Potential noise problems which may arise due to the integration of various land uses within the project location. These include:

      (1) Noise from activities occurring at the proposed golf course and park, such as grounds maintenance or club activities.

      (2) Noise resulting from activities at the proposed schools, such as paging systems, band practices, and athletic events.

      (3) Noise from stationary equipment, such as air conditioning/ventilation units, and exhaust fans.

   b. Construction activities must comply with the provisions of Title 11, Administrative Rules Chapter 43, Community Noise Control for Oahu.

      (1) The contractor must obtain a noise permit if the noise levels from the construction activities are expected to exceed the allowable levels of the rules.

      (2) Construction equipment and onsite vehicles requiring an exhaust of gas or air must be equipped with mufflers.

      (3) The contractor must comply with the conditional use of the permit as specified in the rules and conditions issued with the permit.

3. The applicant has discussed the noise impacts resulting from military aircraft operations. The study of these impacts from aircraft noise indicates that portions of the project site are located within the Barber's Point Naval Air Station Ldn 60 contours. However, Ldn values may include isolated high noise level events, such as aircraft flyover, and the occurrence of such noise intrusions tend to be more pronounced to the impacted community. Therefore, possible mitigative measures to lessen these impacts need to be addressed.

BRUCE S. ANDERSON, Ph.D.

cc: Mr. David Sills

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

April 4, 1988

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

Bruce S. Anderson, Ph.D.
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Dr. Anderson:

We thank you for your comments, dated March 3, 1988 regarding the subject project. We are providing the following responses to your comments:

1. Air Pollution - The Final Environmental Impact Statement will identify revised State air quality standards. In addition, the Final Environmental Impact Statement will also identify mitigation measures which can be implemented to reduce exceedances in carbon monoxide standards.

2. Noise - The Final Environmental Impact Statement will specifically identify the potential noise problems which may arise due to the integration of various land uses within the project area. The Final Environmental Impact Statement will further specifically identify the requirements related to construction activities as contained in your letter.

   The Environmental Impact Statement includes a discussion relating to the Barbers Point Naval Air Station AICUZ Study. This study was undertaken to show the average effects of aircraft noise associated with the Barbers Point facility. No attempt is being made to assess the effect if isolated high noise events, since these are taken into account during the course of a typical AICUZ study.

Should you have any questions regarding this matter, please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:sc
1488
cc: General Planning

119 MERCHANT STREET, SUITE 807, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
Department of Business and Economic Development
Housing Finance and Development Corporation
P. O. BOX 17907
HONOLULU, HAWAII 96817

Joseph K. Conant
Executive Director

IN REPLY REFER TO:
88:PLNG/1370JT

March 24, 1988

Date Received MAR 29 1988
File:
For: DB
Action:

Mr. Donald A. Clegg, Chief Planning Officer
City and County of Honolulu
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Re: Draft Environmental Impact Statement (EIS) for Proposed Ewa Gentry Project

We have reviewed the subject draft EIS and offer the following comments:

The State administration has identified those families earning from 140% of the area median income and below as the target group under its comprehensive State housing program. The U.S. Department of Housing and Urban Development has established the 1988 median income for a family of four in the City and County of Honolulu at $36,500. Based upon the State's guidelines, a family of four earning $51,100 or less would fall within this target group. The "affordable" range of sales prices is as follows:

Income	Affordable Sales Price[1]
80% of median, $29,200	$ 89,000
120% of median, $43,800	$139,800
140% of median, $51,100	$165,200

The "affordable" range of rents for (1) a family of four and (2) a single person, based upon a family paying no more than 30% of its adjusted gross income for rent, is as follows:

[1] The affordable sales price is based upon the following assumptions: (1) 30-year loan at an interest rate of 10%; (2) 10% down payment; (3) customer trust fund of $100 for property tax, insurance, maintenance, etc.; and, (4) an income-to-payment ratio of 3:1.

Income	4 Persons	1 Person	Affordable Rent 4 Persons	1 Person
50% of median,	$18,250	$12,800	$450	$320
80% of median,	$29,200	$20,450	$730	$500

Based upon the income criteria established above, it appears that all of the proposed multi-family units will be sold or rented at prices affordable to the target group; thus, making a substantial contribution to the provision of affordable housing.

It is unclear, however, what portion of the single family units will be sold at prices affordable to the target group. For example, will the majority of the single family units be priced at the $175,000 end of the sales spectrum? We believe that a continuum of affordable housing opportunities should be provided within the project. Multi-family, as well as single-family units, should be provided to a range of housing consumers from the lower-income or elderly renter to the gap group homebuyer. This would enable families to move up to larger, higher-priced homes within the planned community as their incomes and housing requirements increase.

Thank you for the opportunity to comment.

Sincerely,

JOSEPH K. CONANT
Executive Director

cc: Mr. David Bills

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. ADKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Mr. Joseph K. Conant
Executive Director
Department of Business and
Economic Development
Housing Finance and Development
Corporation
P.O. Box 17907
Honolulu, Hawaii 96817

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Conant:

We thank you for your letter dated March 24, 1988 regarding the subject project. Your letter was informative. As identified in the Draft Environmental Impact Statement, this project is being developed to reflect market condition and multi-family homes are expected to sell between $70,000 and $120,000. Single-family homes will range between $120,000 and $175,000. It is not clear as of this date what the median single-family home price will be. This will partially be developed based on improvement costs as well as establishing a program for affordable housing. The Final Environmental Impact Statement will identify that the affordable housing requirements have not been developed as of this date.

Should you have any questions regarding this matter, please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ac
1488

cc: General Planning

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8016

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

March 24, 1988

Mr. Donald A. Clegg
Chief Planning Officer
City and County of Honolulu
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Draft Environmental Impact Statement
Ewa Gentry
Ewa, Oahu

The Environmental Center has reviewed the above referenced Draft Environmental Impact Statement (EIS) with the assistance of Anders Daniels, Meteorology; Bertell Davis, Anthropology; and Nancy Kanyuk, Environmental Center. The project proposes a phased residental development of 7,150 single family and multi-family units, required support facilities, and public services on a 932-acre site situated on Oahu's Ewa Plain between Ewa Village and Ewa Beach.

Air Quality

Our reviewers find the air quality portion of the Draft EIS totally inadequate. Specifically it is predicted that State air quality standards will be exceeded for the adjacent West Loch project. However, no reasons are given as to why this will not occur for the Ewa Gentry as well. Thus, a complete analysis based on latest models available (CALNE 4) should be required.

There is no mention of dust and smoke from sugar cane fires in the neighborhood. Since such fires very likely will result in complaints from occupants, this should be addressed in the EIS, particularly now when it is suspected that silicon fibres might be present in the smoke.

The project site is located near the Campbell Industrial Park where higher levels of sulphur dioxide are "occasionally" generated. Although it is stated in the Draft EIS that this will rarely affect the ambient air quality of the site since the surface winds "generally" blow from the project to Campbell Industrial Park, this is no reason to accept exceedance of Hawaii Ambient Air Quality Standards (HAAQS). These are

violated if, during any two 3-hour periods, the concentrations of sulphur dioxide exceed the HAAQS.

For the air quality study (Table 3-4) the State of Hawaii standards should be quoted rather than those of the U.S. Army Corps of Engineers. This means that the units for CO will be written as milligram/cu.m., rather than microgram/cu.m.

Water Sources

Potable and non-potable water sources should be identified even when they come from offsite sources. Additionally it would be helpful if the impacts of the Ewa Plain Water Development Corporation (EPWDC) on Oahu water resources were described.

Initially, dual water supply systems for potable and non-potable waters for the Ewa Plain development were promoted by the Board of Water Supply. Will the dual water systems be one of the alternatives of the water supply plan?

If the underlying caprock aquifer is the ultimate source of the non-potable water supply on the Ewa plain, there is a continuing need to recharge that aquifer with fresher water. Heretofore, this recharge has occurred as a consequence of sugarcane over-irrigation. With conversion to the more efficient drip system, decreasing sugarcane acreage resulting from urbanization, and reduced infiltrative surfaces there most likely will be a reduction in total recharge.

In order to mitigate this, measures need to be enacted during planning to encourage active recharge. The two sumps on the east side and incorporation of Kaloi Gulch flow through the golf course will certainly help. Would it also be possible to retain some of the water in the golf course for recharging without jeopardizing its capacity for removing large flood flow? If this is possible, runoff from lesser storms can be retained for recharge.

On a broader scale encompassing more of the Ewa plain than this specific development, the effluent from the Honouliuli Wastewater Treatment Plant may be a water source for recharge. Currently, the primary-treated 17 MGD flow is discharged into the ocean. The treatment plant itself is situated adjacent to the Barbers Point NAS where distribution to recharge sites would not pose particularly great difficulty. The planning process should incorporate consideration of appropriate locations of these recharge sites so that they will be most effective, yet not pose any unusual environmental problems.

Recreational Facilities

The Draft EIS calls for development of two new community parks as well as a school to satisfy additional demands. However, in the Preliminary land-use plan (Fig. 2-4), one 20 acre package set aside for parkland has been labelled park/school. This issue needs clarification. Does the propocal provide for two parks and one school, or one park and one school?

Thank you for the opportunity to comment on this Draft EIS. We hope our comments will be helpful in preparing the final document.

Yours truly,

John T. Harrison, Ph.D.
Environmental Coordinator

cc: OEQC
L. Stephen Lau
Gray, Hong, Bills & Associates, Inc.
Anders Daniels
Bertell Davis
Nancy Kanyuk

GRAY, HONG, BILLS & ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

John T. Harrison, Ph.D
Environmental Coordinator
University of Hawaii at Manoa
Environmental Center
2550 Campus Road, Crawford 317
Honolulu, Hawaii 96822

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Dr. Harrison:

We thank you for your comments dated March 24, 1988 regarding the subject project. We are providing the following responses to your comments:

1. Air Quality - The Final Environmental Impact Statement will provide a more detailed description of how the West Loch Estates Environmental Impact Statement Air Quality Analysis directly correlates to the Ewa Gentry Project. Based on the work conducted in that study, the major impact of urbanization upon air quality relates to traffic as generated on Fort Weaver Road and secondary emissions relating from power generation and solid waste disposal. The air quality portion of the West Loch Estates Environmental Impact Statement assumed there would be additional projects along the Fort Weaver Road corridor which would generate additional traffic. The West Loch Estates Project was evaluated with the West Loch Estates Project and without the West Loch Estates Project, assuming addition urbanization in the area. The traffic projections are comparable and therefore the analysis has a direct relationship to the Ewa Gentry Project since they both will be utilizing Fort Weaver Road as a major traffic corridor. The Final Environmental Impact Statement will discuss the relationship between the two projects and why the validity of extrapolating impacts as well as mitigation measures is appropriate.

2. Water Resources - The Ewa Gentry Project as well as other projects on the Ewa Plains are all part of the Ewa Plains Water Development Corporation. A complete Water Master Plan has been prepared identifying source locations as well as transmission components. The water system provided for the Ewa Gentry Project as well as other projects must meet long-term commitments with respect to sustainable yields as well as recharge considerations. The Final Environmental Impact Statement will incorporate a complete Ewa Plains Water Master Plan as prepared by the Ewa Plains Water Development Corporation. This information should clarify your concern regarding water resources.

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

3. Recreational Facilities - Figure 3-4 of the Draft Environmental Impact Statement shows one 20-acre parcel which will be set aside for park and school use as well as one 19-acre parcel which will be set aside totally for park use. Therefore, there will be two parks and one school. It is quite a common practice as you should be aware to accommodate recreational facilities in the form of parks adjacent to schools. We think that the presentation as provided in the Draft Environmental Impact Statement is sufficiently clear and will be shown as such in the Final Environmental Impact Statement. This letter should clarify your specific concern.

Should you have any questions regarding this matter, please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:sc
1488

cc: General Planning

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING
[illegible]
[illegible] HONOLULU, HAWAII 96816-4495

FEB 1 - '88

Engineering Office

Date Received FEB 17 1988
File: 1154
To: DB
Action:

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Ewa Gentry
Ewa, Oahu

Thank you for providing us the opportunity to review the above subject project.

We have no comments to offer at this time regarding this project.

Sincerely,

[illegible]

Jerry M. Matsuda
Major, Hawaii Air
National Guard
Contr & Engr Officer

Enclosure

cc:
Mr. David Bills ✓

GRAY, HONG, BILLS & ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Jerry M. Matsuda
Major, Hawaii Air National Guard
Contracts & Engineering Officer
State of Hawaii
Department of Defense
Office of the Adjutant General
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Matsuda:

Thank you for your letter dated February 10, 1988 regarding the subject project. We appreciate your effort in reviewing this document.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

cc: General Planning

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

JOHN WAIHEE
GOVERNOR

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

OFFICE OF THE SUPERINTENDENT

February 22, 1988

Date Received MAR 4 1988
Filed
To DB
Action

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

SUBJECT: EWA GENTRY - Draft EIS

Our assessment in the subject draft EIS still appears valid.

We concur with the need for an elementary school within the development, but we would like to reserve our comments on the siting until a later date.

Sincerely,

Charles T. Toguchi
Superintendent

CTT:jl(MR1)
cc E. Imai, OBS
E. Nakano, Leeward Dist.
D. Bills, Gray, Hong, Bills & Assoc.

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

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

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Toguchi:

Thank you for your letter dated February 22, 1988 regarding the subject project. We appreciate your review of the document.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

cc: General Planning

118 MERCHANT STREET, SUITE 807, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX. (808) 531-8018

JOHN WAIHEE
GOVERNOR OF HAWAII

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

MAR 4 1988

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

LIBERT K. LANDGRAF
DEPUTY

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

DOC. NO.: 2819E
FILE NO.: 88-377

Date Received MAR 5 1988
Ltr: _____
Em. DPP
Actions _____
_____

Honorable Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

SUBJECT: Ewa Gentry, Draft EIS
TMK: 9-1-10: por. 7; 9-1-14: 29, 30

In response to your request, we have reviewed the document cited above and have the following comments to offer.

The water use projected in the draft EIS is 3.43 mgd of potable water and 1.03 mgd of non-potable water. The Pearl Harbor Ground Water Control Area may not be able to supply this water requirement. The final EIS should specify the water source rather than refer to the Ewa Water Master Plan. The developer must apply for a water allocation permit from the Commission on Water Resource Management. A stream channel alteration permit may also be needed.

An archaeological survey conducted for this project found no historic sites. However, the archaeological survey is not mentioned in Chapter 3, Environmental Setting, of the EIS. The negative results of the survey must be documented in the EIS. Also, a statement should be made to the effect that if unanticipated archaeological deposits are encountered during ground disturbance or any state of construction, work will cease and the Historic Sites Section (548-7460) will be notified.

Finally, a discussion of the use trees, shrubs, etc. along residential and business streets should be included in the final EIS. A master plan is recommended and our Division of Forestry and Wildlife should be consulted before the plan is implemented.

Thank you for the opportunity to comment on this project.

Very truly yours,

WILLIAM W. PATY, Chairperson
Board of Land and Natural Resources

cc: David Bills

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

April 4, 1988

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

Mr. William W. Paty, Chairperson
Board of Natural Resources
State of Hawaii
Department of Land & Natural Resources
P.O. Box 621
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Paty:

We thank you for your letter dated March 4, 1988 regarding the subject project. With respect to your comments regarding potable and non-potable water we will be revising the Final Environmental Impact Statement to identify the ground water source locations. These locations are identified in the Ewa water master plan but will be specifically stated in the final document. We will also be revising the Final Environmental Impact Statement to identify that a water allocation permit from the Commission of Water Resource Management is required. Finally, we will also identify that a stream channel alteration permit may be required for modification to the Kaloi Channel.

The Final Environmental Impact Statement will be revised to summarize the findings of the archaeological survey within Chapter 3, Environmental Setting. We will also be adding a statement that identifies if unanticipated archaeological deposits are encountered during ground disturbance or any construction activity, the work will be stopped and the Historic Sites Section will be notified.

With respect to landscaping, the project will be required to provide street trees and landscaping. The agencies responsible for the review of these plans are the City and County Department of Parks and Recreation as well as the City and County of Honolulu Department of Land Utilization. It is premature to develop this plans at this time. However, need for street trees and landscaping will be identified in the Final Environmental Impact Statement.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488
cc: General Planning

119 MERCHANT STREET, SUITE 807, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX. (808) 531-8018

STATE OF HAWAII
OFFICE OF HAWAIIAN AFFAIRS
1600 KAPIOLANI BLVD., SUITE 1500
HONOLULU, HAWAII 96814
(808) 548-6000
(808) 548-3042

Date Received MAR 24 1988
To: _____
cc: DPP
Actions _____
_____

March 15, 1988

Mr. Donald A. Clegg, Chief
Dept. of General Planning
City and County of Honolulu
650 S. King St.
Honolulu, HI. 96813

Dear Mr. Clegg:

SUBJECT: Draft EIS: Ewa Gentry, Honouliuli, Oahu
TMK: 9-1-10: 2,7
9-1-12: 1,29,30, por.5

The proposed undertaking will irrevocably eliminate some of the best soils on Oahu from agricultural use. This project will reduce our island's future options for increased agricultural production and expansion of diversified agriculture. This has an adverse effect on those Hawaiians who choose to seek or maintain a career in agriculture and a rural lifestyle.

Additional archaeological study should be done in the project area to complement the studies that are being done near Honouliuli for the West Loch Golf Course and Park project. A surface survey is inadequate for assessing the adverse effect this project will have on the research potential of archaeological resources in the project area.

Sincerely,

Kamaki O. Kanahele

Kamaki A. Kanahele III
Administrator

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Mr. Kamaki A. Kanahele, III
Administrator
State of Hawaii
Office of Hawaiian Affairs
1600 Kapiolani Blvd., Suite 1500
Honolulu, Hawaii 96814

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Kanahele:

We thank you for your letter dated March 15, 1988 regarding the subject project. The draft document included a specific agricultural report in Appendix I. This report specifically looked at the options for diversified agriculture and the availability of lands for small farmers. The report identified that the supply of prime agricultural lands available for diversified agriculture far exceeds the need. The report concludes an urban development consisting of the Ewa Gentry project or other projects on the Ewa Plains would not have an adverse impact. The appendix further points out that current land use regulations in the political environment make it unprofitable and to risky to lease small farm parcels. This is furthered compounded by the cost to develop small parcels of agricultural land. We therefore believe the Draft Environmental Impact Statement identifies your concern with respect to diversified agriculture. The Final Environmental Impact Statement will include the same evaluation.

With respect to the archaeological study all work was coordinated with the state of Hawaii Department of Land & Natural Resources. The Historic Sites Section of the Department of Land & Natural Resources has reviewed the archaeological report and has had no comment other than to identify the need for additional archaeological work should unanticipated archaeological deposits be encountered during ground disturbance. Therefore, we do not see need for additional archaeological work.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

cc: General Planning

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX (808) 531-8018

INTRODUCTION

The 900-acre Gentry-Ewa site is located on both sides of Fort Weaver and below the railroad right-of-way in Ewa, Oahu. The project could ultimately consist of up to 8000 single family and multi-family residential units. The boundaries of the site and its land use plan are shown on Figure 1. This report describes the drainage plan to convey offsite and onsite runoff across the project to a discharge point at its makai end.

KEY DRAINAGE CONSIDERATIONS

There are a number of hydrologic aspects of this site which require a comprehensive approach to the drainage design. Some of these features are:

1. The 7.8-square mile basin of Kaloi Gulch drains through the west side of the project site. Its existing channel through the site is man-made (by Oahu Sugar Company), has an alignment chosen for sugar cane operations, and has only minimal capacity which is far less than the magnitude of runoff which can occur.

2. An existing drain line carries runoff from Fernandez Village, Ho'a Kea Subdivision, and the adjacent Elderly Housing Project into the project site. Its hydraulic grade line is significantly below existing ground. To continue this hydraulic grade line through the project site would require deep burial of large drainage conduits. These conduits would also have to go below the existing 84-inch sewer line in Geiger Road. The cost of this scheme is not economically feasible.

3. The 387 acres of project site on the east side of Fort Weaver Road has no natural drainage outlet to the ocean or to Pearl Harbor's West Loch.

4. Minimal ground slopes across the project site on both sides of Fort Weaver Road are a constraint to internal drainage.

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

Date Received MAR 25 1988
File:
To: DB
Action:

DONALD A. CLEGG
CHIEF PLANNING OFFICER

GENE CONNELL
DEPUTY CHIEF PLANNING OFFICER

KK/DGP 2/88-421

March 24, 1988

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

Dear Mr. Bills:

Draft Environmental Impact Statement
for the Proposed Ewa-Gentry Development
Situated in Ewa, Gentry

We have reviewed the subject Draft Environmental Impact Statement (EIS) and have the following comments:

1. A recent application for a development plan amendment for Kapolei Town Center provides revised dwelling unit and employment figures. The Draft EIS should be updated to reflect these new figures of 1,700 dwelling units and employment of 12,500 persons. Changes should be made to tables and/or the narrative on pages 2-6, 3-19, 3-20 and 3-22 of the body of the Draft EIS and pages 2-1, 2-2 and 2-3 of Appendix G, Socio-Economic Impact Evaluation.

2. In Section 2.7.3 on page 2-11 it is stated that Alternative A (the no project alternative) may impact the 650 jobs at Oahu Sugar since other sugar lands will be developed. Later in this section it is stated that Alternatives C and D (redevelopment of 932 acres of Ewa land - 857 acres in sugarcane production) are not expected to reduce the number of jobs at Oahu Sugar Company. This concept is difficult to understand since in this and the following section, Alternatives C and D are said to have greater impact due to the cumulative nature of these alternatives combined with all other proposed projects in Ewa (retail and service employment and traffic).

The issue of impacts are further confused in Section 2.7.6, page 2-12, where it is stated that Alternatives C and D "also assume a market share which is significantly less than the cumulative residential development projects which are proposed for the Ewa district (Alternative A)."

3. Section 2.7.5 on page 2-12 indicates that under Alternative A a significant increase in the amount and rate of stormwater flows and normal drainage runoff will occur while under Alternative B and C mitigation measures are indicated. Your tables on pages 2-14 through 2-17, however, indicate no significant consequences to stormwater flows for Alternative A while Alternatives C and D will result in adverse impacts. Section 2.7.5 should be revised to be consistent with the tables. Perhaps mitigation measures planned for projects in Alternative A should also be mentioned.

4. In Section 4.3.3 on page 4-7 the figure "10 students per family unit" appears to be incorrect.

5. Table 4-3 on page 4-11 should be revised to add "other Oahu Areas" so totals will add up to 100 (%). See Table 3-3 on page 3-7 of Appendix G.

   Also in this section, it is indicated that the 73,000 square feet of existing commercial floor space in Ewa Beach supports 13,000 existing residents. As such it does not appear appropriate to subtract the 73,000 square feet from the 264,000 square feet that the fully developed Ewa-Gentry population will support. This information appears on page 4-14 and on page 3-7 of Appendix G.

6. In Section 4.7 on page 4-18 the unresolved issues should include a discussion of the unilateral agreement signed by the former developer of the site (Aloha State, Corp.), agreeing to certain facility improvements on- and off-site. The conditions of the unilateral agreement run with the land and are now the responsibility of the Gentry Companies.

The following comments pertain to Tables credited to our department on pages 2-7 (Table 2-1), 3-22 (Table 3-9), 3-23 (Table 3-11) and 3-26 (Table 3-13) of the Draft EIS and pages 2-3 (Table 2-2), 2-4 (Table 2-4) and 2-6 (Table 2-5) of Appendix G:

1. This data is preliminary and has since been revised.

2. A portion (existing development plan approvals for approximately 3,300 units) of the Ewa-Gentry project is reflected in the projected Year 2005 figures in these tables and some double counting appears to be occurring when the total Ewa-Gentry project (7,150 units) is added in.

3. These Tables were, as stated previously, preliminary and for this reason not intended for publication. This information was presented to a consultant for a City agency and was intended for use internally within the agency. Because of the preliminary and internal nature of this information, we feel it is inappropriate to use it as a basis for an application to this department.

If you have any questions, please contact Keith Kurahashi of my staff at 527-6051.

Sincerely,

DONALD A. CLEGG
Chief Planning Officer

GRAY, HONG, BILLS & ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Mr. Keith Kurahashi
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Kurahashi:

We appreciate your taking the time to review the draft EIS for the Ewa Gentry project. We have reviewed your concerns and comments, and have prepared the following responses for your review.

1. Given the recent availability of revised dwelling unit and employment forecasts for the proposed Kapolei Town Center project, regional socio-economic descriptions will be revised appropriately on pages 2-6, 3-20 and 3-22 of the body of the draft EIS and pages 2-1, 2-2, and 2-3 of Appendix G, Socio-Economic Impact Evaluation.

2. Section 2.0 of the Draft EIS will be revised to clarify the description of the four project alternatives. Alternatives C and D are not expected to generate a loss in employment at Oahu Sugar Company. Alternative A, the "no project alternative" will also not bring about employment reductions at Oahu Sugar Company. However, the planned withdrawal of a significant portion of Oahu Sugar lands situated throughout Ewa and the Central Plains will gradually impact jobs at Oahu Sugar Company. Section 2.7.3 will be reworded to convey this conclusion more clearly.

3. Section 2.7.5 will be revised, as recommended, to the consistent with Tables 2-2 through 2-5. This revision will clarify the general degree of regional impact expected by increased stormwater flows in the overall Ewa district. The preliminary nature of most of the proposed residential development projects in the Ewa district will not permit any detailed identification of proposed mitigation measures being considered by other development organizations at his time. However, we will indicate that conceptual plans for other residential development projects, e.g. Kapolei Village project, indicate the potential use of golf course development as a method of accomodating increased stormwater flows.

4. Based on historical observations of new residential developments on Oahu, the State Department of Education indicates that school enrollments in the Ewa Villages and Ewa Beach communities will likely increase at the rate of approximately 20 students per every 100 single family units, and approximately 10 students for every 100 multi-family units (Matsushige 1988). Our typographical error will be corrected in the Final EIS.

119 MERCHANT STREET, SUITE 807, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8019

5. The transposition error on Table 4-3 (page 4-11) will be revised to be synonymous with Table 3-3 in Appendix G.

The discussion of anticipated commercial floor space demands deducts 73,000 square feet from an estimated calculation of the expected demand for 264,000 square feet of commercial floor space. This deduction enables the reviewer to understand that the Ewa Gentry project will, in itself, create a demand for 191,000 of new commercial floor space, as well as support some 73,000 square feet of existing commercial floor space which is already available and developed at the nearby Ewa Beach Shopping Center

The segregation of new and existing commercial floor space estimates is not intended to suggest that future Ewa Gentry residents will not use commercial services located at the existing Ewa Beach Shopping Center.

6. Section 4.7 of the Draft Environmental Impact Statement will be revised to identify the unilateral agreement signed by the former developer of the site (Hirano Brothers, Ltd. & Associates) agreeing to certain facility improvements on- and off-site is unresolved. In general the current developer, the Gentry Companies, plans to implement all improvements identified in the unilateral agreement directly affecting their property. However, the developer is considering a request to amend the unilateral agreement for improvements on areas not affected by current plans. The previous developer proposed a development along Renton road. The Gentry Companies no loner has development rights on this property and therefore may wish to consider amendment of the unilateral agreement for roadway improvements to the Renton road right of way.

7. During the preparation of the EIS, Gray, Hong, Bills and Associates obtained copies of preliminary forecasts of various socio-economic indicators, e.g. population and employment, which were recently prepared by the Department of General Planning, Planning Information Branch for OMPO. OMPO representatives authorized GHB's use of this information.

Through our recent discussions with Mr. Steve Young, however, we recognize that the Final EIS should indicate the preliminary nature of these forecasts and their intent to support OMPO's ongoing update of the HALI 2000 study. The forecasts will be further qualified to indicate that the statistical assumptions used to make the forecasts, which make assumptions concerning the extent of potential development to the year 2000, do not endorse any of the proposed residential projects for the Ewa district..

We appreciate the opportunity to respond to your comments and concerns, and to incorporate these revisions in the Final EIS.

Should you have any questions regarding this matter please call our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

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

FRANK F. FASI
MAYOR

JOHN P. WHALEN
DIRECTOR

BENJAMIN B. LEE
DEPUTY DIRECTOR

Date Received MAR 2 3 1988
File:
To: DD
Action:

March 22, 1988

MEMORANDUM

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: JOHN P. WHALEN

SUBJECT: EWA GENTRY DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) COMMENTS

We have reviewed the DEIS, and have the following comments and questions:

1. The Final EIS should describe the proposed development in context with current projects under review for land use approvals (e.g., Soda Creek). A map exhibit clarifying the relationship of these projects should be attached as a part of the zoning application.

2. The Final EIS should include a history of the zoning and land use policy changes for the site.

3. The Final EIS should address the relationship of the project to the plans for expansion of the Honouliuli Wastewater Treatment Plant.

4. The Final EIS should include a discussion on how the project will relate to the north-south roadway connector from H-1 Freeway to the Ewa Marina as shown on the City's Development Plan Public Facilities Map.

5. The Final EIS should include a discussion of the Air Installations Compatible Use Zone (AICUZ) Plan for Barber's Point Naval Air Station. Specifically, accident potential should be discussed.

6. For zoning purposes, the report should include a detailed evaluation of the infrastructure improvements required to support the project. An expansion on Sections 2.8.6.2 Water Supply and Distribution and 2.8.6.3 Wastewater Management is appropriate (e.g., What is the breakdown of estimated sewage and water usage (MGD) for the new units?) What is the project capacity of the water and sewage disposal system being proposed? What is the system demand by the Soda Creek project?

7. For zoning purposes, a phasing plan for the development should be outlined in detail and listed in tabular form as well as mapped.

Thank you for the opportunity to comment. If there are any questions regarding these comments, please call Bennett Mark of our staff at 527-5038.

JOHN P. WHALEN
Director of Land Utilization

JPW:sl
1711B

cc: √David Bills - Gray Hong & Associates, Inc.

GRAY, HONG, BILLS & ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Whalen:

Thank you for your letter dated March 22, 1988 regarding the subject project. We are providing the following responses to your comments and questions:

1. The Ewa Gentry Project as proposed consist of 7,150 units which will be constructed on 957 acres of land. Soda Creek is one small specific project within the total property. This project happens to be located in the portion of the project where a suitable development plan designation as well as zoning designation currently exist. Figure 2-4 of the Draft Environmental Impact Statement shows the proposed projects. We will identify the location of the Soda Creek Project on this exhibit in the Final Environmental Impact Statement. At the time a zoning application is prepared, more specific projects will be identified.

2. The Draft Environmental Impact Statement identifies that the project is consistent with the plans of the Estate of James Campbell to convert lands from agricultural production, and specifically sugarcane production, to more productive forms of income, and specifically housing. The Draft Environmental Impact Statement also provides a historical perspective with respect to the rise and decline of Ewa's sugarcane industry. This information is believed pertinent with respect to the current project. We have not included in the Draft Environmental Impact Statement nor do we feel it beneficial in the Final Environmental Impact Statement to cite specific zoning changes in the area. We have, however, identified all land use changes that will be necessary to implement the project.

3. The Final Environmental Impact Statement will specifically show the area for expansion of the Honouliuli Wastewater Treatment Plant.

119 MERCHANT STREET, SUITE 807, HONOLULU, HAWAII 96813 · TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

4. Land Use plan for the Ewa Gentry Project shows a new north-south roadway. This roadway alignment generally matches that shown on the Public Facilities Map. The impact section of the Final EIS will be revised to specifically state that this proposed north-south alignment is intended to conform with the Development Plan Public Facilities Map.

5. The Draft Environmental Impact Statement contains an exhibit showing the Air Installations Compatible Use Zone (AICUZ) Plan for the Barbers Point Naval Air Station. The Final Environmental Impact Statement will specifically add the accident potential zones (APZ) to this exhibit and provide a discussion regarding these zones. None of the accident potential zones enter into the Ewa Gentry project area.

6. The Draft Environmental Impact Statement generally describes project requirements under Section 2.8, which is the project description of the selected project alternative. Specific infrastructure demands with respect to water supply requirements and wastewater generation rates are contained in Chapter 4 under the specific infrastructure item. The total demand for the whole Ewa Gentry Project has been estimated and a breakdown by various specific project is not available at this time.

7. At the time the zoning application is prepared, a specific phasing plan will be developed outlining in detail when all projects would be constructed. The Draft Environmental Impact Statement provides a more general breakdown identifying the number of housing units which will be available yearly.

Should you have any questions regarding this matter, please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:sc
1488
cc: General Planning

MAR : 0 1988

File: [illegible]

To: DP

Action: [illegible]

ENV 88-61

March 8, 1988

MEMORANDUM

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: ALFRED J. THIEDE, DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT EIS FOR EWA GENTRY, EWA, OAHU, HAWAII
(TAX MAP KEY: 9 1 10: POR. OF 7; 9 1 14:29, 30, POR. OF 5)

The subject Draft EIS was received and we have the following comments:

1. A revised sewer master plan should be submitted at the appropriate time or prior to the preparation of engineering plans to the Division of Wastewater Management for review and approval. The existing master plan made provisions to serve the existing Ewa Village, but the preliminary plan in the Draft EIS does not have those provisions.

2. We are opposed to further encroachment by the proposed development towards the Honouliuli WWTP. The present land use designation of agriculture around the plant site should be retained as a buffer area between the plant and urban development. The residential subdivision within the mauka golf course and the north clubhouse are located too close to the plant site. The proposed golf course should be no closer to the plant than the existing Barbers Point golf course.

3. There is no assurance that the entire Gentry project can be accommodated by the planned expansion of the Honouliuli WWTP to 38 mgd. As stated in our memorandum of December 17, 1987, if all approved and proposed developments in the Honouliuli WWTP tributary areas were constructed by the year 2005, the anticipated flows will exceed the proposed plant capacity of 38 mgd by 10 mgd.

4. The drainage master plan is still being reviewed by the Drainage Section of the Division of Engineering. If the marina portion of the Ewa Marina development is not constructed, a revised master plan may become necessary.

5. If the drainage pump station is constructed and dedicated to the City and County for operation and maintenance, it must be built in accordance with the specifications of the Division of Wastewater Management. In addition to paying for the operation and maintenance expenses, the developer should be required to pay replacement costs of the station. Are these expenses and costs known at this time?

Sam Callejo

ALFRED J. THIEDE
Director and Chief Engineer

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

GRAY, HONG, BILLS & ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Mr. Alfred J. Thiede
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Thiede:

We thank you for your letter dated March 8, 1988 regarding the subject project. We are providing the following responses to your comments:

1. A sewer master has been shown in the Draft Environmental Impact Statement to provide guidelines as to the system by which the Ewa Gentry Project will be sewered. We recognize the need that a revised and more specific master plan will need to be prepared and submitted at the appropriate time and prior to the preparation of engineering plans. It is in the intent of the master plan that provisions will be made to serve the existing Ewa Village. The master plan has not been updated by the developer's engineering consultant and a revised exhibit may not be available. However, please be assured that the connection of the existing Ewa Village area is fully intended to be part of the project's master plan.

2. The Final Environmental Impact Statement will more clearly show the location of the Honouliuli Wastewater Treatment Plant as well as area proposed for plant expansion. The current Land Use Plan shows a golf course surrounding the wastewater treatment facilities. It is the intent that any proposed development comply with setback and buffer requirements as defined in the City and County of Honolulu Land Use Ordinance. Any additional setbacks or buffer areas will have to be further evaluated. For this reason the Final Environmental Impact Statement will identify that the buffer between the Wastewater Treatment Plant facilities and proposed development is unresolved.

3. Your letter to our office dated January 6, 1988 identified that the existing Honouliuli Wastewater Treatment Plant can accommodate only 3,550 units from the Ewa Gentry Project. The remaining units would not be allowed to connect until the treatment plant is expanded in 1993. This information was reported in the Draft Environmental Impact Statement. Your current letter indicates that if all proposed developments in the Honouliuli Wastewater Treatment Plant tributary area were constructed, the proposed treatment plant capacity would be exceeded by 10 million gallons per day. Based on your letter, we will revise the Final Environmental Impact Statement to identify the foregoing facts. The issue regarding the Honouliuli Wastewater Treatment Plant capacity will also be identified as an unresolved issue in the Final Environmental Impact Statement.

119 MERCHANT STREET, SUITE 807, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

4. We understand your department is still reviewing the Drainage Master Plan for the project. We will revise the Final Environmental Impact Statement to provide a statement that a revised master plan may become necessary if the Ewa marina development is not constructed. The Final Environmental Impact Statement will also identify that the Drainage Master Plan is an unresolved issue.

5. The drainage system for the Ewa Gentry Project proposes to use a drainage pump station on the west side of Fort Weaver Road. The Final Environmental Impact Statement will identify that this station will be constructed in accordance with standards and specifications of the Division of Wastewater Management. At present, the Drainage Master Plan has not been approved and the developer's engineers have not developed estimates for operation and maintenance expenses with respect to this drainage pump station. As identified in Comment No. 4 above, the issue of the Drainage Master Plan will be identified as unresolved in the Final Environmental Impact Statement.

Should you have any questions regarding this matter, please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:sc
1488

cc: General Planning

FEB 2 2 1988
Date Received
From: 1488
To: DE
Action:

PB 88-162

February 18, 1988

MEMO TO: MR. DONALD A. CLEGG, DIRECTOR
DEPARTMENT OF GENERAL PLANNING

FROM: HERBERT K. MURAOKA
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: DRAFT EIS FOR EWA GENTRY

We have reviewed the Ewa Gentry draft Environmental Impact Statement and have no comments.

Thank you for the opportunity to review the documents.

HERBERT K. MURAOKA
Director and Building Superintendent

TH:ly
cc: J. Harada
Gray, Hong, Bills & Assoc,, Inc.

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Herbert K. Muraoka
Director and Building Superintendent
Building Department
City and County of Honolulu
650 South King Street, 2nd Floor
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Muraoka:

Thank you for your memo dated February 18, 1988 regarding the subject project. We appreciate your effort in reviewing this document.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

cc: General Planning

119 MERCHANT STREET, SUITE 807, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813
PHONE 523-4181

FRANK F. FASI
MAYOR

MIKE MOON
DIRECTOR

ROBERT IWASAKO
DEPUTY DIRECTOR

March 8, 1988

Date Received MAR 11 1988
File: 1488
To: DB
Action:

MEMORANDUM

TO: Donald A. Clegg, Chief Planning Officer
Department of General Planning

FROM: Mike Moon

SUBJECT: Ewa Gentry Draft Environmental Impact Statement
Ewa, Oahu

We appreciate the opportunity to review and comment on the Ewa Gentry Draft Environmental Impact Statement (DEIS). As, we noted in our comments regarding the EIS Preparation Notice for the Ewa Gentry project proposal, the development will be subject to the City's affordable housing requirements. The DEIS indicated that the developer intends to consult with the Department in developing a program that satisfactorily addresses these requirements. Staff from the Department remains available to coordinate the development of such a program with The Gentry Companies for the Ewa Gentry project.

Thank you for the opportunity to comment.

MIKE MOON
Director

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

GRAY, HONG, BILLS & ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Mr. Mike Moon, Director
Department of Housing and Community Development
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Moon:

Thank you for your letter dated March 8, 1988 regarding the subject project. The final document will identify a single family homes will sell at approximately $120,000.00 to $175,000.00. Multi-family units expected to range in price from $70,000.00 to $120,000.00. These estimates are based on 1987 market conditions, development cost and financing terms. As identified in the Draft Environmental Impact Statement a program will be developed to address the City and County of Honolulu's affordable housing requirements and this program will be developed through consultation with your office. Final Environmental Impact Statement will identify that the affordable housing program details have not been developed.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

cc: General Planning

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX (808) 531-8019

HONOLULU FIRE DEPARTMENT
1455 S. Beretania Street, Room 305
Honolulu, Hawaii 96814

March 8, 1988

Date Received MAR 10 1988
File: 1488
To: DFV
Reflex:

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: FRANK K. KAHOOHANOHANO, FIRE CHIEF

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT--EWA GENTRY

We have reviewed the above subject and are requesting the following change to Section 3.4.5.10 "Police and Fire Protection", specifically paragraph 2.

Ewa Beach Fire Station has only one engine and a manpower of five. Supplemental manpower of 12 will come via the dispatch of an additional engine and ladder company from Waipahu.

Should you have any questions pertaining to the above matter, please contact Battalion Chief Kenneth Word at 943-3838.

FRANK K. KAHOOHANOHANO
Fire Chief

FKK/DF:sb

cc: Mr. David Bills, Vice President
Gray, Hong, Bills & Associates, Inc.

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S C HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. MOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Mr. Frank K. Kahoohanohano, Fire Chief
Honolulu Fire Department
1455 South Beretania Street, Room 305
Honolulu, Hawaii 96814

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Kahoohanohano:

We thank you for your letter dated March 8, 1988 regarding the subject project. Section 3.4.5.10 police and fire protection will be revised to identify the equipment in manpower availability identified in your letter. We will also identify that additional assistance if needed will respond from the Pearl City & Waiau fire stations as identified in your December 29, 1987 letter.

We appreciate your review of the subject document.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

cc: General Planning

119 MERCHANT STREET, SUITE 807, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-0018

JOHN WAIHEE
Governor

MARY MIURA, Ph.D.
Director

TELEPHONE NO.
548-6915

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
465 SOUTH KING STREET, ROOM 104
HONOLULU, HAWAII 96813

February 8, 1988

Dear Reviewer:

Attached for your review is an Environmental Impact Statement (EIS) that was prepared pursuant to Chapter 343, Hawaii Revised Statutes and Chapter 11-200, Administrative Rules, EIS Rules:

TITLE: Ewa Gentry

LOCATION: Ewa, Oahu

CLASSIFICATION: Applicant Action

Your comments or acknowledgments of no comments on the EIS are welcomed. Please submit your reply to the accepting authority or approving agency:

Mr. Donald A. Clegg
Chief Planning Officer
City and County of Honolulu Dept. of General Planning
650 South King Street
Honolulu, Hawaii 96813

Please send a copy of your reply to the proposing party:

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

Your comments must be received or postmarked by: March 24, 1988

If you have no further use for this EIS, please return it to the Office of Environmental Quality Control.

Thank you for your participation in the EIS process.

2/9/88
Energy Division

STATE OF HAWAII
DEPARTMENT OF BUSINESS
AND ECONOMIC DEVELOPMENT

LAND USE COMMISSION

Room 104 Old Federal Bldg. 335 Merchant Street
Honolulu, Hawaii 96813 Telephone 548-4611

JOHN WAIHEE
Governor

TEOFILO PHIL TACBIAN
Chairman

FREDERICK P. WHITTEMORE
Vice Chairman

COMMISSION MEMBERS
Richard B. F. Chan
Lawrence F. Chun
Everett L. Entrekin
Sharon R. Himeno
Toru Suzuki
Robert S. Tamaki
Renton L.K. Siu

ESTHER UEDA
Executive Officer

February 29, 1988

DPP Rec'd MAR 2 5 1988

File:
To: DB
Action:

Mr. Donald A. Clegg
Chief Planning Officer
City & County of Honolulu
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Ewa Gentry Draft Environmental Impact Statement

We have no comments to offer except that the draft EIS does not contain information on whether the applicant intends to seek a land use district boundary amendment. If so, we suggest this should be indicated along with appropriate maps with respect to the location of the proposed change and the acreage involved.

Thank you for this opportunity to comment.

Sincerely,

ESTHER UEDA
Executive Officer

EU:to

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Ms. Esther Ueda, Executive Officer
Land Use Commission
335 Merchant Street, Room 104
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Ms. Ueda:

We thank you for your letter dated February 29, 1988 regarding the subject project. The final Environmental Impact Statement will be revised to more clearly identify which portions of land are subject to State Land Use Commission district boundary adjustments.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

cc: General Planning

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

1455 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96814 • AM & COCE (808) 943-3111

FRANK F. FASI
MAYOR

DOUGLAS G. GIBB
CHIEF

MARREN FERREIRA
DEPUTY CHIEF

OUR REFERENCE SS-LK

Date Received FEB 2 9 1988
Time 1443
For DB
Action RE-PROJ.1

February 26, 1988

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: DOUGLAS G. GIBB, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS)
EWA GENTRY, EWA, OAHU

We have reviewed the EIS for the Ewa Gentry Project and would like to state our concerns for the impact that the development will have on traffic.

In your Traffic Assessment study, it is noted that the proposed development will increase the traffic volume in locations where congested and near-capacity conditions already exist.

Of particular concerns are 1) the single-lane ramp from Fort Weaver/Kunia Roads from the south onto the on-ramp to the H-1 Freeway, and 2) the H-1 Freeway between Waiau and Waiawa Interchanges. This project, along with other developments occuring in the Ewa and Central Oahu areas will definitely escalate the traffic problems in the above locations and throughout the district as a whole.

We reiterate our previous response that a collaborative effort be made between the developers, government and private agencies to explore viable alternatives, solutions and incentives for the public. We recommend that this be done before additional planning and approval is received. Subjects to explore and negotiate may include mass transit, express buses, Park-and-Ride sites, free bus passes or tax credits.

DOUGLAS G. GIBB
Chief of Police

cc: Mr. David Bills

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Mr. Douglas G. Gibb
Chief of Police
Police Department
City and County of Honolulu
1455 South Beretania Street
Honolulu, Hawaii 96814

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Chief Gibb:

Thank you for your letter dated February 26, 1988 regarding the subject project. The draft Environmental Impact Statement identifies the proposed impacts from this development as well as other urban development on Ewa Plains. The document also identifies the need for a new north-south roadway in the project area connecting to the H-1 Freeway system. The developer, State of Hawaii and the City and County of Honolulu will all be involved in the decision making process as to what solutions are available and where funding will come for the various project. The Draft Environmental Impact Statement identifies that the issue regarding the extent of offsite roadway improvements as well as responsibility for construction and funding are unresolved. The Final Environmental Impact Statement will also report the same facts.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488
cc: General Planning

119 MERCHANT STREET, SUITE 807, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX (808) 531-8018

Hawaiian Electric Company, Inc. • PO Box 2750 • Honolulu, HI 96840-00..

ENV 2-1
JA/G

Brenner Munger Ph.D. P.E.
Manager
Environmental Department
(808) 548 6915

March 18, 1988

MAR 2 1 1988

file: _____
cc: DB
Action: _____
_____

Mr. Donald A. Clegg
Chief Planning Officer
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

Dear Mr. Clegg:

Subject: Draft Environmental Impact Statement (EIS) for Proposed Ewa Gentry Project, Ewa, Oahu, Hawaii

We have reviewed the above document and have several comments.

1. The reference to the power systems given in section 2.8.6.6 (i.e., page 2-25) is incorrectly stated. The first two sentences of this paragraph should read, "Each household within the Ewa Gentry project is expected to have a peak electrical demand of 3 kilowatts. Given the proposed development of 7,150 house s and an assumed load factor of 0.8, the expected peak demand for the Ewa Gentry project will be approximately 18 megawatts."

2. In Section 2.8.6.6., the developer mentions that HECO and the developer will construct a new transformer substation in the project area. In regard to this matter, it is HECO's position that any reclassification of agricultural land to non-agricultural use by developer shall also be done on HECO's behalf for the substation site.

3. The future Waiua-CEIP 138 KV line may be located in the vicinity of the project.

Sincerely,

Brenner Munger

cc: David Bills, Vice President
Gray, Hong, Bills & Associates, Inc.

An HEI Company

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID P.E.

April 4, 1988

Brenner Munger, Ph.D., P.E.
Manager
Environmental Department
Hawaiian Electric Company, Inc.
P.O. Box 2750
Honolulu, Hawaii 96840-0001

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Dr. Munger:

We thank you for your letter dated March 18, 1988 regarding the subject project. The final Environmental Impact Statement will be revised to reflect the following:

1. Section 2.866 will be revised to identify "load" factor rather than "power" factor as identified in your letter.

2. Utility installations including transformer substation are permitted uses within the state Agricultural district as well as within the City & County of Honolulu's Land Use Ordinance's Agricultural Districts. With respect to the Land Use Ordinance a new transformer substation will either be a principal use or conditional use structure. Therefore, no request for land reclassification is anticipated with respect to the substation's site.

3. The Final Environmental Impact Statement will identify that the Waiau-CEIP 138 KV line maybe located in the vicinity of the project.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

cc: General Planning

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521 0306 / FAX (808) 531 801R

DEPARTMENT OF PARKS AND RECREATION

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

Date Received MAR 25 1988
File:
To: DG
Action:

HIRAM K. KAMAKA
DIRECTOR

WALTER M. OZAWA
DEPUTY DIRECTOR

March 22, 1988

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: HIRAM K. KAMAKA, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT
EWA-GENTRY - EWA
TAX MAP KEY 9-1-12

We have reviewed the Draft Environmental Impact Statement (EIS) for the Ewa-Gentry project and make the following comments and recommendations:

The Draft EIS has not adequately addressed the recreational needs of the project. The recreational system in the report does not reflect our concerns which we expressed in our review of the project's EIS Preparation Notice. The number, types and locations of public parks, as indicated in the report, do not meet the City's and the Department of Parks and Recreation's park standards.

We are reviewing additional information which we had requested the Gentry Companies provide our department to assess and establish a functional park plan for the project. We are also coordinating with the Department of Education (DOE) in establishing school/park complexes in the Ewa district. The DOE has indicated that the school site in the Ewa-Gentry Land Use Plan is unacceptable. We have also determined that the park site adjacent to the school along Fort Weaver Road is unacceptable.

We have discussed our concerns with the Gentry Companies and they are aware that changes to their land use plans will be required. Subsequent reports, Development Plan Public Facilities and Zoning Amendments should reflect the recommendations of the DOE and DPR.

Thank you for the opportunity to review the Draft EIS reports.

HIRAM K. KAMAKA, Director

HKK:el

cc: ✓Mr. Dave Bills - Gray, Hong & Associates, Inc.
Mr. Richard Inouye - Department of Education

GRAY, HONG, BILLS & ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Mr. Hiram K. Kamaka, Director
Department of Parks and Recreation
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Mr. Kamaka:

We thank you for your letter dated March 22, 1988 regarding the subject project. The Ewa Gentry project will comply with your standards regarding number, types and locations of public parks. The amount of land proposed for parks was based on your standards requiring 350 sq. ft. for a single-family residential unit and 110 sq. ft. for multi-family housing units. The total land area requirement based on 7,120 units is 37.5 acres. The acreage for schools/parks is shown as 39 acres in the Draft Environmental Impact Statement. This was specifically increased from the 34 acres shown at the time the preparation notice was circulated.

Based on your letter, we understand your department is working in conjunction with the Department of Education to determine the suitability of the park/school site location. It is obvious based on your letter that additional coordination and consultation will be required. Therefore, we are proposing to revise the unresolved issues section of the Final Environmental Impact Statement to identify that the park site issue with respect to number, types and locations is unresolved.

Should you have any questions regarding this matter please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:ric
1488

cc: General Planning

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX (808) 531-8018

245 North Kukui Street, Honolulu, Hawaii 96817, Telephone (808) 537-5966

AMERICAN LUNG ASSOCIATION of Hawaii
The Christmas Seal People®

March 24, 1988

Date Received MAR 29 1988
Files:
To: DB
Action:

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Draft EIS for Ewa Gentry

We have reviewed the subject EIS with particular attention to those sections addressing air quality impacts and have the following comments to offer.

1. Pages 3-1 to 3-3, Section 3.1.3 Climate. Both the text and Table 3-1 indicate the prevalence of NE trade winds. The section fails to note the significant seasonal as well as diurnal variation in both wind direction and speed. This distinction is very important to make when one is evaluating air quality impact. In this particular case the project's main contribution to air pollution is its traffic generation. The principal pollutant associated with traffic is carbon monxide (CO), and CO standards are short-term (1-hour and 8-hour) standards not long-term (annual) standards; therefore, short-term, local meteorology is of interest, not long-term average conditions.

2. Page 3-9, Section 3.1.6 Air Quality. The text indicates that the State Department of Health maintains emissions data summaries for various pollutants including hydrocarbons and that these emissions are "generally compared with federal and State of Hawaii Ambient Air Quality Standards..." It would appear that the EIS writer is mixing up emissions with ambient concentrations. Emissions are normally expressed in terms of mass per unit time (pounds per hour, tons per year, grams per second) while ambient concentrations are expressed as mass per

unit volume (micrograms per cubic meter, milligrams per cubic meter) or volume of pollutant gas per volume of air (parts per million, parts per billion). Emissions and ambient concentrations are related but not interchangeable or comparable as indicated in this EIS. Ambient monitoring data (pollutant concentrations), not emissions data, can be compared with state and federal ambient standards.

3. Page 3-10, Table 3-4. This table includes a number of inaccuracies and omissions. The term "photochemical" should be "photochemical oxidants". "Suspended particulate matter" should be "total suspended particulate matter" or "TSP". There is no longer a federal TSP standard as indicated in the table. It was replaced by a PM-10 standard on 1 July 1987. Also, the state TSP and sulfur dioxide standards are wrong since they were revised in April, 1986 to be the same as the federal standards which existed at that time. There are no longer hydrocarbon standards at either the federal or state level, nor is there a state 24-hour nitrogen dioxide standard. The notes at the bottom indicate that all standards are expressed as "micrograms per cubic meter" which is true for all except carbon monoxide which is in "milligrams per cubic meter." Since it is the U.S. EPA and the State DOH which promulgate these standards we are curious why the "Source" listed at the bottom of the table is the U.S. Army Corps of Engineers.

4. Page 3-11. The first line on this page speaks of "...continuous sampling of sulfur dioxide from 1979 to present." The State DOH has not conducted continuous SO2 monitoring. The monitoring has been generally a 24-hour sampling once every six days.

The fourth paragraph on this page cites some spot sampling conducted by another consultant in September, 1987, but fails to say anything about the conditions under which that sampling occurred. Knowledge of those conditions is important for a reviewer to determine the significance of the spot sampling. Furthermore, that other consultant's report could not be found in the bibliography of this EIS.

The last paragraph on this page asserts the belief that the "project site and surrounding Ewa district environment is presently not influenced by any significant sources of air pollution." This belief is said to be based on "longer-term available information." Since there has been no monitoring at the site itself, no assessment of the long term impact of the H-1 Freeway which is "upwind" in terms of the prevailing trade winds, and no mention at all of cane field burning in the area, the validity of that statement is at best questionable.

5. Page 4-3, Section 4.1.5 Decreased Air Quality. This section simply cites the results of an air quality impact study conducted for another project along Fort Weaver Road. It notes that violations of the State's carbon monoxide (CO) standards were predicted in that other study and that future CO levels are expected to be higher yet due to the cumulative effect of the Ewa Gentry and West Loch Estates projects. Despite these clear indications of impact, this EIS lacks any specific analysis of the air quality impact of the Ewa Gentry project itself. This is a serious shortcoming given the number of projects and large numbers of vehicles expected to be generated in the Ewa area over the next 10 - 20 years. Simply citing the results of another study is not an acceptable substitute for a site- and project-specific impact analysis.

6. Page 4-18, Section 4.7 Unresolved Issues. Despite the clear indication on page 4-3 that the Ewa Gentry project will contribute to violations of state air quality standards, there is no mention of the problem in this section.

7. Other Shortcomings. The EIS fails to mention other indirect air pollution impacts associated with the project. Its completion and use will result in increased demand for electrical power as well as solid waste disposal. At present, the means of taking care of both of those needs involves combustion and therefore emissions. This should have been mentioned in the report. During the construction phase, there will be offsite emissions as a result of the concrete batching and asphalt plant operations necessary to complete the project. There should have been some mention of this as well.

The foregoing comments on this EIS address a number of significant shortcomings. We respectfully urge that you not accept the EIS until they have been corrected.

Sincerely yours,

Helene Takemoto
Chairman
Environmental Health Committee

HT:ct
L8816

cc: OEQC
UH-Environmental Center
Gray, Hong, Bills & Associates

GRAY, HONG, BILLS
& ASSOCIATES, INC.
CONSULTING ENGINEERS

BRIAN L. GRAY, P.E.
DANIEL S.C. HONG, P.E.
DAVID B. BILLS, P.E.
MICHAEL H. NOJIMA, P.E.
ROY T. AOKI, P.E.
BEVERLY G. ING, P.E.
DENNIS M. REID, P.E.

April 4, 1988

Ms. Helene Takemoto, Chairman
Environmental Health Committee
American Lung Association
245 North Kukui Street
Honolulu, Hawaii 96817

SUBJECT: Ewa Gentry
Draft Environmental Impact Statement

Dear Ms. Takemoto:

Thank you for your letter dated March 24, 1988 regarding the subject project. As a preface to our response to your comments, we would like to address the philosophical approach as to the method that air quality was handled during the preparation of this document. As you are aware, there are numerous projects proposed on the Ewa Plains which will lead to increase urbanization. Urbanization will result in increased traffic as well as increased demands for electrical generation and solid waste disposal. Traffic, electrical generation and solid waste disposal will all increase the potential for decreased air quality. We have relied on the factual information presented in the West Loch Estates Environmental Impact Statement to characterize the environmental impacts associated with the Ewa Gentry Project. We believe this approach is valid since traffic generation estimates in the West Loch Estates Environmental Impact Statement assumed traffic from other projects such as Ewa Gentry and the total traffic generation factors on a cumulative basis are very comparable. With respect to secondary effects such as those related to electrical generation, solid waste disposal and smoke from agricultural field burning are also comparable. The conclusions reached as a part of the West Loch Estates Project are substantially identical to those for the Ewa Gentry Project. The Final Environmental Impact Statement for the Ewa Gentry Project will specifically identify the discussion in the West Loch Estate's EIS as well as identify the conclusions and mitigation measures.

We are providing specific responses to your other comments are indicated below:

1. Section 3.1.3 - Climate is intended to generally describe climatic information for the Ewa Plains. A general statement identifying that seasonal as well as diurnal variation occur in both wind direction and speed will be added to the final document.

2. Section 3.1.6 - Air Quality will be revised to identify that the Health Department keeps records on ambient air concentrations rather than emissions.

3. Table 3-4 will be revised in its entirety to identify current standards. This table was originally obtained from a document published by the U.S. Army Corps of Engineers. It is correct that

119 MERCHANT STREET, SUITE 607, HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-0306 / FAX: (808) 531-8018

the information has been promulgated by the U.S. EPA and the State of Hawaii Department of Health and an appropriate reference will be added.

4. Page 3-11 - the term "continuous sampling" will be revised to specifically state "continuous monitoring consisting of sampling once every 6 days."

   A statement will be added to the Final Environmental Impact Statement identifying the conditions under which the concentration of carbon monoxide was taken and a consultant's report will be identified in the bibliography of the Final Environmental Impact Statement.

   We believe the statement that the project site and surrounding Ewa District environment is presently not influenced by any sources of air pollutants is appropriate. Based on existing land uses, there is no basis to conclude there are significant sources of air pollutants with the possible exception of field burning related to sugarcane. As of this date, we know of no studies conducted by any State agency or other entity which suggest there is a significant source of air pollution in the area.

5. We do not concur with your assessment of using other studies to project the effect of decrease air quality resulting from the Ewa Gentry Project. We think it is totally valid to use such an approach when these studies specifically utilized assumptions that there would be additional growth in the area as a result of projects such as the Ewa Gentry Project.

6. The Final Environmental Impact Statement will summarize the pertinent discussions contained in other studies as well as identify the proposed impacts as well as mitigation measures with respect to air quality.

7. The Ewa Gentry Project as well as other projects on the Ewa Plains will contribute increased air emissions and deterioration of air quality. The extent of deterioration will be identified as extrapolated from other air quality work conducted in the area. We do not propose to identify this issue as an unresolved issue, however the accepting authority has to the ability to identify air quality as such if they desire.

Should you have any questions regarding this matter, please contact our office.

Very truly yours,

GRAY, HONG, BILLS & ASSOCIATES, INC.

David B. Bills

DBB:sc
1488

APPENDIX C

DRAINAGE MASTER PLAN FOR THE GENTRY-EWA PROJECT

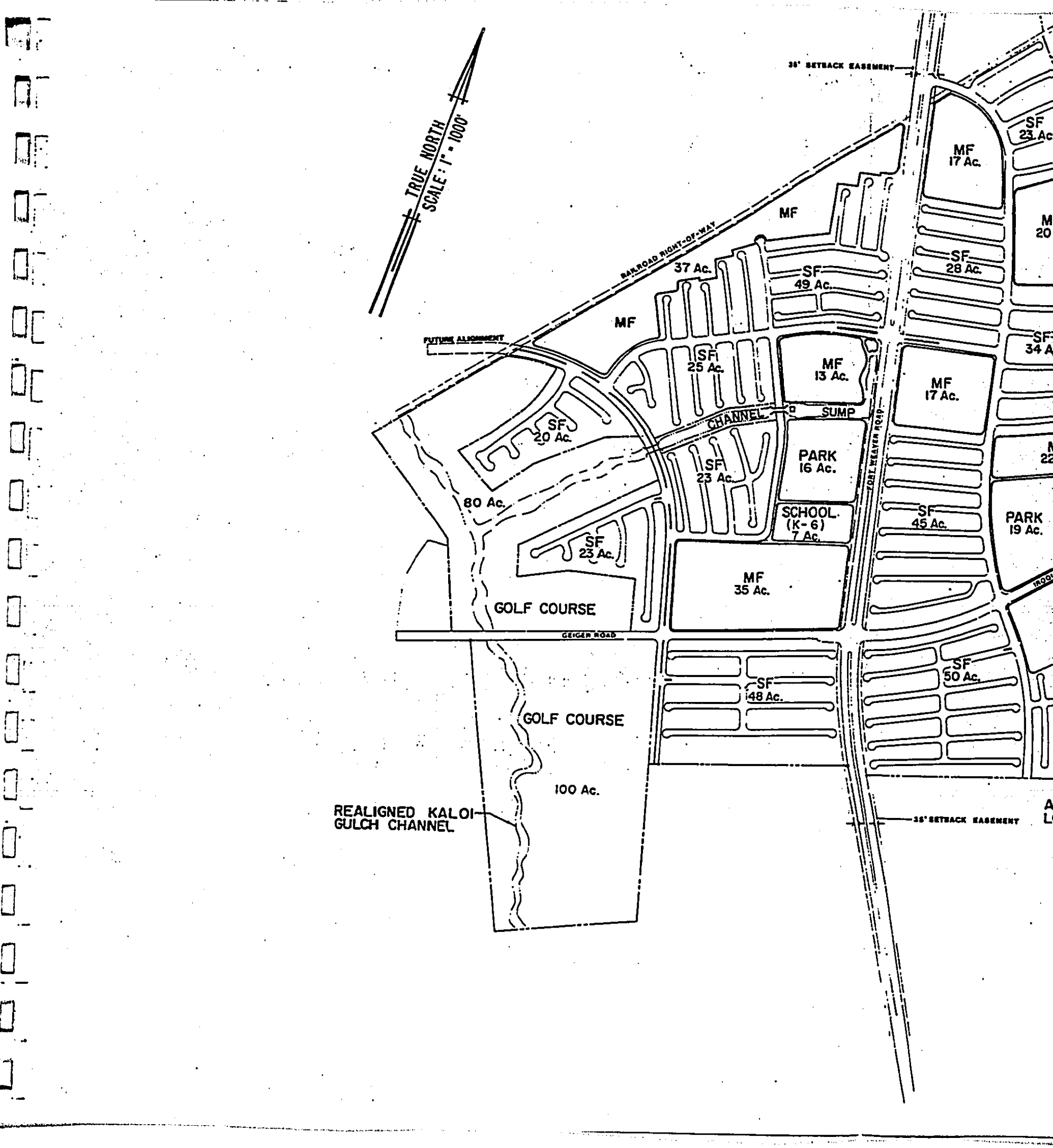
by

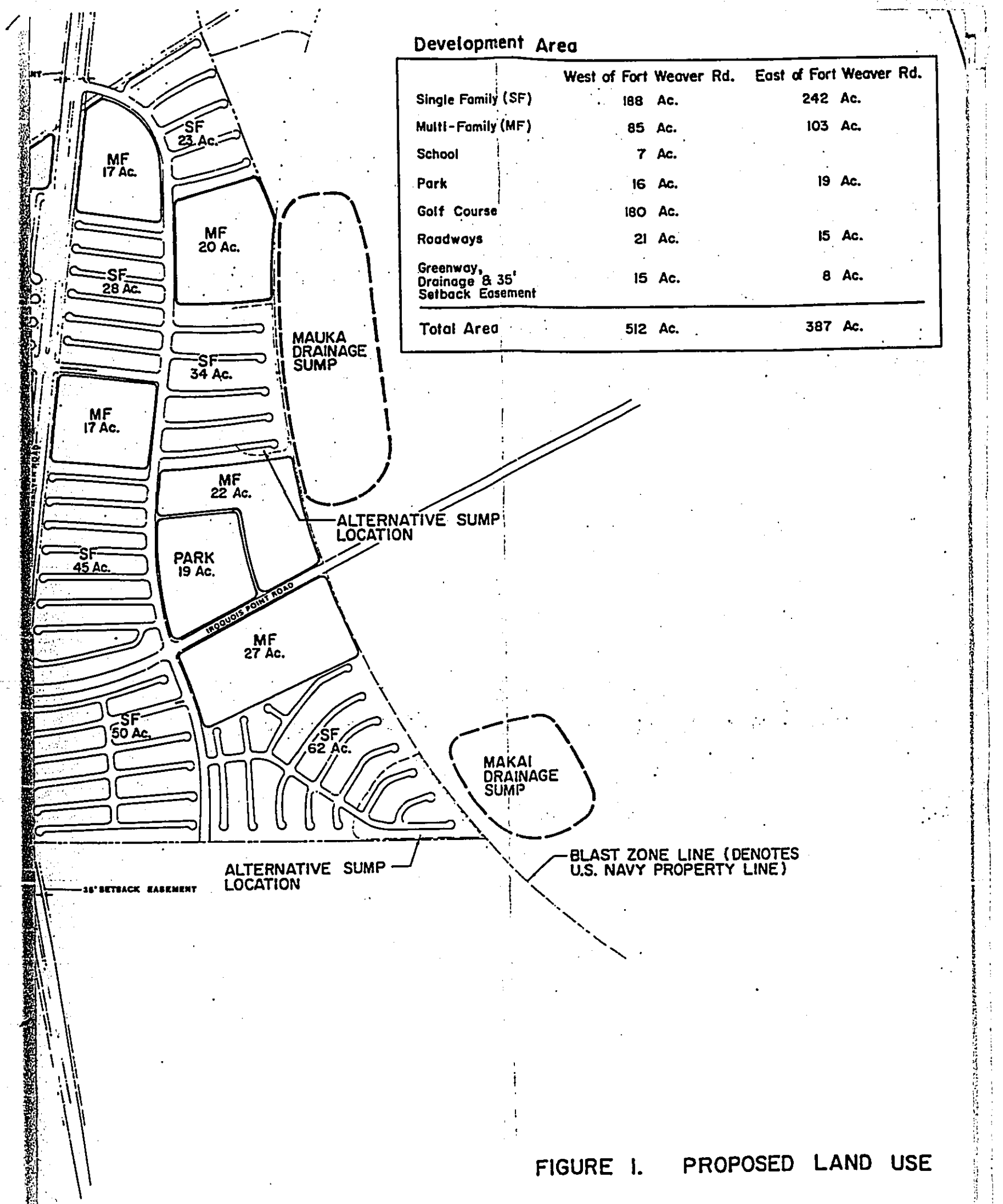
Belt Collins & Associates

November 1987

C O N T E N T S

List of Figures


TRUE NORTH
SCALE: 1" = 1000'
35' SETBACK EASEMENT
RAILROAD RIGHT-OF-WAY
FUTURE ALIGNMENT
MF
17 Ac.
SF
23 Ac.
MF
37 Ac.
SF
49 Ac.
SF
28 Ac.
MF
MF
13 Ac.
SF
25 Ac.
CHANNEL
SUMP
FORT WEAVER ROAD
MF
17 Ac.
SF
20 Ac.
PARK
16 Ac.
SF
23 Ac.
80 Ac.
SCHOOL
(K-6)
7 Ac.
SF
45 Ac.
PARK
19 Ac.
SF
23 Ac.
MF
35 Ac.
GOLF COURSE
GEIGER ROAD
SF
50 Ac.
SF
48 Ac.
GOLF COURSE
100 Ac.
REALIGNED KALOI
GULCH CHANNEL
35' SETBACK EASEMENT



Development Area

	West of Fort Weaver Rd.	East of Fort Weaver Rd.
Single Family (SF)	188 Ac.	242 Ac.
Multi-Family (MF)	85 Ac.	103 Ac.
School	7 Ac.	
Park	16 Ac.	19 Ac.
Golf Course	180 Ac.	
Roadways	21 Ac.	15 Ac.
Greenway, Drainage & 35' Setback Easement	15 Ac.	8 Ac.
Total Area	512 Ac.	387 Ac.

FIGURE 1. PROPOSED LAND USE

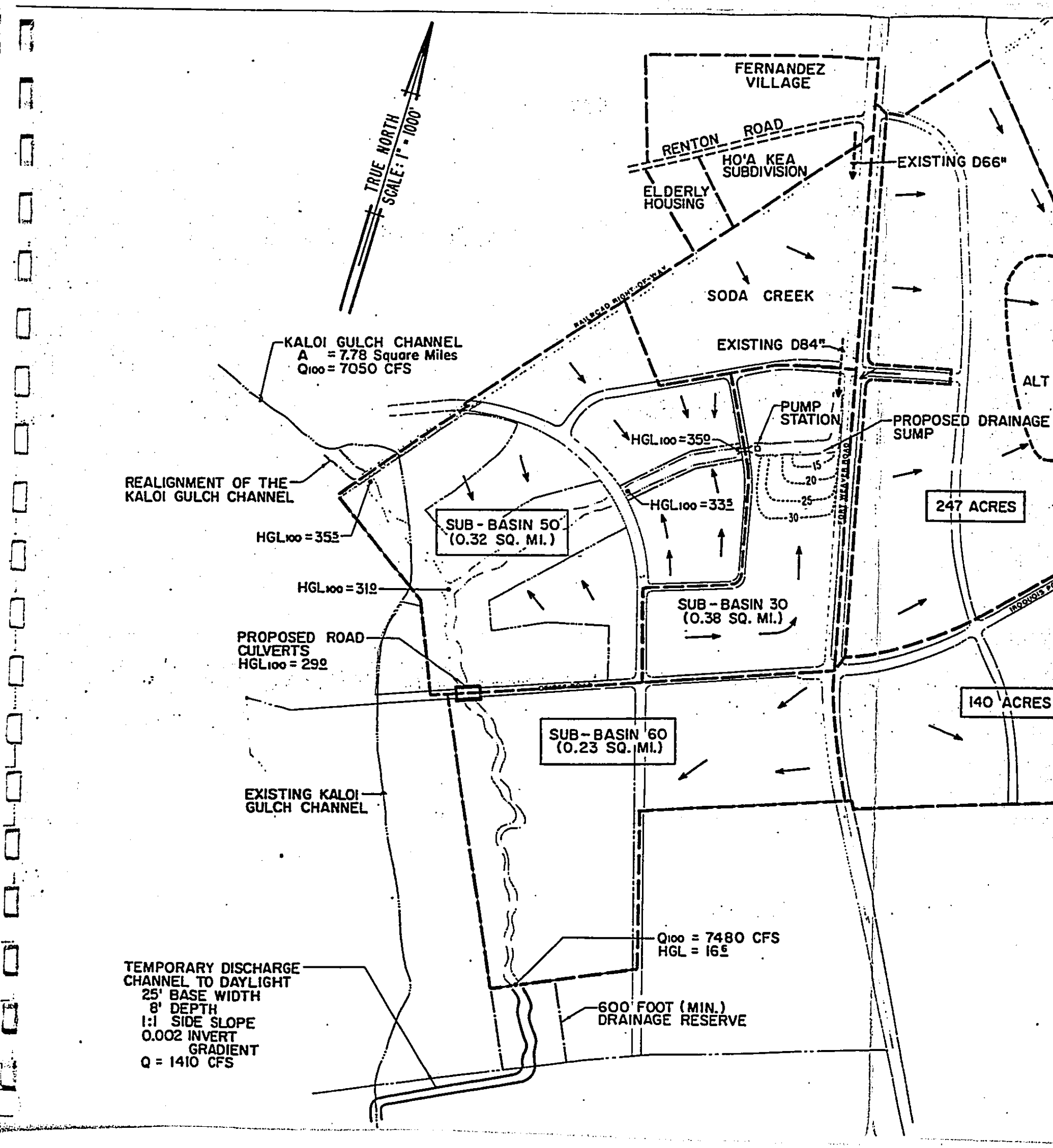
CONCEPTUAL DRAINAGE PLAN

Key elements of the recommended drainage plan are illustrated on Figure 2 and discussed below. Except as indicated in this discussion, all drainage improvements would be designed in accordance with the City and County Drainage Standards.

Mass Grading Concept for the West Side of Fort Weaver Road. Requirements of major conveyance capacity to handle Kaloi Gulch runoff and the creation of adequate land slope within the development areas for internal drainage have a common solution. A golf course will be constructed to contain the Kaloi Gulch channel. Excavation of 1.5 million cubic yards from the golf course and embankment of this material in the residential areas will provide both conveyance capacity and adequate internal land slope. Figure 3 illustrates the mass grading concept.

Mass Grading and Drainage for the East Side of Fort Weaver Road. Since this portion of the project site has no practical outlet to the ocean or West Loch, it is proposed to drain the 387-acre area to two excavated sumps. Placement of material excavated from the sumps in the residential areas will provide sufficient gradient for drainage. The sumps are sized to retain the entire runoff volume of a 100-year, 24-hour storm with a minimum of two feet freeboard. Although both sumps will be equipped with gravity injection wells, sump sizes have not been reduced by the rate of gravity injection or seepage loss.

Conveyance of Kaloi Gulch Through the Golf Course. The plan proposes that the golf course be a functional part of the Kaloi drainage channel. A 100-foot wide channel will run through the course; it is sized to handle the 5-year peak flow. Peak flows in excess of this will be conveyed by adjacent fairway and rough of the golf course. For flows as large as the 100-year peak runoff rate, most of the golf course (with the exception of tees and greens) will function as a drainage channel. Sufficient freeboard will be provided to separate the lowest elevation of adjacent residential areas from the highest level of flow through the golf course.


TRUE NORTH
SCALE: 1" = 1000'
FERNANDEZ VILLAGE
RENTON ROAD
HO'A KEA SUBDIVISION
EXISTING D66"
ELDERLY HOUSING
SODA CREEK
RAILROAD RIGHT-OF-WAY
KALOI GULCH CHANNEL
A = 7.78 Square Miles
Q100 = 7050 CFS
EXISTING D84"
ALT
PUMP STATION
PROPOSED DRAINAGE SUMP
HGL100 = 35±
REALIGNMENT OF THE KALOI GULCH CHANNEL
HGL100 = 33±
15
20
25
30
247 ACRES
HGL100 = 35±
SUB - BASIN 50 (0.32 SQ. MI.)
HGL100 = 31±
SUB - BASIN 30 (0.38 SQ. MI.)
PROPOSED ROAD CULVERTS
HGL100 = 29±
140 ACRES
SUB - BASIN 60 (0.23 SQ. MI.)
EXISTING KALOI GULCH CHANNEL
Q100 = 7480 CFS
HGL = 16±
TEMPORARY DISCHARGE CHANNEL TO DAYLIGHT
25' BASE WIDTH
8' DEPTH
1:1 SIDE SLOPE
0.002 INVERT GRADIENT
Q = 1410 CFS
600 FOOT (MIN.) DRAINAGE RESERVE

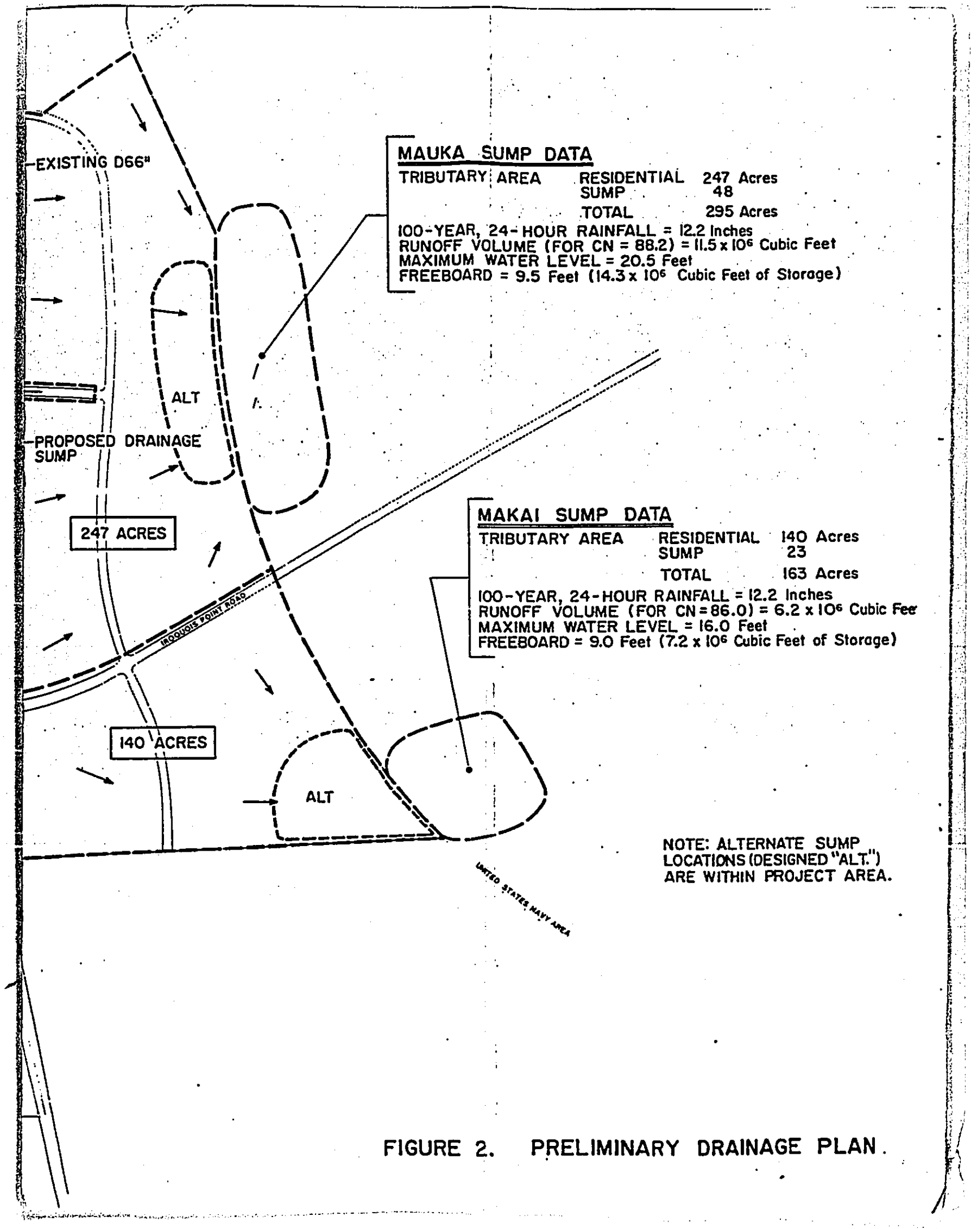
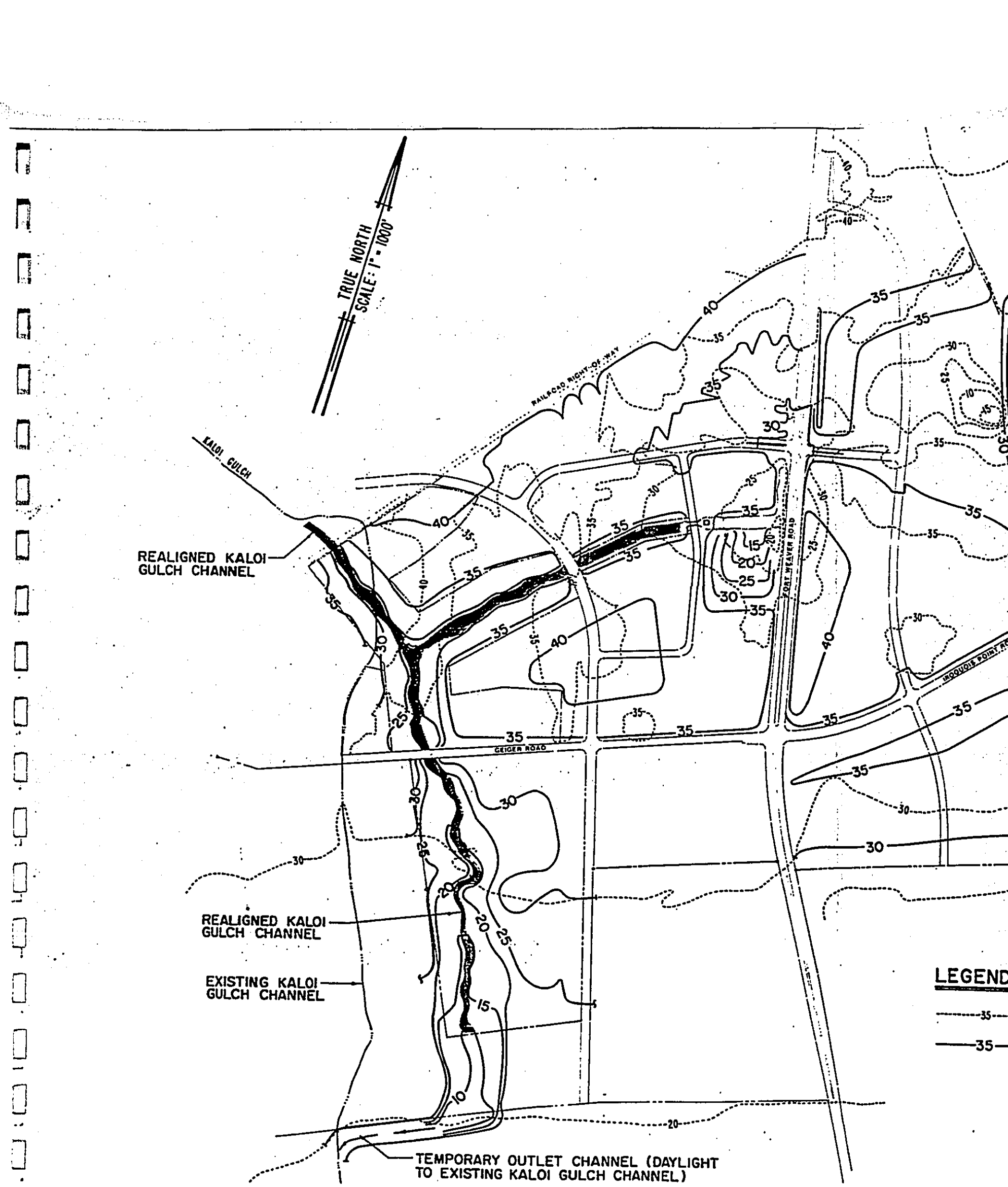


FIGURE 2. PRELIMINARY DRAINAGE PLAN.


TRUE NORTH
SCALE: 1" = 1000'
RAILROAD RIGHT-OF-WAY
KALOI GULCH
REALIGNED KALOI GULCH CHANNEL
FORT MEAVER ROAD
IROQUOIS POINT RO
GEIGER ROAD
REALIGNED KALOI GULCH CHANNEL
EXISTING KALOI GULCH CHANNEL
TEMPORARY OUTLET CHANNEL (DAYLIGHT TO EXISTING KALOI GULCH CHANNEL)
LEGEND

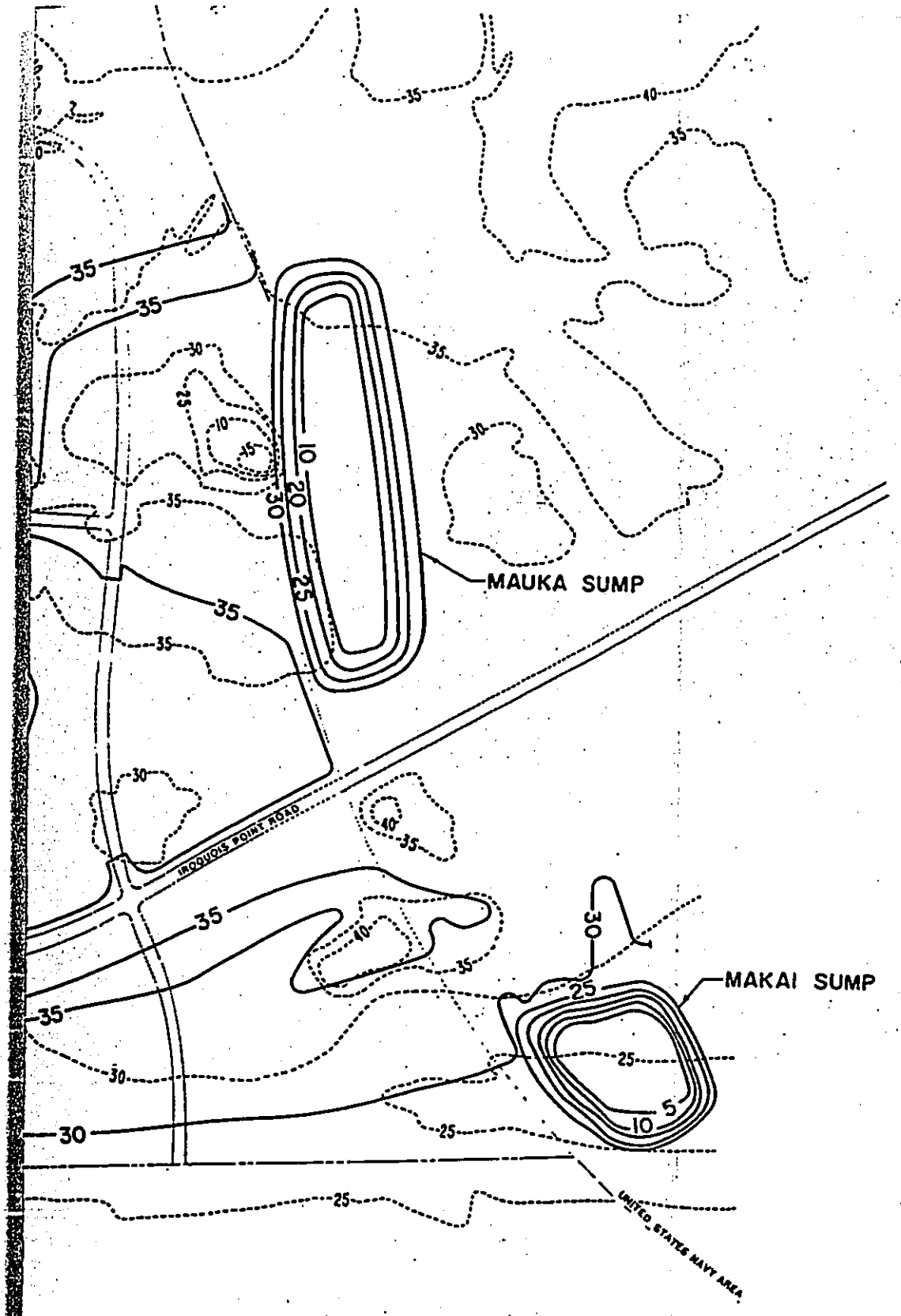


FIGURE 3. PRELIMINARY GRADING PLAN

Drainage Sump and Pump Station. A sump and pump station is the proposed solution to handle runoff from Fernandez Village, Ho'a Kea Subdivision, the Elderly Housing project, and 189 onsite acres. Initial disposal in the sump will occur by gravity injection and seepage. If and when the water level in the sump builds to a pre-determined height, pumps will begin to supplement the disposal process. Pumped water will be lifted into an open channel which connects with the Kaloi channel within the golf course. The pump station will be equipped with independent power (individual engine drives for each pump) and standby capacity. It is proposed that this facility be operated and maintained by the City and County of Honolulu. A community association including all property west of Fort Weaver Road and north of Geiger Road is being developed by Gentry. This association could be responsible for any expenses associated with operation and maintenance of the pump station.

HYDROLOGIC AND HYDRAULIC ANALYSES IN SUPPORT OF THE DRAINAGE PLAN

Details of the analytical work on which the drainage plan is based are provided in this section.

Determination of Peak Runoff From Kaloi Gulch. Peak runoff from Kaloi Gulch has been computed by two independent techniques. One technique is based on the records of USGS gaging stations on Kaloi and Honouliuli Gulches, watersheds of 1.70 and 11.0 square miles, respectively. This anlaysis can be summarized as follows:

1. A Log-Pearson Type III analysis of the two gaging records was made. The technique used is described in "Guidelines for Determining Flood Flow Frequency" (Bulletin 17A, Hydrology Committee, U.S. Water Resources Council, 1977). Resulting curves of peak discharge in relation to probability of occurrence are shown on Figure 4. Computations to develop these curves can be found in Appendix A.

2. Resulting 5-, 10-, 50- and 100-year flood peaks determined statistically for the two stations were plotted as a function of drainage area on log-log paper and connected by straight lines. The resulting flood peak-drainage area relationships are depicted on Figure 5.

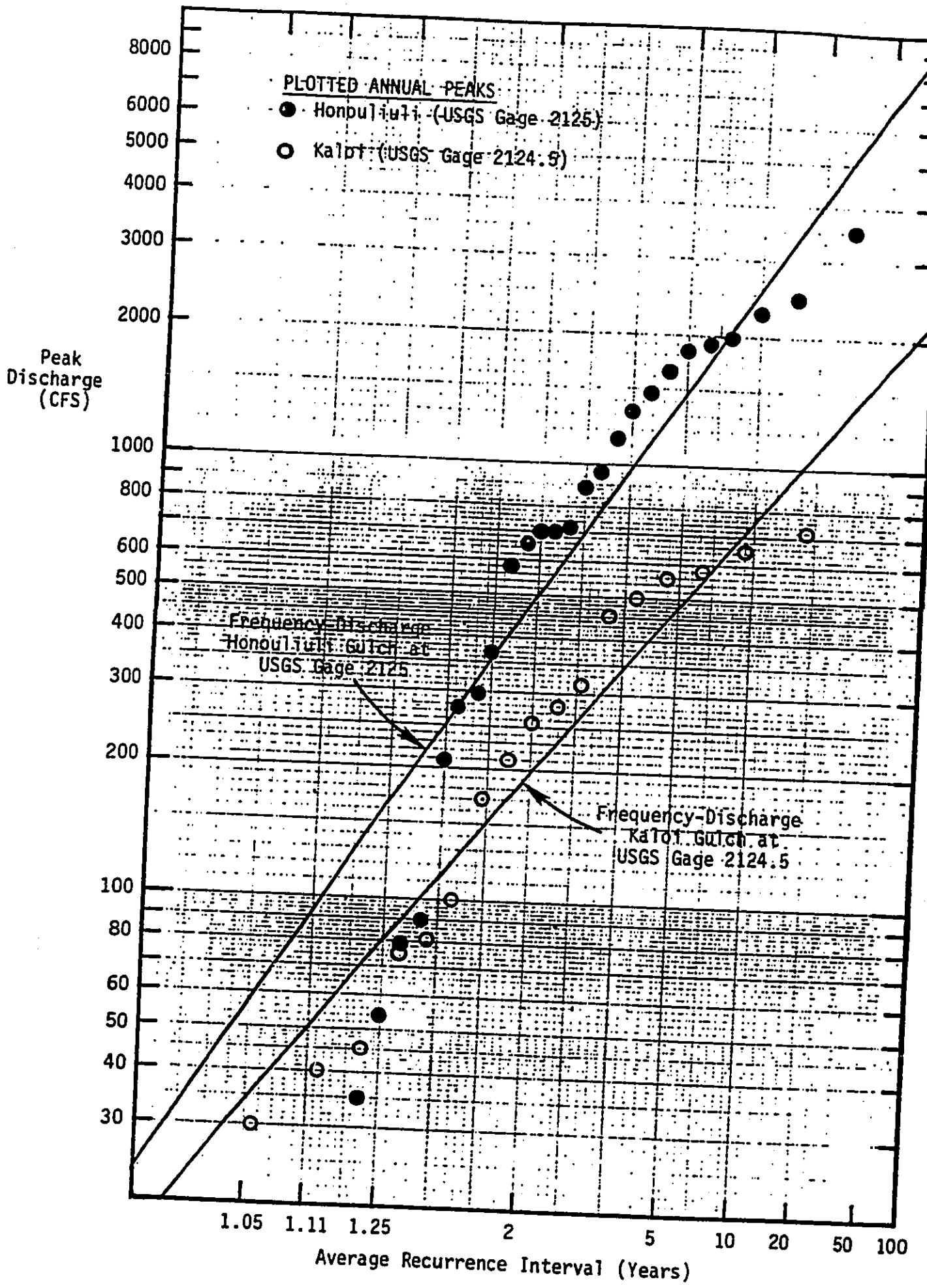


Figure 4. Frequency-Discharge for the USGS Gaging Stations at Kaloi and Honouliuli Gulches

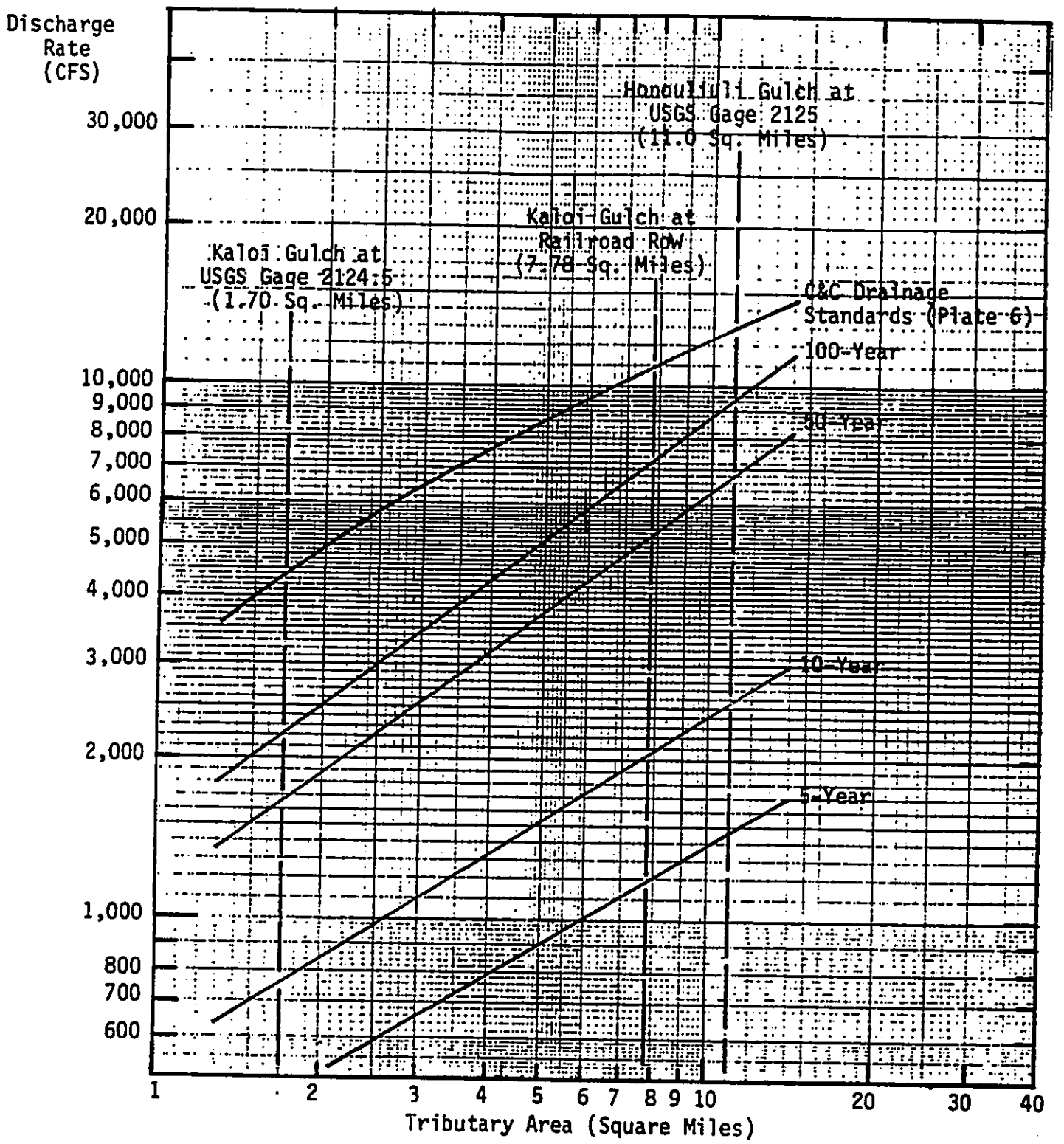


Figure 5. Peak Runoff-Drainage Area Relationship for the Kaloi-Honouliuli Basin

3. The 100-year peak runoff determined by this method for the 7.8-square mile area of Kaloi tributary to the top of the project site is 7200 CFS. As a basis of comparison, runoff according to Plate 6 of the City and County Drainage Standards is also plotted on Figure 5. This curve indicates a peak runoff of 11,000 CFS for the Kaloi basin.

The second technique for predicting the 100-year peak runoff from the Kaloi watershed is based on SCS synthetic hydrographs and flood routing. The steps involved in this method are:

1. The 7.8-square mile watershed was divided into the three sub-basins delineated on Figure 6. Soil type, land use, topographic regimes, and the network of tributary channels were the basis for these divisions.

2. Parameters required for generation of synthetic hydrographs and flood routing of these flows were developed. These included:

   a. 100-year rainfall for durations from five minutes to 24 hours as presented in "Rainfall Frequency Study for Oahu" (Report R73 by the University of Hawaii Water Resources Research Center for the Department of Land and Natural Resources, 1984);

   b. Soil-cover complex numbers (CN values) based on soil types in "Soil Survey of Islands of Kauai, Oahu, Molokai, and Lanai, State of Hawaii" (U.S. Department of Agriculture, 1972) and CN values in "Erosion and Sediment Control Guide for Urbanizing Areas in Hawaii" (USDA-SCS, 1981) for the soil type and vegetative cover;

   c. Times of concentration for each sub-basin determined as a combination of overland flow by the SCS Curve Number Method and channel flows using the Manning formula;

   d. Routing times for reaches of the main Kaloi Gulch channel from USGS Gaging Station 2124.5 to the top of the project site based on flow velocity computed using the Manning formula.

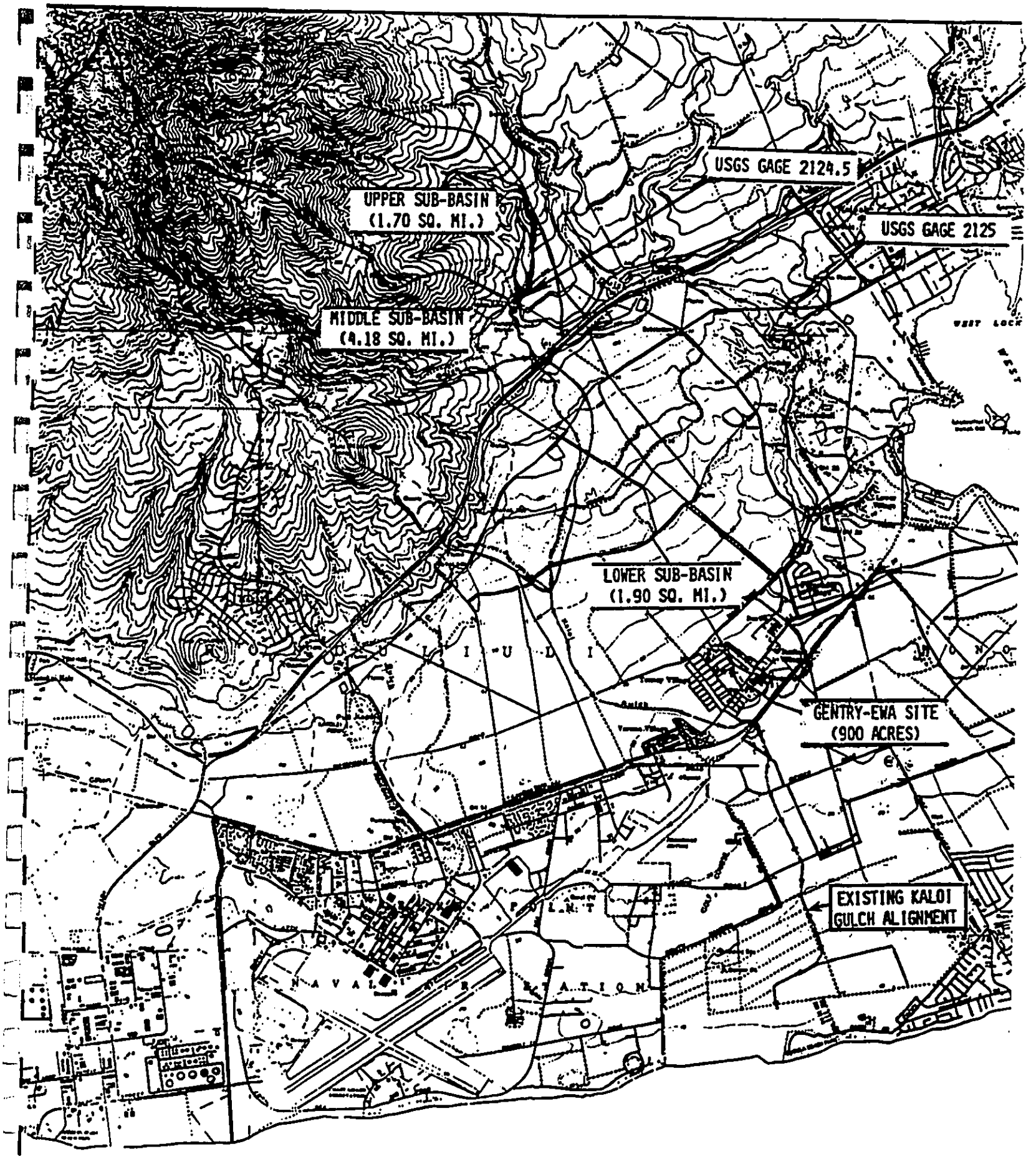


Figure 6. Sub-Basins of the Kaloi Watershed

3. When all necessary parameters were assembled, the HEC1 computer program was utilized to generate the synthetic hydrographs and route these flows to the top of the project site. The computer printout of this analysis is contained in Appendix B.

Comparative 100-year peak runoff rates for Kaloi Gulch are tabulated below. There is reasonable correlation between the statistical and synthetic hydrograph techniques, indicating a peak rate in the range of 7050 to 7200 CFS. Peak flow by the curve in the City and County Drainage Standards is significantly higher. Two most significant reasons for this are: the Kaloi-Honouliuli region has significantly less storm rainfall than the areas on which the City and County "envelope curve" is based; and the broad, flat area between the freeway and the project site attenuates the flood peaks from the steeper upland areas. It is proposed to use results of the synthetic hydrograph and flood routing technique as the basis for design.

COMPARISON OF 100-YEAR FLOOD PEAKS FOR THE 7.8-SQUARE MILE KALOI BASIN

Location in the Kaloi Gulch Watershed	Tributary Area (Sq. Miles)	Statistical Analysis (Figs. 5 & 6)	Synthetic Hydrograph (Appendix B)	C & C Drainage Standards (Plate 6)
At USGS Gage 2124.5	1.70	2,200	2,265	4,350
At 85-Ft. Channel Elevation	5.88	5,850	6,150	9,400
At Top of Project	7.78	7,200	7,050	11,000

Routing Offsite and Onsite Runoff Through the Sump and Pump Station. As an economic practicality, runoff from Fernandez Village, Ho'a Kea Subdivision, Elderly Housing, and 189 onsite acres will be directed into an excavated sump. The sump will be equipped with gravity injection wells and engine-driven pumps. If and when runoff to the sump exceeds the combined disposal capacity of the injection wells and seepage, the pumps will lift excess runoff to an open channel which connects with Kaloi Gulch via an open channel within the golf course.

Figure 7 illustrates proposed grading for the sump and its relationship with the pump station, outlet channel, and adjacent areas. Figure 8 presents the preliminary pump station design concept. HEC1 computer routing of the 100-year, 24-hour storm through the sump can be found in Appendix C. The analysis consists of development of a synthetic inflow hydrograph for the 244-acre tributary area, diversion to account for gravity injection and seepage, and routing the remainder of the inflow hydrograph into the sump for retention and pump disposal. The design storm of 12.2 inches of rainfall is anticipated to produce 11.0 inches of runoff; this is equivalent to 9.7 million cubic feet. Performance of sump and pump station for various pumping rates is summarized below.

PERFORMANCE OF THE SUMP AND PUMP STATION FOR VARIOUS PUMP DISCHARGE RATES WITH THE 100-YEAR, 24-HOUR STORM

Pump Station Capacity (CFS)	Maximum Sump Water Level (Feet)	Flooding Condition
240	20.9	Normal operation with three pumps on; minor inundation of adjacent park site.
160	23.9	2 of 3 pumps operating; some inundation of the lower portion of adjacent park site.
80	26.8	1 of 3 pumps operating; minor additional flooding on Fort Weaver Road and within the park site and some backwater effect in Soda Creek and Fernandez Village drainage conduits and catch basins.
0	30.2	No pumps operating; substantial inundation of Fort Weaver Road, the adjacent park site, and streets within a corner of Soda Creek (refer to Figure 7); and significant backwater effect in Soda Creek and Fernandez Village drainage facilities.

Several comments on these results are appropriate. First, a combined gravity injection and seepage rate of 40 CFS has been assumed. To the extent that field testing indicates this rate cannot be achieved, equivalent additional pumping capacity will be installed. Second, three engine-driven pumps are proposed, each capable of 80 CFS (36,000 GPM). The engine drives are independent sources of power which provide assurance against complete failure

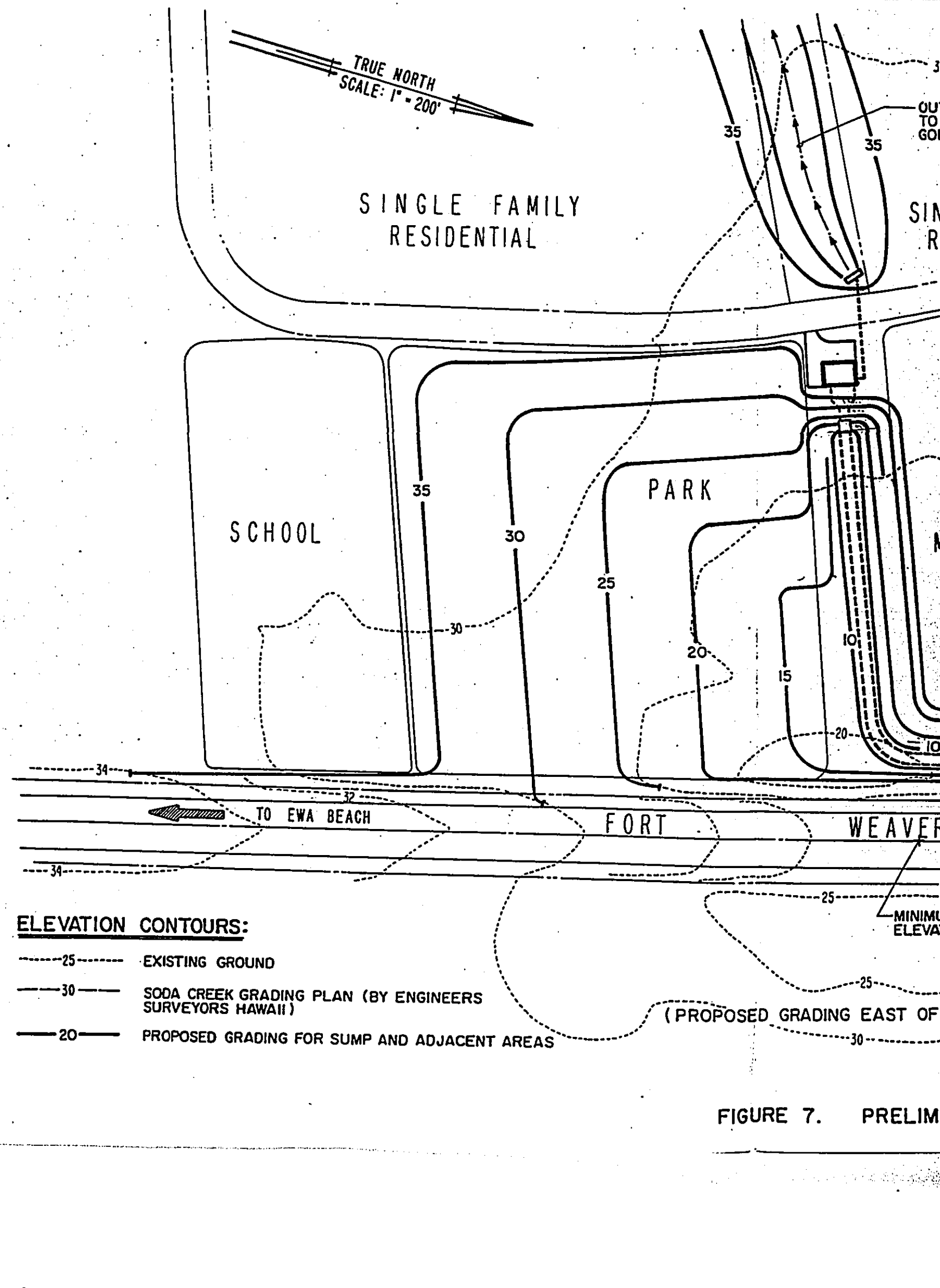
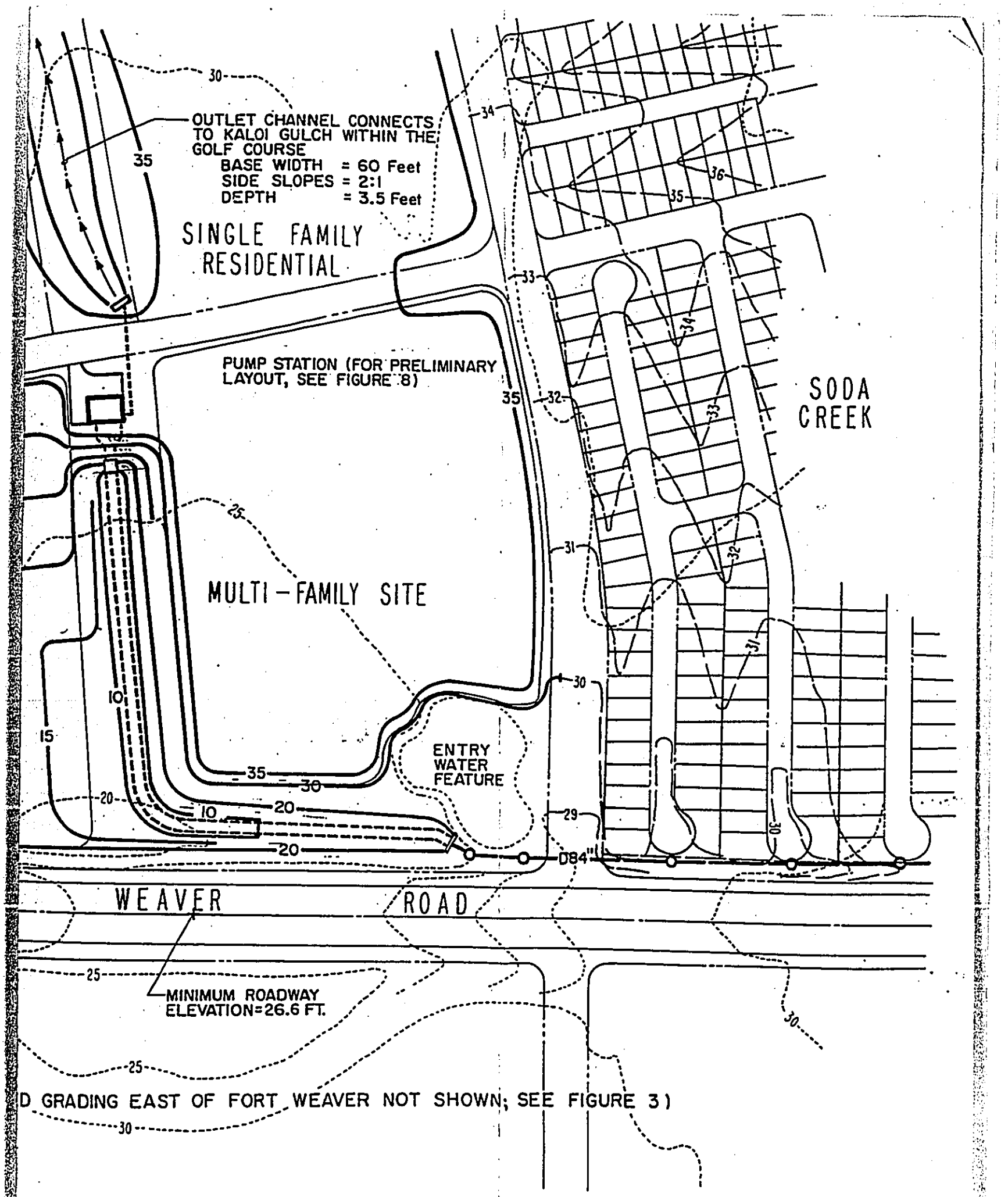
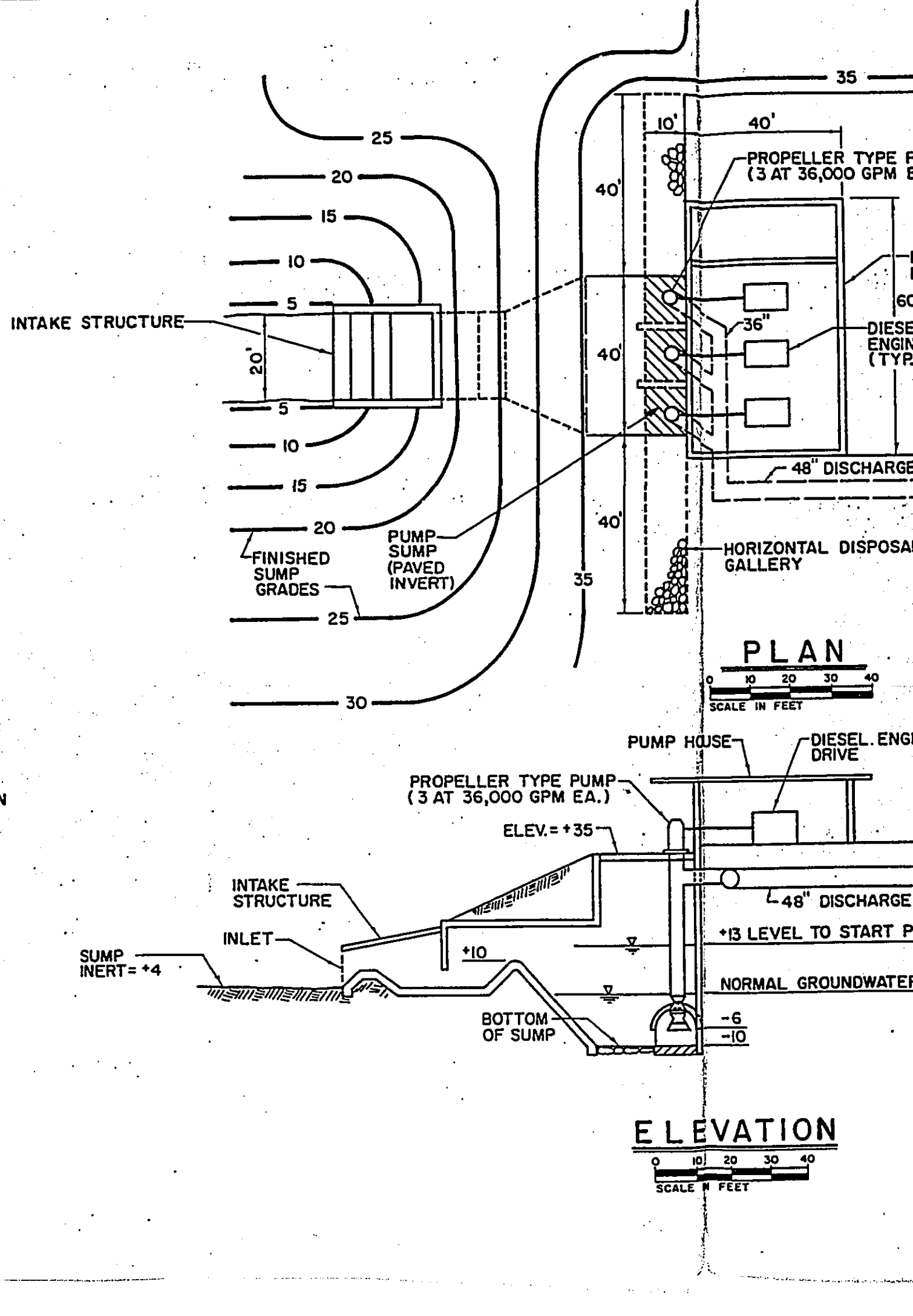
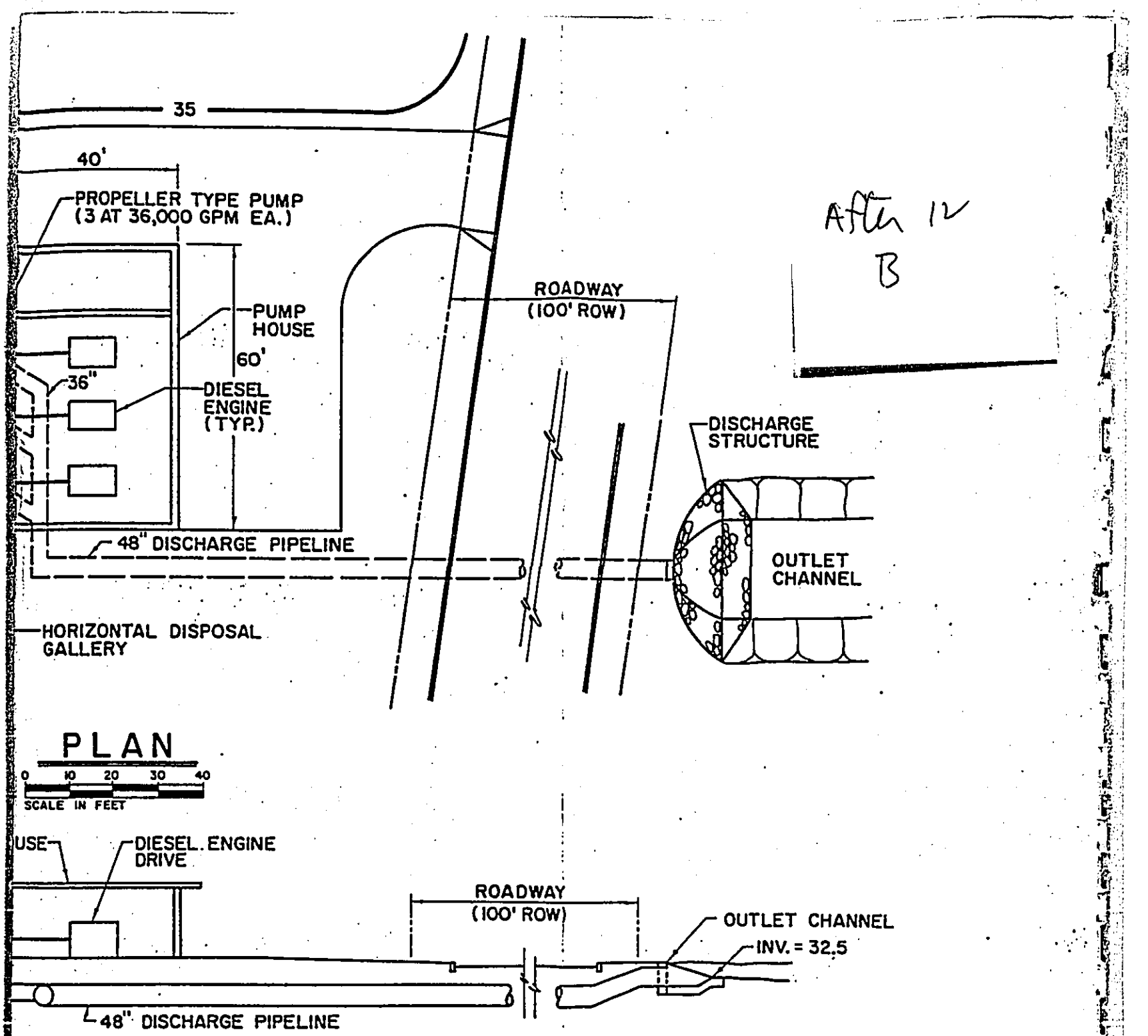


FIGURE 7. PRELIM



URE 7. PRELIMINARY GRADING PLAN FOR THE SUMP AND ADJACENT AREAS


25
20
15
10
5
INTAKE STRUCTURE
20'
5
10
15
20
FINISHED SUMP GRADES
PUMP SUMP (PAVED INVERT)
25
30
35
10'
40'
PROPELLER TYPE P
(3 AT 36,000 GPM E
40'
40'
40'
35
36"
DIESE
ENGIN
(TYP
48" DISCHARGE
HORIZONTAL DISPOSA
GALLERY
PLAN
0 10 20 30 40
SCALE IN FEET
ELEVATION (FEET)
40
30
20
10
0
-10
-20
PUMP HOUSE
DIESEL. ENG
DRIVE
PROPELLER TYPE PUMP
(3 AT 36,000 GPM EA.)
ELEV.= +35
INTAKE STRUCTURE
INLET
SUMP INERT= +4
+10
48" DISCHARGE
+13 LEVEL TO START P
NORMAL GROUNDWATER
BOTTOM OF SUMP
-6
-10
ELEVATION
0 10 20 30 40
SCALE IN FEET



After 12
B

FIGURE 8. PRELIMINARY PUMP STATION DESIGN

of the pump station. Third, with two pumps operating, a reasonable design condition with one pump considered to be standby, inundation would be confined to the sump and a minor portion of the adjacent park site. Fourth, with one or no pumps operating, flooding would be limited to the park site, Fort Weaver Road, and a minor portion of Soda Creek roadways.

Routing Offsite and Onsite Runoff Through the Golf Course. The HEC1 computer printout in Appendix D is complete analysis of offsite and onsite runoff. It includes results of Kaloi Gulch and the sump and pump station discussed previously, adds the balance of onsite runoff, and considers the effects of routing the flood flows through the golf course. Figure 9 schematically depicts the analytical process. As a result of time delay in the drainage sump and flood peak attenuation in routing through the golf course, combined peak flows of 7050 CFS (Kaloi Gulch), 175 CFS (Fernandez, Ho'a Kea, & Elderly Housing), and 1530 CFS (onsite basins 50, 60 and a portion of 30) leave the project site with a flood peak of just 7570 CFS.

The idealized cross section through the golf course assumed for this analysis is shown in Figure 10. Routing results depict a resulting freeboard of 2.13 feet relative to the lowest adjacent residential area. In actual construction, the golf course will not have the formalized shape on Figure 10. A defined channel sufficient to convey the 5-year flood peak will meander through the center of the golf course and adjacent fairways and roughs will have undulating forms. However, grading will provide a conveyance capacity equal to or greater than the idealized cross section. For most of the course, actual conveyance capacity will be substantially greater than shown on Figure 10.

The analysis in Appendix D incorporates several assumptions regarding future land use and drainage facilities on the land below and above the project site. For the makai land (the area of the former "Ewa Marina" project), the assumption is that sufficient conveyance capacity will be provided to handle the 7570 CFS peak leaving the Gentry-Ewa site. Golf course elevations have been chosen to provide a hydraulic gradient of 0.002 across the Gentry-Ewa and Ewa Marina sites to discharge at the existing shoreline on a mean higher high water (MHHW) tide level. Conveyance capacity through the

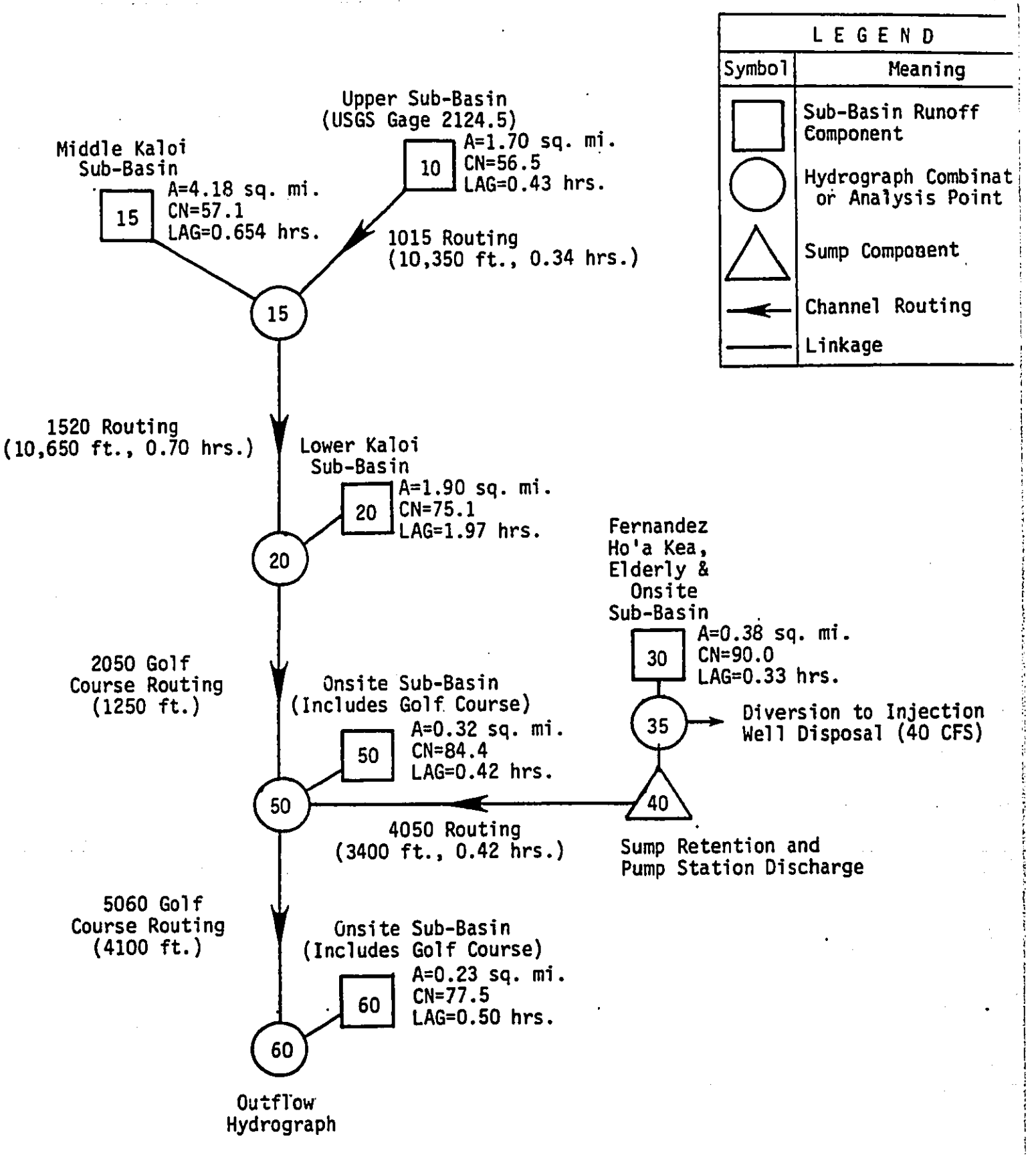
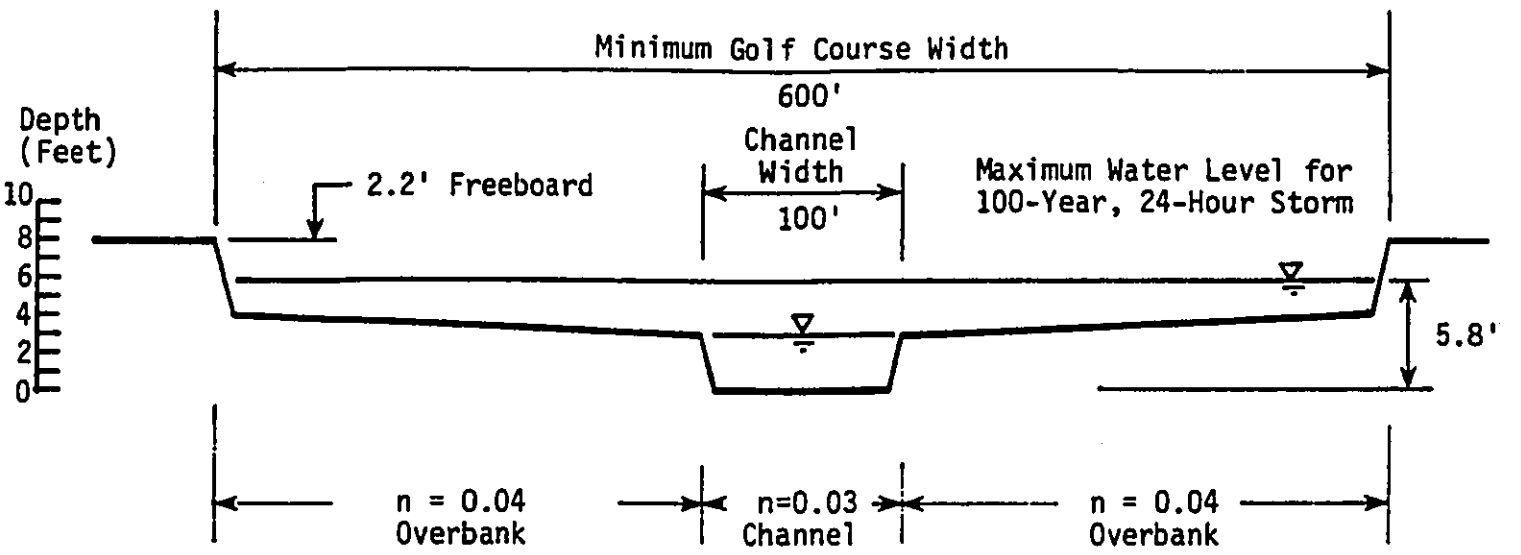


Figure 9. Schematic Diagram of the Flood Routing Analysis



Bank-Full Channel Capacity
(Normal Depth, Manning Equation)

Area = 282 Ft^2
Wetted Perimeter = 101.42 Ft
Hydraulic Radius = 2.78 Ft
n = 0.03
s = 0.002
Discharge Capacity = 1235 CFS

Bank-Full Golf Course Capacity
(Normal Depth, Manning Equation)

Channel
Area = 782 Ft^2
Wetted Perimeter = 101.42 Ft
Hydraulic Radius = 7.71 Ft
n = 0.03
s = 0.002
Overbank Areas
Area = 2210 Ft^2
Wetted Perimeter = 501.89 Ft
Hydraulic Radius = 4.40 Ft
n = 0.04
s = 0.002
Combined Discharge = 16,625 CFS

Figure 10. Conveyance Capacity for Minimum Golf Course Cross Section

Ewa Marina site could be provided in a wide greenbelt similar to the Gentry-Ewa project or in a narrower, more formalized channel.

The assumption made for the land mauka of Gentry-Ewa is that the existing land use of agriculture and open space will continue. This assumption is based on Campbell Estate's commitment to keep the land between Mango Tree Road and H-1 Freeway in agriculture and the steep slopes of the land further mauka. All of the Estate's land use and infrastructure planning has incorporated the commitment to agriculture. However, a "worst case" development scenario for this land has been analyzed to determine how conveyance through the golf course would function at higher runoff rates from Kaloi Gulch. This scenario assumes complete urban development from the railroad right-of-way up to H-1 Freeway, including construction of lined channels for Kaloi Gulch and its tributaries within this area.

Computer printouts for this worst case scenario can be found in Appendix E and summary results are tabulated below. The 100-year Kaloi flood peak is increased to 9150 CFS. This additional runoff could be conveyed through the minimum golf course section with 1.6 feet of freeboard.

	Design Analysis (Appendix D)	Worst Case Scenario (Appendix E)
Kaloi Sub-Basin Parameters		
Upper Sub-Basin: CN	56.5	56.5
Lag (hours)	0.426	0.426
Middle Sub-Basin: CN	57.1	61.0
Lag (hours)	0.654	0.640
Lower Sub-Basin: CN	75.1	91.1
Lag (hours)	1.974	0.819
Routing Times		
1015 Reach (hours)	0.342	0.250
1520 Reach (hours)	0.704	0.460
Peak Runoff Rates		
Top of Project Site (CFS)	7050	9150
Leaving the Project Site (CFS)	7570	9670
Maximum Golf Course Water Level (feet)	5.87	6.42
Freeboard (feet)	2.13	1.58

Drainage of the Project Site East of Fort Weaver Road. Drainage within the 387-acre portion of the project site east of Fort Weaver Road will be handled independently. Two excavated sumps for stormwater retention and disposal are proposed. Material excavated from these sumps will be used to create the necessary elevations and slopes within adjacent residential areas to drain to the sumps. This concept is incorporated into the drainage and grading plans shown on Figures 2 and 3.

Collection and conveyance of runoff in the residential areas will be by conventional catch basins and drain lines sized in accordance with the City and County Drainage Standards. The sumps are sized to retain all of the 100-year, 24-hour runoff volume with substantial freeboard and without credit for disposal by injection wells and seepage. The freeboard volumes are 1.2 times the 100-year, 24-hour runoff volumes into the mauka and makai sumps. Design parameters for this sizing are as follows:

Design Parameters	Mauka Sump	Makai Sump
Tributary Area (Acres)	247	140
100-Year, 24-Hour Rainfall (Inches)	12.2	12.2
Weighted CN	80	80
Runoff Amount: Inches	9.64	9.64
: Cubic Feet	11.5×10^6	6.2×10^6
Maximum Sump Water Level	20.5	15.5
Freeboard: Feet	9.5	9.0
: Cubic Feet	14.3×10^6	7.2×10^6

INTERIM DRAINAGE MEASURES FOR EXISTING MAUKA AND MAKAI CONDITIONS

At the present time, the Kaloi channel in the vicinity of the project site has a limited capacity estimated to be less than 1000 CFS (based on the existing channel dimensions and normal depth flow with a hydraulic gradient of 0.002; it ignores bottlenecks at culverts which further reduce capacity).

There is no schedule for improvements to the channel upstream of the project site. Improvements to the channel downstream of the Gentry-Ewa project will be made when development of the Ewa Marina site is undertaken.

Limited upstream capacity poses no problem for the Gentry-Ewa site because the railroad embankment restricts entry of offsite runoff to the Kaloi channel. The backwater effect of limited existing downstream capacity must be considered, however. It is proposed that an interim use channel below the Gentry-Ewa site be constructed. Its size would be based on a 10-year design storm. Since development of the Ewa-Marina site is expected in the next several years, a 10-year storm is considered to be sufficient.

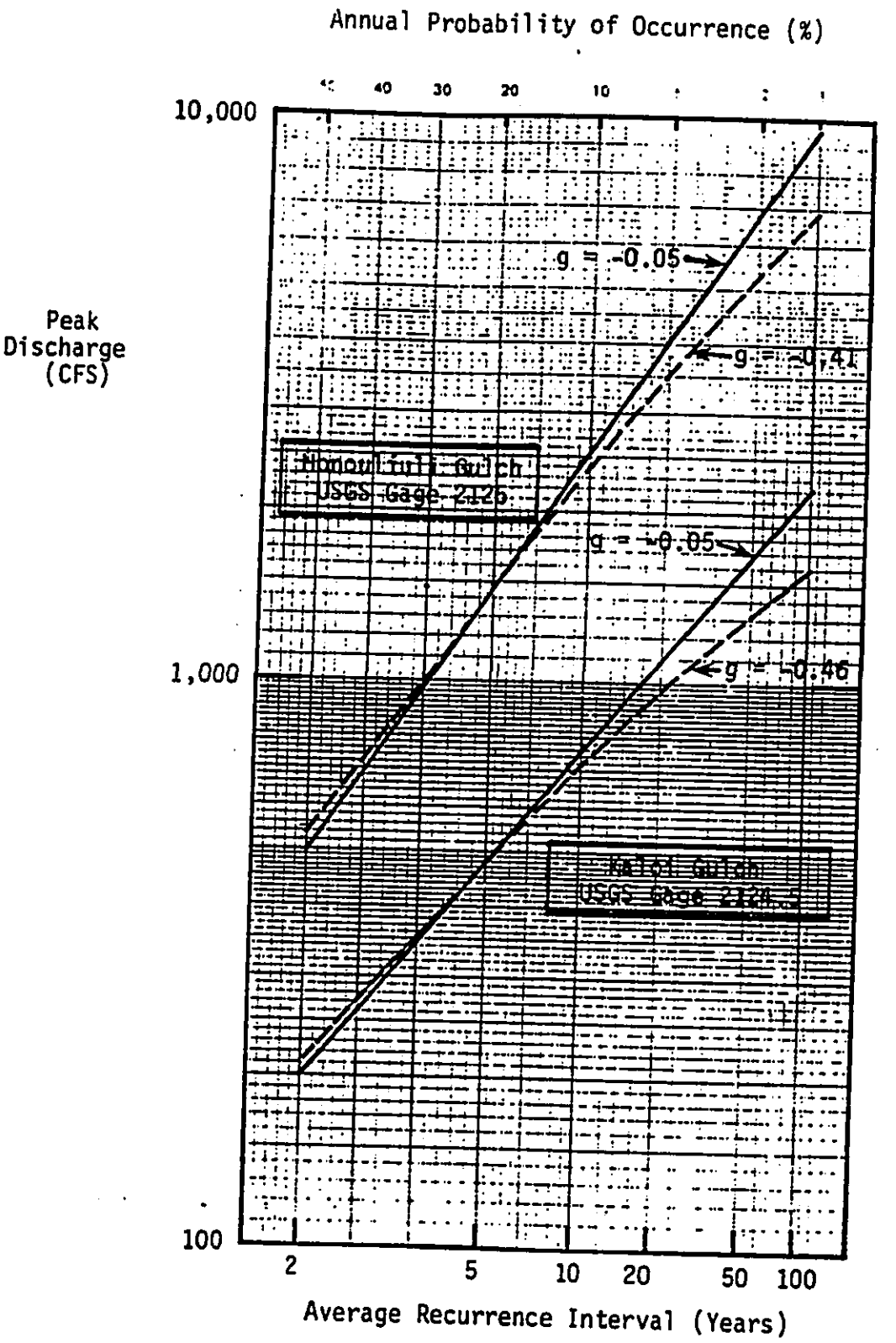
An HEC1 computer printout of the interim design analysis is included in Appendix F. The analysis limits the 10-year, offsite peak flow to 1000 CFS. Routing and sump delay effects result is a 1560 CFS peak flow leaving the Gentry-Ewa site. A temporary channel will be constructed to handle this peak. The channel will have 25-foot base width, one-to-one side slopes, and 9-foot depth (normal depth of flow would be 7.3 feet). Its alignment will be as shown on Figure 2 and its excavation will be carried to daylight using a 0.002 invert gradient.

APPENDIX

A. Statistical Analyses of USGS Gaging Stations 2124.5 and 2125
B. Analysis of the 7.8-Square Mile Kaloi Watershed
C. Flood Routing Through the Sump and Pump Station
D. Flood Routing Through the Golf Course
E. "Worst Case" Mauka Development Scenario
F. Interim Drainage Analysis

Appendix A

Statistical Analyses of USGS Gaging Stations 2124.5 and 2125



NOTE: Dashed lines are plots with each stations computed skew coefficient. The solid lines are based on a -0.05 regional skew coefficient for Hawaii.

Log Pearson Type III Analysis
Honouliuli Stream Near Waipahu
USGS Gage 2125
1956 to 1984: 29 Years

Rank	Annual Peak (CFS)	Year of Occurrence
1	3500	1982
2	2470	1969
3	2270	1972
4	1990	1976
5	1900	1958
6	1830	1966
7	1640	1979
8	1460	1975
9	1310	1980
10	1140	1965
11	959	1967
12	882	1962
13	712	1963
14	696	1956
15	696	1971
16	653	1968
17	578	1983
18	368	1974
19	294	1957
20	274	1970
21	207	1977
22	125*	1959
23	125*	1960
24	125*	1961
25	125*	1964
26	90	1984
27	79	1973
28	54	1981
29	35	1978

*Estimated based on station rating curve.

Log Values:

Mean, M = 2.691
Standard Deviation, S = 0.562
Skew Coefficient, g = -0.41

Frequency-Discharge:

Recurrence Interval (Years)	k (g = -0.05)	Peak Discharge* (CFS)
100	2.2895	9500
50	2.0267	6760
20	1.6304	4050
10	1.2760	2560
5	0.8439	1460
2	0.0083	500

*Computed using: Log Qp = M + kS

Log Pearson Type III Analysis
Kaloi Gulch Tributary to Honouliuli
USGS Gage 2124.5
1968 to 1984: 17 Years

Rank	Annual Peak (CFS)	Year of Occurrence
1	724	1980
2	645	1969
3	580	1972
4	562	1979
5	500	1976
6	452	1971
7	314	1975
8	279	1968
9	255	1977
10	209	1982
11	171	1974
12	100	1983
13	81	1978
14	75	1970
15	45	1981
16	40	1973
17	30	1984

Log Values:

Mean, M = 2.292

Standard Deviation, S = 0.458

Skew Coefficient, g = -0.46

Frequency-Discharge:

Recurrence Interval (Years)	k (g = -0.05)	Peak Discharge* (CFS)
100	2.2895	2190
50	2.0267	1660
20	1.6304	1090
10	1.2760	750
5	0.8439	480
2	0.0083	200

*Computed using: Log Qp = M + kS

Appendix B

Analysis of the 7.8-Square Mile Kaloi Watershed

1

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FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616

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THIS HEC-1 VERSION CONTAINS ALL OPTIONS EXCEPT ECONOMICS, AND THE NUMBER OF PLANS ARE REDUCED TO 3

1

HEC-1 INPUT PAGE 1

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LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  1         ID  100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
  2         ID  FILE "KALOI": DIVIDES KALOI INTO THREE SUB-BASINS; 5-MIN DURATION
  3         IT     5  1JAN88    1200     288
  4         IO     5

  5         KK     10 HYDROGRAPH OF KALOI SUB-BASIN AT USGS GAGE 2124.5
  6         BA   1.70
  7         PH          1.70   0.71   1.46   2.70   4.00   5.20   7.90   10.2   12.8
  8         LS     0    56.5
  9         UD  0.426

 10         KK     1015 ROUTE TO 85-FOOT CHANNEL ELEVATION
 11         RM     1   0.342    0.05

 12         KK     15 HYDROGRAPH OF THE MIDDLE KALOI SUB-BASIN
 13         BA   4.18
 14         PH          4.18   0.68   1.40   2.60   3.90   5.15   7.85   10.1   12.7
 15         LS     0    57.1
 16         UD  0.654

 17         KK     15 COMBINE HYDROGRAPHS OF UPPER TWO SUB-BASINS
 18         HC     2

 19         KK     1520 ROUTE TO TOP OF GENTRY PROJECT
 20         RM     1   0.704    0.50

 21         KK     20 HYDROGRAPH OF MAKAI PORTION OF KALOI BASIN
 22         BA   1.90
 23         PH          6.08   0.66   1.35   2.50   3.80   5.10   7.80   10.0   12.6
 24         LS     0    75.1
 25         UD  1.974

 26         KK     20 COMBINE HYDROGRAPHS
 27         HC     2
 28
 29         ZZ
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1

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FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616

****

100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
FILE "KALOI": DIVIDES KALOI INTO THREE SUB-BASINS; 5-MIN DURATION

IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1JAN88	STARTING DATE
ITIME	1200	STARTING TIME
NQ	288	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2JAN88	ENDING DATE
NDTIME	1155	ENDING TIME

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 23.92 HOURS

ENGLISH UNITS

ERROR 1 CARD NO. 28
1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	10	2265.	12.42	855.	301.	301.	1.70		
ROUTED TO	1015	1823.	12.67	852.	299.	299.	1.70		
HYDROGRAPH AT	15	4325.	12.67	2082.	733.	733.	4.18		
2 COMBINED AT	15	6148.	12.67	2934.	1032.	1032.	5.88		
ROUTED TO	1520	5696.	13.17	2934.	1014.	1014.	5.88		
HYDROGRAPH AT	20	1660.	14.17	1210.	449.	449.	1.90		
2 COMBINED AT	20	7050.	13.25	4140.	1463.	1463.	7.78		

Appendix C

Flood Routing Through the Sump and Pump Station

1

****

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
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****

THIS HEC-1 VERSION CONTAINS ALL OPTIONS EXCEPT ECONOMICS, AND THE NUMBER OF PLANS ARE REDUCED TO 3

1

HEC-1 INPUT PAGE 1

```
LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
  1         ID  100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
  2         ID  FILE "SUMP3"
  3         IT     5  1JAN88    1200     280
  4         IO     5

  5         KK     30 HYDROGRAPH OF THE AREAS TRIBUTARY TO THE SUMP
  6         BA  0.381
  7         PH        0.381    0.61    1.24    2.30    3.70    4.80    7.40    9.60    12.2
  8         LS  0     90
  9         UD  0.33

 10         KK     35 DIVERSION TO INJECTION WELLS
 11         DT  INJ
 12         DI  0     40    40.1    1000
 13         DQ  0     40     40      40

 14         KK     40 SUMP ROUTING OF INFLOW HYDROGRAPH LESS INJECTION WELL DISPOSAL
 15         RS  1   ELEV     10
 16         SV  0   5.80    25.3    60.4   141.0   363.5
 17         SE  10    15     20      25      30      35
 18         SQ  0     0     240     240
 19         SE  10  12.99    13.0    60
 20
 21         ZZ
```

1

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FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616
****

100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
FILE "SUMP3"

4 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1JAN88	STARTING DATE
ITIME	1200	STARTING TIME
NQ	280	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2JAN88	ENDING DATE
NDTIME	1115	ENDING TIME

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 23.25 HOURS

ENGLISH UNITS

ERROR 1 CARD NO. 20
1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	30	780.	11.92	289.	114.	114.	.38		
+	DIVERSION TO	INJ	40.	11.92	40.	34.	34.	.38		
+	HYDROGRAPH AT	35	740.	11.92	249.	79.	79.	.38		
+	ROUTED TO	40	240.	11.08	234.	77.	77.	.38		
+									20.92	13.17

1

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FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
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****

THIS HEC-1 VERSION CONTAINS ALL OPTIONS EXCEPT ECONOMICS, AND THE NUMBER OF PLANS ARE REDUCED TO 3

1

HEC-1 INPUT


```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  1       ID  100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
  2       ID  FILE "SUMP2"
  3       IT     5  1JAN88    1200     280
  4       IO     5

  5       KK     30 HYDROGRAPH OF THE AREAS TRIBUTARY TO THE SUMP
  6       BA  0.381
  7       PH         0.381   0.61   1.24   2.30   3.70   4.80   7.40   9.60   12.2
  8       LS     0     90
  9       UD  0.33

 10       KK     35 DIVERSION TO INJECTION WELLS
 11       DT  INJ
 12       DI     0     40   40.1   1000
 13       DQ     0     40     40     40

 14       KK     40 SUMP ROUTING OF INFLOW HYDROGRAPH LESS INJECTION WELL DISPOSAL
 15       RS     1   ELEV     10
 16       SV     0   5.80   25.3   60.4  141.0  363.5
 17       SE    10     15     20     25     30     35
 18       SQ     0      0    160    160
 19       SE    10  12.99   13.0     60
 20
 21       ZZ
```

****

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
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****

100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
FILE "SUMP2"

♦ IO	OUTPUT CONTROL VARIABLES		
	IPRNT	5	PRINT CONTROL
	IPLOT	0	PLOT CONTROL
	QSCAL	0.	HYDROGRAPH PLOT SCALE
IT	HYDROGRAPH TIME DATA		
	NMIN	5	MINUTES IN COMPUTATION INTERVAL
	IDATE	1JAN88	STARTING DATE
	ITIME	1200	STARTING TIME
	NQ	280	NUMBER OF HYDROGRAPH ORDINATES
	NDDATE	2JAN88	ENDING DATE
	NDTIME	1115	ENDING TIME
	COMPUTATION INTERVAL	.08	HOURS
	TOTAL TIME BASE	23.25	HOURS

ENGLISH UNITS

ERROR 1 CARD NO. 20
1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
	HYDROGRAPH AT									
+		30	780.	11.92	289.	114.	114.	.38		
	DIVERSION TO									
+		INJ	40.	11.92	40.	34.	34.	.38		
	HYDROGRAPH AT									
+		35	740.	11.92	249.	79.	79.	.38		
	ROUTED TO									
+		40	160.	10.17	160.	77.	77.	.38		
+									23.91	14.58

****

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
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****

THIS HEC-1 VERSION CONTAINS ALL OPTIONS EXCEPT ECONOMICS, AND THE NUMBER OF PLANS ARE REDUCED TO 3

HEC-1 INPUT PAGE 1

```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  1       ID  100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
  2       ID  FILE "SUMP1"
  3       IT     5  1JAN88    1200     280
  4       IO     5

  5       KK     30 HYDROGRAPH OF THE AREAS TRIBUTARY TO THE SUMP
  6       BA  0.381
  7       PH          0.381   0.61   1.24   2.30   3.70   4.80   7.40   9.60   12.2
  8       LS     0    90
  9       UD  0.33

 10       KK     35 DIVERSION TO INJECTION WELLS
 11       DT  INJ
 12       DI     0     40    40.1   1000
 13       DQ     0     40     40     40

 14       KK     40 SUMP ROUTING OF INFLOW HYDROGRAPH LESS INJECTION WELL DISPOSAL
 15       RS     1   ELEV     10
 16       SV     0   5.80   25.3   60.4  141.0  363.5
 17       SE    10     15     20     25     30     35
 18       SQ     0      0     80     80
 19       SE    10  12.99   13.0     60
 20
 21       ZZ
```

****

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
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****

100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
FILE "SUMP1"

4 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1JAN88	STARTING DATE
ITIME	1200	STARTING TIME
NQ	280	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2JAN88	ENDING DATE
NDTIME	1115	ENDING TIME

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 23.25 HOURS

ENGLISH UNITS

ERROR 1 CARD NO. 20
1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	30	780.	11.92	289.	114.	114.	.38		
+	DIVERSION TO	INJ	40.	11.92	40.	34.	34.	.38		
+	HYDROGRAPH AT	35	740.	11.92	249.	79.	79.	.38		
+	ROUTED TO	40	80.	9.17	80.	51.	51.	.38		
+									26.82	15.25

****

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
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****

THIS HEC-1 VERSION CONTAINS ALL OPTIONS EXCEPT ECONOMICS, AND THE NUMBER OF PLANS ARE REDUCED TO 3

HEC-1 INPUT PAGE 1

```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  1       ID  100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
  2       ID  FILE "SUMPO"
  3       IT     5  1JAN88   1200     280
  4       IO     5

  5       KK    30 HYDROGRAPH OF THE AREAS TRIBUTARY TO THE SUMP
  6       BA  0.381
  7       PH        0.381   0.61   1.24   2.30   3.70   4.80   7.40   9.60   12.2
  8       LS     0     90
  9       UD  0.33

 10       KK    35 DIVERSION TO INJECTION WELLS
 11       DT   INJ
 12       DI     0     40   40.1   1000
 13       DQ     0     40     40     40

 14       KK    40 SUMP ROUTING OF INFLOW HYDROGRAPH LESS INJECTION WELL DISPOSAL
 15       RS     1   ELEV     10
 16       SV     0   5.80   25.3   60.4   141.0   363.5
 17       SE    10     15     20     25      30      35
 18       SQ     0      0      0      0
 19       SE    10  12.99   13.0     60
 20
 21       ZZ
```

****

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
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****

100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
FILE "SUMPO"

4 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1JAN86	STARTING DATE
ITIME	1200	STARTING TIME
NQ	280	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2JAN88	ENDING DATE
NDTIME	1115	ENDING TIME

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 23.25 HOURS

ENGLISH UNITS

ERROR 1 CARD NO. 20
1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	30	780.	11.92	289.	114.	114.	.38		
+	DIVERSION TO	INJ	40.	11.92	40.	34.	34.	.38		
+	HYDROGRAPH AT	35	740.	11.92	249.	79.	79.	.38		
+	ROUTED TO	40	0.	.08	0.	0.	0.	.38		
+									30.25	23.25

Appendix D

Flood Routing Through the Golf Course

1

****

FLOOD HYDROGRAPH PACKAGE HEC-1 (16M XT 512K VERSION) -FEB 1,1985
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****

THIS HEC-1 VERSION CONTAINS ALL OPTIONS EXCEPT ECONOMICS, AND THE NUMBER OF PLANS ARE REDUCED TO 3

1

HEC-1 INPUT PAGE 1

```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  1       ID  100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
  2       ID  FILE "GENTRY": DIVIDES KALOI INTO THREE SUB-BASINS; 5-MIN DURATION
  3       IT     5  1JAN88    1200     288
  4       IO     5

  5       KK    10 HYDROGRAPH OF KALOI SUB-BASIN AT USGS GAGE 2124.5
  6       BA  1.70
  7       PH        1.70   0.71   1.46   2.70   4.00   5.20   7.90   10.2   12.8
  8       LS     0  56.5
  9       UD  0.426

 10       KK  1015 ROUTE TO 85-FOOT CHANNEL ELEVATION
 11       RM     1  0.342   0.05

 12       KK    15 HYDROGRAPH OF THE MIDDLE KALOI SUB-BASIN
 13       BA  4.18
 14       PH        4.18   0.68   1.40   2.60   3.90   5.15   7.85   10.1   12.7
 15       LS     0  57.1
 16       UD  0.654

 17       KK    15 COMBINE HYDROGRAPHS OF UPPER TWO SUB-BASINS
 18       HC     2

 19       KK  1520 ROUTE TO TOP OF GENTRY PROJECT
 20       RM     1  0.704   0.50

 21       KK    20 HYDROGRAPH OF MAKAI PORTION OF KALOI BASIN
 22       BA  1.90
 23       PH        6.08   0.66   1.35   2.50   3.80   5.10   7.80   10.0   12.6
 24       LS     0  75.1
 25       UD  1.974

 26       KK    20 COMBINE HYDROGRAPHS
 27       HC     2
```

```
28          KK    2050 ROUTING THROUGH THE UPPER END OF THE GOLF COURSE
29          RS      1   FLOW     -1
30          RC   0.04    0.03    0.04    1200   0.002
31          RX      0       8     250     256     344     350     592     600
32          RY      8       4       3       0       0       3       4       8

33          KK     50 HYDROGRAPH OF ONSITE AREA DRAINING TO THE GOLF COURSE ABOVE GEIGER
34          BA   0.319
35          PH           0.319    0.61    1.24    2.30    3.70    4.80    7.40    9.60    12.2
36          LS      0   84.4
37          UD   0.42

38          KK     30 HYDROGRAPH OF THE AREAS TRIBUTARY TO THE SUMP
39          BA   0.384
40          PH           0.384    0.61    1.24    2.30    3.70    4.80    7.40    9.60    12.2
41          LS      0      90
42          UD   0.33
```



```
LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

43          KK     35 DIVERSION TO INJECTION WELLS
44          DT    INJ
45          DI      0      40      41    1000
46          DQ      0      40      40      40

47          KK     40 SUMP ROUTING OF INFLOW HYDROGRAPH LESS INJECTION WELL DISPOSAL
48          RS      1    ELEV      10
49          SV      0    5.80    25.3    60.4   141.0   363.5
50          SE     10      15      20      25      30      35
51          SQ      0       0     160     160
52          GE     10   12.99    13.0      60

53          KK    4050 ROUTE SUMP OUTFLOW TO KALOI GULCH WITHIN THE GOLF COURSE
54          RM      1    0.42    0.10

55          KK     50 COMBINE HYDROGRAPHS WITHIN THE GOLF COURSE
56          HC      3

57          KK    5060 ROUTE COMBINED HYDROGRAPHS THROUGH THE LOWER PORTION OF GOLF COURSE
58          RS      3   FLOW     -1
59          RC   0.04    0.03    0.04    4000   0.002
60          RX      0       8     250     256     344     350     592     600
61          RY      8       4       3       0       0       3       4       8

62          KK     60 HYDROGRAPH OF LOWER PORTION OF THE PROJECT AREA
63          BA   0.231
64          PH           0.231    0.61    1.24    2.30    3.70    4.80    7.40    9.60    12.2
65          LS      0    77.5
66          UD   0.50

67          KK     60 COMBINE HYDROGRAPHS: ROUTED KALOI AND LOWER PORTION OF PROJECT AREA
68          HC      2
69
70          ZZ
```

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
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****

100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
FILE "GENTRY": DIVIDES KALOI INTO THREE SUB-BASINS; 5-MIN DURATION

4 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1JAN88	STARTING DATE
ITIME	1200	STARTING TIME
NQ	288	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2JAN88	ENDING DATE
NDTIME	1155	ENDING TIME

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 23.92 HOURS

ENGLISH UNITS

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 14576. TO 16670.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

ERROR 1 CARD NO. 69
1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	10	2265.	12.42	855.	301.	301.	1.70		
+	ROUTED TO	1015	1823.	12.67	852.	299.	299.	1.70		
+	HYDROGRAPH AT	15	4325.	12.67	2082.	733.	733.	4.18		
+	2 COMBINED AT	15	6148.	12.67	2934.	1032.	1032.	5.88		
+	ROUTED TO	1520	5696.	13.17	2934.	1014.	1014.	5.88		

+	HYDROGRAPH AT	20	1660.	14.17	1210.	449.	449.	1.90		
+	2 COMBINED AT	20	7050.	13.25	4140.	1463.	1463.	7.78		
+	ROUTED TO	2050	7032.	13.25	4138.	1460.	1460.	7.78		
+									5.77	13.25
+	HYDROGRAPH AT	50	565.	12.33	231.	87.	87.	.32		
+	HYDROGRAPH AT	30	787.	12.25	292.	113.	113.	.38		
+	DIVERSION TO	INJ	40.	12.25	40.	35.	35.	.38		
+	HYDROGRAPH AT	35	747.	12.25	252.	78.	78.	.38		
+	ROUTED TO	40	160.	10.50	160.	76.	76.	.38		
+									24.06	14.92
+	ROUTED TO	4050	160.	20.25	160.	76.	76.	.38		
+	3 COMBINED AT	50	7471.	13.25	4497.	1623.	1623.	8.48		
+	ROUTED TO	5060	7388.	13.50	4491.	1613.	1613.	8.48		
+									5.87	13.50
+	HYDROGRAPH AT	60	352.	12.42	155.	57.	57.	.23		
+	2 COMBINED AT	60	7568.	13.50	4624.	1670.	1670.	8.71		

1

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FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
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****

THIS HEC-1 VERSION CONTAINS ALL OPTIONS EXCEPT ECONOMICS, AND THE NUMBER OF PLANS ARE REDUCED TO 3

1

HEC-1 INPUT


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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
    1     ID  100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
    2     ID  FILE "WORST": DIVIDES KALOI INTO THREE SUB-BASINS; 5-MIN DURATION
    3     IT     5  1JAN88    1200     288
    4     IO     5

    5     KK    10 HYDROGRAPH OF KALOI SUB-BASIN AT USGS GAGE 2124.5
    6     BA  1.70
    7     PH        1.70   0.71   1.46   2.70   4.00   5.20   7.90   10.2   12.8
    8     LS     0  56.5
    9     UD  0.426

   10     KK    1015 ROUTE TO 85-FOOT CHANNEL ELEVATION
   11     RM     1  0.250   0.15

   12     KK    15 HYDROGRAPH OF THE MIDDLE KALOI SUB-BASIN
   13     BA  4.18
   14     PH        4.18   0.68   1.40   2.60   3.90   5.15   7.85   10.1   12.7
   15     LS     0  61.0
   16     UD  0.640

   17     KK    15 COMBINE HYDROGRAPHS OF UPPER TWO SUB-BASINS
   18     HC     2

   19     KK    1520 ROUTE TO TOP OF GENTRY PROJECT
   20     RM     1  0.460   0.50

   21     KK    20 HYDROGRAPH OF MAKAI PORTION OF KALOI BASIN
   22     BA  1.90
   23     PH        6.08   0.66   1.35   2.50   3.80   5.10   7.80   10.0   12.6
   24     LS     0  91.1
   25     UD  0.819

   26     KK    20 COMBINE HYDROGRAPHS
   27     HC     2
```

Appendix E

"Worst Case" Mauka Development Scenario

```
 28        KK    2050 ROUTING THROUGH THE UPPER END OF THE GOLF COURSE
 29        RS      1    FLOW      -1
 30        RC   0.04    0.03    0.04    1200   0.002
 31        RX      0       8     250     256     344     350     592     600
 32        RY      8       4       3       0       0       3       4       8

 33        KK     50 HYDROGRAPH OF ONSITE AREA DRAINING TO THE GOLF COURSE ABOVE GEIGER
 34        BA   0.319
 35        PH           0.319   0.61    1.24    2.30    3.70    4.80    7.40    9.60    12.2
 36        LS      0    84.4
 37        UD   0.42

 38        KK     30 HYDROGRAPH OF THE AREAS TRIBUTARY TO THE SUMP
 39        BA   0.384
 40        PH           0.384   0.61    1.24    2.30    3.70    4.80    7.40    9.60    12.2
 41        LS      0     90
 42        UD   0.33
```



```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 43        KK     35 DIVERSION TO INJECTION WELLS
 44        DT    INJ
 45        DI      0      40      41    1000
 46        DQ      0      40      40      40

 47        KK     40 SUMP ROUTING OF INFLOW HYDROGRAPH LESS INJECTION WELL DISPOSAL
 48        RS      1    ELEV      10
 49        SV      0    5.80    25.3    60.4   141.0   363.5
 50        SE     10      15      20      25      30      35
 51        SQ      0       0     160     160
 52        SE     10   12.99    13.0      60

 53        KK    4050 ROUTE SUMP OUTFLOW TO KALOI GULCH WITHIN THE GOLF COURSE
 54        RM      1    0.42    0.10

 55        KK     50 COMBINE HYDROGRAPHS WITHIN THE GOLF COURSE
 56        HC      3

 57        KK    5060 ROUTE COMBINED HYDROGRAPHS THROUGH THE LOWER PORTION OF GOLF COURSE
 58        RS      3    FLOW      -1
 59        RC   0.04    0.03    0.04    4000   0.002
 60        RX      0       8     250     256     344     350     592     600
 61        RY      8       4       3       0       0       3       4       8

 62        KK     60 HYDROGRAPH OF LOWER PORTION OF THE PROJECT AREA
 63        BA   0.231
 64        PH           0.231   0.61    1.24    2.30    3.70    4.80    7.40    9.60    12.2
 65        LS      0    77.5
 66        UD   0.50

 67        KK     60 COMBINE HYDROGRAPHS: ROUTED KALOI AND LOWER PORTION OF PROJECT AREA
 68        HC      2
 69
 70        ZZ
```

1 ****

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95615
****

100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
FILE "WORST": DIVIDES KALOI INTO THREE SUB-BASINS; 5-MIN DURATION

4 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1JAN88	STARTING DATE
ITIME	1200	STARTING TIME
NQ	288	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2JAN88	ENDING DATE
NDTIME	1155	ENDING TIME

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 23.92 HOURS

ENGLISH UNITS

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 14576. TO 16670.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

ERROR 1 CARD NO. 69
1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	10	2265.	12.42	855.	301.	301.	1.70		
+	ROUTED TO	1015	1985.	12.58	854.	299.	299.	1.70		
+	HYDROGRAPH AT	15	4785.	12.67	2269.	803.	803.	4.18		
+	2 COMBINED AT	15	6770.	12.58	3122.	1102.	1102.	5.88		
+	ROUTED TO	1520	6557.	13.00	3122.	1091.	1091.	5.88		

HYDROGRAPH AT	20	2721.	12.75	1492.	574.	574.	1.90		
2 COMBINED AT	20	9154.	13.00	4570.	1664.	1664.	7.78		
ROUTED TO	2050	9122.	13.00	4569.	1661.	1661.	7.78		
								6.33	13.00
HYDROGRAPH AT	50	565.	12.33	231.	87.	87.	.32		
HYDROGRAPH AT	30	787.	12.25	292.	113.	113.	.38		
DIVERSION TO	INJ	40.	12.25	40.	35.	35.	.38		
HYDROGRAPH AT	35	747.	12.25	252.	78.	78.	.38		
ROUTED TO	40	160.	10.50	160.	76.	76.	.38		
								24.06	14.92
ROUTED TO	4050	160.	20.25	160.	76.	76.	.38		
3 COMBINED AT	50	9598.	13.00	4948.	1824.	1824.	8.48		
ROUTED TO	5060	9461.	13.17	4940.	1814.	1814.	8.48		
								6.42	13.17
HYDROGRAPH AT	60	352.	12.42	155.	57.	57.	.23		
2 COMBINED AT	60	9673.	13.17	5087.	1871.	1871.	8.71		

Appendix F

Interim Drainage Analysis

1 ****

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616
****

THIS HEC-1 VERSION CONTAINS ALL OPTIONS EXCEPT ECONOMICS, AND THE NUMBER OF PLANS ARE REDUCED TO 3

1 HEC-1 INPUT PAGE 1

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

    1         ID  100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
    2         ID  FILE "TEMP": DIVIDES KALOI INTO THREE SUB-BASINS; 10-YEAR, 24-HOUR STORM
    3         IT     5  1JAN88    1200     288
    4         IO     5

    5         KK    10 HYDROGRAPH OF KALOI SUB-BASIN AT USGS GAGE 2124.5
    6         BA  1.70
    7         PH        1.70   0.49   1.00   1.85   2.60   3.40   5.00   6.50   8.10
    8         LS     0  56.5
    9         UD  0.426

   10         KK   1015 ROUTE TO 85-FOOT CHANNEL ELEVATION
   11         RM     1  0.342   0.05

   12         KK    15 HYDROGRAPH OF THE MIDDLE KALOI SUB-BASIN
   13         BA  4.18
   14         PH        4.18   0.47   0.95   1.80   2.57   3.30   4.90   6.40   8.05
   15         LS     0  57.1
   16         UD  0.654

   17         KK    15 COMBINE HYDROGRAPHS OF UPPER TWO SUB-BASINS
   18         HC     2

   19         KK   1520 ROUTE TO TOP OF GENTRY PROJECT
   20         RM     1  0.704   0.50

   21         KK    20 HYDROGRAPH OF MAKAI PORTION OF KALOI BASIN
   22         BA  1.90
   23         PH        6.08   0.45   0.92   1.75   2.53   3.20   4.80   6.30   8.00
   24         LS     0  75.1
   25         UD  1.974

   26         KK    20 COMBINE HYDROGRAPHS
   27         HC     2
```

```
28        KK     25 DIVERSION TO ACCOUNT FOR LIMITED CHANNEL CAPACITY
29        DT    DIV
30        DI      0    1000    1500   10000
31        DQ      0       0     500    9000

32        KK   2550 ROUTING THROUGH THE UPPER END OF THE GOLF COURSE
33        RS      1    FLOW      -1
34        RC   0.04    0.03    0.04    1200   0.002
35        RX      0       8     250     256     344     350     592     600
36        RY      8       4       3       0       0       3       4       8

37        KK     50 HYDROGRAPH OF ONSITE AREA DRAINING TO THE GOLF COURSE ABOVE GEIGER
38        BA  0.319
39        PH          0.319   0.45    0.92    1.70    2.50    3.00    4.50    5.85    7.30
40        LS      0   84.4
41        UD   0.42
```



```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

42        KK     30 HYDROGRAPH OF THE AREAS TRIBUTARY TO THE SUMP
43        BA  0.384
44        PH          0.384   0.45    0.92    1.70    2.50    3.00    4.50    5.85    7.30
45        LS      0     90
46        UD   0.33

47        KK     35 DIVERSION TO INJECTION WELLS
48        DT    INJ
49        DI      0      40      41    1000
50        DQ      0      40      40      40

51        KK     40 SUMP ROUTING OF INFLOW HYDROGRAPH LESS INJECTION WELL DISPOSAL
52        RS      1    ELEV      10
53        SV      0    5.80    25.3    60.4   141.0   363.5
54        SE     10      15      20      25      30      35
55        SQ      0       0     160     160
56        SE     10   12.99    13.0      60

57        KK   4050 ROUTE SUMP OUTFLOW TO KALOI GULCH WITHIN THE GOLF COURSE
58        RM      1    0.42    0.10

59        KK     50 COMBINE HYDROGRAPHS WITHIN THE GOLF COURSE
60        HC      3

61        KK   5060 ROUTE COMBINED HYDROGRAPHS THROUGH THE LOWER PORTION OF GOLF COURSE
62        RS      3    FLOW      -1
63        RC   0.04    0.03    0.04    4000   0.002
64        RX      0       8     250     256     344     350     592     600
65        RY      8       4       3       0       0       3       4       8

66        KK     60 HYDROGRAPH OF LOWER PORTION OF THE PROJECT AREA
67        BA  0.231
68        PH          0.231   0.45    0.92    1.70    2.50    3.00    4.50    5.85    7.30
69        LS      0    77.5
70        UD   0.50
```

```
 71          KK     60 COMBINE HYDROGRAPHS: ROUTED KALOI AND LOWER PORTION OF PROJECT AREA
 72          HC      2
 73
 74          ZZ
1                                                    ****
                        FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
                  U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616
                                                     ****

                     100-YEAR RUNOFF ANALYSIS OF KALOI GULCH AND THE EWA-GENTRY PROJECT AREA
                     FILE "TEMP": DIVIDES KALOI INTO THREE SUB-BASINS; 10-YEAR, 24-HOUR STORM

 4 IO        OUTPUT CONTROL VARIABLES
                  IPRNT         5  PRINT CONTROL
                  IPLOT         0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE

  IT         HYDROGRAPH TIME DATA
                   NMIN         5  MINUTES IN COMPUTATION INTERVAL
                  IDATE     1JAN88  STARTING DATE
                  ITIME       1200  STARTING TIME
                     NQ        288  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE    2JAN88  ENDING DATE
                  NDTIME       1155  ENDING TIME

               COMPUTATION INTERVAL      .08 HOURS
                   TOTAL TIME BASE   23.92 HOURS

          ENGLISH UNITS

 *** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN    14576. TO    16670.
                 THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
                 THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

 ERROR 1      CARD NO.  73
1
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
					6-HOUR	24-HOUR	72-HOUR			
+	HYDROGRAPH AT	10	1060.	12.42	392.	136.	136.	1.70		
+	ROUTED TO	1015	840.	12.67	390.	134.	134.	1.70		
+	HYDROGRAPH AT	15	2030.	12.67	949.	332.	332.	4.18		

+	2 COMBINED AT	15	2870.	12.67	1340.	466.	466.	5.88		
+	ROUTED TO	1520	2625.	13.17	1357.	457.	457.	5.88		
+	HYDROGRAPH AT	20	919.	14.17	655.	241.	241.	1.90		
+	2 COMBINED AT	20	3366.	13.25	2010.	697.	697.	7.78		
+	DIVERSION TO	DIV	2366.	12.50	1013.	254.	254.	7.78		
+	HYDROGRAPH AT	25	1000.	12.50	997.	443.	443.	7.78		
+	ROUTED TO	2550	1000.	12.92	997.	441.	441.	7.78		
+									2.64	13.00
+	HYDROGRAPH AT	50	381.	12.42	129.	47.	47.	.32		
+	HYDROGRAPH AT	30	556.	12.25	170.	63.	63.	.38		
+	DIVERSION TO	INJ	40.	12.25	40.	28.	28.	.38		
+	HYDROGRAPH AT	35	516.	12.25	130.	35.	35.	.38		
+	ROUTED TO	40	160.	12.00	127.	33.	33.	.38		
+									18.97	13.08
+	ROUTED TO	4050	160.	15.58	125.	33.	33.	.38		
+	3 COMBINED AT	50	1464.	12.58	1203.	521.	521.	8.48		
+	ROUTED TO	5060	1405.	12.92	1202.	513.	513.	8.48		
+									3.20	12.92
+	HYDROGRAPH AT	60	221.	12.50	81.	29.	29.	.23		
+	2 COMBINED AT	60	1563.	12.83	1275.	542.	542.	8.71		

APPENDIX D

BOTANICAL SURVEY

'EWA GENTRY RESIDENTIAL COMMUNITY

'EWA DISTRICT, O'AHU

by

Winona P. Char
George K. Linney

CHAR & ASSOCIATES
Botanical/Environmental Consultants
Honolulu, Hawaii

Prepared for: GRAY, HONG & ASSOCIATES, INC.

January 1988

Table of Contents

BOTANICAL SURVEY
'EWA GENTRY RESIDENTIAL COMMUNITY
'EWA DISTRICT, O'AHU

INTRODUCTION

The proposed 'Ewa Gentry project site consists of approximately 932 acres designated Agriculture. The applicant, Gentry Pacific Ltd., is requesting a change to Residential, Low Density Apartment, Public Facility and Park in order to develop a residential community.

The project site is located on more or less level, fairly well-drained soils; elevation ranges from about 25 ft. near the southern boundary to 40 ft. along the Oahu Railway and Land (OR&L) easement, northern boundary. The major portion of the land is actively under sugarcane cultivation by Oahu Sugar Company, with smaller acreages in seed corn production. The remaining acreages support weedy or ruderal vegetation.

A survey to inventory and assess the botanical resources on the project site was conducted in January 1988.

SURVEY METHODS

Prior to undertaking the field survey, a search was made of the pertinent literature to familiarize the investigators with other biological studies conducted in the general area.

Existing topographic maps as well as aerial photographs were examined to determine access, terrain characteristics, vegetation patterns, and potential logistical and technical problems.

Access onto parts of the project site was primarily by a number

of paved and unpaved canehaul roads as well as by Ft. Weaver Road and the Geiger-Iroquois Point Roads. From these road areas, a walk-through survey was conducted. The survey focused on the less disturbed portions of the site, such as rock piles, drainageways, scrub areas, etc., as native plants are more likely to occur in such areas.

Species were identified in the field; plants which could not be positively identified were collected for later determination in the herbarium (U.H., Manoa) and laboratory. The species recorded are indicative of the season (rainy vs. dry) and environmental conditions under which this survey was made. Surveys taken at different times of the year and under varying environmental conditions would no doubt yield slight variations in the species list, especially of the weedy annual taxa.

DESCRIPTION OF THE VEGETATION

A number of botanical and biological surveys have been made in the 'Ewa Plain area, some of which have included portions of the project site or areas adjacent to the site. In the U.S. Fish and Wildlife Service's botanical survey (Char and Balakrishnan 1979), vegetation on the 'Ewa Gentry site has been mapped as "C", sugar cane fields. Smaller vegetation units (less than 5 acres) were not mapped. Recent flora surveys for a number of nearby proposed developments, such as West Loch Estates (Char 1987), Kapolei Town Center (Char and Whistler 1986), Kapolei Village (Char and Whistler 1987), and 'Ewa Marina (Char 1980), describe similiar vegetation types.

In general, sugarcane fields cover areas which are actively cultivated, while vegetation types dominated by introduced, mostly weedy, species occur on the more or less undisturbed sites.

Very few remnant native plant communities remain on the 'Ewa

Plain area because it has been disturbed for such a long period of time, first by the early Polynesian settlers and, later, by the other immigrants. The few native plant communities are limited to areas where the limestone or karst topography has remained exposed and not covered by soil; these are areas which support kiawe forests or koa-haole/kiawe scrub. Two officially endangered plant species occur on the 'Ewa Plain: the 'Ewa Plains 'akoko (Euphorbia skottsbergii var. kalaeloana) and Achyranthes rotundata. Both species are limited in distribution to Campbell Industrial Park and Barbers Point Naval Air Station, where they occur on limestone substrate (Char and Balakrishnan 1979; Botanical Consultants 1984). No endangered plants were found on the nearby West Loch Naval Magazine although it too has rather large areas of exposed coralline material (Hawaiian Agronomics 1986).

No remnant native plant communities or rare, threatened and endangered plants have ever been recorded from the 'Ewa Gentry project site.

In this botanical survey report, two major vegetation types are recognized on the project site and are discussed in detail below.

Cultivated Fields

Cultivated fields occur generally on well-drained alluvial soils, overlying a substratum of coral limestone. Much of the agricultural lands of the 'Ewa Plain area have been made productive by the massive application of silt, topsoil, and other sugar mill wastes.

The actively cultivated agricultural lands are geared to more or less intensive cultivation of a single crop. Sugarcane (Saccharum officinale) forms monodominant stands on most of the cultivated lands, while seed corn (Zea mays) occupies smaller

acreages. Agricultural lands represent a dynamic system and the structure of sugarcane fields undergo a number of variations from field to field; this can be seen on aerial photographs as different toned mosaics. This variation results from vegetation densities varying from low, open, newly planted fields to tall, dense grassland structure as the cane matures.

The fields themselves support few other species as they are more or less intensively cultivated. Also, the denser sugarcane tends to shade out smaller ground cover species. Weedy species are largely confined to the margins of fields where they adjoin roadsides, watercourses, old fields, etc. These weedy species found associated with the fields are largely annuals and are adapted to the frequent disturbances related to cultivation practices. These include nut sedge (Cyperus rotundus), finger grass (Chloris barbata), common sowthistle (Sonchus oleraceus), pink bindweed (Ipomoea triloba), and hairy merremia (Merremia aegyptia).

Ruderal Vegetation

Ruderal or weedy, wayside vegetation occurs on areas which are not actively cultivated and which may occasionally to infrequently be maintained, if at all. These areas provide a constant weed seed source for invasion of the nearby cultivated fields.

Within the project site, three broad subtypes of ruderal vegetation may be recognized, depending on how often the area is disturbed. In areas which are occasionally maintained, as along the network of paved and unpaved roads and irrigation ditches, vegetation consists of a mixed grass-herb association. This association consists of a mixture of quick-growing grasses such as finger grass, buffel grass (Cenchrus ciliaris), Bermuda grass (Cynodon dactylon), and hurricane grass (Bothriochloa pertusa); annual herbaceous species such as a number of spurges

(Chamaesyce spp.), golden crown-beard (Verbesina encelioides), coat buttons (Tridax procumbens), and spiny amaranth (Amaranthus spinosus); and vines which tend to form low, tangled mats such as wild bittermelon (Momordica charantia) and pink bindweed. Locally, plants of the prostrate indigo (Indigofera suffruticosa) form large mats alongside Geiger Road. These roadside and ditch areas are periodically subjected to herbicide treatment and/or mowing.

Areas which have not been disturbed or cleared for sometime, such as old fields and Kaloi Channel as well as other drainages or low-lying areas, support a mixed grass-shrub association. Here, the grass species tend to be largely perennial and are taller; these include two species of Panicum and, where the soil is moist, California grass (Brachiaria mutica). Woody shrubs and smaller subshrubs include buddleia (Buddleia asiatica), two species of Pluchea, castorbean (Ricinus communis), 'ilima (Sida fallax), 'uhaloa (Waltheria indica var. americana), ma'o (Abutilon grandifolium), and rattlepod (Crotalaria incana). Occasionally, small clumps of koa-haole (Leucaena leucocephala) shrubs, 3 to 6 ft. high, are encountered. A varied assortment of weedy herbaceous species can be found here; these commonly include Spanish needle (Bidens pilosa), various spurges, cheeseweed (Malva parviflora), red-flowered emilia (Emilia fosbergii), common sowthistle, and two species of Amaranthus.

Locally abundant along the Kaloi Drainage Channel is coccinea (Coccinea grandis), a member of the Cucumber (or Squash) Family, recently introduced into the islands. It has spread rather rapidly into dry to moist lowland situations. The bright red fruits, about the size of a gherkin or sweet pickle, are eaten by the red-vented bulbul (Pycnonotus cafer) which then spread the seeds. Coccinea is an aggressive species and many shrubs and small trees as well as powerline poles along the drainageway have been quickly enshrouded by this vine.

On the makai side of Ft. Weaver Road are several large greenhouses which are used for a plant nursery operation. This nursery is slowly being phased out and, as a result, the grounds around the greenhouses have become overgrown, and, in many places, supports a grass-scrub association. Abandoned vegetable gardens of former employees still contain plants of yardlong beans (Vigna unguiculata), okra (Abelmoschus esculentus), eggplant (Solanum melongena), etc.

The third ruderal subtype is a scrub composed primarily of koa-haole with scattered trees of kiawe (Prosopis pallida) and 'opiuma (Pithecellobium dulce). These scrub areas, as along the OR&L easement and rock piles scattered through the cane fields, appear to be very rarely disturbed and the woody species predominate. The koa-haole usually forms an open scrub (about 50% cover) and may vary from 6 to 12 ft. in height. On top of rock piles, green panic grass (Panicum maximum var. trichoglume) is abundant and forms a fairly dense cover, up to 3 ft. high, between the koa-haole shrubs. Chinese violet (Asystasia gangetica) and lion's ear (Leonotis nepetaefolia) as well as the endemic 'anuanu vine (Sicyos microcarpa) are locally common in these areas.

Along the OR & L easement, Chinese violet is again also locally common along with buffel grass, 'ilima, Guinea grass (Panicum maximum), and coccinea. Other shrub and tree species found along the easement include Christmas berry (Schinus terebinthifolius), pluchea (Pluchea symphytifolia), klu (Acacia farnesiana), and Chinese banyan (Ficus microcarpa).

DISCUSSION AND RECOMMENDATIONS

The proposed 'Ewa Gentry project is not expected to have a significant impact on the botanical resources of the site, nor is it expected to have a significant cumulative impact on the flora of the general 'Ewa region.

Because the project site and the 'Ewa Plain area in general have been disturbed for such a long period of time and most of the land actively cultivated and, in some places, urbanized, there is little of botanical interest left. Areas which contain native plant communities are few and are confined to the limestone or karst topography along the coastal margin.

The kinds of species found associated with the cultivated fields and ruderal or weedy situations on the project site can be found throughout the 'Ewa Plain area wherever sugarcane cultivation is practiced. Other recent botanical studies in the 'Ewa Plain area have produced similiar checklists of plants and findings as this study.

As in the greater portion of the 'Ewa District, introduced or extotic species are the major components of the vegetation on the 'Ewa Gentry site. Of a total of 127 plant species inventoried (see Appendix A), 114 or 90% are introduced species; 7 (6%) are indigenous, i.e., native to the islands and elsewhere; 1 (0.1%) is endemic, i.e., native only to the islands; and 5 (3.9%) are of early Polynesian origin. Of the native species, the indigenous taxa are found throughout the islands (and elsewhere) in similiar environmental habitats. Some, like the 'uhaloa, popolo (Solanum nigrum), and koali (Ipomoea cairica) are considered rather "weedy" natives as they favor more or less disturbed sites for establishment. The only endemic species, the 'anuanu or Sicyos microcarpus, is an annual vine which is widely distributed along the lowlands areas from 'Ewa to Mokule'ia. It is especially abundant behind the Mokule'ia coastline and along the Kealia cliffs during the rainy season.

No listed, proposed or candidate threatened and endangered plant species designated by the federal and/or state governments (U.S. Fish and Wildlife Service 1980; Herbst 1987) are found on the project site. Also, no rare plants (Fosberg and Herbst 1975) or sensitive native plant communities occur on the site.

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APPENDIX A. PLANT SPECIES LIST. 'EWA GENTRY RESIDENTIAL COMMUNITY, 'EWA DISTRICT, O'AHU.

A list of all the vascular plants found on the project site follows. The flowering plants are divided into Monocots and Dicots. Within each of these subgroups, the plants are arranged alphabetically by family, genus, and species. For each species, the scientific name with author citation is given; an accepted English or Hawaiian name is provided, when known; and the biogeographic status is indicated by a letter code. The presence (+) or absence (-) of a species within each of two vegetation types recognized on the project site is also provided. Taxonomy and nomenclature of the flowering plants follows Wagner et al. (in prep.).

An explanation of the abbreviations used (other than author citation) is provided below:

SCIENTIFIC NAME

c.f. = similiar to a certain taxa
cv. = cultivar
s.l. = in a broad sense (sensu lato)
subsp. = subspecific level
sp. = correct species name not determined due to insufficient material
var. = variety

STATUS

E = endemic, native only to the Hawaiian Islands
I = indigenous, considered native to the islands but also found elsewhere
P = Polynesian, not native, thought to have been introduced by the early Polynesians
X = exotic or introduced, not native, brought to the islands after Western contact either intentionally or accidentally

VEGETATION TYPES (see text for description)

cf = cultivated fields

r = ruderal vegetation

SPECIES LIST

SCIENTIFIC NAME	COMMON NAME	BIOGEOGRAPHIC STATUS	VEG. TYPE cf	VEG. TYPE r
MONOCOTS				
Araceae				
Colocasia esculenta (L.) Schott	taro	P	-	+
Commelinaceae				
Commelina benghalensis L.	purple day flower	X	-	+
Commelina diffusa N.L. Burm.	blue day flower	X	-	+
Cyperaceae				
Cyperus rotundus L.	nut sedge, nutgrass	X	+	+
Gramineae				
Bothriochloa aristata Poir.	Wilder grass	X	-	+
Bothriochloa pertusa (L.) A. Camus	hurricane grass	X	-	+
Bothriochloa sp.		X	-	+
Brachiaria mutica (Forsk.) Stapf	California grass	X	+	+
Cenchrus ciliaris L.	buffel grass	X	-	+
Cenchrus echinatus L.	sandbur	X	-	+
Chloris barbata (L.) Sw.	finger grass	X	+	+
Chloris radiata (L.) Sw.	plush grass	X	-	+
Coix lachryma-jobi L.	Job's tears	X	-	+
Cymbopogon citratus (DC. ex Nees) Stapf	lemon grass	X	-	+

SCIENTIFIC NAME	COMMON NAME	STATUS	cf	r
Cynodon dactylon (L.) Pers.	Bermuda grass	X	+	+
Digitaria insularis (L.) Mez ex Ekman	sour grass	X	-	+
Digitaria sp.	crab grass	X	-	+
Echinochloa crus-galli (L.) Beauv.	barnyard grass	X	-	+
Eleusine indica (L.) Gaertn.	goose grass	X	-	+
Eragrostis cilianensis (All.) Vignolo-Lutati	stink grass	X	-	+
Eragrostis tenella (L.) Beauv. ex R. & S.	Japanese love-grass	X	-	+
Leptochloa uninervia (Presl.) Hithc. & Chase	leptochloa	X	-	+
Panicum maximum Jacq.	Guinea grass	X	-	+
Panicum maximum Jacq. var. trichoglume Eyles ex Robyns	green panic grass	X	-	+
Paspalum conjugatum Berg.	Hilo grass	X	-	+
Paspalum dilatatum Poir.	Dallis grass	X	-	+
Rhynchelytrum repens (Willd.) C. E. Hubb.	Natal redtop	X	-	+
Saccharum officinale L.	sugar cane	P	+	+
Setaria verticillata (L.) Beauv.	bristly foxtail	X	-	+
Zea mays L.	corn	X	+	+
Liliaceae s.l.				
Aloe sp.	aloe	X	-	+
Musaceae				
Musa x paradisiaca L.	banana, mai'a	P	-	+
Palmae				
cf. Roystonea sp.	royal palm	X	-	+

SCIENTIFIC NAME	COMMON NAME	STATUS	cf	r
DICOTS				
Acanthaceae				
Asystasia gangetica (L.) T. Anders.	Chinese violet	X	-	+
Amaranthaceae				
Achyranthes aspera L.	achyranthes	X	-	+
Alternanthera pungens H.B.K.	khaki weed	X	-	+
Amaranthus spinosus L.	spiny pigweed	X	+	+
Amaranthus viridis L.	slender amaranth	X	+	+
Anacardiaceae				
Schinus terebinthifolius Raddi	Christmas berry	X	-	+
Bignoniaceae				
Spathodea campanulata Beauv.	African tulip tree	X	-	+
Buddlejaceae				
Buddleia asiatica Lour.	buddleia	X	-	+
Cactaceae				
Opuntia cochenillifera (L.) Mill.	cochineal cactus	X	-	+
Opuntia ficus-indica (L.) Mill.	panini	X	-	+
Capparaceae				
Cleome gynandra L.	spider plant	X	+	+

SCIENTIFIC NAME	COMMON NAME	STATUS	cf	r
Caricaceae				
Carica papaya L.	papaya	X	-	+
Chenopodiaceae				
Atriplex suberecta Verdoorn	saltbush	X	-	+
Chenopodium murale L.	chenopodium	X	-	+
Compositae				
Bidens pilosa L.	Spanish needle	X	+	+
Calyptocarpus vialis Less.	hierba del caballo	X	-	+
Conyza bonariensis (L.) Cronq.	hairy horseweed	X	-	+
Eclipta alba (L.) Hassk.	eclipta	X	-	+
Emilia fosbergii D.H. Nicolson	red-flowered emilia	X	-	+
Emilia sonchifolia (L.) DC.	purple-flowered emilia	X	-	+
Gnaphalium purpureum L.	purple cudweed	X	-	+
Lactuca serriola L.	prickly lettuce	X	-	+
Lapsana communis L.	nipplewort	X	-	+
Pluchea indica (L.) Less.	pluchea	X	-	+
Pluchea symphytifolia (Miller) Gillis	pluchea	X	-	+
Sonchus oleraceus L.	common sowthistle	X	+	+
Tridax procumbens L.	coat buttons	X	+	+
Verbesina encelioides (Cav.) B. & H.	golden crownbeard	X	-	+
Convolvulaceae				
Ipomoea alba L.	moon flower	X	-	+
Ipomoea batatas (L.) Lam.	sweet potato, 'uala	P	-	+

SCIENTIFIC NAME	COMMON NAME	STATUS	cf	r
Ipomoea cairica (L.) Sweet	koali	I	-	+
Ipomoea indica (J. Burm.) Merr.	koali awahi'a	I	-	+
Ipomoea obscura (L.) Ker-Gawl.	yellow bindweed	X	+	+
Ipomoea triloba L.	pink bindweed	X	-	+
Jacquemontia ovalifolia (Choisy) H. Hallier	pa'u-o-Hi'i'aka	I	-	+
Merremia aegyptia (L.) Urban	hairy merremia	P?	-	+
Crassulaceae				
Kalanchoe cv. 'Houghtonii'	coconut plant	X	-	+
Cruciferae				
Brassica oleracea L.	collard	X	-	+
Coronopus didymus (L.) Sm.	wart cress	X	-	+
Cucurbitaceae				
Citrullus lanatus (Thunb.) Matsum. & Nakai	watermelon	X	-	+
Coccinea grandis (L.) Voigt	coccinea	X	+	+
Cucumis dipsaceus Ehrenb. ex Spach.	wild cucumber	X	-	+
Cucurbita maxima Duch.	winter squash, pumpkin	X	-	+
Lagenaria siceraria (Molina) Standl.	bottle gourd	X	-	+
Momordica charantia L.	bittermelon	X	+	+
Sechium edule (Jacq.) Swartz	chayote	X	-	+
Sicyos microcarpus H. Mann	sicyos, 'anunu	E	-	+
Euphorbiaceae				
Chamaesyce hirta (L.) Millsp.	spurge	X	+	+

SCIENTIFIC NAME	COMMON NAME	STATUS	cf	r
Chamaesyce hypericifolia (L.) Millsp.	spurge	X	-	+
Chamaesyce prostrata (Ait.) Small	spurge	X	-	+
Chamaesyce thymifolia (L.) Millsp.	spurge	X	-	+
Euphorbia cyathophora Murr.	summer poinsettia	X	-	+
Euphorbia lactea Haw.	milk bush	X	-	+
Euphorbia tirucalli L.	pencil plant	X	-	+
Phyllanthus debilis Klein ex Willd.	phyllanthus	X	-	+
Ricinus communis L.	castorbean	X	+	+
Labiatae				
Leonotis nepetaefolia (L.) R. Br.	lion's ear	X	-	+
Leguminosae				
Acacia farnesiana (L.) Willd.	klu	X	-	+
Crotalaria incana L.	rattlepod	X	+	+
Desmanthus virgatus (L.) Willd.	virgate mimosa	X	-	+
Indigofera spicata Forssk.	prostrate indigo	X	-	+
Leucaena leucocephala (Lam.) deWit	koa-haole	X	-	+
Macroptilium lathyroides (L.) Urb.	wild bush-bean	X	-	+
Pithecellobium dulce (Roxb.) Benth.	'opiuma	X	-	+
Prosopis pallida (Humb. & Bonpl. ex Willd.) H.B.K.	kiawe	X	-	+
Vigna caracalla (L.) Verdc.	snail flower	X	-	+
Vigna unguiculata (L.) Walp. subsp. sesquipedalis (L.) Verdc.	asparagus bean	X	-	+
Malvaceae				
Abelmoschus esculentus (L.) Moench	okra	X	-	+

SCIENTIFIC NAME	COMMON NAME	STATUS	cf	r
Abutilon grandifolium (Willd.) Sweet	ma'o	X	-	+
Abutilon incanum (Link) Sw.	abutilon	I?	-	+
Gossypium barbadense L.	Sea Island cotton	X	-	+
Malva parviflora L.	cheeseweed	X	+	+
Malvastrum coromandelianum (L.) Garcke	malvastrum	X	+	+
Sida fallax Walp.	'ilima	I	-	+
Sida rhombifolia L.	sida	X	-	+
Sida spinosa L.	sida	X	-	+
Moringaceae				
Moringa oleifera Lam.	moringa	X	-	+
Moraceae				
Ficus microcarpa L. f.	Chinese banyan	X	-	+
Nyctaginaceae				
Boerhavia coccinea Mill.	boerhavia	X	-	+
Oxalidaceae				
Oxalis corniculata L.	yellow wood-sorrel	X	+	+
Oxalis corymbosa DC.	pink wood-sorrel	X	+	+
Papaveraceae				
Argemone mexicana L.	prickly poppy	X	-	+

SCIENTIFIC NAME	COMMON NAME	STATUS	cf	r
Passifloraceae				
Passiflora foetida L.	love-in-a-mist	X	+	+
Plantaginaceae				
Plantago major L.	common plantain	X	-	+
Portulacaceae				
Portulaca oleracea L.	common purslane	X	+	+
Solanaceae				
Datura stramonium L.	Jamestown weed, jimson weed	X	-	+
Lycopersicon pimpinellifolium Mill.	currant tomato	X	-	+
Lycopersicon esculentum Mill.	tomato	X	-	+
Solanum americanum Mill.	popolo	I?	-	+
Solanum melongena L.	egg plant	X	-	+
Solanum seaforthianum Andr.	potato vine	X	-	+
Sterculiaceae				
Waltheria indica L. var. *americana* (L.) R. Br. ex Hosaka	'uhaloa, hi'aloa	I?	-	+
Tiliaceae				
Corchorus olitorius L.	jute	X	-	+
Zygophyllaceae				
Tribulus terrestris L.	puncture vine	X	-	+

APPENDIX E

Birds and Mammals of the Ewa Gentry Region

By Andrew J. Berger

This report was prepared on instructions received over a period of six weeks from David B. Bills of Gray, Hong, Bills & Associates and from James H. Pedersen, Planning Consultant. In my proposal, dated November 10, 1987, I had stated that I would prepare a report covering the terrestrial vertebrate animals of the project area. In his letter Notice to Proceed, dated December 30, 1987, however, Mr. Bills called for my preparing a "bird and mammals survey," which I am doing in this report.

A site visit was made with Mr. Pedersen on December 21, 1987. Additional field studies were made on December 23, 1987. These were deemed to be adequate because I have made several other studies in the West Loch, Pearl Harbor, region during the past six months and have made repeated field trips to this general area for a period of more than 20 years.

The Habitat

The habitat of the entire Ewa region has been drastically disturbed for well over 100 years. There is no semblance of any endemic ecosystem anywhere near this lowland region of Oahu. A large percentage of the proposed project site is now devoted to growing sugarcane. In the surrounding areas are many species of introduced trees, shrubs, vines, and grasses.

Birds

Three groups of birds are found in the Hawaiian Islands: 1. introduced or alien, 2. indigenous or native, and 3. endemic. The vast majority of all birds found in the general region of the proposed project are introduced species.

I. Introduced birds

More than 170 species of alien birds have been introduced to the Hawaiian Islands (Berger, 1981). The following have been reported in the project site and the surrounding Ewa habitat.

A. Family Ardeidae, Herons and Egrets

1. Cattle Egret (Bulbucus ibis). This species was imported to Hawaii from Florida to aid "in the battle to control house flies, horn flies, and other flies that damage hides and cause lower weight gain in cattle" (Breese, 1959). A number of birds were released on Oahu in 1959 and 22 additional birds were released during July 1961. Thistle (1962) reported that the population of egrets on Oahu exceeded 150 birds by July 1962; the population has increased greatly since that time. Personnel of the State Division of Forestry and Wildlife counted 621 egrets on Oahu during their January 1986 census (Walker, et al., 1986); 988 Cattle Egrets were reported on the Honolulu Christmas Count of the Hawaii Audubon Society (Pyle, 1987), and 386 egrets were reported in the Waipio sector during the same period (Bremer, 1987). Although they do not forage in well-established cane fields, Cattle Egrets do sometimes forage for food on cane haul roads and fallow fields. They are common throughout the project area.

B. Family Columbidae, Pigeons and Doves

2. Feral Pigeon or Rock Dove (Columba livia). The pigeon probably was the first exotic bird introduced to the Hawaiian Islands; their importation has been traced back to 1796. Schwartz and Schwartz (1949) found heavy parasitism of feral pigeons by tapeworms, and they stated that the tapeworm infestation retards proper nutrition and "occludes the intestine, produces undesirable toxins, and hinders breeding." Navvab Gojrati (1970) reported infection by bird malaria, Haemoproteus, and Leucocytozoon in birds at the Honolulu Zoo. Kishimoto and Baker (1969) reported finding the fungus Cryptococcus neoformans in 13 out of 17 samples of pigeon droppings collected on Oahu. The full significance of their findings has not been determined, but, in man, this fungus causes a chronic cerebrospinal meningitis; Hull (1963:468) remarked that "in all but the cutaneous forms the prognosis is very grave." I saw a small group of pigeons flying over the cane fields and other birds in surrounding areas.

3. Spotted or Lace-necked Dove (Streptopelia chinensis). Also called the Chinese Dove, this Asian species was released in the Hawaiian Islands at an early date; the exact date is unknown, but the birds are said to have been very common on Oahu by 1879. Although this species occurs were annual rainfall exceeds 100 inches per year, the highest densities are found in drier areas, especially where the introduced kiawe or mesquite(Prosopis pallida) is one of the dominant

plants. Schwartz and Schwartz (1949), for example, found densitities as high as 200 birds per square mile in dry areas on Molokai. This dove is found throughout the Ewa region, and frequently feeds on weed seeds along cane haul roads.

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

4. Barred Dove or Zebra Dove (Geopelia striata). This species is native to the Orient and Australia. It is said that this dove was introduced to Hawaii sometime after 1922 (Bryan, 1958). It has been a very successful species and now is common to abundant on all of the inhabited islands. The Zebra Dove also prefers the drier areas. Schwartz and Schwartz (1949) reported densities as high as 400 to 800 birds per square mile in some areas on Oahu: for example, Barbers Point to Makaha. The Zebra Dove is an abundant species in the Ewa region, frequently feeding in mixed flocks with the Lace-necked Dove on weed seeds along cane haul road.

Both species of introduced doves are classified as game birds in Hawaii. One study of the food habits of the Zebra Dove in Hawaii revealed that the diet consists of 97 percent seeds and other plant materials; the 3 percent animal matter included several species of beetles, weevils, and wireworm larvae.

C. Family Tytontidae, Barn Owls

5. The first Barn Owls (Tyto alba pratincola) were imported from California and released in Hawaii (at Kukuihaele, island of Hawaii) during April 1958. Barn Owls were released at Hauula, Oahu, on two different occasions. Seven birds were imported from the San Diego Zoo and released during September 1959; 11 additional birds were imported from the San Antonio Zoo, Texas, and released at Hauula during October 1960 (Tomich, 1962). As with the mongoose during the last century, Barn Owls were introduced in the hope that they would prey on the rats that were destructive to sugarcane. No food habits studies have been conducted of Barn Owls on Oahu, but Tomich (1971) found that on Hawaii island almost 90 percent of the food consisted of house mice. He commented that, although the Barn Owl sometimes feeds on rats, it is not likely a significant factor in the economic control of rats in Hawaii. And, Byrd and Telfer (1980) reported that Barn Owls had killed more than 100 seabirds and their chicks on Kauai and Kaula Rock.

No study of the spread of the Barn Owl from the Hauula release site since 1960 has been conducted, but the birds have been seen or found dead or injured in both windward and leeward sides of the island. This owl is nocturnal in habits, and I did not see any during my daytime field studies. Ms. Winona Char, however, told me that she had seen a Barn Owl in the kiawe thickets near the project site in the past.

D. Family Alaudidae, Larks

6. Eurasian Skylark (Alauda arvensis). The first Skylarks were brought to Hawaii from England in 1865; others were brought from New Zealand (where they had previously been introduced) in 1870.Hænshaw (1904) wrote that the introduction of the Skylark to Oahu had been "a great success", and that some birds had beem released on the windward side of Hawaii. Skylarks were fairly common in suitable habitat on Oahu 20 years ago, but have become increasingly uncommon in many areas as the years have passed. The Waipio region continues to provide good habitat for the Skylark and 17 birds were counted there during December 1986 (Bremer, 1987). I heard one bird in full flight song on December 21, 1987, near the project site.

E. Family Pycnonotidae, Bulbuls. Although all members of this Old-world family are listed as "prohibited entry" by the State Quarantine Division of the Department of Agriculture, two species are now well established on Oahu. The history of the spread of the Red-vented Bulbul (Pycnonotus cafer) has been discussed by Berger (1975b, 1981) and Williams (1987); the status of the Red-whiskered Bulbul has been discussed by van Riper, van Riper, and Berger (1979).

The Red-vented Bulbul now occurs in the Ewa region. The birds are a scourge to both fruit and flower growers. The birds eat buds, flowers, and ripe fruits of many kinds.

F. Family Turdidae, Thrushes and Bluebirds

8. White-rumped Shama (Copysychus malabaricus). Shama

is the Indian name for this thrush, which is native to India, Nepal, Burma, Malyasia, and throughout Indochina. The Hui Manu imported Shamas in 1940 and released them in Nuuanu Valley "and at some homes in the 2400 block on Makiki Heights road" (Harpham, 1953). The Shama is now common on both the windward and leeward sides of Oahu. The birds prefer lush vegetation, but I heard at least two birds singing in thickets near the cane fields.

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

9. Japanese White-eye (Zosterops japonicus). Long a favorite cage bird in the Orient, this species was first introduced by the Territorial Board of Agriculture and Forestry in 1929 (Caum, 1933). Later importations were made by the Hui Manu. The Japanese name is Mejiro, and Mejiro clubs held singing competitions with these birds. The White-eye has been a remarkably successful introduction and this species undoubtedly is now the most abundant song bird in the Hawaiian Islands. These birds occur from sea level to 10,000 feet elevation on Maui and Hawaii; these inhabit near-desert areas (e.g., Kawaihae, Hawaii) and those with an annual rainfall of more than 300 inches. The White-eye is very common throughout the project site and surrounding areas.

H. Family Sturnidae, Mynas and Starlings

10. Common Indian Myna (Acridotheres tristis). This myna is native to Sri Lanka, India, Nepal, and adjacent regions. It was "introduced from India in 1865 by Dr. William Hillebrand to combat the plague of army worms that was ravaging the pasture

lands of the islands. . . . reported to be abundant in Honolulu by 1879, it now is extremely common throughout the Territory" (Caum, 1933). The Myna continues to be common on Oahu and it occurs in the vicinity of man and his buildings, on golf courses, and throughout the Ewa region.

I. Family Ploceidae, Weaverbirds and Their Allies.

a. Subfamily Estrildinae, Waxbills

11. Orange-cheeked Waxbill (Estrilda melpoda). This waxbill is native to Central and West Africa. This popular cage bird has accidentally escaped in a number of areas on Oahu and may have been intentionally released in others. Breeding populations have been found in the Diamond Head area, Waipio, and West Beach. I have seen these birds feeding in sugarcane fields.

12. Red-eared or Common Waxbill (Estrilda troglodytes). This is another African waxbill that is a common cage bird. This species was first reported in the wild at Diamond Head in 1965. Since that time, this species has been seen in such widely separated areas as Kuilima near Kahuku, West Beach, and the Waipio region. Like the preceding species, the Common Waxbill often inhabits sugarcane fields. Nothing has been published on the nesting activities of either of these waxbills in Hawaii.

13. Red Avadavat or Red Munia (Amandava amandava). Known as the Strawberry Finch in the petstore trade, Caum (1933) wrote that "it is not known with certainty just when these birds came to Hawaii but it was probably sometime between 1900 and 1910. Many were imported as cage birds during this period and it is supposed that the present population is derived from individuals escaped from captivity." Ord (1967) wrote that the Strawberry

Finch "can usually be found near grassy areas around sugar cane fields. . . in the lowlands about Pearl Harbor." The birds still inhabit this area, where 57 birds were counted during the December 1986 Hawaii Audubon Society Christmas Count (Bremer, 1987). The birds also have spread into the Ewa area and to the West Beach sugarcane fields.

14. Nutmeg Mannikin or Ricebird (Lonchura puntulata). Also known as the Spotted Munia, this Asian species was released in Hawaii by Dr. William Hillebrand about 1865 (Caum, 1933). Caum wrote that the ricebird "feeds on the seeds of weeds and grasses and does considerable damage to green rice." Rice is no longer grown in Hawaii, but the Ricebird has recently become a serious pest by eating the seeds of sorghum (to be discussed under the House Finch). This is another abundant species wherever there are weed seeds, and I saw several small flocks along cane haul roads and in adjoining habitat.

15. Black-headed Munia (Lonchura malacca atricapilla). This bird also is called the Chesnut Mannikin and the Black-hooded Nun. The species was first recorded in the wild by Udvardy (1960), who observed 10 adults and 15 juvenile birds near West Loch, Pearl Harbor, on April 26, 1959. Ord (1967) said that the sppecies was abundant "in open grassy areas around Middle Loch and West Lochs of Pearl Harbor." The species has spread since that time (e.g., to the West Beach area) and still is abundant in the WaipioWest Loch region. More than 200 birds were counted during the Audubon Society Christmas Count during December 1986, and the species has spread to the Ewa region.

16. Java Sparrow (Padda oryzivora). Caum (1933) said that this species may have been introduced to the islands by Dr. William Hillebrand about 1865, and others may have been brought in about 1900. These birds did not survive, however. Throp (1969) reported that Java Sparrows nested and raised young on Diamond Head during late 1968 or early 1969. The increase in numbers and their range expansion since that time have been impressive (Berger, 1975a). Pyle (1987) reported that 754 Java Sparrows were counted in the December 1986 Audubon Society count, which covered only a small part of Oahu. The birds have now moved into the Ewa Beach area.

b. Subfamily Passerinae, Sparrow Weavers

17. House Sparrow (Passer domesticus). Also called the English Sparrow, this species was first imported to Oahu in 1871, when nine birds were brought from New Zealand (where the species had previously been introduced from England). Caum (1933) wrote that "whether or not there were further importations is not known, but the species was reported to be numerous in Honolulu in 1879." The House Sparrow in North America (first introduced to Brooklyn, New York, in 1852) became a serious pest and tens of thousands of dollars were spent in attempting to control the population (Dearborn, 1912). This sparrow apparently never became a pest in Hawaii; it is omnivorous in diet eating weed seeds as well as insects and their larvae. House Sparrows are common around man's buildings and in outlying areas.

J. Family Fringillidae, Cardinals, Buntings, and New World Sparrows

a. Subfamily Emberizinae

18. Red-crested Cardinal (Paroaria coronata). Although this species traditionally has been called the Brazilian Cardinal in Hawaii, the species has a much larger native range in Uruguay, Paraguay, Brazil, and parts of Bolivia and Argentina. This cardinal was released in Hawaii on several occasions between 1928 and 1931 (Caum, 1933). The Red-crested Cardinal is a common species both in rural and residential regions. It is not an inhabitant of cane fields but is common in kiawe thickets that border some of the fields.

b. Subfamily Cardinalinae

19. Cardinal (Cardinalis cardinalis). This species has been given a number of vernacular names: e.g., Virginia Cardinal, Kentucky Cardinal, Kentucky Redbird. Its native range is the eastern part of North America, east of the plains and northward into Ontario. The Cardinal was released several times in Hawaii between 1929 and 1931 (Caum, 1933). The species is common in some lowland areas, and is a characteristic bird of the leeward section of Oahu, finding the dry introduced vegetation (e.g., kiawa, koa haole) suitable habitat for its annual cycle. It is not an inhabitant of the full-grown cane fields but may forage along the edges of the fields.

c. Subfamily Carduelinae.

20. House Finch (Carpodacus mexicanus frontalis). Also known as the Papayabird in Hawaii, the House Finch was introduced from California "prior to 1870, probably from San Francisco"

(Caum,1933). The House Finch is now an abundant species on all of the islands, in both rural and urban areas, and probably is the second most common song bird in the islands. Although the birds sometimes eat overripe papaya andother soft fruits, the House Finch is predominantly a seed-eater. House Finches and Ricebirds caused great damage to experimental sorghum crops planted on Kauai and Hawaii during 1971-1972. "A report by the Senate Committee on Zoology, Environment, and Recreation says ricebirds and linnets [House Finches] caused a 30 to 50 percent loss in the sorghum fields at Kilauea on Kauai last year. . . . Seed-eating birds at Kohala ate about 50 tons of sorghum grain in a 30-acre experimental field that was expected to produce 60 tons" (Honolulu Advertiser, March 14, 1972, page B-2). Hence, the growing of small grain crops in the islands is not a promising potential for the much talked about "diversified agriculture" in the State. Other seed-eating birds also have become established on one or more islands during the past 15 or 20 years. The House Finch is widely distributed throughout the Ewa Beach region.

II. Indigenous Birds

These are species that are native to the Hawaiian Islands but whose total range includes other islands in the Pacific Basin or North America. These are the Black-crowned Night Heron, 22 species of seabirds, and a number of migratory species that nest in North America or Siberia and which spend their winter or nonbreeding season in the islands.

A. Family Ardeidae, Herons and Egrets

1. Black-crowned Night Heron (Nycticorax n. hoactli). This subspecies has a breeding range that includes Hawaii and the Western Hemisphere, extending from Washington and Oregon south to northern Chile and south-central Argentina. Because the Hawaiian birds are considered the same subspecies as the mainland birds, the species is not classified as an endangered species, even though the future of the species in Hawaii depends on the preservation of suitable wetland areas. Herons inhabit marshes, swamps, and rivers. They feed on a wide variety of aquatic and terrestrial life: e.g., fish, frogs, crayfish, mice, and insects. In Hawaii, however, this heron is known also to eat the downy young of seabirds and perhaps of the endangered Hawaiian waterbirds (Berger, 1981). There is no habitat for this heron in the project site, although the species is found in the West Loch region of Pearl Harbor.

B. Seabirds

None of these birds are found in or near the project site.

C. Migratory Species

The most conspicuous of these is the Lesser Golden Plover (Pluvialis dominca fulva), which occurs from sea level to nearly 10,000 feet elevation on Hawaii and Maui during the winter season. This plover frequents lawns in residentail areas, golf courses, weedy pastures, open areas in the mountains, mud flats, and cane haul roads. I saw several plovers along cane haul roads.

III. Endemic Birds

These are birds that are restricted to the Hawaiian Islands; they are unique to the islands. At least 40 percent of these unique birds already are extinct, and another 40 percent are now classified as endangered or threatened with extinction. Most of these endangered species are forest birds, and very few are left on the island of Oahu. There are none anywhere near the Ewa plain.

Four species of endangered Hawaiian waterbirds occur in the Pearl Harbor region of Oahu: Koloa or Hawaiian Duck (Anas wyvilliana), Hawaiian Gallinule or 'Alae 'Ula (Gallinula chloropus sandvicensis), Hawaiian Coot or 'Alae Ke'oke'O (Fulica amdericana alai), and the Hawaiian Stilt or Ae'O (Himantopus mexicanus knudseni).

It is because of these endangered waterbirds that we can point out that the only concern for the proposed project deals with any possible detrimental effects on the bird sanctuaries in the West Loch of Pearl Harbor. For example, when a Chevron Oil Company jet fuel pipeline ruptured on May 13, 1987, some 1,000 gallons of fuel were pumped into the Waiawa spring, from which water was pumped into the Waiawa NWR. This pollution caused the death of several waterbirds and caused the desertion of at least six Hawaiian Stilt nests (Stephen Berendzen, in Stine, 1987; Honolulu Star-Bulletin, May 14, May 15, 1987). We mention this point because of item 2.3.4. in the Project

Description: "To the east of Fort Weaver Road, all drainage generally flows towards the West Loch of Pearl Harbor. However, sump conditions exist between the project boundary and West Loch."

The Pueo or Hawaiian Owl (Asio flammeus sandwichensis) is a permanent endemic resident on all of the main islands in the Hawaiian chain. The birds are tolerant of wide climatic conditions (Richardson and Bowles, 1964). The Division of Forestry and Wildlife considers the Pueo to be an endangered species on Oahu but not on the other islands. The Pueo differs from most other owls in that it is diurnal in habit; hence, they are seen far more often than is the nocturnal Barn Owl. Scott et al. (1986) wrote that the Pueo "was most often seen in grasslands, shrublands, and montane-parklands." I did not see any Hawaiian Owls during my field trips either for this project or for others in the general region during the past six months. However, two owls were reported in the Waipio area during December 1986 (Bremer, 1987). The Pueo is not an inhabitant of sugareane fields. Moreover, they forage over a large area, and it is my firm conviction that the proposed project would not have any adverse effects on any owls that do inhabit the Ewa region.

The Mammals

I. Endemic Mammals

The only endemic land mammal in Hawaii is the Hawaiian

bat (Lasiurus cinerus semotus), a subspecies of the North American hoary bat. The Hawaiian bat occurs primarily on the islands of Hawaii and Kauai (Tomich, 1969; Kramer, 1971; Ten Bruggencate, 1983). I know of no evidence that there is a resident population on the island of Oahu.

II. Introduced Mammals

All of these introduced species of mammals in Hawaii have proven to be highly destructive to man, his buildings, products, or agricultural crops and/or to the native forests and their animal lice. None is an endangered species and none is of concern as far as detrimental effects resulting from this, or any other, proposed project. It would, in fact, be a great boon to the islands if it were possible to exterminate all of them.

With the possible exception of the house mouse (Mus musculus), all of the smaller alien mammals prey on birds their eggs or young. These small mammals include the roof rat (Rattus rattus), Polynesian rat (Rattus exulans), Norway rat (Rattus norvegicus), and the small Indian mongoose (Herpestes auropunctatus), as well as feral cats (Felis catus), and feral dogs (Canis familiaris). The mongoose is diurnal in habits, and I saw several during my field studies. Because the rodents are serious pests, I did not set night traplines in order to sample the population. It is reasonable to assume that all of them occur in the project site (Tomich, 1969; Kramer, 1971).

Summary and Conclusions

1. A substantial portion of the proposed project site consists of sugarcane fields, in several stages of development. The remaining portion, plus adjacent lands, has a dense growth of exotic or alien trees, shrubs, vines, and grasses, especially as one approaches the shores of West Loch, Pearl Harbor. In its present condition, therefore, the area properly can be called a "waste land" in relation to the endemic or native vegetation and its animal life. In fact, the vegetation has been greatly disturbed in the entire region for well over 100 years.

2. There are no endemic Hawaiian forest birds in the project area or anywhere near it.

3. I have not seen the Pueo or Hawaiian Owl in the project area nor have I found any published records of its presence there. Nevertheless, I feel that the proposed project would have no serious adverse effects on whatever owls may inhabit this general region. They are not inhabitants of sugarcane fields nor of residential areas.

4. There is no habitat for any of the endangered Hawaiian waterbirds on the proposed project area. As pointed out on page 14 of this report, however, all necessary steps will have to be taken to prevent any kind of runoff that would find its way to the bird sancutaries in West Loch, Pearl Harbor.

5. None of the 20 species of introduced or alien birds found in the project area is an endangered species and a

number have proven to be serious pests in Hawaii. The destruction to sorghum crops by the Ricebird and the House Finch already has been discussed. The doves and the Myna have been implicated in spreading the seeds of such noxious plants as Lantana camara. The Red-vented Bulbul and the Japanese White-eye cause considerable damage to ornamental flowers and to fruit crops (Keffer, et al., 1976). The Barn Owl is known to eat birds on Kauai and probably on other islands. To be sure, some of the introduced birds apparently cause no damage to crops or to the endemic forest birds, and they do provide pleasure for many people. However, developement, including landscaping, would provide habitat for many of the introduced species.

6. All of the mammals that occur in the project region are introduced or alien mammals. Many of them are predators on birds, and and most of them are destructive to agriculture and forest lands and/or to man, his buildings and products. None of these animals is of any significance for an envirnmental impact assessment.

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APPENDIX F

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of
HAWAII

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JOSEPH KENNEDY
Archaeologist

January 6, 1988

Mr. David Bills
Gray, Hong, Bills & Associates
119 Merchant St.
Honolulu, Hawaii 96813

Dear Mr. Bills:

SUBJECT: Archaeological reconnaissance report concerning the proposed Ewa Gentry Project in Honouliuli, Oahu.

INTRODUCTION

At the request of your office, Archaeological Consultants of Hawaii, Inc. has conducted an on-site surface survey and has also reviewed archival documents relevant to the cultural history of the property in question. No above ground archaeological sites were located in this survey and related documents seem to indicate that subsurface recovery potentials will also be very limited, if not nonexistent.

PHYSICAL SETTING

The subject property is presently in sugarcane and corn. The land is flat and has been greatly disturbed by these agricultural activities. Water on the subject property passes through man made irrigation canals. There are clearing areas located throughout the subject property consisting of rock mounds of earth and boulders.

METHODOLOGY

The surface survey portion of this report was conducted by truck and on foot. The truck was used to drive through the many cane haul roads networking the property and to examine the boundaries from major roadways. The pedestrian portion involved an examination of the scattered mounds and the rare scraps of real estate not devoted to corn or sugarcane.

Prior to this examination, a consultation with Dr. Joyce Bath at the State of Hawaii, Department of Land and Natural Resources, Historic Sites Division took place. At this meeting the author outlined the procedures for the survey and archival search. Mention was made of certain geographic features that may appear on the property and be of archaeological interest. These features were not present.

The author also met with Mr. Charlie Okino of the State of Hawaii Survey Division to review the map archives for this area of the Ewa plain. The following maps were examined; State of Hawaii Land Court Application Maps, ND; Fire Control Map, prepared by the War Department, U.S. Army Corps of Engineers in 1922; The undated Fred Harvey Maps; The first State of Hawaii Tax Maps, prepared in 1930; The Malden map of 1825; the Alexander map of 1873 and the City and County Map of the area prepared in 1927, 1928 and 1930.

There are no Land Commission Awards for the subject property and in fact the entire Honouliuli ahupua'a (the largest on the island) was awarded in a single Royal Patent.

PREVIOUS ARCHAEOLOGICAL WORK IN THE AREA

To begin with, there has been no previous archaeological work on this particular piece of property. However, there must be mention of the fact that the old OR&L railroad bed/right of way forms a portion of the mauka boundary. This entire right of way has been placed on the Federal Register of Historic places.

In addition to this, there has been significant work conducted just south of this location at the Ewa Marine and at One'Ula, which is an Archaeological Disrtict and also designated as a National Register site. Towards the West Loch of Pearl Harbor and quite a ways east of the subject property some promising archaeological work is currently being conducted. At this writing, and for various reasons, the final results of these investigations are not available. Preliminary indications point to some historic graves in the area and some midden scatters that are consistant with habitation areas.

In terms of the ethnohistoric information available for this general area we know that the lands of Ewa were the residents of a class of chiefs descended from Liloa throught the maternal branch. Other ali'i left remarks of their preference for this land, and as is so often the case in Polynesia, this preference was connected to food. The abundance of shellfish and ponds coupled with a delicious local variety of taro (kai koi o Ewa) made Ewa famous.

As far as this section of Honouliuli is concerned, it seems that most of the reported six heiau and single Ko'a (known as Kaihuopalaai) were located near the One'Ula shoreline or along the west side of West Loch.

Vancouver anchored off the entrance to West Loch in 1793 and said:

> The part of the island opposite to us was low or rather moderately elevated, forming a level country between the mountains that compose the east and west ends of the island. This tract of land was of some extent but did not seem to be populous, nor to possesss any great degree of natural fertility; although we were told that that at a little distance from the sea, the siol is rich and all necessaries of life are abundantly produced.

DISCUSSION

Perhaps the most germane statement concerning the subject property was made by Lt. Malden, author of the 1825 map of the region referred to earlier in this report. Across this section of Ewa he wrote the words "Low, Uncultivated Plain." As indicated by the location of former heiau and ko'a, aboriginal activity seems to have been in coastal areas or along the shore of West Loch. This is, of course, where aquacultural opportunities were the greatest and therefore the most desirable habitation locations. It is likely that the famous taro fields were located along streams close to these preferred habitations.

While it has already been stated that no above ground structures of cultural interest remain on the subject property, archaeological concern must also extend to subsurface possibilities as well. There can be no doubt that historic plantation activities in this area have contributed much to the loss of any above ground structures that may have once existed here and also to significant landscape modification, however, it has also been demonstrated that subsurface deposits can still be present even after years of farming.

In order for these deposits to survive, it goes without saying that they had to exist in the first place. I do not believe that the site of the proposed development involves land that could be said to have a high, or even good chance of subsurface cultural retrieval. A good case can be made for the known aboriginal activities in this area to have centered along the attractive shorelines located south and west of the subject property. This is indicated by map information, and supported by ethnohistoric data and the location of now-destroyed sites.

Not a single map of the area indicated anything more than the presence of a Filipino Camp once located near the intersection of the OR&L bed and the first cane road west of Ft. Weaver Road. There is no trace of this camp today. Given its somewhat recent historical appearance, and supposed lack of deeply buried strata, we may assume that there is little left in terms of subsurface possibilities.

In consideration of the data presented above, I do not believe that any additional archaeological work is necessary for this property. As always, should human remains appear in the grubbing or grading portions of this project, work should be interrupted and an archaeologist contacted.

Should there be any questions concerning this brief report, please feel free to contact me.

Sincerely,

Joseph Kennedy

APPENDIX G

SOCIO-ECONOMIC IMPACT EVALUATION
EWA GENTRY PROJECT
EWA, OAHU, HAWAII

January, 1988

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SECTION 1.0

INTRODUCTION

1.1 PURPOSE

The purpose of this report is to identify potential social and economic impacts which are expected with the development of the proposed Ewa Gentry project.

1.2 SCOPE AND METHODOLOGY

The focus of the social impact analysis is to initially identify historical community attitudes and structure. Subsequently, forecasts are made of anticipated social attitudes and behavior modifications by the existing residents of the Ewa Villages and nearby Ewa Beach community, as well as future residents of the Ewa Gentry project. Social analyses are based primarily upon available historical land use information; prior social evaluations of the Ewa villages; historical population census data; and more recent City and County of Honolulu estimates and forecasts of selected social indicators. Selected representatives of local neighborhood boards and community associations in the Ewa district were also personally contacted to better ascertain general project concerns and community attitudes. The nature and scope of available information necessitated the predominant use of qualitative analysis; however, every effort was made to quantify anticipated social attitudes and behavioral trends.

The economic analysis is directed at identifying the dynamics of the local economy of Ewa and its relationship to the larger Oahu-based economy. Particular attention is directed at local employment and household income in the Ewa district which are expected to be significantly changed by the Ewa Gentry project. Statistical forecasts of future employment and income are presented to quantify anticipated project consequences.

Accepted statistical indicators are used to identify the dynamics of the local economy. Preliminary regional estimates and forecasts of future population and employment, prepared by the City and County of Honolulu, Department of General Planning, were used as a statistical basis for calculating the new resident population which is expected to be generated by the Ewa Gentry project.

1.3 HISTORICAL PERSPECTIVE: THE TRANSITION OF EWA SINCE 1879

1.3.1 The Rise and Decline of Ewa's Sugarcane Industry

In 1879, development of the first artesian well near West Loch by James Campbell brought about a productive use of

lands which otherwise had little use or development potential. The availability of fresh water gradually evolved into the establishment of a productive sugarcane industry, involving both crop cultivation and processing, by the late 1800's. The Ewa Plantation Company, established in 1890, flourished for some 60 to 70 years.

As production and labor costs increased during the 1960's, new international production areas emerged. Eventually, increased competition from international market and rising production costs gradually reduced the profitability of Ewa Plantation Company. Ultimately, Ewa Plantation Company was sold in 1970 and was subsequently merged with Oahu Sugar Company by the end of 1971. Concurrently, Ewa Mill was closed and processing operations were combined with the nearby mill in Waipahu (Phillips, Brandt, Reddick, 1979).

Today, Oahu Sugar Company continues to cultivate approximately 13,500 acres of sugarcane in the Ewa district and employs about 450 workers (Plasch, 1988).

> "Since (its) consolidation in 1970, Oahu Sugar is the only surviving plantation in the (Ewa) district, and one of only two surviving sugar operations on Oahu. Virtually all the land now cultivated by the Amfac-owned Oahu Sugar Company is leased from Campbell Estate, and the leases expire in the early 1990's" (City and County of Honolulu, Department of Housing and Community Development, 1987).

1.3.2 Social and Economic Reliance

During the flourishing years of the sugar industry in Hawaii, production areas such as Ewa revolved around the plantation both socially and economically. Plantation workers and their families were provided nominal labor and wages as well as affordable housing, utility service, recreational opportunities, and other community services, e.g., medical. Financial security, self-contained community services, and a clearly defined social structure provided most plantation workers and their families with a comfortable, secure lifestyle.

With the continual decline and uncertainty of Hawaii's sugar industry, the Ewa plantation villages of Varona, Tenney, Renton, C Village, Mill Village, Middle Village, Lower Village, and Fernandez have changed. The Ewa villages are no longer a plantation town which relies entirely upon the sugarcane industry and its related social structure. Rather, these and other nearby Ewa communities are now connected to new employment and social opportunities throughout the island of Oahu. Further, Ewa communities now

look to public agencies for providing a variety of desired community and public services which formerly were provided by the plantation.

Despite these social and economic changes,

> "... the bulk of the (Ewa village) families have a member still working for the sugar company, which continues to provide the focal point for the community, even though its influence is not nearly as pervasive as in former decades" (Phillips, Brandt, Reddick, 1979).

In addition, many residents in the Ewa villages still maintain and enjoy most of their interpersonal relationships among relatives and friends within Ewa's closer-knit village communities (Phillips, Brandt, Reddick, 1979).

SECTION 2.0

SOCIO-ECONOMIC INDICATORS AND TRENDS WITHIN THE EWA DISTRICT

2.1 PRESENT SOCIO-ECONOMIC ENVIRONMENT

The Ewa district has been, in recent years, generally regarded as a residential bedroom community supporting the housing needs of the Island of Oahu, as well as the desired public and commercial services of its residents. During the past decade, public and private development proposals aimed at creating Oahu's new secondary urban center are believed to have gradually changed Oahu residents' perceptions concerning Ewa.

Even though the Ewa district has no significant primary industries, there are several larger employers such as Barber's Point Naval Air Station and Oahu Sugar Company which maintain and generate new jobs within Oahu's supporting service economy. A major expansion of this type of economic environment in the Ewa district environment is already foreseen by the City and County of Honolulu. Cumulative consultant evaluations for various resort, residential and commercial development proposals (Table 2-1) in the Ewa district indicate that approximately 20,900 new jobs will be created within the district during the next 20 years (Kurahashi, 1988).

TABLE 2-1

DEVELOPMENT PROPOSALS IN THE EWA DISTRICT
AND THEIR ANTICIPATED EMPLOYMENT GENERATION
CALENDAR YEAR 1988 THROUGH 2005

Proposed Development Project	Anticipated Employment Generation
Campbell Industrial Park Expansion	4,000
Barber's Point Harbor	2,000
Ko Olina (West Beach) Expansion	5,100
Kapolei Town Center	9,000
Ewa Marina	800
	20,900

Source: Kurahashi, 1988.

While the status of some of these development proposals is pending or uncertain, the anticipated combination of resort, commercial and residential growth is expected to provide, at least, a greater diversity of employment opportunities, more jobs, and increased local income.

2.2 POPULATION

Recent population estimates for the Ewa district suggest a 1985 regional population of approximately 37,000 residents, or roughly 4.5 percent of Oahu's total population (City and County of Honolulu, Department of General Planning, 1988). Roughly one-third of Ewa's population is distributed in the Iroquois Point area where many Pearl Harbor-based military families live (Table 2-2). Some 55 percent of the population resides in Makakilo (24 percent) and Ewa Beach (21 percent). The remaining residents live in the Ewa villages (14 percent) or Barber's Point area.

During the next 17 years, the City and County of Honolulu, Department of General Planning, anticipates the resident population of the Ewa district will increase almost 143 percent, or at an annual rate of 8 percent per year (Table 2-2). The rapid growth of the district is also expected to increase Ewa's proportional share of Oahu's total resident population. By calendar year (CY) 2005, the forecasted Ewa district population of 91,119 residents will represent almost 10 percent of Oahu's residents.

The anticipated growth of the Ewa district is based upon a variety of factors, e.g., zoning, housing absorption, household size, which continues to influence the rate of residential growth. One of the more significant influences involves existing land use development proposals, exclusive of the Ewa Gentry project, which indicate the potential construction of some 30,000 new homes in the Ewa district by CY 2005 (Table 2-3). However, City and County of Honolulu Department of General Planning believes that future housing demands will only be able to absorb roughly 16,500 new housing units from CY 1986 through 2005.

In contrast to the present population distribution within the Ewa district, the future residential population is expected to be focused in the Ewa, Ewa Beach, and Makakilo communities. Each of these areas have considerable land area which is available for housing development. A combined total of approximately 31,000 homes are proposed for construction in these communities from CY 1988 to 2005 (Kurahashi, 1988).

The future size of anticipated households in the Ewa district is expected to decrease from a statistical average of 3.74 persons per household in CY 1988 to a 3.53 persons per household in CY 2005. Larger household sizes are expected to be located in the Iroquois Point and Ewa villages area (Table 2-4).

TABLE 2-2

ESTIMATED RESIDENT POPULATION IN THE EWA DISTRICT
CALENDAR YEARS 1985 AND 2005

Community	CY 1985	CY 2005
Iroquois Point	12,272	12,711
Ewa Beach	7,596	24,065
Barber's Point	2,913	2,883
Makakilo	8,628	21,610
Ewa	5,181	27,475
	36,590	88,744

Source: City and County of Honolulu
Department of General Planning, 1988

TABLE 2-3

EXISTING RESIDENTIAL DEVELOPMENT PROPOSALS
PLANNED FOR THE EWA DISTRICT
CALENDAR YEAR 1988 THROUGH 2005

Project Location	Number of Housing Units
West Beach	5,200
Makakilo	3,700
Ewa Beach	400
Ewa Village	380
Ko Olina (West Beach Expansion)	6,600
Kapolei Town Center	3,000
Kapolei Village	5,000
Ewa Marina	4,800
West Loch	1,500
Other Smaller Projects	350
Total	30,930

Source: City and County of Honolulu
Department of General Planning, 1988

TABLE 2-4

ANTICIPATED HOUSEHOLD SIZE
WITHIN EWA DISTRICT
CALENDAR YEAR 2005

Type of Household	Iroquois Point	Ewa Beach	Barber's Point	Makakilo	Ewa	Total Ewa Dist.
1-person	101	567	133	706	416	1923
2-persons	460	1833	332	2060	1546	6231
3-persons	593	1568	177	1538	1574	5450
4-persons	774	1580	129	1390	1795	5668
5-persons	1081	1430	67	1072	1960	5610
Total Households	3009	6978	838	6766	7291	24882
Total Persons in Households	12565	24039	2263	21586	27451	87904
Average Household Size	4.18	3.44	2.70	3.19	3.76	3.53

Source: City and County of Honolulu,
Department of General Planning, 1988.

2.3 EMPLOYMENT

Data concerning employment within the district in CY 1980 is available via the Hawaii State Department of Transportation's 1982 Urban Transportation Planning Package (City and County of Honolulu, Department of Housing and Community Development, 1987). This information indicates that there were approximately 6,170 jobs in the area generally encompassing the communities of Iroquois Point, Ewa Beach and Barber's Point Naval Air Station. The majority of this employment reflects active-duty armed forces personnel (3,303) and a variety of retail trade and commercial services employment. Approximately 3,445 jobs were present in the remaining communities of the district, which generally include the Ewa villages and Makakilo. Principal employers within this area included Campbell Industrial Park (2,500 jobs) and Oahu Sugar Company (450 jobs).

Preliminary employment estimates and forecasts were recently prepared for the Oahu Metropolitan Planning Office by the City and County of Honolulu, Department of General Planning. This information indicates that approximately 10,550 persons were employed within the Ewa District in CY 1985. Unfortunately, available information for Calendar Year 1985 does not distribute the estimated jobs among the Ewa district's five residential communities.

Preliminary forecasts of anticipated employment, within the Ewa district in CY 2005, indicate that the greatest number of employment opportunities will be available in the Ewa village - Kapolei area (Table 2-5). The majority of employment opportunities in this area are expected within the services, retail, construction and industrial sectors of the local economy. This data, in general, assumes the development of Kapolei Town and other proposed residential projects; the operation of the Barber's Point Deep-Draft Harbor; anticipated Ewa district population; and other related trends (Young, 1988).

The secondary location of future employment in the Ewa district is expected to occur within the Ewa Beach area for various commercial services, retail trade, and construction activity. These estimates generally reflect the development of the proposed Ewa Marina, Ewa Gentry and other residential development projects and associated increases in resident population (Young, 1988).

2.4 RECREATION

Available information concerning recreational participation information for the Ewa district is generally limited to 1) the results of a 1980 statewide recreational participation survey which was prepared in conjunction with the State Comprehensive Outdoor Recreation Plan (SCORP); and 2) data from a 1983 telephone survey, conducted by Hawaii Opinion, Inc., concerning the leisure time activities of Oahu residents, as well as residents' uses and attitudes concerning the importance and quality of the City's recreational programs. Survey results of information gained from selected Ewa residents is reflected in the 1980 SCORP participation survey. The 1983 Hawaii Opinion, Inc. survey combines Ewa residents information with similar data for Central Oahu and the North Shore.

Available recreational participation data from these information sources indicates that the two primary outdoor recreational activities of local residents include: 1) swimming and sunbathing at local beach parks in the Ewa district, and 2) bicycling along public roads and sidewalks (State Division of Parks, Outdoor Recreation and Historic Sites, 1987). Results from the Hawaii Opinion survey indicate that fishing, picnicking, and general City and County park use (at inland facilities) are also significant recreational activities of Ewa residents.

TABLE 2-5

ESTIMATED EMPLOYMENT WITHIN
EWA DISTRICT COMMUNITIES
CALENDAR YEAR 2005

Type of Job	Iroquois Point	Ewa Beach	Barber's Point	Makakilo	Ewa	Total
Military	179	0	3777	0	0	3956
Government	130	41	567	19	545	1302
Hotel	0	0	0	0	427	427
Agriculture	0	56	42	30	275	403
Transp, Commun., & Utilities	0	110	20	22	70	222
Industrial	0	513	37	59	2835	3444
Finance, Ins. & Real Estate	0	1147	31	221	1706	3105
Services	490	3324	255	550	4783	9402
Retail	56	1976	466	344	3911	6753
Construction	20	1685	3	682	3272	5662
Total Jobs	875	8852	5198	1927	17824	34676

Source: City and County of Honolulu,
Department of General Planning, 1988

SCORP recreational participation data suggests that most recreational activities of Ewa residents are carried out within the Ewa district. This is generally confirmed by Hawaii Opinion Survey results. One notable exception is use of the Honolulu Zoo which is apparently used and perceived as an important recreational opportunity by Ewa residents. Other facilities and programs considered important include the availability of children's playground equipment and quiet parks.

2.6 EDUCATIONAL BACKGROUND

Information concerning the educational background of Ewa district residents is generally available from the 1980 Census, and a household survey of selected Ewa village residents by Phillips, Brandt, Reddick in 1971. More recent 1980 Census information indicates that the Barber's Point and Makakilo communities contain the greatest proportion of high school graduates while the Ewa village community has the least. Similarly, a higher number of college graduates also live in the Makakilo and Barber's Point areas; the least reside in the Ewa villages and Ewa Beach areas (Table 2-6).

A 1975 correlation between the age, sex and education of Ewa Village residents indicates that roughly 92 to 96 percent of men and women over the age of 50 years never completed high school which suggests a greater formal education of Ewa Village children and the younger adult population.

TABLE 2-6

EDUCATIONAL BACKGROUND OF EWA DISTRICT RESIDENTS

Community/ Census Tract	Last Educational Level Attended: 0-8	High School 9-11	High School 12	College 1-3	College 4+	Total
Ewa Beach (84)	543	525	1664	713	343	3788
Barber's Point (85)	39	72	532	244	84	971
Makakilo-Kunia (86.01)	373	357	2052	853	820	4455
Ewa Villages (86.02)	1004	415	692	282	177	2570
Total	1959	1369	4940	2092	1424	11784

Source: 1980 Census; Matsushige, 1988.

More recent estimates of the September, 1988 public school enrollment in the Ewa area are presented in Table 2-7.

TABLE 2-7

ANTICIPATED PUBLIC SCHOOL ENROLLMENT IN EWA VILLAGE AND EWA BEACH SEPTEMBER, 1988

Public School	Expected Sept. 1988 Enrollment (Students)
Ewa Elementary	432
Ewa Beach Elementary	380
Pohakea Elementary	520
All Elementary	1,332
Ilima Intermediate	945
Campbell High School	1,880
Total Enrollment (K-12)	4,157

Source: Matsushige, 1988.

SECTION 3.0

ANTICIPATED SOCIAL AND ECONOMIC CONSEQUENCES

3.1 SOCIAL IMPACTS

3.1.1 Increase in the Ewa District Resident Population

Chapter 2 of the primary EIS document outlines a preliminary residential development schedule of 7,150 housing units during the 1988 - 1995 period. Application of the City and County of Honolulu's average household size forecasts to this development schedule indicates that the Ewa Gentry project will generate an additional resident population of approximately 26,385 persons from 1988 to 1996 (Table 3-1). This estimate conservatively assumes that all new residents of the project presently live outside the Ewa district. A small portion of the new resident population (5 percent or less) is expected to be existing residents of the Ewa district.

From a regional perspective, the combined Ewa Gentry population (26,385 persons) and potential population from other residential development projects (79,052 persons) would generate a potential Ewa district population of 105,437 residents during the next 17 years. Assuming a relatively constant annual rate of growth over the 17-year period, the Ewa district population would increase approximately 6,202 persons annually, or 13.9 percent per year.

The cumulative district population estimate was derived by adjusting the preliminary City and County of Honolulu population forecasts for the Ewa district in the year 2005 (91,129 residents). The Ewa district forecast of 91,229 residents assumes the population impact of 3,300 homes which were originally planned for the former Ewa Plantation Project. This project was cancelled and replaced by the larger proposed Ewa Gentry project. The adjusted City and County forecast for the Ewa district (79,052 residents without the Ewa Gentry project) reflects the deduction of residents which, previously, would have been generated by the Ewa Plantation project (91,229 residents - 12,177 residents). The deduction of 12,177 residents was calculated by multiplying 3,300 housing units x 3.69 (average household size between 1988 and 1995).

3.1.2 General Changes in Human Behavior and Community Attitudes

The influx of an increased residential population and the related change from a more rural to urban setting will gradually impact the day-to-day behavior and attitudes of existing residents in the Ewa villages and the Ewa Beach areas. Longer term residents of the Ewa area will notice and, occasionally, be sensitive to the effects of more

vehicular traffic congestion along Fort Weaver Road, delayed customer service at the local shopping center, more crowded recreational facilities, and other changes in community lifestyles and conditions. In contrast to present conditions, existing residents may also become more wary or suspicious of new residents.

TABLE 3-1

ANTICIPATED RESIDENT POPULATION
EWA GENTRY PROJECT

Proposed Development Schedule

Year	Single-family Units	Multi-family Units	Total Units	Average Household Size	Anticipated Resident Population
1988	410	300	710	3.74	2,655
1989	280	440	720	3.73	2,686
1990	330	460	790	3.72	2,939
1991	510	460	970	3.70	3,589
1992	520	500	1020	3.68	3,754
1993	530	480	1010	3.67	3,707
1994	530	480	1010	3.66	3,697
1995	470	450	920	3.65	3,358
Total Units	3580	3570	7150	-	26,385

Source: The Gentry Companies, 1987;
Gray, Hong, Bills & Associates, Inc., 1988

Each of these potential behavioral changes are common characteristics for communities transitioning from a more rural to urban lifestyle and setting. Within a few years, most long-term residents will adjust to their new environment. Other existing residents may relocate if community changes become unacceptable. New incoming residents will initially tend to make interpersonal friendships with other new neighbors within the Ewa Gentry project. As some new residents become involved in school,

community functions, the local business community, or local recreational programs, the relationships between long-term residents and new community residents will be established.

3.1.3 Increase in Local School Enrollments

Local school enrollments in the Ewa - Ewa Beach community will gradually increase with growth in the local resident population. Based on historical observations of new residential developments on Oahu, the State Department of Education indicates that school enrollments in the Ewa villages and Ewa Beach communities will likely increase at the rate of approximately 20 students per every 100 single family units and 10 students per every multi-family unit (Matsushige, 1988). Given these assumptions, the Ewa Gentry project is expected to generate the following additional student populations by the year 2000 (Table 3-2).

Education Level	Number of Students
Elementary	1,200
Intermediate	300
High School	500
Total	2,000

Source: State Department of Education, 1988.

3.1.4 Recreation

An increased residential population via the Ewa Gentry project will gradually affect the capacity of existing City and County parks in the Ewa and Ewa Beach communities. Existing beach parks in Ewa Beach are expected to be the most significantly affected. These facilities will likely continue to be the preferred recreational destination for both new and existing residents.

The determination of whether or not increased recreational participation will saturate the capacity of existing recreational facilities cannot be estimated due to the lack of specific recreational participation information. General recreational standards, e.g., 4 acres per 1,000 population, are not believed to be specific enough to adequately assess specific facility capacity and ever-changing recreational use trends.

TABLE 3-2

ANTICIPATED NEW STUDENT POPULATION GENERATED BY EWA GENTRY

Year	Elementary	Intermediate	High	Total
1988	112	22	38	172
1989	208	42	71	321
1990	320	64	108	492
1991	468	93	158	719
1992	622	124	209	955
1993	776	155	260	1191
1994	930	186	311	1427
1995	1069	214	358	1641
1996	1095	231	386	1712
1997	1121	248	414	1783
1998	1147	265	442	1854
1999	1173	282	470	1925
2000	1200	300	500	2000

Source: State Department of Education, 1988

3.2 ECONOMIC IMPACTS

3.2.1 Economic Viability of Oahu Sugar Company

In 1995, Oahu Sugar Company land lease agreements with The Estate of James Campbell will expire. Given the intense demands to continue the westward urbanization of Oahu, Oahu Sugar will be challenged to retain fields which are economical to cultivate and, at the same time, generate economic yields adequate to operate its Waipahu-based mill. Other factors influencing the future economic viability of Oahu Sugar Company include continued federal price supports for sugar; union support to reduce costs; and adequate water allocations from the Pearl Harbor aquifer (Decision Analysts Hawaii, Inc., 1988).

Despite the significant influence of various economic and agricultural production factors, the Ewa Gentry project and

other proposed land development projects in the Ewa district are not expected to threaten the economic viability of Oahu Sugar Company. Further, the Oahu Sugar Company has production options which could reduce the extent of cultivation, reduce production without losing its economies of scale. These options focus upon the alternate use of a one or two mill operation at varying production levels (Decision Analysts Hawaii, Inc., 1988). The feasibility of these options; and other influencing factors, are discussed in greater detail in Appendix F.

3.2.2 Oahu Sugar Company Employment

The termination of Oahu Sugar Company operations is not expected to be a consequence of the Ewa Gentry project. However, if this impact would occur, some 450 Oahu Sugar employees would lose their jobs. In addition, approximately 510 indirect jobs would also be affected (Decision Analysts Hawaii, Inc., 1988).

These potential employment impacts would, however, be offset by concurrent new job opportunities which would be created through the anticipated expansion of Campbell Industrial Park; the construction and operation of Barber's Point Deep-Draft Harbor; and the development of Kapolei Town. Some unskilled workers may experience difficulty in securing other employment, or obtaining a new job at a comparable wage scale (Decision Analysts Hawaii, 1988).

3.2.3 Potential Employment Generation

3.2.3.1 Construction Activity

Construction of the Ewa Gentry project will generate a variety of direct employment in contract construction and various building trades on Oahu. These jobs will, in turn, create indirect employment to other construction-related activities, e.g., building suppliers, architects, and engineers, which support the direct construction effort. Finally, the consumption of income derived from direct and indirect employment will also produce other jobs in Hawaii's retail trade and service sector which will be referred to as induced employment.

In order to estimate an order-of-magnitude estimate of the potential employment generation via construction; use was made of the employment model developed by the State Department of Business and Economic Development (DBED). Use of the model requires prior estimation of the construction labor force and the subsequent application of established statistical multipliers which have been developed by DBED (Mapes, 1988).

In 1985, the value of in-place construction projects in Hawaii totalled approximately $1.4 billion. The direct employment used to complete these 1985 construction projects involved approximately 16,950 persons (State Department of Business and Economic Development, 1986). Consequently, the average annual economic output of each construction worker in 1985 was approximately $82,600.

The Ewa Gentry project is expected to require a development cost of an estimated $52,065,000. Assuming an average economic output of $82,600 for each construction worker, it is estimated that the Ewa Gentry project will provide roughly 630 direct jobs. Application of the direct employment estimate to the DBED employment model indicates that approximately 1,700 additional jobs would be generated in other construction-related services (indirect employment) and other jobs in retail trade and services (induced employment).

3.2.3.2 Retail Trade and Commercial Services

During and following construction of the project, new residents of Ewa Gentry will be purchasing household and convenience items from a diverse range of retail suppliers and commercial services on Oahu. This commercial trade will generate new jobs within the Ewa district community at existing shopping centers and other proposed commercial service complexes, e.g., Kapolei Town.

In order to estimate new potential employment within the Ewa district, various arbitrary assumptions were made to establish a statistical basis for subsequent employment calculations. These assumptions are presented in the following paragraphs.

New consumers from Ewa Gentry are expected to shop both within and outside the Ewa district. Prior to the proposed construction of Kapolei Town, the distribution of potential commercial sales will be somewhat greater outside the Ewa district. Following the development of Kapolei Town, consumer purchases are assumed to double (Table 3-3) and will be made primarily within the Ewa district.

TABLE 3-3

ANTICIPATED DISTRIBUTION OF RETAIL & COMMERCIAL SALES
BY EWA GENTRY RESIDENTS
PRIOR TO KAPOLEI TOWN DEVELOPMENT

Retail/Commercial Service Area	Proportion of Total Consumer Purchases by Ewa Gentry Residents	
	Before Kapolei	After Kapolei
Within Ewa District	40	80
Waipahu-Pearl City	35	10
Honolulu	20	05
Other Oahu Areas	05	05
Total	100	100

In the vicinity of the project site, the existing Ewa Beach Shopping Center, which contains approximately 73,000 square feet of commercial floor space, is believed to be supported by a primary consumer market of approximately 13,000 residents. From a statistical perspective, each resident presently supports approximately 6 square feet of commercial floor space.

Consumer demands by future residents of Ewa Gentry are expected to generate a concurrent demand for approximately 10 square feet of commercial floor space per resident. Retail trade and commercial service employment is assumed to represent approximately 1.1 jobs for every 1,000 square feet of commercial floor space.

Most all of the future buyers of Ewa Gentry homes will be existing residents on the Island of Oahu. Consequently, the only new employment generated will be from expanded or new commercial businesses within the Ewa district.

On the basis of these arbitrary assumptions, it is estimated that a fully-developed Ewa Gentry population will support approximately 264,000 square feet of commercial floor space within the Ewa district. Since 73,000 square feet of commercial floor space are already available in the vicinity of the project site, future Ewa Gentry consumers will be able to support approximately 191,000 square feet of new commercial floor space. This amount of floor space represents the

amount of floor space for approximately two neighborhood shopping centers (James H. Pedersen, Planning Consultant, 1988).

The development of this amount of new commercial floor space, within a convenient distance of the project, is expected to be eventually developed by the Estate of James Campbell, or another commercial land development organization. The direct employment generated by the development of 191,000 square feet of commercial floor space would be approximately 210 jobs (James H. Pedersen, Planning Consultant, 1988).

3.2.4 Potential Income Generation

3.2.4.1 Construction - Related Income

In order to derive estimates of potential construction-related income, use was made of the Type II input/output multipliers which were developed by the State Department of Business and Economic Development in 1977. The application of the type II output multipliers to estimated total construction costs provides a convenient statistical method for estimating the amount of direct, indirect and induced sales (or income) which will be derived via construction activities required to develop the Ewa Gentry project (Mapes, 1988).

Based upon 1987 construction costs, the total construction value of the Ewa Gentry project is estimated to be approximately $52,065,000. Application of the multiplier to this value indicates that the Ewa Gentry project is expected to generate potential direct, indirect and induced sales (or income) of approximately $106,650,000 in Hawaii. This estimated income represents a significant contribution of potential income within the State economy.

3.2.4.2 Retail Trade and Commercial Services Income

The creation of approximately 210 new jobs in the Ewa district's retail trade and commercial services sector will concurrently generate greater household income within the Ewa district. Assuming an average gross wage range of approximately $6 to $8 per employee ($12,480 to $16,640 per year), this employment will create total direct household income, within the Ewa district, which will range from roughly $2.6 million to $3.5 million annually.

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APPENDIX H

DRAFT

TRAFFIC ASSESSMENT

EWA BY GENTRY

February 1988

Prepared by: Parsons Brinckerhoff
Quade & Douglas, Inc.

TRAFFIC ASSESSMENT
EWA BY GENTRY
Ewa, Hawaii

February 3, 1988

The Gentry Companies has proposed a major residential development on the Ewa Plain of Oahu. The project site is located on both sides of Fort Weaver Road, between the Ewa village and Ewa Beach communities. The master plan of the 930-acre project shows development of 7,000 dwelling units by 1995. The first increment of the project, the 413-unit "Soda Creek" project, is currently under construction and is expected to be completed in mid-1989.

This assessment identifies the regional impacts of the proposed project, and identifies the major roadway improvements that will be necessary to accommodate traffic generated by the project. Localized improvements at the Fort Weaver Road intersections with Geiger Road and the project access road will be identified in a separate site access study.

EXISTING CONDITIONS

Existing conditions were identified from traffic counts taken in April 1987 and supplemented with traffic estimates from the 1985 Traffic Summary, prepared by the State Highways Division. Traffic conditions in the AM Peak Hour and PM Peak Hour were evaluated.

On the four-lane Fort Weaver Road north of the project, two-way peak hour traffic was approximately 2,200 vehicles per hour (vph), with about 60 percent of the traffic in the peak direction. Highway

conditions could be described as Level of Service (LOS) C. Estimated peak hour turn volume at the single-lane ramp from Fort Weaver/Kunia Road from the south onto the on-ramp to the H-1 Freeway was 800 vph, with congested conditions (LOS E) since these vehicles must yield to vehicles which had turned left at the signalized intersection from the north.

Once on the freeway, traffic moves unconstrained (LOS B) until Waiawa Interchange. Two-way traffic in the AM Peak Hour on the eight-lane H-1 Freeway between Kunia Road and Waiawa Interchange was approximately 5,700 vph with a distribution of about 65 percent in the peak direction toward downtown Honolulu. Traffic volume in the PM Peak Hour in this segment was approximately 5,100 vph, with about 55 percent traveling away from downtown Honolulu.

The critical highway segment for commuters from the project area would be H-1 Freeway between Waiau and Waiawa Interchanges. In 1985, this segment of H-1 was eight lanes wide and carried between 10,000 vph and 11,000 vph during peak hours, with 65-70 percent in the peak direction. Near-capacity conditions (LOS E) occurred in the peak directions during peak hours.

PROPOSED PROJECT

The proposed project would construct approximately 7,000 dwelling units, with about half single-family units and half multi-family units. A school/park site and an eighteen-hole golf course would also be provided within the project.

The traffic volumes generated by the project were estimated using trip generation factors from the Institute of Transportation Engineers' informational report, Trip Generation, Third Edition. Some internal

traffic among the dwelling units and between residential areas and the school are expected. Total and net (out of project) traffic generated by the project are shown in Table 1.

Table 1
PROJECT TRAFFIC

	Total traffic	Net traffic
Daily (two-way)	60,400	51,600
AM Peak Hour		
Entering	1,300	1,030
Exiting	3,660	3,390
PM Peak Hour		
Entering	3,870	3,220
Exiting	2,180	1,530

A review of estimates and projections of the location on Oahu of existing and future employment and population indicate that the traffic generated out of this project will predominantly travel toward downtown Honolulu. The estimated distribution would is shown in Table 2.

Table 2
TRIP DISTRIBUTION

Direction	AM Peak Hour	PM Peak Hour
Toward Honolulu	93 %	92 %
Toward Waianae	4 %	5 %
Toward Ewa Beach	2 %	2 %
Toward Barbers Point	1 %	1 %

The project would generate a traffic demand of 4,300 vph (3,300 vph in the northbound direction) on Fort Weaver Road in the AM Peak Hour and 4,600 vph (3,100 vph southbound) in the PM Peak Hour. Increased traffic demand on H-1 toward Honolulu is estimated to be 4,100 vph (3,200 vph eastbound) in the AM Peak Hour and 4,600 vph (3,000 vph westbound) in the PM Peak Hour.

FUTURE CONDITIONS

Future traffic volumes on Fort Weaver Road south of the project is expected to increase by about 20 percent by 1995 because of other development in the Ewa Beach area. North of the project, other residential projects are proposed, which would also add traffic to Fort Weaver Road.

North of Renton Road, future conditions without the project would continue to be described as LOS B. Other development along Fort Weaver Road, at Ko'Olina, Makakilo, and Kapolei west of Kunia Interchange, and in Central Oahu will add traffic to H-1; future conditions along H-1 would be highly dependent on the slowing of the increase in traffic demands, either through a dispersal of demand over time (staggered work hours) or destinations (second city) or more efficient use of the highway facilities (State's HOV program).

Due to the limited improvements which could be implemented at Kunia Interchange, an additional north-south corridor between the proposed Ewa By Gentry project and the H-1 Freeway will be needed to accommodate the traffic demand of the project. As the project is located on both sides of Fort Weaver Road, much of the project traffic destined for Honolulu is expected to continue to use Fort Weaver Road. With one-third of the project traffic to/from Honolulu and all of the project traffic toward Waianae using the second north-south road, LOS E would describe conditions if a two-lane road is built. A four-lane

north-south road would provide LOS B conditions during the peak hours. Table 3 summarizes the traffic assignments and LOS findings.

Table 3
ROADWAY CONDITIONS

Condition	AM Peak Hour Volume	AM Peak Hour LOS	PM Peak Hour Volume	PM Peak Hour LOS
Existing (1987)				
Fort Weaver Road				
Northbound	1,265	B	805	B
Southbound	895	B	1,310	B
Future (1995) without project				
Fort Weaver Road				
Northbound	1,463	B	908	B
Southbound	1,016	B	1,463	B
Future (1995) with project				
Fort Weaver Road only				
Northbound	4,769	F	2,399	D
Southbound	2,020	C	4,653	F
Fort Weaver Road (with North-South Road)				
Northbound	3,569	E	1,850	C
Southbound	1,656	B	3,497	E
North-South Road				
two-lane road	1,564	D	1,705	E
four-lane road:				
Northbound	1,200	B	549	B
Southbound	364	B	1,156	B

On the H-1 Freeway, the project contribution will be less, as some traffic will have destinations in Waipahu, Central Oahu, or the Pearl City area, and may use Farrington Highway, Kamehameha Highway, or other alternate routes. However, an indication of the project's impact, as compared to existing volumes, is shown in Table 4.

Table 4
H-1 TRAFFIC IMPACTS

Location	Traffic Volumes		Percent
	Existing	Project	Change
Inbound (AM Peak Hour)			
Kunia to Waiawa IC	3,705	3,153	85 %
Waiau to Halawa IC	7,438	3,153	42 %
Outbound (PM Peak Hour)			
Halawa to Waiau IC	6,500	2,968	46 %
Waiawa to Kunia IC	2,805	2,968	106 %

Residents of the proposed project will need to participate in some sort of ridesharing program, as will be the case for all residents of Oahu in the future. The project's peak hour traffic generation could therefore be expected to be less than shown herein.

APPENDIX I

DRAFT

PROPOSED EWA GENTRY:
IMPACT ON AGRICULTURE

January 1988

CONTENTS

TABLES

EXECUTIVE SUMMARY

The development of Ewa Gentry would result in the urbanization of approximately 932 acres of sugarcane lands which are currently under cultivation by Oahu Sugar Company, Ltd. (OSCo), of which about 300 acres are located within the State Urban District and 75 acres are zoned residential by the City and County of Honolulu. Assuming that U.S. sugar prices will continue to be high enough to justify continued sugar operations in Hawaii, an important question is whether Ewa Gentry—combined with other planned and proposed projects—would eventually cause the closing of OSCo, either by reducing sugarcane acreage sufficiently to reduce economies of scale, and/or by contributing to a scattered and therefore inefficient plantation rather than a more compact and efficient one.

Assuming that all proposed projects will be approved, and that it would take about 20 years to realize the full development of all projects, OSCo would retain about 11,760 acres under cultivation in 1995 when its major lease expires. If yields increase from their current average of about 15 tons of raw sugar to 16 tons per acre by the end of 1995 (which is a conservative projection), then 11,760 acres would be sufficient land to maintain the current production of about 90,000 to 95,000 tons of raw sugar per year, without any loss in economies of scale. No layoffs of sugar workers would be expected, since OSCo has a practice of reducing its employment by attrition.

However, if the sequence of urbanization results in a scattered plantation that is too inefficient to operate at the current level of production, or if urbanization and loss of sugarcane acreage proceeds at too rapid a rate to be compensated by increasing yields, then a switch from a two- to one-mill operation would be required to maintain an efficient and economically viable operation. For this case, land requirements would be about 8,440 acres, assuming a yield of 16 tons per acre and production of about 67,500 tons per year. This would provide a buffer of 3,320 acres from which to assemble an efficient plantation; this figure is based on 11,760 acres remaining after projected urbanization (assuming approval of all planned and

proposed projects), minus the estimated 8,440 acres required for a one-mill operation. It is uncertain whether or not attrition would be sufficient to accommodate a reduction in employment associated with a switch to a one-mill operation.

At full development of all the planned and proposed projects (assuming approval of all projects), the amount of land under cultivation by OSCo would be about 8,520 acres. If development proceeds gradually, and if yields increase sufficiently (as a result of genetic engineering and other advances), then it is conceivable that OSCo could maintain production near its current level. In order for this to occur, the average yield would have to increase by about 45 percent, from 15 to 21.7 tons per acre.

It is more likely, however, that a switch to a one-mill operation would be required to maintain economic viability. Assuming an average yield of 18 tons per acre by the time the various projects reach full development (which is a conservative projection), a one-mill operation would require about 7,500 acres. This would provide a buffer of about 1,020 acres from which to assemble an efficient plantation; this figure is based on 8,520 acres remaining after urbanization (assuming approval and full development of all planned and proposed projects), minus the estimated 7,500 acres needed for a one-mill operation.

To summarize the above, Ewa Gentry, in combination with other approved and proposed projects, is not expected to threaten the economic viability of OSCo; economies of scale and a compact efficient plantation would be possible by (1) switching to a single-mill operation, or (2) retaining a two-mill operation provided that urbanization proceeds gradually and yields can be increased rapidly to compensate for the loss of acreage.

If OSCo were to cease operations for whatever reason (most likely because of low sugar prices), the loss of jobs would be less than 450 direct jobs and 510 indirect jobs. This would be equivalent to the loss of a hotel about half the size of the Hyatt Regency in Waikiki. Immediately following the mill closing, significant economic loss and social disruption would occur. But over the long term, the economic loss would be absorbed easily by expanding economic opportunities in the Ewa/Central-Oahu area.

Assuming that OSCo does close, revenues to Waialua Sugar Compay, Inc. (WSCo) would be decreased slightly because OSCo's contribution to shared terminal facilities and services would be lost. At worst, the economic effect would correspond to an increase in production cost of less than 2 percent. But rather than absorb increased terminal charges, a more profitable alternative would be to increase the refining capacity of C&H in Aiea to process all of the WSCo production. Refined

sugar in excess of the Hawaii requirements would be shipped at favorable backhaul rates to Los Angeles and Seattle. Currently, Hawaiian sugar is delivered to these markets by rail from the C&H refinery in Crockett, California near San Franscisco. Consequently, the net economic effect of the closing of OSCo on WSCo would be small, and would be unlikely to force the closing of WSCo—like OSCo, the future economic health of WSCo will be determined primarily by the price of sugar in the U.S. market.

The development of Ewa Gentry on sugarcane acreage would eliminate the possibility of using these lands for diversified agriculture (including aquaculture). However, it is extremely doubtful that this would adversely affect the growth of diversified agriculture in Hawaii. There are four reasons for this assessment: (1) an extensive amount of prime-agricultural land and water has been freed from sugar and pineapple production because of past mill closings and reductions in operations; (2) a very real possibility exists that additional land and water will be freed from sugar production given the outlook for low sugar prices; (3) some—if not most or even all—of the sugar operations will make their lands available for profitable replacement crops to the extent that such crops are available; and (4) compared to the available supply, a very small amount of land and water is required to grow proven and promising crops to achieve a realistic level of food and animal-feed self-sufficiency, and to increase exports. The increasing availability of prime agricultural land in Hawaii is part of very long-term and accelerating trends occurring throughout most developed and developing market economies. Productivity and yields have been increasing faster than population growth, and genetic engineering and other advances, combined with slower population growth, indicate an acceleration of these trends. Rapid productivity and yield increases require that labor, land, and other resources be withdrawn from agriculture in order to restore balanced markets and to increase farm income for those who remain.

Since Ewa Gentry is not expected to adversely affect the economic viability of OSCo, and would not limit the growth of diversified agriculture, the project is consistent with the major thrust of the agricultural portion of the Hawaii State Plan, the State Agriculture Functional Plan, and the General Plan of the City and County of Honolulu. This thrust is to preserve the economic viability of plantation agriculture and to promote the growth of diversified agriculture. Also, the project would provide a public benefit (i.e., reasonably priced housing) which would override the proposed "important agricultural lands" designation of the Land and Evaluation Site Assessment (LESA) Commission.

The project is also consistent with the City & County policy of directing population growth to Ewa which, by definition, must occur at the expense of sugarcane acreage.

Sugar operations and housing would be buffered from one another by sufficient vegetation and other appropriate measures in order to minimize conflicts between the two. Therefore, with one exception, the project would not adversely affect cultivation of adjacent sugarcane acreage, and complies with the Hawaii Right-to-Farm Act. The single exception concerns complaints over the burning of fields just prior to harvest; in order to minimize these complaints, OSCo is likely to schedule the burning of adjacent fields when the fewest residents are at home—such as during the work day rather than on weekends—or to harvest without burning. Similar operations are already conducted for other fields adjacent to urban areas. Nevertheless, complaints should be expected over dust generated when fields are prepared for planting, noise from trucks and harvesters, and smoke from burning cane prior to harvesting.

PROPOSED EWA GENTRY:
IMPACT ON AGRICULTURE

The proposed Ewa Gentry development would involve the urbanization of about 932 acres of sugarcane lands cultivated by Oahu Sugar Company, Ltd. (OSCo), of which about 300 acres are located within the State Urban District and 75 acres are zoned residential by the City and County of Honolulu. The impacts of this loss on OSCo operations, as well as on Waialua Sugar Compay, Inc. (WSCo) which shares terminal facilities at Honolulu Harbor, and on the potential growth of diversified agriculture (including aquaculture), are summarized in this report.

SOIL QUALITY OF AFFECTED SUGARCANE ACREAGE

The affected sugarcane acreage consists primarily of five soil types, with very limited amounts of four others:

—EmA: Ewa silty clay loam, moderately shallow, 0 to 2 percent slopes, comprising about 450 acres (48 percent) of the development and located in the lower half of the project.

—MnC: Mamala stony silty clay loam, 0 to 12 percent slopes, comprising about 153 acres (16 percent) of the area and located primarily along the eastern border of the development, and also in far western and southwestern tips;

—HxA: Honouliuli clay, 0 to 2 percent slopes, comprising about 172 acres (18 percent) of the area and located primarily along the upper northwestern portion of the development;

—WzA: Waipahu silty clay, 0 to 2 percent slopes, comprising about 98 acres (11 percent) of the area and located in the northernmost tip of the development;

—WkA: Waialua silty clay, 0 to 3 percent slope, comprising about 27 acres (3 percent) of the area and located at the western end of the development;

—CR, Fd, HxB and WzC: These four soil types (Coral outcrop, Fill land, Honouliuli clay, and Waipahu silty clay) comprise some 32 acres (3 percent) of the area (about 1 percent for each soil type, except for WzC).

With the exception of CR (1 percent of the land), all of the soils can be used for sugarcane; and with the exception of WzA and WzC, all of the lands can be used for truck crops and pasture.

The soils within the petition area have been rated in terms of four classification systems commonly used in Hawaii:

—Land Capability Classification by the United States Department of Agriculture Soil Conservation Service (SCS).

This classification rates soils according to eight levels, ranging from the highest classification level I to the lowest level VIII. If irrigated, WkA and HxA both have a capability classification I, which indicates that the soils have few limitations which restrict their use. Soil type EmA is in Subclass IIs if irrigated, which indicates that the soil has a moderate limitation of stoniness, unfavorable texture, shallowness, or low water-holding capacity. Soil type MnC is in Subclass IIIs if irrigated, which indicates that the soil has a severe limitation of stoniness, unfavorable texture, shallowness, or low water-holding capacity.

—Agricultural Lands of Importance in the State of Hawaii (ALISH), by the SCS, University of Hawaii College of Tropical Agriculture and Human Resources, and the State of Hawaii Department of Agricuture.

This system classifies lands into three categories: (1) prime agricultural land which is land that is best suited for the production of crops because of its ability to sustain high yields with relatively little input and with the least damage to the environment; (2) unique agricultural land which is non-prime agricultural land that is currently used for the production of specific high-value crops; and (3) other prime agricultural land which is non-prime and non-unique agricultural land that is of importance to the production of crops. About two-thirds of the development consists of soils which are rated as "prime" agricultural lands.

—Overall Productivity Rating, by the Land Study Bureau (LSB) of the University of Hawaii.

This classification rates soils according to five levels, with "A" representing the class of highest productivity and "E" the lowest. About one-third of the petition lands now planted in sugarcane is rated A; one-

third is rated B, and one-third C. The A lands are in the southern region of the development; the B lands are located along the northwestern edge; and the C lands are along the eastern edge and in the southwesternmost tip.

—Proposed Land Evaluation and Site Assessment (LESA) System, by the State of Hawaii Land Evaluation and Site Assessment Commission

Based on soil quality, locational attributes, improvements, nearby activities, and land-use plans, this proposed system would designate a sufficient amount of the better agricultural lands so as to meet projected agricultural goals. The designated lands would be termed important agricultural lands (IAL), and would include all lands having a rating of 67 or over out of a possible total of 100. Based on the proposed maps, about 763 acres (82 percent) of the lands in the petition area would be designated as IAL. The ratings for each soil type within the petition are: EmA, 74; MnC, 66; HxA, 87; WzA, 92; WkA, 93; Cr, 12; Fd, 65; HxB, 85; WzC, 74. However, the identification would be subject to change based on a change in nearby activities and a change in County land-use plans. Also, the designation could be changed if there is an overriding public benefit.

IMPACT ON OSCo[1]

Background Information

Amfac's OSCo first milled sugar in 1899, and is now the fourth largest sugar operation in the State. It cultivates about 13,540 acres of sugarcane land, and produces about 90,000 to 95,000 tons of raw sugar, or nearly 10 percent of Hawaii's total sugar production. Its lands cover portions of Central Oahu on each side of Kunia Road above Pearl Harbor, and portions of the Ewa Plain to the west of Pearl Harbor. The Ewa lands were taken over from Ewa Plantation in 1970.

Another 4,860 acres of OSCo lands were in production in 1982, the bulk of which are now fallow, while a few hundred acres have been urbanized. These lands are mostly mauka lands with high pumping costs, and lands close to the seashore where soils tend to be inferior, yields low, and hauling costs high because of the distance to the mill.

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[1]Unless otherwise noted, the material in this section is from OSCo, Amfac, and/or Section B, Chapter VI of Hawaii's Sugar Industry: Problems, Outlook, and Urban Growth Issues.

Nearly all of the land which OSCo cultivates is leased, principally from Campbell Estate with a lease expiration date of 1995, and from Robinson Estate with a lease expiration date of 1996. The lease rents on these lands are among the highest in the State for sugarcane acreage, and are adjusted as a function of the revenues from sugar operations. Both leases allow partial withdrawal of lands for urbanization. The Campbell Estate lands above H-1 Freeway and west of Kunia Road have been dedicated to agricultural use in order to obtain special property tax assessments.

OSCo is one of the major water users on Oahu, pumping up to 92.5 million gallons per day (MGD) of groundwater, and diverting in normal-rainfall years 25 to 30 MGD from the Windward side via Waiahole Ditch. Per-acre usage by OSCo can exceed 9,000 gallons per day. For comparison, pumpage by the Board of Water Supply averages about 140 MGD, and per-acre useage for single-family homes at 5 units per acre averages about 2,130 gallons per day.

Field, mill, and management employment at OSCo is approximately 450 workers. Indirect employment dependent upon OSCo is estimated to be 510 jobs (multiplier of 1.13, based on the State Economic Model). For comparison, OSCo's economic contribution to Hawaii's economy is less than half that of the Hyatt Regency Hotel in Waikiki.

Because of favorable growing conditions, good farming practices, and drip irrigation, sugar yields at OSCo are very high, about 14.5 to 15.5 tons per acre, versus a 1986 Statewide average of 12.5 tons per acre (HSPA, "Hawaii Sugar News," March 30, 1987). In fact, OSCo holds the world record sugar yield at 21.63 tons per acre set in April 1985 (HSPA, "Hawaii Sugar News," June 26, 1985). The current average yield is about 33 percent higher than the 1979 yield of 11.3 tons per acre.

But even with high yields and very efficient operations, OSCo is only marginally profitable—the principal problem being low sugar prices. The marginal profitability is measured before accounting for new capital investment needed to replace equipment.

Outlook for Sugar Prices

In the long term, the survival of OSCo will depend primarily on the price of sugar, for which the outlook is pessimistic. In the world market, the average price of sugar is expected to remain well below the production costs for all countries. This is because most sugar is traded in controlled and/or subsidized markets, with surplus sugar dumped onto the world market for sale at a loss. Dramatic price increases

have occurred, however, following a 6- to 9-year cycle, with prices increasing whenever world production falls short of consumption. But, there have been a number of fundamental developments in sugar and related industries in the past 10 years which appear to have altered the pattern of sugar prices, reducing peak prices and extending the periods of low prices. These changes include: the decline or stagnation of sugar consumption in most developed countries; inroads made by the liquid sweetener high-fructose corn syrup (HFCS); the availability of substantial sugar reserves in the form of sugarcane now devoted to ethanol production; major gains in sugar beet productivity in several European countries which were traditionally cane sugar importers; and the appearance of the European Economic Community ECC as a major exporter of refined sugar (Brown).

In the United States, Federal legislation protects sugar from the low world prices by import quotas, tariffs, and import fees. However, U.S. sugar prices are managed so that they are fairly low in order to prevent accelerating the growth of competing sweeteners, and to maintain public support. Under the U.S. Farm Bill, which runs to 1991, the target price for sugar is 18 cents per pound, with no adjustments for inflation.

The competing sweetener of major concern has been HFCS. It is as sweet or sweeter than regular sugar, costs less to produce, sells for less, is more profitable, is very similar to liquid sugar, can be substituted readily in many applications, and is easier and cheaper to handle. It has experienced rapid growth in sales at the expense of regular sugar sales. However, HFCS has captured nearly all of the liquid-sweetener market so that continued growth will depend on the market acceptance of Crystar, the crystaline version of HFCS. In addition, the new low-calorie sweetener aspartame, sold under the brand name "Equal," is capturing market share and putting additional downward pressure on U.S. sugar prices.

Regarding the long-term outlook for sugar legislation, it should be noted that, because of HFCS, many corn states have joined the sugar and sweetener coalition, making it larger and stronger than in the past, even though a number of sugar companies have closed in recent years. Also, the Farm Act is generally supported by those countries which receive a sugar quota, since they benefit from a high price for a major portion of their sugar. The considered expectation among sugar experts and lobbyists is that sugar will continue to be included in the U.S. Farm Act, but that the price-support level may be relatively low and may increase at a rate that is somewhat slower than inflation. Even though this is expected, there is a risk that efforts by sugar users and consumer groups to exclude sugar from the Farm Act or to reduce the support price will be successful.

OSCo Plans

In 1982, Amfac developed a Master Agricultural Plan which included a Survival Plan for OSCo. This plan, which has been fully implemented, was developed in response to an operating loss of nearly $10 million in 1981 and an outlook for low sugar prices. In recognition of the fact that sugar plantations are in place with substantial improvements, but suitable replacement crops have yet to be identified, the plan amounts to a holding action to gain time to find as many replacement crops as possible before OSCo may be forced by outside economic factors to cease operations. Key components of the plan are:

—continue to improve the economic efficiency of OSCo by increasing sugar yields and reducing production costs (both of which have been improved substantially in the last few years);

—urbanize Waikele (the only OSCo land owned by Amfac) in order to derive revenues to help support and justify continued sugar operations; and

—experiment with a variety of crops (papaya, sweet corn, potatoes, forage and feed crops, coffee, etc.) in order to find profitable replacements to sugar.

An important component of OSCo's reduction in costs is a continued decline in the labor force; over the past 2 years, employment decreased by about 150 jobs, or about 25 percent. The employment decrease is accomplished by attrition—that is, employees who retire or leave OSCo for other voluntary reasons generally are not replaced.

Continued success of the OSCo Survival Plan will depend on (1) continued Federal price supports for sugar which are sufficiently high to justify continued operations, (2) union support to reduce costs, (3) an adequate allocation of water from the Pearl Harbor aquifer, and (4) retaining fields which are economical to farm and which provide sufficient yields to operate the mill at an economical level. After the major leases expire with Campbell Estate and Robinson Estate in 1995 and 1996, respectively, continued sugar operations also will depend on success in negotiating favorable lease terms.

An additional option which has been under consideration by OSCo is to contract operations by running a single mill rather than two mills in parallel as is currently the case. With a single mill, OSCo could reduce production from its current level of from 90,000 to 95,000 tons per year to from 60,000 to 75,000 tons without losing its economies of scale; a corresponding decrease would occur in the acreage requirements for OSCo. Of significance, Amfac's Kekaha Sugar Company, Inc., which has climatic

conditions similar to those of OSCo lands and a similar yield potential, historically has been one of the most profitable sugar operations in the State. Yet this plantation has only about 8,000 acres under cultivation, and produces only about 55,000 tons of sugar per year.

Of interest, nearly all sugarcane operators throughout the world are pursuing a similar strategy to that expressed in the OSCo Survival Plan: improve efficiency by increasing yields and reducing production costs; and search for alternative crops (Brown).

Urbanization Pressures on OSCo

The gradual growth westward of urban Honolulu has consumed a large amount of former sugarcane land as evidenced by the fact that the eastern boundary of OSCo lands has moved westward by 9 miles from Moanalua Valley out past Waikele Stream. Since the 1960s, four ridges west of Halawa have been urbanized. But because of new plantings in the foothills of the Waianae mountains and on former pasture lands, sufficient acreage was cultivated to maintain economies of scale. The westward urbanization pressures of Honolulu continues, but plantings of new lands to compensate for lost fields is no longer feasible.

The economic forces which create urbanization pressures on OSCo include:

—Financial returns from urban land uses far exceed those from agricultural uses.

—Proximity to the new or growing employment centers of West Beach, Barbers Point Harbor, Campbell Industrial Park, and downtown Honolulu.

—Reasonable travel times to these employment centers because of the H-1 Freeway.

—Availability of water if it is freed from sugar production.

—Proximity to the Honouliuli waste-treatment facility.

—Low construction costs compared to areas that require extensive grading or removal of structures.

In contrast, redevelopment of downtown suffers from the high expense and displacement problems required to remove existing structures, the high expense and inconvenience of redeveloping inadequate infrastructure, less desirable high-rise housing compared to single-family homes, and strong community opposition on occasion. Hawaii Kai suffers from a lack of employment growth centers, relatively little land available for further single-family housing, severe transportation problems, and community opposition to further development. Similarly, the Windward side suffers from

a lack of growing employment centers, transportation problems, and community opposition to further development.

In view of these factors, the City & County of Honolulu has designated the Ewa area as a "Secondary Urban Center" which will be developed to accommodate a major portion of Honolulu's future growth. Developments approved and proposed for the Ewa/Central-Oahu area which would affect OSCo acreage include:

	Sugarcane Acreage
Ewa Gentry (300 acres approved by the State, and 75 by the County)	932
Kapolei Village	775
Kapolei Town Center	693
Lusk Kapolei	55
Ko Olina Resort (approved)	281
Other (see text)	241
Ewa Marina (approved)	410
West Loch Estates	195
Village Park (547.5 acres approved by the State)	980
Kunia Golf Course	190
Golf Course (J. Myers)	270
Total	5,022

In this listing of major developments, the 241 acres for "Other" represents acreage to the west of Kapolei; OSCo expects to fallow this acreage due to the expense of farming this relatively small and isolated area. It is likely that this land would be laid fallow as soon as Kapolei Village is developed down to Waimanalo Road, which would occur in the latter stages of the project. Regarding the Kunia Golf Course, the land owner lacks withdrawal rights before the lease expires in 1996.

Acreage Required to Maintain Economies of Scale

Before addressing the question of how the acreage withdrawals for the above projects would affect the economic viability of OSCo, acreage requirements of OSCo are discussed. These requirements are summarized in Table 1 for a one- and two-mill operation as a function of yield. As mentioned previously, OSCo currently produces from 90,000 to 95,000 tons of raw sugar per year using two mills. With a single mill, OSCo could reduce production to from 60,000 to 75,000 tons without losing its economies of scale. The mid-values for these ranges are used in Table 1: 67,500 and 92,500 tons of raw sugar per year for a one- and two-mill operation, respectively.

Table 1.— OSCo ACREAGE REQUIREMENTS FOR ONE AND TWO MILLS, BY YIELD LEVEL[1]

Yield (tons of raw sugar per harvested acre)	One Mill[2] (67,500 tons of raw sugar per year)	Two Mills[3] (92,500 tons of raw sugar per year)
10	13,500 acres	18,500 acres
11	12,273	16,818
11.3 (1979 average yield)	11,947	16,372
12	11,250	15,412
13	10,385	14,231
14	9,643	13,214
15 (1987 average yield)	9,000	12,333
16 (1995 conservative projection)	8,438	11,563
17	7,942	10,882
18 (2008 conservative projection)	7,500	10,278
19	7,105	9,737
20	6,750	9,250
21	6,429	8,810
21.6 (record yield)	6,241	8,553
22	6,136	8,409

[1]It is assumed that one-half of the acreage is harvested annually.

[2]The estimated output from a one-mill operation would be from 60,000 to 75,000 tons of raw sugar per year.

[3]Current production from the two-mill operation is from 90,000 to 95,000 tons of raw sugar per year.

Also shown in Table 1 are yield assumptions, along with two past yields and OSCo's world-record yield: 11.3 tons of raw sugar per harvested acre in 1979, 15 tons in 1987, and 21.63 tons for the record yield. The two past yields indicated the substantial increase which can occur over time, while the record yield indicates future potential under favorable farming conditions.

Average sugar yields fluctuate from year to year but, over the long term, yields have increased gradually over time, and are expected to continue their gradual increase. For the future, increasing yields are expected to occur as a result of contracting operations to higher-quality fields, introducing improved varieties of cane, improving farming practices, adding chemical ripeners, introducing more efficient harvesters, etc. In the long-term, genetic engineering provides the promise of dramatically improved cane varieties that will have much higher yields and will be cheaper to farm because they will require less fertilizer, will resist diseases, and will produce less leafy trash.

Based on long-term industry trends, a conservative projection of OSCo's average yield in 1995, when the lease with Campbell Estate expires, is 16 tons of raw sugar per harvested acre; 20 years into the future, a conservative projection for the average yield is 18 tons per acre. The projected increase in the average yield is less than 1 percent per year.

Table 1 indicates that OSCo could reduce acreage and maintain economies of scale by increasing its average yield and/or switching from a two- to a single-mill operation. Increasing the average yield to 16 tons per acre would reduce land requirements from the current 13,540 acres to about 11,560 acres, thereby freeing about 1,980 acres. If the average yield were to increase to 18 tons per acre, this would reduce land requirements to about 10,280 acres, which would free about 3,260 acres. Switching from a two- to one-mill operation while maintaining yields at 15 tons per acre would reduce land requirements to about 9,000 acres and free about 4,540 acres. Switching to a single mill and increasing yields to 16 tons per acre would reduce land requirements to about 8,440 acres, and free about 5,100 acres. Finally, switching to a single mill and increasing yields to 18 tons per acre would reduce land requirements to only about 7,500 acres, and free about 6,040 acres.

Although these acreage reductions would allow economies of scale to be maintained, economic viability will also depend on other factors, one of the most important of which will be a favorable U.S. price for sugar. The agricultural quality of the lands which remain, and the form of the plantation would also be important. In general, any reduction in the plantation lands should occur from the outside in

because this would result in a compact plantation with high-quality lands: a more compact plantation reduces trucking and other costs, while higher quality lands contribute to higher yields.

Outlook for OSCo

Assuming that U.S. sugar prices will continue to be high enough to justify continued sugar operations in Hawaii, an important question is whether Ewa Gentry—combined with other planned and proposed projects—would eventually cause the closing of OSCo, either by reducing sugarcane acreage sufficiently to reduce economies of scale, and/or by contributing to a scattered and therefore inefficient plantation rather than a more compact and efficient one. The concern is over three proposed projects: Ewa Gentry, Kapolei Village, and Kapolei Town Center.

Outlook to 1995

Assuming that all the planned and proposed developments previously listed are approved, a 20-year average development period for the housing, commercial, and resort projects, and at least a one-year delay before construction begins for most of the projects, then the loss of sugarcane acreage by the end of 1995 when the major lease with Campbell Estate expires would be about 1,780 acres. Remaining acreage under cultivation by OSCo would fall from 13,540 acres to about 11,760 acres, assuming no replanting of fallowed land.

In terms of land required to maintain economies of scale, 11,760 acres would provide sufficient land to maintain a two-mill operation, assuming the projected average yield of about 16 tons per year in 1995 (see Table 1).

In terms of the form of the plantation, the development sequence for Ewa Gentry would be from Ewa Villages starting on land already approved for development, then proceeding makai. This is not the preferred sequence, but it does proceed from an existing urban area in an outward direction toward inferior lands rather than inward toward superior lands. For Kapolei Village and Kapolei Town Center, the development sequence would proceed from mauka to makai (from north to south). Again, this is not the preferred sequence (from the outside in, which is west to east), nor is it the worst sequence (from within the plantation towards the outside, which is from east to west).

If the resulting form of the plantation proves to be inefficient for a two-mill operation (or if urbanization proceeds much more rapidly than projected), then an efficient sugar operation could be achieved by switching to a one-mill operation. For

this case, land requirements would be about 8,440 acres, assuming a yield of 16 tons per acre (see Table 1). This would provide a buffer of 3,320 acres from which to assemble an efficient plantation; the figure of 3,320 acres is based on 11,760 acres remaining after projected urbanization assuming approval of all planned and proposed projects, minus the estimated 8,440 acres needed for a one-mill operation.

In summary, by the end of 1995 when the major lease with Campbell Estate expires, Ewa Gentry, in combination with other planned and proposed projects, is not expected to threaten the economic viability of OSCo. However, in order to retain economic viability, a switch from a two- to a one-mill operation may be required if urbanization proceeds rapidly, or if the sequence of urbanization results in a scattered plantation that is inefficient for a two-mill operation.

Long-Term Outlook

Assuming approval and full development of all the planned and proposed projects, the amount of land under cultivation by OSCo would decline by 5,022 acres, from 13,540 acres to about 8,520 acres. If development proceeds gradually, and if yields increase sufficiently (possibly resulting from advances in genetic engineering), then it is conceivable that OSCo could maintain economies of scale and an economically viable operation with two mills. It is more likely, however, that a switch to a one-mill operation would be required to maintain economic viability. Assuming an average yield of 18 tons per acre, a one-mill operation would require about 7,500 acres. This would provide a buffer of about 1,020 acres from which to assemble an efficient plantation; the figure of 1,020 acres is based on 8,520 acres remaining after urbanization assuming approval of all planned and proposed projects, minus the estimated 7,500 acres needed for a one-mill operation.

In summary, given a change from a two- to a single-mill operation, Ewa Gentry, in combination with other approved and proposed projects, is not expected to threaten the economic viability of OSCo.

Economic Impact of Reducing OSCo Operations

Assuming that a two-mill operation remains economically viable, little or no loss in revenues to OSCo would occur as a result of urbanizing sugarcane lands because production would remain near its current level. Also, the reduction in employment associated with the projected reduction in acreage is not expected to require any layoffs of sugar workers since OSCo makes a practice of reducing employment through attrition.

For a one-mill operation, production would decline by about 25,000 tons of raw sugar per year, or 27 percent of current production. Based on 1986 prices ($334.59 per ton for sugar, and $45.80 per ton for molasses, with one-third of a ton of molasses produced for each ton of sugar), lost revenues would amount to about $8.7 million per year. But because less sugar would be grown and milled, production costs would also decline. Whether or not attrition would be sufficient to accommodate a reduction in employment associated with a switch to a one-mill operation is uncertain.

Economic Impact of Closing OSCo

If OSCo were to cease operations for whatever reason (most likely because of low sugar prices), the loss of jobs would be less than 450 direct jobs and 510 indirect jobs, with the actual number dependent upon the reduced employment made possible by continuing productivity increases. This would be the economic equivalent of losing of a hotel about half the size of the Hyatt Regency in Waikiki. Immediately following the mill closing, there would be a significant economic loss and social disruption. But over the long term, the economic loss would be absorbed easily by expanding economic opportunities in the Ewa/Central-Oahu area. For example, the new hotels at Ko Olina will be the equivalent of about nine OSCos in terms of direct plus indirect jobs and—when tip income and all indirect jobs are considered—will provide higher average wages (based on analysis with the State Economic Model). Other new jobs in the Ewa area will be provided by Barbers Point Harbor, expansion of Campbell Industrial Park, development of Kopolei Town Center, growth of diversified agriculture made possible by lands freed from sugar (growth which is likely to be at the expense of Neighbor Island farmers), and other economic activities which may be attracted to the area or which may occur spontaneously due to of the increased availability of land and water, and lower urban land costs than would otherwise be the case. Therefore, most if not all sugar employees can be expected to find other employment if this should be required. However, some unskilled sugar workers and those having non-transferable skills may receive reduced pay when and if they are forced to find non-sugar jobs.

Assuming a policy favoring rapid urbanization of lands freed by the closing of sugar operations—a policy which presumably would be designed to increase the supply of land for housing and various economic opportunities, and increase competition among landowners and developers, with the objective of decreasing housing costs and increasing economic opportunities—three to four decades, or even longer, would be required to absorb the land. During this period, a huge supply of land and water

would remain available for diversified agriculture and other economic activities. Even at full urbanization, over 2,000 acres would remain available for agriculture in the blast zone surrounding the Navy's magazine storage area located at West Loch, Pearl Harbor.

IMPACT ON WAIALUA SUGAR COMPANY

If OSCo ceases operations for whatever reason, the profitability of WSCo would be decreased—an operation which employs about 450 workers. This is because OSCo's contribution to the Honolulu Harbor terminal charges would be lost. In 1986, these charges were $978,000, of which $418,800 were WSCo's share. If only WSCo's production were to be handled by the Harbor, then the terminal manager estimates that the charge would be only about $100,000 less than currently. Therefore, the terminal charge to WSCo would increase from $418,800 to about $878,000, or an increase of $460,000. Based on WSCo's 1986 production of 72,446 tons, the increase in WSCo's cost amounts to 0.3 cent per pound. This is less than a 2-percent increase in the cost of production.

Rather than absorb the increased terminal charges, a more profitable alternative would be to increased the refining capacity of C&H in Aiea from about 45,000 tons per year to about 72,500 tons per year so as to process all of the WSCo production. A crude estimate for the cost of the plant expansion is about $2 million. Refined sugar in excess of the 36,000-ton-per-year Hawaii requirements would be shipped at favorable backhaul rates to Los Angeles and Seattle. Currently, Hawaiian sugar is delivered to these markets by rail from the C&H refinery in Crockett, California near San Francisco. The economic feasibility of this alternative is considered to be "very probable."

In view of the above, a closing of OSCo for whatever reason is unlikely to force the closing of WSCo. Like OSCo, the future economic health of WSCo will be determined primarily by the price of sugar in the U.S. market.

IMPACT ON DIVERSIFIED AGRICULTURE

The development of Ewa Gentry is an irretrievable commitment of prime agricultural land to urban use. For the purposes of this discussion, prime agricultural land is loosely defined to mean any high-quality agricultural land capable of providing high yields for a variety of crops, and would include most of the lands currently cultivated in the petition area. This commitment to urban use raises the question of

whether Ewa Gentry would affect adversely the development of diversified agriculture (including aquaculture), either immediately or in the long term. Before addressing this question, the demand for and the supply of prime agricultural land for diversified agriculture is clarified.

Demand for Prime Agricultural Land

As part of its analysis to identify IAL (see page 2), the LESA Commission adopted projections of the amount of agricultural land required to increase food and animal-feed self-sufficiency given resident plus visitor population growth, and increased crop exports. The projections for the State and Oahu are shown in Tables 2 and 3, respectively. As indicated, an estimated 52,684 additional acres will be required Statewide to accommodate the the 1983-to-1995 increase in production. The corresponding figure for Oahu is 7,979 acres. As shown, the crops and acreage requirements are categorized according to those which generally do not require prime agricultural land (although some crops may be grown profitably on prime agricultural land), those crops which generally do require prime agricultural land, plus a contingency of 10 percent of all acreage other than for beef and cattle.

It should be noted that the LESA projections and the corresponding Illustrative Generalized IAL Maps contain, or appear to contain, a number of major flaws which have led to a gross overestimation of the amount of agricultural land required:

—Based on a thorough, in-depth, and widely reviewed analysis of the market potential for crops grown on Molokai (Plasch and Garrod), and analysis of previous projections distributed by the State of Hawaii Department of Agriculture, the LESA projection for diversified agriculture appears to be excessively optimitistic. Apparently, it is assumed that many unprofitable crops will become profitable, that Hawaii farmers will be able to undersell low-cost summer crops from California, and that each and every activity will experience rapid growth. Verification of the exent of these flaws is hampered by the fact that the assumptions and analysis which underlie the LESA projections have not been made available for public inspection.

—Some of the acreage estimates are for harvested acreage, which leads to an overestimate of the land requirements for those crops which are harvested more than once a year (e.g., a crop harvested twice a year should have its acreage requirement halved).

Table 2.— LESA AGRICULTURAL ACREAGE REQUIREMENTS, STATE OF HAWAII: 1983 AND 1995

Crop or Activity	1983	1995	Increase
Crops and Activities which Generally Do Not Require Prime Agricultural Lands			
Beef/cattle[1,2]	765,450	365,090	--
Livestock:			
Dairy	1,000	1,182	182
Eggs/Poultry	281	515	234
Swine	600	1,050	450
Subtotal for Livestock	1,881	2,747	866
Unique Crops:			
Aquaculture	500	4,500	4,000
Coffee	2,000	5,700	3,700
Flowers/Nursery	1,786	3,040	1,254
Papaya	2,120	11,850	9,730
Taro/Watercress	400	527	127
Subtotal for Unique Crops	6,806	25,617	18,811
Macadamia Nuts	15,800	27,000	11,200
Crops and Activities which Generally Do Require Prime Agricultural Lands			
Plantation:			
Sugarcane[2,3]	194,300	177,700	-16,600
Pineapple	36,000	36,049	49
Subtotal for Plantation	230,300	213,749	-16,551
Other:			
Guava	965	1,400	435
Seed Corn	730	1,060	330
Bananas	1,100	2,200	1,100
Feed/Forage[2,4]	8,705	12,495	3,790
Fruits	635	1,156	521
Vegetables/Melons[5]	4,340	7,022	2,682
Subtotal for Other Crops	16,475	25,333	8,858
Contingency[6]	--	29,500	29,500
TOTAL	1,036,712	689,036	—
TOTAL, Excluding Beef/Cattle	271,262	323,946	52,684

Table 2.— **LESA AGRICULTURAL ACREAGE REQUIREMENTS, STATE OF HAWAII: 1983 AND 1995**
(continued)

[1]Includes marginal grazing and pasture lands. The 1983 figure includes arid zones and other areas having low carrying capacity, while the 1995 figure does not.

[2]Often includes land in a holding operation awaiting discovery of profitable uses.

[3]The decline in acreage primarily reflects the loss of Puna Sugar Co.

[4]Includes some pasture and 8,000 of guinea grass from Molokai.

[5]Overstated in that the acreage figures are for harvested acres, not the amount of land required.

[6]Based on 10% of all acreage other than that for beef/cattle. Adding a contingency amounts to double counting in that the projections are optimistic to begin with. Also, the contingency figure includes 17,770 acres for expansion of sugarcane, even though the sugar industry is expected to decline, not expand.

Table 3.— LESA AGRICULTURAL ACREAGE REQUIREMENTS, CITY AND COUNTY OF HONOLULU: 1983 AND 1995

Crop or Activity	1983	1995	Increase
Crops and Activities which Generally Do Not Require Prime Agricultural Lands			
Beef/cattle[1,2]	18,200	10,090	--
Livestock:			
Dairy	340	402	62
Eggs/Poultry	250	390	140
Swine	144	200	56
Subtotal for Livestock	734	992	258
Unique Crops:			
Aquaculture	300	2,400	2,100
Flowers/Nursery	495	850	355
Papaya	70	170	100
Taro/Watercress	60	85	25
Subtotal for Unique Crops	925	3,505	2,580
Crops and Activities which Generally Do Require Prime Agricultural Lands			
Plantation:			
Sugarcane[2]	27,200	25,300	-1,900
Pineapple	11,829	11,800	-29
Subtotal for Plantation	39,029	37,100	-1,929
Other:			
Guava	--	242	242
Seed Corn	125	180	55
Bananas	540	836	296
Feed/Forage[2,3]	1,741	2,912	1,171
Fruits	90	200	110
Vegetables/Melons[4]	1,155	1,595	440
Subtotal for Other Crops	3,651	5,965	2,314
Contingency[5]	--	4,756	4,756
TOTAL	62,539	62,408	--
TOTAL, Excluding Beef/Cattle	44,339	52,318	7,979

Table 3.— **LESA AGRICULTURAL ACREAGE REQUIREMENTS, CITY AND COUNTY OF HONOLULU: 1983 AND 1995**
(continued)

[1]Includes marginal grazing and pasture lands. The 1983 figure includes arid zones and other areas having low carrying capacity, while the 1995 figure does not.

[2]Often includes land in a holding operation awaiting discovery of profitable uses.

[3]Includes some pasture.

[4]Overstated in that the acreage figures are for harvested acres, not the amount of land required.

[5]Based on 10% of all acreage other than that for beef/cattle. Adding a contingency amounts to double counting in that the projections are optimistic to begin with. Also, the contingency figure includes 2,530 acres for expansion of sugarcane, even though the sugar industry is expected to decline, not expand.

—The LESA contingency of 29,500 acres is excessive, especially since LESA projects a requirement for less than 9,000 additional acres of prime agricultural lands. The contingency is large primarily because the LESA methodology implicitly allows for expansion of sugar operations—a grossly unrealistic possibility. Furthermore, the contingency amounts to double counting since optimistic projections have a built-in contingency.

—The LESA methodolgy assumes that prime agricultural lands that were freed from sugar and pineapple production and placed in pasture or some other low-profit operation will stay in these uses. This is very unrealistic in that these are holding operations for land until profitable crops can be identified.

—The LESA methodolgy incorrectly assumes that sugar is a healthy industry, and that sugar lands would be unavailable for more profitable replacement crops.

—The Illustrative Generalized IAL Maps incorrectly allocates prime agricultural lands to certain activities which do not need such lands (e.g., aquaculture should be allocated the agriculturally low-quality coastal lands at Kahuku).

The relevant figures from Tables 2 and 3 are not the total figures, but the increase in the amount of prime agricultural land required to accommodate diversified agriculture: the increase is 8,858 acres for the State, and 2,314 acres for Oahu. As discussed above, these figures are excessive; a more realistic estimate for the State is probably closer to 1,200 acres (Plasch and Garrod). Nevertheless, even using the excessive LESA estimate, the amount of additional prime agricultural land that would be required to accommodate diversified agriculture, and provide the hope (but not the realistic expectation) of profitable operations, is surprisingly small.

If diversified agriculture is to require a large amount of prime agricultural land, then additional crops will have to be grown for the export market rather than the small Hawaii market. However, the extreme difficulty of developing large export markets should be noted. Numerous and extensive crop searches and experiments for over a century by many people and organizations has led to surprisingly few major long-term successes in Hawaii, thereby indicating the extreme difficulty in identifying new export crops and developing them into new and profitable industries. Furthermore, the difficulty in developing export markets is increasing because of increasing competition from other sugarcane-growing areas. As noted previously, low sugar prices have led nearly all sugarcane operators throughout the world to search for profitable replacement crops, particularly crops which can maintain export earnings.

Supply of Prime Agricultural Land

Regarding the supply of land, an enormous and growing supply of prime agricultural land is available for other uses. Since 1970, about 83,000 acres of Hawaii's prime agricultural land has been freed from sugar and pineapple production: about 43,000 acres of land freed from sugar production (about 9,000 acres on Oahu and 33,600 on the Neighbor Islands), and over 40,000 acres freed from pineapple production (about 12,000 acres on Oahu and over 28,000 on the Neighbor Islands) [Plasch, Hawaii's Sugar Industry, HSPA, Hawaii Agricultural Reporting Service]. Some of the land freed from sugar and pineapple production has or will be converted to urban, diversified agriculture, and aquaculture uses. Also, some of the land freed from pineapple use on Oahu was converted to sugar production. Making allowances for the various conversions, uncommitted acreage which remains available to diversified agriculture and aquaculture amounts to many tens of thousands of acres, with a large share of this on Oahu. Much of this land is fallow, in pasture, or some other low-value land-holding operation.

This supply of prime agricultural land probably will increase given the very real possibility of future sugar-mill closings. As discussed above, the outlook for sugar prices is unfavorable, and some unprofitable mills are in operation today only because they have lease and/or energy contracts which make closing too expensive. However, these contracts eventually will end.

Furthermore, much of the sugarcane lands is in holding awaiting the discovery of profitable replacement activities, so is part of the supply of prime agricultural land available to profitable diversified agriculture crops. For example, one of the components of the OSCo Survival Plan is to experiment with a variety of crops in order to find profitable replacements to sugar.

Many of the lands freed, to be freed, or which can be freed from sugar and pineapple production have excellent agricultural qualities and climatic conditions, and are well-suited for a variety of crops. Also, water is available for most of these lands, especially lands freed from sugar production. However, some of the lands freed from sugar are at high elevations where pumping costs are relatively high.

Additional lands which have been made available for diversified agriculture are in government-sponsored agricultural parks throughout the State. Lands for agricultural activities which do not require prime agricultural land include pasture land, land for livestock operations, and unique lands. Unique lands are not prime agricultural lands, but are important lands for certain crops, the principal examples are the coffee lands in Kona, and certain lava lands in Puna that are well-suited for growing

papaya. The supply of unique lands is quite large and distinct from the supply of prime agricultural lands.

Availability of Land to Small Farmers

Even though considerable agricultural land is available, it should be noted that in many areas of the State small agricultural parcels are not available to small-scale farmers under long-term leases. The reason for the unavailability is that land-use regulations and the political environment make it unprofitable and too risky to lease small farm parcels. It is unprofitable because agriculture is generally a low-value use of land which can afford only relatively low lease rents, while County subdivision regulations designed for rural estates require expensive electrical power, paved rather than gravel roads, and buried rather than surface water lines. The combination of low rents and expensive subdivision requirements makes it unprofitable to subdivide land for small farms. For example, rather than develop the State agricultural park in Kahuku, it would have been cheaper for the State to give each farmer $100,000. In addition, there is the risk that when the lease expires, the farmer will turn to the legislature to try and prevent an escalation of the lease rent, or to prevent eviction by the landowner in favor of a higher and more profitable use—this is often the case for long-term leases for land on which the farmer has built a home. Such an economic environment favors leases to large-scale operators (including cooperatives consisting of many small farmers), short-term and illegal leases of unsubdivided land, subdivision of the land into rural estates for sale to buyers who can afford the costs of the subdivision requirements, or leaving the land fallow.

The unavailability of small parcels of land to farmers is a serious problem, but does not invalidate the fact that there is a vast supply of prime agricultural land available for profitable diversified agricultural activities. However, the activities must be large scale, or the subdivision requirements circumvented.

Outlook for Diversified Agriculture

Based on the above analysis, ample prime agricultural land will be available to easily accommodate prime agricultural land requirements of diversified agriculture. This conclusion derives from the fact that there is a vast amount of prime agricultural land and water that has been freed from sugar and pineapple production in recent years, the very real possibility that additional sugarcane acreage and water will be freed given the outlook for low sugar prices, the fact that some if not most or even all of the sugar operations would make their lands available for profitable re-

placement crops, and the surprisingly modest land requirements for diversified agriculture. In other words, the limiting factor will be the market, not the land supply. Ewa Gentry, combined with other major housing developments in the Ewa/Central-Oahu area and elsewhere, involves far too little land to affect this conclusion. Therefore, **Ewa Gentry would not affect adversely the growth of diversified agriculture.**

Consistency with Overseas Long-Term Trends

Hawaii's increased availability of prime agricultural land compared to that of prior decades is part of some very long-term and accelerating trends occurring throughout most developed and developing market economies. For example, an excess of about 45 million acres of agricultural land exists in the United States (Dvoskin). Productivity and yields have been increasing faster than population growth; and genetic engineering—which gives promise of developing crops having higher yields, increased resistance to diseases and pests, and increased tolerance to climatic variations—and other advances, combined with slower population growth, indicate an acceleration of these trends. Rapid productivity and yield increases lead to overproduction, market gluts, low agricultural prices, low farm income, bankruptcies, and a need to withdraw labor, land, and other resources from agriculture in order to restore balanced markets and increase farm income to those who remain. The major agricultural problem facing the United States and many other economies is how to make this withdrawal an orderly one so as to minimize social problems. This is a problem associated with tremendous success in agriculture, and contrasts sharply with and invalidates the 200-year old prediction of Thomas Malthus that population will increase faster than the food supply.

CONSISTENCY WITH STATE AND COUNTY PLANS

Ewa Gentry is consistent with the major thrust of the agricultural portions of the Hawaii State Plan, the State Agriculture Functional Plan, and the General Plan of the City and County of Honolulu. This thrust is to preserve the economic viability of plantation agriculture and to promote the growth of diversified agriculture (see Table 4). To accomplish this, an adequate supply of agriculturally suitable lands and water must be assured. The thrust of these plans is not to preserve prime agricultural lands simply for the sake of preservation—preservation is to occur only if there is a potential agricultural need for these lands.

Table 4.— SELECTED STATE AND COUNTY OBJECTIVES, POLICIES, AND GUIDELINES RELATED TO AGRICULTURAL LANDS

HAWAII STATE PLAN (Chapter 226, Hawaii Revised Statutes, as amended):

Section 226-7 Objectives and policies for the economy—agriculture.

(a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:

(1) Continued viability in Hawaii's sugar and pineapple industries.

(2) Continued growth and development of diversified agriculture throughout the State.

(b) To achieve the agricultural objectives, it shall be the policy of the State to:

(6) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.

Section 226-103 Economic priority guidelines.

(c) Priority guidelines to promote the continued viability of the sugar and pineapple industries:

(1) Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries.

(d) Priority guidelines to promote the growth and development of diversified agriculture and aquaculture:

(1) Identify, conserve, and protect agricultural and aquacultural lands of importance and inititate affirmative and comprehensive programs to promote economically productive agricultural and aquacultural uses of such lands.

Section 226-104 Population growth and land resources priority guidelines.

(b) Priority guidelines for regional growth distribution and land resource utilization:

(2) Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.

Table 4.— SELECTED STATE AND COUNTY OBJECTIVES, POLICIES, AND GUIDELINES RELATED TO AGRICULTURAL LANDS
(continued)

STATE AGRICULTURAL FUNCTIONAL PLAN (June 1985)
(Functional plans are guidelines for implementing the State Plan, and are not adopted by the State Legislature.)

B. Objective: Achievement of Productive Agricultural Use of Lands Most Suitable and Needed for Agriculture.

(5) Policy: Provide greater protection to agricultural lands in accordance with the Hawaii State Constitution.

(c) Implementing Action: Identify important agricultural lands to promote diversified agriculture, increased agricultural self-sufficiency, and assure the availability of agriculturally suitable lands.

(d) Implementing Action: Until standards and criteria to conserve and protect important agricultural lands are enacted by the Legislature, important agricultural lands should be classified in the State Agricultural District and zoned for agricultural use, except where, by the preponderance of the evidence presented, injustice or inequity will result or overriding public interest exists to provide such lands for other objectives of the Hawaii State plan.

CITY AND COUNTY OF HONOLULU
GENERAL PLAN, Objectives and Policies (Resolution No. 82-188)

Population

Objective C. To establish a pattern of population distribution that will allow the people of Oahu to live and work in harmony.

Policy 1. Encourage the gradual development of a secondary urban center in the West Beach-Makakilo area to relieve developmental pressures in the urban-fringe and rural areas.

Economic Activity

Objective C. To maintain the viability of agriculture on Oahu.

Policy 4. Provide sufficient agricultural land in Ewa, Central Oahu, and the North Shore to encourage the continuation of sugar and pineapple as viable industries.

Policy 5. Maintain agricultural land along the Windward, North Shore, and Waianae coasts for truck farming, flower growing, aquaculture, livestock production, and other types of diversified agriculture.

Regarding housing, the Ewa Gentry is clearly in support of the Hawaii State Plan, particularly those policies, objectives, and priority directions which encourage development of reasonably priced, safe, sanitary, livable homes in suitable environments. Nevertheless, certain priority guidelines (but not objectives or policies) dealing with population growth and distribution do call for directing urban growth primarily to existing urban areas and marginal agricultural lands, and away from important agricultural lands (e.g., Section 226-104 (b)(2)). While this is desirable, it is unrealistic in terms of the supply of lands suitable for building reasonably priced housing, and unrealistic as to the agricultural market which could use the vast supply of prime agricultural lands profitably.

Ewa Gentry is also consistent with the City and County policy of directing population growth to Ewa which, by definition, must occur at the expense of sugarcane acreage.

Since Ewa Gentry would not adversely affect the economic viability of OSCo, would not limit the growth of diversified agriculture, but would contribute to a healthier housing market in a district designated for development, the project is consistent with the major thrust of the State and County Plans. Also, the project would provide a public benefit which would override the proposed IAL designation of the LESA Commission.

Residents of homes adjacent to and/or downwind from sugar operations often complain about the dust generated when fields are prepared for planting, noise from trucks and harvesters, and smoke when fields are burned prior to harvesting. In order to minimize conflicts and complaints, sugar operations and housing would be buffered from one another by sufficient vegetation and other appropriate measures. Therefore, with one exception, Ewa Gentery would not adversely affect cultivation of adjacent sugarcane acreage, and complies with the Hawaii Right-to-Farm Act. The one exception concerns the burning of fields just prior to harvesting; in order to minimize complaints, OSCo is likely to schedule the burning of adjacent fields when the fewest residents are at home—such as during the work day rather than on weekends—or to harvest without burning. Similar operations are already conducted for other fields adjacent to urban areas.

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