DEPARTMENT OF PLANNING
CITY AND COUNTY OF HONOLULU
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DONA L. HANAIKE
DEPUTY CHIEF PLANNING OFFICER

April 12, 1997

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

Dear Mr. Gill:

Acceptance Notice for the Final
Environmental Impact Statement,
Amfac Commercial and Park, TMK: 9-4-2:4 (Portion)

We are notifying you of our acceptance of the Final Environmental Impact Statement (FEIS) for the proposed Amfac Commercial and Park project. Pursuant to Section 11-200-23(e), Chapter 200, Title 11 ("Environmental Impact Statement Rules") of the Hawaii Administrative Rules, this Acceptance Notice should be published in the May 8, 1997 issue of The Environmental Notice.

We have attached our Acceptance Report of the Final EIS for the project and the completed publication form for The Environmental Notice. Should you have any questions on the matter, please contact Lin Wong of our staff at 523-4485.

Sincerely,

PATRICK T. ONISHI
Chief Planning Officer

PTO:ft

Attachment

cc: Vicent Shigekuni, PBR Hawaii
Timothy Johns, Amfac Property Development Corp.

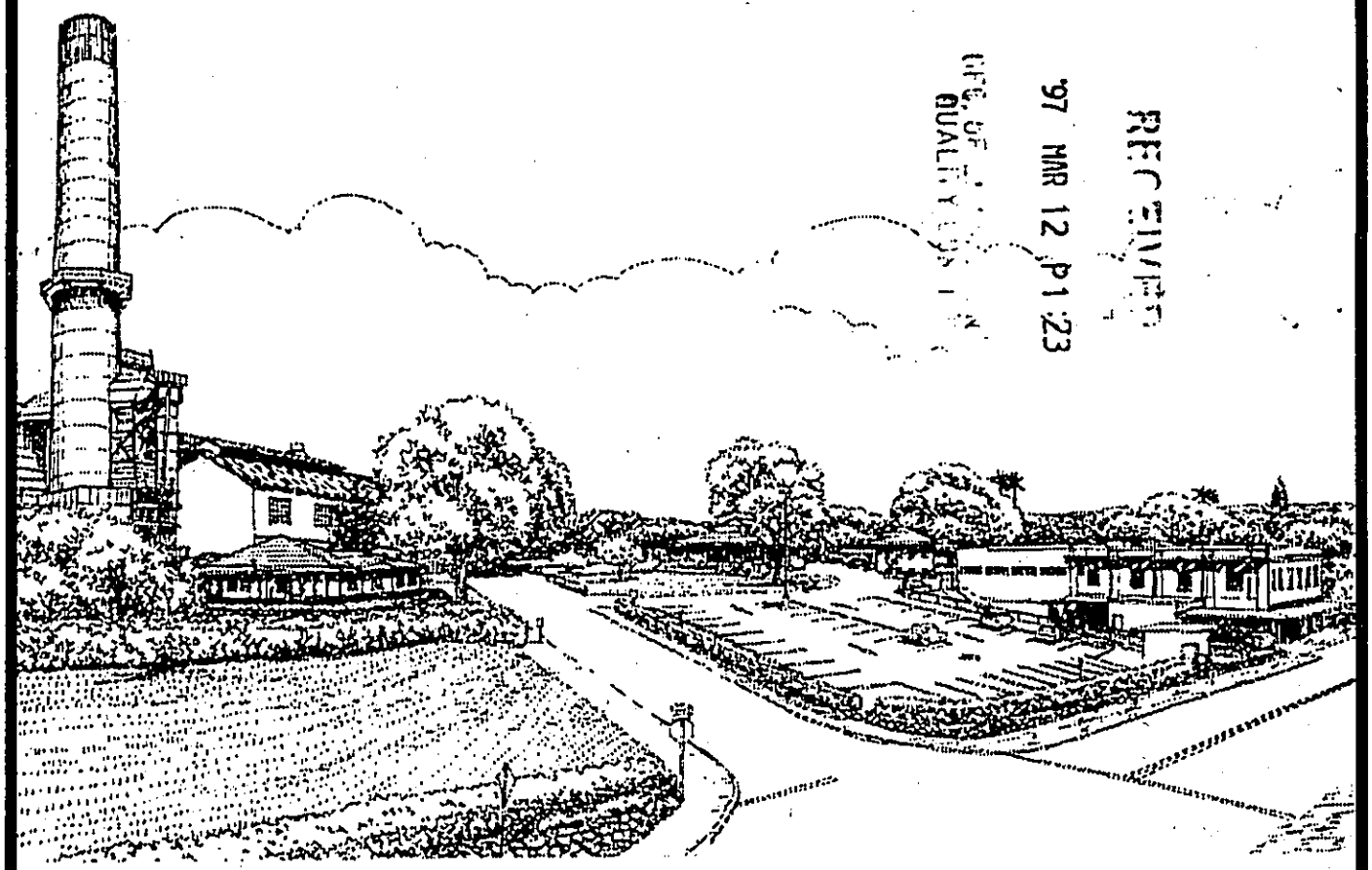
1997- Oahu - FEIS -

Amfac Commercial

AMFAC COMMERCIAL AND PARK

WAIPAHU • CENTRAL OAHU

TMK 9-4-02:04 (por.)



FINAL ENVIRONMENTAL IMPACT STATEMENT

March 1997

AMFAC COMMERCIAL AND PARK

WAIPAHU • CENTRAL OAHU

TMK 9-4-02:04 (por.)

FINAL ENVIRONMENTAL IMPACT STATEMENT

March 1997

AMFAC COMMERCIAL AND PARK

FINAL ENVIRONMENTAL IMPACT STATEMENT

This Environmental Document is Submitted Pursuant to
Chapter 343, Hawaii Revised Statutes
and
Hawaii Administrative Rules, Title 11, Chapter 200.
Environmental Impact Statement Rules

PREPARED FOR:
AMFAC PROPERTY DEVELOPMENT CORP.

FOR SUBMISSION TO:
CITY AND COUNTY OF HONOLULU
PLANNING DEPARTMENT

This Environmental Impact Statement and all ancillary documents were prepared under the signatory's direction or supervision and the information submitted, to the best of the signatory's knowledge, fully addresses document content requirements as set forth in Sections 11-200-17 and 11-200-18, as appropriate.

APPLICANT:

TIMOTHY E. JOHNS, GENERAL MANAGER
OAHU AND KAUAI DEVELOPMENT
AMFAC PROPERTY DEVELOPMENT CORP.
HONOLULU, HAWAII

EIS PREPARER:

WM. FRANK BRANDT, PRESIDENT
PBR HAWAII
HONOLULU, HAWAII

March 1997

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

SUMMARY SHEET

This Environmental Impact Statement has been prepared to address the potential environmental impacts of the Amfac Commercial and Park project. It has been compiled to fulfill application requirements of the City and County of Honolulu Planning Department for a Central Oahu Development Plan Land Use Map Amendment, filed in October 1996. The purpose of the requested amendment is to implement one of the recommendations of the City's Special Area Plan for Waipahu.

Brief Description of the Action

The Commercial and Park project is located on 25.4 acres of the former Oahu Sugar Company mill site in Waipahu. Amfac, the applicant, has completed a detailed planning process which involved numerous individuals and organizations, as well as the City Planning Department, to plan for the redevelopment of the mill site. The finalized site plan involves adaptive reuse of several key buildings for community facilities which will include a Heritage Center to document the history of Oahu Sugar Company and the Leeward YMCA. Area for a Filipino Community Center and for the expansion for the City's Hans L'Orange Park is also included. The Commercial area of 12.5 acres will integrate retail and office space and community facilities.

Significant Beneficial and Adverse Impacts (Including Cumulative Impacts and Secondary Impacts)

There are a number of project impacts that will be beneficial to residents of Waipahu and Central Oahu and Oahu residents in general. Many of the environmentally associated impacts (i.e., smoke, dust, industrial noise) of the previous operations of an intensive industrial use have ceased with the closure of Oahu Sugar Company.

The need for the proposed development is evidenced by the higher rate of unemployment in Waipahu and the surrounding area due to the closure of the sugar company. This has been identified repeatedly in the community planning process.

Potential environmental impacts may occur primarily during construction related to noise, soil erosion, increased construction machinery exhaust emissions, and temporary disruption of traffic.

No significant impacts are anticipated regarding water quality and drainage, flora and fauna, and archaeological resources. There may be impacts associated with traffic but these will be mitigated with the project improvements and the base improvements which is planned by the governmental agencies. The visual prominance of the mill smokestack as a regional landmark will remain unchanged.

Proposed Mitigative Measures

If implemented with appropriate mitigative measures, project development will maintain existing environmental resources. The design of all the major infrastructure and public facility improvements will incorporate methods to ensure that the environmental resources of the area will not be negatively affected.

Flora/Fauna - No endangered flora and fauna resources exist on the project area and no mitigative measures are planned.

Archaeological/Cultural Resources - No known archaeological resources requiring preservation exist on the property. Cultural resources, including several structures, now vacant since the closure of the mill, including the mill smokestack and several buildings (Laboratory, Generator, Administration, Human Resources, and Waipahu Store) will be preserved or adapted for modern reuse. Design Guidelines will be implemented and followed in all construction and development.

Noise - The project is not expected to generate any significant long-term noise that cannot be mitigated. During construction, equipment will be used in accordance with accepted standards and during daylight hours to mitigate potential noise impacts.

Air Quality - The primary air quality impacts will result from use of construction equipment, fugitive dust, and emissions from vehicular traffic. Watering during construction will largely mitigate dust emissions. Emissions from vehicular traffic may be mitigated by the development of transportation improvements at busy intersections.

Visual - Design guidelines will be implemented prior to development to ensure that architectural and landscape design features are compatible with the "heritage theme" and compatible and integrated in a cohesive manner.

Public Services and Utilities - All new infrastructure will be developed in accordance with project requirements. Electrical and communications improvements necessary to support the requirements of the project will be served from existing utility systems.

Alternatives Considered

The City and County of Honolulu *General Plan* and *Development Plan Land Use Maps* establish policy and set parameters to guide land use and development. Special Area Plans, such as the recently completed and adopted *Waipahu Town Plan, A Special Area Plan of the Central Oahu Development Plan* (December 1995), further describes the City's directive in the DP process. The *Waipahu Town Plan* identifies three land uses for the Oahu Sugar mill site -- light industrial, commercial and community-oriented uses. The commercial and community-oriented uses would be located in the area designated by the City as the "Old Waipahu Town Anchor" site.

Hence, the alternatives to the proposed action are guided by the *Waipahu Town Plan,* and, in accordance with the provisions of *Title 11, Department of Health, Chapter 200, Environmental Impact Statement Rules,* Section 11-200-17(f), the "known feasible" alternatives to the proposed project, as described in this section of the EIS, are limited to those that would allow the objectives of the *Waipahu Special Area Plan* to be met. Examples of alternatives include: (1) the alternative of no action; (2) alternatives requiring actions of a significantly different nature which would provide similar benefits with different environmental impacts; (3) alternatives related to different designs or details of the proposed actions which would present different environmental impacts; (4) the alternative of postponing action pending further study; and, (5) alternative locations for the proposed project.

Unresolved Issues

The preparation of the EIS involved a comprehensive analyses of the technical, social, and economic aspects of the project and have identified several potentially unresolved issues which are described in detail in Section 10.

1. Amfac, as the master developer, intends to sub-contract, or sell in fee, portions of the property to second party developers. Marketing of the project will begin in earnest upon the receipt of the discretionary approvals for the project. While the desire for economic revitalization of the mill site has been well documented by members of the community and governmental agencies, formal marketing of the project has not yet begun, nor are specific commercial uses known at this time.

2. The Heritage Area which will include the restoration and reuse of the Smokestack, Laboratory building, and Generator Building are expected to be developed by a second party non-profit organization. Presently, Hawaii's Plantation Village is finalizing a business plan for the development of the 2.1 acre site into a possible sugar museum visitor attraction. This issue is expected to be resolved within a short period of time.

3. Amfac has an agreement-in-principle for the Leeward YMCA to acquire 2.1 acres of land which would include the Administrative and Human Resources Building pending subdivision and resolution of other details. Amfac has an agreement to convey approximately 2.0 acres of land to the FilCom Center organization pending subdivision and resolution of other details. Both issues are expected to be resolved shortly.

4. Implementation of the project will require a change of zone to appropriate zoning designations for the proposed uses. Amfac is currently working with the City to establish appropriate designations to allow the development of the project.

5. City Department of Parks and Recreation is willing to accept dedication of land for the expansion of Hans L'Orange Park but will not be able to maintain the park due to current budget constraints. An "adopt-a-park" program for the maintenance of the park is under consideration.

6. Determination by the Board of Water Supply (BWS) of the availability of water when the Building Permit applications are submitted for review and approval.

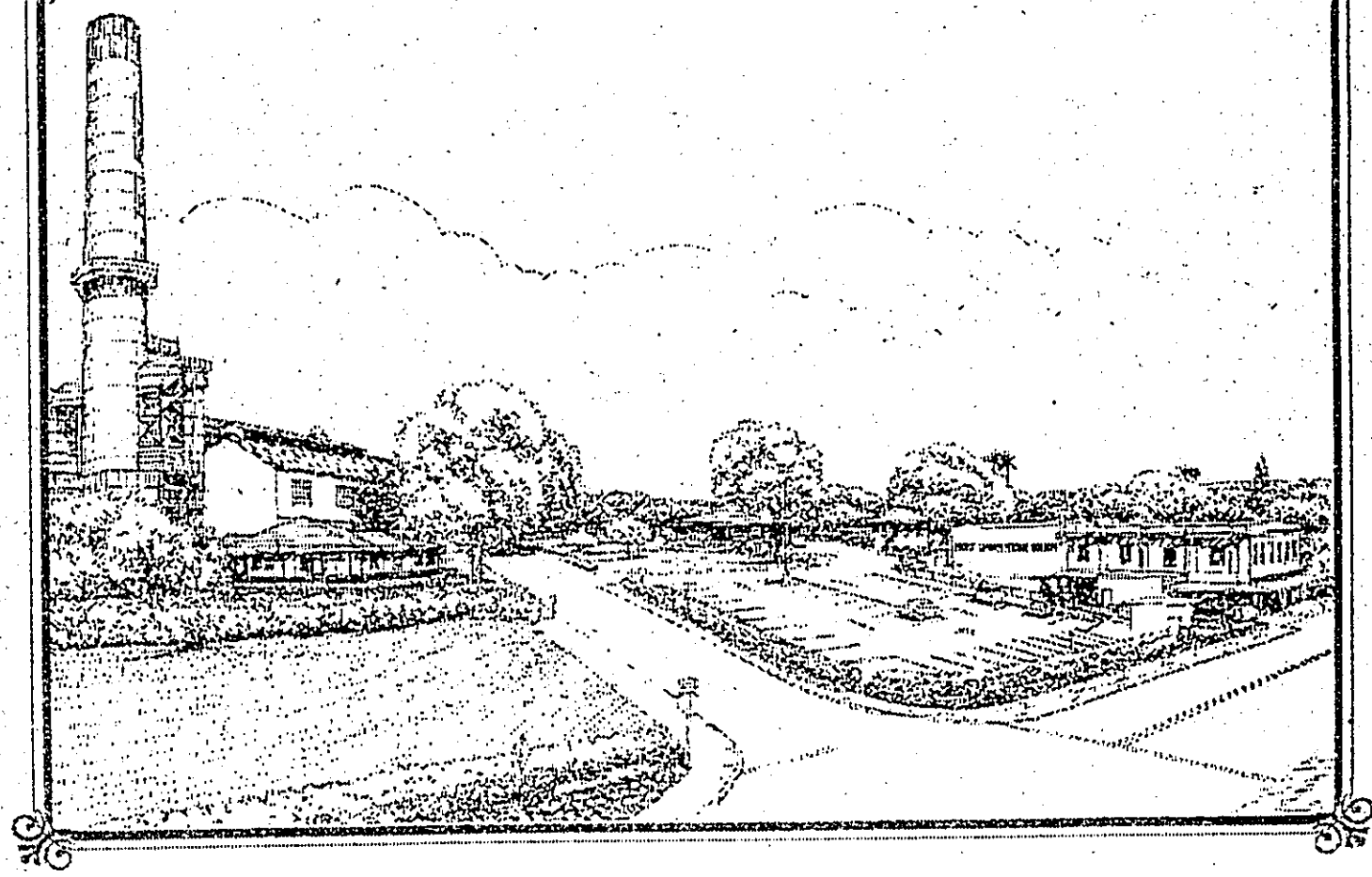
Compatibility with Land Use Plans and Policies and Listing of Permits and Approvals

Implementation of the proposed master plan would generally be consistent with the City's *Waipahu Town Plan, A Special Area Plan of the Central Oahu Development Plan,* the Development Plan Special Provisions, *Hawaii State Plan* and various functional plans. A Development Plan Land Use Map amendment is requested for consistency with the Special Area Plan. A Change of Zone will also be required. The site is currently designated by the State Land Use Commission as "Urban" and has been used for intensive industrial uses related to the milling of sugar cane at Oahu Sugar Company.

In addition to the Development Plan Land Use Map Amendment and the Change of Zone, ministerial permits including Subdivision Approval, Grading Permit, NPDES Permit, and Building Permit will be required.

1.0

INTRODUCTION



1.0 INTRODUCTION

This section contains a project summary, a statement of purpose and need for the proposed action, as well as background information on the subject property.

1.1 PROJECT SUMMARY

Applicant/Landowner:	Amfac Property Development Corp. 700 Bishop Street, 21st Floor Honolulu, HI 96813 Contact Person: Timothy E. Johns Phone: 543-8525
Master Developer:	Amfac Property Development Corp. 700 Bishop Street, 21st Floor Honolulu, HI 96813 Contact Person: Timothy E. Johns Phone: 543-8525
Planning Consultant and EIS Preparer:	PBR HAWAII Pacific Tower, Suite 650 1001 Bishop Street Honolulu, HI 96813 Contact Person: Vincent Shigekuni Phone: 521-5631
EIS Accepting Authority:	City and County of Honolulu Planning Department
Proposed Action:	Applicant requests an amendment to the Central Oahu Development Plan from Industrial & Residential designation to Commercial (22.4 acres); and former Residential land to Park designation (3 acres).
Project Name:	Amfac Commercial and Park
Project Location:	Project is located at the former Oahu Sugar Company mill site and adjacent lands in Waipahu Town. The project is located in the Central Oahu Development Plan area; mauka (north) of Waipahu Street near Waipahu Depot Road (Figures 1-1 and 1-2).
Tax Map Keys:	1st Division, 9-4-02:04 (portion) (Figure 1-3).

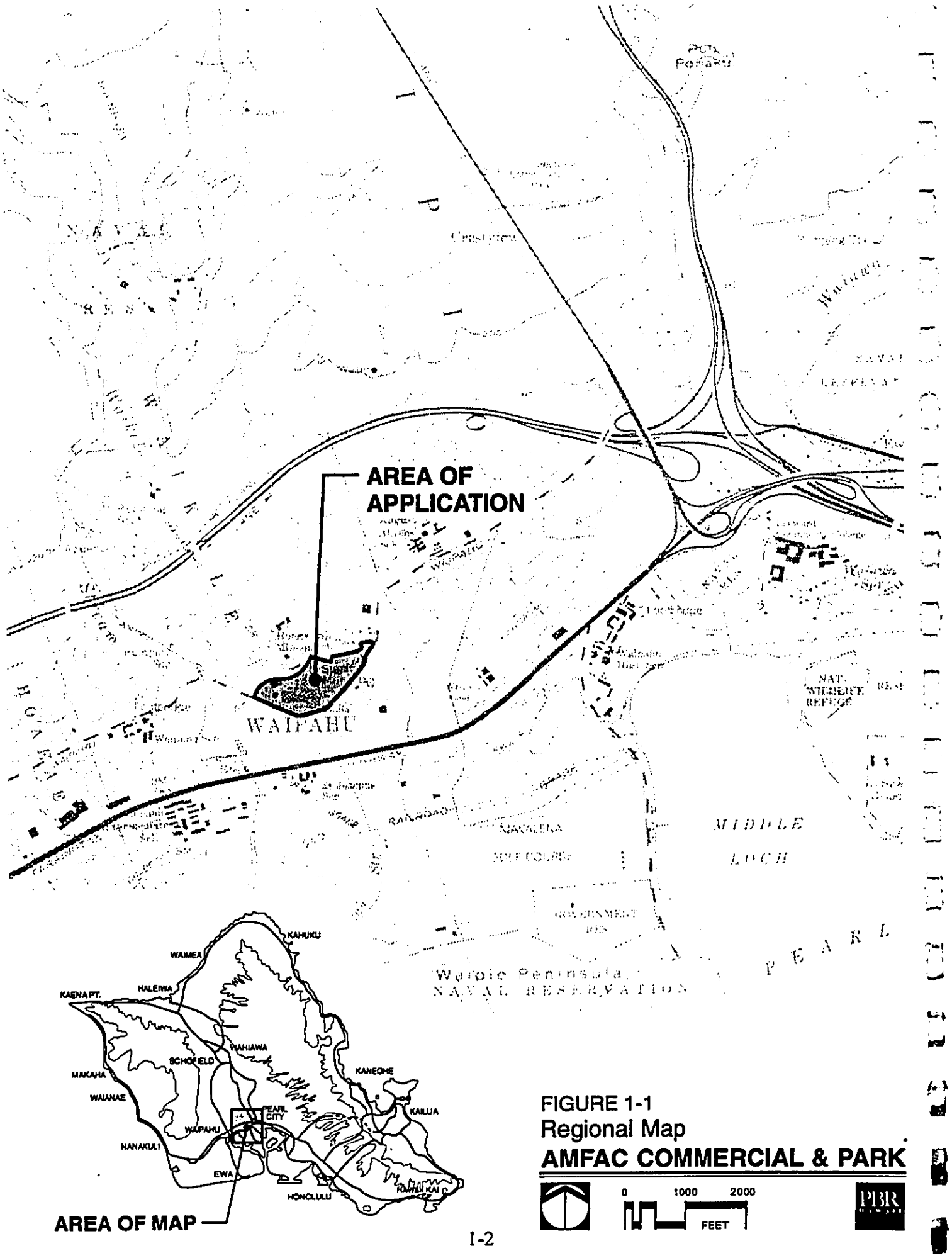


FIGURE 1-1
Regional Map
AMFAC COMMERCIAL & PARK

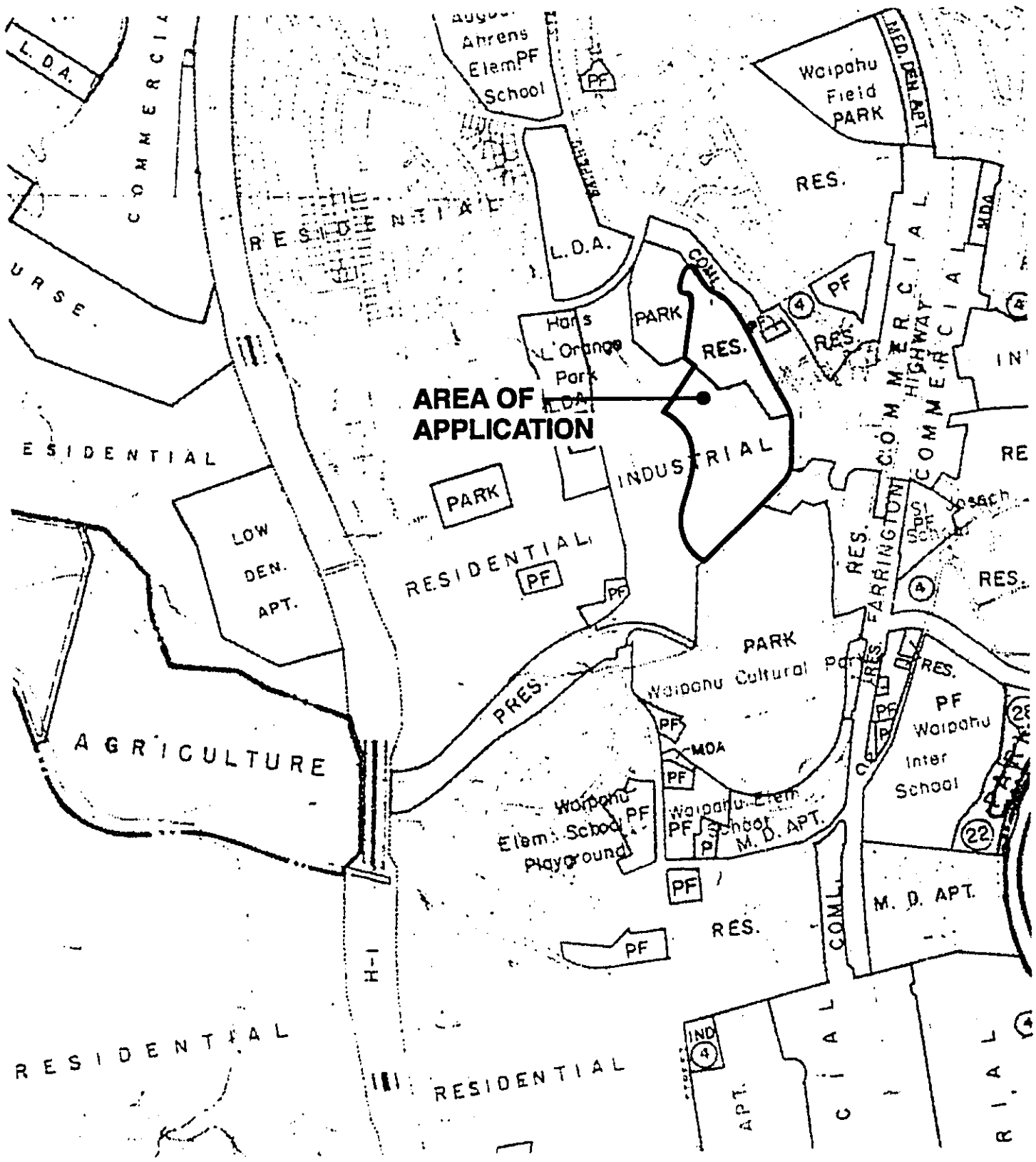


FIGURE 1-2
Project Location Map
AMFAC COMMERCIAL & PARK

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FEET

Source: City & County of Honolulu - Planning Department

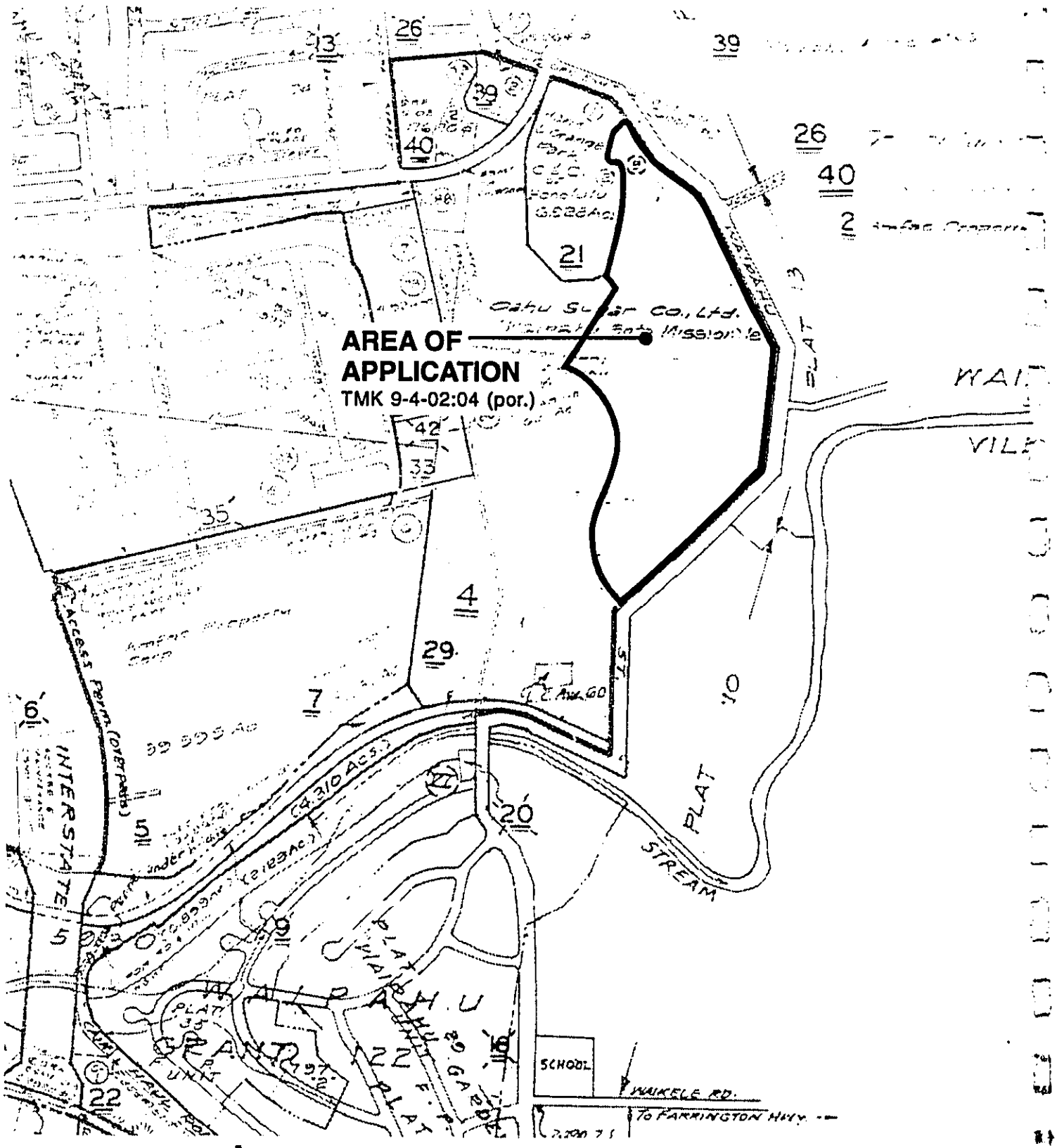


FIGURE 1-3
Tax Map Key 9-4-02:04 (por.)
AMFAC COMMERCIAL & PARK

Total Project Area:	25.4 acres.
Existing Uses:	Offices of Oahu Sugar Company (OSCo) and Waiahole Irrigation Company. Portions of the site leased to City of Refuge Church for meetings and parking, F. & G. Landscaping, to a physician for pharmacy uses, and Roberts Hawaii for parking.
State Land Use District:	Urban District
General Plan:	Urban-Fringe
Existing Zoning:	I-2 Intensive Industrial (16.7 acres) R-5 Residential (8.7 acres)

1.2 STATEMENT OF PURPOSE

The lands of the former Oahu Sugar Company mill site, now largely vacated by the closure of the sugar company, and the adjacent area formerly used for skilled employee housing, are being proposed for commercial, community facilities, and park uses. The purpose for the requested action is to allow the conversion of these lands to other productive uses for the revitalization of the Waipahu economy, for cultural and community facilities, and for recreational uses. The subject request would allow the implementation of the City's *Waipahu Town Plan, A Special Area Plan for the Central Oahu Development Plan,* (December 1995), the *Waipahu 2000 Update* (1995), and the *Waipahu Heritage Area Plan* (Amfac, August 1996).

1.3 OWNERSHIP AND PRESENT USES OF THE PROPERTY

The subject land, identified as TMK: 9-4-02: 04, 1st Division, is owned in fee by Amfac Property Development Corp. (APD). Amfac will serve as the Master Developer ("Developer") for the project. This role is similar to its role as Master Developer in the successful Waikele Planned Community located nearby the subject project. Amfac will similarly contract with third party builders and sub-developers to construct the commercial development and will be responsible for the full development of the Master Plan area. Design controls to preserve land values and to maintain integrity of the project will be instituted. All major infrastructure will be constructed, contracted for or arranged by Amfac.

The site contains the offices of Oahu Sugar Company (OSCo) and Waiahole Irrigation Company. Various parts of the site are being leased on a month-to-month basis to City of Refuge Church for meetings and parking, F. & G. Landscaping for storage purposes, to a physician for pharmacy uses, and Roberts Hawaii for parking.

1.4 BACKGROUND

Historical/Cultural Background. Before the 19th century, Hawaiians had cleared much of the land and settled in the Waipahu area, which, at the time, was a wealthy fishing resource. As many as 27 fish ponds ringed the shoreline. These ponds were the property of the ali'i or chiefs of the area. The abundant fresh water in the area supported numerous taro lo'i. Although the ahupua'a, or mauka to makai land unit, was called "Waikele" by the early Hawaiians, the area eventually became known as "Waipahu." The name "Wai-pahu" which means "bursting water" or "water bursting from underground," referred to the natural springs that once characterized the area. It was also home of the legendary shark goddess Ka'ahupahau.

Oahu Sugar Company. Waipahu evolved as a result of its economic mainstay, the Oahu Sugar Company which operated for nearly a century, from 1897 to 1995. The plantation was a major determinant of Waipahu's growth and prosperity. OSCo provided the primary source of employment, attracting a mixture if immigrants to work on the plantation creating a community of various cultures, traditions, and lifestyles. Waipahu became a typical plantation town. With expansive amounts of land, abundant water, and a newly installed railway system, the OR&L, which linked the Leeward area to the port of Honolulu, Waipahu gradually changed from a fishing and wetland farming community to a successful sugar plantation town with a heritage which has been its most widely recognized element.

With the closure of the mill and sugar operations in 1995, Waipahu moves forward with a rich and colorful history rooted in its plantation past. Several planning studies have been completed by numerous organizations and individuals including community groups, the City and Amfac.

Waipahu 2000 (Waipahu Community Master Plan). The *Waipahu 2000* long-range planning effort was undertaken in Spring 1983 by the Waipahu community. The planning group represented over fifteen community, business and labor organizations. The master plan is often cited as model of community-based planning in Hawaii.

Waipahu 2000 Update. Subsequently, the announced closure of Oahu Sugar in 1994 precipitated community concern about the economic vitality of Waipahu Town and the disposition of the mill site. OSCo ceased its operations in the April, 1995. The shutdown of the sugar processing operations represented the loss of jobs.

The *Waipahu 2000 Update* planning process was convened in October 1994 with representatives from the community organizations that participated in the original *Waipahu 2000* process. The purpose of this effort was to update the earlier plan to address the challenges, as well as opportunities that face Waipahu. These representatives, along with many new members from the community, formed the Waipahu 2000 Update Committee, and met twice monthly from October 1994 to May 1995. Area legislators and/or their aides also attended these meetings. The *Waipahu 2000 Update*

Executive Summary was widely circulated to all Waipahu households receiving the *West Oahu Current* newspaper; the plan is attached as Figure 1-4 and described in Appendix C.

The *Waipahu 2000 Update* envisions the future of Waipahu Town as a *"mixed use (industrial/ commercial), in the area occupied by most of the sugar mill buildings, [this] is proposed as a way of helping to replace the economic activity and employment that was provided by Oahu Sugar Company. The mixed use area could have a heritage theme, and should include businesses that would attract Oahu residents and visitors..."*

The *Waipahu 2000 Update Final Report* describes the planning effort held over eight months and attended by many members of the Waipahu community; describes the vision for Waipahu ("Waipahu Tomorrow"); and includes a summary of the major proposals. On October 30, 1995, the community planning merits of the *Waipahu 2000 Update* effort were recognized and awarded by the Hawaii Chapter of the American Society of Landscape Architects. The Waipahu 2000 Update Committee continues to meet monthly, primarily to work on implementation of the various Waipahu community based plans.

City and County of Honolulu Special Area Plan for Waipahu. The Honolulu City Council adopted Resolution No. 94-309, C.D. 1 in January 1995, to endorse the City Planning Department's preparation of a community-based Special Area Plan for Waipahu. The Resolution called for the Waipahu Town Plan to provide comprehensive, long-range objectives to guide land use and public improvements, as well as specific plans for certain improvements, including transportation improvements, which address the needs and concerns of the community and enhance the long-term livability and economic vitality of Waipahu.

In February 1995, the Planning Department sponsored a visioning workshop to gauge community interests and desires regarding the future of Waipahu. As directed by the City Council Resolution, a Waipahu Town Plan Task Force was also convened to advise the Planning Department and provide community input to the planning process. The Task Force included members of the Waipahu 2000 Update Committee, Waipahu Business Association, Waipahu Neighborhood Board, the Planning Department, and members of the State Senate, State House of Representatives, the City Council member representing Waipahu, and other members of the community. The Waipahu Town Plan Task Force's Preferred Plan (Figure 1-5), which became the Waipahu Special Area Plan, identified the subject project area as 1) the "Old Waipahu Town 'Anchor'" with commercial and community facilities (including a "heritage park/center", "open market", "Filipino community center" and "YMCA"); and, 2) a "passive park" expansion of Hans L'Orange Park. In February 1996, the City Council accepted the recommendations of the Waipahu Town Plan (attached as Appendix C) and commended the Waipahu Town Task Force for their effort (Resolution 96-14). On March 21, 1996, the Waipahu Neighborhood Board unanimously voted "to urge both public and private sectors to establish a timely and expedient implementation of the Waipahu Town Plan."

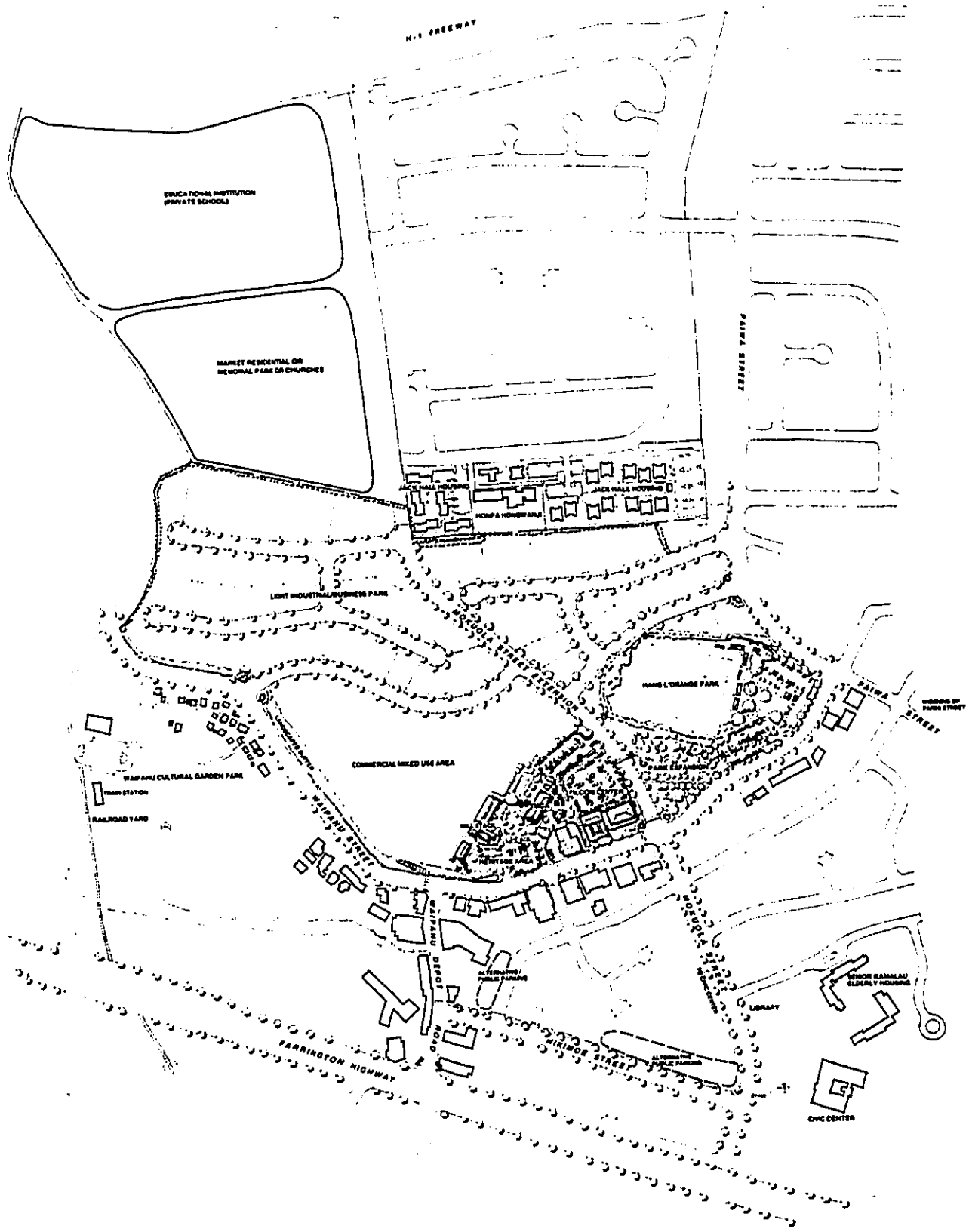


FIGURE 1-4
Waipahu 2000 Update
AMFAC COMMERCIAL & PARK

0 300 600
FEET

Source: City & County of Honolulu - Planning Department

FIGURE 1-5
Waipahu Special Area Plan
AMFAC COMMERCIAL & PARK

The Waipahu Town Plan represents "the collective desires of the community to integrate economic development with social, cultural, and recreational enhancements," including promotion of the cultural heritage of Waipahu. The Special Area Plan designates the mill site below the proposed light industrial subdivision for "commercial use and community facilities," and calls for "selected existing structures on the mill site (smokestack, and the Generator, Lab, Administration, Human Resources and Waipahu Store [Clinic] buildings)" to be retained for future redevelopment. To help promote Waipahu's heritage, the applicant has prepared the *Waipahu Town Heritage Area Plan* (Appendix D).

Recently, funding has been made available from the Livable Communities Program to develop urban design guidelines and an integrated transportation plan for Waipahu, emphasizing opportunities for transit, pedestrian and bicycle modes of travel where feasible and appropriate. ~~The first~~ Waipahu Livable Communities Task Force meetings have been ~~was~~ held on November 19, 1996, January 22, 1997 and February 27, 1997, and the applicant is a participating member of the Task Force. Discussions with the Planning Department and the rest of the Task Force have been initiated and will be continued until the Waipahu Livable Communities Task Force's products are finalized (scheduled for the end of 1997).

Common Themes. Two common themes emerged from the above-described planning efforts: 1) the need for economic revitalization for Waipahu Town, and 2) the desire to recognize and promote important aspects of Waipahu's special plantation heritage. These two major themes are balanced and incorporated throughout the three community-based plans.

For example, both the original Waipahu 2000 and the Waipahu 2000 Update state, "Although preservation of historically significant structures is encouraged, this plan primarily seeks to encourage new development which is architecturally compatible with the historic aspects of Waipahu." The Waipahu 2000 Update, major proposal No. 3 reads, "Retain the area from the smokestack to the Clinic Building in its existing condition as a cultural/historic area. Encourage the development of a museum together with an arts and crafts center and a farmers' market area." Major proposal No. 6 reads, "Redevelop the remaining portion of the 'Mill site' for commercial/industrial uses. . . ."

The *Waipahu Town Heritage Area Plan* includes the following: 1) identifies an area (the "Heritage Area") within the Oahu Sugar mill site that would focus on preserving Waipahu's historic character; 2) describes the guidelines that are being prepared to control the design of new facilities within the town core, the mill site, and the park expansion/Filipino Community Center site; and 3) summarizes current efforts of historic documentation. The Heritage Area Plan is intended to provide a more detailed framework for the implementation of the Heritage Area as called for in the Waipahu 2000, the Waipahu 2000 Update, and the Waipahu Town Plan.

As part of the commercial and community facilities components planned for the mill site, an area will be set aside as a "heritage area." In accordance with the Waipahu 2000 Plan Update and the

Special Area Plan, the applicant intends to retain the mill smokestack ("the Eiffel Tower of Waipahu"), and the Generator, Laboratory, Administration, Human Resources, and Old Waipahu Store Buildings for re-use. Re-use is discussed in more detail below and could include a YMCA and a historical park/mill museum could house exhibits of Hawaiian culture in the Waipahu area before sugar cultivation, mill and plantation mementos, as well as photo collections. The condition, safety, and necessary maintenance programs for the smokestack and nearby buildings are currently being studied.

Status of the Development Plan Review Process. The City and County of Honolulu is currently updating the Central Oahu Development Plan. This process includes the completion of the Special Area Plan (described above) to address communities (or areas) undergoing change or facing special problems or opportunities. In addition to Waipahu, the town of Wahiawa is also included in the Central Oahu DP review area. The Special Area Plan for Waipahu is intended to be incorporated in the DP Land Use designations. Since the schedule for the adoption of the Planning Department's recommended update of the Central Oahu DP is uncertain, and, since the review of the DP Land Use Map occurs only once a year, the applicant has decided to submit this application for the 1997 Development Plan Annual Review. Thus, in the event that the City's Central Oahu DP Update is delayed or discontinued, the applicant will have a "back-up" that will allow the implementation of the City's Special Area Plan for the applicant's property. If the Central Oahu DP Update (including the Special Area Plan) is successfully adopted, then this application will be withdrawn.

Public Informational Meetings. The proposed project has been presented or discussed at a number of public meetings including the following:

- Waipahu 2000 Update Committee, February 12, 1996
- Waipahu 2000 Update Committee, April 10, 1996
- Waipahu 2000 Update Committee, May 29, 1996
- Waipahu Neighborhood Board, July 18, 1996
- Waipahu 2000 Update Committee, October 30, 1996
- Waipahu Livable Communities Initiative Task Force, November 19, 1996
- Waipahu Neighborhood Board, February 20, 1997

1.5 NEED FOR THE PROPOSED ACTION

Waipahu is poised for the transition into the next century. The recent purposeful planning to revitalize the economy maintains key elements of the plantation legacy as a reminder of its past. These elements have been identified in the plans which have been created by the community through the auspices of the City and County of Honolulu and Amfac. The plans for the mill site require approval and inclusion into the policy documents of the City for future implementation. The requested actions to amend the Central Oahu Development Plan will allow the development of the sugar mill site into a viable commercial area, cultural and community area, and recreational park.

These needs have been identified by the community, the City and the applicant as the best course of action for the mill site.

1.6 DESCRIPTION OF THE PROPERTY

The property is an irregular shaped parcel in the heart of old Waipahu town. Set on a bluff, the buildings which comprise the mill are still prominent and punctuated by the 170 foot tall smoke stack. The 25.4 acre site was formerly used for three uses, the mill facilities, OSCo office buildings, and skilled worker housing. The remaining industrial buildings are vacant, several buildings previously used as office buildings are largely vacant except for one building which still houses the OSCo and Waiahole Irrigation Company offices. The land area (5.4 acres) of the former skilled worker housing is vacant except for one remaining wooden house which is being used as an office by on-site security.

Vegetation at the office building complex consists of landscape plantings and lawns. The vegetation at the vacant residential area consists of weedy species and fruit and flower trees.

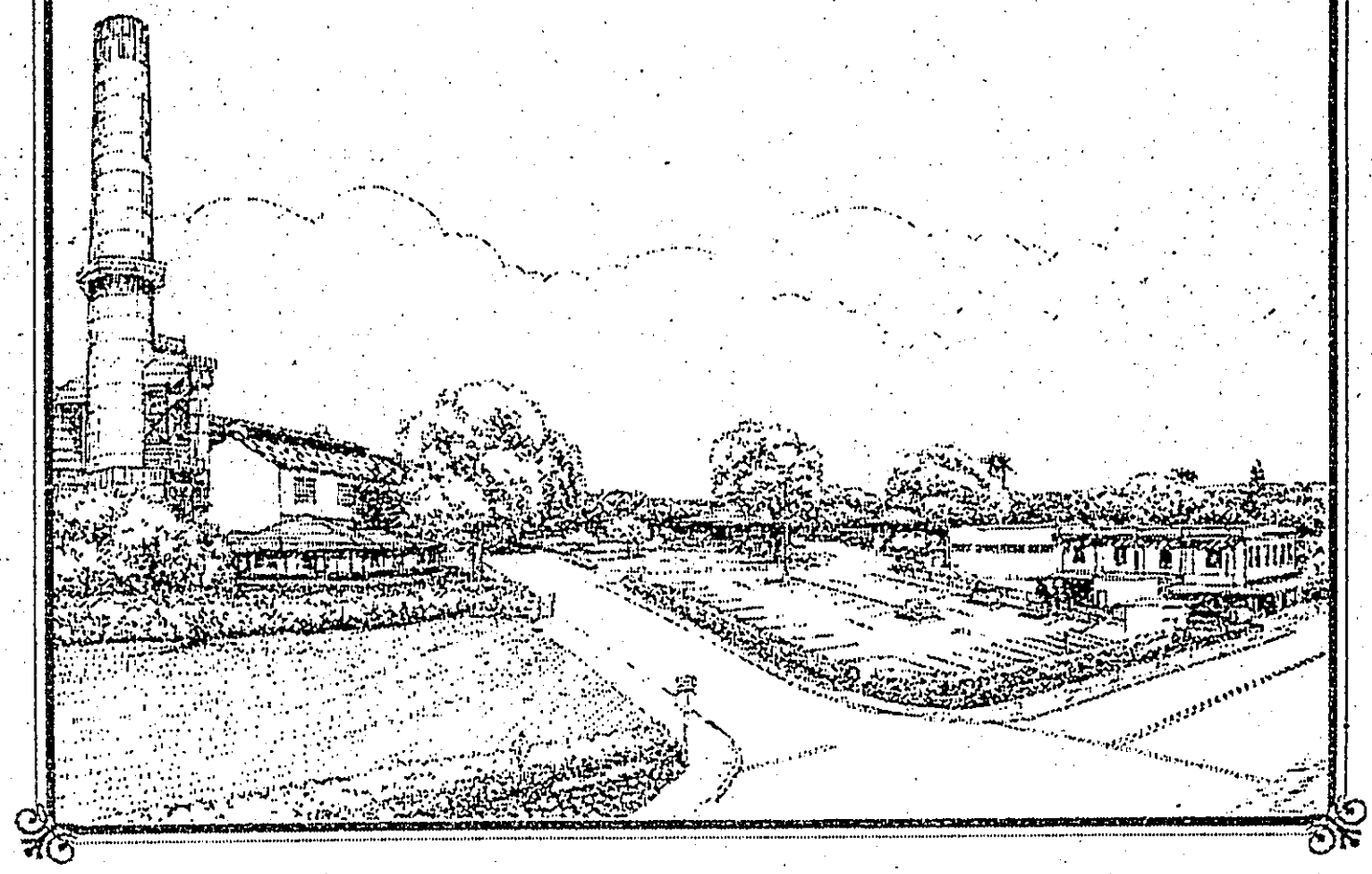
1.7 SURROUNDING LAND USES

Waipahu Street borders the project site along the makai boundary. Surrounding land uses include the Hans L'Orange Park to the northeast, various commercial businesses and Waipahu Cultural Garden Park/Hawaii's Plantation Village along the makai side (south) of Waipahu Street. To the north/northwest the project is vacant land which has recently been approved for the Amfac Light Industrial Subdivision.

The 38-acre light Industrial Subdivision has been referred to as Phase I of the overall Oahu Sugar Company mill site redevelopment and has been included in the technical infrastructure studies for traffic, water, wastewater and drainage. The subject Commercial and Park project has been referred to as Phase II in the infrastructure studies.

2.0

DESCRIPTION OF THE PROJECT



2.0 DESCRIPTION OF THE PROJECT

A statement of objectives for the project and a description of the key elements of the master plan is provided in this section.

2.1 OBJECTIVES OF THE AMFAC COMMERCIAL AND PARK PROJECT

The purpose of the requested amendment to the Central Oahu Development Plan Land Use Map is to implement one of the recommendations of the City's Waipahu Special Area Plan (discussed in Section 1.4). The proposed project involves the development of commercial uses, community facilities and park on approximately 25.4 acres of land mauka of Waipahu Street, on lands occupied by the now closed Oahu Sugar Mill (Figure 2-1). The proposed land uses are summarized in the following table:

DEVELOPMENT PLAN SUMMARY OF LAND USES

	(LAND USES)	(DP AMENDMENT)
Park		3.0 acres
Commercial		22.4 acres
Commercial	12.5 acres	
Open Space Buffer	2.0 acres	
Waipahu St. Widening	0.4 acres	
Mokuola St. Extension	0.9 acres	
Heritage Area	2.1 acres	
YMCA	2.0 acres	
Fil/Com Center	2.0 acres	
Old Waipahu Store	0.5 acres	
Sub-total	22.4 acres	
(Approximate) Total Area		25.4 acres

The City's *Waipahu Special Area Plan* identifies the subject property as the "Old Waipahu Town Anchor". This application to amend the Central Oahu DP Land Use Map is required to change the present designations of Industrial & Residential to Commercial & Park designations. The DP amendment (and a future change of zone amenment) will allow the implementation of the commercial and park project.

A separate zoning application for a light industrial subdivision on the same TMK parcel was recently approved in December 1996 (Ordinance 96-69).

The traffic and civil engineering reports which have been prepared included studies of both the light industrial subdivision and the subject commercial and park project. These studies have been

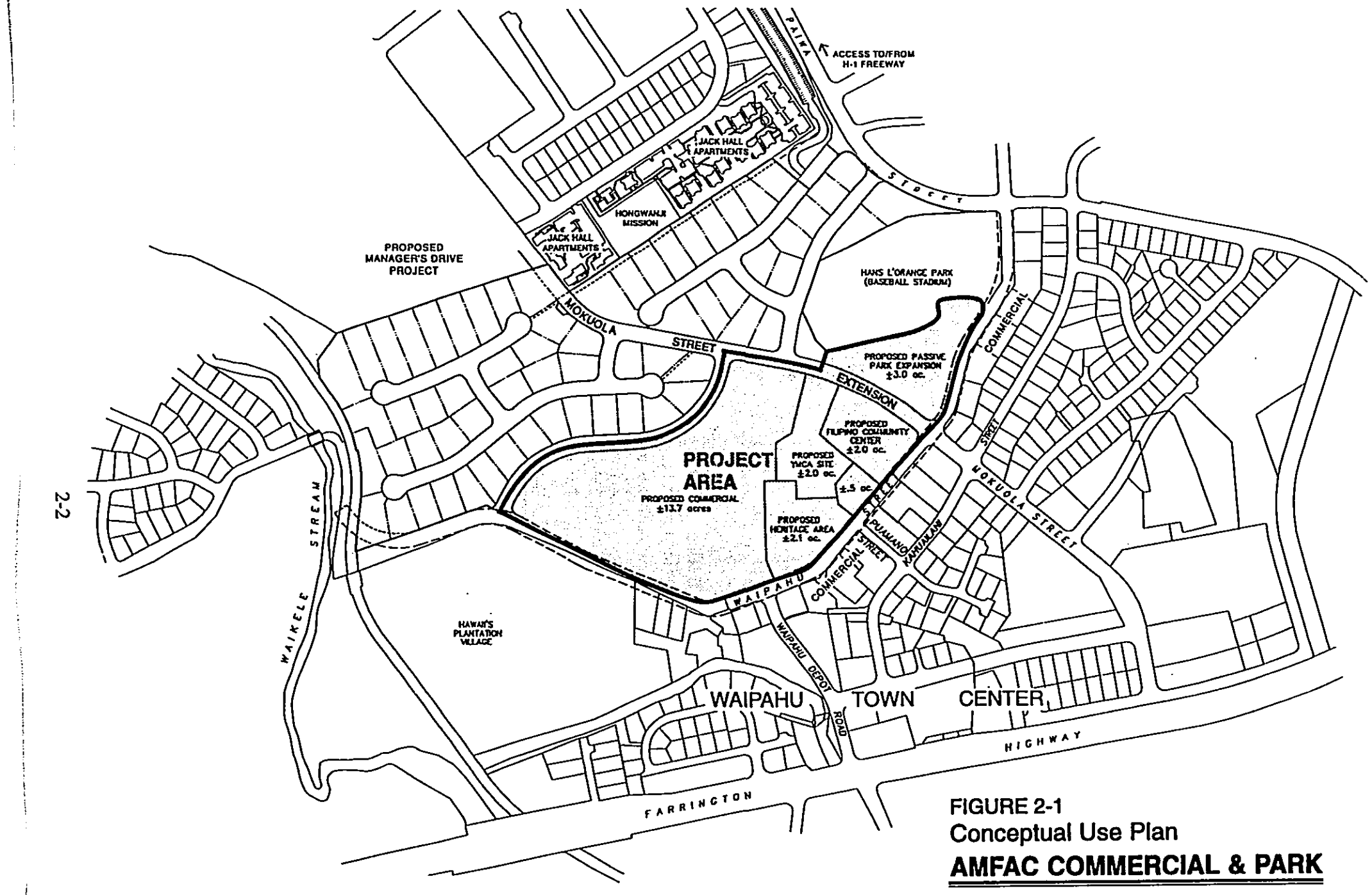


FIGURE 2-1
Conceptual Use Plan
AMFAC COMMERCIAL & PARK

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Source: Community Planning Inc.

reviewed and approved by the appropriate government agencies in the zone change application process and are summarized in this report. The reports are also appended in their entirety to this EIS.

2.2 KEY ELEMENTS OF THE MASTER PLAN

The sugar mill site is designated to be redeveloped into three land uses -- light industrial, commercial, and community-oriented and recreational uses. The proposed light industrial subdivision is consistent with the existing Industrial DP designation and, is therefore, not subject to DP amendment. The commercial and community-oriented and recreational uses are the subject of this DP Amendment application and EIS (Figure 2-2).

These uses are situated in the area designated by the City as the "Old Waipahu Town Anchor" site. The centerpiece is the prominent mill smoke stack which has served as a landmark of Waipahu for the past century. The visibility of the smoke stack provides a landmark for potential patrons from Waikele and from the H-1 Freeway to the proposed project. The site's location on a bluff provides establishments the opportunity to offer patrons panoramic views of Waipahu.

The entire approximately 25.4 acre core area makai of the light industrial subdivision is proposed to be roughly allocated as follows:

- a "commercial" lot of approximately 14.5 acres, which includes an approximately 2 acres of landscaped open space to be retained along Waipahu Street west of Depot Road;
- an approximately 3.0 acre park/open space expansion of Hans L'Orange Park;
- roadways of approximately 1.3 acres (which will provide: area for the widening of Waipahu Street; access to the YMCA and Filipino Community Center; via an extension of Mokuola Street; and a Road "X" connection ~~connect~~ with Road "Y" to provide an alternate route around the Waipahu Street/Paiwa Street intersection);
- the 0.5 acre site of the Old Waipahu Store;
- a YMCA site of approximately 2 acres;
- a Filipino Community Center site of approximately 2 acres; and
- the Heritage Park and Museum site of approximately 2.1 acres.

This allocation yields a mix of approximately 13.0 acres of commercial uses and approximately 12.4 acres of "community-oriented" uses, which is consistent with the intent of the ~~WSAP~~Waipahu Town Plan.

2.2.1 Commercial Uses

The mill site offers a prime location for potential commercial activities and is centrally located for serving Central Oahu, Ewa, and downtown Honolulu. Commercial development could potentially include a business park based on a theme of a former sugar mill which incorporates industrial-style

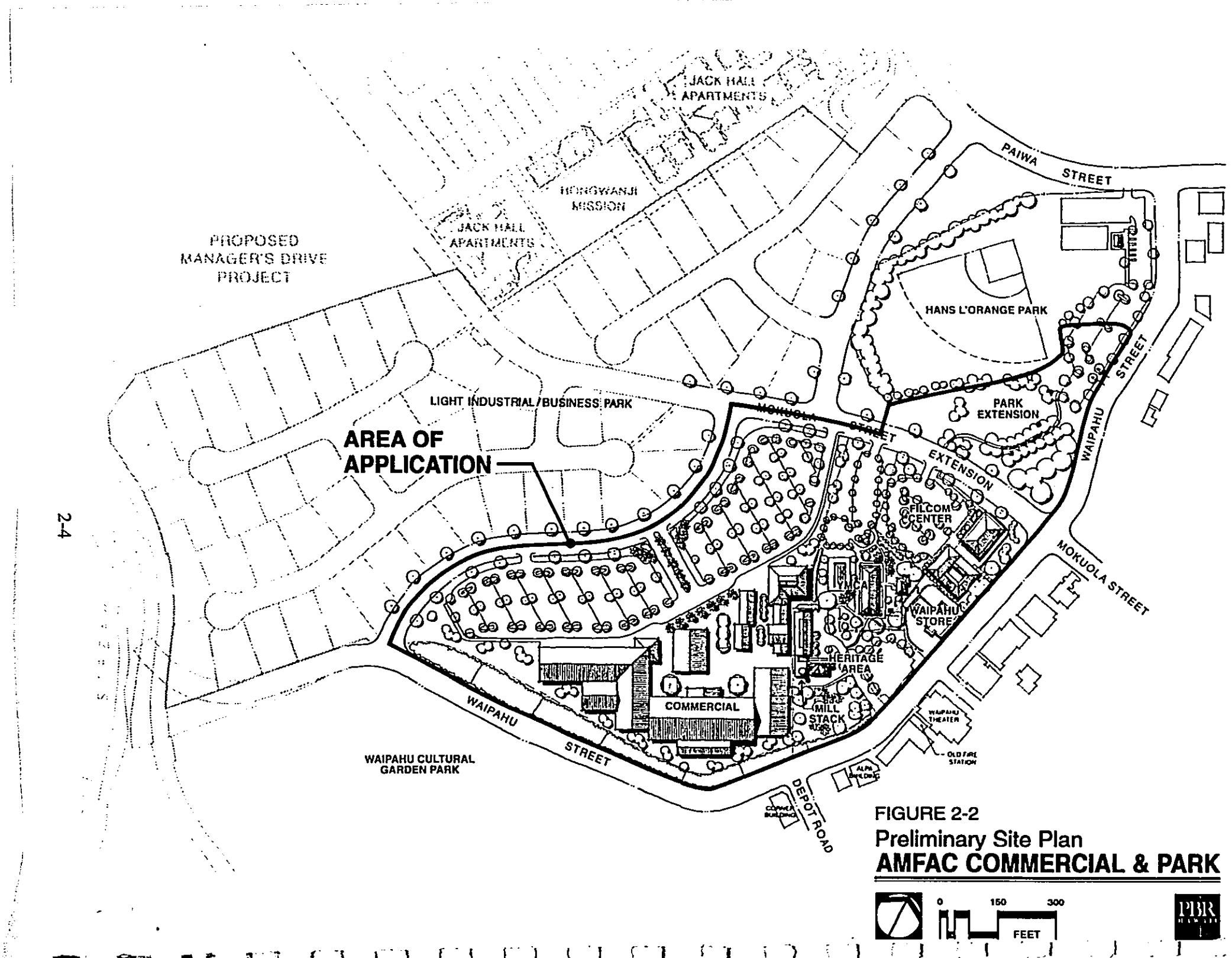


FIGURE 2-2
Preliminary Site Plan
AMFAC COMMERCIAL & PARK

buildings, old equipment, photographs, the mill stack, etc. Activities could include a large discount specialty store (an example would be a consumer electronics store featuring audio and video equipment, computers, software, cameras and other photography equipment, video games, etc.), a neighborhood commercial center, restaurants, building supply showrooms, and auto dealerships and services. There could also be the opportunity to integrate commercial uses with community facilities which are discussed below.

2.2.2 Community and Other Public Purpose Uses

A heritage park/center and community facilities, including a YMCA and a Filipino Community Center, are designated to be located on land adjacent to the commercial area. Designated as the Old Waipahu Town Anchor on the City's Special Area Plan for Waipahu, the mill stack punctuates the cultural area of the project from the mill smokestack to Hans L'Orange Park.

Heritage Center. Reminders of Waipahu's historic plantation legacy as evidenced by the sugar mill stack, and its proximity to the Waipahu Cultural Garden Park, make it appropriate to develop a heritage area. Adaptive re-use of some of the existing mill structures could serve as the heritage center. Its relationship to the commercial area would also help to support visitor attendance at the heritage center, which is intended to complement and be supplemental to the Waipahu Cultural Garden Park. Furthermore, the proposed heritage center is appropriately located near the Waipahu Cultural Garden Park and Hawaii's Plantation Village so the three facilities would benefit from visitors.

In efforts to promote the cultural heritage of the various ethnic groups, the heritage center could be operated by a non-profit organization. In showcasing the plantation era, the center could offer multimedia displays incorporating artifacts and old photographs covering the cultivation of sugar cane, mill operations, the water system, the history of the plantation and plantation labor, plantation life, etc. The Alexander and Baldwin Sugar Museum on Maui could serve as a prototype for a successful sugar plantation museum. An open market concept could also be developed in conjunction with the heritage center. The Friends of Waipahu Cultural Garden Park (FWCGP) have inspected the 2.1 acre site, which includes the smokestack, Laboratory Building, Generator Building and parking area fronting Waipahu Street. The FWCGP are finalizing a business plan for the development of the site into a possible sugar museum visitor attraction and ~~believe~~ have concluded that the 2.1 acre site is more than adequate for a successful attraction.

This "heritage area" also includes space for a Filipino Community Center and a "passive park" and open space area. This passive park area is proposed to be incorporated into Hans L'Orange Park, allowing for the expansion of the baseball field at the Park for professional-level play. Hans L'Orange Park, named after the famous Oahu Sugar plantation manager, was traditionally a focal point of the plantation communities for recreation and social interaction. Thus, the green, park-like atmosphere on the mauka side of Waipahu Street up to the Old Waipahu Store, an important part of

the existing character of the historic core of Waipahu, would be retained. The Heritage Center, YMCA and FilCom Center will all be subject to design guidelines established by Amfac.

The proposed "heritage area" is a key part of the center of old Waipahu, a center that has lost much of its economic vitality, a condition that is reflected in its deteriorating buildings. In several similar small towns in Hawaii, communities have turned to the Main Street program in an effort to revitalize the economies of their business districts and to recapture the visual character and heritage of their past. The Waipahu 2000 Update Plan called for establishing such a program in Waipahu to ensure implementation of improvements to the town. Due to the current state fiscal situation, it is unlikely that state revenues would be available for a new Main Street program for Waipahu. Therefore, with the assistance of district City Councilmembers and the applicant, private sources of funding are being sought to help establish a similar program. In addition, an application for funding from the State Community-Based Economic Development Program has been submitted and is currently being reviewed. Hawaii's Plantation Village or a site within the "heritage area"may serve as the "Waipahu Main Street" headquarters, providing organization and coordinating promotion of the town.

This entire "heritage area" could then serve as a focal point for a "heritage district" that links with Hawaii's Plantation Village and the proposed "Old Town commercial" area along Waipahu Street and Depot Road. The Waipahu 2000 Update Committee's vision for the "heritage district" is as follows:

> *"There is a desire by the community to save and show the objects that preserve the history of Oahu Sugar Mill and all ethnic groups of Hawaii who were employed by the plantation. Heritage/cultural activities are envisioned for the area near the existing stack. This area was selected for cultural/heritage activities due to its high visibility from Waipahu Street, potential reuse of existing buildings, and the panoramic views of Waipahu Town from the top of the bill. The smokestack could be preserved, and the feasibility of reuse of some of the existing buildings should be considered. Preservation and/or reuse of some of the buildings in better condition could help to preserve the character of Oahu Sugar's influence on Waipahu. The heritage district could include a historical museum, arts and crafts center and/or a community center with an emphasis on one of the island's many nationalities, such as the Filipino community. The area should be linked with the Waipahu Cultural Garden Park by a pedestrian path. This pedestrian path could also be linked to an area proposed for expansion of Hans L'Orange Park (which may be improved to accommodate play by the Hawaii Winter Baseball League). Together with the existing Waipahu Cultural Garden Park/Hawaii's Plantation Village, this site may create the critical mass of activities that will attract island residents and visitors to Waipahu and its business."*

The machinery in the existing mill has been sold and will be reused at other sugar mills and for other industrial uses. Based on extensive analysis and studies, most structures that remain are impractical and unsuitable for other uses, including the commercial uses envisioned in the Special Area Plan. It is also important to note that any adaptive re-use of most of the existing mill structures would

require major structural and utility renovations to bring the buildings up to acceptable public safety levels to allow occupancy and re-use.

Thus, most structures in the area designated for commercial use will be dismantled and removed. In anticipation of the dismantling of the mill structures, archival photographs documenting the structures were taken. In accordance with the specifications of the Historical American Buildings Survey (United States Secretary of the Interior documentation specifications), three sets of archival prints were made and will be filed in the U.S. Library of Congress and the University of Hawaii. The photographs thoroughly document the structures and buildings of the Oahu Sugar Company for posterity (27 exteriors of 22 structures, 28 interiors in 14 buildings).

The mill structures will be replaced by buildings constructed according to design guidelines intended to promote the plantation theme and cultural heritage of Waipahu, while at the same time allowing a feasible use for the site and creating new business infrastructure an employment opportunities for Waipahu's town core. All of these efforts should combine to promote Waipahu's heritage, to make Waipahu an attractive place to live, work, play and visit, to bring new customers to existing businesses, and to revitalize the town. In their review of the Draft EIS, SHPD stated that, "We look forward to the re-use of the historic structures including the mill smoke stack, the generator, laboratory, administration, human resources and the old Waipahu store buildings. We believe that the proposed establishment of design guidelines will help preserve the character of Waipahu."

Young Men's Christian Association (YMCA). The YMCA of Honolulu Leeward Branch will be adapting the existing Administration and Human Resources Buildings for reuse as a new community YMCA facility to more fully serve the growing population of the region. The overall plan for the Oahu YMCA organization calls for development of a new community YMCA in the Waipahu-Ewa area by year 2000 as one of its top priorities. Such a community service-oriented facility is needed for the youth of Waipahu as it provides recreational outlet and social support.

The existing Leeward YMCA branch, which has been in existence for five years, is located in the Westgate Center in Waipahu. Approximately 1,500 students are involved in the Leeward YMCA program, including students in the A+ program at Waipahu, Honowai and Kaleiopuu Elementary Schools in Waipahu, and elementary schools in the Ewa/Ewa Beach area. The YMCA also offers Summer Fun programs at Kaleiopuu and Makakilo Elementary Schools. About 600 teens are enrolled in the YMCA Teen Program at Waipahu Elementary, Intermediate and High Schools, and at August Ahrens Elementary School in Waipahu.

The YMCA site is adjacent to Hans L'Orange Park for outdoor recreational activities and programs, and in close proximity to schools, homes, shopping and a main road. The YMCA facility would potentially include exercise and child care facilities, offices, meeting rooms, locker/shower rooms, a multi-purpose room, an outdoor swimming pool, a play area, and parking area. In August 1996 an agreement (in principle) was reached between Amfac and the YMCA for acquisition of the two acre site identified in this proposed project, subject to several conditions, including the signing of

a definitive purchase and sale agreement now being prepared. Occupancy by the YMCA is now targeted for May - June 1997.

Filipino Community Center. The Filipino Community Center ("FilCom Center") is intended as a gathering place for promoting activities associated with the cultural heritage and values of Filipinos, as well as a family-focused center offering diverse programs of social, recreational and human services accessible to all members of the community. Services to be offered by the FilCom Center include cultural events and activities, a senior center providing elderly services, children and youth activities and services, family and counseling services, and conference and meeting facilities. The FilCom Center will consist of a new building and parking area. Initiated by the Filipino Chamber of Commerce of Hawaii in 1991, the FilCom Center would be developed, owned and operated by the Filipino Community Center, Inc., a Hawaii non-profit corporation. It ~~was~~ is a primary goal of The Filipino Community Center, Inc. to establish the FilCom Center in Central or Leeward Oahu due to the rapid growth and development of the communities and increasing youth population, and to be close to urban clusters of the Filipino population.

An agreement has been reached between Amfac and the Filipino Community Center, Inc. for the transfer of the two acre site identified in this proposal. The transfer is now targeted for ~~February~~ April - ~~March~~ May 1997.

From a traffic standpoint, the heritage and community facilities are centrally located to major arterials, with facilities-related traffic expected to occur primarily during off-peak traffic hours. Off-street parking areas would need to be provided.

2.2.3 Recreational Uses

The adjacency of the proposed "passive park/open space" site to Hans L'Orange Park is ideal for related outdoor recreational activities and programs, and is in close proximity to the civic center, new public library, and the elderly housing project for conducting social and human services. Other factors which contribute to the appropriateness of the site include easy accessibility by private vehicle, public transportation and walking, a highly visible location, and the need for minimal site improvements. Adjacency to the YMCA facility would also enhance opportunities for integrating social and recreational activities and programs.

Rich in baseball tradition, the City's Hans L'Orange Park is also the home field for the Hawaii Winter Baseball League's franchise West Oahu Cane Fires team. To meet professional league standards, the Park has upgraded improvements including an expanded bleacher system to accommodate a 2,200-person seating capacity, installation of a chainlink fence around the Park, an improved lighting system, a press box and expanded dugouts, installation of an electronic scoreboard, an outfield warning track, and improved restroom facilities. Concession stands and a gift booth are also planned for the Park. In addition to the Park's existing parking area along Waipahu Street, an area behind left field was recently cleared to provide temporary parking. Future

improvements to the Park include infill and extension of the left field line to regulation size and provision of a permanent parking area.

The Plan's designated improvements to the existing 6.9-acre Hans L'Orange Park include a 3-acre expansion within the area along the southern boundary of the park, encompassing the area of the existing Makaaloha Street and extending down to Waipahu Street. The expansion would allow for extension of the Park's left field lane, and to create more passive park area, additional parking area, additional open space, and area for any other improvements. The improvements will enhance the visual character of the Park and provide increased recreational opportunities.

Discussions with the City Parks Department indicate that the plan for the park expansion is generally acceptable but the funding for City maintenance of the additional area is not currently available.

2.3 INFRASTRUCTURE IMPROVEMENTS

The project will require infrastructure development on-site as well as off-site, including roads, water, sewer and drainage improvements. The improvements will tie into the existing City and County water, sewer, roadway, and drainage systems. Other improvements will include ~~underground utilities,~~ landscaping, coordinated signage, and a project entry feature.

2.3.1 Wastewater Collection and Transmission

New wastewater facilities including collection, transmission, treatment and effluent disposal will be developed as part of the project. A complete description of the proposed wastewater collection, treatment and disposal systems is provided in Section 5-8 and Appendix K.

It is estimated the proposed project will generate an average daily wastewater flow of approximately 0.16 mgd, with a peak flow of 0.70 mgd. The existing municipal wastewater collection system appears adequate to accommodate this discharge. The first phase of the proposed commercial development should be completed in 1999.

A sewer master plan and sewer connection application form for 48 acres (61.0 acres less 13 acres of unsewered park land) has been submitted and approved on September 24, 1996 and November 21, 1996, respectively. Approval for connection was contingent on discharge from this development not to exceed 200,000 gallons per day. Although the Oahu Sugar Company Property Sewer Master Plan, as approved on September 24, 1996, projected an average daily flow of 0.46 million gallons per day (mgd) from the entire site, only 0.2 mgd was approved. The applicant has discussed the reasons for this difference with the Department of Wastewater Management (DWWM) and may submit a sewer connection application in the future for the additional 0.26 mgd, or portion thereof, as needed.

Project wastewater will be conveyed to the Waipahu Sewage Pump Station via an existing main in Waipahu Depot Road. On the east side, several existing sewer mains which may service the proposed land use are located in Puamano Street, Mokuola Street and Waipahu Street. These mains are 8 inches in diameter and eventually tie into an existing 15-inch main which connects to the main in Waipahu Depot Road at the Hikimoe Street intersection. According to the Department of Wastewater Management's Public Service Section, these mains are operating at only about 30 percent capacity.

As required by DWWM, Amfac shall provide an interconnection between the existing 24-inch sewer line and 36-inch Mililani effluent sewer line in Waipahu Depot Road to bypass an inadequate 30-inch sewer line section with an adverse slope.~~–~~

~~For the area of application,~~ The existing sewer laterals serving the Administration, Human Resources and the Old Waipahu Store buildings (proposed YMCA and existing clinic sites) will be intercepted by a new 8-inch sewer line in Waipahu Street and connected to the existing 8-inch sewer line in Mokuola Street. The proposed Heritage Area and Filipino Community Center Sites will also be served by this new 8-inch sewer ~~main~~ line in Waipahu Street. The rest of the proposed commercial area will be connected to the upper end of the existing sewer ~~main~~ line in Waipahu Depot Road. Project wastewater will be conveyed via these sewer lines to the Waipahu Sewage Pump Station and then to the Honouliuli Wastewater Treatment Plant.

2.3.2 Water Supply and Distribution

This section summarizes the water requirements of the subject commercial and park project ~~and the adjacent industrial subdivision which has been calculated by Community Planning, Inc. at 0.180 mgd (average daily demand)~~. Detailed descriptions of the proposed water system is found in Section 5-8 and Appendix J.

Waterlines maintained by the Board of Water Supply are located around the subject property in sizes suitable for delivering the required quantity of water for domestic use and fire protection. The area of application will be serviced by a proposed network of 12-inch waterlines which would connect to an existing 12-inch waterline in Paiwa Street and a 16-inch waterline in Waipahu Street.

Up until recently, the water source to the site of the former sugar mill was provided by a private OSCo water system with private wells in the adjoining Waikele Gulch. Recently, this existing private water system was redirected and used for irrigation of the existing Waikele Golf Course, which had been serviced by the Board of Water Supply. Subsequently, the municipal water service that was used for irrigation of the golf course was discontinued and reallocated to the proposed OSCo development projects. The Board of Water Supply confirms this arrangement in its letter of August 27, 1996. The Board of Water Supply also confirms in its letter to the Department of Land Utilization of August 27, 1996, that the storage requirement for the proposed Amfac Commercial

and Park project can be accommodated by the existing municipal "228" storage reservoir system provided that the appropriate facility charge is paid by the developer.

The average daily water demand for the area of application is estimated to be ~~67,510~~ approximately 67,300 gallons per day. Peak demand is estimated to be ~~202,530~~201,900 gallons per day. The estimated daily water demand can be accommodated by the existing municipal water system.

2.3.3 Drainage Facilities

Storm runoff from the proposed development area presently flows to existing municipal storm drain systems in Waipahu Street, Waikele Stream and a private Oahu Sugar Company system located on the former mill site. Storm runoff collected in the private system from about 34 acres was pumped along with mill processed water in a pipeline by Oahu Sugar Company to ponds located in Waipio Peninsula near the lower end of Waipahu Depot Road. Although some storm runoff still goes to Waipio Peninsula by gravity, for some time now, ~~however, the major mill~~ some runoff from the site ~~drainage cut-off ditch overflows and runoff~~ sheet flows to Waipahu Street at the back entry to the mill at Kopaa Street.

Proposed storm drainage improvements include diversion of the storm runoff from the private mill system to Waikele Stream. The total diversion of about ~~140~~51 acres from the mill site as well as other mauka tributary areas will have an insignificant effect on Waikele Stream with its overall tributary area of 45.8 square miles or ~~28,800~~29,306 acres. The effect of the diversion will be reduced further by the detention structures required by Ordinance 96-34.

The diversion, on the other hand, will reduce storm runoff to the existing municipal drain systems in Waipahu Street between Kopaa Street and the present main entry road to the mill. Waipahu Street, thereafter, should not be subjected to additional storm runoff from the area of this application.

Storm runoff from the remaining portion of the area of this application consisting of the proposed Heritage Area, Clinic, YMCA and Filipino Community Center sites, presently drain to Waipahu Street between the main entry road to the mill and Mokuola Street intersection. This area as well as Hans L'Orange Park and expansion are tributary to an existing municipal storm drain system in Waipahu Street. That system, consisting of 24- and 36-inch drain line culverts, continues down Mokuola Street to empty into the Kahu/Wailani Drainage Channel.

2.3.4 Traffic and Roadways

Development of the applicant's property will occur in two phases, with Phase I related to primarily the proposed Amfac Industrial Subdivision and Phase II involving the subject proposed Amfac Commercial and Park project. The Traffic Impact Analysis Report has been prepared by Austin, Tsutsumi & Associates and is further described in Section 5-2 and Appendix F.

The first phase of development will include the following roadway improvements. To conform to the Waipahu Special Area Plan, a new east-west roadway with a 60-foot right-of-way will be constructed from Paiwa Street (south of its intersection with Paiwa Place) to ~~Road Y,~~ a new mauka-makai road (Mokuola Street Extension) within the applicant's property (Road "Y" as shown on the Conceptual Use Plan, Figure 2-1). Road "X" and Road "Y" are proposed roads which will intersect with the Mokuola Street Extension and separate the Industrial Subdivision and the subject Commercial and Park project. The intersection of Road "Y" and Paiwa Street will be signalized. Along with the signalization of the Road "Y"/Paiwa Street intersection, the traffic signal at Paiwa Street and Paiwa Place will be removed and the west leg of the intersection will be restricted to right-turn in and right-turn out only. Egress from the area will be shifted to the new intersection of Road "Y" and Paiwa Street. The northbound approach of the Road "Y"/Paiwa Street intersection will include one shared left-turn and through lane and one through lane. The southbound approach should provide one through lane and one shared through and right-turn lane. The eastbound approach will provide one exclusive left-turn lane and one exclusive right-turn lane.

The intersection of Road "Y" and the Mokuola Street Extension will be controlled by stop signs, until future traffic volumes warrant the installation of traffic signals. Provisions will be made to include conduits for possible future traffic signal installation should it be needed.

From the applicant's makai property line, Mokuola Street will be extended into the project. This roadway (Mokuola Street Extension) will have a minimum of 60-foot right-of-way with 44 feet of roadway between curbs (as shown on Figure 2-1). In conjunction with the extension of Mokuola Street to serve the proposed Amfac Industrial Subdivision and Amfac Commercial and Park project, the eastbound and southbound approaches of the Waipahu Street intersection will be improved to provide an exclusive left turn lane and a shared through and right turn lane.

Amfac is proposing to bear the entire cost of improving Waipahu Street, as shown on the detailed plans for the improvements along Waipahu Street, less any amounts that various utility companies may be responsible for via Ordinance 2412) from the western portion of Hans L'Orange Park to ~~the entrance to Hawaii's Plantation Village~~ approximately 300 feet west of Waipahu Depot Road, so long as the City agrees to improve Waipahu Street to the east and west of this area as is currently needed for either capacity and/or safety reasons. DTS has recently indicated that they generally concur with Amfac's plans for Phase IA, IB, and Road "X". No agreement has yet been reached on the improvements to Waipahu Street to the west of the entrance of Hawaii's Plantation Village. Continued coordination with the Department of Transportation Services will be necessary to resolve this matter.

Amfac proposes to complete the Waipahu Street Improvements in three phases that will be coordinated with the onsite improvements. ~~Phases 1A and 1B~~The first two phases of the Waipahu Street widening (from the southern edge of Hans L'Orange Park to approximately 300 feet west of Waipahu Depot Road) would be completed in conjunction with the proposed Phase ~~1A~~IA and ~~1B~~IB industrial subdivision (Mokuola Street Extension, Road "Y" and internal industrial subdivision

roads) and would complete Amfac's obligations for those portions of Waipahu Street. The completion of the proposed "Phase ~~1A~~IA" improvements (Mokuola Street Extension to Road "Y" and Road "Y") will provide an alternative route for motorists and may thereby relieve the existing Waipahu/Paiwa Street intersection. By ~~allowing~~ Amfac ~~to construct Phase 1A~~constructing Phase IA before the City improves the Waipahu/Paiwa Street intersection, the construction bottlenecks at that intersection can be greatly reduced.

~~Phase 2~~ The third phase of Waipahu Street (from 300 feet west of Waipahu Depot Road to near the entrance of Waipahu Cultural Garden Park) is to remain a two-lane road, at least until the proposed commercial area is developed. This strategy is both consistent with the "roadway character" desired by the community and adequate on a traffic basis, based on the Traffic Impact Assessment Report prepared by Austin, Tsutsumi & Associates, Inc. (Appendix F). Frontage improvements along Waipahu Street will be designed in accordance with City standards and the Americans With Disabilities Act Accessibility guidelines.

When the future proposed commercial area is developed, ~~Phase 2 of Waipahu Street at the intersection of Road "X" will be improved along with any other required improvements within this section~~ the following roadway improvements will be implemented. To conform to the Waipahu Special Area Plan, a new east-west roadway, "Road X", with a 60-foot right-of-way, or other transportation improvements acceptable to DTS, will be constructed between Waipahu Street (replacing the existing Aualii Street/Waipahu Street intersection) and to the Mokuola Street Extension. The intersection of Road "X"/Waipahu Street would be signalized and one through lane and one exclusive right-turn lane in the northbound approach would be provided. The southbound approach will include one exclusive left-turn lane and one through lane. The westbound approach will provide one shared left-turn lane and right-turn lane. The Road "X"/Mokuola Street Extension intersection will be controlled with stop signs, until future traffic volumes warrant the installation of traffic signals. Provisions will be made to include conduits for possible future traffic signal installation should it be needed. In their review of the Draft EIS, the Planning Department states that the Waipahu Town Plan's Circulation Plan calls for street intersections with narrow curb radii. Such a provision may be included in the proposed project if required by both the Department of Transportation Services and Department of Public Works.

~~Amfac also proposes to convey approximately 3 acres of land to the City for the expansion of the Hans L'Orange Park. Prior to any conveyance, Amfac will meet with the Department of Parks and Recreation and propose a land trade, the 3 acres of additional park land in return for the Department of Parks and Recreation agreeing to subdivide and convey to DTS any additional right of way from Hans L'Orange Park that may be required in order for DTS to improve Waipahu Street and/or Paiwa Street.~~

The City and County of Honolulu has had plans to widen Waipahu Street since at least 1993 (Austin, Tsutsumi & Associates, Inc., "Waipahu Street Widening and Realignment Project", prepared for the

City and County of Honolulu, Department of Transportation Services, July 1993). This plan included land acquisition (including from Hans L'Orange Park) for the realignment and widening of Waipahu Street, and was prepared two and a half years before the Waipahu Town Plan identified commercial development of Amfac's property.

Due to the administrative difficulties in obtaining "park land" for roadway widening, the Department of Transportation Services asked Amfac to incorporate the acquisition of the necessary "park land" with the conveyance of the additional "park land". Amfac is trying to assist in order to expedite the City's planned improvements to the Waipahu Street and Paiwa Street intersection.

The currently needed improvements to Waipahu Street and the intersection of Paiwa and Waipahu Streets involve approximately 5,760 square feet of Hans L'Orange Park land, of which none will affect current park operations. In contrast, the park dedication involves 117,889 square feet of land, a net gain to the park of approximately 112,129 square feet.

The most current plans for widening of Waipahu Street, which have been reviewed and approved by the department of Transportation Services, involve the relocation and/or replacement of existing monkeypod trees on that portion of the widening project fronting Hans L'Orange Park. The possibility that some of these trees may be relocated and/or replaced has been presented to the Department of Transportation Services, the Waipahu 200 Update Committee, the Friends of Hans L'Orange Park Committee and the Waipahu Neighborhood Board voted unanimously (16-0) to support the park expansion as proposed and to urge the City Administration to continue to work with the community.

To provide for alternative modes of transportation, the Waipahu Town Plan's Circulation Plan calls for a separated pedestrian/bikeway along Manager's Drive/Mokuola Street. The current design of the Mokuola Street Extension through Amfac's property includes 4-foot wide, grade-separated pedestrian/bikeways along both sides of the proposed roadway.

In their review of the Draft EIS, the Planning Department states that the Waipahu Town Plan's Circulation Plan calls for an internal transit system linking the Waikele Shopping Center, the Old Town area along Waipahu Street, Waipahu Cultural Garden Park and the commercial area on the subject site. The provision of such a transit system is outside of the purview of the applicant, and would probably best be provided by the Honolulu Public Transit Authority, its successor and/or a private transportation company(ies) and is subject of a study by the Waipahu Livable Communities Initiative Task Force.

2.4 DESIGN GUIDELINES

The project is consistent with Landscape and Open Space Plan of the Waipahu Town Plan. The Landscape and Open Space Plan identifies an area makai of Hans L'Orange Park as open space, which is the area being proposed for the expansion of the park. In the Landscape and Open Space

Plan, open spaces such as the proposed Hans L'Orange Park would be connected by tree-lined pathways such as what is being proposed along Mokuola Street Extension. The Plan also states that "Roads and pathways shall be landscaped in a manner which identifies their role as visual and functional linkages between open spaces and centers of activity."

Details such as floor area, number of parking spaces, number of parking spaces provided to employees, and heights of structures are unknown at this time. The applicant will establish design guidelines that will, at a minimum, enforce the development standards found in the Land Use Ordinance for Business and Preservation (Park) Districts and implement the intent of the Waipahu 2000 Update Plan and Special Area Plan. The design guidelines will address architecture (including building colors), signage, landscaping and exterior lighting facilities and will be in place prior to sub-contracting or sale by the applicant to a second party developer(s).

The landscaping portion of the design guidelines will address the following: promoting a strong pedestrian shopping orientation via enhancement of streetscape and walking environments (such as adequate sidewalks, shade trees, street furniture, continuous pedestrian linkages, etc.) and consolidation of new off-street parking behind buildings (away from Waipahu Street) wherever possible. The design guidelines will also include special signage and paving to encourage safe and convenient pedestrian and bicycle crossings, where finished grades allow them to occur.

2.5 PHASING AND TIMING OF ACTION

Construction of the ~~project~~ roadway improvements would begin after all required approvals and permits have been obtained. Based on the timing involved for the proposed Development Plan Amendment, rezoning, subdivision, and grading permit processing, construction is anticipated to begin in last quarter of 1998. The project will be developed in ~~phases~~ increments. The widening of Waipahu Street between the southern end of Hans L'Orange Park to the Old Waipahu Store, the extension of Mokuola Street to Road "Y", the improvement of Mokuola Street/Waipahu Street intersection, and the construction of Road "Y" would occur during the second, third, and fourth quarters of 1997. The widening of Waipahu Street from the Old Waipahu Store to approximately 300 feet west of Waipahu Depot Road would occur during the last quarter of 1997 through the first quarter of 1998. The construction of Road "X" would occur during the last quarter of 1998 through ~~the first quarter of~~ mid-1999. The widening of Waipahu Street from 300 feet west of Waipahu Depot Road to near the entrance of Waipahu Cultural Garden Park would occur during the last quarter of 1998 through the second quarter of 1999. Site work construction would take place during the second, third and fourth quarters of 1999. Construction of buildings could start in the third quarter of 1999 with completion of buildings by mid-2000.

Onsite infrastructure improvements for Phase I (the light industrial portion) between Paiwa Street and the Mokuola Street Extension; and 2) Waipahu Street improvements from Hans L'Orange Park to Waipahu Depot Road will be in place before the construction of the commercial buildings is initiated (third quarter of 1999).

It is planned that major grading and grassing of the park expansion area will occur in conjunction with Phase I site work almost immediately after the necessary approvals are in place. The YMCA is in the process of obtaining a Site Plan Review permit, and may be renovating the existing Administration and Human Resources buildings as soon as this summer. Construction of the FilCom Center and the Heritage/Museum area are the responsibility of the FilCom Center, Inc. and the Friends of Waipahu Cultural Garden Park (or another appropriate organization), respectively.

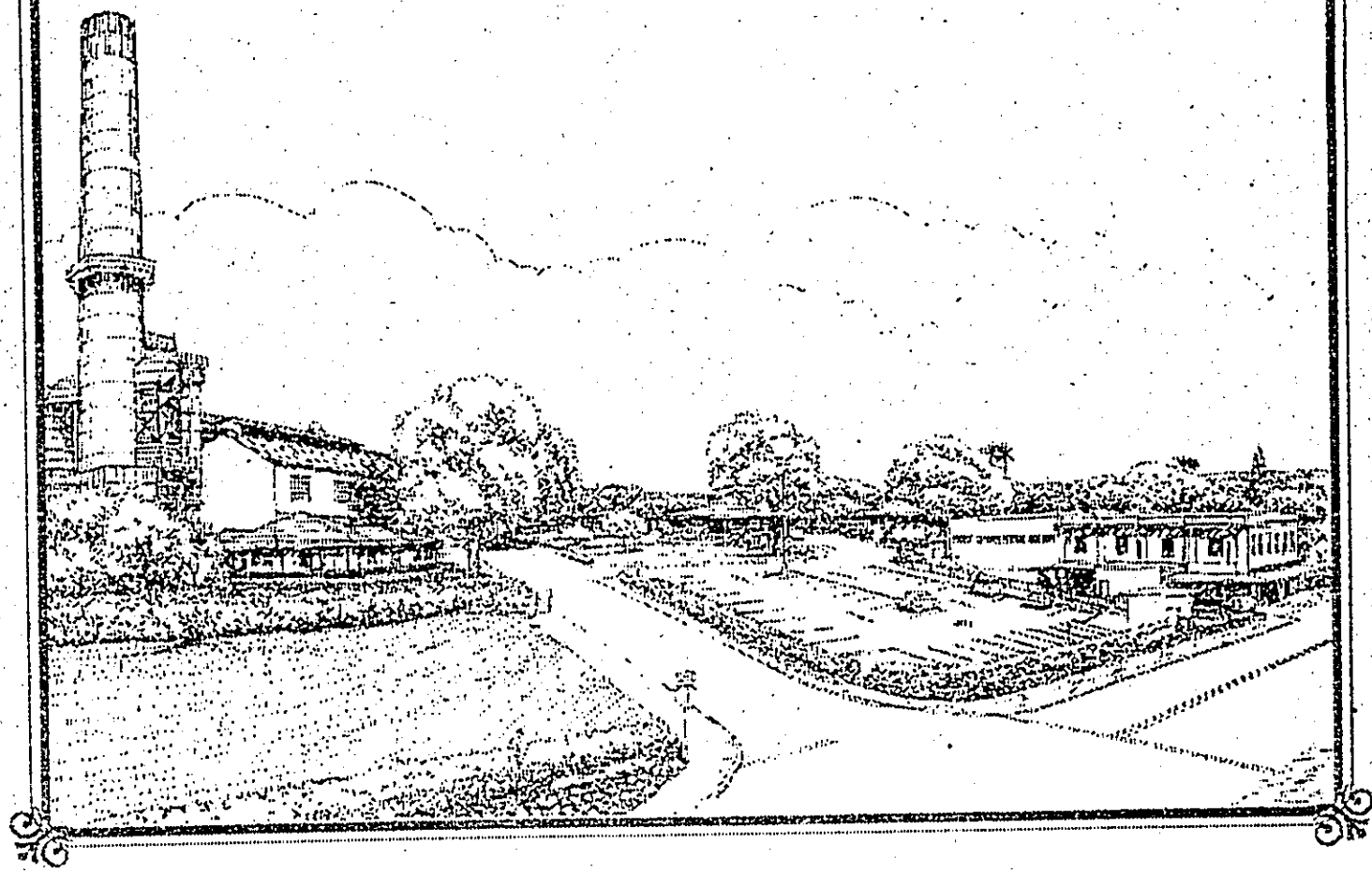
LAND USE AND DEVELOPMENT PERMITS	Tentative Schedule
Environmental Impact Statement	10/96 - 4/97
Development Plan Amendment	10/96 - 12/97
Change of Zone	~~2~~3/97 - 1/98
Subdivision and Construction Permits	1/98 - ~~5~~9/98

2.6 APPROXIMATE CONSTRUCTION COSTS

The construction cost for the commercial project is estimated at be approximately $20 million (1996 dollars), not including tenant improvements. This does not include costs for the development of the FilCom Center, YMCA and the Heritage Area.

3.0

REQUIRED APPROVALS AND PERMITS



3.0 REQUIRED APPROVALS AND PERMITS

The Waipahu Commercial and Park project will require several entitlements, including a Development Plan Land Use Map Amendment and a Change of Zone Amendment, and several permits prior to implementation.

3.1 CHAPTER 343, HAWAII REVISED STATUTES

This EIS is prepared pursuant to Chapter 343, *Hawaii Revised Statutes*, and *Hawaii Administrative Rules, Title 11, Department of Health, Chapter 200, Environmental Impact Statement Rules* in conjunction with the requested City and County of Honolulu Development Plan Amendment application presently being processed by the City Planning Department.

An Application for Development Plan Amendment and EIS Notice of Preparation (EISNOP) for Amfac Commercial and Park was filed and published in *The Environmental Notice* (OEQC) on November 8, 1996. The accepting authority for the EIS is the City Planning Department.

Comments which have been received during the 30-day (EISNOP) comment period which ended on December 9, 1996 have been addressed in the Draft EIS and are reproduced in their entirety in Section ~~12.0~~13.0.

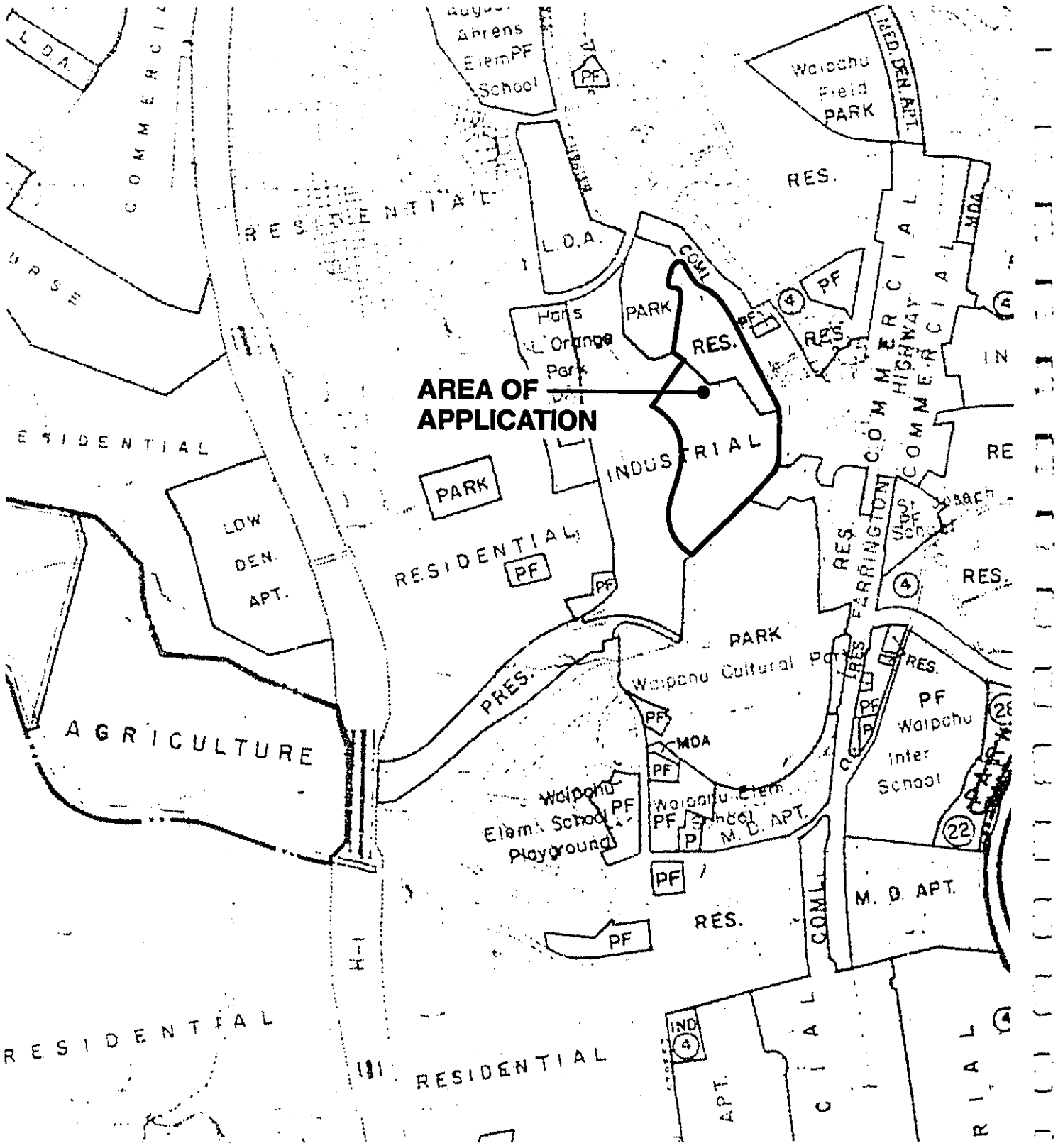
Comments which have been received during the 45-day DEIS comment period which ended on February 24, 1997 have been addressed in the Final EIS and are reproduced in their entirely in Section 14.0.

3.2 CITY AND COUNTY OF HONOLULU

3.2.1 Central Oahu Development Plan Land Use Map Amendment

Existing Development Plan. Waipahu, the location of the Oahu Sugar mill site, is located in the Central Oahu DP area. The DP designation for the subject Commercial and Park project is Industrial (16.7 acres) and Residential (8.7 acres) (Figure 3-1).

The City's *Waipahu Town Plan, A Special Area Plan of the Central Oahu Development Plan*, designates the project area as the Old Waipahu Town Anchor (as shown in Figure 1-5) with commercial and community facilities (including a heritage park/center, open market, Filipino community center and YMCA; and a passive park expansion of Hans L'Orange Park). The Plan was accepted by the City Council in February 1996. Also, the Waipahu Neighborhood Board has unanimously voted "to urge both public and private sectors to establish a timely and expedient implementation of the Waipahu Town Plan.



LEGEND

- PRESERVATION
- AGRICULTURE
- RESIDENTIAL
- APARTMENT
  - LOW DENSITY
  - MEDIUM DENSITY
  - HIGH DENSITY
- RESORT
- COMMERCIAL
- INDUSTRIAL
- PARKS AND RECREATION
- MILITARY
- PUBLIC FACILITIES
- RESIDENTIAL EMPHASIS MIXED USE
- COMMERCIAL EMPHASIS MIXED USE
- COMMERCIAL-INDUSTRIAL EMPHASIS MIXED USE
- DP BOUNDARY
- STATE LAND USE BOUNDARY
- MILITARY BOUNDARY

Source: City & County of Honolulu - Planning Department

FIGURE 3-1
Central Oahu Development Plan
AMFAC COMMERCIAL & PARK

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FEET

PBR HAWAII

Proposed Development Plan Amendment. The *Waipahu Town Plan* has served as a guide in planning the subject project. The portions of the Central Oahu DP Land Use Map which contain the project area, consisting of Industrial and Residential designations, require a DP amendment to Commercial (22.4 acres) and Park (3.0 acres) to be consistent with the proposed Site Plan, as shown in Figure 3-2 and the *Waipahu Town Plan.*

Responsible Agencies. An application to amend the DP was submitted to the Department of Planning in October 1996. The Planning Commission and the City Council are the reviewing and decision making bodies for the requested action.

3.2.2 Development Plan Public Facilities Map Designation

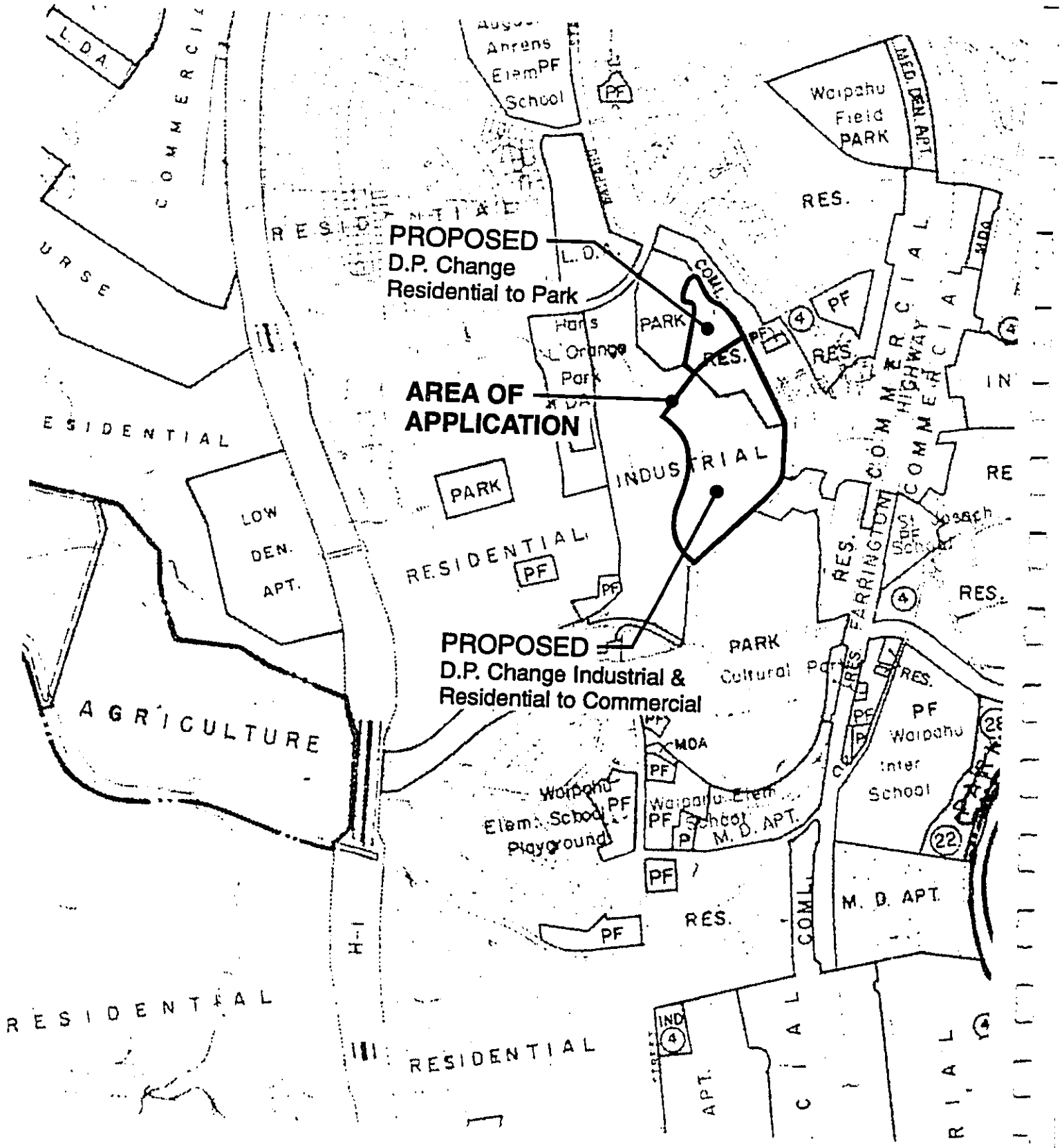
Existing Designation. The existing DP Public Facilities Map shows plans to widen Waipahu Street (Figure 3-3).

The Department of Transportation Services (DTS) had assumed that Waipahu Street had an existing right of way of 50 feet and that a 5-foot road widening "setback" would be taken from both sides to make a total right of way of 60 feet. Amfac is prepared to provide sufficient land to allow the entire road widening to occur on the mauka side (within Amfac's property) if physically possible and if acceptable to DTS. This offer was made, in part, to minimize the road widening's impact to the businesses/property owners on the makai side of Waipahu Street. The offer of the land was made assuming the existing traffic conditions warranted the widening of Waipahu Street, and the widening costs, less any improvements related to Amfac's development (such as at the intersection of Mokuola Street and Waipahu Street), would be the City's responsibility.

At Amfac's cost, it recently completed a detailed survey of Waipahu Street from Paiwa Street to Hawaii's Plantation Village. Amfac determined that the existing right-of-way width for this section is not 50 feet, but varies from 39 to 60 feet. Amfac also determined that it is possible to widen Waipahu Street in this section, without taking any land from the makai side. Amfac completed a preliminary plan for the improvement of Waipahu Street which was submitted to DTS review and approval.

Amfac is proposing to bear the entire cost of improving Waipahu Street, as shown on the detailed plans for the improvements along Waipahu Street, (less any amounts that various utility companies may be responsible for via Ordinance 2412) from the western portion of Hans L'Orange Park to approximately 300 feet west of Waipahu Depot Road as part of the previously approved Light Industrial Subdivision.

Although "road widening" is usually done evenly to both sides, Amfac is offering to provide sufficient land to allow the widening of Waipahu Street to be limited to the mauka side. Based on the above conditions, Amfac is also offering to bear the full cost of improvements even though, via



LEGEND

- PRESERVATION
- AGRICULTURE
- RESIDENTIAL
- APARTMENT
  - LOW DENSITY
  - MEDIUM DENSITY
  - HIGH DENSITY
- RESORT
- COMMERCIAL
- INDUSTRIAL
- PARKS AND RECREATION
- MILITARY
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- RESIDENTIAL EMPHASIS MIXED USE
- COMMERCIAL EMPHASIS MIXED USE
- COMMERCIAL-INDUSTRIAL EMPHASIS MIXED USE
- DP BOUNDARY
- STATE LAND USE BOUNDARY
- MILITARY BOUNDARY

Source: City & County of Honolulu - Planning Department

FIGURE 3-2
Proposed Amendment to the
Central Oahu D.P. Land Use Map
AMFAC COMMERCIAL & PARK

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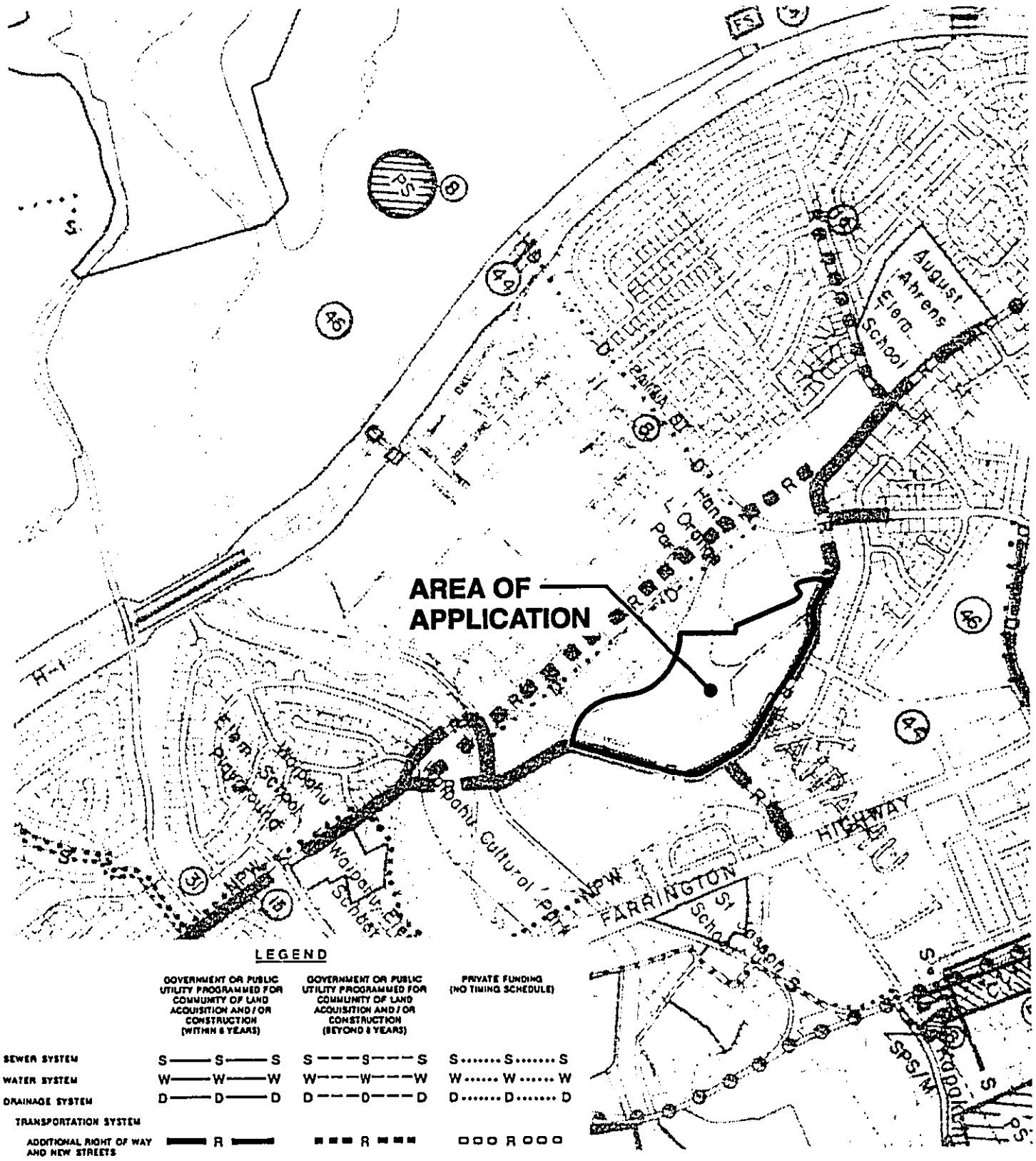

Source: City & County of Honolulu - Planning Department

FIGURE 3-3
Central Oahu Development Plan
Public Facilities Map
AMFAC COMMERCIAL & PARK

Ordinance 2412, Amfac believes it would only be required to pay for "half" the improvement cost (assuming the same amount of widening to both sides). Amfac proposes to complete the Waipahu Street Improvements in three phases that will be coordinated with the onsite improvements. Phases IA and IB of the Waipahu Street widening (from the southern edge of Hans L'Orange Park to approximately 300 feet west of Waipahu Depot Road) would be completed in conjunction with the proposed Phase IA and IB industrial subdivision (Mokuola Street Extension, Road "Y" and internal industrial subdivision roads) and would complete Amfac's obligations for those portions of Waipahu Street. The completion of the proposed "Phase IA" improvements (Mokuola Street Extension to Road "Y" and Road "Y") will provide an alternative route for motorists and thereby relieve the Waipahu/Paiwa Street intersection. By allowing Amfac to construct Phase IA before the City improves the Waipahu/Paiwa Street intersection, the construction bottlenecks at that intersection can be greatly reduced. Phase II of Waipahu Street (from 300 feet west of Waipahu Depot Road to near the entrance of Waipahu Cultural Garden Park) is to remain a two-lane road, at least until the proposed commercial area is developed. This strategy is both consistent with the "roadway character" desired by the community and adequate on a traffic basis, based on the Traffic Impact Assessment Report prepared by Austin, Tsutsumi & Associates, Inc. (Appendix F). When the future proposed commercial area is developed, Phase II of Waipahu Street at the intersection of Road "X" will be improved along with any other required improvements within this section.

Amfac also proposes to convey approximately 3 acres of land to the City for the expansion of the Hans L'Orange Park. Amfac has met with the Department of Parks and Recreation and proposed a land trade, the 3 acres of additional park land in return for the Department of Parks and Recreation agreeing to subdivide and convey to DTS any additional right of way from Hans L'Orange Park that may be required in order for DTS to improve Waipahu Street and/or Paiwa Street.

These plans are consistent with the Waipahu Special Area Plan prepared by the Planning Department of the City and County of Honolulu in December 1995.

3.2.3 Land Use Ordinance Designation - Zoning

Existing Zoning. The project area is zoned I-2, Intensive Industrial (16.7 acres) and R-5 Residential (8.7 acres) (Figure 3-4). In their review of the Draft EIS, the Department of Land Utilization confirmed that the project area is currently zone I-2 Intensive Industrial and R-5 Residential Districts.

Proposed Change of Zone. The applicant ~~is exploring the possibilities of~~ will be requesting processing a zone change application concurrently with a the subject DP Land Use Map amendment. A zone change application ~~would then be~~ has been filed ~~in the first quarter of~~ on March 6, 1997.

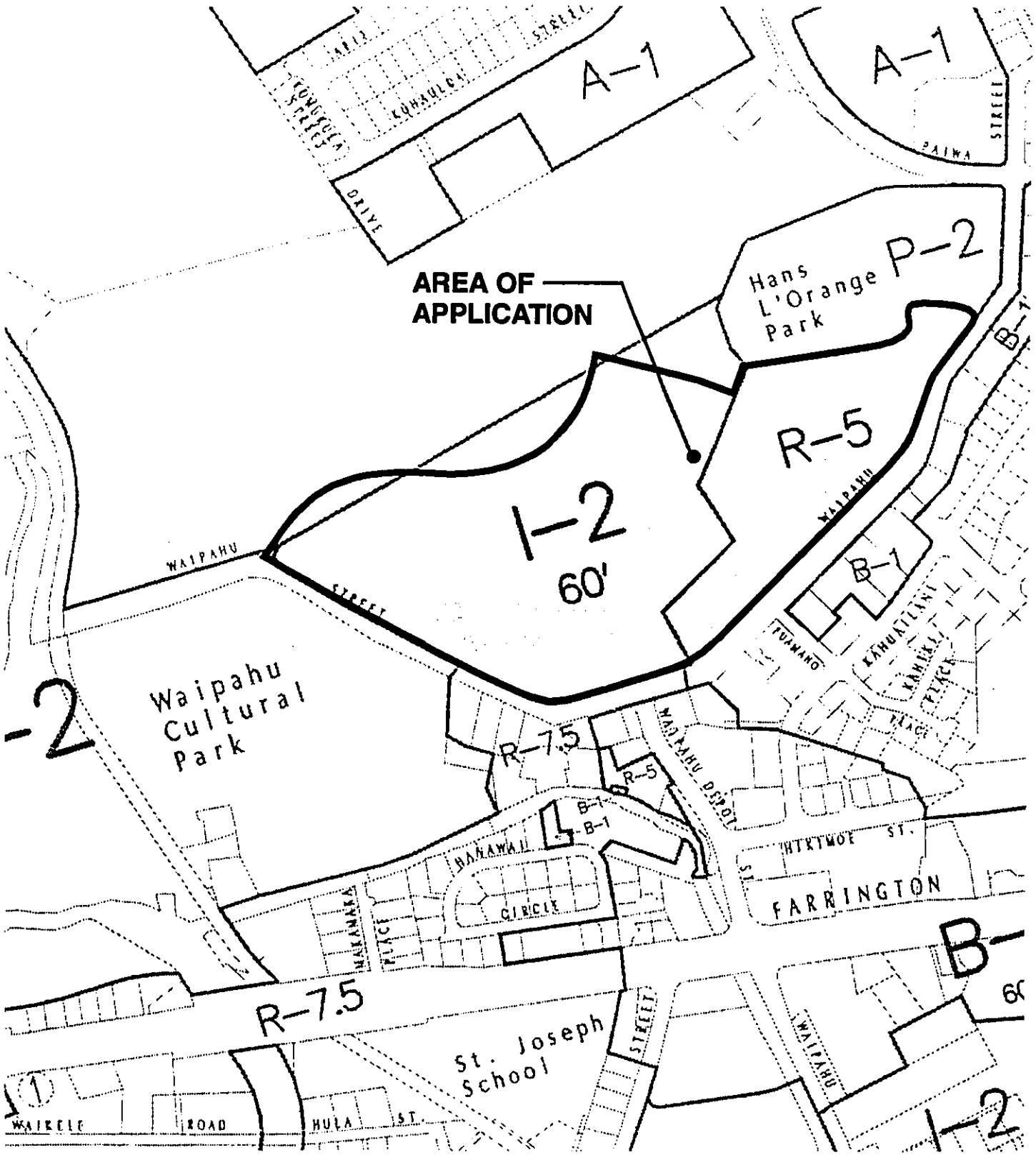

FIGURE 3-4
Land Use Ordinance (Zoning) Designation
AMFAC COMMERCIAL & PARK

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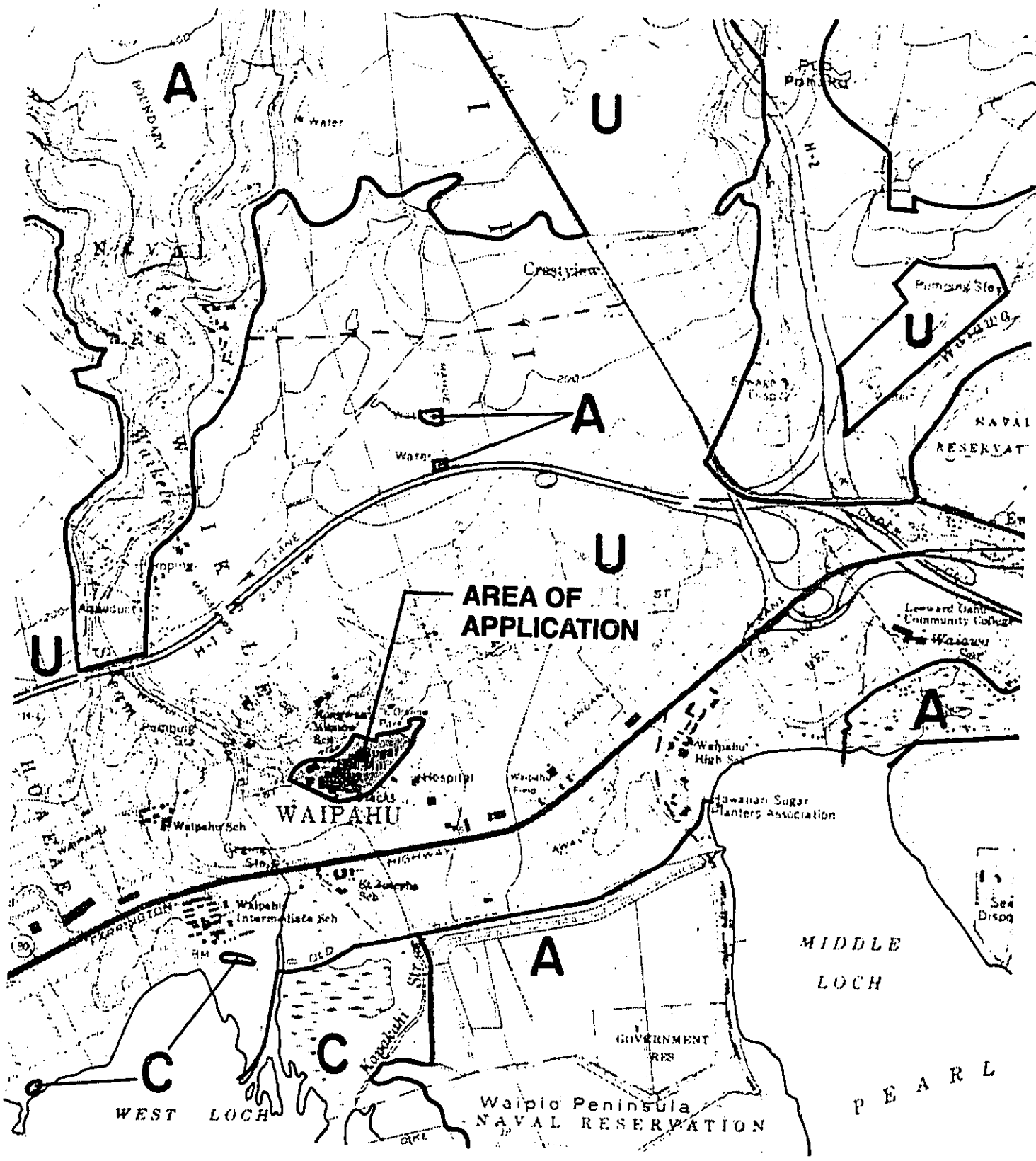
Source: City & County of Honolulu - Department of Land Utilization



LEGEND

U	URBAN
A	AGRICULTURE
C	CONSERVATION

Source: State Land Use Commission

FIGURE 3-5
State Land Use Classification
AMFAC COMMERCIAL & PARK

3.3 OTHER LAND USE INFORMATION

3.3.1 State Land Use District.

The subject property is in the State Urban District (Figure 3-5), an appropriate classification for the proposed project. In their review of the Draft EIS, the Land Use Commission confirmed that the property is within the State Land Use Urban District.

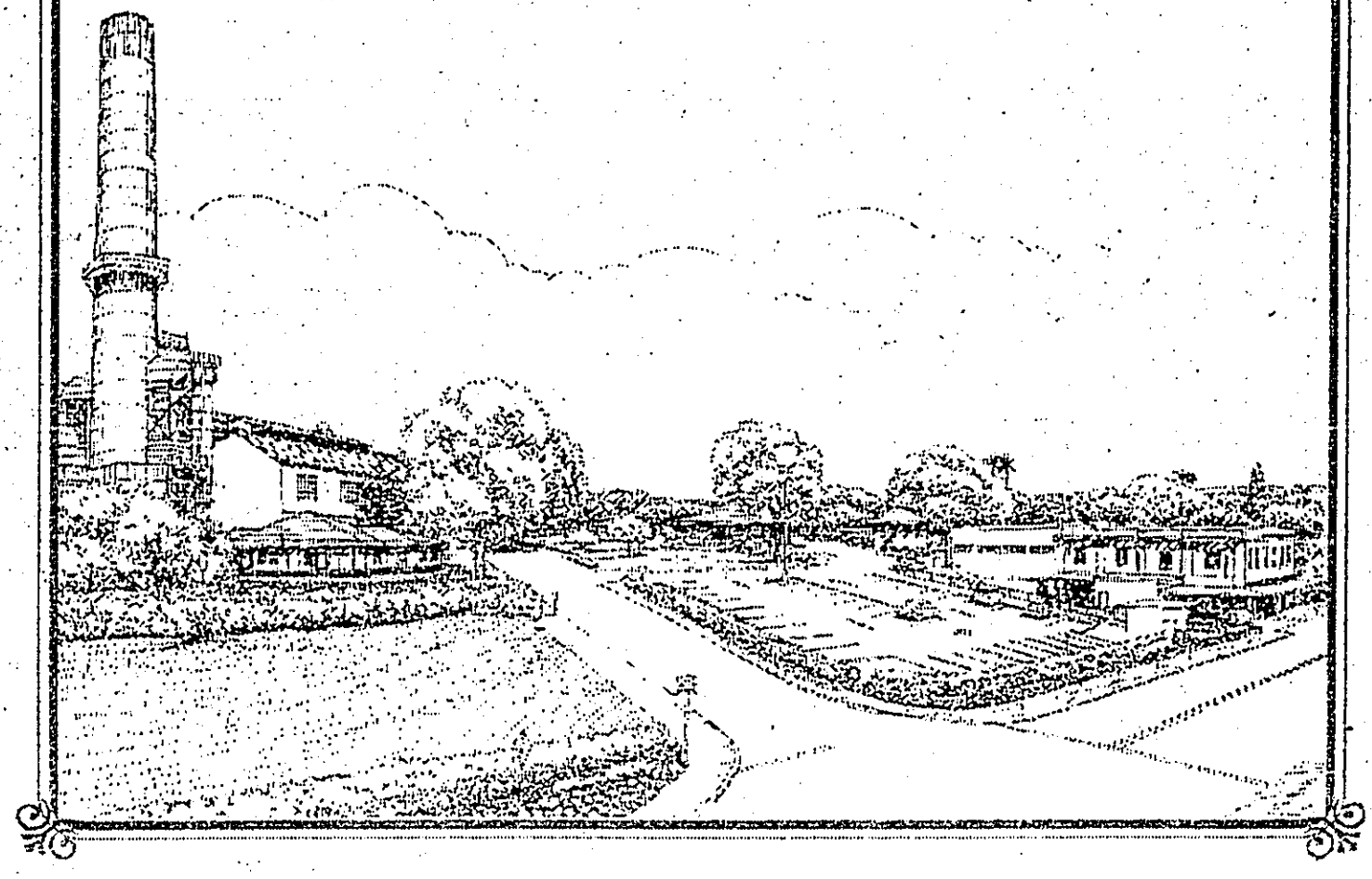
3.4 OTHER REQUIRED PERMITS AND APPROVALS

Listed below are subdivision and construction related permits which will be required to implement the project after the approval of the DP amendment and zone change:

Permit or Approval	Authority
Subdivision Approval	Department of Land Utilization
Grading Permit	Department of Public Works
NPDES Permit	Department of Health
Building Permit	Building Department

4.0

ASSESSMENT OF THE EXISTING NATURAL ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATIVE MEASURES



4.0 ASSESSMENT OF THE EXISTING NATURAL ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATIVE MEASURES

Background information on the existing natural and physical environment is presented in this section to evaluate the project for its potential to generate significant environmental impacts. Impact discussions are classified as short-term construction-related impacts and long-term operational impacts. Mitigative measures to offset the impacts are presented.

4.1 CLIMATE

A. Existing Conditions

Trade wind showers are relatively common and although heavy rains occur at times, most of the showers are light and of short duration. Normal annual rainfall is greater than 40 inches, three-fourths of which occurs during the wet season from October through April. Normal precipitation in January, the wettest month, is over 6 inches, and in June, the driest month, averages one and one-half inches.

Surface winds are generally around 13 to 24 miles per hour from the northeast. There are some seasonal changes in prevailing wind direction in winter with southerly Kona winds. Strong winds do occur at times in connection with storm systems moving through the area. Daily variations include diurnal effects of winds from the southwest quadrant during the night and morning hours, shifting to the northeast during the day.

B. Anticipated Impacts and Mitigative Measures

Design of the proposed project will be typical for a tropical climate. The proposed project will have no effect on climatic conditions and no mitigative measures are necessary. Project landscaping will help mitigate any localized temperature increases from parking areas, roadways, and buildings, and design guidelines will incorporate building orientation recommendations during the design process.

4.2 PHYSICAL CHARACTERISTICS

The property has been utilized as the Oahu Sugar Company mill site and for employee housing for the past 100 years. Therefore, there are no unique natural features in the project area.

A. Existing Conditions

Until 1995, the subject property was utilized as sugar mill and plantation, as a result, the original topography was probably altered and the site is mostly bare soil except where there are remaining

buildings and where weedy vegetation remains in the former skilled housing area. The site generally has average slopes of 1 to 7 percent, with the ground surface generally sloping in the southerly (makai) direction. The western portion of the site which houses the remnants of the sugar mill is situated on a bluff with slopes that rise sharply from Waipahu Street and is supported in areas by a retaining wall. The groundcover on the slope is wedelia. Most of the project area on the bluff is flat (Figure 4-1). The eastern end of the property which was formerly the site of OSCo skilled housing is gently sloped.

A search for wetland indicators on-site and in the existing literature was made. No areas defined as "wetlands" were found to be located within the project site. Further, the project is located considerably inland from the West Loch at Pearl Harbor and is not expected to impact on any marine resources.

B. Anticipated Impacts

The implementation of the project will require earthwork and grading of the soils over the buildout period. As an urban redevelopment project, the plan incorporates commercial, community facility and park uses which will require different levels of site preparation. The mill site will require remediation which is presently in process. Development of building sites will require grading to establish level building surfaces with drainage improvements to direct surface flows into the project's drainage system.

C. Mitigative Measures

(1) Utilization of the Natural Topography. The natural topography of the land will not require any major cut and fill of building areas, therefore impacts to the topography will be minimized.

(2) Grading Ordinance Compliance. All grading operations will be conducted in full compliance with dust and erosion control and other requirements of the City and County of Honolulu Grading Ordinance, and all construction activities must comply with the provisions of Chapter 11-60.1, Hawaii Administrative Rules, Section 11-60.1-33 on Fugitive Post. A grading permit is a requirement to modify the topography. In addition, a National Pollutant Discharge Elimination System (NPDES) permit will also be required prior to construction to address non-point source discharges to bodies of water.

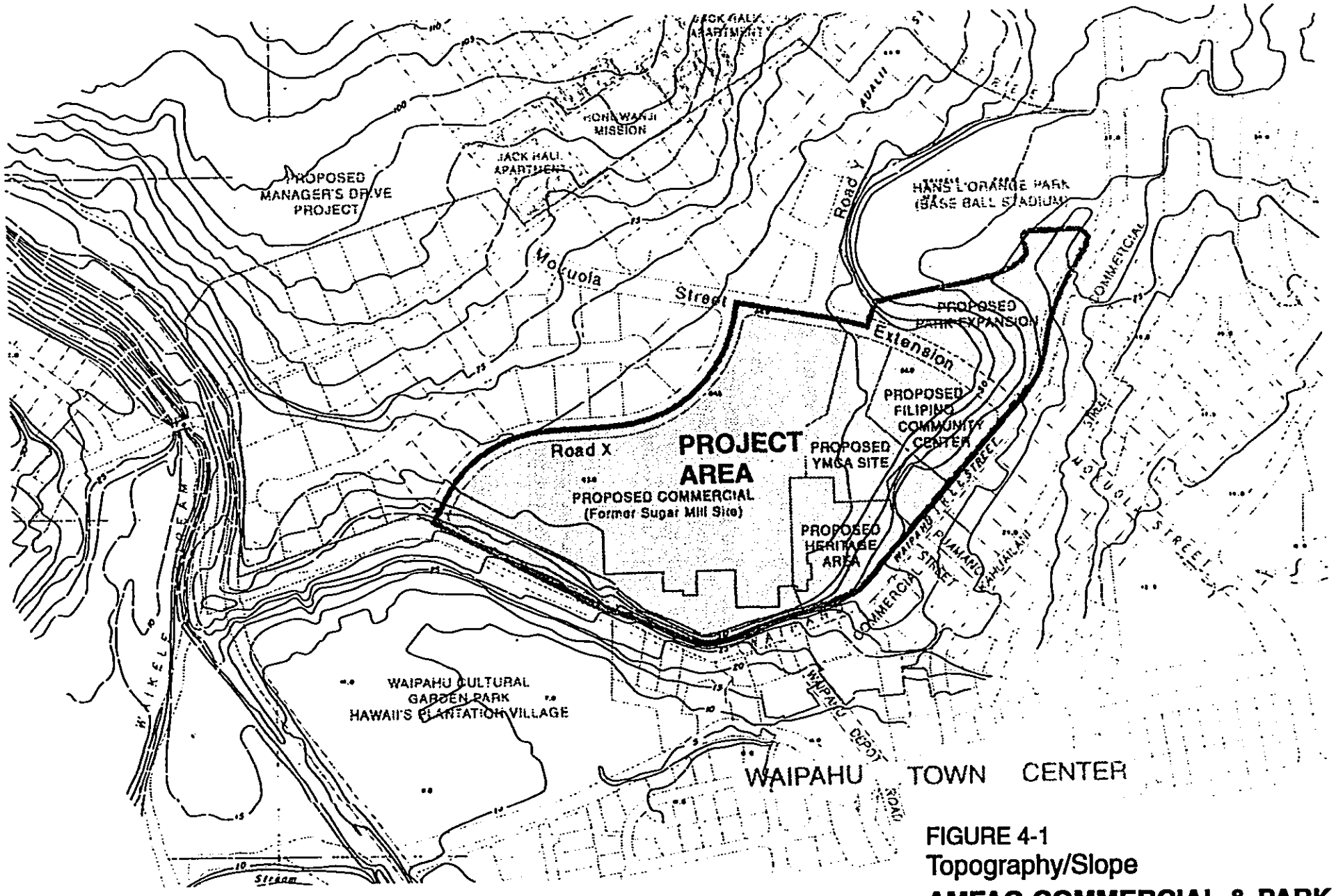


FIGURE 4-1
Topography/Slope
AMFAC COMMERCIAL & PARK

4.3 SOILS

4.3.1 Soil Suitability Studies

A. Existing Conditions

There have been three soil suitability studies prepared for Hawaii whose principal focus has been on describing the physical attributes of land and the relative productivity of different land types for agricultural production. These are (1) the Land Study Bureau Detailed Land Classification, (2) the U.S. Department of Agriculture Soil Conservation Service Soil Survey, and (3) the Agricultural Lands of Importance to the State of Hawaii (ALISH).

4.3.1.1 Land Study Bureau Detailed Land Classification

According to Section 205-4.5 of the *Hawaii Revised Statues*, the LSB studies define the areas in the State Agricultural District wherein specific agricultural uses are permitted and where restrictions relating to the disposition of the land are applicable.

The Land Study Bureau Detailed Land Classification (1965 through 1972) series was produced by the Land Study Bureau (LSB) 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 subject property has been utilized for its industrial uses for nearly a century and also for sugar worker employee housing. The parcel has therefore, not been classified under the Land Study Bureau system since its uses foreclosed an agricultural potential (Figure 4-2).

The LSB land classification is a synthesis of the information found in the 1955 Soil Survey for the Territory of Hawaii as well as several other sources for data on geology, topography, climate, water resources and crops. The LSB classification system groups land into homogeneous units called Land Types, describes their condition and environment, delineates the areas on aerial photo base maps, rates the lands on their overall quality (productivity) in relation to other lands, and appraises their performance under selected alternative agricultural crops. The productivity evaluations were based on statewide standards of crop yields and levels of management at the time the classification was made.

4.3.1.2 Soil Conservation Service Soil Survey

The USDA Soil Survey classifies the site as containing mostly silty clay soils of the Waipahu Series, which are characterized as generally level soils in areas with rainfall of 25 to 35 inches annually. Runoff is medium and the erosion hazard is moderate.

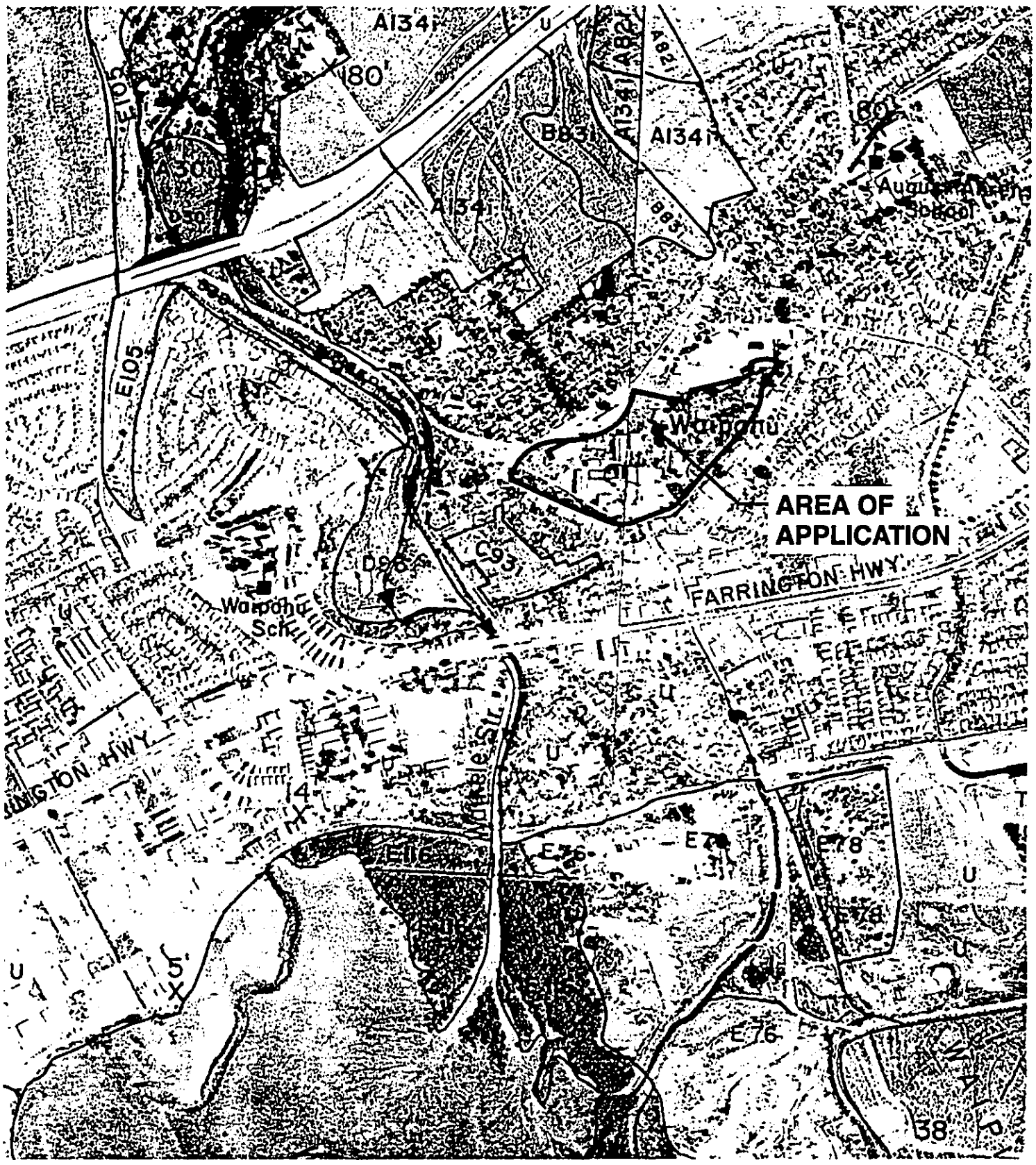


FIGURE 4-2
LSB Detailed Land Classification
AMFAC COMMERCIAL & PARK

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Source: Land Study Bureau, University of Hawaii - State of Hawaii, May 1967

The Soil Conservation Service Soil Survey (1972) series for each island was prepared by the U.S. Department of Agriculture Soil Conservation Service (SCS) 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 adapted 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.

All of the soils on site are of the Waipahu Series, Waipahu silty clay (WzC and WzA) (Figure 4-3). On this soil, runoff is medium and the erosion hazard is moderate.

4.3.1.3 Agricultural Lands of Importance to the State of Hawaii

The Agricultural Lands of Importance to the State of Hawaii (ALISH) (1977) system includes 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, Unique, and Other Important Agricultural Land.

The project area is not classified in any category by the ALISH system most likely due to its use of the past century for urban uses such as industrial and plantation housing, etc. (Figure 4-4).

B. Anticipated Impacts

During the construction phases of the project, there is a potential for the generation of dust and for water-borne soil erosion. However, since much of the site consists of bare soil, overall soil loss will be reduced significantly after development. As portions of the Project Area are developed, there will also be beneficial impacts resulting from the project's landscaping plan.

C. Mitigative Measures

Mitigative measures will be implemented to reduce short-term soil erosion during construction.

(1) Construction Erosion Control. Construction activities will follow strict erosion control measures specified by applicable Federal, State and City regulations. Prior to issuance of a grading permit by the City Department of Public Works, an erosion control plan and best management practices required for the NPDES permit will be submitted describing the implementation of appropriate erosion control measures. These generally include use of cut-off ditches, temporary ground cover, and use of detention areas.

(2) Watering and Landscaping. A watering program will be implemented to minimize soil loss through fugitive dust emissions during construction. Other control measures include cleaning of

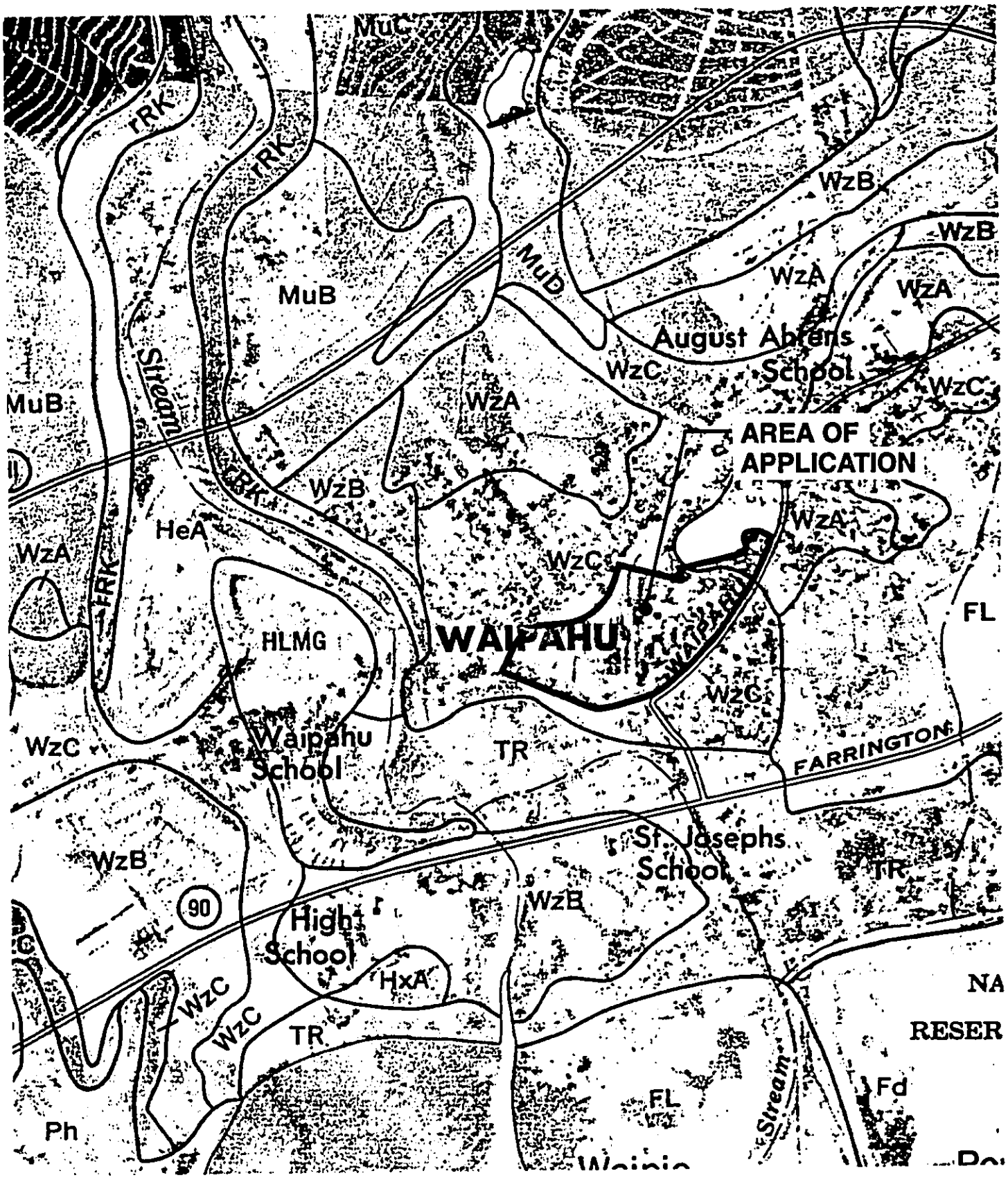

FIGURE 4-3
Soil Survey Classification
AMFAC COMMERCIAL & PARK

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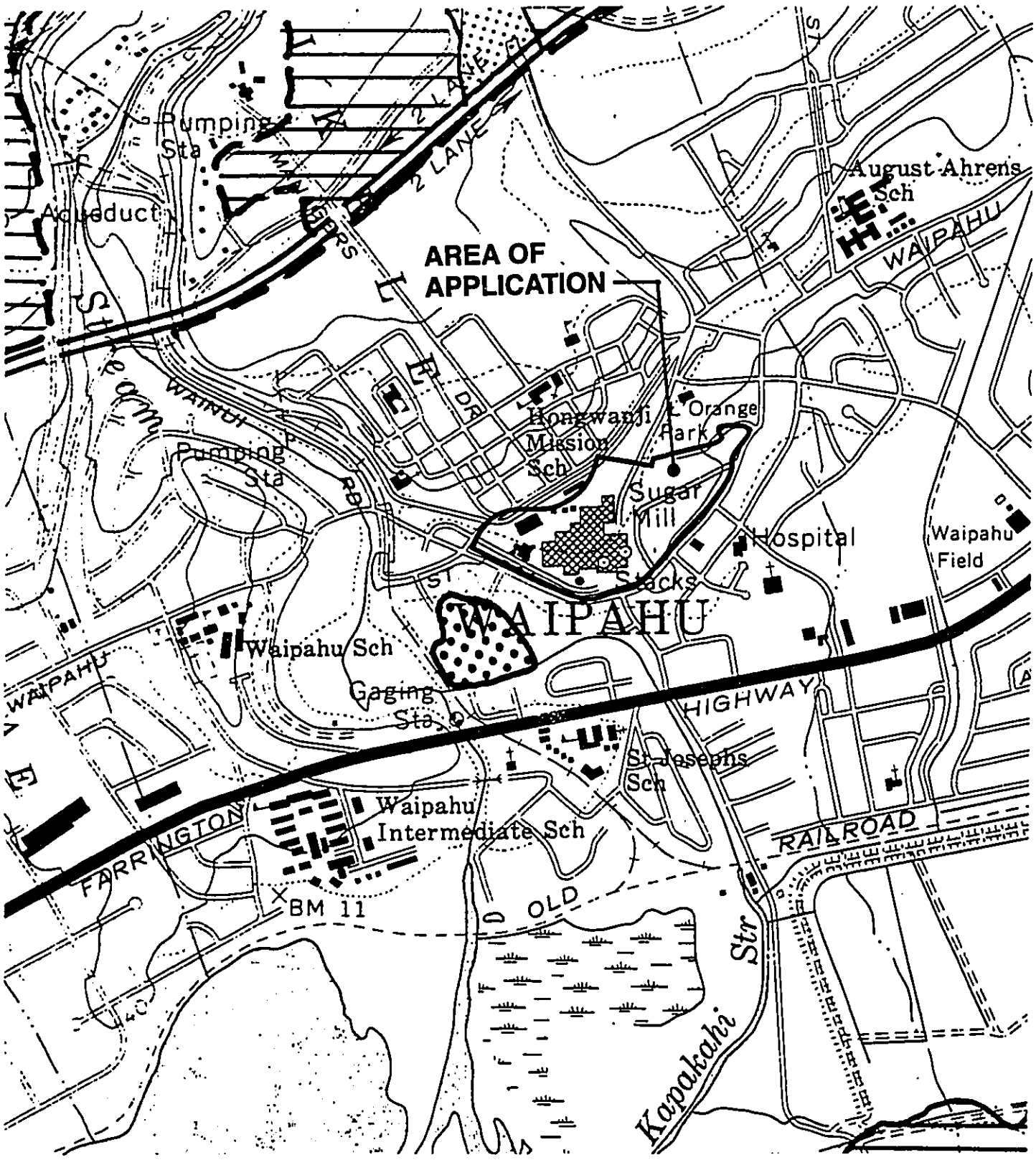
Source: U.S. Department of Agriculture, Soil Conservation Service & University of Hawaii, August 1992



LEGEND

- Prime Agricultural Land
- Unique Agricultural Land
- Other Important Agricultural Land
- Existing Urban Development

Source: Department of Agriculture-State of Hawaii, January 1977

FIGURE 4-4
Agricultural Lands of Importance to the State of Hawaii (ALISH)
AMFAC COMMERCIAL & PARK

0 500 1000
FEET

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construction equipment on the job-site and establishment of ground cover as quickly as possible after grading.

(3) Landscaping and Long-Term Erosion Control. Permanent landscaping will re-establish the soil retention values throughout the project area. This extensive, continuous, and long-term landscape management program for the property will significantly reduce erosion compared to the previous conditions under agricultural/industrial use (i.e., large trucks hauling cane to the mill for processing).

(4) Other Mitigation. In addition to those listed above, erosion control measures to further lessen construction impacts include:

a. Retain existing ground cover until the latest date before construction.
b. Early construction of drainage control features.
c. Use temporary sprinklers in non-active construction areas when ground cover is removed.
d. Station water trucks on-site during the construction period to provide immediate sprinkling as needed, in active construction zones (weekends and holidays included).
e. Construct temporary sediment basins to trap silt.
f. Use temporary berms and cut-off ditches where needed, to interrupt and divert flows to the nearest sediment basin.
g. Construct temporary silt fences or straw bale barriers to trap silt.
h. Thorough watering of graded areas after construction activity has ceased for the day and on weekends.
i. Sod or plant all cut and fill slopes immediately after grading work has been completed.

4.3.2 Phase II Environmental Assessment

A Phase II environmental assessment has been completed by Brewer Environmental Services, Inc. (BES). The only on-going "cleanup" activity in this area at this time is the recovery of diesel fuel that leaked from an underground storage tank (UST) that was subsequently removed in accordance with Federal and State regulations, and asbestos abatement from the existing mill structures. The cleanup of this spill is being completed via recovery wells and quarterly reports are submitted to the State Department of Health. Amfac and BES have met with the State Department of Health (DOH), and provided the information described below, including the current environmental assessments for the site, descriptions of all investigations that have been conducted, findings of hazardous materials, status of current remediation programs, and descriptions of proposed remediation programs, so that DOH can insure that all public health issues are being addressed.

BES performed a Phase II Site Investigation on a portion of the project in the area which includes the sugar mill and the surrounding land as shown on Figure 4-5. The objective was to determine if chemical or chemical constituents historically used, stored, or spilled onsite are present in the

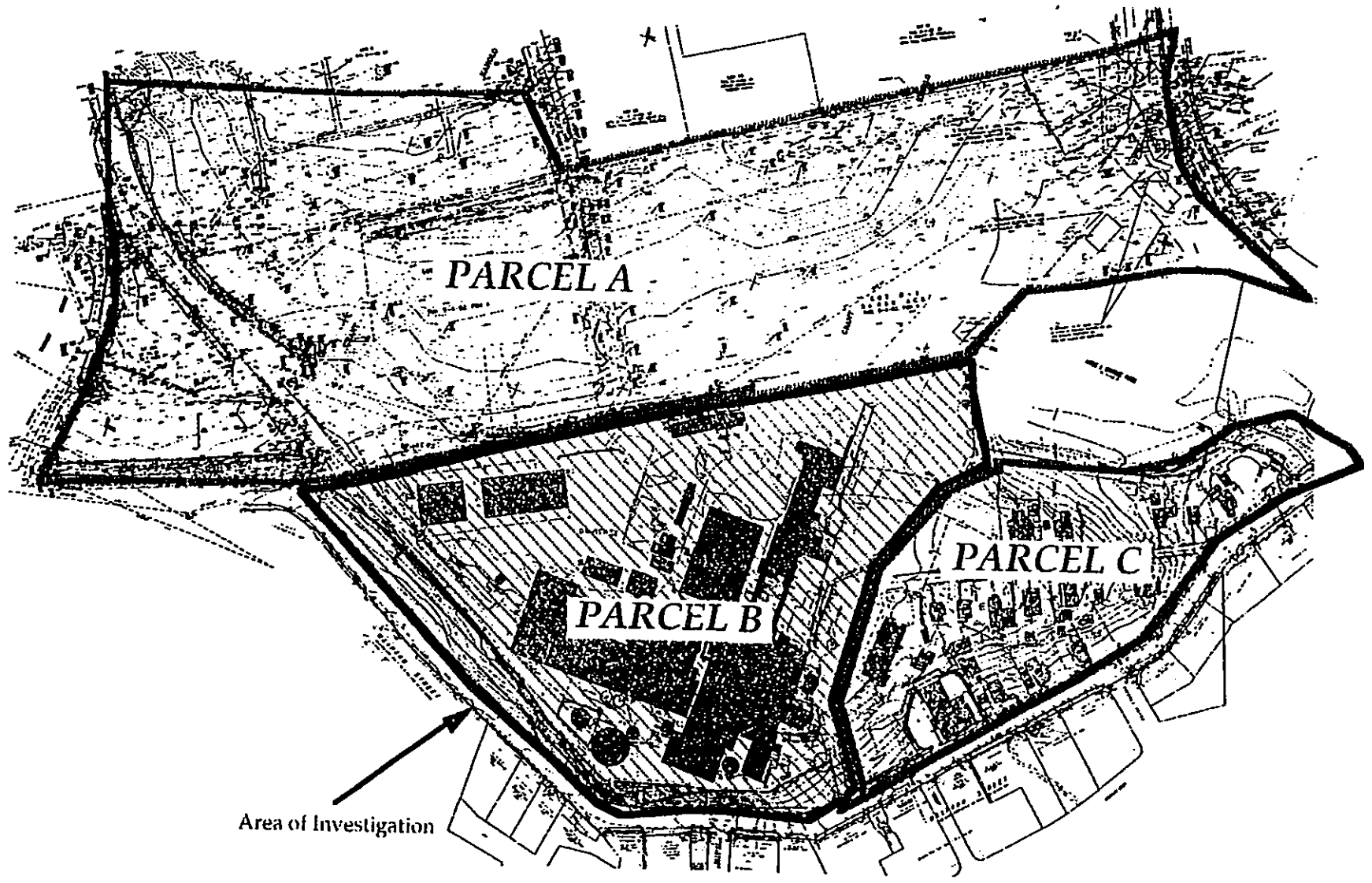


FIGURE 4-5
PHASE II Investigation Study Area
AMFAC COMMERCIAL & PARK

Source: Brewer Environmental Services

NOT TO SCALE

PBR HAWAII

shallow subsurface soils. A report of these investigations is attached as **Appendix D.** Groundwater conditions beneath the subject site are addressed in the section on groundwater.

The Phase II investigation consisted of subsurface soil sample collection at various depths and locations across the site and chemical analyses of those samples. The collection method utilized direct push sampling technology. Each sample was screened for the presence of volatile organic hydrocarbons in the field. Samples were then analyzed using a field immunoassay analytical technology. Immunoassay tests included: (1) total petroleum hydrocarbons (TPH) as diesel; (2) polynuclear aromatic hydrocarbons (PAHs); (3) polychlorinated biphenyls (PCBs); (4) 2,4-D, a pesticide; (5) atrazine, a pesticide; (6) carbendizim, a pesticide; (7) and chlordane, a pesticide. Immunoassay tests were performed on 141 samples. A total of 139 samples were analyzed for TPH as diesel, 56 samples for PAHs, 30 for PCBs, 32 for benlate, and 19 for 2,4-D, atrazine, and Carbendizim.

A total of 74 soil samples, at least one from each of the 53 sample points, were selected for confirmation analysis at an analytical laboratory. Confirmation analyses was based on either immunoassay analysis results or knowledge of past land use, or both. Confirmation analyses included at least one of the following tests: (1) total recoverable petroleum as hydrocarbons (TRPH); (2) TPH as gasoline; (3) TPH as diesel; (4) TPH as oil; (5) four regulated PAHs - benzo (a) pyrene, acenaphthene, fluoranthene, and naphthalene; (6) benzene, toluene, ethyl benzene, and total xylenes (BTEX); (7) PCBs; (8) four halogenated volatile organic compounds (HVOCS); (9) the pesticides benlate, velpar, topsin, and diuron; (10) the pesticide chlordane; (11) the pesticides DDE and DDT; and (12) total metals.

A. Existing Conditions

The results of the study indicated that petroleum hydrocarbons as measured by either TRPH, TPH as diesel, toluene, total xylenes, or acenaphthene were detected in 33 samples; however, these concentrations were below the State of Hawaii Department of Health (DOH) soil action levels (SALs) for those compounds. However, one soil sample, FMT-1-10', collected from the 10 foot depth interval, located east of the molasses tank had a concentration of TPH as oil of 8,469 mg/kg which exceeded the DOH SAL of 5,000 mg/kg. Sample FMT-1-2', collected from the two foot depth interval, contained 21.21 mg/kg of fluoranthene, a PAH, which exceeds the DOH SAL of 11 mg/kg.

During the demolition of the molasses tank in April 1996, laborers encountered a heavy petroleum product at the base of the aboveground storage tank. An employee of OSCo surmised that the tank may have been used to store petroleum prior to use as a molasses tank. OSCo notified HDOH HEER office of the discovery in April 1996 (HDOH release report #051396-1420.)

The petroleum hydrocarbons detected at concentrations below SALs are not considered to be an environmental concern; however, TPH as oil and fluoranthene in the former molasses tank area were

detected at concentrations above SALs. Therefore, further investigation of the subsurface soil in the former molasses tank area is warranted in order to determine the areal and vertical extent of the contamination. BES recommended employing test pits to determine the extent of the contamination, or, if conditions permit, proceed directly with excavating and disposing of the impacted soil as a local landfill or thermal desorption landfill or thermal desorption facility. As reported to DOH, these investigations will be underway shortly.

Arsenic was detected in four soil samples collected from two feet below grade surrounding the cane washer at concentrations exceeding the Environmental Protection Agency (EPA) preliminary remediation goals (PRGs). Although arsenic concentrations exceed the PRG, these concentrations are "total" concentrations rather than toxicity leaching characteristic procedure (TCLP) that is used for the characterization of hazardous waste. Using a dilution factor of 20, which is used in the TCLP testing of soils, the average concentration of arsenic in soils using a TCLP test would be less than 1.5 milligrams per liter, the regulatory level established by the EPA.

BES contacted DOH Hazard Evaluation and Emergency Response (HEER) office. HEER indicated that the arsenic concentrations detected at the site are lower than those detected at other industrial sites in which the EPA did not require further action. HEER stated that it is not aware of any situations in Hawaii where these concentrations were treated as hazardous waste.

Based on current DOH practices and BES's past experiences with industrial sites having similar arsenic concentrations, BES recommended no further action. This recommendation is made with the understanding that area be kept for either industrial or commercial use only.

Analyses for pesticides were performed on samples collected from areas surrounding the seed treatment wells and cane cleaning plant. There were no detectable concentrations of these ~~analytes~~analyses in any of the samples analyzed. No further action is recommended by BES regarding pesticides.

Halogenated volatile organic compounds, and polychlorinated biphenyls were analyzed for samples collected from areas surrounding the machine shop, the automotive repair shop, the cane washer, the bagasse warehouse and the service station. There were no detectable concentrations of these compounds at these locations. No further action pertaining to HVOCs or PCBs was recommended.

According to BHP Gas Company, the project area is currently clear of utility gas facilities.

C. Potential Impacts and Mitigation Measures

There are two primary findings derived from this investigation: (1) TPH as oil and fluoranthene were detected above HDOH SALs at one location, FMT-1, located adjacent to the former molasses tank and (2) arsenic was detected at concentrations above the industrial PRG at four locations adjacent to the cane washer area.

In order to address the detected release of petroleum in the area around the molasses tank, BES recommends using test pits to obtain soil samples beneath the former AST location. These samples can be used to delineate the vertical and horizontal extent of the TPH as oil and fluoranthene contamination detected in the soil at FMT- 1. Assuming that the impacted area is limited to soils within fifteen feet then the impacted soil can be excavated. ~~if~~If contaminant concentrations are within permissible limits, the impacted soil can then be transported to Nanakuli Landfill in Waianae, Hawaii or to a local thermal treatment facility. As soon as the mill equipment is removed, Amfac intends to initiate studies to determine the extent of contamination, and/or begin remediation, of the former molasses tank area. Amfac estimates that this work would start before the end of 1997. A report documenting field methods, extent of contamination, nature of contaminants, and the remedial process should be prepared by the environmental consultant and submitted to the HDOH HEER office.

In response to the arsenic detected in concentrations above the PRG in the area of the cane washer, because the average concentration of arsenic in the soils tested is below the regulatory level using the TCLP rule and assuming that the site will be used for industrial or commercial purposes, BES recommends no further actions at this time.

4.4 AGRICULTURAL IMPACT

A. Existing Conditions

The site is not being used for agricultural purposes and has little or no potential to be used for cultivation.

B. Potential Impacts and Mitigative Measures

No adverse impacts to agriculture are expected; therefore, no mitigative measures are needed.

4.5 GROUNDWATER RESOURCES

A. Existing Conditions

The State Department of Health has established the UIC line makai of Farrington Highway approximately 0.5 mile from the project area. The primary purpose of the UIC line is to protect potential source soft drinking water by not allowing wastewater injection wells or cesspools mauka of the line.

In late 1989, ~~Oahu Sugar Company (OSCo) removed~~ three ~~steel~~ underground diesel storage tanks were removed from ~~the area south~~ near the middle of ~~what used to be the tire shop~~ the OSCo site. The tanks had been in service since 1966 for the storage of gasoline and diesel fuel. During the removal ~~activities~~, a ~~petroleum hydrocarbon~~ release of hydrocarbons (diesel) was discovered ~~in the~~

~~subsurface around the tanks~~ and reported to DOH. ~~OSCo retained Brewer Environmental Services~~The tanks were removed and diesel-impacted soil (~~BES~~)down to ~~conduct~~ a ~~subsurface investigation~~depth of approximately 20 feet, which was the maximum depth/reach of the backhoe) was removed and treated on site. ~~BES advanced~~Because the diesel-impacted soil ~~borings and installed monitoring wells in an effort to define~~ extended to the water table, approximately 45 feet below the ~~area affected by the release~~ surface, it was not practical to remove all of it. A ~~hydrocarbon plume covering approximately 2 acres~~ Phase II investigation was ~~detected floating on~~ conducted which established the ~~groundwater within~~ extent of the ~~mill area~~ diesel fuel. Monitoring wells were established within and around the detected product plume. Currently (December 1996) the diesel plume extent is approximately 350 feet by 220 feet in size and product thickness ranges from 0.01 feet to a maximum of 0.3 feet.

B. Anticipated Impacts and Mitigation Measures

~~In 1993, BES met with the State Department of Health (DOH) on the methodology for the removal of the petroleum~~Remediation in the form of product recovery via product recovery wells was begun in early 1994 and over 1,365 gallons have been recovered. ~~In 1994, BES installed a recovery system~~Quarterly monitoring by BEI indicates that remedial activities have prevented the plume from migrating and have recently begun to ~~remediate~~ reduce the ~~petroleum and groundwater beneath the Waipahu mill~~ plume in both areal extent and product thickness. ~~In addition, BES has monitored the volume of petroleum recovered and has provided quarterly~~Quarterly monitoring reports ~~to~~ have been filed with the DOH ~~since 1993 (the latest was filed~~ on ~~October 29,~~ a regular basis (since 1993-latest report filed December 1996)~~. When monitoring began in 1992, seven wells contained petroleum~~ and product recovery and quarterly monitoring and reporting is continuing until such time that it is appropriate to curtail the remediation. Monitoring is expected to continue for a period of time after remediation is stopped to ensure that conditions do not change. ~~Currently product is detected in only five~~Groundwater samples from three monitoring wells ~~indicating that product recovery activities are containing and reducing the amount of product on the groundwater~~ located outside the plume have been analyzed for benzene, toluene, ethylebenezene and total xylenes and for polynuclear aromatic hydrocarbons, but none have been detected. ~~The latest gauging data from the wells containing petroleum indicates that product thickness has decreased in the wells compared to results of the previous quarterly monitoring event. The product plume is in the same general location since March 1996 and has not migrated outside the boundaries (according to data from three monitoring wells located outside the plume). Groundwater samples from these latter three wells have been analyzed for benzene, toluene, ethylebenzene and total xylenes and for polynuclear aromatic hydrocarbons, but none have been detected.~~

No injection wells or cesspools are proposed, and any runoff or wastewater disposal required for the project will be done in full compliance with the UIC and other applicable regulations.

No measurable impact on groundwater quality from the proposed project is anticipated; therefore no mitigative measures are necessary.

4.6 NATURAL HAZARDS

A. Existing Conditions

Natural hazards are events such as tsunami, earthquakes, floods, hurricanes, soil slippage and volcanic hazards. There are no known topographic features on the project site that could result in natural hazards such as geologic faults, or volcanic activity.

The project area may be subject to hurricanes and minor earthquakes in the future; the site is not unique to these potential hazards. Earthquakes in the Hawaiian Islands are associated with volcanic eruption or tectonic movement. Volcanic hazards in the area are considered minimal due to the extinct status of former volcanoes. Seismic hazards in the area are no greater than other locations on Oahu.

Flood hazards are primarily identified by the Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency (FEMA), National Flood Insurance Program. According to the FIRM (1995), the project area is generally outside of any flood boundaries. A small area along Waipahu Street is located within "Zone X", an area defined as outside of the 500-year flood plain (Figure 4-6). *In addition, the project area is not a shoreline property and lies entirely outside* of the coastal flood zone attributable to either high wave action or tsunami. Due to the location of the site, the proposed project is not expected to either affect or be affected by flood hazards.

B. Potential Impacts

Because the project area is not located within a floodway or a flood fringe area, nor within a designated tsunami inundation area, no part of the project will be impacted by potential flooding hazards. Storm drainage will be controlled by detention areas which will minimize and control potential off-site flooding both within and at downstream areas of the project. As noted in the Drainage Study (Appendix L), discharge of runoff (rates and volumes) from the project will be handled through the existing drainages or the proposed improvements to the drainage system. None of the land uses proposed for the project are susceptible to flooding as described by the Flood Insurance Rate Maps (FIRM).

The State of Hawaii has been affected twice since 1982 by devastating hurricanes, Iwa in 1982 and Iniki in 1992. While it is difficult to predict these natural occurrences it is reasonable to assume that future events could be likely given the record of the past fourteen years. The project area, as the rest of the island, is no more or less vulnerable to the destructive winds and torrential rains associated with hurricanes and cyclones.

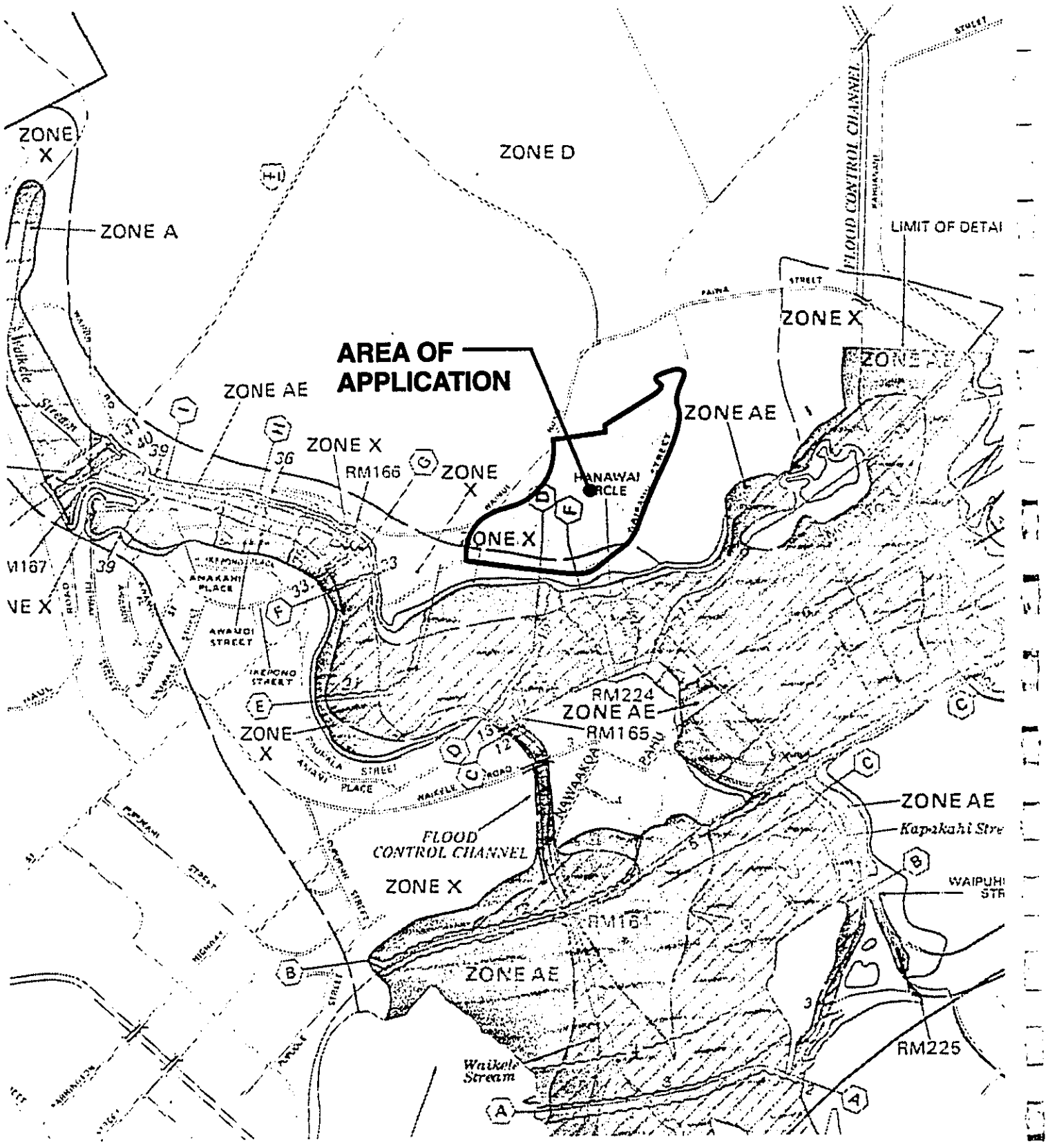


FIGURE 4-6
Flood Insurance Rate Map
AMFAC COMMERCIAL & PARK

0 500 1000
FEET

Source: National Flood Insurance Program, FEMA, 1995

C. Mitigative Measures

(1) Protection of Buildings. The potential impact of destructive winds and torrential rainfall of tropical cyclones/hurricanes on structures within the project will be mitigated by compliance with the Uniform Building Code adopted by the City and County. All structures will be constructed for protection from earthquakes and tropical cyclones/hurricanes in accordance with the requirements of the City and County.

(2) Drainage Improvements. Drainage improvements will include adequate provisions to prevent any localized flooding problems. No other mitigative measures are required to avoid potential flood hazard areas since none exists within the project area. There are no streams on site and according to the State Commission on Water Resource Management, a Stream Channel Alteration Permit does not appear to be required to implement the project.

4.7 FLORA AND FAUNA

A. Existing Conditions

The project area was highly modified for industrial, office and residential uses over the past century, as a result, the existing vegetation is representative of introduced species. There are generally four environments on the property: 1) the mill site with now vacant industrial buildings proposed for commercial uses, 2) the Administration and Human Resources buildings and lawn proposed for a YMCA, 3) the old Waipahu Store (Clinic) building, and 4) the now vacant skilled employee housing area proposed for the Filipino Community Center and the Hans L'Orange Park Expansion.

The mill site is largely devoid of vegetation. The Administration and Human Resources buildings and grounds are well kept lawns with mature trees. The former skilled employee housing site is now vegetated with weeds typical of degraded lots and the Clinic Building is basically an urban streetfront property. No endangered plant or animal species are known to exist in the subject property. In addition, no wetlands, streams, estuaries or other habitats that could accommodate endangered plant or animal species are present on the subject property. The flora consists of exotic weedy species due to previous disturbance (clearing), and industrial and residential use of the land. The buffer along Waipahu Street west of the Depot Road is covered with wedelia, a groundcover. Birds and animals common to urban areas were sighted or are presumed to exist on the site.

B. Potential Impacts

Implementation of the project is not expected to have a significant impact on flora and fauna resources. Development will take place on lands which are highly degraded. The slope buffer will remain and will not be affected by the implementation of the project.

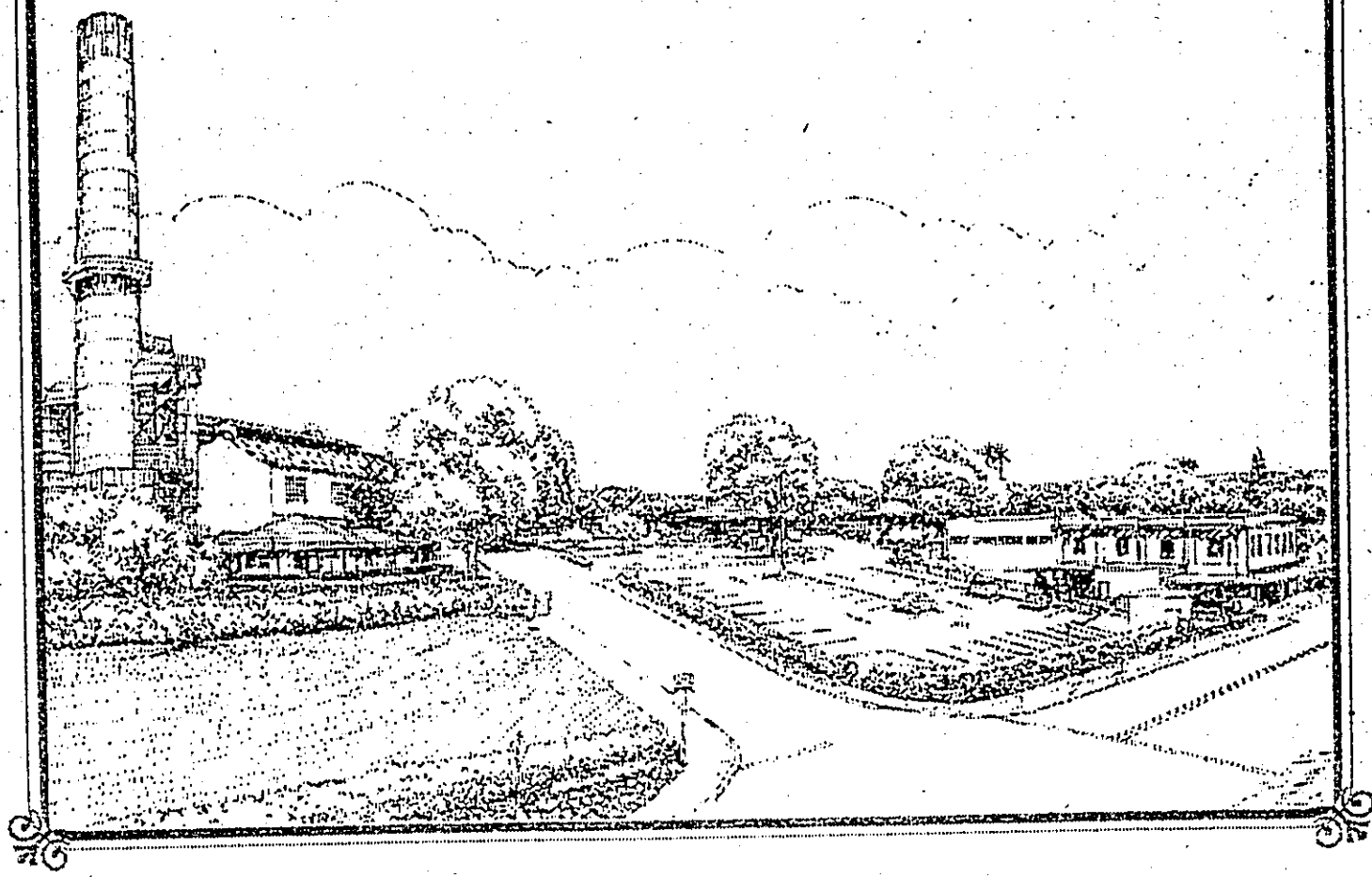
C. Mitigative Measures

(1) **Erosion Control**. Measures will be taken to alleviate runoff and soil erosion effects on undisturbed vegetation throughout the project site. Steps will be taken during the construction phase to reduce soil erosion tendencies.

(2) **Landscaping**. Landscaping is planned for the project within the commercial area, heritage area, and park. Plant materials will be selected to maximize the efficient use of irrigation water while enhancing the urban setting. Native plants and plants suitable to enhance the heritage theme will be utilized where site conditions and aesthetic considerations permit.

5.0

ASSESSMENT OF EXISTING HUMAN ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATIVE MEASURES



5.0 ASSESSMENT OF THE EXISTING HUMAN ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATIVE MEASURES

This section presents summary background information on the existing human environment. Subject areas such as archaeology, traffic, air, noise and visual conditions are addressed in this section. It also includes a presentation of demographic conditions in the project area, and the potential effects of the project on the resident population. Economic factors, employment, government expenditures and revenues are considered. Technical studies and analyses have been undertaken to address the potential impacts of the project, and, mitigative measures are recommended to minimize the potential short and long term impacts.

5.1 ARCHAEOLOGICAL AND HISTORIC RESOURCES

A. Existing Conditions

Archaeological Resources

Paul L. Cleghorn, Ph.D., of Pacific Legacy, Inc. conducted an archaeological survey of the project in March 1996 to determine if any potentially significant archaeological resources are present on the property. The study entailed research of previous studies and a surface survey. The archival research included a review of relevant archaeological research previously conducted in the project vicinity and historic records and maps. The surface survey was conducted on March 6, 1996 to identify traditional Hawaiian archaeological resources. The full report is attached as Appendix E.

A review of the record indicated that Spear (1993, 1994) conducted two reconnaissance surveys for the Amfac Industrial Subdivision proposed for the adjacent area (on the same TMK) to the subject project. Spear concluded that the area had been extensively disturbed and no archaeological sites were found. Other earlier studies by McAllister (1933), Cox and Stassack (1970:97), Folk (1990), were researched. Folk recorded three historic-period dressed stone walls along Waipahu Street and dressed curbstones along Waipahu Street and Makaaloha Street. The wall segments along Waipahu Street range in height from 0.2 to 3.0 m and are constructed of basalt boulders which have been flaked and dressed to form rectangular blocks. It appeared that the walls were constructed without mortar.

An open excavation trench was observed in the area northeast of the project area. The trench revealed that approximately 40 cm of fill has been deposited over the area. Much of the fill contains coral gravel which was observed scattered over most of the unpaved surface in the vicinity of the mill. The excavation trench also showed deeper disturbance (a pipe and wooden post) extending to a meter below surface. These data suggest that there is a low likelihood that subsurface archaeological deposits occur within the project area. However, there may be a possibility that historic period deposits may be present in the project area.

Cleghorn concluded that no traditional sites were found in the project area and it appears unlikely that there will be potentially significant subsurface archaeological deposits of prehistoric age in the project area.

Historic Buildings and Structures

In 1990, Spencer Mason Architects conducted a study of potentially historic properties along Waipahu Street for a proposed street widening project. Subsequently, Spencer Mason Architects inspected, photographed, described and evaluated the 18 plantation homes that were once located near Waipahu and Makaaloha Streets, known as the Skilled Workers' Housing. A copy of the draft report is attached as Appendix E-1). Spencer Mason Architects also oversaw the compilation of archival photographs to document the mill structures in accordance with the specifications of the Historical American Buildings Survey (United States Secretary of the Interior documentation specifications). These photographs are to be compiled in a report and will be filed in the U.S. Library of Congress and the University of Hawaii.

B. Potential Impacts

Archaeological Resources

The archaeological report concluded that no traditional sites were found in the project area and that it was unlikely that there are potentially significant subsurface archaeological deposits of prehistoric age in the area. As proposed, the wall at Waipahu Street will not be altered by the project. Therefore, the project is not expected to cause any significant impacts to the archaeological resources and mitigative measures are not warranted. The 1996 archaeological report which was included as Appendix E in the Draft EIS has been reviewed by the State Historic Preservation Division (SHPD). In their review comments, SHPD stated that "it is unlikely that historic sites will be found, and believe that this project will have 'no effect' on historic sites."

Historic Buildings and Structures

The machinery in the existing mill has been sold and will be reused at other sugar mills and for other industrial uses. Based on extensive analysis, most structures that remain are impractical and unsuitable for other uses, including the commercial uses envisioned in the Special Area Plan. It is also important to note that any adaptive re-use of the existing mill structures would require major structural and utility renovations to bring the buildings up to acceptable public safety levels to allow occupancy and re-use. Thus, most structures in the area designated for commercial use are being dismantled and removed. However, the proposed project includes the preservation and/or reuse of the Smokestack, the Generator Building, the Laboratory Building, the Administration Building, the Human Resources Building, and the Waipahu Store Building.

C. Mitigative Measures

(1) Preservation of the Mill Stack.

The mill smoke stack is planned to be preserved and will continue to be a prominent symbol of Waipahu's heritage.

(2) Preservation and Adaptive Reuse of Historic Buildings.

Several buildings on the mill site have been identified in the Waipahu Town Plan for their historical value and will be preserved and incorporated into the proposed heritage area. The buildings include the Generator Building, the Laboratory Building, the Administration Building, the Human Resources Building, and the Waipahu Store Building. The mill smoke stack, the Generator Building and the Laboratory Building are included in the proposed Heritage Museum Area. The Human Resources Building and the Administration Building, and a total of two acres are being sold to the Leeward Branch of the YMCA to establish a permanent facility. The buildings will be adapted for use as a community recreational facility.

(3) Design Guidelines.

Amfac commissioned Spencer Mason Architects to establish design guidelines for the Waipahu Town core, the mill site and the FilCom site. The aim of establishing the design guidelines is to ensure that the design of new buildings and alterations to existing buildings will help to continue and strengthen the architectural character of the Waipahu Town core.

(4) Standard Procedures.

In anticipation of the dismantling of the mill structures, archival photographs documenting the structures were taken. In accordance with the specifications of the Historical American Buildings Survey (United States Secretary of the Interior documentation specifications), three sets of archival prints were made and will be filed in the U.S. Library of Congress and the University of Hawaii. The photographs thoroughly document the structures and buildings of the Oahu Sugar Company for posterity (27 exteriors of 22 structures, 28 interiors in 14 buildings).

To ensure that no important cultural features will be destroyed during project construction, a qualified archaeologist will selectively monitor initial grubbing activity and/or vegetation clearing within the project area. Should subsurface remains, artifacts, deposits of charcoal or shells be found during construction activities, work in the area will be stopped immediately and the Department of Land and Natural Resources will be contacted to determine the significance of the site and to identify appropriate mitigation measures.

5.2 ROADWAYS AND TRAFFIC

A traffic study was conducted by Austin Tsutsumi & Associates, Inc. ("ATA") (March 1996) to evaluate the potential traffic impacts and circulation needs with and without the proposed Amfac Commercial and Park, and Amfac Industrial Subdivision projects. The report is attached as Appendix F.

The "project" within the ATA traffic study refers to both the Amfac Commercial and Park (for which the subject DP amendment is being requested) and the Amfac Industrial Subdivision (which is not within the requested DP amendment area).

The proposed project is designed to be accessible from both Paiwa and Waipahu Streets. ATA studied nine existing intersections in the vicinity of the proposed project (Figure 5-1):

- Waipahu Street and Waipahu Depot Road
- Waipahu Street and Mokuola Street
- Waipahu Street and Paiwa Street
- Paiwa Street and Paiwa Place
- Paiwa Street and Hapapa Street
- Paiwa Street and Hiapo Street
- Paiwa Street and H-1 Eastbound Ramps
- Paiwa Street and H-1 Westbound Ramps
- Paiwa Street and Lumiaina Street

A. Existing Conditions

Streets and Roadways in the Project Area

Paiwa Street. Paiwa Street is a collector road which runs north-south between the newly developed Waikele residential area and Farrington Highway; south of Farrington Highway, it continues as Awanui Street. From the Waikele residential area (near the Waikele Golf Club) to just south of the H-1 Eastbound Ramps, Paiwa Street is a four-lane, divided roadway fronting mostly residential uses as well as the Waikele Shopping Center. Between the H-1 Eastbound Ramps and Hiapo Street, Paiwa Street is an access restricted, four lane undivided collector road fronting mainly residential uses. From south of Hiapo Street through Farrington Highway, Paiwa Street operates as a two-lane roadway. Near the project area, Paiwa Street is signalized at Waipahu Street, Hapapa Street, Paiwa Place, Hiapo Street, H-1 Eastbound Ramps, H-1 Westbound Ramps and Lumiaina Street.

Waipahu Street. Waipahu Street is a two-lane City collector street which runs east-west between Kunia Road and Kamehameha Highway. Waipahu Street is a major collector/distributor road through Waipahu Town serving residences, small commercial areas, parks and schools. Certain

segments of Waipahu Street are narrow with curving alignments. Near the project area, Waipahu Street is signalized at Depot Road, Mokuola Street, and Paiwa Street.

Mokuola Street. Mokuola Street is a two-lane City street which runs north-south between Waipahu Street and Farrington Highway (south of Farrington Highway, it continues as Awalau Street). Near the project area, Mokuola Street serves mainly residential uses as well as the Waipahu Civic Center and some commercial uses.

Lumiaina Street. Lumiaina Street is an east-west collector street which runs from Kamehameha Highway through the Waikele community just north of the H-1 Freeway. Between Kamehameha Highway and just east of the Waikele Center/Factory Stores Outlet driveway, Lumiaina Street is a four-lane divided, restricted access roadway serving the residential subdivision and the Waikele Shopping Center/Factory Stores Outlet. West of the Waikele Shopping Center/Factory Stores Outlet driveway, Lumiaina Street becomes a four-lane undivided roadway. West of Paiwa Street, Lumiaina Street narrows to a 60-foot right-of-way collector road serving residential areas.

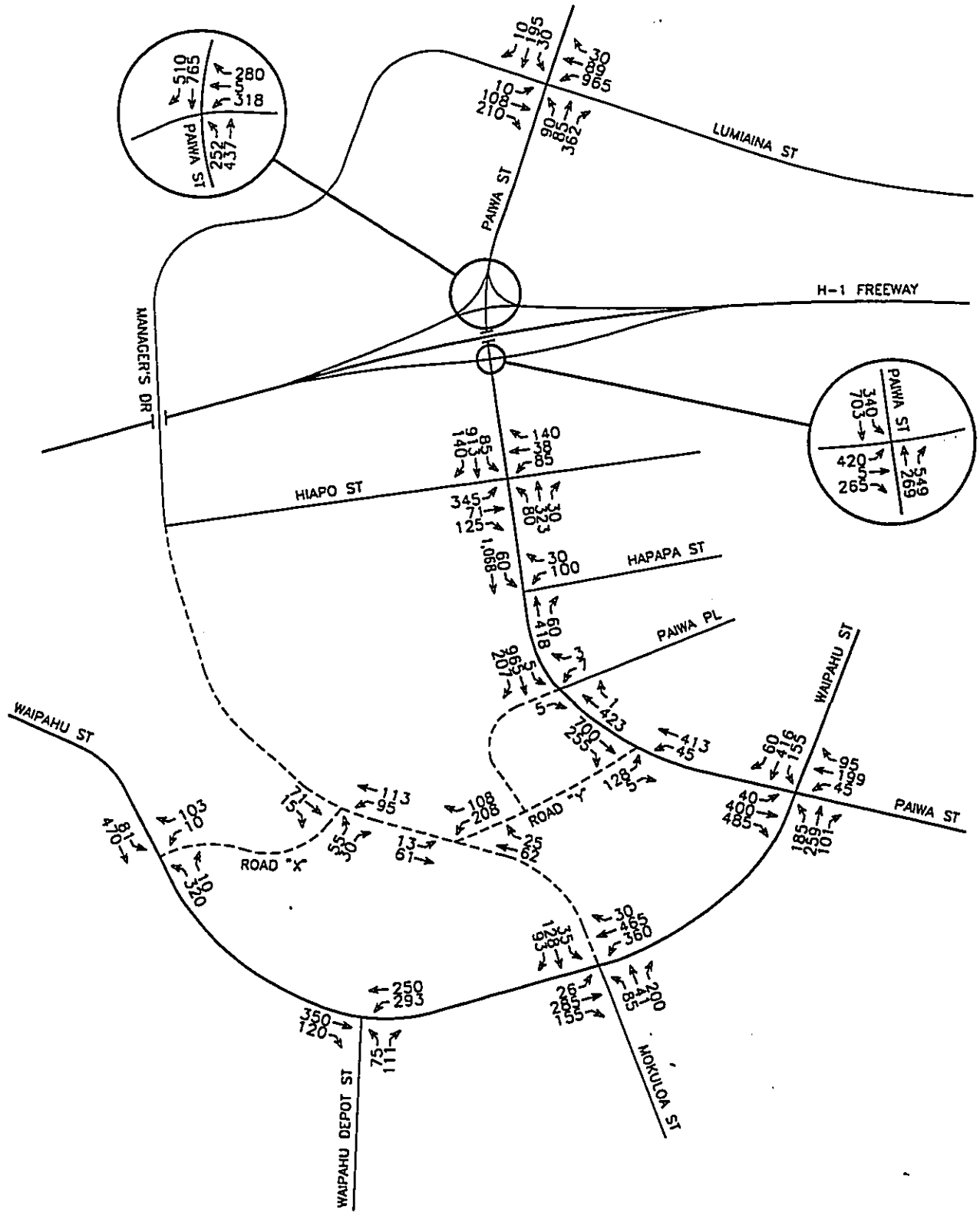
Findings of the Traffic Study

ATA found that three of the intersections are currently operating at undesirable levels of service (LOS E and F). The intersections are Waipahu/Mokuola Streets, Waipahu/Paiwa Streets, and Paiwa/Lumiaina Streets.

Intersection	Existing AM LOS	Existing PM LOS
Waipahu Street/ Mokuola Street	E	E
Waipahu Street/ Paiwa Street	E	D
Paiwa Street/ Lumiaina Street	D	F

B. Anticipated Impacts and Mitigative Measures

To determine the potential traffic impact of the project, traffic projections were developed under conditions both "with" and "without" project development for the Year 2000. Project generated trips were developed utilizing "Trip Generation" 5th Edition, Institute of Transportation Engineers (ITE),



LEGEND

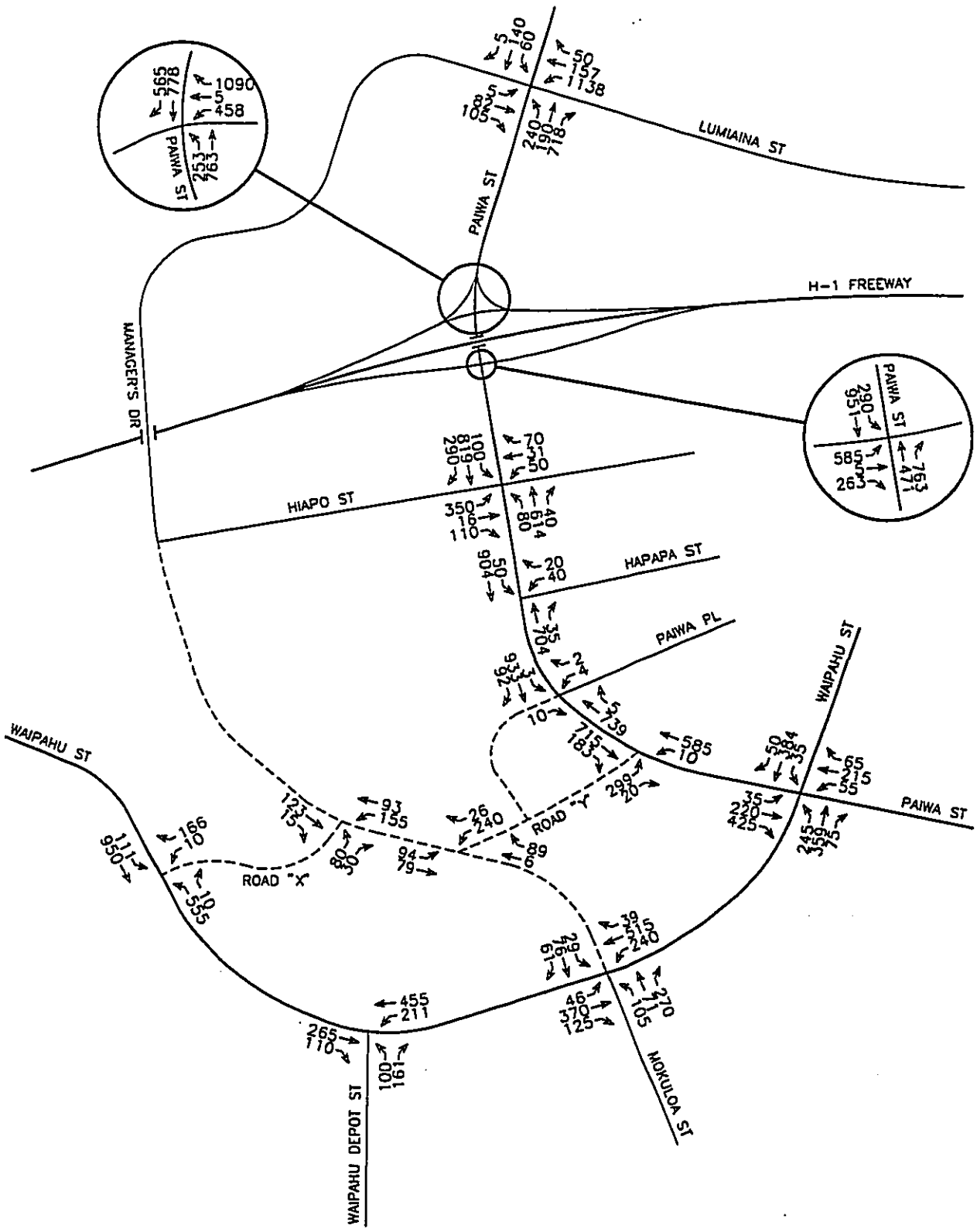
Existing Roadway

Proposed Roadway

Source: Austin, Tsutsumi & Associates, Inc.

FIGURE 5-1A
Year 2000 Base (Without Project)
AM Peak Hour Traffic Volumes
AMFAC COMMERCIAL & PARK

NOT TO SCALE



LEGEND

Existing Roadway

Proposed Roadway

Source: Austin, Tsutsumi & Associates, Inc.

FIGURE 5-1B
Year 2000 Base (Without Project)
PM Peak Hour Traffic Volumes
AMFAC COMMERCIAL & PARK

NOT TO SCALE

Year 2000 Base Traffic "Without Project". Based on future base traffic projections to the year 2000 (without the proposed subject project and the proposed Amfac Industrial Subdivision, as shown ~~in Figures 5-1A and 5-1B), ATA has determined that of the nine intersections studied, the following~~ in Figures 5-1A and 5-1B), ATA has determined that of the nine intersections studied, the following three intersections will be operating at undesirable levels of service (LOS E and F):

Intersection	Existing AM LOS	Existing PM LOS	Future AM LOS "Without Project"	Future PM LOS "Without Project"
Waipahu Street/ Mokuola Street	E	E	F	F
Waipahu Street/ Paiwa Street	E	D	F	F
Paiwa Street/ Lumiaina Street	D	F	D	F

The three intersections listed above are the same three intersections operating at undesirable levels of service under existing conditions. The following were recommended base improvements which should be implemented with or without the proposed project:

(1) Waipahu Street/Mokuola Street - Provide the westbound approach with one exclusive left turn lane and one through lane. Provide the northbound approach with one exclusive left-turn lane and one exclusive right-turn lane.

(2) Waipahu Street/Paiwa Street - Provide the northbound, eastbound and westbound approaches with one exclusive left-turn lane and one shared through and right turn lane. Also, provide the southbound approach with an exclusive left-turn lane; the southbound approach will then have an exclusive left-turn lane, one through lane and one exclusive right-turn lane.

(3) Paiwa Street/Lumiaina Street - Restripe to provide the westbound approach with one exclusive left-turn lane, one shared left-turn and through lane and one shared through and right-turn lane (which has recently been completed). Also, the northbound approach should be provided with a separate right-turn lane. The northbound approach will then include: one exclusive left-turn lane, two through lanes and one exclusive right-turn lane.

According to ATA, with these recommended base improvements (without the proposed project) all the intersections will operate at LOS D or better under the Year 2000 Base ("Without project") conditions.

Year 2000 Traffic "With Project". Development of the applicant's property will occur in two phases, with Phase I limited to primarily the proposed Amfac Industrial Subdivision and Phase II involving the subject proposed Amfac Commercial and Park project.

The first phase of development will include the following roadway improvements. To conform to the Waipahu Special Area Plan, a new east-west roadway with a 60-foot right-of-way will be constructed from Paiwa Street (south of its intersection with Paiwa Place) to ~~Road "Y",~~ a new mauka-makai road (Mokuola Street Extension) within the applicant's property (Road "Y" as shown on the Conceptual Use Plan, Figure 2-1). Road "X" and Road "Y" are proposed roads which will intersect with the Mokuola Street Extension and separate the Industrial Subdivision and the subject Commercial and Park project. The intersection of Road "Y" and Paiwa Street will be signalized. Along with the signalization of the Road "Y"/Paiwa Street intersection, the traffic signal at Paiwa Street and Paiwa Place will be removed and the west leg of the intersection will be restricted to right-turn in and right-turn out only. Egress from the area will be shifted to the new intersection of Road "Y" and Paiwa Street. The northbound approach of the Road "Y"/Paiwa Street intersection will include one shared left-turn and through lane and one through lane. The southbound approach should provide one through lane and one shared through and right-turn lane. The eastbound approach will provide one exclusive left-turn lane and one exclusive right-turn lane.

The intersection of Road "Y" and the Mokuola Street Extension will be controlled by stop signs, until future traffic volumes warrant the installation of traffic signals. Provisions will be made to include conduits for possible future traffic signal installation should it be needed.

From the applicant's makai property line, Mokuola Street will be extended into the project. This roadway (Mokuola Street Extension) will have a minimum of 60-foot right-of-way with 44 feet of roadway between curbs (as shown on Figure 2-1). In conjunction with the extension of Mokuola Street to serve the proposed Amfac Industrial Subdivision and Amfac Commercial and Park project, the eastbound and southbound approaches of the Waipahu Street intersection will be improved to provide an exclusive left turn lane and a shared through and right turn lane.

Amfac is proposing to bear the entire cost of improving Waipahu Street, as shown on the detailed plans for the improvements along Waipahu Street, (less any amounts that various utility companies may be responsible for via Ordinance 2412) from the western portion of Hans L'Orange Park to approximately 300 feet west of Waipahu Depot Road as part of the previously approved Light Industrial Subdivision.

Amfac proposes to complete the Waipahu Street Improvements in three phases that will be coordinated with the onsite improvements. The first two phases ~~Phases 1A and 1B~~ of the Waipahu Street widening (from the southern edge of Hans L'Orange Park to approximately 300 feet west of Waipahu Depot Road) would be completed in conjunction with the proposed Phase 1A and 1B industrial subdivision (Mokuola Street Extension, Road "Y" and internal industrial subdivision roads) and would complete Amfac's obligations for those portions of Waipahu Street. The

completion of the proposed "Phase 1A" improvements (Mokuola Street Extension to Road "Y" and Road "Y") will provide an alternative route for motorist and may thereby relieve the existing Waipahu/Paiwa Street intersection. By ~~allowing~~ Amfac ~~to~~ constructing Phase 1A before the City improves the Waipahu/Paiwa Street intersection, the construction bottlenecks at that intersection can be greatly reduced.

The third phase ~~Phase 2~~ of Waipahu Street (from 300 feet west of Waipahu Depot Road to near the entrance of Waipahu developed. This strategy is both consistent with the "roadway character" desired by the community and adequate on a traffic basis, based on the Traffic Impact Assessment Report prepared by Austin, Tsutsumi & Associates, Inc. (Appendix F). When the future proposed commercial area is developed, ~~Phase 2 of Waipahu Street at the intersection of Road "X" will be improved along with any other required improvements within this section.~~ the following roadway improvements wil be implemented. To conform to the Waipahu Special Area Plan, a new east-west roadway, "Road X", with a 60-foot right-of-way, or other transportation improvements acceptable to DTS, will be constructed between Waipahu Street (replacing the existing Aualii Street/Waipahu Street intersection) and to the Mokuola Street Extension. The intersection of Road X/Waipahu Street would be signalized and one through lane and one exclusive right-turn lane in the northbound approach would be provided. The southbound approach will include one exclusive left-turn lane and one through lane. The westbound approach will provide one shared left-lane and right-turn lane. The Road X/Mokuola Street Extension intersection will be controlled with stop signs, until future traffic volumes warrant the installation of traffic signals. *Provisions will be made to include* conduits for possible future traffic signal installation should it be needed.

(1) Roads related to the proposed Amfac Industrial Subdivision will create the following intersections:

- Paiwa Street and Road Y
- Mokuola Street Extension and Road X
- Mokuola Street Extension and Road Y

(2) Project-related roads will create the following intersection:

- Waipahu Street and Road X

~~Amfac also proposes to convey approximately 3 acres of land to the City for the expansion of the Hans L'Orange Park. Amfac has met with the Department of Parks and Recreation and proposed a land trade, the 3 acres of additional park land in return for the Department of Parks and Recreation agreeing to subdivide and convey to DTS any additional right of way from Hans L'Orange Park that may be required in order for DTS to improve Waipahu Street and/or Paiwa Street.~~ The City and County of Honolulu has had plans to widen Waipahu Street since at least 1993 (Austin Tsutsumi & Associates, Inc., "Waipahu Street Widening and Realignment Project", prepared for the City and County of Honolulu, Department of Transportation Services, July 1993). This plan included land

acquisition (including from Hans L'Orange Park) for the realignment and widening of Waipahu Street, and was prepared two and a half years before the Waipahu Town Plan identified commercial development of Amfac's property.

Due to the administrative difficulties in obtaining "park land" for roadway widening, the Department of Transportation Services asked Amfac to incorporate the acquisition of the necessary "park land" with the conveyance of the additional "park land." Amfac is trying to assist in order to expedite the City's planned improvements to the Waipahu Street and Paiwa Street intersection.

The currently needed improvements to Waipahu Street and the intersection of Paiwa and Waipahu Streets involve approximately 5,760 square feet of Hans L'Orange Park land, of which none will affect current park operations. In contrast the park dedication involves 117,889 square feet of land, a net gain to the park of approximately 112,129 square feet.

The most current plans for widening of Waipahu Street, which have been reviewed and approved by the Department of Transportation Services, involve the relocation and/or replacement of existing monkeypod trees on that portion of the widening project fronting Hans L'Orange Park. The possibility that some of these trees may be relocated and/or replaced has been presented to the Department of Transportation Services, the Waipahu 2000 Update Committee, the Friends of Hans L'Orange Park Committee and the Waipahu Neighborhood Board, with no adverse comments expressed. On February 20, 1997, the Waipahu Neighborhood Board voted unanimously (16-0) to support the park expansion as proposed and to urge the City Administration to continue to work with the community.

The Amfac Industrial Subdivision, the subject community facilities (i.e., YMCA, FilCom Center), and the Hans L'Orange Park expansion would together generate an estimated 2,751 daily vehicle trips, which include 339 AM peak hour vehicle trips and 377 PM peak hour vehicle trips. The Commercial component of the subject project would generate an estimated 7,338 daily vehicle trips, 168 AM peak hour vehicle trips and 682 PM peak hour vehicle trips.

With the project, but without any base (without project) improvements, the following intersections are projected to operate at LOS E or F during either the AM or PM peak hours, or both:

- Waipahu Street and Mokuola Street
- Waipahu Street and Paiwa Street
- Paiwa Street and Lumiaina Street
- The westbound approach at the stop-controlled intersection of Paiwa Street and Paiwa Place

With the exception of the Paiwa Street and Paiwa Place intersection, all the intersections that are projected to operate at LOS E or F under "with project" conditions are already currently operating at LOS E or F and will continue to operate at LOS E or F with or without the proposed project.

At the intersection of Paiwa Street and Paiwa Place, only the westbound approach will experience long delays (LOS E) during the PM peak hour. However, no improvements are recommended due to the relatively low number of westbound vehicles which will be affected. In addition, when the eastbound leg of Paiwa Place is restricted to right-turn in and right-turn out, as anticipated in connection with Phase I, the northbound left-turn storage lane will provide a sheltered area for the westbound left-turn vehicles from Paiwa Place to southbound Paiwa Street.

The traffic study shows that with the recommended base (without project and the proposed Amfac Industrial Subdivision) improvements previously described and roadway improvements associated with the proposed project and the proposed Amfac Industrial Subdivision, all the intersections (with the exception of Paiwa Street and Paiwa Place) will be operating at acceptable levels of service (LOS D or better) during both the AM and PM peak hours. In their ~~reviewr~~reviews of the EISNOP and the Draft EIS, the State Department of Transportation stated that they anticipated that the State facilities (H-1 and Farrington Highway) should be able to adequately accommodate the project.

5.3 NOISE

An acoustic study for the project was conducted by Y. Ebisu & Associates (December 1996) and is summarized in this section. The detailed report is attached as Appendix G. The primary objective of the study was to describe the existing and future traffic noise environment of the proposed project. Traffic noise level increases and impacts associated with the proposed development were determined within the project site as well as along public roadways expected to service the project traffic.

A. Existing Conditions

Presently, noise conditions of the project area is dominated by environmental cleanup and equipment removal on the project site, distant traffic on H-1 Freeway, traffic along Waipahu Depot Road and Paiwa Street, Mokuola and Waipahu Streets, and aircraft.

The adjacent area to the south or makai of Waipahu Street consists of commercially zoned properties and the Waipahu Cultural Garden Park/Hawaii's Plantation Village. There are no residential units adjacent to the property. To the north or mauka of the project is the property proposed for industrial development. None of the existing or proposed land uses are classified as noise sensitive uses.

B. Potential Impacts

Short-term Noise Impacts. Unavoidable, but temporary, noise impacts may occur during the construction of the proposed project, particularly during the excavation activities on the project site. Because construction activities are predicted to be audible within the project and at adjoining properties, the quality of the acoustic environment may be degraded to unacceptable levels during periods of construction. Mitigation measures to reduce construction noise to inaudible levels will not be practical in all cases, but the use of quiet equipment and the implementation of the State

Department of Health construction noise permit procedures are recommended as mitigation measures.

Long-term Noise Impacts. Potential noise impacts are primarily limited to those generated by the increased volume of traffic, and noise associated with the operation of commercial, community facility and park facilities. Overall noise levels should not exceed those generated by previous industrial operations of the Oahu Sugar Mill.

The existing and future noise levels in the vicinity of the project were evaluated for their potential impacts and their relationship to current FHA/HUD noise standards. The traffic noise level increases along three access roadways to the project were calculated. These three roadways were: Paiwa Street; Waipahu Street; and the proposed Mokuola Street Extension. By CY 2000, increases in traffic noise of 0.1 to 2.7 Ldn units are predicted to occur as a result of project plus non-project traffic.

Along Paiwa Street, traffic noise levels are expected to increase by 0.1 to 1.9 Ldn, as a result of both project and non-project traffic. Project traffic noise contributions along Paiwa Street should range between 0 and 0.2 Ldn. Along Waipahu Street, traffic noise levels are expected to increase by 0.2 to 2.7 Ldn, with project traffic contributions ranging from 0 to 0.5 Ldn. According to Y. Ebisu & Associates, these levels of traffic noise increases resulting from project generated traffic are not considered to be significant, and are not expected to generate adverse noise impacts.

C. ~~Mitigation~~ Mitigative Measures

(1) Compliance with DOH Rules. Mitigation of construction noise to inaudible levels will not be practical due to the intensity of development and nature of the work (grading, trenching, concrete pouring, hammering, etc.). However, properly muffled construction equipment will be used on the job site. In addition, all applicable State Department of Health regulations regarding construction noise limits, curfew times, and holiday work, will be applied to the project to ensure that unacceptable noise levels do not occur. The use of noise suppression equipment on construction vehicles and construction curfew periods are required under the State Department of Health (DOH) noise regulations. Construction equipment will utilize required mufflers and be shut off when not operated. Construction activities would be limited to daytime hours and comply with all applicable noise control regulations of the City and County of Honolulu and the State of Hawaii. Activities associated with the construction phase of the project must comply with the provisions of Hawaii Administrative rules, Chapter 11-46, "Community Noise Control. The contractor(s) must obtain a noise permit if the noise levels from the construction activities are expected to exceed the maximum permissible sound levels of the regulations as stated in Section 11-46-6(a). The contractor(s) must comply with the conditional use of the permits as specified in the regulations and conditions issued with the permit as stated in Section 11-46-7(d)(4).

(2) **Traffic Noise.** On-site mitigation measures will be undertaken for project and non-project related traffic noise during more detailed design phases of project development where appropriate setbacks, landscape buffers, topographical barriers, and physical barriers such as berms and walls can be easily incorporated into project development typical of master planned communities. Heavy vehicles traveling to and from the project site must comply with the provisions of Title 11, Administrative Rules Chapter 42, "Vehicular Noise Control for Oahu".

5.4 AIR QUALITY

An air quality survey of the proposed project was prepared by Ogden Environmental and Energy Services Co. (December 1996). The results of the survey are summarized; the complete report is attached as Appendix H.

A. Existing Conditions

In general, air quality in Hawaii is excellent due to the predominant northeast trade winds. Some localized conditions, such as heavy traffic at intersections, can negatively impact air quality. To ensure that existing air quality continues, both Federal and State standards have been established to identify ambient air quality conditions and potential changes as they may occur in the future. Presently, the State of Hawaii is considered by the U.S. Environmental Protection Agency to be in attainment for all criteria pollutants.

B. Potential Impacts

Construction of this project is referred to as Phase II and is part of a larger project. Phase I involves the development of a 37-acre light industrial subdivision which is anticipated to be completed by the year 2000. This study ~~does not address Phase I, other than to use~~utilizes the traffic analysis data from Phase I as a base for the year 2000 with the assumption that Phase I development has occurred. Phase II development of 20.3 acres of land for the subject project, is anticipated to also be completed in the year 2000.

The air quality study focuses on worst-case air quality conditions for morning and evening peak hours in the years:

- 1995 (existing conditions)
- 2000 (without the Commercial and Park project)
- 2000 (with Phases I and II of the project)

Short-term impacts of the project are considered to be those associated with construction activities. While localized pollutant increases are expected to occur, they are not considered to be significant. The amount of fugitive dust generated per month is expected to be less that U.S. Environmental Protection Agency (EPA) estimates for construction operations. As a result, fugitive dust impacts

to the air quality during the construction phase of the project will be localized, temporary, and considered insignificant and less than what occurred during cane processing operations.

Long-term pollutant impacts of the proposed project are considered to be those associated with everyday use of the project. The most significant long-term emission sources are motor vehicles, with the most significant tailpipe emission being Carbon Monoxide (CO).

For the 1-hour dispersion modeling scenarios, there are no potential violations of the National Ambient Air Quality Standards (NAAQS). However, both evening scenarios without the project (Phase I only) and the project (Phases I and II) in the year 2000 indicate an exceedance of the State Ambient Air Quality Standards (SAAQS). For the 8-hour dispersion modeling scenarios, there are no potential violations of the NAAQS. However, all scenarios, including the base year 1995, indicate an exceedance of the SAAQS.

Although the modeling results indicate that the project is expected to slightly exceed the SAAQS for CO in some scenarios, implementation of the mitigation measures recommended in the traffic analysis report and in this report will significantly reduce the CO impact to ambient air quality.

There are no mitigation measures designed to reduce motor vehicle trip generation that can be incorporated into the overall project strategy. Implementation of the following measures are suggested:

- implement traffic flow improvement measures, such as proper signalization and road widening for intersections with poor LOS ratings;
- encourage ride-sharing/car pooling or use of public transportation by employees;
- limit the number of passenger parking spaces to promote the use of shuttle services and public transportation;
- discourage idling vehicles at drop-off points;
- implement bicycle lanes for bicycles; or
- encourage walking.

Many of the measures listed above are similar to those commonly suggested by the Waipahu 2000 Update, the Waipahu Town Plan and Livable Communities initiatives. Amfac is a participant of the Waipahu Livable Communities Initiative Task Force which has just recently started. The Task Force is scheduled to complete a Transportation Plan and an Implementation Plan by the fourth quarter of 1997.

Indirect pollutant impacts beyond those associated with construction and traffic are considered to be insignificant. No significant air quality impacts will result from the proposed project. During project construction, measures will be taken to ensure that fugitive dust emissions are controlled. Emission sources include construction equipment, workers' vehicles, and fugitive dust.

The Final Urban Design for the Mill Town Center dated February 12, 1997 indicates that the only industrial activities permitted to be developed within the property that have the potential to affect air quality would be light industrial activities. Cumulative impacts to the air quality, especially from proposed light industrial activities are anticipated to be insignificant. These activities are anticipated to be insignificant because the National and State Ambient Air Quality Standards (NAAQS/SAAQS) prohibit industrial pollutants from exceeding any regulated ambient air quality standard or hazardous air pollutant standard without first securing approval from the Hawaii State Department of Health (DOH). The NAAQS/SAAQS represent the maximum allowable levels of pollution concentration considered safe, with an adequate margin of safety, to protect the public health and welfare. For an industrial activity to obtain DOH approval to exceed the standards and cause a significant impact to air quality, that particular facility would need to apply for a covered source or non-covered source air permit, dependent on the level of pollutant concentrations desired to be emitted into the ambient air. Obtaining such permits would be determined on a case by case situation. The State of Hawaii is presently in attainment for all criteria pollutants (i.e., not violating the NAAQS or SAAQS). It is unlikely that DOH would allow a facility to cause an exceedance of the ambient air quality standards, which would cause the State to be in Nonattainment with its own SAAQS and potentially the NAAQS.

C. Mitigative Measures

It is possible that during construction, air quality in the area may be impacted by exhausts generated from construction equipment and fugitive dust. Mitigation measures are available to significantly reduce the potential impact on air quality during the construction period. Soil erosion control measures will mitigate the impact of both water and air borne emissions of silt, dust, and vehicular emissions.

(1) Construction Period Mitigative Measures. Fugitive dust and heavy equipment use during construction are the primary short-term emission sources associated with the project. Although similar impacts resulted during mill operations, mitigation measures during project construction can be more easily implemented as part of the construction management program. Specific mitigation measures include minimizing the amount of cleared area and related construction activity at any one time, and watering of exposed areas.

(32) Long-Term Base Traffic Improvements. Based on the base improvements and mitigation measures recommended by the traffic consultants, the modeled intersection will improve to a below capacity LOS rating if the mitigation measures recommended with project development are provided. The CO concentrations produced by other intersections along the development are expected to be equivalent to or less than the CO concentrations at the modeled intersection due to their equivalent or smaller traffic volumes. As the base traffic improvements and mitigation measures are implemented during project development, the LOS ratings will improve and CO concentrations reduced.

5.5 VISUAL RESOURCES AND OPEN SPACE

Existing views of the project site and the adjoining Mill Town Center Business and Industrial Park from the surrounding area and within the subject property have been inventoried both descriptively and through photographs (Figures 5-2A ~~and 5-2B~~through 5-2E). Short-term and long-term effects of views of the site and the adjoining Mill Town Center Business and Industrial Park which will result from development ~~of this project~~ are assessed, and measures are proposed to minimize adverse effects.

A. Existing Conditions

The City and County of Honolulu, has conducted a comprehensive viewshed assessment documented in Coastal View Study (City and County of Honolulu Department of Land Utilization, 1987). In this study, the existing visual resources of the entire Oahu coastline are inventoried, prioritized, and documented.

According to the Coastal View Study, the Waipahu viewshed is residential, commercial, and industrial. Farrington Highway is designated as a "Coastal Roadway", however, no significant coastal visual resources in the vicinity of the project and the adjoining Mill Town Center Business and Industrial Park are identified in the Study.

Important public views that could be applicable to the proposed project and the adjoining Mill Town Center Business and Industrial Park as defined by the Special Provisions for Central Oahu are: Pearl Harbor from Farrington Highway across Waipahu High School, Waianae Mountains and the sea from Kunia Road, Waipahu Sugar Mill from Waipahu Depot Road, and view of the Waianae Mountains from the Waipahu Cultural Park.

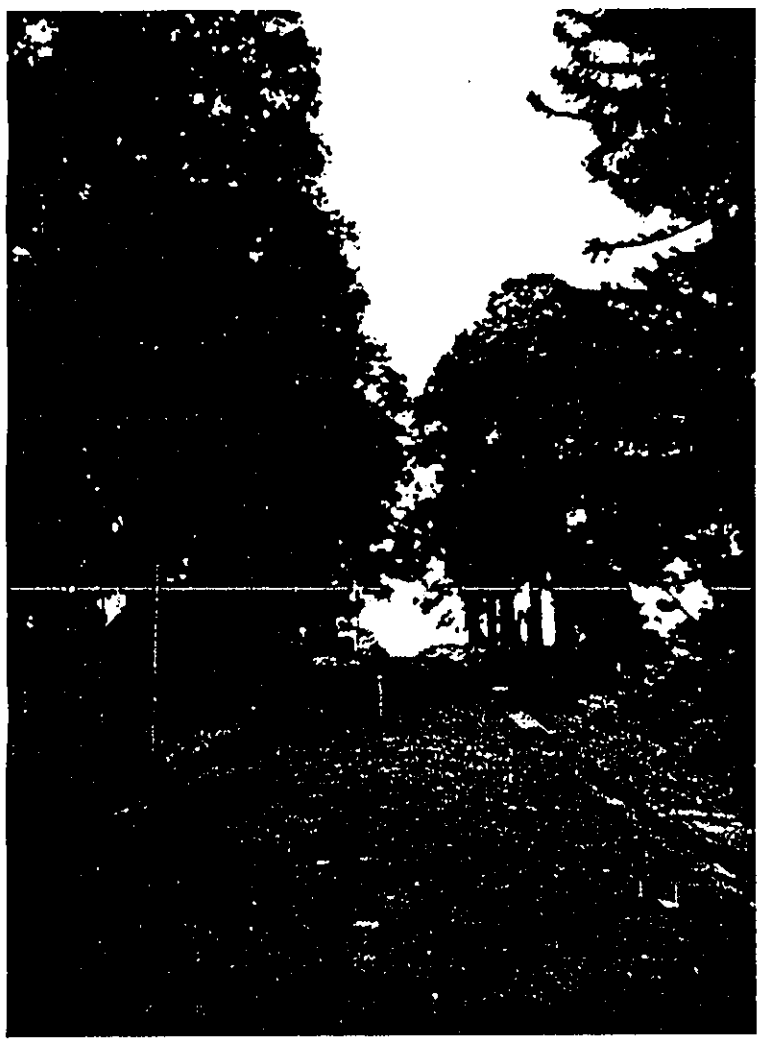
The project area is along Waipahu Street. Primary views of the project area are presently available from ~~these~~this roadway ~~corridors~~corridor. ~~A project~~Project site photograph key ~~map (Figure 5-2) identifies the locations from which site photographs (~~maps provided on Figures 5-2A ~~and 5-2B through 5-2E)~~ identify the locations from which site photographs were taken.

The present visual character of the project ~~area~~are from east and west approaches on Waipahu Street, and mauka approaches of Mokuola Street and Waipahu Depot Road. Distant views of the Koolaus are seen from ~~Mokuloa~~Mokuola Street heading mauka and of Pearl Harbor while heading makai.

The mill is located on a bluff close to Waikele Stream. The town of Waipahu grew around the mill and the mill now anchors what remains of the historic core of the town. The smokestack of the mill is a landmark that is seen from many places and directions including most of Waipahu and its surroundings.

① View toward the west of the property (slope leading up to the bluff) along the Waipahu Street frontage from the Waipahu Depot Road/ Waipahu Street intersection

② View from Waipahu Street of the old Waipahu Store buildin (a.k.a. "Clinic Building") on the property

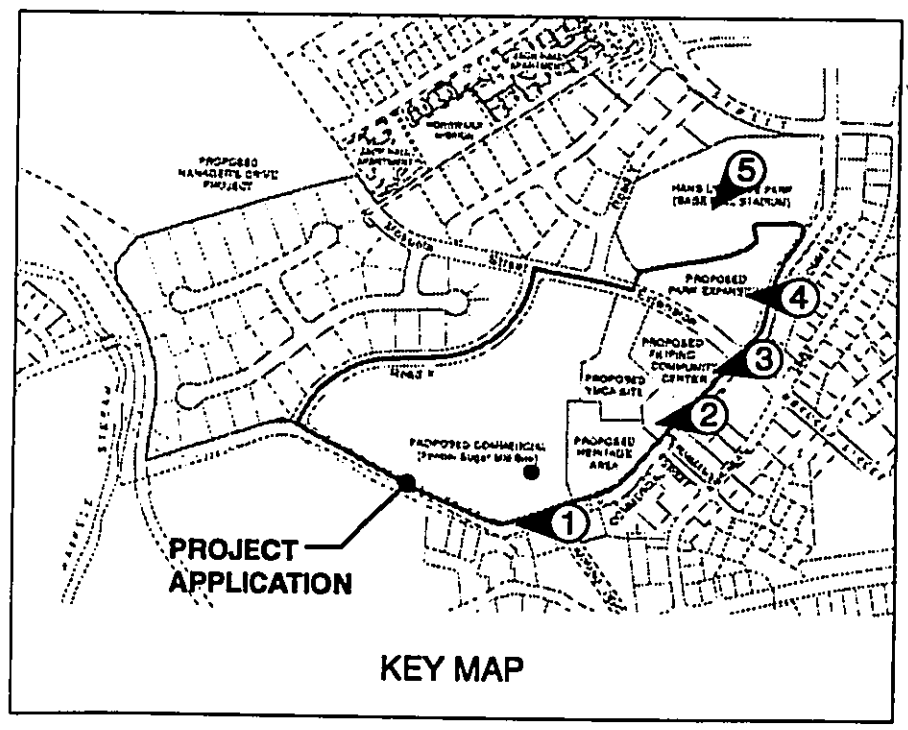


④ Makaaloha Street - Proposed Hans L'Orange Park expansion area

⑤ Hans L'Orange Park

the old Waipahu Store building
the property

③ View from Mokuola Street/Waipahu Street Intersection looking towards the FilCom Center site

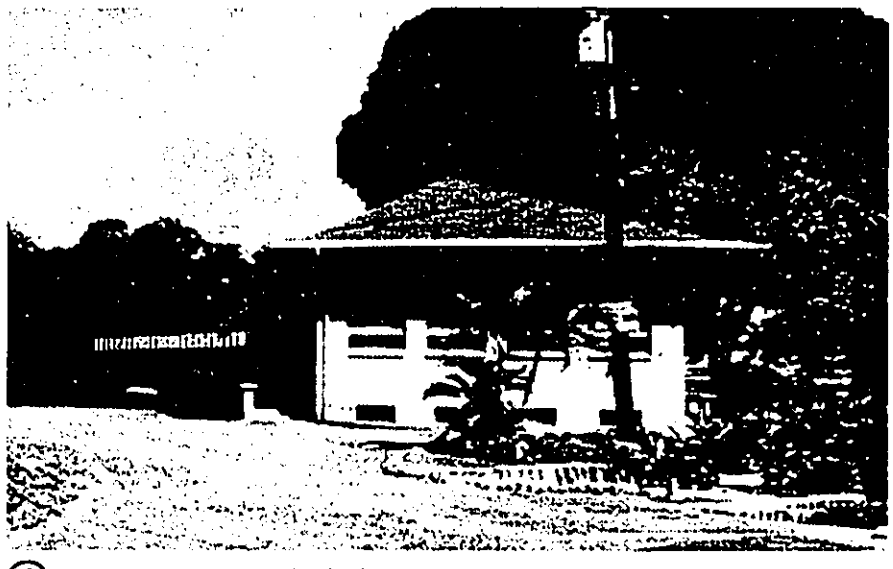


KEY MAP

FIGURE 5-2A
Public Views of the Project Site
AMFAC COMMERCIAL & PARK

① Mill Smokestack and Generator Building

② Laboratory Building and base of the smokestack



④ Human Resources Building

⑤ Easterly view of the Administration Building from the industrial

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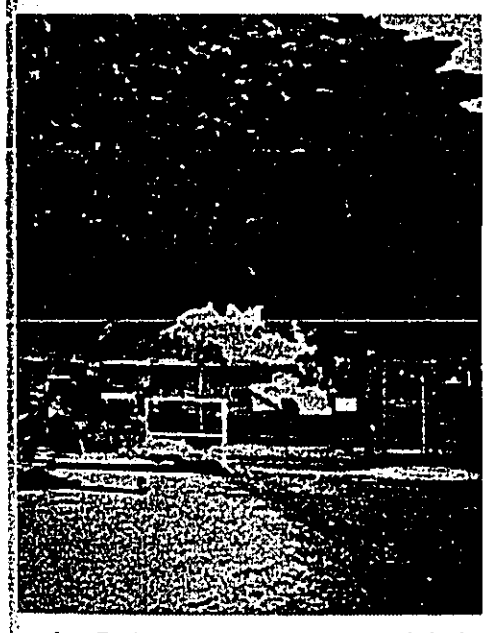
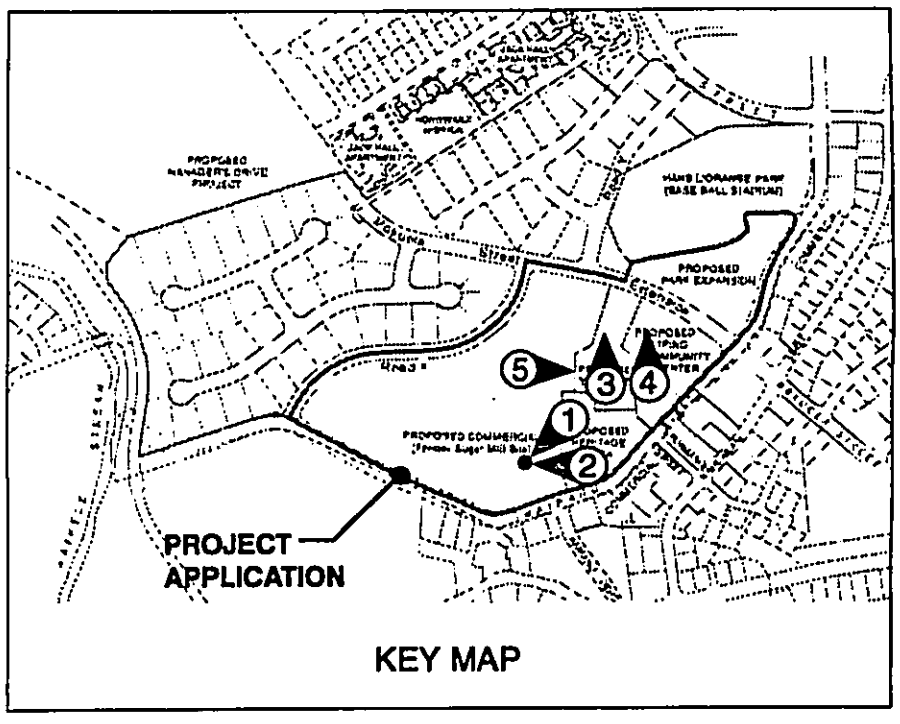
the smokestack

③ Administration Building



tration Building from the industrial site

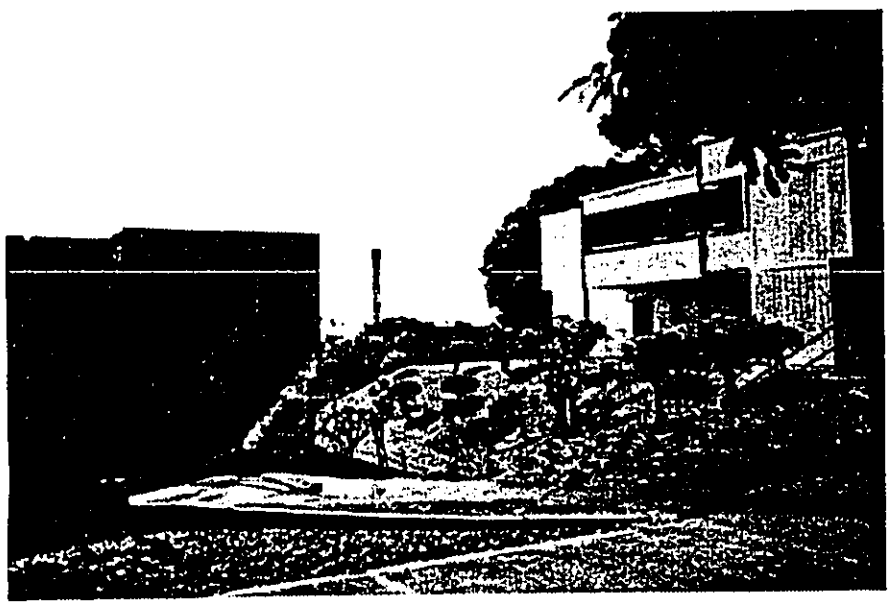


KEY MAP

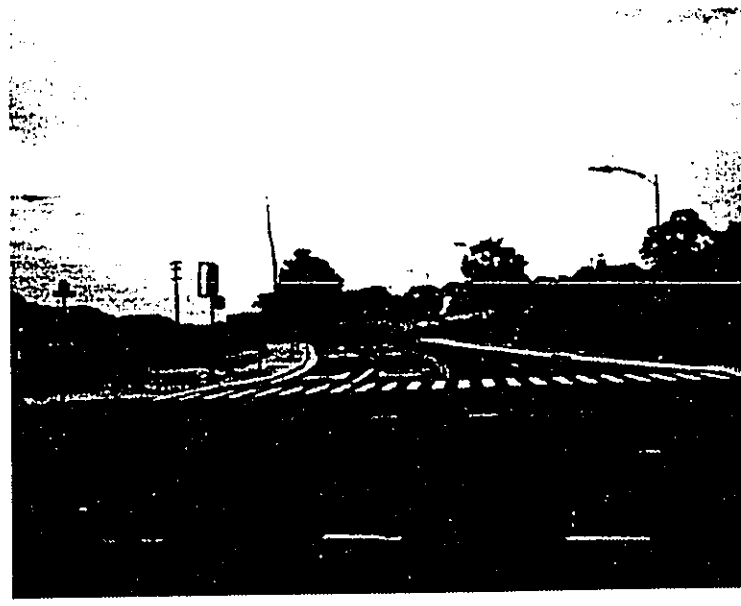
FIGURE 5-2B
Interior Views of the Project Site
AMFAC COMMERCIAL & PARK

PBR

(1) View towards the Mill Town Center Business and Industrial Park



(2) View towards Project Site from Paiwa Place



(3) View towards Project Site from Jack Hall Housing

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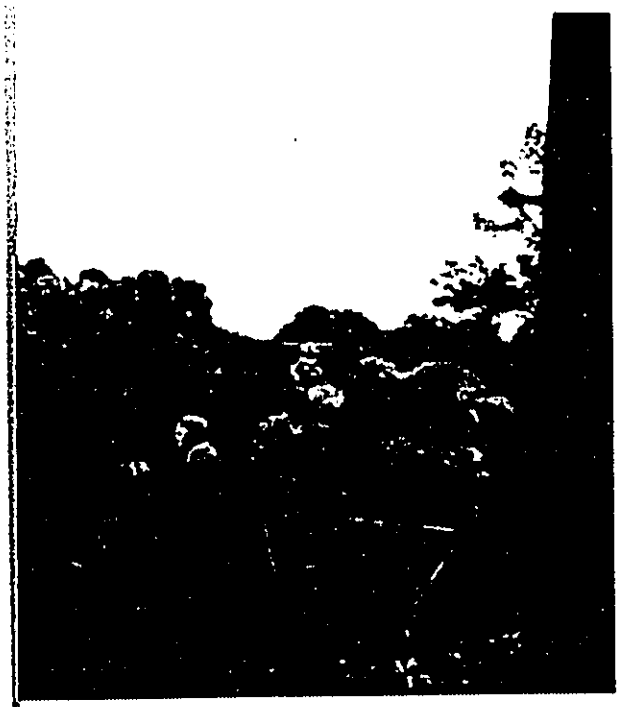
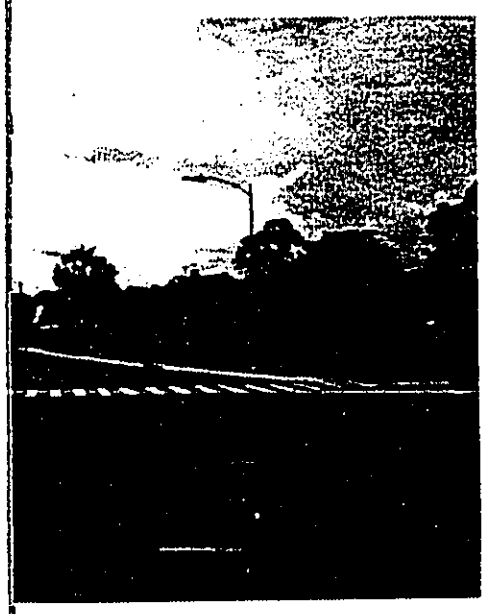
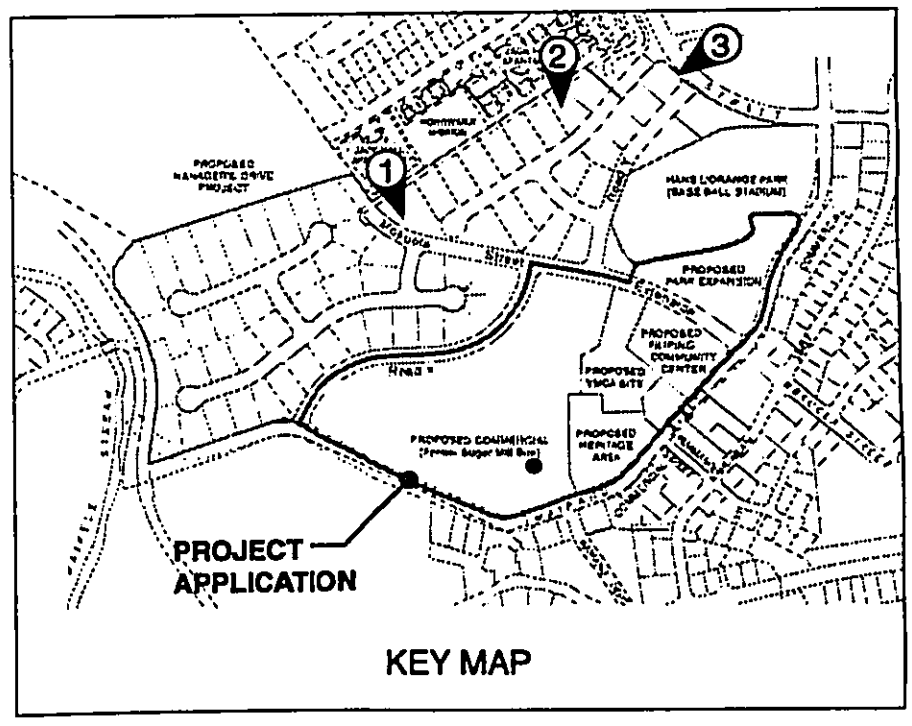




from Jack Hall Housing



KEY MAP

FIGURE 5-2C
Public Views of the Project Site
AMFAC COMMERCIAL & PARK

PBR

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① View towards the Mill Town Center Business and Industrial Park

② View towards the future intersection of "Road X"

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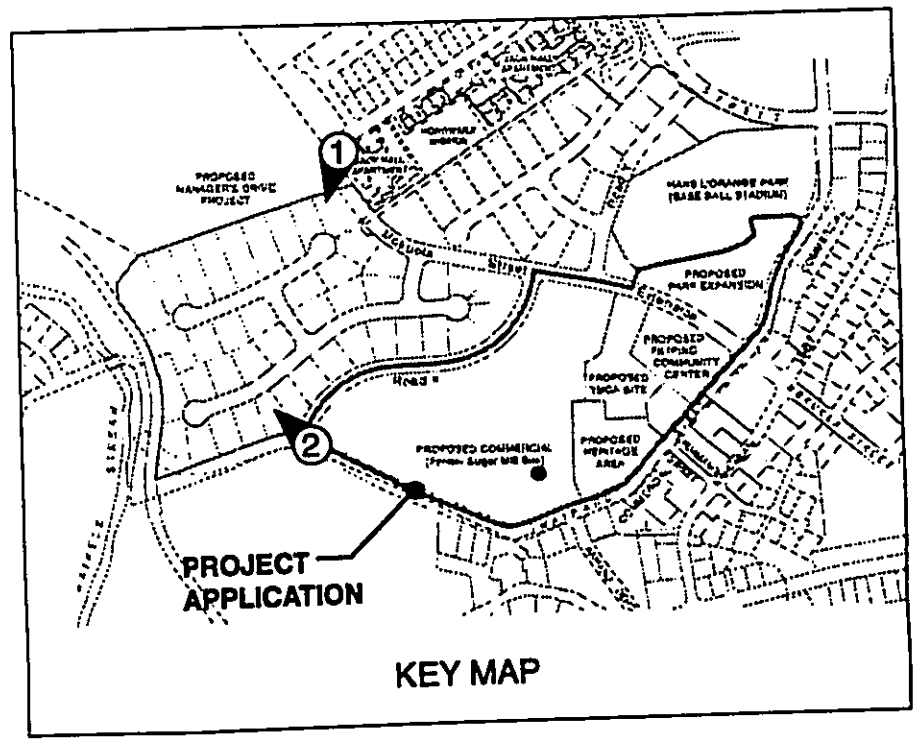
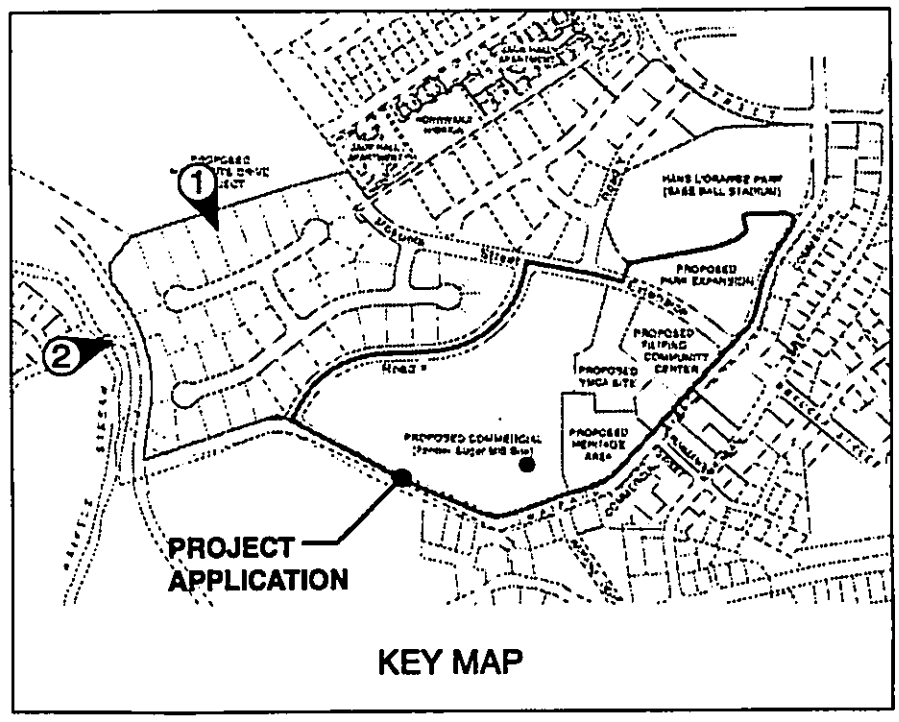


FIGURE 5-2D
Public Views of the Project Site
AMFAC COMMERCIAL & PARK

PBR

① View towards the Mill Town Center Business and Industrial Park from City's Manager's Drive Property

② View towards Project Waipahu Street Bridge over Waikele Stream the Mill Town Center Business and Industrial Park



KEY MAP

FIGURE 5-2E
Public Views of the Project Site
AMFAC COMMERCIAL & PARK

Views onto the adjoining Mill Town Center Business and Industrial Park are only available from Manager's Drive, from the Waipahu Hongwanji and from the adjoining Jack Hall Memorial Housing Project, with only partial views available from Paiwa Street. No significant natural resources or other significant landforms are present on the Mill Town Center Business and Industrial Park.

B. Potential Impacts

~~The proposed project will not impact the open space values of the Koolau and Waianae mountain ranges, Kipapa Gulch, Waipio Peninsula, or the Wahiawa Reservoir. The visibility, preservation, enhancement and accessbility of open space areas, as defined in Section 24-1.4 of the Common Provisions, will not be negatively impacted by the proposed project.~~

The proposed project and the adjoining Mill Town Center Business and Industrial Park will not impact the open space values of the Koolau and Waianae mountain ranges, Kipapa Gulch, Waipio Peninsula, or the Wahiawa Reservoir. The visibility, preservation, enhancement and accessibility of open space areas, as defined in Section 24-1.4 of the Common Provisions, will not be negatively impacted by the proposed project or the adjoining Mill Town Center Business and Industrial Park.

The proposed project will not obstruct: any mauka-makai view corridors, views of significant landmarks or natural resources, or ridge line views from outside or within the project boundaries. ~~Similarly, views~~Views of the ocean and mountain ranges are generally not available from the area of application or surrounding residential areas. The transitional and standard height requirements set forth by the LUO will preserve public views of the distant Waianae Mountains. This will ensure that the above noted view planes are maintained as applicable.

The adjoining Mill Town Center Business and Industrial Park will impact mauka-makai views and views of the sugar mill stack from the Jack Hall Memorial Housing Project and the Waipahu Hongwanji. Views of the ocean and mountain ranges are generally not available from the adjoining Mill Town Center Business and Industrial Park or surrounding residential areas.

~~Short-term Visual Impacts - Construction activities will create some adverse effects on the views of the project along the roadway corridors.~~ Short-term Visual Impacts - Construction activities will create some adverse effects on the views of the project and the adjoining Mill Town Center Business and Industrial Park along the roadway corridors. Depending on the phase of development, construction sites will be undergoing clearing and grubbing, grading, site work, foundation construction, framing and/or finishing.

Long-term Visual Impacts - The visual character of the project site will be changed from its present industrial appearance to a plantation heritage themed commercial (retail and office) and cultural park. Design guidelines will be established to implement the plantation theme. The proposed industrial land use of the adjoining Mill Town Center Business and Industrial Park is compatible with the adjacent industrial facilities associated with the former operations of OSCo.

C. Mitigative Measures

Project Design Considerations. The project and the adjoining Mill Town Center Business and Industrial Park will minimize adverse visual effects by conforming to setback requirements, installing appropriate landscaping, and establishing design guidelines for structures which will include building heights, locations, materials, colors and surrounding landscaping. An Urban Design Plan for the Mill Town Center Business and Industrial Park has recently been approved by the Department of Land Utilization in accordance with one of the conditions of the Unilateral Agreement for the rezoning of the industrial project.

5.6 SOCIAL CHARACTERISTICS

This assessment of social impacts draws on the Waipahu Town Plan (Appendix B) and the social impact assessment for the adjacent Amfac Industrial Park site (Community Resources, Inc., 1994). The assessment briefly reviews historical characteristics of the community and existing social conditions. It projects how the project would affect those lifestyles and conditions.

Historical Background. Waipahu has been a busy plantation town for most of this century, centered around the operations of the Oahu Sugar Mill. The plantation prospered for decades. Oahu Sugar workers lived in camps throughout the surrounding region, and Waipahu grew up below the mill site. Its shops served a wide region. By 1940, Waipahu had a high school for students from the Waianae, Ewa, and Waipahu areas. The project site was the location for the sugar mill operations.

After the 1920 strike, Hawaii sugar companies increasingly provided varied benefits to workers, encouraging workers to rely on their employers (Fuchs, 1961). In Waipahu, plantation manager Hans L'Orange supported many different athletic organizations.

Waipahu's population grew steadily during this century. Today, it stands at the center of urban growth on Oahu, lying at the intersection of the island's major highways and between Oahu's urban core and the areas designated for future urban expansion. Development in Central Oahu and Ewa will continue to have an impact on Waipahu.

While population growth trends for the last half-century show that overall Waipahu CDP population grew sharply in the 1960s, the area around the mill show increasing population growth more recently, as infill housing development has proceeded.

5.6.1 Population

A. Existing Conditions

In 1990, Waipahu had 51,295 residents. Of these, 31,364 persons (61%) were in Waipahu Town, the area surrounding the project site. While there is a slightly younger population in Waipahu than

on Oahu as a whole, some areas in Waipahu Town had large numbers of persons over 65 years of age. Waipahu residents were less likely than others on Oahu to have moved in the last five years, especially ones living near the mill.

In Waipahu Town, Filipinos comprise the largest ethnic group (45.7%). Most of the population is Hawaii-born (60.3%), but slightly more than a quarter of the residents are foreign-born (26.7%).

Resident Population. There are no longer any residential units on the subject property; however, the current R-5 residential zoning of 7.5 acres could result in as many as 50 detached, single-family units. If these were occupied by households of a size typical of the region, the site would be populated by 150 to 200 residents. The lower figure comes from Honolulu County's average household size of 3.02 persons/household. The higher figure is based on the current average household size in Waipahu CDP of 4.13 persons/household.

B. Potential Impacts and Mitigative Measures

Resident Population. The subject project which proposes commercial and park uses (including community facilities) and the industrial subdivision proposed for the adjacent area will not include any residential units, therefore no increase in population is expected to occur from the implementation of the projects and no mitigative measures are needed.

Visitor/Defacto Population. The proposed commercial development, cultural heritage area, YMCA and Filipino Community center are intended to attract visitors and Oahu residents in order to increase economic activity in Waipahu. In addition the project will create employment opportunities for approximately 514 people. Therefore, the number of people expected to access and be on the property when the various establishments are open is expected to increase. The subject project will provide recreational and employment opportunities for this segment of the population. The project will further disperse visitors on Oahu which is a goal of the State and the City and is considered to be beneficial.

5.6.2 Household Income and Employment

A. Existing Conditions

The project area has been identified by the City's Special Area Plan for Waipahu Town for the development of the uses as identified in this project. As a redevelopment project of the main economic engine for Waipahu, the project will continue to provide gainful employment for the people of Waipahu and surrounding areas.

Household income in Waipahu was comparable to the Oahu annual average, but per capita income was significantly lower in Waipahu Town ($10,888 versus $16,256 for Oahu in 1990).

Waipahu is a working-class town. Approximately 44% of those living in Waipahu are working in service, precision craft, or operator/laborer jobs. The 1990 Census showed unemployment in Waipahu to be slightly higher (0.9% more) than for the island as a whole. The situation worsened during the 1990s. By early 1994, it was estimated at 7%, when the island rate was 4.4% (Community Resources, Inc., 1994).

Waipahu has lost jobs as Oahu Sugar closed down all its operations, and Arakawa Store closed. The closure of the Sugar Mill in 1995 put 338 employees out of work. A state project was set up to assist the affected Oahu Sugar employees. Sixty percent (204) of the affected workers were served by this project of which 170 (83%) found alternative employment with the assistance of the project. Another 47 workers found employment without the assistance of the DLIR (Personal communication, Pauline Matsuyama, Manager, Waipahu Office, Workforce Development Division, State of Hawaii Department of Labor and Industrial Relations, December 1996). Most of the jobs were in Honolulu; a few were in Waikele and Kapolei. Many Oahu Sugar workers have had to adjust to new work environments and retained for new tasks. Even with new jobs, they are at risk. As the newest employees at their job sites, many are vulnerable if firms need to cut jobs in today's sluggish economy.

B. Potential Impacts and Mitigative Measures

According to the Waipahu Town Plan Report new permanent job opportunities associated with the project could total as many as 514 full-time and part-time jobs after full build out. This includes 274 full-time jobs at the new commercial center, 130 full-time and part-time positions at the YMCA, 20 employees in the Heritage Area, and 90 employees at the FilCom Center. The estimate does not include the number of people employed by various businesses located within the Old Waipahu Store, or employed due to the expansion of Hans L'Orange Park.

5.6.3 Housing

A. Existing Conditions

The area of the property zoned as R-5 Residential once supported approximately 18 sugar worker homes and is presently vacant. The proposed project does not include development of new housing and an amendment to reclassify the residential area to Commercial and Park designation is being requested.

B. Potential Impacts and Mitigative Measures

The proposed project does not include housing and will therefore does not provide opportunities for investors to buy residential properties with the intention of profiting from eventual resale. It is not anticipated that this project would affect area residential property values since there are no adjacent residential properties. It is Amfac's goal to develop a quality commercial center with the same

standards used in its residential, recreational and commercial development at Waikele. In their review of the Draft EIS, the Department of Housing and Community Development stated that "The proposed development does not conflict with any current or proposed projects of the Department of Housing and Community Development (DHCD), and we do not oppose the proposed development." No negative impacts on housing are anticipated; therefore no mitigative measures are necessary.

5.6.4 Lifestyle/Character of the Community

A. Existing Conditions

Major community planning efforts have resulted in clear statements of community aims (Waipahu Town Plan Report, A Special Area Plan of the Central Oahu Development Plan, City and County of Honolulu Planning Department, December 1995). Looking at the possibility of future development, Waipahu residents stress the importance of:

- Preserving the plantation heritage;
- Parks and recreation areas;
- A Filipino community center;.
- More parking; and
- Alleviating traffic congestion.

Major needs identified by members of the community include:

- Jobs;
- Customers for local businesses; and
- More opportunities/activities for youth.

The present plan for the Commercial and Park Site follows the ideas stated by members of the community in planning sessions in 1994 and 1995.

B. Potential Impacts

Major social impacts of the proposed Commercial and Park development fit well with community aims:

Continuity with Waipahu's past: The mill stack continues as a reference point and will give the commercial area an identity and visibility. Commercial development could potentially include a business park based on a sugar mill incorporating elements such as industrial-style architecture, old equipment, photographs, and the mill stack.

Furthermore, development of a heritage area builds on both the plantation history of Waipahu and its ethnic and cultural diversity. The heritage center could be integrated into some of the existing mill structures to be retained and would complement the existing Waipahu Cultural Garden Park.

Rich in baseball tradition, the City's Hans L'Orange Park is also the home field for the Hawaii Winter Baseball League's franchise West Oahu Cane Fires team. The project would provide needed expansion of the Park and would allow the Park's left field line to be extended. Additionally, development would create additional permanent parking as well as increase more passive park area. At the same time the visual character of the park would be improved, increased recreational opportunities would be provided.

Community Pride and Cohesion: For Waipahu, redevelopment of the central commercial and industrial area supports community life. This step affirms the landowner's commitment to prosperity for the town.

Waipahu is viewed by many in Hawaii as a predominantly Filipino town. In 1990, the population was about half Filipino in ethnicity, and included many who are foreign born. Near the project site, nearly two-thirds of the population was Filipino. Since 1970, the Filipino share of the population near the project site has grown steadily.

Establishing the FilCom Center in Waipahu would fill a primary goal of the Filipino Community Center, Inc. to establish a center in Central or Leeward Oahu. The FilCom Center is intended as a gathering place for promoting activities associated with the cultural heritage and values of Filipinos, as well as a family-focused center offering diverse programs of social, recreational and human services accessible to all members of the community. Additionally, the FilCom Center could provide the physical context to bring together, in one place, local Filipino residents and recent immigrants.

Similar cultural centers have helped other groups to foster community pride and tradition, as well as serving as a resource center for the community at large (Personal communication, Bonnie Miyashiro, Executive Secretary, Hawaii Okinawa Center, December 1996). By supporting specialized ethnic shops and restaurants at the project site, Waipahu can become a cultural center as envisioned by community leaders.

Jobs: By bringing jobs to the center of Waipahu, the project will improve the chances for employment of nearby residents. The mill site offers a prime location for potential commercial activities and is centrally located for serving downtown Honolulu, Central Oahu, and Ewa. Opportunities could arise to integrate commercial uses with community facilities.

The project will increase local activity at the property, while allowing some workers to avoid the long commute to Honolulu.

Opportunities for youth: The existing Leeward YMCA branch, which has been in existence for five years, has office space only at the Westgate Center in Waipahu. It currently serves approximately 1,500 students, generally through activities at local schools. The YMCA location at the project site will increase recreational opportunities for Waipahu's youth. (The current rented space has no recreational facilities.)

The YMCA site is adjacent to Hans L'Orange Park for outdoor recreational activities and programs, and in close proximity to schools, homes, shopping and a main road. The YMCA facility would potentially include exercise and childcare facilities, offices, meeting rooms, locker/shower rooms, a multi-purpose room, an outdoor swimming pool, a play area, and parking area.

Development of the FilCom Center at the project site will also provide additional opportunities for youth in the community.

Aspects of the proposed project which could lead to undesirable impacts are:

Traffic: As noted in Section 5.2, development of the commercial project will result in increased local traffic. In response to long-standing community concerns, Amfac will widen a portion of Waipahu Street without taking land from businesses on the makai side of the street. This is being undertaken by Amfac along with development of the industrial and commercial project sites.

The new Waikele Shopping Center, Waikele residential development, and the new H-1 access on Paiwa Street have increased traffic on Paiwa Street. Residents expressed concern that the industrial park would lead to increased traffic, increasing anxiety about pedestrian traffic safety (especially elderly pedestrians) and large trucks (Community Resources, Inc., 1994). Similar concerns regarding pedestrian safety may understandably arise with commercial development in the project.

Construction: With any major construction project, nearby residents are concerned with noise, dust, and traffic impacts associated with construction.

In the present project area, residential neighbors are buffered by the Amfac Industrial site, Waipahu Street, Hans L'Orange Park and Paiwa Street, and topography. Accordingly, social and physical impacts due to construction should be minor.

C. Mitigative Measures

Traffic: As noted elsewhere, Amfac, in consultation with the City Department of Transportation Services and the State Department of Transportation, has developed a master plan which will provides alternate routes through Waipahu that will alleviate traffic congestion, especially at the intersection of Waipahu and Paiwa Streets. Amfac is also providing land for the widening of Waipahu Street. The applicant is supportive of the Leeward Oahu Transportation Management Association and the City's efforts to explore alternative means of travel (as a member of the

Waipahu Livable Communities Initiative Task Force). Alternative modes of travel will reduce traffic volumes and may possible reduce traffic accidents.

Construction: As noted elsewhere, proposed construction activities must comply with the provisions of Chapter 11-60.1, Hawaii Administrative Rules, Section 11-60.1-33 on Fugitive Dust. Construction activities must also comply with Department of Health regulations on noise.

5.7 ECONOMIC CHARACTERISTICS

5.7.1 Employment, Personal Income and Expenditures

A. Existing Conditions

Approximately 20 people are employed and working on site. This is significantly reduced from the previous period prior to the closure of Oahu Sugar Company.

B. Potential Impacts and Mitigative Measures

Employment

Construction. Construction of infrastructure and buildings in the area of application could cost approximately $20 million (1996 dollars). Based on 1994 data (Bank of Hawaii, 1996), this spending would generate an estimated 175 person-years of direct construction jobs. (These jobs are full-time equivalents, but could include many part-time or short-term jobs in the project.) Spending by construction firms and workers would in turn support another 350 person-years of indirect and induced jobs in the Hawaii economy. The total short term employment associated with the project's construction hence amounts to about 525 person-years.

Operations. With closure of OSCo, the major source of jobs on-site has disappeared. According to the Waipahu Town Plan Report (Appendix B), new permanent job opportunities associated with the project could total as many as 514 full-time and part-time jobs after full build out. This includes 274 full-time jobs at the new commercial center, 130 full-time and part-time positions at the YMCA, 20 employees in the Heritage Area, and 90 employees at the FilCom Center. The estimate does not include the number of people employed by various businesses located within the Old Waipahu Store, or that would be employed by the expansion of Hans L'Orange Park. Some of the existing businesses that would move to the proposed commercial area may already have employees. On-site jobs will not automatically be available to nearby residents. It is highly likely, however, that some employees may not want to relocate to Waipahu, some existing businesses will hire additional employees, some businesses will be entirely new, requiring new employees, and that all businesses will eventually replace employees. Over time, new jobs will become available through growth, attrition, and turnover, benefitting local residents who prefer work in the Waipahu area. The proposed Amfac Commercial and Park project will generate a number of permanent jobs to

Waipahu. The development will also create short-term construction jobs. Indirect and induced jobs which support construction activity will also contribute to the total jobs produced by project development.

Personal Income

With more jobs located in Waipahu, local employment and incomes will rise over time, while the cost of commuting will decline. The impacts of the project on employment, personal income, and consumer expenditures are anticipated to be beneficial to the area residents and businesses, therefore, no mitigative measures are needed or recommended.

C. Mitigative Measures

The impacts of the project on employment, personal income and consumer expenditures appear to be beneficial to the area residents and businesses, therefore, no mitigative measures are needed or recommended.

5.7.2 Economic Factors/Government Revenues

SMS Marketing and Research evaluated the fiscal impacts of the project based on the following assumptions: 1) Total construction cost of the project is $20 million; 2) 13.7 acres will be developed eventually in Commercial use; and 3) the remaining 9.6 acres will be in non-profit uses (land made available for a park; community facilities) on which only minimal real property taxes will be assessed.

5.7.2.1 State of Hawaii - Revenues and Expenditures

State Revenues

The State of Hawaii will receive revenues from both construction and operations at the site. Taxes on operations (excise tax, workers' and corporate income tax) arguably could be raised from similar operations elsewhere in the event the project were not built. Hence, only taxes on construction are counted here as fiscal impacts of the project. Those taxes (in 1996 dollars) would amount to some $2.1 million.

STATE REVENUES FROM PROJECT CONSTRUCTION

CONSTRUCTION SPENDING	$20.0	million
CORPORATE INCOME TAX (1)	$0.1	
EXCISE TAX		
Construction Spending (2)	$0.8	
Construction-Related Workforce Spending (3)	$0.5	
PERSONAL INCOME TAX (4)	$0.7	
CONVEYANCE TAXES (5)	$0.0	
Total	$2.1	million

Notes:
(1) Calculated at 0.25% of construction spending, based on historical ratios between business receipts and tax collections (State Department of Taxation, 1992; Tax Foundation of Hawaii, 1992).
(2) Calculated at 4.167% of direct construction spending.
(3) Calculated at 4.167% of total workforce income spent on taxable items. Share of Income calculated from 1929-1999 study of Oahu consumers (U.S. Bureau of Labor Statistics, reported in DBEDT, 1992). Wages estimated from average 1995 wages by industry. (Hawaii Department of Labor and Industrial Relations, 1996).
(4) Calculated at 4.04% of wages.
(5) Calculated at $1 per thousand dollars in real estate sales. For this analysis, assumed not to apply to the project.

To the extent that the allocation of land for park use supports the Hawaii Winter Baseball League, making its growth more feasible, the project makes a new contribution to the economy, and hence to excise and income tax revenues, over and above the revenues counted above.

State Expenditures

The proposed project would not depend on any new State construction or contribution. Presumably, it would lower State expenses, to the extent that provision of new jobs will lower the level of unemployment in the surrounding area. Consequently, State costs are treated here as nil.

5.7.2.2 City and County of Honolulu - Revenues and Expenditures

City and County Revenues

Real property tax revenues are the main source of income for the City and County. At the project site, real property tax revenues would change due to:

- Dedication of much of the property to community facilities, on which no or minimal ($100/year) taxes are paid;

- Commercial, not industrial use of the remaining acreage; and
- Development of the commercial area.

These revenues would change upon redesignation, since commercial land has a higher value than industrial land. With construction and occupancy of the commercial area, real property values and tax revenues would increase. At buildout, taxes on the property would come to about $320,000 annually. Taxes would continue at or above that level indefinitely.

REAL PROPERTY TAXES FROM THE PROJECT, AT BUILDOUT

	LAND	BUILDINGS
VALUE Commercial (1)	$20.89	$16.59 millions
TAX RATE Commercial	$8.51	$8.51 per $1,000 value
TAXES Commercial	$0.18	$0.14 millions
Total Annual Taxes		$0.32 million

Notes: Calculations do not include community facilities, on the assumption that these would be largely or wholly tax-exempt.

(1) Land value estimated at $35/square foot, based on valuation of Waipahu area commercial sites. Improved value from estimated construction costs.

The above calculation is in 1996 dollars, and assumes that tax rates will not increase. The dollar value of future tax revenues, at the time they are assessed and collected, will no doubt be greater than shown.

As of 1996, taxes on the project site come to about $160,000 annually. The increase in tax revenues would then come to about $160,000 annually, as of project buildout.

One alternative mentioned in the EIS Notice of Preparation involved industrial use of the Commercial area. With that alternative, land values in the project site would be higher than at present, but lower than with commercial development. Presumably the improved value of the area would also be lower. Based on land values alone, the industrial alternative would yield some $25,000 less in City and County revenues annually than would the Preferred Alternative.

City and County Expenditures

Project development would involve little or no cost to the City and County. While some new services (e.g., police and fire protection on the project site) will be needed, these will be offset by future tax revenues generated by the project.

City and County costs attributable to the project accordingly are judged to be minimal or nil.

C. Mitigative Measures

Future tax revenues that will be collected by the City and County of Honolulu and the State are expected to offset the costs of providing public services. No additional mitigative measures are considered necessary with respect to government expenditures.

5.8 INFRASTRUCTURE

This section includes a brief descriptions of the existing infrastructure on the project site and in the surrounding area for water supply, wastewater collection, drainage facilities, roadways and solid waste disposal. Anticipated project impacts are evaluated along with mitigative measures proposed to minimize impacts on infrastructure.

Community Planning, Inc. has prepared preliminary engineering reports for the combined Industrial Subdivision (Phase I) and the subject Commercial and Park (Phase II) development. These include the project's water, wastewater and drainage requirements. Austin, Tsutsumi & Associates, Inc. has prepared a traffic analysis and improvement plan. The reports are attached as Appendices J, K, L, and F respectively. Information from these reports is summarized in this section.

5.8.1 Water Supply Facilities

Water Transmission System Development

A. Existing Conditions

Waterlines maintained by the Board of Water Supply (BWS) are located around the subject property in sizes suitable for delivering the required quantity of water for domestic use and fire protection. The Industrial Subdivision and the subject Commercial and Park developments will be serviced by a network of proposed 12-inch ~~waterline~~waterlines which would connect to an existing 12-inch waterline in Paiwa Street and a 16-inch waterline in Waipahu Street.

Up until recently, the water source to the site of the former sugar mill was provided by a private OSCo water system with private wells either onsite or in the adjoining Waikele Gulch. Recently, a portion of this existing private water system was redirected and used for irrigation of the existing

Waikele Golf Course, which had an approved connection to BWS system. Subsequently, the municipal water service that was approved for irrigation of the golf course was discontinued and reallocated to the proposed OSCo development projects. The Board of Water Supply (BWS) confirms this arrangement in its letter of August 27, 1996 (Appendix J-1).

B. Potential Impacts

The average daily water demand for the area of application is estimated to be ~~67,510~~67,300 gallons per day. Peak demand is estimated to be ~~202,530~~201,900 gallons per day. The estimated daily water demand can be accommodated by the existing municipal water system.

The Board of Water Supply also confirms in its letter to the Department of Land Utilization of August 27, 1996, that the storage requirement for the proposed Amfac Commercial and Park project can be accommodated by the existing municipal "228" storage reservoir system provided that the appropriate facility charge is paid by the developer.

In their review of the EISNOP, the BWS noted that the proposed project conforms to the approved Oahu Sugar Mill Water Master Plan. BWS also noted that the availability of water will be determined when Building Permit applications are submitted to BWS for review and approval.

C. Mitigative Measures

If water is made available, Amfac or its subdevelopers will be required to pay BWS Facilities Charges for transmission and daily storage. Amfac (or its subdevelopers) will also be required to install the necessary on-site water system improvements to serve the proposed development.

5.8.2 Wastewater Facilities

New wastewater facilities including collection and transmission will be developed as part of the project. A complete description of the proposed wastewater collection system is provided in Appendix K. The following summary describes the existing conditions, probable impacts, and mitigation measures for the wastewater system..

A. Existing Conditions

The project site is tributary to the Waipahu Sewage Pump Station tributary and the Honouliuli Wastewater Treatment Plant. Several existing municipal sewer collection/transmission mains are located adjacent to or in the vicinity of the proposed project site. For the area of application, however, wastewater will be conveyed to the Waipahu Sewage Pump Station via an existing main in Waipahu Depot Road.

The existing municipal sewer main located in Waipahu Depot Road starts as an 8-inch pipeline at the Waipahu Street intersection and increases in size to 42 inches before entering the Waipahu Sewage Pump Station. Wastewater from areas to the east and west side of Waipahu Depot Road are collected by local sewer mains which connect and discharge their flow to the main in Waipahu Depot Road.

On the east side, several existing sewer mains which may service the proposed land use are located in Puamano Street, Mokuola Street and Waipahu Street. These mains are 8 inches in diameter and eventually tie into an existing 15-inch main which connects to the main in Waipahu Depot Road at the Hikimoe Street intersection. According to the Department of Wastewater Management's Public Service Section, these mains are operating at only about 30 percent capacity.

B. Potential Impacts

~~For the area of application, the~~The existing sewer laterals serving the Administration, Human Resources and the Old Waipahu Store buildings (proposed YMCA and existing clinic sites) will be intercepted by a new 8-inch sewer line in Waipahu Street and connected to the existing 8-inch sewer line in Mokuola Street. The proposed Heritage Area and Filipino Community Center Sites will also be served by this new 8-inch sewer ~~main~~line in Waipahu Street. The rest of the proposed commercial area will be connected to the upper end of the existing sewer ~~main~~line in Waipahu Depot Road. Project wastewater will be conveyed via these sewer lines to the Waipahu Sewage Pump Station and then to the Honouliuli Wastewater Treatment Plant.

It is estimated the proposed project will generate an average daily wastewater flow of approximately 0.16 mgd, with a peak flow of 0.70 mgd. The existing municipal wastewater collection system is adequate to accommodate this discharge, although connections to the Waipahu Wastewater Pump Station are being done on a case by case basis until a final determination is made as to the capacity of the Waipahu Wastewater Pump Station. In addition, the City's Honolulu Wastewater Treatment Plant's secondary treatment improvements have been completed, allowing additional connections to the City's system to be made. The first phase of the proposed commercial development should be completed in 1999.

C. ~~Mitigation~~Mitigative Measures

(1) **Conformance to DOH Regulations.** The proposed wastewater system will be designed and developed in accordance with all applicable State Department of Health requirements for wastewater systems.

The proposed service connections for the area of application are in conformance with the Sewer Master Plan for the industrial and commercial development of the former Oahu Sugar Company property at Waipahu as approved by the Department of Wastewater Management by letter of September 24, 1996.

Other liquid wastes are likely to be generated by some of the commercial enterprises operating within the project. Facilities for the treatment and disposal of these wastes will be reviewed by the Department of Land Utilization and State Department of Health during the building and occupancy permit process as applicable. Any hazardous wastes generated will be required to be collected by a hazardous waste management company.

5.8.3 Drainage Facilities

A. Existing Conditions

Storm runoff from the project site flows to three drainageways in the vicinity of the property. These drainageways are the Waikele Stream, the Kapakahi Stream and the Kahu/Wailani Stream Drainage Channel all of which eventually drain into Pearl Harbor. The property is outside of the flood zone as defined by the Federal Emergency Management Agency's (FEMA) Insurance Rate Map.

The major drainpipe systems are the Paiwa Street 96-inch drain line that drains into the Kahu Drainage Channel and the Waipahu/Mokuola Streets 24- and 36- inch drain line that drains into the Wailani Stream Drainage Channel.

B. Potential Impacts

The proposed drainage plan for the development is to limit the amount of runoff to the existing Mokuola Street drain system to the present amount of flow, thereby maintaining the same total discharge in the existing drainage system to Wailani Stream. Community Planning estimated that the increase in runoff to this system was less than 1 (one) cfs and detention techniques can be employed in the grading design of the park expansion and the community center to reduce and/or eliminate this relatively small amount of increase. In addition, storm runoff that was pumped to the Waipio Peninsula will be diverted to Waikele Stream. In diverting storm runoff to Waikele Stream, the flow to the Waipahu Stream drain system will be reduced. The total area and runoff flowing into Waikele Stream for the existing condition and the proposed condition are 6.71 acres and 12.1 cfs and ~~76.525~~1.9 acres and 154.0 cfs, respectively. The additional drainage area ~~to Waikele Stream~~ is small when compared to ~~its~~ Waikele Stream's total drainage area of 45 square miles.

The design discharge for the Paiwa Street drainage system were updated to conform to the revised rainfall intensities specified in the City Drainage Standards. The original design discharge from the property was 62.7 cfs from 18.3 acres. The total drainage area and discharge for the existing condition and the proposed condition are estimated at 16.01 acres and 32.3 cfs and 16.59 acres and 51.7 cfs, respectively. Therefore, the Paiwa Street drain will be adequate to accommodate the runoff from the eastern portion of the industrial subdivision.

C. Mitigative Measures

For temporary erosion control, appropriately sized ponding basins will be constructed on-site for desilting storm runoff prior to discharge into existing drainageways. All applicable Federal, State, and City requirements regarding drainage and surface runoff will be integrated and implemented in accordance with an accepted erosion control plan.

As required by Ordinance 96-34, permanent detention drainage structures will be constructed to provide gravity settling of sediments, suspended solids and other particulate pollutants as well as provide a control on the timing and rate of discharge of storm water runoff from the development areas.

Proposed storm drainage system improvements will be constructed in accordance with the Storm Drainage Master Plan for the Oahu Company Property at Waipahu as approved by the Department of Public Works on July 11, 1996.

Storm runoff from the proposed development area presently flows to existing municipal storm drain systems in Waipahu Street, Waikele Stream and a private Oahu Sugar Company system located on the former mill site. Storm runoff collected in the private system from about 34 acres was pumped along with mill processed water in a pipeline by Oahu Sugar Company to ponds located in Waipio Peninsula near the lower end of Waipahu Depot Road. ~~For~~Although some storm runoff still goes to Waipio Peninsula by gravity for some time now, ~~however, the major mill~~some runoff from the site ~~drainage cut-off ditch overflows and runoff~~ sheet flows to Waipahu Street at the back entry to the mill at Kopaa Street.

Proposed storm drainage improvements include diversion of the storm runoff from the private mill system to Waikele Stream. The total diversion of about ~~70~~51 acres from the mill site as well as other mauka tributary areas will have an insignificant effect on Waikele Stream with its overall tributary area of ~~45~~45.8 square miles or ~~28,800~~29,306 acres. The effect of the diversion will be reduced further by the detention structures required by Ordinance 96-34.

The diversion, on the other hand, will reduce storm runoff to the existing municipal drain systems in Waipahu Street between Kopaa Street and the present main entry road to the mill. Waipahu Street, thereafter, should not be subjected to additional storm runoff from the area of this application.

Storm runoff from the remaining portion of the area of this application consisting of the proposed Heritage Area, Clinic, YMCA and Filipino Community Center sites, presently drain to Waipahu Street between the main entry road to the mill and Mokuola Street intersection. This area as well as Hans L'Orange Park and expansion are tributary to an existing municipal storm drain system in Waipahu Street. That system, consisting of 24- and 36-inch drain line culverts, continues down Mokuola Street to empty into the Kahu/Wailani Drainage Channel.

Under the proposed widening of Waipahu Street, the storm drainage system will be improved by construction of additional catch basins and drain pipelines which will intercept and reduce accumulation of runoff within the street gutter. The present drain pipeline system has adequate capacity to convey storm runoff from its tributary area to the Kahu/Wailani Stream Drainage Channel. Detention structures required under Ordinance 96-34 will be constructed to limit peak storm water runoff rates for storms of higher frequencies to predevelopment levels.

(1) **Short-term Construction Period Measures.** During the construction period, sediment basins will be used to treat the runoff from construction areas before it is discharged off-site. Construction plans will be coordinated with the State Department of Health and City and County of Honolulu to obtain the necessary permits for grading and stormwater discharges (NPDES). Specific mitigation measures during the construction period include:

(a) Minimize the time soil is left exposed by providing temporary vegetative cover.

(b) Construct temporary berms, sediment ditches, filter fences, and sediment basins to divert runoff and trap silt.

(c) Use water trucks and sprinkler systems to keep the area moist during construction to limit fugitive dust emissions.

5.8.4 Solid Waste Disposal Facilities

A. Existing Conditions

The State of Hawaii and the City and County of Honolulu have a stated goal of achieving 50% waste diversion by the year 2000. With a mix of commercial and community facility components, the development offers many opportunities to contribute toward this goal through recycling and waste reduction programs.

At present, solid waste generated in neighboring residential areas is collected and disposed of by the City and County Department of Public Works Refuse Division.

B. Potential Impacts

Solid waste would be generated by the commercial and community facility uses at the project would be collected by a private collection service and disposed of in the City and County of Honolulu disposal incinerator or landfills.

During the construction phase, solid wastes would be collected and disposed of by the construction contractor(s). After construction, the solid waste generated by the commercial businesses would be

of similar composition to that generated in other Oahu commercial developments. Any hazardous wastes generated will be required to be collected by a hazardous waste management company.

Once the project begins occupancy, solid waste will be collected by the Department of Public Works and disposed of at the H-Power Plant.

C. Mitigative Measures

Solid waste generated during construction of the project will be recycled or trucked to City approved landfill.

Recycling Programs. Opportunities to encourage and facilitate solid waste recycling will be explored by the developer. Proposed programs could address both commercial and commercial facility solid waste. Programs such as these could reduce the quantities of solid waste entering the County landfill.

Compliance with Ordinance No. 95-64. The project will comply with the provisions of the City's ordinance for recycling by commercial establishments. Commercial buildings with more than 20,000 square feet of space will recycle office paper, newspaper, corrugated cardboard, and glass, as appropriate.

5.8.5 Electrical Service

A. Existing Conditions

Electrical service is currently supplied to the subject property from HECO overhead lines coming from Waipahu Street.

The State's Model Energy Code, Energy Efficient Standard for Buildings (DBEDT, July 1993) goal is to reduce the consumption of oil and provide significant savings in utility costs as well as help clean the air by reducing fossil-fuel burning and provide economic benefits by yielding an average rate of return of over 25 percent.

B. Potential Impacts

Future electrical needs will require installation of underground electrical conduits within all new roadways. Therefore, the existing HECO distribution system will be upgraded to provide adequate electrical service into the project area. The development of the project will result in the increased demand for electricity. Total electrical service demand required for the proposed project will depend on the ultimate density and individual needs of commercial businesses established within the project area. In their review of the Draft EIS, HECO had "no comments at this time on the proposed

project." HECO also stated that it "shall reserve further comments pertaining to the protection of existing powerlines bordering the project area until construction plans are finalized."

C. ~~Mitigating~~Mitigative Measures

(1) Energy Conservation. In order to keep operations costs to a minimum, it is likely that the various businesses will practice various forms of energy conservation.

(2) Coordination with HECO. The applicant will coordinate its planning efforts with HECO's efforts to supply power to the area. The applicant will participate in providing necessary improvements to the electrical distribution system required to serve the project.

(3) Model Energy Code. Applicable standards of the Code for residential and public buildings will be integrated into the Design Guidelines for the project and will become a code requirement to obtain building permits for the various structures planned at the project.

5.8.6 Telephone

A. Existing Conditions

Telephone lines presently exist in the area and have the capacity to accommodate the proposed project with minor modifications.

B. Potential Impacts

GTE Hawaiian Telephone Company (HTCo) lines are adequate to serve the proposed project and would also be extended as needed to service the commercial businesses. In their review of the Draft EIS, HTCo stated that it ". . . does not anticipate any problems in providing telecommunication services to the proposed project. However, further review will be required by HTCo during the design stages of the project. We look forward to working with you and your consultants to ensure all of your telecommunication needs are met."

5.9 PUBLIC SERVICES

5.9.1 Schools

The Project does not include any residential units, and, will therefore not generate a need for schools.

5.9.2 Police Protection

A. Existing Conditions

The City and County Police Department maintains a Waipahu Substation. Waipahu belongs to the Police Department's District 3, which encompasses approximately 204 square miles from Kaena Point to Red Hill. There are about 200 field officers assigned to the district. The Administrative Lieutenant considers this beat district to be short-staffed. Response time for the entire district fluctuates between five and seven minutes (Personal Communication, Lieutenant Yap, City and County Policy Department, Pearl City Station Administrative Lieutenant, January 1994).

The Waipahu Substation is basically a storefront operation. A single officer staffs the substation per shift. The substation is open 24 hours a day. The public can go to the substation to file reports.

The most frequent types of crime in the high-density residential areas of Waipahu are domestic violence, thefts, and robberies. The number of shootings and stabbings are higher in Waipahu than nearby Pearl City.

Responding to silent alarms poses a problem for the police, because it distracts the field officers from attending to more urgent calls, especially at night when two officers must respond to alarms. However, use of the project site for commercial use would probably involve less serious demand for police services than residential use.

B. Potential Impacts

Portions of the project area are vacant and overgrown, and probably presents some concerns about security to area residents. Development of the property will make it more difficult for loitering, illegal dumping and other illegal and criminal activities to occur. In their review of the Draft EIS, the Police Department stated that "This project should have no significant impact on the operations of the Honolulu Police Department."

C. Mitigative Measures

(1) **Central Location of the Project.** The project concentrates development in the heart of Waipahu, thereby minimizing travel distances and response times, and allows for consolidation of efforts and efficient police operations.

(2) **Project Design.** Design of the project will help to deter crime and traffic problems, thereby minimizing the need for police services. Design measures will include well-lit and visible common areas and parks, and an efficient network of roadways to facilitate circulation.

5.9.3 Fire Protection

A. Existing Conditions

The Waipahu Fire Station is located on Leonui Street. It is approximately four to six minutes away from the project site. Annually, the fire company answers on average about 773 calls. The occurrence and frequency of alarms depends on the time of year. During New Year 1993, during the three-day period -- December 31st, January 1st and 2nd, the Waipahu Fire Station received 9 alarms compared to 180 alarms for the island of Oahu

B. Potential Impacts and Mitigative Measures

Increased fire hazard with the proposed development or a significant impact on demand on the Fire Department for fire safety services is not anticipated. Newer commercial complexes are usually equipped with fire mitigation fixtures like smoke alarms, sprinkler systems, and extinguishers.

It should be noted that the City plans to build a new fire station in Waikele. However, the Amfac Commercial and Park project site will continue to be under the jurisdiction of the Waipahu Fire Station with backup from nearby fire stations such as the one proposed at Waikele.

Water supply and transmission system is sufficient. Fire control capabilities will be incorporated into the design of the water storage and transmission system employing accepted standards and regulations for fire protection. In their review of the Draft EIS, the Fire Department stated that it had "no objections" to the EIS.

C. Mitigative Measures

Water Source Development and Transmission. Engineering studies for water source development and water transmission and distribution indicate that the water system has been planned to meet fireflow requirements.

5.9.4 Health Care / Hospitals

A. Existing Conditions

Health care facilities within the area include the St. Francis Medical Center-West, and Honolulu clinics and hospitals including The Queen's Medical Center, and Straub Clinic and Hospital. The nearest facility is the 85-bed St. Francis Medical Center-West facility at Kapolei located approximately 7 minutes drive by car from the project site. In addition, Waipahu supports a number of private physician offices.

B. Potential Impacts

At buildout, the project can be expected to have a minimal impact on area medical facilities.

C. Mitigative Measures

Potential for Medical Offices to Locate to the Commercial Area. The proposed DP Amendment and subsequent zoning for the Commercial area would allow medical offices and clinics to be located at the project.

5.9.5 Recreational Facilities

A. Existing Conditions

There are several parks in the general vicinity of the proposed project. Waipahu Field and Gym is a City and County of Honolulu district park. It has recreational facilities for classes and other organized activities. Hans L'Orange, Pupu'ole, and Waipahu Uka are neighborhood parks. Waipahu Cultural Garden Park is a cultural center with historic exhibits of plantation life and open space. Waipahu Cultural Garden Park and Hans L'Orange Park are the two parks closest to the project site. With the assistance of the applicant, among others, Hans L'Orange Park was improved in 1995 to allow for professional play and spectator amenities.

Existing public recreational facilities in Waipahu near the subject property include the Waipahu Cultural Garden Park (48.2 acres Regional Park), Waipahu Field and Gym (13.8 acre District Park), Hans L'Orange Park (6.9 acre Neighborhood Park), and Honowai Park (6.3 acre Neighborhood Park). The combined recreational facilities provided by these parks is as follows.

Basketball (5)
Volleyball (4)
Softball (5)
Tennis (4)
Baseball (2)
Swimming Pool (1)
Educational Building (1)
Multipurpose Building (1)
Gymnasium (1)
Picnicking (1)
Comfort Stations (4)

Park usage depends on convenience of access (by car or foot) and type of facility. Recently, the district park has been used mainly by senior citizens, plantation retirees, and other adults who take classes (personal communication, Ronald Wong, City and County Parks & Recreation District Manager, January 1994). Young children usually play at neighborhood parks.

B. Potential Impacts

The requested DP Land Use Map amendment includes a charge in land use designations for approximately 3 acres, from Residential to Park, to allow for expansion of Hans L'Orange Park. The park is one of the best sites on Oahu for baseball but its left field is a little short by professional standards. In addition, the park expansion would provide area for additional park parking, passive park use and open space, and area for any other improvements.

C. Mitigative Measures

(1) Expansion of Hans L'Orange Park. The Plan's designated improvements to the existing 6.9-acre Hans L'Orange Park include a 3-acre expansion within the area along the southern boundary of the park, encompassing the area of the existing Makaaloha Street and extending down to Waipahu Street. The expansion would allow for extension of the Park's left field line, and to create more passive park area, additional parking area, and area for any other improvements. The improvements will improve the visual character of the Park and provide increased recreational opportunities.

(2) YMCA of Honolulu - Leeward Branch. The YMCA of Honolulu Leeward Branch will be developing a new community YMCA facility on-site through the adaptive reuse of the Administration and Human Resources Buildings. The buildings and two acres of land, appraised at $2 million, are being sold to the YMCA at a discounted price of $800,000. The community service-oriented facility is needed for the youth of Waipahu as it provides recreational outlet and social support and because current YMCA facilities cannot provide a range of services that could be provided on the proposed site.

(3) Heritage Area. The proposed heritage center is located nearby the popular Waipahu Cultural Garden Park and Hawaii's Plantation Village and is expected that the non-profit organization which operates the Hawaii's Plantation Village would also operate the proposed heritage area as an ~~extention~~extension of their present facilities.

(4) FilCom Center. Among the services envisioned at the FilCom Center are planned activities for senior citizens, and traditional dance and martial art classes for youth and adults.

5.9.6 Public Transportation

A. Existing Conditions

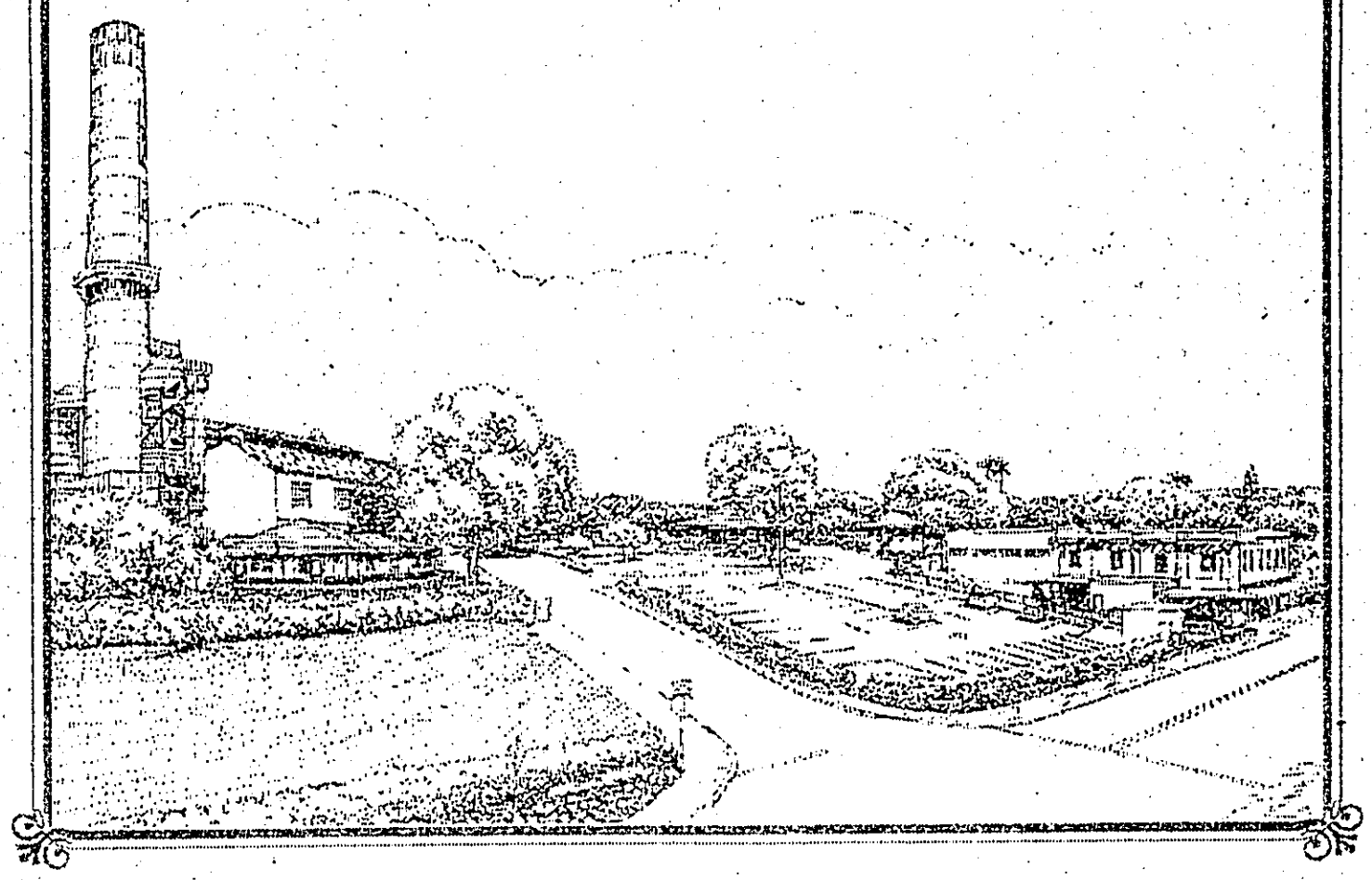
~~The Bus~~The Bus Route 47 Waipahu - Waikiki traverses Waipahu Street fronting the proposed project. There are six bus stops in the project area, three in the eastbound direction and three in the westbound direction.

B. Potential Impacts and Mitigative Measures

If that portion of Waipahu Street fronting the project is widened, existing bus stops along Waipahu Street may need to be relocated. Bus stops should remain proximal to their current location and any new and or refurbished bus stop must meet the requirements of the Americans with ~~Disabilities~~Disabilities Act. At the appropriate stage in design of the widening of Waipahu Street, the Facilities and Equipment Branch of the Honolulu Public Transit Authority will be consulted for design specifications.

6.0

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES



6.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The construction and operation of the proposed commercial and park project will involve the irretrievable commitment of certain natural and fiscal resources. The major resource commitment will be the 25.4 acres of land required for development of the commercial uses, community facilities and park and infrastructure elements of the project. Money, construction materials, manpower and energy will all be expended to complete construction and to operate these facilities. The impact of utilizing these resources should, however, be weighed against the economic, social and recreational benefits to the residents of Waipahu, the region, the County and the State.

There would be a permanent commitment of private funds and resources to plan, design and construct and operate the project facilities. This will result in a permanent increase in jobs and other employment-related benefits and resources. It is expected that increased tax revenues will be generated along with increase in economic activity and appreciated value of the community.

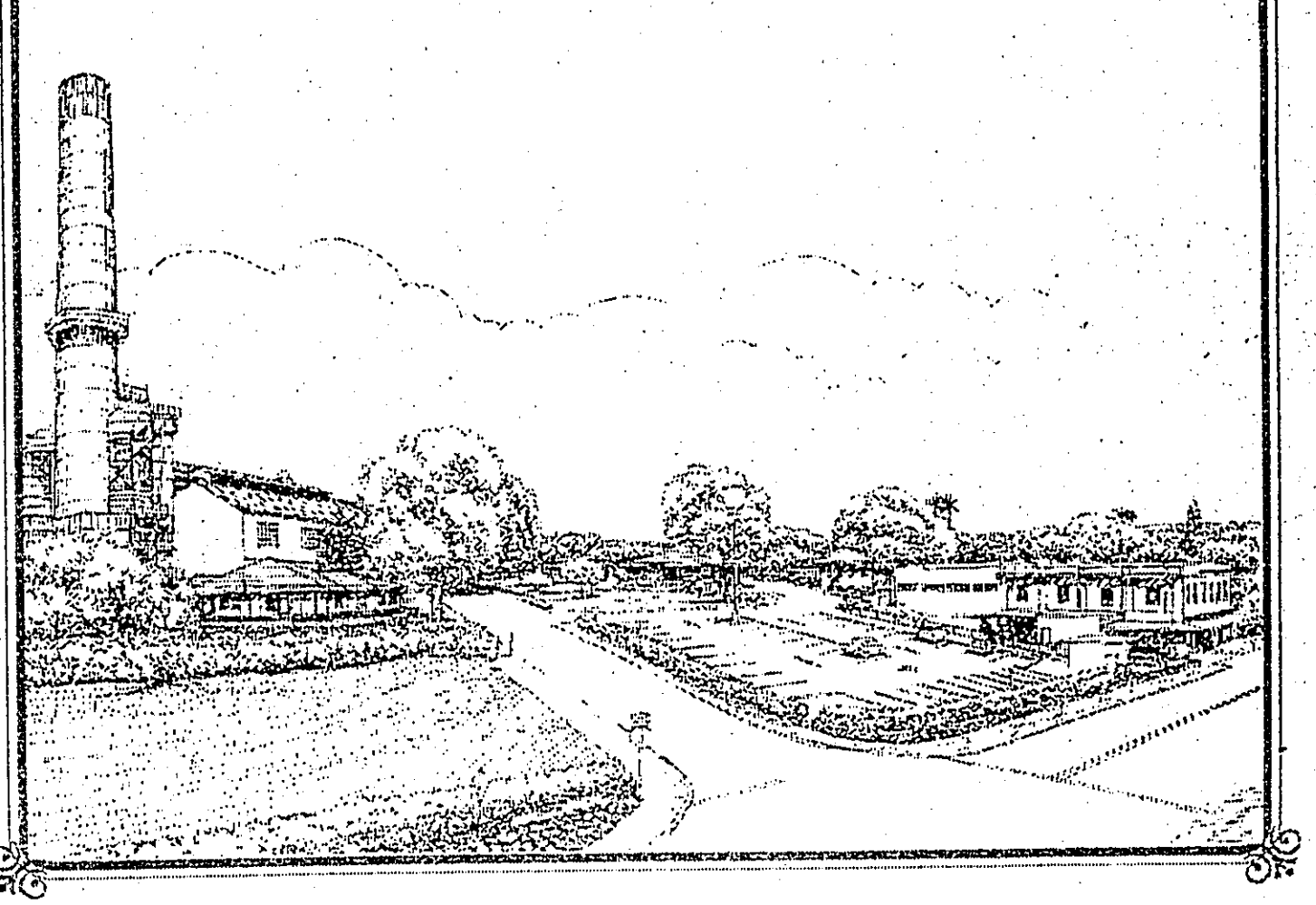
The existing industrial buildings and structures of the Oahu Sugar mill are a historic and cultural resource of the plantation era and represent a period in Hawaii's history that is now in decline. The mill smokestack, and certain of the buildings, including the Generator building, Laboratory building, the Administration building, Human Resources building, and Waipahu Store are planned to be adapted to other uses and will be preserved. The remainder of the buildings which would be dismantled to make way for other uses would be irretrievably lost.

Beyond the on-site improvements constructed and operated by the developer, there will be increased usage of public facilities such as Waipahu Street for project-related traffic and greater load on the City and County solid waste facilities.

The commitment of resources required to accomplish the project includes labor and materials, which are mostly unrenewable and irretrievable. The operation of the project will also include consumption of potable water and petroleum-generated electricity which also represents irretrievable commitments of resources.

7.0

CONFORMANCE TO FEDERAL, STATE AND CITY PLANS AND PROGRAMS



7.0 CONFORMANCE TO FEDERAL, STATE AND CITY PLANS AND PROGRAMS

The proposed Amfac Commercial and Park is a re-development project requiring a City and County of Honolulu Development Plan Amendment and Change of Zone land use approvals. The proposed development of the project will substantially comply with the applicable land use growth policies and plans of the State of Hawaii and the City and County of Honolulu.

7.1 FEDERAL

The Americans with Disabilities Act (ADA) of 1990 sets guidelines for accessibility to buildings and facilities by individuals with disabilities. These guidelines are to be applied during the design, construction, and alteration of buildings during the design, construction and alteration of buildings and facilities covered by the ADA to the extent required by regulations issued by federal agencies under the ADA, including the Department of Justice and Transportation.

Primary site accessability must be provided from all entrance points to all individual facilities that require access. In accordance with the ADA, parking and accessible routes must be provided for individuals with disabilities in order to link all campus facilities. Maximum slopes for ADA accessibility is 8 percent.

All facilities must be totally accessible to individuals with disabilities, as governed by the ADA.

- At least one entrance, preferably the principal entrance, must interface with an accessible route on the site.
- Access must be provided to all floors of all buildings except in unusual circumstances.
- All toilet facilities must be accessible.
- Emergency egress must be provided for individuals with disabilities equal to that for able bodied occupants.

In their review of the Draft EIS, the U.S. Army Corps of Engineers states that "The information provided in the Draft EIS does not identify any specific activities involving work in waters of the U.S., therefore, a DA permit will not be required at this time."

Other than the National Pollution Discharge Elimination System (NPDES) Permit, which is administered by the State Department of Health, there are no other known federal plans and programs applicable to the project.

7.2 STATE OF HAWAII

7.2.1 Hawaii State Plan

The *Hawaii State Plan*, establishes a set of goals, objectives and policies that are to serve as long-range guidelines for the growth and development of the state and establishes a basis for determining priorities and allocating limited resources. The Plan is divided into three parts. Part I (Overall Theme, Goals, Objectives and Policies); Part II (Planning, Coordination and Implementation); and Part III (Priority Guidelines).

The following sections of the *Hawaii State Plan* are directly applicable to the proposed project:

226-12 Objectives and Policies for the Physical Environment - Scenic, Natural Beauty and Historic Resources.

Objectives:

(a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/ historical resources.

Policies:

(b)(3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.

(b)(5) Encourage the design of developments and activities that complement the natural beauty of the islands.

Discussion: Presently, the project area contains no significant natural features. The site, however, contains some manmade features which merit protection or special treatment. As such, the proposed project is planned to include a heritage area that would include a number of existing structures from the Oahu Sugar mill. These structures include the mill smoke stack, the Laboratory Building, the Generator Building, the Administration Building, the Human Resources Building and the Old Waipahu Store. The proposed character of the project will be designed to complement the historic character of old Waipahu Town with complimentary architectural designs and landscaping. Design guidelines will be established by the applicant to further regulate the use of building materials, size of structures, colors, signage, landscaping, etc. These features are proposed to mitigate visual and impacts on Waipahu Town.

No significant archaeological sites are known to exist on the area of application, however, should any historical/cultural or archaeological sites be uncovered during the site preparation phase of

project development, the Historic Sites Division of the Department of Land and Natural Resources will be notified, and the site will be treated in accordance with applicable requirements and an accepted archaeological mitigation plan.

226-13 Objectives and Policies for the Physical Environment - Land, Air and Water Quality.

Objectives:

(a) Planning for the State's physical environment with regard to land, air and water quality shall be directed towards achievement of the following objectives:

(a)(1) Maintenance and pursuit of improved quality in Hawaii's land, air and water resources.

(a)(2) Greater awareness and appreciation of Hawaii's environmental resources.

Policies:

(b)(2) Promote the proper management of Hawaii's land and water resources.

(b)(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground and coastal waters.

(b)(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.

(b)(6) Encourage design and construction practices that enhance the physical qualities of Hawaii's Communities.

Discussion: The proposed project will be planned and designed in an environmentally compatible and beneficial manner that would foster the recognition, importance, and value of the area's land, air, and water resources. Located within a highly urbanized area, the proposed project should not negatively impact the nearby commercial uses along Waipahu Street and Waipahu Depot Road.

The site is not subject to unusual hazards associated with erosion, flooding, tsunami, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters. No impacts on ground water are anticipated. All surface water runoff and wastewater will be collected and treated in accordance with Federal, State, and City ordinances and regulations. Design and construction of project improvements will take advantage of the site's existing aesthetic potential by enhancing the physical attributes of the area compared to the property's current condition.

226-16 Objectives and Policies for Facility Systems - Water

Objectives:

(a) Planning for the State's facility systems with regard to water, shall be directed toward achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational and other needs within resource capacities.

Policies:

(b)(1) Coordinate development of land use activities with existing and potential water supply.

(b)(3) Reclaim and encourage the productive use of runoff water and waste water discharges.

(b)(4) Assist in improving the quality, efficiency, service and storage capabilities of water systems for domestic and agricultural use.

Discussion: All potable water for the project will be drawn from the existing Board of Water Supply distribution system. Up until recently, the water source to the site of the former sugar mill was provided by a private OSCo water system with private wells in the adjoining Waikele Gulch. Recently, this existing private water system was redirected and used for irrigation of the existing Waikele Golf Course, which had been serviced by the Board of Water Supply. Subsequently, the municipal water service that was used for irrigation of the golf course was discontinued and reallocated to the proposed OSCo development projects. The Board of Water Supply confirms this arrangement in its letter of August 27, 1996.

All City and County of Honolulu and/or State of Hawaii standards for surface drainage, erosion control, water transmission, and the collection, treatment and disposal of wastewater, will be implemented, as applicable.

7.2.2 State Functional Plans

In conjunction with the County General Plans and Development Plans, State Functional Plans are the primary guideposts for implementing the Hawaii State Plan. While the Hawaii State Plan establishes long-term objectives for Hawaii, the State Functional Plans delineate specific strategies of policies and priority actions that should be addressed within a two- to six-year period. The following Functional Plans are applicable to the proposed project.

7.2.2.1 State Functional Plan - Historic Preservation (1991)

OBJECTIVES, POLICIES AND ACTIONS

I. ISSUE AREA: Preservation of Historic Resources

II. ISSUE AREA: Collection and Preservation of Historic Records, Artifacts and Oral Histories and Perpetuation of Traditional Skills

Discussion: As previously mentioned, Amfac has prepared the Waipahu Town Heritage Area Plan which included the following: 1) identifying an area (the "Heritage Area") within the Oahu Sugar mill site that would focus on preserving Waipahu's historic character; 2) describing the guidelines that are being prepared to control the design of new facilities within the town core, the mill site, and the park expansion/Filipino Community Center site; and 3) summarizing current efforts of historic documentation. This plan is intended to provide a more detailed framework for the implementation of the Heritage Area as called for in the Waipahu 2000, the Waipahu 2000 Update, and the Waipahu Town Special Area Plans.

III. ISSUE AREA: Public Information and Education on the ethnic and cultural heritages and history of Hawaii

Discussion: Amfac has undertaken several archival and documentary measures to ensure the appropriate recordation of the Oahu Sugar mill and its activities while in operation.

Archival correspondence, publications, annual reports, historical slides, photos, and other documents dating back to the late 1800s have been carefully catalogued for future use. historical items such as bangos, sports trophies, factory reports, journals, relief maps, signs, production charts, films, and antique office equipment have also been catalogued and boxed for future use.

The Oahu Sugar Company photo collection, consisting of more than 500 historical photographs, has been donated to Hawaii's Plantation Village by Amfac and the Oahu Sugar Company. The restoration and preservation of this collection is an integral part of the Hawaii's Plantation Village archives project, which was funded by a grant from the Hawaii State Foundation on Culture and the Arts.

One of Hawaii's Plantation Village's primary missions is to document plantation life in Hawaii. The photographs from the Oahu Sugar Company collection have been instrumental in helping Hawaii's Plantation Village to achieve this mission. Furthermore, the collection has proven to be an invaluable research and educational tool because it offers visual documentation of the many personal facets of plantation life, including:

- the unique plantation clothing worn by both male and female workers and the number of workers stationed at Oahu's sugar fields.

- the changes in planting and harvesting techniques and technologies. For example, some of the earlier photographs show mule- and horse-drawn cane cars and plows, as well as some of the first lap-seam boiler tractors.

- the extensive irrigation systems used on sugar lands. The photos document exact locations of pumping stations and different technology used over the 97-year history of the operation here on Oahu.

- identifying and crediting individuals and ethnic groups who worked with the company in both management and labor.

- plantation worker and management housing and various landscape treatments.

- the machinery utilized in each of the successive steps in the harvesting process.

7.2.2.2 State Functional Plan - Tourism (1991)

OBJECTIVES, POLICIES, AND POLICIES

Issue Area II: Physical Development

Objective II.A Develop and maintenance of well-designed visitor facilities and related developments which are sensitive to the environment, sensitive to neighboring communities and activities, and adequately serviced by infrastructure and support services.

Discussion: As the old Oahu Sugar Company mill in Waipahu closed in April, 1995, the owners of the mill site, Amfac, initiated various studies connected with the future use and development of the site.

Amfac retained Spencer Mason Architects to assess the visual character and historic significance of the Oahu Sugar mill and to develop design guidelines for new and existing structures so as to maintain the existing visual character of the area. Spencer Mason Architects' report includes the following elements:

- A history of Oahu Sugar to aid in assessing the historic significance of the mill buildings and the skilled worker houses.

- A visual character assessment of the Oahu Sugar mill area. Critical visual elements are identified. Visual images are prioritized as to their contributing characteristics.

- Ways in which these visual elements and images might possibly by maintained or recreated.

The design guidelines are intended to protect the historic character and integrity of Waipahu Town core, as well as increase public awareness of the community's historic resources and the elements that contribute to its character.

The aim of establishing the design guidelines is to ensure that the design of new buildings and alterations to existing buildings will help continue and strengthen the architectural character of the Waipahu Town core. Each of the elements discussed in the report is useful for maintaining and enhancing the historic architectural character.

ISSUE AREA III: Environmental Resources and Cultural Heritage

Policy III.A.2. Assist in preserving, perpetuating, and interpreting cultural, historic and archaeological resources. Preserve cultural authenticity as much as possible in commercialized and tourist-oriented presentations.

Discussion: An interesting feature of the historic character of Waipahu Town core is the contrast that exists between the scale, materials, and feeling of the mill buildings, the small town commercial buildings on Waipahu Street, and the landscaped setting of Hans L'Orange Park. Although the historical patterns of uses that created these contrasts as the town developed no longer exist, maintaining the distinct character of different parts of the town core is a key aspect to preserving the historic character.

It is therefore appropriate to have different design guidelines for the town core, the mill site, and the park area. These design guidelines are organized in three sections: 1) general design guidelines for the town core, including guidelines for signs, 2) recommendations for the mill site, and 3) recommendations that apply specifically tot eh proposed "Park" area, including the Filipino Community Center site.

In addition, the project includes a site for the Filipino Community Center which should serve to preserve and perpetuate the Filipino culture in Hawaii.

7.2.3 State Land Use Law, Chapter 205, *Hawaii Revised Statutes*

Discussion. The subject property is classified by the State Land Use Commission as "Urban" (Figure--). As such, development of the proposed commercial, community facility and park uses would conform to Chapter 205, HRS, and the State of Hawaii Land Use Commission Rules (*Hawaii Revised Statutes, Chapter 205; Hawaii Administrative Rules, Title 15, Subtitle 3, Chapter 15*). As provided in the Land Use Commission rules, Section 15-15-24, *"Permissible uses within the "U" urban district, any and all uses permitted by the counties, either by ordinances or rules shall be*

allowed within this district, subject to any conditions imposed by the commission pursuant to Section 205-4, HRS." Therefore, the proposed commercial, community facility and park development would be in conformance with all applicable provisions of Chapter 205, HRS.

7.2.4 Coastal Zone Management Act

The objectives of the Hawaii Coastal Zone Management (CZM) Act as set forth in Chapter 205A, Hawaii Revised Statutes, applies to the protection and maintenance of valuable coastal resources and the establishment of Special Management Areas (SMA) boundaries. The subject property does not lie within the Special Management Area as defined by the City and County of Honolulu, and therefore does not require a Special Management Area Use Permit. However, the CZM encompasses the entire stake. The objectives and policies of Chapter 205A are presented below, followed by a brief discussion of the project's consistency and compliances with CZM objectives and policies.

~~Discussion. The project is located outside of the SMA, however, the proposed project conforms to the applicable CZM objectives:~~

~~1) Erosion control measures will be undertaken during project construction to mitigate the potential impact of soil erosion during intense storm events. Design of project drainage systems will follow all design standards of the City and County of Honolulu to ensure the safe conveyance and discharge of storm water runoff.~~

~~2) Other than the construction of required drainage facilities/outlets, no development or construction will occur within the 100-year flood hazard zone as identified in the Flood Insurance Rate Maps (as shown in Figure 4-6).~~

Objective 1: ***Provide coastal recreational opportunities accessible to the public;***

Discussion: Not applicable to the subject property, since it is located over a half mile away from the coastline.

Policy 1a: ***Improve coordination and funding of coastal recreational planning and management; and***

Discussion: Not applicable. This policy appears to be directed to governmental agencies.

Policy 1b: ***Provide adequate, accessible and diverse recreational opportunities in the coastal zone management area by:***

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

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

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

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

(v) Ensuring public recreational use of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches and artificial reefs for surfing and fishing; and

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

Discussion: The project is not located on the coastline or shoreline and does not involve coastal resources. The installation of drainage detention basins as required by Ordinance 96-34 will protect coastal ecosystems from adverse impacts. The site is not in a location to develop new shoreline recreational opportunities or to dedicate shoreline areas with recreational value.

Objective 2: Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture;

Discussion: There are no known resources of natural value on the site. There were also no traditional sites found in the project area and that it is unlikely that there are potentially significant subsurface archaeological deposits of prehistoric age in the area. In accordance with the Waipahu Town Plan, several buildings on the mill site have been identified for having historical value and will be preserved and incorporated into the proposed heritage area. The buildings include the smokestack, Generator Building, the Laboratory Building, the Administration Building, the Human Resources Building and the Waipahu Store Building. The mill smoke stack, the Generator Building

and the Laboratory Building are included in the proposed Heritage Museum Area. In their review of the Draft EIS, the State Historic Preservation Division wrote that "We look forward to the re-use of the historic structures including the mill smoke stack, the generator, laboratory, administration; human resources and the old Waipahu Store buildings."

Policy 2a: ***Identify and analyze significant archaeological resources;***

Discussion: In their review of the Draft EIS, the State Historic Preservation Division wrote that "...it is unlikely that historic sites will be found, and [we] believe that this project will have 'no effect' on historic sites."

Objective 2b: ***Maximize information retention through preservation of remains and artifacts or salvage operations; and***

Discussion: In anticipation of the dismantling of the structures that will not be preserved, archival photographs documenting the mill buildings were taken. In accordance with the specifications of the Historical American Buildings Survey (United States Secretary of the Interior documentation specifications), three sets of archival prints were made and will be filed in the U.S. Library of Congress and the University of Hawaii. The photographs thoroughly document the structures and buildings of the Oahu Sugar Company for posterity (27 exteriors of 22 structures, 28 interiors in 14 buildings).

To ensure that no important cultural features will be destroyed during project construction, a qualified archaeologist will selectively monitor initial grubbing activity and/or vegetation clearing within the project area. Should subsurface remains, artifacts, deposits of charcoal or shells be found during construction activities, work in the area will be stopped immediately and the Department of Land and Natural Resources will be contacted to determine the significance of the site and to identify appropriate mitigation measures.

Objective 2c: ***Support state goals for protection, restoration, interpretation and display of historic resources.***

Discussion: Reminders of Waipahu's historic plantation legacy as evidenced by the sugar mill stack, and its proximity to the Waipahu Cultural Garden Park, makes it appropriate to develop a heritage area. Adaptive re-use of some of the existing mill structures including the smokestack, Generator Building, the Laboratory Building, the Administration Building, the Human Resources Building and the Waipahu Store Building could serve as the heritage center.

In efforts to promote the cultural heritage of the various ethnic groups, the heritage center could be operated by a non-profit organization. In showcasing the plantation era, the center could offer multimedia displays incorporating artifacts and old photographs covering the cultivation of sugar cane, mill operations, the water system, the history of the plantation and plantation labor, plantation

life, etc. The Alexander and Baldwin Sugar Museum on Maui could serve as a prototype for a successful sugar plantation museum.

Objective 3: ***Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources;***

Discussion: Not applicable. The site is not located on the coastline and does not provide coastal scenic and open space resources.

Policy 3a: ***Identify valued and scenic resources in the coastal zone management area;***

Discussion: The City and County of Honolulu, has conducted a comprehensive viewshed assessment documented in Coastal View Study (City and County of Honolulu Department of Land Utilization, 1987). In this study, the existing visual resources of the entire Oahu coastline are inventoried, prioritized, and documented.

According to the Coastal View Study, the Waipahu viewshed is residential, commercial, and industrial. No significant coastal visual resources in the vicinity of the project are identified in the Study.

The mill is located on a bluff close to Waikele Stream. The town of Waipahu grew around the mill and the smokestack of the mill is a landmark that is seen from many places and directions including most of Waipahu and its surroundings.

Policy 3b: ***Insure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;***

Discussion: The project will not alter the bluff on which is located and will not alter public views to and along the shoreline.

Policy 3c: ***Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and***

Discussion: Not applicable. The project does not include shoreline open space and scenic resources.

Policy 3d: ***Encourage those developments which are not coastal dependent to locate in inland areas;***

Discussion: Not applicable. The subject property is located over a half mile inland from the coastline.

Objective 4: ***Protect valuable coastal ecosystems, including reefs from disruption and minimize adverse impacts on all coastal ecosystems.***

Discussion: Not applicable. This project does not involve coastal waters, reefs and ecosystems.

Policy 4a: ***Improve the technical basis for natural resource management;***

Discussion: This Environmental Impact Statement adds to the database of information for this area, which may be useful for natural resource management.

Policy 4b: ***Preserve valuable coastal ecosystems, including reefs of significant biological or economic importance.***

Discussion: The proposed development area is remotely located from valuable coastal ecosystems, including reefs.

Policy 4c: ***Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses recognizing competing water needs; and***

Discussion: The installation of drainage detention basins as required by Ordinance 96-34 will preserve coastal ecosystems from adverse impacts.

Policy 4d: ***Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards.***

Discussion: Refer to previous discussion.

Objective 5: ***Provide public or private facilities and improvements important to the State's economy in suitable locations.***

Discussion: Development of the project will provide needed commercial, community facility and park uses in a location suitable for these uses, as identified by two extensive, community-based planning efforts: the Waipahu 2000 Update and the Waipahu Town Plan.

Policy 5a: ***Concentrate coastal dependent development in appropriate areas;***

Discussion: The project is not coastal dependent and located over a half mile inland from the coastline.

Policy 5b: ***Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and***

Discussion: Although the project is not coastal dependent and is located over a half mile inland from the coastline, it will be designed and constructed to minimize adverse social, visual and environmental impacts.

Policy 5c: ***Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:***

(i) Use of presently designated locations is not feasible;

(ii) Adverse environmental effects are minimized; and

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

Discussion: Not applicable. The project is not coastal dependent and thus does not require a decision on siting the project on the coastline.

Objective 6: ***Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.***

Discussion: The site is not subject to tsunami or storm wave inundation and stream flooding. The proposed project will include measures to minimize erosion. The proposed project is not expected to cause subsidence. The project is not expected to generate any significant long-term noise that cannot be mitigated. During construction, equipment will be used in accordance with accepted standards and during daylight hours to mitigate potential noise impacts. The primary air quality impact will result from the use of construction equipment, fugitive dust and emissions from vehicular traffic. Watering during construction will largely mitigate dust emissions. Emissions from vehicular traffic may be mitigated by the development of transportation improvements at busy intersections. The applicant is presently in the process of removing asbestos from existing buildings, conducting groundwater monitoring and remediation, and will be remediating contaminating soils in the vicinity of a former molasses tank.

Policy 6a: ***Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;***

Discussion: This Environmental Impact Statement was developed to communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards.

Policy 6b: ***Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;***

Discussion: The site is not subject to storm wave or tsunami inundation, flooding and subsidence. The proposed project will include measures to minimize erosion, the effects of hurricanes and winds, and point and nonpoint source pollution hazards.

Policy 6c: ***Ensure that developments comply with requirements of the Federal Flood Insurance Program;***

Discussion: All requirements of the Federal Flood Insurance Program will be complied with.

Policy 6d: ***Prevent coastal flooding from inland projects; and***

Discussion: Proposed storm drainage improvements include diversion of the storm runoff from the private mill system to Waikele Stream. The total diversion of about 70 acres from the mill site as well as other mauka tributary areas will have an insignificant effect on Waikele Stream with its overall tributary area of 45 square miles or 28,800 acres. The effect of the diversion will be reduced further by the detention structures required by Ordinance 96-34.

Policy 6e: ***Develop a coastal and nonpoint source pollution program.***

Discussion: The installation of drainage detention basins as required by Ordinance 96-34 will preserve coastal ecosystems from adverse impacts.

Objective 7: ***Improve the development review process, communication and public participation in the management of coastal resources and hazards.***

Discussion: This Environmental Impact Statement is an integral component of the development review process, communicating information regarding the project and providing opportunities for public participation in the reviews of the Notice of Preparation and Draft Environmental Impact Statement.

Policy 7a: ***Use, implement and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development.***

Discussion: Not applicable. This policy appears to be directed to governmental agencies.

Policy 7b: ***Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and***

Discussion: Not applicable. This policy appears to be directed to governmental agencies.

Policy 7c: ***Communicate the potential short and long-term impacts of proposed significant coastal development early in their life-cycle and in terms understandable to the public to facilitate public participation in the planning and review process.***

Discussion: Although the project does not involve coastal development, this Environmental Impact Statement communicates the potential short and long-term impacts of the project in terms understandable to the public to facilitate public participation in the planning and review process.

Objective 8: ***Stimulate public awareness, education and participation in coastal management.***

Discussion: Refer to previous discussion.

Policy 8a: ***Maintain a public advisory body to identify coastal management problems and to provide policy advice and assistance to the coastal zone management program;***

Discussion: Not applicable. This policy appears to be directed to governmental agencies.

Policy 8b: ***Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal-related issues, developments, and government activities; and***

Discussion: Not applicable. This policy appears to be directed to governmental agencies.

Policy 8c: ***Organize workshops, policy dialogues and site-specific mediations to respond to coastal issues and conflicts.***

Discussion: Not applicable. This policy appears to be directed to governmental agencies.

Objective 9: ***Protect beaches for public use and recreation.***

Discussion: The subject property, located over a half mile from the coastline and should not affect beaches used by the public for recreation.

Policy 9a: ***Locate new structures inland from the shoreline setback to conserve open space and to minimize loss of improvements due to erosion;***

Discussion: The project is located a half-mile inland from the shoreline setback and will not affect shoreline open space or shoreline erosion.

Policy 9b: ***Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and***

Discussion: Not applicable. The project does not include the construction of structures seaward of the shoreline.

Policy 9c: ***Minimize the construction of public erosion - protection structures seaward of the shoreline.***

Discussion: Not applicable. This policy appears to be directed to governmental agencies.

Objective 10: ***Implement the State's ocean resources management plan.***

Discussion: Not applicable. This policy appears to be directed to governmental agencies.

Policy 10a: ***Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;***

Discussion: Not applicable. This policy appears to be directed to governmental agencies.

Policy 10b: ***Assure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;***

Discussion: Not applicable. The project does not include the use and development of marine and coastal resources.

Policy 10c: ***Coordinate the management of marine and coastal resources and activities management to improve effectiveness and efficiency;***

Discussion: Not applicable. This policy appears to be directed to governmental agencies.

Policy 10d: ***Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;***

Discussion: Not applicable. This policy appears to be directed to governmental agencies.

Policy 10e: ***Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and***

Discussion: Not applicable. This policy appears to be directed to governmental agencies.

Policy 10f: ***Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.***

Discussion: Not applicable. This policy appears to be directed to governmental agencies.

It is anticipated that none of the proposed improvements are in conflict with any plans, programs, or other activities of the State Coastal Zone Management Program.

7.3 CITY AND COUNTY OF HONOLULU

7.3.1 General Plan

The *General Plan* for the City and County of Honolulu has designated the subject property as part of the "Central Oahu Development Plan Area".

Development of the proposed property for commercial, community facility and park uses would directly fulfill many of the objectives and policies of the City's *General Plan*. The project's relationship to these *General Plan* Policies and Objectives are described below.

Population, Objective B - To Plan for Future Population Growth.

Discussion: Existing and planned large-scale housing development projects within the Central Oahu Development Plan area are presently contributing to a population growth rate which may exceed the General Plan's population guidelines for this area. The proposed project will not in itself generate population growth but provide potential employment opportunities to help replace those that were lost in the closing of OSCo's sugar cultivation and processing activities, as well as provide employment opportunities for nearby residents in a growing urban area.

Population, Objective B, Policy 1: Allocate efficiently the money and resources of the City and County in order to meet the needs of Oahu's anticipated future population.

Discussion: The applicant or designee will pay for all on-site improvements (and certain off-site improvements ~~mentioned~~identified in this report) related to the delivery of water, collection of wastewater and collection of storm runoff for the project. City and County funds will not be diverted from the existing capital improvements program ~~in order~~ to accommodate this specific project. In

addition, potentially higher property values and expansion of employment opportunities will generate new sources of direct and indirect revenue for the City and County of Honolulu. Once these new revenues become available, they will be placed into the City's General Fund and allocated by the City for capital improvements as appropriate to "meet the needs of Oahu's anticipated future population" on an island-wide basis.

Population, Objective C - To establish a pattern of population distribution that will allow the people of Oahu to live and work in harmony.

Discussion: The proposed project would provide significant employment opportunities in close proximity to established residential neighborhoods and a growing workforce. The potential population growth lost from redesignation of that portion of the project area from Residential to Commercial and Park, can be reallocated to other areas within the Central Oahu Development Plan area.

Consequently, approval of the requested DP Land Use Map amendment will allow many future employees to work in a quality environment close to their families and neighborhoods in Waipahu and other master planned communities in Central Oahu and Ewa. This harmonious relationship between home and work will significantly improve the quality of life for many residents, while reducing the need to commute many miles between work and home, and reduce demands on regional traffic to and from Honolulu during peak hours.

Population, Objective C, Policy 2: Encourage development within the secondary urban center at Kapolei and the Ewa and Central Oahu urban-fringe areas to relieve developmental pressures in the remaining urban-fringe and rural areas, and to meet housing needs not readily provided in the primary urban center.

Discussion: The proposed project will help fulfill the preceding policy by providing employment opportunities for existing residents of the Waipahu community and by providing employment opportunities for others in the region, thereby encouraging residential development within Oahu's "secondary urban center". It is important that existing and new employment centers, such as those proposed proximate to residential areas, also be allowed to complement and support future development and employment as it occurs in the future. The project area is located on a former established employment center, and represents an example of "retooling" or diversifying the industrial-type economic activity, which was outdated or in a shrinking market, with other forms of economic activities.

Population, Objective C, Policy 3: Manage physical growth and development in the urban-fringe and rural areas so that:

a. An undesirable spreading of development is prevented; and

b. Their population densities are consistent with the character of development and environmental qualities desirable for such areas.

Discussion: The proposed project complies with the above policy by not directly contributing to the spreading of residential growth in the Central Oahu Development Plan area. Rather, the proposed DP Land Use Map Amendment application would permit development that could be considered as an "in-fill" of an existing urban area in a manner consistent with the City's General Plan, and adjacent land uses. As such, undesirable spreading of development would not occur and potential population densities in the immediate area would be reduced or remain essentially unchanged.

The environmental quality of the project area would be consistent with environmental impacts typically associated with commercial, community facility and park uses using mitigative measures. While the proposed land uses would be commercial and park, the uses would be less environmentally intrusive (noise, dust, odors) than past, more intensive industrial uses that occurred on the subject property (processing sugar cane at Oahu Sugar Mill).

Population, Objective C, Policy 4: Seek a year 2010 distribution of Oahu's residential population which would be in accord with the following:

Central Oahu - 14.9 to 16.5 percent of Year 2010 island wide population.

Discussion: As previously described, the proposed project will not directly contribute to population growth in the Central Oahu Development Plan area. However, if the Residential-designated portion (7.5 acres) of the 23.3 acre project site were developed to the maximum densities permitted by R-5 Residential zoning (approximately 50 detached, single-family units), the site could be populated by 150 residents (based on Honolulu County's average household size of 3.02 persons per household; in Waipahu Census Designated Place (CDP), it is 4.13 persons per household).

By removing the population potential of the portion of the project site with the existing Residential designation, a potential population of 150 persons from the Central Oahu Development Plan area would also be removed.

Economic Activity, Objective A - To promote employment opportunities that will enable all the people of Oahu to attain a decent standard of living.

Discussion: The proposed project will provide temporary and long-term employment opportunities for skilled workers in Waipahu through project construction-related activities, as well as permanent employment opportunities from businesses that are located within the area of application. According to the Planning Department's economic consultant, Decision Analysts Hawaii, Inc., the project could result in a significant number of new permanent full-time and part-time jobs in Waipahu after full build out.

Economic Activity, Objective G, Policy 2: Permit the moderate growth of business centers in the urban-fringe areas.

Discussion: The proposed project will allow both new and established commercial enterprises to relocate or expand within a master planned commercial area. The project's location within the vicinity of existing residential land uses outside of Oahu's central urban area, and will also mitigate island-wide traffic related impacts and promote greater efficiency in the use of existing infrastructure. Employees could live in Waipahu near to their jobs, existing shopping, schools, recreational facilities and other public services and facilities.

Natural Environment, Objective A - To protect and preserve the natural environment of Oahu.

Natural Environment, Objective A, Policy 1: Protect Oahu's natural environment, especially the shoreline, valleys and ridges, from incompatible development.

Discussion: The requested DP Land Use Map amendment is compatible with the above objectives and policy by utilizing a highly urbanized area, an area that has historically been used for heavy industrial-type activities. The project area has already been disturbed and does not contain shoreline, valleys or ridges. By allowing "in-fill" projects on sites previously used for urban purposes, development pressures on presently undeveloped land will be subsequently reduced.

Natural Environment, Objective B - To preserve and enhance the natural monuments and scenic views of Oahu for the benefit of both residents and visitors.

Natural Environment, Objective B, Policy 2: Protect Oahu's scenic views, especially those seen from highly developed and heavily traveled areas.

Discussion: The proposed project will not affect the scenic views of the ocean or any ridge lines from the H-1 Freeway or other heavily traveled roadways in the area.

Physical Development and Urban Design, Objective A - To coordinate changes in the physical environment of Oahu to ensure that all new developments are timely, well designed and appropriate for the areas in which they will be located.

Discussion: The proposed project will be designed to be compatible with surrounding land uses with the installation of infrastructure improvements, the inclusion of landscaped setbacks, and the establishment of design guidelines.

Physical Development and Urban Design, Objective A, Policy 2: Coordinate the location and timing of new development with the availability of adequate water supply, sewage treatment, drainage, transportation and public safety facilities.

Discussion: The applicant will continue to coordinate with the appropriate government agencies to ensure that there will be adequate water supply, sewage treatment, drainage, transportation and public safety facilities to service the project.

Physical Development and Urban Design, Objective A, Policy 4: Require new developments to provide or pay the cost of all essential community services, including roads, utilities, schools, parks and emergency facilities that are intended to directly serve the development.

Discussion: The applicant or its designee will pay for all costs involved in connecting to the City's water, wastewater and drainage systems. Businesses and organizations within the proposed project will pay for all usual and customary water and sewer user fees. Any other community services will be paid for by County real property taxes and State excise taxes generated by the project.

7.3.2 Development Plan Objectives and Policies

There are essentially four elements to each of Oahu's Development Plans (DP): 1) Common Provisions that apply to all Development Plan areas, 2) Special Provisions which are unique to each Development Plan Area, 3) Land Use Map(s) which define each Development Plan area and distribute the various DP land uses consistent with General Plan objectives and policies; and 4) Public Facilities Maps that identify planned public and private facilities and associated infrastructure. Figures 3-1 and 3-3 show the Central Oahu Development Plan Land Use and Public Facilities Maps respectively as they relate to the project area.

It should be noted that the City and County of Honolulu is currently updating its Development Plans for Central Oahu (and Ewa). This process includes the preparation of Special Area Plans to address certain communities or areas undergoing change or facing special problems or opportunities. In Central Oahu, these include the towns of Waipahu and Wahiawa. In these areas, the Special Area Plans are intended to be incorporated in the DP Land Use designations for these towns. As previously noted, the *Waipahu Town Plan* has been completed, and the City Council accepted the recommendations of this plan in February 1996 through City Council Resolution 96-14.

7.3.3 Development Plan Common Provisions

The Development Plan Common Provisions define the following administrative and functional categories for all Development Plans: 1) definitions of terms, 2) procedures for implementation of the Land Use and Public Facilities Maps, 3) fifteen (15) different land use categories, 4) General Urban Design Principles and Controls, 5) General Principles and Controls for Parks, Recreation and Preservation Areas, 6) Identification of Areas, Sites and Structures of Historical Significance, 7) Identification of Public Thoroughfares, Highways, and Streets, 8) Identification of Public Buildings, Public or Private Facilities for Utilities, Terminals, and Drainage, 9) provisions for Sequencing Public Facilities, 10) criteria for identifying the Social Impact of Development, 11)

Social Impact Management System, 12) Certificate of Compliance with the Social Impact Factors, 13) Amendment Procedures (of the Development Plans), 14) provisions for the Development Plan Status Review, and 15) additional application requirements for Golf Course Development.

The proposed DP Land Use Map Amendment from Residential and Industrial to Commercial and Park is consistent with the Development Plan Common Provisions as follows:

Section 24-1.4 General Urban Design Principles and Controls

1. *Public Views - Public views include views along streets and highways, mauka-makai view corridors, panoramic, and significant landmark views from public places, views of natural features, heritage resources, and other landmarks, and view corridors between significant landmarks.*

Discussion: The proposed project will not obstruct: public views along streets and highways, mauka-makai view corridors, views of significant landmarks (such as the mill stack) or natural resources, or ridgeline views from outside or within the project boundaries. Similarly, views of the ocean and mountain ranges are generally not available from the project area or surrounding commercial and recreational areas. The transitional and standard height requirements set forth in the LUO will preserve public views of the distant Waianae Mountains. This will ensure that the above noted view planes are maintained as applicable.

2. *Open Space - Open space areas consist of, but are not limited to, the ocean, beaches, parks, plazas, institutional properties with park-like grounds, streams, inland bodies of water, significant land forms, golf courses, cemeteries and agricultural and preservation lands.*

Discussion: The requested DP Land Use Map amendment will not affect the enjoyment or use of any open space areas described above.

3. *Vehicular and Pedestrian Routes - Landscaping shall be provided along major vehicular arterials and collector streets as a means to increase the general attractiveness of the community and the enjoyment of vehicular travel for visitors and residents. Landscaping controls shall be established for ground level parking areas in order to provide pleasing environments and to help minimize the visual dominance of paved surfaces.*

Discussion: The proposed project will be landscaped along the project boundaries to buffer and soften views to the project from surrounding areas and to minimize the visual impact of paved surfaces.

4. *General Height Controls*

Discussion: All structures within the project area will conform to maximum allowable heights as defined in the Special Provisions for the Central Oahu Development Plan area, the LUO and the applicable zoning map.

5. Energy Efficiency in Developments

Discussion: The project is ideally located to promote energy efficiency in at least two ways: 1) sales of goods and services in the project to residents of Waianae, Central Oahu and Ewa would be closer than a similar project located in Primary Urban Center, representing reduced travel and gas savings; and 2) reduced travel will be experienced by employees residing in the area, compared to if they were to commute to the Primary Urban Center.

Section 24-1.5 General Principles and Controls for Parks, Recreation and Preservation Areas

1. Parks and Recreation Areas

Discussion: The proposed project will have a positive impact on Hans L'Orange Park by expanding the park to allow its improvement to a professional baseball-sized field, and provide passive park area, additional parking and any other improvements. The proposed heritage area and Filcom Center are expected to benefit the Waipahu Cultural Garden Park/Hawaii's Plantation Village by adding to the critical mass of historical- and/or cultural-related attractions in Waipahu.

2. Preservation Areas

Discussion: There are no Preservation areas designated within the area of application.

Section 24-1.9 Sequencing of Public Facilities

The primary function of the Development Plan Public Facilities Map is to plan for the sequencing of future public facilities and infrastructure. As previously described, roadway, utilities, and drainage improvements are planned for Waipahu on the Central Oahu Development Plan Public Facilities Map. All improvements intended to directly serve only the development will be provided by the applicant or its designee. All improvements will be constructed in accordance with all applicable subdivision and infrastructure design standards. Improvements to Waipahu Street are described in Section 5.0.

Section 24-1.10 Social Impact of Development

1. Social Impact Factors

Discussion: The potential social impacts that could result from the proposed project are expected to be generally positive. The compatibility of the proposed commercial, community facility and park project (and the jobs that they create) adjacent to existing commercial and in the vicinity of recreational land uses, will enhance the overall socio/economic condition of the community. As such, the viability of existing commercial, recreational and residential areas will be enhanced. This is especially critical considering the closure of the OSCo.

The following "social impact factors" identified by Section 24-1.10 are applicable as described below and are more fully discussed in Section 5.6 of this report:

a) *Demographic* - Development of the project will not directly increase residential population. New employment opportunities will be created by providing a more diverse economic base. Opportunities to live and work within the same community will be enhanced. This will strengthen the community's cultural foundation and stability. The designation of the project area as part of an enterprise zone (Resolution 95-92) will address inefficiencies in the location of workplaces relative to workers' residences and in commuting patterns. The character of the neighborhood (commercial and recreational), which was centered around industrial activities, will not be significantly altered.

b) *Economic* - The project area provides some revenue in the form of real property and general excise taxes. Along with the DP Land Use Map Amendment of the project area for commercial, community facility and park use, Resolution 95-92's designation of the subject property as an enterprise zone, will also help to increase economic activity in Waipahu, and elsewhere in the State.

c) *Housing* - Employment opportunities and income generation potential afforded by the project will make home ownership more attainable to those employed in the construction and operation of the project.

d) *Public Services* - Infrastructure improvements, such as for water, sewer and drainage will be paid for by the applicant or its designee. Usual and customary water and sewer fees will be paid for by various users within the project. There will be an occasional and unavoidable demand for public services such as police and fire protection, but it is anticipated that the increased public revenues that would be generated from the project will adequately cover these public sector expenditures.

e) *Physical/Environmental* - The requested DP Land Use Map amendment represents a reuse of highly urbanized lands, minimizing physical and environmental impacts on undeveloped areas.

7.3.4 Central Oahu DP Special Provisions

Section 24-5.1 Area Description

The Special Provisions of the Central Oahu Development Plan state that physical growth and development in the urban-fringe area of Oahu (including Central Oahu) should be managed such that, a) An undesirable spreading of development is prevented, and; b) the proportion of the island-wide resident population remains unchanged.

Further, the Special Provisions note that in Waipahu, *"most new residential development will occur in areas mauka of the H-1 Freeway while the area makai of the freeway can be characterized as a basically stable community with residential development occurring mauka of the Waipahu [Oahu] Sugar Mill".*

Discussion: The requested DP Land Use Map amendment is consistent with the latter description of Waipahu by helping to stabilize the community by providing job opportunities. By proposing development consistent with City's Special Area Plan, an undesirable spreading of development is prevented, reducing the demand for more commercial land in undeveloped rural or agricultural areas.

The proposed DP Land Use Map amendment will not have any effect on the proportion of the island-wide resident population.

Section 24-5.2 Urban Design Principles and Controls for Central Oahu

a. Specific Urban Design Considerations

1. Open Space

Discussion: The proposed project will not impact the open space values of the Koolau and Waianae mountain ranges, Kipapa Gulch, Waipio Peninsula, or the Wahiawa Reservoir. The visibility, preservation, enhancement and accessibility of open space areas, as defined in Section 24-1.4 of the Common Provisions, will not be negatively impacted by the proposed project.

2. Public Views

Discussion: Important public views that could be applicable to the proposed project as defined by the Special Provisions for Central Oahu are: Pearl Harbor from Farrington Highway across Waipahu High School, Waianae Mountains and the sea from Kunia Road, Waipahu Sugar Mill from Waipahu Depot Road, and view of the Waianae Mountains from the Waipahu Cultural Park. As noted previously, view planes of the Waianae Range and adjacent ridgelines from both outside and within the project boundaries will be retained. Views towards the project area from Waipahu Depot Road will not be significantly altered, and the mill stack will be retained.

3. *Height Controls*

Discussion: The height limits applicable to all proposed structures within the project area will be in compliance with the Special and Common Provisions of the Development Plan, and applicable provisions of the Land Use Ordinance once the appropriate zoning is in place. Except for the existing mill stack and as specified in Section 24-5.2 (3), the general height limits of buildings shall be a maximum of 60 feet in the Central Oahu Development Plan's Commercial district.

4. *Density Controls*

Discussion: The Central Oahu Development Plan has no density controls for commercial, and parks and recreation development. However, the Land Use Ordinance stipulates the maximum density within each Business (Commercial) district. This project will comply with these development standards, except where existing older buildings exceeded these standards prior to the adoption of the LUO and the earlier Comprehensive Zoning Code.

Section 24-5.3 Development Priorities

Discussion: Planning for the proposed project has been undertaken in consonance of the policies set forth in Section 24-1.9 of the Development Plan Common.Provisions. The Special Provisions of the Central Oahu Development Plan "provide for projects in the priority shown" below.

1. Public facilities improvements, i.e., wastewater management, transportation, and potable water.

2. Provision of affordable housing which conforms to the General Plan Distribution of Residential Population Table for Central Oahu.

3. Improvement of infrastructure to encourage redevelopment of Waipahu and Wahiawa.

While the above stated policies prioritize public sector development, the proposed project will have a direct and positive impact of encouraging redevelopment of Waipahu given the closure of OSCo.

Section 24-5.4 Land Use and Public Facilities Map

7.3.5 Central Oahu DP Land Use Map

Discussion: Described in **Section 1.b.** below.

7.3.6 Central Oahu DP Public Facilities Map

Discussion: The Central Oahu Development Plan Public Facilities Map (as shown in Figure 3-3) identifies roadway improvements to occur adjacent to the project area within the next six years (Waipahu Street widening). The applicant is proposing to bear the entire cost of improving Waipahu Street (less any amounts that various utility companies may be responsible for via Ordinance 2412) from the western portion of Hans L'Orange Park to the entrance of Hawaii's Plantation Village, so long as the City agrees to improve Waipahu Street to the east and west of this area as is currently needed for either capacity and/or safety reasons.

Although "road widening" is usually done evenly to both sides, the applicant has previously offered to provide sufficient land to allow the widening of Waipahu Street to be limited to the mauka side. Based on the above conditions, the applicant is also offering to bear the full cost of improvements even though, via Ordinance 2412, the applicant believes that it would only be required to pay for "half" the improvement cost (assuming the same amount of widening to both sides).

The applicant proposes to complete the Waipahu Street Improvements in three phases that will be coordinated with the onsite improvements. Phases 1A and 1B of the Waipahu Street widening would be completed in conjunction with the proposed Phase 1A and 1B industrial subdivision and would complete the applicant's obligations for those portions of Waipahu Street. Phase 2 of Waipahu Street is to remain a two-lane road, at least until the proposed commercial area is developed. This strategy is both consistent with the "roadway character" desired by the community and adequate on a traffic basis, based on the Traffic Impact Assessment Report prepared by Austin, Tsutsumi & Associates, Inc. When the proposed commercial area is developed, Phase 2 of Waipahu Street at the intersection of Road "X" will be improved along with any other required improvements within this section. The applicant has also proposed, in connection with the overall redevelopment of the site, to convey approximately 3 acres of land to the City for the expansion of the Hans L'Orange Park. Prior to any conveyance, the applicant will meet with the Department of Parks and Recreation and propose a land trade, the 3 acres of additional park land in return for the Department of Parks and Recreation agreeing to subdivide and convey to DTS any additional right of way from Hans L'Orange Park that may be required in order for DTS to improve Waipahu Street and/or Paiwa Street.

No significant public facility improvements, funded by the City or State, are required to implement the project.

b. Consistency with the Development Plan Land Use Map

Discussion: The project area is designated by the State Land Use Commission as "Urban" (Figure 3-4). The project area is currently designated "Industrial" and "Residential" on the Central Oahu DP Land Use Map (Figure 3-2). As such, the requested DP Land Use Map amendment application is

consistent with the State land use regulatory system and the Waipahu Town Plan, Special Area Plan (Figure 1-5), and is contiguous to existing DP Commercial- and Park-designated areas.

The availability of other residential lands in Central Oahu (and Ewa), indicate that the use of the property for residential purposes is not critical and that the proposed Commercial and Park land use designations are consistent with the Central Oahu Development Plan Land Use Map designations for the surrounding areas. This type of commercial development will support the existing and proposed residential development in Central Oahu and Ewa.

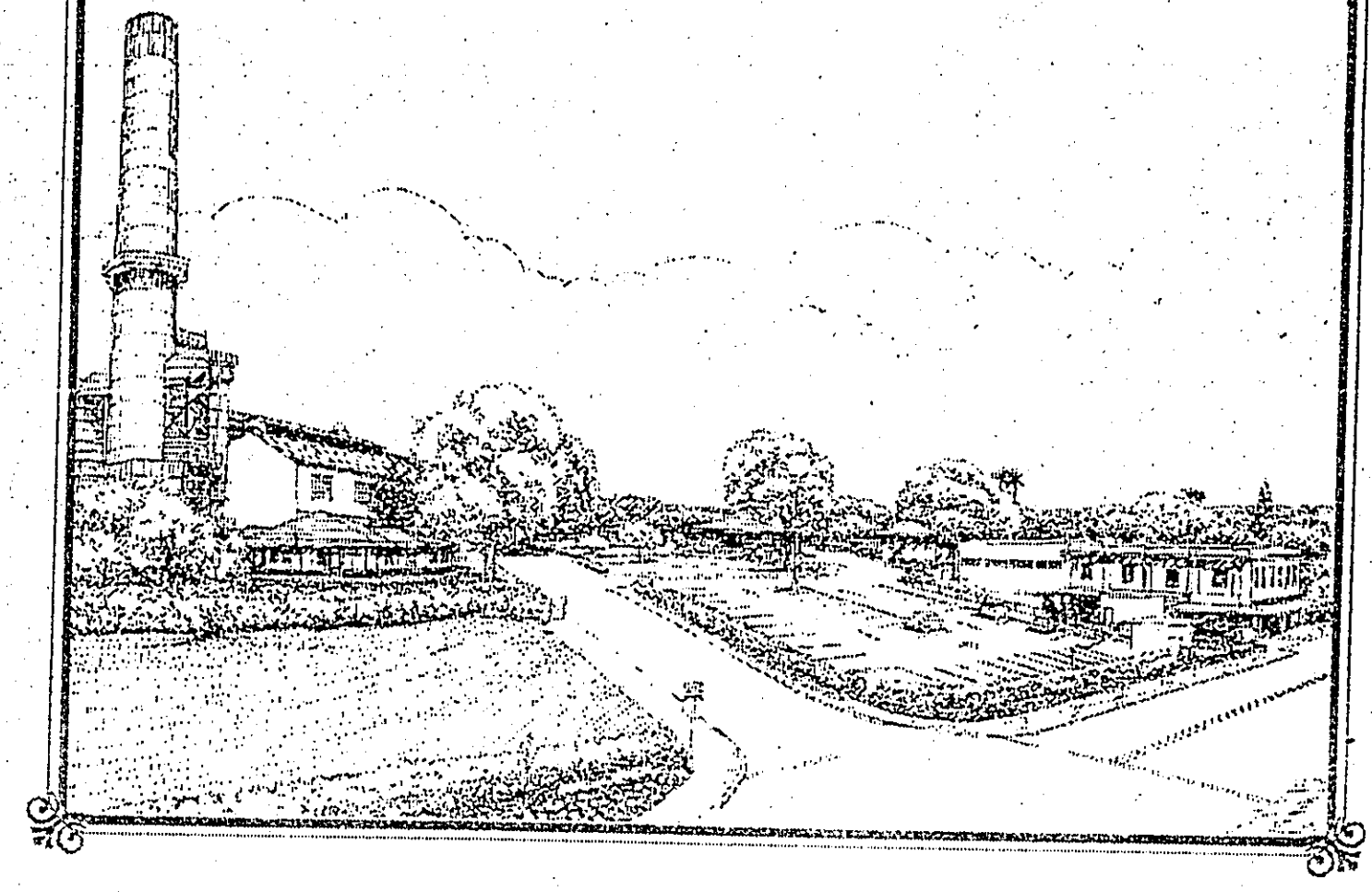
7.3.7 Waipahu Town Plan, Special Area Plan

The Waipahu Town Plan's description of the Preferred Plan (Figure 1-5) for the applicant's property states, *"This site housed Oahu Sugar Company's sugar mill operations. Selected existing structures on the mill site will be retained for future redevelopment of the site. The sugar mill site is designated to be redeveloped into three land uses -- light industrial, commercial, and community-oriented uses. The commercial and community-oriented uses would be located at the "Old Waipahu Town Anchor" site."*

The proposed project will be consistent with the Waipahu Town Plan's Preferred Plan for the applicant's property.

8.0

ALTERNATIVES TO THE PROPOSED ACTION



8.0 ALTERNATIVES TO THE PROPOSED ACTION

The City and County of Honolulu *General Plan* and *Development Plan Land Use Maps* establish policy and set parameters to guide land use and development. Special Area Plans, such as the recently completed and adopted *Waipahu Town Plan, A Special Area Plan of the Central Oahu Development Plan* (December 1995), further describes the City's directive in the DP process. The *Waipahu Town Plan* identifies three land uses for the Oahu Sugar mill site -- light industrial, commercial and community-oriented uses. The commercial and community-oriented uses would be located in the area designated by the City as the "Old Waipahu Town Anchor" site.

The proposed subject Commercial and Park project has been planned to be consistent with the City's *Special Area Plan*. The planning objectives which guided the preparation of the *Special Area Plan* and the proposed project are twofold: (1) Provide opportunities for economic revitalization which generate jobs and attract people to Waipahu while minimizing adverse impacts to existing businesses, and (2) provide land uses which are compatible with existing uses and which provide for community needs.

Hence, as we identify the alternatives to the proposed action, we are guided by the *Waipahu Town Plan,* and, in accordance with the provisions of *Title 11, Department of Health, Chapter 200, Environmental Impact Statement Rules*, Section 11-200-17(f), the "known feasible" alternatives to the proposed project, as described in this section of the EIS, are limited to those that would allow the objectives of the *Waipahu Special Area Plan* to be met.

8.1 Preferred Alternative - The Proposed Commercial and Park Project

The proposed Commercial and Park project on the Oahu Sugar mill site occupies a small area of the *Waipahu Special Area Plan* and is generally consistent with the guidelines set therein. The City, in developing the "Preferred Plan" for the *Waipahu Special Area Plan*, evaluated and analyzed potential land uses and economic activities on the basis of their market and economic feasibility studies, employment generated, and impacts on existing businesses and the community. Some of the activities were dismissed early in the planning process by the Planning Department due to either non-support by the community, eventual location of the activity elsewhere, potential adverse impact to existing businesses or the community, or lack of demand for the activity.

In the course of the planning process for the Waipahu Special Area Plan, alternative land use concept schemes were prepared which depicted a range of future scenarios for Waipahu. A total of five alternative land use schemes were formulated based on potential economic, recreational and social activities derived from the Waipahu Town Plan Task Force, the City Planning Department, economic consultant Decision Analysts Hawaii, Inc., the Waipahu 2000 Update Plan, the Waipahu Business Association, and the community. Each of the alternative schemes were comprised of various potential land uses depicting variations in the siting of these land uses with consideration

toward existing land uses. The economic development and market implications of the five alternative land use schemes were analyzed, a summary of which is included in the full Waipahu Special Area Plan Report. In formulating the five alternative schemes, considerations included: 1) the heritage aspect of Waipahu; 2) land uses that will bring people into Waipahu; and 3) various circulation systems.

Each of the three alternatives included the following land use elements, with variations in acreage:

- Retain the area in the vicinity of the smokestack to the clinic building as a cultural/heritage area. Potential uses could include development of a museum (to be operated by a non-profit organization, similar to Hawaii's Plantation Village) and an open market area. An area would also be designated for a community service-oriented Filipino Community Center.

- Redevelop the remainder of the sugar mill site for mixed-use commercial uses.

- Retain existing landscaped buffer along the sugar mill site adjacent to Waipahu Street.

- Expand Hans L'Orange Park to the vicinity of Makaaloha Street in order to extend the left field line, and to create more passive park area and an area for additional parking. The park expansion and improvements are proposed to accommodate play by the Hawaii Winter Baseball League.

The preferred alternative (the proposed project) would implement the *Special Area Plan* designation of Commercial and Park for the subject proposed project.

8.2 "No-Action" Alternative

The "no-action" alternative would not be consistent with stated governmental policies encouraging economic revitalization in Waipahu and would not create the overall positive economic impacts to the residents of the area, City and County and the State. New tax revenues would not be generated and the infrastructure improvements to be provided in support of the conceptual master plan would not be constructed by the developer.

This alternative would likely maintain the mill site as unimproved Industrial zoned land. The "no-action" alternative would keep the site as primarily vacant. Consequently, the overall negative impacts to the area, mostly economic, but including aesthetic, would also continue, as there would be no economic activity to support maintenance of the buildings.

The site would continue to be under-utilized in terms of implementing the project objectives of providing opportunities for economic revitalization and providing land uses for community enhancement. Therefore, this alternative was rejected.

The project site is currently designated Industrial and Residential on the Central Oahu DP Land Use Map and I-2 and R-5 on the zoning map. The area proposed for commercial use is located within the industrial districts (entirely within the Industrial district on the Central Oahu DP, almost entirely within I-2 District on the zoning map). If the proposed Central Oahu DP Land Use Map Amendment is not approved, and/or the Special Area Plan designation for the project site is not included in the Central Oahu DP Update, then the applicant will try to seek a buyer and/or user of the I-2 District zoning. The project site would be especially attractive to potential buyers/users since it is included in an Enterprise Zone (City Council Resolution 95-292). Industrial use would appear to minimize competition with existing business makai of Waipahu Street and along Waipahu Depot Road and would still provide opportunities for economic revitalization.

8.3 Alternatives related to different designs or details of the proposed actions which would present different environmental impacts

Industrial Mixed-Use (Industrial and Commercial) would appear to be a viable alternative to the proposed Commercial use that would present different environmental impacts. Because use of the area would include industrial, there may be more noise generated (during manufacturing). Traffic volumes should decrease (depending on the proportion of industrial area and commercial area), although morning peak hour traffic would be slightly higher (commercial businesses are open later). Water and sewer demands would be less for industrial mixed-use than commercial.

8.4 Actions of a significantly different nature which would provide similar benefits with different environmental impacts

There are no known actions significantly different to those discussed which would provide opportunities for economic revitalization and attract people to Waipahu. Residential development may provide construction jobs but little in the way of long-term operational employment. Major medical facilities are already built nearby (St. Francis Medical Center-West and Pali Momi) and most of the major hospitals are actually looking to develop smaller satellite clinics. A facility such as a federal detention center would likely not attract people to Waipahu.

8.5 The alternative of postponing action pending further study

Studies for the proposed Commercial and Park project have been completed, therefore the "alternative of postponing actions pending further study" is not relevant.

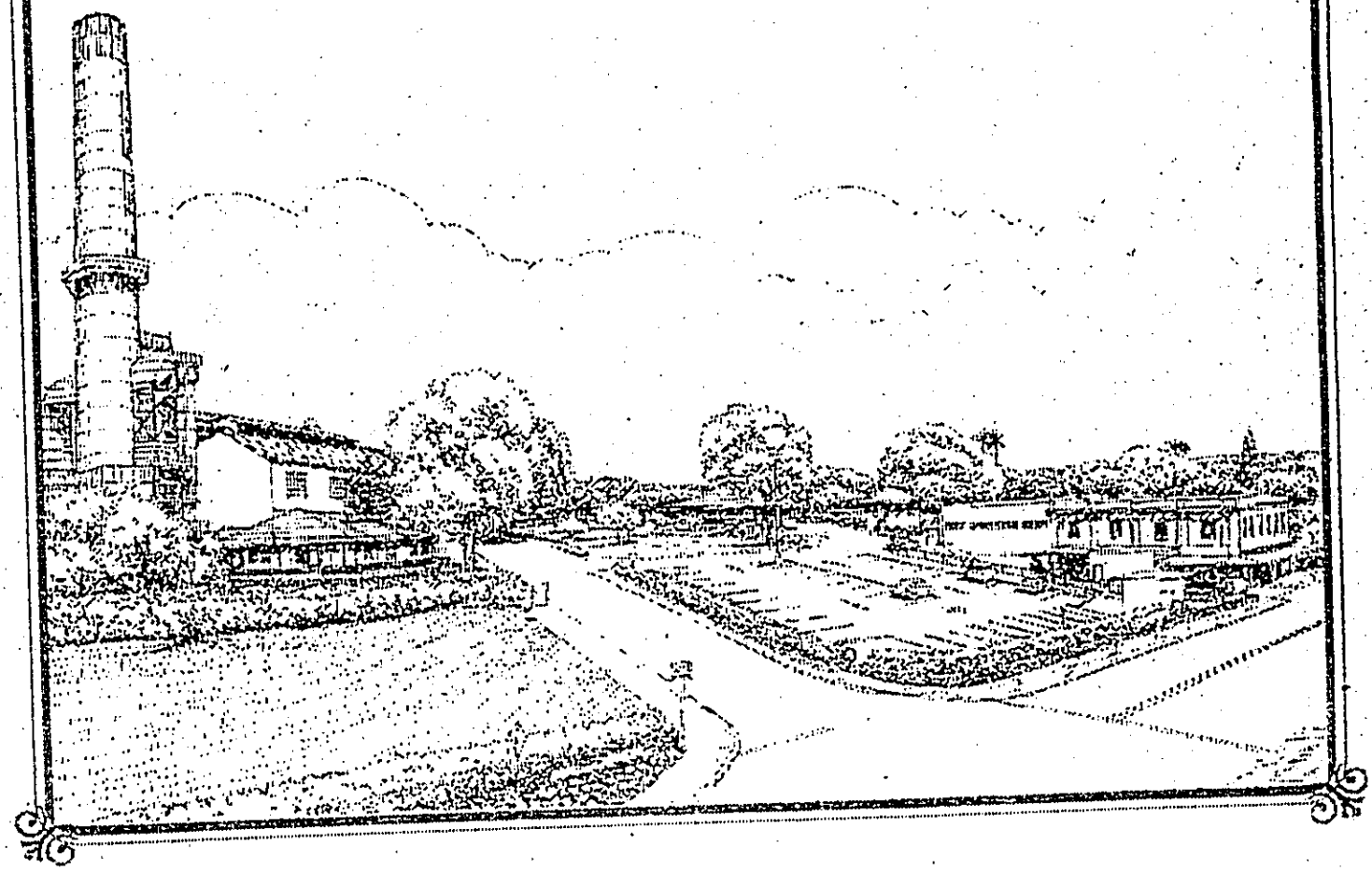
8.6 Alternative locations for the proposed project

With the closure of Oahu Sugar Company, other lands have been vacated and are potentially available for consideration for commercial and community-oriented uses. However, the purpose and intent of the proposed project could not be fulfilled at any other location but at the subject mill site. The purpose of revitalizing the economic core of Waipahu Town while maintaining the plantation

heritage theme forecloses all other locations.

9.0

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



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

Existing land uses associated with the Oahu Sugar mill site have been described in earlier sections of this report as sugar mill structures that are today largely vacant except for one office building which is still occupied by Oahu Sugar Company. The activities over the past century involved a significantly higher intensity industrial use. This is contrasted to the proposed lower intensity commercial and park uses.

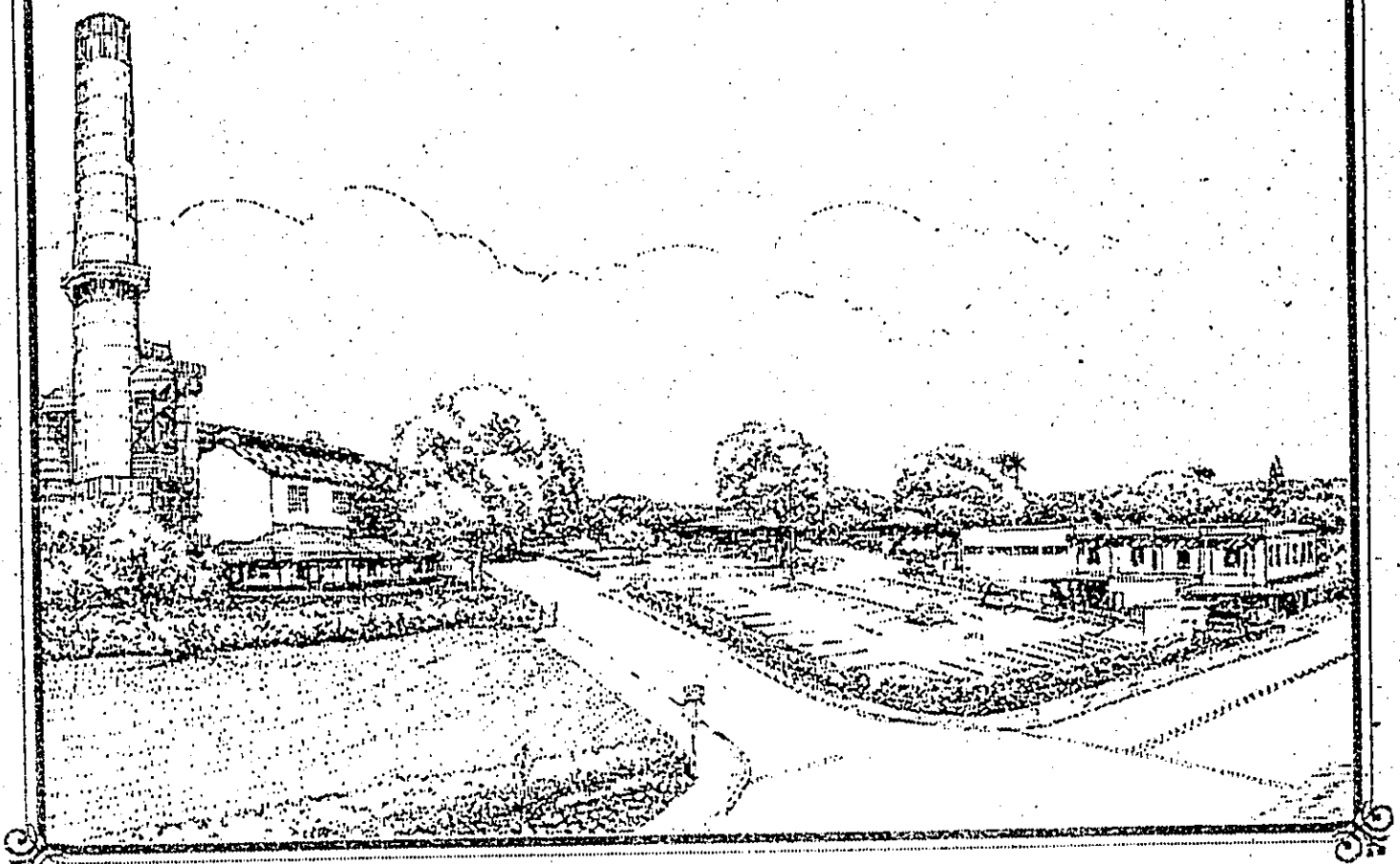
Development of the project would curtail the present short-term uses of the property temporarily. However, upon development of both the Industrial Subdivision and the Commercial and Park projects, the current temporary users of the property would have the opportunity to be relocated to permanent sites or facilities in the completed project.

In terms of trade-offs associated with long-term uses of the site, the proposed Commercial and Park development would curtail and foreclose other uses of the site. However, as previously discussed the proposed uses have been determined through a lengthy planning and visioning process which involved multiple parties including members of the community, Amfac and its representatives, and the City. Through those processes many options were evaluated for this site and consensus was reached in defining commercial, cultural and park uses as desirable for economic revitalization and plantation heritage preservation.

Other benefits include increased tax revenue to the State and City along with a greater number of employment opportunities. As discussed in the various sections of the Draft EIS, there would be no long-term adverse environmental impacts resulting from the development and mitigative measures are provided to ensure compatibility.

10.0

SUMMARY OF UNRESOLVED ISSUES



10.0 SUMMARY OF UNRESOLVED ISSUES

The preparation of the ~~Draft~~ EIS involved a comprehensive analyses of the technical, social, and economic aspects of the project and have identified several potentially unresolved issues of the project.

Amfac, as the master developer, intends to sub-contract, or sell in fee, portions of the property to second party developers. Marketing of the project will begin in earnest upon the receipt of the discretionary approvals for the project. While the desire for economic revitalization of the mill site has been well documented by members of the community and governmental agencies, formal marketing of the project has not yet begun, nor are specific commercial uses known at this time.

The Heritage Area which will include the restoration and reuse of the Smokestack, Laboratory building, and Generator Building are expected to be developed by a second party non-profit organization. Presently, Hawaii's Plantation Village is finalizing a business plan for the development of the 2.1 acre site into a possible sugar museum visitor attraction. This issue is expected to be resolved within a short period of time.

Amfac has an agreement-in-principle for the Leeward YMCA to acquire 2.1 acres of land which would include the Administrative and Human Resources Building pending subdivision and resolution of other details. Amfac has an agreement to convey approximately 2.0 acres of land to the FilCom Center organization pending subdivision and resolution of other details. Both issues are expected to be resolved shortly.

Implementation of the project will require a change of zone to appropriate zoning designations for the proposed uses. Amfac is currently working with the City to establish appropriate designations to allow the development of the project. It is expected that this issue will be resolved during the early period in 1997, although final approval of zoning cannot occur until the Central Oahu Development Plan Land Use Map designations for site are amended.

According to the last consultations with the City Department of Parks and Recreation (DPR), DPR is willing to accept dedication of land for the expansion of Hans L'Orange Park but will not be able to maintain the park due to current budget constraints. However, as in other parks elsewhere on Oahu, DPR is encouraging that a private party (or parties) start an "adopt-a-park" program for the maintenance of the park expansion. This possibility has been raised with the Waipahu 2000 Update Committee for their consideration, but other non-governmental parties may be interested in "adopting" the park expansion area.

According to the Board of Water Supply (BWS), the availability of water will be determined when the Building Permit applications are submitted to BWS for review and approval.

11.0

REFERENCES AND LIST OF PREPARERS

11.0 REFERENCES AND LIST OF PREPARERS

11.1 REFERENCES

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11.2 PREPARERS OF THE ENVIRONMENTAL IMPACT STATEMENT

This EIS has been prepared by PBR HAWAII, Pacific Tower, Suite 650, 1001, Bishop Street, Honolulu, Hawaii 96813. The staff involved in the preparation of this document included:

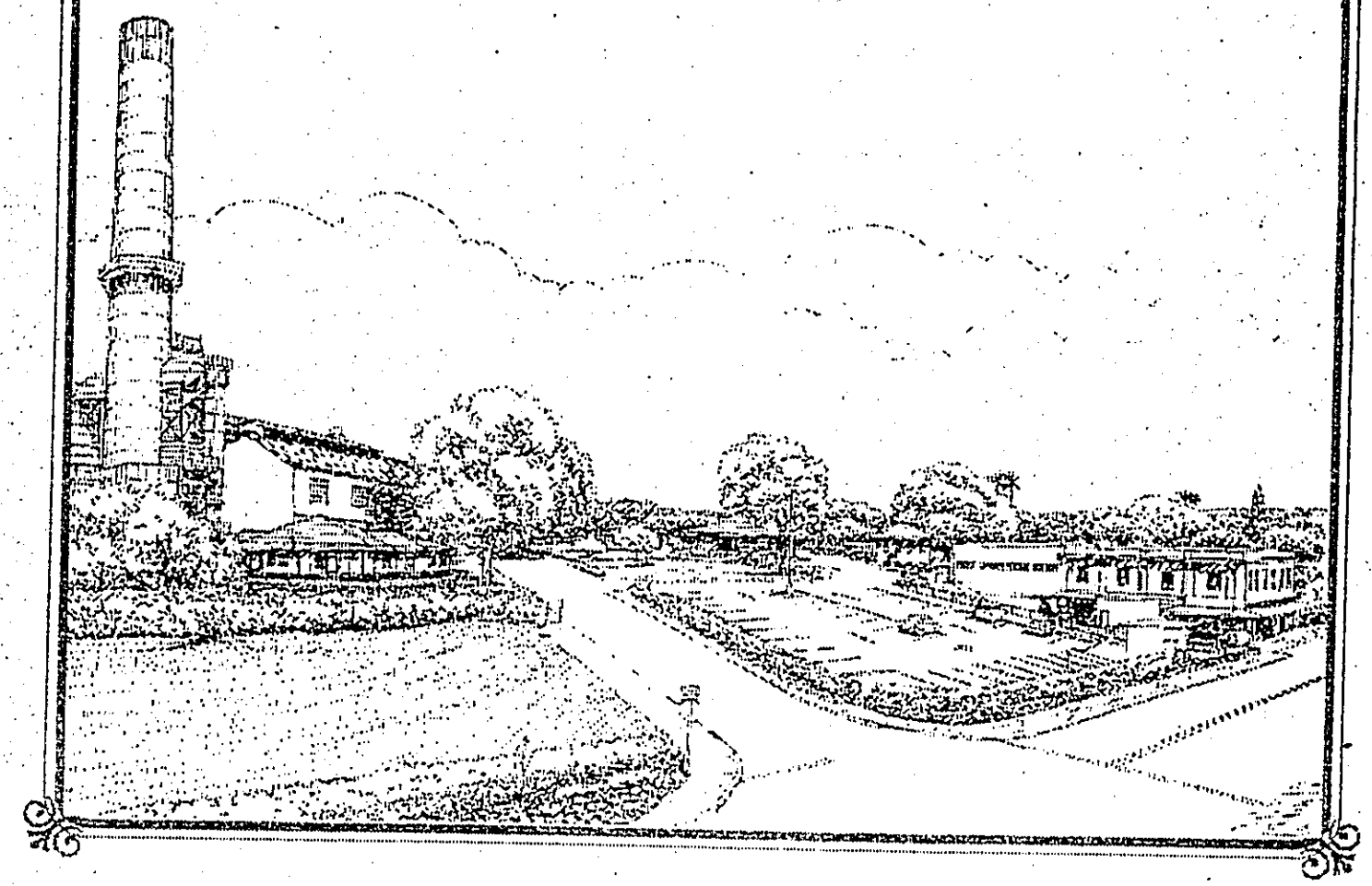
Wm. Frank Brandt	President
Vincent R. Shigekuni	Project Manager
Yukie Y. Ohashi	Project Planner
Toshiko Matsushita	Graphics
Nadine Matsunaga	Production
Dionne Self	Production

Several key technical consultants were employed to provide specific assessments of environmental factors for this project. These consultants, their company affiliation, and their specialty are listed below:

Bernard Kea, P.E.	Community Planning, Inc.	Civil Engineering
Ted Kawahigashi, P.E.	Austin, Tsutsumi & Associates	Traffic Engineering
Bob Cheung	Austin, Tsutsumi & Associates	Traffic Engineering
Yoichi Ebisu	Y. Ebisu and Associates	Noise Impact Assessment
Greg McCartney	Ogden Environmental	Air Quality Assessment
John Kirkpatrick, Ph.D.	SMS Marketing and Research	Social/Fiscal Impact Assessment
Paul Cleghorn, Ph.D.	Pacific Legacy, Incorporated	Archaeology Assessment
Spencer Leinweber	Spencer Mason Architects	Historical Architect
Kevin Kennedy	Brewer Environmental Services	Phase II EA

12.0

CONSULTED PARTIES AND PARTICIPANTS IN THE EIS PROCESS



12.0 CONSULTED PARTIES AND PARTICIPANTS IN THE EIS PROCESS

12.1 GOVERNMENT AGENCIES CONSULTED IN THE PREPARATION OF THE EIS

The following list includes governmental agencies contacted as part of the consultation process for the review of the Environmental Assessment/EISNOP.

CITY AND COUNTY OF HONOLULU
Board of Water Supply*
Building Department*
Department of Finance
Department of Housing and Community Development
Department of Human Resource
Department of Land Utilization
Department of Parks and Recreation
Department of Public Works*
Department of Transportation Services*
Department of Wastewater Management*
Fire Department*
Honolulu Public Transit Authority*
Planning Department*
Police Department*

STATE AGENCIES
Department of Agriculture
Department of Business, Economic Development, and Tourism
Department of Education
Department of Health
Department of Land and Natural Resources
Department of Land and Natural Resources
- Commission on Water Resource Management*
- State Historic Preservation Division

Department of Transportation*
Housing Finance & Development Corporation*
Oahu Metropolitan Planning Organization
Office of Environmental Quality Control*

* Identifies those who provided written comments
** Identifies those who provided verbal comments

STATE AGENCIES, CONT'D
Office of Planning
University of Hawaii Environmental Center
Waipahu Library

FEDERAL AGENCIES
U.S. Department of Agriculture, Natural Resources Conservation Service*
U.S. Army Corps of Engineers
U.S. Department of the Interior, U.S. Geological Survey*
Naval Base, Pearl Harbor
U.S. Department of the Interior, U.S. Fish and Wildlife Service**

PUBLIC UTILITIES
BHP Gas Company*
GTE Hawaiian Telephone Company*
Hawaiian Electric Company, Inc.*

* Identifies those who provided written comments
** Identifies those who provided verbal comments

12.2 INDIVIDUALS AND ORGANIZATIONS CONSULTED DURING THE EIS PREPARATION PROCESS

INDIVIDUALS / ORGANIZATIONS
Zen Abe, Friends of Hans L'Orange Park
Ephraim Amodo Sr., United Church of Christ
C.O. Andy Anderson, Waipahu 2000 Update Committee
Wayne E. Anderson, Ph.D., City of Refuge Christian Church
Bill Elston, Waipahu Improvement Association
Irene R. Elston, Waipahu Neighborhood Improvement Association
Eddie Flores, Jr., Filipino Community Center
Mac Flores, Waipahu Jackrabbits
James Fujisaki, Waipahu Business Association
James Gomes, St. Joseph's Church
Joe Hamada, Friends of Hans L'Orange Park
Cookie Harris, Councilwoman Rene Mansho
Kelani Lessary, Waipahu Neighborhood Board
Ruth Lum, Waipahu Neighborhood Boar
Ed Marcus, Representative Nestor Garcia
Sanford Murata, Historic Hawaii Foundation
Ron Nakatsu, Waipahu Hongwanji Mission
Rich Nono, Councilman Mufi Hannemann

INDIVIDUALS / ORGANIZATIONS, CONT'D
Rodolpho Ramos, ILWU
Bobby Stivers, Leeward YMCA
Crawford Sullivan, Waipahu Community Association
Tom Tanji, Leeward Oahu Lions Club
Annette Yamaguchi, Waipahu Neighborhood Board No. 22

ELECTED OFFICIALS
City Councilmember Rene Mansho
City Councilmember John DeSoto
City Councilmember Mufi Hannemann
State Representative Nestor Garcia
State Representative Roy Takumi
State Senator Cal Kawamoto

12.3 INDIVIDUALS AND ORGANIZATIONS CONSULTED DURING THE MASTER PLAN PREPARATION PROCESS

The following agencies and organizations have reviewed the entire master plan for the applicant's property in Waipahu, including the proposed industrial, commercial, community and park uses.

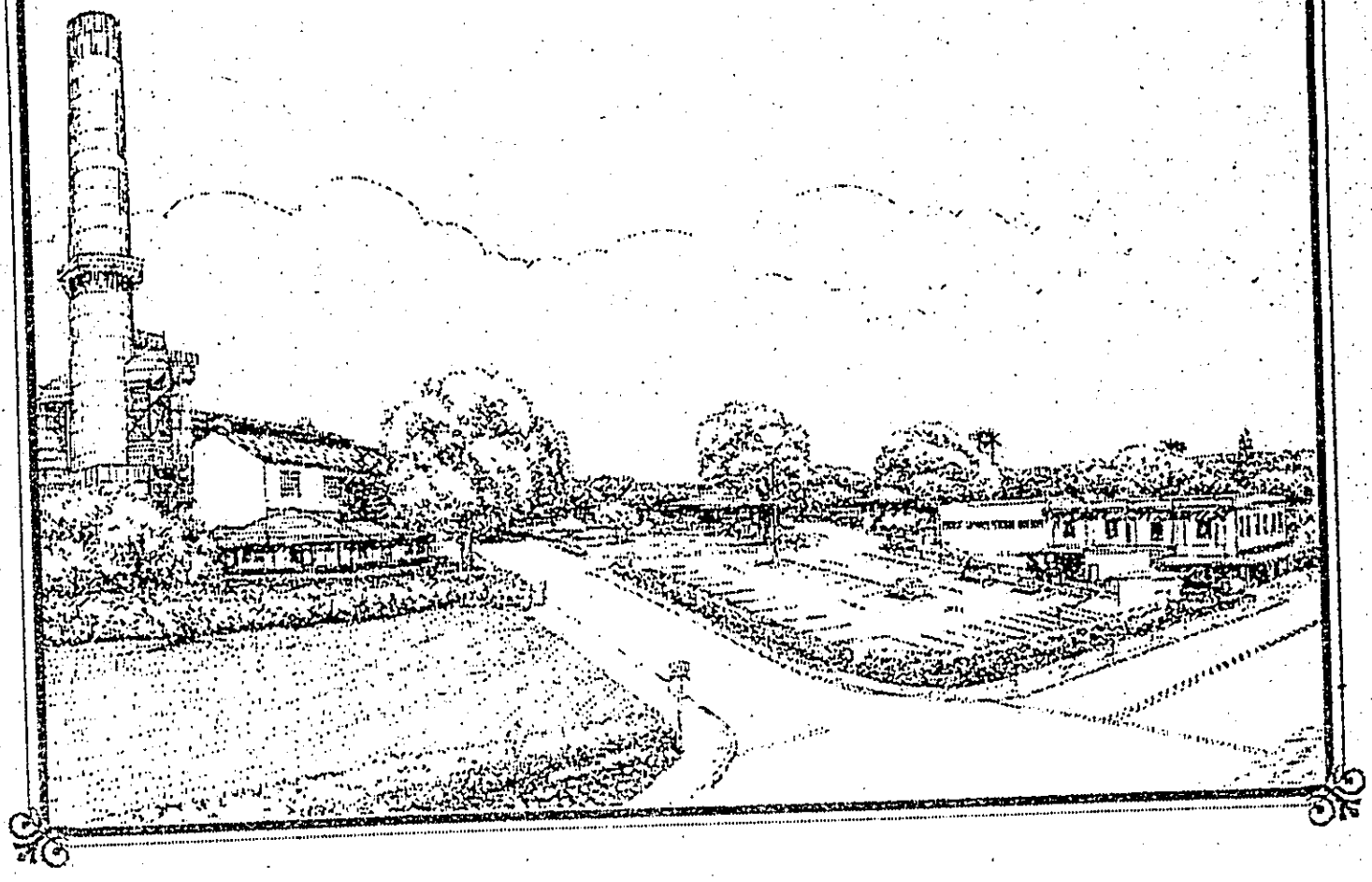
CITY AND COUNTY OF HONOLULU
Board of Water Supply
Department of Housing and Community Development
Department of Parks and Recreation
Planning Department
Department of Public Works
Department of Transportation Services
Waipahu Neighborhood Board
Department of Wastewater Management

STATE AGENCIES
Department of Transportation

ORGANIZATIONS
Filipino Community Center
Friends of Hans L'Orange Park
Hawaii's Plantation Village
Leeward YMCA
Waipahu Business Association
Waipahu Special Area Plan Task Force
Waipahu 2000 Update Committee

13.0

COMMENTS AND RESPONSES TO THE EISNOP



13.0 COMMENTS AND RESPONSES TO THE EISNOP

The public comment period as required by Chapter 343, HRS, on the Environmental Impact Statement Notice of Preparation for the Amfac Commercial and Park project resulted in the following responses from governmental agencies. The agency letters and responses prepared by the planning consultant are included in this section.

13.1 AGENCIES THAT RESPONDED TO THE EISNOP

CITY AND COUNTY OF HONOLULU
Board of Water Supply
Building Department
Department of Public Works
Department of Transportation Services
Department of Wastewater Management
Fire Department
Honolulu Public Transit Authority
Planning Department
Police Department

STATE AGENCIES
Department of Budget and Finance, Housing Finance and Development Corporation
Department of Land and Natural Resources, Commission on Water Resource Management
Department of Transportation
Office of Environmental Quality Control

FEDERAL AGENCIES
US Department of the Interior, US Geological Survey, Water Resources Division
US Department of Agriculture, Natural Resources Conservation Service

COMMUNITY ORGANIZATIONS AND INDIVIDUALS
BHP Gas Company
GTE Hawaiian Tel

13.2 EISNOP COMMENT LETTERS AND THE APPLICANT'S RESPONSES

Responses to the comment letters have been prepared by PBR HAWAII on behalf of Amfac. The letters are attached.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

December 10, 1996

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

ATTN: LIN WONG

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

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR THE AMFAC COMMERCIAL AND PARK PROJECT, WAIPAHU, OAHU, TMK: 9-4-02: PORTION 04

Thank you for the opportunity to review and comment on the Environmental Impact Statement Preparation Notice for the subject project.

We have the following comments to offer:

1. The proposed development is required to obtain a water allocation from AMFAC.
2. The proposed development conforms to the approved Oahu Sugar Mill Water Master Plan.
3. The developer will be required to install the necessary on-site water system improvements to serve the proposed development.
4. The availability of water will be determined when the Building Permit Applications are submitted for our review and approval. If water is made available, the applicant will be required to pay our Water System Facilities Charges for transmission and daily storage.
5. The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

6. There is an existing one-inch domestic water meter currently serving the project site.
7. If a three-inch or larger water meter is required, the construction drawings showing the installation of the meter should be submitted for our review and approval.
8. Board of Water Supply approved Reduced Pressure Principle Backflow Prevention Assemblies are required to be installed immediately after all water meters serving the project site.

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

cc: Office of Environmental Quality Control
PBR Hawaii

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

December 18, 1996

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

Dear Mr. Sato:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. We have reviewed your letter of December 10, 1996 and offer the following responses:

1. The applicant Oahu Sugar Company (OSCo) is an affiliate company of Amfac. Amfac has agreed to allocate the required amount of water to OSCo.

2. We appreciate the information provided that the proposed development conforms to the approved Oahu Sugar Mill Water Master Plan. This information will be included in the Draft EIS.

3. Amfac understands that it will be required to install the necessary on-site water system improvements to serve the proposed development. This will be stated in the Draft EIS.

4. Amfac also understands that the availability of water will be determined when the Building Permit applications are submitted to the Board of Water Supply (BWS) for review and approval. If water is made available, Amfac acknowledges that it or its subdevelopers will be required to pay BWS Facilities Charges for transmission and daily storage. This information will be included in the Draft EIS.

5. Amfac or its consulting civil engineer will coordinate on-site fire protection requirements with the Fire Prevention Bureau of the Honolulu Fire Department. This will be stated in the Draft EIS.

W Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y.J. Chung

PACIFIC TOWER, SUITE 650 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5631 FAX: (808) 523-1402
MAUI OFFICE 1108 KAAHUMANU CENTER 305 A'APUNI STREET, SUITE 300 HILO, HAWAII 96720 TELEPHONE: (808) 961-3333 FAX: (808) 961-0409

6. We appreciate the information provided on the water meter currently serving the project site. If a three-inch or larger water meter will be required for the proposed project, then construction drawings showing the installation of the meter will be submitted to BWS for its review and approval.

7. Amfac understands that BWS-approved Reduced Pressure Principle Backflow Prevention Assemblies are required to be installed immediately after all water meters serving the project site.

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac
Bernard Kea, Community Planning, Inc.

1032.13bb-18 w61

DEC-12-96 THU 11:24 PLANNING DEPT C&C P.06/06

12/96-2476

BUILDING DEPARTMENT

CITY AND COUNTY OF HONOLULU

HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET, 2ND FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 523-4366 • FAX: (808) 523-4347

PB 96-717

December 5, 1996

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

FROM: RANDALL K. FUJIKI
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: AMFAC COMMERCIAL AND PARK PROJECT, WAIPAHU, OAHU
ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION
(EISNOP), TMK: 9-4-02:04 (POR.)

This is in response to a request by PBR HAWAII to review and comment on the subject document.

We have a comment regarding the construction of the Waikele Fire Station as referenced on page 37 of the subject EISNOP. We antioipate construction to begin in 1997 and be completed in 1998.

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

Should there be any questions, please have your staff contact Douglas Collinson at local 6375.

RANDALL K. FUJIKI
Director and Building Superintendent

cc: G. Tamashiro
PBR HAWAII (V. Shigekuni)

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

December 11, 1996

Mr. Randall K. Fujiki
Director and Building Superintendent
Building Department
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Fujiki:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. We appreciate the information provided on the construction schedule for the Waikele Fire Station and will include it in the Draft EIS. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\M-8.w61

W Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y.J. Chung
PACIFIC TOWER, SUITE 650 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521 5631 FAX: (808) 523 1402
BRANCH OFFICE: HILO LAGOON CENTER 101 AUPUNI STREET, SUITE 330 HILO, HAWAII 96720 TELEPHONE: (808) 961 3333 FAX: (808) 961 6999

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

2

JEREMY HARRIS
MAYOR

KENNETH E. SPRAGUE
DIRECTOR AND CHIEF ENGINEER

DARWIN J. HAMAMOTO
DEPUTY DIRECTOR

ENV 96-282

November 21, 1996

MEMORANDUM:

TO: CHERYL SOON, CHIEF PLANNING OFFICER
DEPARTMENT OF PLANNING

ATTN: LIN WONG

FROM: for KENNETH E. SPRAGUE
DIRECTOR AND CHIEF ENGINEER

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION (EISNOP) - AMFAC COMMERCIAL AND PARK
TMK: 9-4-02: POR. 4

We have reviewed the subject EISNOP and have no comments to offer at this time.

Should you have any questions, please contact Alex Ho, Environmental Engineer, at Local 4150.

cc: PBR Hawaii

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

November 22, 1996

Mr. Kenneth E. Sprague
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Sprague:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. If you have any comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.17M-8.w61

W. Frank Brandt • Thomas S. Witten • R. Scott Duncan • Russell Y.J. Chung
PACIFIC TOWER, SUITE 650 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5631 FAX: (808) 523-1402
BRANCH OFFICE: HILO LAGOON CENTER 101 AUPUNI STREET, SUITE 310 HILO, HAWAII 96720 TELEPHONE: (808) 961-3133 FAX: (808) 961-8099

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

PACIFIC PARK PLAZA
711 KAPIOLANI BOULEVARD SUITE 1200
HONOLULU HAWAII 96813

JEREMY HARRIS
MAYOR

CHARLES O SWANSON
DIRECTOR

10/96-05115R

December 9, 1996

MEMORANDUM

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

ATTN: LIN WONG

FROM: CHARLES O. SWANSON, DIRECTOR

SUBJECT: AMFAC COMMERCIAL AND PARK PROJECT

In response to the October 29, 1996 letter from PBR HAWAII, the Environmental Impact Statement Notice of Preparation for the subject project was reviewed. The following comments are provided for your use:

1. A detailed phasing plan of the proposed transportation improvements should be provided to this department for review and approval. The plan should include the schematic intersection design, including lengths of left and right turn lanes, as required.

2. Road widening setbacks exist along the project's frontage on Waipahu Street. Full frontage improvements should be provided with respect to the new property line.

3. Traffic signals should be installed by the developer at all intersections, where warranted. In anticipation of signalization, pullboxes, underground conduits, and traffic signal interties should be provided at all locations where the potential for warrants exist.

4. Construction plans for roadways which are intended for dedication to the City should be submitted to this department for review and approval.

We look forward to reviewing the draft environmental impact statement. To facilitate our review, we request that two copies of the document be provided to this department.

Should you have any questions regarding these comments, please contact Faith Miyamoto of the Transportation System Planning Division at Local 6976.

for CHARLES O. SWANSON

cc: Mr. Vincent Shigekuni, PBR HAWAII

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

December 20, 1996

Mr. Charles O. Swanson, Director
Department of Transportation Services
City and County of Honolulu
Pacific Park Plaza
711 Kapiolani Boulevard, Suite 1200
Honolulu, Hawaii 96813

Dear Mr. Swanson:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. We have reviewed your letter of December 9, 1996 and provide the following responses:

1. The applicant, Amfac, will provide a detailed phasing plan of the proposed transportation improvements for your Department's review and approval. The plan will include schematic intersection design, including lengths of left and right turn lanes, as required.

2. Amfac is proposing, subject to certain conditions, to provide full frontage improvements along Waipahu Street, as shown on the detailed plan for the improvements along Waipahu Street (submitted to your Department on October 2, 1996), (less any amounts that various utility companies may be responsible for via Ordinance 2412) from the western portion of Hans L'Orange Park to approximately 300 feet west of Depot Road as part of the previously approved light industrial subdivision. From the end of these improvements to the entrance of Hawaii's Plantation Village, Amfac has proposed to leave Waipahu Street a two-lane road which is consistent with the recommendation in Austin Tsutsumi & Associates, Inc.'s (ATA) Traffic Impact Analysis Report (TIAR).

3. As noted in its letter to your Department dated July 31, 1996, Amfac will install traffic signal systems where warranted as the result of its development. According to ATA's TIAR, this would be at the following intersections:

a. Mokuola Street and Waipahu Street*;

b. Road "Y" and Paiwa Street (as per the City's Special Area Plan, this entails the relocation of the existing signal at the Paiwa Street/Paiwa Place intersection)*; and

c. Road "X" and Waipahu Street.

Amfac will also provide pullboxes and underground conduits for future traffic signal systems at all locations where the potential for warrants exist as a result of its proposed development. According to ATA's TIAR, this would be at the following intersections:

a. Road "X" and the proposed Mokuola Street Extension*; and

b. Road "Y" and the proposed Mokuola Street Extension*.

(*To be done as part of the previously approved light industrial subdivision.)

4. As also noted in Amfac's letter to your Department dated July 31, 1996, construction plans for roadways which are intended for dedication to the City will be submitted to your Department for review and approval. Preliminary plans for a portion of the roads to be dedicated (as part of the light industrial subdivision) are included in the Applicant's current subdivision application.

5. As requested, two copies of the Draft EIS will provided to your Department to facilitate its timely review.

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac
Bernard Kea, Community Planning, Inc.
Ted Kawahigashi, Austin Tsutsumi & Associates, Inc.

1012.13\14-14.wd

DEPARTMENT OF WASTEWATER MANAGEMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 3RD FLOOR • HONOLULU, HAWAII 96813
PHONE (808) 527-6663 • FAX (808) 527-6678

JEREMY HARRIS
MAYOR

FELIX B. LIMTIACO, P.E.
DIRECTOR

CHERYL K. OKUMA-SEPE, ESQ.
DEPUTY DIRECTOR

In reply refer to:
WCC 96-126

November 19, 1996

NOV 20

MEMORANDUM

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

ATTN: MS. LIN F. WONG

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

SUBJECT: APPLICATION FOR DEVELOPMENT PLAN AMENDMENT AND EIS NOTICE OF PREPARATION (OCTOBER 1996)
AMFAC COMMERCIAL AND PARK
TMK: 9-4-02:04 (POR.)

The Oahu Sugar Company Property Sewer Master Plan with revised sheets 1, 4 and 5 submitted on July 17, 1996, was approved on September 24, 1996. However, as indicated in the sewer master plan, the developer will provide an interconnection between the existing 24-inch sewer line and the 36-inch sewer Mililani Effluent Sewer Line in Waipahu Depot Road to bypass the inadequate 30-inch sewer line section. Additionally, connections to the Waipahu Wastewater Pump Station (WWPS) are being done on a case by case basis until a final determination is made as to the capacity of the Waipahu WWPS. A Sewer Connection Application form was submitted to this department for the entire development. However, because of the limited capacity at the Waipahu WWPS, we requested that the use of each parcel be provided. Our subsequent review of the Sewer Connection Application form is pending receipt of this information.

If you have any questions, please contact Ms. Tessa Yuen of the Service Control Branch at 523-4956.

CHERYL K. OKUMA-SEPE
for FELIX B. LIMTIACO
Director

cc: Vincent Shigekuni, PBR HAWAII

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

December 23, 1996

Mr. Felix B. Limtiaco
Director
Department of Wastewater Management
City and County of Honolulu
650 South King Street, 3rd Floor
Honolulu, Hawaii 96813

Dear Mr. Limtiaco:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. We appreciate the information provided. Subsequent to your letter dated November 19, 1996, the applicant provided information regarding the proposed uses, as requested, and received the approved Sewer Connection Application by letter dated November 26, 1996. Although the Oahu Sugar Company Property Sewer Master Plan, as approved on September 24, 1996, projected an average daily flow of 0.46 million gallons per day (mgd) from the entire site, only 0.2 mgd was approved. We are discussing the reasons for this difference with your staff and may submit a sewer connection application in the future for the additional 0.26 mgd, or portion thereof, as needed. If you have further any comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Bernard Kea, Community Planning, Inc.

1032.13bl-6 w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y.J. Chung
PACIFIC TOWER, SUITE 650 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5631 FAX: (808) 523-1402
BRANCH OFFICE: 101B1 LAGOON CENTER 101 AUTUMN STREET, SUITE 300 HILO, HAWAII 96720 TELEPHONE: (808) 961-3333 FAX: (808) 961-8811

FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

3375 KOAPAKA STREET, SUITE H425
HONOLULU, HAWAII 96819-1869

JEREMY HARRIS
MAYOR

ANTHONY J. LOPEZ, JR.
FIRE CHIEF

ATTHUR K. LEONARD
FIRE DEPUTY CHIEF

November 18, 1996

TO: CHERYL SOON, CHIEF PLANNING OFFICER
PLANNING DEPARTMENT

ATTN: LIN WONG
PLANNING DEPARTMENT

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

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION
AMFAC COMMERCIAL AND PARK
WAIPAHU, OAHU, HAWAII
TMK 9-4-02: 04 [por.]

The Honolulu Fire Department has reviewed the Environmental Impact Statement Notice of Preparation for the above-described project and would like to offer the following statistical data for your review:

SECTION 6.0 SOCIO-ECONOMIC IMPACTS

Para. 6.4.9 Fire
(Page 36)

The average annual number of alarms for the Waipahu Fire Station is 773.

The number of alarms for the Waipahu Fire Station during New Years 1993 (three-day period: 12/31/92 - 01/02/93) was 9.

The total number of alarms for the island of Oahu during New Years 1993 (three-day period: 12/31/92 - 01/02/93) was 180.

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

Sincerely,

ANTHONY J. LOPEZ, JR.
Fire Chief

AJL/MPN:ay

cc: Vincent Shigekuni, PBR Hawaii (with attachment)

Environmental Impact Statement Notice to Preparation booklet returned to Planning

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

November 22, 1996

Mr. Anthony J. Lopez, Jr.
Fire Chief
Fire Department
City and County of Honolulu
3375 Koapaka Street, Suite H425
Honolulu, Hawaii 96819-1869.

Dear Mr. Lopez:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. We appreciate the information provided and will include it in the Draft EIS. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.1364-9.n61

W. Frank Brandt • Thomas S. Witte • R. Stan Duncan • Russell Y. J. Chung

PACIFIC TOWER, SUITE 660 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5631 FAX: (808) 523-1402
BRANCH OFFICE: HILO LAGOON CENTER 101 AUPUNI STREET, SUITE 206 HILO, HAWAII 96720 TELEPHONE: (808) 961-3333 FAX: (808) 961-8399

HONOLULU PUBLIC TRANSIT AUTHORITY
CITY AND COUNTY OF HONOLULU
PACIFIC PARK PLAZA, SUITE 270
711 KAPIOLANI BOULEVARD • HONOLULU, HAWAII 96813
PHONE: (808) 527-6950 • FAX: (808) 596-2380

JEREMY HARRIS
MAYOR

BOARD OF DIRECTORS
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CHAIRMAN
DOROTHY T. BUNDA
VICE-CHAIR
ANNIE O. CORPUZ
RUSSELL W. MITAKE
CHARLES O. SWANSON
HELEN D. WARNER, ED. D.

December 9, 1996

MEMORANDUM

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

FROM: HOWARD K. TAKARA, EXECUTIVE DIRECTOR

SUBJECT: AMFAC COMMERCIAL AND PARK

We have reviewed the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project located in Waipahu, Oahu (TMK 9-4-02:04 [por.]) and have the following comments:

TheBus Route 47 Waipahu - Waikiki traverses Waipahu Street fronting the proposed project. There are six bus stops in the project area, three in the eastbound direction and three in the westbound direction. (See attached map).

Since Waipahu Street fronting the project will be widened, it is expected that bus stops along Waipahu Street will be relocated. Bus stops should remain proximal to their current location, and any new and or refurbish bus stop must meet the requirements of the Americans with Disabilities Act. Please contact our Facilities and Equipment Branch for design specifications.

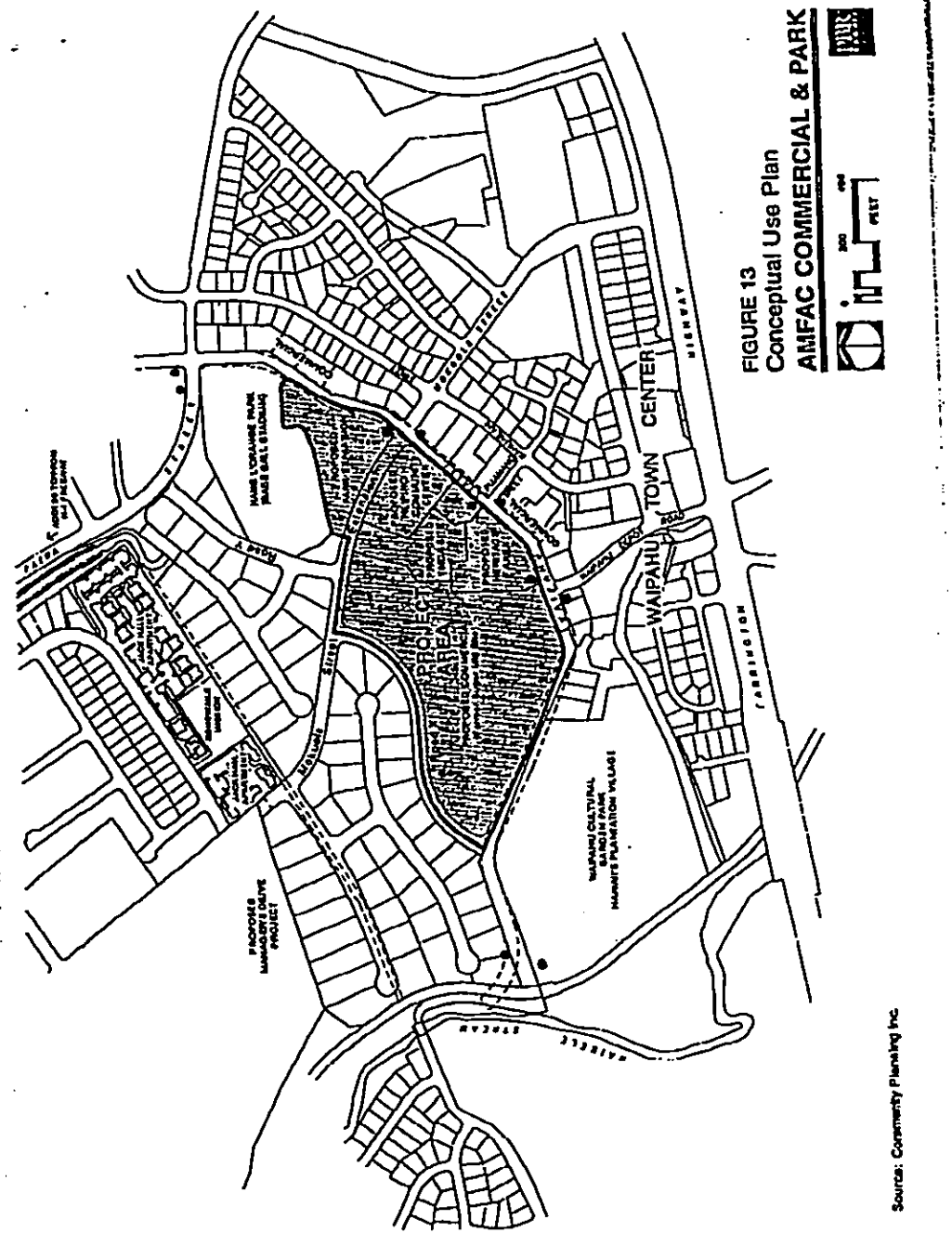
Thank you for the opportunity to review and comment on this most interesting EISNOP. If you have any questions, please call James Burke at 4445.

Howard K. Takara
HOWARD K. TAKARA

Attachment

Post-it™ brand fax transmittal memo 7671 | # of pages > 2

To PBR Hawaii	From James Burke
Co. V. Shigekuni	Co. HPTA
Dept.	Phone # 523-4445



PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

December 18, 1996

Mr. Howard K. Takara, Executive Director
Honolulu Public Transit Authority
City and County of Honolulu
Pacific Park Plaza, Suite 275
711 Kapiolani Boulevard
Honolulu, Hawaii 96813

Dear Mr. Takara:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. We provide the following responses to your comments:

1. We appreciate the information provided on current bus service to the project site; it will be included in the Draft EIS.

2. We also appreciate the information on the relocation of bus stops (if required). At the appropriate stage in the design of the widening of Waipahu Street, the appropriate parties will contact your Facilities and Equipment Branch for design specifications.

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac
Bernard Kea, Community Planning, Inc.

1032.13\61-11.wGI

W Frank Brandt • Thomas S. Watson • R. Stan Duncan • Russell Y.J. Chung

PACIFIC TOWER, SUITE 650 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5631 FAX: (808) 523-1402
BRANCH OFFICE: HILO SQUARE CENTER 100 ALPUNI STREET, SUITE 208 HILO, HAWAII 96720 TELEPHONE: (808) 961-3333 FAX: (808) 961-0999

PLANNING DEPARTMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET 8TH FLOOR • HONOLULU HAWAII 96813-3017
PHONE (808) 523-4701 • FAX (808) 523-4950

JEREMY HARRIS
MAYOR

CHERYL D. SOON
CHIEF PLANNING OFFICER

CAROLL TAKAHASHI
DEPUTY CHIEF PLANNING OFFICER

16

LW

December 11, 1996

Mr. Vincent R. Shigekuni
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Shigekuni:

Environmental Impact Statement Notice of Preparation (EISNOP)
Amfac Commercial and Park Project, 9-4-2:4 (por), 97/CO-1

We have reviewed the subject EISNOP and note that the proposal is consistent with the recommendations of the Waipahu Special Area Plan (WSAP) for the subject site. We would like to offer the following comments:

1. The Waipahu Special Area Plan (WSAP) proposes a relatively equal distribution of acreage between the commercial and community-oriented uses for the 20-acre "Old Waipahu Town Anchor" site. The applicant proposes 13.7 acres for the commercial area and 6.6 acres for community facilities. In the Draft Environmental Impact Statement (DEIS), please document your discussion with the affected community organizations and their comments on or concurrence with the proposed allocation of land at the site.

2. Please provide additional information on potential commercial uses in the DEIS. As the WSAP discourages inclusion of "big box" stores for the commercial area to minimize adverse impact to existing businesses, please clarify what is meant by the "large discount specialty store" proposed in the EISNOP as a potential use.

3. The DEIS should provide a proposed development schedule for the subject site, including information on how it would interface with the Phase I light industrial use proposed for the adjacent site.

4. The DEIS should indicate any landscaping and open space provisions intended for the site.

5. The Traffic Impact Assessment Report referenced in the EISNOP should be included in the DEIS. It should include additional information on the phasing of the proposed improvements along Waipahu Street and status of discussions with Department of Transportation, Department of Transportation Services and Department of Public Works regarding the proposed improvements.

6. The DEIS should include the Phase II environmental assessments referenced in the EISNOP. The DEIS should address concerns about existing soil and potential ground or surface contamination due to history of heavy industrial use on site. It should include a discussion of clean-up activities on site and concurrence from Department of Health that public health issues are being addressed.

Should you have any questions, please contact Lin Wong of our staff at 523-4485.

Sincerely,

CHERYL D. SOON
Chief Planning Officer

CDS:ft

cc: Timothy E. Johns, Amfac/JMB Hawaii, Inc.

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

December 21, 1996

Ms. Cheryl D. Soon
Chief Planning Officer
Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Ms. Soon:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project and your letter of December 11, 1996, which notes that the proposal is consistent with the recommendations of the Waipahu Special Area Plan (WSAP) for the subject site. We have reviewed your letter and offer the following responses:

1. The Draft Environmental Impact Statement (DEIS) will address the proposed allocation of land at the site and our discussions with the affected community organizations. Briefly, we believe the proposed allocation is consistent with the overall intent of the WSAP's proposed relatively equal distribution of acreage between the commercial and community-oriented uses. Based on more detailed information available from recently prepared subdivision maps, the entire approximately 25.4 acre core area makai of the light industrial subdivision is proposed to be roughly allocated as follows:

   - a "commercial" lot of approximately 14.5 acres, which includes an approximately 2 acres of landscaped open space to be retained along Waipahu Street west of Depot Road;
   - an approximately 3.0 acre park/open space expansion of Hans L'Orange Park;
   - roadways of approximately 1.3 acres (which will provide: area for the widening of Waipahu Street; access to the YMCA and Filipino Community Center; and reconnect with Road Y to provide an alternate route around the Waipahu Street/Paiwa Street intersection);
   - the 0.5 acre site of the Old Waipahu Store;
   - a YMCA site of approximately 2 acres;
   - a Filipino Community Center site of approximately 2 acres; and
   - the Heritage Park and Museum site of approximately 2.1 acres.

   This allocation yields a mix of approximately 13.0 acres of commercial uses and approximately 12.4 acres of "community-oriented" uses, which we believe is consistent with the intent of the WSAP. As noted above, our discussions with the affected community organizations will be discussed in the DEIS.

W Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

PACIFIC TOWER, SUITE 650 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5631 FAX: (808) 523-1402
MAUI BRANCH OFFICE HIGH'S MASON CENTER 305 ALPUNI STREET, SUITE 104 HILO, HAWAII 96720 TELEPHONE: (808) 961-3333 FAX: (808) 961-8811

2. Additional information on potential commercial uses will be included in the Draft EIS. The potential commercial uses cited on page 7 of the EISNOP (including "large discount specialty store" are exactly those listed on page 4-10 of the Planning Department's Waipahu Town Plan Report. On page 38 of Appendix C, an example of a "discount specialty store" is a "...consumer electronics store featuring audio and video equipment, computers, software, cameras and other photography equipment, video games, etc..."

3. The Draft EIS will include a proposed development schedule for the subject site, including information on how it would interface with the proposed Amfac Industrial project.

4. The Draft EIS will also indicate landscaping and open space provisions intended for the site.

5. A copy of the Traffic Impact Assessment Report which was referenced in the EISNOP will be included in the Draft EIS. The Draft EIS will include information on the phasing of the proposed improvements along Waipahu Street and the status of discussions with the Department of Transportation, Department of Transportation Services and Department of Public Works regarding the proposed improvements.

6. The Draft EIS will append reports that address the existing soil and potential ground or surface contamination from past industrial uses. The Draft EIS will also include a discussion of clean-up activities on site and the coordination that has been taking place between Amfac and the State Department of Health (DOH). Amfac and its consultant, Brewer Environmental Services, have met with DOH, provided DOH with current environmental assessments for the site, and described in detail all investigations that have been conducted, any findings of hazardous materials, the status of current remediation programs and proposed remediation programs, so that DOH can insure that all public health issues are being addressed.

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

0012 DEM-20 w61

Hawaii's Plantation Village

Friends of Waipahu Cultural Garden Park
94-695 WAIPAHU ST. • WAIPAHU, HI 96797 • (808) 677-0110 • FAX (808) 676-6727

December 20., 1996

Mr. Timothy E. Johns
Vice President & General Manager
Oahu & Kaual Development
Amfac
700 Bishop Street - 21st Floor
Honolulu, Hawaii 96813

Re: Oahu Sugar Masterplan Heritage Area

Dear Mr. Johns:

The Friends of Waipahu Cultural Garden Park (FWCGP) have inspected the 2.1 acre site for the proposed heritage area within Amfac's Oahu Sugar Mill masterplan. The site includes the smokestack, lab building, generator building and parking area fronting Waipahu Street.

The Friends are excited about the opportunity to develop a sugar museum at this site. There will be synergy created by tying together the existing Waipahu Cultural Garden Park's, Hawaii's Plantation Village showcasing domestic plantation life and the Sugar Mill Heritage Area, interpreting the associated industrial sugar story.

Although a business plan is being finalized for the developmet of this site into a possible sugar museum visitor attraction, The Friends are confidant that the 2.1 acre site is more than adequate for a successful attraction for both visitors and kama'aina, especially when viewed in the context of the entire Oahu Sugar Mill Masterplan.

Sincerely,

C.O. Anderson
President,
Friends of Waipahu Cultural Garden Park

cc: Chairman, Board of Directors, Executive Director, File

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96813 · AREA CODE (808) 529-3111

JEREMY HARRIS
MAYOR

MICHAEL S. NAKAMURA
CHIEF

HAROLD M. KAWASAKI
LEE DONOHUE
DEPUTY CHIEFS

OUR REFERENCE BS-DL

November 15, 1996

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

FROM: MICHAEL S. NAKAMURA, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: APPLICATION FOR DEVELOPMENT PLAN AMENDMENT AND ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

This is in response to Mr. Vincent Shigekuni's letter of October 29, 1996, requesting comments concerning the subject above for the AMFAC Commercial and Park in Waipahu.

This project should have no significant impact on the operations of the Honolulu Police Department.

Thank you for the opportunity to comment.

MICHAEL S. NAKAMURA
Chief of Police

By Eugene Uemura
EUGENE UEMURA, Assistant Chief
Administrative Bureau

cc: Mr. Vincent Shigekuni
PBR Hawaii

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

November 21, 1996

Mr. Michael S. Nakamura
Chief of Police
Administrative Bureau
Police Department
City and County of Honolulu
801 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Nakamura:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. We appreciate the information provided and will include it in the Draft EIS. If you have any comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13bb-5.w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung
PACIFIC TOWER, SUITE 650 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5631 FAX: (808) 523-1402
BRANCH OFFICE: HILO LAGOON CENTER 101 AUPUNI STREET, SUITE 240 HILO, HAWAII 96720 TELEPHONE: (808) 961-5133 FAX: (808) 961-6999

BENJAMIN J. CAYETANO
GOVERNOR

ROY S. OSHIRO
EXECUTIVE DIRECTOR

IN REPLY REFER TO

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

96:PPE/4089

November 12, 1996

Ms. Lin Wong
Planning Department
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Ms. Wong:

Re: Environmental Impact Statement Notice of Preparation for the Amfac Commercial and Park Project

We have reviewed the subject EISNOP and have no specific comments to make on the proposed Commercial and Park Project.

Thank you for the opportunity to comment.

Sincerely,

Roy S. Oshiro
Executive Director

c: Vincent Shigekuni, PBR HAWAII

HFDC

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

November 15, 1996

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

Dear Mr. Oshiro:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. If you have any comments or questions regarding the EISNOP, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control

1032.13bb-3.w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung
PACIFIC TOWER, SUITE 660 841 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5631 FAX: (808) 523-1402
BRANCH OFFICE: HILO LAGOON CENTER 101 AUPUNI STREET, SUITE 310 HILO, HAWAII 96720 TELEPHONE: (808) 961-3333 FAX: (808) 961-3399

DEC-10-96 TUE 10:07 PLANNING DEPT C&C P.01/01

Post-it® Fax Note 7671 | Date 12/10/96 | # of pages 2

To Vicent Shigekuni | From Lin Wang

Co./Dept. PBR | Co. Planning Dept

Phone # | Phone # 523-4432

Fax # 523-1402 | Fax # 523-4730

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

RECEIVED
'96 NOV 18 10:03

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P. O. BOX 621
HONOLULU, HAWAII 96809

RICHARD R. COX
HERBERT H. RICHARDS, JR
RAE M. LOUI, P.E.
DEPUTY

NOV 15 1996

Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, HI 96813

Attn: Lin Wang

SUBJECT: EISNOP for Amfac Commercial and Park, Waipahu, Oahu, TMK 9-4-02:04(por.)

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

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

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

[X] We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

[ ] A Well Construction Permit and a Pump Installation Permit from the CWRM would be required before ground water is developed as a source of supply for the project.

[ ] The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the CWRM would be required prior to use of this source.

[ ] Groundwater withdrawals from this project may affect streamflows. This may require an instream flow standard amendment.

[ ] We recommend that no development take place affecting highly erodible slopes which drain into streams within or adjacent to the project.

[ ] If the proposed project diverts additional water from streams or if new or modified stream diversions are planned, the project may need to obtain a stream diversion works permit and petition to amend the interim instream flow standard for the affected stream(s).

[ ] Based on the information provided, it appears that a Stream Channel Alteration Permit pursuant to Section 13-169-50, HAR will be required before the project can be implemented.

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

[ ] An amendment to the instream flow standard from the CWRM would be required before any stream water is diverted.

[ ] Any new development that is proposed along a stream that is not yet channelized should be based on the express condition that no streams will be channelized to prevent flooding of the development. Development in the open floodplain should not be allowed; other economic uses of the floodplain should be encouraged.

[X] OTHER:

Our records show that the Waikele Golf Course irrigation supply source is currently WP 1 (Well Nos. 2301-01 to -03), which is a private well owned by Amfac and not served by the municipal water system as stated on page 32 of EISNOP.

Honolulu Board of Water Supply (BWS) was awarded a bulk allocation in 1993. At present 1.581 mgd of ground water is "reserved" for new developments in Pearl Harbor. BWS may assign a portion of their bulk allocation to this project.

If there are any questions, please contact Lenore Nakama at 587-0218.

Sincerely,

RAE M. LOUI
Deputy Director

LN:sa

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

December 20, 1996

Ms. Rae M. Loui
Deputy Director
State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management
P.O. Box 621
Honolulu, Hawaii 96809

Dear Ms. Loui:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. We have reviewed your comments of November 15, 1996 and provide the following responses:

1. The applicant is in the process of conducting a groundwater remediation program that includes providing regular reports to the State Department of Health (since 1994).

2. We appreciate the information provided that a Stream Channel Alteration Permit does not appear to be required before the project can be implemented. This information will be included in the Draft EIS.

3. Thank you for the information provided on the irrigation supply source for the Waikele Golf Course; the Draft EIS will correctly note that the source is a private well owned by Amfac. As noted in the EISNOP, the Board of Water Supply (BWS) agreed that the municipal water allocation which had been approved for irrigating the Waikele Golf Course could be reallocated for the Amfac Industrial and Amfac Commercial and Park projects.

   We also appreciate the information provided that the Board of Water Supply was awarded a bulk allocation of 1.581 million gallons per day (mgd) of ground water that is "reserved" for new developments in Pearl Harbor, and that the Board of Water Supply may assign a portion of their bulk allocation to this project. At the present time, it appears that the water that has been allowed to be reallocated from the Waikele Golf Course is of adequate capacity

W. Frank Brandt • Thomas S. Witte • R. Stan Duncan • Russell Y. J. Chung
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BRANCH OFFICE: HILO LAGOON CENTER 101 AUPUNI STREET, SUITE 310 HILO, HAWAII 96720 TELEPHONE: (808) 961-3333 FAX: (808) 961-8399

to service the proposed project and may not require significant amounts of water from BWS bulk allocation of 1993.

We greatly appreciate the information provided and will incorporate it into the Draft EIS. If you have any further comments or questions regarding the EISNOP, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac
Bernard Kea, Community Planning, Inc.
Bert Hatton, WIC

1032.13bb-15.w61

BENJAMIN J. CAYETANO
GOVERNOR

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

December 6, 1996

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
JERRY M. MATSUDA
GLENN M. OKIMOTO

IN REPLY REFER TO:
STP 8.7651

Ms. Cheryl Soon
Chief Planning Officer
Planning Department
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Attention: Lin Wong

Dear Ms. Soon:

Subject: AMFAC Commercial and Park
Environmental Impact Statement Preparation Notice
TMK: 9-4-02: 04 por.

Thank you for your transmittal of October 29, 1996, requesting our review of the subject project.

The improvements to be provided by the developer to address the project related impacts will be on the City roadways. We anticipate that the State facilities should be able to adequately accommodate the proposal.

We appreciate the opportunity to provide comments.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

c: Mr. Vincent Shigekuni, PBR Hawaii
Mr. Gary Gill, Office of Environmental Quality Control

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

December 11, 1996

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

Dear Mr. Hayashida:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. We greatly appreciate the information provided and will incorporate it into the Draft EIS. If you have any further comments or questions regarding the EISNOP, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\ltr-12.w61

W Frank Brandt • Thomas S. Waiau • R. Stan Duncan • Russell Y.J. Chung
PACIFIC TOWER, SUITE 650 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5631 FAX: (808) 523-1402
BRANCH OFFICE: HILO LAGOON CENTER 101 AUPUNI STREET, SUITE 310 HILO, HAWAII 96720 TELEPHONE: (808) 961-3333 FAX: (808) 961-8811

BENJAMIN J. CAYETANO
GOVERNOR

GARY GILL
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE [808] 586-4185
FACSIMILE [808] 586-4186

November 7, 1996

Cheryl Soon
Planning Department, City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Attention: Lin Wong

Dear Ms. Soon:

Subject: Environmental Impact Statement (EIS) Preparation Notice for Amfac Commercial and Park Project, Waipahu

Please include the following in the draft EIS:

1. A full discussion of the diesel fuel leak cleanup and UST removal.

2. Besides the diesel fuel leak, is there any other hazardous waste on site? If so indicate how this condition will be mitigated.

3. Has groundwater on site or nearby been contaminaedt? If so, discuss any plans for remediation.

4. On what dates were Waipahu community groups and residents notified of this project? Include this information in the draft EIS.

5. Correspondence with the Board of Water Supply on 8/27/96 and with the Department of Wastewater Management on 9/24/96 was mentioned in the text. Contact letters to all agencies and their responses during the early consultation phase need to be included.

6. All studies prepared for this project need to be included. Those referenced in the text include the traffic study, noise study, wetlands study and the Brewer Environmental report.

If you have any questions call Nancy Heinrich at 586-4185.

Sincerely,

Gary Gill
Director

c: Timothy Johns, Amfac
Vincent Shigekuni, PBR Hawaii

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

December 20, 1996

Mr. Gary Gill, Director
State of Hawaii
Office of Environmental Quality Control
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

Dear Mr. Gill:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. We are providing the following responses to your comments:

1. The Draft EIS will describe the diesel fuel leak cleanup and UST removal.

2. The Draft EIS will also include whether there is any other hazardous waste on site and how it is being (or will be) mitigated.

3. The Draft EIS will discuss the groundwater remediation in place.

4. The Draft EIS will include information on what dates Waipahu community groups and residents were notified of the proposed project.

5. The Draft EIS will include either agency review comments (in response to the EISNOP) or the latest letters sent by agencies during the early consultation phase.

6. We will append the traffic study, noise study, and an environmental report by Brewer Environmental, Inc. to the Draft EIS. As we have discussed with Ms. Nancy Heinrich of your office, the Draft EIS will note that we have conducted a field visit and have determined that there are no wetlands onsite. This verifies our review of wetlands-related literature and maps. Therefore, it was agreed that the study that was referred to in the EISNOP need not be appended to the Draft EIS.

W Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

PACIFIC TOWER, SUITE 650 [illegible] BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5631 FAX: (808) 523-1402
BRANCH OFFICE HILO LAGOON CENTER 101 AUPUNI STREET, SUITE 310 HILO, HAWAII 96720 TELEPHONE: (808) 961-3333 FAX: (808) 961-3199

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong/City and County of Honolulu Planning Department
Nancy Heinrich/Office of Environmental Quality Control
Tim Johns/Amfac

1032 13\61-7 w61

United States Department of the Interior

U.S. GEOLOGICAL SURVEY

WATER RESOURCES DIVISION
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawaii 96813

November 19, 1996

Ms. Lin Wong
Planning Department
City and County of Honolulu
650 South King St., 8th Floor
Honolulu, Hawaii 96813

NOV 20

Dear Ms. Wong:

Subject: Environmental Impact Statement Notice of Preparation (EISNOP)
AMFAC Commercial and Park Project
Waipahu, Central Oahu
TMK 9-4-02:04 (por.)

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

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

Sincerely,

William Meyer
District Chief

Enc.

cc: Mr. Vincent Shigekuni, PBR Hawaii

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

November 21, 1996

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

Dear Mr. Meyer:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. If you have any comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13bl-4.w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung
PACIFIC TOWER, SUITE 650 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521 5631 FAX: (808) 523-1402
BRANCH OFFICE: HILO LAGOON CENTER 101 AUPUNI STREET, SUITE 240 HILO, HAWAII 96720 TELEPHONE: (808) 961 3333 FAX: (808) 961-8049

USDA

United States
Department of
Agriculture

Natural
Resources
Conservation
Service

P.O. Box 50004
Honolulu, HI
96850

Our People...Our Islands...In Harmony

December 10, 1996

Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

ATTN: Lin Wong

Dear Ms. Wong:

Subject: Environmental Impact Statement Notice of Preparation (EISNOP) - Proposed Amfac Commercial and Park Project; Waipahu, HI

We have reviewed the above-mentioned document and have no comments to offer at this time.

Thank you for the opportunity to review this document.

Sincerely,

KENNETH M. KANESHIRO
State Conservationist

cc:
Mr. Vincent Shigekuni, Associate, PBR Hawaii, Pacific Tower, Suite 650,
1001 Bishop Street, Honolulu, HI 96813

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

December 12, 1996

Mr. Kenneth M. Kaneshiro
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
P.O. Box 50004
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:

SUBJECT: 'AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. If you have any comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\bl-16.w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y.J. Chung

PACIFIC TOWER, SUITE 650 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5631 FAX: (808) 525-1102
BRANCH OFFICE: HILO LAGOON CENTER 101 AUPUNI STREET, SUITE 360 HILO, HAWAII 96720 TELEPHONE: (808) 961-3333 FAX: (808) 961-3399

BHP

DEC 1 2

BHP Hawaii

December 10, 1996

Ms. Lin Wong
Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Ms. Wong:

Subject: Environmental Impact Statement Notice of Preparation
Amfac Commercial and Park

In response to PBR Hawaii's letter dated October 29, 1996, we are returning the EISNOP for the subject project. Based on our review of the notice, it has been determined that the area is currently clear of utility gas facilities.

Thank you for the opportunity to comment on the notice. Should there be any questions, or if additional information is desired, please call me at 594-5574.

Very truly yours,

BHP Gas Company

Keith K. Yamamoto
Supervisor, Engineering

KKY:ln
96-123

Attachment: EISNOP

cc: Mr. Vincent Shigekuni, PBR Hawaii

BHP Gas Company
515 Kamakee Street Honolulu Hawaii 96814
PO Box 3379 Honolulu Hawaii 96842
Telephone 808 547 3333 Facsimile 808 594 5561 Materials 808 594 5630 Sales

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

December 12, 1996

Mr. Keith K. Yamamoto
Supervisor
Engineering
BHP Gas Company
P.O. Box 3379
Honolulu, Hawaii 96842

Dear Mr. Yamamoto:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. We appreciate the information provided and will include it in the Draft EIS. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\nopletr\bl-17.w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung
PACIFIC TOWER, SUITE 650 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521 5631 FAX: (808) 525 5102
BRANCH OFFICE: HILO LAGOON CENTER 101 AUPUNI STREET, SUITE 310 HILO, HAWAII 96720 TELEPHONE: (808) 961 3333 FAX: (808) 961 8989

GTE Hawaiian Tel

Beyond the call

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

December 2, 1996

DE:

Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Attention: Lin Wong

Subject: **Amfac Commercial and Park Project**
Environmental Impact Statement Notice of Preparation

Thank you for the opportunity to review and comment on the Environmental Impact Statement Notice of Preparation (EISNOP) for the Amfac Commercial and Park project in Waipahu.

GTE Hawaiian Telephone Company, HTCo, does not foresee any problems in providing telecommunication services to the proposed development. However, further review will be required by HTCo during the design stages of the project.

If you have any questions or concerns, please call Kevin Ayano at 483-8027.

Sincerely,

Mark K. Taosaka
Section Manager
Access Design and Construction

cc: 1450 3P002HC
Stacy Shishido (A-5)
PBR HAWAII - Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813
Attn: Vincent Shigekuni

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

December 4, 1996

Mr. Mark K. Taosaka
Section Manager
Access Design and Construction
GTE Hawaiian Telephone Company Incorporated
P.O. Box 2200
Honolulu, Hawaii 96841

Dear Mr. Taosaka:

SUBJECT: AMFAC COMMERCIAL AND PARK ENVIRONMENTAL IMPACT STATEMENT NOTICE OF PREPARATION

Thank you for your review of the Environmental Impact Statement Notice of Preparation (EISNOP) for the proposed Amfac Commercial and Park project. We appreciate the information provided and will include it in the Draft EIS. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

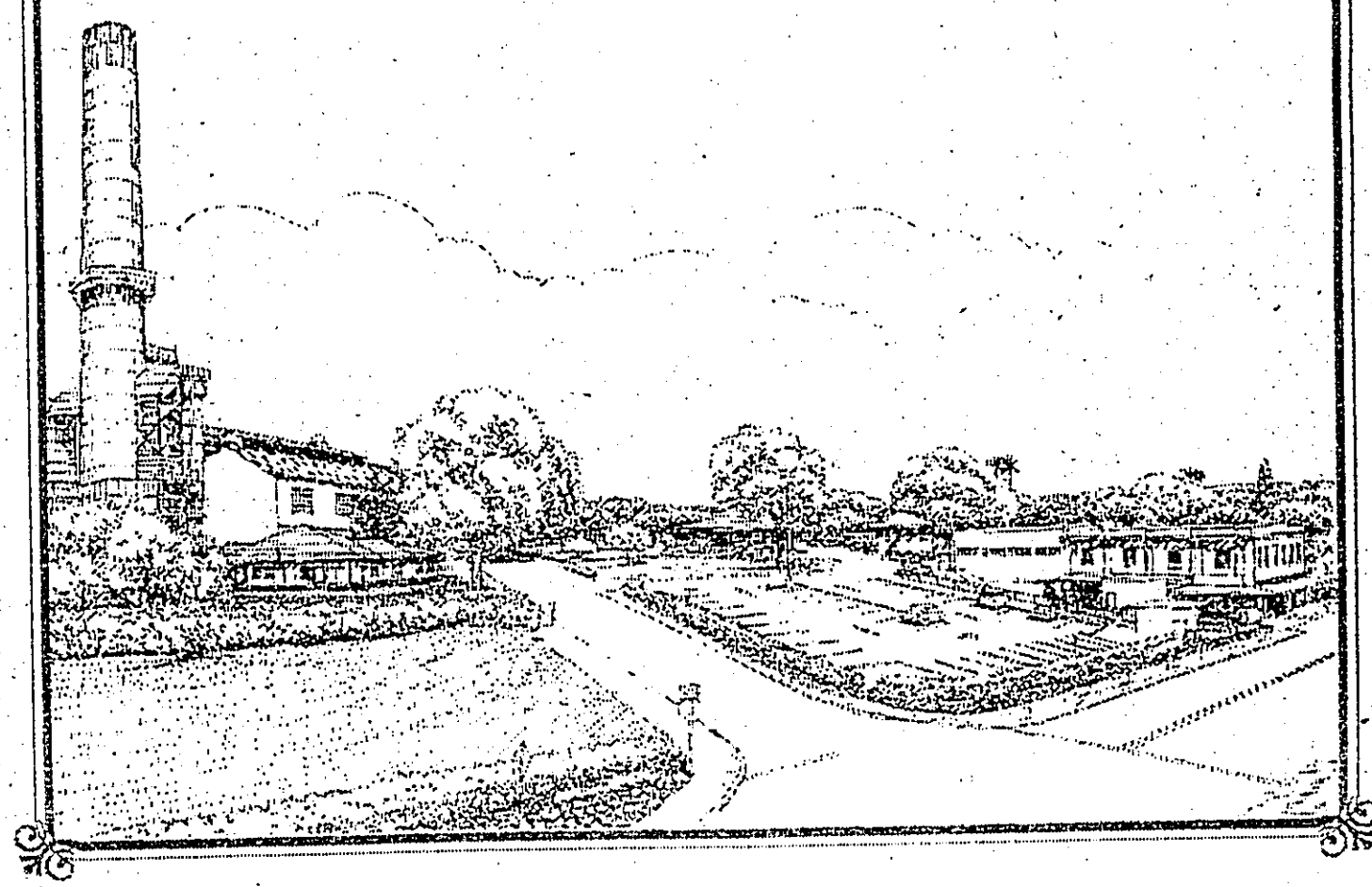
cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\vrs\letter\bl-10.w61

W Frank Brandt • Thomas S Witten • R. Scott Duncan • Russell Y. J. Chung
PACIFIC TOWER, SUITE 650 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521 5631 FAX: (808) 525 [illegible]
BRANCH OFFICE: HILO LAGOON CENTER 101 AUPUNI STREET, SUITE 310 HILO, HAWAII 96720 TELEPHONE: (808) 961 3333 FAX: (808) 961 [illegible]

14.0

COMMENTS AND RESPONSES TO THE DEIS



14.0 COMMENTS AND RESPONSES TO THE DEIS

The public comment period as required by Chapter 343, HRS, on the Draft Environmental Impact Statement for the Amfac Commercial and Park project resulted in the following responses from governmental agencies. The agency letters and responses prepared by the planning consultant are included in this section.

14.1 AGENCIES THAT RESPONDED TO THE DEIS

CITY AND COUNTY OF HONOLULU
Board of Water Supply
Building Department
Department of Housing and Community Development
Department of Land Utilization
Department of Parks and Recreation
Department of Public Works
Department of Transportation Services
Department of Wastewater Management
Fire Department
Planning Department
Police Department

STATE AGENCIES
Department of Accounting and General Services, Public Works Division
Department of Budget and Finance, Housing Finance and Development Corporation, Department of Business Economic Development and Tourism
Department of Health
Department of Land and Natural Resources, State Historic Preservation Division
Department of Transportation
Land Use Commission
Office of Environmental Quality Control
Office of Hawaiian Affairs

FEDERAL AGENCIES
US Department of Agriculture, Natural Resources Conservation Service
US Department of the Army, Corps of Engineers
US Department of the Interior, US Geological Survey, Water Resources Division

COMMUNITY ORGANIZATIONS AND INDIVIDUALS
BHP Gas Company
FilCom Center, Inc.
Friends of Hans L'Orange Park
Friends of Waipahu Cultural Garden Park
GTE Hawaiian Tel
Hawaiian Electric Company, Inc.
Waipahu Hongwanji Mission
Waipahu 2000 Update
YMCA of Honolulu Leeward Branch

14.2 DEIS COMMENT LETTERS AND THE APPLICANT'S RESPONSES

Responses to the comment letters have been prepared by PBR HAWAII on behalf of Amfac. The letters are attached:

BOARD OF WATER SUPPLY

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

FEB 2 4

February 18, 1997

TO: PATRICK T. ONISHI, ACTING CHIEF PLANNING OFFICER
PLANNING DEPARTMENT

ATTN: MS. LIN WONG

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

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE AMFAC COMMERCIAL AND PARK PROJECT, WAIPAHU, OAHU, TMK: 9-4-02: PORTION 04

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement for the subject project.

Our previous comments of December 10, 1996 have been adequately addressed and are included in Section 13 of the document.

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

cc: Office of Environmental Quality Control
PBR Hawaii

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

February 24, 1997

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

Dear Mr. Sato:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac
Bernard Kea, Community Planning, Inc.

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W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

1001 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813
TELEPHONE: (808) 521-5631 FAX: (808) 523-1402 E-MAIL: pbrhi@aloha.net

MAUI BRANCH OFFICE:
2145 KAHOLO STREET, WAILUKU, MAUI, HAWAII 96793
TELEPHONE: (808) 242-2978 FAX: (808) 242-2982

HILO BRANCH OFFICE:
101 AUPUNI STREET, HILO LAGOON CENTER, SUITE 310, HILO, HAWAII 96720
TELEPHONE: (808) 961-3533 FAX: (808) 961-4909

JAN 27

PB 97-56

January 22, 1997

MEMO TO: CHERYL D. SOON, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

ATTN: LIN WONG

FROM: RANDALL K. FUJIKI
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: AMFAC COMMERCIAL AND PARK PROJECT, WAIPAHU, OAHU
DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
TMK: 9-4-02: 04 (POR.)

This is in response to a request by PBR Hawaii to review and comment on the subject document.

Our previous response to the EISNOP of December 5, 1996 has been addressed on Page 5-37 of the subject DEIS.

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

Should there be any questions, please have your staff contact Douglas Collinson at ext. 6375.

RANDALL K. FUJIKI
Director and Building Superintendent

QLDC:ln
cc: G. Tamashiro
Off. of Environ. Quality Control
PBR Hawaii ✓

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

January 27, 1997

Mr. Randall K. Fujiki
Director and Building Superintendent
Building Department
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Fujiki:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.17\dcis\bl-30.w61

Wm. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

HONOLULU OFFICE
[illegible]
TELEPHONE: [illegible] FAX [illegible]

WAILUKU OFFICE
[illegible]
TELEPHONE: [illegible] FAX [illegible]

HILO OFFICE
[illegible]
TELEPHONE: [illegible] FAX: [illegible]

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET 5TH FLOOR • HONOLULU HAWAII 96813
PHONE (808) 523-4427 • FAX (808) 527-5488

JEREMY HARRIS
MAYOR

ROBERT AGRES JR
DIRECTOR

DARWIN J HAMAMOTO
DEPUTY DIRECTOR

February 24, 1997

MEMORANDUM

TO: PATRICK T. ONISHI, ACTING DIRECTOR
PLANNING DEPARTMENT

ATTENTION: LIN WONG

FROM: ROBERT AGRES, JR., ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (Draft EIS)
PROPOSED AMFAC COMMERCIAL AND PARK
TAX MAP KEY: 9-4-2: PORTION OF 4
WAIPAHU, OAHU

This is in response to the PBR Hawaii letter of December 23, 1996 requesting our comments on the Proposed Amfac Commercial and Park Draft Environmental Impact Statement. The DHCD understands that this project will not contain a residential segment. The proposed development does not conflict with any current or proposed projects of the Department of Housing and Community Development (DHCD), and we do not oppose the proposed development.

Should you have any questions, please contact Jason Ching of our Planning and Analysis Division at 523-4368.

Thank you for the opportunity to comment.

ROBERT AGRES, JR.
Acting Director

cc: Office of Environmental Quality Control
PBR Hawaii

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

March 10, 1997

Mr. Robert Agres, Jr., Director
Department of Housing and Community Development
City and County of Honolulu
650 South King Street, 5th Floor
Honolulu, Hawaii 96813

Dear Mr. Agres:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project and your letter dated February 24, 1997. We appreciate the information provided and will revise Section 5.6.3 Housing, B. Potential Impacts and Mitigative Measures, by adding the following before the last sentence in this section:

...In their review of the Draft EIS, the Department of Housing and Community Development stated that "The proposed development does not conflict with any current or proposed projects of the Department of Housing and Community Development (DHCD), and we do not oppose the proposed development..."

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

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W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

1001 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813
TELEPHONE: (808) 521-5631 FAX: (808) 523-1402 E-MAIL: pbrhi@aloha.net

MAUI BRANCH OFFICE:
2145 KAOHU STREET, WAILUKU, MAUI, HAWAII 96793
TELEPHONE (808) 242-2870 FAX: (808) 242-2872

HILO BRANCH OFFICE
101 AUPUNI STREET, HILO TAMOKO CENTER SUITE 310 HILO, HAWAII 96720
TELEPHONE (808) 961-3333 FAX (808) 961-4990

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 523-4414 • FAX: (808) 527-6743

PBR HAWAII
RECEIVED
FEB 28 1997
PROJECT
Job No.

JEREMY HARRIS
MAYOR

JAN NAOE SULLIVAN
ACTING DIRECTOR

LORETTA K.C. CHEE
DEPUTY DIRECTOR

97-00006(51)
'97 EA Comments Zone 9

February 27, 1997

MEMORANDUM

TO: PATRICK T. ONISHI, ACTING CHIEF PLANNING OFFICER
PLANNING DEPARTMENT

ATTN: LIN WONG

FROM: JAN NAOE SULLIVAN, ACTING DIRECTOR
DEPARTMENT OF LAND UTILIZATION

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
AMFAC COMMERCIAL AND PARK, WAIPAHU, OAHU
TAX MAP KEY: 9-4-02: POR. 04

We have reviewed the DEIS for the proposed project transmitted by PBR Hawaii's letter received on January 2, 1997, and have the following comments:

- We confirm that the project area is currently zoned I-2 Intensive Industrial and R-5 Residential Districts.
- Relative to Section 3.2.3, page 3-6 which indicates that the applicant is considering the concurrent filing of a zone change application, we note that such an application has not yet been filed.
- On an editorial note, Figures 5-2A and B have typographical errors on their Key Maps.

We have no other comments to offer at this time. Should you have any questions, please contact the Environmental Review Branch at 523-4077.

JAN NAOE SULLIVAN
Acting Director of Land Utilization

JNS:am

/cc: Vincent Shigekuni, PBR Hawaii

g:\9700006.sht

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

March 10, 1997

Ms. Jan Naoe Sullivan, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, Hawaii 96813

Dear Ms. Sullivan:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project and your letter dated February 27, 1997. We are providing the following responses to your comments:

1. The following will be added the end of Section 3.2.3 Land Use Ordinance Designation - Zoning, Existing Zoning:

   "...In their review of the Draft EIS, the Department of Land Utilization confirmed that the project area is currently zone I-2 Intensive Industrial and R-5 Residential Districts."

2. The filing of the application for zone change has been delayed pending the receipt of the final comments on the Amfac Commercial and Park Draft EIS. Section 3.2.3 Land Use Ordinance Designation - Zoning, Proposed Change of Zone has been revised to read as follows:

   "Proposed Change of Zone. The applicant will be requesting processing a zone change application concurrently with the subject DP Land Use Map amendment. A zone change application has been filed on March 6, 1997."

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung
1001 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813
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MAUI BRANCH OFFICE
1787 KAAHUMANU STREET, WAILUKU, MAUI, HAWAII 96793
TELEPHONE: (808) 242-7979 FAX: (808) 242-7982
OAHU BRANCH OFFICE
101 AUPUNI STREET, HALE LEMAMO CENTER, SUITE 310, HILO, HAWAII 96720
TELEPHONE: (808) 961-3333 FAX: (808) 961-8993

3. As you have noted, the notation "Project Application" on the key maps of Figures 5-2A and 5-2B has been correctly revised to "Project Application".

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

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

JEREMY HARRIS
MAYOR

MG (RET.) JOHN R. D'ARAUJO, JR.
Acting Director

ALVIN K.C. AU
DEPUTY DIRECTOR

FEB 14

February 12, 1997

Mr. Vincent Shigekuni
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Shigekuni:

Subject: Draft Environmental Impact Statement for Amfac Commercial Area and Park in Waipahu

Thank you for the opportunity to review the draft environmental impact statement (EIS) for the proposed Amfac Commercial and Park in Waipahu.

We are in support of the proposed addition of approximately 3.0 acres to Hans L'Orange Neighborhood Park, allowing the extension of the baseball field's left field line, creating additional parking area and a passive park area. We agree that the proposed improvements will enhanca the visual character of the park and provide increased recreational opportunities.

Also, as correctly stated in the draft EIS, funding for City maintenance of the additional area is not currently available. It is our expectation that the developer will be responsible for maintenance of the passive park area added to Hans L'Orange Neighborhood Park at least into the foreseeable future.

We understand that the proposed three-acre expansion to the park is intended to compensate for loss of other portions of the park that are to be subdivided and conveyed to the Department of Transportation Services to improve and realign Waipahu and/or Paiwa Street in support of the commercial development of Amfac's property.

Existing monkeypod trees will interfere with the proposed road widening and realignment of Waipahu Street. The developer must resolve this issue with the community and the City's Department of Transportation Services before our department will accept the expansion of Hans L'Orange Neighborhood Park.

Please have your staff contact Terry Hildebrand of our Advance Planning Branch at 523-4246 if you need further information.

Sincerely,

For MG (RET.) JOHN R. D'ARAUJO, JR.
Acting Director

JRD:ei

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

March 7, 1997

Major General (Ret.) John R. D'Araujo, Jr.
Director
Department of Parks and Recreation
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. D'Araujo:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We have reviewed your letter of February 12, 1997 and offer the following responses:

1. We note your support for the Hans L'Orange Park Expansion. We would like to take this opportunity to clarify that the dedication of land would allow the following: the extension of the existing Hans L'Orange park baseball field's left field, additional area for parking, and area for passive park. Although there is no park dedication requirement associated with the proposed DP Land Use Map Amendment and subsequent zoning, Amfac is generously donating the land to the City and County of Honolulu in order to expand the City's Hans L'Orange Park. This donation will implement the land use plans of the Waipahu 2000 Update and the City's Waipahu Town Plan. Neither of these community based plans called for Amfac to provide improvements; and this information was presented as such in the Draft EIS. No revisions are necessary for the Final EIS.

2. We concur that we have correctly indicated that funding for City maintenance of the Hans L'Orange Park Expansion is not currently available, however, we will revise that paragraph by adding the following:

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

1001 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813
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MAUI BRANCH OFFICE:
2023 KAOHE STREET, WAILUKU, MAUI, HAWAII 96793
TELEPHONE: (808) 242 2878 FAX: (808) 242 2882

HILO BRANCH OFFICE:
101 AUPUNI STREET, HILO LAGOON CENTER, SUITE 310, HILO, HAWAII 96720
TELEPHONE: (808) 961 3333 FAX: (808) 961-0999

> *"...An operating budget from the City and County of Honolulu for the maintenance of the expansion area will be sought and/or a community adopt-a-park program will be established for the expansion area."*

3. We would like to clarify that the park dedication was intended to fulfill the community's desires as expressed in the Waipahu 2000 Update and the City's Waipahu Town Plan, and not to compensate for the loss of the park that is needed by the Department of Transportation Services to improve and realign Waipahu Street. As shown on the attached plan, the City and County of Honolulu has had plans to widen Waipahu Street since at least 1993 (Austin, Tsutsumi & Associates, Inc., "Waipahu Street Widening and Realignment Project", prepared for the City and County of Honolulu, Department of Transportation Services, July 1993). This plan included land acquisition (including from Hans L'Orange Park) for the realignment and widening of Waipahu Street, and was prepared two and a half years before the Waipahu Town Plan identified commercial development of Amfac's property.

   Due to the administrative difficulties in obtaining "park land" for roadway widening, the Department of Transportation Services asked Amfac to incorporate the acquisition of the necessary "park land" with the conveyance of the additional "park land." Amfac is trying to assist in order to expedite the City's planned improvements to the Waipahu Street and Paiwa Street intersection.

   The currently needed improvements to Waipahu Street and the intersection of Paiwa and Waipahu Streets involve approximately 5,760 square feet of Hans L'Orange Park land, of which none will affect current park operations. In contrast the park dedication involves 117,889 square feet of land, a net gain to the park of approximately 112,129 square feet.

4. The most current plans for widening of Waipahu Street, which have been reviewed and approved by the Department of Transportation Services, involve the relocation and/or replacement of existing monkeypod trees on that portion of the widening project fronting Hans L'Orange Park. The possibility that some of these trees may be relocated and/or replaced has been presented to the Department of Transportation Services, the Waipahu 2000 Update Committee, the Friends of Hans L'Orange Park Committee and the Waipahu Neighborhood Board, with no adverse comments expressed. On February 20, 1997, the Waipahu Neighborhood Board voted unanimously (16-0) to support the park expansion as proposed and to urge the City Administration to continue to work with the community.

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

Enclosure: Waipahu Street Realignment and Widening, Exhibit 13

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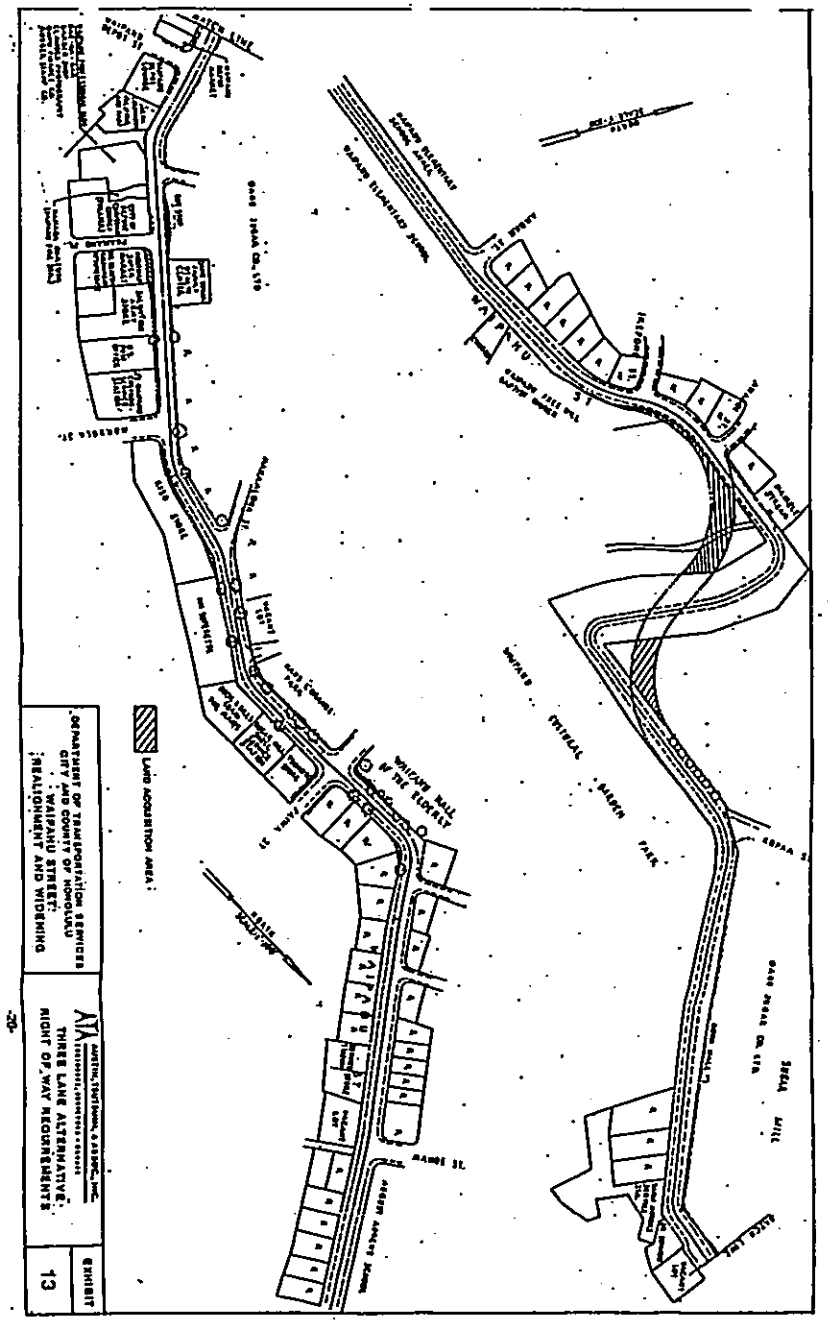

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

JEREMY HARRIS
MAYOR

JAN 14

KENNETH E. SPRAGUE
DIRECTOR AND CHIEF ENGINEER

DARWIN J. HAMAMOTO
DEPUTY DIRECTOR

ENV 97-009

January 10, 1997

MEMORANDUM:

TO: PATRICK T. ONISHI
CHIEF PLANNING OFFICER DESIGNATE
PLANNING DEPARTMENT

ATTENTION: LIN WONG

FROM: KENNETH E. SPRAGUE
DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
AMFAC COMMERCIAL AND PARK
TMK: 9-4-02: POR. 4

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

1. Frontage improvements along Waipahu Street should be in accordance with City standards and the Americans With Disabilities Act Accessibility guidelines.

2. Page 2-10, Section 2.3.3 Drainage

   Is all of drainage being directed to Waikele Stream or only a portion of it? Where will the detention structure be located?

3. Page 4-12, Section 4.3.2 Phase II Site Investigation

   The DEIS should provide approximate schedule to determine extent of contamination due to total petroleum hydrocarbons (TPH) in former molasses tank area.

Should you have any questions, please contact Alex Ho at Local 4150.

cc: OEQC
PBR Hawaii

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

March 10, 1997

Mr. Johnathan K. Shimada, Ph.D., P.E.
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street, 11th Floor
Honolulu, Hawaii 96813

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Shimada:

Thank you for your review of the Draft EIS (DEIS) for the proposed Amfac Commercial and Park project. We have reviewed your department's memorandum of January 10, 1997 and offer the following responses:

1. The following will be added after the fifth sentence of the seventh paragraph of Section 2.3.4 Traffic and Roadways:

   "Frontage improvements along Waipahu Street will be designed in accordance with City standards and the Americans With Disabilities Act Accessibility guidelines."

2. Only a portion of the drainage will be directed to Waikele Stream. Storm runoff from the proposed park expansion, Filipino Community Center, YMCA site, Heritage Park site, and other areas outside the project (most of Hans L'Orange Park), totaling approximately 25 acres will drain into the existing Waipahu/Mokuola Streets drainage system that leads to the Wailani Stream Drainage Channel. Storm runoff from the landscaped "slopes" along the mauka side of Waipahu Street, with an area of approximately two acres, drains to Waipahu Street and then through two box culverts to Kapakahi Stream. Storm runoff from the remaining project area, along with some other areas, totaling approximately 18 acres, will be diverted to Waikele Stream.

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung
1001 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813
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HILO BRANCH OFFICE
101 AUPUNI STREET, HILO LAGOONS CENTER, SUITE 310, HILO, HAWAII 96720
TELEPHONE: (808) 961-3333 FAX: (808) 961-4909

Detention structures have not been designed yet but are anticipated to occur at various locations within the project as necessary, in accordance with city regulations.

3. The following will be added after the fourth sentence of the second paragraph of Section 4.3.2 Phase II Site Investigation, C. Potential Impacts and Mitigation Measures:

"As soon as the mill equipment is removed, Amfac intends to initiate studies to determine the extent of contamination, and/or begin remediation, of the former molasses tank area. Amfac estimates that this work would start before the end of 1997."

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac
Bernard Kea/Community Planning, Inc.

1032.13dcisbl-54.w61

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

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

JEREMY HARRIS
MAYOR

CHERYL D. SOON
DIRECTOR

JOSEPH M. MAGALDI, JR.
DEPUTY DIRECTOR

TSP1/97-00020R

February 21, 1997

PBR HAWAII
RECEIVED
FEB 25 1997
Project No.

MEMORANDUM

TO: PATRICK T. ONISHI, CHIEF PLANNING OFFICER
PLANNING DEPARTMENT

ATTN: LIN WONG

FROM: CHERYL D. SOON, DIRECTOR

SUBJECT: AMFAC COMMERCIAL AND PARK PROJECT

In response to the December 23, 1996 letter from PBR Hawaii, the draft environmental impact statement (DEIS) for the subject project was reviewed. The second paragraph on page 2-12 discusses the improvement of Waipahu Street. This paragraph should be revised to indicate that no agreement has been reached on the improvements to Waipahu Street to the west of the entrance to Hawaii's Plantation village. Continued coordination with this department will be necessary to resolve this matter.

Should you have any questions regarding these comments, please call Faith Miyamoto of the Transportation System Planning Division at Local 6976.

Cheryl D. Soon
CHERYL D. SOON

cc: Office of Environmental
Quality Control
✓Mr. Vincent Shigekuni, PBR Hawaii

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

March 7, 1997

Ms. Cheryl D. Soon, Director
Department of Transportation Services
City and County of Honolulu
Pacific Park Plaza
711 Kapiolani Boulevard, Suite 1200
Honolulu, Hawaii 96813

Dear Ms. Soon:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We have reviewed your letter of February 21, 1997 and will revise the second full paragraph on page 2-12 to read as follows:

Amfac is proposing to bear the entire cost of improving Waipahu Street, as shown on the detailed plans for the improvements along Waipahu Street, (less any amounts that various utility companies may be responsible for via Ordinance 2412) from the western portion of Hans L'Orange Park to the entrance of Hawaii's Plantation Village, so long as the City agrees to improve Waipahu Street to the east and west of this area as is currently needed for either capacity and/or safety reasons. DTS has recently indicated that they generally concur with Amfac's plans for Phase IA, IB, and Road "X". No agreement has yet been reached on the improvements to Waipahu Street to the west of the entrance of Hawaii's Plantation Village. Continued coordination with the Department of Transportation Services will be necessary to resolve this matter.

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

1001 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813
TELEPHONE: (808) 521-5631 FAX: (808) 523-1402 E-MAIL: pbrhi@aloha.net

MAUI BRANCH OFFICE:
2123 KAOHU STREET, WAILUKU, MAUI, HAWAII 96793
TELEPHONE: (808) 242-2070 FAX: (808) 242-2072

HILO BRANCH OFFICE:
101 AUPUNI STREET, HILO TRADE CENTER, SUITE 310, HILO, HAWAII 96720
TELEPHONE: (808) 961-3333 FAX: (808) 961-8990

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac
Bernard Kea, Community Planning, Inc.
Ted Kawahigashi, Austin Tsutsumi & Associates, Inc.

1032.13\deis\bl-46w61

DEPARTMENT OF WASTEWATER MANAGEMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 3RD FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 527-6663 • FAX: (808) 527-6879

JEREMY HARRIS
MAYOR

CHERYL K. OKUMA-SEPE, ESQ.
DEPUTY DIRECTOR

JAN 20

In reply refer to:
WCC 97-5

January 16, 1997

MEMORANDUM

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

ATTN: MR. LIN WONG

FROM: CHERYL K. OKUMA-SEPE, ACTING DIRECTOR
DEPARTMENT OF WASTEWATER MANAGEMENT

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS), DATED DECEMBER 1996, AMFAC COMMERCIAL AND PARK
TMK: 9-4-002:004 (POR.)

We have no objection to the proposed 25.4 acre Amfac Commercial and Park. This DEIS represents a portion of the entire Oahu Sugar Company property, 61.0 acres total. A sewer master plan and sewer connection application form for 48 acres (61.0 acres less 13 acres of unsewered park land) have been submitted and approved on September 24, 1996 and November 21, 1996, respectively. Please see attached letter and form. Approval for connection was contingent on discharge from this development not to exceed 200,000 gallons per day. Also, the developer is required to provide an interconnection between the existing 24-inch sewer line and 36-inch Mililani effluent sewer line in Waipahu Depot Road to bypass an inadequate 30-inch sewer line section with an adverse slope. This information was not conveyed in section 2.3.1 and Appendix K of the subject document.

If you have any questions, please contact Ms. Tessa Ching of the Service Control Branch at 523-4956.

CHERYL K. OKUMA-SEPE

CHERYL K. OKUMA-SEPE
Acting Director

Attachments

cc: ✓PBR HAWAII, Vincent Shigekuni
Office of Environmental Quality Control

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

March 7, 1997

Ms. Cheryl K. Okuma-Sepe, Director
Department of Wastewater Management
City and County of Honolulu
650 South King Street, 3rd Floor
Honolulu, Hawaii 96813

Dear Ms. Okuma-Sepe:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (EIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided and will revise Section 2.3.1 of the EIS by adding the following paragraph after the second paragraph in this section:

"A sewer master plan and sewer connection application form for 48 acres (61.0 acres less 13 acres of unsewered park land) has been submitted and approved on September 24, 1996 and November 21, 1996, respectively. Approval for connection was contingent on discharge from this development not to exceed 200,000 gallons per day. Although the Oahu Sugar Company Property Sewer Master Plan, as approved on September 24, 1996, projected an average daily flow of 0.46 million gallons per day (mgd) from the entire site, only 0.2 mgd was approved. The applicant has discussed the reasons for this difference with the Department of Wastewater Management (DWWM) and may submit a sewer connection application in the future for the additional 0.26 mgd, or portion thereof, as needed."

We will also revise Section 2.3.1 of the EIS by adding the following to the end of the third paragraph in this section:

"...As required by DWWM, Amfac shall provide an interconnection between the existing 24-inch sewer line and 36-inch Mililani effluent sewer line in Waipahu Depot Road to bypass an inadequate 30-inch sewer line section with an adverse slope."

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

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2145 KAOHU STREET, WAILUKU, MAUI, HAWAII 96793
TELEPHONE: (808) 242-2878 FAX: (808) 242-2787

HILO BRANCH OFFICE:
101 AUPUNI STREET, HILO LAGOON CENTER, SUITE 310, HILO, HAWAII 96720
TELEPHONE: (808) 961-3333 FAX: (808) 961-4999

If you have further any comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Timothy Johns, Amfac
Bernard Kea, Community Planning, Inc.

1032.13\ltr\ltr-27.w61

FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

3375 KOAPAKA STREET, SUITE H425
HONOLULU, HAWAII 96819-1869

JEREMY HARRIS
MAYOR

ANTHONY J. LOPEZ, JR.
FIRE CHIEF

ATTILIO K. LEONARDI
FIRE DEPUTY CHIEF

January 17, 1997

JAN 2 4

TO: LIN WONG
PLANNING DEPARTMENT

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

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT
AMFAC COMMERCIAL AND PARK
WAIPAHU, OAHU, HAWAII
TMK 9-4-02:04 (por.)

The Honolulu Fire Department has reviewed the Draft Environmental Impact Statement for the above-described project and has no objections.

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

ANTHONY J. LOPEZ, JR.
Fire Chief

AJL/MN:ay

cc: Vincent Shigekuni, PBR Hawaii
OEQC w/EIS report

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

January 27, 1997

Mr. Anthony J. Lopez, Jr.
Fire Chief
Fire Department
City and County of Honolulu
3375 Koapaka Street, Suite H425
Honolulu, Hawaii 96819-1869

Dear Mr. Lopez:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\dcls\bl-29.w61

PLANNING DEPARTMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 8TH FLOOR • HONOLULU, HAWAII 96813-3017
PHONE (808) 523-4711 • FAX (808) 523-4850

JEREMY HARRIS
MAYOR

PATRICK Y. ONISHI
CHIEF PLANNING OFFICER
DONA L. HANAIKE
DEPUTY CHIEF PLANNING OFFICER

LW

February 24, 1997

Mr. Vincent R. Shigekuni
PBR Hawaii
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Shigekuni:

Draft Environmental Impact Statement (DEIS) for
Amfac Commercial and Park Project, 9-4-2:4 (por), 97/CQ-1

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

1. The proposed project is consistent with the recommendations of the Waipahu Town Plan for the subject site.

2. We note that the Waipahu Town Plan establishes design guidelines for the Old Town Commercial Area in the historic town core; and that the applicant's consultant, Spencer Mason Architects, has prepared specific design guidelines for the town core, the mill site, and the Filipino Community Center site. In addition, as part of the on-going Waipahu Livable Communities Initiative project, the Planning Department's consultant has developed urban design options along Waipahu and Waipahu Depot Streets near the mill site. Discussions with the applicant have been initiated and will be continued as part of the implementation phase for this project.

3. The DEIS states that design guidelines will be implemented prior to development to ensure that architectural and landscape design features are compatible with the plantation heritage theme proposed for the area. To preserve the integrity of the project and to ensure that the project is developed in a cohesive manner, design guidelines or declaration of covenants, conditions and restrictions (DCCR's) to guide development of the area should be in place prior to sub-contracting or sale by the applicant to second party developers.

4. In addition to site and architectural guidelines to promoting the plantation theme and cultural heritage of Waipahu, design guidelines for the commercial area should include landscaping guidelines to promoting a strong pedestrian shopping orientation via enhancement of streetscape and walking environments (such as adequate sidewalks, shade trees, street furniture, continuous pedestrian linkages, etc.) and consolidation of off-street parking behind buildings wherever possible.

5. The Circulation Plan for the Waipahu Town Plan includes provisions for a separated pedestrian/bikeway along the Mokuloa Street extension; street intersections with narrow curb radii; special signage and paving to encourage safe and convenient pedestrian and bicycle crossings; and an internal transit system linking the Waikele Shopping Center, the Old Town area along Waipahu Street, Waipahu Cultural Garden Park and the commercial area on the subject site. Please indicate in the FEIS whether these provisions will be included in the proposed project.

6. The DEIS states that detailed plans for improvements on Waipahu Street were submitted to Department of Transportation Services (DTS) for review and approval. The applicant proposes to widen Waipahu Street from the southern edge of Hans L'Orange Park to the vicinity of Waipahu Depot Road, but the remainder of Waipahu Street from the vicinity of Waipahu Depot Road to the entrance of Waipahu Cultural Garden Park is to remain a two-lane road, at least until the proposed commercial area is developed. The DEIS indicates that the applicant will bear the entire cost of improving Waipahu Street (less any amounts that various utility companies may be responsible for via Ordinance 2412) from the western portion of Hans L'Orange Park to the entrance of Hawaii's Plantation Village, subject to City agreeing to improve Waipahu Street to the east and west of this area as is currently needed for either capacity and/or safety reasons. Please indicate in the Final EIS if detailed plans were approved and if DTS has agreed to improve Waipahu Street to the east and west of the area as stated above.

7. The DEIS states that the proposed commercial project is the second phase of the overall mill site development and that construction for Phase II is anticipated to begin in the last quarter of 1998. Is it fair to assume that by then, infrastructure improvements for Phase I (the light industrial portion) between Paiwa Street and Mokuloa Street extension will be in place; Waipahu

Street improvements from Paiwa Street to Waipahu Depot Road will be completed; and construction for Phase II will begin with the proposed community facilities and park expansion?

Should you have any questions, please contact Lin Wong of our staff at 523-4485.

Sincerely,

PATRICK T. ONISHI
Chief Planning Officer

PTO:js

cc: Timothy E. Johns
Amfac/JMB Hawaii, Inc.

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

March 7, 1997

Mr. Patrick T. Onishi
Chief Planning Officer
Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Mr. Onishi:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We have reviewed your letter of February 24, 1997 and offer the following responses:

1. As discussed in Section in 1.4 of the DEIS, we concur with your department's conclusion that the proposed project is consistent with the recommendations of the Waipahu Town Plan for the subject site.

2. The second paragraph of the DEIS will be revised to read as follows:

"Recently, funding has been made available from the Livable Communities Program to develop urban design guidelines and an integrated transportation plan for Waipahu, emphasizing opportunities for transit, pedestrian and bicycle modes of travel where feasible and appropriate. The first Waipahu Livable Communities Task Force Meeting was held on November 19, 1996, and the applicant is a participating member of the Task Force. Discussions with the Planning Department and the rest of the Task Force have been initiated and will be continued until the Waipahu Livable Communities Task Force's products are finalized (scheduled for the end of 1997)."

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

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TELEPHONE: (808) 961-3333 FAX: (808) 961-8989

3. The last sentence of the second paragraph of Section in 2.4 of the EIS will be revised to read as follows:

"The design guidelines will address architecture (including building colors), signage, landscaping and exterior lighting facilities and will be in place prior to sub-contracting or sale by the applicant to a second party developer(s)."

4. The following will be added after the last sentence of the second paragraph of Section in 2.4 of the EIS:

"The landscaping portion of the design guidelines will address the following: promoting a strong pedestrian shopping orientation via enhancement of streetscape and walking environments (such as adequate sidewalks, shade trees, street furniture, continuous pedestrian linkages, etc.) and consolidation of new off-street parking behind buildings (away from Waipahu Street) wherever possible."

5. The following will be added to the end of Section 2.3.4 Traffic and Roadways:

"To provide for alternative modes of transportation, the Waipahu Town Plan's Circulation Plan calls for a separated pedestrian/bikeway along Manager's Drive/Mokuola Street. The current design of the Mokuola Street Extension through Amfac's property includes 4-foot wide, grade-separated pedestrian/bikeways along both sides of the proposed roadway."

The following will be added to the end of the fifth paragraph of Section 2.3.4 Traffic and Roadways:

"In their review of the Draft EIS, the Planning Department states that the Waipahu Town Plan's Circulation Plan calls for street intersections with narrow curb radii. Such a provision may be included in the proposed project if required by both the Department of Transportation Services and Department of Public Works."

The following will be added after the last sentence of the second paragraph of Section in 2.4 of the EIS:

"The design guidelines will also include special signage and paving to encourage safe and convenient pedestrian and bicycle crossings, where finished grades allow them to occur."

The following will be added to the end of Section 2.3.4 Traffic and Roadways:

"In their review of the Draft EIS, the Planning Department states that the Waipahu Town Plan's Circulation Plan calls for an internal transit system linking the Waikele Shopping Center, the Old Town area along Waipahu Street, Waipahu Cultural Garden Park and the commercial area on the subject site. The provision of a such a transit system is outside of the purview of the applicant, and would probably best be provided by the Honolulu Public Transit Authority, its successor and/or a private transportation company(ies) and is subject of a study by the Waipahu Livable Communities Initiative Task Force."

6. In their review of the Draft EIS and their response (letter dated 2/19/97) to Amfac's proposed plans (see attached), the Department of Transportation Services generally concurs with the planned roadway improvements for Phases IA, IB, and Road "X". The second full paragraph on page 2-12 will be revised to read as follows:

"Amfac is proposing to bear the entire cost of improving Waipahu Street, as shown on the detailed plans for the improvements along Waipahu Street, (less any amounts that various utility companies may be responsible for via Ordinance 2412) from the western portion of Hans L'Orange Park to the entrance of Hawaii's Plantation Village, so long as the City agrees to improve Waipahu Street to the east and west of this area as is currently needed for either capacity and/or safety reasons. DTS has recently indicated that they generally concur with Amfac's plans for Phase IA, Phase IB, and Road "X". No agreement has yet been reached on the improvements to Waipahu Street to the west of the entrance of Hawaii's Plantation Village. Continued coordination with the Department of Transportation Services will be necessary to resolve this matter."

7. The applicant confirms that: 1) onsite infrastructure improvements for Phase I (the light industrial portion) between Paiwa Street and the Mokuola Street Extension; and 2) Waipahu Street improvements from Hans L'Orange Park to Waipahu Depot Road will be in place before the construction of the commercial buildings is initiated (third quarter of 1999).

In regards to the construction of Phase II, it is planned that major grading and grassing of the park expansion area will occur in conjunction with Phase I site work almost immediately after the necessary approvals are in place. The YMCA is in the process of obtaining a Site Plan Review permit, and may be renovating the existing Administration and Human Resources buildings as soon as this summer. Construction of the FilCom Center and the Heritage/Museum area are the responsibility of the FilCom Center, Inc. and the Friends of Waipahu Cultural Garden Park (or another appropriate organization), respectively.

In addition, Section 2.5 will be revised to read as follows:

"Construction of the roadway improvements would begin after all required approvals and permits have been obtained. Based on the timing involved for the required Development Plan Amendment, rezoning, subdivision, and grading permit processing, construction is anticipated to begin in the last quarter of 1998. The project will be developed in increments. The construction of Road "X" and any required improvements along Waipahu Street are anticipated to occur during the last quarter of 1998 through mid-1999. Site work construction is anticipated to take place during the second, third and fourth quarters of 1999. Construction of buildings could start in the third quarter of 1999 with completion of buildings by mid-2000.

LAND USE AND DEVELOPMENT PERMITS	*Tentative Schedule*
Environmental Impact Statement	*10/96 - 4/97*
Development Plan Amendment	*10/96 - 12/97*
Change of Zone	*3/97 - 1/98*
Subdivision and Construction Permits	*1/98 - 9/98*

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

Enclosure: Letter to John Higham

1032.13\ltr\M-48.wpd

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
PACIFIC PARK PLAZA • 711 KAPIOLANI BOULEVARD, SUITE 1200 • HONOLULU, HAWAII 96813
PHONE: (808) 523-4529 • FAX: (808) 523-4730

JEREMY HARRIS
MAYOR

CHERYL D. SOON
Acting Director
CHARLES S. SWANSON
Deputy Director
JOSEPH M. MAGALDI, JR.
Deputy Director

TMD-4663
(PRI.365 MH)

February 19, 1997

RECEIVED
MAR 3 1997
Amfac Property Development Corp

Mr. John L. Higham
AMFAC Property Development Corp.
700 Bishop Street, 21st Floor
Honolulu, Hawaii 96813

Dear Mr. Higham:

Subject: Oahu Sugar Mill Site
Roadway Improvements and Phasing Plan
TMK: 9-4-2: Por. 4

This is in response to your letter dated October 2, 1996 and from subsequent meetings between members of our respective staffs.

We generally concur with plans provided to our office and the phasing of the planned roadway improvements for Phases 1A, 1B and Road "X". We are deferring our decision on the widening and alignment of Waipahu Street for the segment of roadway that is west of Phase 1B until a later date when more information on the surrounding land uses become available. We still need to work with your office and the Department of Parks and Recreation with regard to the proposed land exchange for the portion of Waipahu Street and Paiwa Street fronting the Hans L'Orange Park and Paiwa Street in the vicinity of Lot 21.

Should you have any questions, please contact Mel Hirayama of my staff at 523-4119.

Sincerely,

CHERYL D. SOON
Director

cc: Department of Land Utilization

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU
801 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96813 - AREA CODE (808) 529-3111

JEREMY HARRIS
MAYOR

MICHAEL S. NAKAMURA
CHIEF

LEE DONOHUE
WILLIAM B. CLARK
DEPUTY CHIEFS

OUR REFERENCE BS-DL

FEB 20

February 18, 1997

TO: LIN WONG, COMMUNITY PLANNING BRANCH
PLANNING DEPARTMENT

FROM: MICHAEL S. NAKAMURA, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE AMFAC COMMERCIAL AND PARK (TMK 9-4-02: 04 POR)

This is in response to Mr. Vincent Shigekuni's letter of December 23, 1996, requesting comments concerning the subject above.

This project should have no significant impact on the operations of the Honolulu Police Department.

Thank you for the opportunity to comment.

MICHAEL S. NAKAMURA
Chief of Police

By James Femia
JAMES FEMIA, Assistant Chief
Administrative Bureau

cc: Mr. Vincent Shigekuni, Associate
PBR HAWAII

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

February 21, 1997

Mr. Michael S. Nakamura
Chief of Police
Administrative Bureau
Police Department
City and County of Honolulu
801 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Nakamura:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided and will add the following to the third paragraph of page 5-37:

...In their review of the Draft EIS, the Police Department stated that "This project should have no significant impact on the operations of the Honolulu Police Department."

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII
Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13bb-37.w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung
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HILO BRANCH OFFICE:
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TELEPHONE: (808) 961-3333 FAX: (808) 961-4990

JAN 30

(P)1052.7

JAN 29 1997

Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Attention: Lin Wong

Gentlemen:

Subject: Amfac Commercial and Park
Waipahu, Oahu, Hawaii
Draft EIS

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

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

Sincerely,

GORDON MATSUOKA
State Public Works Engineer

RY:jk
c: OEQC
PBR Hawaii

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

January 30, 1997

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

Dear Mr. Matsuoka:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact for the proposed Amfac Commercial and Park project. We appreciate the information provided. If you have any comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

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Wm. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

HONOLULU OFFICE
1001 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813-3429
TELEPHONE: (808) 521-5631 FAX: (808) 523-1402 E-MAIL: pbrhi@aloha.net

WAILUKU OFFICE
2145 KAHOLO STREET, WAILUKU, HAWAII 96793-2284
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HILO OFFICE
101 AUPUNI STREET, HILO LAGOON CENTER, SUITE 310, HILO, HAWAII 96720-4276
TELEPHONE: (808) 961-3333 FAX: (808) 961-8999

BENJAMIN J. CAYETANO
GOVERNOR

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

ROY S. OSHIRO
EXECUTIVE DIRECTOR

IN REPLY REFER TO

97:PPE/72

January 9, 1997

JAN 13

Ms. Lin Wong
Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Ms. Wong:

Re: Draft Environmental Impact Statement (DEIS) for the Amfac Commercial and Park Project

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

We have no housing related comments to offer at this time.

Sincerely,

Roy S. Oshiro
Executive Director

c: Vincent Shigekuni, PBR HAWAII

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

January 13, 1997

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

Dear Mr. Oshiro:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. If you have any comments or questions regarding the DEIS, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13M-22.w61

HFDC

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung
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235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
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Telephone: (808) 587-2846
Fax: (808) 587-2824

Ref. No. P-6461

JAN 29

January 23, 1997

Ms. Cheryl D. Soon
Chief Planning Officer
Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Attention: Lin Wong

Dear Ms. Soon:

SUBJECT: Amfac Commercial and Park - Draft Environmental Impact Statement (EIS)

We have the following comment on the draft EIS for the subject project.

As indicated on page 7-8, the project is not situated within the County's Special Management Area. However, please note that the Coastal Zone Management (CZM) area encompasses the entire State. Therefore, the EIS should include an assessment of the project's consistency and compliance with CZM objectives and policies.

Sincerely,

Rick Egged
Director
Office of Planning

cc: PBR Hawaii
Office of Environmental
Quality Control

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

March 7, 1997

Mr. Rick Egged, Director
State of Hawaii
Department of Business, Economic Development & Tourism
Office of Planning
P.O. Box 2359
Honolulu, Hawaii 96804-2359

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr. Egged:

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We have reviewed your letter and will revise Section 7.2.4. Coastal Zone Management Act to read as follows:

The objectives of the Hawaii Coastal Zone Management (CZM) Act as set forth in Chapter 205A, Hawaii Revised Statutes, applies to the protection and maintenance of valuable coastal resources and the establishment of Special Management Areas (SMA) boundaries. The subject property does not lie within the Special Management Area as defined by the City and County of Honolulu, and therefore does not require a Special Management Area Use Permit. However, the CZM encompasses the entire stake. The objectives and policies of Chapter 205A are presented below, followed by a brief discussion of the project's consistency and compliances with CZM objectives and policies.

Objective 1: *Provide coastal recreational opportunities accessible to the public;*

Discussion: *Not applicable to the subject property, since it is located over a half mile away from the coastline.*

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

1003 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813
TELEPHONE: (808) 521-5631 FAX: (808) 523-1402 E-MAIL: pbrhi@aloha.net

MAUI BRANCH OFFICE
[illegible]

HILO BRANCH OFFICE
[illegible]

Policy 1a: *Improve coordination and funding of coastal recreational planning and management; and*

Discussion: *Not applicable. This policy appears to be directed to governmental agencies.*

Policy 1b: *Provide adequate, accessible and diverse recreational opportunities in the coastal zone management area by:*

- *(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;*
- *(ii) Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;*
- *(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;*
- *(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;*
- *(v) Ensuring public recreational use of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;*
- *(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;*
- *(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches and artificial reefs for surfing and fishing; and*
- *(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, county planning commissions; and crediting such dedication against the requirements of Section 46-6.*

Discussion: *The project is not located on the coastline or shoreline and does not involve coastal resources. The installation of drainage detention basins as required by Ordinance 96-34 will protect coastal ecosystems from adverse impacts. The site is not in a location to develop new shoreline recreational opportunities or to dedicate shoreline areas with recreational value.*

Objective 2: *Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture;*

Discussion: *There are no known resources of natural value on the site. There were also no traditional sites found in the project area and that it is unlikely that there are potentially significant subsurface archaeological deposits of prehistoric age in the area. In accordance with the Waipahu Town Plan, several buildings on the mill site have been identified for having historical value and will be preserved and incorporated into the proposed heritage area. The buildings include the smokestack, Generator Building, the Laboratory Building, the Administration Building, the Human Resources Building and the Waipahu Store Building. The mill smoke stack, the Generator Building and the Laboratory Building are included in the proposed Heritage Museum Area. In their review of the Draft EIS, the State Historic Preservation Division wrote that "We look forward to the re-use of the historic structures including the mill smoke stack, the generator, laboratory, administration, human resources and the old Waipahu Store buildings."*

Policy 2a: *Identify and analyze significant archaeological resources;*

Discussion: *In their review of the Draft EIS, the State Historic Preservation Division wrote that "...it is unlikely that historic sites will be found, and [we] believe that this project will have 'no effect' on historic sites."*

Objective 2b: *Maximize information retention through preservation of remains and artifacts or salvage operations; and*

Discussion: *In anticipation of the dismantling of the structures that will not be preserved, archival photographs documenting the mill buildings were taken. In accordance with the specifications of the Historical American Buildings Survey (United States Secretary of the Interior documentation specifications), three sets of archival prints were made and will be filed in the U.S. Library of Congress and the University of Hawaii. The photographs thoroughly document the structures and buildings of the Oahu Sugar Company for posterity (27 exteriors of 22 structures, 28 interiors in 14 buildings).*

To ensure that no important cultural features will be destroyed during project construction, a qualified archaeologist will selectively monitor initial grubbing activity and/or vegetation clearing within the project area. Should subsurface remains, artifacts, deposits of charcoal or shells be found during construction activities, work in the area will be stopped immediately and the Department of Land and Natural Resources will be contacted to determine the significance of the site and to identify appropriate mitigation measures.

Objective 2c: *Support state goals for protection, restoration, interpretation and display of historic resources.*

Discussion: *Reminders of Waipahu's historic plantation legacy as evidenced by the sugar mill stack, and its proximity to the Waipahu Cultural Garden Park, makes it appropriate to develop a heritage area. Adaptive re-use of some of the existing mill structures including the smokestack, Generator Building, the Laboratory Building, the Administration Building, the Human Resources Building and the Waipahu Store Building could serve as the heritage center.*

In efforts to promote the cultural heritage of the various ethnic groups, the heritage center could be operated by a non-profit organization. In showcasing the plantation era, the center could offer multimedia displays incorporating artifacts and old photographs covering the cultivation of sugar cane, mill operations, the water system, the history of the plantation and plantation labor, plantation life, etc. The Alexander and Baldwin Sugar Museum on Maui could serve as a prototype for a successful sugar plantation museum.

Objective 3: *Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources;*

Discussion: *Not applicable. The site is not located on the coastline and does not provide coastal scenic and open space resources.*

Policy 3a: *Identify valued and scenic resources in the coastal zone management area;*

Discussion: *The City and County of Honolulu, has conducted a comprehensive viewshed assessment documented in Coastal View Study (City and County of Honolulu Department of Land Utilization, 1987). In this study, the existing visual resources of the entire Oahu coastline are inventoried, prioritized, and documented.*

According to the Coastal View Study, the Waipahu viewshed is residential, commercial, and industrial. No significant coastal visual resources in the vicinity of the project are identified in the Study.

The mill is located on a bluff close to Waikele Stream. The town of Waipahu grew around the mill and the smokestack of the mill is a landmark that is seen from many places and directions including most of Waipahu and its surroundings.

Policy 3b: *Insure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;*

Discussion: *The project will not alter the bluff on which is located and will not alter public views to and along the shoreline.*

Policy 3c: *Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and*

Discussion: *Not applicable. The project does not include shoreline open space and scenic resources.*

Policy 3d: *Encourage those developments which are not coastal dependent to locate in inland areas.*

Discussion: *Not applicable. The subject property is located over a half mile inland from the coastline.*

Objective 4: *Protect valuable coastal ecosystems, including reefs from disruption and minimize adverse impacts on all coastal ecosystems.*

Discussion: *Not applicable. This project does not involve coastal waters, reefs and ecosystems.*

Policy 4a: *Improve the technical basis for natural resource management;*

Discussion: *This Environmental Impact Statement adds to the database of information for this area, which may be useful for natural resource management.*

Policy 4b: *Preserve valuable coastal ecosystems, including reefs of significant biological or economic importance.*

Discussion: *The proposed development area is remotely located from valuable coastal ecosystems, including reefs.*

Policy 4c: *Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses recognizing competing water needs; and*

Discussion: *The installation of drainage detention basins as required by Ordinance 96-34 will preserve coastal ecosystems from adverse impacts.*

Policy 4d: *Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards.*

Discussion: *Refer to previous discussion.*

Objective 5: *Provide public or private facilities and improvements important to the State's economy in suitable locations.*

Discussion: *Development of the project will provide needed commercial, community facility and park uses in a location suitable for these uses, as identified by two extensive, community-based planning efforts: the Waipahu 2000 Update and the Waipahu Town Plan.*

Policy 5a: *Concentrate coastal dependent development in appropriate areas;*

Discussion: *The project is not coastal dependent and located over a half mile inland from the coastline.*

Policy 5b: *Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and*

Discussion: *Although the project is not coastal dependent and is located over a half mile inland from the coastline, it will be designed and constructed to minimize adverse social, visual and environmental impacts.*

Policy 5c: *Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:*

(i) Use of presently designated locations is not feasible;
(ii) Adverse environmental effects are minimized; and
(iii) The development is important to the State's economy.

Discussion: *Not applicable. The project is not coastal dependent and thus does not require a decision on siting the project on the coastline.*

Objective 6: *Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.*

Discussion: *The site is not subject to tsunami or storm wave inundation and stream flooding. The proposed project will include measures to minimize erosion. The proposed project is not expected to cause subsidence. The project is not expected to generate any significant long-term noise that cannot be mitigated. During construction, equipment will be used in accordance with accepted standards and during daylight hours to mitigate potential noise impacts. The primary air quality impact will result from the use of construction equipment, fugitive dust and emissions from vehicular traffic. Watering during construction will largely mitigate dust emissions. Emissions from vehicular traffic may be mitigated by the development of transportation improvements at busy intersections. The applicant is presently in the process of removing asbestos from existing buildings, conducting groundwater monitoring and remediation, and will be remediating contaminating soils in the vicinity of a former molasses tank.*

Policy 6a: *Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;*

Discussion: *This Environmental Impact Statement was developed to communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards.*

Policy 6b: *Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;*

Discussion: *The site is not subject to storm wave or tsunami inundation, flooding and subsidence. The proposed project will include measures to minimize erosion, the effects of hurricanes and winds, and point and nonpoint source pollution hazards.*

Policy 6c: *Ensure that developments comply with requirements of the Federal Flood Insurance Program;*

Discussion: *All requirements of the Federal Flood Insurance Program will be complied with.*

Policy 6d: *Prevent coastal flooding from inland projects; and*

Discussion: *Proposed storm drainage improvements include diversion of the storm runoff from the private mill system to Waikele Stream: The total diversion of about 70 acres from the mill site as well as other mauka tributary areas will have an insignificant effect on Waikele Stream with its overall tributary area of 45 square miles or 28,800 acres. The effect of the diversion will be reduced further by the detention structures required by Ordinance 96-34.*

Policy 6e: *Develop a coastal and nonpoint source pollution program.*

Discussion: *The installation of drainage detention basins as required by Ordinance 96-34 will preserve coastal ecosystems from adverse impacts.*

Objective 7: *Improve the development review process, communication and public participation in the management of coastal resources and hazards.*

Discussion: *This Environmental Impact Statement is an integral component of the development review process, communicating information regarding the project and providing opportunities for public participation in the reviews of the Notice of Preparation and Draft Environmental Impact Statement.*

Policy 7a: *Use, implement and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development.*

Discussion: *Not applicable. This policy appears to be directed to governmental agencies.*

Policy 7b: *Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and*

Discussion: *Not applicable. This policy appears to be directed to governmental agencies.*

Policy 7c: *Communicate the potential short and long-term impacts of proposed significant coastal development early in their life-cycle and in terms understandable to the public to facilitate public participation in the planning and review process.*

Discussion: *Although the project does not involve coastal development, this Environmental Impact Statement communicates the potential short and long-term impacts of the project in terms understandable to the public to facilitate public participation in the planning and review process.*

Objective 8: *Stimulate public awareness, education and participation in coastal management.*

Discussion: *Refer to previous discussion.*

Policy 8a: *Maintain a public advisory body to identify coastal management problems and to provide policy advice and assistance to the coastal zone management program;*

Discussion: *Not applicable. This policy appears to be directed to governmental agencies.*

Policy 8b: *Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal-related issues, developments, and government activities; and*

Discussion: *Not applicable. This policy appears to be directed to governmental agencies.*

Policy 8c: *Organize workshops, policy dialogues and site-specific mediations to respond to coastal issues and conflicts.*

Discussion: *Not applicable. This policy appears to be directed to governmental agencies.*

Objective 9: *Protect beaches for public use and recreation.*

Discussion: *The subject property, located over a half mile from the coastline and should not affect beaches used by the public for recreation.*

Policy 9a: *Locate new structures inland from the shoreline setback to conserve open space and to minimize loss of improvements due to erosion;*

Discussion: *The project is located a half-mile inland from the shoreline setback and will not affect shoreline open space or shoreline erosion.*

Policy 9b: *Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and*

Discussion: *Not applicable. The project does not include the construction of structures seaward of the shoreline.*

Policy 9c: *Minimize the construction of public erosion - protection structures seaward of the shoreline.*

Discussion: *Not applicable. This policy appears to be directed to governmental agencies.*

Objective 10: *Implement the State's ocean resources management plan.*

Discussion: *Not applicable. This policy appears to be directed to governmental agencies.*

Policy 10a: *Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;*

Discussion: *Not applicable. This policy appears to be directed to governmental agencies.*

Policy 10b: *Assure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;*

Discussion: *Not applicable. The project does not include the use and development of marine and coastal resources.*

Policy 10c: *Coordinate the management of marine and coastal resources and activities management to improve effectiveness and efficiency;*

Discussion: *Not applicable. This policy appears to be directed to governmental agencies.*

Policy 10d: *Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;*

Discussion: *Not applicable. This policy appears to be directed to governmental agencies.*

Policy 10e: *Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and*

Discussion: *Not applicable. This policy appears to be directed to governmental agencies.*

Policy 10f: *Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.*

Discussion: *Not applicable. This policy appears to be directed to governmental agencies.*

It is anticipated that none of the proposed improvements are in conflict with any plans, programs, or other activities of the State Coastal Zone Management Program.

Thank you for your comments, we believe the above assessment of the project's consistency and compliance with CZM objectives and policies to be very useful in furthering the State's overall goals for business, economic development and tourism.

If you have any further comments or questions regarding the DEIS, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong/City and County of Honolulu Planning Department
Nancy Heinrich/Office of Environmental Quality Control
Tim Johns/Amfac Property Development Corp.

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BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

LAWRENCE MIKE
DIRECTOR OF HEALTH

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

In reply, please refer to

February 20, 1997 96-192A/epo

Ms. Lin Wong
Planning Department
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Ms. Wong:

Subject: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
Project: Amfac Commercial and Park
Location: Waipahu, Oahu, Hawaii
TMK: 9-4-02: Por. 04

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

Noise Concerns

1. Activities associated with the construction phase of the project must comply with the provisions of Hawaii Administrative Rules, Chapter 11-46, "Community Noise Control."

   a. The contractor must obtain a noise permit if the noise levels from the construction activities are expected to exceed the maximum permissible sound levels of the regulations as stated in Section 11-46-6(a).

   b. The contractor must comply with the conditional use of the permits as specified in the regulations and conditions issued with the permit as stated in Section 11-46-7(d)(4).

2. Heavy vehicles travelling to and from the project site must comply with the provisions of Title 11, Administrative Rules Chapter 42, "Vehicular Noise Control for Oahu."

Should there be any questions on this matter, please call Jerry Haruno, Environmental Health Program Manager of the Noise, Radiation and Indoor Air Quality Branch at 586-4701.

Sincerely,

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

c: NRB
PBR Hawaii ✓
OEQC

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

March 10, 1997

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

Dear Mr. Anderson:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project and for your letter. We are providing the following responses to your comments:

1. The following will be added to the end of Section 5.3 Noise, C. Mitigation Measures, (1) Compliance with DOH Rules:

   "Activities associated with the construction phase of the project must comply with the provisions of Hawaii Administrative rules, Chapter 11-46, "Community Noise Control. The contractor(s) must obtain a noise permit if the noise levels from the construction activities are expected to exceed the maximum permissible sound levels of the regulations as stated in Section 11-46-6(a). The contractor(s) must comply with the conditional use of the permits as specified in the regulations and conditions issued with the permit as stated in Section 11-46-7(d)(4)."

2. The following will be added to the end of Section 5.3 Noise, C. Mitigation Measures, (2) Traffic Noise:

   "Heavy vehicles traveling to and from the project site must comply with the provisions of Title 11, Administrative Rules Chapter 42, 'Vehicular Noise Control for Oahu'".

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

1001 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813
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Mr. Bruce S. Anderson, Ph.D.
SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT
March 10, 1997
Page 2

If you have any comments or questions regarding the DEIS, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

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BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

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

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

DEPUTIES

GILBERT COLOMA-AGARAN

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

January 15, 1997

Lin Wong
Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

JAN 20

LOG NO: 18752 ✓
DOC NO: 9701EJ12

Dear Ms. Wong:

SUBJECT: Historic Preservation Review Chapter 6E-42 – Draft EIS for the AMFAC Commercial and Park Project Located in Waipahu, O'ahu
Waipahu, 'Ewa, O'ahu
TMK: 9-4-02: por. 04

We responded to the City and County Planning Department on the EIS preparation notice (EISPN) on this project. We commented that an archaeological reconnaissance survey conducted in 1993 and additional work conducted in 1994 for portions of the proposed project area, did not locate any traditional archaeological sites due to the extensive land alteration resulting from the industrial use of the area over the past 100 years.

The EISPN also stated that an archaeological inventory survey was conducted of the project area in April of 1996. At that time, our office had not had the opportunity to review the report and as a condition to a "no effect" determination, we requested that a copy of the April 1996 archaeological report be submitted to this office for review before a final "no effect" determination was issued. The April 1996 report which is included in the DEIS, has been reviewed by our office. Therefore, we believe that it is unlikely that historic sites will be found, and believe that this project will have "no effect" on historic sites.

We look forward to the re-use of the historic structures including the mill smoke stack, the generator, laboratory, administration, human resources and the old Waipahu store buildings. We believe that the proposed establishment of design guidelines will help preserve the character of Waipahu.

If you have any questions please call Elaine Jourdane at 587-0015.

Aloha,

Don Hibbard, Administrator
Historic Preservation Division

EJ:jk

c: ✓ Vincent Shigekuni, PBR Hawaii, Pacific Tower Suite 650, 1001 Bishop Street, Honolulu, Hawaii 96813

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

January 20, 1997

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

Dear Mr. Hibbard:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (EIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided and will revise Section 5.1, B. of the EIS by adding the following to the first paragraph of this section: *"The 1996 archaeological report which was included as Appendix E in the Draft EIS has been reviewed by the State Historic Preservation Division (SHPD). In their review comments, SHPD stated that "it is unlikely that historic sites will be found, and believe that this project will have 'no effect' on historic sites."* If you have further any comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Bernard Kea, Community Planning, Inc.

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W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

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BENJAMIN J. CAYETANO
GOVERNOR

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
JERRY M. MATSUDA
GLENN M. OKIMOTO

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

IN REPLY REFER TO:
STP 8.7691

January 16, 1997

JAN 20

Ms. Cheryl Soon
Chief Planning Officer
Planning Department
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Attention: Lin Wong

Dear Ms. Soon:

Subject: AMFAC Commercial and Park
Draft Environmental Impact Statement
TMK: 9-4-02: 04 por.

Thank you for your transmittal of December 23, 1996, requesting our review and comments of the subject project.

We anticipate that the State facilities should be able to adequately accommodate the proposal.

We appreciate the opportunity to provide comments.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

c: Mr. Gary Gill, Office of Environmental Quality Control
Mr. Vincent Shigekuni, PBR Hawaii

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

January 20, 1997

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

Dear Mr. Hayashida:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact for the proposed Amfac Commercial and Park project. We appreciate the information provided. If you have any comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.17\ltr\kk-26.w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung
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BRANCH OFFICE: HILO LAGOON CENTER 101 AUPUNI STREET, SUITE 310 HILO, HAWAII 96720 TELEPHONE: (808) 961-3333 FAX: (808) 961-9988

BENJAMIN J. CAYETANO
GOVERNOR

ESTHER UEDA
EXECUTIVE OFFICER

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
P.O. Box 2359
Honolulu, HI 96804-2359
Telephone: 808-587-3822
Fax: 808-587-3827

JAN 7

January 6, 1997

Ms. Cheryl D. Soon
Chief Planning Officer
Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Attn.: Ms. Lin Wong

Dear Ms. Soon:

Subject: AMFAC Commercial and Park - Draft Environmental Impact Statement

We have reviewed the subject draft environmental impact statement as transmitted by a letter dated December 23, 1996 from Mr. Vincent Shigekuni, PBR Hawaii, and confirm that the subject property that is the subject of the draft environmental impact statement, identified as TMK: 9-4-02: por. 04, is within the State Land Use Urban District.

We have no further comments to offer at this time.

Thank you for the opportunity to provide comments on this draft environmental impact statement.

If you have any questions in regards to this matter, please feel free to contact me or Leo Asuncion of my staff at 587-3822.

Sincerely,

for ESTHER UEDA
Executive Officer

EU:th

cc: OEQC
Mr. Vincent Shigekuni

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

January 13, 1997

Ms. Esther Ueda
Executive Officer
State of Hawaii
Department of Business, Economic Development & Tourism
Land Use Commission
P.O. Box 2359
Honolulu, Hawaii 96804-2359

Dear Ms. Ueda:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided. If you have any comments or questions regarding the DEIS, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13(6)-23.w61

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BENJAMIN J. CAYETANO
GOVERNOR

GARY GILL
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

236 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

February 24, 1997

Cheryl Soon
Planning Department, City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Attention: Lin Wong

Dear Ms. Soon:

Subject: Draft Environmental Impact Statement (EIS) for Amfac Commercial and Park Project, Waipahu; TMK 9-4-2: por. 4

We have the following comments to offer:

1. Groundwater contamination: The draft EIS notes that periodic reports have been made to the State Department of Health. Please include a discussion about this as well as any remedial measures that are planned.

2. Cumulative impacts: On the remaining portion of this TMK parcel, Amfac proposes development of an industrial park. The EIS law requires a discussion of the relationship between projects and an analysis of the cumulative impacts of all projects in the area. Impacts to traffic, water, wastewater, and drainage systems for the entire parcel have been discussed in the appendices of the DEIS. In the final EIS please include a full discussion for both projects of visual impacts, especially of mauka viewpoints from makai locations. Include also a full discussion of cumulative impacts to air quality, especially from proposed industrial activities.

3. Hawaiian Electric comment letter: Hawaiian Electric is listed as a commenter, but neither this comment letter nor its response is included in the draft EIS.

If you have any questions call Nancy Heinrich at 586-4185.

Sincerely,

Gary Gill
Director

c: Timothy Johns, Amfac
Vincent Shigekuni, PBR Hawaii

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

March 10, 1997

Mr. Gary Gill, Director
State of Hawaii
Office of Environmental Quality Control
236 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Mr. Gill:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We have reviewed your letter of February 24, 1997, and are providing the following responses to your comments:

1. The second paragraph of Section 4.5 Groundwater Resources, A. Existing Conditions will be revised to read as follows:

In late 1989, three underground diesel storage tanks were removed from near the middle of the OSCo site. The tanks had been in service since 1966 for the storage of gasoline and diesel fuel. During the removal, a release of hydrocarbons (diesel) was discovered and reported to DOH. The tanks were removed and diesel-impacted soil (down to a depth of approximately 20 feet, which was the maximum depth/reach of the backhoe) was removed and treated on site. Because the diesel-impacted soil extended to the water table, approximately 45 feet below the surface, it was not practical to remove all of it. A Phase II investigation was conducted which established the extent of the diesel fuel. Monitoring wells were established within and around the detected product plume. Currently (December 1996) the diesel plume extent is approximately 350 feet by 220 feet in size and product thickness ranges from 0.01 feet to a maximum of 0.3 feet.

The first paragraph of Section 4.5 Groundwater Resources, B. Anticipated Impacts and Mitigative Measures will be revised to read as follows:

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

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Remediation in the form of product recovery via product recovery wells was begun in early 1994 and over 1,365 gallons have been recovered. Quarterly monitoring by BEI indicates that remedial activities have prevented the plume from migrating and have recently begun to reduce the plume in both areal extent and product thickness. Quarterly monitoring reports have been filed with the DOH on a regular basis (since 1993-latest report filed December 1996) and product recovery and quarterly monitoring and reporting is continuing until such time that it is appropriate to curtail the remediation. Monitoring is expected to continue for a period of time after remediation is stopped to ensure that conditions do not change. Groundwater samples from three monitoring wells located outside the plume have been analyzed for benzene, toluene, ethylebenezene and total xylenes and for polynuclear aromatic hydrocarbons, but none have been detected.

2. As requested, the discussion on cumulative impacts of the proposed project and the previously approved Mill Town Center Business and Industrial Park (formerly known as the Amfac Industrial Subdivision) will be supplemented with revisions to the assessment of visual and air quality impacts. The current photo analysis will be supplemented with additional photos and Section 5.5 Visual Resources and Open Space will be revised to read as follows:

Existing views of the project site and the adjoining Mill Town Center Business and Industrial Park from the surrounding area and within the subject property have been inventoried both descriptively and through photographs (Figures 5-2A and 5-2E). Short-term and long-term effects of views of the site and the adjoining Mill Town Center Business and Industrial Park which will result from development are assessed, and measures are proposed to minimize adverse effects.

A. <u>Existing Conditions</u>

The City and County of Honolulu, has conducted a comprehensive viewshed assessment documented in Coastal View Study *(City and County of Honolulu Department of Land Utilization, 1987). In this study, the existing visual resources of the entire Oahu coastline are inventoried, prioritized, and documented.*

According to the Coastal View Study, *the Waipahu viewshed is residential, commercial, and industrial. Farrington Highway is designated as a "Coastal Roadway", however, no significant coastal visual resources in the vicinity of the project and the adjoining Mill Town Center Business and Industrial Park are identified in the Study.*

Important public views that could be applicable to the proposed project and the adjoining Mill Town Center Business and Industrial Park as defined by the Special Provisions for Central Oahu are:

Pearl Harbor from Farrington Highway across Waipahu High School, Waianae Mountains and the sea from Kunia Road, Waipahu Sugar Mill from Waipahu Depot Road, and view of the Waianae Mountains from the Waipahu Cultural Park.

The project area is along Waipahu Street. Primary views of the project area are presently available from this roadway corridor. Project site photograph key maps provided on Figures 5-2A and 5-2B identify the locations from which site photographs were taken.

The present visual character of the project are from east and west approaches on Waipahu Street, and mauka approaches of Mokuola Street and Waipahu Depot Road. Distant views of the Koolaus are seen from Mokuola Street heading mauka and of Pearl Harbor while heading makai.

The mill is located on a bluff close to Waikele Stream. The town of Waipahu grew around the mill and the mill now anchors what remains of the historic core of the town. The smokestack of the mill is a landmark that is seen from many places and directions including most of Waipahu and its surroundings.

Views onto the adjoining Mill Town Center Business and Industrial Park are only available from Manager's Drive, from the Waipahu Hongwanji and from the adjoining Jack Hall Memorial Housing Project, with only partial views available from Paiwa Street. No significant natural resources or other significant landforms are present on the Mill Town Center Business and Industrial Park.

B. *Potential Impacts*

The proposed project and the adjoining Mill Town Center Business and Industrial Park will not impact the open space values of the Koolau and Waianae mountain ranges, Kipapa Gulch, Waipio Peninsula, or the Wahiawa Reservoir. The visibility, preservation, enhancement and accessibility of open space areas, as defined in Section 24-1.4 of the Common Provisions, will not be negatively impacted by the proposed project or the adjoining Mill Town Center Business and Industrial Park.

The proposed project will not obstruct: any mauka-makai view corridors, views of significant landmarks or natural resources, or ridge line views from outside or within the project boundaries. Views of the ocean and mountain ranges are generally not available from the area of application or surrounding residential areas. The transitional and standard height requirements set forth by the LUO will preserve public views of the distant Waianae Mountains. This will ensure that the above noted view planes are maintained as applicable.

The adjoining Mill Town Center Business and Industrial Park will impact mauka-makai views and views of the sugar mill stack from the Jack Hall Memorial Housing Project and the Waipahu Hongwanji. Views of the ocean and mountain ranges are generally not available from the adjoining Mill Town Center Business and Industrial Park or surrounding residential areas.

Short-term Visual Impacts - Construction activities will create some adverse effects on the views of the project and the adjoining Mill Town Center Business and Industrial Park along the roadway corridors. Depending on the phase of development, construction sites will be undergoing clearing and grubbing, grading, site work, foundation construction, framing and/or finishing.

Long-term Visual Impacts - The visual character of the project site will be changed from its present industrial appearance to a plantation heritage themed commercial (retail and office) and cultural park. Design guidelines will be established to implement the plantation theme. The proposed industrial land use of the adjoining Mill Town Center Business and Industrial Park is compatible with the adjacent industrial facilities associated with the former operations of OSCo.

C. *Mitigative Measures*

Project Design Considerations. The project and the adjoining Mill Town Center Business and Industrial Park will minimize adverse visual effects by conforming to setback requirements, installing appropriate landscaping, and establishing design guidelines for structures which will include building heights, locations, materials, colors and surrounding landscaping. An Urban Design Plan for the Mill Town Center Business and Industrial Park has recently been approved by the Department of Land Utilization in accordance with one of the conditions of the Unilateral Agreement for the rezoning of the industrial project.

The following will be added to the end of Section 5.4 Air Quality, B. Potential Impacts:

The Final Urban Design for the Mill Town Center dated February 12, 1997 indicates that the only industrial activities permitted to be developed within the property that have the potential to affect air quality would be light industrial activities. Cumulative impacts to the air quality, especially from proposed light industrial activities are anticipated to be insignificant. These activities are anticipated to be insignificant because the National and State Ambient Air Quality Standards (NAAQS/SAAQS) prohibit industrial pollutants from exceeding any regulated ambient air quality standard or hazardous air pollutant standard without first securing approval from the Hawaii State Department of Health (DOH). The NAAQS/SAAQS represent the maximum allowable levels of pollution concentration considered safe, with an adequate margin of safety, to protect the public health and welfare. For an industrial activity to obtain DOH approval to exceed the standards and

cause a significant impact to air quality, that particular facility would need to apply for a covered source or non-covered source air permit, dependent on the level of pollutant concentrations desired to be emitted into the ambient air. Obtaining such permits would be determined on a case by case situation. The State of Hawaii is presently in attainment for all criteria pollutants (i.e., not violating the NAAQS or SAAQS). It is unlikely that DOH would allow a facility to cause an exceedance of the ambient air quality standards, which would cause the State to be in Nonattainment with its own SAAQS and potentially the NAAQS.

3. Although Hawaiian Electric was listed as a commenter, we regret that there was a typographical error. No letter was received from Hawaiian Electric in response to NOP. The EIS will be revised accordingly.

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Tim Johns, Amfac

1032.13deisbl-55.w61

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813-5249
PHONE (808) 594-1888
FAX (808) 594-1865

February 03, 1997

Mr. Timothy Johns
Amfac/IMB Hawaii, Inc.
700 Bishop Street, 21st Floor
Honolulu, HI 96813

Dear Mr. Johns:

Thank you for the opportunity to review the Draft Environmental Assessment (DEA) for Amfac Commercial and Park, Waipahu, Island of Oahu. The DEA was prepared to address potential environmental impacts.

The Office of Hawaiian Affairs (OHA) has no objections at this time to the proposed project. Based on information contained in the DEA, the development apparently bears no significant long-term adverse impacts on adjacent urban areas nor upon existing flora or fauna habitats. Furthermore, no known archaeological remains exist and the development will not significantly affect the local scenery. But OHA has serious concerns about the title of the project and the connotations associated with it. The title implies a dual development, commercial and park. A review of land allocations (Page 2-1) reveals, however, that only 12% of the area will be actually used for park facilities. OHA urges the preparers to revise the project's title to reflect what the project is: a commercial complex with a small park designed to meet green area requirements for commercial developments. Please contact Lynn Lee, Acting Officer of the Land and Natural Resources Division, or Luis Manrique, should you have any questions on this matter.

Sincerely yours,
Martha Ross
Deputy Administrator

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

February 25, 1997

Ms. Martha Ross
Deputy Administrator
State of Hawaii
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Dear Ms. Ross:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact for the proposed Amfac Commercial and Park project. We have reviewed your letter of February 3, 1997, and offer the following responses:

1. We understand your concern regarding the title of the project. Please note that the project is subject to Chapter 343, Hawaii Revised Statutes, only because of the proposed amendment to the Central Oahu Development Plan Land Use Map from Industrial and Residential to Commercial and Park designations. To be more accurate, the title could read "Amfac Commercial, Hans L'Orange Park Expansion, Heritage Area, Leeward YMCA, FilCom Center, Open Space Buffer, Mokuola Street Extension, and Waipahu Street Widening Project", but it would be too long. Since "Amfac Commercial and Park" is descriptive of the applicant and the proposed action, the present project name will remain unchanged.

2. We would also like to note that other than setbacks, there are no "green area requirements" for commercial developments. Based on our review of Article 7, Chapter 22 of the Revised Ordinances of Honolulu, there are no park dedication requirements for non-dwelling or non-lodging developments. This was confirmed by telephone with the Department of Land Utilization. Also, the Land Use Ordinance contains no development standards for maximum building area ("green area" requirements) for commercial developments.

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

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3. While there are no "green area requirements for commercial developments", the proposed amendment to the Central Oahu Development Plan Land Use Map is requested to implement two community-based plans (Waipahu 2000 Update and the City's Waipahu Town Plan), which called for the expansion of Hans L'Orange Park and the retention of a landscaped buffer above Waipahu Street.

If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

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United States
Department of
Agriculture

Natural
Resources
Conservation
Service

P.O. Box 50004
Honolulu, HI
96850

Our People...Our Islands...In Harmony

February 25, 1997

Ms. Lin Wong
Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, HI 96813

Dear Ms. Wong:

Subject: Draft Environmental Impact Statement (DEIS) - Proposed Amfac Commercial and Park, Waipahu, Oahu, Hawaii

We have reviewed the above mentioned document and have no comments to offer at this time.

Thank you for the opportunity to review this document.

Sincerely,

KENNETH M. KANESHIRO
State Conservationist

cc:
Mr. Vincent Shigekuni, PBR Hawaii, Pacific Tower, Suite 650, 1001 Bishop Street, Honolulu, Hawaii 96813

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

March 5, 1997

Mr. Kenneth M. Kaneshiro
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
P.O. Box 50004
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. If you have any questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\dcis\bl-49.w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

1001 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813
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101 AUPUNI STREET, HILO LAGOON CENTER, SUITE 310, HILO, HAWAII 96720
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DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

January 10, 1997

Planning and Operations Division

JAN 1 4

Ms. Lin Wong
Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Ms. Wong:

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement (DEIS) for the Proposed Amfac Commercial and Park Project, Waipahu, Oahu (TMK 9-4-2: por. 4). The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. The information provided in the DEIS does not identify any specific activities involving work in waters of the U.S.; therefore, a DA permit will not be required at this time. Please contact Mr. Farley Watanabe of my Operations Branch at 438-9258 (extension 14) for further information and refer to file number 960000400.

b. The flood hazard information provided on page 4-14 of the DEIS is correct.

Sincerely,

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

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

January 15, 1997

Mr. Paul Mizue, P.E.
Acting Chief, Planning and Operations Division
Department of the Army
Pacific Ocean Division
Corps of Engineers
Honolulu, Hawaii 96858-5440

Dear Mr. Mizue:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.17304-24.w61

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United States Department of the Interior

U.S. GEOLOGICAL SURVEY

WATER RESOURCES DIVISION
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawaii 96813

January 13, 1997

JAN 17

Ms. Lin Wong
Planning Department
City and County of Honolulu
650 South King St., 8th Floor
Honolulu, Hawaii 96813

Dear Ms. Wong:

Subject: Draft Environmental Impact Statement
AMFAC Commercial and Park
Waipahu, Central Oahu
TMK 9-4-02:04 (por.)

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

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

Sincerely,

William Meyer
District Chief

cc: Office of Environmental Quality Control
Mr. Vincent Shigekuni, PBR Hawaii

Enc.

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

January 17, 1997

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

Dear Mr. Meyer:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. If you have any comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\letts\04-25.w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

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BHP

FEB 6

BHP Hawaii

February 4, 1997

Ms. Lin Wong
Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Ms. Wong:

Subject: Draft Environmental Impact Statement (DEIS)
Amfac Commercial and Park

In response to PBR Hawaii's letter dated December 23, 1996, we are returning the DEIS for the subject project. Based on our review of the statement, it has been determined that the area is currently clear of utility gas facilities.

Thank you for the opportunity to comment on the statement. Should there be any questions, or if additional information is desired, please call me at 594-5574.

Very truly yours,

BHP Gas Company

Keith K. Yamamoto
Supervisor, Engineering

KKY:krs
97-103

Attachment: DEIS

cc: Mr. Vincent Shigekuni, PBR Hawaii

BHP Gas Company
515 Kamakee Street Honolulu Hawaii 96814
PO Box 3379 Honolulu Hawaii 96842
Telephone 808 547 3333 Facsimile 808 594 5561 Materials 808 594 5630 Sales

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

February 7, 1997

Mr. Keith K. Yamamoto
Supervisor
Engineering
BHP Gas Company
P.O. Box 3379
Honolulu, Hawaii 96842

Dear Mr. Yamamoto:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided and please note that it was included in the seventh paragraph of page 4-12 of the Draft EIS. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1002.13\deis\bl-34.w61

Wm. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

HONOLULU OFFICE
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FILCOM CENTER, INC.

Internal Revenue Service Tax Exempt 501(c)(3) Publicly Supported Organization
100 N. Beretania Street #1290*Honolulu*Hawaii*96817*Phone: 521-3044 Fax: 523-5838

Mr. Patrick Onishi
Chief Planning Officer,
City and County of Honolulu
650 S. King Street
Honolulu, HI 96813
Attn: Lin Wong

February 18, 1997

Dear Mr. Onishi,

This letter is to provide comments to Amfac's draft Environmental Impact Statement for reclassification of 20+ acres for commercial, park and community facilities as the second phase of the master plan for the sugar mill site in Waipahu.

As part of the Waipahu community, our FilCom members recognized the need for economic revitalization as well as social and community programs and facilities for Waipahu and its residents. These needs have been identified and addressed in the Waipahu Town Plan. Plans for the sugar mill site are consistent with the Waipahu Town Plan, and our goals for FilCom Center.

Amfac's plans for the mill site in the heart of Waipahu is an encouraging beginning for Waipahu's revitalization. New investment capital in commercial and industrial properties, particularly during these poor economic times benefits not only Waipahu, but all of the island. It is vital that we invest and provide upgrades and improvements to our communities, especially the older one's like Waipahu, to keep them socially and economically healthy.

The YMCA and FilCom Center are facilities that strengthen community and family ties. Improvements to Hans L'Orange park upgrade facilities for recreation and youth athletics. Also, importantly, a heritage area will help us remember our plantation roots.

Teenagers especially can benefit from strengthening and developing a sense of community and family pride.

Page 2-7 of the draft EIS describes the FilCom Center as part of the components of Amfac's master plan. The FilCom Center will include programs for the community from youths to senior citizens. We envision it to be a gathering place, prominently located on Waipahu Street and available to serve people of all ethnic backgrounds. Importantly, commercial designation for the FilCom Center will help the center become self sufficient through renting space for events, meetings and other activities.

Economic development and new facilities for the community will help Waipahu get back on its feet and make Waipahu a better place to live. We are pleased to be part of this joint effort to bring these plans to fruition.

Sincerely,

Eddie Flores, Jr.
Executive Vice President, FilCom Center

cc: Mr. Vince Shigekuni, PBR Hawaii
Mr. Gary Gill, OEQC

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

February 21, 1997

Mr. Eddie Flores, Jr.
Executive Vice President
FilCom Center, Inc.
100 N. Beretania Street #129Q
Honolulu, Hawaii 96817

Dear Mr. Flores:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\dcin\bl-41.w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

1001 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813
TELEPHONE: (808) 521-5631 FAX: (808) 523-1402 E-MAIL: pbrhi@aloha.net

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101 AUPUNI STREET, HILO LAGOON CENTER, SUITE 310, HILO, HAWAII 96720
TELEPHONE: (808) 961-3333 FAX: (808) 961-4909

Planning Department
City and County of Honolulu
650 South King Street, 8th fl.
Honolulu, HI 96813
Attn: Lin Wong

FEB 2 4

February 20, 1997

Dear Ms. Wong,

This is in response to requests for comments to the EIS prepared for Amfac's plans for the Oahu Sugar Mill property in Waipahu. The Friends of Hans L'Orange Park support Amfac's efforts to develop the sugar mill site for the revitalization of Waipahu through economic development and community facilities.

The key to economic revitalization is to bring more people into the area with new commercial activity, as well as recreation and entertainment like the West Oahu Canefire's baseball games. When the Hawaii Winter League has its games, fans from all parts of the islands come into Waipahu to watch and enjoy good professional baseball.

Hans L'Orange Park is part of Waipahu's rich plantation history. Named after the famous Oahu Sugar plantation manager Mr. Hans L'Orange, the park has been used by plantation leagues for baseball, for parades, boxing matches and track meets and all sorts of activities since before the second world war.

Park improvements proposed by the Friends of Hans L'Orange Park include extension of the left field line to 320 feet, landscaping and lighting improvements, and a passive park expansion for picnics under the trees. Extension of left field to regulation dimensions to facilitate professional league play will benefit both the professional league during its short three month season, as well as the numerous community leagues that play on the field most of the year. Approximately three acres will be set aside by Amfac for expansion of Hans L'Orange Park.

Combined with the improvements that the Hawaii Winter Baseball League have put into the field, Hans L'Orange park has become and will continue to be a community asset and one that both Waipahu residents and the City and County of Honolulu can be proud of.

The Friends of Hans L'Orange Park support the commercial, cultural, community and recreational facilities proposed by Amfac for the sugar mill site.

Yours Truly,

Joe Hamada
Friends of Hans L'Orange Park

cc: Office of Environmental Quality Control
Vince Shigekuni, PBR Hawaii

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

February 24, 1997

Mr. Joseph Hamada
Friends of Hans L'Orange Park
94-333 Hokuahiahi Street #102
Mililani, Hawaii 96789

Dear Mr. Hamada:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\dels\bl-45.w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

1001 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813
TELEPHONE: (808) 521-5631 FAX: (808) 523-1402 E-MAIL: pbrhi@aloha.net

MAUI BRANCH OFFICE:
2127 KAOHU STREET, WAILUKU, MAUI, HAWAII 96793
TELEPHONE: (808) 242 2678 FAX: (808) 242 2902

HILO BRANCH OFFICE:
101 AUPUNI STREET, HILO LAGOON CENTER, SUITE 310, HILO, HAWAII 96720
TELEPHONE: (808) 961-3333 FAX: (808) 961-8811

Hawaii's Plantation Village

Friends of Waipahu Cultural Garden Park
94-695 WAIPAHU ST. • WAIPAHU, HI 96797 • (808) 677-0110 • FAX (808) 676-6727

FEB 21 ..:

Planning Department
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813
Fax No: 523-4950

Attention: Ms. Lin Wong

February 14, 1997

Dear Ms. Wong:

As Executive Director of The Friends of Waipahu Cultural Garden Park (FWCGP), I have had the honor of working with the Waipahu community, the City and Amfac on finalizing a master plan for Oahu Sugar Mill.

The goal of the plan centers on revitalization of our historic plantation town through creation of an economic base with light industrial and commercial uses, and cultural preservation through dedication of a heritage area including the smoke stack, the generator building and the laboratory building for a possible mill museum.

In section 2.2.2 of the draft EIS for Amfac's Commercial and Park development, a "heritage center" is proposed as one key element of the master plan. Friends takes great interest in this component as a facility that will promote the unique plantation heritage that is the foundation of Waipahu town. Re-use of some of the existing mill structures for a heritage center, in addition to the attraction of the commercial area, would complement Waipahu Cultural Garden Park and may bring more visitors to Waipahu and Waipahu Cultural Garden Park.

We agree that the smoke stack, lab and generator buildings, the Administration and Human Resources buildings (for the YMCA), the preservation of the Old Waipahu Store, Filipino Community center, and historic Hans L'Orange park could serve as a focal point a "heritage district." This heritage district would include the Old Waipahu Theater, the Old Fire Station the Alpa and Corner buildings and would link HPV with the Old Town Commercial area as proposed by the Waipahu 2000 Update and the Waipahu Town Plan.

Hawaii's Plantation Village

Friends of Waipahu Cultural Garden Park
94-695 WAIPAHU ST. • WAIPAHU, HI 96797 • (808) 677-0110 • FAX (808) 676-6727

Waipahu will be celebrating its centennial this year, and many Waipahuans will remember their plantation days foudly. Together with the need for economic stimulation, the promotion of cultural heritage through various facilities planned for the Oahu Sugar Mill site could revitalize Waipahu and give the town new direction and spirit for Waipahu's second century.

Sincerely,

Rich Chavka
Hawaii's Plantation Village

cc: Mr. Gary Gill, Office of Environmental Quality Control
Mr. Vincent Shigekuni, PBR Hawaii

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

February 21, 1997

Mr. Rich Chavka
Friends of Waipahu Cultural Garden Park
94-695 Waipahu Street
Waipahu, Hawaii 96797

Dear Mr. Chavka:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\deis\bl-39.w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

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TELEPHONE: (808) 961-3333 FAX: (808) 961-4909

GTE Hawaiian Tel

Beyond the call

GTE Hawaiian Telephone Company Incorporated
P.O. Box 2200 - Honolulu, HI 96841 - (808)546-7868

JAN 2 9

January 28, 1997

Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, HI 96813
Attn.: Lin Wong

Subject: Amfac Commercial and Park project in Waipahu, Oahu

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement for the proposed Amfac Commercial and Park project located in Waipahu, Oahu.

GTE Hawaiian Telephone Company, HTCo, does not anticipate any problems in providing telecommunication services to the proposed project. However, further review will be required by HTCo during the design stages of the project. We look forward to working with you and your consultants to ensure all of your telecommunication needs are met.

If you have any questions or concerns, please call Stacy Shishido at 546-1611.

Sincerely,

Keith Yoshino
Section Manager-Access Design
Infrastructure Provisioning

KY:ss

c: V. Shigekuni-PBR HAWAII
M. Taosaka-GTE Hawiian Tel-HIABY-3

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

January 29, 1997

Mr. Keith Yoshino
Section Manager
Access Design and Infrastructure Provisioning
GTE Hawaiian Telephone Company Incorporated
P.O. Box 2200
Honolulu, Hawaii 96841

Dear Mr. Yoshino:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided and will include it in the DEIS. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\ltr\61-31.w61

Wm. Frank Brandt • Thomas S. Witten • R. Scan Duncan • Russell Y. J. Chung

HONOLULU OFFICE
1001 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813-3429
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101 AUPUNI STREET, HILO LAGOON CENTER, SUITE 310, HILO, HAWAII 96720-4276
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Patricia Uyehara Wong, Esq.
Manager
Environmental Department

February 25, 1997

Planning Department
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, HI 96813
Attention: Lin Wong

Dear: Lin Wong

Subject: AMFAC Commercial and Park

Thank you for the opportunity to comment on your December 1996 DEIS for AMFAC Commercial and Park, as proposed by the AMFAC Property Development Corp. We have reviewed the subject document and have no comments at this time on the proposed project. HECO shall reserve further comments pertaining to the protection of existing powerlines bordering the project area until construction plans are finalized. Again, thank you for the opportunity to comment on this document.

Sincerely,

cc: OEQC

PBR HAWAII
Pacific Tower, Suite 650
1001 Bishop Street
Honolulu, HI 96813
Attn: Vincent Shigekuni

WINNER OF THE EDISON AWARD
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LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

March 5, 1997

Ms. Patricia Uyehara Wong, Esq.
Manager
Environmental Department
Hawaiian Electric Company, Inc.
P.O. Box 2750
Honolulu, Hawaii 96840-0001

Dear Ms. Wong:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project and your letter dated February 25, 1997. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\dcis\bl-50.w61

W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung
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WAIPAHU HONGWANJI MISSION

P.O. Box 208 WAIPAHU, HAWAII 96797

February 14, 1997

FEB 2 4

Ms. Lin Wong
Planning Department
City and County of Honolulu
650 S. King Street, 8th Floor
Honolulu, Hawaii 96813
fax: 523-4950

Dear Ms. Wong:

Re: Amfac Commercial and Park Draft Environmental Impact Statement

The board of directors of the Waipahu Hongwanji Mission are in favor of the development plan amendment proposed by Amfac for commercial and park development. This would facilitate completion of the Waipahu 2000 Update Committee's master plan for the Oahu sugar mill site, which has the endorsement of our board.

The Waipahu Hongwanji Mission is located on the mauka boundary of the Oahu Sugar Mill property. The Hongwanji has served the people of Waipahu, particularly those who came to work for the plantation.

Today our members consists of approximately 350 families. Our membership includes many business people from the Waipahu area, and people with roots in the community. Our minister resides on the temple grounds at the minister's quarters.

Amfac has worked with our board to satisfy any concerns about dust, noise, traffic, and access for the mission, and has been a good neighbor to the Hongwanji.

The master plan for commercial, light industrial and community uses provides and economic stimulus to the community and jobs for our local people, as well as recreation and cultural facilities for Waipahu.

Our Hongwanji members look forward to the improvements planned for the Oahu sugar mill site.

Very Truly Yours,

Yoshio Iwai
President

Ron Nakatsu
2nd Vice President

cc: Gary Gill - Office of Environmental Quality Control
Vincent Shigekuni, PBR Hawaii

PBR HAWAII
LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

February 21, 1997

Mr. Ron Nakatsu
2nd Vice President
Waipahu Hongwanji Mission
P.O. Box 208
Waipahu, Hawaii 96797

Dear Mr. Nakatsu:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\dcls\bl-39.wpd

W. Frank Brandt • Thomas S. Witte • R. Stan Duncan • Russell Y. J. Chung

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TELEPHONE: (808) 961 3333 FAX: (808) 961-9599

WAIPAHU 2000 UPDATE COMMITTEE
c/o C.O. Andy Anderson, Chairman
94-114 Hulahu Street
Waipahu, HI 96797

FEB 2 0

17 February 1997

Planning Department
City and County of Honolulu
650 S. King Street, 8th floor
Honolulu, HI 96813

Attention: Lin Wong

Dear Ms. Wong,

Subject: Amfac Commercial and Park Development Plan Amendment and Draft EIS

This letter is in response to the draft environmental impact statement prepared for phase 2 of Amfac's master plan for the former Oahu sugar mill in Waipahu.

The Waipahu 2000 Update Committee has met since October 1994 to come up with a plan for the sugar mill site to include economic development, preservation of cultural heritage, and facilities and programs for youth and families to strengthen community ties. Your department's Waipahu Town Plan, completed in December 1995 and accepted by the City Council a year ago, is consistent with our committee's recommendations for the Amfac property.

The mill site master plan takes into account the long term goals of our community and addresses some of the immediate economic, social and recreational needs of our area. Phase 1 of the master plan, the light industrial subdivision for job creation and industry, has been rezoned and is underway.

Our committee supports the commercial uses, the expansion of Hans L'Orange Park, heritage area, and the YMCA and Filipino Community Center planned for phase 2, as desirable uses for the lower half of the mill site along Waipahu street.

Plans for the mill site are positive efforts for Waipahu's revitalization which benefit our residents through economic opportunities, as well as providing recreational, cultural and community facilities.

Sincerely,

C.O. "Andy" Anderson,
Chairman, Waipahu 2000 Update Committee

cc: Mr. Vince Shigekuni, PBR Hawaii ✓
Mr. Gary Gill, OEQC

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

February 21, 1997

Mr. C.O. "Andy" Anderson
Chairman
Waipahu 2000 Update Committee
94-114 Hulahu Street
Waipahu, Hawaii 96797

Dear Mr. Anderson:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

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W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

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HILO BRANCH OFFICE:
101 AUPUNI STREET, HILO LAGOON CENTER, SUITE 310, HILO, HAWAII 96720
TELEPHONE: (808) 961-3333 FAX: (808) 961-8989

Leeward Branch
Young Men's Christian Association of Honolulu

Serving the People of Honolulu Since 1869 — A Member of Aloha United Way — Serving Leeward Oahu Since 1990

94-366 Pupupani Street, Suite 209 Waipahu, HI 96797 Telephone: (808) 671-6495 FAX: (808) 671-7985

GLENN OAMILDA
Chair

ROBERT STIVERS
Executive Director

February 20, 1997

Mr. Patrick Onishi
Director, Planning Department
City and County of Honolulu
650 South King Street, 8th Fl.
Honolulu, Hawaii 96813

Attention: Mr. Lin Wong

Dear Mr. Onishi,

Reference: Amfac EIS for Commercial and Park Designation for Oahu Sugar Mill Site in Waipahu

As the Executive Director of the YMCA of Honolulu Leeward Branch, I am writing to express my support for Amfac's request for commercial, community and recreational uses for a portion of their property in Waipahu at the site of the former Oahu sugar mill.

The Leeward YMCA has participated in planning of the mill site through the Waipahu 2000 Update and the Planning Department's Special Area Town Plan. The uses as proposed by Amfac are consistent with the community's desires for the mill site as identified in these plans. In them are reflected the need for economic revitalization, heritage promotion and more facilities for youths and families.

Being a professional working with youth for twenty four years and opening the Leeward YMCA in 1990, I know first-hand that without long term stable employment opportunities there is little hope for their future. As our youths grow up, stable employment will provide them with the security to become responsible members of our community and the State. Tommorrow's families are today's youth. Job opportunities within the area will help them achieve their goals and dreams. A key factor for young families and the development of young children is the availability of experienced and quality childcare. The Leeward YMCA intends to continue providing year round childcare services, and we believe our facilities will be able to service children of

employees of the Mill Town Center development as well as the surrounding community. Equally important to the well being of our families are recreational, social and cultural facilities that give them guidance, and a sense of pride in who they are.

The Leeward YMCA has been building strong youth, strong families and strong communities for seven years. Enrollment in our programs have grown from 412 in 1990 to 3,033 in 1996. The YMCA, working with schools, community organizations and community leaders are finding solutions to the youth problems that we hear about so often in the news . . . drugs, gangs and violence. Our youth programs focus on character development, self-esteem, leadership, responsibility and respect.

The Leeward YMCA will soon relocate to the mill site in two existing historic buildings. The Y will be better able to service the needs of youths and families with our larger facility. And the YMCA benefit from its proximity next to the FilCom Center, the heritage area, and improved Hans L'Orange Park.

The plans for the mill site, once completed, help to revitalize Waipahu and bring new hope and opportunities for its youth and families.

Sincerely,

Robert Stivers
Executive Director
Leeward Branch YMCA

cc: Gary Gill, OEQC
Vince Shigekuni, PBR, Hawaii

PBR HAWAII

LAND PLANNING
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL STUDIES

February 21, 1997

Mr. Robert Stivers
Executive Director
Leeward Branch YMCA
94-366 Pupupani Street, Suite 209
Waipahu, Hawaii 96797

Dear Mr. Stivers:

SUBJECT: AMFAC COMMERCIAL AND PARK DRAFT ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the Draft Environmental Impact Statement (DEIS) for the proposed Amfac Commercial and Park project. We appreciate the information provided. If you have any further comments or questions regarding the project, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni
Associate

cc: Lin Wong, City and County of Honolulu Planning Department
Nancy Heinrich, Office of Environmental Quality Control
Tim Johns, Amfac

1032.13\dei\61-41.w61

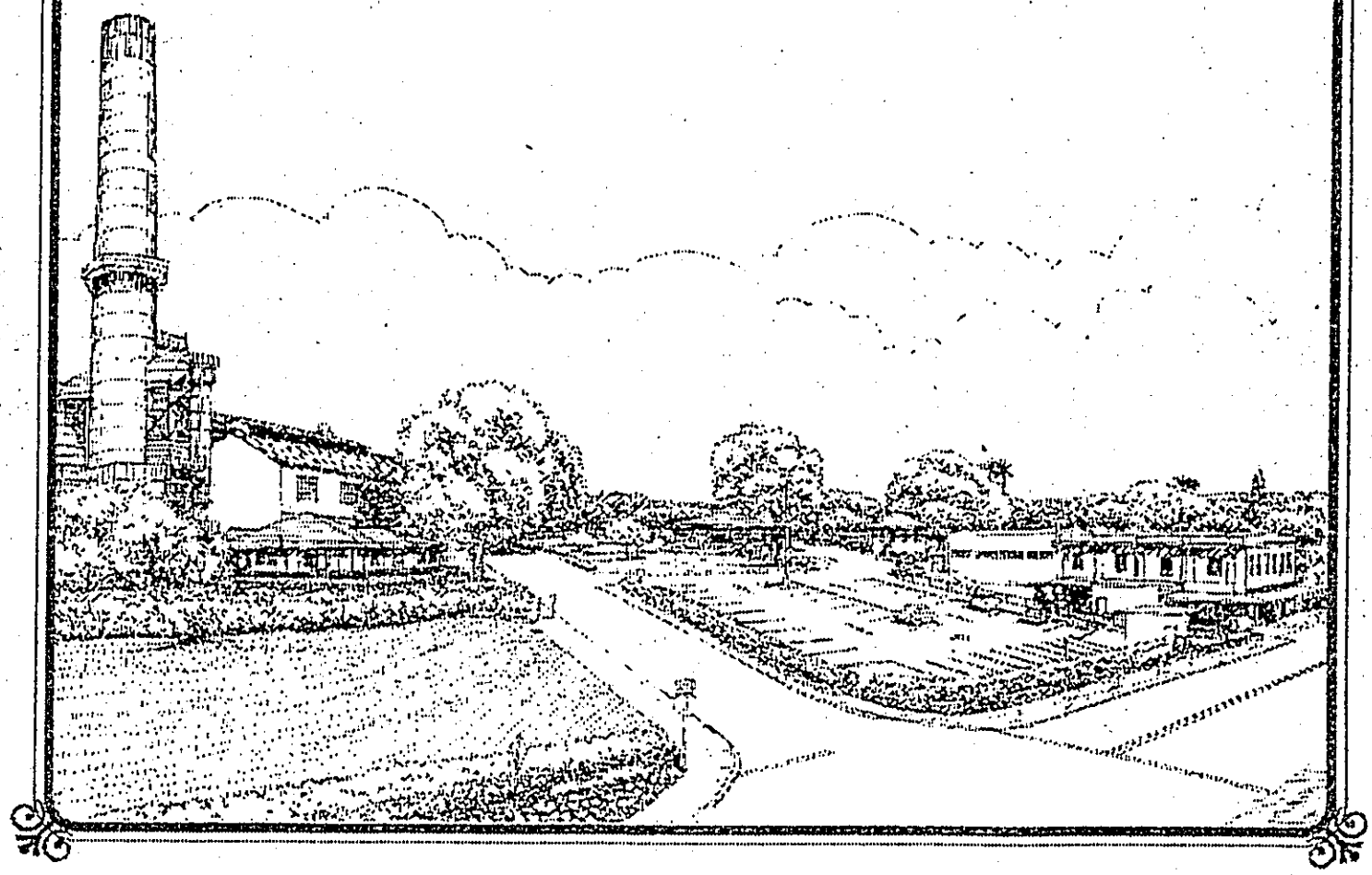
W. Frank Brandt • Thomas S. Witten • R. Stan Duncan • Russell Y. J. Chung

1001 BISHOP STREET, PACIFIC TOWER, SUITE 650, HONOLULU, HAWAII 96813
TELEPHONE: (808) 521-5631 FAX: (808) 523-1402 E-MAIL: pbrhi@aloha.net

MAUI BRANCH OFFICE:
[illegible]

HILO BRANCH OFFICE:
[illegible]

APPENDICES



APPENDICES

Appendix A

Waipahu 2000 Update Summary

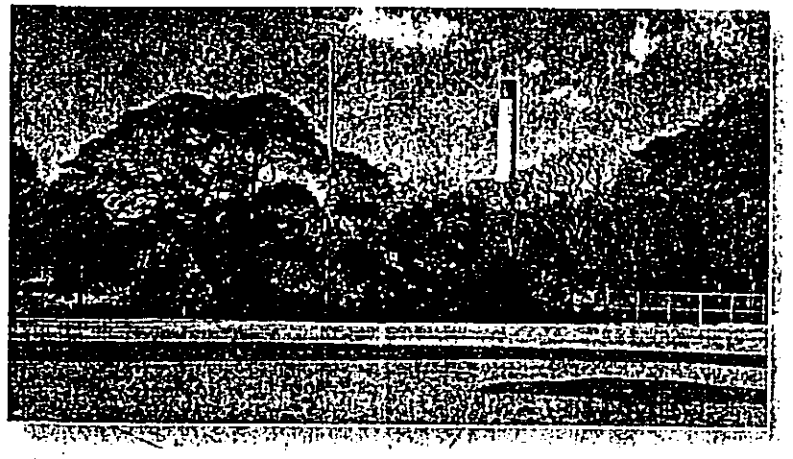
Waipahu 2000 Update Committee
94-916A Waipahu Street
Waipahu, Hawaii 96797

WAIPAHU 2000 UPDATE

For further information, contact Pat Lee, Project Coordinator at 247-2889

WAIPAHU 2000 UPDATE

EXECUTIVE SUMMARY



JUNE 1, 1995

Aloha,

In the spring of 1983, representatives from various Waipahu community groups began work on a long-range plan for Waipahu. This nine-month planning effort produced a community master plan called the Waipahu 2000 Plan. This Plan is often cited as one of the best examples of community-based planning undertaken in Hawaii.

The group was comprised of representatives from fifteen community, business and labor organizations.

With the closing of the Oahu Sugar Mill, many in the Waipahu community expressed concern about the economic vitality of Waipahu Town and the disposition of the mill site. Representatives from the community organizations that participated in the Waipahu 2000 Plan met and agreed that it was time to update the earlier plan to address the challenges, as well as opportunities that face Waipahu, following the closure of Oahu Sugar Company. The Waipahu 2000 Update Committee has met twice a month since October 1994. Area legislators and/or their aides have also attended these meetings which were open to the public.

This brochure summarizes a report that describes the effort held over eight months and attended by many members of the Waipahu community who brought with them a broad range of perspectives. A list of individuals who participated in these meetings is provided on the second to the last page of this brochure. While there was not unanimous approval of every conclusion, the Plan does reflect a general consensus of the Committee.

Although much of the original Waipahu 2000 Plan was implemented, there were many proposals that were never carried out. In addition to those old proposals, we have identified other necessary improvements. Of course, this vision for Waipahu is not static. As improvements are made and as times change, the vision for Waipahu will change accordingly. This Plan is intended to guide the City and the landowners involved as to how Waipahu can be improved by providing for economic development and job generation, preserving Waipahu's heritage and improving community ties. An equally important factor in the implementation of this Plan is community support and commitment, especially given the current economic climate.

As with the original Waipahu 2000 Plan, this update brochure is being sent to you as a Waipahu resident so that you can give us your suggestions in making this Plan a reality. Your comments can be forwarded to me or Mr. Pat Lee, Project Coordinator, at 247-2889. Copies of the full Waipahu 2000 Update Report are available for review upon request.

Mahalo nui loa,

C.O. Andy Anderson
Chair, Waipahu 2000 Update Committee

June 1, 1995

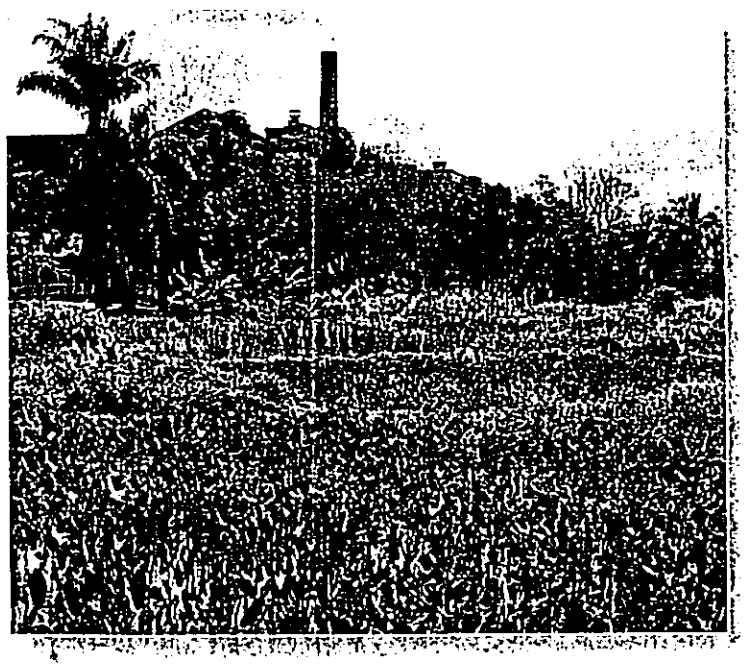
Objectives

The Waipahu 2000 Update Committee revisited the objectives of the previous effort and revised the objectives to reflect current community needs.

Community-wide planning objectives which set the guidelines for this program are as follows:

1. Improve Waipahu with well-planned growth.
2. Retain Waipahu's sugar heritage and sense of place.
3. Strive to improve the economic vitality of Waipahu.
4. Provide more middle-income housing.
5. Reduce crime and vandalism.
6. Improve the physical appearance of Waipahu.
7. Improve traffic circulation and provide more parking in Waipahu.
8. Improve inter- and intracity public transportation.
9. Strengthen community ties with youth and family programs.

WAIPAHU 2000



Waipahu Yesterday

Perhaps the late Major Okada, a driving force in the Waipahu Community, appropriately set the stage for this planning study with these words of wisdom:

"You gotta know the past, where you came from, to know where you're going"

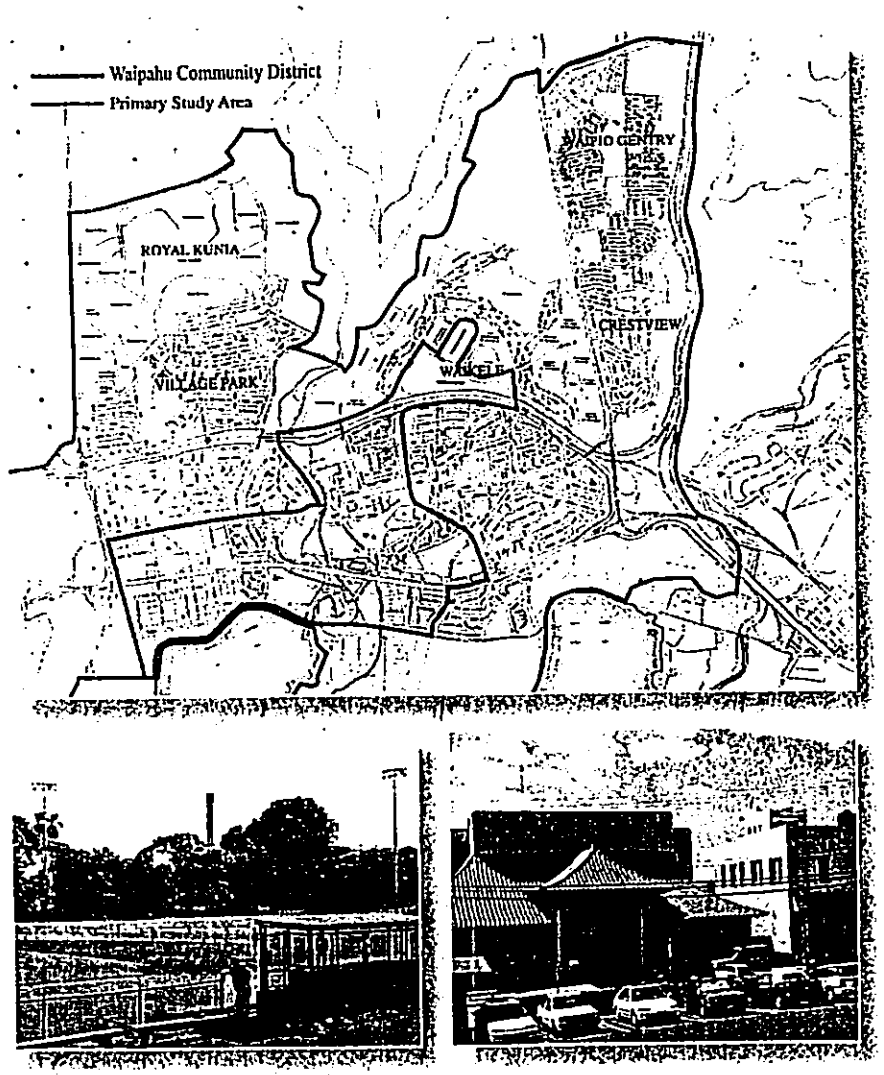
To plan Waipahu's future, examination of its past is worthwhile, for a strong appreciation of its sense of place, community's spirit and rich and colorful plantation heritage becomes apparent. As set out more fully in the Waipahu 2000 Update Report, this section of the Plan examines the history of Waipahu. A brief overview of this section follows.

Historically, Waipahu evolved over time as a result of its economic mainstay. Oahu Sugar Company, established in 1897, was a major determinant of the town's growth and prosperity. With expansive amounts of land, abundant water and a newly installed railway system (the OR&L, which linked the Leeward area to the port of Honolulu), Waipahu gradually changed from a fishing and wetland farming community to a successful sugar plantation town.

Waipahu became a classic example of a sugar plantation town. The sugar mill, with its prominent working smokestack (Oahu Sugar Mill also had the distinction of being the only mill with two stacks), was and remains the landmark of the town. Surrounding the mill were plantation camps, segregated by ethnicity, which provided housing for its workers. Hans L'Orange Park, became a focal point of the plantation communities for recreation and social interaction.

Particularly significant from a planning perspective is the pattern of business development over time. Originally, the town's activities were focused on Waipahu Street and Depot Road, so named because it led from the mill to the OR&L train depot at the edge of Pearl Harbor. With the exception of Waipahu Store, most of the business establishments were located on the makai side of Waipahu Street and strung along both sides of Depot Road. Only after the widening of Farrington Highway in the 1960's and as people acquired a dependence on the automobile and the volume of traffic increased along this highway, did the major retailing activity of Waipahu shift to the higher visibility corridor of Farrington Highway and development of business establishments along Farrington Highway became more apparent.

For Waipahu, the most widely recognized element of its past is its sugar plantation heritage. Unlike other communities on Oahu, Waipahu has a rich and colorful history which is reflected in Hawaii's Plantation Village and perpetuated in the spirit of its long-time residents.



Waipahu Today

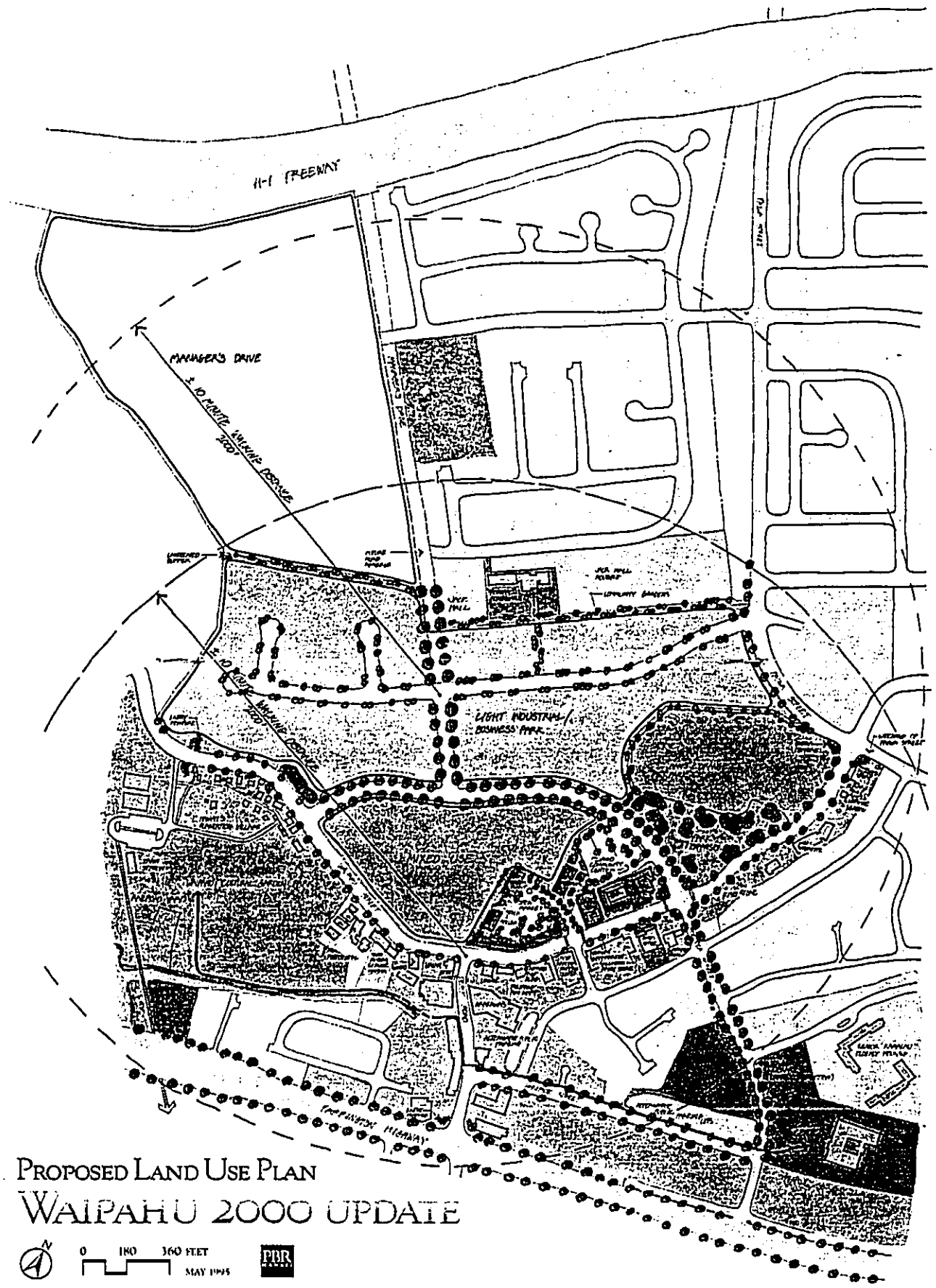
Waipahu today is an active town situated at the crossroads to the leeward regions of Oahu. As the home for some 51,000 residents, Waipahu has grown beyond its physical boundaries as new developments have taken place mauka of the H-1 Freeway, between H-2 and Kunia Road. As population continues to shift from downtown Honolulu toward Central Oahu and Ewa, Waipahu finds itself in the path of urbanization.

Although Waipahu is one of Oahu's oldest communities, its district boundaries have grown. For many years, Waipahu has been associated with Central Oahu instead of Ewa or Pearl City which appear to share more common attributes. One of the first and most important steps in this planning process was to redefine the Community District boundaries. This is useful in creating a sense of community identity, as well as establishing clear-cut political and legal jurisdictions which are important for resource allocations. A second part of this step was to identify a primary study area where more detailed studies would be conducted to determine the area's redevelopment potential.

To properly plan the future of Waipahu, information regarding existing land uses, land ownership, County Development Plan designations, economic and marketing trends, (traffic) circulation, public transportation, parks and recreation, schools, community and public facilities, hospitals and medical care, and utilities was compiled. Highlights of background data are provided in the full Waipahu 2000 Update Report.

Waipahu is a major residential community of historical significance made up mostly of middle-income, single-family residences and lower-income apartment areas. Commercial uses are concentrated along Farrington Highway and within the historic town core along Waipahu Street and Waipahu Depot Road. Areas of new commercial growth are located mauka of H-1 at the Waikele Commercial Center and at the Royal Kunia Wal Mart/Times shopping center. A large portion of the land makai of Farrington Highway is devoted to light industrial uses. Of significance, however, is the general lack of large, undeveloped or vacant parcels within the established business areas. This changed when Oahu Sugar Company closed in April 1995. Sixty-two (62+) acres of Amfac's property and thirty-five (35+) acres of City land adjacent to Waipahu Depot Road, Hans L'Orange Park, Hawaii's Plantation Village and the H-1 Freeway will be vacant near the center of Waipahu.

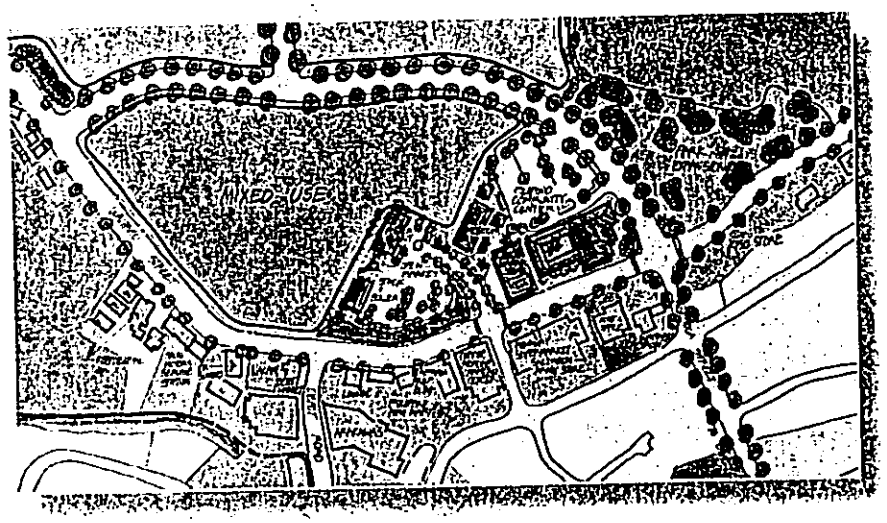
The community of Waipahu has many positive attributes, including: its cultural heritage; its churches; its strong, established community organizations; its strong sense of identity; the fact that its business community is the oldest and largest in Leeward Oahu; its central location; its public schools (including Leeward Community College and University of Hawaii – West Oahu); and its health care facilities and care homes. Most of all, unlike most of the urban expansion on Oahu, Waipahu retains a sense of place developed from its long history as an insular plantation community.



PROPOSED LAND USE PLAN

WAIPAHU 2000 UPDATE

Waipahu Tomorrow — Vision for Waipahu Town



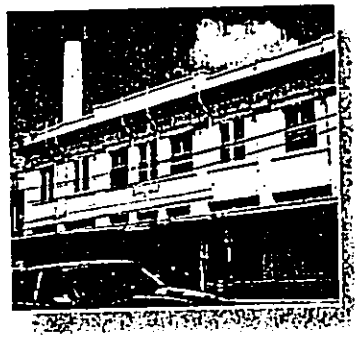
This section of the Waipahu 2000 Update Report describes the overall planning vision for Waipahu Town.

Waipahu has an excellent opportunity to move in a direction which will set it apart from other communities on Oahu and provide the catalyst to continue to unify the community toward common goals. With careful planning of complementary land uses and improved transit, pedestrian and bicycle access to housing, employment, recreation, education and other community services, Waipahu can truly become a "livable community."

The recommended plan for Waipahu Town recognizes the merits of Waipahu's plantation heritage and suggests that this heritage be an important part of the town's economic redevelopment. With key improvements in transportation circulation (such as the establishment of a transportation hub, the use of jitneys and a train tying Ko Olina to Hawaii's Plantation Village through Waipahu Cultural Garden Park) and implementation of the heritage district theme, Waipahu could evolve into a vibrantly unique community and a source of pride for its residents.

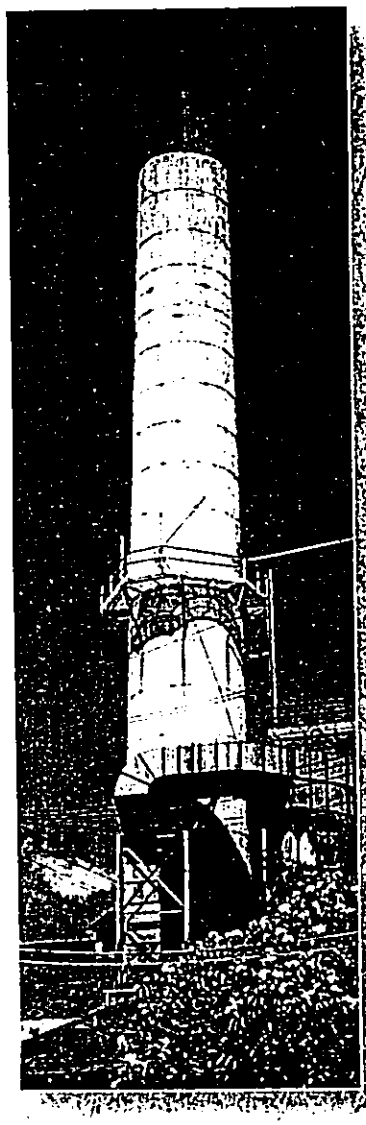
Although preservation of historically significant structures is encouraged, this plan primarily seeks to encourage new development which is architecturally compatible with the historic aspects of Waipahu.

To achieve the themes discussed above, the overall vision for Waipahu Town is to revitalize the area in the immediate vicinity of the mill by providing employment opportunities while including a cultural/heritage element. In addition, the Waipahu 2000 Plan Update proposes the following: the widening of Waipahu Street; the widening and/or improvement of Paiwa Street between Waipahu Street and Kahuailani Street; where possible, expanding pavement widths within street right-of-way to accommodate bicycles; where possible, the provision of public joint use parking for existing commercial businesses along Waipahu Street and Waipahu Depot Road; the extension of Manager's Drive, with connections to Waipahu Cultural Garden Park, and to the Civic Center via Mokuola Street; a pedestrian connection between the Civic Center and the Waipahu Cultural Garden Park; a transit hub on State land near the Civic Center, or on City land at the Manager's Drive parcel; and the expansion of Hans L'Orange Park for active and passive recreation. All are proposed to encourage more pedestrian activity along Waipahu Street and Waipahu Depot Road and to reinforce the heritage district theme.



There is a desire by the community to save and show the objects that preserve the history of Oahu Sugar Mill and all ethnic groups of Hawaii who were employed by the plantation. Heritage/cultural activities are envisioned for the area near the existing stack. This area was selected for cultural/heritage activities due to its high visibility from Waipahu Street, potential reuse of existing buildings, and the panoramic views of Waipahu Town from the top of the hill. The smokestack could be preserved, and the feasibility of reuse of some of the existing buildings should be considered. Preservation and/or reuse of some of the buildings in better condition could help to preserve the character of Oahu Sugar's influence on Waipahu. The heritage district could include a historical museum, arts and crafts center and/or a community center with an emphasis on one of the island's many nationalities, such as the Filipino community. The area should be linked with the Waipahu Cultural Garden Park by a pedestrian path. This pedestrian path could also be linked to an area proposed for expansion of Hans L'Orange Park (which may be improved to accommodate play by the Hawaii Winter Baseball League). Together with the existing Waipahu Cultural Garden Park/Hawaii's Plantation Village, this site may create the critical mass of activities that will attract island residents and visitors to Waipahu and its businesses.

The increased heritage/cultural activity may serve as a catalyst to attract more businesses to Waipahu Street and Waipahu Depot Road. Developing new commercial/office structures, while observing heritage themes and guidelines, could strengthen the existing small town architectural character of Waipahu Depot Road and Waipahu Street and could recapture the existing heritage of Waipahu. This occurs in Chinatown, where the historical character of the area is maintained by design controls on new commercial buildings. Businesses in these new commercial areas could provide alternative dining experiences (ethnic restaurants), specialty foods, leis, and fresh produce or provide small offices for professionals such as attorneys, doctors, dentists, realtors, architects and engineers. With increased commercial activity along these roads and a heritage/cultural center to



serve as an anchor to the town, Waipahu Town could have a similar role to Central Oahu and Ewa as Chinatown serves to the Primary Urban Center.

Mixed use (industrial/commercial), in the area occupied by most of the sugar mill buildings, is proposed as a way of helping to replace the economic activity and employment that was provided by Oahu Sugar Company. The mixed use area could have a heritage theme, and should include businesses that would attract Oahu residents and visitors. A desirable scenario would be for a large, single user to develop this area. This area could also include a food processing and distribution center for crops to be grown by small farmers of lands once cultivated by Oahu Sugar Company in Ewa and Central Oahu, and a "farmers' market."

It is also anticipated that a light industrial subdivision will generate employment and a new market for existing retail and service businesses in Waipahu. The mixed use and industrial areas should be designated as an enterprise zone, to provide economic incentives for businesses to start in or relocate to Waipahu. The proposed enterprise zone would also be located within a 10-minute walking distance of existing residential areas, reducing commuting traffic on area streets.

A landscaped buffer should be provided between any new industrial, commercial and/or mixed use and existing residential areas. Community gardens could also be developed within a landscaped buffer between the proposed light industrial subdivision and the Jack Hall Housing project.

The committee supports the City's proposed residential development of its Manager's Drive parcel. However, in light of the announcement on April 25, 1995, that the City may abandon the proposed residential development of its Manager's Drive parcel, there may be an opportunity for the City to plan uses that add or help to accomplish the non-housing objectives of this plan. For example, the Manager's Drive parcel which consists of approximately 35 acres, when added to the Oahu Sugar Mill site and the existing commercial along Waipahu Street and Waipahu Depot Road, presents an opportunity to replace the core of activity that was provided by Oahu Sugar Company. If the City abandons its proposed residential development, the Committee encourages that a mix of non-residential uses be proposed within both the Oahu Sugar Mill property and the Manager's Drive parcel.

Extending an enterprise zone designation around the Manager's Drive parcel could be used as a way of "jump starting" new manufacturing businesses, including artist incubators. Some of the industrial subdivision tenants could possibly include artisans, woodworkers and other craftsman being relocated from other areas of Oahu such as Kakaako, who would receive economic incentives from the government.

Although striving "to improve the economic vitality of Waipahu" is one of this plan's major objectives, other potential uses of the Manager's Drive parcel cited by the Committee included: affordable rental housing, a transportation hub, parks, youth-oriented facilities and community gardens. An interim use that was suggested was parking for professional baseball (Hawaii Winter Baseball League) events at Hans L'Orange Park. If parking at Manager's Drive is deemed to be too far away from Hans L'Orange Park (even with a shuttle system), then the Committee encourages the City to consider exchanging some land with Amfac. This will allow the use of some of the Oahu Sugar Mill property closer to Hans L'Orange Park for park parking at night, park and ride parking during the weekday, and "farmer's" or "open" market during the weekend days.

This vision for Waipahu will not be possible without the cooperation and commitment of Amfac, the City, and most importantly, the Waipahu Community. The Committee sees that at the community level, organizations like the Waipahu Community Association need to be revived, with representation from the various community associations. Each supporting community association needs to take responsibility for their respective communities, relying less on government (i.e., more on community associations, less on the Neighborhood Board; more on community policing efforts, less on "911").

Finally, the Committee sees that intra-community ties need to be strengthened. We must not lose sight of the critical importance of reinforcing and providing support for families and our precious youth. Additional resources must be directed to family and youth programs. The Committee believes that the multi-pronged approach presented by the Waipahu 2000 Update Plan will help to develop community pride, employment and educational opportunities and other long-term solutions to challenges facing Waipahu as it looks to the future. While this plan is intended to guide future improvements, it will take the concerted effort of the City, the landowners involved, and most importantly, Waipahu residents, to make Waipahu a truly livable community and to keep its special historical character.

Major Proposals of the Waipahu 2000 Plan Update

Major proposals of the Waipahu 2000 Update Plan are more fully described in the full report and are summarized below:

1. Create a Heritage District with design guidelines to maintain Waipahu's plantation heritage. Implementing a "mainstreet USA" type project may help accomplish this.
2. Provide landscaped gateways on Waipahu Street and Waipahu Depot Road.
3. Retain the area from the smokestack to the Clinic Building in its existing condition as a cultural/historic area. Encourage the development of a museum (to be operated by a non-profit organization such as Hawaii's Plantation Village) together with an arts and crafts center and a farmers' market area.
4. Expand the Hans L'Orange Park to the vicinity of Makaaloha Street in order to extend the "left field line" and create more passive park area and area for additional parking.
5. Set aside the area between the Clinic and the expanded Hans L'Orange Park for a Filipino community center.
6. Redevelop the remaining portion of the "Mill site" for commercial/industrial uses, if possible by a single large user.
7. Provide an area for a farmers' market and an agricultural products processing and distribution center.
8. Provide pedestrian connections to the Hawaii's Plantation Village and the Civic Center.
9. Improve visual character of Waipahu Street and Waipahu Depot Road.
10. Improve visual appearance of business areas along Farrington Highway.
11. Provide landscaping along Farrington Highway to create a "boulevard-like" experience.
12. Improve transportation circulation by the following:
    a. Widen Waipahu Street to 4 lanes from Mahoe to Waikele Stream if it doesn't impact area businesses.
    b. Widen Paiwa Street from Waipahu Street to Kahuailani Street.
    c. Provide bus cut-outs along Waipahu Street.
    d. Create a transportation hub.
    e. Establish intracity and paratransit systems within Waipahu.
13. Encourage more parking near town core, including "shared" parking facilities.
14. If possible, develop the Pearl Harbor waterfront for recreational uses and convert the Waipahu Incinerator site into a public park.
15. Improve Waipahu Depot Road from Farrington Highway to the Police Academy to include road resurfacing, curbing and landscaping along Kapakahi Stream.
16. Encourage the reactivation of the historic railway through Waipahu including a rail yard within the Hawaii's Plantation Village.
17. Build and staff a police station in Waipahu and encourage other community policing efforts.
18. Improve exterior lighting and security within the town.
19. Modify the existing Waipahu Street bridge to reduce storm water back-up.
20. Support diversified agriculture in Leeward Oahu and the continued supply of Waiahole Ditch water to Leeward Oahu.
21. Encourage economic revitalization through enterprise zones, community block grants and other federal, state, county and private efforts.

Acknowledgements

The following individuals participated in the Waipahu 2000 Update Committee meetings (any organizational affiliations shown below does not necessarily indicate official representation by the organization).

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Waipahu Neighborhood Board

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Filipino Community Center

Lloyd Ajimine
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Ephraim Amodo, Sr.
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Espe Cadavona
Neighborhood Commission

William Cadavona
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Rose Churma
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Dorothy Colby
Leeward Oahu Public Health Nursing Section

Dennis Davis
Waipahu Business Association

Joseph De Mauro
Waipahu Resident

Irene Elston
Waipahu Neighborhood Board
Waipahu Neighborhood Improvement Association

William Elston
Waipahu Neighborhood Improvement Association

Rocky Finseth
Councilmember Hanneman's Office

Mac Flores
Waipahu Jaclrabbit Assn.

Nestor Garcia
State Representative

James Gomes
St. Joseph's Church
Waipahu Neighborhood Board

Joe Hamada
Hans L'Orange Baseball Park Committee

Mufi Hannemann
City Councilmember

Cookie Harris
Councilmember Marshall's Office

John Higham
Amfac

Robert Hirayama
Waipahu Community Association

Glen Houlton
Hawaiian Railway Society

Miles Ichinose
Waipahu Business Association

Yoshio Iwai
Waipahu Hongwanji Mission

Tim Johns
Amfac

Ben Junasa
System of Care Project

Phyllis Kacher
Amfac

Bob Kato
Hawaii's Plantation Village

Cal Kawamoto
State Senate

Young Kim
Waipahu Neighborhood Board

Russell Kokubun
Hale Mainstreet

Pat Kubota
Councilmember Hannemann's Office

Frank Kudo
Hawaii Winter Baseball League

Lori Kunioka
Councilmember DeSoto's Office

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Ernest Malterre
Waipahu Cosmopolitan Club

Jake Manegdeg
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Craig Okui
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Tom Tanji
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Annette Yamaguchi
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Leeward Oahu Lions Club
Leeward YMCA

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Councilmember Marshall's Office

Darrell Young
Residents of the Champions at Waikele

Steve Yuen
Hawaii's Plantation Village

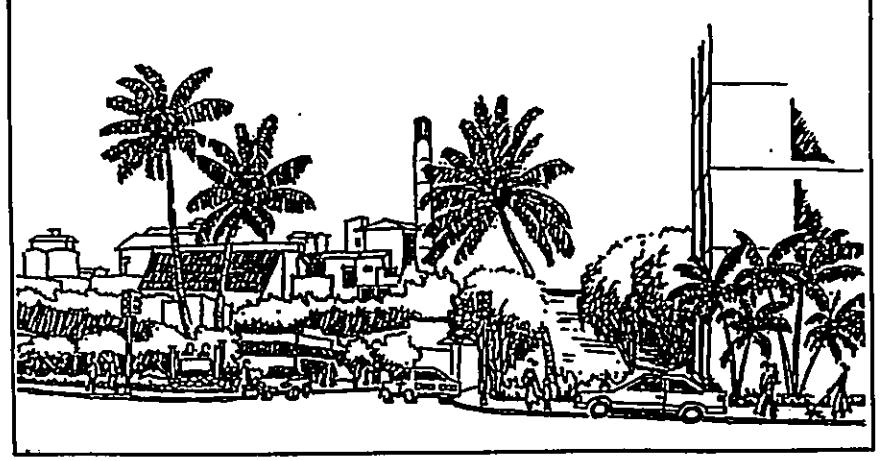
Kevin Zane
Hawaii's Plantation Village

Appendix B

Waipahu Town Plan, A Special Area Plan for the Central Oahu Development Plan

WAIPAHU
TOWN PLAN

REPORT



A SPECIAL AREA PLAN OF THE CENTRAL OAHU DEVELOPMENT PLAN

CITY AND COUNTY OF HONOLULU
PLANNING DEPARTMENT

PREPARED BY:
WILSON OKAMOTO & ASSOCIATES, INC.
HONOLULU, HAWAII

DECEMBER 1995

WAIPAHU TOWN PLAN

REPORT

A Special Area Plan of the Central Oahu Development Plan

Prepared for:

City and County of Honolulu
Planning Department

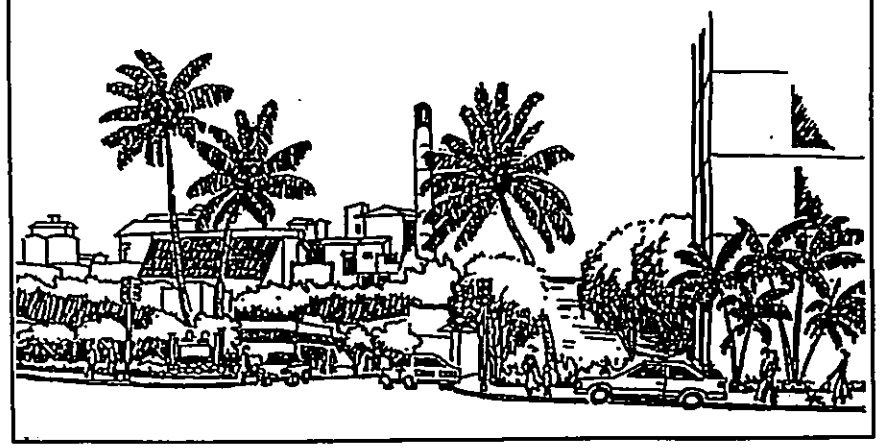
Prepared by:

Wilson Okamoto & Associates, Inc.
Kimura International
Decision Analysis Hawaii, Inc.
Miyabara Associates

December 1995

WAIPAHU
TOWN PLAN

REPORT



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Miyabara Associates

December 1995

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1
INTRODUCTION

1. INTRODUCTION

Waipahu is a former sugar plantation town located at the crossroads to the two major growth regions of Oahu – Ewa/Kapolei and the Central Oahu/Mililani areas. The closing of the Oahu Sugar Company marks the end of an era and of Waipahu's role as a sugar mill town. Decisions on the future use of the sugar mill site, which is the heart of the old town, will play a major role in defining the future character of Waipahu. Waipahu's commercial and industrial areas have been adversely affected by the growth of new commercial and industrial developments elsewhere in Ewa and Central Oahu, requiring a search for new service and market opportunities if the business areas are to be revitalized.

In January 1995, the Honolulu City Council adopted Resolution No. 94-309, C.D. 1 to endorse the City Planning Department's preparation of a community-based special area plan for Waipahu. The Resolution called for the Waipahu Town Plan to provide comprehensive, long-range objectives to guide land use and public improvements, as well as specific plans for certain improvements, including transportation improvements, which address the needs and concerns of the community and enhance the long-term livability and economic vitality of Waipahu.

This report on the Waipahu Special Area Plan documents the planning analysis, plan elements and rationale involved in the formulation of the Special Area Plan.

1.1 History of Waipahu[1]

Waipahu, "the land of gushing waters", is located in Leeward Oahu, approximately 14 miles west of downtown Honolulu. The boundaries of Waipahu encompass three ahupuaa (economically self-sufficient corridors of land running from the mountains to the sea) -- Waipio, Waikele and Hoaeae. The ahupuaa were distributed first to chiefs and powerful individuals of the Hawaiian monarchy, and after the establishment of the Constitution of the Kingdom of Hawaii, to William Jarrett, a high ranking official in the Hawaiian government. The name "Waipahu" was formally approved by the Hawaii State Board of Geographic Names in November 1966. The boundaries were officially approved by the United States Bureau of the Census on March 1967 (Beechert, 1974).

Water has always been important in the history of Waipahu, from the days of the ancient Hawaiians to the sugar plantation era. Indeed, the name "Waipahu" comes from the words 'wai' meaning water and 'pahu' meaning forceful ejection out of the ground. In ancient Hawaiian history, Waipahu was known as a fishing village. The Hawaiians believed that the spring in Waipahu stemmed from under the Koolau mountain range from a spring named Punahoolapa at Kahuku. The irregular coastline with coral reefs

[1] History of Waipahu summarized from University of Hawaii Department of Urban and Regional Planning Practicum study, "An Inventory of Community Assets in Waipahu", 1995

and shallow water made the construction of fish ponds possible. The ample water supply was ideal for wetland farming, which produced taro, a staple food in the Hawaiian diet. Thanks to an abundant food supply, in ancient Hawaii the area around Pearl Harbor had the second highest density in population after Honolulu (Beechert, 1974).

The development of Waipahu came about with the arrival of Benjamin Franklin Dillingham to Hawaii in 1865. Originally from Massachusetts, Dillingham had been the first mate of the Whistler until he was hospitalized in Honolulu with a fractured leg. Dillingham was convinced of the agricultural potential of the Leeward Oahu area. The area was lacking three elements for agricultural development: 1) land consolidation, 2) transportation, and 3) water necessary for large-scale agriculture. The first obstacle was cleared by forming a partnership with James Campbell in order to consolidate parcels of land (Beechert, 1974). The second obstacle was eliminated when in 1889, Dillingham was able to secure a Charter from the Government of Hawaii which extended the Oahu Railway and Land Company (OR&L) from the port of Honolulu to Leeward Oahu. The establishment of a railroad system made possible the transportation of people, supplies and harvested cane. The third obstacle was eliminated when Dillingham employed hydraulic engineers, James D. Schuyler and G.F. Allardt, who discovered an artesian belt which became the prime source of water for the Oahu Sugar company until its closure. (Beechert, 1974) With the removal of these three obstacles to large-scale agriculture, Oahu Sugar Company was established in 1897, and Waipahu gradually changed from a small fishing and wetland farming community to a sugar plantation town.

Expansive land, good soils, sunny conditions, and abundant water became the main reasons for establishing a sugar plantation in the area of Waipahu. Sugar plantation was supported by an infrastructure of irrigation, railroads and boat landings. The Waiahole ditch system - a network of tunnels and ditches - carries water from Windward Oahu to the island's central plain. The Waiahole Water Company, Ltd., a subsidiary of Oahu Sugar Company built the main bore and smaller tunnels from 1913 to 1916. With the closure of the Oahu Sugar Company, future use and allocation of the water to Leeward and Windward Oahu has become an issue.

The plantation brought immigrant plantation workers from China, Japan, Okinawa, the Philippines, Portugal, Puerto Rico and several other countries. The cultures, lifestyles, and traditions - the languages spoken, the games played, the gods worshipped, and the attitudes towards family, property and authority - that these people brought to Waipahu remain the basis of the social fabric of the community today (Fuchs, 1983).

The sugar mill, with its symbolic smoke stack was still is a major landmark of the Waipahu community. Another reminder of the plantation lifestyle is Manager's Drive, located near the mill. A broad-based middle class did not exist in the social structure of the early plantation era. Thus, it may be assumed that during the plantation era, this road stretched through the most prominent neighborhood in the community, reflecting the manager's social status.

The Oahu Sugar Company provided housing for the immigrant workers, living in plantation camps which were segregated by ethnicity. The plantation company was the primary source of employment, providing housing as well as basic infrastructure, including water, from the immigrant workers. After the success of the sugar economy, a unionization movement became stronger and brought about improvements in working and hosing conditions. A sense of community could be derived visually from elements such as common residential architectural styles and the use of uniform colors to paint the structures. Use of open porch styles - which have been enclosed since then - fostered an atmosphere that invited neighbors to each other's homes and thus provided a setting for social interaction.

Facilities such as community bathhouses were another setting for social interaction with in the plantation community. It was also during this era that Waipahu Depot Road became the focus of the majority of commercial and retail activities. Plantation stores, such as Arakawa's - which has changed locations several times - were the worker's linkage to the outside world. Social interaction was relatively high on Waipahu Depot Road due to business activities.

During the plantation era, villages were isolated from each other. Lack of modern transportation such as the automobile made each community a close-knit one. Pedestrian circulation was more common. This led to a relatively high level of social interaction. The close-knit quality, and high level of social interaction contributed to a general 'sense' of place within the community. Another factor contributing to a sense of community was its homogeneity - as plantation workers, the people in the community had similar ethnic backgrounds and income levels, which led to the pursuit of similar activities.

The social fabric of the Waipahu community changed quickly after World War II, and Hawaii's admission to Statehood in 1959. The accumulated impact of an increase in population and household income, the extension of major highways, the availability of motor vehicles and improved access to other parts of the island subsequently led to a change in the lifestyle of the community.

The population of Waipahu nearly tripled during the 1960's. The relatively new physical appearance of Waipahu is attributed to this change. For some residents, this meant 'the loss of rural atmosphere' of the area. The commercial strip along Farrington Highway developed after the 1960s. Sugar cane fields gradually receded with the expansion of residential subdivisions and the last of the plantation camps was demolished in 1975. As in other parts of the island, "mom-and-pop" stores have closed in Waipahu due to the fierce competition from chain and large-scale retailers.

Waipahu is now going through another phase of transition. The closing down of Oahu Sugar Company Mill as well as Arakawa's indicate that the plantation era is truly over. Future land use decisions on the mill site and surrounding areas will have a major impact on how the community will be formed.

1.2 Background

1.2.1 Council Resolution

On January 25, 1995, the Honolulu City Council adopted Resolution No. 94-309, C.D. 1 to endorse the City Planning Department's preparation of a community-based special area plan for Waipahu (see Appendix A). The Resolution acknowledged the historic role of Waipahu in Oahu's sugar industry and labor union movement. In addition, it noted that rapidly developing surrounding communities, especially the new Waikele community and the Waikele Commercial Center, are having a significant impact on the Waipahu business community. The closing of the Oahu Sugar Company was cited as bringing about major changes in the economic and social character of Waipahu.

The Resolution called for the Waipahu Town Plan to provide comprehensive, long-range objectives to guide land use and public improvements, as well as specific plans for certain improvements, including transportation improvements, which address the needs and concerns of the community and enhance the long-term livability and economic vitality of Waipahu. The Resolution encouraged that redevelopment opportunities involving the sugar mill site and adjacent City-owned Manager's drive site be coordinated with the Waipahu town plan effort.

The Resolution called for submittal of the Waipahu Town Plan, by December 1995 to the Mayor and the City Council for review and adoption by City Council resolution.

1.2.2 Waipahu 2000 Update

A long range and community master plan for Waipahu, the Waipahu 2000 Plan was originally developed in 1983 with support from Amfac Property Development Corporation. Development of the plan involved representatives from community, business and labor organizations. With the closing of the Oahu Sugar Mill and community concerns regarding the economic vitality of Waipahu Town and disposition of the mill site, an update to the Waipahu 2000 Plan was undertaken in 1994-1995.

The Waipahu 2000 Update Committee met twice a month for eight months to develop the update plan. Major proposals of the Waipahu 2000 Update plan are summarized below:

WAIPAHU 2000 UPDATE PLAN ELEMENTS[1]

1. Create a Heritage District with design guidelines to maintain Waipahu's plantation heritage. Implementing a "mainstreet USA" type project may help accomplish this.
2. Provide landscaped gateways on Waipahu Street and Waipahu Depot Road.
3. Retain the area from the smokestack to the Clinic Building in its existing condition as a cultural/historic area. Encourage the development of a museum (to be operated by a non-profit organization such as Hawaii's Plantation Village) together with an arts and crafts center and a farmer's market area.
4. Expand the Hans L'Orange Park to the vicinity of Makaaloha Street in order to extend the "left field line" and create more passive park area and area for additional parking.
5. Set aside the area between the Clinic and the expanded Hans L'Orange Park for a Filipino community center.
6. Redevelop the remaining portion of the "Mill site" for commercial/industrial uses, if possible by a single large user.
7. Provide an area for a farmer's market and an agricultural products processing and distribution center.
8. Provide pedestrian connections to the Hawaii's Plantation Village and the Civic Center.
9. Improve visual character of Waipahu Street and Waipahu Depot Road.
10. Improve visual appearance of business areas along Farrington Highway.
11. Provide landscaping along Farrington Highway to create a "boulevard-like" experience.
12. Improve transportation circulation by the following:
    a. Widen Waipahu Street to 4 lanes from Mahoe to Waikele Stream if it doesn't impact area businesses.
    b. Widen Paiwa Street from Waipahu Street to Kahuailani Street.
    c. Provide bus cut-outs along Waipahu Street.
    d. Create a transportation hub.
    e. Establish intracity and paratransit systems within Waipahu.
13. Encourage more parking near town core, including "shared" parking facilities.
14. If possible, develop the Pearl Harbor waterfront for recreational uses and convert the Waipahu Incinerator site into a public park.
15. Improve Waipahu Depot Road from Farrington Highway to the Police Academy to include road resurfacing, curbing and landscaping along Kapakahi Stream.
16. Encourage the reactivation of the historic railway through Waipahu including a rail yard within the Hawaii's Plantation Village.
17. Build and staff a police station in Waipahu and encourage other community policing efforts.
18. Improve exterior lighting and security within the town.
19. Modify the existing Waipahu Street bridge to reduce storm water back-up.
20. Support diversified agriculture in Leeward Oahu and the continued supply of Waiahole Ditch water to Leeward Oahu.
21. Encourage economic revitalization through enterprise zones, community block grants and other federal, state, county and private efforts.

[1]Waipahu 2000 Update, Waipahu Community Master Plan Update, May 1995.

CHAPTER 2
PLANNING APPROACH

2. PLANNING APPROACH

The planning approach included consideration of existing planning efforts, in particular, the Waipahu 2000 Update Plan outlined above and the proposed revision of the Ewa and Central Oahu Development Plans. A comprehensive community-based planning process was also undertaken to provide ample opportunities for public involvement and ensure that community needs and concerns are reflected in the Plan.

2.1 Development Plan Revision Program: Special Area Plans

The City and County of Honolulu is currently revising its Development Plans for the Ewa and Central Oahu regions. Development Plans provide maps and policy statements to implement the objectives and policies of the City General Plan and serve as a guide for more detailed zoning and public and private sector investment decisions.

The Central Oahu Development Plan (DP) Area encompasses Waipahu and the communities north to Mililani and Wahiawa. Central Oahu's role in Oahu's future growth is to provide lands for diversified agriculture, residential development with a variety of housing types, new employment in existing commercial and industrial areas, and to help limit urban development pressures on other rural and urban fringe areas.

Waipahu is planned to be revitalized through policies and programs designed to attract new investment and increase levels of activity in the traditional commercial and civic center areas. Additional mid-rise development would be allowed and encouraged along the transit corridor in Waipahu as part of an economic revitalization strategy.

An east-west Transit Corridor through Waipahu is proposed to link the Primary Urban Center with the University of Hawaii West Oahu Campus and the City of Kapolei. The corridor is characterized by high density residential development within walking distance of the major nodes and transit stops. Three nodes are planned -- near Leeward Community College, near the intersection of Waipahu Depot Road and Farrington Highway, and near the intersection of Kunia Road and Farrington Highway. Access to the rapid transit system from other Central Oahu communities will be provided by park and ride facilities and express bus lanes.

The Central Oahu DP notes that Waipahu's future is being addressed as part of the Waipahu Special Area Plan. The DP process incorporated the preparation of Special Area Plans to address certain communities or areas undergoing change or facing special problems or opportunities. In Central Oahu, the Waipahu Town Plan is one of these Special Area Plans.

The Central Oahu DP (Public Review Draft, July 1995) provides the following general policy and major themes for Waipahu Town:

General Policy. Waipahu is a vital multi-cultural residential community. It is centrally located to both the Ewa and Central Oahu Development Plan areas, and accommodates a wide range of age, ethnic, and income groups. Waipahu's future lies in:

- *Strengthening its residential neighborhoods;*
- *Retaining and highlighting the rich social, cultural, and industrial heritage associates with the sugar industry; and*
- *Revitalizing the town core.*

It will be characterized by five major themes:

1. *Small Town Lifestyle. Waipahu will be a community with clusters of discrete residential neighborhoods with easy access to commercial areas and nearby neighborhood parks, recreation areas, churches, and public facilities.*

2. *Outdoor Lifestyle. Waipahu will be a place where greenbelts and large open spaces are readily accessible, where fishing areas, outdoor recreation facilities, and neighborhood gardens create open skylines and green spaces.*

3. *Old Town/New Town. Waipahu will be a place where the old and the new coexist in two complementary commercial areas:*

   - *The various shopping centers clustered at the Ewa end of the Farrington Highway business area provide modern shopping facilities and services.*
   - *The old town commercial core near the Sugar Mill celebrates the town's history and culture and has the potential to become a center for gatherings and social activities.*

4. *Multi-cultural Lifestyle. Waipahu will be a place whose institutions and shopping areas celebrate its cultural diversity.*

5. *Transit Corridor. An east-west transit corridor with sufficient right-of-way for grade separated rapid transit will be reserved along Farrington Highway. Higher density housing will be centered around the two nodes located within Waipahu at the intersection of Farrington and Waipahu Depot Road and the intersection of Farrington and Kunia Road. Uses adjoining the nodes will be designed so that they face toward the nodes, encouraging pedestrian traffic to flow to and from the nodes.*

2.2 Community-Based Planning Process

The Waipahu Special Area Plan boundaries include the area of Waipahu bounded by the H-1 Freeway to the north, Kunia Road to the west, Kamehameha Highway to the east, and the Waipio Peninsula to the south (see Figure 2-1). Consideration in the plan has

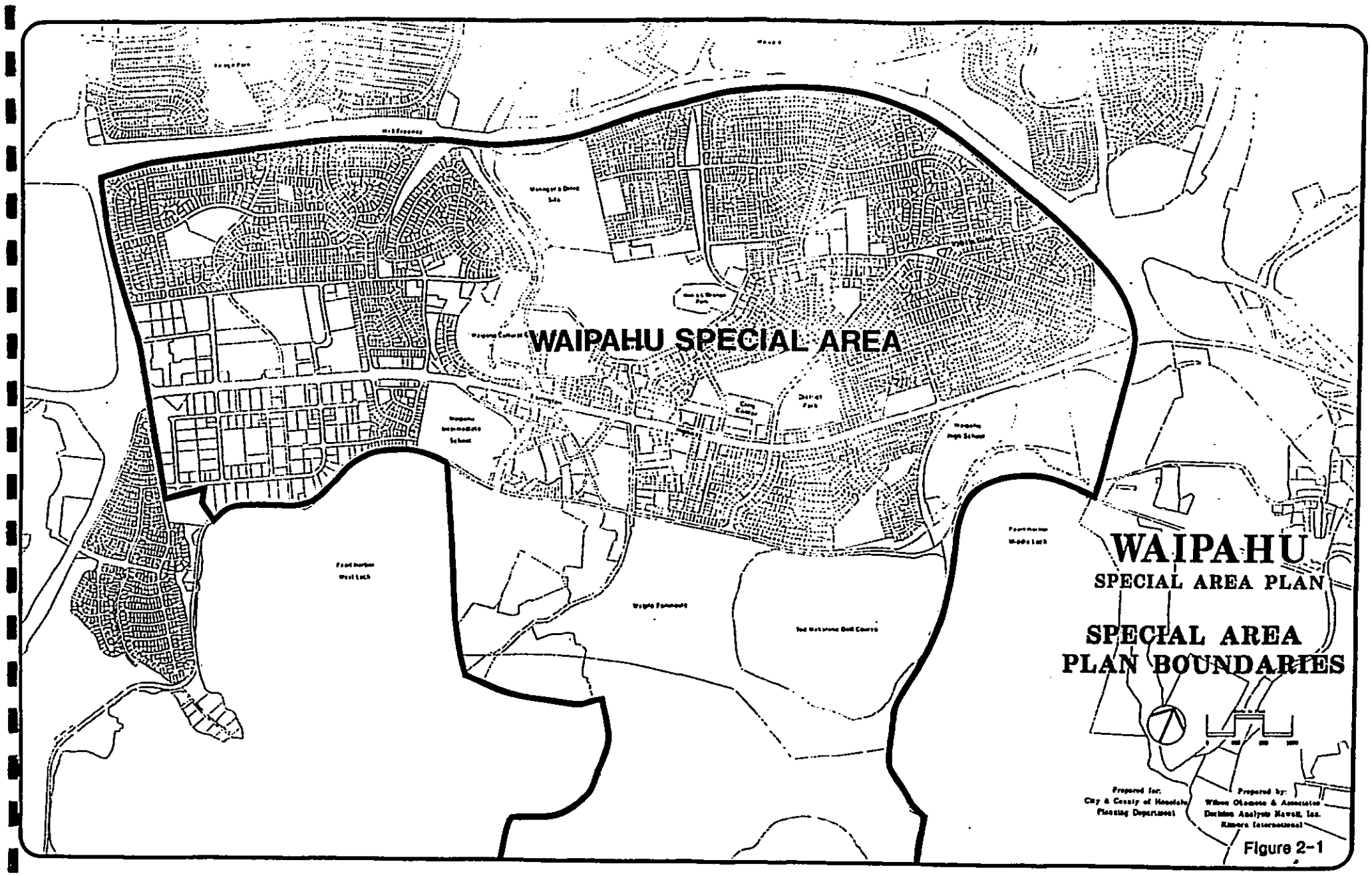
WAIPAHU SPECIAL AREA
WAIPAHU
SPECIAL AREA PLAN
SPECIAL AREA
PLAN BOUNDARIES
Prepared for:
City & County of Honolulu
Planning Department
Prepared by:
Wilson Okamoto & Associates
Decision Analysts Hawaii, Inc.
Kimura International

Figure 2-1

been given to the relationships of Waipahu Town with surrounding mauka communities, including Village Park and Waikele.

The planning process included the preparation of alternative land use concept schemes which depict a range of future scenarios for Waipahu, and the formulation of a preferred scheme. Major components of the Waipahu Special Area Plan include:

Economic Development: the provision of opportunities for economic revitalization which generate jobs and attract people to Waipahu while minimizing impacts to existing businesses.

Land Use: locating future uses which provide for compatible economic development and address community needs.

Circulation: circulation plan to improve traffic flow and encourage a pedestrian and transit-oriented circulation system.

Urban Design: urban design plan which promotes Waipahu's identity and heritage, and improves the Town's visual appearance.

Implementation: sequencing and considerations for implementing recommendations of the Plan.

The planning process is illustrated in the flow chart in Figure 2-2. In keeping with the intent of the Council Resolution that the Plan be community-based, there have been extensive meetings and discussions with the community, including monthly meetings of the Waipahu Town Plan Task Force from April to December 1995. Two major public workshops were conducted to solicit input from the broader community -- a February 1995 visioning workshop and a July 1995 workshop on alternative concept schemes. Numerous other meetings and discussions have been held with individuals and organizations including the Waipahu Neighborhood Board, Waipahu Business Association, and the Waipahu 2000 Update Committee. In November 1995, a community meeting was held to present and receive public comments on the Preferred Plan.

2.2.1 Visioning Workshop

On February 7, 1995, the Planning Department sponsored a visioning workshop to gauge community interests and desires regarding the future of Waipahu. Attendees at the visioning workshop were first asked to identify elements in their community that were unique or which they liked about Waipahu. The "group memory" summarizing the input received from this workshop is included as Appendix B. Participant responses included the Sugar Mill, the smokestack, Arakawa's, Manager's Drive, Cultural Park, old big

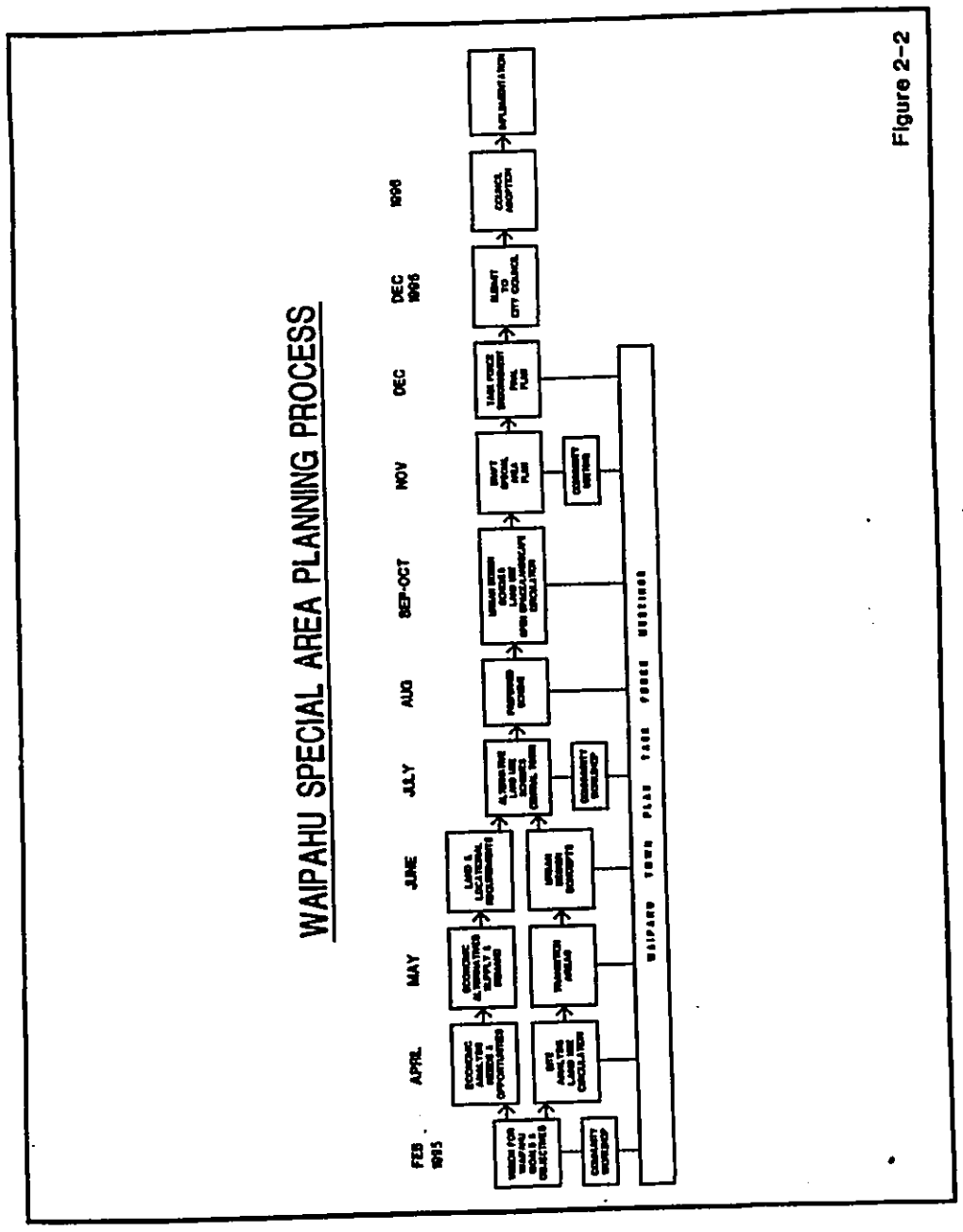

Figure 2-2

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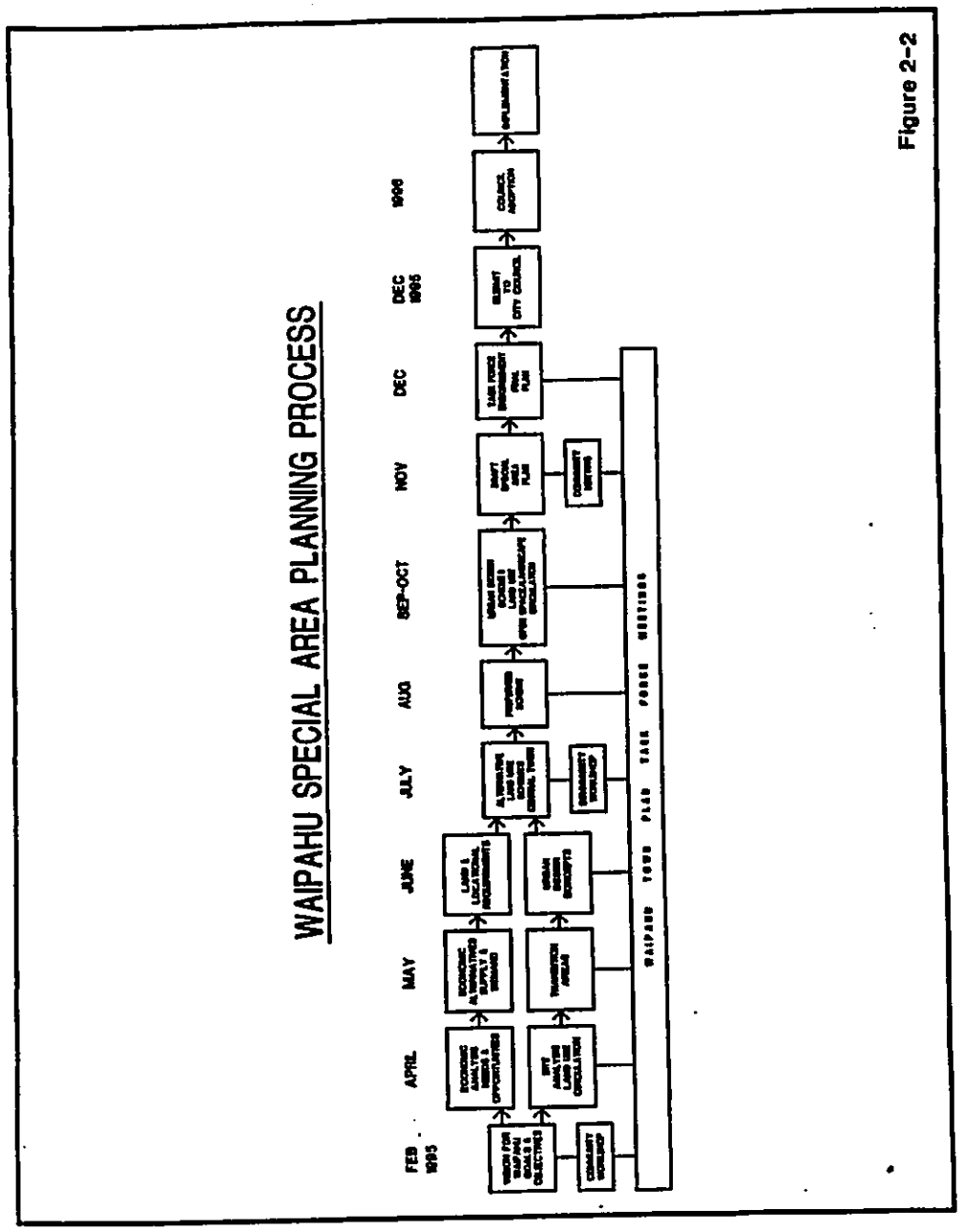


Figure 2-2

trees/monkeypod trees, mixture of old style plantation with contemporary design, the winding road through the town, sugar cane fields, diversity in nationalities, and plantation heritage.

Community members were then asked to identify the changes to the community that cause them discomfort. Responses included traffic, business impacts from Waikele, youth and crime, trash and abandoned vehicles, inadequate parking, poorly maintained roadways, park and recreation needs, speeding cars, and landscaping encroachments on private property.

Community workshop participants were finally asked what they would like to see in Waipahu's future. A wide range of responses were obtained, including retaining country atmosphere and green open spaces, providing more parks and recreation areas, train restoration, historic redevelopment of mill site, museum, heritage park, shoreline recreation, more opportunities/activities for youth, improved roads, beautification of Farrington Highway, better maintenance and removal of abandoned vehicles, historic district in old town area, agricultural park, more job opportunities, improved elderly access, and expanded police presence.

2.2.2 Waipahu Town Plan Task Force

As directed by the City Council Resolution, a Waipahu Town Plan Task Force was convened to advise the Planning Department and provide community input to the planning process. The Task Force consists of members of the Waipahu 2000 Update Committee, Waipahu Business Association, Waipahu Neighborhood Board, representative of Amfac/JMB, representative of the City Planning Department, members of the State Senate, State House of Representatives, and the City Council members representing Waipahu, and members from the community. The Task Force met monthly from April to December 1995 to review and advise the Planning Department on proposed land use, economic, circulation, and urban design concepts and proposals. Alternative concept schemes were extensively discussed at Task Force meetings. The Preferred Plan and final Special Area Plan were endorsed by the Task Force in December 1995.

2.2.3 Vision for Waipahu and Plan Objectives

The Visioning workshop, the City Council Resolution and discussions and input from the Waipahu Town Plan Task Force were used to develop the following vision statement for Waipahu and planning objectives to guide the preparation and assessment of the Special Area Plan.

Vision for Waipahu

The Waipahu of the future is envisioned as a harmonious blend of the old and the new. Within the framework of this vision, Waipahu Town would retain and embrace its cultural

and plantation heritage -- the sugarmill and smokestack would remain as a dominant symbol and the Waipahu Cultural Garden Park serve as a reminder of this heritage.

Waipahu Town would be revitalized for the betterment of the business community and would provide gainful employment serving the regional community. There would be a mixture of old style plantation with more contemporary building designs. Streets would be landscaped and more pedestrian friendly, with ample roads to get around and through the town. Waipahu Street would remain a slow, winding road with large monkey pod trees.

Greenery and open spaces would be preserved and enhanced for the current and future residents to use and enjoy. Waipahu's shoreline would be reopened for fishing, boating, and picnicking. Youth in the community would have more programs and recreational opportunities. The OR&L Railroad would be restored and feature train rides to and from Ewa and beyond.

The future of Waipahu is envisioned to embrace a vibrant community, where the country atmosphere is preserved, where business prospers, and where diverse people can come together to live, work, shop and play.

Planning Objectives

The objectives guiding the preparation of the Waipahu Special Area Plan are as follows:

1. *Provide opportunities for economic revitalization which generate jobs and attract people to Waipahu while minimizing adverse impacts to existing businesses.* Faced with increased competition from the neighboring power center in Waikele and other national discount stores, Waipahu faces the difficult challenge of pursuing economic development and revitalization in a manner which does not harm existing businesses.

2. *Provide land uses which are compatible with existing uses and which provide for community needs.* Community and social needs, in particular the needs of the youth in the community and the various ethnic groups which are part of Waipahu's plantation heritage should be addressed in the plan.

3. *Promote and preserve Waipahu's plantation and cultural heritage.* The identify and cultural heritage of Waipahu as a plantation town are important to community members and should be preserved and enhanced wherever possible.

4. *Improve the overall visual appearance and character of Waipahu Town.* Major thoroughfares such as Farrington Highway should be visually enhanced with landscaping and the old town area in the vicinity of Waipahu Street and Depot Road should be revitalized.

5. *Provide increased opportunities for recreation and nearshore recreation.* There is a strong need for pursuing expanded recreational opportunities, particularly along the unused shoreline area and on Waipio Peninsula.

6. *Improve vehicular access into and within Waipahu, and integrate pedestrian, bicycles and transit facilities.* Improved vehicular and pedestrian circulation within Waipahu would improve the business climate and living conditions by easing congestion and facilitating access to activity centers in Waipahu Town.

CHAPTER 3
LAND USE AND SOCIO-ECONOMIC ANALYSIS

3. LAND USE AND SOCIO-ECONOMIC ANALYSIS

3.1 Land Use

3.1.1 Land Ownership

Land ownership within the Waipahu Special Area Plan boundaries include Federal lands, State and City and County of Honolulu lands for public facilities, major landowners, and many small individual land owners (see Figure 3-1). Substantial Federal lands are owned and administered by the U.S. Navy in Waipio Peninsula (approximately 1,200 acres) and Waikele Gulch. The Navy also has jurisdiction over the waters in Pearl Harbor's West Loch and Middle Loch. State lands include public schools, parks, library, elderly housing projects and the Waipahu Civic Center. City lands include parks, the Police Academy, fire station, refuse convenience center, wastewater pump station, ash landfill, selected housing developments, and the Ted Makalena Golf Course. Much of the City lands in Waipio Peninsula are leased from the State of Hawaii.

Major private landowners include Amfac/JMB, Robinson Estate heirs, Savio Development, Bishop Estate, and Queen Emma Foundation. There are also many small individual land owners whose parcels are typically less than one acre.

3.1.2 Existing Land Uses

Within the Special Area Plan boundaries, Waipahu is generally an older residential, commercial and industrial community (see Figure 3-2). The residential areas are made up mostly of middle income single-family residences and lower-income apartment areas. Commercial uses are concentrated along Farrington Highway and within the historic town core along Waipahu Street and Waipahu Depot Road. The west end of Waipahu has newer commercial retail developments as well as large land areas in light-industrial use makai of Farrington Highway. Waipio Peninsula has municipal facilities including the Ted Makalena Golf Course, the Police Academy, the former Waipahu Incinerator and ash landfill, a wastewater pump station, and a refuse convenience station.

3.1.3 Current Plans

There are a number of proposed private and public developments in the Waipahu Town area which are in various stages of planning and design.

The Queen Emma Foundation is proposing to develop an elderly care facility on approximately 13 acres of land makai of Farrington Highway. Preliminary conceptual plans for the Waipahu Senior Care Campus include a 90-bed skilled nursing facility and 50 assisted care units. Other amenities which may be provided include an elderly day care facility, recreation and eating facilities. The development would be low-rise in character (up to 2 stories) and will conform to existing zoning densities. Primary access to the site is off of Awanui Street, with secondary accesses from Waipio Point Access

Road and Awaiki Street. An application for a Conditional Use Permit is expected to be submitted in 1996.

McCully Bicycle is proposing to develop a one-half acre lot on Hikimoe Street for commercial use. Rezoning for the site, which is zoned R-6 but is adjacent to existing business uses, is currently being pursued by the owner.

A new Post Office facility is planned by the U.S. Postal Service on a vacant 4.5-acre parcel at the intersection of Leoku Street and Waipahu Street (mauka of the Punawai Clinic). Development is tentatively scheduled to begin in 1996.

The State Housing Finance and Development Corporation plans to construct a mid-rise elderly rental building and low-rise public rental units (in excess of 100 units) on vacant lands mauka of the Waipahu District Park.

There are two proposals for development of a portion of a 1.76-acre vacant parcel located at the Ewa-mauka corner of Hikimoe and Mokuola Streets, which is under the ownership of the State of Hawaii Housing and Finance Development Corporation. One proposal is for an independent living facility consisting of 15 units within a two-story apartment complex, with supportive care services for persons with severe physical disabilities. This project is proposed by a consortium comprised of Independent Living Housing, Rehabilitation Hospital of the Pacific, and Accessible Space, Incorporated. The other is a proposal by the Waipahu United Church of Christ for development of an elderly day care/respite center facility of approximately 6,000 square feet.

Existing Development Plan Land Use, Development Plan Public Facilities, and Zoning maps in the Waipahu Town area are shown in Figures 3-3, 3-4 and 3-5. DP Land Use and zoning closely follow existing land uses. Zoning heights in commercial and industrial areas are limited to 60 feet. As earlier noted, revisions to the existing Development Plans are in progress which will supersede the existing land use maps. The Special Area Plan will provide the more detailed guidance under the revised Development Plan program.

3.2 Environmental

3.2.1 Blast Zone

The U.S. Navy has designated an Explosives Safety Hazard Zone (more commonly known as "blast zone") to limit types of land uses within the probable damage area of an accidental explosion from ordnance storage and handling operations. The blast zone boundary encompasses much of Waipio Peninsula, as shown in Figure 3-6. Department of Defense safety criteria prohibit the siting of non-ordnance related buildings and structures within established hazard zones. Certain types of land uses such as agriculture, open air recreation, or other uses that do not involve the construction of inhabited buildings or structures may be permitted within the outer 40 percent of the hazard zone.

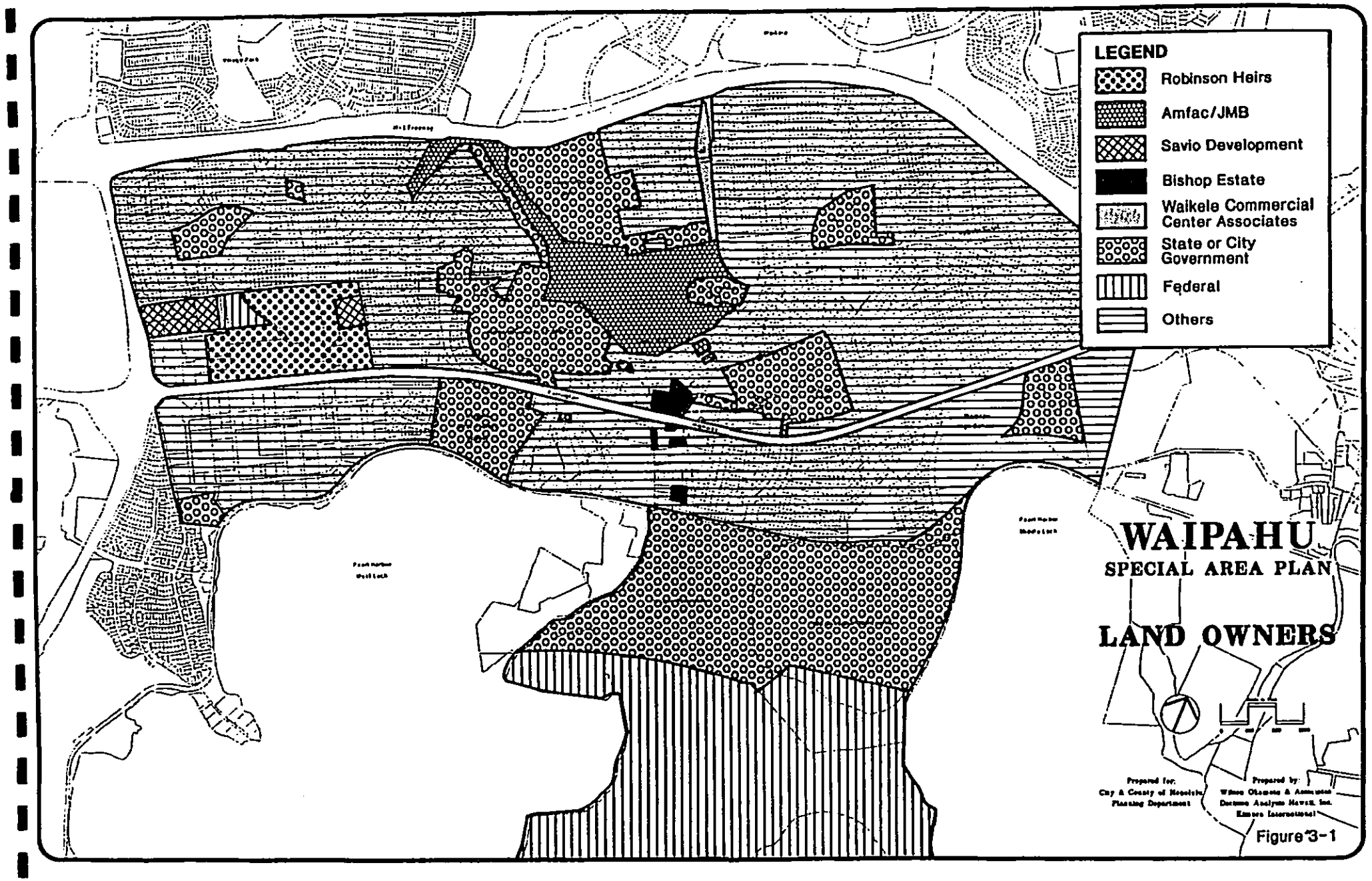
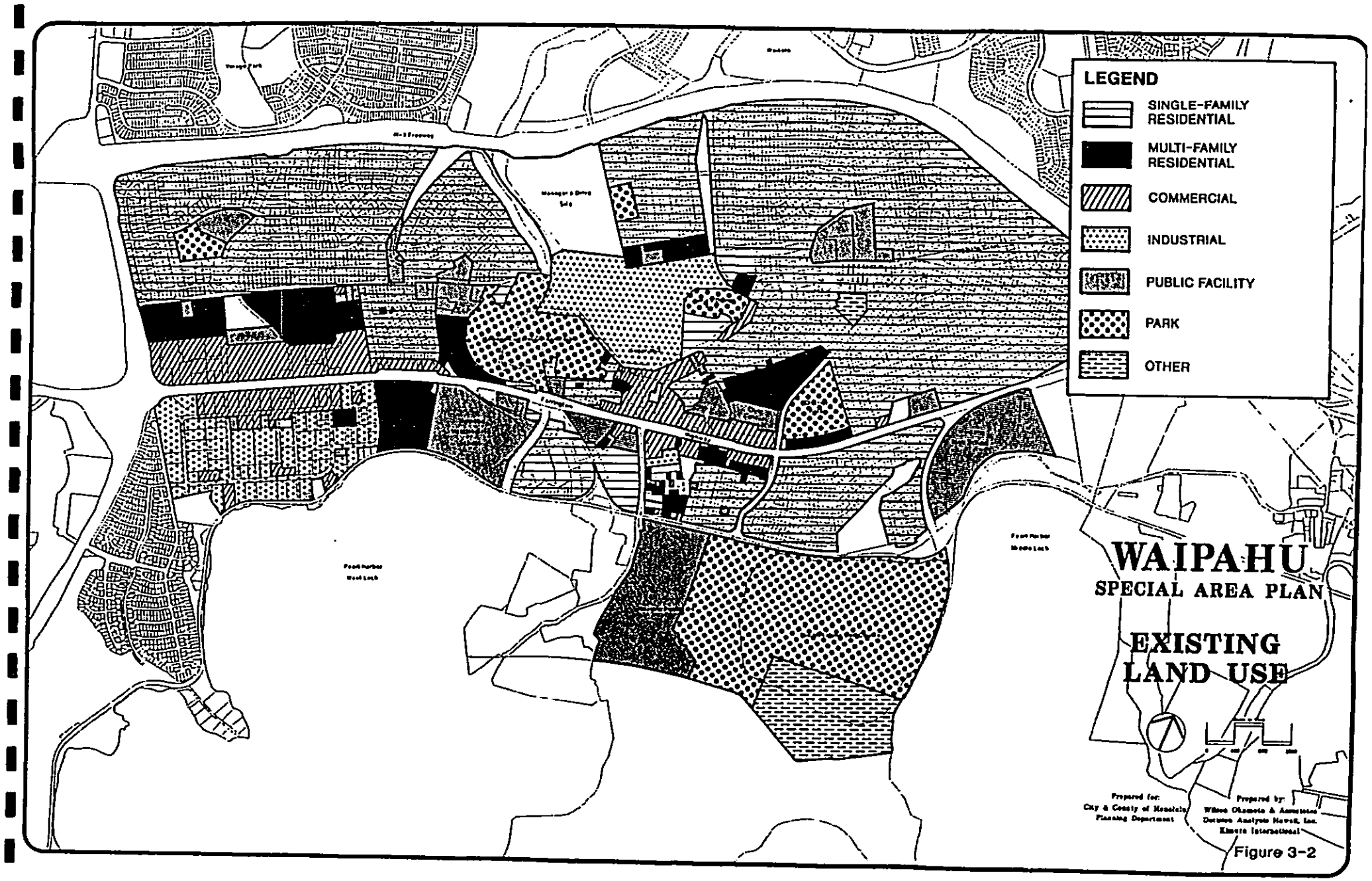

LEGEND
Robinson Heirs
Amfac/JMB
Savio Development
Bishop Estate
Waikele Commercial Center Associates
State or City Government
Federal
Others
WAIPAHU
SPECIAL AREA PLAN
LAND OWNERS
Prepared for:
City & County of Honolulu
Planning Department
Prepared by:
Wilson Okamoto & Associates
Dames Analysis Hawaii, Inc.
Kimpo International

Figure 3-1


LEGEND
SINGLE-FAMILY RESIDENTIAL
MULTI-FAMILY RESIDENTIAL
COMMERCIAL
INDUSTRIAL
PUBLIC FACILITY
PARK
OTHER
WAIPAHU
SPECIAL AREA PLAN
EXISTING LAND USE
Prepared for:
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Dornoo Analysis Hawaii, Inc.
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Figure 3-2

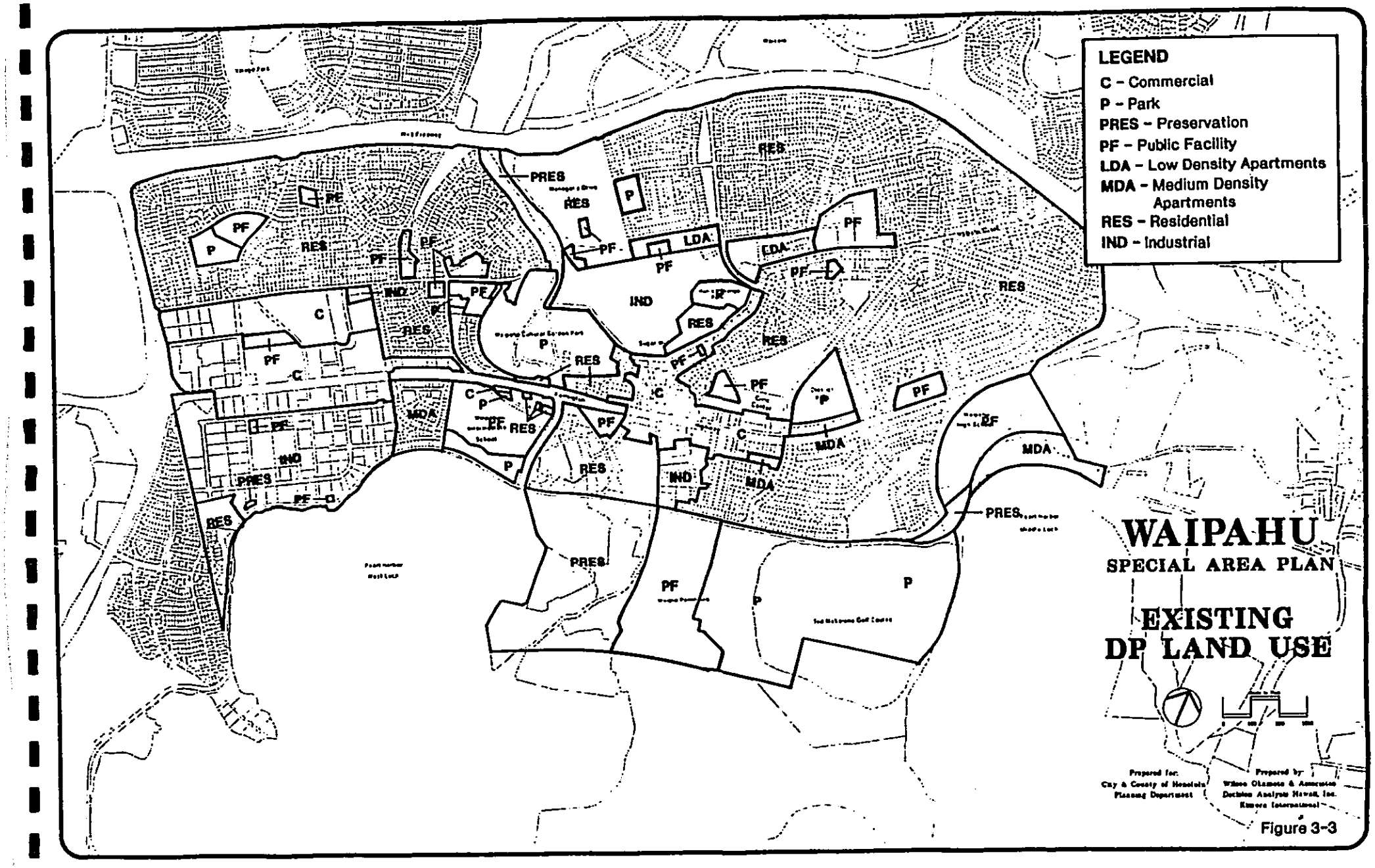

LEGEND
C – Commercial
P – Park
PRES – Preservation
PF – Public Facility
LDA – Low Density Apartments
MDA – Medium Density Apartments
RES – Residential
IND – Industrial
WAIPAHU
SPECIAL AREA PLAN
EXISTING DP LAND USE
Prepared for:
City & County of Honolulu
Planning Department
Prepared by:
Wilson Okamoto & Associates
Dahlin Analysis Hawaii, Inc.
Kimura International

Figure 3-3

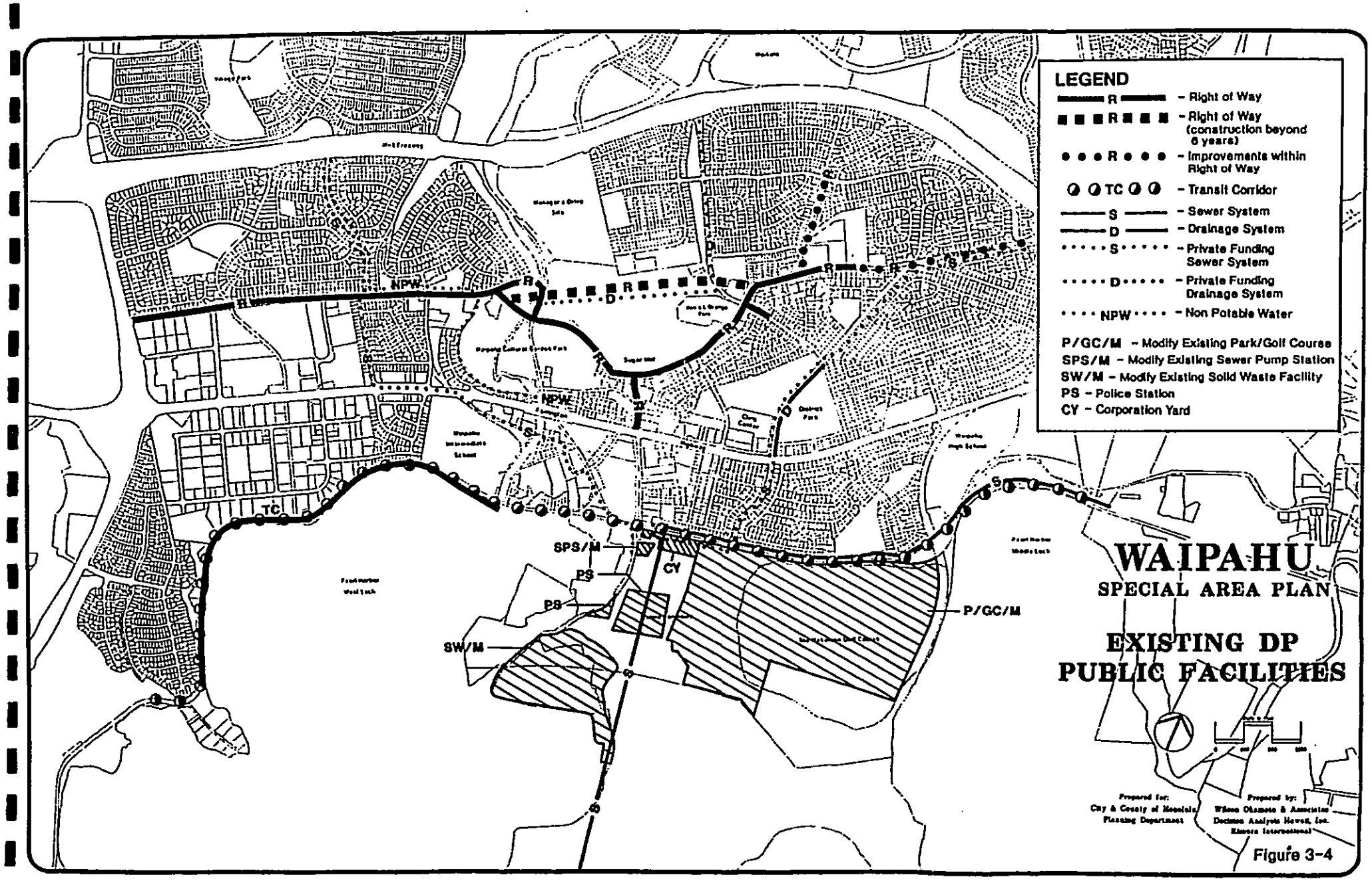

LEGEND
R – Right of Way
R – Right of Way (construction beyond 6 years)
R – Improvements within Right of Way
TC – Transit Corridor
S – Sewer System
D – Drainage System
S – Private Funding Sewer System
D – Private Funding Drainage System
NPW – Non Potable Water
P/GC/M – Modify Existing Park/Golf Course
SPS/M – Modify Existing Sewer Pump Station
SW/M – Modify Existing Solid Waste Facility
PS – Police Station
CY – Corporation Yard
NPW
TC
SPS/M
PS
PS
CY
SW/M
P/GC/M
WAIPAHU
SPECIAL AREA PLAN
EXISTING DP
PUBLIC FACILITIES
Prepared for:
City & County of Honolulu
Planning Department
Prepared by:
Wilson Okamoto & Associates
Dowmon Analysis Hawaii, Inc.
Kimura International

Figure 3-4

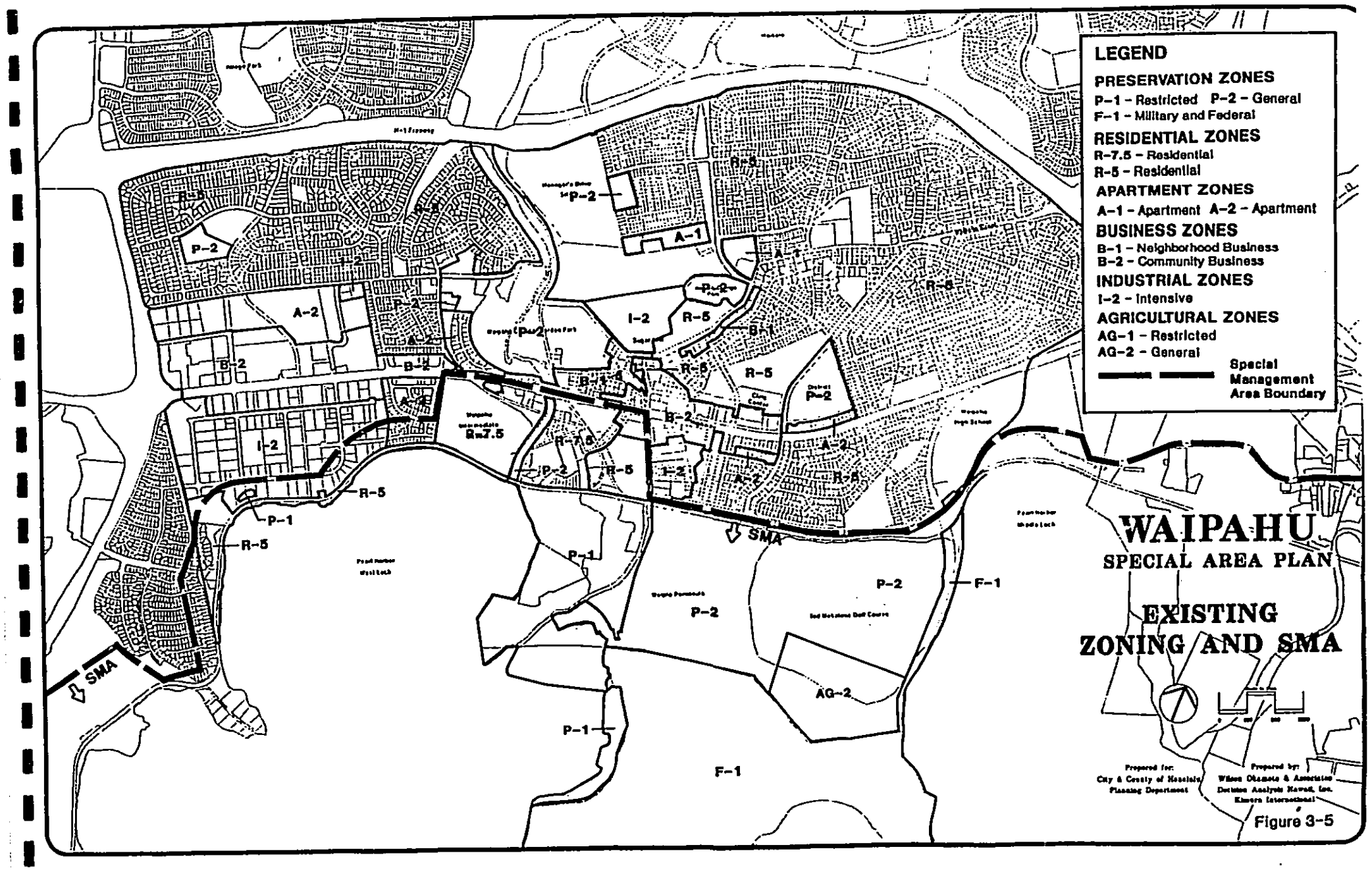

LEGEND
PRESERVATION ZONES
P-1 - Restricted P-2 - General
F-1 - Military and Federal
RESIDENTIAL ZONES
R-7.5 - Residential
R-5 - Residential
APARTMENT ZONES
A-1 - Apartment A-2 - Apartment
BUSINESS ZONES
B-1 - Neighborhood Business
B-2 - Community Business
INDUSTRIAL ZONES
I-2 - Intensive
AGRICULTURAL ZONES
AG-1 - Restricted
AG-2 - General
Special Management Area Boundary
WAIPAHU
SPECIAL AREA PLAN
EXISTING ZONING AND SMA
SMA
Prepared for: City & County of Honolulu Planning Department
Prepared by: Wilson Okamoto & Associates Decision Analysis Hawaii, Inc. Kimura International

Figure 3-5

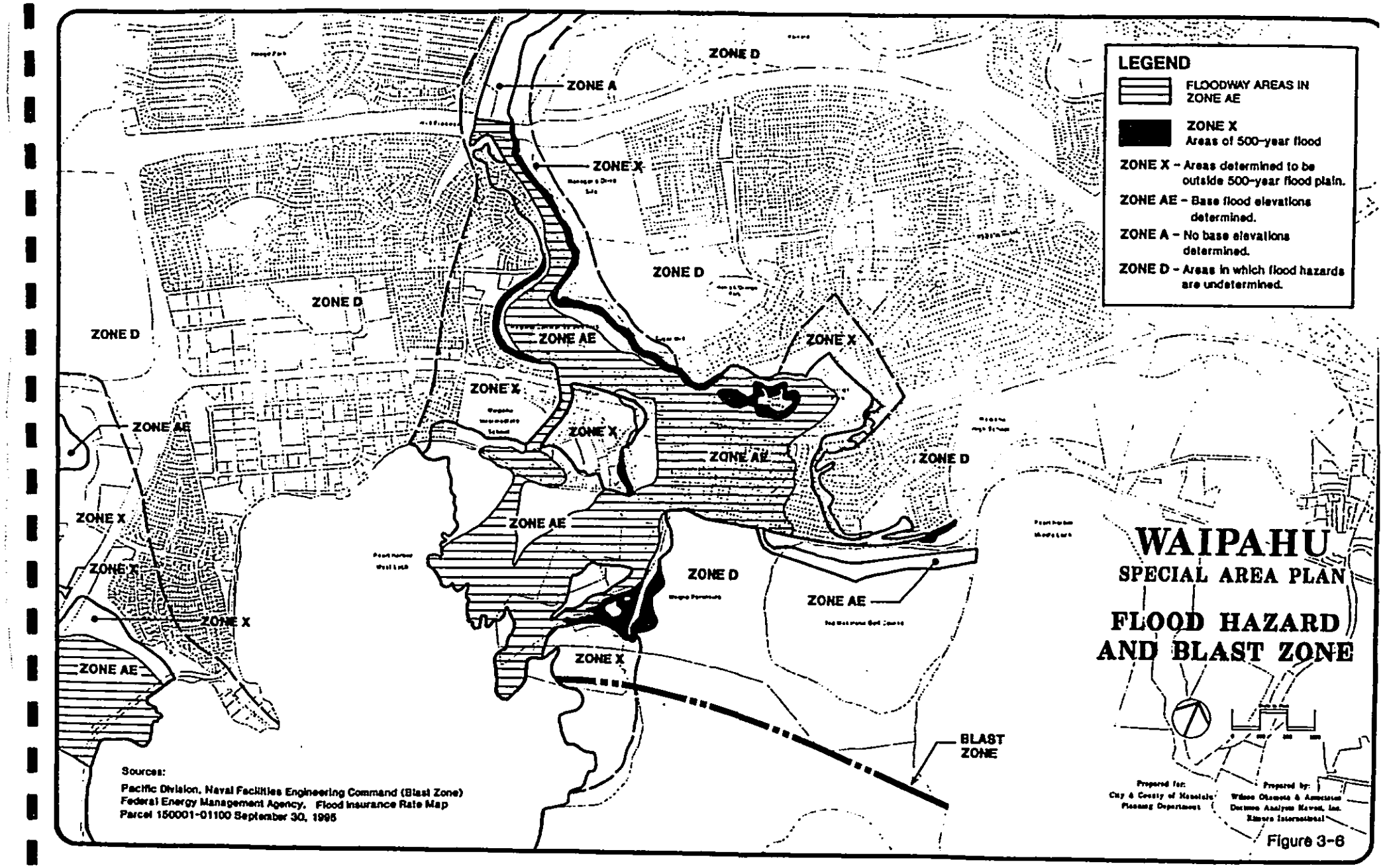

LEGEND
FLOODWAY AREAS IN ZONE AE
ZONE X
Areas of 500-year flood
ZONE X – Areas determined to be outside 500-year flood plain.
ZONE AE – Base flood elevations determined.
ZONE A – No base elevations determined.
ZONE D – Areas in which flood hazards are undetermined.
ZONE A
ZONE D
ZONE X
ZONE D
ZONE D
ZONE AE
ZONE X
ZONE X
ZONE X
ZONE AE
ZONE AE
ZONE D
ZONE X
ZONE X
ZONE AE
ZONE AE
ZONE D
ZONE AE
ZONE X
BLAST ZONE
Sources:
Pacific Division, Naval Facilities Engineering Command (Blast Zone)
Federal Energy Management Agency, Flood Insurance Rate Map
Parcel 150001-01100 September 30, 1995
WAIPAHU
SPECIAL AREA PLAN
FLOOD HAZARD AND BLAST ZONE
Prepared for:
City & County of Honolulu
Planning Department
Prepared by:
Wilson Okamoto & Associates
Duncan Analysis Hawaii, Inc.
Ramara International

Figure 3-6

3.2.2 Flood Hazard

According to the Flood Insurance Rate Map (FIRM, Community Panel Number 150001-0110-D Revised September 30, 1995), much of the central portion of Waipahu Town has been designated within the Floodway (see Figure 3-6). This includes most of the Waipahu Cultural Garden Park, areas along and east of Waipahu Depot Road to Wailani Canal, and areas makai of the OR&L right-of-way between Kapakahi Stream and Waikele Stream. While existing structures are grandfathered, new developments are typically prohibited within the Floodway zone unless it can be shown that flood elevations will not increase with the development.

The amount of lands designated within the Floodway have significantly increased with the recent revision of the flood insurance maps. Location within a Floodway seriously constrains potential future developments.

3.3 Economic Assessment

A market and economic analysis study was conducted by Decision Analysts Hawaii, Inc. in support of the planning recommendations of the Waipahu Special Area Plan (Appendix C).

3.3.1 Economic Setting

Waipahu's economy has evolved over the past century and continues to evolve. In the late 1800's, economic activity in Waipahu centered around fishing and wetland farming. Following the creation of Oahu Sugar Co., Ltd. in 1897, Waipahu evolved into a typical plantation town made up of stores and plantation camps near the sugar mill. During the first half of the 1900's, sugar was the driving force behind the growth and change in Waipahu's economy.

The economic importance of sugar has declined in recent decades and Oahu Sugar Company ceased operating in 1995, but Waipahu's heritage as a plantation town continues to define the identity of the community, and the sugar mill stack remains the most prominent landmark in town. Waipahu Town has evolved into a residential community and a commercial and light-industry center serving the surrounding community.

A major change affecting established stores in Waipahu has been the introduction of large nation-wide retail-store chains which can sell goods profitably at costs significantly lower than those of local stores. New stores in or near Waipahu include 1) power centers featuring low-cost factory outlets and specialty stores (Waikele Center), 2) low-cost warehouse stores (Sam's Club and Costco/Price Club), and 3) discount stores (KMart and Wal-Mart). These new stores are attracting shoppers from throughout Oahu, including many visitors who are bussed in from Waikiki to shop at Waikele Center.

Established stores that compete directly against these new ones often are unable to match the lower prices and, as a result, are forced to change their mix of goods and services, or must close. In Waipahu, two prominent general merchandise stores are no longer in operation -- Arakawa's and Gem which has been replaced by Daiei. Not all stores are adversely affected, as specialty and "niche" stores which do not compete against the new chains may realize an increase in sales with the new customers who are attracted to the area by the new stores.

3.3.2 Existing Economic and Social Conditions

A demographic profile of the Waipahu community based on U.S. Census data is presented in Table 3-1.

Population. In 1990, Waipahu had a population of 51,295. This includes 31,364 persons (61%) in Waipahu Town (within the Special Area Plan boundaries), and 19,931 (39%) in the outlying communities of Village Park, Royal Kunia, Waikele, Waipio Gentry, and Crestview. There is a slightly younger population in Waipahu than in Oahu as a whole, although some areas in Waipahu Town have relatively large numbers of persons over 65 years of age.

In Waipahu Town, race statistics indicate a large concentration of Filipinos (45.7%), whereas outlying Waipahu communities are predominantly Japanese and Caucasian (30.7% and 26.4% respectively). Most of the people in Waipahu are Hawaii-born (60.3%), although there is a fairly large percentage of foreign-born in Waipahu Town (26.7%).

In Waipahu Town, there are significantly high numbers of people who do not have a high school diploma (34.3%) as compared with Oahu as a whole (18.8%). Persons with four or more years of college are also significantly lower.

Employment and Income. Household income in Waipahu was comparable to the Oahu annual average, but per capita income was significantly lower in Waipahu Town ($10,888 versus $16,256 for Oahu).

In 1990, the unemployment rate in Waipahu Town was higher than the Oahu average (5.6% versus 3.5%). By occupation, more persons in Waipahu Town were employed in services; farming, forestry and fishing, precision craft, and operators, fabricators and laborers. Fewer than average were employed in managerial and professional, and technical, sales and administrative support jobs.

Many workers from Waipahu commute to jobs outside their neighborhoods. In 1990, 84.3% of those in Waipahu Town commuted and 95.7% in Waipahu-Outlying Areas commuted, compared with an islandwide average of 48.3%.

Table 3-1
WAIPAHU SOCIO-ECONOMIC PROFILE
(1990 Census Data)

	Waipahu Town	Waipahu-Outlying Areas	Waipahu Total	Oahu Total
Population	31,364	19,931	51,295	836,231
Percent	61.1%	38.9%	100.0%	
Age				
Under 18 years	29.3%	29.8%	29.5%	24.5%
18 to 64 years	60.2%	67.1%	62.9%	64.6%
Over 65 years	10.5%	3.1%	7.6%	10.9%
Race				
Filipino	45.7%	21.1%	36.2%	14.2%
Japanese	17.8%	30.7%	22.8%	23.8%
White	11.7%	26.4%	17.4%	31.7%
Hawaiian	11.4%	7.6%	9.9%	10.8%
Other	13.5%	14.1%	13.7%	19.6%
Place of Birth				
Hawaii	60.5%	60.0%	60.3%	54.2%
Other State	12.8%	25.1%	17.6%	30.1%
Foreign	26.7%	14.9%	22.1%	15.7%
Education				
No high school diploma	34.3%	9.6%	24.3%	18.8%
High School Diploma	65.7%	90.4%	75.7%	81.2%
College, 4+ years	7.6%	28.2%	15.9%	24.6%
Income				
Household Income	$42,353	$53,700	$47,516	$43,786
Per Capita Income	$10,888	$17,530	$13,469	$16,256
Poverty-level Incomes	13.1%	1.6%	8.7%	7.2%
Employment				
Labor Force	15,683	12,237	27,920	463,572
Unemployed Rate	5.6%	2.7%	4.4%	3.5%
Job Commute Outside Neighborhood	84.3%	95.7%	89.4%	48.3%
Occupation				
Managerial, Professional	13.4%	29.8%	20.4%	27.7%
Tech., Sales, Support	31.7%	37.0%	34.0%	34.6%
Service	23.3%	13.2%	19.0%	16.8%
Farming, Fishing	2.5%	1.1%	1.9%	1.5%
Precision Craft	12.3%	10.0%	11.3%	9.9%
Operators, Laborers	16.8%	8.9%	13.4%	9.5%
Households	7,587	6,334	13,921	265,625
Persons per Household	4.13	3.15	3.68	3.02
Housing Units	7,712	6,559	14,271	281,683
Owner-Occupied	50.4%	71.2%	60.0%	49.0%
Renter-Occupied	47.4%	25.5%	37.4%	45.2%
Vacant	2.2%	3.2%	2.7%	5.8%

Based on information from the City Planning Department, there were 12,300 jobs in Waipahu in 1990, over 80% of which were in Waipahu Town. It is estimated that about 20% of the jobs in Waipahu are filled by workers living in Waipahu.

Housing. In Waipahu Town, there are significantly larger numbers of persons per household: 4.13 in Waipahu Town, compared with 3.15 in outlying Waipahu areas and 3.02 for Oahu. The percentage of owner-occupied versus renter-occupied units are comparable between Waipahu Town and the islandwide average.

3.3.3 Socio-Economic Trends

Waipahu is centrally located with respect to much of the residential, resort, commercial and industrial development that is projected for Oahu. This presents opportunities for businesses located in Waipahu to serve the growing number of nearby residents, visitors and other businesses.

The resident population of Waipahu is projected by the Planning Department to increase to about 71,900 persons by the year 2020, or about 20,600 (40%) more than in 1990 (see Table 3-2). This amounts to an average annual growth of 687 new residents per year. Most of this growth is expected to occur in outlying Waipahu communities, given the lack of developable area within Waipahu Town.

The number of housing units are projected to increase commensurately with population: from 14,268 units in 1990 to 22,760 units in 2020.

The number of jobs in Waipahu are projected by the Planning Department to increase from 12,334 in 1990 to 27,062 in the year 2020. Major job sectors projected to increase include industrial, services, retail, construction, and finance/insurance/real estate.

Table 3-2
PROJECTED GROWTH FOR WAIPAHU
1990 TO 2010

	1990	2000	2010	2020
Population	51,307	58,637	66,534	71,903
Percent Increase (cum.)		14.3%	29.7%	40.1%
Housing Units	14,268	16,874	20,343	22,760
Percent Increase (cum.)		18.3%	42.6%	59.5%
Jobs	12,334	16,686	22,703	27,062
Percent Increase (cum.)		35.3%	84.1%	119.4%
Government, Military	362	276	276	276
Government, Civilian	610	610	610	610
Hotel	0	0	0	0
Agriculture	225	241	296	392
Trans., Comm., Utilities	490	586	778	892
Industry	1,449	1,538	1,954	2,589
Finance, Ins., Real Estate	660	825	1,478	1,809
Services	3,719	5,793	8,302	9,990
Retail Trade	3,837	5,538	7,031	8,036
Construction	982	1,279	1,978	2,468

Source: Planning Department, City and County of Honolulu

CHAPTER 4
PREFERRED PLAN

4. PREFERRED PLAN

The Preferred Plan represents the collective desires of the community to integrate economic development with social, cultural, and recreational enhancements. Central to the development of the Plan is the economic development and revitalization of Waipahu, particularly within the town core area. The Plan also recognizes the social and recreational opportunities that would achieve a balance in the future development of Waipahu, enhance the experience of residing and working in the area, and make the Town an attractive place to visit.

4.1 Planning Area Analysis

As part of an initial effort to identify areas within Waipahu Town that would be appropriate for consideration as part of the Special Area Plan, an analysis was undertaken of the planning area (see Figure 4-1). Areas were analyzed based on four categories: high transition zone, medium transition zone, stable areas, and circulation system. The findings of the analysis are as follows:

- **High Transition Zone**

  Important Site – Development Imminent: 1) The City's vacant, undeveloped Manager's Drive site; and 2) Amfac/JMB's sugar mill site which was formerly used for Oahu Sugar Company's mill operations.

  Important Site – High Development Potential: Upper Waipio Peninsula between the OR&L right-of-way and the Navy's blast zone, with existing uses consisting of the Pouhala Marsh area, the City's former ashfill and incinerator sites, and existing City public facilities.

- **Medium Transition Zone**

  Areas with Potential for New Development: 1) Manager's Drive site; 2) the sugar mill site; 3) the area west of lower Waipahu Depot Road between Farrington Highway and the OR&L right-of-way consisting of existing residential use (Pearl Harbor Gardens); and 4) the area east of lower Waipahu Depot Road between Farrington Highway and the OR&L right-of-way encompassing existing commercial, light industrial and residential uses.

  Areas for Redevelopment or Revitalization: Encompasses the areas adjacent and south of Waipahu Street, continuing along both sides of Waipahu Depot Road mauka of Farrington Highway (existing commercial and retail uses).

- **Stable Areas**

  Commercial and Light Industrial Areas: 1) West Waipahu commercial area immediately mauka of Farrington Highway between Kunia Road and Westgate Shopping Center; 2) west Waipahu light industrial area located immediately makai of Farrington Highway and adjacent to West Loch Estates; and 3) area of existing strip commercial along both sides of Farrington Highway east of Waipahu Depot Road (vicinity of Hikimoe and Moloalo Streets).

  Residential and Apartment Areas: Existing Harbor View Subdivision, Waipahu Gardens, Waiolu Tract, Ota Camp, Waipahu Estates, Waipahu Triangle, and the residential areas located mauka of the Waipahu Civic Center, and between Farrington Highway and the Ted Makalena Golf Course.

- **Circulation System**

  Major Circulation Corridors: H-1 Freeway, Farrington Highway, and Kunia Road.

  Important Internal Routes: Waipahu Street, Waipahu Depot Road, Leoku Street, Paiwa Street, future Manager's Drive, and a potential east-west connector route between Waipahu and Paiwa Streets.

In conjunction with the planning area analysis, an assessment was undertaken of potential land uses and economic activities as suggested by the Waipahu Town Plan Task Force, the Waipahu community, the City, and the project's economic consulting firm Decision Analysis Hawaii, Inc. The potential land uses and economic activities were selected and evaluated based on their market and economic feasibility, the employment opportunities they are likely to generate, and their impacts on existing businesses in the community. In general, projects and economic activities which attract shoppers into the community and stimulate sales in existing stores were preferred over activities which would compete with existing businesses and divert shoppers from them.

The potential land uses and their respective economic implications were the basis for formulating alternative land use schemes. A discussion of the alternative land use schemes is included in this Chapter, with supplemental information included in Appendix D. Based on these alternative schemes, the Preferred Plan was developed with input and guidance from the Waipahu Town Plan Task Force and the public comments provided of the July 27, 1995 community workshop.

The alternative land use concept schemes include the designation of four distinct land use "anchors" – an Old Waipahu Town anchor at the sugar mill site, a commercial anchor denoting the existing commercial and light industrial businesses in West Waipahu, a community facilities anchor at the civic center site, and a recreation anchor at Waipio Peninsula. Alternatives as well as the preferred Land Use Plan are based on the

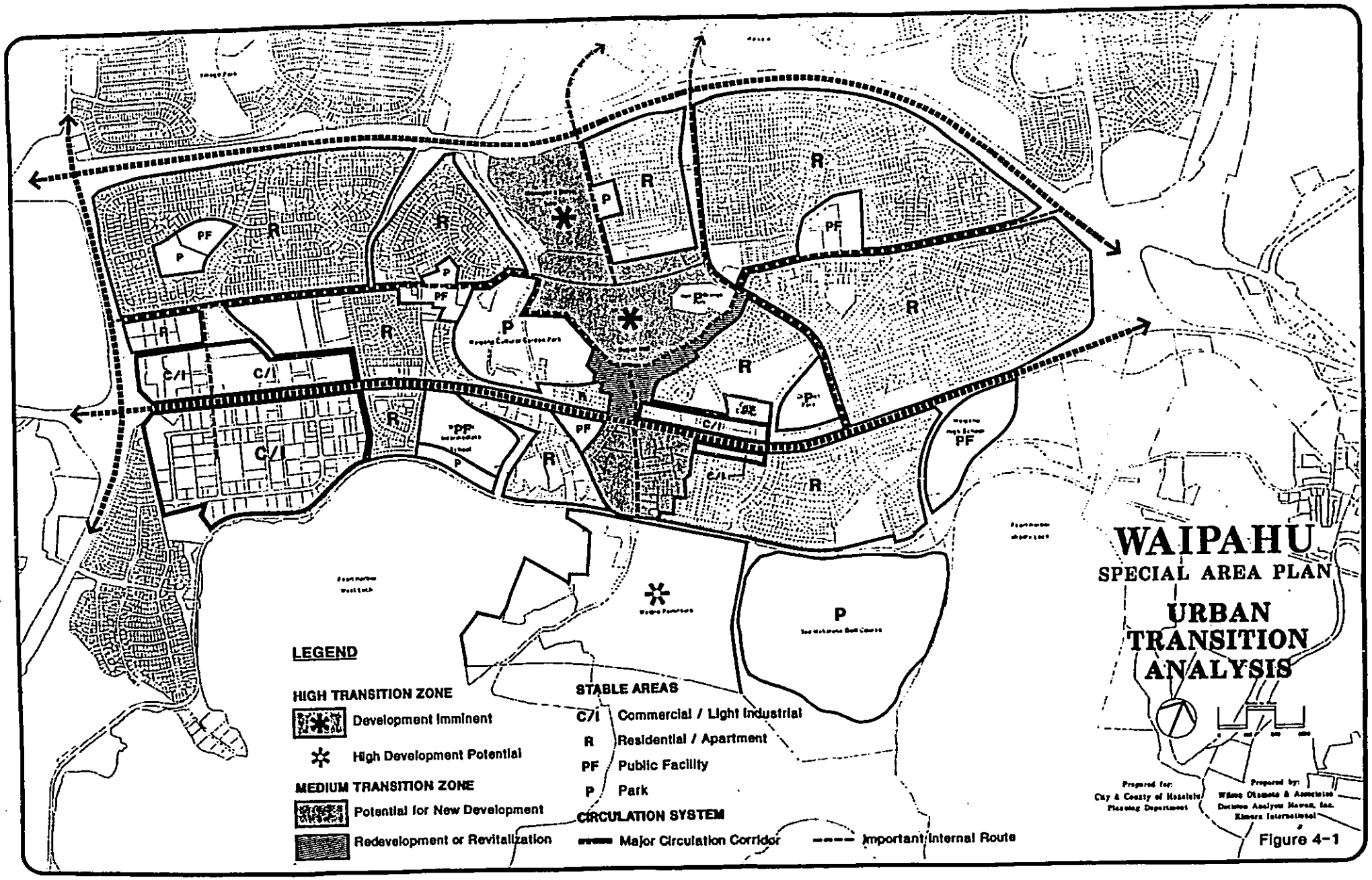

R
P
PF
C/I
LEGEND
HIGH TRANSITION ZONE
Development Imminent
High Development Potential
MEDIUM TRANSITION ZONE
Potential for New Development
Redevelopment or Revitalization
STABLE AREAS
C/I Commercial / Light Industrial
R Residential / Apartment
PF Public Facility
P Park
CIRCULATION SYSTEM
Major Circulation Corridor
Important Internal Route
WAIPAHU
SPECIAL AREA PLAN
URBAN TRANSITION ANALYSIS
Prepared for:
City & County of Honolulu
Planning Department
Prepared by:
Wilson Okamoto & Associates
Duncan Analysis Hawaii, Inc.
Kimura International

Figure 4-1

designated geographic locations of the following land use areas which were derived from the urban transition analysis:

Manager's Drive Site: The approximately 39.59-acre City-owned vacant, undeveloped parcel is located to the east, adjacent to Manager's Drive, between the H-1 Freeway and the sugar mill site. The site has a relatively flat topography which would facilitate site development.

Sugar Mill Site: The approximately 62.8-acre site housed Oahu Sugar Company's sugar mill operations. Selected existing structures on the mill site will be retained for future redevelopment of the site (smokestack, and the Generator, Lab, Administration, Human Resources, and Waipahu Store buildings). Due to its prior industrial use, environmental clean-up of the mill site may be required prior to new construction.

Hans L'Orange Park: Located at the corner of Paiwa and Waipahu Streets, the 6.9-acre City park recently became the homefield for the Hawaii Winter League's franchise West Oahu CaneFires baseball team.

Civic Center Site: Located in the vicinity of Mokuola Street and the Waipahu District Park, the area includes the existing Waipahu Civic Center facility, the new Waipahu Public Library (scheduled to open in April 1996), existing elderly rental housing, and planned facilities including a senior citizen center, additional elderly rental and low-rise public rental units.

Waipahu Street and Waipahu Depot Road (Mauka of Farrington Highway): Adjacent to and along a portion of the south side of Waipahu Street (vicinity of Hans L'Orange Park and the sugar mill site), and continuing along both sides of Waipahu Depot Road mauka of Farrington Highway, the area encompasses predominantly commercial and retail establishments (former Arakawa's Store, Big Way Supermarket, Nii Superette, Waipahu Post Office, Salvation Army, etc.).

Farrington Highway: This is a 4-lane major east-west arterial that traverses through Waipahu Town.

Area Makai of Farrington Highway: Encompassing the area between Farrington Highway, up to and including the OR&L right-of-way, and the Pearl Harbor shoreline, existing land uses include single family residences and Kapakahi Stream west of lower Waipahu Depot Road; and commercial, light industrial and apartment residential east of lower Depot Road.

Waipio Peninsula: The Peninsula encompasses approximately 1,400 acres of State, City and Navy lands makai of the OR&L right-of-way. Existing uses include City public facilities east of Waipahu Depot Road, including the Police Training Academy, Waipahu Refuse Convenience Center, Waipahu wastewater pump station, City Department of Parks and Recreation temporary plant nursery, the former City incinerator facility, and

the Ted Makalena Golf Course. The former City ashfill site is located west of Waipahu Depot Road. The State Department of Land and Natural Resources Division of Forestry and Wildlife is seeking the establishment of a wildlife sanctuary at the Pouhala Marsh located immediately makai of the OR&L right-of-way and west of lower Depot Road. The sanctuary would encompass approximately 7.5 acres of fastland and 27 acres of water. Lower Waipio Peninsula consists of lands which were used for sugar cane cultivation. The Navy's blast zone, which bisects the Peninsula in an east-west direction, restricts the intensity of human activities and precludes development of structures.

Also reflected on the Preferred Plan is the proposed commercial designation for the approximately 0.47-acre KDEO radio station site located west of the Church of Latter Day Saints and adjacent and mauka of Farrington Highway. The parcel currently has a residential land use designation.

4.2 Land Use Plan

The land use component of the Preferred Plan encompasses the various land uses, projects and economic activities which most contribute toward the economic development and revitalization of Waipahu, while also providing for enhanced recreational and social opportunities (see Figure 4-2).

4.2.1 Manager's Drive Site

Different land uses are proposed for the Manager's Drive site: a private school, and market residential development, a memorial park, or churches. By designating multiple land uses, the City is provided with more flexibility in establishing a land use that would provide a greater economic return while meeting community needs. During the course of discussions with the Town Plan Task Force, the acreages of the different land uses have been focused on a relatively equal distribution.

Private School

The primary land use focus within the Manager's Drive site is the designation of a private school (educational institution). With Waipahu located at the crossroads of the rapidly developing Ewa and Central Oahu regions, a private school would serve the community and broader region, while benefitting and enhancing Waipahu both socially and economically. Provision of a private school campus that could support up to grade levels Kindergarten through 12 with an enrollment of approximately 1,000 students is designated within the mauka portion of the Manager's Drive site.

The relatively level and uniform configuration of the site makes it suitable for a school campus. Also, by being located within the mauka portion of the Manager's Drive site, the school would not abut incompatible land uses along three sides. The site is buffered

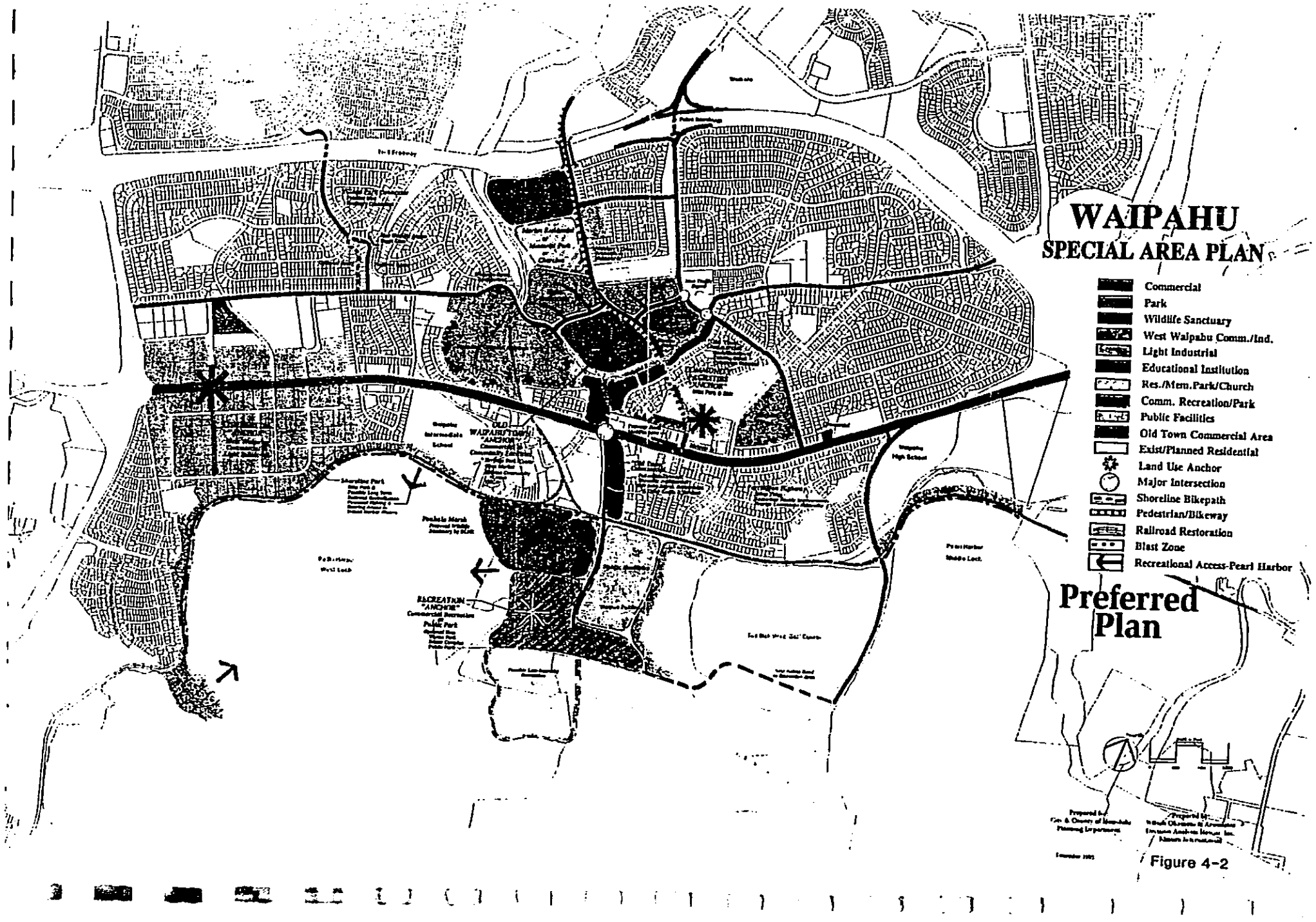

WAIPAHU
SPECIAL AREA PLAN
Commercial
Park
Wildlife Sanctuary
West Waipahu Comm./Ind.
Light Industrial
Educational Institution
Res./Mem.Park/Church
Comm. Recreation/Park
Public Facilities
Old Town Commercial Area
Exist/Planned Residential
Land Use Anchor
Major Intersection
Shoreline Bikepath
Pedestrian/Bikeway
Railroad Restoration
Blast Zone
Recreational Access-Pearl Harbor
Preferred Plan

Figure 4-2

by a large, natural gulch along its Ewa side, the H-1 Freeway along its mauka perimeter, and Manager's Drive to its east. Along its makai side, the school would abut potential market residential development, a memorial park, or church facilities.

The physical location of the site would require careful siting of the school's facilities so as to minimize any adverse impacts from adjacent land uses. To overcome traffic noise problems from the H-1 Freeway, facilities which would normally be noise-tolerant or noise-generating, such as a gymnasium or cafeteria, athletic fields, or air-conditioned facilities, could be sited toward the freeway. Facilities that are not noise-tolerant, such as classrooms, could be sited along the makai side of the campus so they would not be distracted by noise which may emanate from potential adjacent residences.

The school site is conveniently accessible from the H-1 Freeway, and its close proximity to the Paiwa Street Interchange reduces potential traffic penetration to the town core area. However, the Hikpo Street neighborhood would experience increased traffic as the street provides the closest route for school traffic traveling to and from the Paiwa Street Interchange. Although the school's peak traffic would coincide with the morning commuter peak hour, it would precede the afternoon commuter peak hour. Also, increased demand and competition for on-street parking in the surrounding areas may result from students who drive to school.

Residential Use

With Waipahu's centralized location to major employment centers in the Primary Urban Center (PUC), Kapolei and Central Oahu, potential market residential development is designated within the makai portion of the Manager's Drive site and would accommodate about 120 single-family residential dwellings.

The site offers good accessibility from the H-1 Freeway and the Paiwa Street Interchange, and its adjacency to a future major connector street (Manager's Drive) affords good access to shopping areas both within the Waipahu town core and at Waikele. The site's elevated Ewa perimeter, which overlooks a large, natural gulch, offers panoramic views for selected house lots. The relatively level topography of the parcel would require minimal site grading during construction. Its adjacency to the future light industrial subdivision along the makai boundary would require a visual or landscaped buffer.

Residential development is expected to generate a significant increase in traffic which coincides with commuter peak periods, and may require roadway improvements to nearby streets to relieve congestion. Demand for on-street parking would be typical of that associated with single-family residential development.

Memorial Park (Alternative to Residential Use)

A memorial park has been suggested by the Task Force and could potentially be located within the makai portion of the Manager's Drive site. The site offers a central location to the dense population region and good accessibility from the H-1 Freeway, Waipahu Street, and Farrington Highway. The memorial park would provide landscaped open space, and the natural bluff along the site's Ewa perimeter provides a good buffer for this land use. However, it is questionable as to whether an intensely developed locality is appropriate for a memorial park, as opposed to a rural location which may be more appropriate. The limited acreage available may render the site economically infeasible.

The nature of a memorial park also raises concerns as some may view this as an undesirable use next to residences. Also, without nighttime presence, illicit activities could potentially occur there. With its location in a densely populated area and adjacency to residences, assurances would need to be provided that the memorial park will be well-maintained.

A memorial park would minimize traffic impacts to area residents, with traffic likely to occur during off-peak periods. The inclusion of a mortuary would generate greater traffic impacts and is not assumed as part of the memorial park. Traffic is anticipated to be heavier on the weekends and during special holidays (such as Memorial Day).

Church Site

During the planning process, concern has been expressed regarding the designation of potential church sites in Waipahu. The Task Force endorsed the use of a portion of the residential parcel for church site(s) in response to the strong need and lack of sites to develop churches in Waipahu. The City and County of Honolulu through its Land Use Ordinance (LUO) has established certain minimum criteria for the allowance of churches in various zoning districts. Churches are classified as "meeting facilities" for purposes of the zoning code and are allowed in all zoning districts except industrial and preservation zones. In resort and business zones, churches are allowed without any special restrictions. In agriculture, residential and apartment zones, however, churches are allowed but are subject to a Site Plan Review approval by the Department of Land Utilization.

In general, siting characteristics for churches should consider factors which would minimize adverse impacts to existing adjacent land uses such as traffic flow and control, access to and circulation within the property, off-street parking and loading, refuse and service areas, screening and buffering, location of structures, location of proposed uses, hours of operation, noise, lighting and dust. Special treatments should be considered for the benefit of surrounding uses, including requirements for sound-proofing structures and providing noise mitigation such as a solid wall or landscaping.

4.2.2 Sugar Mill Site

The sugar mill site is designated to be redeveloped into three land uses -- light industrial, commercial, and community-oriented uses. The commercial and community-oriented uses would be located at the "Old Waipahu Town Anchor" site. During the course of the planning process, discussion of the anchor site has focused on a relatively equal distribution of acreage between the commercial and community-oriented uses.

Light Industrial Use

As Waipahu is centrally located with good accessibility to surrounding regions, it is an ideal location for light industrial businesses that service customers and establishments in downtown Honolulu, Central Oahu, Ewa, and Waianae. A light industrial subdivision is designated in the area adjacent and mauka of the sugar mill. The use would continue the industrial nature associated with the sugar mill site, and promote economic development with new construction and employment opportunities, while providing a convenient job location for local area residents.

The light industrial subdivision could include businesses which typically locate in these areas such as:

- Construction companies which would use vacant lots to store materials, equipment, and partially fabricated structures;
- Companies that support construction and housing (masonry, plumbing, electrical systems, metal working, glass, painting, floor coverings, roofing, air-conditioners, alarm systems, yard supplies, furniture assembly and repair, etc.;
- Automotive maintenance and repair shops covering mechanical and electrical systems, radiators, air conditioning, body repair and painting, upholstering, tires, glass-tinting, alarm systems, etc.;
- Other businesses, such as signage companies, printers, film processors, food distributors, clothing and footwear manufacturers, and sporting equipment manufacturers; and
- Warehouse and storage operations for nearby businesses and residents.

The light industrial subdivision would be adjacent to the existing Jack Hall Housing and potential new residential development along its mauka perimeter, and Hans L'Orange Park along a portion of its makai boundary. Concern has been expressed regarding light industrial uses due to potential adverse impacts to nearby residents and the types of light industrial businesses and appearance of the area. For example, reverse warning beepers on trucks may annoy adjacent residents, especially during late evenings or early mornings. Adequate buffers or setbacks to mitigate potential noise, visual and pollution impacts would be required to maintain compatibility with adjacent land uses. Also, light industrial subdivisions could be designed and managed to provide a more visually attractive environment, such as the Gentry Business Park in Waipio, the Mililani Technology Park, and portions of Campbell Industrial Park. This could be accomplished

by establishing design guidelines or declaration of covenants, conditions and restrictions to enforce development standards. There could also be certain restrictions or provisions imposed on the types of light industrial businesses which would be allowed to locate in the subdivision. For example, the Waipio Gentry Business Park is encumbered by a Declaration of Covenants, Conditions and Restrictions for the Gentry-Waipio Industrial Area which insures the orderly and proper development and use of the industrial area in relation to the development of Gentry-Waipio as a whole, as well as to promote a high type and quality of improvement and use of the industrial area. The Declaration establishes specific limitations and restrictions on use of the area, including restricting uses which create a nuisance to adjacent sites, and development standards which require that all outdoor storage be visually screened from streets and adjacent properties.

The designated site offers good proximity and access from the H-1 Freeway via the Paiwa Street Interchange. However, light industrial uses would introduce truck traffic to the local streets. The previous heavy truck traffic associated with the sugar mill operations traveled along the privately-owned cane haul roads and not the public streets. Depending on the type of activities, there would be increased traffic during the morning and afternoon peak traffic periods and during all hours of the day. Also, some residents of the Hiapo Street neighborhood suggested the possibility of restricting light industrial truck traffic from using Hiapo Street. The City Department of Transportation Services (DTS) has indicated that trucks could not be restricted from using public roadways unless load factors or geometric constraints are of concern. Demand for on-street parking in the nearby vicinity may also increase by employees of the light industrial businesses.

Commercial

The prominence of the sugar mill is a factor which encourages the designation of commercial use within the area. With the mill being the landmark and symbol of the Waipahu heritage, this provides an opportunity to convert the mill structure to a themed commercial experience, thereby ensuring preservation of the landmark and providing economic revitalization of the area. An area within the Ewa portion of the sugar mill site is designated for commercial use.

The mill site offers a prime location for potential commercial activities and is centrally located for serving downtown Honolulu, Central Oahu, and Ewa. Also, the mill stack would give the commercial area an identity and visibility, making it easy for customers to locate. The proximity of the mill site also offers an opportunity to attract patrons from Waikele into the town core. The site's location on a bluff provides selected commercial establishments the opportunity to offer patrons panoramic views of Waipahu. Commercial development could potentially include a business park based on a theme of a former sugar mill which incorporates industrial-style buildings, old equipment, photographs, the mill stack, etc. Activities could include a large discount specialty store, a neighborhood commercial center, restaurants, building supply showrooms, and auto dealerships and services. There could also be the opportunity to integrate commercial uses with community facilities which are discussed below.

The mill site's central location affords good access from the H-1 Freeway, the Paiwa Street Interchange and major arterials. Increased traffic from commercial uses would occur primarily during off-peak traffic hours. Commercial activities could cause traffic congestion primarily at the Mokuola/Waipahu Street and Paiwa/Waipahu Street intersections, possibly requiring widening of Waipahu Street and/or Mokuola Street/Manager's Drive. A large off-street parking area would be required for the commercial development. An increase in demand for on-street parking by employees and shoppers may potentially occur.

Heritage Park/Center and Community Facilities

A heritage park/center and community facilities, including a YMCA and a Filipino Community Center, are designated to be located adjacent to the commercial area, in the area of the mill smokestack to the clinic building.

Heritage Park/Center: Waipahu's historic plantation era as evidenced by the sugar mill, and its ethnic and cultural diversity, makes it appropriate to develop a heritage park/center facility. The center could be integrated into some of the existing mill structures to be retained. It would also provide the opportunity to fully integrate uses in a sugar mill themed shopping center. Its relationship to the commercial sugar mill would also help to support visitor attendance at the heritage center, which is intended to complement and be supplemental to the Waipahu Cultural Garden Park. Furthermore, the heritage center is more appropriately located near the Waipahu Cultural Garden Park and Hawaii Plantation Village so the three facilities would benefit from visitors.

In efforts to promote the cultural heritage of the various ethnic groups, the cultural center would be operated by a non-profit organization. In showcasing the plantation era, the center could offer multimedia displays incorporating artifacts and old photographs covering the cultivation of sugar cane, mill operations, the water system, the history of the plantation and plantation labor, plantation life, etc. The Alexander & Baldwin Sugar Museum on Maui could serve as a prototype for a successful sugar plantation museum. An open market concept could also be developed in conjunction with the cultural center.

YMCA: Development of a new community YMCA facility would more fully serve the growing population of the region. The overall plan for the Oahu YMCA organization calls for development of a new community YMCA in the Waipahu-Ewa area by year 2000 as one of its top priorities. Such a community service-oriented facility is needed for the youth of Waipahu as it provides recreational outlet and social support.

The existing Leeward YMCA branch, which has been in existence for five years, is located in the Westgate Center in Waipahu. Approximately 1,500 students are involved in the Leeward YMCA program, including students in the A+ program at Waipahu, Honowai and Kaleiopuu Elementary Schools in Waipahu, and elementary schools in the Ewa/Ewa Beach area. The YMCA also offers Summer Fun programs at Kaleiopuu and Makakilo Elementary Schools. About 600 teens are enrolled in the YMCA Teen

Program at Waipahu Elementary, Intermediate and High Schools, and at August Ahrens Elementary School in Waipahu.

The locational advantages of the sugar mill site are compatible with the siting criteria for a YMCA facility. The site is adjacent to Hans L'Orange Park for outdoor recreational activities and programs, and in close proximity to schools, homes, shopping and a main road. The YMCA facility would potentially include exercise and childcare facilities, offices, meeting rooms, locker/shower rooms, a multi-purpose room, an outdoor swimming pool, a play area, and parking area.

Filipino Community Center: The Filipino Community Center (also known as the Filcom Center) is intended as a gathering place for promoting activities associated with the cultural heritage and values of the Filipinos, as well as a family-focused center offering diverse programs of social, recreational and human services accessible to all members of the community. Services to be offered by the Center include cultural events and activities, a senior center and elderly services, children and youth activities and services, family and counseling services, and conference and meeting facilities. The Filcom Center will consist of a building and associated parking area. Initiated by the Filipino Chamber of Commerce of Hawaii in 1991, the Filcom Center would be developed, owned and operated by The Filipino Community Center, Inc., a Hawaii non-profit corporation. It was a primary goal of The Filipino Community Center, Inc. to establish the Filcom Center in Central or Leeward Oahu due to the rapid growth and development of the communities and increasing youth population, and to be close to urban clusters of the Filipino population.

The adjacency of the site to Hans L'Orange Park is ideal for related outdoor recreational activities and programs, and is in close proximity to the civic center, new public library, and the elderly housing project for conducting social and human services. Other factors which contribute to the appropriateness of the site include easy accessibility by private vehicle, public transportation and walking, a highly visible location, and the need for minimal site improvements. Adjacency to the YMCA facility would also enhance opportunities for integrating social and recreational activities and programs.

From a traffic standpoint, the cultural museum and community facilities are centrally located to major arterials, with facilities-related traffic expected to occur primarily during off-peak traffic hours. Off-street parking areas would need to be provided.

4.2.3 Hans L'Orange Park

Rich in baseball tradition, the City's Hans L'Orange Park is also the homefield for the Hawaii Winter Baseball League's franchise West Oahu CaneFires team. To meet professional league standards, the Park has upgraded improvements including an expanded bleacher system to accommodate a 2,200-person seating capacity, installation of a chainlink fence around the Park, an improved lighting system, a press box and expanded dugouts, installation of an electronic scoreboard, an outfield warning track, and

improved restroom facilities. Concession stands and a gift booth are also planned for the Park. In addition to the Park's existing parking area along Waipahu Street, an area behind left field was recently cleared to provide temporary parking. Future improvements to the Park include infill and extension of the left field line to regulation size and provision of a permanent parking area.

The Plan's designated improvements to the existing 6.9-acre Hans L'Orange Park include a 3-acre expansion within the area along the southern boundary of the park, encompassing the area of the existing Makaaloha Street and extending down to Waipahu Street. The expansion would allow for extension of the Park's left field line, and to create more passive park area and additional parking area. The existing allee of mahogany trees along Makaaloha Street will be retained and incorporated in the passive park. The improvements will improve the visual character of the Park and provide increased recreational opportunities.

Access to the Park is currently provided off of Paiwa Street near Waipahu Street. The close proximity of the existing Paiwa Street access to Waipahu Street results in traffic congestion in the immediate vicinity during events at the Park. With the proposed Park improvements, improvements to the Waipahu/Paiwa Street intersection would be needed, although park-related traffic would primarily occur during off-peak traffic hours. Although off-street parking would be provided, there would potentially be on-street parking impacts to nearby area residents and businesses.

4.2.4 Civic Center Site

The overall plan for this area is to consolidate government services in the vicinity of the civic center, which includes the existing State Civic Center, elderly rental housing and new public library, and planned senior citizens center, elderly rental housing and low-rise public rental units, and to provide a connection to the Waipahu town core via pedestrian linkages along Mokuola and Hikimoe Streets.

Recently, there have been two proposals for development of a portion of a 1.76-acre vacant, undeveloped parcel located at the Ewa-mauka corner of Hikimoe and Mokuola Streets (Tax Map key: 9-4-17: portion 51). The parcel is under the ownership of the State of Hawaii Housing Finance and Development Corporation. One proposal is for an independent living facility consisting of 15 units within a two-story apartment complex, with supportive care services for persons with severe physical disabilities. This project is proposed by a consortium comprised of Independent Living Housing, Rehabilitation Hospital of the Pacific, and Accessible Space, Incorporated. The other is a proposal by the Waipahu United Church of Christ for development of an elderly day care/respite center facility of approximately 6,000 square feet. A Hawaii Legislative Senate resolution was passed which stated that the vacant parcel be leased to the Waipahu United Church of Christ for $1.00 a year for 30 years for an elderly day care center.

In an effort to encourage mass transit ridership and usage of alternative ride sharing modes, a mini park and ride facility is designated to be located on a portion of the 1.76-acre parcel and would be co-located with either the independent living facility or the elderly day care facility. The parcel is centrally located within the town core area, and would provide a convenient location for users of the civic center, library, and elderly housing in terms of available transit service. The mini park and ride facility would increase the potential to provide mauka-makai mass transit service in addition to the east-west lines, and would intercept motorists and other transit services (shuttles) in outlying areas, as well as facilitate passenger transfer to express transit lines. Traffic from a mini park and ride facility would primarily occur during off-peak traffic hours (prior to the morning peak and after the afternoon peak).

4.2.5 Waipahu Street and Waipahu Depot Road (Mauka of Farrington Highway)

Old Town Commercial Area: The "historic" ambience of the commercial area along Waipahu Street and Waipahu Depot Road in the vicinity of the sugar mill fosters the opportunity to revitalize the existing businesses and to create an "Old Town" commercial area. The approximately 10.3-acre area would encompass the area adjacent to and along a portion of the south side of Waipahu Street (vicinity of Hans L'Orange Park and the sugar mill site), continuing along both sides of Waipahu Depot Road mauka of Farrington Highway. In addition to its central location in the town core, its close proximity to the commercial/heritage facilities at the sugar mill site further unifies the historic town core and enhances Waipahu's cultural diversity. In addition to the existing businesses, new businesses which would be appropriate to the area could include smaller establishments such as specialty stores, ethnic restaurants, and other specialty goods and services.

Thematic architecture in the form of streetscape and building form guidelines have been established to enhance the Old Town identity (see Chapter 5). A pedestrian-oriented theme will be incorporated in the Old Town commercial area to encourage shoppers and other patrons to stroll through the area. Revitalization of the area would possibly require the obtaining of grants or other private sources of funding.

As the result of recent revision to the Flood Insurance Rate Maps, substantial portions of the commercial areas in the vicinity of Waipahu Depot Road are within the restrictive floodway designation (see Section 3.2). Flood control improvements are required to facilitate any redevelopment and revitalization in the area.

The Old Town commercial development is anticipated to generate a moderate amount of vehicular traffic since pedestrian-oriented facilities will be a primary element of the area. Vehicular traffic demand would occur primarily during the off-peak traffic periods. Some off-street parking areas may be required.

4.2.6 Farrington Highway

Farrington Highway would be maintained as a car-oriented thoroughfare. To improve the visual appearance of the highway between Kamehameha Highway and Fort Weaver Road, canopy street trees (monkeypod trees) would be planted within the center median. Although the present State Department of Transportation (DOT) Highways Division administration is more receptive to planting trees in the median areas of road, median barriers or guardrails may be required if the median is less than 60 feet wide. Also, periodic maintenance of the trees would be required as tree limb overhangs would pose a potential highway hazard.

The enhancement of Farrington Highway could possibly include landscape and sidewalk improvements along both sides of the Highway. Attractive gateway or entry features could be provided at both ends of Farrington Highway in Waipahu to establish formal entry into the community. A gateway feature could also be located at Waipahu Depot Road at Farrington Highway to establish an identity to this landmark road.

The Central Oahu Development Plan revision program designates Farrington Highway as a future major east-west transit corridor through Waipahu, requiring that sufficient right-of-way be provided for a grade-separated rapid transit. The east-west corridor through Waipahu is intended to link the Primary Urban Center with the University of Hawaii West Oahu Campus and the City of Kapolei. Three major nodes are planned in the area – near Leeward Community College, near the intersection of Waipahu Depot Road and Farrington Highway, and near the intersection of Kunia Road and Farrington Highway. The corridor is characterized by high-density residential development within walking distance of the major nodes and transit stops. The Central Oahu DP calls for higher density housing to be centered around the two nodes located within Waipahu at the intersections of Farrington Highway with Waipahu Depot Road and Kunia Road. Mid-rise, medium- to high-density residential uses would be permitted within one-quarter mile of future transit nodes when combined with retail commercial uses on the ground level. The DP further establishes that uses adjoining the nodes be designed so that they face toward the nodes, encouraging pedestrian traffic flow to and from the nodes.

The State Department of Transportation's recently completed Oahu Regional Transportation Plan recognizes rapid transit coming on line beyond the 2020 horizon year. In view of this, the Central Oahu DP essentially establishes that space should be reserved for a possible future transit corridor along Farrington Highway.

4.2.7 Area Makai of Farrington Highway

Old Town Commercial Area: An "Old Town" commercial area is designated for the area east of Waipahu Depot Road between Farrington Highway and the OR&L right-of-way. Encompassing approximately 5.5 acres, this serves as a logical extension of the upper Waipahu Depot Road Old Town commercial area and provides a "connection" from the shoreline to the sugar mill. Revitalization of the area would occur through thematic

architecture in the form of streetscape and building form guidelines which have been established to enhance the Old Town identity (see Chapter 5). The thematic architecture would emulate to a lesser degree the streetscape and building form guidelines which have been established for the Old Town commercial area near the sugar mill. The pedestrian-oriented theme will also be carried through to enhance the ambience of the area.

Redesignation of this area to Old Town commercial would require changes in land uses and possible displacement of residents. Existing businesses in the area may be impacted to some degree. However, the enhancement of the area is intended to provide economic revitalization as well as improve the character of the area. The revitalization efforts would also visually improve the entrance to Waipio Peninsula. Th s change in land use and character of the area also enhances the opportunity to build a train station at its original site at the end of Depot Road.

Vehicular traffic generated by the Old Town commercial would be moderate, with traffic primarily occurring during off-peak periods. The provision of pedestrian facilities is also intended to further reduce traffic in the area. Off-street parking areas may be required.

Shoreline Park/Preservation Area: A shoreline park and preservation area is designated along the entire length of shoreline in Pearl Harbor's West Loch and Middle Loch in accordance with provisions of the proposed Central Oahu Development Plan. In establishing a long-term shoreline park/preservation area, a 150-foot setback from the Pearl Harbor shoreline is required for all new developments located along the shoreline. In addition to visually improving and enhancing the shoreline area, this designation would contribute toward long-term development of a shoreline park and greenbelt connection between the various shoreline parks along Pearl Harbor from West Loch to Rainbow Bay Marina near Aloha Stadium. Increased recreational opportunities would also potentially include nearshore fishing and boating in the Pearl Harbor West Loch waters, which the U.S. Navy was recently receptive to pursuant to discussions with the City. A formal agreement would need to be established with the Navy for recreational use of the Pearl Harbor waters.

Due to uncertainty of the existing shoreline's location, a shoreline certification to establish the effect of the setback on existing uses would be required for designation of the shoreline park/preservation area. The park would extend through portions of or entire parcels of the West Waipahu light industrial area and adjacent residential area near Waipahu Intermediate School, and may preclude the redevelopment of existing structures in the affected parcels. Implementation of the shoreline park/preservation area may result in long-term condemnation proceedings since some of the parcels may become unusable given the prohibition of development within the 150-foot setback.

Shoreline Bike Path: In an effort to improve the visual appearance along the Pearl Harbor shoreline, a shoreline bike path is designated along the OR&L right-of-way which would also increase recreational opportunities. This would also contribute toward the long-term development of a greenbelt connection between the various shoreline parks

along Pearl Harbor, and would provide for a long-term continuous bike path from West Loch to Rainbow Bay Marina.

Development of the bike path would enable clean-up and beautification of the shoreline area, as well as facilitate police patrol in areas presently inaccessible. The Honolulu Police Department has expressed support for implementation of the bike path in an effort to reduce crime in the area. The bike path would allow police to patrol the area on a regular basis and eliminate many of the hiding areas which are prone to criminal activities. The bike path would also provide a recreational area for youths who have no other play area, which would further help to reduce crime.

OR&L Right-of-Way: The long-term restoration of the historic OR&L train operations into Waipahu would be a highly beneficial complement to the community by promoting the town's plantation heritage. It would serve as a major visitor and cultural attraction which would draw visitors to Waipahu, and thereby contribute to economic revitalization of the area. In the long-term, the train could transport visitors between the Ko Olina Resort and the Waipahu Cultural Garden Park.

The Oahu Railway and Land Company initially provided train service linking Honolulu with Leeward and North Shore communities. The train service was instrumental in the early success of the Oahu Sugar Company and other sugar operations, and to the initial development of Waipahu and other communities. In 1950, the Federal government acquired a portion of the rail line for munitions transport from Lualualei to West Loch. By 1974, the right-of-way was declared surplus and in 1980 was transferred to the State of Hawaii for Historic Places Guardianship. The main line between Ewa and Nanakuli was placed on the National Register of Historic Places in 1975. Deed and other restrictions limit the use of the right-of-way to a non-profit train operation, bike path, and/or park.

With the help of volunteers, the Hawaiian Railway Society (HRS) is restoring a portion of the old, narrow-gauge main line of the OR&L, old locomotives, passenger and freight cars, and other equipment. On Sundays, the HRS operates two 13-mile roundtrip rides lasting 1-1/2 hours, starting at Ewa Villages and traveling west, and offering views of former sugar cane fields, Fort Barrette, two ghost towns, Barbers Point Harbor, Ko Olina Resort, and Paradise Cove. During the week, the HRS offers 45-minute train rides to students and special groups.

In the near term, the HRS plans to undertake the following: renovate a second diesel locomotive to haul a passenger train; restore passenger cars and other rolling stock; install automated crossing signals and gates at Kalaeloa Boulevard and Barbers Point Access Road; reconstruct a loading platform; and construct the first phase of the maintenance building. Over the long term, the HRS plans to: restore a steam locomotive; restore the track and five bridges out to Nanakuli; and construct a historic railroad station, museum, gift shop, restaurant, and additional maintenance facilities at

their Ewa yard. The railroad track bed out to Nanakuli is in relatively good condition, and the extended train ride will offer 3-1/2 miles of ocean views.

Possible extension of the train operations into Waipahu up to the Waipahu Cultural Garden Park would result in major problems and expense in crossing Farrington Highway. Along with the grade separation of Farrington Highway in the vicinity of the existing train track right-of-way, an at-grade train crossing would require that vehicular traffic be stopped for a duration to allow the crossing, resulting in disruption of traffic flow. Also, the proximity of the OR&L right-of-way to adjacent residences would result in noise impacts and vehicular access interference by the train operations. Implementation of the train operations would require an Environmental Assessment and public hearing through the Special Management Area Use Permit process, which would provide the opportunity to address community concerns.

4.2.8 Waipio Peninsula

New City Fire and Police Department Vehicle Maintenance Facilities:

The City and County of Honolulu is developing new vehicle maintenance facilities for the Fire and Police Departments, respectively, east of Waipahu Depot Road in the vicinity of the existing Police Training Academy, Waipahu Refuse Convenience Center, and the Waipahu wastewater pump station. The facilities are being constructed on two separate portions of the City-owned parcel identified as Tax Map Key: 9-3-02: portion 9.

City Fire Department Vehicle Maintenance and Storage Facility: The Fire Department facility, which is currently under construction, consists of storeroom and vehicle maintenance facilities on approximately 4 acres of land located north of the City Department of Parks and Recreation's temporary plant nursery and east of the Refuse Convenience Center. The facility is for the maintenance and repair of the entire Fire Department's truck fleet, with activities to include motor vehicle safety inspections, overhaul of major components, and routine maintenance. The facilities include single-story structures approximately 25 feet high, consisting of a vehicle maintenance repair shop, storeroom, radio repair shop, foam storage shed, wash rack, and equipment parking shed, with employee parking spaces outside the building. This new facility will replace the Fire Department's existing maintenance facilities in Kakaako, which are inadequate to meet the Department's current vehicle maintenance and storeroom requirements.

Access to the site will be off of Waipahu Depot Road through an unnamed road (along the OR&L right-of-way) north of the site. The facility will incur minimal traffic demand during peak traffic hours. Traffic to and from the facility will consist of employees (approximately 37) reporting to work and vehicles being transported for repair.

City Police Department Vehicle Maintenance Facility: The Police Department vehicle maintenance facility, which is currently in the approval process by the City, will be located on approximately 1.2 acres of undeveloped land located adjacent and north of the existing Police Training Academy. Activities to be conducted at the facility include light vehicle maintenance for the Leeward District substations and heavy vehicle maintenance

for the Department's entire vehicle fleet. The facility will consist of a single-story building approximately 25 feet high, with work bays, shops, storage and equipment rooms, locker rooms, offices, and a conference room, and an employee parking area. This new facility was deemed necessary as the existing maintenance facility across the former Police Headquarters Station in Pawaa has been targeted for a superblock development.

Access to the site will be via the existing Police Training Academy entrance off of Waipahu Depot Road. The facility will result in minimal traffic demand during peak traffic hours. Traffic to and from the facility will consist of employees (about 20, with approximately 10 more added with work load increases due to new substations) reporting for work, and vehicles arriving for maintenance.

Commercial Recreational Use:

Commercial recreational use is designated for portions of the upper Waipio Peninsula area. This designation differs from the typical recreational use in that visitors or participants are charged a fee or admission. Two possibilities for commercial recreational use have been preliminarily proposed to the City.

Makai Park Hawaii: One proposal for commercial recreational use is the Makai Park Hawaii, which is proposed to be a world-class educational, research and entertainment facility. The intent of the visitor-oriented facility is to recreate and represent Hawaii, its culture and history. Makai Park Hawaii proposes to offer three major attractions, including:

- A swim-through aquarium which represents the Hawaiian reefs. Guided tours would allow visitors the opportunity to swim, snorkel or float with the fishes. Tide pools and shark viewing would also be available. Improvements to transport salt water from the ocean for the aquarium facility would possibly be required.

- A botanical park representing Hawaii's unique fauna and flora. The park is proposed to include Hawaiian botanical gardens, a Hawaiian aviary, tropical bird show, reef fish and shark research facility, tide pools, theater, open air banquet facilities, full service food facilities, and authentic Hawaiian gifts.

- A water park with island-theme adventure slides representing famous waterfalls, mountains and valleys of each island.

Developers of the facility estimate attendance at approximately 950,000 visitors per year, including residents, tourists, and school field trip activities. Also proposed are research links to such institutions as the University of Hawaii, Oceanic Institute, Sea Life Park, Waikiki Aquarium, Honolulu Zoo, National Marine Fisheries Service, and the U.S. Fish and Wildlife Service.

Land is potentially available for the Makai Park Hawaii facility on an approximately 39-acre area which includes the City's ashfill site below Pouhala Marsh, and the former City incinerator site. Although the developers of the Park have indicated a need for up to 75

acres of land, they have also indicated the possibility of scaling down their facility requirements based on land availability. The developers of the Park, although expressing interest in locating at Waipio Peninsula, are also exploring other potential locations including Barbers Point Naval Air Station, near the Turtle Bay Hilton on the North Shore of Oahu, and the Hilton Hawaiian Village in Waikiki.

The central location of Waipahu and its close proximity to the fast-growing Second City region makes it an attractive location for Makai Park Hawaii. Also, the location of the Waipio Peninsula site to the ocean is advantageous for maintaining facility operations. However, careful siting of the Park facilities would be required so as to minimize impact to the State's adjacent proposed Pouhala Marsh wildlife sanctuary. For example, the more passive components of the botanical park could be located along the wildlife sanctuary to serve as a buffer.

The Park site is served by a direct vehicular connection from Farrington Highway via Waipahu Depot Road. An off-street parking area would be required, although the high estimated attendance would encourage the Park operator to use a variety of transportation modes to conveniently and efficiently transport visitors to and from the Park site. To accommodate anticipated traffic demand, roadway improvements would be required along lower Waipahu Depot Road, as well as possible improvements to the Farrington Highway/Waipahu Depot Road intersection. There is also the potential of vehicular "landlock" occurring during high demand periods since the area is served by only one access road from Farrington Highway. An alternate vehicular access would need to be provided to alleviate this condition.

Sports Complex: Another commercial recreational use proposal is for a privately-developed sports complex which would primarily serve as a soccer/softball training facility for international athletes. Major facilities could potentially include:

- Soccer and softball practice fields.
- Soccer/softball stadium to accommodate about 5,000 spectators.
- An amphitheater for concerts (15,000 seats), dual purpose with the stadium.
- Tennis complex.
- Fitness training facilities (weight/exercise equipment).
- Golf course within the Navy's blast zone. The golf course would potentially be semi-private, with tee times possibly allowed for both residents and Navy personnel. The golf course would provide monies to support the other activities in the sports complex.

Land is available for the sports complex on an approximately 39-acre site which includes the City's ashfill site below Pouhala Marsh and the former City incinerator site, and in the area below or makai of the Navy's blast zone (undetermined acreage). Initial discussions have been conducted with the Navy regarding possible use of portions of the Federal-owned lands for the sports complex. In addition to the golf course, the soccer and softball practice fields could also potentially be located in the blast zone, and would require an agreement with the Navy. Facilities such as the golf course clubhouse, the grandstand or seating area for the stadium, the amphitheater, and parking area would need to be located in the area mauka or outside of the blast zone. Also, the structure of the former City incinerator could potentially be reused as a maintenance or other facility

for the sports complex. The facilities of the sports complex would need to be sited so as to minimize impact to the State's adjacent proposed Pouhala Marsh wildlife sanctuary.

The traffic demand for the sports complex would primarily occur during off-peak traffic periods, although a significant amount of traffic is anticipated to be generated during large spectator events. Improvements to lower Waipahu Depot Road would be required to accommodate traffic demand from the sports complex. A large off-street parking area would be needed to accommodate spectators, although the limited developable land area available outside of the blast zone would require the event operator to use alternative transportation modes to efficiently transport spectators to and from the complex site during large events. Although the site is accessible by direct connection to a major arterial (Farrington Highway) via Waipahu Depot Road, there is only a single access road available to service between 5,000 to 15,000 potential spectators at any one time. As such, there would be a need to provide an alternate access road to the sports complex site.

Public Park: A shoreline passive park could potentially be designated for an approximately 23.5-acre area within the City's ashfill site adjacent and makai of Pouhala Marsh. Fronting the waters of Pearl Harbor West Loch, the site offers adequate land and shoreline area, although extensive mangrove vegetation clearing would be required to open up the shoreline. The park would also enhance the increased recreational opportunities of potential nearshore fishing and boating in the West Loch waters as previously discussed under Shoreline Park/Preservation Area.

Except for the existing and planned public facilities in the near vicinity, the shoreline park would be conducive with the relatively passive nature of land uses within Waipio Peninsula. It would also serve as an appropriate buffer to the State's proposed Pouhala Marsh wildlife sanctuary. Direct vehicular connection to the site is provided from Farrington Highway via Waipahu Depot Road. An off-street parking area would be required.

Commercial Recreation (Lower Waipio Peninsula): Commercial recreation activities could potentially occur along the outer fringes of lower Waipio Peninsula within the Navy's blast zone, and an area within City-owned lands outside or mauka of the blast zone (undetermined acreage). Such recreational uses could include supervised low-intensity and outdoor activities including nature hikes, mountain/dirt bikes, horseback trail rides, etc. for a fee.

The Peninsula offers adequate land area in a secluded location appropriate for supervised low-intensity recreational activities. The outer fringes of the Peninsula have remained in its natural state and, with the Pearl Harbor waters along its outer perimeter, offers opportunities appropriate for nature and recreational enthusiasts. Such recreational uses, however, would be subject to an agreement with the Navy for use of the area. Due to restrictions imposed by the blast zone, the base of operations for the activities would potentially need to be located on City-owned land mauka of the blast zone, and activities would be restricted to a low number of people.

Agriculture: Approximately 1,200 acres of Federal-owned lands on lower Waipio Peninsula within the Navy's blast zone will be available for lease for continued

agricultural use. This property was previously leased by the Oahu Sugar Company for sugar cane cultivation. The lease includes the agricultural lands, unpaved roads, one structure formerly known as the Island Garage, and easements for electrical utility service. Terms are for a 10-year lease from the Navy.

The proposed lease of lands on Waipio Peninsula will continue longstanding use of the property for agricultural purposes. Only the type of crop or crops produced and the method of irrigation are expected to change. Potential low-elevation crops for the Honolulu market include fruits (such as bananas, lychee, mango, watermelon), vegetables (such as green beans, eggplant, Manoa lettuce, cabbage, sweet corn, watercress, etc.), flowers, potted foliage, and plants for landscaping. Potential low-elevation export crops could include tropical fruits, winter vegetables, flowers, potted foliage, and seed crops. Cattle grazing would also be possible for areas which are not farmed.

Waipio Peninsula has favorable soil and climate conditions for cultivating crops. Also, the Peninsula's location and the Navy's blast zone restrictions offer natural protection from infringing urbanization. The area offers a central location for transporting produce to intended destinations such as Honolulu markets, the airport, and shipping terminals. Also, the building of structures would be precluded due to restrictions within the Navy blast zone.

The Pacific Division, Naval Facilities Engineering Command recently completed and issued a Findings of Suitability to Lease (FOSL) (October 1995) which documents environmental conditions related to the proposed outlease of agricultural lands on Waipio Peninsula. Conditions which have been met for areas subject to leasing indicate: no hazardous substances of known reportable quantity were released on the parcel; no hazardous substances were stored for one year or more, or were disposed of on the parcel; and the property contains some concentration of hazardous substances or petroleum products, but the property can be used pursuant to the proposed lease (e.g., agricultural use), with specified use restrictions that result in an acceptable risk to human health and the environment.

Vehicular trips generated by land uses such as commercial recreational activities and other leisure activities, as well as agricultural facilities for crop production, are generally minimal compared to the vehicular carrying capacity of the service roadways. The number of vehicle trips generated by these types of uses are typically increased during the weekends and holidays, exclusive of weekday commuter traffic peak hours. As a result, the proposed low-intensity commercial recreation and agricultural uses are not expected to significantly impact traffic operations in its vicinity.

4.3 Economic Implications

A market and economic analysis of the land use components of the Waipahu Special Area preferred plan was conducted by Decision Analysts Hawaii, Inc. in November 1995 and is summarized below (see Attachment C). The analysis includes a market and economic feasibility, employment opportunities likely to be generated, and a discussion of the economic benefits and impacts on existing businesses in the area for each land use component. For the purpose of conducting the analyses, the market and economic analysis assumes designated acreages for the respective land uses.

4.3.1 Market and Feasibility

Private School

Ewa and Central Oahu are the fastest growing regions on Oahu, with a population over 300,000 residing in the surrounding region (from Halawa to Waianae and up to the North Shore). However, the region has few private schools to meet the growing population demand, and most private-school students residing in these areas must commute to schools in Central Oahu. Waipahu's centralized location within the region offers locational advantages, as well as good accessibility.

Recognizing the need for private schools in the region and the fact that many students from the region attend Central Honolulu private schools, there have been varying levels of interest expressed by private school administrators in developing a private school in the area. Among the private schools expressing interest are:

- The Lanakila Baptist Church and Schools which has been a part of the Waipahu community for 28 years. Presently, the school has two campuses -- the Waipahu campus (the Church facility on Waipahu Street) consisting of Kindergarten through Grade 6 with an enrollment of 150 students, and the Ewa campus (Renton Road) of Grades 7 through 12 with an enrollment of 150 students. The School is interested in consolidating both campuses at one location in Waipahu.

- Hawaii Baptist Academy (HBA) which has two campuses on Oahu. The Waianae campus has an enrollment of 50 students in grades Kindergarten through 6, and primarily serves the Waianae community. The other campus is located in Nuuanu, consisting of grades Kindergarten through 12 with an enrollment of 1,150 students. HBA has an ongoing plan to relocate the Waianae campus to either the Waipahu or Kapolei area to serve the broader region, and is planning to expand its services to the high school level. Approximately 15 to 20 acres would be required for a Kindergarten through Grade 12 school.

- The Catholic Diocese is considering the possibility of developing a high school in the region to serve the various communities. Although consideration was given to locating a campus in Kapolei, the Diocese would consider locating a campus in Waipahu if sufficient land were available. Approximately 20 acres would be adequate for a campus. The Diocese has no plans to develop an elementary school in the Leeward area since it would compete with St. Joseph School in Waipahu.

- The San Francisco District Office of Our Redeemer Lutheran School is considering the possibility of developing a new campus up to the high school level in the Leeward area.

A estimated development period of five to 10 years would be required to select a school, transfer landownership, master plan and design the school, obtain the necessary permits and approvals, and construct the facilities.

Residential Use

The market analysis for residential use focuses on market-priced, single-family homes, with the presumption that housing priced below market will accelerate sales.

Housing Prices: Comparatively high housing prices throughout Oahu are a market signal that a housing shortage exists on the island. In the area of Waipahu below the H-1 Freeway, over 80 single-family homes were sold between January 1994 and April 1995, with 90 percent of the sales ranging in price from $280,000 to $390,000. The median sales price was $320,000. New homes in this area of Waipahu, being similar in quality to existing homes, would probably sell for about $325,000 or more.

Locational Advantages: A considerable amount of housing is currently being developed in the region surrounding Waipahu, including Waikele, Royal Kunia, Mililani, and Ewa. Nevertheless, a residential project located in the central area of Waipahu would offer the following advantages: 1) a central location with respect to major employment centers (Primary Urban Center, Kapolei and Central Oahu) and shopping opportunities; 2) excellent vehicular access; and 3) desirable vistas for selected houselots located along the bluff on the Manager's Drive site.

Market Absorption: For the surrounding region (Aiea to Ewa, and north to Mililani), an average of nearly 1,500 new homes were sold annually from 1980 to 1994, of which over 1,000 were single-family homes. Projections to the year 2020 show an average of over 1,500 new homes per year being sold. At recent housing absorption rates, a housing project at the Manager's Drive site would add only a few months of housing inventory to the region.

Development Period: Depending upon market conditions at the time of development, the project size (potential for 120 to 475 new homes; upper range based on original City plans for the Manager's Drive Development), and assuming competitive pricing, a residential project could be developed within 4 to 6 years. This estimate is based on two years for landownership transfer, project design, obtaining necessary permits and approvals, arranging financing, and installing infrastructure. This also assumes that housing construction and sales would occur at a rate of about 50 to 100 market-priced homes per year.

Memorial Park

One of the larger mortuary companies on Oahu is lookin: for about 20 to 60 acres of land in Central Oahu or Ewa to develop a memorial park. Site factor considerations

include a relatively level site with good access, and may be located on urban, agriculture, or conservation land. The Manager's Drive site is an acceptable location for a memorial park as it meets the site criteria, and provided that the land cost is favorable. There is the potential for discounted land costs due to slow absorption, high carrying costs, and low-cost land alternatives.

Full development of a 17-acre memorial park may take 17-plus years to achieve. This includes a few years to transfer the land and obtain permits and approvals, arrange financing, followed by land absorption at a rate of about 1 acre per year.

Light Industrial

Prices of Industrial Land: Relatively small parcels of light industrial-improved land in Waipahu sell for about $50 per square foot, or over $2 million per acre. Such high prices are a market signal that demand for light industrial land is strong.

Demand for Light Industrial Land (Absorption Rate): The annual absorption of industrial land for the area from Waipahu to Aiea averaged about 16 acres from 1980 to 1994. Based on this absorption rate, the proposed 29.5-acre light industrial subdivision at the sugar mill site would provide about 2.2 years of additional inventory for the region.

Reflecting Hawaii's business cycles, average annual absorption was faster during the 1980's (about 19 acres) than it was during the early 1990's (about 9 acres). Absorption in Ewa was about 26 acres per year during the 1980's, but slowed considerably during the early 1990's. About 25 percent of the 103.5-acre Mililani Technology Park near Wahiawa has been developed, and additional acreage has been sold but remains vacant.

In the future, additional industrial-zoned land will be needed in the region to: 1) accommodate economic and population growth on Oahu; 2) compensate for reductions in industrial acreage elsewhere on Oahu due to conversions to commercial and other uses; 3) accommodate companies that are forced to move due to high lease rents near downtown; and 4) provide a sufficient supply of vacant industrial land in order to foster competition and affordable land prices. The redevelopment of the Kakaako area mauka of Ala Moana Boulevard will affect about 450 acres of land, much of which is presently being used for light industry. Although replacement space for light industry activities will be provided as part of the Kakaako redevelopment, many businesses in the area may choose to move due to high lease rents, property values, and property taxes; and/or their incompatibility with nearby high-rise residential and office development. In addition, the planned expansion of the Honolulu International Airport will displace about 10 acres of light industrial area by the year 2012.

Supply of Vacant Industrial land: Waipahu to Aiea

Existing Inventory: A new light industrial subdivision in Waipahu would have to compete with other similar projects in the region. The Waipio Gentry Business Park, which is the closest competitor with a similar product, has about 66 acres of available vacant land in fee, of which about 31.2 acres are zoned industrial and 34.8 acres are zoned industrial/commercial mixed use. Other vacant land in the region that is zoned industrial includes 2.4 acres in Waipahu below Farrington Highway, 9.5 acres of

improved but vacant land in Halawa Valley, and another 15.7 acres of raw land in Halawa Valley that is not subdivided and lacks roads and utilities.

Assuming eventual development of the raw land in Halawa Valley, the existing supply of vacant industrial land amounts to about 94 acres. About 70 percent of this inventory is in the Waipio Gentry Business Park. At past absorption rates of 16 acres per year, this supply amounts to about 6 years of inventory. However, absorption could proceed more rapidly since commercial development is allowed within a portion of the Gentry Business Park.

Planned and Proposed Industrial Projects: Light industrial projects which have been proposed for the region include the 29.5-acre Waikele Light Industrial Subdivision by Amfac/JMB Hawaii, a 123-acre project at Royal Kunia Phase II, up to a 60-acre project at Gentry Waiawa, and a 35-acre business park at Manana (Pearl City) on City-owned land. If approved and developed, these projects would increase the supply of land available in the region for light industry by about 248 acres, for a total supply of about 342 acres. Based on the past absorption rate, this amounts to about 21 years of inventory.

Supply of Vacant Industrial Land: Mililani and Ewa: Approximately 487 acres of vacant industrial land are available in Ewa, with most of the land located in two projects by Campbell Estate -- the Campbell Industrial Park and the 130-acre Kapolei Business/Industrial Park, Phase I. Some of the vacant land is located in the 65-acre Kenai Industrial Park by Barbers Point Harbor. Planned and proposed light industrial projects in Ewa include the Kapolei Business/Industrial Park Phase II (670 acres) and Gentry Ewa (12 acres).

In Central Oahu near Wahiawa, more than half of the 103.5-acre Mililani Technology Park remains available, and another 115 acres are planned for development.

Locational Advantages: Because Waipahu is centrally located with good access to surrounding areas, it is a prime location for light-industry businesses that service customers in downtown Honolulu, Central Oahu, Ewa, the North Shore, and Waianae. With the future opening of the H-3 Freeway, Waipahu businesses would be able to more easily service the windward side. The comparative locational advantages of Waipahu for light industry are evidenced by the proven success of light industry in west Waipahu below Farrington Highway, and at the Gentry Business Park.

Development Period: The development period for a new light industrial subdivision in Waipahu is dependent upon the size of the project, future business cycles and market conditions, how aggressively the lots are marketed, and how competitively the lots are priced.

Assuming a 30-acre project, development could take about 10 years, assuming that 2 years would be required to design the project, obtain the necessary permits and approvals, arrange and secure financing, and installation of infrastructure; and that land will be occupied at the average absorption rate of about 4 acres per year.

State Enterprise Zone: In an effort to stimulate business growth, the City Council recently approved a resolution to establish enterprise zones in four areas throughout Oahu, including:

- Central Oahu/Primary Urban Center Enterprise Zone of Waipahu, Pearl City, Waipio, and Waiawa;
- Central Oahu Enterprise Zone of Mililani Technology Park and Wahiawa;
- Ewa Enterprise Zone of the Barbers Point Naval Air Station, Kapolei Business Park, Campbell Industrial Park, and Barbers Point Deep Draft Harbor; and
- North Shore Enterprise Zone of Haleiwa and Waialua.

The designation of Waipahu as part of an Enterprise Zone would enhance its attractive location for light industry, accelerate the occupancy of a light industrial park in Waipahu, and enhance the economic feasibility of such a park.

In addition to stimulating the growth of business, the State Enterprise Zone Program was established to stimulate the hiring of "low-income" employees in areas having above-average unemployment and/or below-average income levels. "Low-income" employees are those who earn less than 80 percent of the median income of the county prior to being hired by a business participating in the Enterprise Zone Program.

Businesses qualifying for this Program include those engaged in manufacturing, wholesaling, agriculture, and the repair and/or maintenance of tangible personal property -- many of which would locate in light industrial parks. Under current State guidelines, most retail operations are not entitled to the enterprise zone designation. Under this Program, qualifying businesses locating in designated Enterprise Zones are eligible for certain State and City tax benefits and other benefits. New and existing businesses which qualify for Enterprise Zones will have an added incentive to locate or relocate to industrial parks in these Enterprise Zones at the expense of those light-industry areas which lack the designation, such as Halawa Valley, Mapunapuna, the Airport, Sand Island, and Kalihi.

Commercial

The central location of the sugar mill site within the Waipahu town core and its proximity and accessibility to the broader region are significant in making it an ideal location for potential commercial activities. In many respects, the mill site is superior to the commercial areas being developed in Kapolei, especially with its centralized location. Depending upon how the mill site is developed, some new commercial and retail establishments would possibly opt to locate there rather than Kapolei.

Discount Specialty Store: A large discount specialty store is a possible establishment, such as a consumer electronics store featuring audio and video equipment, computers, software, cameras and other photography equipment, video games, etc. Unlike most other discount specialty stores, a consumer electronics store does not necessarily need to be located in a power center with other discount stores. Furthermore, the added competition would adversely impact few stores in Waipahu. At least one major mainland-based electronics store is pursuing a potential site.

A regional population of about 250,000 people or more would be required to support such a store, with land requirements ranging from less than 3 acres to 12 acres or more.

Neighborhood Commercial Center: A neighborhood commercial center would include convenience stores, video stores, beauty shops, stationary stores, florists, fast-food and family restaurants, animal clinics, travel agencies, television repair shops, service stations, small recreational centers, professional offices (physicians, dentists, attorneys, real estate agents), etc.

Given the store closures in Waipahu caused by the advent of the Waikele Center, it would appear that Waipahu has an adequate supply of local retail space. Furthermore, the population of the Waipahu core area is not expected to increase significantly. Also, the larger new residential projects in the surrounding region include neighborhood commercial centers in their plans. Nevertheless, opportunities exist for local retailing and services. Presently, retail stores in west Waipahu along Farrington Highway are supplying many of the needs of the West Loch Estates residents (which lacks a retail center), Ewa Gentry, and other growing communities in Ewa. New local retail stores located at the mill site could supply many of the needs of the Waikele residents since the Waikele Center lacks most of these store types.

About 5.5 acres of land would be needed to accommodate local retail stores. This estimate is based upon serving about 2,500 families in Waikele and nearby portions of Waipahu, with an average of four people per family.

Building-Supply Show Rooms: Another possible establishment is showrooms for construction and home-improvement businesses such as model kitchen and bathrooms, flooring materials, lighting fixtures and supplies, furniture, fabrics, Oriental rugs, artwork, etc. Related offices could house architects, structural engineers, interior designers, and other construction and home improvement-related professionals. The mill site is well located for such showrooms given its central location near new developments in Central Oahu and Ewa, and its access. Based upon the acreage for the Gentry Pacific Design Center on Nimitz Highway, which houses similar showrooms, approximately 2 acres of land would be required.

Auto Dealerships and Services: Auto dealerships and services are another possible establishment, given the central location of the mill site and excellent access. Also, new communities in the region generally provide little or no space for such establishments. As such, Farrington Highway and Kamehameha Highway have become centers for automobile dealers and auto-service shops.

Demand in the region for such space is estimated at 1.6 acres per year. The 10-acre mill site area would provide about 6 years of inventory.

Development Period: Development of commercial use of the 10-acre sugar mill site is possible within about 5 years. This is based on the assumption of 2 years for project design, obtaining the necessary permits and approvals, arranging financing, and installing the infrastructure; plus an additional 3 years for building construction and leasing of the space. If a single, large establishment were to locate at the site, the entire area could be developed within a few years.

Heritage Park/Center

Potential Markets: Visitors to the heritage park/center, along with the Waipahu Cultural Garden Park and the Hawaii Plantation Village, will include visitors from the Ko Olina Resort, planned Ewa Marina resort, and Waikiki, as well as residents from throughout Oahu and the State. By year 2020, the surrounding region is expected to host over 500,000 visitors per year and over 150,000 additional residents.

For many visitors, the major draw of the heritage park/center, Cultural Garden Park and Plantation Village would be the train ride. Some visitors may combine a train ride/ cultural tour with a shopping trip to Waikele Shopping Center. Shopping at Waikele is a major visitor attraction for Japanese visitors, with an estimated one-third traveling to Waikele to take advantage of the large variety of goods and comparatively low prices. This amounts to an average of about 1,400 tourist shoppers per day. It should be noted, however, that the number of visitors to Waikele is expected to significantly diminish following the opening of the Factory Outlet at Dole Cannery which will be similar to Waikele, but located much closer to Waikiki.

Anticipated Visitors: Without the OR&L train operation, an estimated 30,000 people per year would visit the heritage park/center, Cultural Garden Park and Plantation Village. This estimate is based on attendance at comparable locations such as Queen Emma Summer Palace and the Mission Houses Museum which, in 1993, attracted 29,790 and 30,090 visitors respectively. In the same year, attendance at the Waipahu Cultural Garden Park numbered 17,270 visitors.

With the operation of the OR&L train, the number of visitors to the heritage park/center, Cultural Garden Park and Plantation Village could increase to between 50,000 and 200,000 visitors or more per year.

Old Town Commercial (Waipahu Street and Waipahu Depot Road - Mauka of Farrington Highway)

The revitalization of the existing buildings and amenities in the area would enhance the appearance of the area and attract consumers to the commercial and retail establishments along the streets. In addition to undertaking physical improvements to the buildings, some Waipahu retail operators may have to change their goods and services in order to cope with the new competition in the region (particularly from the new discount stores offering lower prices), and take advantage of the growing number of consumers in the Ewa and Central Oahu region.

In view of the new economic environment, characteristics of smaller retail stores and commercial establishments which are likely to succeed in Waipahu include:

- Specialty stores and certain commercial establishments which would be sought out by residents from throughout the region. Such establishments could include: ethnic-oriented establishments (restaurants, groceries, videos, books, travel, etc.); specialized sporting goods stores (fishing, surfing, kayaks, diving, kites, etc.); dance supplies (ballet, jazz, tap, ballroom, etc.); specialized hobby stores (trains, baseball cards, etc.); health services (chiropractors, acupuncture, massage, etc.);

veterinarians; florists; beauty salons; tailors/seamstresses; repair shops (television, computers, shoes/luggage; jewelry, etc.); security alarm stores, and locksmiths.

- Stores delivering goods and services to the surrounding community, including pizza operations, pool and spa supplies and services, insurance agencies, pet kennels with pick-up service, etc.

- Businesses supplying goods and services to other businesses, including signage and printing companies, a bakery supplying markets and restaurants, paint stores, equipment rental, laundry services for hotels and restaurants, repair and maintenance companies, delivery companies, etc.

Old Town Commercial (Area makai of Farrington Highway, east of Waipahu Depot Road between Farrington Highway and the OR&L right-of-way)

Revitalization of the area to Old Town commercial would provide a more attractive entry into Waipio Peninsula and attract customers to the commercial and retail establishments. However, the success of commercial use in the area would be dependent on a major attraction being located at Waipio Peninsula. Without this attraction, success is unlikely due to nearby competition and the relatively light traffic on lower Waipahu Depot Road. The attraction which would generate the greatest demand for new commercial establishments in this area would be the proposed Makai Park Hawaii, a project for which success is uncertain.

Assuming successful development of Makai Park Hawaii and other potential or planned projects at Waipio Peninsula, total retail sales in the nearby area would reach about $3.5 million per year, of which 77 percent would be generated by Makai Park Hawaii. If the commercial establishments along lower Waipahu Depot Road were to capture all the retail sales associated with these potential projects, the land required for the Old Town commercial would be only 1.6 acres, which is far less then the proposed 5.5 acres. The 1.6-acre land requirement is based on assumed sales of $200 per square foot, and a floor-to-land ratio of 25 percent.

Due to the lack of market and the need for some of the existing land uses to change to commercial designation, development of the Old Town commercial area is anticipated to take over 20 years.

OR&L Right-of-Way

The feasibility of extending the OR&L train operations into Waipahu will also be explored by the Hawaiian Railway Society (HRS). The appeal of visitors taking a train ride into Waipahu would be enhanced by an extension of the line to the U.S.S. Arizona visitor center, which would combine the ride with the most popular visitor attraction on Oahu (about 1.5 million visitors per year), and would offer views of the three lochs of Pearl Harbor, U.S. Navy ships, and old Hawaiian fishponds.

Potential Ridership: Once the planned train improvements are implemented by the HRS, the historic train rides in Ewa are likely to become very popular. This is based on the

popularity of similar visitor-oriented historic train rides throughout the United States, Canada, and Europe. On Maui, the Lahaina-Kaanapali & Pacific Railroad attracts about 400,000 visitors per year, of which about two-thirds are one-way trips covering 4 miles. About two-thirds of the riders are Japanese visitors, most of whom are on day trips from Oahu. Based on this experience, the train rides in Ewa are likely to attract as many as 500,000 or more riders per year.

Development Costs and Financing: The 4-mile track extension into Waipahu will be relatively costly due to construction of a new track bed (which no longer exists on most of the route), purchasing and laying new tracks (about $1 million per mile), and purchasing and installing automated crossing signals and gates at Fort Weaver Road and Farrington Highway. The cost could eventually amount to $10 million or more. Financing the improvements is likely to require a combination of government grants; private contributions from affected landowners, developers, and businesses; fund-raising activities; and possibly debt which would be serviced from operating revenues. It is likely that the extension of track to Waipahu will not occur until development of the Ko Olina Resort and planned Ewa Marina resort (10-plus years).

Commercial Recreational Use

Makai Park Hawaii: Although water parks have proven to be popular on the mainland, successful development of Makai Park Hawaii is uncertain. The project is presently in the early conceptual stage, and has yet to proceed with securing the land, designing facility components, estimating costs, obtaining permits and approvals, and arranging and securing financing. Even if the project proceeds, Makai Park Hawaii may locate elsewhere if it is determined that the land available at Waipio Peninsula is insufficient.

Also, the projection of 950,000 visitors per year to the Park is ambitious. This represents about 50 percent more than the 635,880 people who visited Sea Life Park Hawaii in 1993. Makai Park Hawaii would also compete against Hawaii's Wild Waters, a commercial amusement park proposed for development on about 23 acres in Kapolei, which would feature water rides, pools and a picnic area. However, the appeal of Makai Park Hawaii would be enhanced if the OR&L train ride into Waipahu were to become part of the attraction.

A development period of 5 years is estimated for Makai Park Hawaii, including project design, land ownership transfer, obtaining necessary permits and approvals, arranging and securing financing, and construction of facilities.

Agriculture

It is uncertain whether crops can be produced successfully on Waipio Peninsula due to the supply of agricultural land on Oahu and statewide far exceeding potential demand, and competition from farmers who are cultivating the high-quality lands of Kunia.

Land Supply versus Demand: On Oahu, about 22,000 acres of high-quality agricultural land have been released with the 1995/96 closing of two sugar plantations, of which about 17,000 acres remain available for replacement crops. Statewide, about 215,000 acres have been released from sugar and pineapple cultivation since the late 1960s, and

177,000 acres remain available for replacement crops. With the possibility of more sugar plantations closing on Kauai and Maui, the large land supply available for new crops would further increase.

For the Honolulu market, 5,000 acres at most could be needed to supply low-elevation crops which are potentially profitable in Hawaii. This includes land to accommodate farmers who would relocate from Molokai to Oahu to take advantage of the recently released land. Moreover, the acreage requirements may be less than 2,000 acres.

Export markets would have to be developed to significantly increase the demand for agricultural land. This has proven to be difficult, however, due to the high costs of labor, pest control, fertilizer, and shipping. Nevertheless, recent successes have occurred with some high-value winter crops which are flown (rather than shipped) to mainland markets because of their short shelf lives.

Farm Operations in Kunia: Competition will come from nearby farms in Kunia which also has favorable conditions for growing crops, including high-quality soils, sunny conditions, low-cost water, a short trucking distance to markets, long-term leases, and terms which allow farm structures to be built. Del Monte Fresh Produce (Hawaii), Inc. is exploring a number of crops for cultivation other than pineapple. Also, the largest diversified farmer in the State has relocated from Molokai to Kunia.

Assuming market success, a development period of at least one year would be required to negotiate a lease with the U.S. Navy, obtain water rights, and prepare the land for the first crop.

4.3.2 Economic Benefits and Impacts

Private School

A private school offering grades Kindergarten through 12 with an enrollment of about 1,000 students would require a staff of about 100 people, including teachers, counselors, administrators, and maintenance personnel. People associated with the school, including staff, students, and parents, would generate additional retail sales to nearby stores of about $360,000 per year ($5/employee/day and $1/student/day for 240-day school year).

Residential

A 17-acre residential development of 120 single-family homes would generate few new direct jobs. It is estimated that direct employment of housekeepers, gardeners, maintenance workers, and others working in the housing development would amount to about 5 jobs, based on 1 job per 30 homes.

A residential development of this size would generate additional retail sales to nearby stores of about $600,000 per year. This is based on local daily expenditures of $7 per employee working 5 days per week, and family incomes of $50,000 or more per year, of which one-third would be spent on consumer goods and services, and about 30 percent would be purchased from local stores. This translates to about $5,000 per household per year.

Memorial Park

A 17-acre memorial park would provide few economic benefits. At full development, about 5 grounds maintenance jobs would be created. The memorial park would also be exempt from property taxes.

Light Industrial

A 30-acre light industrial subdivision would generate approximately 300 jobs based on 10 jobs per acre. Many of these jobs would be in the skilled or semi-skilled positions, offering higher wages and salaries than the Oahu average.

Through their purchase of goods and services, new employees in the area would increase the sales in nearby stores. For a 30-acre project, additional retail sales would amount to about $550,000 per year, based on daily local expenditures of $7 per employee and a 5-day work week.

A light industrial subdivision would possibly compete with and draw customers away from the existing light industrial businesses located in Waipahu, most of which are located in the west Waipahu industrial area makai of Farrington Highway, and those in the Gentry Business Park in Waipio.

Commercial

Commercial development of a 10-acre site at the sugar mill would generate approximately 200 jobs, based on 20 jobs per acre.

New employees and shoppers in the area are estimated to generated an estimated $2.8 million per year of additional retail sales by nearby stores. This is based on local daily expenditures of about $7 per employee and $2.50 per shopper, 250 shoppers per acre per day, and a 7-day per week operation. Depending upon the types of stores and businesses which would locate within the commercial project, some of the establishments could compete with and draw customers away from some of the existing similar operations in Waipahu.

Commercial use also generates high property and excise tax revenues.

Heritage Park/Center

Assuming 100,000 visitors per year would visit the heritage park/center, Cultural Garden Park and the Plantation Village, revenues of about $1 million per year would be generated. This would assume an average of $10 per person spent on admissions and purchases of gifts, food and beverages. These revenues could support about 20 full-time equivalent jobs.

Additional retail sales by nearby stores which would be generated by employees and visitors to these cultural attractions are estimated at about $250,000 per year. This is based on local daily expenditures of about $7 per employee and $2 per visitor, and 7 days of operation per week. Purchases from surrounding businesses are expected to be

relative small since most visitors are expected to arrive by train or bus, with few venturing beyond the Waipahu Cultural Garden Park.

YMCA

Development of the YMCA's planned facility at the sugar mill site is estimated take from 4 to 6 years, including land transfer, facility design, obtaining necessary permits and approvals, fund raising, and facility construction. Once the new YMCA is completed and in operation, the facility would provide about 30 additional full-time and part-time jobs. Current staffing is about 100 people.

Additional retail sales by nearby stores which would be generated by new staff and YMCA participants in the area are estimated at about $360,000 per year. This is based on the current and future staffing level, 800 students and adults during the three summer months and 200 during the school year, at a 7-day per week operation. Local daily expenditures is estimated at $5 per employee and $1 per participant.

Filipino Community Center

Development of the Filipino Community Center at the sugar mill site is possible within 4 to 6 years, including transfer of landownership, facility design, obtaining necessary permits and approvals, raising of funds, and facility construction. An estimated 90 jobs will be provided by the Filcom Center, including employment provided by facility space leased to other organizations.

About $190,000 per year of additional retail sales by nearby stores is expected to be generated by new staff and participants in the area. This is based on the estimated staffing level, 30,000 participants per year, a 7-day per week operation, and local daily expenditures of $5 per employee and $1 per participant.

Hans L'Orange Park

The Hawaii Winter League's season lasts two months a year, from mid-October to mid-December. The West Oahu CaneFires play 28 home games per season, with an anticipated average attendance of 2,500 per game.

Excluding the baseball players and coaches, an estimated 60 jobs will be provided during baseball games. Employment includes ticket sellers, gate keepers, ushers, concession operators, hawkers, parking attendants, a score keeper, an announcer, a stadium manager, security, etc. The 60 part-time jobs for 28 homes is equivalent to less than 5 full-time-equivalent jobs when averaged over about 235 work days per year.

Old Town Commercial (Waipahu Street and Waipahu Depot Road - Mauka of Farrington Highway)

A principal objective of revitalizing the existing commercial areas in Waipahu is to help existing businesses maintain and improve economically by attracting new consumers to Waipahu. Correspondingly, it is expected that the existing stores would capture a significant portion of the additional sales by nearby retail stores which is discussed under

each of the land use components in this section. These sales to new consumers would help compensate for the loss of business to the new discount stores in the region.

Given the competing forces of attracting new consumers to Waipahu and the loss of business to the discount stores, it is assumed that the employment of existing stores will stay near their current levels. It is assumed, however, that one or more retail stores will occupy the Arakawa's site and employ about 100 workers. These employees would generate about $260,000 in additional retail sales by nearby stores, based on local daily expenditures of about $7 per employee and 7-day per week operations.

Old Town Commercial (Area makai of Farrington Highway, east of Waipahu Depot Road between Farrington Highway and the OR&L right-of-way)

Development of a 5.5-acre commercial project would generate approximately 110 jobs, based on 20 jobs per acre. About $280,000 in additional retail sales by nearby stores would be generated by new employees in the area, based on local daily expenditures of about $7 per employee and 7-day per week operations. However, development of the new commercial establishments would compete with existing stores in Waipahu, potentially impacting the existing businesses to some degree.

OR&L Right-of-Way

The primary economic benefit of restored train operations into Waipahu would be the large number of visitors and residents visiting such attractions as the new heritage park/ center, Waipahu Cultural Garden Park, Hawaii Plantation Village, and nearby commercial and retail establishments. The economic impacts for these attractions are discussed in this section under the respective land use components.

New Fire and Police Department Vehicle Maintenance Facilities

City Fire Department Vehicle Maintenance and Storage Facility: The new facility, which is estimated for completion in 2 years, will provide about 18 jobs, with additional retail sales by nearby stores estimated at $30,000 per year. This is based on daily expenditures of about $7 per employee and 5-day per week operations.

City Police Department Vehicle Maintenance Facility: Estimated to be developed within 4 years, the new Police Department vehicle maintenance facility will employ about 30 people. Additional retail sales by nearby stores is estimated at $50,000 per year, based on daily local expenditures of about $7 per employee and 5-day per week operations.

Commercial Recreational Use

Makai Park Hawaii: Assuming full development of the various educational, research and entertainment components of Makai Park Hawaii, an estimated 80 full-time and 40 part-time jobs, and 40 to 50 seasonal jobs would be provided by the facility. These would include positions in administration, marketing, public relations, fund raising, education, graphic arts, admissions, retail sales, food service and catering, maintenance and operations, animal care, biology, and horticulture.

The high number of visitors which are projected to visit the facility, along with the employees, are estimated to generate additional retail sales by nearby stores of about $2.7 million per year. This is based on local daily expenditures of $7 per full- and part-time employee, and $2.50 per visitor, and a 7-day per week operation.

Sports Complex: An period of 5 years is estimated for development of the sports complex, including project design, landownership transaction, arranging and securing financing, obtaining necessary permits and approvals, and construction of facilities. An estimated 25 to 35 full-time equivalent jobs would be provided to operate and maintain the sports and concert facilities.

Success of the sports complex would provide an economic boost to the Waipahu area. Additional retail sales by nearby stores which would be generated by new employees and visitors in the area are estimated at about $1.1 million per year. The is based on local daily expenditures of 30 employees and an estimated 400,000 users per year, at $7 per employee and $2.50 per user, and 7-day per week operations.

Commercial Recreation (Lower Waipio Peninsula)

The development period for establishment of low-intensity commercial recreational uses would be about 3 years, including obtaining the necessary approvals from the U.S. Navy, negotiating a lease, obtaining land use permits and approvals, arranging financing, providing the necessary facilities, and purchasing of equipment. Employment is estimated at about 15 jobs, serving about 200 people per day.

Additional retail sales by nearby stores which would be generated by new employees and visitors in the area are estimated at about $220,000 per year. This is based on local daily expenditures of $7 per employee and $2.50 per visitor, and a 7-day per week operation.

Agriculture

Assuming the successful farming of diversified crops on the entire 1,200 acres in Waipio Peninsula, there may be employment of about 100 jobs, based on an estimated 8 jobs per 100 acres. Additional retail sales by nearby stores which would be generated by new employees in the area are estimated at about $220,000 per year, based on local daily expenditures of $7 per employee and farming 6 days per week.

4.4 Circulation Plan

This section addresses the circulation plan component of the Waipahu Special Area Plan. This assessment is based on existing and proposed land uses within the study area and is evaluated at a planning level of detail.

4.4.1 Existing Roadway Network

Farrington Highway is primarily a divided arterial that traverses Waipahu Town through the project area. Farrington Highway, a State highway, serves as a major east-west artery from the Pearl Harbor area to areas on the west coast of the island. Within Waipahu Town, this major street has two through lanes in each direction, plus provides separate left-turn lanes at most intersections. Traffic signal controls are located at each major cross street within Waipahu. Parking is prohibited along this street.

Waipahu Street traverses the core of Waipahu Town in the east-west direction between Kamehameha Highway and Kunia Road. Waipahu Street is a two-lane collector/distributor road with varying right-of-way widths. Pavement widths also vary throughout the length of the roadway ranging from about 22 feet to about 44 feet. There are certain sections of roadway that permit parallel parking, primarily near the former sugar mill area. Near Waikele Stream, Waipahu Street is relatively narrow and has two tight curves that are difficult for buses and large vehicles to maneuver without encroaching the roadway centerline into the on-coming lane. The major intersections on Waipahu Street are at the mauka-makai roadways of Paiwa Street, Mokuola Street, and Waipahu Depot Road.

Paiwa Street is primarily a two-lane, two-way undivided roadway oriented in the mauka-makai directions between Waikele and Farrington Highway. Certain sections of roadway between Waikele and Waipahu Street have four lanes. This roadway serves as a link between the Waikele area and Waipahu Town, and also provides access to and from the H-1 Freeway via the Paiwa Street Interchange.

Mokuola Street and Waipahu Depot Road are other roadways oriented in the mauka-makai direction that link Waipahu Street and Farrington Highway. These roadways are two-lane roadways with on-street parking permitted on Waipahu Depot Road and on certain sections of Mokuola Street. Several segments on both roadways were improved to include sidewalks and curb/gutter sections.

4.4.2 Proposed Roadway Network Modifications

Based on the proposed land use plan, input from public agencies, and community feedback, improvements and modifications to the existing roadway network were developed on a planning level to include the following (see Figure 4-3):

Manager's Drive

Amfac/JMB currently plans to widen the existing 2-lane Manager's Drive overpass to four lanes. Widening would include the Manager's Drive roadway makai of the overpass to Hiapo Street. The Special Area Plan proposes to further extend Manager's Drive

makai to Mokuola Street, and widen the road to four lanes to Farrington Highway. There will also be provision of a separated pedestrian/bikeway along the Manager's Drive overpass, continuing along Mokuola Street to the civic center.

The Manager's Drive overpass links areas mauka of the H-1 Freeway with Waipahu Town and enhances the opportunity for increased economic development of the area. It also provides an alternate access, relieving the Paiwa Street traffic demand. However, there may be increased traffic impacts for Hiapo Street and Waikele residents. The potential traffic increase may also impact on-street parking along Hiapo and Kuhaulua Streets.

Paiwa Street to Waipahu Street Connector Roads

The proposed roadway connects Paiwa Street with Waipahu Street near the Waipahu Cultural Garden Park. The roadway is oriented in the east-west direction through the proposed light industrial subdivision. Access from the H-1 Freeway would be via the Paiwa Street Interchange. The alignment of the segment of the connector road along Hans L'Orange Park to the intersection at Paiwa Street may eliminate the need for traffic signals at the intersections of Paiwa Street at Hapapa Street and Paiwa Place, and limit signalization to the connector road only. Further analysis would be required to validate this assessment. The roadway alignment would also discourage motorists from speeding through the light industrial area.

The connector road provides an alternative route for east-west commuters through the Waipahu Town core, and may alleviate traffic demands on Waipahu Street between Paiwa Street and the Cultural Garden Park. Although traffic demands may increase on Paiwa Street, the connector road may also improve traffic operations at the Paiwa and Waipahu Street intersection.

Waipahu Street and Waipahu Depot Road (Mauka of Farrington Highway)

The Special Area Plan proposes the widening of Waipahu Street to three lanes, with left-turn storage lanes at the major intersections. The City Department of Transportation Services (DTS) has plans to widen Waipahu Street within the planning area from the existing two lanes to four lanes. However, in a traffic study prepared for DTS, several alternatives were explored to improve the existing traffic operational conditions in the area. In the DTS report, a three-lane alternative was also studied and found to be acceptable in terms of traffic operation (see Figure 4-4). It should be noted that the DTS report was based on a street network system unlike what is presented in this Plan. The Special Area Plan was undertaken after the completion of the DTS report. The Paiwa Street connector roads that would link Paiwa Street with Waipahu Street near the Cultural Garden Park was not included in the DTS study. For this reason, the distribution of forecasted trips were solely assigned to Waipahu Street. With the addition of the Paiwa Street connector roads, some of the vehicle trips are expected to be assigned to these new roadways. From a conservative viewpoint, the Waipahu Street three-lane alternative, with left-turn storage lanes at the major intersections, may be a viable alternative since the DTS report concluded that this alternative was found to be acceptable in terms of traffic operation. In addition, limited additional right-of-way acquisition may be required compared to the four-lane alternative. The community also raised concerns on

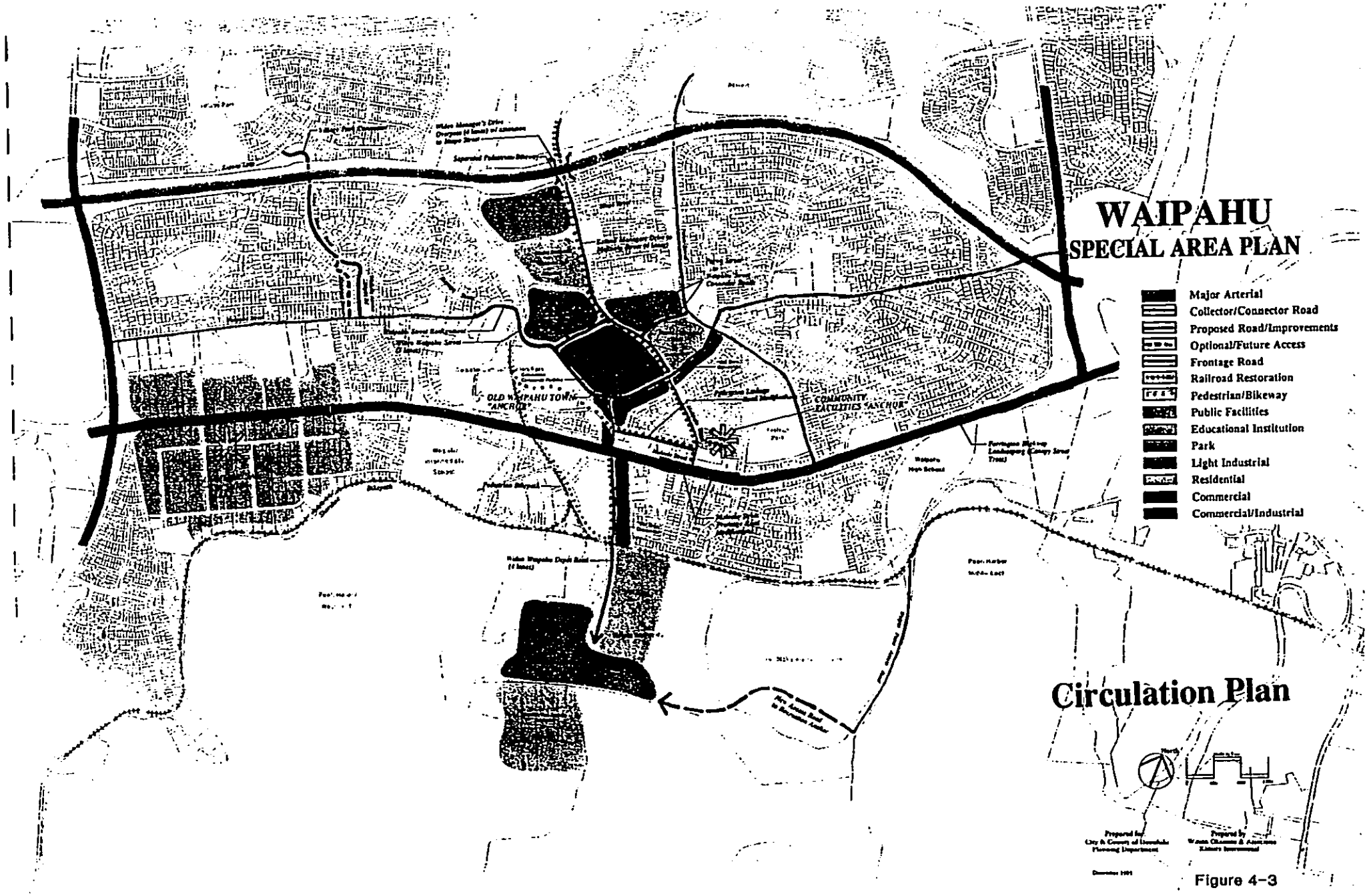
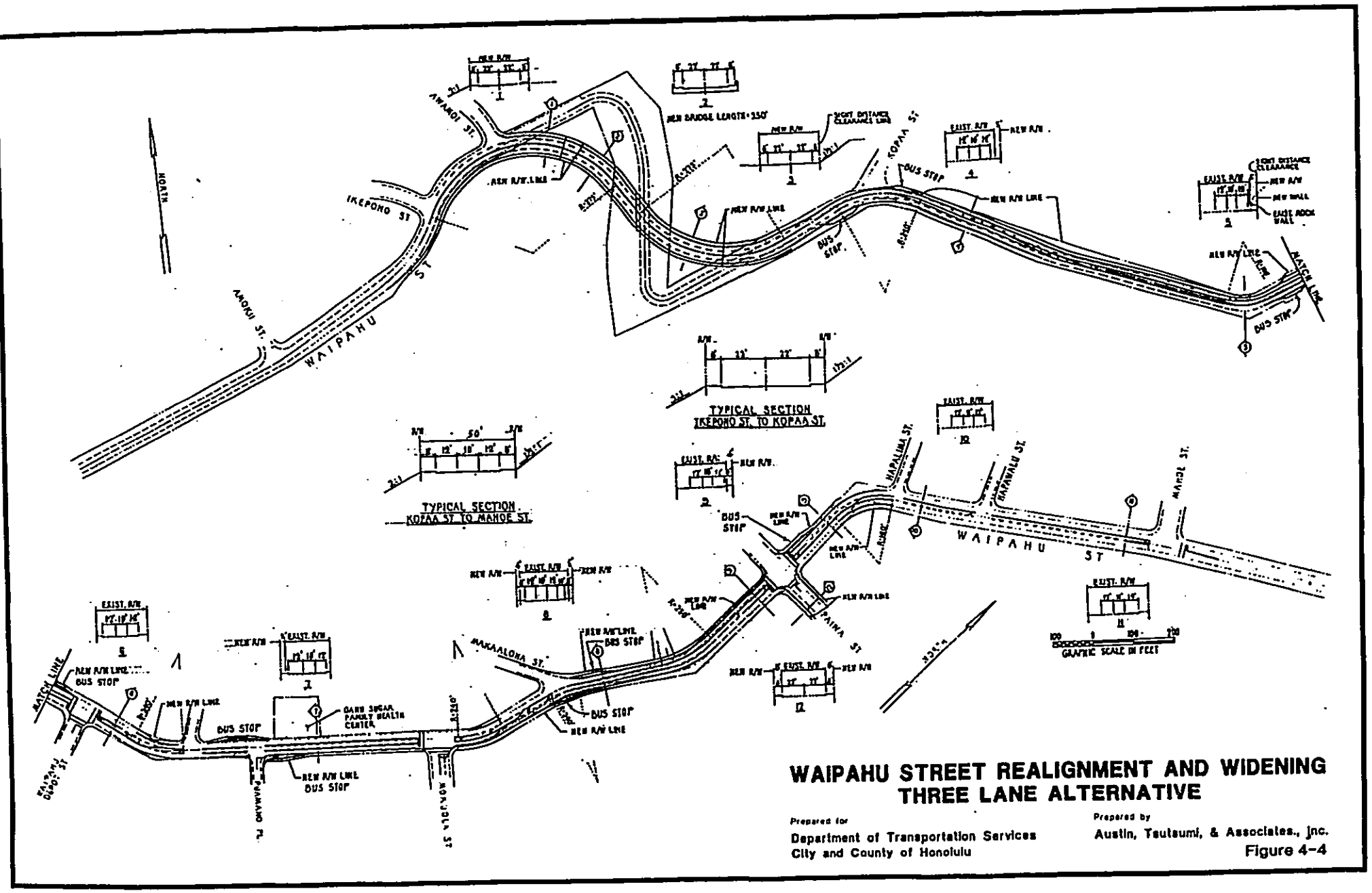

WAIPAHU
SPECIAL AREA PLAN
Major Arterial
Collector/Connector Road
Proposed Road/Improvements
Optional/Future Access
Frontage Road
Railroad Restoration
Pedestrian/Bikeway
Public Facilities
Educational Institution
Park
Light Industrial
Residential
Commercial
Commercial/Industrial
OLD WAIPAHU TOWN
COMMUNITY FACILITIES AVENUE
Circulation Plan

Figure 4-3



WAIPAHU STREET REALIGNMENT AND WIDENING THREE LANE ALTERNATIVE

Prepared for
Department of Transportation Services
City and County of Honolulu

Prepared by
Austin, Tsutsumi, & Associates., Inc.

Figure 4-4

maintaining the tree-lined character of Waipahu Town which may be minimized with the implementation of the three-lane alternative. A Neighborhood Board task force convened for the proposed Waipahu Street widening found that most residents and business people prefer the three-lane concept. In February 1992, the Waipahu Neighborhood Board endorsed the three-lane concept for the proposed widening of Waipahu Street.

The "Z" curve alignment on Waipahu Street east of Ikepono Street presents a safety hazard as well as a restriction to free flow two-way traffic operations. This segment of roadway would be realigned to an "S" curve to increase safety for motorists and to accommodate both existing and anticipated future traffic demands. This segment of roadway was also identified in a report prepared by the City DTS.

Farrington Highway Frontage Road Modifications

The existing Moloalo Street intersection with Mokuola Street currently experiences traffic movement conflicts. With the proposed extension of Mokuola Street up to Manager's Drive, Mokuola Street will become a major collector road servicing traffic from proposed uses at the Manager's Drive, sugar mill and civic center sites.

The Plan proposed to modify the existing Moloalo Street by providing a new driveway off Farrington Highway on the west side of Moloalo Street, and limit ingress/egress to Moloalo Street at its intersection with Mokuola Street to right-turn in and right-turn out only movements (See Figure 4-5). This would help to resolve existing traffic movement conflicts and future traffic problems with the extension of Mokuola Street through Manager's Drive, and would enhance the character and function of Moloalo Street. Decel or storage lane improvements along Farrington Highway at the Moloalo Street intersection may be required depending on future traffic volumes. In the long term, the widening of Moloalo Street could be explored to provide a row of 90-degree parking stalls with appropriate landscaping along Farrington Highway. This may require acquisition of land from the Farrington Highway right-of-way. Alternatively, the City could consider selling Moloalo Street to the abutting landowners or businesses.

Waipio Peninsula Access Improvements

Waipahu Depot Road makai of Farrington Highway is proposed to be widened from the existing two-lane roadway to four lanes to support the development of the proposed commercial recreational uses in the Waipio Peninsula area. The possible uses for this area have been proposed to include relatively high vehicle trip generators. As a result, detailed studies may need to address specific roadway improvements resulting from the proposed developments, specifically to the Farrington Highway intersection. The Depot Road widening may require the acquisition or taking of land for additional right-of-way.

With the proposed commercial recreational land uses in the Waipio Peninsula area, a secondary access road to Farrington Highway in addition to the Waipahu Depot Road access is proposed. This roadway would link future developments of relatively high trip generation characteristics within the Waipio Peninsula area to Farrington Highway near the Waiawa Interchange, limiting the number of trips on Farrington Highway at the Waipahu Depot Road access. The alignment of the roadway would follow the makai boundary of the Ted Makalena Golf Course, and connect Farrington Highway near

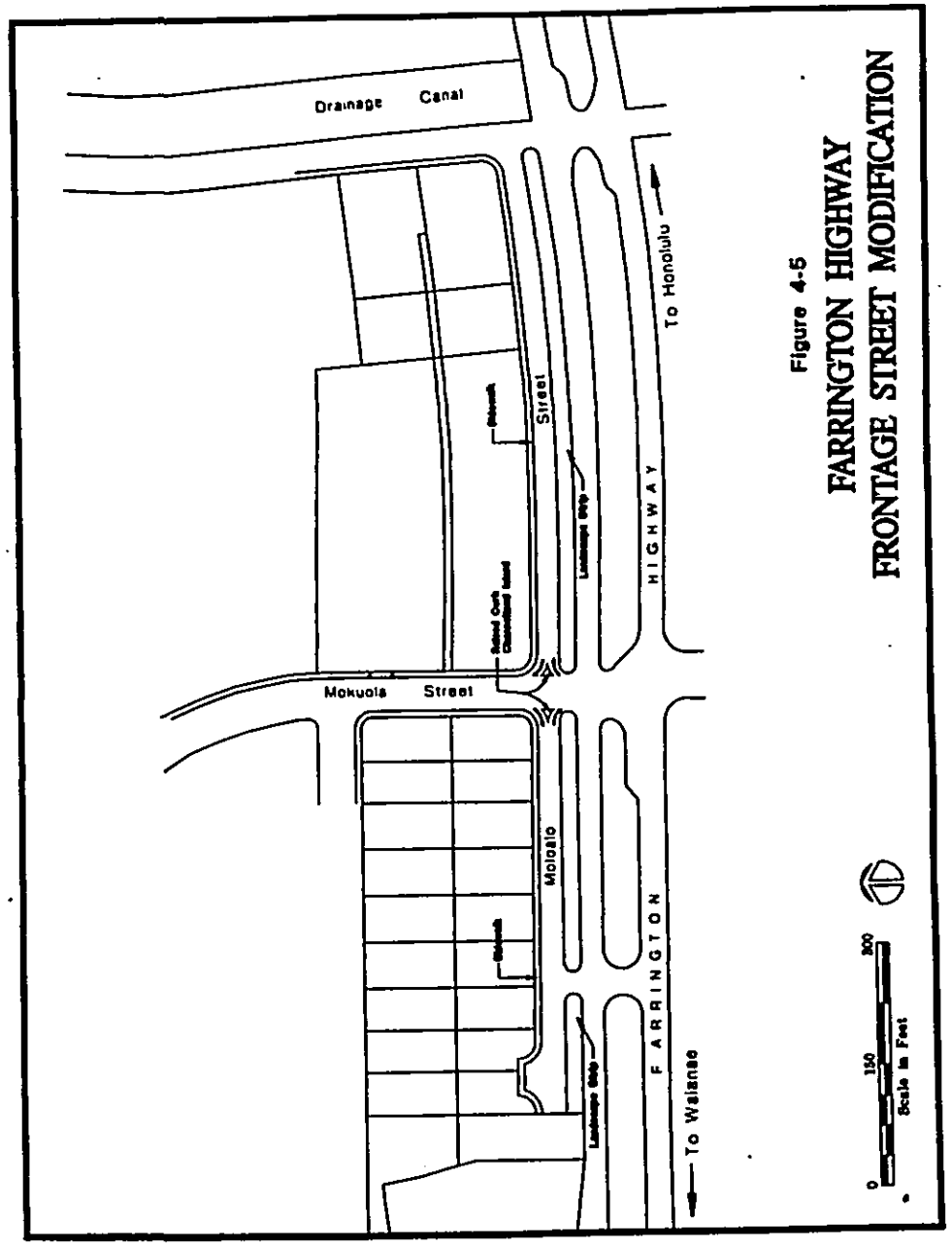


Figure 4-5
FARRINGTON HIGHWAY
FRONTAGE STREET MODIFICATION

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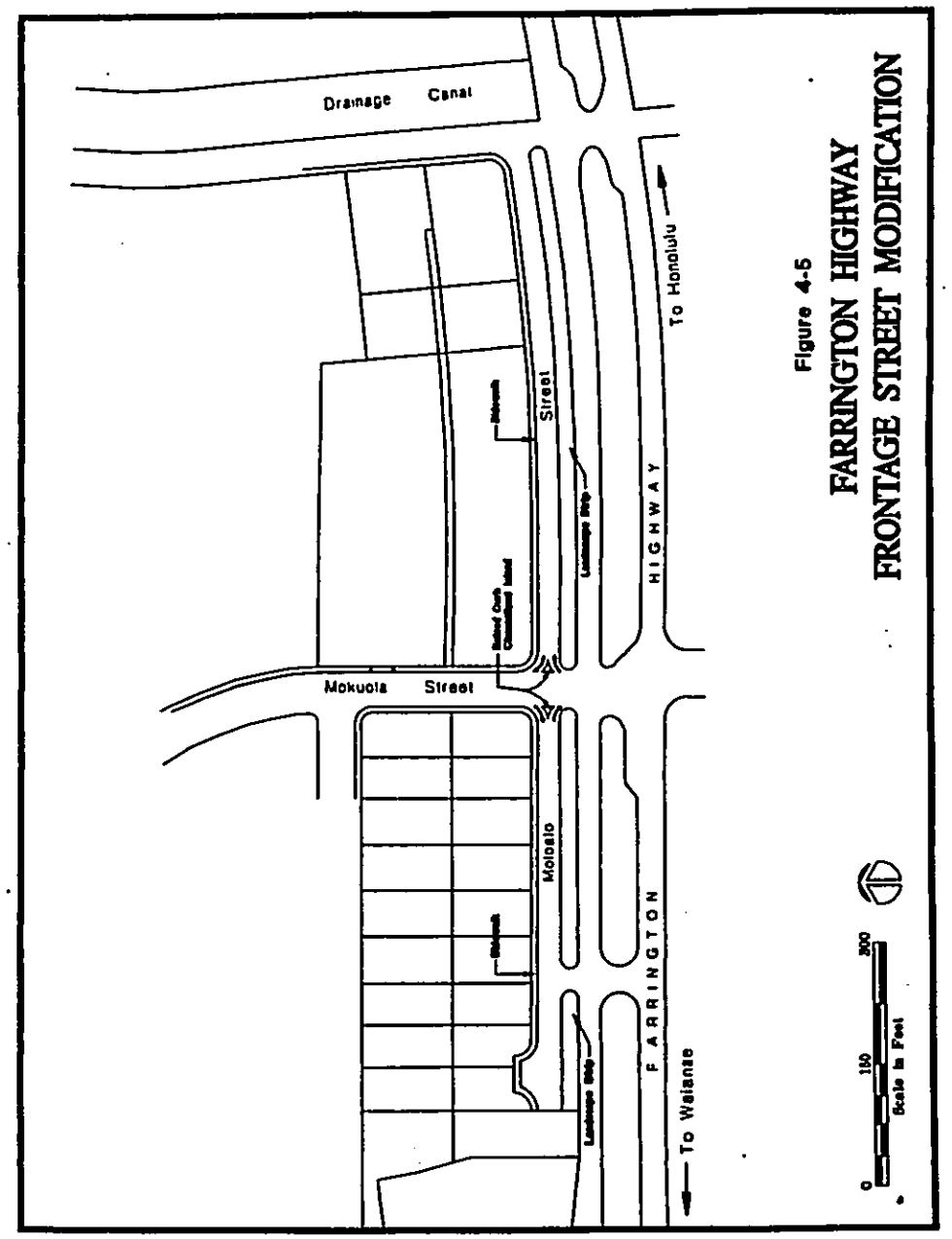


Figure 4-5
FARRINGTON HIGHWAY
FRONTAGE STREET MODIFICATION

Waipahu High School via the Waipio Point Access Road. However, roadway widths and laneage requirements may be restricted by a bridge on the Waipio Point Access Road.

Village Park Connector Road

Under existing roadway conditions, motorists from Village Park/Royal Kunia subdivisions use either Kunia Road or Paiwa Street via the H-1 Freeway to access areas makai of the Freeway. The proposed roadway would connect the Village Park area with the Waipahu Town core via an improved existing cane haul road. The new road would be aligned in the mauka-makai direction, connecting to Kupuna Loop at the mauka end and to Waipahu Street on the makai end via the Navy's Waikele Ammunition Depot Road. This link would provide a convenient alternative route to and from the two areas as well as relieve traffic demands on Kunia Road.

Development of the connector road would be subject to discussions and permission from the respective landowners of the former cane haul road and the Navy's Waikele Ammunition Depot Road. The roadway must also meet the minimum engineering design standards for City roadways. Another consideration is the cost incurred with improving the cane haul road to dedicable City standards. Potential mitigation measures (i.e., construction of a wall along the road) may be necessary to in order to buffer traffic and noise impacts to adjacent residents.

Internal Transit System

An internal transit system could include future extension of the trolley service from Waikele Shopping Center, or a shuttle bus system, to serve the Old Town along Waipahu Street, Waipahu Cultural Garden Park, and the sugar mill commercial area. It would provide an alternate mode of transportation and would provide access to and internal circulation within the town core area. Given the success of such a system, it would reduce the number of vehicles on the roadways. The system would likely attract more tour/charter buses to the area, which would increase the economic potential of the area.

An internal transit system would require direct and frequent service to attract significant ridership. It would require comparable out-of-pocket costs versus travel by automobile to attract riders. Also, roadways and intersections may require improvements to accommodate the bus and trolley vehicles. The frequent stops and slow-moving trolley vehicles may also impede traffic flow on the roadways.

Transit Element

The pedestrian potential near major generators should be evaluated to examine the transit system potential. The transit system can provide both access to and internal circulation within the area. The key to attracting access trips to transit is to provide direct service to and from activity centers from throughout the area in which employees, patrons, visitors, as well as residents live or park. To the extent possible, activity anchors incorporated in the plan could be treated as destinations for transit planning purposes. With direct and frequent service, transit may be able to attract significantly increased ridership. However, maximization of transit use will also require:

- Convenient boarding and alighting locations within a short walk at both ends of the trip.
- Comparable out-of-pocket costs to travel by transit and/or auto.
- Reasonable weather protection and other amenities to help transit compete with the automobile.

The development of a transit center could provide these items and serve as a regional transit station for the surrounding areas such as Ewa Beach, Kapolei, Waianae, Kunia, and Mililani.

Pedestrian Element

The pedestrian system was incorporated in the proposed plan to effectively serve internal trips and provide a convenient access to transit systems, as well as to provide a pedestrian mall environment in certain areas of the plan. Pedestrian paths with attractive environments that include continuous walkways of adequate width for two-way travel with amenities and interesting features along the way should be incorporated in the design to promote the usage of these facilities. Ideally, significant pedestrian linkages should be supported with pedestrian facilities which directly connect trip generators, provide shelter or other appropriate amenities, are interesting to walk along, and have a minimum of conflicts with vehicles. In general, standard sidewalks adjacent to streets is not sufficient in areas where buildings are flanked on most sides by parking to promote usage as a pedestrian path. As a result, a more defined pedestrian pattern to connect existing pedestrian systems was evaluated and incorporated in the Plan.

4.5 Alternative Concepts

In developing the Preferred Plan, potential land uses and economic activities were evaluated and analyzed on the basis of their market and economic feasibility, employment generated, and impacts on existing businesses and the community. Some of the activities were dismissed early in the planning process due to either non-support by the community, eventual location of the activity elsewhere, potential adverse impact to existing businesses or the community, or lack of demand for the activity. The other economic activities were integrated within various aspects of five alternative land use schemes, which were further evaluated in developing the Preferred Plan. Information on the economic activities which received initial consideration, and the alternative land use schemes are included in Appendix D.

The following is a summary of the economic activities which were evaluated and the reasons for their exclusion:

Commercial - Excluded and Unlikely Activities: Market analyses were either not performed or were terminated for a number of possible commercial activities at the sugar mill site, including the following:

- A large stand-alone discount center, warehouse operation, or home-improvement outlet. Such establishments could succeed at the mill site and would provide significant employment. However, these operations were not supported by the community due to concerns of existing stores losing business, and increased traffic.

- Regional mall and upscale department store. These were not considered due to Waipahu's proximity to other regional shopping centers and factory outlet center, and incompatibility of upscale stores with adjacent light industrial use.

- A large regional office complex. This was not regarded as a possibility due to commitments made by the State, City and other private businesses to locate at Kapolei. Also, Waipahu lacks the concentration of government, financial, legal and other professional services essential to the success of a regional office complex.

- A large recreational complex. Operators of large theater complexes and recreational parks are locating in the Ewa region.

Medical Facilities: These include full-service hospitals, clinics providing diagnostic services and out-patient care, and nursing hospitals providing long-term medical care. There are planned medical facilities in the Kapolei area, next to St. Francis Medical Center West, and Mililani Mauka. There are no plans for expansion by the major hospitals.

City Maintenance and Support Facilities:

- The Bus and Handi-Van maintenance facility. This facility was initially considered for the Manager's Drive site. Concerns were raised by the

community about noise from nighttime operations and added rush-hour traffic. This facility was eventually designated in the City's Manana project.

- The Board of Water Supply. This facility was initially considered at the Manager's Drive site and was also eventually designated in the City's Manana project.

- Department of Parks and Recreation Nursery. The nursery would have been located at the Manager's Drive site or at the base of Waipio Peninsula. The City subsequently indicated that they did not need a nursery facility at these locations.

Federal Detention Center: The location of the Federal detention center in Waipahu failed to receive community support.

Affordable Housing: An affordable housing development was designated at the Manager's Drive site. The community expressed opposition to more low-income or affordable housing.

Light Industrial – Waipio Peninsula: Light industry-use was designated for an area makai of Farrington Highway, east of Waipahu Depot Road. Although this is the current land use, there was preference for the Old Town Commercial use.

CHAPTER 5
URBAN DESIGN PLAN

5. URBAN DESIGN PLAN

The urban design plan for the Waipahu Special Area Plan focuses on landscape and open space concepts for Waipahu Town, and on design guidelines for the Old Town Commercial Area in the historic town core.

5.1 General Urban Design Principles

The following general urban design principles are recommended for the Waipahu Special Area Plan.

- ***The scale and sense of Waipahu as a small town shall be preserved.*** Existing zoning heights and densities should for the most part be preserved throughout Waipahu Town to help maintain the small town scale.

- ***The visual dominance of the sugar mill shall be maintained.*** The sugar mill and the smokestack in particular are landmarks of the town, the visual prominence of which should be maintained with future development in Waipahu Town. The visual qualities of the mill structures should be preserved through design guidelines for any new developments.

- ***Structures having historic, cultural, and/or visual significance shall be retained and renovated as needed.*** On the mill site and in the Old Town area, historic buildings should be identified and adaptive reuse encouraged for these structures.

- ***Waipahu's designated Old Town Commercial Area shall have a special image signifying its historic character and role as the cultural and business center for Waipahu.*** A more detailed set of design guidelines are offered for the Old Town Commercial Area to help achieve the desired historic plantation redevelopment theme.

- ***The visual appearance and pedestrian/bicycle linkages within and between the Old Town Commercial Area and surrounding areas, and along Farrington Highway shall be upgraded.*** A landscape and open space plan has been developed to improve the Town's visual appearance and improve pedestrian and bicycle pathways.

- ***Open spaces, the shoreline and other available natural areas shall be developed for use by the public and integrated into the built environment.*** Proposed uses in Waipio Peninsula and along the Pearl Harbor shoreline promote increased use by the public of Waipahu's open space and coastal resources. The landscape/open space plan encourages the linkage of parks, open spaces and centers of interest with landscaping and pedestrian/bicycle pathways.

5.2 Landscape and Open Space

Two major landscape and open space concepts are proposed to be incorporated in the Waipahu Special Area Plan. The first is to use landscape and open space to create linkages among the various major private and public open spaces (see Figure 5-1).

- ***Existing and planned parks and open space areas shall, wherever possible but particularly within the town core, be connected by a series of tree-lined pedestrian pathways, jogging paths and bikeways.***

  Waipahu is fortunate to have a diversity of significant open space areas within the Town as well as a natural shoreline environment along Pearl Harbor which presently is highly underutilized for its recreational and open space potential. The Waipahu Cultural Garden Park, the Hans L'Orange Park, various City parks and the shoreline are physically separated recreational entities which could be more usefully linked together.

  The second major concept is to enhance the streetscape and create a more pedestrian-oriented environment. The intent is to enhance the major thoroughfares in Waipahu, primarily to improve the street environment for both the pedestrian in terms of actual walking experience, and the motorists from an aesthetic point of view.

- ***Roads and pathways shall be landscaped in a manner which identifies their role as visual and functional linkages between open spaces and centers of activity.***

  As the central thoroughfare through Waipahu Town, Farrington Highway is proposed to be enhanced with the landscaped installation of large canopy trees in the median. This would create shade and provide aesthetic visual relief to the wide and expansive highway. Coordination would be required with the State Department of Transportation, Highways Division since it is a State-owned right-of-way. If the median is less than 60 feet in width, the State may require additional protective barriers such as guardrails along the row of trees.

  Enhanced landscape treatment at both ends of Farrington Highway in Waipahu is also envisioned to make an attractive entry statement. A distinctive feature would need to be designed which gives a sense that one is entering Waipahu Town. Similar entry features should also be developed for the Old Town Commercial Area at the intersection of Waipahu Depot Road and Farrington Highway, and at both ends of the Old Town area on Waipahu Street.

  A primary pedestrian way along Hikimoe Street is proposed which would help link the Waipahu Cultural Garden Park to the Civic Center (see Figure 5-2). The pedestrian mall along Hikimoe Street would still allow vehicular traffic and parking to serve the commercial uses, but the streetscape would be turned into

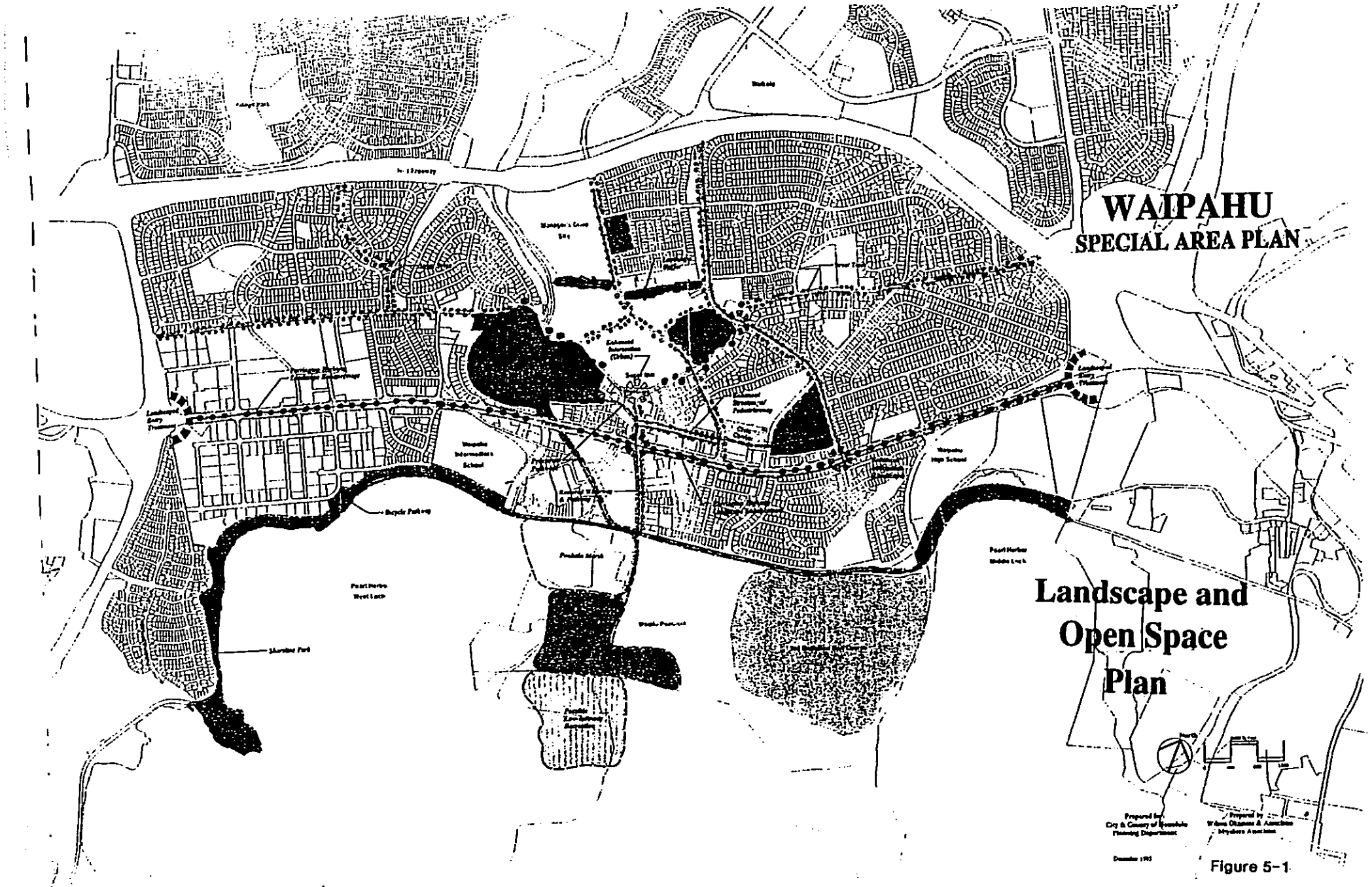
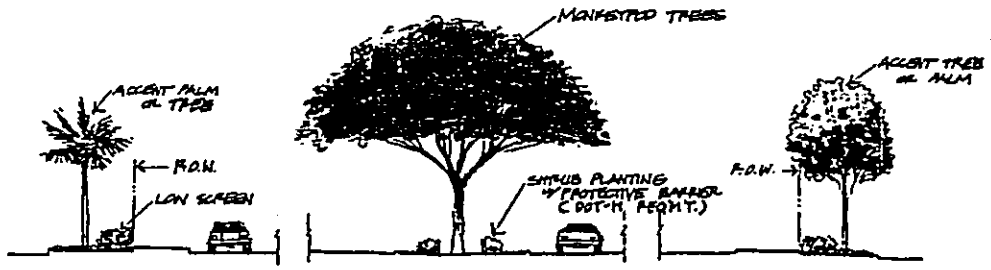


Figure 5-1



FARRINGTON HIGHWAY LANDSCAPE IMPROVEMENTS
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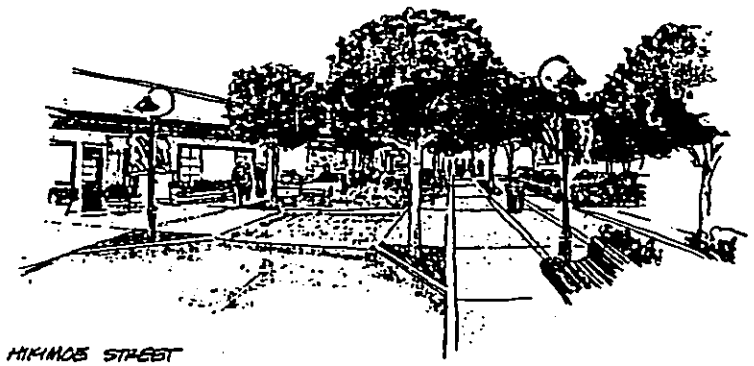
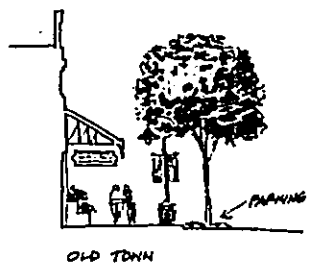


HIKIMOE STREET



OLD TOWN

TYPICAL STREETS

STREET TREES
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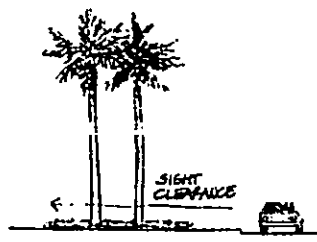
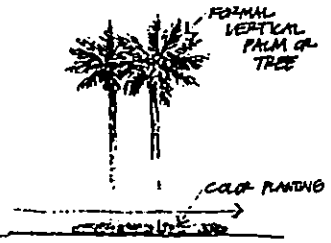




ENHANCED INTERSECTIONS
N.T.S.

SECTIONS

WAIPAHU DEPOT ROAD

LANDSCAPE & OPEN SPACE
WAIPAHU SPECIAL AREA PLAN

PREPARED FOR: C & C HONOLULU PLANNING DEPARTMENT
PREPARED BY: WILSON OKAMOTO & ASSOCIATES, INC.
HIYABARA ASSOCIATES

21 NOVEMBER 1995

Figure 5-2

a more pedestrian-friendly area. Sitting areas could be created with street furniture and plant enhancements, which would create a nicer primary pedestrian experience in the central town area.

Mauka-makai collector streets which serve as important connections to activity centers would also be enhanced with a street tree planting program which would feature a different type of tree along each of the major streets, in particular, Paiwa Street, Manager's Drive/Mokuola Street, and Waipahu Depot Road. On the lower side of Waipahu Depot Road, a pedestrian streetscape is envisioned to be integrated with the clean-up of Kapakahi Stream to create a park-like promenade and link to the makai recreational uses.

The following is a list of recommended street trees, selected for their appropriateness. Except for Monkeypod, all other trees are known as flowering trees and were selected for their attractiveness and color.

Farrington Highway	• Monkeypod
Waipahu Street	• Monkeypod and Hong Kong Orchid
Mokuola Street	• Rainbow Shower
Depot Road	• Rainbow Shower
Paiwa Street	• Gold Tree, Silver Trumpet
Hikimoe Street	• Giant Crape Myrtle
Paiwa Street Connector	• Pink Tecoma or Royal Poinciana

5.3 Old Town Commercial Area

Design guidelines were developed for the Old Town Commercial Area to help assure that the development of new buildings and renovations to existing buildings will preserve and strengthen the plantation era architectural character of Waipahu's historic town core. These guidelines could be implemented through the passage of a Special District regulation in the City's Land Use Ordinance as has been done for areas such as Chinatown and Haleiwa. Spencer Mason Architects is also preparing design guidelines for Amfac/JMB which encompasses the sugar mill site and the historic town core area. Preliminary coordination with the Spencer Mason effort has been initiated and should be continued as part of the Plan's implementation phase.

- **Renovations to the sugar mill for adaptive reuse shall retain the visual qualities and building character that defined the mill's original purpose.**

  The existing Oahu Sugar Mill governs Waipahu's historic district. Located at the end of Waipahu Depot Road at the hill crest, the mill's structure dominates views in the area, emphasizing its historic role and setting a strong plantation town theme for Waipahu.

- **The compactness of the town's historic shopping area shall be maintained, with new uses encouraged to infill between existing buildings along Waipahu Street and Waipahu Depot Road.**

  To preserve and restore the plantation town image, owners and tenants would be encouraged to revitalize their existing building facades to reflect the basic design principles of this theme. Developers of new projects would be required to integrate these Old Town design guidelines in their design of proposed developments.

- **The character of Waipahu Street and Waipahu Depot Road shall be maintained except for adjustments to improve traffic flow and safety, to safeguard the historically and visually significant buildings and maintain the area's pedestrian scale and orientation.**

5.3.1 Existing Buildings

- **Existing significant historic structures shall be identified, maintained and restored wherever possible, and adaptive reuse encouraged where necessary to ensure their continued viability and use.**

  Buildings which are reminiscent of old Waipahu Town can be roughly divided into two categories: plantation houses and commercial buildings. Until just recently, plantation houses were clustered near the mill on Waipahu and Makaaloha Street. Built between 1909 and 1934, these houses were occupied by plantation supervisors and skilled-workers, and therefore, more sophisticated in design than the houses of the typical plantation worker. Although each house has its own distinct architectural style, common design themes include vertical tongue and groove siding, hip roofs, double-hung windows, slat-screened past foundations, and entry porches.

  Significant commercial buildings are grouped along Waipahu Street, near the Sugar Mill. Although the architectural design is not uniform, the materials used are either wood or stucco for exterior appearance.

  Although ethnic diversity of the community accounts for many differences in the architectural style, there are some common design features shared by buildings in Waipahu. These features include: strong orientation to the street, roof overhangs, awnings or porches, building entrances and windows, decorated parapet walls, flat or hip-roofs and double hang windows.

Significant buildings which contain prime examples of the above features can be found at (see Figures 5-3 to 5-6):

Former Plantation Store (Clinic Building)
94-897 Waipahu Street (Waipahu Theater)
94-891 Waipahu Street (Waipahu Fire Station)
Building on the corner of Waipahu Street & Waipahu Depot Rd.
94-871 Waipahu Street (Alpa Corporation/Philippine Mini-Mart)

5.3.2 Proposed Architectural Character

- **The architectural character of new buildings should reflect the plantation era architecture of Waipahu's historic past. Basic design principles, texture, construction materials and colors should be compatible with styles from this era.**

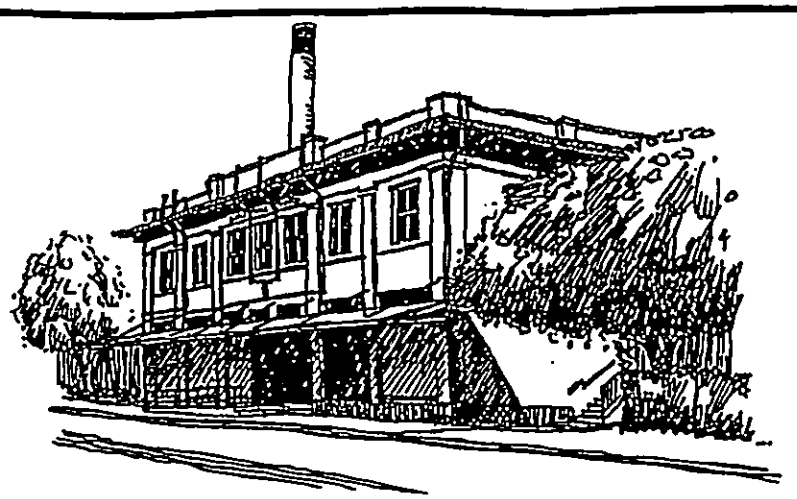
  The "traditional" character of buildings in Waipahu are based mostly on ethnic architectural styles, but modified to fit the climate and atmosphere of a Hawaiian plantation town. Building facades may reflect influences from Oriental, Plantation, art deco or colonial architecture, or even a combination of these styles; but each structure's relation to the tropical climatic and social environment is uniform. Inventing a new unified architectural character for Waipahu would ignore the ethnic diversity and heritage of the community.

  It is recommended that the diversity of architectural influences be respected by allowing for creative adaptation of Waipahu building styles. However, building scale, massing, orientation, shape, and spacing, window size, roof shape and use of exterior materials should remain consistent throughout the district.

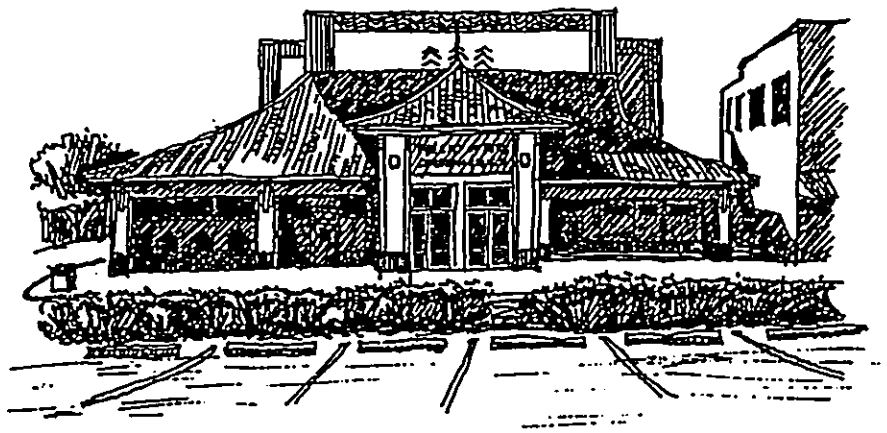
  Figure 5-7 shows an aerial perspective of the Old Town Commercial Area with sketches of the urban design concepts suggested for the area.

- **Strong pedestrian orientation shall be encouraged and maintained through the expansion of "storefront" businesses, enhancement of the streetscape and walking environment, and consolidation of off-street parking behind buildings.**

Building Siting and Setback. To ensure that the old Waipahu Town district becomes a vibrant, pedestrian oriented business area, rather than just another line of shops along a congested thoroughfare, new buildings or additions should be located close to the street, with parking areas screened to the rear or in centrally located structures.



FORMER PLANTATION STORE
Figure 5-3



WAIPAHU THEATER
Figure 5-4

CORNER BUILDING

Figure 5-5

WAIPAHU FIRE STATION

Figure 5-6

- **New buildings or additions should be located close to the street, creating a traditional "street line" of facades, with buildings forming an attractive edge to the roadway.** A traditional "street line" of facades will allow buildings to form an attractive edge to the roadway, rather than allowing the thoroughfare to become visually dominated by large areas of parking.

  Large, meaningful, pedestrian-oriented open spaces can be created by grouping buildings together in clusters along the street and consolidating the resulting open space along the street.

- **Storefronts should be oriented to the street and include elements such as canopies, overhangs, porches, and trellises to scale down building heights and enhance the street-level environment.** In keeping with historic design, all store fronts should be oriented to the street and as open to the sidewalk as possible to reveal merchandise within. Entrance doors may be recessed to create a more interesting space. Such a layout creates an inviting environment to the pedestrian/shopper. Merchandise may also be displayed in front of the store, on the walkway, to attract customers.

  In addition, elements such as canopies, overhangs, porches and trellises scale down building heights, making taller structures less formidable. Landscaping and street furniture further enhance the street-level environment and invite people to spend their time along street fronts.

Building Scale. To maintain the intimate community-oriented atmosphere of old Waipahu Town, the town design should cater to pedestrians, who generally feel more comfortable between low-rise buildings (two- to three- stories) than high-rise buildings.

- **Buildings shall be limited to two or three floors in height in keeping with the area's historic scale and to preserve views of existing mill structures.** One-story buildings typical of newer commercial developments are too low to create a strong sense of enclosure and safety along the main street. Thus, buildings of two- to three-stories should be encouraged along street fronts. In two- to three-story structures, ground floors are usually devoted to retailing, while upper stories can hold offices, residential units or special services not requiring the convenience of ground floor accessibility.

Building Massing.

- **Buildings should avoid awkward or overscaled forms, and long building forms should be broken down or offset into smaller masses of more residential proportions.** Given the poor economic situation of most plantation workers, the forms of plantation houses tended to be small and simple, primarily offering shelter from the elements. In keeping with traditional massing, buildings should avoid awkward or overscaled forms and long building forms should be

WAIPAHU OLD TOWN COMMERCIAL AREA

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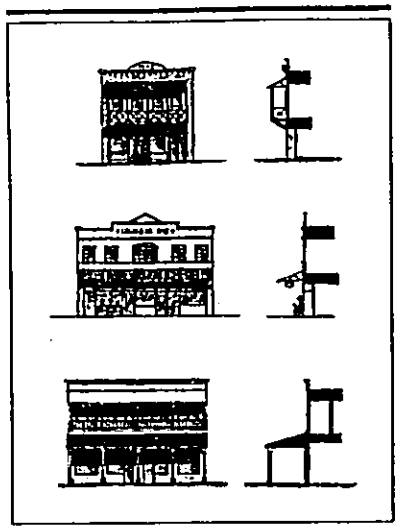
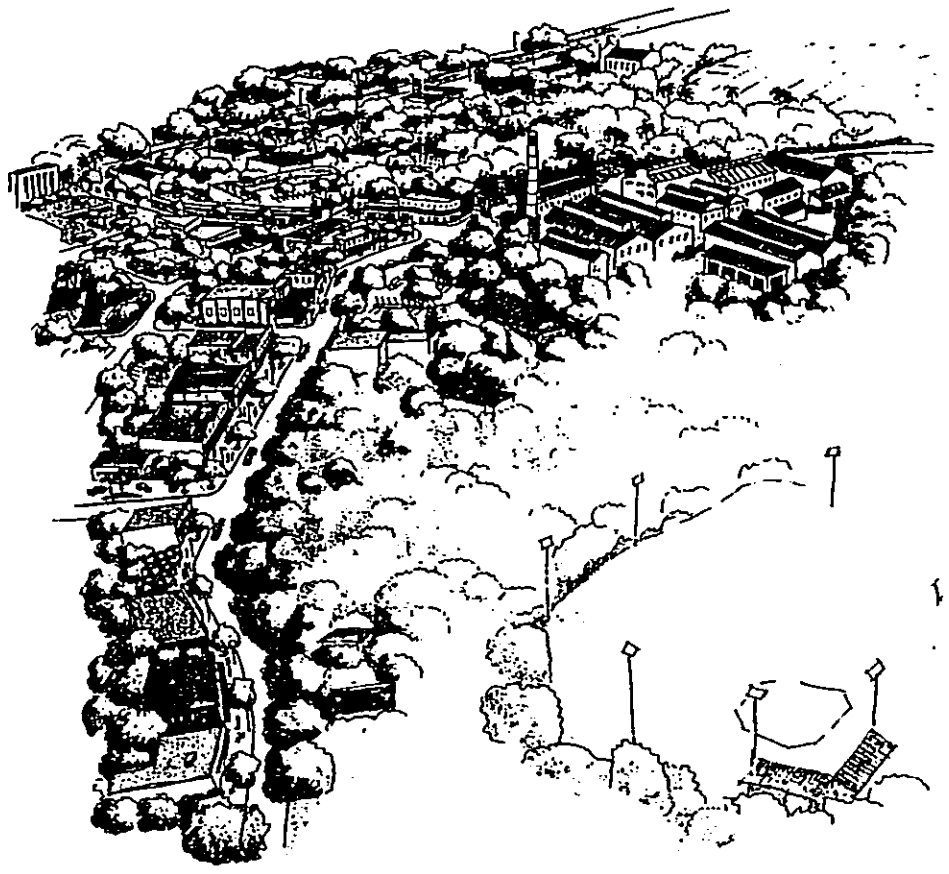
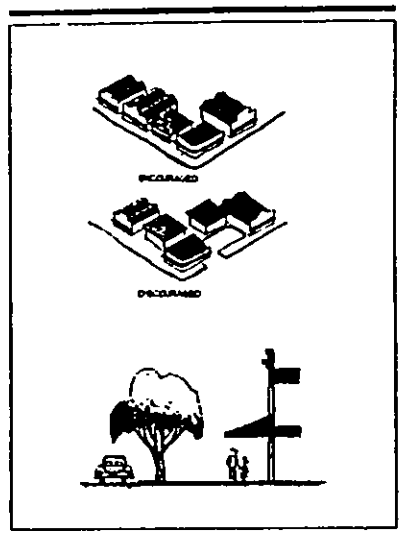
URBAN DESIGN CONCEPTS



BUILDING SCALE / MASSING



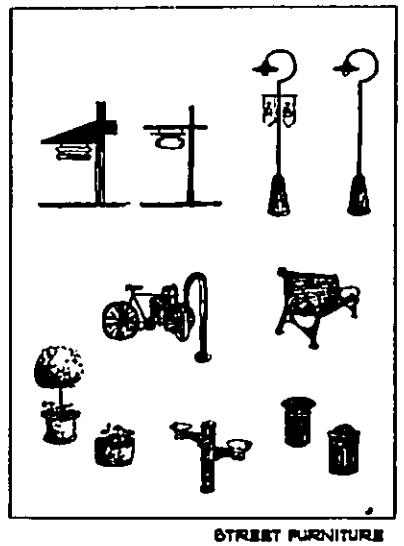
AERIAL PERSPECTIVE



BUILDING SITING / SETBACK

PERSPECTIVE WAIPAHU STREET

STREET SCENE



STREET FURNITURE

Figure 5-7

broken down or offset into smaller masses of more residential proportions. Buildings may have false facades which could make a smaller building appear larger for compatibility with adjacent buildings. In addition, sloped or flat roofs are acceptable as long as the main orientation of the building is towards the street.

Fenestration. Careful proportioning and placement of windows on all major facades is essential to maintaining architectural character. New fenestration should draw its inspiration from traditional building facades by continuing similar "rhythms", proportions and architectural balance between the wall surface and the openings. Typical windows on Waipahu building facades are rectangular with a strong vertical orientation. Most windows are double-hung windows. Large picture windows, glass curtain walls, circular, octagonal and bay windows would act counter to the architectural character and should be avoided.

Building Material. Although they do not create a sense of character independently, traditional materials such as tongue and grove wood siding, stucco and lava rock should be encouraged. Such traditional materials add to the town's architectural character only when used on buildings that are consistent with common principles of scale, proportion, and sizing. Introducing new materials such as plastics, steels and glass products, which do not have the capacity to weather and mature with the community, should be done with caution.

Colors. Color in plantation towns is subdued, brought about by weathering of paints and material. The application of new colors should pursue this subdued feeling since it also softens the buildings and psychologically "cools" the town atmosphere.

Guidelines for color finishes include:

- subdued, earthen tones rather than bright, bold colors;
- matt finish paints rather than high gloss; and,
- stains which accent the natural wood grain, rather than opaque paints which hide the grain.

Building Signs. Historically, signs on the building facade which include the name of the building and its construction date was a common tradition that has since diminished. A revival of this tradition should be encouraged to capture the atmosphere of days long past. Building signs may be painted, curved, raised, incised or crafted using appropriate techniques. The lettering type should be similar to styles popular during the plantation period.

Fences and Walls. Fences, walls and hedges may be used to define a property's "formal but friendly" relationship to the street, as well as to maintain privacy. Appropriate material include lava rocks and wood.

Parking. Each development should provide sufficient off-street parking and loading, with the joint development of parking lots or structures encouraged. Parking should be hidden from the street behind commercial buildings to aid in creating a strong building edge along the street and to reduce traffic congestion. Efficient and attractive design of parking lots and structures, including landscaping to provide shade and to buffer cars from neighboring properties, should be encouraged. Off-street parking should be accessed from the side streets and not from new lanes leading to Waipahu Street.

5.3.3 Streetscape Features

Reconstructing the architectural quality is only half of the task in emphasizing the "sense of place" for old Waipahu Town. Restoring the vitality of the community is another essential component. The flurry of activity between the buildings is the heartbeat of the community; therefore, the streetscape and landscape should encourage social interaction as much as possible.

Rather than become a collection of stores and parking lots, the Old Town area should offer individuals a meaningful experience through its opportunities for human interaction. Physical planning should prevent isolation and promote contact by encouraging areas for gathering, standing and sitting, short pathways between destinations, and slow vehicular speed. On the street, a pleasant outdoor space should give the individual a feeling of being protected from vehicular traffic, unpleasant weather and crime.

Lighting. Although the priority of street lighting is to provide safety, security and convenience to streets, sidewalks, parking, buildings, signs, and other aesthetic features, lighting features can be used to enhance the street scene and add ambience to old Waipahu town. Considerations for designing a lighting plan include:

- determining the precise purpose of each light fixture;
- avoiding high-intensity sodium vapor lights which cast eerie orange glows over streets and parking lots;
- preventing glare by utilizing shields and hoods to color-correct outdoor lighting;
- reducing intensity by employing a larger number of smaller light poles; and,
- choosing simple and traditional styles for light fixtures.

Signage. A well-designed signage system will help unify the district and present a more friendly image. Historically, signage in Waipahu has been simple expressions made with basic materials and easily read. Such a style should be emulated. The sign design should be artistic, interesting, sometimes amusing, and compatible with the architectural character of the building to which it is attached.

Sign forms and graphics which relate to the historic plantation period enhance the historic and architectural character of Waipahu. Representational signs (images associated with Waipahu) should be encouraged. A coordinated signage system should be developed using an appropriate letter style typical of the plantation period.

Materials used in signage common to historic Waipahu should be encouraged. All signs should be constructed of wood, and chains and ropes should be used for hanging purposes only. Ground signs, announcing signs, and public signs should utilize wood and stone masonry for support. Wrought iron may be used as ornamentation.

Street Furniture. Street furniture creates a warm atmosphere along the public sidewalks and is therefore highly encouraged. Furnishings should be grouped and integrated with plant materials to create a variety of places. Examples of street furniture include:

- Benches
- Trash Containers
- Drinking Fountain
- Bollards
- Kiosks
- Clocks
- Sculptures
- Bike Racks

Bus Stops. Bus stops should provide a comfortable place for people to wait and socialize. Designs should be functional, handicapped accessible, vandal-resistant, provide shelter from the elements as well as blend in with the historic and architectural character of Old Waipahu Town.

Bus stops should be built using natural materials common in Waipahu. Other methods to shade and soften the bus stop structure, such as a trellised design with flowering vines and ample landscaping, or integrating the bus stop under a building canopy should be encouraged.

Gateway Features. A clearly defined entry should enhance the old Waipahu town area, creating a welcome statement to the public. The entry treatment should be visible to motorists and pedestrians. One sign should be located at the intersection of Waipahu Depot Road and Farrington Highway and another two should be placed at both ends of the Old Town area on Waipahu Street.

CHAPTER 6
PLAN IMPLEMENTATION

6. PLAN IMPLEMENTATION

Following its endorsement by the Planning Department and Waipahu Town Plan Task Force, the Waipahu Special Area Plan will be submitted to the Honolulu City Council for consideration and adoption by City Council resolution. Once adopted, the Plan will provide the overall guidance for the implementation of land use, circulation, and urban design improvements to Waipahu Town.

The Plan's provisions will be implemented through a combination of public and private initiatives. Public initiatives focus on publicly owned lands and public rights-of-way, as well as on the allowance of zoning changes which support the Plan's vision. Private initiatives are accomplished through rezoning and privately funded development projects which are subject to any adopted design guidelines which may influence the manner in which development is accomplished.

6.1 Relationship to Development Plans and Zoning

The Special Area Plan should provide the basis for the City's decisions on proposed developments seeking zoning and other regulatory approvals. Proposed developments should conform to the Special Area Plan if the site is within the Plan boundaries and specific land uses or design guidelines are applicable to the site. If there are no applicable references from the Special Area Plan, the Central Oahu Development Plan would be the guiding document in development reviews.

6.2 Phasing Plan

A generalized phasing and implementation responsibilities plan has been developed to indicate the general sequencing and responsible entities for implementation of the Plan's provisions (see Tables 6-1 and 6-2). These are based on near term, mid-term, and long term actions.

6.3 Amendments to the Special Area Plan

Revisions or amendments to the Special Area Plan may need to be considered periodically, but the overall Plan should be reviewed at least every five years. Such review could be timed to coincide with the Development Plan review. To oversee the five-year review, the Waipahu Town Plan Task Force should be reconvened.

LONG TERM	• Shoreline Park Improvements	• Old Town Commercial Redevelopment (Ongoing) • ORS&L Right-of-Way Train Restoration
MID-TERM	• Old Town Commercial Streetscape Improvements • Paiwa and Motokola Street Landscape and Streetscape Improvements • Hiikimoe Street Enhanced Pedestrian Way • ORS&L Right-of-Way Bikepath to Cultural Garden Park • Shoreline Park Improvements Along ORS&L Right-of-Way.	• Waipio Peninsula Commercial -Recreational Use • Waipio Peninsula Access Improvements • Old Town Commercial Market of Farrington Highway
	• Waipio Peninsula/Pearl Harbor Recreational Access • Waipio Peninsula Maintenance Facilities, Ash Landfill Closure • Pouhala Marsh Wildlife Sanctuary Establishment	

Table 6-1
WAIPAHU SPECIAL AREA PLAN
PHASING PLAN

	PUBLIC ACTIONS	PRIVATE ACTIONS
NEAR TERM	• Special Area Plan adoption • Designate Plan Implementation Task Force/Review Body • Manager's Drive Property Development • Roadway Improvements, traffic study as needed -Waipahu Street Widening -Frontage Road Modifications (Mokolo Street) -Village Park Connector Road • Farrington Highway Median Landscaping and Sidewalks • Entry Features Construction • Flood Study and Improvements - Waikele Stream • Civic Center Mini Park & Ride • Shoreline Bikepath Construction • Waipio Peninsula/Pearl Harbor Recreational Access • Waipio Peninsula Maintenance Facilities, Ash Landfill Closure • Pouhala Marsh Wildlife Sanctuary Establishment	• Old Town Revitalization Program/ Organization • Sugar Mill Site Development • Community Facilities Development at Mill Site: -YMCA -FilCom Center -Heritage Park/Center -Hans L'Orange Park Expansion • Roadway Improvements, traffic study as needed: -Manager's Drive Bridge Widening -Manager's Drive Extension to Motokola Street -Paiwa Street Connector Roads • Internal Transit System - Waikele to Sugar Mill/Town

Table 6-2
WAIPAHU SPECIAL AREA PLAN
IMPLEMENTATION RESPONSIBILITIES

Implementing Action	Near Term	CITY						STATE			PRIVATE			
		City Council	PD	DLU	DTS	DICD	DPW	DTR	DOT-HWY	DLNR	Town Plan Impl. TF	Assn/ IMB	Other Private	
Special Area Plan adoption	●	●												
Designate Plan Implementation Task Force/Review Body	●		●											
Manager's Drive Property Development														
Roadway Improvements, traffic study as needed														
- Waipahu Street Widening									●					
- Frontage Road Modification (Mokolo Street)				●										
- Village Park Connector Road					●									
Farrington Highway														
- Median Landscaping and Sidewalks						●	●							
Entry Features Construction								●						
Flood Study and Improvements									●		●			
- Waikele Stream									●		●			
Civic Center Mini Park & Ride										●				
Shoreline Bikepath Construction														
Waipio Peninsula/Pearl Harbor Recreational Access														
Waipio Peninsula Maintenance Facilities, Ash Landfill Closure											●			●
Pouhala Marsh Wildlife Sanctuary Establishment														
Old Town Revitalization Program/Organization		●	●									●		
Sugar Mill Site Development		●												
Community Facilities Development at Mill Site:														
- YMCA														
- FilCom Center														
- Heritage Park/Center														
- Hans L'Orange Park Expansion														

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MID-TERM	• Old Town Commercial Streetscape Improvements • Paiwa and Mokuola Street Landscape and Streetscape Improvements • Hikimoe Street Enhanced Pedestrian Way • OR&L Right-of-Way Bikepath to Cultural Garden Park • Shoreline Park Improvements Along OR&L Right-of-Way	• Waipio Peninsula Commercial -Recreational Use • Waipio Peninsula Access Improvements • Old Town Commercial Makai of Farrington Highway
LONG TERM	• Shoreline Park Improvements	• Old Town Commercial Redevelopment (Ongoing) • OR&L Right-of-Way Train Restoration

Table 6-2
WAIPAHU SPECIAL AREA PLAN
IMPLEMENTATION RESPONSIBILITIES

	Implementing Action	CITY							STATE			PRIVATE		
		City Council	PD	DLU	DTS	OHCD	DPW	DFR	DOT-HWY	DLNR	Town Plan Impl. TF	Amfac/ JMB	Other Private
Near Term	Special Area Plan adoption	●											
	Designate Plan Implementation Task Force/Review Body	●	●								●		
	Manager's Drive Property Development												
	Roadway Improvements, traffic study as needed - Waipahu Street Widening - Frontage Road Modification (Moloalo Street) - Village Park Connector Road					●			●		●		
	Farrington Highway - Median Landscaping and Sidewalks						●		●		●		
	Entry Features Construction												
	Flood Study and Improvements - Waikele Stream			●									●
	Civic Center Mini Park & Ride				●								
	Shoreline Bikepath Construction						●			●			
	Waipio Peninsula/Pearl Harbor Recreational Access		●					●				●	
	Waipio Peninsula Maintenance Facilities, Ash Landfill Closure												
	Pouhala Marsh Wildlife Sanctuary Establishment												
	Old Town Revitalization Program/Organization												
	Sugar Mill Site Development												
	Community Facilities Development at Mill Site: - YMCA - FilCom Center - Heritage Park/Center - Hans L'Orange Park Expansion												●

Table 6-2 (Cont.)
WAIPAHU SPECIAL AREA PLAN
IMPLEMENTATION RESPONSIBILITIES

		CITY							STATE		PRIVATE		
	Implementing Action	City Council	PD	DLU	DTS	DHCD	DPW	DPR	DOT-HWY	DLNR	Town Plan Impl TF	Amfac/JMB	Other Private
Near Term (cont.)	Roadway Improvements, traffic study as needed: - Manager's Drive Bridge Widening - Manager's Drive Extension to Mokuola Street - Paiwa Street Connector Roads											● ● ●	
	Internal Transit System - Waikele to Sugar Mill/Town											●	●
Mid-Term	Old Town Commercial Streetscape Improvements				●						●		
	Paiwa and Mokuola Street Landscape and Streetscape Improvements				●								
	Hikimoe Street Enhanced Pedestrian Way				●								
	OR&L Right-of-Way Bikepath to Cultural Garden Park				●								
	Shoreline Park Improvements Along OR&L Right-of-Way							●					
	Waipio Peninsula Commercial - Recreational Use												●
	Waipio Peninsula Access Improvements												●
	Old Town Commercial Makai of Farrington Highway										●		●
Long Term	Shoreline Park Improvements							●					
	Old Town Commercial Redevelopment (Ongoing)										●		●
	OR&L Right-of-Way Train Restoration												●

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Wilson Okamoto and Associates. *General Comments from the Waipahu Special Area Plan Public Workshop.* July 27, 1995.

CITY COUNCIL
CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII

No. 94-309
CD1

RESOLUTION

ENDORSING THE PREPARATION OF A COMMUNITY-BASED PLAN FOR WAIPAHU.

WHEREAS, the objectives and policies of the General Plan of the City and County of Honolulu recognize the importance of enhancing the economic, physical and social character and historic heritage of Oahu's older towns and communities; and

WHEREAS, Waipahu had its origins as a sugar plantation town, later became a regional shopping town, and today supports a variety of residential neighborhoods and community business areas; and

WHEREAS, the rapidly developing new communities of Ewa and Central Oahu are having a significant impact on Waipahu--especially the new Waikele community and the Waikele Commercial Center; and

WHEREAS, Waipahu has played a prominent historic role in Oahu's sugar industry and labor union movement; and

WHEREAS, in 1984 the Waipahu community prepared and adopted the "Waipahu 2000 Plan" which called for the creation of a "Heritage District" encompassing the Cultural Garden Park, the Sugar Mill, and surrounding historic residential and commercial areas; and

WHEREAS, the Waipahu 2000 Plan also called for numerous improvements to traffic circulation, public facilities, streetscapes, and other aspects of Waipahu; and

WHEREAS, Amfac/JMB has announced the closing of the Oahu Sugar Company--its entire sugar mill and field operations--in April 1995; and

WHEREAS, for 100 years the Oahu Sugar Mill complex has been a dominant economic, social, and visual element of Waipahu town; and

WHEREAS, the closing of the Mill will bring major changes in the economic and social activities of Waipahu; and

WHEREAS, new development on the Sugar Mill site will have major impacts on Waipahu town and the Waipahu Cultural Garden Park and will be visible throughout the community; and

WHEREAS, in consideration of the needs of Waipahu, the transition caused by surrounding new developments and the closing of the Oahu Sugar Company, and other needs expressed in the

APPENDIX A
RESOLUTION NO. 94-309

RESOLUTION

Waipahu 2000 Plan, the Planning Department has met with community leaders and has recommended the preparation of a special area plan for Waipahu using funds appropriated in the department's FY 95 budget; and

WHEREAS, members of Waipahu business and neighborhood organizations concur that there is a need for a plan for Waipahu Town and have expressed interest in working with the City in developing this special area plan; and

WHEREAS, the City and County of Honolulu owns 40 acres of vacant land immediately abutting the Sugar Mill site, known as the Manager's Drive site; and

WHEREAS, joined with Amfac/JMB's Sugar Mill site, this represents a 100-acre joint redevelopment opportunity that could be coordinated with the Waipahu town plan effort; now, therefore,

BE IT RESOLVED by the Council of the City and County of Honolulu that the City Council hereby endorses the preparation of a community-based special area plan for Waipahu as a priority project of the Planning Department--to be known as the "Waipahu Town Plan," which shall consider recommendations contained in the Waipahu 2000 Plan, the opportunity for joint redevelopment of the 100-acres in and around the Sugar Mill site, and other major land use changes in Waipahu over the last 10 years; and

BE IT FURTHER RESOLVED that the Planning Department is requested to submit the Waipahu Town Plan by December 1995 to the Mayor and the City Council for review and adoption by City Council resolution; and

BE IT FURTHER RESOLVED that the Planning Department is requested to provide for active participation by the community in the Waipahu Town Plan, including community workshops and a Waipahu Town Plan Task Force consisting of members of the Waipahu 2000 Update Committee; the Waipahu Business Association; members of the Waipahu Neighborhood Board; a representative of Amfac/JMB; a representative of the City Planning Department; members of the State Senate, State House of Representatives, and the Councilmembers representing Waipahu; and members from the community; and

CITY COUNCIL
CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII

No. 94-309 CD1

RESOLUTION

BE IT FURTHER RESOLVED that the Waipahu Town Plan should provide comprehensive, long-range objectives to guide land use and public improvements, as well as specific plans for certain improvements including but not limited to transportation improvements, all of which address the needs and concerns of the community and enhance the long-term livability and economic vitality of Waipahu; and

BE IT FURTHER RESOLVED that the Planning Department is requested to coordinate a joint planning effort with the Department of Housing and Community Development, Amfac/JMB and community representatives for future development of the Manager's Drive and Amfac/JMB properties in conjunction with the Waipahu Town Plan project and in support of Waipahu Town Plan goals and objectives; and

RESOLUTION

BE IT FINALLY RESOLVED that the Clerk transmit, and is hereby directed to transmit, copies of this Resolution to the Chief Planning Officer, the Director of Housing and Community Development, the Director of Transportation Services, the Director of Land Utilization, the Waipahu Neighborhood Board, the Waipahu Business Association, the Waipahu 2000 Update Committee, and Amfac/JMB Hawaii, Inc.

INTRODUCED BY:

John DeSoto (BR)

Councilmembers

RECEIVED
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CITY CLERK
C&C HONOLULU

DATE OF INTRODUCTION:

October 27, 1994
Honolulu, Hawaii

(OCS/011295/pn) -4-

CITY COUNCIL
CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII

I hereby certify that the foregoing RESOLUTION was adopted by the COUNCIL OF THE CITY AND COUNTY OF HONOLULU on the date and by the vote indicated to the right.

ATTEST:

GENEVIEVE G. WONG
CITY CLERK

JOHN DeSOTO
CHAIR AND PRESIDING OFFICER

Dated 1/25/95

ADOPTED MEETING HELD 1/25/95	AYE	NO	A/E
BAHUM			
FELIX			
HANNEMANN			
HOLMES			
KIM			
MANSHO			
MORIKITANI			
YOSHIMURA			
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Reference

Report No. P-8

Resolution No
94-309
CD1

APPENDIX B
VISIONING WORKSHOP GROUP MEMORY

City & County of Honolulu
Planning Department
Waipahu Town Master Plan
Community Workshop
Tuesday, February 7, 1995

GROUP MEMORY

Welcome

The meeting began with a welcome by the Honorable Jeremy Harris, Mayor of Honolulu. Mayor Harris explained that the intent for the meeting was to have the community come together to develop a Waipahu Town Plan. The City's goal is to act as a catalyst and provide a mechanism to develop plans that are community based. Mayor Harris continued by saying that "this is your town and community, we want to pull together your dreams". The City has set a December 1995 deadline for completion of the plan. The City hopes to begin implementation at that time. Mayor Harris stressed that the most important aspect of the planning process is the community's input. Staff members were present to respond to the community's questions. Mayor Harris concluded by thanking community participants and introduced Gary Okino of the City's Planning Department.

Introduction & Overview

Gary Okino extended his welcome and explained that the City's Planning Director, Cheryl Soon, was late arriving due to her confirmation hearings being held the same evening. He apologized for the absence of council members who were also at the same confirmation hearings.

Mr. Okino mentioned that handouts of two resolutions relating to the preparation of a community-based plan for Waipahu and the cultural significance of the Oahu Sugar Mill which were recently adopted by the City Council, and an "after thoughts" form were available.

The meeting has been designed as a "visioning" session that will hopefully assist in the City's attempt to design a Master Plan for Waipahu which meets the community's needs. The town plan is a part of the City's development plan, a "special area plan". The special area plan is a little more detailed and addresses areas of special needs and implementation plans. He stated that it is a process which envisions much community involvement.

A Task Force was formed to drive the planing effort, with 12 - 16 representatives (e.g., Neighborhood Boards, Business Associations). This task force can be expanded, interested parties were invited to sign up. The process will involve participation from the representatives through several forums.

He stated that the boundaries of the plan are not set, can be part of the discussions, and may change through the planning process.

Meeting Focus & Process

The State Judiciary's Center for Alternative Resolution provided neutral facilitators to assist in managing the meeting, assure that information exchange would occur, and allow anyone who wanted to speak, the opportunity to do so. Dee Dee Letts and Alice Paet-AhSing served as the group's facilitators. The agenda was reviewed, community members were presented with the intent and purpose of the meeting, and ground rules were suggested. Varying opinions are

anticipated and agreement is not expected. Community participants were invited to use the "after thoughts" form and encouraged to take additional forms for friends who were not able to attend.

The meeting this evening is being held very early in the planning process. A key element was getting out to the community in the early stages of the planning process. The purpose of the meeting was to identify what the community felt were elements unique in Waipahu and would like to have preserved, as well as elements that caused discomfort. With these ideas, the planners would work with the community and Task Force to draft a plan for implementation.

DISCUSSION:

UNIQUE ELEMENTS OF WAIPAHU

Community members were asked to identify elements in their community that were unique. When driving through the town, what do you see? What makes you stay in Waipahu? What are the things that you would want your grandchildren to see and enjoy?

- The Sugar Mill.
- The Sugar Mill's smoke stack is a landmark.
- Arakawa's General Store.
- Manager's Drive.
- Cultural Park.
- The absence of sidewalks.
- The feeling of "openness" and green setbacks. The old big trees, especially the monkey pods trees.
- The mixture of City and State roads.
- The mixture of old style plantation with the more contemporary design and architecture.
- Sugar Cane fields.
- The winding road through the middle of town.
- Diversity in nationalities.
- Plantation heritage.
- Distinctness of the borders.
- The focusing of the community, the interest, support and concern.

CHANGES IN WAIPAHU

Community members were then asked to identify the changes that cause discomfort.

- The increase in traffic.
- Ingress and egress is a problem. The increasing difficulty in commuting to and from town.
- The loss of businesses due to the development of new commercial areas and the change in access to Waipahu Street. Access throughout Waipahu Street is an important factor for the businesses in town.
- Mega merchant marketing developments (i.e., Waikele warehouse outlets) are too competitive for Waipahu's small businesses.
- The small Post Office. Waipahu needs a larger station to accommodate the community.
- The growing situation of youths that are engaging in unfavorable activities as evidenced in the increase in graffiti. Youths need to be involved in programs. More programs and activities are needed.
- Increase in parking on residential streets and sidewalks.
- Growth in the surrounding communities seems to "squeeze" Waipahu with the imposition of traffic impacts, etc.
- Increases in crime.
- Seems that Waipahu is a "dumping ground". There is an increase in "trashing" and abandoned vehicles.
- Inadequate parking at the recreational center. The parking facility does not adequately accommodate activities and events.
- The decline in maintenance of roadways. This reflects poor pride of the community.
- Development of educational facilities are not consistent with the needs of growing population and student numbers.
- The change in the residents mix, we are seeing an increase of transient residents as opposed to long term residents.
- Hans L'Orange Park needs a larger left field, should be expanded and the trees should be preserved. The park could be a focal point in the development plan. The park offers a rich history that should be preserved.
- Pressure on the community to accept undesirable industry (e.g., medical waste treatment facility). These kinds of things should signal the community to be vigilant of these kinds of changes.
- Need to be careful of what you request, be sure of what you want. There are current plans for a large regional park in the vicinity. Need to be aware of impacts that may physically change the area, impacts that are transportation related, etc.
- Lot built out through Ohana, etc., is changing the character by doing away with yard space and over-stressing infrastructure.

The following comments regarding "changes that are discomforting" were submitted after the meeting:

- Because of the increase in crime: Need "neighborhood watch" at the Waipahu Highland area especially at the hours from 12:00 p.m. to 5:00 a.m.
- Hiapo Street at Waipahu Highland is used as a race track. Would like to see speed bumps on that street.
- Trees that are planted on the City and County property are destroying our property (94-1227 Henokea Street), the roots which have shoots of new growth extend into our property.
- Lack of response after repeated requests made to the City and County Beautification Department to have an inspector follow-up on complaint: Tree was planted twenty five years ago and now presents a problem. Resident's stone wall is breaking. Resident initiated call on September 1, 1994, followed up with call on September 28, 1994. Another call on December 15, 1994 was made, supervisor, Mr. Kua advised resident that he would make inspection within two weeks. To date, inpsection has not been done and City has not contacted resident. "It is now February 1995 and am still waiting. Hope I don't have to wait five years. Maybe I should call ACTION LINE for better results. If the roots cause damage to the sewer line, I am going to send the bill to the mayor for payment". Mary Alvaro, 94-1250 Huakai Street.

WAIPAHU'S FUTURE

Community members were asked to project for the future. In the year 2025, what would you like to see?

- Electric cars.
- Retain the open spaces and greenbelts.
- Retain the "country" atmosphere, not too crowded, not "downtown".
- Maintain the monkey pod trees.
- Low structures, not high rises.
- Improvements to the Cultural Center, hook up the train.
- Low cost transportation system to facilitate safe and easy ways for the elderly to get around town.
- Retain the old Mill site as a heritage/cultural landmark. Develop it as a historic site with interpretive features. There could be a museum and nice restaurants.
- More bike lanes, pedestrian walkways and jog ways.
- Specialty shops for local artisans and craftsman.
- Utilize the water that is currently at the Mill site in ways that would lower rates for the community.

- More "open spaces", have more parks for active recreation (e.g., playing fields) as well as for passive recreation (e.g., picnic areas and rest stops). Expansion of existing parks around the Mill site.
- Have places that are conducive for holding youth activities and programs.
- Continued generation of electricity at the Mill.
- Underground utilities.
- Other communities tied into Waipahu town. Waipahu be more accessible to other communities with roads and transportation links in a well planned network. Areas that need more immediate attention include Hanawai Street, the exit at the Cultural Garden, exit at the Church, and the future development of Wai'awa.
- Retain the Cultural Gardens.
- The Waipahu incinerator should be developed as a passive park, a place to stop and rest.
- More public pools at recreational centers.
- Heritage Park developed with ten acres at the Mill site, with an additional ten acres that can be used for economic development. The second ten acres would be a revenue base that could be used for maintaining the cultural park, etc. Perhaps discussion could be initiated with AMFAC/JMB to consider the concept and donation of the twenty acres.
- More opportunities for youths (e.g., learning centers, youth programs and activities) and a location/facility to hold these activities (i.e., Youth Center).
- Railway Station offering an educational experience for youths. Could be situated at the park.
- Designate the oldest section of town as a historic district to help keep the "flavor" of Waipahu's uniqueness.
- An exercise and stretch facility at the park.
- Filipino Cultural Center.
- Movie theaters and commercial uses that community members have had to go out of town to enjoy.
- Design guidelines for commercial development that retain the "plantation" theme.
- Beautification efforts along Farrington Highway, the boulevard from Wai'awa right on through (i.e., landscaped and trees maintained, scrub and trash removed, etc.) as well as all along, within, and throughout town.
- Maintenance of entry ways. Currently, the "welcome to Waipahu" signage cannot be seen due to shrubbery, etc.
- A good transportation system that facilitates movement within town as well as commuting in and out of town.

- From Paiwa and Waipahu Streets, Ewa to Waipahu Depot Street (central area of town) and continuing along this street to Farrington Highway, along Hikimoe Street from Waipahu Depot Street to Mokuola Street (could include the Mokuola Street and Moloalo Street area) be designated as a "Main Street Project". With this kind of development concept, the civic center could be used as an anchor point.

- More greenery, more flowers.

- Elderly needs are addressed (e.g., ease in access to various places, a bus stop in front of the hospital). Uses that are planned have appropriate infrastructure designed into plan (i.e., bus stops that are convenient and close to entrances to community facilities and hospitals).

- Easy access for everyone, especially the elderly.

- Open space located north of Waikele, between Waikele and Kipapa Gulch, retained as open space, kept green, a possible park site.

- Expanded police presence, a district station in town.

- Harbor and stream cleaned and developed for recreational use (e.g., fishing, crabbing, etc.). Green way or enhancement of the connection between Waipahu Stream and Pearl Harbor.

- A mini passive park (i.e., for resting and waiting stop) on the piece of state property at Hikimoe and Moku'ola. Look at mini parks throughout the area.

- An agriculture park created for small family farms that will assist in maintaining the "rural" character.

- Low density development, no "wall-to-wall" construction. Concern with Ohana and Zero Lot abilities (i.e., maximum lot coverage and use). Need to be cognizant of potential impacts resulting from high density development (e.g., increase in parking, fire hazards, safety, etc.).

- No visible evidence of abandoned vehicles and clutter of white goods. There is a current need for some quick response on the existing problems of abandoned vehicles and discarded "white" appliances. "Get these out!"

- More job opportunities and continual encouragement of small businesses. Job opportunities that are agriculturally related, perhaps light industrial types that would utilize youth person power, and those that involve high technology.

- Community Meeting Rooms that would handle large and small groups that are available "after hours". (The Civic Center is not available for use "after hours".)

- A "small business corporation" developed.

- Waipahu is a microcosm of what Hawaii is all about (multi-cultures, multi-ethnicities, harmony, aloha, etc.). With the many changes occurring, it is important that the significant and symbolic landmarks are retained. These landmarks are meaningful to many people.

  Development of a strong Historical Center. Waipahu town can be the central point for interpretive history of the island. Use the cultural/historical strength of the area from pre-contact, through plantation struggles to today, as part of the building of an economic base.

The following comments regarding "Waipahu's future" were submitted after the meeting:

- More employment opportunities (i.e., good jobs) for Waipahu's youth and laid off sugar workers.

- Factory Outlet stores.

- Mr. Crawford Sullivan, resident and member of Waipahu 2000 Update...
  Ideas that have been considered in their meetings since October, for the near future planning of Waipahu Town:

  In addition to the widening of Waipahu Street, sidewalks and curbing is needed in numerous locations, including beautification and landscaping. A start on beautification could be at the junction of Kamehameha Highway and Waipahu Street, continuing on to the proposed area of the widening project. Some of this could be accomplished at the present time.

  Designating the central part of town as a "Main Street" project... (See comment made during meeting.)

  Hikimoe is a wide street that would stand out in a town plan with little improvement (e.g., parking bays with trees). Improvements should include the removal of large planters and neglected dying trees on the sidewalks. At the corner of Hikimoe and Mokuola Streets is an empty lot that is owned by the State. With the State's permission, the lot could be used for as a parking facility or developed as a community mini park. Preference is a mini park, would fit nicely with the Civic Center across the street and new library presently under construction. Some of the improvements on Hikimoe Street could be done immediately.

  Upon completion of the improvements to the canal between the Waipahu district and the Civic Center, the area surrounding the park should be landscaped with xeroscape plantings such as bougainvillaea.

  To carry out planning for the future of Waipahu and preserving its uniqueness, we still have to consider State property (e.g., Farrington Highway, Kunia Road) and surrounding interchanges that have not received proper maintenance and improvement to landscaping for decades.

  These are things that should be considered in the near future. The town of Waipahu has waited too long to consider long range planning. One example is the length of time it took in the planning and opening of our Civic Center.

OTHER CULTURAL AMENITIES

Community members were asked to identify any other cultural amenities that should be preserved and included in the development plan.

- WWII Memorial that is currently located in front of school.

- Railroad right of way.

- Fish ponds along the harbor, very much a part of native Hawaiian history. (Note: There are current efforts to request identification of the ponds with the intention for restoration).

- The Japanese Memorial and it's relationship to the immigration movement.

- The various churches in the immediate area (e.g., Hongwangi, etc.).

- Wai'hole Ditch.
- Waipahu Spring located approximately a half mile north of the Cultural Gardens. Kapuka na wai o' Ka'huku.
- Petroglyphs in the Waikele area.
- The Mill site and the Legend of the *Last Tapa Beater*...where legend and history come together.

WAIPAHU AS A TRANSPORTATION HUB

Community members were asked to comment on the thought of having Waipahu as a transporation hub.

- Important to note, that when considering this concept, that there currently is no access/adequate bus system that serves the community of affordable homes.

STREET WIDENING

Community members were asked to comment on the possibility of having streets widened.

- Along Waipahu Street: Maintaining the viability of businesses is a concern, to precedence over widening if both couldn't be accommodated. Three lanes are preferred, the third lane would serve as a turn/trunk lane.
- Hiapo Street: Concern that parking for businesses will be taken. Need to be sensitive to the merchants.
- Paiwa Street: If any trees need to be removed, would like to see them transplanted and/or not butchered.
- For Kunia Road, where there are plans currently slated for street widening, widening should continue all the way to the Golf Course.
- Farrington Highway: Should be developed using a "Boulevard" concept.
- There should be street widening done from Waipahu Depot Road to the Police Academy. The areas should also be cleaned, the canal should be included in the cleaning effort.

COMMERCIAL DEVELOPMENT

Community members were asked to comment on their preference of commercial development.

- Development should be less "commercial", more "parks".
- Strip development is acceptable, but would be appropriate only in specific areas and planned in a manner that is considerate of existing activities in the area.
- Consider having a stadium built in Waipahu.

The meeting adjourned after closing comments by Planning Director, Cheryl Soon.

APPENDIX C
THE ECONOMIC REVITALIZATION OF WAIPAHU

PREPARED FOR:
Planning Department,
City and County of Honolulu

PREPARED BY:
Decision Analysts Hawaii, Inc.

November 1995

PREFACE

PURPOSE

This report presents the results of a market and economic analysis that was performed in order to further the economic revitalization of Waipahu. The material was prepared for the Planning Department of the City and County of Honolulu for use in developing a "Waipahu Town Plan," which will guide land use and public improvements in the community.

GEOGRAPHIC FOCUS

The eventual Waipahu Town Plan will encompass that portion of Waipahu which is south of the H-1 Freeway between Kamehameha Highway on the east and Kunia Road/Ft. Weaver Road on the west (referred to in this report as "Old Waipahu"). The Town Plan does not include the remaining areas of Waipahu, which are referred to in this report as "New Waipahu;" that is, Village Park, Royal Kunia, Waikele, Waipio Gentry, Crestview, Sea View Village, and the Leeward Community College area.

As appropriate, the analysis covers not only Old Waipahu, but also the surrounding region, including New Waipahu, Central Oahu, Ewa, Aiea, Pearl City and beyond.

CONTENT AND ORGANIZATION

The report is divided into three parts. Part I presents an overview of the economic environment affecting Waipahu, including the changing economic role of Waipahu and the economic forces driving this change, current economic and social conditions, potential markets, and the economic resources and competitive advantages available to companies locating in Waipahu.

Part II presents an analysis of potential projects and economic activities including: light industry, commercial development, historic train operations, a Heritage District, a private school, medical facilities, a memorial park, private community-support activities, commercial recreation, City maintenance and support facilities, a Federal detention center, agriculture, residential development, and an elderly day-care center. The analysis includes a description of the project or economic activity, a market assessment, the development period, and the economic benefits and impacts.

Part III presents an economic assessment of the land-use scheme preferred by those members of the Waipahu community who participated in public forums.

METHODOLOGY

The potential projects and economic activities included in the analysis were suggested by members of the Waipahu community; the City; and the economic consulting firm on the project, Decision Analysts Hawaii, Inc. The projects and activities were selected and evaluated based on their market and economic feasibility, the employment opportunities they are likely to generate, and their impacts on existing businesses in the community. In general, projects and economic activities which attract shoppers into the community and stimulate sales in existing stores were preferred over activities which would compete with existing businesses and divert shoppers from them.

The preferred land-use scheme and its various economic components reflects considerable interaction with the Waipahu community. This included Waipahu Town Plan Task Force meetings, a community workshop held by the City and County of Honolulu, and meetings with various local organizations. The Waipahu Town Task Force was comprised of representatives of the community, but its meetings were open to all who wished to attend and participate.

Much of the analysis contained in this report is quantitative in nature, where numerical estimates—which are based on local and mainland studies—are used to help communicate the development potential of an activity or project, absorption rates, and economic impacts. The estimates should not be interpreted as precise pre-

dictions, but rather as order-of-magnitude estimates of what is likely to occur based on the various assumptions given in the report.

It should also be noted that all dollar amounts are expressed in terms of 1995 purchasing power. Figures after 1995 have *not* been increased to account for inflation.

PROJECT ANALYST

This market and economic analysis was conducted by Decision Analysts Hawaii, Inc. (DAHI) under subcontract to Wilson Okamoto & Associates, Inc., the lead consultant for developing the Waipahu Town Plan.

DAHI is an economic-consulting firm which specializes in economic development, land and housing economics, feasibility studies, valuations, market analysis, public policy analysis, and the economic impacts of projects.

CONTENTS

TABLES

EXECUTIVE SUMMARY

The land-use scheme preferred by the community for the economic development and revitalization of Waipahu is summarized in Table ES-1. It is based upon recommendations made and concerns expressed by those members of the Waipahu community who have been active in the Waipahu Town Task Force meetings and a community workshop held by the City and County of Honolulu.

The proposed land uses are organized by their location: (1) the Central Area of Waipahu (the former Oahu Sugar Co., Inc. mill site, Manager's Drive, the Waipahu Cultural Garden Park & Hawaii Plantation Village, Waipahu Street and Waipahu Depot Road); (2) the Civic Center area; (3) Farrington Highway; and (4) Waipio Peninsula.

For each proposed land use in the table, the information includes: (1) the approximate acreage required for the activity; (2) a market assessment of whether sufficient demand exists to achieve success given the location of the activity and competition from elsewhere; (3) the approximate development period (including the estimated time to transfer land ownership, design a project, obtain permits, arrange financing, construct the facilities, and have the project be absorbed or sold); (4) the estimated number of jobs which would result; and (5) an *order-of-magnitude* estimate of the additional retail sales which nearby stores would experience as an outcome of having new people come into the area (i.e., employees, visitors and shoppers).

At full development, the land-use scheme preferred by the community would result in an estimated 1,240 jobs, and additional retail sales at nearby stores of about $9 million per year. However, about 27% of the jobs and 35% of the retail sales are for activities for which a market is questionable.

Table ES-1. Waipahu Economic Development: Preferred Land-Use Scheme

PROPOSED LAND USES	Acres	Market	Development Period (years)	New Jobs (direct)	Additional Sales, Nearby Stores[1] ($ thousands per year)
CENTRAL AREA					
Residential Development (120 market-priced homes; about 480 people) (or in the same area, a Memorial Park employing about 5 people)	17.0	yes	4+	5	$ 600
Private School (1,000+ students)	20.0	probable	5+	100	$ 360
Light Industry	29.5	yes	10	300	$ 550
Commercial	10.0	yes	5	200	$ 2,780
YMCA	2.0	yes	4 to 6	30	$ 360
Filipino Community Center	2.0	yes	4 to 6	90	$ 190
Winter Baseball—Hans L'Orange Park (jobs are full-time equivalent, not per game	10.0	yes	0	5	$ 140
Heritage Park and Museum	6.0	yes	10+	20	$ 250
"Old Town" Commercial (revitalization and reorientation)	10.3	yes	5 to 10	100	$ 260
FARRINGTON HWY.—Revitalization/Reorientation of Commercial Areas	n.e.	yes	5 to 10	0	$ 0
WAIPIO PENINSULA					
"Old Town" Commercial	5.5	questionable	20+	110	$ 280
Fire Department—Vehicle Maintenance and Storage Facility	4.0	yes	2	18	$ 30
Police Department—Vehicle Maintenance Facility	1.2	yes	4	30	$ 50
Makai Park Hawaii (aquarium, water park, botanical gardens)	39.0	questionable	5	120	$ 2,680
Commercial Recreation (supervised group hiking, biking and horseback riding)	n.a.	probable	3	15	$ 220
Agriculture	1,200	questionable	1+	100	$ 220
TOTAL				1,240	$ 8,970

n.e.: not estimated n.a.: not applicable

1. Estimate of additional retail sales by nearby stores generated by new people in the area.

EXECUTIVE SUMMARY

The land-use scheme preferred by the community for the economic development and revitalization of Waipahu is summarized in Table ES-1. It is based upon recommendations made and concerns expressed by those members of the Waipahu community who have been active in the Waipahu Town Task Force meetings and a community workshop held by the City and County of Honolulu.

The proposed land uses are organized by their location: (1) the Central Area of Waipahu (the former Oahu Sugar Co., Inc. mill site, Manager's Drive, the Waipahu Cultural Garden Park & Hawaii Plantation Village, Waipahu Street and Waipahu Depot Road); (2) the Civic Center area; (3) Farrington Highway; and (4) Waipio Peninsula.

For each proposed land use in the table, the information includes: (1) the approximate acreage required for the activity; (2) a market assessment of whether sufficient demand exists to achieve success given the location of the activity and competition from elsewhere; (3) the approximate development period (including the estimated time to transfer land ownership, design a project, obtain permits, arrange financing, construct the facilities, and have the project be absorbed or sold); (4) the estimated number of jobs which would result; and (5) an *order-of-magnitude* estimate of the additional retail sales which nearby stores would experience as an outcome of having new people come into the area (i.e., employees, visitors and shoppers).

At full development, the land-use scheme preferred by the community would result in an estimated 1,240 jobs, and additional retail sales at nearby stores of about $9 million per year. However, about 27% of the jobs and 35% of the retail sales are for activities for which a market is questionable.

Table ES-1. Waipahu Economic Development: Preferred Land-Use Scheme

PROPOSED LAND USES	Acres	Market	Development Period (years)	New Jobs (direct)	Additional Sales, Nearby Stores[1] ($ thousands per year)
CENTRAL AREA					
Residential Development (120 market-priced homes; about 480 people)	17.0	yes	4+	5	$ 600
(or in the same area, a Memorial Park employing about 5 people)					
Private School (1,000+ students)	20.0	probable	5+	100	$ 360
Light Industry	29.5	yes	10	300	$ 550
Commercial	10.0	yes	5	200	$ 2,780
YMCA	2.0	yes	4 to 6	30	$ 360
Filipino Community Center	2.0	yes	4 to 6	90	$ 190
Winter Baseball—Hans L'Orange Park (jobs are full-time equivalent, not per game)	10.0	yes	0	5	$ 140
Heritage Park and Museum	6.0	yes	10+	20	$ 250
"Old Town" Commercial (revitalization and reorientation)	10.3	yes	5 to 10	100	$ 260
FARRINGTON HWY—Revitalization/Reorientation of Commercial Areas	n.e.	yes	5 to 10	0	$ 0
WAIPIO PENINSULA					
"Old Town" Commercial	5.5	questionable	20+	110	$ 280
Fire Department—Vehicle Maintenance and Storage Facility	4.0	yes	2	18	$ 30
Police Department—Vehicle Maintenance Facility	1.2	yes	4	30	$ 50
Makai Park Hawaii (aquarium, water park, botanical gardens)	39.0	questionable	5	120	$ 2,680
Commercial Recreation (supervised group hiking, biking and horseback riding)	n.a.	probable	3	15	$ 220
Agriculture	1,200	questionable	1+	100	$ 220
TOTAL				1,240	$ 8,970

n.e.: not estimated
n.a.: not applicable
1. Estimate of additional retail sales by nearby stores generated by new people in the area.

PART I

THE ECONOMIC ENVIRONMENT

INTRODUCTION

Presented in the following sections is an overview of the economic environment affecting Waipahu, including the changing economic role of Waipahu and the economic forces driving this change, current economic and social conditions, potential markets, and the economic resources and competitive advantages available to companies locating in Waipahu.

THE CHANGING ECONOMIC ROLE OF WAIPAHU

Historic Changes

The nature of Waipahu's economy has evolved over the past century and continues to evolve. In the late 1800s, economic activity in Waipahu centered around fishing and wetland farming. Following the creation of Oahu Sugar Co., Ltd. (OSCo) in 1897, Waipahu evolved into a typical plantation town made up of stores and plantation camps near the sugar mill. During the first half of the 1900s, sugar was the driving force behind the growth and change in Waipahu's economy, population, ethnic composition, land-use patterns, transportation system, and other physical and social conditions. The economic importance of sugar has declined in recent decades and OSCo ceased operating in 1995, but Waipahu's heritage as a plantation town continues to define the identity of the community, and the sugar mill stack remains the most prominent landmark in town.

In more recent decades, Waipahu evolved into a community which houses a great many commuters (about 90% of the workforce holds jobs outside the immediate area) and a commercial and light-industry center serving surrounding communities. The forces driving these changes were (1) development of nearby military facilities (Pearl Harbor, Schofield Barracks, Barbers Point Naval Air Station, etc.) and their support businesses, with most of the growth occurring before and during World War II; (2) growth in tourism and their support businesses starting in the 1960s; and (3) major road improvements (the widening of Farrington Highway and new freeways) which made it possible for residents to commute to distant jobs, and enabled businesses in Waipahu to service other communities.

Recent and Continuing Changes

Closure of OSCo and the Growth of Diversified Agriculture

The economic role of Waipahu continues to evolve. The most visible change was the contraction and eventual closure of OSCo in early 1995. In the early 1980s, OSCo farmed over 18,000 acres of land and employed over 800 workers.[1] By 1992, it was farming just 10,800 acres and employed only about 350 workers.[2]

The contraction of OSCo resulted from the fallowing of high-cost fields and urbanization to accommodate Oahu's growing population. This urbanization occurred because new freeways and other road improvements have made it possible for the region to become a reasonable commute to jobs in the downtown area, and because government policies have directed urban development to the sugarcane fields of Ewa. The eventual closure of OSCo was caused by U.S. sugar prices that were simply too low to allow profitable operations. The low U.S. sugar prices resulted from a number of factors, one of the most important of which was technological advances which led to competition from lower-cost high-fructose corn syrup and low-calorie NutraSweet (aspartame).

Currently, a number of farmers are experimenting with various diversified-agriculture crops on a portion of the land that was released due to the closure of OSCo.

New Low-Cost Retail Stores

A major change affecting established stores in Waipahu has been the introduction of large nation-wide retail-store chains which can sell goods profitably at costs significantly lower than those of local stores. This expansion of large chain stores results from technological advances which have transformed retail trade throughout the nation. Bar-code scanners, computers, faxes, satellite and fiber-optic communications, transportation, etc., have made it possible for the chain stores to: (1) monitor

consumer purchases nationwide so as to determine the quantity and identity of goods to be ordered; (2) buy in bulk at low cost; (3) combine goods destined to the same location, thereby reducing shipping costs; (4) deliver goods to individual stores when needed, thereby reducing warehousing costs; and (5) reduce staffing, primarily at the middle-management level.[3]

New stores in or near Waipahu include: (1) power centers featuring low-cost factory outlets and specialty stores (e.g., Waikele Center), (2) low-cost warehouse stores (e.g., Costco/Price Club and Sam's Club), and (3) discount stores (KMart and Wal-Mart). These new stores are attracting shoppers from throughout Oahu, including a great many visitors who are bused in from Waikiki to shop at Waikele Center.

Established stores that compete directly against these new ones often are unable to match the lower prices and, as a result, are forced to change their mix of goods and services, or must close. In Waipahu, two prominent general-merchandise stores are no longer in operation: Arakawas which employed about 100 workers, and Gem which will be replaced by Daiei.

Not all stores are adversely affected, however. Specialty and "niche" stores which do not compete against the new chains may realize an increase in sales because of the new customers who are attracted to the area by the new stores.

New power centers elsewhere on Oahu are likely to divert customers away from Waikele and from other shopping opportunities in Waipahu. In particular, the planned Kapolei power center will provide regional competition, and the Factory Outlet at the Dole Cannery, which is under construction less than 5 miles from Waikiki, will be favorably located for attracting visitors.

Regional Growth

Waipahu is centrally located with respect to much of the residential, resort, commercial and industrial development that is projected for Oahu (see section entitled "Regional Growth and Potential Markets"). This presents opportunities for businesses located in Waipahu to serve the growing number of nearby residents, visitors, and other businesses.

Such opportunities have already been demonstrated. Stores and businesses currently serving the surrounding region include (1) retail stores located in Waikele, at the west end of Waipahu and, more recently, at Royal Kunia; and (2) numerous light-industry businesses in Waipio Gentry and at the west end of Waipahu.

Opening of the H-3 Freeway

The opening of the H-3 Freeway will expand opportunities for certain stores and businesses in Waipahu. In particular, Kailua and Kaneohe residents will be able to travel more quickly and conveniently to Waikele. At the same time, it will be more convenient for certain Waipahu businesses to service the windward side.

Military Changes

Federal cutbacks in defense expenditures and on-going closures of military bases have raised concerns about the military presence in Hawaii and its long-standing contributions to Hawaii's economy. A cutback in military personnel would reduce the sales of goods and services for many businesses, including those in Waipahu. This concern was heightened by the recent closure of the nearby Barbers Point Naval Air Station (BPNAS).

However, because of Hawaii's strategic mid-Pacific location, little overall change is anticipated in the level of the military presence in Hawaii. In fact, a number of military units have been reassigned to Hawaii from the Philippines, California and elsewhere following the closure of bases there. Also, the BPNAS facilities will continue to house military personnel assigned to other bases.

The economic impacts on Waipahu businesses that result in changes in the level of military activity are expected to be small relative to the economic impacts caused by the economic and population growth that is occurring in the surrounding region.

ECONOMIC AND SOCIAL CONDITIONS: 1980 AND 1990

To provide insight into the economic and social character of Waipahu, Tables 1 and 2 show selected data from the 1980 and 1990 census regarding economic and social conditions there.[4] Table 1 also shows the average annual growth between 1980 and 1990, and 1990 data for Old Waipahu and New Waipahu. Table 2 shows 1990 data for twelve areas which comprise Old Waipahu and New Waipahu (see the top of each column for the name of each area). As relevant, both tables show comparisons to 1990 Oahu data.

Table 1. Waipahu and Oahu Census Data: 1980 and 1990

ITEM	WAIPAHU 1980	WAIPAHU 1990 Old[1]	WAIPAHU 1990 New[2]	WAIPAHU 1990 Total	WAIPAHU Annual Growth	OAHU 1990
POPULATION	33,927	31,364	19,931	51,295	1,737	836,231
Distribution		61.1%	38.9%	100.0%		
Population, by Age						
Pre-school Age, 4 and under	3,392	2,640	2,109	4,749	136	61,168
School Age, 5 to 17	8,359	6,540	3,832	10,372	201	143,328
Working Age, 18 to 64	20,239	18,884	13,380	32,264	1,203	540,250
Retirement Age, 65 and over	1,937	3,300	610	3,910	197	91,485
Distribution						
Pre-school, 4 and under	10.0%	8.4%	10.6%	9.3%		7.3%
School Age, 5 to 17	24.6%	20.9%	19.2%	20.2%		17.1%
Working Age, 18 to 64	59.7%	60.2%	67.1%	62.9%		64.6%
Retirement Age, 65 and over	5.7%	10.5%	3.1%	7.6%		10.9%
Population, by Race						
Filipino	13,211	14,340	4,211	18,551	534	119,053
Japanese	7,257	5,568	6,122	11,690	443	198,732
White	5,053	3,659	5,262	8,921	387	264,767
Hawaiian	2,912	3,567	1,524	5,091	218	90,174
Other	5,494	4,230	2,812	7,042	155	163,505
Distribution						
Filipino	38.9%	45.7%	21.1%	36.2%	30.7%	14.2%
Japanese	21.4%	17.8%	30.7%	22.8%	25.5%	23.8%
White	14.9%	11.7%	26.4%	17.4%	22.3%	31.7%
Hawaiian	8.6%	11.4%	7.6%	9.9%	12.5%	10.8%
Other	16.2%	13.5%	14.1%	13.7%	8.9%	19.6%
Population, by Place of Birth						
Native Born, Hawaii	19,736	18,980	11,960	30,940	1,120	453,359
Native Born, Other State or Overseas	5,347	4,019	5,004	9,023	368	251,910
Foreign Born	8,844	8,365	2,967	11,332	249	130,962
Distribution						
Native Born, Hawaii	58.2%	60.5%	60.0%	60.3%	64.5%	54.2%
Native Born, Other State or Overseas	15.8%	12.8%	25.1%	17.6%	21.2%	30.1%
Foreign Born	26.1%	26.7%	14.9%	22.1%	14.3%	15.7%

1. Old Waipahu includes communities below the H-1 Freeway and west of Kamehameha Highway.
2. New Waipahu includes communities above the H-1 Freeway and east of Kamehameha Highway: Village Park, Royal Kunia, Waikele, Waipio Gentry, Crestview, and Leeward Community College.

Table 1. Waipahu and Oahu Census Data: 1980 and 1990
(continued)

ITEM	WAIPAHU 1980	WAIPAHU 1990 Old[1]	WAIPAHU 1990 New[2]	WAIPAHU 1990 Total	WAIPAHU Annual Growth	OAHU 1990
LABOR FORCE AND EMPLOYMENT						
Labor Force	16,259	15,683	12,237	27,920	1,166	463,572
Armed Forces	1,653	626	1,276	1,902	25	53,549
Civilian Labor Force	14,606	15,057	10,961	26,018	1,141	410,023
Employed	13,745	14,214	10,661	24,875	1,113	395,811
Unemployed	861	843	300	1,143	28	14,212
Unemployment Rate	5.9%	5.6%	2.7%	4.4%		3.5%
Working-Age Population in Labor Force	80.3%	83.0%	91.5%	86.5%		85.8%
Civilian Employment, by Type of Employer						
Private Company	9,927	11,043	7,124	18,167	824	285,194
City Government	417	316	347	663	25	11,627
State Government	1,111	1,013	948	1,961	85	39,454
Federal Government	1,872	1,248	1,861	3,109	124	36,548
Self-Employed	397	569	357	926	53	21,743
Unpaid Family Workers	21	25	24	49	3	1,245
Distribution						
Private Company	72.2%	77.7%	66.8%	73.0%	74.0%	72.1%
City Government	3.0%	2.2%	3.3%	2.7%	2.2%	2.9%
State Government	8.1%	7.1%	8.9%	7.9%	7.6%	10.0%
Federal Government	13.6%	8.8%	17.5%	12.5%	11.1%	9.2%
Self-Employed	2.9%	4.0%	3.3%	3.7%	4.8%	5.5%
Unpaid Family Workers	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%
Civilian Employment, by Industry						
Agriculture, Forestry and Fishery	279	299	106	405	13	6,068
Construction and Mining	1,344	1,202	763	1,965	62	28,678
Manufacturing	1,712	1,272	820	2,092	38	24,908
Transportation, Communications and Utilities	981	1,147	1,297	2,444	146	37,740
Wholesale Trade	536	658	569	1,227	69	15,457
Retail Trade (including eating and drinking)	2,953	3,307	1,778	5,085	213	76,799
Finance, Insurance and Real Estate	812	871	854	1,725	91	32,575
Personal Services (including hotel)	1,198	1,295	534	1,829	63	25,006
Other Services	2,369	3,113	2,535	5,648	328	112,680
Public Administration	1,561	1,050	1,405	2,455	89	35,880

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Table 1. Waipahu and Oahu Census Data: 1980 and 1990
(continued)

ITEM	WAIPAHU 1980	WAIPAHU 1990 Old[1]	WAIPAHU 1990 New[2]	WAIPAHU 1990 Total	WAIPAHU Annual Growth	OAHU 1990
Civilian Employment, by Industry (continued)						
Distribution						
Agriculture, Forestry and Fishery	2.0%	2.1%	1.0%	1.6%	1.1%	1.5%
Construction and Mining	9.8%	8.5%	7.2%	7.9%	5.6%	7.2%
Manufacturing	12.5%	8.9%	7.7%	8.4%	3.4%	6.3%
Transportation, Communications and Utilities	7.1%	8.1%	12.2%	9.8%	13.1%	9.5%
Wholesale Trade	3.9%	4.6%	5.3%	4.9%	6.2%	3.9%
Retail Trade (including eating and drinking)	21.5%	23.3%	16.7%	20.4%	19.2%	19.4%
Finance, Insurance and Real Estate	5.9%	6.1%	8.0%	6.9%	8.2%	8.2%
Personal Services (including hotel)	8.7%	9.1%	5.0%	7.4%	5.7%	6.3%
Other Services	17.2%	21.9%	23.8%	22.7%	29.5%	28.5%
Public Administration	11.4%	7.4%	13.2%	9.9%	8.0%	9.1%
Civilian Employment, by Occupation						
Managerial and Professional Specialty	1,970	1,905	3,174	5,079	311	109,492
Technical, Sales and Administration Support	4,084	4,500	3,946	8,446	436	136,945
Service	2,705	3,305	1,411	4,716	201	66,462
Farming, Forestry and Fishing	328	361	116	477	15	6,113
Precision Craft	2,281	1,748	1,070	2,818	54	39,287
Operators, Fabricators and Laborers	2,377	2,395	944	3,339	96	37,512
Distribution						
Managerial and Professional Specialty	14.3%	13.4%	29.8%	20.4%	27.9%	27.7%
Technical, Sales and Administration Support	29.7%	31.7%	37.0%	34.0%	39.2%	34.6%
Service	19.7%	23.3%	13.2%	19.0%	18.1%	16.8%
Farming, Forestry and Fishing	2.4%	2.5%	1.1%	1.9%	1.3%	1.5%
Precision Craft	16.6%	12.3%	10.0%	11.3%	4.8%	9.9%
Operators, Fabricators and Laborers	17.3%	16.8%	8.9%	13.4%	8.6%	9.5%

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Table 1. Waipahu and Oahu Census Data: 1980 and 1990
(continued)

ITEM	WAIPAHU 1980	WAIPAHU 1990 Old[1]	WAIPAHU 1990 New[2]	WAIPAHU 1990 Total	WAIPAHU Annual Growth	OAHU 1990
COMMUTE TO WORK						
Commute to Jobs Outside Neighborhood	10,483	12,124	11,139	23,263	1,278	211,197
Percentage of Labor Force	71.0%	84.3%	95.7%	89.4%		48.3%
Travel Time to Work (average minutes)	26.5	29.2	32.1	30.4		24.8
Relative to Oahu Average		17.6%	29.4%	22.6%		
Vehicles per Household (average)	1.73	1.93	1.97	1.95		1.67
Relative to Oahu Average		15.6%	18.1%	16.8%		
INCOME						
Household Income, Annual Average	$25,214	$42,353	$53,700	$47,516	$2,230	$43,786
Relative to Oahu Average		-3.3%	22.6%	8.5%		
Per-Capita Income	$6,264	$10,888	$17,530	$13,469	$721	$16,256
Relative to Oahu Average		-33.0%	7.8%	-17.1%		
People in Households with Poverty-Level Incomes	4,043	4,116	325	4,441	40	60,093
Percent of Population	11.9%	13.1%	1.6%	8.7%		7.2%
EDUCATION						
Educational Attainment, 25 Years and Older						
Less than 9th Grade	4,206	3,606	578	4,184	-2	50,131
Grades 9 to 12, No Diploma	2,068	2,630	594	3,224	116	50,222
High School Graduate, No College	6,051	6,189	2,946	9,135	308	151,930
Some College	2,763	4,383	4,667	9,050	629	150,735
College, 4 Years or More	1,887	1,385	3,453	4,838	295	131,169
Total Population, Age 25 and Older	16,977	18,193	12,238	30,431	1,345	534,187
Distribution						
Less than 9th Grade	24.8%	19.8%	4.7%	13.7%		9.4%
Grades 9 to 12, No Diploma	12.2%	14.5%	4.9%	10.6%		9.4%
High School Graduate or Higher	63.0%	65.7%	90.4%	75.7%		81.2%
College, 4 Years or More	11.1%	7.6%	28.2%	15.9%		24.6%

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Table 1. Waipahu and Oahu Census Data: 1980 and 1990
(continued)

ITEM	WAIPAHU					OAHU
		1990			Annual	
	1980	Old[1]	New[2]	Total	Growth	1990
School Enrollment, K to 12						
Public	7,579	5,561	2,831	8,392	81	110,708
Private	813	600	816	1,416	60	24,770
Total School Enrollment, K to 12	8,392	6,161	3,647	9,808	142	135,478
Distribution						
Public	90.3%	90.3%	77.6%	85.6%	57.4%	81.7%
Private	9.7%	9.7%	22.4%	14.4%	42.6%	18.3%
English Language Skills, Age 5 and Over						
Speak English Well or Very Well	28,247	26,495	17,361	43,856	1,561	736,891
Speak English Poorly	2,359	2,229	461	2,690	33	38,172
Total Population, Age 5 and Over	30,606	28,724	17,822	46,546	1,594	775,063
Distribution						
Speak English Well or Very Well	92.3%	92.2%	97.4%	94.2%	97.9%	95.1%
Speak English Poorly	7.7%	7.8%	2.6%	5.8%	2.1%	4.9%
HOUSING						
Households	8,261	7,587	6,334	13,921	566	265,625
People per household	4.03	4.13	3.15	3.66	3.17	3.02
Housing Units						
Owner-Occupied	4,486	3,884	4,673	8,557	407	137,893
Renter-Occupied	3,775	3,656	1,875	5,331	158	127,411
Vacant	252	172	211	383	13	16,379
Total Units	8,513	7,712	6,559	14,271	576	281,683
Distribution						
Owner-Occupied	52.7%	50.4%	71.2%	60.0%	70.7%	49.0%
Renter-Occupied	44.3%	47.4%	25.5%	37.4%	27.0%	45.2%
Vacant	3.0%	2.2%	3.2%	2.7%	2.3%	5.8%
Housing Values, Medians						
Value, Owner-Occupied Units	$118,700			$262,900	$14,420	$281,500
Relative to Oahu Median				-6.8%		
Rents	$293			$698	$41	$663
Relative to Oahu Median				5.3%		

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Source: US Census.

Table 2. Waipahu Census Data, by Area: 1990

ITEM	Old Waipahu					
	August Ahrens Area	Waipio Peninsula	Waipahu Triangle, Lower	Waipahu Triangle, Upper	Sugar Mill Area	Waipahu Town
POPULATION	3,128	2,980	3,404	2,637	4,103	3,850
Distribution	6.1%	5.8%	6.6%	5.1%	8.0%	7.5%
Population, by Age						
Pre-school Age, 4 and under	211	130	304	124	260	409
School Age, 5 to 17	509	567	633	471	880	955
Working Age, 18 to 64	1,969	1,774	2,059	1,666	2,386	2,144
Retirement Age, 65 and over	439	509	408	376	577	342
Distribution						
Pre-school, 4 and under	6.7%	4.4%	8.9%	4.7%	6.3%	10.6%
School Age, 5 to 17	16.3%	19.0%	18.6%	17.9%	21.4%	24.8%
Working Age, 18 to 64	62.9%	59.5%	60.5%	63.2%	58.2%	55.7%
Retirement Age, 65 and over	14.0%	17.1%	12.0%	14.3%	14.1%	8.9%
Population, by Race						
Filipino	1,673	1,304	2,378	1,617	2,656	1,483
Japanese	732	848	408	503	559	519
White	226	334	147	265	384	399
Hawaiian	290	229	292	89	274	460
Other	207	265	181	163	230	989
Distribution						
Filipino	53.5%	43.8%	69.8%	61.3%	64.7%	38.5%
Japanese	23.4%	28.5%	12.0%	19.1%	13.6%	13.5%
White	7.2%	11.2%	4.3%	10.0%	9.4%	10.4%
Hawaiian	9.3%	7.7%	8.6%	3.4%	6.7%	11.9%
Other	6.6%	8.9%	5.3%	6.2%	5.6%	25.7%
Population, by Place of Birth						
Native Born, Hawaii	1,938	1,969	1,854	1,514	2,128	2,314
Native Born, Other State or Overseas	266	280	242	187	297	600
Foreign Born	924	731	1,308	936	1,678	936
Distribution						
Native Born, Hawaii	62.0%	66.1%	54.5%	57.4%	51.9%	60.1%
Native Born, Other State or Overseas	8.5%	9.4%	7.1%	7.1%	7.2%	15.6%
Foreign Born	29.5%	24.5%	38.4%	35.5%	40.9%	24.3%

Table 2. Waipahu Census Data, by Area: 1990

(continued)

ITEM	Old Waipahu (continued)			New Waipahu		
	Waipahu Gardens	Waipahu Industrial Area	Waipahu Town Center, Robinson Hgts	Leeward College Area	Waipio Gentry, Crestview	Village Park, Waikele
POPULATION	3,105	2,813	5,344	526	11,812	7,593
Distribution	6.1%	5.5%	10.4%	1.0%	23.0%	14.8%
Population, by Age						
Pre-school Age, 4 and under	116	435	651	79	1,244	786
School Age, 5 to 17	618	773	1,134	50	2,020	1,762
Working Age, 18 to 64	2,030	1,560	3,296	364	8,205	4,811
Retirement Age, 65 and over	341	45	263	33	343	234
Distribution						
Pre-school, 4 and under	3.7%	15.5%	12.2%	15.0%	10.5%	10.4%
School Age, 5 to 17	19.9%	27.5%	21.2%	9.5%	17.1%	23.2%
Working Age, 18 to 64	65.4%	55.5%	61.7%	69.2%	69.5%	63.4%
Retirement Age, 65 and over	11.0%	1.6%	4.9%	6.3%	2.9%	3.1%
Population, by Race						
Filipino	1,242	482	1,507	103	2,115	1,993
Japanese	1,129	154	716	205	3,926	1,991
White	181	644	1,079	111	3,405	1,736
Hawaiian	210	702	1,021	45	745	734
Other	343	831	1,021	62	1,621	1,139
Distribution						
Filipino	40.0%	17.1%	28.2%	19.6%	17.9%	26.2%
Japanese	36.4%	5.5%	13.4%	39.0%	33.2%	26.2%
White	5.8%	22.9%	20.2%	21.1%	28.8%	22.9%
Hawaiian	6.8%	25.0%	19.1%	8.6%	6.3%	9.7%
Other	11.0%	29.5%	19.1%	11.8%	13.7%	15.0%
Population, by Place of Birth						
Native Born, Hawaii	2,279	1,949	3,035	361	7,048	4,551
Native Born, Other State or Overseas	186	590	1,371	122	3,329	1,553
Foreign Born	640	274	938	43	1,435	1,489
Distribution						
Native Born, Hawaii	73.4%	69.3%	56.8%	68.6%	59.7%	59.9%
Native Born, Other State or Overseas	6.0%	21.0%	25.7%	23.2%	28.2%	20.5%
Foreign Born	20.6%	9.7%	17.6%	8.2%	12.1%	19.6%

Table 2. Waipahu Census Data, by Area: 1990

(continued)

ITEM	Old Waipahu					
	August Ahrens Area	Waipio Peninsula	Waipahu Triangle, Lower	Waipahu Triangle, Upper	Sugar Mill Area	Waipahu Town
LABOR FORCE AND EMPLOYMENT						
Labor Force	1,660	1,464	1,741	1,449	2,057	1,709
Armed Forces	25	9	59	13	56	34
Civilian Labor Force	1,635	1,455	1,682	1,436	2,001	1,675
Employed	1,557	1,382	1,559	1,338	1,896	1,583
Unemployed	78	73	123	98	105	92
Unemployment Rate	4.8%	5.0%	7.3%	6.8%	5.2%	5.5%
Working-Age Population in Labor Force	84.3%	82.5%	84.6%	87.0%	86.2%	79.7%
Civilian Employment, by Type of Employer						
Private Company	1,222	1,069	1,297	1,010	1,487	1,207
City Government	24	25	0	46	63	60
State Government	118	131	77	105	130	111
Federal Government	118	79	113	115	140	136
Self-Employed	67	78	72	55	76	69
Unpaid Family Workers	8	0	0	7	0	0
Distribution						
Private Company	78.5%	77.4%	83.2%	75.5%	78.4%	76.2%
City Government	1.5%	1.8%	0.0%	3.4%	3.3%	3.8%
State Government	7.6%	9.5%	4.9%	7.8%	6.9%	7.0%
Federal Government	7.6%	5.7%	7.2%	8.6%	7.4%	8.6%
Self-Employed	4.3%	5.6%	4.6%	4.1%	4.0%	4.4%
Unpaid Family Workers	0.5%	0.0%	0.0%	0.5%	0.0%	0.0%
Civilian Employment, by Industry						
Agriculture, Forestry and Fishery	30	42	70	60	12	28
Construction and Mining	144	124	153	113	124	156
Manufacturing	135	117	132	119	290	111
Transportation, Communications and Utilities	77	86	109	99	144	156
Wholesale Trade	59	83	60	56	68	72
Retail Trade (including eating and drinking)	310	251	352	249	461	427
Finance, Insurance and Real Estate	135	119	82	48	99	73
Personal Services (including hotel)	201	92	198	140	156	189
Other Services	358	392	315	345	417	267
Public Administration	108	76	88	111	125	124

Table 2. Waipahu Census Data, by Area: 1990

(continued)

ITEM	Old Waipahu (continued)			New Waipahu		
	Waipahu Gardens	Waipahu Industrial Area	Waipahu Town Center, Robinson Hgts	Leeward College Area	Waipio Gentry, Crestview	Village Park, Waikele
LABOR FORCE AND EMPLOYMENT						
Labor Force	1,679	1,119	2,805	338	7,427	4,472
Armed Forces	0	145	285	47	826	403
Civilian Labor Force	1,679	974	2,520	291	6,601	4,069
Employed	1,599	896	2,404	284	6,402	3,975
Unemployed	80	78	116	7	199	94
Unemployment Rate	4.8%	8.0%	4.6%	2.4%	3.0%	2.3%
Working-Age Population in Labor Force	82.7%	71.7%	85.1%	92.9%	90.5%	93.0%
Civilian Employment, by Type of Employer						
Private Company	1,264	662	1,825	181	4,143	2,800
City Government	23	36	39	6	192	149
State Government	114	90	137	66	547	335
Federal Government	145	73	329	21	1,281	559
Self-Employed	53	35	64	6	225	126
Unpaid Family Workers	0	0	10	4	14	6
Distribution						
Private Company	79.0%	73.9%	75.9%	63.7%	64.7%	70.4%
City Government	1.4%	4.0%	1.6%	2.1%	3.0%	3.7%
State Government	7.1%	10.0%	5.7%	23.2%	8.5%	8.4%
Federal Government	9.1%	8.1%	13.7%	7.4%	20.0%	14.1%
Self-Employed	3.3%	3.9%	2.7%	2.1%	3.5%	3.2%
Unpaid Family Workers	0.0%	0.0%	0.4%	1.4%	0.2%	0.2%
Civilian Employment, by Industry						
Agriculture, Forestry and Fishery	37	0	20	10	42	54
Construction and Mining	105	43	240	42	476	245
Manufacturing	160	44	164	23	560	237
Transportation, Communications and Utilities	153	79	244	16	819	462
Wholesale Trade	60	42	158	0	339	230
Retail Trade (including eating and drinking)	447	263	547	50	1,026	702
Finance, Insurance and Real Estate	137	55	125	28	469	357
Personal Services (including hotel)	136	53	150	0	285	249
Other Services	257	223	539	78	1,474	983
Public Administration	107	94	217	37	912	456

Table 2. Waipahu Census Data, by Area: 1990

(continued)

ITEM	Old Waipahu					
	August Ahrens Area	Waipio Peninsula	Waipahu Triangle, Lower	Waipahu Triangle, Upper	Sugar Mill Area	Waipahu Town
Civilian Employment, by Industry (continued)						
Distribution						
Agriculture, Forestry and Fishery	1.9%	3.0%	4.5%	4.5%	0.6%	1.8%
Construction and Mining	9.2%	9.0%	9.8%	8.4%	6.5%	9.9%
Manufacturing	8.7%	8.5%	8.5%	8.9%	15.3%	7.0%
Transportation, Communications and Utilities	4.9%	6.2%	7.0%	7.4%	7.6%	9.9%
Wholesale Trade	3.8%	6.0%	3.8%	4.2%	3.6%	4.5%
Retail Trade (including eating and drinking)	19.9%	18.2%	22.6%	18.6%	24.3%	27.0%
Finance, Insurance and Real Estate	8.7%	8.6%	5.3%	3.4%	5.2%	4.6%
Personal Services (including hotel)	12.9%	6.7%	12.7%	10.5%	8.2%	10.7%
Other Services	23.0%	28.4%	20.2%	25.8%	22.0%	16.9%
Public Administration	6.9%	5.5%	5.6%	8.3%	6.6%	7.8%
Civilian Employment, by Occupation						
Managerial and Professional Specialty	238	271	148	158	223	197
Technical, Sales and Administration Support	562	363	436	417	617	420
Service	359	282	395	319	469	411
Farming, Forestry and Fishing	30	57	60	53	48	21
Precision Craft	172	179	176	182	220	188
Operators, Fabricators and Laborers	196	230	326	209	319	346
Distribution						
Managerial and Professional Specialty	15.3%	19.6%	9.4%	11.8%	11.8%	12.4%
Technical, Sales and Administration Support	36.1%	26.3%	28.0%	31.2%	32.5%	26.5%
Service	23.1%	20.4%	25.3%	23.8%	24.7%	26.0%
Farming, Forestry and Fishing	1.9%	4.1%	5.1%	4.0%	2.5%	1.3%
Precision Craft	11.0%	13.0%	11.3%	13.6%	11.6%	11.9%
Operators, Fabricators and Laborers	12.6%	16.6%	20.9%	15.6%	16.8%	21.9%

Table 2. Waipahu Census Data, by Area: 1990
(continued)

ITEM	Old Waipahu (continued)			New Waipahu		
	Waipahu Gardens	Waipahu Industrial Area	Waipahu Town Center, Robinson Hgts	Leeward College Area	Waipio Gentry, Crestview	Village Park, Waikele
Civilian Employment, by Industry (continued)						
Distribution						
Agriculture, Forestry and Fishery	2.3%	0.0%	0.8%	3.5%	0.7%	1.4%
Construction and Mining	6.6%	4.8%	10.0%	14.8%	7.4%	6.2%
Manufacturing	10.0%	4.9%	6.8%	8.1%	8.7%	6.0%
Transportation, Communications and Utilities	9.6%	8.8%	10.1%	5.6%	12.8%	11.6%
Wholesale Trade	3.8%	4.7%	6.6%	0.0%	5.3%	5.8%
Retail Trade (including eating and drinking)	28.0%	29.4%	22.8%	17.6%	16.0%	17.7%
Finance, Insurance and Real Estate	8.6%	6.1%	5.2%	9.9%	7.3%	9.0%
Personal Services (including hotel)	8.5%	5.9%	6.2%	0.0%	4.5%	6.3%
Other Services	16.1%	24.9%	22.4%	27.5%	23.0%	24.7%
Public Administration	6.7%	10.5%	9.0%	13.0%	14.2%	11.5%
Civilian Employment, by Occupation						
Managerial and Professional Specialty	231	132	309	69	2,007	1,096
Technical, Sales and Administration Support	508	282	895	90	2,418	1,438
Service	339	257	474	47	737	627
Farming, Forestry and Fishing	18	13	41	10	41	65
Precision Craft	232	48	351	54	636	380
Operators, Fabricators and Laborers	271	164	334	14	563	367
Distribution						
Managerial and Professional Specialty	14.4%	14.7%	12.9%	24.3%	31.3%	27.6%
Technical, Sales and Administration Support	31.8%	31.5%	37.2%	31.7%	37.8%	36.2%
Service	21.2%	28.7%	19.7%	16.5%	11.5%	15.8%
Farming, Forestry and Fishing	1.1%	1.5%	1.7%	3.5%	0.6%	1.6%
Precision Craft	14.5%	5.4%	14.6%	19.0%	9.9%	9.6%
Operators, Fabricators and Laborers	16.9%	18.3%	13.9%	4.9%	8.8%	9.2%

Table 2. Waipahu Census Data, by Area: 1990
(continued)

ITEM	Old Waipahu					
	August Ahrens Area	Waipio Peninsula	Waipahu Triangle, Lower	Waipahu Triangle, Upper	Sugar Mill Area	Waipahu Town
COMMUTE TO WORK						
Commute to Jobs Outside Neighborhood	1,372	1,131	1,336	1,074	1,591	1,309
Percentage of Labor Force	87.9%	83.3%	85.4%	81.7%	83.3%	84.9%
Travel Time to Work (average minutes)	31.1	26.0	29.0	29.7	28.5	30.5
Relative to Oahu Average	25.4%	4.6%	17.1%	19.6%	15.0%	23.1%
Vehicles per Household (average)	2.34	1.83	2.26	2.57	2.12	1.75
Relative to Oahu Average	40.1%	9.6%	35.3%	53.9%	26.9%	4.8%
INCOME						
Household Income, Annual Average	$47,910	$36,378	$49,641	$52,847	$52,361	$34,660
Relative to Oahu Average	9.4%	-16.9%	13.4%	20.7%	19.6%	-20.8%
Per-Capita Income	$11,784	$12,103	$10,840	$12,233	$11,534	$8,462
Relative to Oahu Average	-27.5%	-25.5%	-33.3%	-24.7%	-29.0%	-47.9%
People in Households with Poverty-Level Incomes	236	276	359	151	376	692
Percent of Population	7.5%	9.3%	10.5%	5.7%	9.2%	18.0%
EDUCATION						
Educational Attainment, 25 Years and Older						
Less than 9th Grade	455	396	536	446	735	359
Grades 9 to 12, No Diploma	195	421	252	165	257	395
High School Graduate, No College	686	566	506	529	693	815
Some College	462	378	547	414	628	318
College, 4 Years or More	223	199	148	127	204	127
Total Population, Age 25 and Older	2,021	1,960	1,989	1,681	2,517	2,015
Distribution						
Less than 9th Grade	22.5%	20.2%	26.9%	26.5%	29.2%	17.8%
Grades 9 to 12, No Diploma	9.6%	21.5%	12.7%	9.8%	10.2%	19.7%
High School Graduate or Higher	67.8%	58.3%	60.4%	63.7%	60.6%	62.5%
College, 4 Years or More	11.0%	10.2%	7.4%	7.6%	8.1%	6.3%

Table 2. Walpahu Census Data, by Area: 1990

(continued)

ITEM	Old Walpahu (continued)			New Walpahu		
	Waipahu Gardens	Waipahu Industrial Area	Waipahu Town Center, Robinson Hgts	Leeward College Area	Waipio Gentry, Crestview	Village Park, Waikele
COMMUTE TO WORK						
Commute to Jobs Outside Neighborhood	1,276	726	2,309	—	7,018	4,121
Percentage of Labor Force	82.1%	77.6%	87.5%	—	99.1%	97.2%
Travel Time to Work (average minutes)	29.2	26.1	30.4	31.7	30.7	33.8
Relative to Oahu Average	17.7%	5.4%	22.7%	27.8%	23.8%	36.3%
Vehicles per Household (average)	2.54	1.16	1.54	2.01	1.88	2.17
Relative to Oahu Average	52.1%	-30.5%	-7.8%	20.4%	12.6%	29.9%
INCOME						
Household Income, Annual Average	$57,776	$23,863	$37,503	$40,914	$53,265	$55,664
Relative to Oahu Average	32.0%	-45.5%	-14.3%	-6.6%	21.6%	27.1%
Per-Capita Income	$13,460	$7,396	$10,650	$14,706	$18,618	$16,030
Relative to Oahu Average	-17.2%	-54.5%	-34.5%	-9.5%	14.5%	-1.4%
People in Households with Poverty-Level Incomes	124	972	930	10	182	133
Percent of Population	4.0%	34.6%	17.4%	1.9%	1.5%	1.8%
EDUCATION						
Educational Attainment, 25 Years and Older						
Less than 9th Grade	326	104	249	45	321	212
Grades 9 to 12, No Diploma	228	243	473	26	321	247
High School Graduate, No College	823	556	1,015	65	1,700	1,181
Some College	445	252	939	141	2,674	1,852
College, 4 Years or More	168	9	180	74	2,344	1,035
Total Population, Age 25 and Older	1,990	1,164	2,856	351	7,360	4,527
Distribution						
Less than 9th Grade	16.4%	8.9%	8.7%	12.8%	4.4%	4.7%
Grades 9 to 12, No Diploma	11.5%	20.9%	16.6%	7.4%	4.4%	5.5%
High School Graduate or Higher	72.2%	70.2%	74.7%	79.8%	91.3%	89.9%
College, 4 Years or More	8.4%	0.8%	6.3%	21.1%	31.8%	22.9%

Table 2. Walpahu Census Data, by Area: 1990

(continued)

ITEM	Old Walpahu					
	August Ahrens Area	Waipio Peninsula	Waipahu Triangle, Lower	Waipahu Triangle, Upper	Sugar Mill Area	Waipahu Town
School Enrollment, K to 12						
Public	457	489	546	338	714	830
Private	33	35	37	89	168	62
Total School Enrollment, K to 12	490	524	583	427	882	892
Distribution						
Public	93.3%	93.3%	93.7%	79.2%	81.0%	93.0%
Private	6.7%	6.7%	6.3%	20.8%	19.0%	7.0%
English Language Skills, Age 5 and Over						
Speak English Well or Very Well	2,657	2,613	2,832	2,281	3,456	3,104
Speak English Poorly	260	237	268	232	387	337
Total Population, Age 5 and Over	2,917	2,850	3,100	2,513	3,843	3,441
Distribution						
Speak English Well or Very Well	91.1%	91.7%	91.4%	90.8%	89.9%	90.2%
Speak English Poorly	8.9%	8.3%	8.6%	9.2%	10.1%	9.8%
HOUSING						
Households	731	811	690	555	895	866
People per household	4.28	3.65	4.93	4.75	4.55	4.45
Housing Units						
Owner-Occupied	570	456	408	405	565	260
Renter-Occupied	162	323	263	181	307	650
Vacant	14	0	23	0	0	39
Total Units	746	779	694	586	872	949
Distribution						
Owner-Occupied	76.4%	58.5%	58.8%	69.1%	64.8%	27.4%
Renter-Occupied	21.7%	41.5%	37.9%	30.9%	35.2%	68.5%
Vacant	1.9%	0.0%	3.3%	0.0%	0.0%	4.1%
Housing Values, Medians						
Value, Owner-Occupied Units	$243,700	$209,400	$264,100	$238,800	$278,200	$187,500
Relative to Oahu Median	-13.4%	-25.6%	-6.2%	-15.2%	-1.2%	-33.4%
Rents	$757	$562	$651	$772	$538	$583
Relative to Oahu Median	14.2%	-15.2%	-1.8%	16.4%	-18.9%	-12.1%

Table 2. Waipahu Census Data, by Area: 1990
(continued)

ITEM	Old Waipahu (continued)			New Waipahu		
	Waipahu Gardens	Waipahu Industrial Area	Waipahu Town Center, Robinson Hgts	Leeward College Area	Waipio Gentry, Crestview	Village Park, Waikele
School Enrollment, K to 12						
Public	540	680	967	34	1,535	1,262
Private	54	41	81	4	385	427
Total School Enrollment, K to 12	594	721	1,048	38	1,920	1,689
Distribution						
Public	90.9%	94.3%	92.3%	89.5%	79.9%	74.7%
Private	9.1%	5.7%	7.7%	10.5%	20.1%	25.3%
English Language Skills, Age 5 and Over						
Speak English Well or Very Well	2,810	2,238	4,504	432	10,314	6,615
Speak English Poorly	179	140	189	15	254	192
Total Population, Age 5 and Over	2,989	2,378	4,693	447	10,568	6,807
Distribution						
Speak English Well or Very Well	94.0%	94.1%	96.0%	96.6%	97.6%	97.2%
Speak English Poorly	6.0%	5.9%	4.0%	3.4%	2.4%	2.8%
HOUSING						
Households	710	881	1,448	190	4,014	2,130
People per household	4.37	3.19	3.69	2.77	2.94	3.56
Housing Units						
Owner-Occupied	618	15	587	104	2,846	1,723
Renter-Occupied	94	845	831	123	1,186	366
Vacant	0	43	53	18	55	138
Total Units	712	903	1,471	245	4,087	2,227
Distribution						
Owner-Occupied	86.8%	1.7%	39.9%	42.4%	69.6%	77.4%
Renter-Occupied	13.2%	93.6%	56.5%	50.2%	29.0%	16.4%
Vacant	0.0%	4.8%	3.6%	7.3%	1.3%	6.2%
Housing Values, Medians						
Value, Owner-Occupied Units	$234,400	$225,000	$194,500	$178,100	$283,700	$281,700
Relative to Oahu Median	-16.7%	-20.1%	-30.9%	-36.7%	0.8%	0.1%
Rents	$439	$583	$709	$519	$897	$1,001
Relative to Oahu Median	-33.8%	-12.1%	6.9%	-21.7%	35.3%	51.0%

Source: US Census.

Population

As indicated, Waipahu grew by an average of over 1,700 new residents per year during the 1980s, resulting in a 1990 population of nearly 51,300, of which 61.1% lived in Old Waipahu.

"Population, by Age" indicates a slightly younger population in Waipahu than that for Oahu as a whole. However, some of the individual areas in Old Waipahu have a relatively large number of retirees.

"Population, by Race" indicates a large concentration of Filipinos in Waipahu: 45.7% for Old Waipahu and 36.2% for all of Waipahu. Other large concentrations include Japanese (22.8%), White (17.4%) and Hawaiian (9.9%). Among the dozen areas, the distribution by race varies markedly.

"Population, by Place of Birth" indicates a large number of foreign-born living in Old Waipahu.

Labor Force and Employment

During the 1980s, the civilian labor force and employment grew by an average of over 1,100 new workers per year.

In 1990, the unemployment rate in Old Waipahu was somewhat higher than the Oahu average (5.6% versus 3.5%), but was lower in New Waipahu (2.7%). The highest unemployment rate (8%) was in the Waipahu Industrial Area.

The closing of OSCo and Arakawas contributed to unemployment in Waipahu. However, many of the affected workers have good job mobility; others are near retirement age; and a number of the workers live in communities other than Waipahu.

Regarding the 300+ former OSCo workers, many former field workers are heavy-equipment operators who have skills that are transferable to construction and trucking; many former mill workers are tradesmen who have skills that are transferable to construction and light industry; and many former office workers have skills that are transferable to other office jobs.

Regarding the approximately 100 former Arakawas workers, most have skills that are transferable to the new retail stores in Waikele and the surrounding region. These new stores have generated far more retail jobs than were lost.

"Employment, by Type of Employer" indicates that, for Old Waipahu in 1990, more workers than average were employed by private companies, and fewer than average were employed by government. For New Waipahu, the reverse was true.

"Employment, by Industry" indicates that, for Old Waipahu in 1990, more workers than average were employed in agriculture, forestry and fishery; construction and mining; manufacturing; wholesale trade; retail trade; and personal services (including hotels). Fewer workers than average were employed in transportation, communications and utilities; finance, insurance and real estate; other services; and public administration. However, among the individual areas in Waipahu, the distribution varies significantly.

"Employment, by Occupation" indicates that, for Old Waipahu in 1990, more workers than average were employed in services; farming, forestry and fishing; precision craft; and operators, fabricators and laborers. Fewer than average were employed in managerial and professional specialty; and technical, sales and administration support. Again, the distribution varies significantly among the individual areas.

Commute to Work

Many workers from Waipahu commute to jobs outside their neighborhoods: in 1990, 84.3% of those living in Old Waipahu commuted and 95.7% of those in New Waipahu commuted, versus an islandwide average of 48.3%. The number of commuters is significantly higher than in 1980 when only 71% of the Waipahu labor force worked outside their neighborhoods.

Average commute times take about one-half hour, or about 5 minutes longer than the islandwide average.

Commensurate with larger families (see subsection below entitled "Housing") and with the large number of people commuting to their jobs, Waipahu residents own more cars per household than average. However, car ownership is below average for two areas in Old Waipahu: the Waipahu Industrial Area and the Waipahu Town Center/Robinson Heights.

Income

In 1990, average household income in Old Waipahu was 3.3% below the islandwide average, although some areas had higher than average incomes. However,

because of large families, per-capita income of Old Waipahu was 33% below average. Also, 13.1% of the residents lived in households having poverty-level incomes versus 7.2% for all of Oahu.

Incomes were particularly low in two areas of Old Waipahu: Waipahu Town (per-capita income that was 47.9% below the Oahu average, with 18% of the people living in households having poverty-level incomes) and the Waipahu Industrial Area (per-capita income that was 54.5% below the Oahu average, with 34.6% of the people living in households having poverty-level incomes).

New Waipahu household and per-capita income levels were higher than the Oahu average.

Educational Attainment

In 1990, the residents of Old Waipahu had completed less education than residents of Oahu as a whole, relied more on public rather than private schools, and had a higher percentage of residents who "Speak English Poorly." The reverse was true for the residents of New Waipahu.

Educational attainment was particularly low in the Waipahu Industrial Area of Old Waipahu where less than 1% had 4 or more years of college, versus 24.6% for all of Oahu.

Housing

Families in Old Waipahu are larger than average: in 1990, they averaged 4.13 people per household, versus 3.15 in New Waipahu and an islandwide average of 3.02. However, family size varied significantly among the twelve areas of Waipahu.

For Old Waipahu, the 1990 percentage split between owner-occupied housing units versus rented units is similar to that for Oahu as a whole, while in New Waipahu a higher-than-average number of units were owner-occupied. Among the twelve areas, however, the split between owner-occupied units and rental units varied markedly: in the Waipahu Industrial Area, only 1.7% of the units were owner-occupied.

For all of Waipahu, the 1990 median value of owner-occupied units was 6.6% below the islandwide average, while rents were 5.3% higher than average. Among the twelve areas of Waipahu, housing values and rents varied significantly.

JOBS IN WAIPAHU

Table 3 shows the estimated number of jobs in Waipahu as of 1990, as opposed to the employment data in Tables 1 and 2 which pertain to workers who live in Waipahu but who may hold jobs outside the community.[5]

As indicated, there were over 12,300 jobs in Waipahu in 1990, of which over 80% were in Old Waipahu. However, with the opening of Waikele and new commercial areas in Royal Kunia, the job count has increased, with more of the jobs being in New Waipahu.

Calculations based on employment and commute data in Tables 1 and 2 indicated that slightly more than 20% of the jobs in Waipahu are filled by workers living in Waipahu.

REGIONAL GROWTH AND POTENTIAL MARKETS

Past growth and growth projected by the City and County of Honolulu for Waipahu, the surrounding region, and Oahu are shown in Table 4.[4,5] The information covers the decade years 1980 to 2020, and gives the average annual growth from 1980 to 1990, and from 1990 to 2020. The region includes Waipahu, Aiea, Pearl City, Mililani, Ewa, the Waianae Coast, Wahiawa, and the North Shore, all of which represent potential markets for Waipahu businesses serving regional demands. Estimates are provided of the resident population, housing units, visitor units, the average daily visitor census, and jobs.

Resident Population

Table 4 also shows that the resident population of Waipahu is projected to increase to about 71,900 people by the year 2020, or about 20,600 (40%) more people than in 1990. This amounts to an average annual growth of 687 new residents per year, which is 38% of the growth rate during the 1980s.

For Waipahu and the surrounding region, the resident population is projected to grow to about 461,000 people by the year 2020, or about 155,000 (51%) more people than in 1990. This amounts to an average annual growth of 5,169 new residents per year, which is about the same rate as that of the 1980s. Further, it represents about two-thirds of the island-wide growth.

Table 3. Waipahu Jobs: 1990

ITEM	Number			Distribution		
	Old[1]	New[2]	Total	Old[1]	New[2]	Total
Government, Military	40	322	362	0.4%	13.8%	2.9%
Government, Civilian	446	164	610	4.5%	7.0%	4.9%
Hotel	0	0	0	0.0%	0.0%	0.0%
Agriculture	165	60	225	1.6%	2.6%	1.8%
Transportation, Communications, and Utilities	401	89	490	4.0%	3.8%	4.0%
Industry	1,335	114	1,449	13.3%	4.9%	11.7%
Finance, Insurance and Real Estate	563	97	660	5.6%	4.2%	5.4%
Services	2,776	943	3,719	27.8%	40.4%	30.2%
Retail	3,494	343	3,837	34.9%	14.7%	31.1%
Construction	781	201	982	7.8%	8.6%	8.0%
TOTAL	10,001	2,333	12,334	100.0%	100.0%	100.0%
Distribution	81.1%	18.9%	100.0%			

1. Old Waipahu includes communities below the H-1 Freeway and west of Kamehameha Highway.
2. New Waipahu includes communities above the H-1 Freeway and east of Kamehameha Highway: Village Park, Royal Kunia, Waikele, Waipio Gentry, Crestview, and Leeward Community College.

Sources: Planning Department, City and County of Honolulu.

Table 4. Waipahu, Regional and Oahu Growth: 1980 to 2020

ITEM	Actual		Projected			Annual Growth	
	1980	1990	2000	2010	2020	'80 to '90	'90 to '20
RESIDENT POPULATION							
Waipahu	33,927	51,307	58,837	66,534	71,903	1,738	687
Aiea	30,084	32,323	33,431	33,731	33,849	224	51
Pearl City	42,577	47,033	50,063	57,363	62,098	446	502
Mililani	26,134	34,679	37,474	40,589	42,735	855	269
Ewa	35,585	42,913	74,318	102,969	124,256	733	2,711
Waianae Coast	31,487	37,411	41,595	45,966	48,155	592	358
Wahiawa	41,562	44,558	55,996	58,007	59,461	300	497
North Shore	13,061	15,660	16,134	17,544	18,501	260	95
Total Region	254,417	305,884	367,648	422,703	460,958	5,147	5,169
Share of Island Total	33.4%	36.6%	39.8%	41.8%	43.0%	69.8%	66.0%
Oahu	762,534	836,231	923,068	1,012,073	1,071,226	7,370	7,833
HOUSING UNITS							
Waipahu	8,513	14,268	16,874	20,343	22,760	576	283
Aiea	9,219	10,821	11,065	11,452	11,674	160	28
Pearl City	11,363	13,882	14,770	17,790	19,827	252	198
Mililani	8,003	10,744	11,919	13,328	14,308	274	119
Ewa	9,304	11,712	21,523	31,523	39,170	241	915
Waianae Coast	9,528	10,680	12,128	14,033	15,127	115	148
Wahiawa	10,674	11,270	15,175	16,438	17,329	60	202
North Shore	4,449	5,258	5,591	6,328	6,838	81	53
Total Region	71,053	88,635	109,045	131,235	147,033	1,758	1,947
Share of Island Total	28.3%	31.5%	34.5%	36.2%	37.2%	57.1%	51.4%
Oahu	250,866	281,683	315,650	362,380	395,193	3,082	3,784
VISITOR UNITS							
Aiea		141	144	163	188		2
Ewa		14	1,541	3,397	4,014		133
Waianae Coast		516	1,326	1,326	1,327		27
Wahiawa		10	10	10	10		0
North Shore		7	8	8	8		0
Total Region		688	3,029	4,904	5,547		162
Share of Island Total		1.9%	7.3%	10.2%	10.0%		26.3%
Oahu	34,334	36,932	41,286	47,915	55,417	260	616

Table 4. Waipahu, Regional and Oahu Growth: 1980 to 2020
(continued)

ITEM	Actual		Projected			Annual Growth	
	1980	1990	2000	2010	2020	'80 to '90	'90 to '20
REGIONAL VISITORS							
Daily Census[1]		877	3,862	6,253	7,072		207
Annual Visitors[2]		53,363	234,937	380,367	430,239		12,563
JOBS							
Waipahu		12,334	16,686	22,703	27,062		491
Government, Military		362	276	276	276		-3
Government, Civilian		610	610	610	610		0
Hotel		0	0	0	0		0
Agriculture		225	241	296	392		6
Transportation, Communications, and Utilities		490	586	778	892		13
Industry		1,449	1,538	1,954	2,589		38
Finance, Insurance and Real Estate		660	825	1,478	1,809		38
Services		3,719	5,793	8,302	9,990		209
Retail		3,837	5,538	7,031	8,036		140
Construction		982	1,279	1,978	2,468		50
Aiea		17,284	16,382	17,588	18,466		39
Pearl City		13,807	15,070	18,187	20,701		230
Mililani		3,308	3,877	5,743	7,186		129
Ewa		17,434	34,299	53,649	84,003		1,552
Waianae Coast		5,611	8,849	9,417	10,246		155
Wahiawa		23,963	28,510	30,875	32,854		296
North Shore		3,583	3,840	4,417	4,836		42
Total Region		97,344	127,513	162,579	185,354		2,934
Share of Island Total		19.3%	23.7%	26.5%	28.0%		55.5%
Oahu		504,076	537,057	612,438	662,533		5,282

1. Estimate based on 75% average occupancy and an average of 1.7 visitors per party.
2. Estimate based on an average stay of 6 days.

Sources: Planning Department, City and County of Honolulu, and US Census.

Population projections for Ewa indicate that it will grow significantly faster than it did during the 1980s, while Aiea, Mililani, and the North Shore will grow more slowly. Growth figures for Mililani may be conservative given its past history and the development momentum of Mililani Mauka.

The growth in the number of housing units in Waipahu and the surrounding region will roughly parallel its population growth.

Visitor Units and Daily Visitor Census

For the region, the number of hotel rooms and other visitor units are projected to increase to about 5,500 rooms by the year 2020, or about 4,900 more units than in 1990. The corresponding average daily census is projected to increase to about 7,100 visitors by the year 2020, or about 6,200 more visitors than in 1990. This corresponds to over 490,000 annual visitors to the region by the year 2020. Most of the increase in tourism will be due to the development of the Ko Olina Resort.

The planned development of 950 visitor units in Ewa Marina—which are not included in Table 4—would add about 1,200 more visitors to the daily census. Thus, by the year 2020, tourism in the region would grow to about 6,500 visitor units, about 8,300 daily visitors, and about 500,000 annual visitors.

In addition to visitors staying in the hotels in the region, a number of visitors from Waikiki can be expected to tour attractions in the region.

Jobs

The economy of Waipahu is projected to grow to provide over 27,000 jobs by the year 2020, or about 14,700 (119%) more jobs than in 1990—an increase of about 490 jobs per year. Most of this increase is expected to be in service; retail trade; construction; industry; and finance, insurance and real estate.

For the region, the economy is projected to provide over 185,000 jobs by the year 2020, or about 88,000 (90%) more jobs than in 1990, an increase of about 2,900 jobs per year. Over half of this job growth is projected to occur in Ewa.

Commercial and Industrial Development

Considerable commercial and industrial development will accompany residential and resort development in the region. Much of the commercial development will locate at Kapolei which has been designated by the City as a secondary urban center. Ongoing developments in the 890-acre town center include shopping centers, a new power center (which includes factory outlets), entertainment centers, office complexes, government offices and facilities, medical clinics and offices, private schools, day-care centers, etc.

Also, industry will continue to expand at the Campbell Industrial Park, the Kapolei Business/Industrial Park, and other areas near the Barbers Point Deep Draft Harbor.

Additional commercial and/or industrial development will locate in Waipahu, Mililani, Royal Kunia, Ewa Marina, and elsewhere in the region.

Small Boat Activities

Ewa will become the largest small-boat center in the State once Ewa Marina and Ko Olina are developed. At 1,400 slips, Ewa Marina will have 70% more slips than the Ala Wai Harbor; it will also offer a boat hoist, on-trailer dry storage, and launching ramps. Ko Olina will provide 400 slips and launching facilities.

Regional Business Opportunities

The tremendous growth occurring in the region surrounding Waipahu presents business opportunities to supply goods and services to residents, visitors, boaters, construction companies, retail stores, office complexes, government offices, medical clinics, and other businesses. As discussed below, Waipahu presents locational advantages for businesses which service the region.

COMPARATIVE ADVANTAGES AND RESOURCES OF WAIPAHU

The comparative locational and other advantages offered by Waipahu that are applicable to a variety of economic activities and projects are discussed below. Additional advantages and resources which are applicable to specific activities and projects are discussed in Part II.

Locational Advantages

Waipahu has important locational advantages which have contributed to the economic success of commercial activities at Waikele and to light industry in Waipahu. In particular, Waipahu's central location allows businesses there to serve downtown Honolulu, Central Oahu, and Ewa. Furthermore, Waipahu is centrally located with respect to the economic and population growth that is projected to occur in Ewa and Central Oahu.

Similarly, Waipahu's central location has contributed to strong housing sales because it is comparatively convenient for commuting to jobs in downtown Honolulu, Central Oahu, and Ewa.

Not only is Waipahu centrally located, but access to and from the surrounding communities is excellent via the H-1 and H-2 Freeways, Farrington Highway, Kamehameha Highway, Fort Weaver Road, and Kunia Road.

Vacant Land

Considerable vacant land is available in Waipahu for economic development. A total of about 102.5 acres are available in the center of town at the mill site and in the Manager's Drive area: the mill site covers about 62.9 acres which is owned by Amfac/JMB, and the Manager's Drive area covers about 39.6 acres which is owned by the City and County of Honolulu.

At the base of Waipio Peninsula, over 40 usable acres are available between the OR&L right-of-way and the blast zone for the West Loch Naval Magazine. Ownership is split between the City and the State, but the State land is under long-term lease to the City.

On the lower part of Waipio Peninsula, about 1,200 acres of U.S. Navy land once leased to OSCo are now available for other crops, and possibly for other low-intensity activities that are consistent with the restrictions of the blast zone.

Cultural Attractions

Waipahu has a number of cultural attractions, one of the most significant of which is the Waipahu Cultural Garden Park & Hawaii Plantation Village. Other

attractions include the old-town character of Waipahu, the sugar mill and stack, the right-of-way of the former OR&L which could be used for a restored train operation, Hawaiian petroglyphs and fishponds, and distinctive churches.

Recreational Resources

Recreational resources include, but are not limited to, Hans L'Orange Park and its baseball facilities, Waipahu District Park, Ted Makalena Golf Course, other city parks, and vacant shoreline land on Waipio Peninsula.

Labor Force

As of 1990, Waipahu had a large workforce of over 26,000 civilian workers. Presumably, most of these workers would be available to fill suitable jobs in Waipahu since about 90% of them commute for an average of about 30 minutes to jobs outside the community (see Table 1).

Furthermore, as indicated by the employment data shown in Table 1, the workforce possesses a broad range of skills.

PART II

ANALYSIS OF POTENTIAL PROJECTS AND ACTIVITIES

INTRODUCTION

A market and economic analysis of a number of potential projects and activities is summarized in the following sections. Proposed by the Waipahu Town Plan Task Force, the community, the City, and the economic consultant, these projects and activities cover: light industry, commercial development, historic train operations, a Heritage District, a private school, medical facilities, a memorial park, private community-support activities, commercial recreation, City maintenance and support facilities, a Federal detention center, agriculture, residential development, and an elderly day-care center.

For each proposed project or activity, the analysis covers, as appropriate: (1) a description of the project or activity, including possible locations; (2) a market assessment; (3) the approximate development period, including the estimated time to transfer land ownership, design a project, obtain permits, arrange financing, construct the facilities, and have the project be absorbed or sold; and (4) economic benefits and impacts. The analysis is abbreviated for those projects and activities which were not supported by the community or were subsequently planned for other areas.

Anticipated absorption rates, potential employment, and the impact on sales by nearby stores are *order-of-magnitude* estimates.

LIGHT INDUSTRY

Description

Amfac/JMB has proposed the Waikele Light Industrial Subdivision, which would be a 56-lot, 29.5-acre project located mauka of the sugar mill.[6] Lots would

range in size from 16,000 square feet (sf) to 69,696 sf, and would average 18,400 sf. Entry would be via Paiwa Street, and the project would be buffered from Jack Hall Housing by walls and landscaping.

A light-industry project could be somewhat larger or smaller than the one proposed by Amfac/JMB, and could extend into the Manager's Drive area.

Businesses which typically locate in light-industry areas include:

- construction companies which would use vacant lots to store materials, equipment, and partially fabricated structures;
- companies that support construction and housing, such as those engaged in masonry, plumbing, electrical systems, metal working, glass, painting, floor coverings, roofing, awnings, cabinet making, carpeting, window shades, air conditioners, alarm systems, yard supplies, furniture assembly and repair, appliance assembly and repair, etc.;
- automotive maintenance and repair shops covering mechanical systems, electrical systems, radiators, air conditioners, body repair and painting, upholstering, tires, glass-tinting, alarm systems, etc.;
- other businesses such as signage companies, printers, film processors, food distributors, clothing and footwear manufacturers, manufacturers of sporting equipment (rackets, clubs, backpacks, boats, surfboards, kayaks, canoes, paddles, etc.); and
- warehouse and storage operations for nearby businesses and residents.

When light-industry areas are designed and managed appropriately, they can be reasonably attractive—such as the Gentry Business Park in Waipio, the Mililani Technology Park, and the Campbell Industrial Park.

Market Assessment

Prices of Industrial Land

Relatively small parcels of land in Waipahu which have been improved for light industry sell for about $50 per sf, or over $2 million per acre.[7] Such high prices are a market signal that demand is strong.

Demand for Industrial Land (Absorption Rate)

The annual absorption of industrial land for the area covering Waipahu to Aiea—which is the central area for servicing downtown Honolulu, Central Oahu, and Ewa—averaged about 16 acres from 1980 to 1994.[5] At this absorption rate, the proposed 29.5-acre Waikele Light Industrial Subdivision would provide about 2.2 years of additional inventory for the area.

Reflecting Hawaii's business cycles, average annual absorption was faster during the 1980s than it was during the early 1990s: about 19 acres versus about 9 acres.

In Ewa, absorption was about 26 acres per year during the 1980s, but slowed considerably during the early 1990s.[5]

About 25% of the 103.5-acre Mililani Technology Park near Wahiawa has been developed, and additional acreage has been sold but remains vacant. This project, which has been on the market since 1986, restricted tenants to high-technology activities until 1992 when zoning was changed to industrial/commercial mixed use. Demand has been demonstrated, but insufficient data exist to determine a meaningful absorption rate.

For the future, additional industrial-zoned land will be needed in the region to: (1) accommodate economic and population growth on Oahu, (2) compensate for reductions in industrial acreage elsewhere on Oahu due to conversions to commercial and other uses, (3) accommodate companies that are forced to move due to high lease rents near downtown, and (4) provide a sufficient supply of vacant industrial land in order to foster competition and affordable land prices.

Regarding displacement of light-industry activities from other areas, the redevelopment of Kakaako mauka of Ala Moana Boulevard will affect about 450 acres of land, much of which is being used for light industry.[8] Although replacement space for light-industry activities will be provided as part of the Kakaako redevelopment, many businesses in the area may choose to move due to (1) high lease rents, property values, and property taxes, and/or (2) their incompatibility with nearby high-rise residential and office development.

In addition, planned expansion of the Honolulu International Airport will displace about 10 acres of light industry by the year 2012.[9]

Supply of Vacant Industrial Land: Waipahu to Aiea

Existing Inventory

A new light-industry park in Waipahu would have to compete with other similar projects in the region. The Gentry Business Park—which would be the closest competitor having a similar product—has about 66 acres of vacant land available in fee, of which about 31.2 acres are zoned industrial and 34.8 acres are zoned industrial/commercial mixed use.[5]

Other vacant land in the region that is zoned industrial includes 2.4 acres in Waipahu below Farrington Highway, 9.5 acres of improved but vacant land in Halawa Valley, and another 15.7 acres of raw land in Halawa Valley that is not subdivided and lacks roads and utilities. This accounting excludes vacant industrial land controlled by the State's Animal Quarantine Station in Halawa Valley, land owned by Hawaiian Electric Co. at the Waiau power plant, and land at the former C&H refinery in Aiea to be developed by Crazy Shirts, Inc.

Thus, assuming eventual development of the raw land in Halawa Valley, the existing supply of vacant industrial land amounts to about 94 acres. About 70% of this inventory is in the Gentry Business Park.

At past absorption rates of 16 acres per year, this supply amounts to about 6 years of inventory. However, absorption could proceed more rapidly since commercial development is allowed within a portion of the Gentry Business Park.

Planned and Proposed Industrial Projects

Light-industry projects which have been proposed for the region include the above-mentioned 29.5-acre Waikele Light Industrial Subdivision by Amfac/JMB, a 123-acre project at Royal Kunia Phase II, up to a 60-acre project at Gentry Waiawa, and a 35-acre business park at Manana on City-owned land.[10]

If approved and developed, these projects would increase the supply of land available in the region for light industry by about 248 acres, for a total supply of about 342 acres. At the past absorption rate, this amounts to about 21 years of inventory.

Supply of Vacant Industrial Land: Mililani and Ewa

In addition, 487 acres of vacant industrial land are available in Ewa.[5] Most of this is located in two Campbell Estate projects: the Campbell Industrial Park and the 130-acre Kapolei Business/Industrial Park, Phase I. Some of the vacant land is available in the 65-acre Kenai Industrial Park by Barbers Point Harbor.

Planned and proposed light-industry projects in Ewa include Phase II of the Kapolei Business/Industrial Park (670 acres) and Gentry Ewa (12 acres).

In Central Oahu near Wahiawa, more than half of the 103.5-acre Mililani Technology Park remains available, and another 115 acres are planned for development.[5]

Locational Advantages

Because Waipahu is centrally located with good access to surrounding areas, it is in an excellent location for light-industry companies that service customers in downtown Honolulu, Central Oahu, Ewa, the North Shore, and Waianae (see Part I, "Comparative Advantages and Resources of Waipahu, Locational Advantages"). Also, with the opening of the H-3 Freeway, companies in Waipahu will be able to service the windward side more easily. Furthermore, Waipahu's central location is superior to that of light-industry projects in Ewa and the Mililani Technology Park.

The comparative locational advantages of Waipahu for light industry are evidenced by the proven success of light industry in the western part of Waipahu below Farrington Highway, and in the Gentry Business Park.

Development Period

The development period for a new light-industry park in Waipahu will depend upon the size of the project, future business cycles and market conditions, how aggressively the lots are marketed, and how competitively they are priced.

Assuming a 30-acre project, development could take about 10 years. This estimate is based on the assumptions that (1) about 2 years would be required to design the project, obtain the necessary approvals and permits, arrange financing, and install the infrastructure; and (2) land will be occupied at the average absorption rate of about 4 acres per year. This absorption rate is based on that of the Gentry Business

Park, and reflects the fact that other projects in the region have reached full development, or are near full development.

State Enterprise Zone

The designation of Waipahu as part of an Enterprise Zone would make it an even more attractive location for light industry, would accelerate the occupancy of a light-industry park in Waipahu, and would enhance the economic feasibility of such a park.

The State Enterprise Zone Program was established in order to stimulate the growth of business and the hiring of "low-income" employees in areas having above-average unemployment and/or below-average income levels.[11] "Low-income" employees are those who earn less than 80% of the median income of the county prior to being hired by a business participating in the Enterprise Zone Program.

Businesses qualifying for this Program—many of which would locate in industrial parks—include those engaged in manufacturing, wholesaling, agriculture, and the repair and/or maintenance of tangible personal property. For new operations in an Enterprise Zone, at least 40% of a business's employees must have been "low-income" employees. For an established operation in an Enterprise Zone, the business must increase its average annual full-time employment by at least 5% during the first year of participation in the program, and at least 40% of the new workers must have been "low-income" employees. Furthermore, the number of these "low-income" employees must increase by 5% each year until at least 40% of the firm's full-time workers are former "low-income" employees.

Under this Program, qualifying businesses locating in designated Enterprise Zones are eligible for certain tax benefits and other benefits. State tax benefits include: (1) a 7-year exemption from general excise taxes on the gross proceeds from all businesses in the Enterprise Zone; (2) an 80% income-tax abatement the first year of participation, decreasing 10% each year thereafter over the succeeding 6 years; and (3) an income tax credit in an amount equal to 80% of the unemployment taxes paid during the first year of participation, decreasing 10% each year thereafter over the succeeding 6 years.

For the City and County of Honolulu, benefits include a rebate on property taxes on all new construction for up to 2 years, and a waiver of fees on building and grading permits (required for new construction) for 7 years.

Up to six Enterprise Zones may be designated within a County. The Zones are nominated by the Counties for approval by the Governor, and must consist of one or more contiguous census tracts that meet either one or both of the following criteria based on 1990 U.S. Census data: (1) 25% or more of the populace of the area must have incomes below 80% of the median income of the County, and (2) the unemployment rate must be 1.5 times the State average.

For the City and County of Honolulu, four areas have been nominated for Enterprise Zones: (1) Central Oahu/Primary Urban Center Enterprise Zone of Waipahu, Pearl City, Waipio and Waiawa; (2) Central Oahu Enterprise Zone of Mililani Technology Park and Wahiawa; (3) Ewa Enterprise Zone of the Barbers Point Naval Air Station, Kapolei Business Park, Campbell Industrial Park and Barbers Point Deep Draft Harbor; and (4) the North Shore Enterprise Zone of Haleiwa and Waialua.

New and existing businesses which qualify for Enterprise Zones will have an added incentive to locate or relocate to industrial parks in these Enterprise Zones at the expense of those light-industry areas which lack the designation, such as Halawa Valley, Mapunapuna, the Airport, Sand Island, and Kalihi.

Economic Benefits and Impacts

Potential Employment

Based on 10 jobs per acre, a 30-acre light-industry park would generate approximately 300 jobs.[10] Many of these would be skilled or semi-skilled jobs, and would offer higher wages and salaries than the Oahu average.

Additional Sales by Nearby Stores

Through their purchase of goods and services, new employees in the area would increase the sales in nearby stores. For a 30-acre project, additional retail sales would amount to about $550,000 per year, based on daily local expenditures of $7 per employee working 5 days per week.[10]

However, new light-industry companies may compete with, and draw customers away from, some existing operations in Waipahu.

COMMERCIAL—MILL SITE

Description

Commercial use of about 10 acres of land has been proposed for the mill site. Although specific components of such a development are undetermined, it could be a business park based on a theme of a former sugar mill which incorporates industrial-style buildings, old equipment, photographs, the mill stack, etc. Activities could include a large discount specialty store; a neighborhood commercial center; building-supply showrooms; and auto dealerships and services.

Locational Advantages

The mill site is an excellent location for a number of potential commercial activities. It is centrally located for serving downtown Honolulu, Central Oahu, and Ewa, and access to freeways and highways is excellent (see Part I, "Comparative Advantages and Resources of Waipahu, Locational Advantages"). Also, the mill stack is a major landmark which would give a business park an identity and visibility, and would make it easy for people to find. These same attributes (location, access and visibility from the Freeway) contribute to the great success of the Waikele Center.

In many respects, the mill site is superior to the commercial areas being developed at Kapolei, particularly with respect to its central location. Depending upon how the mill site is developed, it is possible that some new retail stores would choose it over Kapolei.

Market Assessment

Discount Specialty Store

One possible business would be a large discount specialty store, such as a consumer electronics store featuring audio and video equipment, computers, software, cameras and other photography equipment, video games, etc. Unlike most other discount specialty stores, a consumer electronics store need not be located in a power

center with other discount stores. Also, the added competition would adversely impact few stores in Waipahu.

A regional population of about 250,000 people or more would be required to support such a store, with land requirements ranging from less than 3 acres to 12 acres or more.[10]

At least one major electronics store is searching for a site.

Neighborhood Commercial Center

A neighborhood commercial center would include convenience stores, video stores, beauty shops, stationery stores, florists, fast-food and family restaurants, animal clinics, travel agencies, television repair shops, service stations, small recreational centers, professional offices (physicians, dentists, attorneys, real estate agents), etc.

Given the store closures caused by the advent of the Waikele Center, it would appear that Waipahu has an adequate supply of local retail space. Furthermore, the population of Old Waipahu is not expected to increase significantly, and the larger new residential projects in the surrounding region include neighborhood commercial centers in their plans.

Nevertheless, opportunities exist for local retailing and services. For example, retail stores located in the western portion of Waipahu along Farrington Highway are supplying many of the needs of the residents of West Loch Estates (which lacks a retail center), Ewa Gentry, and other growing communities in Ewa.

Regarding the mill site, if new local retail stores were located there, they could supply many of the needs of the residents living in Waikele, since the Waikele Center lacks most of these types of stores. At the present time, Waikele residents must travel to Waipio Gentry or to other stores in the region to shop at local retail stores. The Waikele residents could reach the mill site easily via Manager's Drive or Paiwa Street.

About 5.5 acres of land would be needed for the retail stores. This estimate is based upon: serving about 2,500 families in Waikele and nearby portions of Waipahu, an average of four people per family, about 6 sf of space per person for local retail stores (excluding grocery stores and drugstores), and a floor-to-land ratio of 25%.[10]

Building-Supply Show Rooms

Another possibility is showrooms for construction and home-improvement businesses such as model kitchens and bathrooms, flooring materials, lighting fixtures and supplies, furniture, fabrics, Oriental rugs, artwork, etc. Related offices could house architects, structural engineers, interior designers, and other professionals associated with construction and home improvement.

The mill site is well-located for showrooms such as these, given its central location near new development in Central Oahu and Ewa, its access, and the prominently visible mill smokestack.

Based upon acreage used for showrooms at the Gentry Pacific Design Center on Nimitz Highway, about 2 acres of land would be required for showrooms.[10]

Auto Dealerships and Services

Auto dealerships and services are another possibility, given that the mill site is centrally located, access is excellent, and is easy to find for customers who are unfamiliar with the area. Furthermore, new communities in the region generally provide little or no space for dealerships and auto-service shops. Because of these factors, Farrington Highway and the connecting Kamehameha Highway have become centers for auto dealers and auto-service shops.

Demand in the region for such space is estimated at 1.6 acres per year. This estimate is based upon: a projected annual growth of about 5,000 new residents per year in areas west and north of Aiea, 3.5 sf per person, and a floor-to-land ratio of 25%.[10] An area of 10 acres amounts to about 6 years of inventory.

Excluded and Unlikely Activities

Market analyses were either not performed or were terminated for a number of possible commercial activities at the mill site. These activities, and the reasons for the abbreviated analyses, follow.

—*A large stand-alone discount center, warehouse operation, or home-improvement outlet*

These possibilities could succeed at the mill site, and would provide significant employment. A discount center, for example, provides about 250 full-

time jobs and 200 part-time jobs, with the hourly pay ranging from $9 for new hires to about $14, with an average of $12.[10]

However, such operations are not supported by the community because of concerns that existing stores would lose business, and traffic would increase.

—*A power center and factory outlets*

If the area were to be increased to about 35 acres, a power center similar in concept to the Waikele Center is another possibility. By the year 2010, sufficient demand will exist to support about five power centers on Oahu, assuming about 200,000 residents per center.[10] In many respects, the mill site would be superior to other existing and planned operations: Costco has too little land to be a power center; Sam's Club also has too little land, encompasses two levels, and has poor access for those traveling from town on the H-1 Freeway; and Kapolei is not as centrally located.

A power center was not supported by the community because of concerns that existing stores would lose business, and traffic would increase. This rejection carries with it the many specialty stores which would have accompanied a power center.

—*Regional mall and upscale department stores*

A new regional mall and upscale department stores were not considered as possibilities because of Waipahu's proximity to the Pearlridge Shopping Center, competition from the Waikele Center, and the power center and other shopping areas being constructed at Kapolei. Also, upscale stores would be incompatible with an adjacent light-industry project.

—*A large regional office complex*

A portion of the mill site could be used for offices which serve the local community (see subsection above entitled "Local Retail Stores and Services").

However, the marketability of a large regional office complex was not regarded as a realistic possibility in view of commitments made by the State, the County, banks and others to locate offices at Kapolei. Furthermore, Waipahu lacks the concentration of government, financial, legal, business and other professional services that are essential to the success of a regional office complex.

—*A large recreational complex*

Operators of large theater complexes and recreational parks are locating in Ewa and have expressed little interest in Waipahu.

Development Period

In view of the various acceptable and realistic possibilities for using 10 acres of commercial land, it could be developed within about 5 years. This is based on the assumptions that it would take about 2 years to design the project, obtain the necessary approvals and permits, arrange financing, and install the infrastructure; plus an additional 3 years to construct buildings and rent out the space. This is a conservative estimate given the possibility of a large electronics specialty store (from 3 acres to over 12 acres), existing and near-term demand for local retail stores (about 5.5 acres), the anticipated demand for building-supply show rooms (about 2 acres), and the possibility of automobile dealerships and service shops (regional demand at about 1.6 acres per year).

If a single, large project were attracted to the site, the entire area could be developed within a few years.

Economic Benefits and Impacts

<u>New Jobs</u>

Based on 20 jobs per acre, a 10-acre commercial project would generate approximately 200 jobs. [10]

<u>Additional Sales by Nearby Stores</u>

Additional retail sales by nearby stores which would be generated by new employees and shoppers in the area are estimated at $2.8 million per year. This is based on local daily expenditures of about $7 per employee and $2.50 per shopper, 250 shoppers per acre per day, and 7 days of operation per week.

Depending upon the types of stores and businesses which locate within a commercial project, some could compete with and draw customers away from some existing operations in Waipahu.

REVITALIZATION OF EXISTING COMMERCIAL AREAS

Description

Revitalization of the "Old Town" commercial area (Waipahu Depot Road, Waipahu Street and Paiwa Street) would include such physical improvements as road realignment, street widening, street landscaping, graffiti removal, the restoration of old buildings, the construction of new buildings and the addition of façades to modern buildings to reflect the "Old Town" style, etc.

Commercial areas along Farrington Highway would undergo similar revitalization, but without the "Old Town" theme.

These improvements would help attract customers to stores in Waipahu by improving vehicular access to Waipahu, traffic flow, and the appearance of the area.

Market Reorientation

In addition to making physical improvements to buildings and improving roads, some Waipahu retail operators may have to change their goods and services in order to (1) cope with the new competition in the region (particularly from the new discount stores offering much lower prices), and (2) take advantage of the growing numbers of consumers in Ewa and Central Oahu (see Part I, "Regional Growth and Potential Markets").

In view of the new economic environment, characteristics of smaller retail stores and commercial establishments which are likely to succeed in Waipahu include:

—*Speciality stores and certain commercial establishments which would be sought out by residents from throughout the region*

Examples include: car dealers; ethnic establishments (groceries, restaurants, videos, books, music, dance, travel, etc.); specialized sporting-goods stores (fishing, surfboards, kayaks, diving, kites, etc.); trophy shops; studios (dance, aerobics, karate, etc.); dance supplies (ballet, jazz, tap, ballroom, etc.); specialized hobby stores (trains, baseball cards, etc.); health services (chiropractor, acupuncture, massage, etc.); veterinarians; florists; beauty salons; tailors and seamstresses; repair stores (television, computers, appliances, watches, luggage, shoes); security alarm stores; locksmiths; etc.

As mentioned above, one of the major opportunities being addressed along Farrington Highway is the increasing numbers of automobile dealerships and auto-service shops that serve the growing communities in Ewa and Central Oahu. In most cases, these operations are not accommodated in the new shopping centers that are being developed in the region.

—*Stores delivering goods and services to the surrounding community*

Examples include: pizza operations, pool and spa supplies and services, insurance agents, dog and cat kennels with a pick-up service, etc.

—*Businesses supplying goods and services to other businesses*

Examples include: signage companies, printing companies, a bakery supplying markets and restaurants, paint stores, equipment rental, laundry services for hotels and restaurants, repair and maintenance companies, delivery companies, etc.

Development Period

A development period is not estimated since revitalization of existing commercial areas will be an on-going process.

Economic Benefits and Impacts

A principal objective of revitalizing the existing commercial areas in Waipahu is to help existing businesses maintain and improve their economic health by attracting new customers to Waipahu. Correspondingly, it is expected that the existing stores would capture a significant portion of the "Additional Sales of Nearby Stores," as discussed for each of the various projects and activities. These sales to new customers will help compensate for the loss of business to new discount stores in the region.

Given the competing forces of attracting new customers to Waipahu and the loss of business to the discount stores, it is assumed that the employment of existing stores and the "spillover" of sales to nearby stores will stay near their current levels.

However, it is assumed that one or more retail stores will occupy the Arakawas site and employ about 100 workers. These employees would generate about $260,000 in additional retail sales by nearby stores, based on local daily expenditures of about $7 per employee and 7 days of operation per week.

"OLD TOWN" COMMERCIAL—WAIPIO PENINSULA

Description

A new commercial area of 5.5 acres or more has been proposed for Waipahu Depot Road between Farrington Highway and the old OR&L railroad right-of-way. Conforming to the "Old Town" theme, the stores in this area would provide a more attractive entry to Waipio Peninsula.

Market Assessment

In order for stores along lower Waipahu Depot Road to succeed, a major attraction is needed on Waipio Peninsula. Without this, success is unlikely given the competition from nearby retail stores, and the relatively light traffic flow along this road.

The attraction being proposed which would generate the greatest demand for new stores along lower Waipahu Depot Road would be Makai Park Hawaii—a project for which success is uncertain (see "Makai Park Hawaii" below).

Assuming the successful development of Makai Park Hawaii and other projects planned for Waipio Peninsula, total retail sales in the nearby area would reach about $3.5 million per year, of which 77% would be generated by Makai Park Hawaii. If new stores along lower Waipahu Depot Road were to capture all the retail sales associated with these projects, then the land required for the stores would amount to only 1.6 acres, which is far less than the proposed 5.5-acre commercial development. The 1.6-acre land requirement is based on assumed sales of $200 per sf, and a floor-to-land ratio of 25%.[10]

Development Period

Given the lack of a market and the need to change some existing land uses in the area from light industry and residential to commercial, development is expected to take over 20 years.

Economic Benefits and Impacts

New Jobs

A new 5.5-acre commercial project would generate approximately 110 jobs, which is based on 20 jobs per acre.[10]

Additional Sales by Nearby Stores

About $280,000 in additional retail sales by nearby stores would be generated by new employees in the area. This is based on local daily expenditures of about $7 per employee and 7 days of operation per week. However, if the new stores are developed, they would compete with the existing stores in Waipahu.

HISTORIC TRAIN OPERATIONS

The restoration of historic train operations into Waipahu would be an highly beneficial complement to a Heritage District, which is discussed in the next section.

Historic Background

The Oahu Railway and Land Company (OR&L), which provided train service on Oahu from 1889 to 1947, was instrumental in the early success of OSCo and other sugar operations, and to the initial development of Waipahu and other communities.[12]

In 1950, the Federal government acquired a portion of the line for moving munitions and other items out to Lualualei. By 1974, the right-of-way was declared surplus and was transferred in 1980 to the State of Hawaii for Historic Places Guardianship. The main line between Ewa and Nanakuli was placed on the National Register of Historic Places in 1975.

Deed and other restrictions limit the use of the right-of-way to a non-profit train operation, bike path, and/or park.

Current Train Operations

Using volunteer help, the Hawaiian Railway Society (HRS) is restoring a portion of the old narrow-gauge main line of the OR&L, old locomotives, passenger cars, freight cars, and other equipment.

On Sundays, the HRS operates two 13-mile round-trip train rides lasting 1-1/2 hours, and costing $8 for adults and $5 for seniors and children. Starting at Ewa Villages and traveling west, the ride features former sugarcane fields, Fort Barrette, two ghost towns, Barbers Point Harbor, Ko Olina Resort, and Paradise Cove.

During the week, the HRS offers 45-minute train rides to students and special groups. Due to safety concerns during the work week, the train travels only up to Kalaeloa Boulevard (the access to Campbell Industrial Park), but does not cross it.

Plans for Physical Improvements

In the near term, the HRS plans to: renovate a second diesel locomotive to haul a passenger train; restore passenger cars and other rolling stock; install automated crossing signals and gates at Kalaeloa Boulevard and Barbers Point Access Road; reconstruct a loading platform; and construct the first phase of a maintenance building.

Over the long term, the HRS plans to: restore a steam locomotive; restore the track and five bridges out to Nanakuli; and construct a historic railroad station, museum, gift shop, restaurant, and additional maintenance facilities at the Ewa yard. The railroad track bed out to Nanakuli is in relative good condition, and the extended train ride will offer 3-1/2 miles of ocean views.

Potential Train Operation into Waipahu

The feasibility of extending train operations into Waipahu will also be explored by the HRS. The relevant parameters of such a study are discussed below.

The Appeal of a Train Ride into Waipahu

A half-hour, one-way historic train ride between Ewa Villages and Waipahu could feature the train ride itself (about 4 miles); seldom-seen views of Pearl Harbor's West Loch and old Hawaiian fishponds, tours of the Hawaii Plantation Village, a new sugar museum and a new train museum, gift shops, and dining at theme restaurants.

The appeal to visitors of taking a train ride into Waipahu would be enhanced by an extension of the line to the U.S.S. Arizona Visitor Center, which would combine the ride with the most popular visitor attraction on Oahu (about 1.5 million visitors per year); and would offer views of all three lochs of Pearl Harbor, U.S. Navy ships, and old Hawaiian fishponds.[13]

Potential Ridership

Once the HRS implements its planned improvements, the historic train rides in Ewa are likely to be very popular. This is based on the popularity of similar visitor-oriented historic train rides throughout the United States, Canada, Europe, and elsewhere.

For example, on Maui, the Lahaina-Kaanapali & Pacific Railroad attracts about 400,000 visitors per year, of which about two-thirds are one-way trips covering 4 miles.[14] Adult fares are $13 for a 1-hour round-trip ride, and $9 for a one-way trip. About two-thirds of the riders are Japanese visitors, most of whom are on day trips from Oahu.

Based on the Maui experience, historic train rides in Ewa are likely to attract as many as a half-million or more riders per year once planned improvements are in place.

Development Costs and Financing

The 4-mile extension of the track into Waipahu will be relatively expensive because of the cost of constructing a new track bed (which no longer exists on most of the route), purchasing and laying new track (about $1 million per mile), and purchasing and installing automated crossing signals and gates at Fort Weaver Road and Farrington Highway. The eventual cost could amount to $10 million or more.

Financing is likely to require a combination of government grants; private contributions from affected landowners, developers, and businesses; fund-raising activities; and possibly debt which would be serviced from operating revenues.

Development Period

It is likely that the extension of the track into Waipahu will occur 10 or more years into the future after most of the hotels at Ko Olina Resort and Ewa Marina are developed.

Economic Benefits and Impacts

The main economic benefit of restored train operations into Waipahu would be the attraction of a large number of people into Waipahu to patronize the Hawaii Plan-

tation Village, the new sugar museum/gift shop, and nearby stores. These impacts are discussed in the section that follows.

HERITAGE DISTRICT

Description

A Heritage District located in the center of Waipahu and having an old sugar-town theme would feature a period in Hawaiian history which witnessed some of the most dramatic changes in Hawaii's economic and cultural development, and which resulted in a unique blend of Polynesian, Western and Eastern cultures.

Physical components of the Heritage District would include the existing Waipahu Cultural Garden Park & Hawaii Plantation Village (including such additions as a school room, blacksmith's shop, manager's home, flumes, auditorium, etc.), the mill stack, a foot bridge which connects the Hawaii Plantation Village to the mill site, a new sugar museum/gift shop, a small restaurant serving ethnic food, the "Old Town" commercial areas on Waipahu Street and Waipahu Depot Road, an operating train, and possibly a trolley system.

The sugar museum/gift shop would be located at the mill site. Multimedia displays incorporating artifacts and old photographs could cover the cultivation of sugarcane, factory operations, the water system, the history of the plantation, the history of plantation labor, plantation life, etc. The Alexander & Baldwin Sugar Museum on Maui could serve as a model for a successful sugar museum.

Market Assessment

Potential Markets

The visitors to the new sugar museum/gift shop and the Waipahu Cultural Garden Park & Hawaii Plantation Village will include (1) visitors from the Ko Olina Resort, Ewa Marina, and Waikiki; and (2) students and residents from throughout Oahu and the State. By the year 2020, the surrounding region is expected to host over 500,000 visitors per year and over 150,000 additional residents (see Part I, "Regional Growth and Potential Markets" and Table 4).

For many visitors, the major draw of a Heritage District would be the train ride. However, a tour of the sugar museum and Hawaii Plantation Village would add interest and provide an activity while waiting for the train or after the train ride.

Some visitors may combine a train ride/cultural tour with a shopping trip to Waikele Center. Shopping at Waikele has turned out to be a major and unexpected attraction for Japanese visitors to Oahu, with an estimated one-third of them journeying to Waikele to take advantage of the large variety of goods and the comparatively low prices.[15] This amounts to an average of about 1,400 tourist shoppers per day. However, the number of visitors to Waikele is expected to drop significantly following the opening of the Factory Outlet at the Dole Cannery which will be similar to the Waikele Center and is much closer to Waikiki.

Anticipated Visitors

Without the train operation, an estimated 30,000 people per year would visit the sugar museum/gift shop and Waipahu Cultural Garden Park & Hawaii Plantation Village. This estimate is based on the attendance at such comparable locations as Queen Emma Summer Palace and the Mission Houses Museum which, in 1993, had 29,790 and 30,090 visitors respectively.[13] In this same year, attendance at the Waipahu Cultural Garden Park numbered 17,270 visitors.

With the train operating, the number of visitors to the sugar museum/gift shop and Waipahu Cultural Garden Park & Hawaii Plantation Village could increase to somewhere between 50,000 and 200,000 visitors per year, or even more. It is assumed here that there will be 100,000 visitors per year.

Economic Benefits and Impacts

Potential Employment

Assuming an average of $10 per person spent on admissions and purchases of gifts, food and beverages, 100,000 visitors would generate revenues of about $1 million per year.

These revenues could support about 20 full-time-equivalent jobs, assuming 80% of the revenues are spent on salaries, benefits and overhead which, in combination, would average $35,000 per job.

Additional Sales by Nearby Stores

Additional retail sales by nearby stores generated by employees and visitors to the sugar museum/gift shop, and Waipahu Cultural Garden Park & Hawaii Plantation Village are estimated at about $250,000. This is based on local daily expenditures of about $7 per employee and $2 per visitor, and 7 days of operation per week. Purchases from surrounding businesses are expected to be relatively small because most visitors are expected to arrive by train or bus, with few venturing beyond the Waipahu Cultural Garden Park.

PRIVATE SCHOOL

Description

A private school in Waipahu could offer Grades K through 12 and have an enrollment of about 1,000 students.[14,17] Land requirements would be about 20 acres, possibly located in the Manager's Drive area.

Market Assessment

The surrounding region (from Halawa to Waianae and up to the North Shore) has a large population of over 300,000 people. In addition, Ewa and Central Oahu are the fastest growing regions on Oahu (see Part I, "Regional Growth and Potential Markets" and Table 4). The region has few private schools, however. Consequently, many private-school students living in these areas must commute to schools in Central Honolulu.

Waipahu offers the locational advantages of having a central location and excellent access (see Part I, "Comparative Advantages and Resources of Waipahu, Locational Advantages"). Kapolei is a competing site, but it is not as centrally located as Waipahu.

Operators of private schools have expressed varying levels of interest in developing a private school in the area. Lanakila Baptist Church and School wants to consolidate its two existing operations into a single 4- to 5-acre site in Waipahu.[18] Grades K through 6 are offered at its Church facilities located on Waipahu Street, and Grades 7 through 12 are offered at its school in Ewa Villages. Current enrollment is about 300 students, which is evenly split between the two sites.

By the year 2000, Hawaii Baptist Academy plans to relocate its Waianae campus to either the Kapolei or Waipahu area, and expand its service to offer Grades K through 12.[16] Approximately 15 to 20 acres would be required.

The Catholic Diocese is considering the possibility of developing a high school on 14 acres of land in Kapolei, although their plans are on hold.[17] Also, the Kapolei site is regarded as too small; 20 acres is ideal. A Waipahu site would be considered if sufficient land were available.

The San Francisco District Office of Our Redeemer Lutheran School is considering the possibility of developing a new school in the Leeward area up to the high-school level.[19]

It should be noted that a private school already operates in Waipahu. St. Joseph School, located on Farrington Highway in Waipahu, offers Grades K through 8 to about 460 students.[20] However, it serves primarily the Waipahu community rather than the surrounding region; about 90% of the students are from Waipahu. There are no plans for expansion because enrollment is declining, although there are waiting lists for entrance into Kindergarten and Grade 8.

Development Period

An estimated 5 or more years would be required to attract and select a school, transfer the land ownership, design the school, obtain the necessary approvals and permits, raise funds, and build the facilities.

Economic Benefits and Impacts

Potential Employment

A private school offering Grades K through 12 to about 1,000 students would require a staff of about 100 people, including teachers, counselors, administrators, and maintenance personnel.[16,17]

Additional Sales by Nearby Stores

Additional retail sales by nearby stores which would be generated by new people in the area are estimated at about $360,000 per year. This order-of-magnitude estimate

is based upon local daily expenditures of about $5 per employee, $1 per student, and 240 days of school operation per year.

MEDICAL FACILITIES

Description

Medical facilities include full-service hospitals, clinics providing diagnostic services and out-patient care, and nursing hospitals providing long-term medical care.

Market Assessment

Anticipated Demand for Health Facilities

Health providers foresee a need for additional long-term nursing facilities, but State and Federal funding for them has diminished. They also foresee a need for additional medical facilities providing diagnostic services and out-patient care.

Locational Advantages

Because of its central location and access, Waipahu would be a good site for medical facilities. This is supported by the fact that the new St. Francis Medical Center West was built on the edge of Waipahu.

Planned Medical Facilities

A number of medical facilities are planned for the region surrounding Waipahu. In Ewa, the Kapolei Medical Mall is to be built across from the Kapolei Shopping Center on 9 to 10 acres of land provided by Campbell Estate.[21] Three 2- and 3-story buildings will provide 120,000 to 150,000 sf of space. Health providers may include The Queen's Medical Center, Kapiolani Medical Center, Straub Clinic & Hospital, Kuakini Medical Center, Kaiser Permanente, and St. Francis Medical Center.

Also in Ewa, St. Francis Medical Center West plans to develop the Aloha West Health Care Center next to its existing hospital.[22] This center will be a 148-bed nursing facility of 54,000 sf on 2 or 3 acres.

In Mililani Mauka, another center envisioned by St. Francis Medical Center is on hold due to financing problems.

Other than the possible facilities at Kapolei Medical Mall, neither Queen's nor Kuakini has current plans for a major hospital in the region.

Economic Benefits and Impacts

A 100-bed nursing facility would provide about 100 jobs and generate business for nearby stores which sell goods and services to employees of the medical facility.[23]

MEMORIAL PARK

Description

A 17-acre memorial park, which could be located in the Manager's Drive area, would include grave sites, but not a mortuary.

Market Assessment

One of the larger mortuaries on Oahu is searching for 20 to 60 acres of land in Central Oahu or Ewa for a memorial park.[10] The site must be relatively level with good access, and may be located on urban, agriculture, or conservation land.

The Manager's Drive area is an acceptable location for a memorial park given its access, and provided that the cost of the land is favorable. In the early 1990s, land to accommodate the expansion of the Mililani Memorial Park sold for about $200,000 per acre, or less than half that of raw land zoned for residential development.

Development Period

More than 17 years may be required to achieve full development of a 17-acre memorial park. This includes a few years to transfer the land and obtain approvals and permits, arrange financing, followed by land absorption at a rate of about 1 acre per year.

Economic Benefits and Impacts

A 17-acre memorial park would provide few economic benefits—about 5 grounds-maintenance jobs at full development. Also, the park would be exempt from property taxes.

YMCA

Description

The YMCA plans to develop a center in Waipahu on about 2 acres of land located at the mill site.

Activities would include exercise and recreation classes, child care services, gang responses, and other community services.[23] Facilities may include a lobby, offices, work room, multipurpose room, exercise studio, weight rooms, meeting/class rooms, kitchen, locker/shower rooms, restrooms, storage areas, mechanical area, and parking. In addition, the YMCA will be conveniently located near the recreational facilities at Hans L'Orange Park.

Development Period

It is estimated that it would take from 4 to 6 years to transfer land, design the buildings, obtain the necessary approvals and permits, raise funds, and build the facilities.

Economic Benefits and Impacts

Potential Employment

Once the move is complete, about 30 additional full-time and part-time jobs would be provided by the YMCA. Current staffing is about 100 people.

Additional Sales by Nearby Stores

Additional retail sales by nearby stores which would be generated by new staff and participants in the area are estimated at about $360,000 per year. This is based on the above staffing level, 800 students and adults during three summer months and 200 during the school year, a 7-day-per-week operation, and local daily expenditures of $5 per employee and $1 per participant.

FILIPINO COMMUNITY CENTER

Description

The Filipino Community (FilCom) Center also plans to locate on about 2 acres of land at the mill site.

Services will be available to all members of the community, and will include cultural events and activities, a senior center and elderly services, children and youth activities and services, family and counseling services, and conference and meeting facilities.[24]

Development Period

It would take from 4 to 6 years to transfer land ownership, design the Center, obtain the necessary approvals and permits, raise funds, and build the facilities.

Economic Benefits and Impacts

Potential Employment

An estimated 90 jobs will be provided by the FilCom Center, including jobs provided by leasing space to other organizations.

Additional Sales by Nearby Stores

Additional retail sales by nearby stores which would be generated by new staff and participants in the area are estimated at about $190,000 per year. This is based on the above staffing level, 30,000 participants per year, a 7-day-per-week operation, and local daily expenditures of $5 per employee and $1 per participant.

WINTER BASEBALL

Description

Hans L'Orange Park is being improved to serve as the home field of the West Oahu CaneFires, one of four baseball teams of the Hawaii Winter League, which consists of national and international players. The season lasts two months a year, from mid-October to mid-December, with 28 home games per season and an expected average attendance of 2,500 people.

About $200,000 worth of needed additions and improvements will be made to the Park including: left field (extended to regulation size), 1,500 new seats (for a total of 2,200), lighting, a press box, dugouts, restrooms, a concession stand, a gift booth, fencing, parking, an entrance, and water and sewer improvements.

Economic Benefits and Impacts

Potential Employment

Excluding the baseball players and coaches, an estimated 60 jobs will be provided during baseball games, including ticket sellers, gate keepers, ushers, concession operators, hawkers, parking attendants, a score keeper, an announcer, a stadium manager, security, etc. The 60 part-time jobs for 28 games is equivalent to less than 5 full-time-equivalent jobs when averaged over about 235 work days per year.

Additional Sales by Nearby Stores

Additional retail sales by nearby stores which would be generated by new employees and fans in the area are estimated at about $140,000 per year. This is based on the above employment and attendance estimates, and local daily expenditures of $2 per person.

MAKAI PARK HAWAII

Description

Makai Park Hawaii would be a major visitor attraction featuring a swim-through aquarium, a recreational water park, and botanical gardens.[25] Sufficient land is available at the base of Waipio Peninsula to allocate about 39 acres for the Park, although the developers would like to have as much as 75 acres.

Market Assessment

Although water parks have proven to be very popular on the mainland, successful development of the Makai Park Hawaii is uncertain. The project is at an early conceptual stage and has yet to proceed through the various steps of obtaining the land, designing the project components, estimating costs, obtaining approvals and permits, arranging financing, etc.

Even if the project proceeds, it may locate elsewhere if it is determined that the amount of land available at Waipio Peninsula is insufficient.

Also, current projections on attendance at the park are ambitious—about 950,000 visitors per year, or about 50% more than the 635,880 people who visited Sea Life Park Hawaii in 1993.[13]

Moreover, the project must compete against Hawaii's Wild Waters, a commercial amusement park to be built at a cost of about $18 million and located on 23 acres near Kapolei.[26] This park will feature a white-water raft ride, a high-speed body flume and slide, a wave-making pool, wading and play pools, a water roller coaster, and a picnic area.

The appeal of the Makai Park would be enhanced if an operating train into Waipahu were to become part of the attraction.

Development Period

A development period of 5 years is estimated. This includes time to design the project, transfer the land ownership, obtain the necessary approvals and permits, arrange financing, and construct the facilities.

Economic Benefits and Impacts

Potential Employment

About 80 full-time jobs, 40 part-time jobs, and 40 to 50 seasonal jobs would be provided.[25] These would include positions in administration, marketing, public relations, fund raising, education, graphic arts, admissions, retail sales, food service and catering, maintenance and operations, animal care, biology, and horticulture.

Additional Sales by Nearby Stores

Additional retail sales by nearby stores which would be generated by new employees and visitors in the area are estimated at about $2.7 million per year. This is based on a 7-day-per-week operation, local daily expenditures of $7 per full- and part-time employee, and $2.50 per visitor.

SPORTS COMPLEX

Description

A City-sponsored sports complex at the base of Waipio Peninsula would be an alternative use for the 39-acre site described above for Makai Park Hawaii.

Facilities would include a 15,000-seat amphitheater for concerts, a sports stadium to seat 5,000 to 10,000 people, soccer fields, softball fields, tennis courts, possibly a fitness center with weights and exercise equipment, parking, and lighting to allow for nighttime activities.[27] If acceptable to the U.S. Navy, outfields for the softball fields and possibly a golf course could be located on Federal lands which are within the munitions blast zone of West Loch Naval Magazine.

Users could include—in addition to residents from throughout the region—professional teams from Japan using the facilities for off-season training.

Anticipated usage is estimated at about one or two major concerts per month, one or two major sporting events per month, and daily participation of 350 to 500 people.

Development Period

A development period of 5 years is estimated. This includes time to design the project, transfer the land ownership, arrange financing, obtain the necessary approvals and permits, and construct the facilities.

Economic Benefits and Impacts

Potential Employment

An estimated 25 to 35 full-time equivalent jobs would be provided to operate and maintain the sports and concert facilities.[27]

Additional Sales by Nearby Stores

Additional retail sales by nearby stores which would be generated by new employees and visitors in the area are estimated at about $1.1 million per year. This is based on a 7-day-per-week operation, local daily expenditures of $7 per employee and $2.50 per user, 30 employees, and an estimated 400,000 users per year.

COMMERCIAL RECREATION—WAIPIO PENINSULA

Description

Commercial recreation on the lower portion of Waipio Peninsula would include supervised low-intensity recreational uses for a fee, possibly including nature hikes, mountain bikes, dirt bikes, trail rides on horseback, etc. If acceptable to the U.S. Navy, the activities would take place on Federal lands in the munitions blast zone of West Loch Naval Magazine. The base of operations, however, would be on City land outside the blast zone.

Similar commercial recreation has been successful at Kualoa Ranch north of Kaneohe Bay.

Development Period

It is estimated that it would take 3 years to obtain the necessary approvals from the U.S. Navy, negotiate a lease, obtain land-use approvals and permits from the City, arrange financing, provide the necessary facilities, and purchase equipment.

Economic Benefits and Impacts

Potential Employment

Employment is estimated at about 15 jobs serving about 200 people per day.

Additional Sales by Nearby Stores

Additional retail sales by nearby stores which would be generated by new employees and visitors in the area are estimated at about $220,000 per year. This is based on a 7-day-per-week operation, local daily expenditures of $7 per employee, and $2.50 per visitor.

CITY MAINTENANCE AND SUPPORT FACILITIES

Discussed below are City support facilities which have been proposed for Waipahu.

Fire Department—Vehicle Maintenance and Storage Facility

The Fire Department plans to construct a vehicle maintenance and storage facility on 4 acres of land at the base of Waipio Peninsula.[28] The development period is estimated at 2 years.

About 18 jobs will be provided, with additional retail sales by nearby stores estimated at $30,000 per year. This is based on local daily expenditures of about $7 per employee, and 5 days of operation per week.

Police Department—Vehicle Maintenance Facility

The Police Department plans to construct a vehicle maintenance facility on 1.2 acres of land next to the Fire Department's vehicle maintenance and storage facility.[28] The development period is estimated at 4 years.

About 30 jobs will be provided, with additional retail sales by nearby stores estimated at $50,000 per year. This is based on local daily expenditures of about $7 per employee and 5 days of operation per week.

Excluded Facilities

The three City facilities discussed below were presented at an early meeting of the Waipahu Town Task Force, but were not considered for the Waipahu Town Plan because they were not supported by the community and/or because the City decided to locate them elsewhere (at least in early draft plans).

—*TheBus and Handi-Van Maintenance Facility*

This facility could have been located on about 18 acres of City land at the Manager's Drive site, and would have employed about 100 mechanics and 150 drivers.[5] Concerns were raised by the community about noise during nighttime operations and added rush-hour traffic caused by departing and returning buses (20 to 40 buses per hour during peak hours). This maintenance facility was included in an early draft of the City's plan for the Manana area.

—*The Board of Water Supply*

This facility, which could have been located on about 9.5 acres of City land at the Manager's Drive site, was included by the City in an early draft of its plan for the Manana area.[5]

—*Department of Parks and Recreation Nursery*

A nursery operated by the Department of Parks and Recreation could have been located on City land at the Manager's Drive site or at the base of Waipio Peninsula.[5] However, the City decided that it did not need a nursery at either of these two locations.

FEDERAL DETENTION CENTER

A Federal Detention Center is to be built on Oahu to hold pretrial detainees and unsentenced prisoners. Requiring 1.5 to 2 acres of land, it will be a 500-bed facility, similar in appearance to a large office building, and will employ 200 to 250 people.[29]

A Waipahu location for this detention center failed to receive community support.

AGRICULTURE—WAIPIO PENINSULA

Description

Approximately 1,200 acres of Federal lands on Waipio Peninsula will be available for lease for diversified farming.[10] These lands, which were farmed by OSCo, are located within the munitions blast zone of West Loch Naval Magazine.

Agricultural Conditions and Locational Advantages

Waipio Peninsula has favorable conditions for cultivating crops: about half the acreage is comprised of high-quality soils; the area is sunny; lease rents are expected to be relatively low; and the area is protected from potential vandalism and urbanization. Also, Waipio Peninsula is a short trucking distance to the large Honolulu market, the airport, shipping terminals, and research support. Irrigation water may be available from OSCo Well #7 or the Board of Water Supply.

Disadvantages include a short 10-year lease from the U.S. Navy, and terms which prevent the building of structures because the area is within the munitions blast zone.

Competition will come from nearby farms in Kunia and Ewa which also have favorable conditions for growing crops, including: high-quality soils, sunny conditions, low-cost water, a short trucking distance to markets, long-term leases (typically 15 years), and terms which allow farm structures to be built.

Potential Crops and Activities

Potential low-elevation crops for the Honolulu market include: bananas, green beans, bittermelon, mustard cabbage, pak choy, cabbage, sweet corn, cucumbers, daikon, dasheen, long eggplant, round eggplant, Manoa lettuce, lotus root, luau leaf, lychee, mango, dry onions, green onions, parsley, Chinese peas, green peppers, pomelos, pumpkins, hechima squash, hyotan squash, Italian squash, sweet potatoes, tomatoes, watercress, watermelons, feed corn for green chop, flowers, potted foliage, and plants for landscaping.

Potential low-elevation export crops include: tropical fruits (if no fruit-fly infestation exists), winter vegetables, flowers, potted foliage, and seed crops.

Cattle grazing is possible for areas which are not farmed.

Market Assessment

It is uncertain whether crops can be produced successfully on Waipio Peninsula because (1) the supply of agricultural land on Oahu and statewide far exceeds potential demand, and (2) competition will occur from farmers who have begun to cultivate the high-quality lands in Kunia.

Land Supply versus Demand

About 22,000 acres of high-quality agricultural land have been released with the 1995/96 closing of the the two sugar plantations on Oahu, of which about 17,000 acres remain available for replacement crops. Statewide, about 215,000 acres have been released from sugar and pineapple since the late 1960s and 177,000 acres remain available for replacement crops. More sugar plantations may close on Kauai and Maui, which would increase even further the large supply of land available for new crops.

This supply of agricultural land far exceeds demand. For the Honolulu market, 5,000 acres at most could be needed to supply low-elevation crops which hold a promise of being profitable in Hawaii. This includes land to accommodate farmers who would relocate from Molokai to Oahu to take advantage of the recently released land. Realistically, the acreage requirements may be less than 2,000 acres.

Export markets would have to be developed to significantly increase the demand for agricultural land. This has proven to be difficult, however, due to the high costs of: labor (tourism has bid up wages), pest control (Hawaii lacks winter freezes which kill pests), fertilizer (soils in Hawaii are low in nutrients), and shipping. Also, many fruits are barred from export because of the risk of fruit-fly infestation. Nevertheless, recent successes have occurred with some high-value winter crops which are flown (rather than shipped) to mainland markets because of their short-shelf lives. Because of Hawaii's large visitor industry, Oahu has far better airfreight service to the U.S. mainland than do other tropical areas—daily fights are available to many cities, and backhaul rates are comparatively low.

Farm Operations in Kunia

Some of the most successful farmers in Hawaii are now cultivating crops on the high-quality agricultural lands in Kunia. For example, Del Monte Fresh Produce (Hawaii), Inc. is exploring a number of crops other than pineapple. Also, the largest diversified farmer in the State has relocated from Molokai to Kunia, as has one of the most successful farm operations in Waianae.

Development Period

Assuming market success, at least one year would be required to negotiate a lease with the U.S. Navy, obtain water rights, and prepare the land for the first crop.

Economic Benefits and Impacts

Potential Employment

If the entire 1,200 acres on Waipio Peninsula is farmed successfully in diversified crops (which is far from certain), then employment may reach about 100 jobs. This is based on an estimated 8 jobs per 100 acres.

Additional Sales by Nearby Stores

Additional retail sales by nearby stores which would be generated by new employees in the area are estimated at about $220,000 per year. This is based on local daily expenditures of $7 per employee farming 6 days per week.

RESIDENTIAL DEVELOPMENT

Description

Alternatives for residential development at the Manager's Drive area range from less than 20 acres to nearly 40 acres, and from 120 market-priced, single-family homes to as many as 475 homes offering a mix of single-family, townhouses and/or apartment units that are priced at and/or below market.

Market Assessment

The market analysis which follows focuses on market-priced, single-family homes, with the understanding that housing priced below market will accelerate sales.

Housing Prices

Comparatively high housing prices throughout Oahu are a market signal that a housing shortage exists on the island. In Old Waipahu (below the H-1 Freeway), over 80 single-family homes were sold between January 1994 and April 1995, with 90% of the sales ranging in price from $280,000 to $390,000; the median price was $320,000.[7]

New homes in old Waipahu, similar in quality to existing homes, would probably sell for $325,000 or more.

Locational Advantages

A considerable amount of housing is being developed in the region surrounding Waipahu, including Waikele, Royal Kunia, Mililani, and various projects in Ewa. Nevertheless, a residential project located in the central area of Waipahu would offer advantages of (1) a central location with respect to jobs and shopping opportunities, (2) excellent access, and (3) desirable vistas for selected lots since homes would be built on a bluff adjacent to a stream.

Market Absorption

For the surrounding region (Aiea to Ewa, and north to Mililani), an average of nearly 1,500 new homes were sold annually from 1980 to 1994, of which over 1,000 were single-family homes.[4,5] Projections to the year 2020 show an average of over 1,500 new homes per year being sold (see Part III, Table 4).

At recent housing absorption rates, a Manager's Drive housing project would add only a few months of housing inventory to the region.

Development Period

Depending upon the market conditions when the project is developed, and on the size of the project (which varies from 120 to 475 homes), and assuming competitive pricing, a residential project could be developed within 4 to 6 years. This estimate is based upon the assumption that it would take 2 years to transfer the land ownership, design the project, obtain the necessary approvals and permits, arrange financing, and install the infrastructure. It also assumes that construction of the homes and sales would occur at a rate of about 50 to 100 market-priced homes per year.

Economic Benefits and Impacts

Potential Employment

For a 17-acre project with 120 single-family homes (about 7 homes per acre), it is estimated that direct employment of housekeepers, gardeners, maintenance workers, and other people working in the housing the project would amount to about 5 jobs. This is based on 1 job per 30 homes.

Additional Sales by Nearby Stores

In a project of this size, it is estimated that nearby stores would realize additional retail sales of about $600,000. This order-of-magnitude estimate is based on local daily expenditures of $7 per employee working 5 days per week, and family incomes of $50,000 or more per year, of which one-third would be spent on consumer goods and services, and about 30% would be purchased from local stores. This per-family expenditure level from local stores translates to about $1,250 per resident per year, based on an average of 4 people per home.

INDEPENDENT-LIVING HOUSING PROJECT

Description

An independent-living housing project for very low-income people who have physical disabilities has been proposed for a portion of a 0.8-acre parcel located on Hikimoe Street near the Civic Center.[30] The project would consist of 15 one-bedroom

apartments and related facilities housing 15 to 25 residents. Nearly half of the cost would be Federally funded.

Development Period

A development period of 3 years is estimated. This includes time to design the project, transfer the land ownership, obtain the necessary approvals and permits, arrange financing, and construct the facilities.

Economic Benefits and Impacts

Potential Employment

Direct employment provided by the independent-living housing project would number about 5 jobs.

Additional Sales by Nearby Stores

Additional retail sales by nearby stores which would be generated by new employees and residents of the facility are estimated at about $30,000 per year. This is based on local daily expenditures of $7 per employee working 7 days per week, and annual expenditures of $1,000 per resident for 20 residents.

ELDERLY DAY-CARE FACILITY

Description

An alternative proposal for this same 0.8-acre parcel on Hikimoe Street is an elderly day-care facility.

Development Period

A development period of 3 years is estimated. This includes time to design the project, transfer the land ownership, obtain the necessary approvals and permits, arrange financing, and construct the facilities.

Economic Benefits and Impacts

The comparatively small economic impacts of this project are not estimated, but are expected to be similar in magnitude to those of the independent-living housing project.

PART III
PREFERRED WAIPAHU LAND-USE SCHEME

COMMUNITY PARTICIPATION AND OBJECTIVES

Through the Waipahu Town Task Force and a workshop held by the City and County of Honolulu, the Waipahu community considered and discussed various land-use alternatives and their relative merits with respect to job creation, impact on other businesses, traffic, community image, etc. The discussion was guided by the following community objectives:

1. Provide opportunities for economic revitalization which generate jobs and attract people to Waipahu while minimizing adverse impacts to existing businesses.
2. Provide land uses which are compatible with existing uses and which provide for community needs.
3. Promote and preserve Waipahu's plantation and cultural heritage.
4. Improve the overall visual appearance and character of Waipahu Town.
5. Provide increased opportunities for recreation and nearshore recreation.
6. Improve vehicular access into and within Waipahu, and integrate pedestrian, bicycle, and transit facilities.

SUMMARY OF ECONOMIC ASSESSMENTS

The preferred land-use scheme to revitalize Waipahu and develop its economy is summarized in Table 5. This summary is repeated in Table 6 where comparisons are made to other land-use schemes which were presented at a public workshop.

As indicated, proposed land uses are organized by their location: (1) the Central Area of Waipahu (the former OSCo mill site, Manager's Drive, Waipahu Cultural Garden Park & Hawaii Plantation Village, Waipahu Street, and Waipahu Depot Road); (2) the Civic Center area; (3) Farrington Highway; and (4) Waipio Peninsula.

Table 5. Waipahu Economic Development: Preferred Land-Use Scheme

PROPOSED LAND USES	Acres	Market	Development Period (years)	New Jobs (direct)	Additional Sales, Nearby Stores[1] ($ thousands per year)
CENTRAL AREA					
Residential Development (120 market-priced homes; about 480 people)	17.0	yes	4+	5	$ 600
(or in the same area, a Memorial Park employing about 5 people)					
Private School (1,000+ students)	20.0	probable	5+	100	$ 360
Light Industry	29.5	yes	10	300	$ 550
Commercial	10.0	yes	5	200	$ 2,780
YMCA	2.0	yes	4 to 6	30	$ 360
Filipino Community Center	2.0	yes	4 to 6	90	$ 190
Winter Baseball—Hans L'Orange Park (jobs are full-time equivalent, not per game)	10.0	yes	0	5	$ 140
Heritage Park and Museum	6.0	yes	10+	20	$ 250
"Old Town" Commercial (revitalization and reorientation)	10.3	yes	5 to 10	100	$ 260
FARRINGTON HWY—Revitalization/Reorientation of Commercial Areas	n.e.	yes	5 to 10	0	$ 0
WAIPIO PENINSULA					
"Old Town" Commercial	5.5	questionable	20+	110	$ 280
Fire Department—Vehicle Maintenance and Storage Facility	4.0	yes	2	18	$ 30
Police Department—Vehicle Maintenance Facility	1.2	yes	4	30	$ 50
Makai Park Hawaii (aquarium, water park, botanical gardens)	39.0	questionable	5	120	$ 2,680
Commercial Recreation (supervised group hiking, biking and horseback riding)	n.a.	probable	3	15	$ 220
Agriculture	1,200	questionable	1+	100	$ 220
TOTAL				1,240	$ 8,970

n.e.: not estimated n.a.: not applicable

1. Estimate of additional retail sales by nearby stores generated by new people in the area.

Table 6. Waipahu Economic Development: Alternative Land-Use Schemes

PROPOSED LAND USES	Preferred Scheme	Alternative #1	Alternative #2	Alternative #3
	ACRES			
CENTRAL AREA				
Residential Development	17.0	39.5	22.0	18.0
Private School (1,000+ students)	20.0			20.0
Light Industry	29.5	36.0	39.0	23.0
Commercial	10.0			
Commercial/Industrial Mixed Use		9.5	9.5	9.5
YMCA	2.0		2.5	4.0
Filipino Community Center	2.0			
Winter Baseball—Hans L'Orange Park	10.0	10.0	10.0	10.0
Heritage Park and Museum	6.0	6.0	6.0	6.0
"Old Town" Commercial (revitalization and reorientation)	10.3	10.3	10.3	10.3
FARRINGTON HWY—Revitalization/Reorientation of Commercial Areas	n.e.	n.e.	n.e.	n.e.
WAIPIO PENINSULA				
"Old Town" Commercial	5.5	5.5	5.5	5.5
Fire Department—Vehicle Maintenance and Storage Facility	4.0	4.0	4.0	4.0
Police Department—Vehicle Maintenance Facility	1.2	1.2	1.2	1.2
Makai Park Hawaii (aquarium, water park, botanical gardens)	39.0			39.0
Commercial Recreation (supervised group hiking, biking and horseback riding)	n.a.		n.a.	n.a.
Agriculture	1,200	1,200	1,200	1,200
	ECONOMIC BENEFITS AND IMPACTS			
TOTAL NEW JOBS	1,240	900	960	1,020
TOTAL ADDITIONAL SALES, NEARBY STORES ($ thousands per year)	$8,970	$4,980	$4,320	$6,960

n.e.: not estimated
n.a.: not applicable

Table 5. Waipahu Economic Development: Preferred Land-Use Scheme

PROPOSED LAND USES	Acres	Market	Development Period (years)	New Jobs (direct)	Additional Sales, Nearby Stores' ($ thousands per year)
CENTRAL AREA					
Residential Development (120 market-priced homes; about 480 people)	17.0	yes	4+	5	$ 600
(or in the same area, a Memorial Park employing about 5 people)					
Private School (1,000+ students)	20.0	probable	5+	100	$ 360
Light Industry	29.5	yes	10	300	$ 550
Commercial	10.0	yes	5	200	$ 2,780
YMCA	2.0	yes	4 to 6	30	$ 360
Filipino Community Center	2.0	yes	4 to 6	90	$ 190
Winter Baseball—Hans L'Orange Park (jobs are full-time equivalent, not per game)	10.0	yes	0	5	$ 140
Heritage Park and Museum	6.0	yes	10+	20	$ 250
"Old Town" Commercial (revitalization and reorientation)	10.3	yes	5 to 10	100	$ 260
FARRINGTON HWY—Revitalization/Reorientation of Commercial Areas	n.e.	yes	5 to 10	0	$ 0
WAIPIO PENINSULA					
"Old Town" Commercial	5.5	questionable	20+	110	$ 280
Fire Department—Vehicle Maintenance and Storage Facility	4.0	yes	2	18	$ 30
Police Department—Vehicle Maintenance Facility	1.2	yes	4	30	$ 50
Makai Park Hawaii (aquarium, water park, botanical gardens)	39.0	questionable	5	120	$ 2,680
Commercial Recreation (supervised group hiking, biking and horseback riding)	n.a.	probable	3	15	$ 220
Agriculture	1,200	questionable	1+	100	$ 220
TOTAL				1,240	$ 8,970

n.e.: not estimated n.a.: not applicable

1. Estimate of additional retail sales by nearby stores generated by new people in the area.

Table 6. Waipahu Economic Development: Alternative Land-Use Schemes

PROPOSED LAND USES	Preferred Scheme	Alternative #1	Alternative #2	Alternative #3
	ACRES			
CENTRAL AREA				
Residential Development	17.0	39.5	22.0	18.0
Private School (1,000+ students)	20.0			20.0
Light Industry	29.5	35.0	39.0	23.0
Commercial	10.0			
Commercial/Industrial Mixed Use		9.5	9.5	9.5
YMCA	2.0		2.5	4.0
Filipino Community Center	2.0			
Winter Baseball—Hans L'Orange Park	10.0	10.0	10.0	10.0
Heritage Park and Museum	6.0	6.0	6.0	6.0
"Old Town" Commercial (revitalization and reorientation)	10.3	10.3	10.3	10.3
FARRINGTON HWY—Revitalization/Reorientation of Commercial Areas	n.e.	n.e.	n.e.	n.e.
WAIPIO PENINSULA				
"Old Town" Commercial	5.5	5.5	5.5	5.5
Fire Department—Vehicle Maintenance and Storage Facility	4.0	4.0	4.0	4.0
Police Department—Vehicle Maintenance Facility	1.2	1.2	1.2	1.2
Makai Park Hawaii (aquarium, water park, botanical gardens)	39.0			39.0
Commercial Recreation (supervised group hiking, biking and horseback riding)	n.a.		n.a.	n.a.
Agriculture	1,200	1,200	1,200	1,200
	ECONOMIC BENEFITS AND IMPACTS			
TOTAL NEW JOBS	1,240	900	960	1,020
TOTAL ADDITIONAL SALES, NEARBY STORES ($ thousands per year)	$8,970	$4,980	$4,330	$8,960

n.e.: not estimated
n.a.: not applicable

For each proposed land use in Table 5, the information provided includes: (1) the approximate acreage required for the activity; (2) a market assessment of whether sufficient demand exists to achieve success, given the location of the activity and competition from elsewhere; (3) the approximate development period (including the estimated time to transfer land ownership, design a project, obtain permits, arrange financing, construct the facilities, and have the project be absorbed or sold); (4) the estimated number of jobs which would result; and (5) an *order-of-magnitude* estimate of the additional retail sales which nearby stores would experience as an outcome of having new people come into the area (i.e., employees, visitors and shoppers). The assumptions underlying the entries in Tables 5 and 6 are given in Part II of this report.

At full development, the preferred land-use scheme would result in an estimated 1,240 new jobs, and additional retail sales at nearby stores of about $9 million per year. However, about 27% of the jobs and 35% of the retail sales are for activities for which a market is questionable.

IMPLEMENTATION

Implementation of the preferred land-use scheme will depend largely upon private initiative and financing. Nevertheless, government will play a major role in terms of: (1) providing the appropriate zoning (City); (2) adding or widening roads and highways and modifying intersections to improve traffic circulation (City and State); (3) landscaping to make streets and other public areas more attractive (City and State); (4) enforcing building-design standards to achieve an "old-town" look to Waipahu (City); (5) selling or leasing land for a private school, residential development, and commercial recreation (City, State and Federal); (6) developing police, fire and park facilities (City); (7) continuing job training and placement programs (State); and (8) serving as a facilitator to achieve planned improvements (City).

Further details on implementation are provided in a separate accompanying report by Wilson, Okamoto & Associates, Inc.

[23]

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APPENDIX D
ALTERNATIVE CONCEPTS

ALTERNATIVE CONCEPTS

In the course of the planning process for the Waipahu Special Area Plan, alternative land use concept schemes were prepared which depicted a range of future scenarios for Waipahu. A total of five alternative land use schemes were formulated based on potential economic, recreational and social activities derived from the Waipahu Town Plan Task Force, the City Planning Department, economic consultant Decision Analysts Hawaii, Inc., the Waipahu 2000 Update Plan, the Waipahu Business Association, and the community. Each of the alternative schemes were comprised of various potential land uses depicting variations in the siting of these land uses with consideration toward existing land uses. The economic development and market implications of the five alternative land use schemes were analyzed, a summary of which is included herein. In formulating the five alternative schemes, considerations included: 1) the heritage aspect of Waipahu; 2) land uses that will bring people into Waipahu; and 3) various circulation systems.

Through an ongoing market and economic feasibility analysis of the various potential land use activities and input and feedback from the Town Plan Task Force, the alternative schemes were refined into the three alternative land use schemes which are included in this section. To assist in the evaluation of the alternative land use schemes, the various land uses were rated in terms of economic development, land use, and community benefits, as well as analysis of the economic development implications of each scheme. These alternative schemes were presented at the community workshop on July 27, 1995 and, with consideration of feedback received, were used to establish the framework for the preferred land use scheme for the Waipahu Special Area Plan.

ALTERNATIVE 1

Alternative 1 encompasses the planning area between the H-1 Freeway and Waipio Peninsula. In this Alternative, there are four distinct land use "anchors" - a commercial anchor at the sugar mill site, another commercial anchor denoting the existing commercial and light industrial businesses in west Waipahu, a community facilities anchor at the civic center site, and a recreation anchor at Waipio Peninsula. Also depicted on Alternative 1 is a possible new roadway connection from Village Park to the Waipahu town area which was pursued based on feedback received from the Waipahu Town Plan Task Force meetings. This roadway connection follows an existing cane haul road, eventually connecting to the Navy's Waikele Ammunition Depot Road. An optional route which traverses through the residential area is also designated.

Manager's Drive Site

- Residential development, which could include a mix of affordable and market-rate housing units (approximately 475 total units), and a neighborhood park (based on the City's previously proposed Manager's Drive Development Master Plan dated July 1994). (39.5 acres)

Sugar Mill Site

This component of Alternative 1 is largely reflective of the Waipahu 2000 Plan Update which was recently completed by the Waipahu 2000 Update Committee and Amfac/JMB Hawaii.

- Retain the area from the smokestack to the clinic building as a cultural/heritage area. Potential uses could include development of a museum (to be operated by a non-profit organization, similar to Hawaii's Plantation Village) and an open market area. An area would also be designated for a community service-oriented Filipino Community Center. (3.7 acres)
- Redevelop the remainder of the sugar mill site for mixed-use commercial uses. (9 acres)
- Develop the area adjacent and mauka of the mill site to light industrial/business park use. (35 acres)
- Provision of a street off of Paiwa Street, with connections to Waipahu Street (near the Waipahu Cultural Garden Park), and to the Civic Center via Mokuola Street.

Hans L'Orange Park

- Expand Hans L'Orange Park to the vicinity of Makaaloha Street in order to extend the left field line, and to create more passive park area and an area for additional parking. The park expansion and improvements are proposed to accommodate play by the Hawaii Winter Baseball League. (10 acres)

Alternative 1 (cont.)

Civic Center Site

- Build upon the civic center concept, which includes the existing State Civic Center and the new public library (currently under construction) facilities, and provide a connection to the Waipahu town core via a pedestrian linkage along Mokuola Street. (4.5 acres)
- Develop a bus terminal in the vicinity of Hikimoe Street and Mokuola Street to encourage transit ridership. (1.76 acres)

Waipahu Street and Waipahu Depot Road (Mauka of Farrington Highway)

- Create an "old town" commercial area adjacent to and along a portion of the south side of Waipahu Street (vicinity of Hans L'Orange Park and the sugar mill site), continuing along both sides of Waipahu Depot Road mauka of Farrington Highway. Revitalize existing commercial establishments with a pedestrian-oriented theme. (10.3 acres)
- Designate primary pedestrian-oriented routes along Waipahu Street, Waipahu Depot Road, and Hikimoe Street.

Farrington Highway

- Improve the visual appearance of Farrington Highway by providing large or medium canopy trees within the median area. Encourage facade improvements to the commercial establishments fronting Farrington Highway.

Area Makai of Farrington Highway

- Redevelop the area east of Waipahu Depot Road, between Farrington Highway and the Oahu Railway and Land Co. (OR&L) right-of-way, to an "old town" commercial area. Provide for a pedestrian-oriented concept with thematic architecture, with commercial establishments such as specialty stores, restaurants, and other goods and services. (5.5 acres)
- Develop a shoreline bikepath to be co-located with the 40-foot wide OR&L railroad right-of-way. The long-term goal is to provide a greenbelt connection between the various shoreline parks along Pearl Harbor.
- Potential re-use of the OR&L railroad right-of-way for a train ride as a tourist attraction. The train could transport visitors between the Ko Olina Resort and the Waipahu Cultural Garden Park.
- Development of possible pedestrian path to be co-located with railroad right-of-way, to provide loop connections to parks, commercial areas, and the civic center.

Alternative 1 (cont.)

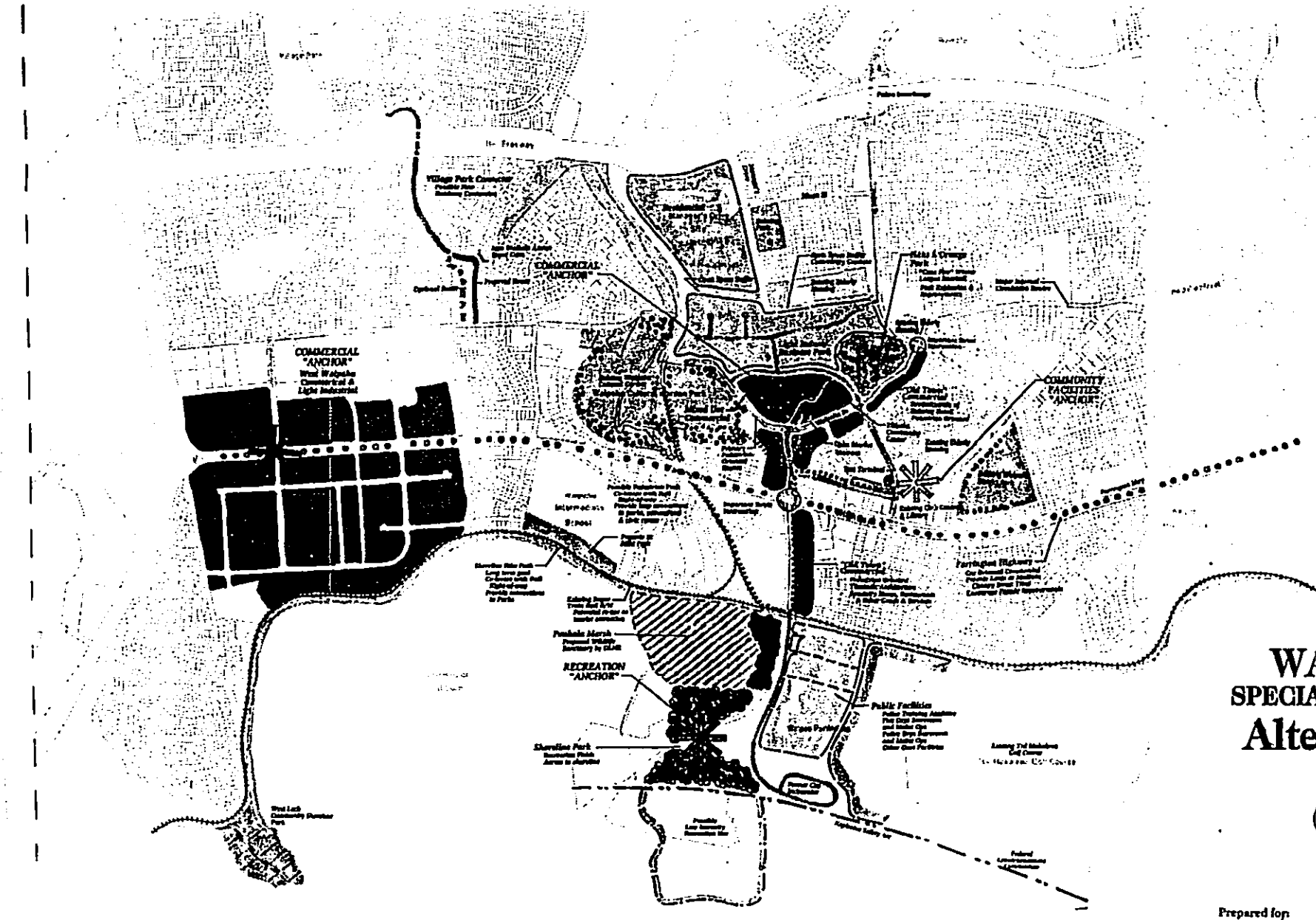
Waipio Peninsula

- Establishment of a Pouhala Marsh wildlife sanctuary by the State Department of Land and Natural Resources, Division of Forestry and Wildlife. (7.5 acres fastland and 27 acres of water)

- Maintain public facilities use east of Waipahu Depot Road, in the vicinity of the existing Police Academy, Waipahu Refuse Convenience Center, Waipahu wastewater pump station, and the former City incinerator site. Planned public facilities include the City Fire Department storeroom and vehicle maintenance facilities, and the City Police Department vehicle maintenance facility. (45.5 acres)

- Redevelopment of the City ashfill site below the Pouhala Marsh to shoreline park use. (23.5 acres)

- Redevelopment of the area below the Navy's explosive arc to possible low-intensity recreation use. (40 acres)


COMMERCIAL "ANCHOR"
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COMMUNITY FACILITIES "ANCHOR"
RECREATION "ANCHOR"
WAIPAHU
SPECIAL AREA PLAN
Alternative 1
North
Prepared for:
City & County of Honolulu
Planning Department
Prepared by:
Wilson Okamoto & Associates
Decision Analysts Hawaii, Inc.
Kimura International

ALTERNATIVE 2

Alternative 2 encompasses the planning area between the H-1 Freeway and Waipio Peninsula. Similar to Alternative 1, there are four distinct land use "anchors" within Alternative 2 - a commercial anchor at the sugar mill site, another commercial anchor denoting the existing commercial and light industrial businesses in west Waipahu, a community facilities anchor at the civic center site, and a recreation anchor at Waipio Peninsula. Alternative 2 depicts proposed land uses within the City-owned Manager's Drive parcel which would achieve a higher return for the City in light of the current budget constraints. Higher economic returns would be realized with the market residential and light industrial/business park uses, while community benefits are achieved with the proposed park and YMCA community facility.

Also depicted on this Alternative is a possible new roadway connection from Village Park to the Waipahu town area which was pursued based on feedback received from the Waipahu Town Plan Task Force meetings. This roadway connection follows an existing cane haul road, eventually connecting to the Navy's Waikele Ammunition Depot Road. An optional route which traverses through the residential area is also designated.

Manager's Drive Site

- Development of market residential units (approximately 120 units) on the mauka portion of Manager's Drive site. The City would sell the parcel to a private developer for development and sale of the homes. (18 acres)
- Development of a YMCA community facility below the market residential use and adjacent to Manager's Drive. (2.5 acres)
- Development of a park adjacent to the YMCA facility. In addition to use of the park by the market residents and the YMCA, the park also serves as a buffer between the light industrial/business park use and the market residential use. (4.5 acres)
- Light industrial/business park use below the park and YMCA facility, extending down toward Waipahu Street. (23 acres)
- Extension of Manager's Drive, with connections to Waipahu Street (near the Waipahu Cultural Garden Park) and to Paiwa Street.

Waipahu Uka Park Site

- Develop market residential use on the existing Waipahu Uka Park site (approximately 25 units) (similar private development concept as the market residential on Manager's Drive site). (4 acres)

Alternative 2 (cont.)

Sugar Mill Site

- Retain the area in the vicinity of the smokestack to the clinic building as a cultural/heritage area. Potential uses could include development of a museum (to be operated by a non-profit organization, similar to Hawaii's Plantation Village) and an open market area. An area would also be designated for a community service-oriented Filipino Community Center. (6 acres)
- Redevelop the remainder of the sugar mill site for mixed-use commercial uses. (9.5 acres)
- Develop the area adjacent and mauka of the mill site to light industrial/business park use. (16 acres)
- Retain existing landscaped buffer along the sugar mill site adjacent to Waipahu Street.

Hans L'Orange Park

- Expand Hans L'Orange Park to the vicinity of Makaaloha Street in order to extend the left field line, and to create more passive park area and an area for additional parking. The park expansion and improvements are proposed to accommodate play by the Hawaii Winter Baseball League. (10 acres)

Civic Center Site

- Build upon the civic center concept, which includes the existing State Civic Center and the new public library (currently under construction) facilities, and provide a connection to the Waipahu town core via a pedestrian linkage along Mokuola Street. (4.5 acres)
- Develop a mini park and ride facility in the vicinity of Hikimoe Street and Mokuola Street to encourage transit ridership. (1.76 acres)

Waipahu Street and Waipahu Depot Road (Mauka of Farrington Highway)

- Create an "old town" commercial area adjacent to and along a portion of the south side of Waipahu Street (vicinity of Hans L'Orange Park and the sugar mill site), continuing along both sides of Waipahu Depot Road mauka of Farrington Highway. Revitalize existing commercial establishments with a pedestrian-oriented theme. (10.3 acres)
- Designate primary pedestrian-oriented routes along Waipahu Street, Waipahu Depot Road, and Hikimoe Street.
- Realignment of the "Z" curve of Waipahu Street (vicinity of Waipahu Cultural Garden Park) to an "S" curve.

Alternative 2 (cont.)

Farrington Highway

- Improve the visual appearance of Farrington Highway by providing large or medium canopy trees within the median area. Encourage facade improvements to the commercial establishments fronting Farrington Highway.

- Modify the existing mauka "frontage road" parallel to Farrington Highway (near Mokuola Street). Possible modifications include closing off the ends of the road to form a T-intersection, or redesigning the road as a long parking strip.

Area Makai of Farrington Highway

- Redevelop the area east of Waipahu Depot Road, between Farrington Highway and the Oahu Railway (OR&L) right-of-way, to an "old town" commercial area. Provide for a pedestrian-oriented concept with thematic architecture, with commercial establishments such as specialty stores, restaurants, and other goods and services. (5.5 acres)

- Develop a shoreline bikepath to be co-located with the 40-foot wide OR&L railroad right-of-way. The long-term goal is to provide a greenbelt connection between the various shoreline parks along Pearl Harbor.

- Potential re-use of the OR&L railroad right-of-way for a train ride as a tourist attraction. The train could transport visitors between the Ko Olina Resort and the Waipahu Cultural Garden Park.

- Development of possible pedestrian path to be co-located with railroad right-of-way, to provide loop connections to parks, commercial areas, and the civic center.

Waipio Peninsula

- Establishment of a Pouhala Marsh wildlife sanctuary by the State Department of Land and Natural Resources, Division of Forestry and Wildlife. (7.5 acres fastland and 27 acres of water)

- Redevelopment of the City ashfill site below the Pouhala Marsh to passive park use. (9.5 acres)

- Redevelopment of the City ashfill site above the Navy's explosive arc to playfields. (12 acres)

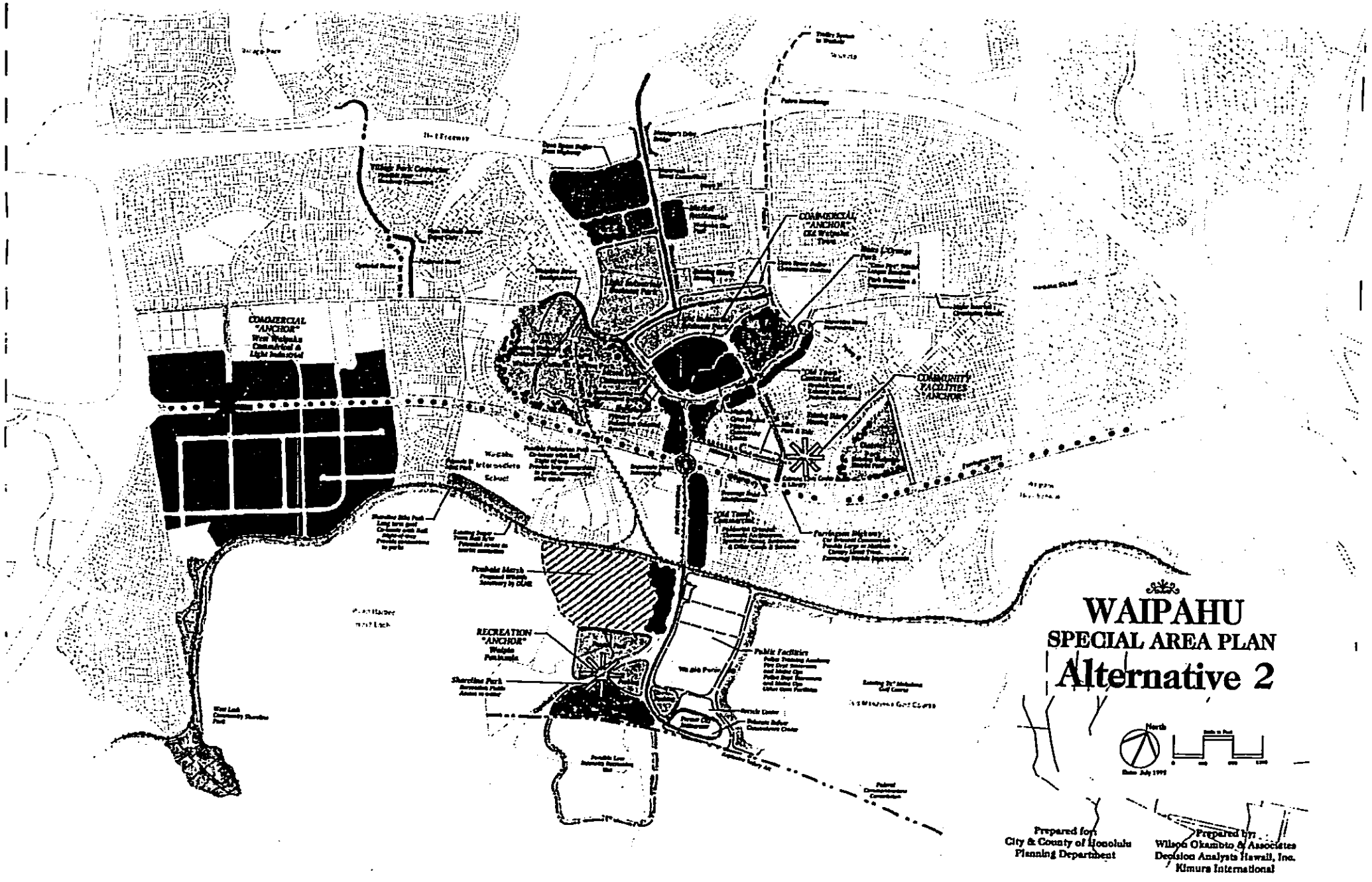
- Redevelopment of the area below the Navy's explosive arc to possible low-intensity recreation use. (40 acres)

- Development of two parking areas (bisected by Waipahu Depot Road) for park users in the near vicinity of the proposed parks. (3.3 acres and 2.5 acres)

Alternative 2 (cont.)

- Maintain public facilities use east of Waipahu Depot Road, in the vicinity of the existing Police Academy and the Waipahu wastewater pump station. Planned public facilities include the City Fire Department storeroom and vehicle maintenance facilities, and the City Police Department vehicle maintenance facility. (29 acres)

- Conversion of the former City incinerator facility to a City recycling center, and relocation of the Waipahu Refuse Convenience Center to the area adjacent to the proposed recycling center. (8.8 acres)


COMMERCIAL "ANCHOR"
West Waipahu Commercial & Light Industrial
COMMERCIAL "ANCHOR"
Old Waipahu Town
COMMUNITY FACILITIES "ANCHOR"
RECREATION "ANCHOR"
Waipio Peninsula
Public Facilities
WAIPAHU
SPECIAL AREA PLAN
Alternative 2
North
Prepared for:
City & County of Honolulu
Planning Department
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ALTERNATIVE 3

Alternative 3 also encompasses the planning area between the H-1 Freeway and Waipio Peninsula. Similar to Alternatives 1 and 2, there are four distinct land use "anchors" within Alternative 2 -a commercial anchor at the sugar mill site, another commercial anchor denoting the existing commercial and light industrial businesses in west Waipahu, a community facilities anchor at the civic center site, and a recreation anchor at Waipio Peninsula. Alternative 3 delineates land uses within the City-owned Manager's Drive parcel which would provide social or community benefits for Waipahu while achieving some economic return to the City through market residential development. The primary land use focus is the educational institution or private school designation which would enhance the image of Waipahu. With Waipahu's situation at the "crossroads" of rapidly increasing development in the surrounding areas, a private educational institution would be appropriate in serving both the community and region, while benefitting Waipahu both economically and socially.

Also depicted on this Alternative is a possible new roadway connection from Village Park to the Waipahu town area which was pursued based on feedback received from the Waipahu Town Plan Task Force meetings. This roadway connection follows an existing cane haul road, eventually connecting to the Navy's Waikele Ammunition Depot Road. An optional route which traverses through the residential area is also designated.

Manager's Drive Site

- Development of market residential units (approximately 120 units) on the mauka portion of Manager's Drive site. The City would sell the parcel to a private developer for development and sale of the homes. (18 acres)
- Development of a park below the market residential, adjacent to Manager's Drive. The park would be jointly used by the market residents, the YMCA facility across Manager's Drive, and the adjacent private school. (4 acres)
- Development of an educational institution/possible private school campus, extending down toward Waipahu Street. (20 acres)
- Extension of Manager's Drive, with connections to Waipahu Street (near the Waipahu Cultural Garden Park), Paiwa Street, and Mokuola Street.

Waipahu Uka Park Site

- Development of a YMCA facility on the existing Waipahu Uka Park site. (4 acres)

Sugar Mill Site

- Retain the area in the vicinity of the smokestack to the clinic building as a cultural/heritage area. Potential uses could include development of a museum (to be operated by a non-profit organization, similar to Hawaii's Plantation Village) and an open market area. An area would also be designated for a community service-oriented Filipino Community Center. (6 acres)

Alternative 3 (cont.)

- Redevelop the remainder of the sugar mill site for mixed-use commercial uses. (9.5 acres)
- Develop the area adjacent and mauka of the mill site to light industrial/business park use. (23 acres)
- Retain existing landscaped buffer along the sugar mill site adjacent to Waipahu Street.

Hans L'Orange Park

- Expand Hans L'Orange Park to the vicinity of Makaaloha Street in order to extend the left field line, and to create more passive park area and an area for additional parking. The park expansion and improvements are proposed to accommodate play by the Hawaii Winter Baseball League. (10 acres)

Civic Center Site

- Build upon the civic center concept, which includes the existing State Civic Center and the new public library (currently under construction) facilities, and provide a connection to the Waipahu town core via a pedestrian linkage along Mokuola Street. (4.5 acres)
- Develop a mini park and ride facility in the vicinity of Hikimoe Street and Mokuola Street to encourage transit ridership. (1.76 acres)

Waipahu Street and Waipahu Depot Road (Mauka of Farrington Highway)

- Create an "old town" commercial area adjacent to and along a portion of the south side of Waipahu Street (vicinity of Hans L'Orange Park and the sugar mill site), continuing along both sides of Waipahu Depot Road mauka of Farrington Highway. Revitalize existing commercial establishments with a pedestrian-oriented theme. (10.3 acres)
- Designate primary pedestrian-oriented routes along Waipahu Street, Waipahu Depot Road, and Hikimoe Street.
- Realignment of the "Z" curve of Waipahu Street (vicinity of Waipahu Cultural Garden Park) to an "S" curve.

Farrington Highway

- Improve the visual appearance of Farrington Highway by providing large or medium canopy trees within the median area. Encourage facade improvements to the commercial establishments fronting Farrington Highway.
- Modify the existing mauka "frontage road" parallel to Farrington Highway (near Mokuola Street). Possible modifications include closing off the ends of the road to form a T-intersection, or redesigning the road as a long parking strip.

Alternative 3 (cont.)

Area Makai of Farrington Highway

- Redevelop the area east of Waipahu Depot Road, between Farrington Highway and the Oahu Railway (OR&L) right-of-way, to an "old town" commercial area. Provide for a pedestrian-oriented concept with thematic architecture, with commercial establishments such as specialty stores, restaurants, and other goods and services. (5.5 acres)

- Develop a shoreline bikepath to be co-located with the 40-foot wide OR&L railroad right-of-way. The long-term goal is to provide a greenbelt connection between the various shoreline parks along Pearl Harbor.

- Potential re-use of the OR&L railroad right-of-way for a train ride as a tourist attraction. The train could transport visitors between the Ko Olina Resort and the Waipahu Cultural Garden Park.

- Development of possible pedestrian path to be co-located with railroad right-of-way, to provide loop connections to parks, commercial areas, and the civic center.

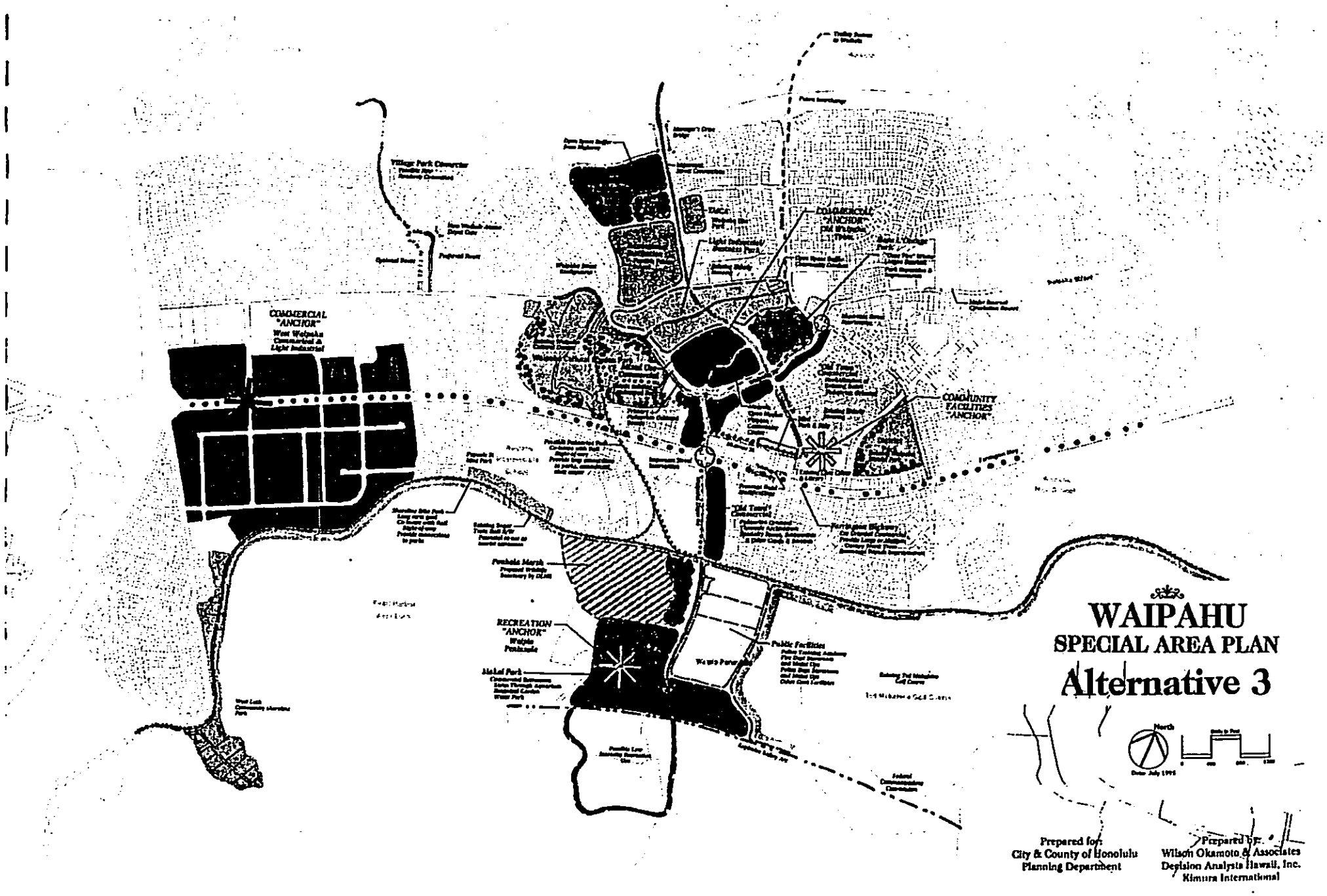
Waipio Peninsula

- Establishment of a Pouhala Marsh wildlife sanctuary by the State Department of Land and Natural Resources, Division of Forestry and Wildlife. (7.5 acres fastland and 27 acres of water)

- Redevelopment of the City ashfill site below Pouhala Marsh and the former City incinerator site to the Makai Park commercial recreation facility. Major facility components include a swim-through aquarium, a botanical garden, and a water park. (39 acres)

- Redevelopment of the area below the Navy's explosive arc to possible low-intensity recreation use. (40 acres)

- Maintain public facilities use east of Waipahu Depot Road, in the vicinity of the existing Police Academy, Waipahu Refuse Convenience Center, and Waipahu wastewater pump station. Planned public facilities include the City Fire Department storeroom and vehicle maintenance facilities, and the City Police Department vehicle maintenance facility. (29 acres)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EVALUATION OF ALTERATIVE LAND USE CONCEPTS

- **ALTERNATIVE LAND USE CONCEPT CONSIDERATIONS**

- **WAIPAHU ECONOMIC DEVELOPMENT**

  (Economic development implications of Alternative Land Use Schemes)

7-27-95

ALTERNATIVE LAND USE CONCEPT CONSIDERATIONS*
WAIPAHU TOWN PLAN

	Alternative 1	Alternative 2	Alternative 3
Economic Development			
- Provides Jobs	High	High	High
- Attracts People to Waipahu	Medium	Medium	High
- Minimal Impacts Exist. Businesses	High	High	High
Economic Feasibility . Manager's Drive . Sugar Mill Site . Waipio Peninsula	Medium High Medium	High High Medium	Medium Medium Low
Land Use			
Compatible w/Neighboring Uses	Medium	Medium	Medium
Minimizes Traffic Impacts	Medium	High	High
Avoids Environmental Conflicts	High	High	Low
Community Benefits			
Improves Town Visual Appearance	Medium	Medium	High
Preserves Cultural Heritage	High	High	High
Provides More Parks/Recreation	Medium	High	High
Addresses Educational Needs	Low	Low	High
Addresses Youth Needs	Medium	High	High

Legend
Extent to which criteria is satisfied: High
Medium
Low

* Previously reviewed by the Waipahu Town Plan Task Force.

WAIPAHU ECONOMIC DEVELOPMENT:
DEFINITIONS, LOCATIONAL ADVANTAGES AND ASSUMPTIONS
(Discussion Draft: July 1995)

DEFINITIONS

- **Proposed Land Uses, Acres:** each Economic Development Alternative is defined by assumed land uses and acreages.
- **Market:** an assessment of whether sufficient demand exists for success, given the activity's location and competition.
- **Development Period:** the approximate number of years required to (1) design the project, obtain permits, construct the facilities, and (2) have the project be absorbed or sold, if applicable.
- **New Jobs:** direct jobs provided by the activity.
- **Additional Sales, Nearby Stores:** an order-of-magnitude estimate of the additional retail sales which nearby stores would experience as an outcome of having new people come into the area (i.e., employees, visitors, shoppers).

LOCATIONAL ADVANTAGES

Locational advantages of Waipahu which contribute to the market success of certain activities:

- Centrally located for serving downtown, Central Oahu, and Ewa.
- Rapid economic and population growth in *the surrounding region.*
- Good freeway and highway access.
- Easy to find (visible sugar mill stack).

ASSUMPTIONS

- **Residential Development**

  Development Period: 2 years, plus absorption of 50 market-priced homes annually.

  Additional Sales, Nearby Stores: $1,250 per resident per year.
- **YMCA**

  Additional Sales, Nearby Stores: 800 students and adults during 3 summer months, 200 during the school year, 7 days per week (360 days), $5 per employee and $1 per participant.
- **PRIVATE SCHOOL**

  Additional Sales, Nearby Stores: $5 per employee, $1 per student, 240 days per year.
- **LIGHT INDUSTRY**

  Development Period: 2 years, plus absorption at 3 acres annually.

  New Jobs: about 10 per acre.

  Additional Sales, Nearby Stores: $7 per employee per day, 5 days per week.
- **MIXED-USE COMMERCIAL**

  Development Period: 2 years, plus absorption within an additional 3 years.

  New Jobs: about 15 per acre.

  Additional Sales, Nearby Stores: $7 per employee, $2.50 per shopper, 100 shoppers per acre per day, 7 days per week.
- **HANS L'ORANGE PARK, WINTER BASEBALL**

  Additional Sales, Nearby Stores: 28 games, 2,500 people per game, $2 per person.
- **CULTURAL PARK AND MUSEUM**

  Additional Sales, Nearby Stores: 100,000 people per year, $2 per person.
- **OLD TOWN COMMERCIAL—Waipio Peninsula**

  New Jobs: about 20 per acre.

  Additional Sales, Nearby Stores: $7 per employee per day, 7 days per week.
- **FIRE AND POLICE DEPARTMENTS**

  Additional Sales, Nearby Stores: $7 per employee per day, 5 days per week.
- **MAKAI PARK**

  Additional Sales, Nearby Stores: $7 per employee per day, $2.50 per visitor, 950,000 visitors per year.
- **COMMERCIAL RECREATION**

  Additional Sales, Nearby Stores: $7 per employee, $2.50 per visitor, 100 visitors per day, 7 days per week.
- **AGRICULTURE**

  New Jobs: about 8 per 100 acres.

  Additional Sales, Nearby Stores: $7 per employee per day, 6 days per week.

Waipahu Economic Development: Alternative 1
(Discussion Draft, July 1995)

PROPOSED LAND USES	Acres	Market	Development Period (years)	New Jobs (direct)	Additional Sales, Nearby Stores ($ thousands per year)
CENTRAL AREA					
Residential Development (475 affordable and market homes; about 1,520 people)	39.5	yes	5	n.a.	$1,900
Light Industry	36.0	yes	14	360	$ 650
Mixed-Use Commercial	9.5	yes	5	140	$1,200
Hans L'Orange Park—Winter Baseball	10.0	yes	1	n.e.	$ 140
Cultural Park and Museum	n.e.	yes	10+	20	$ 200
"Old Town" Commercial (revitalization and reorientation)	10.3	yes	5 to 10	n.e.	n.a.
FARRINGTON HWY— Revitalization/Reorientation of Commercial Areas	n.e.	yes	5 to 10	n.e.	n.a.
WAIPIO PENINSULA					
"Old Town" Commercial	5.5	questionable	n.e.	110	$ 280
Fire Department—Vehicle Maintenance and Storage Facility	4.0	yes	2	18	$ 30
Police Department—Vehicle Maintenance Facility	1.2	yes	4	30	$ 50
Agriculture	1,200	questionable	1	100	$ 220
TOTAL				780	$4,670

n.a.: not applicable n.e.: not estimated

Waipahu Economic Development: Alternative 2

(Discussion Draft, July 1995)

PROPOSED LAND USES	Acres	Market	Development Period (years)	New Jobs (direct)	Additional Sales, Nearby Stores ($ thousands per year)
CENTRAL AREA					
Residential Development (145 market-priced homes; about 580 people)	22.0	yes	5	n.a.	$ 720
YMCA	2.5	yes	3 to 5	30	$ 180
Light Industry	39.0	yes	15	390	$ 710
Mixed-Use Commercial	9.5	yes	5	140	$1,200
Hans L'Orange Park—Winter Baseball	10.0	yes	1	n.e.	$ 140
Cultural Park and Museum	n.e.	yes	10+	20	$ 200
"Old Town" Commercial (revitalization and reorientation)	10.3	yes	5 to 10	n.e.	n.a.
***FARRINGTON HWY*— Revitalization/Reorientation of Commercial Areas**	n.e.	yes	5 to 10	n.e.	n.a.
WAIPIO PENINSULA					
"Old Town" Commercial	5.5	questionable	n.e.	110	$ 280
Fire Department—Vehicle Maintenance and Storage Facility	4.0	yes	2	18	$ 30
Police Department—Vehicle Maintenance Facility	1.2	yes	4	30	$ 50
Commercial Recreation (supervised group hiking, biking and horseback riding)	n.a.	probable	2	10	$ 110
Agriculture	1,200	questionable	1	100	$ 220
TOTAL				850	$3,840

n.a.: not applicable n.e.: not estimated

Waipahu Economic Development: Alternative 3

(Discussion Draft, July 1995)

PROPOSED LAND USES	Acres	Market	Development Period (years)	New Jobs (direct)	Additional Sales, Nearby Stores ($ thousands per year)
CENTRAL AREA					
Residential Development (120 market-priced homes; about 480 people)	18.0	yes	4	n.a.	$ 600
YMCA	4.0	yes	3 to 5	30	$ 180
Private School (1,000+ students)	20.0	probable	5 to 10	100	$ 360
Light Industry	23.0	yes	10	230	$ 420
Mixed-Use Commercial	9.5	yes	5	140	$1,200
Hans L'Orange Park—Winter Baseball	10.0	yes	1	n.e.	$ 140
Cultural Park and Museum	n.e.	yes	10+	20	$ 200
"Old Town" Commercial (revitalization and reorientation)	10.3	yes	5 to 10	n.e.	n.a.
***FARRINGTON HWY*— Revitalization/Reorientation of Commercial Areas**	n.e.	yes	5 to 10	n.e.	n.a.
WAIPIO PENINSULA					
"Old Town" Commercial	5.5	questionable	n.e.	110	$ 280
Fire Department—Vehicle Maintenance and Storage Facility	4.0	yes	2	18	$ 30
Police Department—Vehicle Maintenance Facility	1.2	yes	4	30	$ 50
Makai Park Hawaii (aquarium, water park, botanical gardens)	39.0	questionable	4	120	$2,680
Commercial Recreation (supervised group hiking, biking and horseback riding)	n.a.	probable	2	10	$ 110
Agriculture	1,200	questionable	1	100	$ 220
TOTAL				910	$6,470

n.a.: not applicable n.e.: not estimated

WAIPAHU ECONOMIC DEVELOPMENT

(Discussion Draft: July 1995)

INTRODUCTION

This document summarizes the economic development and market implications of five alternative land-use schemes for the economic development and revitalization of Waipahu. For each alternative, proposed land uses are listed in the accompanying tables and are organized by the location of the land use: the Central Area of Waipahu (the Mill site of the former Oahu Sugar Co., Ltd., Manager's Drive, the Cultural Gardens, Waipahu Street and Depot Road), and the base of Waipio Peninsula.

For each proposed land use, the information provided includes (1) the approximate acreage needed for the activity, (2) an assessment of whether or not there is a market for the activity, (3) the approximate development period (including the estimated time it would take for a project to be absorbed or sold), (4) an estimate of the jobs which would result, and (5) an *order-of-magnitude* estimate of the additional retail sales which nearby stores would experience as an outcome of having new people come into the area (i.e., employees, visitors and shoppers).

RESIDENTIAL DEVELOPMENT

Description

Market-priced single-family homes are assumed for three of the alternatives; Alternative 2 provides affordable rental and elderly housing, and Alternative 3 has no housing component. The land area for the various alternatives varies from 18 acres to 39.5 acres, and the number of units varies from 120 homes to 475 homes.

The Market

Housing Prices

Comparatively high housing prices on Oahu are a market signal that a housing shortage exists on the island. In "old Waipahu" (below the H-1 Freeway), over 80 single-family homes were sold between January 1994 and April 1995, with 90% of the sales ranging in price from $280,000 to $390,000; the median price was $320,000.

New homes similar in quality to those which already exist in old Waipahu would probably sell for $325,000 or more.

Market Absorption

For the surrounding region (Aiea to Ewa, and north to Mililani), an average of nearly 1,500 new homes were sold annually from 1980 to 1994, of which over 1,000 were single-family homes. It is projected that, to the year 2000, an average of 2,200 new homes per year will be sold.

At recent housing absorption rates, the alternative residential projects would add only a few months of housing inventory to the region.

Locational Advantages

A considerable amount of housing is being developed in the region surrounding Waipahu, including Waikele, Royal Kunia, Mililani, and various projects in Ewa. Nevertheless, a residential project located in the central area of Waipahu would offer a number of advantages. It would:

- —be centrally located with respect to downtown Honolulu, Central Oahu, and Ewa;
- —have excellent access to the H-1 Freeway, as well as to shopping at the Waikele Center and in Waipahu;
- —offer desirable vistas since it would be located on a bluff adjacent to a stream.

Development Period

Depending upon the size of the project (which varies from 120 to 475 homes) and on market conditions when the project is developed, and assuming competitive pricing, a residential project could be developed within 4 to 6 years. This estimate is based upon the assumption that it would take 2 years to transfer the land ownership, design the project, obtain the necessary permits and approvals, and install the infrastructure. It also assumes that construction of the homes and sales would occur at a rate of about 50 market-priced homes per year.

New Jobs

Once fully developed, direct employment of people working within the housing project is expected to be small and therefore is not estimated.

Additional Sales for Nearby Stores

It is estimated that nearby stores would realize additional retail sales to new residents in the area of about $5,000 per household This order-of-magnitude esti-

mate is based upon family incomes of $50,000 or more per year, of which one-third is spent on consumer goods and services, and about 30% is purchased from local stores. For Alternatives 1 and 2 which include affordable and elderly housing, the amounts were scaled down to reflect the fewer number of people per housing unit.

YMCA

The YMCA plans to move its Leeward operation from Westgate Center to a new building on about 3 acres of land. It is estimated that it would take from 3 to 5 years to transfer the land ownership, design the project, obtain the necessary permits and approvals, and build the facilities.

Once developed, about 30 additional full-time and part-time workers would be required (current staffing is about 100 people).

Additional retail sales for nearby stores which would be generated by new staff and students in the area is estimated at about $5 per staff person per day and $1 per student per day, 6 days per week. Participation is assumed to increase by about 500 additional students per year, or about 30%. [verify]

PRIVATE SCHOOL

Description

A private school, offering grades K-12 and having an enrollment of about 1,000 students, would require about 20 acres of land and a staff of about 100 people.

The Market

The surrounding region (from Halawa to Waianae and up to the North Shore) has a large population of over 300,000 people, and Ewa and Central Oahu are the fastest growing regions on Oahu. The region has few private schools, however. Consequently, many private-school students living there must commute from their homes to private schools in Central Honolulu.

Operators of private schools have expressed an interest in constructing a private school in the area. Kapolei is a competing site, but one which is not as centrally located as Waipahu.

Development Period

It would take from 5 to 10 years to attract a school, transfer the land ownership, design the school, obtain the necessary permits and approvals, and build the facilities.

Additional Sales for Nearby Stores

It is estimated that additional retail sales which would be generated by new people in the area would amount to about about $360,000 per year for nearby

stores. This order-of-magnitude estimate is based upon daily expenditures of about $5 per employee and $1 per student, and 240 days of school operation per year.

LIGHT INDUSTRY—CENTRAL AREA

Description

Depending upon the alternative selected, a light-industry park would encompass from 13 to 39 acres.

The Market

Land Prices

Relatively small parcels of improved land for light industry in Waipahu sells for about $50 per square foot, or over $2 million per acre. Such high prices are a market signal that demand is strong.

Market Absorption

For the surrounding region (Aiea to Waipahu, but excluding Ewa and the Mililani Technology Park), annual absorption of industrial land has averaged about 10 acres in recent years. The demand reflects economic and population growth, as well as displacement from other areas on Oahu (e.g., Kakaako).

Depending upon the alternative, a light-industry park would add about 1 to 4 years of inventory at recent absorption rates.

Vacant Industrial Land

A light-industry park at the Mill site would have to compete with other projects in the region. The Gentry Business Park would be the closest competitor having a similar product, with 68.5 acres of vacant land available in fee. Other vacant land in the region includes 2.4 acres in Waipahu below Farrington Highway, 10.8 acres in Pearl City, and 32 acres in Aiea. This amounts to about 11 years of inventory at recent absorption rates.

Also proposed but not approved in the area is 123 acres of light industry at Royal Kunia Phase II, and 90 acres at Gentry Waiawa. One or more light-industry parks in the area would provide beneficial competition.

In Ewa, 487 acres of industrial land is vacant, most of which would be leasehold land owned by Campbell Estate. In addition, 670 acres are planned for Phase II of the Kapolei Business/Industrial Park.

Near Wahiawa, land is available at the Mililani Technology Park (103.5 acres within the entire project, with another 115 acres planned).

Locational Advantages

The Mill site is an excellent location for a light-industry park. It is centrally located for serving downtown Honolulu, Central Oahu, and Ewa, and access is excellent to the H-1 Freeway, Farrington Highway, Kamehameha Highway, Kunia Road, and Ft. Weaver Road. The Mill site location is superior to the light-industry projects in Ewa which are not centrally located.

Furthermore, light industry is a proven success in the area, as evidenced by the industrial area below Farrington Highway near Ft. Weaver Road, and by the nearby Gentry Business Park.

Development Period

Depending upon the size of the light-industry park (from 13 to 39 acres) and the market conditions when the project is developed and, assuming competitive pricing, a light-industry park could be developed in from 6 to 15 years. This estimate is based upon the assumptions that it would take 2 years to design the project, obtain the necessary permits and approvals, and install the infrastructure; it is also based upon a project absorption rate of about 3 acres per year. Aggressive pricing could accelerate this rate, however.

The assumed average absorption rate is based upon other projects in the area (generally from 2 acres per year to over 4 acres), and upon the fact that other projects have reached full development or are near full development.

New Jobs

Direct employment is estimated at 10 jobs per acre. Many of the jobs would be skilled or semi-skilled, and would offer higher wages and salaries than those for other proposed land uses.

Additional Sales for Nearby Stores

Additional retail sales for nearby stores which would be generated by new employees in the area are estimated at about $7 per day.

MIXED-USE COMMERCIAL AREA

Description

For each alternative, a mixed-use commercial area would take up 9.5 acres at the Mill site. It could be a business park based upon a theme of a former sugar mill (industrial buildings, old equipment, photographs, the Mill stack, etc.), and could include light-industry activities that have a commercial orientation as well as compatible commercial activities, such as showrooms, restaurants, and some offices.

In any case, the specific components of a mixed-use commercial project are not yet determined. Consequently, the analysis which follows focuses on possible activities which could be located at the Mill site.

The Market

Locational Advantages

The Mill site is an excellent location for a number of potential commercial activities. It is centrally located for serving downtown Honolulu, Central Oahu, and Ewa. Access is excellent to the H-1 Freeway, Farrington Highway, Kamehameha Highway, Kunia Road and Ft. Weaver Road. Also, the Mill stack is a major landmark which would give a business park an identity and visibility, and would make it easy for people to find.

These attributes (location, access and visibility from the freeway) contribute to the success of the Waikele Center. In many respects, the Mill site is superior to the commercial areas being developed at Kapolei, particularly with respect to its central location. Depending upon how the Mill site is developed, it is possible that some new retail stores would choose it over Kapolei.

Discount Specialty Store

One possible business would be a large discount specialty store, such as a consumer electronics store featuring audio and video equipment, computers, software, cameras and other photography equipment, video games, etc. Unlike most other discount specialty stores, a consumer electronics store need not be located in a power center with other discount stores.

The regional population required to support such a store would be about 250,000 people or more, and land requirements range from less than 3 acres to 12 or more acres.

At least one major electronics store is searching now for a site.

Local Retail Stores

Local retail stores include convenience stores, video stores, beauty shops, stationary stores, florists, fast-food restaurants, animal clinics, travel agencies, television repair shops, service stations, professional offices (physicians, dentists, attorneys, real estate agents), etc.

At first blush, Waipahu appears to have an adequate supply of local retail space given store closures caused by the Waikele Center. Furthermore, old Waipahu (located below the H-1 Freeway) is not expected to grow in population, and the larger new residential projects in the surrounding region include neighborhood commercial centers in their plans.

Nevertheless, opportunities exist for local retailing. For example, retail stores located in the western portion of Waipahu along Farrington Highway are supplying many of the needs of residents of West Loch Estates (which lacks a retail center), Ewa Gentry, and other growing communities in Ewa.

Regarding the Mill site, new local retail stores could supply many of the needs of the residents living in Waikele. Inasmuch as the Waikele Center lacks most of these types of convenience stores, Waikele residents must shop at Waipio Gentry or other stores in the region. If retail stores were located at the Mill site, residents of Waikele could access these stores via Manager's Drive or Paiwa Street.

The amount of land required would be on the order of 4 acres. This estimate is based upon serving about 2,500 families in Waikele and nearby portions of Waipahu, an average of three people per family, about 6 square feet of space for local retail stores (excluding grocery markets and drug stores), and a floor-to-land ratio of 25%.

A bus transit station in the area (a component of Alternative 2) would add to the demand for local retail stores.

Building-Supply Show Rooms

Another possibility would be showrooms for construction and home-improvement businesses: kitchen and bathroom models, flooring materials, lighting fixtures and supplies, furniture, fabrics, Oriental rugs, artwork. Related offices could include architects, structural engineers, interior designers, etc.

The Mill site would be well-located for such showrooms, given its central location near new development in Central Oahu and Ewa, access, and the simple directions to the smokestack.

About 2 acres of land would be required for showrooms. This is based upon acreage used at the Gentry Pacific Center on Nimitz Highway.

Auto Dealerships and Services

Auto dealerships and services are another possibility, given that the Mill site is centrally located, access is excellent, and the area is easy to find. Furthermore, new communities in the region generally provide little or no space for dealerships and auto-service shops. Because of these factors, Farrington Highway and the connecting Kamehameha Highway have become centers for auto dealers and auto-service shops.

Demand in the region for such space is estimated at 2.5 acres per year. This estimate is based upon: a projected annual growth of about 8,000 new residents per year in areas west and north of Aiea, 3.5 square feet per person, and a floor-to-land ratio of 25%. The entire 9.5 acres of mixed-use commercial area amounts to less than 4 years of inventory.

Industrial Activities

Another possibility for the mixed-use commercial area is additional space for light-industry as discussed above. The 9.5 acres of mixed-use commercial would add about 1 year of inventory at the regional absorption rate of 10 acres per year.

Excluded and Unlikely Activities

Market analysis was either not performed or was terminated for a number of possible commercial activities at the Mill site. These activities, and the reasons for the abbreviated analysis, include:

—A large stand-alone discount center, warehouse operation, or home-improvement outlet

These possibilities could succeed at the Mill site. However, such operations are not supported by the community because of concerns about their adverse impacts on surrounding businesses and increased traffic.

—A power center and factory outlets

If the area were to be increased to about 35 acres, a power center similar in concept to the Waikele Center is another possibility. By the year 2010, sufficient demand will exist to support about five power centers on Oahu, assuming about 200,000 residents per center. In many respects, the Mill site would be superior to other existing and planned operations: Costco has too little land to be a power center; Sam's Club also has too little land, encompasses two levels, and has very poor access; and Kapolei is not as centrally located.

However, a power center was not supported by the community for the same reasons as stated above. This rejection carries with it the many specialty stores which would have accompanied a power center.

—Regional mall and upscale department stores

A new regional mall and upscale department stores were not considered as possibilities because of Waipahu's proximity to the Pearlridge Shopping Center, competition from the Waikele Center, and the power center and other shopping areas being constructed at Kapolei. Also, upscale stores would be incompatible with light-industry.

—A large regional office complex

A portion of the Mill site could be used for offices which serve the local community (see Local Retail Stores above).

However, the marketability of a large regional office complex was not regarded as a realistic possibility in view of commitments made by the State, County, banks and others to locate offices at Kapolei. Furthermore, Waipahu lacks the concentration of government, financial, legal, business and other professional services that are essential to the success of a regional office complex.

—A large recreational complex

Operators of large theater complexes and recreational parks are locating in Ewa and have expressed little interest in Waipahu. Nevertheless, smaller recreational activities could locate at the Mill site.

Development Period

In view of the various acceptable and realistic possibilities for the 9.5 acres of the mixed-use commercial area, it could be developed within about 5 years. This is based on the assumptions that it would take about 2 years to design the project, obtain the necessary permits and approvals, and install the infrastructure; and also upon the assumption that market absorption will occur within 3 years. This is a conservative estimate given the possibility of a large electronics specialty store (3 acres to over 12 acres), existing and near-term demand for local retail stores (about 4 acres), the anticipated demand for building-supply show rooms (about 2 acres), the possibility of automobile dealerships and service shops (regional demand growing at about 2.5 acres per year), and light-industry activities.

However, if a single, large project were attracted to the site, the entire area could be developed within a few years.

New Jobs

Direct employment is estimated at 15 jobs per acre.

Additional Sales for Nearby Stores

Additional retail sales for nearby stores which would be generated by new employees in the area are estimated at about $7 per day per employee, plus $2.50 per shopper per day and 100 shoppers per day per acre.

HANS L'ORANGE PARK—WINTER BASEBALL

Hans L'Orange Park is being improved to serve as one of the home fields for the Hawaii Winter League. The season lasts for 2 months a year, from mid-October to mid-December, with 28 games per season having an average attendance of 2,500 people.

The small number of temporary jobs is not estimated. Regarding additional retail sales for nearby stores, it is assumed that fans attracted to watch the games will spend on the order of $2 per person outside the park.

CULTURAL PARK AND MUSEUM

Improvements to the cultural park, a new sugar museum, heritage center, and a train ride would draw additional people to Waipahu. For many, the major draw would be the train ride, although the tracks may not be extended to Waipahu until the resorts planned for Ewa are developed—which may be 10 years off, or more.

Once the train ride is in place, it is assumed that about 100,000 people per year would visit the museum and cultural gardens, generating about 20 new jobs.

Estimates of additional retail sales for nearby stores are based upon expenditures of $2 per person.

OLD TOWN COMMERCIAL AREA—CENTRAL AREA

Revitalization of the Old Town commercial area (Depot Road, Waipahu Street and Paiwa Street) would include such physical improvements as road realignment, street widening, street landscaping, and building beautification and restoration. The purpose would be to improve vehicular access to Waipahu, traffic flow, and the appearance of the area in order to draw consumers to stores in Waipahu.

In addition, some stores may have to change their goods and services in order to take advantage of new consumers in the region and to cope with new competition.

FARRINGTON HIGHWAY

Farrington Highway would undergo similar revitalization and reorientation. One of the major market reorientations that is occurring is the increasing numbers of automobile dealerships and auto-service shops that serve Ewa, Central Oahu and Waianae.

OLD TOWN COMMERCIAL AREA—WAIPIO PENINSULA

Alternative 2 includes commercial land on the south side of Farrington Highway where it intersects Depot Road. Since this is the current land use, there may be no significant change in the level of economic activity. However, the area would be upgraded to be consistent with the Old Town theme and to improve the entrance to the lower part of Waipio Peninsula.

The other alternatives include from 5.5 to 7.5 acres of new commercial development along Depot Road south of Farrington Highway. The stores would conform to the Old Town theme, and provide a more attractive entrance to the lower part of Waipio Peninsula.

In order for stores along lower Depot Road to be a market success, a major attraction is needed on the Waipio Peninsula. Without such an attraction, success is unlikely given the nearby competition and light traffic along this road.

The greatest demand for new stores would occur with Alternative 5, which includes Makai Park Hawaii (see below). Assuming that the new stores could capture most of the additional sales from new activities in the area (i.e., the lower portion of Table 5, last column), total sales at full development would amount to about $3.4 million per year, of which 80% would be generated by Makai Park. This would require about 1.6 acres of land, assuming sales of $200 per square foot, and a floor-to-land ratio of 25%. The new demand would be insufficient to achieve market success of a commercial area of 5.5 acres or more.

Assuming success, however, employment is estimated at 20 jobs per acre, and additional sales for nearby stores are estimated at $7 per employee.

LIGHT INDUSTRY—WAIPIO PENINSULA

Alternative 2 includes land for light industry on Depot Road below Farrington Highway. Since this is the current land use, there would be no significant change in economic activity. However, the area would be upgraded to improve the entrance to the lower part of the Waipio Peninsula.

FIRE DEPARTMENT—VEHICLE MAINTENANCE AND STORAGE FACILITY

The Fire Department plans to construct a vehicle maintenance and storage facility on 4 acres of land at the base of Waipio Peninsula. The development period is estimated at 2 years.

About 18 jobs will be provided, with local sales estimated at $7 per employee per work day.

POLICE DEPARTMENT—VEHICLE MAINTENANCE FACILITY

The Police Department plans to construct a vehicle maintenance facility on 1.2 acres of land next to the Fire Department's vehicle maintenance and storage facility. The development period is estimated at 4 years.

About 30 jobs will be provided, with local sales estimated at $7 per employee per work day.

MAKAI PARK HAWAII

Makai Park Hawaii would be a major visitor attraction featuring a swim-through aquarium, a recreational water park, and botanical gardens. Sufficient land is available to allocate about 39 acres for the Park, although the developers would like to have as much as 75 acres. At full operation, 950,000 visitors and residents per year are anticipated (about 50% more than Sea Life Park).

A development period of 4 years is estimated. This includes time to design the project, arrange financing, transfer the land ownership, obtain the necessary permits and approvals, and construct the facilities.

About 120 full-time and part-time jobs would be provided, plus a number of seasonal jobs.

The estimate of additional retail sales for nearby stores is based on expenditures of $7 per employee per day and $2.50 per visitor per day.

COMMERCIAL RECREATION

Commercial recreation would include supervised low-intensity recreational uses on Waipio Peninsula for a fee, possibly including nature hikes, mountain bikes, dirt bikes, trail rides on horseback, etc. If acceptable to the U.S. Navy, the activities would take place on Federal lands which are within a munitions blast zone. The base of operations, however, would be on City land outside the blast zone.

Similar commercial recreation has been successful at Kualoa Ranch north of Kaneohe Bay.

It is estimated that it would take 2 years to obtain the necessary approvals from the U.S. Navy, negotiate a lease, obtain lands and approvals from the City, and provide the necessary facilities and equipment.

Employment is estimated at about 10 jobs serving about 100 people per day. The estimate of additional retail sales of nearby stores is based on expenditures of $7 per employee per day and $2.50 per visitor per day.

AGRICULTURE

Approximately 1,200 acres of Federal lands formerly farmed by Oahu Sugar Co., Ltd. will be available for lease for diversified farming in 1995. About half of the acreage is comprised of high-quality soils, the area is sunny, it is protected from vandalism as well as urbanization, and the Waipio Peninsula is a short trucking distance to major markets. Disadvantages include a short, 5-year lease and terms which prevent the building of structures because the area is within a munitions blast zone.

The market for crops which can be grown on this land is uncertain in view of competition from the farmers who have begun to cultivate high-quality lands in Kunia.

Based on approximately 8 jobs per 100 acres, agricultural employment could reach 100 jobs if the entire area is farmed successfully in diversified crops. The estimate of additional retail sales for nearby stores is based on expenditures of $7 per employee farming 6 days per week.

EXCLUDED LAND USES

Land uses which were considered but were excluded from all alternatives are:

- a Federal detention center;
- a baseyard for maintaining City buses and vans;
- a baseyard for maintaining Board of Water Supply vehicles and equipment; and
- a nursery for the Department of Parks and Recreation.

These activities were either not supported by the community, and/or the decision has been made to locate them elsewhere.

Waipahu Economic Development: Alternative 1

(Discussion Draft, July 1995)

PROPOSED LAND USES	Acres	Market	Development Period (years)	New Jobs (direct)	Additional Sales, Nearby Stores[1] ($ thousands per year)
CENTRAL AREA					
Residential Development (475 affordable and market homes; about 1,520 people)	39.5	yes	5	n.a.	$1,900
Light Industry	36.0	yes	14	360	$ 650
Mixed-Use Commercial	9.5	yes	5	140	$1,200
Hans L'Orange Park—Winter Baseball	10.0	yes	1	n.a.	$ 140
Cultural Park and Museum	n.a.	yes	10+	20	$ 200
"Old Town" Commercial (revitalization and reorientation)	10.3	yes	5 to 10	n.a.	n.a.
FARRINGTON HWY— Revitalization/Reorientation of Commercial Areas	n.a.	yes	5 to 10	n.a.	n.a.
WAIPIO PENINSULA					
"Old Town" Commercial	5.5	questionable	n.a.	110	$ 280
Agriculture	1,200	questionable	1	100	$ 220
TOTAL				730	$4,590

n.a.: not applicable n.a.: not estimated

1. Estimate of additional retail sales for nearby stores generated by new people in the area.

The market for crops which can be grown on this land is uncertain in view of competition from the farmers who have begun to cultivate high-quality lands in Kunia.

Based on approximately 8 jobs per 100 acres, agricultural employment could reach 100 jobs if the entire area is farmed successfully in diversified crops. The estimate of additional retail sales for nearby stores is based on expenditures of $7 per employee farming 6 days per week.

EXCLUDED LAND USES

Land uses which were considered but were excluded from all alternatives are:

—a Federal detention center;

—a baseyard for maintaining City buses and vans;

—a baseyard for maintaining Board of Water Supply vehicles and equipment; and

—a nursery for the Department of Parks and Recreation.

These activities were either not supported by the community, and/or the decision has been made to locate them elsewhere.

Waipahu Economic Development: Alternative 1

(Discussion Draft, July 1995)

PROPOSED LAND USES	Acres	Feasible Market	Development Period (years)	New Jobs (direct)	Additional Sales, Nearby Stores[1] ($ thousands per year)
CENTRAL AREA					
Residential Development (475 affordable and market homes; about 1,520 people)	39.5	yes	5	n.a.	$1,900
Light Industry	36.0	yes	14	360	$ 650
Mixed-Use Commercial	9.5	yes	5	140	$1,200
Hans L'Orange Park—Winter Baseball	10.0	yes	1	n.e.	$ 140
Cultural Park and Museum	n.e.	yes	10+	20	$ 200
"Old Town" Commercial (revitalization and reorientation)	10.3	yes	5 to 10	n.e.	n.a.
FARRINGTON HWY.— Revitalization/Reorientation of Commercial Areas	n.e.	yes	5 to 10	n.e.	n.a.
WAIPIO PENINSULA					
"Old Town" Commercial	5.5	questionable	n.e.	110	$ 280
Agriculture	1,200	questionable	1	100	$ 220
TOTAL				730	$4,590

n.a.: not applicable n.e.: not estimated

1. Estimate of additional retail sales for nearby stores generated by new people in the area.

Waipahu Economic Development: Alternative 2

(Discussion Draft, July 1995)

PROPOSED LAND USES	Acres	Market	Development Period (years)	New Jobs (direct)	Additional Sales, Nearby Stores[1] ($ thousands per year)
CENTRAL AREA					
Residential Development (150 affordable rentals, 50 elderly homes; about 550 people)	16.0	yes	3	n.a.	$ 690
Light Industry	24.5	yes	10	240	$ 440
Mixed-Use Commercial	9.5	yes	5	140	$1,200
Hans L'Orange Park—Winter Baseball	10.0	yes	1	n.e.	$ 140
Cultural Park and Museum	n.e.	yes	10+	20	$ 200
"Old Town" Commercial (revitalization and reorientation)	10.3	yes	5 to 10	n.e.	n.a.
***FARRINGTON HWY*— Revitalization/Reorientation of Commercial Areas**	n.e.	yes	5 to 10	n.e.	n.a.
WAIPIO PENINSULA					
"Old Town" Commercial (revitalization and reorientation of existing commercial area)	6.5	yes	5 to 10	n.e.	n.a.
Light Industry (current use, but upgraded)	7.5	yes	5 to 10	n.e.	n.a.
Agriculture	1,200	questionable	1	100	$ 220
TOTAL				500	$2,890

n.a.: not applicable n.e.: not estimated

1. Estimate of additional retail sales for nearby stores generated by new people in the area.

Waipahu Economic Development: Alternative 3

(Discussion Draft, July 1995)

PROPOSED LAND USES	Acres	Market	Development Period (years)	New Jobs (direct)	Additional Sales, Nearby Stores[1] ($ thousands per year)
CENTRAL AREA					
YMCA	3.0	yes	3 to 5	30	$ 200
Private School (1,000+ students)	23.0	probable	5 to 10	100	$ 360
Business Park (light industrial orientation)	13.0	yes	6	130	$ 240
Mixed-Use Commercial	9.5	yes	5	140	$1,200
Hans L'Orange Park—Winter Baseball	10.0	yes	1	n.e.	$ 140
Cultural Park and Museum	n.e.	yes	10+	20	$ 200
"Old Town" Commercial (revitalization and reorientation)	10.3	yes	5 to 10	n.e.	n.a.
***FARRINGTON HWY*— Revitalization/Reorientation of Commercial Areas**	n.e.	yes	5 to 10	n.e.	n.a.
WAIPIO PENINSULA					
"Old Town" Commercial	7.5	questionable	n.e.	150	$ 380
Agriculture	1,200	questionable	1	100	$ 220
TOTAL				670	$2,940

n.a.: not applicable n.e.: not estimated

1. Estimate of additional retail sales for nearby stores generated by new people in the area.

Waipahu Economic Development: Alternative 4

(Discussion Draft, July 1995)

PROPOSED LAND USES	Acres	Market	Development Period (years)	New Jobs (direct)	Additional Sales, Nearby Stores[1] ($ thousands per year)
CENTRAL AREA					
Residential Development (145 market-priced homes; about 580 people)	22.0	yes	5	n.a.	$ 720
YMCA	2.5	yes	3 to 5	30	$ 200
Light Industry	39.0	yes	15	390	$ 710
Mixed-Use Commercial	9.5	yes	5	140	$1,200
Hans L'Orange Park—Winter Baseball	10.0	yes	1	n.e.	$ 140
Cultural Park and Museum	n.e.	yes	10+	20	$ 200
"Old Town" Commercial (revitalization and reorientation)	10.3	yes	5 to 10	n.e.	n.a.
FARRINGTON HWY— Revitalization/Reorientation of Commercial Areas	n.e.	yes	5 to 10	n.e.	n.a.
WAIPIO PENINSULA					
"Old Town" Commercial	5.5	questionable	n.e.	110	$ 280
Fire Department—Vehicle Maintenance and Storage Facility	4.0	yes	2	18	$ 30
Police Department—Vehicle Maintenance Facility	1.2	yes	4	30	$ 50
Commercial Recreation (supervised group hiking, biking and horseback riding)	n.a.	probable	2	10	$ 110
Agriculture	1,200	questionable	1	100	$ 220
TOTAL				850	$3,860

n.a.: not applicable n.e.: not estimated

1. Estimate of additional retail sales for nearby stores generated by new people in the area.

Waipahu Economic Development: Alternative 5

(Discussion Draft, July 1995)

PROPOSED LAND USES	Acres	Market	Development Period (years)	New Jobs (direct)	Additional Sales, Nearby Stores[1] ($ thousands per year)
CENTRAL AREA					
Residential Development (120 market-priced homes; about 480 people)	18.0	yes	4	n.a.	$ 600
YMCA	4.0	yes	3 to 5	30	$ 200
Private School (1,000+ students)	20.0	probable	5 to 10	100	$ 360
Light Industry	23.0	yes	10	230	$ 420
Mixed-Use Commercial	9.5	yes	5	140	$1,200
Hans L'Orange Park—Winter Baseball	10.0	yes	1	n.e.	$ 140
Cultural Park and Museum	n.e.	yes	10+	20	$ 200
"Old Town" Commercial (revitalization and reorientation)	10.3	yes	5 to 10	n.e.	n.a.
FARRINGTON HWY— Revitalization/Reorientation of Commercial Areas	n.e.	yes	5 to 10	n.e.	n.a.
WAIPIO PENINSULA					
"Old Town" Commercial	5.5	questionable	n.e.	110	$ 280
Fire Department—Vehicle Maintenance and Storage Facility	4.0	yes	2	18	$ 30
Police Department—Vehicle Maintenance Facility	1.2	yes	4	30	$ 50
Makai Park Hawaii (aquarium, water park, botanical gardens)	39.0	questionable	4	120	$2,680
Commercial Recreation (supervised group hiking, biking and horseback riding)	n.a.	probable	2	10	$ 110
Agriculture	1,200	questionable	1	100	$ 220
TOTAL				910	$6,490

n.a.: not applicable n.e.: not estimated

1. Estimate of additional retail sales for nearby stores generated by new people in the area.

Appendix C

Waipahu Town Heritage Plan

WAIPAHU TOWN HERITAGE AREA PLAN

August 1996

ACKNOWLEDGEMENTS

AMFAC wishes to extend its sincere appreciation to all of those individuals who helped to prepare or review the Waipahu Town Heritage Area Plan. These individuals are too numerous to list here, but include members of the following organizations (although not all of these organizations have formally endorsed the plan):

- Waipahu 2000 Update Committee
- Hawaii's Plantation Village
- Historic Hawaii Foundation
- Waipahu Neighborhood Board
- Friends of Hans L'Orange Park
- Leeward YMCA
- The Filipino Community Center

Table of Contents

BACKGROUND

Before the 19th century, Hawaiians had cleared much of the land and settled in the Waipahu area, which, at the time, was a wealthy fishing resource. As many as 27 fish ponds ringed the shoreline. These ponds were the property of the ali'i or chiefs of the area. The abundant fresh water in the area supported numerous taro lo'i. Although the ahupua'a, or land unit reaching from the mountains to the ocean, was called "Waikele" by the early Hawaiians, the area eventually became known as "Waipahu." The name "Wai-pahu" which means "bursting water" or "water bursting from underground," referred to the natural springs that once characterized the area. It was also home of the legendary shark goddess Ka'ahupahau.

Historically, Waipahu evolved over time as a result of its economic mainstay, the Oahu Sugar Company. Originally called Oahu Plantation, the sugar operation was established in 1897 and was a major determinant of the town's growth and prosperity. With expansive amounts of land, abundant water, and a newly installed railway system, the OR&L, which linked the Leeward area to the port of Honolulu, Waipahu gradually changed from a fishing and wetland farming community to a successful sugar plantation town.

As a primary source of employment, the plantation attracted a mixture of immigrant workers, which formed a community of various cultures, traditions, and lifestyles. Waipahu became a classic example of a sugar plantation town. For Waipahu, the most widely recognized element of its past is its sugar plantation heritage. With the closure of the mill and sugar operations in 1995, Waipahu moves forward with a rich and colorful history rooted in its plantation past.

SUMMARY OF PLANS FOR WAIPAHU

There have been three community planning efforts completed for Waipahu Town: the original Waipahu 2000 Plan, the Waipahu 2000 Update, and the Waipahu Town Special Area Plan. Numerous residents, organizations and groups, businessmen, area legislators, and other members of the community have spent literally hundreds of hours in the preparation of these documents.

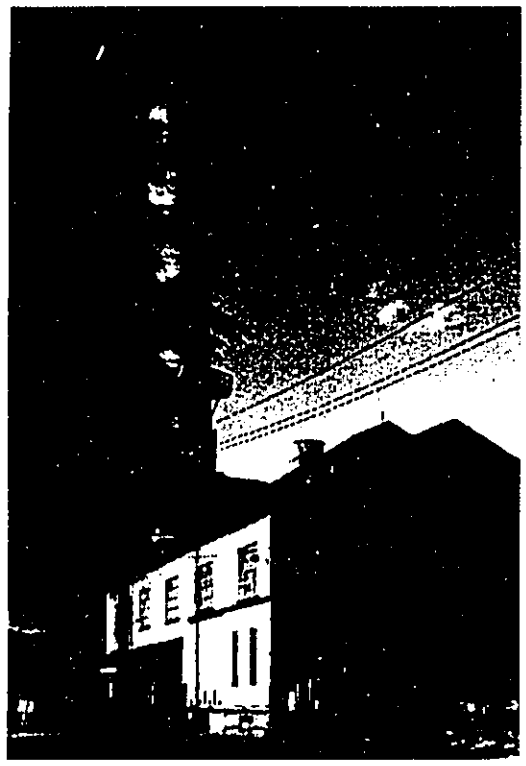
Two common themes emerged from these planning efforts: 1) the need for economic revitalization for Waipahu Town, and 2) the desire to recognize and promote important aspects of Waipahu's special plantation heritage. These two major themes are balanced and incorporated throughout the three community-based plans.

For example, both the original Waipahu 2000 and the Waipahu 2000 Update state, "Although preservation of historically significant structures is encouraged, this plan primarily seeks to encourage new development which is architecturally compatible with the historic aspects of Waipahu." The Waipahu 2000 Update, major proposal No. 3 reads, "Retain the area from the smokestack to the Clinic Building in its existing condition as a cultural/historic area. Encourage the development of a museum together with an arts and crafts center and a farmers' market area." Major

Waipahu Depot Road

Source: State Archives

Waipahu 2000 Plan, Waipahu 2000 Update and Waipahu Town Plan

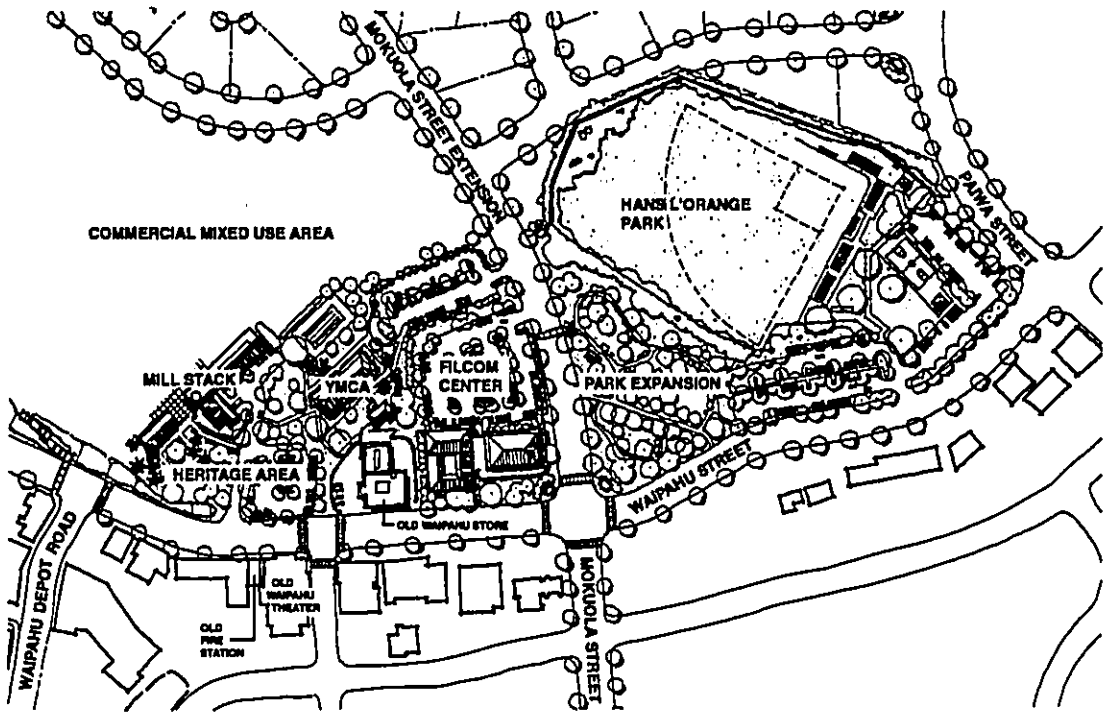


Mill Smokestack and Generator Building *Photo by David Franzen*

proposal No. 6 reads, "Redevelop the remaining portion of the 'Mill site' for commercial/industrial uses...."

The Waipahu Town Special Area Plan specifically represents "the collective desires of the community to integrate economic development with social, cultural, and recreational enhancements," including promotion of the cultural heritage of Waipahu. The Special Area Plan designates the mill site below the proposed light industrial subdivision for "commercial use and community facilities," and calls for "selected existing structures on the mill site (smokestack, and the Generator, Lab, Administration, Human Resources and Waipahu Store [Clinic] buildings)" to be retained for future redevelopment.

The Waipahu Town Heritage Area Plan set out below continues this theme of balancing economic redevelopment with heritage promotion by: 1) identifying an area (the "Heritage Area") within the Oahu Sugar mill site that would focus on preserving Waipahu's historic character; 2) describing the guidelines that are being prepared to control the design of new facilities within the town core, the mill site, and the park expansion/Filipino Community Center site; and 3) summarizing current efforts of historic documentation. This plan is intended to provide a more detailed framework for the implementation of the Heritage Area as called for in the Waipahu 2000, the Waipahu 2000 Update, and the Waipahu Town Special Area Plans.



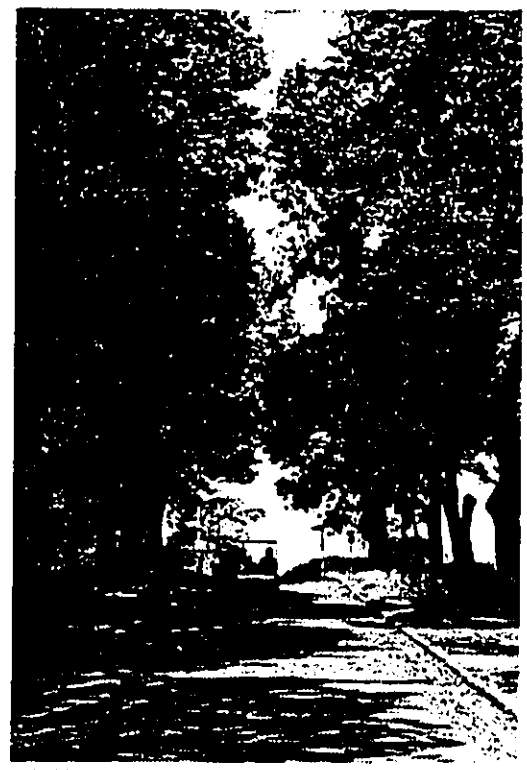
Heritage Area Plan *Drawing by PBR HAWAII*

RECEIVED AS FOLLOWS

Hans L'Orange Park

PROPOSED WAIPAHU TOWN "HERITAGE AREA"

As part of the commercial and community facilities components planned for the mill site, an area will be set aside as a "heritage area." In accordance with the Waipahu 2000 Plan Update and the Special Area Plan, Amfac intends to retain the mill smokestack ("the Eiffel Tower of Waipahu"), and the Generator, Laboratory, Administration, Human Resources, and Old Waipahu Store Buildings for re-use. Re-use could include a YMCA and a historical park/mill museum to be operated by an appropriate organization. The historical park/mill museum could house exhibits of Hawaiian culture in the Waipahu area before sugar cultivation, mill and plantation mementos, as well as photo collections. The condition, safety, and necessary maintenance programs for the smokestack and nearby buildings are currently being studied.



Makaaloha Street - Proposed Hans L'Orange Park Expansion Area

Hawaii's Plantation Village *Photo by F. L. Morris*

This "heritage area" also includes space for a Filipino Community Center and a "passive park" area that would retain most of the mature trees and existing ambience of the Makaaloha Street area. For example, the fine allee of mahogany trees-one of only two historic rows of mahogany trees on Oahu-would be retained. This passive park area would be incorporated into Hans L'Orange Park, allowing for the expansion of the baseball field at the Park for professional-level play. Hans L'Orange Park, named after the famous Oahu Sugar plantation manager, was traditionally a focal point of the plantation communities for recreation and social interaction. Thus, the green, park-like atmosphere on the mauka side of Waipahu Street up to the Old Waipahu Store—an important part of the existing character of the historic core of Waipahu—would be retained.

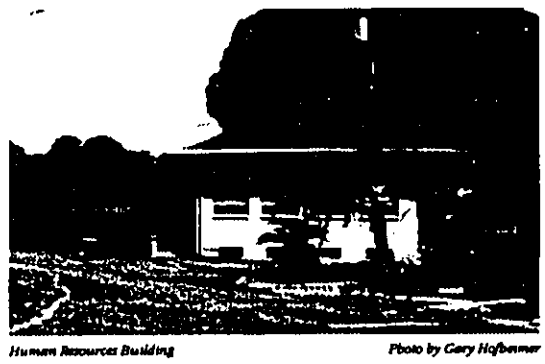
The proposed "heritage area" is a key part of the center of old Waipahu, a center that has lost much of its economic vitality, a condition that is reflected in its deteriorating buildings. In several similar small towns in Hawaii, communities have turned to the Main Street program in an effort to revitalize the economies of their business districts and to recapture the visual character and heritage of their past. The Waipahu 2000 Update Plan called for establishing such a program in Waipahu to ensure implementation of improvements to the town. Due to the current state fiscal situation, it is unlikely that state revenues would be available for a new Main Street program for Waipahu. Therefore, with the assistance of district City Councilmembers and Amfac, private sources of funding are being sought to help establish a similar program. Hawaii's Plantation Village may

serve as the "Waipahu Main Street" headquarters, providing organization and coordinating promotion of the town.

This entire "heritage area" could then serve as a focal point for a "heritage district" that links with Hawaii's Plantation Village and the proposed "Old Town Commercial" area along Waipahu Street and Depot Road. The Waipahu 2000 Update Committee's vision for the "heritage district" is as follows:

> *"There is a desire by the community to save and show the objects that preserve the history of Oahu Sugar Mill and all ethnic groups of Hawaii who were employed by the plantation. Heritage/cultural activities are envisioned for the area near the existing stack. This area was selected for cultural/heritage activities due to its high visibility from Waipahu Street, potential reuse of existing buildings, and the panoramic views of Waipahu Town from the top of the hill. The smokestack could be preserved, and the feasibility of reuse of some of the existing buildings should be considered. Preservation and/or reuse of some of the buildings in better condition could help to preserve the character of Oahu Sugar's influence on Waipahu. The heritage district could include a historical museum, arts and crafts center and/or a community center with an emphasis on one of the island's many nationalities, such as the Filipino community. The*

Administration Building *Photo by Gary Hofbauer*



Human Resources Building *Photo by Gary Hofbauer*

> *area should be linked with the Waipahu Cultural Garden Park by a pedestrian path. This pedestrian path could also be linked to an area proposed for expansion of Hans L'Orange Park (which may be improved to accommodate play by the Hawaii Winter Baseball League). Together with the existing Waipahu Cultural Garden Park/Hawaii's Plantation Village, this site may create the critical mass of activities that will attract island residents and visitors to Waipahu and its business.*

The machinery in the existing mill has been sold and will be reused at other sugar mills and for other industrial uses. Based on extensive analysis, most structures that remain are impractical and unsuitable for other uses, including the commercial uses envisioned in the Special Area Plan. It is also important to note that any adaptive re-use of the existing mill structures would require major structural and utility renovations to bring the buildings up to acceptable public safety levels to allow occupancy and re-use.

Thus, most structures in the area designated for commercial use will be dismantled and removed. These structures will be replaced by buildings constructed according to design guidelines intended to promote the plantation theme and cultural heritage of Waipahu, while at the same time allowing a feasible use for the site and creating new business infrastructure and employment opportunities for Waipahu's town core. All of these efforts should combine to promote Waipahu's heritage, to make Waipahu an attractive place to live, work, play and visit, to bring new customers to existing businesses, and to revitalize the town.

Fourth Floor of Boiling House *Photo by David Franzen*

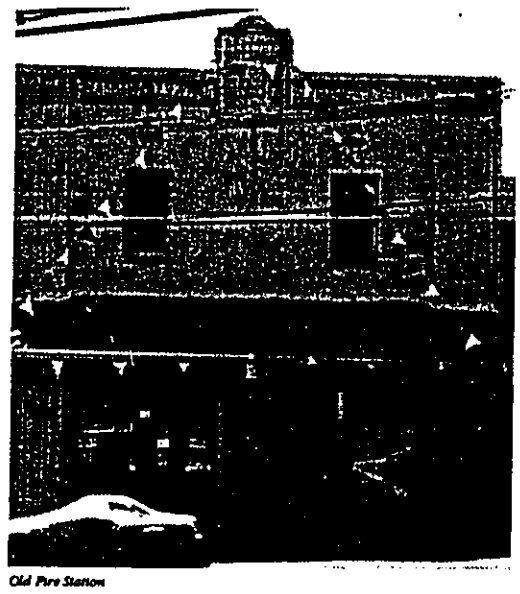
Proposed "Heritage Area"

Sketch by PBR HAWAII

DESIGN GUIDELINES

As the old Oahu Sugar Company mill in Waipahu closed in April 1995, the owners of the mill site, Amfac, initiated various studies connected with the future use and development of the site.

Amfac retained Spencer Mason Architects to assess the visual character and historic significance of the Oahu Sugar mill and to develop design guidelines for new and existing structures so as to maintain the existing visual character of the area. Spencer Mason Architects' report includes the following elements:



Old Fire Station

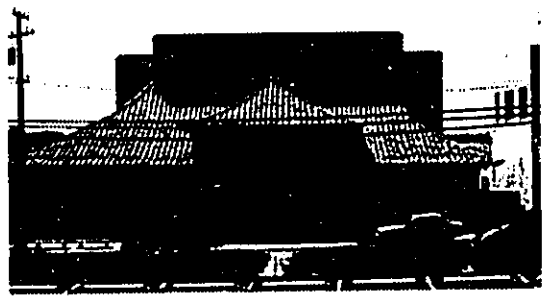
- A history of Oahu Sugar to aid in assessing the historic significance of the mill buildings and the skilled worker houses.
- A visual character assessment of the Oahu Sugar mill area. Critical visual elements are identified. Visual images are prioritized as to their contributing characteristics.
- Ways in which these visual elements and images might possibly be maintained or recreated.

The design guidelines are intended to protect the historic character and integrity of Waipahu Town core, as well as increase public awareness of the community's historic resources and the elements that contribute to its character.

The aim of establishing the design guidelines is to ensure that the design of new buildings and alterations to existing buildings will help continue and strengthen the architectural character of the Waipahu Town core. Each of the elements discussed in the report is useful for maintaining and enhancing the historic architectural character.

An interesting feature of the historic character of Waipahu

Town core is the contrast that exists between the scale, materials, and feeling of the mill buildings, the small town commercial buildings on Waipahu Street, and the landscaped setting of Hans L'Orange Park. Although the historical patterns of uses that created these contrasts as the town developed no longer



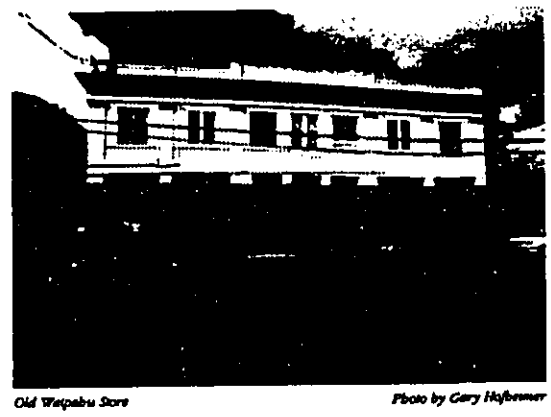
Old Waipahu Theater

exist, maintaining the distinct character of different parts of the town core is a key aspect to preserving the historic character.

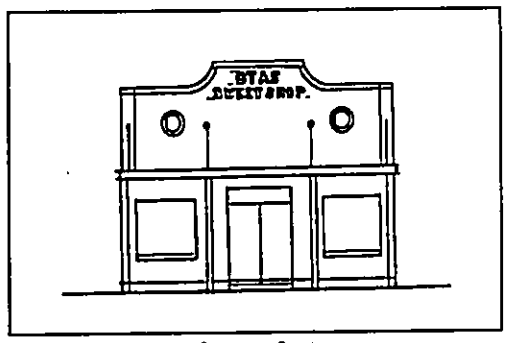
It is therefore appropriate to have different design guidelines for the town core, the mill site, and the park area. The design guidelines are organized in three sections; 1) general design guidelines for the town core, including guidelines for signs, 2) recommendations for the mill site, and 3) recommendations that apply specifically to the proposed "Park" area, including the Filipino Community Center site.

Town Core

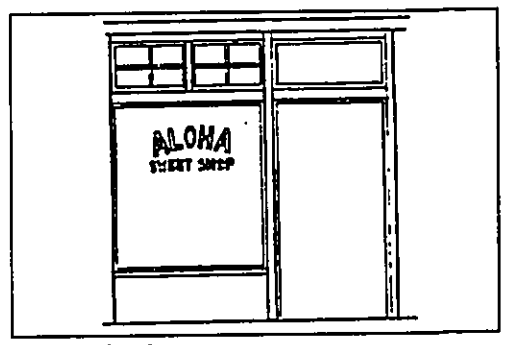
There are many elements of scale and form that are important to maintain and enhance the character of the Waipahu historic town core. The elements that define architectural character are scale, setbacks, height, roofs, facades, doors, windows, exterior wall materials, ornamentation, color, signs, sidewalks, and parking. Design guidelines have been developed for each of these elements. For each guideline



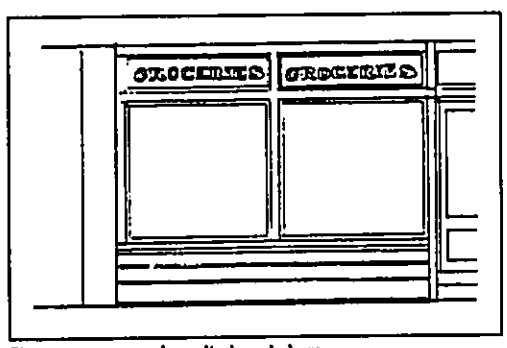
Old Waipahu Store *Photo by Gary Hylbemer*



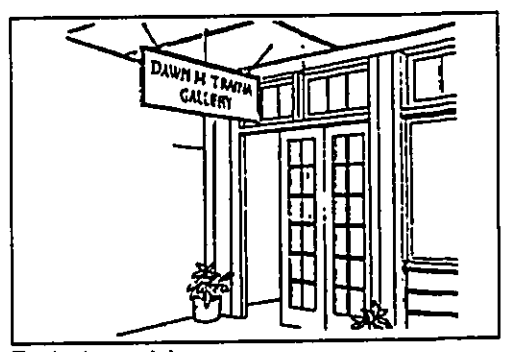
Painted sign on parapet above storefront



Signs painted on glass



Signs on transoms above display windows



Hanging (marquee) signs

Recommended Sign Types and Locations for Waipahu Town Core *Source: Spencer Mason Architects*

Laboratory Building *Photo by David Franzen*

element "recommended" design treatments are outlined. Under some elements of the town core design guidelines, separate guidance for new construction is provided.

Mill Site

The design guidelines for the mill site are derived from the visual character assessment of the existing buildings. The mill buildings physically dominate the town and are symbolically and, until recently, economically, the center of Waipahu. The design guidelines for the mill site address scale, massing, proportion, composition, rhythm, compatibility, shape, setbacks, height, roofs, windows, exterior wall materials, ornamentation, and color. Based on the Waipahu 2000 Update and Waipahu Town Special Area Plan recommendations, it is likely that the smokestack, the Generator, Laboratory, Administration, Human Resources, and Old Waipahu Store buildings will be retained.

Park/Filipino Community Center

The general direction recommended for the design of the Filipino Community Center is derived from visual analysis of the area. The new building should read as a building in a park setting rather than as a building fronting the street similar to the commercial buildings on the makai side of Waipahu Street. The Old Waipahu Store has historically been a unique exception as the only commercial building on the mauka side of Waipahu Street in that area. The continuation of the green, park-like atmosphere on the mauka side of Waipahu Street up to the Old Waipahu Store will maintain the existing character of the historic core of Waipahu. Leafy trees should be planted along Waipahu Street and landscaping should be carefully integrated into the design. It is recommended that, since the Filipino Community Center will be a public building, its design should relate to the other nearby historic civic buildings, the Old Waipahu Theater, Old Fire Station, Administration Building, and Old Waipahu Store. However, it is not intended that the design guidelines should be interpreted as prescribing a building of "historical" appearance. The Filipino Community Center will be one of the first results to come out of the Waipahu 2000 Update initiative as the town begins a new life after the closure of the sugar mill. Its design should set an example for the future of the town core.

HISTORIC DOCUMENTATION

Amfac has undertaken several archival and documentary measures to ensure the appropriate recordation of the Oahu Sugar mill and its activities while in operation.

Archival correspondence, publications, annual reports, historical slides, photos, and other documents dating back to the late 1800s have been carefully catalogued for future use. Historical items such as bangos, sports trophies, factory reports, journals, relief maps, signs, production charts, films, and antique office equipment have also been catalogued and boxed for future use.

Oahu Sugar Company Photograph Collection

The Oahu Sugar Company photo collection, consisting of more than 500 historical photographs, has been donated to Hawaii's Plantation Village by Amfac and the Oahu Sugar Company. The restoration and preservation of this collection is an integral part of the Hawaii's Plantation Village archives project, which was funded by a grant from the Hawaii State Foundation on Culture and the Arts.

One of Hawaii's Plantation Village's primary missions is to document plantation life in Hawaii. The photographs from the Oahu Sugar Company collection have been instrumental in helping Hawaii's Plantation Village to achieve this mission. Furthermore, the collection has proven to be an invaluable research and educational tool because it offers visual documentation of the many personal facets of plantation life, including:

- the unique plantation clothing worn by both male and female workers and the number of workers stationed at Oahu's sugar fields.
- the changes in planting and harvesting techniques and technologies. For example, some of the earlier photo graphs show mule- and horse-drawn cane cars and plows, as well as some of the first lap-seam boiler tractors.
- the extensive irrigation systems used on sugar lands. The photos document exact locations of pumping stations and different technology used over the 97-year history of the operation here on Oahu.
- identifying and crediting individuals and ethnic groups who worked with the company in both management and labor.
- plantation worker and management housing and various landscape treatments.
- the machinery utilized in each of the successive steps in the harvesting process.

"Final Harvest" Videotape Project

Videotape of the last harvest of Oahu Sugar Company (Spring 1995) was compiled by Tom Coffman Multimedia at the request of Amfac. This firm has produced videos for Dole Cannery, Ko Olina, the City of Kapolei, and Hawaii's Judiciary History Center. The Oahu Sugar videotape captured the activities of the last sugar harvest, including

Hawaii's Plantation Village

Final Harvest

Photo by Tom Coffman Multimedia

footage on growing, burning, harvesting, and processing the cane, and interviews with employees and retirees. Documentation was shot in color, as well as black and white, and color slides. Fifteen hours of Beta SP Video was shot and later edited to a 25-minute overview. Footage is a broadcast-quality format with potential for both television broadcasting and educational purposes. Shooting took place around the clock during the final five weeks of plantation operations. Also, all news coverage of the final harvest was compiled for future use.

Aerial Photography Project

In 1995, Photographer Gary Hofheimer was hired by Amfac to shoot aerial slides of the mill site, including views from Farrington Highway and the H-1 freeway.

The compiled data, photographs, and videos may also become available to the Hawaii's Plantation Village, or displayed at a future time in the proposed mill museum/ history center to be situated on the mill site.

Sugar Mill Archival Photograph Project

Architect Spencer Leineweber was commissioned by Amfac to oversee the compilation of archival photos to document the mill structures. David Franzen Photography was hired to shoot three sets of archival prints in accordance with the specifications of the Historical American Buildings Survey (United States Secretary of the Interior documentation specifications). These archival photographs will be filed in the U.S. Library of Congress and the University of Hawaii through Spencer Mason Architects. The photos thoroughly document the structures and buildings of the Oahu Sugar Company for posterity (27 exteriors of 22 structures, 28 interiors in 14 buildings).

Skilled Workers' Housing Study

Amfac also hired architect Spencer Leineweber to inspect, photograph, describe, and evaluate the 18 plantation homes that were once located near Waipahu and Makaaloha Streets, known as the Skilled Workers' Housing. Ms. Leineweber's firm selected eight homes to photograph and provided descriptions of their most interesting architectural features.

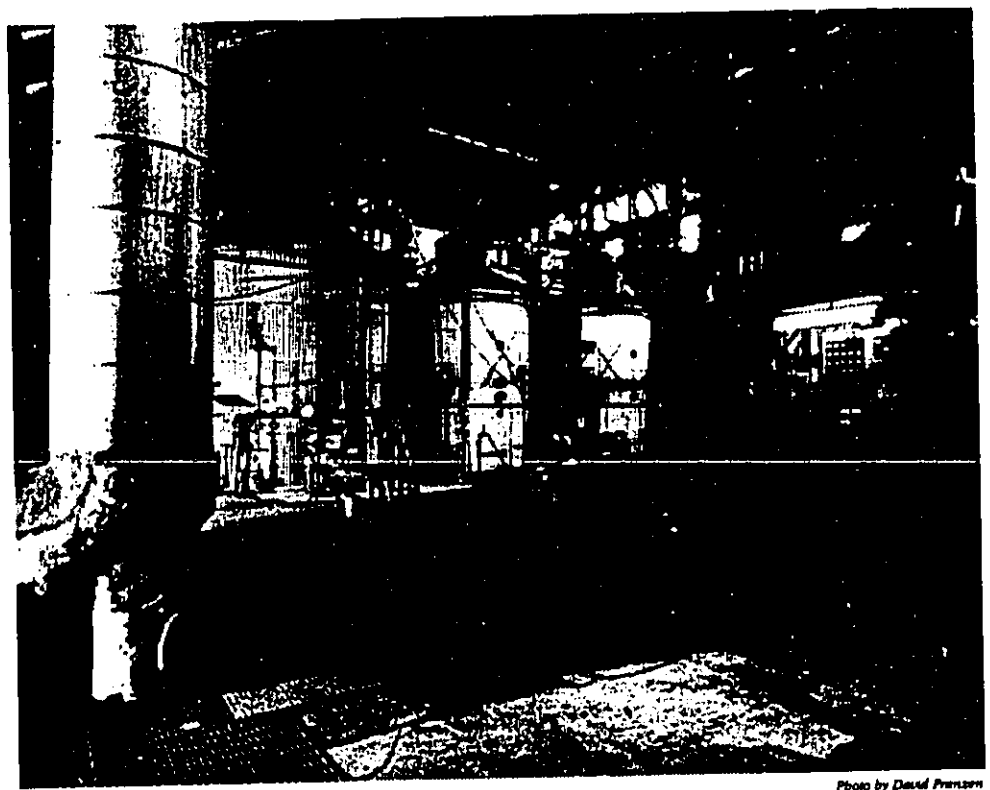
Community "Memory"

During the Hawaii's Plantation Village's 1994 "Plantation Heritage Annual Festival," an information booth was set up to obtain data and gather community recollections about the sugar mill. Nine hundred sixty-eight attendees were surveyed and questioned about their memories of the mill, and a data base was created. SMS Research was retained to compile the survey results. Most of the memories focused on the smokestack, the smell of the mill, and employment opportunities created by the plantation.

CLOSING

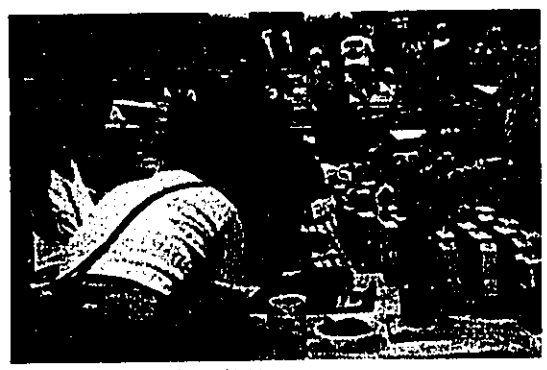
As Waipahu moves into its second hundred years of existence, the improvements planned for the Waipahu Town core are intended to keep this area as a focal point of the community, as the mill has always been in the past. These improvements will provide new and upgraded facilities, carefully designed to preserve historical and cultural roots, but with the capabilities of providing for and meeting the challenges of the next century.

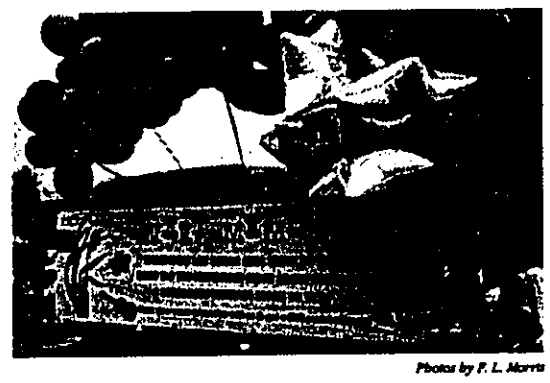
Amfac welcomes interest and participation in planning in the "heritage area." For information, contact Pat Lee, Project Coordinator, at (808) 247-2889.



Evaporators in the Boiling House Building

Photo by David Franzen





Plantation Heritage Annual Festival 1994

Photos by F. L. Morris

Appendix D

Phase II Environmental Site Assessment

PHASE II ENVIRONMENTAL SITE ASSESSMENT
OAHU SUGAR CO. - WAIPAHU MILL
WAIPAHU, HAWAII
PARCEL B

BES Job No. 4603

Prepared for:

AMFAC/JMB Hawaii, Inc.

Prepared by

Brewer Environmental Services

A Report Prepared For:

AMFAC/JMB Hawaii, Inc.
700 Bishop Street, 21st Floor
P.O. Box 3230
Honolulu, Hawaii 96801

PHASE II ENVIRONMENTAL SITE ASSESSMENT
OAHU SUGAR MILL
OAHU SUGAR COMPANY
WAIPAHU, HAWAII

BES Job No. 4603

November 20, 1996

Sherrie K. Sasaki
Project Geologist

Kevin S. Kennedy
Project Manager

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TABLE OF CONTENTS

APPENDICES

EXECUTIVE SUMMARY

BES Environmental Services (BES) was contracted by AMFAC/JMB Hawaii, Inc. to perform a Phase II Site Investigation at a portion of TMK 9-4-2: 04 known as Parcel B located at the former Oahu Sugar Company Sugar Mill in Waipahu, Oahu, Hawaii. The objective of this project was to determine if chemical or chemical constituents historically used, stored, or spilled onsite are present in the shallow subsurface soils. Groundwater conditions beneath the subject site were not investigated because AMFAC/JMB Hawaii, Inc. is addressing the groundwater in a separate investigation.

BES performed the Phase II investigation in June, 1996. The investigation consisted of subsurface soil sample collection at various depths and locations across the site and chemical analyses of those samples. Soil samples were collected using direct push sampling technology. Each sample was screened for the presence of volatile organic hydrocarbons in the field. Samples were then analyzed using a field immunoassay analytical technology. Immunoassay tests included: (1) total petroleum hydrocarbons (TPH) as diesel; (2) polynuclear aromatic hydrocarbons (PAHs); (3) polychlorinated biphenyls (PCBs); (4) 2,4-D, a pesticide; (5) atrazine, a pesticide; (6) carbendizim, a pesticide; (7) and chlordane, a pesticide. Immunoassay tests were performed on 141 samples. A total of 139 samples were analyzed for TPH as diesel, 56 samples for PAHs, 30 for PCBs, 32 for benlate, and 19 for 2,4-D, atrazine, and Carbendizim.

A total of 74 soil samples, at least one from each of the 53 sample points, were selected for confirmation analysis at an analytical laboratory. Confirmation analysis was based on either immunoassay analysis results or knowledge of past land use or both. Confirmation analyses included at least one of the following tests: (1) total recoverable petroleum as hydrocarbons (TRPH); (2) TPH as gasoline; (3) TPH as diesel; (4) TPH as oil; (5) four regulated PAHs - benzo (a) pyrene, acenaphthene, fluoranthene, and naphthalene; (6) benzene, toluene, ethylbenzene, and total xylenes (BTEX); (7) PCBs; (8) four halogenated volatile organic compounds (HVOCs); (9) the pesticides benlate, velpar, topsin, and diuron; (10) the pesticide chlordane; (11) the pesticides DDE and DDT; and (12) total metals.

Petroleum hydrocarbons as measured by either TRPH, TPH as diesel, toluene, total xylenes, or acenaphthene were detected in 33 samples; however, these concentrations were below the State of Hawaii Department of Health (HDOH) soil action levels (SALs) for those compounds. However, one soil sample, FMT-1-10', collected from the 10 foot depth interval, located east of the molasses tank had a concentration of TPH as oil of 8,469 mg/kg which exceeded the HDOH SAL of 5,000 mg/kg. Sample FMT-1-2', collected from the two foot depth interval, contained 21.21 mg/kg of fluoranthene, a PAH, which exceeds the HDOH SAL of 11 mg/kg.

OSCO Phase II Investigation
Executive Summary
November 20, 1996

The petroleum hydrocarbons detected at concentrations below SALs are not considered to be an environmental concern; however, TPH as oil and fluoranthene in the former molasses tank area were detected at concentrations above SALs. Therefore, further investigation of the subsurface soil in the former molasses tank area is warranted in order to determine the areal and vertical extent of the contamination. BES recommends employing test pits to determine the extent of the contamination or, if conditions permit, proceed directly with excavating and disposing of the impacted soil at a local landfill or thermal desorption facility.

Arsenic was detected in four soil samples collected from two feet below grade surrounding the cane washer at concentrations exceeding the Environmental Protection Agency (EPA) preliminary remediation goals (PRGs). Although arsenic concentrations exceed the PRG, these concentrations are "total" concentrations rather than toxicity leaching characteristic procedure (TCLP) that is used for the characterization of hazardous waste. Using a dilution factor of 20, which is used in the TCLP testing of soils, the average concentration of arsenic in soils using a TCLP test would be less than 1.5 milligrams per liter, the regulatory level established by the EPA (40 CFR Part 261 Table 1).

Based on current DOH practices and BES's past experiences with industrial sites having similar arsenic concentrations, BES recommends no further action. This recommendation is made with the understanding that zoning for Parcel B will be kept for either industrial or commercial use only. If residential zoning or child care facilities are planned for the parcel, a preliminary risk assessment should be performed to assess the health risks to humans.

Analyses for pesticides were performed on samples collected from areas surrounding the seed treatment wells and cane cleaning plant. There were no detectable concentrations of these analytes in any of the samples analyzed. No further action is recommended regarding pesticides.

Halogenated volatile organic compounds, and polychlorinated biphenyls were analyzed for samples collected from areas surrounding the machine shop, the automotive repair shop, the cane washer, the bagasse warehouse and the service station. There were no detectable concentrations of these compounds at these locations. BES recommends no further action pertaining to HVOCs or PCBs.

1.0 INTRODUCTION

Brewer Environmental Services (BES) has prepared this report detailing a Phase II Environmental Site Assessment (ESA) for a property known as Parcel B of the Tax Map Key number 9-4-2: 02 located at the Oahu Sugar Company's (OSCO) former sugar mill in Waipahu, Oahu, Hawaii (Figure 1-1, Location Map; Figure 1-2, Parcel Distribution Map). The purpose of the investigation was to determine if chemical or chemical constituents historically used, stored, or spilled onsite are present in the shallow subsurface soils at the subject site.

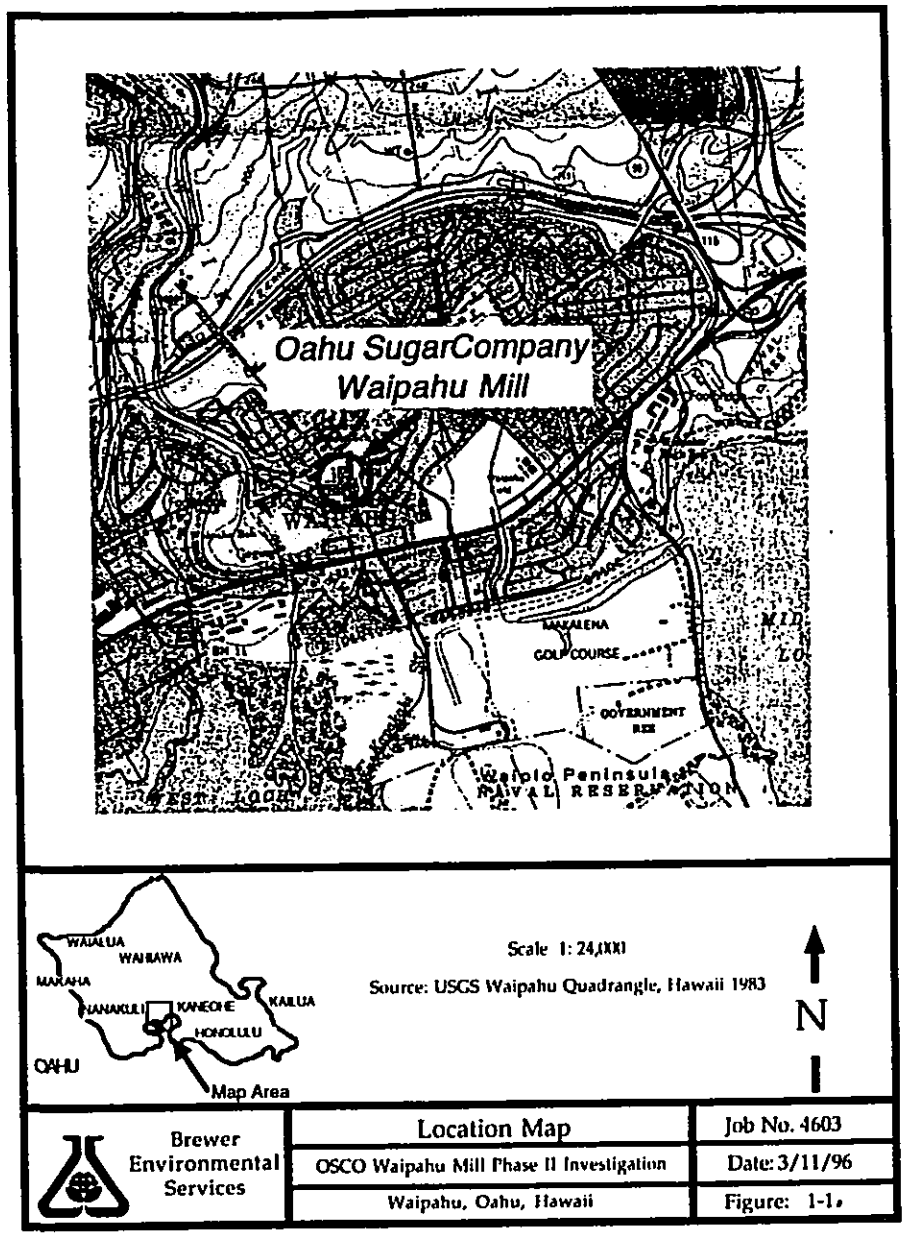
1.1 SITE BACKGROUND

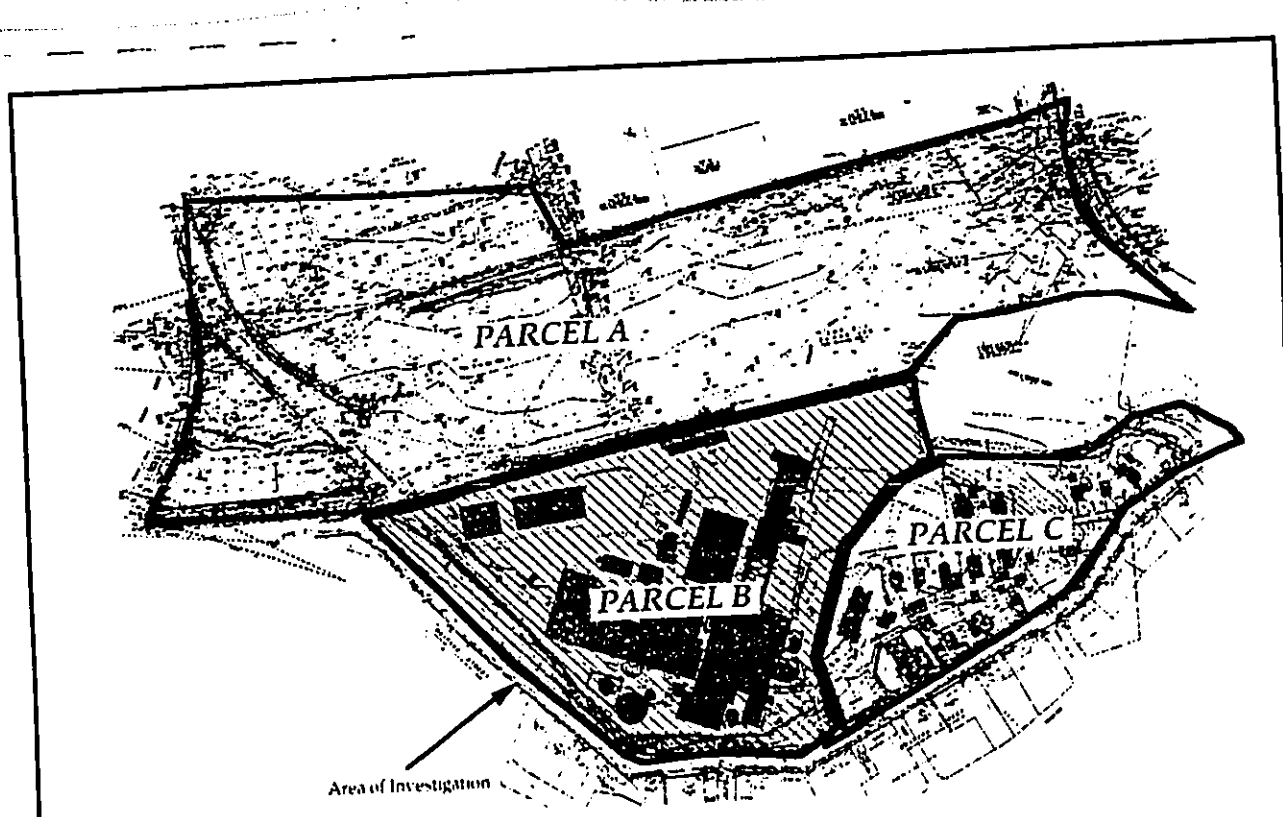
The subject site (Figure 1-3) includes the entire OSCO sugar mill area and is located in a residential/commercial land use district of Waipahu, Hawaii. Parcel A is north of Parcel B, while Parcel C is east of Parcel B. Adjacent land use includes residential housing to the north, northeast, & northwest and commercial businesses to the south, southeast, & southwest.

OSCO's Waipahu Sugar Mill has been used for sugar cane processing operations since the early 1900's. Sugar cane processing at the Waipahu Mill consisted of the following steps: 1) transportation of burnt and cut sugar cane from the field to the cane washer; 2) washing of the cane; 3) running the washed cane through a series of crushers; 4) collection of the cane syrup; 5) boiling of syrup; 6) and extraction of sugar syrup and molasses via centrifuges.

Mill activities included the operation of boilers, power generation, vehicle & equipment maintenance, operation of a service station, seed treatment, sugarcane washing, and the processing of raw sugar and molasses.

In April 1995, OSCO ceased all operations. Demolition and dismantling of the onsite structures began in early 1996. In April 1996, BES personnel performed a site reconnaissance of the mill area with Mr. Elmer Nii, a former OSCO Factory Superintendent. He assisted BES by providing information on past onsite activities including information regarding past use and storage of hazardous substances such as petroleum hydrocarbons regulated by the Hawaii Environmental Response Law (HERL).



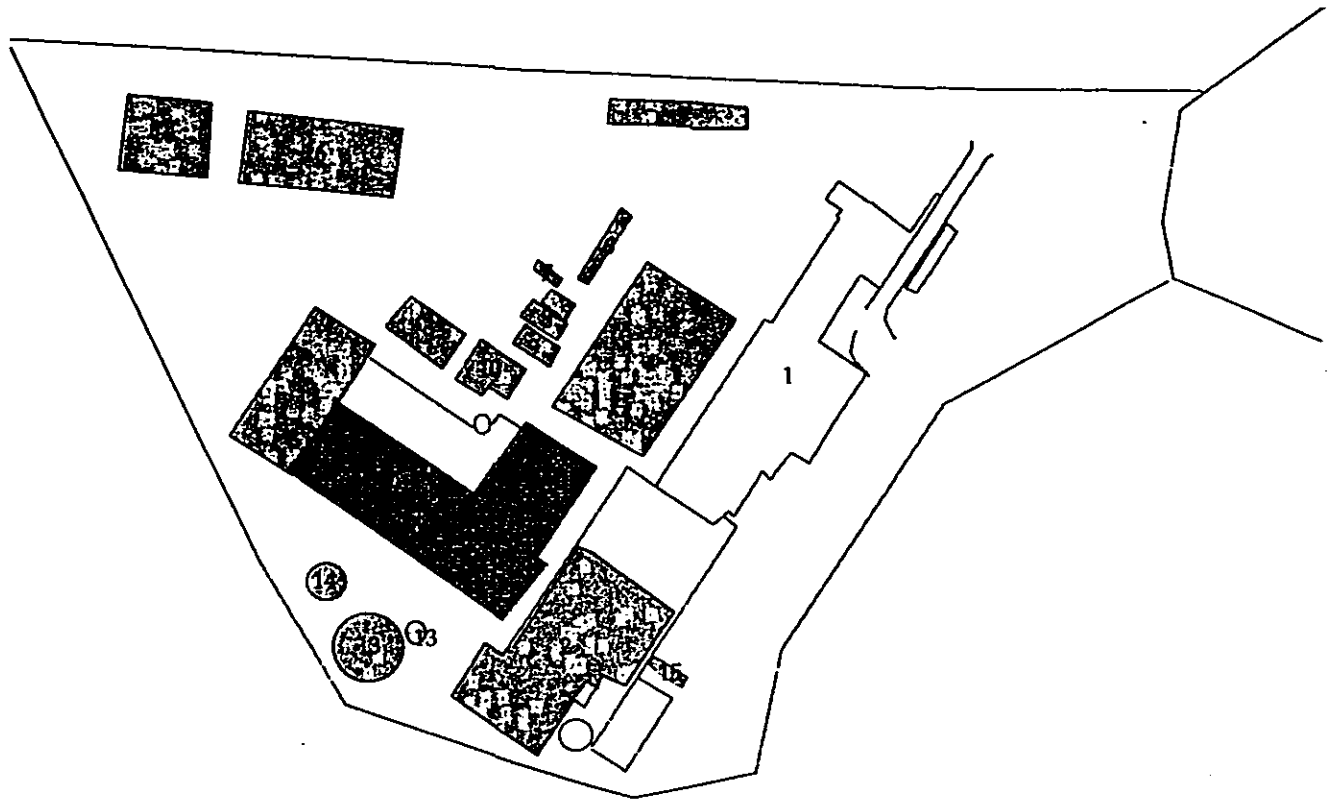


Brewer Environmental Services	Parcels A, B, and C	Job No.: 4603
	OSCO Waipahu Mill Phase II Investigation	Date: 3-11-96
	Waipahu, Hawaii	Figure: 1-2

Figure 1-3 Parcel B - Site Map

LEGEND

1 Cane Cleaning Plant
2 Bagasse Storage & Warehouse
3 Service Station & Dispatcher Office
4 Machine Shop
5 Boiling House
6 Sugarcane Seed Hot Water Treatment Tank
7 Sugarcane Seed Fungicide Dip Tank
8 Truck Tire Warehouse
9 Blacksmith Shop
10 Fabricating Shop & Welding Shed
11 Sugar Room
12 General Warehouse
13 MolassesTank & Molasses Transfer Tank
14 Oil Tank
15 Waste Oil Tank
16 Truck and Tractor Repair Shop



Phase II Site Investigation
Oahu Sugar Company
Waipahu Mill
Waipahu, Hawaii

Brewer Environmental Services

BES Job No: 4603.00 *July 31, 1996*

1.2 SCOPE OF WORK

BES performed the following scope of work as part of the Phase II Site Investigation at the OSCO Waipahu Sugar Mill:

- Conducted a site reconnaissance to identify the former storage and usage areas of HERL-regulated hazardous substances including petroleum hydrocarbons
- Developed a sampling aquisition plan and sample grid approach for the investigation
- Conducted utility clearances for sample accessibility
- Cleared each sample point for utilities using a magnetic pipe and cable locator
- Punched 53 holes across the subject site using Strataprobe™ direct push sampling technology
- Collected multiple soil samples from each Strataprobe™ hole at various depths
- Performed onsite field screening of soil samples for volatile organic compounds using a portable photoionization detector (PID)
- Performed immunoassay chemical analysis on 141 soil samples for one or more of the following analytes: total petroleum hydrocarbons as diesel (TPH-D), polynuclear aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), and the following pesticides or pesticide components - Carbendizim, Atrazine, 2,4-D, and Chlordane
- Using the immunoassay results as the basis for selection, submitted one soil sample from each sample location for offsite confirmation laboratory analyses. Confirmation analytes included one or more of the following:
  - TPH as diesel (D), gasoline (G), & oil by EPA Method 8015M
  - benzene, toluene, ethylbenzene, & xylenes (BTEX) by EPA Method 8020
  - halogenated volatile organic compounds (HVOCs) by EPA Method 8010
  - four polynuclear aromatic hydrocarbons (PAHs): benzo (a) pyrene, acenaphthene, fluoranthene, and naphthalene by EPA Method 8010
  - eight metals by EPA Method 6010
  - PCBs and organochlorine pesticides by EPA Method 8080
  - PCBs only by EPA Method 8081
  - pesticides by EPA Method 632
  - chlorinated herbicides by EPA Method 615

- Prepared this written report detailing field methods, analytical procedures, sample locations, physical and chemical results, discussions, and recommendations

2.0 INVESTIGATION APPROACH

Based on our site reconnaissance, conversations with Mr. Nii, and past experiences with other sugar mill investigations, BES identified potential areas of environmental concern at the OSCO Sugar Mill and prepared a work plan for the Phase II site investigation. The field portion of the investigation was conducted in June 1996 and consisted of systematic subsurface soil sample collection and chemical analysis.

2.1 GRID SAMPLING

BES used a systematic grid sampling approach, as recommended by the Environmental Protection Agency (EPA, 1991), to aid in identifying areas of contamination. A 100 foot by 100 foot grid was superimposed on the site map of the mill area as shown in Figure 2-1. The grid provided a reproducible sample location framework which allowed for both an easy sample location reference and identification system. The origin of the grid was chosen arbitrarily and the gridlines were oriented in the north-south and east-west direction. Grid nodes were designated as potential sample locations and soil sampling depths were chosen to be two, six, and ten feet below grade (fbg). The selection of grid nodes for sample collection points were based on the location of the node relative to a specific past activity. The sample grid was surveyed by licensed surveyors so that the sample nodes could be relocated in the future, if necessary.

2.2 SELECTION OF AREAS OF INVESTIGATION - GRID LAYOUT

The areas selected for investigation were identified as those historically used for:

- chemical storage - warehouses, storage areas, underground storage tanks [UST], aboveground storage tanks [AST] locations, and the seed treatment tanks
- equipment maintenance - machine shop, welding shop, electrical shop
- sugar cane processing - mill, boiler house, generators
- areas affected by known chemical releases.

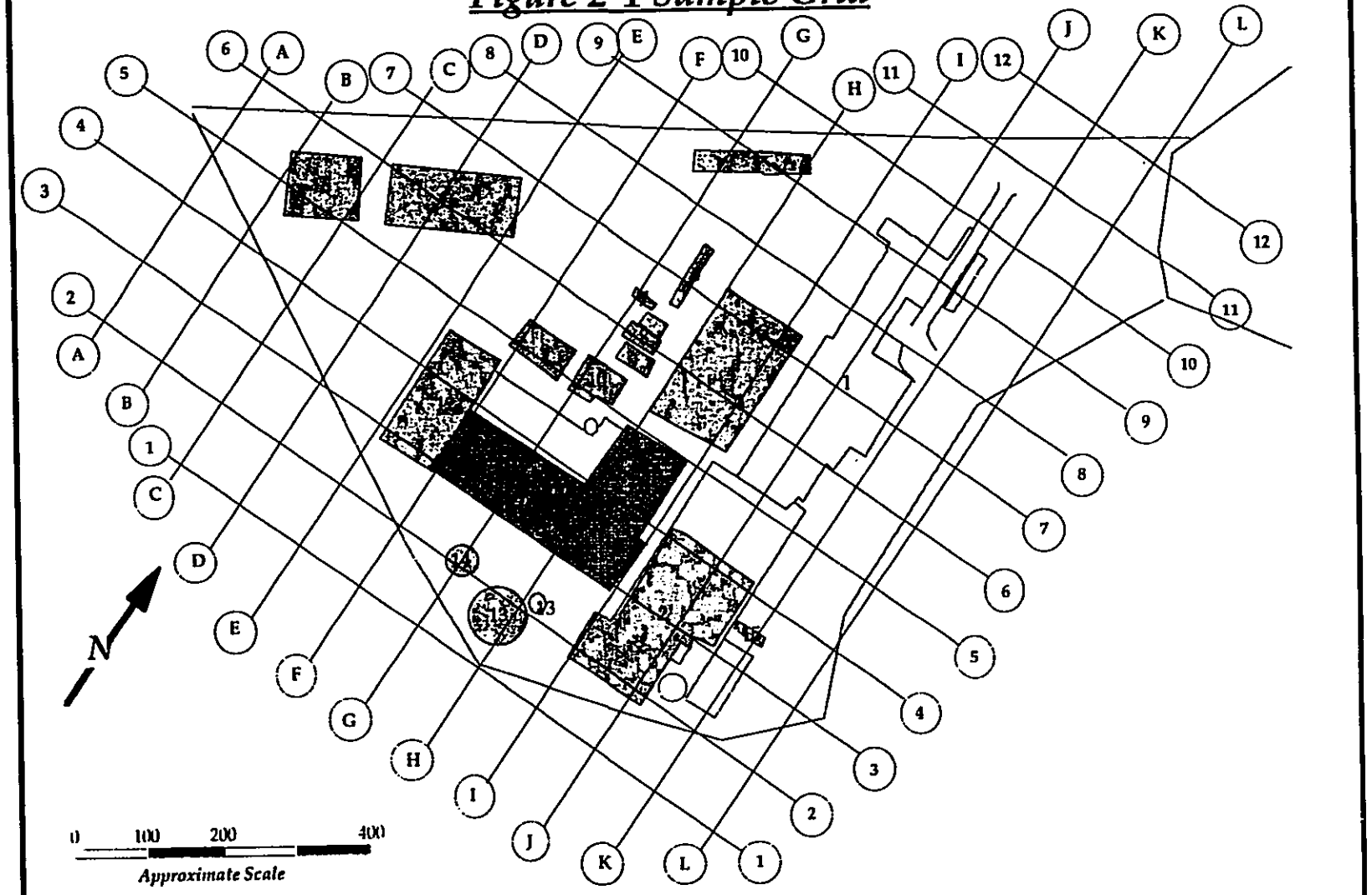
By superimposing a 100 foot by 100 foot sampling grid over the site, grid nodes were selected in areas previously identified as "areas of concern."

Figure 2-1 Sample Grid

LEGEND

1 Cane Cleaning Plant
2 Bagasse Storage & Warehouse
3 Service Station & Dispatcher Office
4 Machine Shop
5 Boiling House
6 Sugarcane Seed Hot Water Treatment Tank
7 Sugarcane Seed Fungicide Dip Tank
8 Truck Tire Warehouse
9 Blacksmith Shop
10 Fabricating Shop & Welding Shed
11 Sugar Room
12 General Warehouse
13 MolassesTank & Molasses Transfer Tank
14 Oil Tank
15 Waste Oil Tank
16 Truck and Tractor Repair Shop

1 A Soil Sampling Grid



Phase II Site Investigation
Oahu Sugar Company
Waipahu Mill
Waipahu, Hawaii

Brewer Environmental Services

BES Job No: 4603.00 *July 31, 1996*

2.3 SELECTION OF CHEMICAL ANALYSES

The chemical analyses selected for the soil samples varied across the site and were based on the potential chemicals of concern identified as having been used in a particular area of the mill. For example, fungicide analyses were selected for samples collected near the former seed treatment areas but were not selected for samples collected from other areas of the mill where fungicides were not known to have been used. Chemical analyses for petroleum products were selected for all sample points because of the extensive use by a large truck fleet over the years.

Metals are the usual residual product of some pesticide applications and were, therefore, selected as analytes for samples collected from areas of known past pesticide handling.

The analyte selection for each mill area is summarized in Table 2-1 and shown graphically by sample node location in Figure 2-2.

TABLE 2-1
Chemical Analytical Suites for Phase II Investigation
OSCO Sugar Mill, Waipahu, Hawaii

Mill Area of Concern	TPH-G, TPH-D, TPH-OIL, TRPH, BTEX	PAHs	HVOCs	PCBs	RCRA Metals	Pesticides Screens: Chlorinated Herbicides	Pesticides Screens: Organochlorine Pesticides	Pesticides
1 Cane Washer	x	x		x	x	x	x	x
2 Bagasse Warehouse	x	x		x	x	x	x	x
3 Service Station	x	x		x	x			
4 Machine Shop	x	x	x					
5 Boiling House	x	x			x			
6 Sugar Cane Treatment Well	x	x						x
7 Seed Treatment Well	x	x						x
8 Blacksmith Shop	x	x						
9 Welding Shop	x	x						
10 Fabrication Shop	x	x						
11 Sugar Room	x							
12 General Warehouse	x							
13 Molasses Tank	x	x						
14 Oil Tank	x	x						
15 Waste Oil Tank	x	x						
16 Automotive Repair Shop	x	x	x		x			

TPH-G: EPA Method 8015M - Total Petroleum Hydrocarbons as gasoline
TPH-D: EPA Method 8015M - Total Petroleum Hydrocarbons as diesel
TPH-Oil: EPA Method 8015M - Total Petroleum Hydrocarbons as oil
TRPH: EPA Method 418.1 - Total Recoverable Petroleum Hydrocarbons
BTEX: EPA Method 8020 - Benzene, Toluene, Ethylbenzene, Xylene
PAHs: EPA Method 8100 - Polynuclear Aromatic Hydrocarbons - benzo (a) pyrene, acenaphthene, fluoranthene, and naphthalene
HVOCs: EPA Method 8010 -Halogenated Volatile Organic Compounds
PCBs: EPA Method 8081 - Polychlorinated Biphenyls
RCRA Metals: EPA Method 6010 - As, Ba, Cd, Cr, Pb, Se, Hg, Ag
Pesticide Screens: Immunoassays - 2,4-D; Carbendizm; Atrazine; Bentazon
(1) Chlorinated Herbicides: EPA Method 615 - 2,4-D; 2,4-DB; 2,4,5-T; 2,4,5-TP; Dinoseb; Dichloroprop, Dicamba; Dalapon; MCPP; MCPA
(2) Pesticides: EPA Method 632 - Bentazon, Vydate, Trycen M, Trycen E, Atrazine, Diuron
(3) Organochlorine Pesticides: EPA Method 8080 - Lindane, Heptachlor & Epoxides, Aldrin, Endosulfan I/II, Dieldrin, DDE, DDD, DDT, Methoxychlor, Endrin, Edosulfan sulfate, Chlordane, Toxaphene

2.3 SELECTION OF CHEMICAL ANALYSES

The chemical analyses selected for the soil samples varied across the site and were based on the potential chemicals of concern identified as having been used in a particular area of the mill. For example, fungicide analyses were selected for samples collected near the former seed treatment areas but were not selected for samples collected from other areas of the mill where fungicides were not known to have been used. Chemical analyses for petroleum products were selected for all sample points because of the extensive use by a large truck fleet over the years.

Metals are the usual residual product of some pesticide applications and were, therefore, selected as analytes for samples collected from areas of known past pesticide handling.

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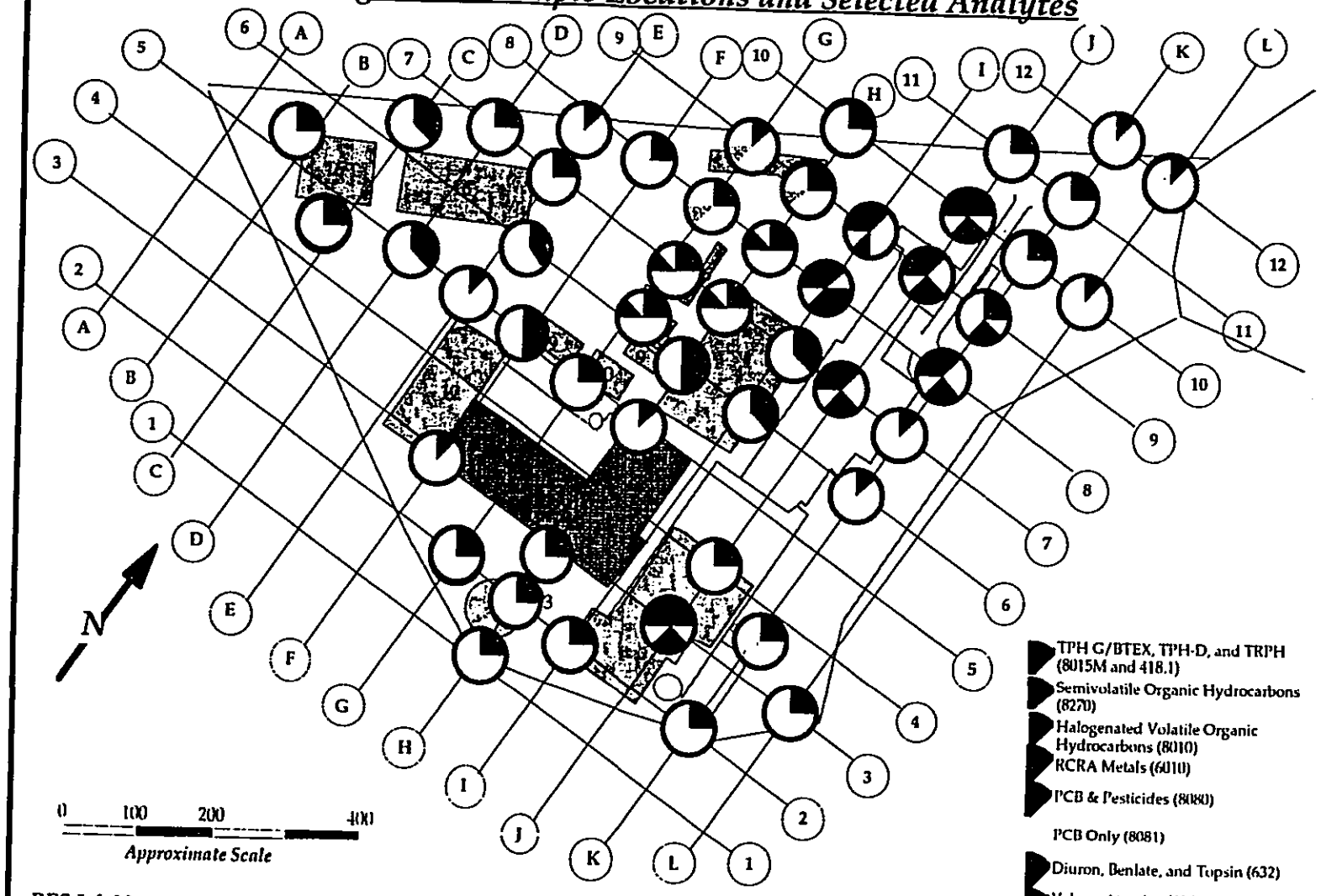
Chemical Analytical Suites for Phase II Investigation
OSCO Sugar Mill, Waipahu, Hawaii

Mill Area of Concern	TPH-G, TPH-D, TPH-OG, TRPH, BTEX	PAHs	HVOCs	PCBs	RCRA Metals	Pesticides Screens: Chlorinated Herbicides	Pesticides Screens: Organochlorine Pesticides	Pesticides
1 Cane Washer	x	x		x	x	x	x	x
2 Bagasse Warehouse	x	x		x	x	x	x	x
3 Service Station	x	x		x	x	x	x	x
4 Machine Shop	x	x	x		x			
5 Boiling House	x	x						
6 Sugar Cane Treatment Well	x	x						
7 Seed Treatment Well	x	x						x
8 Blacksmith Shop	x	x						x
9 Welding Shop	x	x			x			
10 Fabrication Shop	x	x						
11 Sugar Room	x							
12 General Warehouse	x							
13 Molasses Tank	x	x						
14 Oil Tank	x	x						
15 Waste Oil Tank	x	x						
16 Automotive Repair Shop	x	x	x					

TPH-G: EPA Method 8015M - Total Petroleum Hydrocarbons as gasoline
TPH-D: EPA Method 8015M - Total Petroleum Hydrocarbons as diesel
TPH-OG: EPA Method 8015M - Total Petroleum Hydrocarbons as oil
TRPH: EPA Method 418.1 - Total Recoverable Petroleum Hydrocarbons
BTEX: EPA Method 8020 - Benzene, Toluene, Ethylbenzene, Xylene
PAHs: EPA Method 8100 - Polynuclear Aromatic Hydrocarbons - benzo (a) pyrene, acenaphthene, fluoranthene, and naphthalene
HVOCs: EPA Method 8010 -Halogenated Volatile Organic Compounds
PCBs: EPA Method 8081 - Polychlorinated Biphenyls
RCRA Metals: EPA Method 6010 - As, Ba, Cd, Cr, Pb, Se, Hg, Ag
Pesticides Screens: Immunoassays - 2,4-D; Carbendizim; Atrazine; Bentazone
(1) Chlorinated Herbicides: EPA Method 615 - 2,4-D; 2,4-DB; 2,4,5-T; 2,4,5-TP; Dinoseb; Dichloroprop; Dicamba; Dalapon; MCPP; MCPA
(2) Pesticides: EPA Method 632 - Bentazon, Velpar, Topsin M, Topsin E, Atrazine, Diuron
(3) Organochlorine Pesticides: EPA Method 8080 - Lindane, Heptachlor & Epoxides, Aldrin, Endosulfan I/II, Dieldrin, DDE, DDD, DDT, Methoxychlor, Endrin, Edosulfan sulfate, Chlordane, Toxaphene

Figure 2-2 Sample Locations and Selected Analytes



LEGEND

1 Cane Cleaning Plant
2 Bagasse Storage & Warehouse
3 Service Station & Dispatcher Office
4 Machine Shop
5 Boiling House
6 Sugarcane Seed Hot Water Treatment Tank
7 Sugarcane Seed Fungicide Dip Tank
8 Truck Tire Warehouse
9 Blacksmith Shop
10 Fabricating Shop & Welding Shed
11 Sugar Room
12 General Warehouse
13 MolassesTank & Molasses Transfer Tank
14 Oil Tank
15 Waste Oil Tank
16 Truck and Tractor Repair Shop

1 A Soil Sampling Grid

Phase II Site Investigation
Oahu Sugar Company
Waipahu Mill
Waipahu, Hawaii

Brewer Environmental Services

BES Job No: 4603.00 July 31, 1996

3.0 METHODOLOGY

The Phase II Site Investigation consisted of three activities: (1) pre-field activities, (2) sample collection, and (3) data evaluation and reporting. Section 3.1 of this report outlines the pre-field activities. Section 3.2 through 3.5 detail the field and analytical methods employed as part of the investigation. Section 4.0 presents a discussion of the field and analytical results.

The Phase II Site Investigation at the OSCO Waipahu Mill consisted of the collection of multiple subsurface soil samples at various depths at 53 sample locations. Soil samples were collected using Strataprobe™ direct push sampling technology. Each soil sample was screened for the presence of volatile organic hydrocarbons upon collection and characterized as to soil type by a BES geologist.

Soil samples were analyzed by a BES field chemist using Ensys™ immunoassay analytical technology. Based on the results of these analyses, selected duplicate soil samples were sent to a certified analytical laboratory for confirmation analysis.

3.1 PRE-FIELD ACTIVITIES

In preparation for the subsurface investigation, BES visited the site to determine potential sample locations and evaluate equipment access. The Hawaiian Electric Company, GTE-Hawaiian Telephone Company, Honolulu Gas Company, Board of Water Supply, AT&T, and Oceanic Cable Service were contacted in order to assess the job site for any underground utilities or structures that may be encountered during sampling activities. Additionally, BES toned each proposed Strataprobe™ sample location using a magnetic pipe and cable locator, prior to commencing work at the site to further ensure clearance of underground utilities or structures.

3.2 GRID SURVEY

As discussed in Section 2.1, BES utilized a systematic grid sampling approach for the placement and identification of soil sample collection points prior to sampling activities. To create the sampling grid, BES contracted Walter P. Thompson, Inc. to conduct a land survey. The surveyors were given an arbitrary point of origin and then constructed a grid in a true north-south and east-west direction, on 100 foot centers across the site. Each grid node was identified by a column letter (A - L) and row number (1 - 12) providing a unique grid node and sample location identification number (e.g. B5, C6, K12). Each surveyed grid node was staked, engraved, or pegged with a nail, flagged, and marked with paint by the surveyor and a survey location map was provided for the BES field crew (Figure 2-1).

Because of buildings, rocks, inaccessibility and other obstacles, the surveyed grid point was not always accessible by the field crew during the sampling activities. At some points, sample collection required that the actual sample point be offset up to several feet from the grid node. Figure 3-1 shows the mill site and the location of the actual sample collection points. The offset samples were analyzed for the same analytes as planned for the original sample location. The actual sample location for all sample points are shown on the surveyors map which is included in Appendix A.

3.3 SOIL SAMPLE COLLECTION

3.3.1 DIRECT PUSH SOIL SAMPLING TECHNOLOGY

BES subcontracted Transglobal Environmental Geochemistry (TEG) of Honolulu, Hawaii to use Strataprobe™ direct-push sampling technology to collect soil samples. All sample acquisition, identification, and handling was performed under the direct supervision of a BES geologist.

The Strataprobe™ technology utilizes a 1.5-inch diameter, hollow steel drive rod, equipped with a conical tip which is hydraulically pushed into the ground to the desired depth. The Strataprobe™ sampling system is mounted on the back of a four-wheel drive, low-profile truck and utilizes the weight of the truck and sampling unit to push the drive rod into the ground. Details regarding the operation of Strataprobe™ system are presented in Appendix B.

3.3.2 SOIL SAMPLING METHODOLOGY

BES sampled 50 sample grid nodes, or sample points, across the site. Three additional sample points were examined in the former molasses tank area for a total of 53 sample points. A total of 146 soil samples were collected from 53 locations (three samples were collected from three distinct depths from 45 points, two samples from three points, and one sample from five points). Table 3-2 shows sample depths for each sample point.

At 45 of the 53 sample points, a soil sample was collected from each of three distinct depths, usually two, six and ten feet below grade (fbg). At each of these depths, a two-foot interval of soil was collected for chemical analysis. The sample

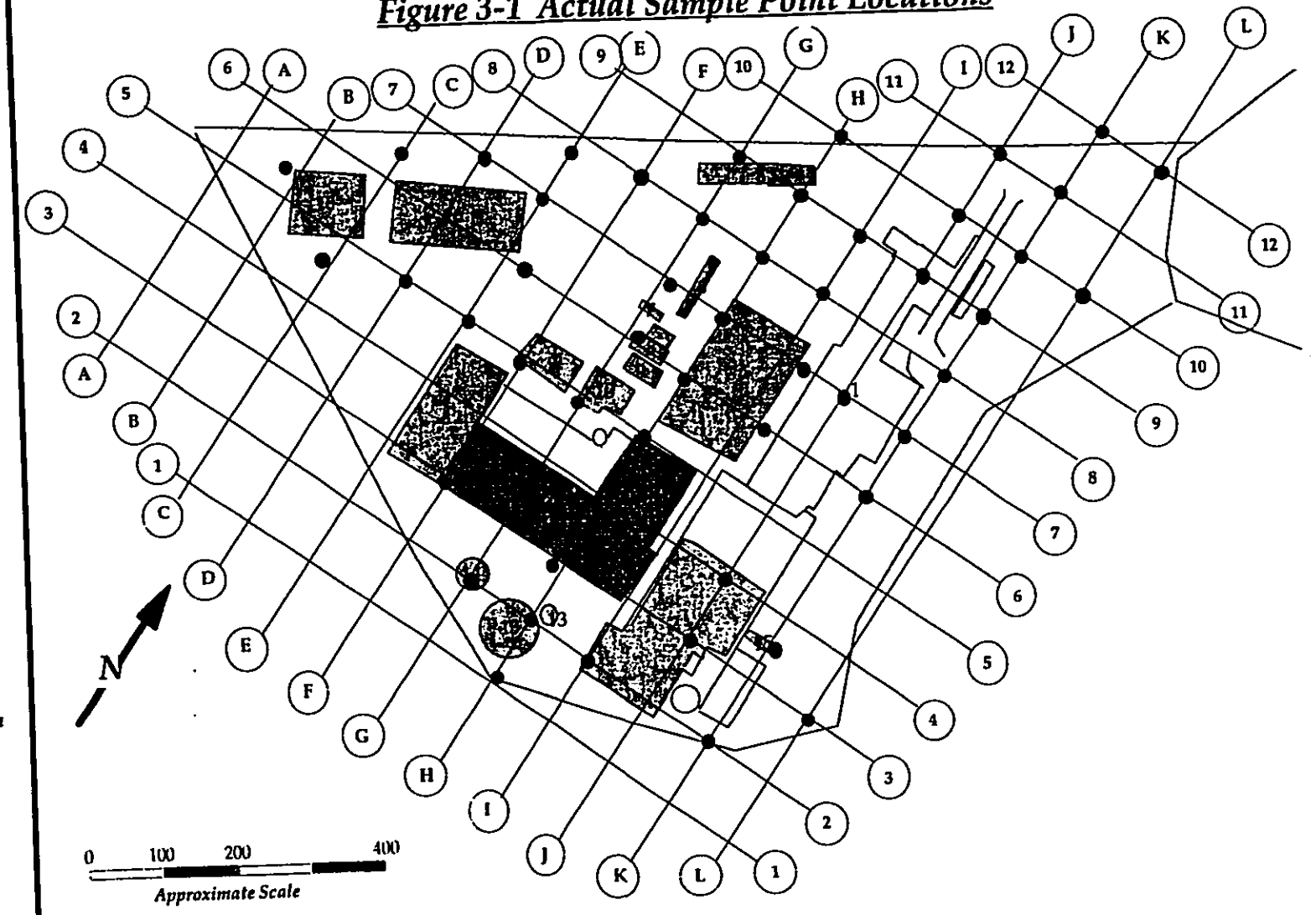
Figure 3-1 Actual Sample Point Locations

LEGEND

1 Cane Cleaning Plant
2 Bagasse Storage & Warehouse
3 Service Station & Dispatcher Office
4 Machine Shop
5 Boiling House
6 Sugarcane Seed Hot Water Treatment Tank
7 Sugarcane Seed Fungicide Dip Tank
8 Truck Tire Warehouse
9 Blacksmith Shop
10 Fabricating Shop & Welding Shed
11 Sugar Room
12 General Warehouse
13 MolassesTank & Molasses Transfer Tank
14 Oil Tank
15 Waste Oil Tank
16 Truck and Tractor Repair Shop

A / 1 — Soil Sampling Grid

Sample Locations



Phase II Site Investigation
Oahu Sugar Company
Waipahu Mill
Waipahu, Hawaii

Brewer Environmental Services

BES Job No: 4603.00 *July 31, 1996*

depths were generally one fbg to three fbg, from five fbg to seven fbg, and from nine fbg to 11 fbg. The resulting samples used for chemical analysis were identified as collected from the two, six and ten foot depths, respectively. Deviations from the sample intervals were caused when the drive rods encountered refusal at depths shallower than 11 fbg. Refusal at shallow depths was encountered at nine points including: B5, G2, G2-54'N, H3, K2, K3, J3, and J4.

Soil samples were collected by using the Strataprobe™ to push the sample cone to the appropriate depth. The sample cone was lined with pre-cleaned six-inch log stainless steel sample tubes. As the cone was pushed through the desired two-foot long sampling interval, the sample tubes were filled with soil and then retrieved.

TEG's standard soil sampling procedures and BES's standard operating procedures (SOP) for soil sampling and headspace analyses are presented in Appendix C - Standard Operating Procedures.

3.3.3 FIELD QUALITY CONTROL

During soil sample collection, certain field quality control (QC) procedures were followed to ensure sample integrity and representation. These procedures are aimed at preventing the mix-up of samples in the field and laboratory, cross contamination between samples, loss of volatile organic compounds during the sampling and sample handling process, and insuring the accuracy of the field analytical method. The QC procedures encompass record keeping, sample handling procedures, equipment decontamination procedures, and calibration of field instruments. These procedures are discussed below.

3.3.3.1 Equipment Decontamination

All sampling equipment was thoroughly decontaminated or washed before each use. Appendix C presents a description of the decontamination procedures employed.

3.3.3.2 Sample Management

Immediately after the retrieval of the sample sleeves from the Stratoprobe™ sample tool, the four 6-inch sample sleeves were separated and removed from the tool. The lower 12 inches of the sample were immediately covered with Teflon™ film and sealed with plastic end caps, labeled, and stored in a cooler with frozen gel ice for temporary storage. The upper portion of the sample was used for onsite measurement of organic vapor concentration of the soil headspace and soil characterization and identification according to the Unified Soil Classification System (USCS) (ASTM, 1990). A description of BES' soil headspace measurement

procedures is presented in Appendix C. Appendix D presents complete soil classification logs for each of the Stratoprobe™ boreholes.

Sample label information included the following: sample identification number, date, time of collection, job number, and sampler's initials. The sample identification number consisted of the BES job number (4603), Stratoprobe™ hole number (sample point number), and depth. For example, the sample ID for the six foot sample collected from borehole D5 would be 4603-D5-6.

Prior to the start of BES's field work, petroleum contamination was uncovered while dismantling the former molasses tank. At AMFAC's request, BES incorporated three additional soil sample locations to help characterize the area of contamination. One sample location was labeled 4603.00-FMT-1 for depths of two, six and ten fbg and two other samples points surrounding the molasses tank were identified with coordinates (e.g. 4603.00-H1-28'-N45'W) and sampling depths (Figure 3-2). These additional soil samples were collected in response to the HDOH reported release number: 051396-1420.

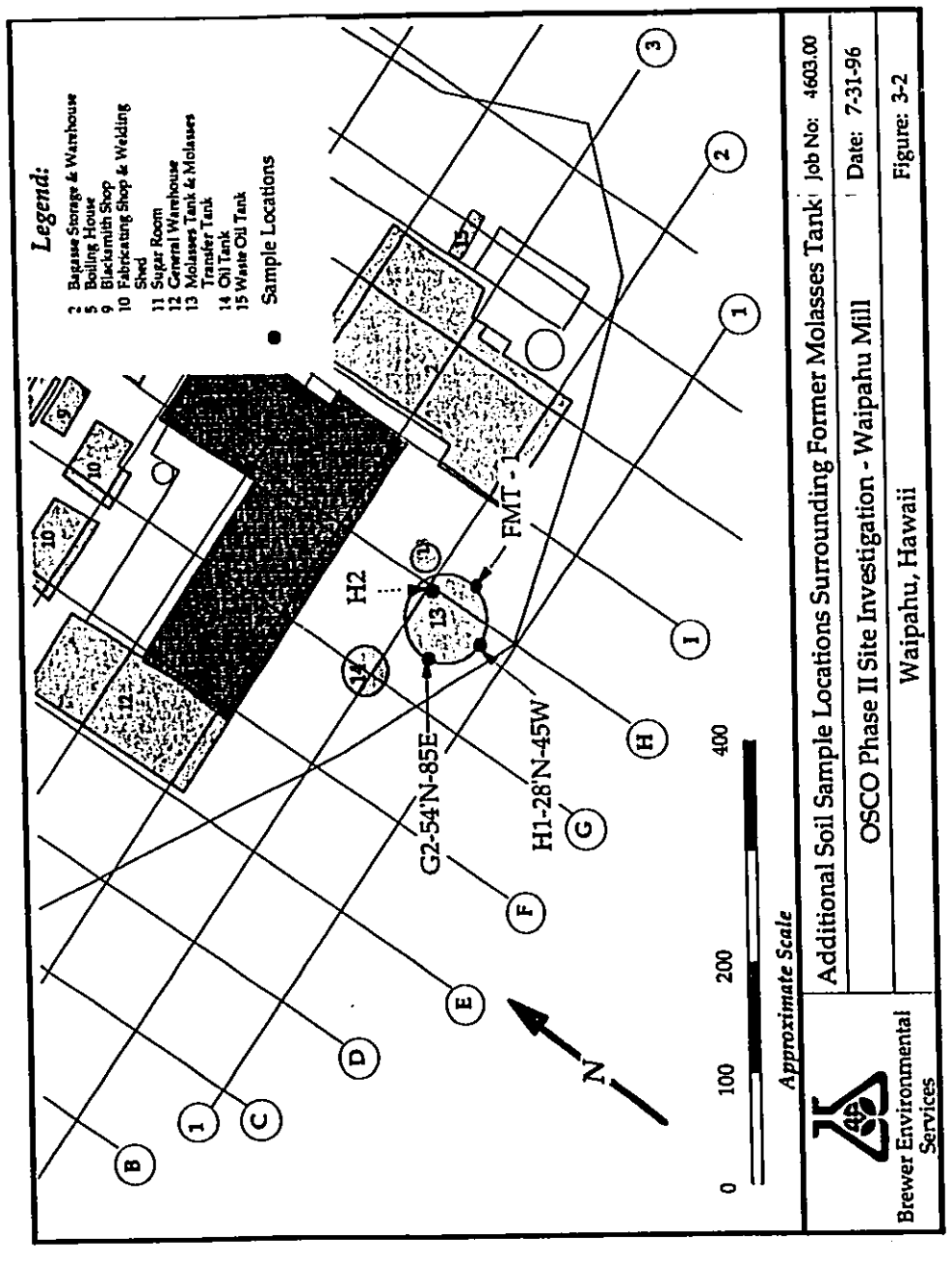
The BES sample labeling and handling standard operating procedure (SOP) is presented in Appendix C.

3.3.3.4 Record Keeping

Record keeping during sample collection activities entailed completing a field boring log for each sample boring location, as well as maintaining a bound hardcover running log of events in the field log book. The boring log is recorded on a standard BES boring form and includes notes on the subsurface geology, sample intervals, and sample identification. Analytical results were added when they became available. Record keeping also includes the immediate labeling of samples with all necessary information to identify, track, and analyze the sample within proper QC parameters, such as holding times and appropriate analytical methods. BES' SOP for the use of a field log book is presented in Appendix C.

3.3.3.5 Sample Handling

Sample handling was conducted according to BES standard sampling protocol outlined in Appendix C.



3.3.3.6 Field Instrument Calibration

The calibration of the field PID, used to screen soil headspace samples, was performed according to the manufacturer's guidelines. BES personnel used a 100 parts per million (ppm) isobutylene span gas to calibrate the PID and to do calibration checks. The calibration was considered to be within QC limits as long as the PID was reading the concentration of the calibration gas within ± 5%. The PID was calibrated at the beginning of each workday. Calibration was checked daily after the lunch break and when the PID measurements of organic vapor concentrations in the ambient air contradicted olfactory observations. The PID probe was frequently cleaned each day due to the dusty environment.

3.3.3.7 Field Blanks and Duplicates

The possible cross-contamination of samples was investigated by collecting various field blank samples. Equipment decontamination blanks (decon or rinsate blanks) were collected twice during the four day investigation to ensure proper cleaning of sampling tools between sample collections. These equipment decontamination blanks were analyzed for the analytes investigated on the day of sampling.

One field blank sample was collected from the tap water source used to wash the sampling tools. A second field blank was collected from the store-bought distilled water used to rinse the sample tools after the initial soap and water wash. These field blanks were collected and analyzed by the certified confirmation laboratory to ensure that contaminants were not being introduced to the field equipment by the washing process. These field blank samples were analyzed for all of the analytes investigated in the Phase II investigation.

3.4 IMMUNOASSAY FIELD SCREENING

Immunoassay analysis was conducted on 141 of the 146 soil samples collected in the Phase II site investigation. Immunoassay provides a semi-quantifiable methodology that provides a quick and generalized overview of the sample contents. The purpose of the immunoassay technique was to provide the field chemist with a rapid and cost-effective preliminary assessment of the concentration(s) of specific analytes that could be present in soil samples. The remaining five soil samples were not analyzed by immunoassay due to a field laboratory error.

Appendix E presents a detailed description of the Ensys™ immunoassay test methods. BES used one or more of the following immunoassay tests to analyze 141 soil samples:

- TPH-D
- PAHs
- PCBs
- 2,4-D (herbicide)
- Atrazine (herbicide)
- Carbendizim (fungicide)
- Chlordane (insecticide)

3.5 CERTIFIED LABORATORY ANALYSIS

The selection of the confirmation soil samples were based on the immunoassay results. The samples with a detectable concentrations of immunoassay analytes were sent to the certified laboratory. There were seven samples that contained detectable concentrations of TPH-D by immunoassay analyses but did not have enough soil for laboratory analyses; in these cases, an alternate soil sample was submitted. For example, sample C5-6' contained detectable concentrations of TPH-D and, after the immunoassay analyses, there was not enough soil left over for laboratory analysis. Because of this, sample C5-10' was analyzed.

Based upon the sample selection process, a total of 69 soil samples were submitted for confirmation chemical analysis at Transglobal Environmental Geochemistry, Hawaii (TEG) laboratory located in Honolulu, Hawaii (Certified with the State of California's Department of Health Services [DOHS] Environmental Laboratory Accreditation Program [ELAP], CA DOHS No. 1887). TEG subcontracted DOHS-ELAP Superior Laboratories, Inc. in Martinez, California to perform the halogenated volatile organic compounds (HVOC) and PCB analyses and DOHS-ELAP (#2075) Ceimic Corporation in San Diego, California for the metals and pesticide analyses. TEG performed the following analyses: TPH-G, TPH-D, TPH-Oil, BTEX, PAHs, and TRPH analyses.

Table 3-1 summarizes the target compounds for each test method and Table 3-2 summarizes the requested analyses for each of the confirmation samples.

TABLE 3-1
Soil Sample Laboratory Analytical
Parameters and Target Contaminants
OSCO Sugar Mill Phase II Investigation, Waipahu, Hawaii

Analyte	Analytical Method	Target Contaminant
TPH-G/BTEX	EPA Method 8015M	Gasoline
TPH-Diesel	EPA Method 8015M	Diesel Fuel
TPH-Oil	EPA Method 8015M	Bunker C Fuel
TRPH	EPA Method 418.1	Waste Oil
HVOC	EPA Method 8010	Solvents
PAHs	EPA Method 8100	Diesel Fuel Byproducts
RCRA Metals	EPA Method 6010	Pesticide Byproducts, Waste Oil Byproducts
PCBs and Pesticides	EPA Method 8081	PCBs, Pesticides
PCBs Only	EPA Method 8080	PCBs
Diuron, Benlate, Topsin, Atrazine, Velpar	EPA Method 632	Fungicides, Herbicides
Halogenated Herbicides	EPA Method 8150	Herbicides

TABLE 3-2
Selected Analytical Parameters
Soil Samples
OSCO Sugar Mill, Waipahu, Hawaii

Sample Locations (Depths)	Immunoassay Analyses					Certified Laboratory Analyses							
	TPH	PAHs	PCBs	Atrazine	Benlate	Petro Cont*	PAHs 8100	HVOCs 8010	PCBs/ Pesticides 8081	PCBs only 8080	Pesticides, Fungicides 632	Herbicides 8150	RCRA Metals 6010
B5													
2'	X	X				X	X						
C5													
2'	X	X											
6'	X	X											
10'	X	X				X	X						
C6													
2'	X	X											
6'	X	X				X	X	X					
10'	X	X											
D5													
2'	X	X											
6'	X	X				X	X	X					
8'	X	X											
D7													
2'	X					X	X						
6'	X					X	X						
8'	X												
E5													
2'	X												
6'	X					X							
10'	X												

*Petro Cont = Petroluem Constituents (BTEX - 8020, TPH-D, G, O 8015 M, and TRPH - 418.1)
"X" = Chemical analysis performed on sample

TABLE 3-2 (Cont.)
Selected Analytical Parameters
Soil Samples
OSCO Sugar Mill, Waipahu, Hawaii

Sample Locations (Depths)	Immunoassay Analyses					Certified Laboratory Analyses							
	TPH	PAHs	PCBs	Atrazine	Benlate	Petro Cont*	PAHs 8100	HVOCs 8010	PCBs/ Pesticides 8081	PCBs only 8080	Pesticides, Fungicides 632	Herbicides 8150	RCRA Metals 6010
E6													
2'	X												
6'	X					X	X	X					
10'	X												
E7													
2'	X	X											
6'	X	X				X	X						
9'	X	X											
E8													
2'	X												
6'	X					X							
10'	X												
F3													
2'	X												
6'	X					X							
10'	X												
F5													
2'						X	X	X					X
6'								X					X
10'													

*Petro Cont = Petroluem Constituents (BTEX - 8020, TPH-D, G, O 8015 M, and TRPH - 418.1)
"X" = Chemical analysis performed on sample

TABLE 3-2 (Cont.)
Selected Analytical Parameters
Soil Samples
OSCO Sugar Mill, Waipahu, Hawaii

Sample ID / Location ID / Depth (ft)	Immunoassay Analyses					Certified Laboratory Analyses							
	TPH	PAHs	PCBs	2,4-D Cleaner/ Atrazine	Benlate	Petro Cont*	PAHs 8100	HVOCs 8010	PCBs/ Pesticides 8081	PCBs only 8080	Pesticides, Fungicides 632	Herbicides 8150	RCRA Metals 6010
FB													
2'	X					X	X						
6'	X												
10'	X												
FMT-1													
2'	X					X	X						
6'	X												
10'	X					X	X						
G2													
2'	X					X	X						
G2-54'N													
2'						X	X						
6'						X	X						
G5													
2'	X	X				X	X						
6'	X	X											
10'	X	X											
G6													
2'	X	X			X								
6'	X	X			X	X	X				X		
10'	X	X			X								

*Petro Cont = Petroluem Constituents (BTEX - 8020, TPH-D, G, O 8015 M, and TRPH - 418.1)
"X" = Chemical analysis performed on sample

TABLE 3-2 (Cont.)
Selected Analytical Parameters
Soil Samples
OSCO Sugar Mill, Waipahu, Hawaii

Sample ID / Location ID / Depth (ft)	Immunoassay Analyses					Certified Laboratory Analyses							
	TPH	PAHs	PCBs	2,4-D Cleaner/ Atrazine	Benlate	Petro Cont*	PAHs 8100	HVOCs 8010	PCBs/ Pesticides 8081	PCBs only 8080	Pesticides, Fungicides 632	Herbicides 8150	RCRA Metals 6010
G7													
2'	X	X			X						X		
6'	X	X			X	X	X						
10'	X	X			X								
G8													
2'	X	X	X		X	X				X			
6'	X	X	X		X	X				X			
10'	X	X	X										
G9													
2'	X	X	X		X	X				X			
6'	X	X	X		X	X				X			
10'	X	X	X										
H1													
2'	X	X				X	X						
6'	X	X											
10'	X	X											
H1-28'N													
2'	X					X	X						
6'	X												
10'	X					X	X						

*Petro Cont = Petroluem Constituents (BTEX - 8020, TPH-D, G, O 8015 M, and TRPH - 418.1)
"X" = Chemical analysis performed on sample

TABLE 3-2 (Cont.)
Selected Analytical Parameters
Soil Samples
OSCO Sugar Mill, Waipahu, Hawaii

Sample Location (ft bgs)	Immunoassay Analyses					Certified Laboratory Analyses							
	TPH	PAH	PCB	Atrazine	Benzene	Petro Cont*	PAHs 8100	HVOCs 8010	PCBs/ Pesticides 8081	PCBs only 8080	Pesticides, Fungicides 632	Herbicides 8150	RCRA Metals 6010
H2													
2'	X	X											
6'	X	X											
9'	X	X				X	X						
H3													
2'	X					X	X						
H5													
2'	X					X							
6'	X												
10'	X												
H6													
2'	X												X
6'	X					X	X	X					
10'	X												
H7													
2'	X	X			X	X	X		X		X		
6'	X	X			X	X	X						
10'	X	X			X								
H8													
2'	X	X			X						X		
6'	X	X			X	X	X						
10'	X	X			X								

*Petro Cont = Petroleum Constituents (BTEX - 8020, TPH-D, G, O 8015 M, and TRPH - 418.1)
"X" = Chemical analysis performed on sample

TABLE 3-2 (Cont.)
Selected Analytical Parameters
Soil Samples
OSCO Sugar Mill, Waipahu, Hawaii

Sample Location (ft bgs)	Immunoassay Analyses (cont.)					Certified Laboratory Analyses							
	TPH	PAH	PCB	Atrazine	Benzene	Petro Cont*	PAHs 8100	HVOCs 8010	PCBs/ Pesticides 8081	PCBs only 8080	Pesticides, Fungicides 632	Herbicides 8150	RCRA Metals 6010
H9													
2'	X	X	X					X		X			
6'	X	X	X			X	X			X			
10'	X	X	X										
H10													
2'	X	X											
6'	X	X				X	X						
10'	X	X											
I2													
2'	X	X											
6'	X	X				X	X						
10'	X	X											
I6													
2'	X	X											
6'	X	X				X	X	X					
10'	X	X											
I7													
2'	X	X											
6'	X	X				X	X	X					
10'	X	X											

*Petro Cont = Petroleum Constituents (BTEX - 8020, TPH-D, G, O 8015 M, and TRPH - 418.1)
"X" = Chemical analysis performed on sample

TABLE 3-2 (Cont.)
Selected Analytical Parameters
Soil Samples
OSCO Sugar Mill, Waipahu, Hawaii

Sample Location / Depth	Immunoassay Analyses					Certified Laboratory Analyses							
	TPH-D	PAHs	PCBs	Atrazine	Benlate	Petro Cont*	PAHs 8100	HVOCs 8010	PCBs/ Pesticides 8081	PCBs only 8080	Pesticides, Fungicides 632	Herbicides 8150	RCRA Metals 6010
I8													
2'	X		X	X	X				X		X	X	X
6'	X		X	X	X	X							
10'	X		X	X	X								
I9													
2'	X		X	X	X				X		X	X	X
6'	X		X	X	X								
10'	X		X	X	X	X							
J3													
2'	X	X	X	X	X								
J4													
2'	X					X	X						
J7													
2'	X								X		X	X	X
6'	X					X							
10'	X												
J9													
2'	X		X	X	X	X							
6'	X		X	X	X	X	X		X		X	X	X
10'	X		X	X	X								

*Petro Cont = Petroluem Constituents (BTEX - 8020, TPH-D, G, O 8015 M, and TRPH - 418.1)
"X" = Chemical analysis performed on sample

TABLE 3-2 (Cont.)
Selected Analytical Parameters
Soil Samples
OSCO Sugar Mill, Waipahu, Hawaii

Sample Location / Depth	Immunoassay Analyses					Certified Laboratory Analyses							
	TPH-D	PAHs	PCBs	Atrazine	Benlate	Petro Cont*	PAHs 8100	HVOCs 8010	PCBs/ Pesticides 8081	PCBs only 8080	Pesticides, Fungicides 632	Herbicides 8150	RCRA Metals 6010
J10													
2'	X		X	X	X				X		X	X	
6'	X		X	X	X								
10'	X		X	X	X	X	X						
J11													
2'	X					X	X						
6'	X												
10'	X												
K2													
2'	X												
6'	X					X	X						
K3													
2'			X										
10'			X			X	X			X			
K6													
2'	X												
6'	X					X							
10'	X												
K7													
2'	X												
6'	X					X							
10'	X												

*Petro Cont = Petroluem Constituents (BTEX - 8020, TPH-D, G, O 8015 M, and TRPH - 418.1)
"X" = Chemical analysis performed on sample

TABLE 3-2 (Cont.)
Selected Analytical Parameters
Soil Samples
OSCO Sugar Mill, Waipahu, Hawaii

Sample Location (Depth)	Immunoassay Analyses					Certified Laboratory Analyses							
	TPH	PAH	PCB	Aniline	Benlate	Petro Cont*	PAHs 8100s	HVOCs 8010	PCBs/ Pesticides 8081	PCBs only 8080	Pesticides, Fungicides 632	Herbicides 8150	RCRA Metals 6010
K8													
2'	X		X	X	X				X		X	X	X
6'	X		X	X	X								
10'	X		X	X	X	X							
K9													
2'	X		X	X					X				X
6'	X		X	X		X							
10'	X		X	X									
K10													
2'	X												
6'	X					X	X						
10'	X												
K11													
2'	X					X	X						
6'	X												
10'	X					X	X						
K12													
2'	X												
6'	X												
10'	X					X	X						

*Petro Cont = Petroluem Constituents (*BTEX - 8020, TPH-D, G, O 8015 M, and TRPH - 418.1*)
"X" = Chemical analysis performed on sample

TABLE 3-2 (Cont.)
Selected Analytical Parameters
Soil Samples
OSCO Sugar Mill, Waipahu, Hawaii

Sample Location (Depth)	Immunoassay Analyses					Certified Laboratory Analyses							
	TPH	PAH	PCB	Aniline	Benlate	Petro Cont*	PAHs 8100	HVOCs 8010	PCBs/ Pesticides 8081	PCBs only 8080	Pesticides, Fungicides 632	Herbicides 8150	RCRA Metals 6010
L3													
2'	X												
5'	X					X	X						
10'	X												
L10													
2'	X												
6'	X					X	X						
10'	X												
L12													
2'	X												
6'	X					X	X						
10'	X												

*Petro Cont = Petroluem Constituents (BTEX - 8020, TPH-D, G, O 8015 M, and TRPH - 418.1)
"X" = Chemical analysis performed on sample

4.0 RESULTS

The results for the onsite geological evaluation of the soil samples, the immunoassay laboratory analyses, and the certified confirmation laboratory analyses are summarized below. The immunoassay and confirmation laboratory reports are included as Appendix F and G, respectively.

4.1 SITE GEOLOGY

Site geological data were obtained from observing and recording the characteristics of the soil samples collected at each sample point. Figure 4-1 shows the sample boring locations used to generate a geological cross-section, which is indicated as a red line. Boring logs for the 53 sample points are included in Appendix D. Figures 4-2 and 4-3 show lithological cross-sections of the site in northeast-southwest and southeast-northwest directions

Evaluation of the soil samples collected from each soil boring indicated that the upper two to three feet of the site is underlain by a coarse coral silty gravel to a silty sand; below this, the entire site is composed generally of a reddish/grayish brown, stiff, dry clay to a depth of approximately 11 fbg.

4.2 SITE HYDROGEOLOGY

The subject site is located in the Waipahu Aquifer Sector of Pearl Harbor Aquifer System (Mink and Lau, 1990). Mink and Lau (1990) describe the aquifer beneath the site as a basal, unconfined, flank aquifer overlaying a basal, confined, sedimentary cap rock with fresh water currently used as a drinking water source. The HDOH defines groundwater beneath the site is considered irreplaceable with a moderate to high vulnerability to contamination. This designation is generally associated with areas with relatively shallow potable drinking water sources that are overlain by porous,permeable, or fractured lithologies.

Investigation of the site hydrogeology was not performed during this Phase II Investigation. However, OSCO is addressing the condition of groundwater beneath the subject site in a separate investigation. Groundwater is known to exist beneath the site at a depth of approximately 45 fbg and has a general gradient to the south-southeast direction.

Figure 4-1 Sample and Cross-section Locations

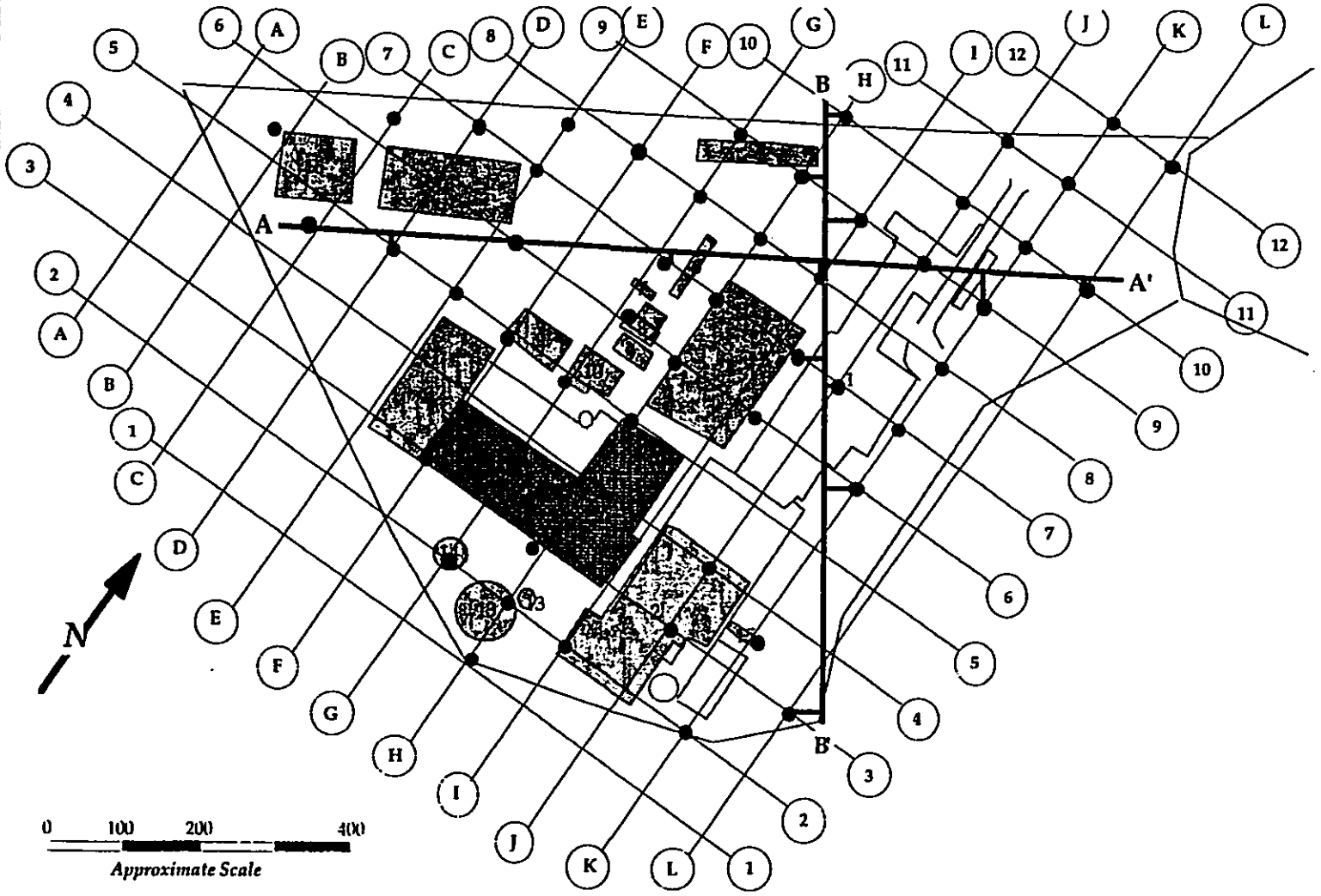
LEGEND

1 Cane Cleaning Plant
2 Bagasse Storage & Warehouse
3 Service Station & Dispatcher Office
4 Machine Shop
5 Boiling House
6 Sugarcane Seed Hot Water Treatment Tank
7 Sugarcane Seed Fungicide Dip Tank
8 Truck Tire Warehouse
9 Blacksmith Shop
10 Fabricating Shop & Welding Shed
11 Sugar Room
12 General Warehouse
13 MolassesTank & Molasses Transfer Tank
14 Oil Tank
15 Waste Oil Tank
16 Truck and Tractor Repair Shop

I A — Soil Sampling Grid

● Sample Locations

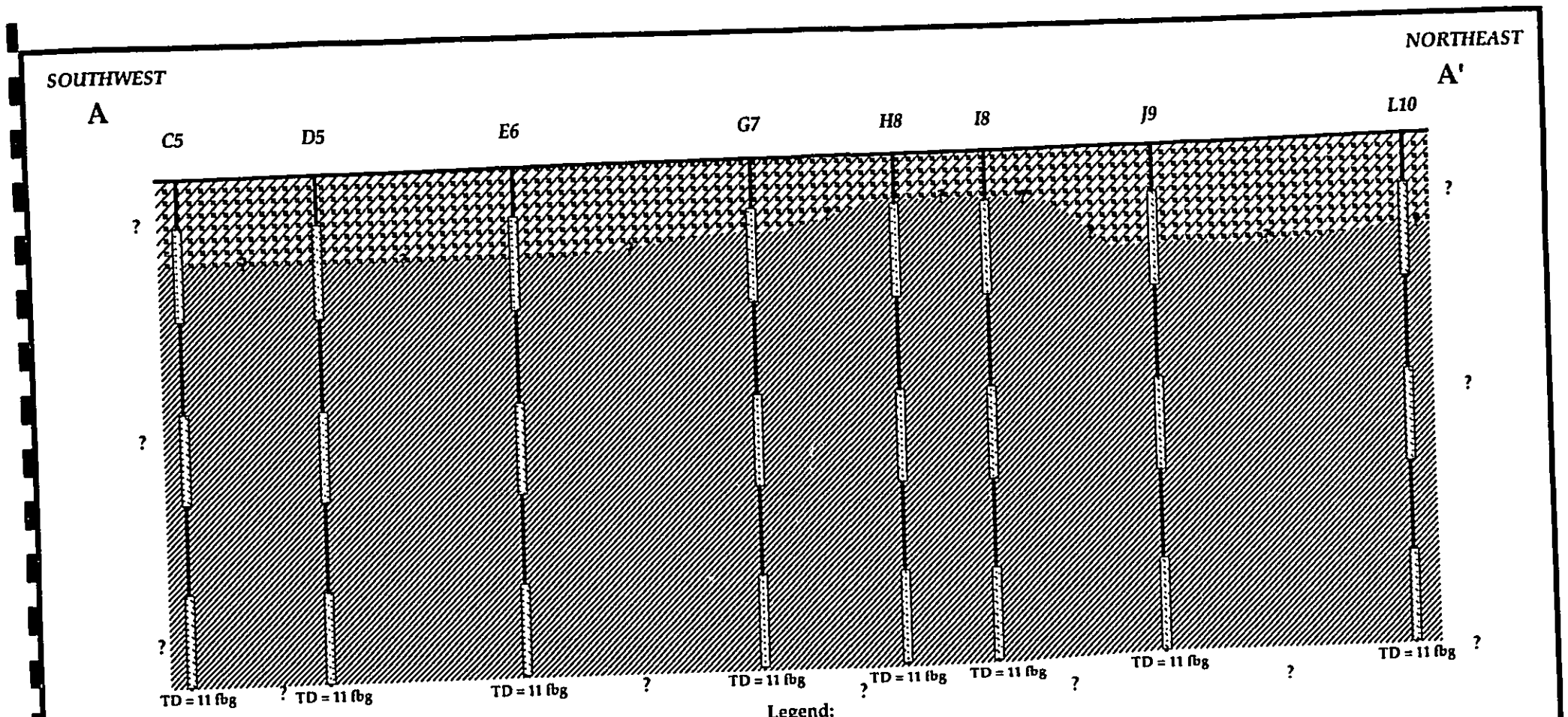
A—A' Cross-Section



Phase II Site Investigation
Oahu Sugar Company
Waipahu Mill
Waipahu, Hawaii

Brewer Environmental Services

BES Job No: 4603.00 *July 31, 1996*



Brewer Environmental Services

Lithological Cross-Section A-A'

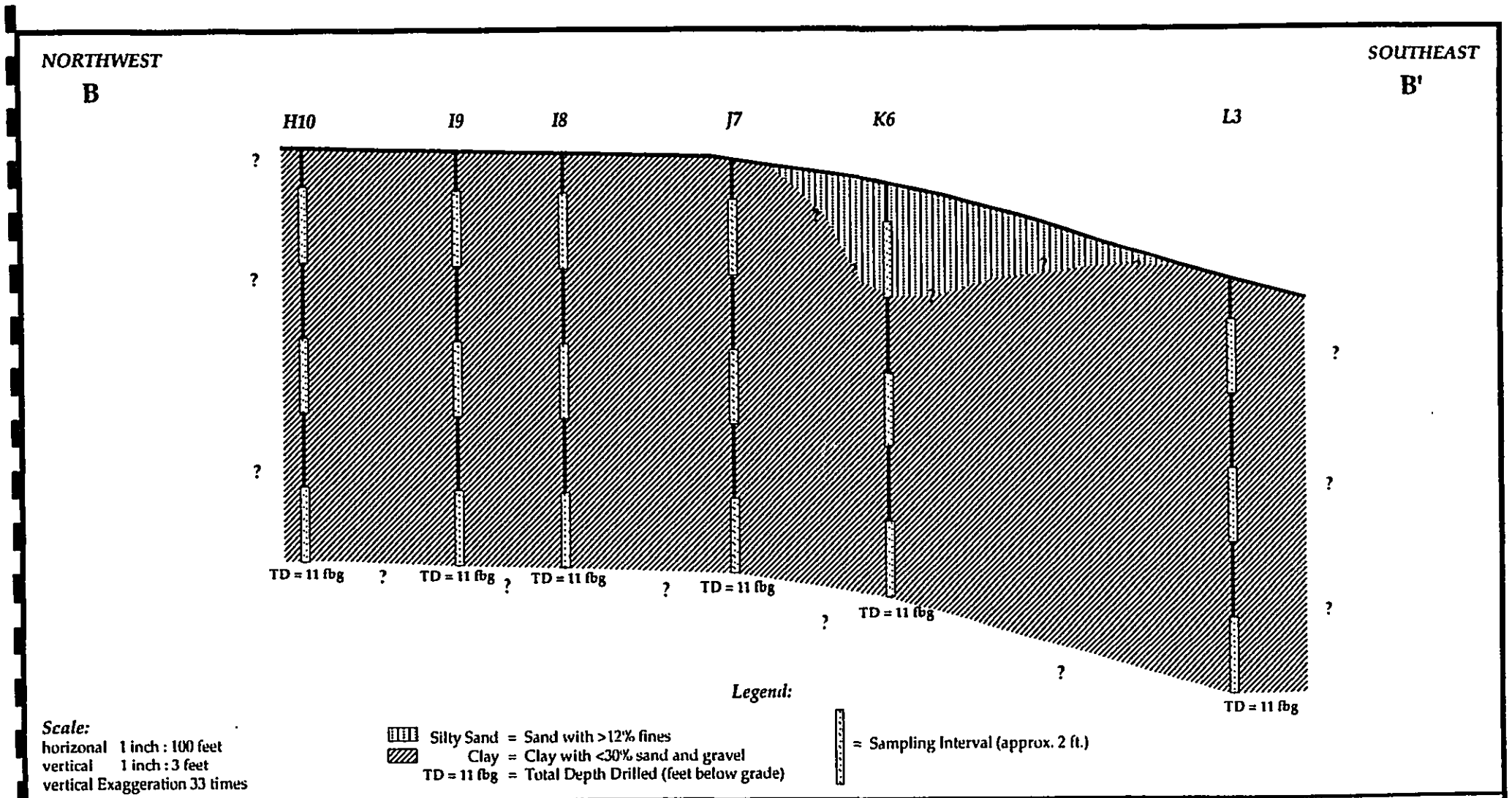
OSCO Phase II Site Investigation - Waipahu Mill

Waipahu, Hawaii

JOB NO: 4603.00

Date: 7-31-96

Figure: 4-2



Brewer Environmental Services	Lithological Cross-Section B-B'	JOB NO: 4603.00
	OSCO Phase II Site Investigation - Waipahu Mill	Date: 7-31-96
	Waipahu, Hawaii	Figure: 4-3

4.3 SOIL SAMPLE RESULTS

4.3.1 FIELD SCREENING RESULTS

BES used a field screening technique known as "soil headspace" to gain a qualitative measure of the volatile organic compound concentration in soil samples. Specifically, the soil headspace method consists of placing a portion of a soil sample in a Ziploc™ bag. The bag is sealed and placed in a warm environment (e.g., in the sun) for approximately ten to 15 minutes. After the soil has had a chance to warm up, the tip of the PID probe is then inserted into the headspace above the soil. The PID is used to measure the volatile organic compound concentration of the vapor in the soil headspace. The PID measurements are recorded on boring logs which are presented in Appendix D. Headspace measurements ranged from zero parts per million (ppm) to 530 ppm. The maximum headspace measurement was made in the 2-foot sample interval at sample location FMT-1 (4603.00-FMT-1-2').

4.3.2 IMMUNOASSAY ANALYTICAL RESULTS

A total of 141 samples were analyzed by immunoassay. Immunoassay analyses included one or more of the following analyses: TPH, PAHs, PCBs, Carbendizim, Chlordane, Atrazine, and 2,4-D. The results of the immunoassay analyses are summarized in Table 4-1 and field laboratory data sheets are included as Appendix F. Table 4-1 is included at the end of this section.

As shown in Table 4-1, concentrations of TPH-D exceeding 10 ppm were detected at 17 of the 53 sample points. PAHs were detected in two samples from one sample point at a concentration greater than 1 ppm. Chlordane, a pesticide, was detected in concentrations greater than 20 ppm but less than 100 ppm in five samples collected from two sample points. PCBs, Atrazine, Benlate and 2,4-D were not detected in any of the samples that were analyzed.

4.3.3 CA-DOHS-CERTIFIED LABORATORY ANALYTICAL RESULTS

Using the results for the immunoassay analyses, BES selected at least one soil sample from each of the 53 sample points was sent to TEG Hawaii in Honolulu, Hawaii for confirmation laboratory analysis of one or more of the following analytes listed in Table 3-1. TEG is certified by the State of California Department of Health Services (CA-DOHS) as an environmental testing laboratory (Appendix F). HDOH does not certify environmental testing laboratories. The results of the laboratory analyses are summarized in Tables 4-2 through 4-5 and Figures 4-4 through 4-8 at the end of this section. The laboratory analytical reports are included as Appendix G.

4.3.3.1 Petroleum Components

Total Recoverable Petroleum Hydrocarbons (TRPH)

Using the results of the immunoassay analyses, BES selected 54 samples for TRPH analysis. TRPH concentrations were detected in 33 samples at concentrations ranging from 11 milligrams per kilogram (mg/kg) to 672 mg/kg, well below the HDOH Tier I soil action level (SAL) of 5,000 mg/kg. Figure 4-4 shows the location of the samples containing detectable concentrations of TRPH, the associated concentrations, and sample depths.

Total Petroleum Hydrocarbons (TPH) as Gasoline

Based on the results of the immunoassay analyses, BES selected 55 soil samples for laboratory analysis of TPH as gasoline. None of the samples had detectable concentrations of TPH as gasoline. Table 4-2 presents the results of these analyses.

Total Petroleum Hydrocarbons (TPH) as Diesel

BES selected 61 soil samples for laboratory analysis for TPH as diesel. The selection was based on the results of the immunoassay analyses. Only four samples had detectable concentrations of TPH as diesel ranging from was 19 mg/kg to 750 mg/kg. The maximum concentration was detected in the two foot depth soil sample from sample location FMT-1, east of the molasses tank. These concentrations are well below the HDOH Tier I SAL of 5,000 mg/kg. Table 4-2 presents the results of these analyses. The locations of the samples with detected TPH as diesel concentrations are shown in Figure 4-5.

Total Petroleum Hydrocarbons (TPH) as Oil

BES selected six samples from three locations around the molasses tank area for analysis for TPH-Oil in order to identify the Bunker C fuel thought to have been present at the former molasses tank area. TPH as oil quantified in the Bunker C fuel range was detected in two of the three sample points. Concentrations ranged from 171 mg/kg to 8,469 mg/kg. The maximum concentrations were detected in sample point FMT-1, where samples contained concentrations ranging from 3,457 mg/kg and 8,469 mg/kg at depths of 2 fbg and 10 fbg, respectively. The 10 fbg sample result, FMT-1-10' was above HDOH SAL of 5,000 mg/kg. Figure 4-6 shows the location of the samples containing detectable concentrations of TPH-Oil, the associated concentrations, and the sample depths.

Benzene, Toluene, Ethylbenzene, and Total Xylenes (BTEX)

A total of 61 soil samples were selected for BTEX analysis. Benzene and ethylbenzene were not detected in any of the samples tested for BTEX. However, toluene was detected in four sample points at concentrations ranging from 0.0261 mg/kg to 0.092 mg/kg. Xylene was detected in five sample points at concentrations ranging from 0.053 mg/kg to 0.161 mg/kg. These concentrations are well below the HDOH SALs of 16 mg/kg and 21 mg/kg for toluene and total xylenes, respectively. Table 4-2 presents the results of the BTEX analysis and Figure 4-7 shows the detectable concentrations of toluene and total xylenes.

Polynuclear Aromatic Hydrocarbons (PAHs)

BES selected 44 samples from 38 sample points for analysis of four HDOH-regulated PAHs: benzo (a) pyrene, acenaphthene, fluoranthene, and naphthalene. The sample selection was made on the basis of the immunoassay results. Benzo (a) pyrene and naphthalene were not detected in any of the soil samples analyzed.

Acenaphthene was detected in three samples with concentrations ranging from 2.33 mg/kg to 10.64 mg/kg. The maximum concentration was detected in sample FMT-1 at the two-foot depth interval. This concentration is below the HDOH SAL of 18 mg/kg.

Fluoranthene was detected in two samples collected from one sample point, FMT-1. FMT-1 contained a fluoranthene concentration of 21.21 mg/kg in the two-foot depth interval and 10.34 mg/kg at the six foot depth interval. One sample, FMT-1 at two fbg, exceeds the HDOH SAL of 11 mg/kg for fluoranthene. Figure 4-8 shows the

locations of the samples containing detectable concentration of PAHs, the associated concentration, and the sample depths. Table 4-3 presents a summary of the results for the PAH analyses.

4.3.3.2 Polychlorinated Biphenyls (PCBs)

A total of 17 samples were selected for PCB analysis by BES. The selection was based on immunoassay analytical results. None of the samples had detectable concentrations of PCBs. Table 4-3 presents the results of the PCBs analyses.

4.3.3.3 Halogenated Volatile Organic Compounds (HVOCs)

BES chose 10 samples for analysis of four HDOH-regulated HVOCs: tetrachloroethylene (PCE), trichloroethylene (TCE), 1.2-dichloroethane (DCE), and vinyl chloride. The basis of the selection was the results of the immunoassay analyses. None of the samples had detectable concentrations of HVOCs. Table 4-3 presents the results of the HVOCs analyses.

4.3.3.4 Pesticides

BES selected ten samples for analysis for the pesticides Benlate, Velpar, Topsin, Atrazine, and Diuron using EPA Method 632. The basis of the selection was the results of the immunoassay analyses. None of the ten samples had detectable concentrations of the compounds Benlate, Topsin, Atrazine, or Diuron. However, Velpar was detected in one sample, J10-2', at a concentration of 0.254 mg/kg. There is no HDOH SAL and no current United States Environmental Protection Agency (EPA) Region IX preliminary remediation goal (PRG) for that compound.

Six samples were analyzed for chlorinated herbicides by EPA Method 615. None of the samples had detectable concentrations of any of the chlorinated herbicides tested for.

Using the results of the immunoassay results, BES selected and submitted nine soil samples for chlorinated pesticide analysis (EPA Method 8080). Only one of the samples, J10-2', had detectable concentrations of chlorinated pesticides. Specifically, DDE and DDT were detected at concentrations of 0.0292 mg/k and 0.00688 mg/kg. These concentrations are below the current EPA PRG for DDE and DDT. All other constituents were not detected.

Table 4-4 presents the results of the pesticides analyses. Figure 4-9 presents the locations of the detectable concentrations of Velpar, DDE, and DDT.

4.3.3.5 Metals

BES selected nine soil samples, collected from eight sample points for analysis of the eight RCRA metals: arsenic (As), barium (Ba), Cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), selenium (Se), and Silver (Ag). Arsenic was detected in four soil samples at 2 fbg with concentrations of 2.6 mg/kg, 6.3 mg/kg, 10.5 mg/kg, and 34.4 mg/kg, which exceeds the EPA PRG for industrial sites of 2 mg/kg.

Barium and chromium were detected in all nine of the samples but at concentrations below the EPA PRG. Selenium and lead were detected in seven of the samples; however, all concentrations were below the EPA PRG. Mercury was detected in one soil sample point at a concentration below the EPA PRG. Cadmium was detected in five of the eight sample points analyzed but at concentrations below the EPA PRG. Silver was not detected in any of the samples.

Table 4-5 presents the analytical results for the metal analyses. Figure 4-10 shows the location of the samples analyzed for metals and the detectable concentrations of metals.

Figure 4-4 TRPH Analytical Results

LEGEND

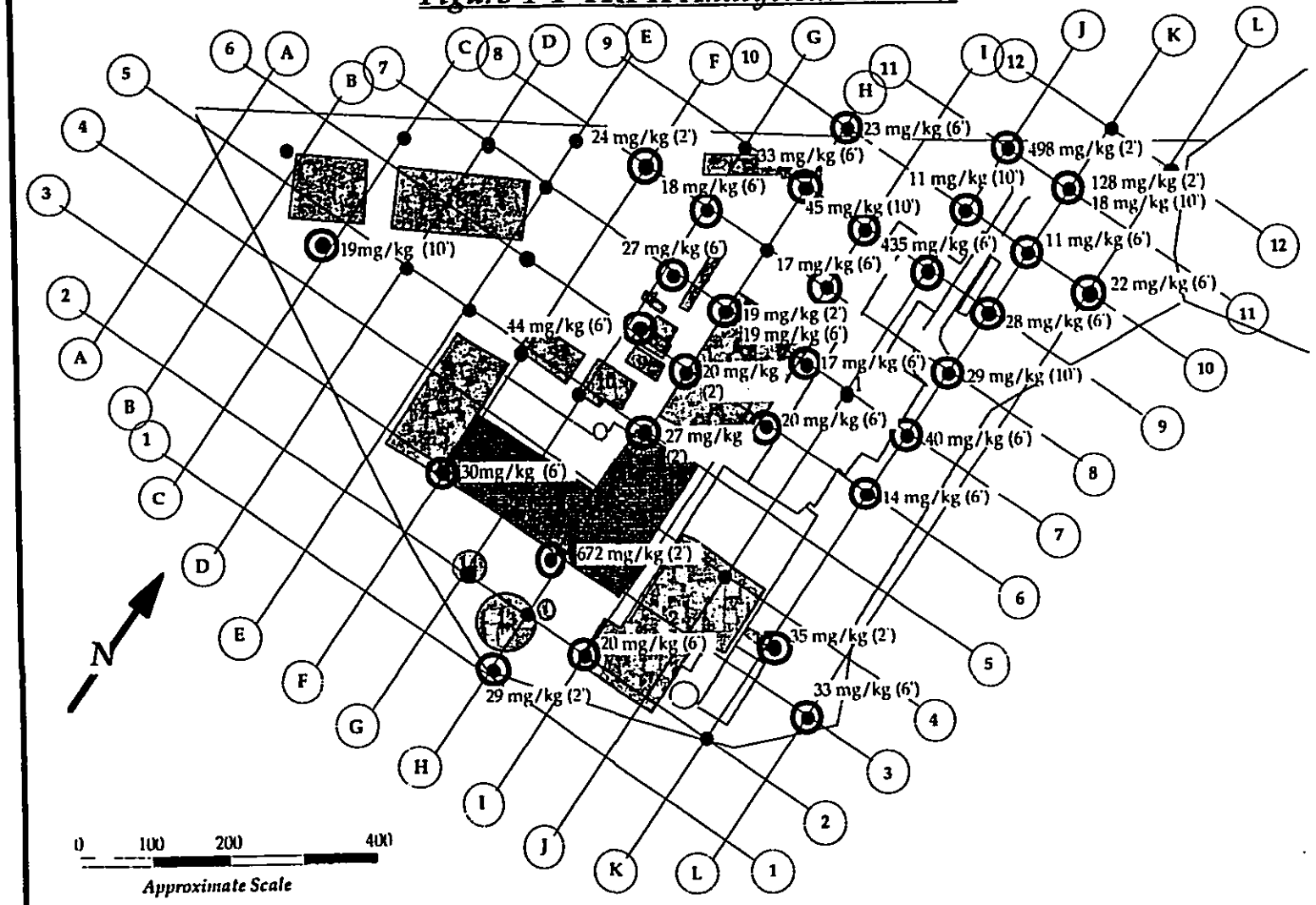
1 Cane Cleaning Plant
2 Bagasse Storage & Warehouse
3 Service Station & Dispatcher Office
4 Machine Shop
5 Boiling House
6 Sugarcane Seed Hot Water Treatment Tank
7 Sugarcane Seed Fungicide Dip Tank
8 Truck Tire Warehouse
9 Blacksmith Shop
10 Fabricating Shop & Welding Shed
11 Sugar Room
12 General Warehouse
13 MolassesTank & Molasses Transfer Tank
14 Oil Tank
15 Waste Oil Tank
16 Truck and Tractor Repair Shop

Soil Sampling Grid

Sample Locations

Detected concentrations

Concetration (Depth)



Phase II Site Investigation
Oahu Sugar Company
Waipahu Mill
Waipahu, Hawaii

Brewer Environmental Services

BES Job No: 4603.00 ***July 31, 1996***

Figure 4-5a TPH as Diesel Analytical Results

LEGEND

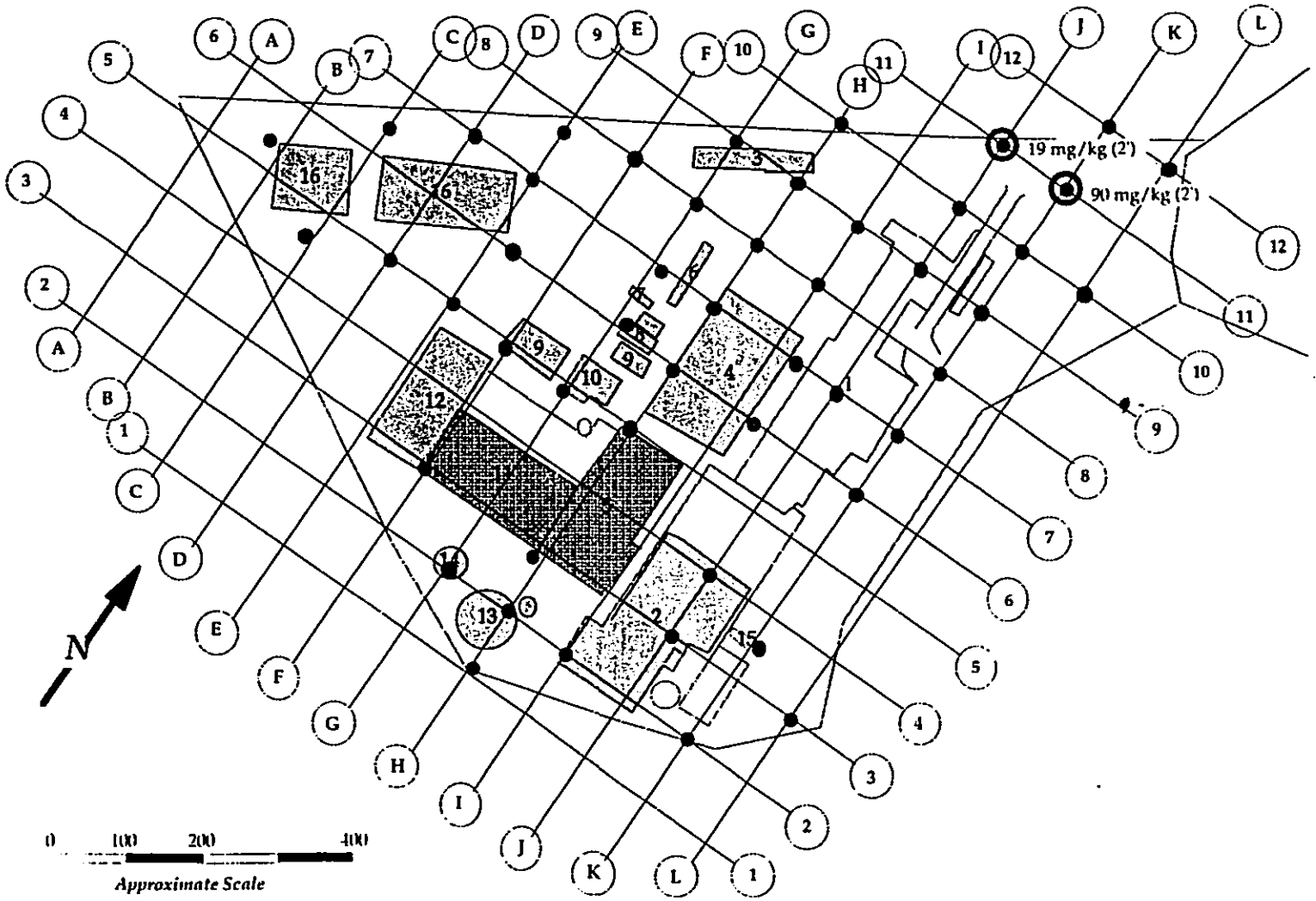
1 Cane Cleaning Plant
2 Bagasse Storage & Warehouse
3 Service Station & Dispatcher Office
4 Machine Shop
5 Boiling House
6 Sugarcane Seed Hot Water Treatment Tank
7 Sugarcane Seed Fungicide Dip Tank
8 Truck Tire Warehouse
9 Blacksmith Shop
10 Fabricating Shop & Welding Shed
11 Sugar Room
12 General Warehouse
13 MolassesTank & Molasses Transfer Tank
14 Oil Tank
15 Waste Oil Tank
16 Truck and Tractor Repair Shop

Soil Sampling Grid

Sample Locations

Detected concentrations

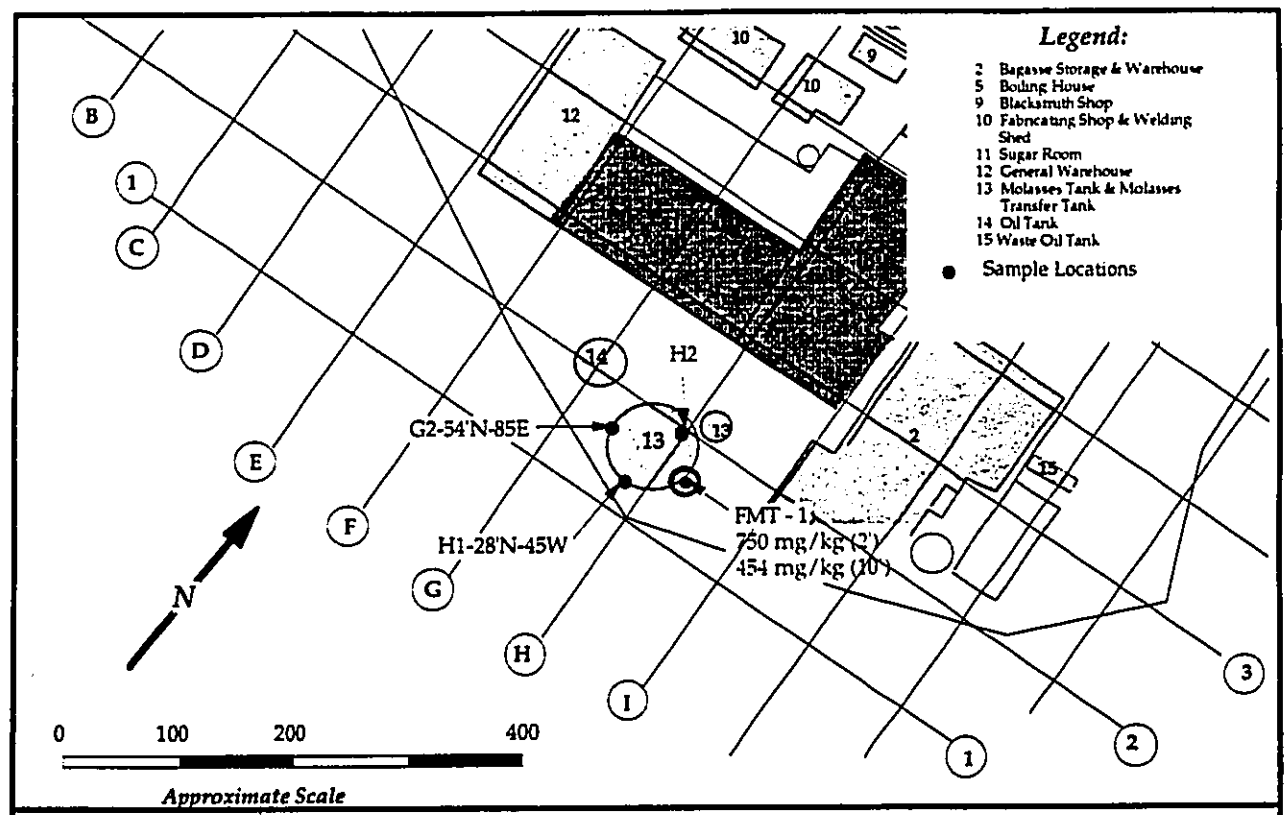
Concetration (Depth)



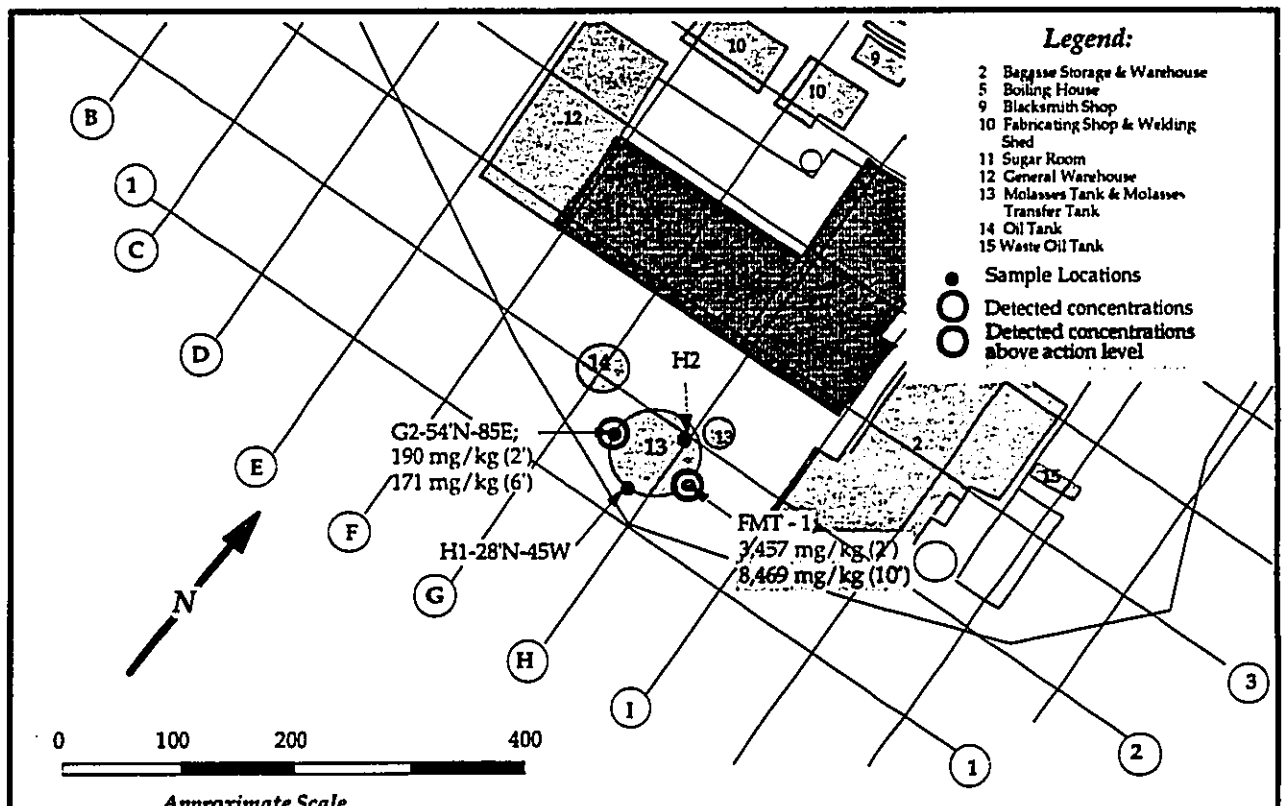
Phase II Site Investigation
Oahu Sugar Company
Waipahu Mill
Waipahu, Hawaii

Brewer Environmental Services

BES Job No: 4603.00 *July 31, 1996*



Brewer Environmental Services	Molasses Tank Area - TPH as Diesel Analytical Results	Job No: 4603.00
	OSCO Phase II Site Investigation - Waipahu Mill	Date: 11-6-96
	Waipahu, Hawaii	Figure: 4-5b



Brewer Environmental Services	Molasses Tank Area - TPH as Oil Analytical Results	Job No: 4603.00
	OSCO Phase II Site Investigation - Waipahu Mill	Date: 11-6-96
	Waipahu, Hawaii	Figure: 4-6

Figure 4-7a BTEX Analytical Results

LEGEND

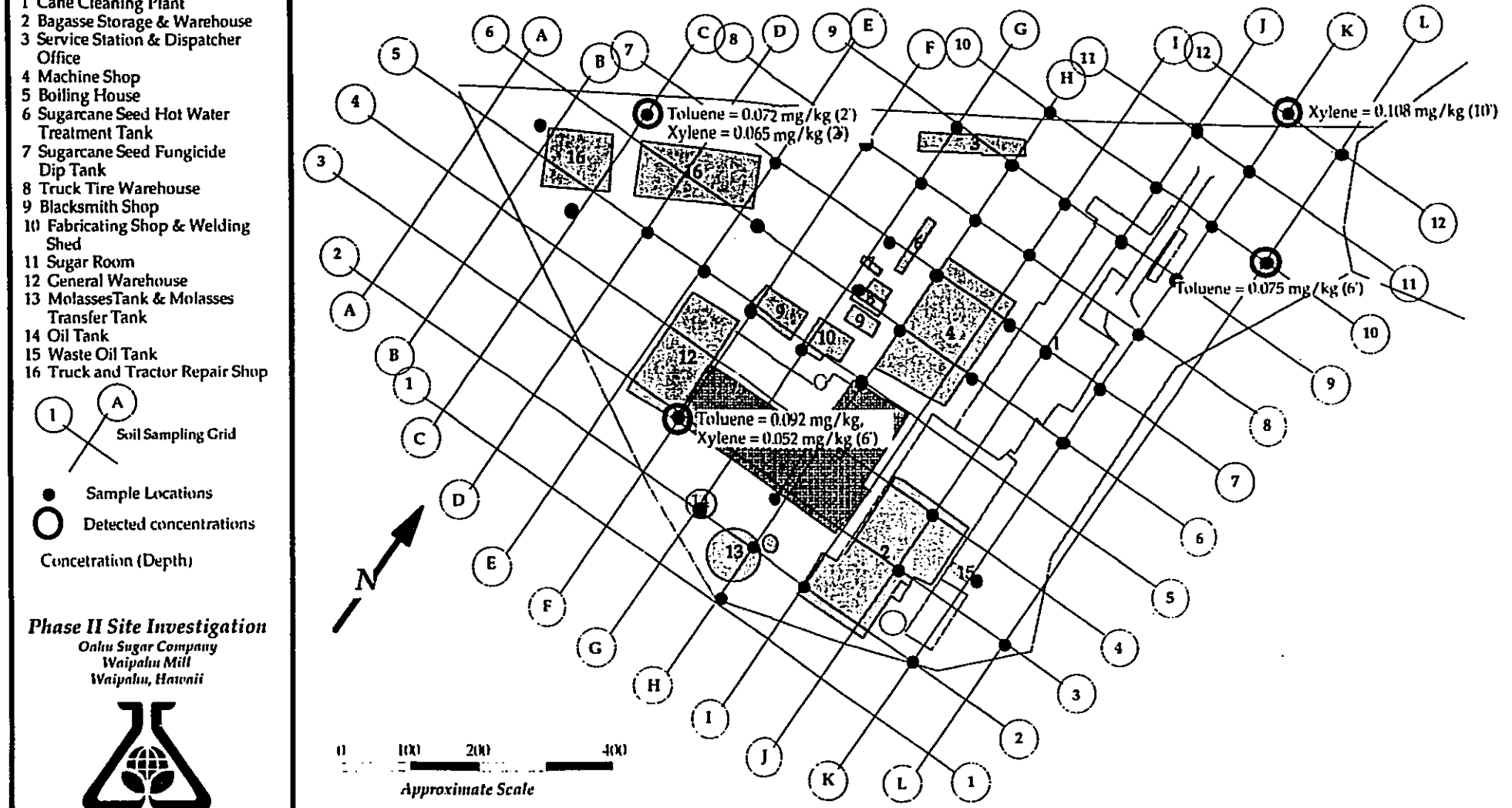
1 Cane Cleaning Plant
2 Bagasse Storage & Warehouse
3 Service Station & Dispatcher Office
4 Machine Shop
5 Boiling House
6 Sugarcane Seed Hot Water Treatment Tank
7 Sugarcane Seed Fungicide Dip Tank
8 Truck Tire Warehouse
9 Blacksmith Shop
10 Fabricating Shop & Welding Shed
11 Sugar Room
12 General Warehouse
13 MolassesTank & Molasses Transfer Tank
14 Oil Tank
15 Waste Oil Tank
16 Truck and Tractor Repair Shop

Soil Sampling Grid

Sample Locations

Detected concentrations

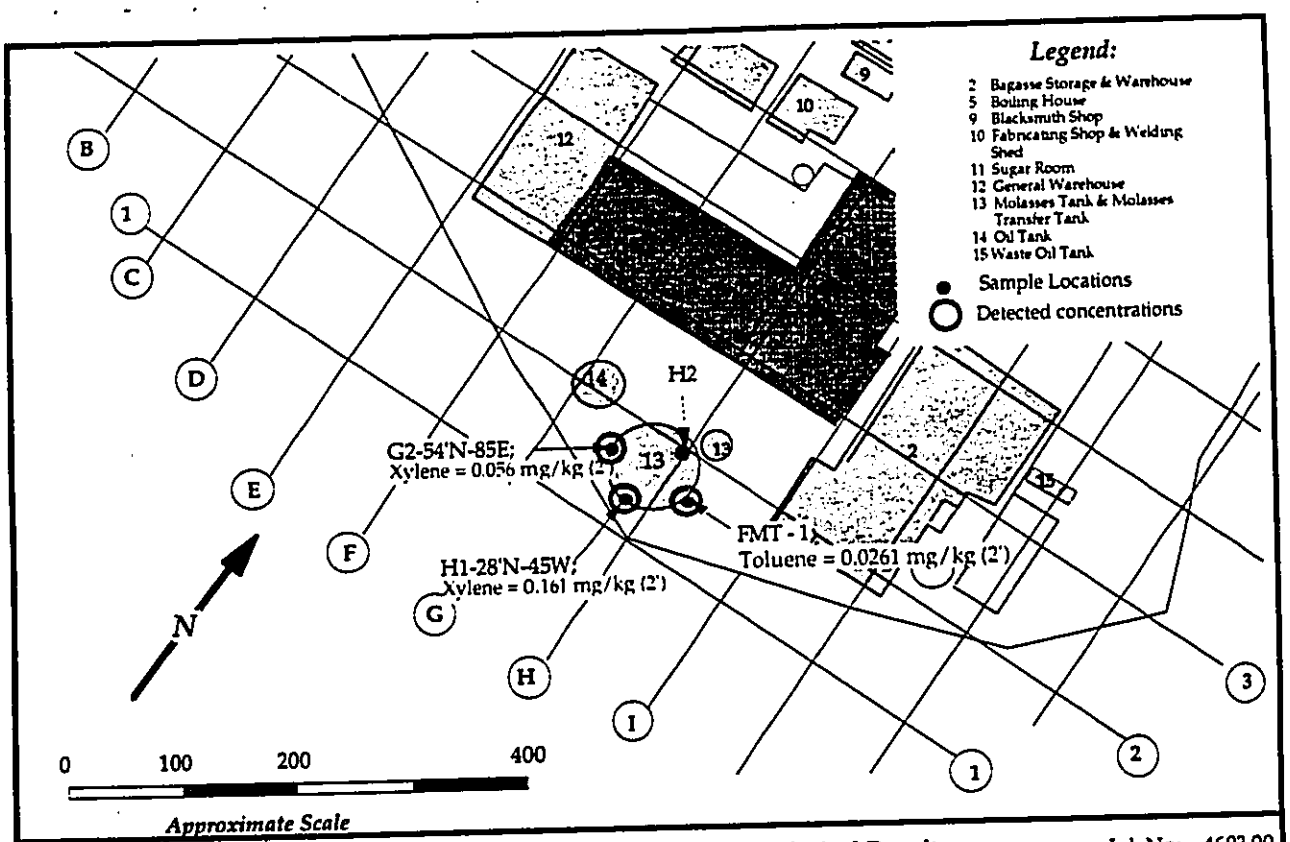
Concetration (Depth)



Phase II Site Investigation
Oahu Sugar Company
Waipahu Mill
Waipahu, Hawaii

Brewer Environmental Services

BES Job No: 4603.00 *July 31, 1996*



Brewer Environmental Services	Molasses Tank Area - BTEX Analytical Results	Job No: 4603.00
	OSCO Phase II Site Investigation - Waipahu Mill	Date: 11-6-96
	Waipahu, Hawaii	Figure: 4-7 b

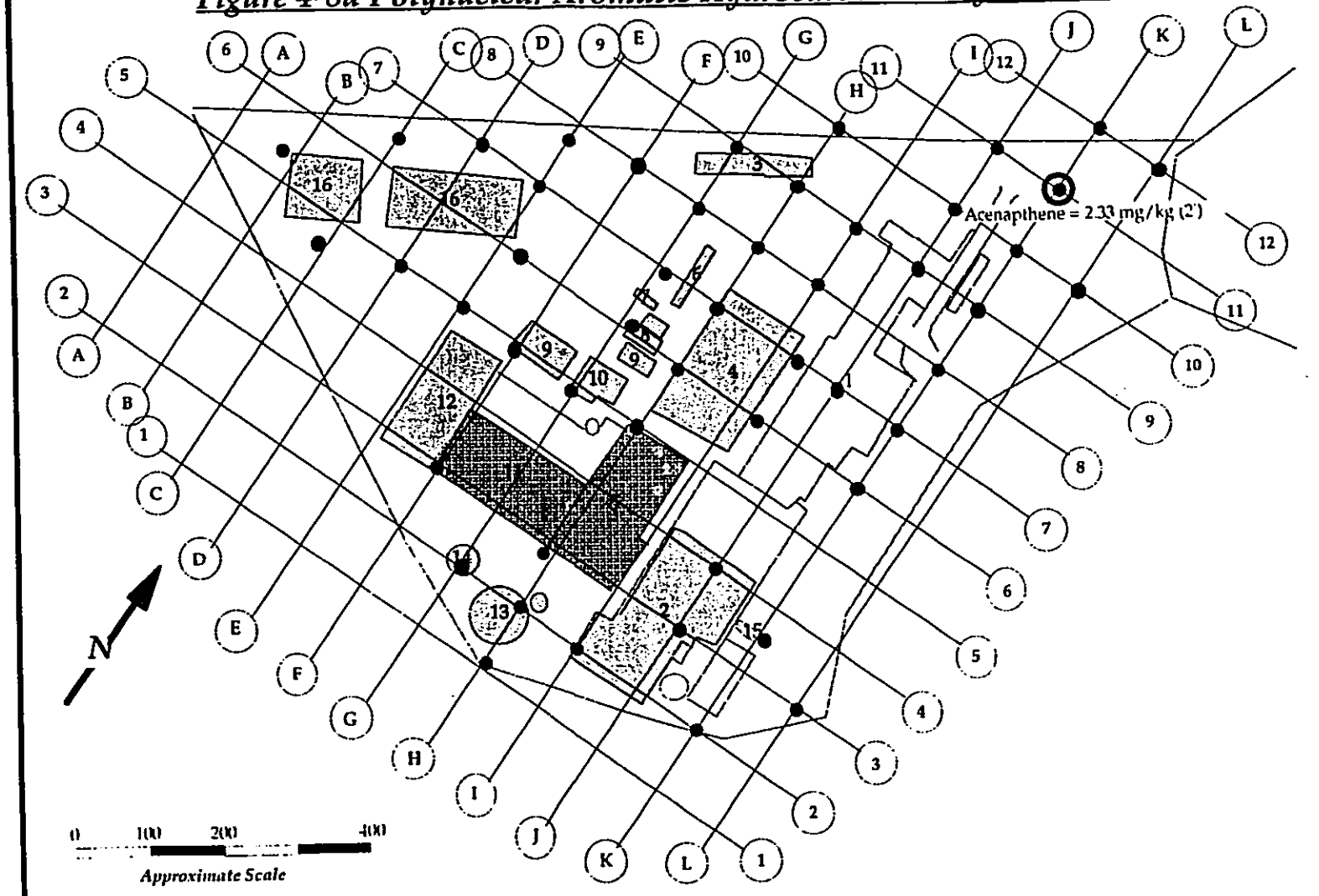
Figure 4-8a Polynuclear Aromatic Hydrocarbon Analytical Results

LEGEND

1 Cane Cleaning Plant
2 Bagasse Storage & Warehouse
3 Service Station & Dispatcher Office
4 Machine Shop
5 Boiling House
6 Sugarcane Seed Hot Water Treatment Tank
7 Sugarcane Seed Fungicide Dip Tank
8 Truck Tire Warehouse
9 Blacksmith Shop
10 Fabricating Shop & Welding Shed
11 Sugar Room
12 General Warehouse
13 MolassesTank & Molasses Transfer Tank
14 Oil Tank
15 Waste Oil Tank
16 Truck and Tractor Repair Shop

Soil Sampling Grid

Sample Locations
Detected concentrations



Phase II Site Investigation
Oahu Sugar Company
Waipahu Mill
Waipahu, Hawaii

Brewer Environmental Services

BES Job No: 4603.00 *July 31, 1996*

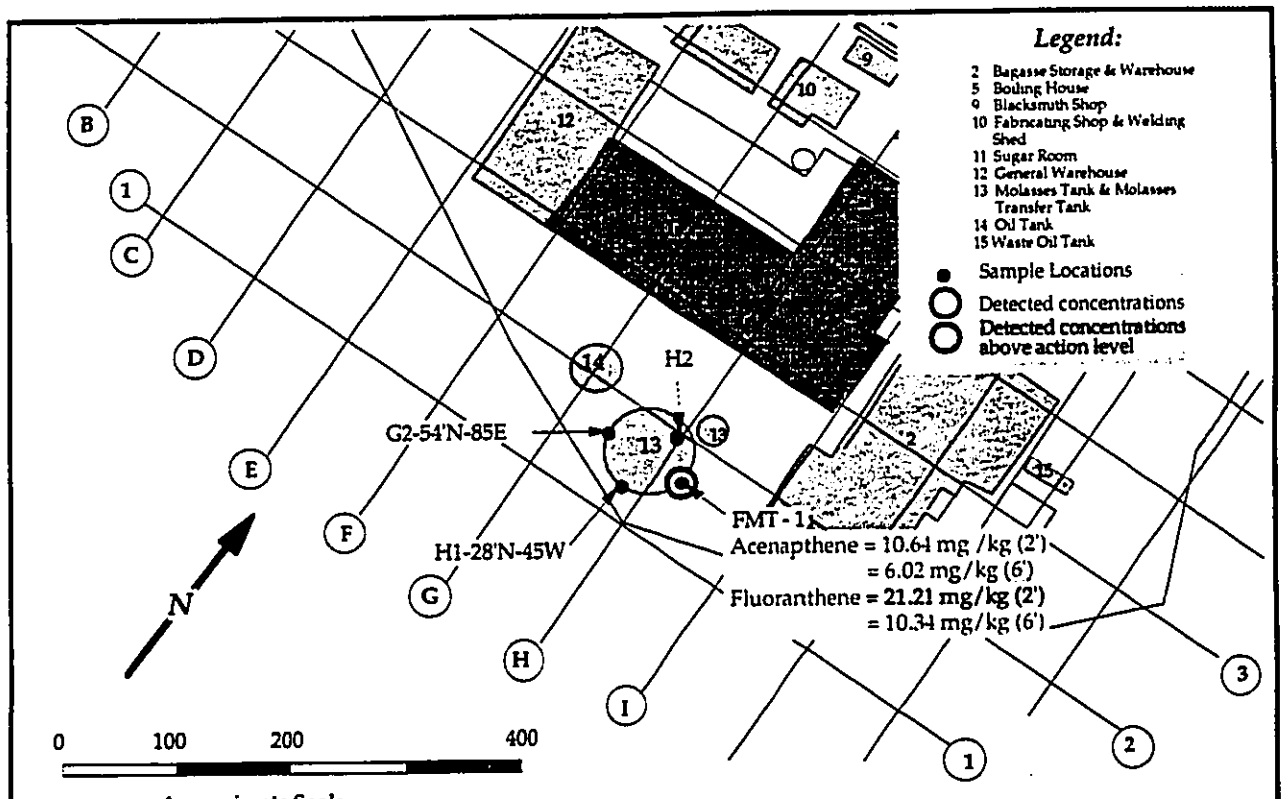

Legend:
2 Bagasse Storage & Warehouse
5 Boiling House
9 Blacksmith Shop
10 Fabricating Shop & Welding Shed
11 Sugar Room
12 General Warehouse
13 Molasses Tank & Molasses Transfer Tank
14 Oil Tank
15 Waste Oil Tank
Sample Locations
Detected concentrations
Detected concentrations above action level
H2
G2-54'N-85E
H1-28'N-45W
FMT - 1
Acenapthene = 10.64 mg /kg (2')
= 6.02 mg/kg (6')
Fluoranthene = 21.21 mg/kg (2')
= 10.34 mg/kg (6')
N
0
100
200
400
Approximate Scale
Brewer Environmental Services
Molasses Tank Area - PAH Analytical Results
OSCO Phase II Site Investigation - Waipahu Mill
Waipahu, Hawaii
Job No: 4603.00
Date: 11-6-96
Figure: 4-8 b

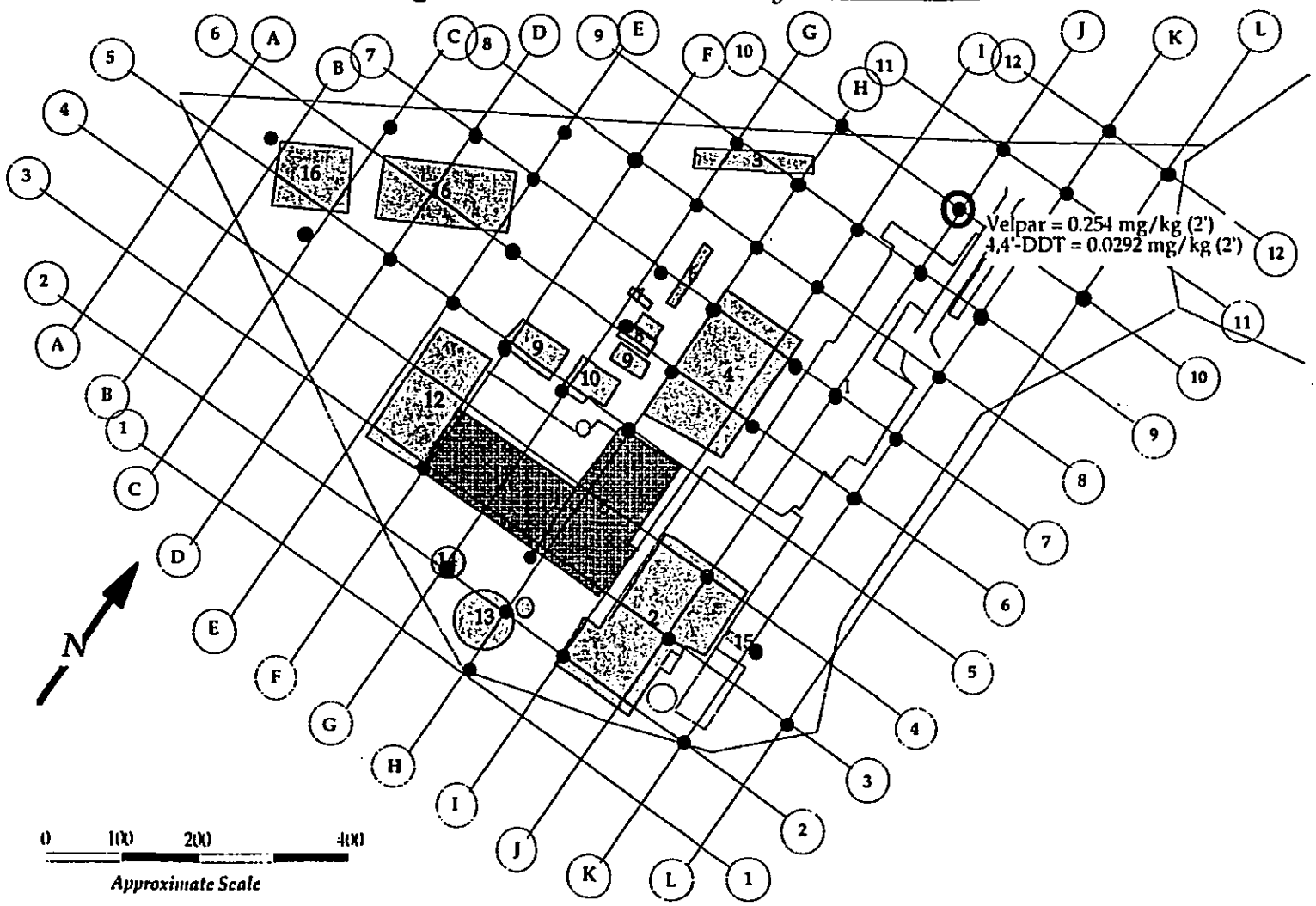
Figure 4-9 Pesticides Analytical Results

LEGEND

1 Cane Cleaning Plant
2 Bagasse Storage & Warehouse
3 Service Station & Dispatcher Office
4 Machine Shop
5 Boiling House
6 Sugarcane Seed Hot Water Treatment Tank
7 Sugarcane Seed Fungicide Dip Tank
8 Truck Tire Warehouse
9 Blacksmith Shop
10 Fabricating Shop & Welding Shed
11 Sugar Room
12 General Warehouse
13 MolassesTank & Molasses Transfer Tank
14 Oil Tank
15 Waste Oil Tank
16 Truck and Tractor Repair Shop

1 A Soil Sampling Grid

Sample Locations
Detected concentrations



Phase II Site Investigation
Oahu Sugar Company
Waipahu Mill
Waipahu, Hawaii

Brewer Environmental Services

BES Job No: 4603.00 *July 31, 1996*

Figure 4-10 Metals Analytical Results

LEGEND

1 Cane Cleaning Plant
2 Bagasse Storage & Warehouse
3 Service Station & Dispatcher Office
4 Machine Shop
5 Boiling House
6 Sugarcane Seed Hot Water Treatment Tank
7 Sugarcane Seed Fungicide Dip Tank
8 Truck Tire Warehouse
9 Blacksmith Shop
10 Fabricating Shop & Welding Shed
11 Sugar Room
12 General Warehouse
13 MolassesTank & Molasses Transfer Tank
14 Oil Tank
15 Waste Oil Tank
16 Truck and Tractor Repair Shop

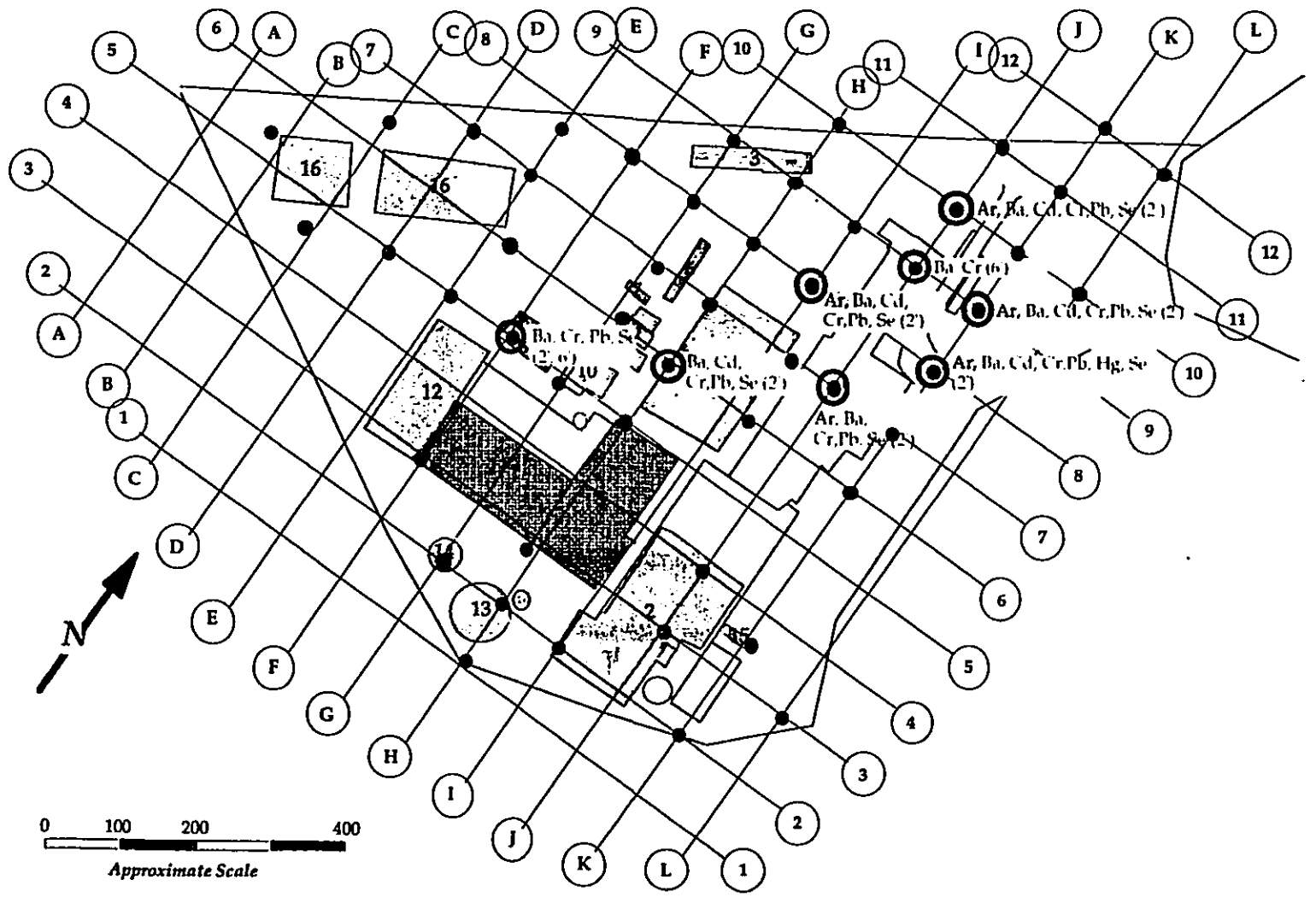
Soil Sampling Grid

Sample Locations

Detected concentrations

Detected concentrations above action level

Analyte (Depth)



Phase II Site Investigation
Oahu Sugar Company
Waipahu Mill
Waipahu, Hawaii

Brewer Environmental Services

BES Job No: 4603.00 *July 31, 1996*

TABLE 4-1

Immunoassay Results
TPH-D, PAHs, PCBs, Fungicides, Pesticides, Herbicides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID		TPH-D	PAHs	PCBs	Chlordane	Atrazine	Benlate	2,4-D
B5	2'	<10	<1	-	-	-	-	-
C5	2'	<10	<1	-	-	-	-	-
	6'	>10	<1	-	-	-	-	-
	10'	<10	<1	-	-	-	-	-
C6	2'	<10	<1	-	-	-	-	-
	6'	<10	<1	-	-	-	-	-
	10'	<10	<1	-	-	-	-	-
D5	2'	<10	<1	-	-	-	-	-
	6'	<10	<1	-	-	-	-	-
	8'	<10	<1	-	-	-	-	-
D7	2'	<10	-	-	-	-	-	-
	6'	<10	-	-	-	-	-	-
	8'	<10	-	-	-	-	-	-
E5	2'	<10	-	-	-	-	-	-
	6'	<10	-	-	-	-	-	-
	10'	<10	-	-	-	-	-	-
DOH SAL		*5000*	-	*1*	-	-	-	-
EPA PRG Soil		-	-	-	*1.5*	*8.6*	*34000*	*6800*

Note: < 10 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
>10 = Sample concentration is greater than detection limit of the analysis

TABLE 4-1 (Cont.)

Immunoassay Results
TPH-D, PAHs, PCBs, Fungicides, Pesticides, Herbicides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID		TPH-D	PAHs	PCBs	Chlordane	Atrazine	Benlate	2,4-D
E6	2'	>10	-	-	-	-	-	-
	6'	<10	-	-	-	-	-	-
	10'	<10	-	-	-	-	-	-
E7	2'	<10	<1	-	-	-	-	-
	6'	<10	<1	-	-	-	-	-
	9'	<10	<1	-	-	-	-	-
E8	2'	<10	-	-	-	-	-	-
	6'	>10	-	-	-	-	-	-
	10'	<10	-	-	-	-	-	-
F3	2'	<10	-	-	-	-	-	-
	6'	<10	-	-	-	-	-	-
	10'	<10	-	-	-	-	-	-
F5	2'	-	-	-	-	-	-	-
	6'	-	-	-	-	-	-	-
	10'	-	-	-	-	-	-	-
DOH SAL		*5000*	-	*1*	-	-	-	-
EPA PRG Soil		-	-	-	*1.5*	*8.6*	*34000*	*6800*

Note: < 10 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
>10 = Sample concentration is greater than detection limit of the analysis

TABLE 4-1 (Cont.)

Immunoassay Results
TPH-D, PAHs, PCBs, Fungicides, Pesticides, Herbicides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Depth	TPH-D	PAHs	PCBs	Chlordane	Atrazine	Benlate	2,4-D
F8	2'	>10	-	-	-	-	-	-
	6'	<10	-	-	-	-	-	-
	10'	<10	-	-	-	-		
FMT-1	2'	>10	-	-	-	-	-	-
	6'	<10	-	-	-	-	-	-
	10'	>10	-	-	-			
G2	2'	<10	-	-	-	-	-	-
G2-54'N	2'	-	-	-	-	-	-	-
	6'	-	-	-	-	-	-	-
G5	2'	<10	<1	-	-	-	-	-
	6'	<10	<1	-	-	-	-	-
	10'	<10	<1	-	-	-	-	-
G6	2'	<10	<1	-	-	-	<10	-
	6'	<10	<1	-	-	-	<10	-
	10'	<10	<1	-	-	-	<10	-
DOH SAL		*5000*	-	*1*	-	-	-	-
EPA PRG Soil		-	-	-	*1.5*	*8.6*	*34000*	*6800*

Note: < 10 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
>10 = Sample concentration is greater than detection limit of the analysis

TABLE 4-1 (Cont.)

Immunoassay Results
TPH-D, PAHs, PCBs, Fungicides, Pesticides, Herbicides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Depth	TPH-D	PAHs	PCBs	Chlordane	Atrazine	Benlate	2,4-D
G7	2'	<10	<1	-	-	-	<10	-
	6'	<10	<1	-	-	-	<10	-
	10'	<10	<1	-	-	-	<10	-
G8	2'	<10	<1	<1	-	-	-	-
	6'	<10	<1	<1	-	-	-	-
	10'	<10	<1	<1	-	-	-	-
G9	2'	<10	<1	<1	-	-	-	-
	6'	<10	<1	<1	-	-	-	-
	10'	<10	<1	<1	-	-	-	-
H1	2'	<10	<1	-	-	-	-	-
	6'	<10	<1	-	-	-	-	-
	10'	<10	<1	-	-	-	-	-
H1-28'N	2'	<10	-	-	-	-	-	-
	6'	<10	-	-	-	-	-	-
	10'	<10	-	-	-	-	-	-
DOH SAL		*5000*	-	*1*	-	-	-	-
EPA PRG Soil		-	-	-	*1.5*	*8.6*	*34000*	*6800*

Note: < 10 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
>10 = Sample concentration is greater than detection limit of the analysis

TABLE 4-1 (Cont.)

Immunoassay Results
TPH-D, PAHs, PCBs, Fungicides, Pesticides, Herbicides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	TPH-D	PAHs	PCBs	Chlordane	Atrazine	Benlate	2,4-D
H2							
2'	<10	<1	-	-	-	-	-
6'	<10	<1	-	-	-	-	-
9'	>10	<1	-	-	-	-	-
H3							
2'	*>10*	-	-	-	-	-	-
H5							
2'	*>10*	-	-	-	-	-	-
6'	<10	-	-	-	-	-	-
10'	<10	-	-	-	-	-	-
H6							
2'	<10	-	-	-	-	-	-
6'	<10	-	-	-	-	-	-
10'	<10	-	-	-	-	-	-
H7							
2'	<10	>1	-	-	-	<10	-
6'	<10	>1	-	-	-	<10	-
10'	<10	<1	-	-	-	<10	-
H8							
2'	<10	<1	-	-	-	<10	-
6'	<10	<1	-	-	-	<10	-
10'	*>10*	<1	-	-	-	<10	-
DOH SAL	*5000*	-	*1*	-	-	-	-
EPA PRG Soil	-	-	-	*1.5*	*8.6*	*34000*	*6800*

Note: < 10 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
>10 = Sample concentration is greater than detection limit of the analysis

TABLE 4-1 (Cont.)

Immunoassay Results
TPH-D, PAHs, PCBs, Fungicides, Pesticides, Herbicides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	TPH-D	PAHs	PCBs	Chlordane	Atrazine	Benlate	2,4-D
H9							
2'	<10	<1	<1	-	-	-	-
6'	<10	<1	<1	-	-	-	-
10'	<10	<1	<1	-	-	-	-
H10							
2'	<10	<1	-	-	-	-	-
6'	*>10*	<1	-	-	-	-	-
10'	<10	<1	-	-	-	-	-
I2							
2'	<10	<1	-	-	-	-	-
6'	<10	<1	-	-	-	-	-
10'	<10	<1	-	-	-	-	-
I6							
2'	<10	<1	-	-	-	-	-
6'	<10	<1	-	-	-	-	-
10'	<10	<1	-	-	-	-	-
I7							
2'	<10	<1	-	-	-	-	-
6'	*>10*	<1	-	-	-	-	-
10'	<10	<1	-	-	-	-	-
DOH SAL	*5000*	-	*1*	-	-	-	-
EPA PRG Soil	-	-	-	*1.5*	*8.6*	*34000*	*6800*

Note: < 10 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
>10 = Sample concentration is greater than detection limit of the analysis

TABLE 4-1 (Cont.)

Immunoassay Results
TPH-D, PAHs, PCBs, Fungicides, Pesticides, Herbicides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

SampleID	TPH-D	PAHs	PCBs	Chlordane	Atrazine	Benlate	2,4-D
I8							
2'	<10	-	<1	<20	<1	<10	<0.4
6'	<10	-	<1	<20	<1	<10	<0.4
10'	<10	-	<1	<20	<1	<10	<0.4
I9							
2'	*>10*	-	<1	*>20; <100*	<1	<10	<0.4
6'	<10	-	<1	<20	<1	<10	<0.4
10'	<10	-	<1	<20	<1	<10	<0.4
J3							
2'	<10	<1	<1	<20	<1	<10	<0.4
J4							
2'	<10	-	-	-	-	-	-
J7							
2'	<10	-	-	-	-	-	-
6'	<10	-	-	-	-	-	-
10'	<10	-	-	-	-	-	-
DOH SAL	*5000*	-	*1*	-	-	-	-
EPA PRG Soil	-	-	-	*1.5*	*8.6*	*34000*	*6800*

Note: < 10 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
>10 = Sample concentration is greater than detection limit of the analysis

TABLE 4-1 (Cont.)

Immunoassay Results
TPH-D, PAHs, PCBs, Fungicides, Pesticides, Herbicides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

SampleID	TPH-D	PAHs	PCBs	Chlordane	Atrazine	Benlate	2,4-D
K7							
2'	<10	-	-	-	-	-	-
6'	<10	-	-	-	-	-	-
10'	<10	-	-	-	-	-	-
K8							
2'	<10	-	<1	<20	<1	<10	<0.4
6'	<10	-	<1	<20	<1	<10	<0.4
10'	<10	-	<1	<20	<1	<10	<0.4
K9							
2'	<10	-	<1	<20	-	-	-
6'	<10	-	<1	<20	-	-	-
10'	<10	-	<1	<20	-	-	-
K10							
2'	<10	-	-	-	-	-	-
6'	*>10*	-	-	-	-	-	-
10'	<10	-	-	-	-	-	-
DOH SAL	*5000*	-	*1*	-	-	-	-
EPA PRG Soil	-	-	-	*1.5*	*8.6*	*34000*	*6800*

Note: < 10 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
>10 = Sample concentration is greater than detection limit of the analysis

TABLE 4-1 (Cont.)

Immunoassay Results
TPH-D, PAHs, PCBs, Fungicides, Pesticides, Herbicides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

SampleID	TPH-D	PAHs	PCBs	Chlordane	Atrazine	Benlate	2,4-D
J9							
2'	<10	-	<1	<20	<1	<10	<0.4
6'	<10	-	<1	<20	<1	<10	<0.4
10'	<10	-	<1	<20	<1	<10	<0.4
J10							
2'	<10	-	<1	*>20; <100*	<1	<10	<0.4
6'	<10	-	<1	*>20; <100*	<1	<10	<0.4
10'	<10	-	<1	*>20; <100*	<1	<10	<0.4
J11							
2'	<10	-	-	-	-	-	-
6'	<10	-	-	-	-	-	-
10'	<10	-	-	-	-	-	-
K2							
2'	<10	-	-	-	-	-	-
6'	<10	-	-	-	-	-	-
K3							
2'	-	-	<1	-	-	-	-
10'	-	-	<1	-	-	-	-
K6							
2'	<10	-	-	-	-	-	-
6'	<10	-	-	-	-	-	-
10'	<10	-	-	-	-	-	-
DOH SAL	*5000*	-	*1*	-	-	-	-
EPA PRG Soil	-	-	-	*1.5*	*8.6*	*34000*	*6800*

Note: < 10 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
>10 = Sample concentration is greater than detection limit of the analysis

TABLE 4-1 (Cont.)

Immunoassay Results
TPH-D, PAHs, PCBs, Fungicides, Pesticides, Herbicides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

SampleID	TPH-D	PAHs	PCBs	Chlordane	Atrazine	Benlate	2,4-D
K11							
2'	<10	-	-	-	-	-	-
6'	<10	-	-	-	-	-	-
10'	<10	-	-	-	-	-	-

Note: < 10 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
>10 = Sample concentration is greater than detection limit of the analysis

TABLE 4-1 (Cont.)

Immunoassay Results
TPH-D, PAHs, PCBs, Fungicides, Pesticides, Herbicides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	TPH-D	PAHs	PCBs	Chlordane	Atrazine	Benlate	2,4-D
K12							
2'	*>10*	-	-	-	-	-	-
6'	<10	-	-	-	-	-	-
10'	<10	-	-	-	-	-	-
L3							
2'	<10	-	-	-	-	-	-
5'	<10	-	-	-	-	-	-
10'	*>10*	-	-	-	-	-	-
L10							
2'	<10	-	-	-	-	-	-
6'	<10	-	-	-	-	-	-
10'	*>10*	-	-	-	-	-	-
L12							
2'	<10	-	-	-	-	-	-
6'	*>10*	-	-	-	-	-	-
10'	<10	-	-	-	-	-	-
DOH SAL	*5000*	-	*1*	-	-	-	-
EPA PRG Soil	-	-	-	*1.5*	*8.6*	*34000*	*6800*

Note: < 10 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
>10 = Sample concentration is greater than detection limit of the analysis

TABLE 4-2

Laboratory Results - Petroleum Components
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Benzene	Toluene	Ethylbenzene	Xylene	TPH-G	TPH-D	TRPH	TPH-Oil
B5								
2'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
C5								
2'	-	-	-	-	-	-	-	-
6'	-	-	-	-	-	-	-	-
10'	<0.05	<0.05	<0.05	<0.05	<10	<10	19	-
C6								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
10'	-	-	-	-	-	-	-	-
D5								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
8'	-	-	-	-	-	-	-	-
D7								
2'	<0.05	0.072	<0.05	0.065	<10	<10	<10	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
8'	-	-	-	-	-	-	-	-
E5								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	17	-
10'	-	-	-	-	-	-	-	-
DOH SAL	*0.05*	*16*	*0.5*	*23*	*2000*	*5000*	*5000*	*5000*
EPA PRG Soil	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" Sample not analyzed due to matrix interference
Quantities exceeding DOH or PRG soil action level

TABLE 4-2 (Cont.)

Laboratory Results - Petroleum Components
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Benzene	Toluene	Ethylbenzene	Xylene	TPH-G	TPH-D	TRPH	TPH-Oil
E6								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
10'	-	-	-	-	-	-	-	-
E7								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
9'	-	-	-	-	-	-	-	-
E8								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
10'	-	-	-	-	-	-	-	-
F3								
2'	-	-	-	-	-	-	-	-
6'	<0.05	0.092	<0.05	0.052	<10	<10	30	-
10'	-	-	-	-	-	-	-	-
F5								
2'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
6'	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-
DOH SAL	*0.05*	*16*	*0.5*	*23*	*2000*	*5000*	*5000*	*5000*
EPA PRG Soil	-	-	-	-	-	-	-	-

Note: <0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" Sample not analyzed due to matrix interference
Quantities exceeding DOH or PRG soil action level

TABLE 4-2 (Cont.)

Laboratory Results - Petroleum Components
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Benzene	Toluene	Ethylbenzene	Xylene	TPH-G	TPH-D	TRPH	TPH-Oil
F8								
2'	<0.05	<0.05	<0.05	<0.05	<10	<10	24	-
6'	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-
FMT-1								
2'	<0.05	0.261	<0.05	<0.05	-	750	-	3457
6'	-	-	-	-	-	-	-	-
10'	<0.05	<0.05	<0.05	<0.05	-	474	-	8469
G2								
2'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
6'	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-
G2-54'N								
2'	<0.05	<0.05	<0.05	0.056	-	<10	-	190
6'	<0.05	<0.05	<0.05	<0.05	-	<10	-	171
G5								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
10'	-	-	-	-	-	-	-	-
G6								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	44	-
10'	-	-	-	-	-	-	-	-
DOH SAL	*0.05*	*16*	*0.5*	*23*	*2000*	*5000*	*5000*	*5000*
EPA PRG Soil	-	-	-	-	-	-	-	-

Note: <0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" Sample not analyzed due to matrix interference
Quantities exceeding DOH or PRG soil action level

TABLE 4-2 (Cont.)

Laboratory Results - Petroleum Components
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID		Benzene	Toluene	Ethylbenzene	Xylene	TPH-G	TPH-D	TRPH	TPH-Oil
G7									
	2'	-	-	-	-	-	-	-	-
	6'	<0.05	<0.05	<0.05	<0.05	<10	<10	24	-
	10'	-	-	-	-	-	-	-	-
G8									
	2'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
	6'	<0.05	<0.05	<0.05	<0.05	<10	<10	18	-
	10'	-	-	-	-	-	-	-	-
G9									
	2'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
	6'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
	10'	-	-	-	-	-	-	-	-
H1									
	2'	<0.05	<0.05	<0.05	<0.05	<10	<10	29	-
	6'	-	-	-	-	-	-	-	-
	10'	-	-	-	-	-	-	-	-
H1-28'N									
	2'	<0.05	<0.05	<0.05	0.161	-	<10	-	<10
	6'	-	-	-	-	-	-	-	-
	10'	<0.05	0.062	<0.05	<0.05	-	<10	-	<10
DOH SAL		*0.05*	*16*	*0.5*	*23*	*2000*	*5000*	*5000*	*5000*
EPA PRG Soil		-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" Sample not analyzed due to matrix interference
Quantities exceeding DOH or PRG soil action level

TABLE 4-2 (Cont.)

Laboratory Results - Petroleum Components
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID		Benzene	Toluene	Ethylbenzene	Xylene	TPH-G	TPH-D	TRPH	TPH-Oil
H2									
	2'	-	-	-	-	-	-	-	-
	6'	-	-	-	-	-	-	-	-
	9'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
H3									
	2'	<0.5	<0.5	<0.5	<0.5	<10	<10	672	-
H5									
	2'	<0.05	<0.05	<0.05	<0.05	<10	<10	27	-
	6'	-	-	-	-	-	-	-	-
	10'	-	-	-	-	-	-	-	-
H6									
	2'	-	-	-	-	-	-	-	-
	6'	<0.05	<0.05	<0.05	<0.05	<10	<10	20	-
	10'	-	-	-	-	-	-	-	-
H7									
	2'	<0.05	<0.05	<0.05	<0.05	<10	<10	19	-
	6'	<0.05	<0.05	<0.05	<0.05	<10	<10	19	-
	10'	-	-	-	-	-	-	-	-
H8									
	2'	-	-	-	-	-	-	-	-
	6'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
	10'	-	-	-	-	-	-	-	-
DOH SAL		*0.05*	*16*	*0.5*	*23*	*2000*	*5000*	*5000*	*5000*
EPA PRG Soil		-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" Sample not analyzed due to matrix interference
Quantities exceeding DOH or PRG soil action level

TABLE 4-2 (Cont.)

Laboratory Results - Petroleum Components
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Benzene	Toluene	Ethylbenzene	Xylene	TPH-G	TPH-D	TRPH	TPH-Oil
H9								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	33	-
10'	-	-	-	-	-	-	-	-
H10								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	23	-
10'	-	-	-	-	-	-	-	-
I2								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	20	-
10'	-	-	-	-	-	-	-	-
I6								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	20	-
10'	-	-	-	-	-	-	-	-
I7								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	17	-
10'	-	-	-	-	-	-	-	-
DOH SAL	*0.05*	*16*	*0.5*	*23*	*2000*	*5000*	*5000*	*5000*
EPA PRG Soil	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" Sample not analyzed due to matrix interference
Quantities exceeding DOH or PRG soil action level

TABLE 4-2 (Cont.)

Laboratory Results - Petroleum Components
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Benzene	Toluene	Ethylbenzene	Xylene	TPH-G	TPH-D	TRPH	TPH-Oil
I8								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	17	-
10'	-	-	-	-	-	-	-	-
I9								
2'	-	-	-	-	-	-	-	-
6'	-	-	-	-	-	-	-	-
10'	<0.05	<0.05	<0.05	<0.05	<10	<10	45	-
J3								
2'	-	-	-	-	-	-	-	-
J4								
2'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
J7								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
10'	-	-	-	-	-	-	-	-
J9								
2'	<0.05	<0.05	<0.05	<0.05	<10	<10	*	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	435	-
10'	-	-	-	-	-	-	-	-
DOH SAL	*0.05*	*16*	*0.5*	*23*	*2000*	*5000*	*5000*	*5000*
EPA PRG Soil	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" Sample not analyzed due to matrix interference
Quantities exceeding DOH or PRG soil action level

TABLE 4-2 (Cont.)

Laboratory Results - Petroleum Components
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID		Benzene	Toluene	Ethylbenzene	Xylene	TPH-G	TPH-D	TRPH	TPH-Oil
J10									
	2'	-	-	-	-	-	-	-	-
	6'	-	-	-	-	-	-	-	-
	10'	<0.05	<0.05	<0.05	<0.05	<10	<10	11	-
J11									
	2'	<0.05	<0.05	<0.05	<0.05	<10	19	498	-
	6'	-	-	-	-	-	-	-	-
	10'	-	-	-	-	-	-	-	-
K2									
	2'	-	-	-	-	-	-	-	-
	6'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
K3									
	2'	<0.05	<0.05	<0.05	<0.05	<10	<10	35	-
	6'	-	-	-	-	-	-	-	-
	10'	-	-	-	-	-	-	-	-
K6									
	2'	-	-	-	-	-	-	-	-
	6'	<0.05	<0.05	<0.05	<0.05	<10	<10	14	-
	10'	-	-	-	-	-	-	-	-
DOH SAL		*0.05*	*16*	*0.5*	*23*	*2000*	*5000*	*5000*	*5000*
EPA PRG Soil		-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" Sample not analyzed due to matrix interference
Quantities exceeding DOH or PRG soil action level

TABLE 4-2 (Cont.)

Laboratory Results - Petroleum Components
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID		Benzene	Toluene	Ethylbenzene	Xylene	TPH-G	TPH-D	TRPH	TPH-Oil
K7									
	2'	-	-	-	-	-	-	-	-
	6'	<0.05	<0.05	<0.05	<0.05	<10	<10	40	-
	10'	-	-	-	-	-	-	-	-
K8									
	2'	-	-	-	-	-	-	-	-
	6'	-	-	-	-	-	-	-	-
	10'	<0.05	<0.05	<0.05	<0.05	<10	<10	29	-
K9									
	2'	-	-	-	-	-	-	-	-
	6'	<0.05	<0.05	<0.05	<0.05	<10	<10	28	-
	10'	-	-	-	-	-	-	-	-
K10									
	2'	-	-	-	-	-	-	-	-
	6'	<0.05	<0.05	<0.05	0.068	<10	<10	11	-
	10'	-	-	-	-	-	-	-	-
K11									
	2'	<0.05	<0.05	<0.05	<0.05	<10	90	128	-
	6'	-	-	-	-	-	-	-	-
	10'	<0.05	<0.05	<0.05	<0.05	<10	<10	18	-
DOH SAL		*0.05*	*16*	*0.5*	*23*	*2000*	*5000*	*5000*	*5000*
EPA PRG Soil		-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" Sample not analyzed due to matrix interference
Quantities exceeding DOH or PRG soil action level

TABLE 4-2 (Cont.)

Laboratory Results - Petroleum Components
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID No.	Benzene	Toluene	Ethylbenzene	Xylene	TPH-G	TPH-D	TRPH	TPH-Oil
K12								
2'	-	-	-	-	-	-	-	-
6'	-	-	-	-	-	-	-	-
10'	<0.05	<0.05	<0.05	0.108	<10	<10	<10	-
L3								
2'	-	-	-	-	-	-	-	-
5'	<0.05	<0.05	<0.05	<0.05	<10	<10	33	-
10'	-	-	-	-	-	-	-	-
L10								
2'	-	-	-	-	-	-	-	-
6'	<0.05	0.075	<0.05	<0.05	<10	<10	22	-
10'	-	-	-	-	-	-	-	-
L12								
2'	-	-	-	-	-	-	-	-
6'	<0.05	<0.05	<0.05	<0.05	<10	<10	<10	-
10'	-	-	-	-	-	-	-	-
DOH SAL	*0.05*	*16*	*0.5*	*23*	*2000*	*5000*	*5000*	*5000*
EPA PRG Soil	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" Sample not analyzed due to matrix interference
Quantities exceeding DOH or PRG soil action level

TABLE 4-3

Laboratory Results
PAHs, Halogenated Volatile Organics, and PCBs
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample No.	Polynuclear Aromatic Hydrocarbons				Halogenated Volatile Organic Compounds				
	Benzo (b) pyrene	Acenaphthene	Fluoranthene	Naphthalene	PCE	DCE	Vinyl Chloride	TCE	PCBs Only
B5									
2'	<1	<1	<1	<1	-	-	-	-	-
C5									
2'	-	-	-	-	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
10'	<1	<1	<1	<1	-	-	-	-	-
C6									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	<0.005	<0.005	<0.005	<0.005	-
10'	-	-	-	-	-	-	-	-	-
D5									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	<0.005	<0.005	<0.005	<0.005	-
8'	-	-	-	-	-	-	-	-	-
D7									
2'	<1	<1	<1	<1	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
8'	-	-	-	-	-	-	-	-	-
DOH SAL	*1*	*18*	*11*	*41*	*0.29*	*0.47*	*0.18*	*0.1*	*1*
PRG soil	-	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
Quantities exceeding DOH or PRG soil action level

TABLE 4-3 (Cont.)
Laboratory Results
PAHs, Halogenated Volatile Organics, and PCBs
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Polynuclear Aromatic Hydrocarbons (PAHs)				Halogenated Volatile Organic Compounds				
	Benzo(a)pyrene	Acenaphthene	Fluoranthene	Naphthalene	PCE	DCE	Vinyl Chloride	TCE	PCBs Only
E5									
2'	-	-	-	-	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
E6									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	<0.005	<0.005	<0.005	<0.005	-
10'	-	-	-	-	-	-	-	-	-
E7									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
9'	-	-	-	-	-	-	-	-	-
E8									
2'	-	-	-	-	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
F3									
2'	-	-	-	-	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
DOH SAL	*1*	*18*	*11*	*41*	*0.29*	*0.47*	*0.18*	*0.1*	*1*
PRG soil	-	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
Quantities exceeding DOH or PRG soil action level

TABLE 4-3 (Cont.)
Laboratory Results
PAHs, Halogenated Volatile Organics, and PCBs
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Polynuclear Aromatic Hydrocarbons (PAHs)				Halogenated Volatile Organic Compounds				
	Benzo(a)pyrene	Acenaphthene	Fluoranthene	Naphthalene	PCE	DCE	Vinyl Chloride	TCE	PCBs Only
F5									
2'	<1	<1	<1	<1	<0.005	<0.005	<0.005	<0.005	-
6'	-	-	-	-	<0.005	<0.005	<0.005	<0.005	-
10'	-	-	-	-	-	-	-	-	-
F8									
2'	<1	<1	<1	<1	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
FMT-1									
2'	<1	10.64	21.21	<1	-	-	-	-	-
6'	<1	6.02	10.34	<1	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
G2									
2'	<1	<1	<1	<1	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
G2-54'N									
2'	<1	<1	<1	<1	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
DOH SAL	*1*	*18*	*11*	*41*	*0.29*	*0.47*	*0.18*	*0.1*	*1*
PRG soil	-	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
Quantities exceeding DOH or PRG soil action level

TABLE 4-3 (Cont.)
Laboratory Results
PAHs, Halogenated Volatile Organics, and PCBs
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Polynuclear Aromatic Hydrocarbons (PAHs)				Halogenated Volatile Organic Compounds				PCBs Only
	Benzo (a) pyrene	Acenaphthene	Fluoranthene	Naphthalene	PCE	DCE	Vinyl Chloride	TCE	
G5									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
G6									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
G7									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
G8									
2'	<1	<1	<1	<1	-	-	-	-	ND
6'	<1	<1	<1	<1	-	-	-	-	ND
10'	-	-	-	-	-	-	-	-	-
G9									
2'	-	-	-	-	-	-	-	-	ND
6'	-	-	-	-	-	-	-	-	ND
10'	-	-	-	-	-	-	-	-	-
DOH SAL	*1*	*18*	*11*	*41*	*0.29*	*0.47*	*0.18*	*0.1*	*1*
PRG soil	-	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
Quantities exceeding DOH or PRG soil action level

TABLE 4-3 (Cont.)
Laboratory Results
PAHs, Halogenated Volatile Organics, and PCBs
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Polynuclear Aromatic Hydrocarbons (PAHs)				Halogenated Volatile Organic Compounds				PCBs Only
	Benzo (a) pyrene	Acenaphthene	Fluoranthene	Naphthalene	PCE	DCE	Vinyl Chloride	TCE	
H1									
2'	<1	<1	<1	<1	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
H1-25'N									
2'	<1	<1	<1	<1	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
10'	<1	<1	<1	<1	-	-	-	-	-
H2									
2'	-	-	-	-	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
9'	<1	<1	<1	<1	-	-	-	-	-
H3									
2'	<1	<1	<1	<1	-	-	-	-	-
H5									
2'	-	-	-	-	-	-	-	-	-
6'	-	-	-	-	<0.005	<0.005	<0.005	<0.005	-
10'	-	-	-	-	-	-	-	-	-
DOH SAL	*1*	*18*	*11*	*41*	*0.29*	*0.47*	*0.18*	*0.1*	*1*
PRG soil	-	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
Quantities exceeding DOH or PRG soil action level

TABLE 4-3 (Cont.)
Laboratory Results
PAHs, Halogenated Volatile Organics, and PCBs
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Polynuclear Aromatic Hydrocarbons (PAHs)				Halogenated Volatile Organic Compounds				PCBs Only
	Benzo (a) pyrene	Acenaphthene	Fluoranthene	Naphthalene	PCE	DCE	Vinyl Chloride	TCE	
H6									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
H7									ND
2'	-	-	-	-	-	-	-	-	ND
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	
H8									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
H9									ND
2'	-	-	-	-	<0.005	<0.005	<0.005	<0.005	ND
6'	<1	<1	<1	<1	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	
H10									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
DOH SAL	*1*	*18*	*11*	*41*	*0.29*	*0.47*	*0.18*	*0.1*	*1*
PRG soil	-	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
Quantities exceeding DOH or PRG soil action level

TABLE 4-3 (Cont.)
Laboratory Results
PAHs, Halogenated Volatile Organics, and PCBs
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Polynuclear Aromatic Hydrocarbons (PAHs)				Halogenated Volatile Organic Compounds				PCBs Only
	Benzo (a) pyrene	Acenaphthene	Fluoranthene	Naphthalene	PCE	DCE	Vinyl Chloride	TCE	
I2									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
I6									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	<0.005	<0.005	<0.005	<0.005	
10'	-	-	-	-	-	-	-	-	-
I7									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	<0.005	<0.005	<0.005	<0.005	-
10'	-	-	-	-	-	-	-	-	-
I8									
2'	-	-	-	-	-	-	-	-	ND
6'	-	-	-	-	<0.005	<0.005	<0.005	<0.005	ND
10'	-	-	-	-	-	-	-	-	-
I9									
2'	-	-	-	-	-	-	-	-	ND
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
DOH SAL	*1*	*18*	*11*	*41*	*0.29*	*0.47*	*0.18*	*0.1*	*1*
PRG soil	-	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
Quantities exceeding DOH or PRG soil action level

TABLE 4-3 (Cont.)

Laboratory Results

PAHs, Halogenated Volatile Organics, and PCBs

OSCO Sugar Mill, Waipahu, Hawaii

All readings in mg/kg

Sample ID	Polynuclear Aromatic Hydrocarbons (PAHs)				Halogenated Volatile Organic Compounds				
	Benzo (a) pyrene	Acenaphthene	Fluoranthene	Naphthalene	PCE	DCE	Vinyl Chloride	TCE	PCBs Only
J3 2'	-	-	-	-	-	-	-	-	-
J4 2'	<1	<1	<1	<1	-	-	-	-	-
J7 2'	-	-	-	-	-	-	-	-	ND
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
J9 2'	-	-	-	-	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	ND
10'	-	-	-	-	-	-	-	-	-
J10 2'	-	-	-	-	-	-	-	-	ND
6'	-	-	-	-	-	-	-	-	-
10'	<1	<1	<1	<1	-	-	-	-	-
DOH SAL	*1*	*18*	*11*	*41*	*0.29*	*0.47*	*0.18*	*0.1*	*1*
PRG soil	-	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
Quantities exceeding DOH or PRG soil action level

TABLE 4-3 (Cont.)

Laboratory Results

PAHs, Halogenated Volatile Organics, and PCBs

OSCO Sugar Mill, Waipahu, Hawaii

All readings in mg/kg

Sample ID	Polynuclear Aromatic Hydrocarbons (PAHs)				Halogenated Volatile Organic Compounds				
	Benzo (a) pyrene	Acenaphthene	Fluoranthene	Naphthalene	PCE	DCE	Vinyl Chloride	TCE	PCBs Only
J11 2'	<1	<1	<1	<1	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
K2 2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
K3 2'	<1	<1	<1	<1	-	-	-	-	ND
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
K6 2'	-	-	-	-	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
K7 2'	-	-	-	-	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
DOH SAL	*1*	*18*	*11*	*41*	*0.29*	*0.47*	*0.18*	*0.1*	*1*
PRG soil	-	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
Quantities exceeding DOH or PRG soil action level

TABLE 4-3 (Cont.)
Laboratory Results
PAHs, Halogenated Volatile Organics, and PCBs
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Polynuclear Aromatic Hydrocarbons (PAHs)				Halogenated Volatile Organic Compounds				
	Benzo (a) pyrene	Acenaphthene	Fluoranthene	Naphthalene	PCE	1,2 DCE	Vinyl Chloride	TCE	PCBs Only
K8									
2'	-	-	-	-	-	-	-	-	ND
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
K9									
2'	-	-	-	-	-	-	-	-	ND
6'	-	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
K10									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
K11									
2'	<1	2.33	<1	<1	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
10'	<1	<1	<1	<1	-	-	-	-	-
DOH SAL	*1*	*18*	*11*	*41*	*0.29*	*0.47*	*0.18*	*0.1*	*1*
PRG soil	-	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
Quantities exceeding DOH or PRG soil action level

TABLE 4-3 (Cont.)
Laboratory Results
PAHs, Halogenated Volatile Organics, and PCBs
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Polynuclear Aromatic Hydrocarbons (PAHs)				Halogenated Volatile Organic Compounds				
	Benzo (a) pyrene	Acenaphthene	Fluoranthene	Naphthalene	PCE	1,2 DCE	Vinyl Chloride	TCE	PCBs Only
K12									
2'	-	-	-	-	-	-	-	-	-
6'	-	-	-	-	-	-	-	-	-
10'	<1	<1	<1	<1	-	-	-	-	-
L10									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
L12									
2'	-	-	-	-	-	-	-	-	-
6'	<1	<1	<1	<1	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
L3									
2'	-	-	-	-	-	-	-	-	-
5'	<1	<1	<1	<1	-	-	-	-	-
10'	-	-	-	-	-	-	-	-	-
DOH SAL	*1*	*18*	*11*	*41*	*0.29*	*0.47*	*0.18*	*0.1*	*1*
PRG soil	-	-	-	-	-	-	-	-	-

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
Quantities exceeding DOH or PRG soil action level

TABLE 4-3 (Cont.)
Laboratory Results
PAHs, Halogenated Volatile Organics, and PCBs
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Polynuclear Aromatic Hydrocarbons (PAHs)												Halogenated Volatile Organic Compounds								PCBs ONLY
	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene	1,2-DCA	Benzene	Carbon Tetrachloride	Chloroform	Vinyl Chloride	TCE	PCBs
RINSATE (6/13/96)	<0.01		<0.03		<0.03		<0.03		<0.03		<0.03		<0.03		<0.03	<0.03	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	ND
RINSATE (6/12/96)	<0.01		<0.03		<0.03		<0.03		<0.03		<0.03		<0.03		<0.03	<0.03	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	ND
TAP WATER	<0.01		<0.03		<0.03		<0.03		<0.03		<0.03		<0.03		<0.03	<0.03	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
DI WATER	<0.01		<0.03		<0.03		<0.03		<0.03		<0.03		<0.03		<0.03	<0.03	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	ND
DOH SAL	*1*		*18*		*11*		*41*		*800*		*2700*		*360*		*0*		*0.29*	*0.47*	*0.18*	*0.1*	*0.011*	*7.1*	*1*
PRG soil	*0*		*360*		*27000*		*800*		*8000*		*27000*		*3600*		*0*		*25*	*0.038*	*0.011*	*7.1*	*0.066*		*0.066*

Note: <0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
Quantities exceeding DOH or PRG soil action level

TABLE 4-4
Laboratory Results
Pesticides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/L

Sample ID	G6	G7	H2	H7	H8	I8	DOH	PRG
	2'	2'	2'	5'	2'	2'	SAL	*SOIL*
EPA Method 632								
Bertate	<0.208	<0.218	<0.211	-	<210	<0.191	-	34,000
Velpar	<0.208	<0.218	<0.211	-	<210	<0.191	-	NS
Topsin M	<0.208	<0.218	<0.211	-	<210	<0.191	-	NS
Atrazine	<0.208	<0.218	<0.211	-	<210	<0.191	-	8.6
Diuron	<0.208	<0.218	<0.211	-	<210	<0.191	-	1,400
Topsin E	<0.208	<0.218	<0.211	-	<210	<0.191	-	NS
EPA Method 615								
2,4-D	-	-	-	-	-	<0.214	-	68,000
2,4-DB	-	-	-	-	-	<0.652	-	5,500
2,4-T	-	-	-	-	-	<0.134	-	68,000
2,4,5-TP	-	-	-	-	-	<0.0781	-	6,800
Dinoseb	-	-	-	-	-	<0.054	-	680
Dicamba	-	-	-	-	-	<0.173	-	-
Dalapon	-	-	-	-	-	<0.222	-	20,000
MCPP	-	-	-	-	-	<106	-	-
MCPA	-	-	-	-	-	<104	-	-
EPA Method 8080								
Lindane (BHC)	-	-	<0.00225	<0.00218	-	<0.00195	-	1.5
Heptachlor & epoxides	-	-	<0.00225	<0.00218	-	<0.00195	-	0.21
Aldrin	-	-	<0.00225	<0.00218	-	<0.00195	-	0.11
Endosulfan I/II	-	-	<0.00225	<0.00218	-	<0.00195	-	34
Dieldrin	-	-	<0.00437	<0.00422	-	<0.00379	-	0.12
4,4'-DDE	-	-	<0.00437	<0.00422	-	<0.00379	-	5.6
Endrin & aldehydes	-	-	<0.00437	<0.00422	-	<0.00379	-	200
4,4'-DDD	-	-	<0.00437	<0.00422	-	<0.00379	-	7.9
Endosulfan sulfate	-	-	<0.00437	<0.00422	-	<0.00379	-	34
4,4'-DDT	-	-	<0.00437	<0.00422	-	<0.00379	-	5.6
Methoxychlor	-	-	<0.0225	<0.00218	-	<0.0195	-	3,400
Chlordane	-	-	<0.00225	<0.00218	-	<0.0195	-	15
Toxaphene	-	-	<0.225	<0.218	-	<0.195	-	1.7

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "" = Samples were extracted past holding times
Quantities exceeding DOH or PRG soil action level

TABLE 4-3 (Cont.)
Laboratory Results
PAHs, Halogenated Volatile Organics, and PCBs
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Polynuclear Aromatic Hydrocarbons (PAHs)										Halogenated Volatile Organic Compounds				PCBs ONLY
	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Indeno(1,2,3-cd)pyrene	Naphthalene	PAHs	PCBs	Carbon Tetrachloride	1,2-DCE	Vinyl Chloride	TCE	
RINSATE (6/13/96)	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	ND
RINSATE (6/12/96)	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	ND
TAP WATER	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	ND
DI WATER	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	ND
DOH SAL	*1*	*18*	*11*	*41*	*0.29*						*0.47*	*0.18*	*0.1*		*1*
PRG soil	*0*	*360*	*27000*	*800*	*25*						*0.038*	*0.011*	*7.1*		*0.066*

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed
Quantities exceeding DOH or PRG soil action level

TABLE 4-4
Laboratory Results
Pesticides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/L

Sample ID	G6 2'	G7A 2'	H7 2'	H7 5'	H8 2'	I8 2'	DOH SAL	PRG SOIL
EPA Method 632								
Benlate	<0.208	<0.218	<0.211	-	<.210	<0.191	-	34,000
Velpar	<0.208	<0.218	<0.211	-	<.210	<0.191	-	NS
Topsin M	<0.208	<0.218	<0.211	-	<.210	<0.191	-	NS
Artrazine	<0.208	<0.218	<0.211	-	<.210	<0.191	-	8.6
Diuron	<0.208	<0.218	<0.211	-	<.210	<0.191	-	1,400
Topsin E	<0.208	<0.218	<0.211	-	<.210	<0.191	-	NS
EPA Method 615								
2,4-D	-	-	-	-	-	<0.214	-	68,000
2,4-DB	-	-	-	-	-	<0.652	-	5,500
2,4,5-T	-	-	-	-	-	<0.134	-	68,000
2,4,5-TP	-	-	-	-	-	<0.0781	-	6,800
Dinoseb	-	-	-	-	-	<0.054	-	680
Dichloroprop	-	-	-	-	-	<0.333	-	-
Dicamba	-	-	-	-	-	<0.173	-	20,000
Dalapon	-	-	-	-	-	<0.222	-	20,000
MCPP	-	-	-	-	-	<106	-	-
MCPA	-	-	-	-	-	<104	-	-
EPA Method 8080								
Lindane (BHC)	-	-	<0.00225	<0.00218	-	<0.00195	-	1.5
Heptachlor & epoxides	-	-	<0.00225	<0.00218	-	<0.00195	-	0.21
Aldrin	-	-	<0.00225	<0.00218	-	<0.00195	-	0.11
Endosulfan I/II	-	-	<0.00225	<0.00218	-	<0.00195	-	34
Dieldrin	-	-	<0.00437	<0.00422	-	<0.00379	-	0.12
4,4'-DDE	-	-	<0.00437	<0.00422	-	<0.00379	-	5.6
Endrin & aldehydes	-	-	<0.00437	<0.00422	-	<0.00379	-	200
4,4'-DDD	-	-	<0.00437	<0.00422	-	<0.00379	-	7.9
Endosulfan sulfate	-	-	<0.00437	<0.00422	-	<0.00379	-	34
4,4'-DDT	-	-	<0.00437	<0.00422	-	<0.00379	-	5.6
Methoxychlor	-	-	<0.0225	<0.0218	-	<0.0195	-	3,400
Chlordane	-	-	<0.00225	<0.00218	-	<0.0195	-	1.5
Toxaphene	-	-	<0.225	<0.218	-	<0.195	-	1.7

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "" = Samples were extracted past holding times
Quantities exceeding DOH or PRG soil action level

TABLE 4-4 (Continued)
Laboratory Results
Pesticides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/L

Sample ID	I9 2'	J7 2'	J9 6'	J10 2'	K8 2'	K9 2'	DOH SAL	PRG SOIL
EPA Method 632								
Benlate	<0.183	<0.208	<0.211	<0.173	<.122	-	-	34,000
Velpar	<0.183	<0.208	<0.211	0.254	<.122	-	-	NS
Topsin M	<0.183	<0.208	<0.211	<0.173	<.122	-	-	NS
Artrazine	<0.183	<0.208	<0.211	<0.173	<.122	-	-	8.6
Diuron	<0.183	<0.208	<0.211	<0.173	<.122	-	-	1,400
Topsin E	<0.183	<0.208	<0.211	<0.173	<.122	-	-	NS
EPA Method 615								
2,4-D	<0.204	<0.231	<0.235	<0.192	<0.226	-	-	68,000
2,4-DB	<0.623	<0.706	<0.716	<0.587	<0.689	-	-	5,500
2,4,5-T	<0.128	<0.145	<0.148	<0.121	<0.142	-	-	68,000
2,4,5-TP	<0.0745	<0.0845	<0.0858	<0.0703	<0.0825	-	-	6,800
Dinoseb	<0.0515	<0.0584	<0.0593	<0.0486	<0.057	-	-	680
Dichloroprop	<0.318	<0.360	<0.366	<0.300	<0.352	-	-	-
Dicamba	<0.166	<0.188	<0.190	<0.156	<0.183	-	-	20,000
Dalapon	<0.212	<0.240	<0.243	<0.199	<0.234	-	-	20,000
MCPP	<101	<114	<116	<952	<112	-	-	-
MCPA	<989	<112	<114	<932	<109	-	-	-
EPA Method 8080								
Lindane (BHC)	<0.00186	<0.00211	<0.00215	<0.00176	<0.00618	<0.00213	-	1.5
Heptachlor & epoxides	<0.00186	<0.00211	<0.00215	<0.00176	<0.00618	<0.00213	-	0.21
Aldrin	<0.00186	<0.00211	<0.00215	<0.00176	<0.00618	<0.00213	-	0.11
Endosulfan I/II	<0.00186	<0.00211	<0.00215	<0.00176	<0.00618	<0.00213	-	34
Dieldrin	<0.00362	<0.00410	<0.00417	<0.00342	<0.012	<0.00414	-	0.12
4,4'-DDE	<0.00362	<0.00410	<0.00417	0.00688	<0.012	<0.00414	-	5.6
Endrin & aldehydes	<0.00362	<0.00410	<0.00417	<0.00342	<0.012	<0.00414	-	200
4,4'-DDD	<0.00362	<0.00410	<0.00417	<0.00342	<0.012	<0.00414	-	7.9
Endosulfan sulfate	<0.00362	<0.00410	<0.00417	<0.00342	<0.012	<0.00414	-	34
4,4'-DDT	<0.00362	<0.00410	<0.00417	0.0292	<0.012	<0.00414	-	5.6
Methoxychlor	<0.0186	<0.0211	<0.0215	<0.0176	<0.0618	<0.0213	-	3,400
Chlordane	<0.00186	<0.00211	<0.00215	<0.00176	<0.00618	<0.00213	-	1.5
Toxaphene	<0.186	<0.211	<0.215	<0.176	<0.618	<0.213	-	1.7

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" = Samples were extracted past holding times
Quantities exceeding DOH or PRG soil action level

TABLE 4-4 (Continued)
Laboratory Results
Pesticides
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/L

Sample ID	Rinsate 6/13/96	Rinsate 6/12/96	Tap Water	DI Water
EPA Method 632				
Benlate	<0.001	<0.001	<0.001	<0.001
Velpar	<0.001	<0.001	<0.001	<0.001
Topsin M	<0.001	<0.001	<0.001	<0.001
Artrazine	<0.001	<0.001	<0.001	<0.001
Diuron	<0.001	<0.001	<0.001	<0.001
Topsin E	<0.001	<0.001	<0.001	<0.001
EPA Method 615				
2,4-D	<0.00130	<0.00130	<0.00130	<0.00130
2,4-DB	<0.000980	<0.000980	<0.000980	<0.000980
2,4,5-T	<0.00185	<0.00185	<0.00185	<0.00185
2,4,5-TP	<0.000390	<0.000390	<0.000390	<0.000390
Dinoseb	<0.0007	<0.0007	<0.0007	<0.0007
Dichloroprop	<0.00152	<0.00152	<0.00152	<0.00152
Dicamba	<0.00119	<0.00119	<0.00119	<0.00119
Dalapon	<0.00158	<0.00158	<0.00158	<0.00158
MCPP	<0.552	<0.552	<0.552	<0.552
MCPA	<0.489	<0.489	<0.489	<0.489
EPA Method 8080				
Lindane (BHC)	<0.00005	<0.00005	<0.00005	<0.00005
Heptachlor & epoxides	<0.00005	<0.00005	<0.00005	<0.00005
Aldrin	<0.00005	<0.00005	<0.00005	<0.00005
Endosulfan I/II	<0.00005	<0.00005	<0.00005	<0.00005
Dieldrin	<0.001	<0.001	<0.001	<0.001
4,4'-DDE	<0.001	<0.001	<0.001	<0.001
Endrin & aldehydes	<0.001	<0.001	<0.001	<0.001
4,4'-DDD	<0.001	<0.001	<0.001	<0.001
Endosulfan sulfate	<0.001	<0.001	<0.001	<0.001
4,4'-DDT	<0.001	<0.001	<0.001	<0.001
Methoxychlor	<0.0005	<0.0005	<0.0005	<0.0005
Chlordane	<0.00005	<0.00005	<0.00005	<0.00005
Toxaphene	<0.005	<0.005	<0.005	<0.005

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" = Samples were extracted past holding times
Quantities exceeding DOH or PRG soil action level

TABLE 4-5
Laboratory Results - Metals
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
F5								
2'	<0.9	103	<0.08	236	3.3	<0.13	0.98	<0.15
6'	<0.86	66.1	<0.07	250	3	<0.12	0.93	<0.14
10'	-	-	-	-	-	-	-	-
H6								
2'	<0.56	164	0.11	267	3.9	<0.12	0.94	<0.14
6'	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-
I8								
2'	6.3	166	0.77	191	83.2	<0.11	3.9	<0.81
6'	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-
J7								
2'	1.6	182	<0.07	291	5.7	<.12	0.94	<.14
6'	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-
J9								
2'	-	-	-	-	-	-	-	-
6'	<2.9	117	<0.35	306	<4.4	<0.13	<4.3	<0.89
10'	-	-	-	-	-	-	-	-
DOH SAL	-	-	*38*	-	*400*	-	-	-
PRG soil	*2*	*100,000*	-	*230*	-	*510*	*8500*	*8500*

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" = Samples were extracted past holding times;
Quantities exceeding DOH or PRG soil action level

TABLE 4-5 (Cont.)
Laboratory Results - Metals
OSCO Sugar Mill, Waipahu, Hawaii
All readings in mg/kg

Sample ID	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
J10								
2'	10.5	132	0.68	111	13.8	<0.1	0.78	<0.12
6'	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-
K8								
2'	34.4	178	0.58	136	24.2	0.19	0.94	<.14
6'	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-
K9								
2'	2.6	258	0.55	268	47.4	<0.13	0.96	<0.15
6'	-	-	-	-	-	-	-	-
10'	-	-	-	-	-	-	-	-
DOH SAL	-	-	*38*	-	*400*	-	-	-
PRG soil	*2*	*100,000*	-	*230*	-	*510*	*8500*	*8500*
RINSATE (6/13/96)	<0.013	<0.0017	<0.0016	<0.004	<0.019	<0.0002	<0.0194	<0.004
RINSATE (6/12/96)	<4	0.2	<0.33	<1.2	<2.4	<0.2	<4.3	<0.67
TAP WATER	<0.013	0.0101	<0.0016	<0.004	<0.0199	<0.0002	0.0311	<0.004
DI WATER	<4	0.33	<0.33	<1.2	<2.4	<0.2	<4.3	<0.67

Note: < 0.02 = Sample concentration is below detection limit of the analysis; "-" Not Analyzed; "*" = Samples were extracted past holding times;
Quantities exceeding DOH or PRG soil action level

5.0 DISCUSSION

Of the 61 confirmation soil samples tested for petroleum hydrocarbons and their constituents, only two, collected from the same sample point (FMT-1-2' and FMT-1-10'), had detectable concentrations above HDOH SALs. Specifically, TPH as oil was detected at a concentration above the HDOH SAL of 5,000 mg/kg in sample FMT-1-10' located on the eastern portion of the molasses tank. Additionally, fluoranthene, a polynuclear aromatic hydrocarbon, was detected in sample FMT-1-2' at concentrations above the HDOH SAL of 11 mg/kg.

As discussed in section 1.0 of this report, during the demolition of the molasses tank in April 1996, laborers encountered a heavy petroleum product at the base of the aboveground storage tank. Mr. Nii (personal communication, April 1996) surmised that the tank may have been used to store petroleum prior to use as a molasses tank. OSCO notified HDOH HEER office of the discovery in April 1996 (HDOH release report #051396-1420).

A total of nine samples were submitted for chemical analysis for total metals. All of the samples had detectable concentrations of metals; however, only four samples collected in the vicinity of the cane washer had detectable concentrations of a metal above the EPA PRG. Specifically, samples I8-2', J10-2', K8-2', and K9-2' had arsenic concentrations ranging from 2.6 mg/kg to 34.4 mg/kg which exceeds the EPA PRG of 2.0 mg/kg. Arsenic is a naturally occurring element which is present in Hawaii's soils. Background samples were not collected and analyzed for arsenic as part of this investigation and published data pertaining to arsenic concentrations is not available for this area; therefore, BES was unable to determine if the detected arsenic could be reasonably attributed to natural soil conditions.

Although arsenic concentrations exceed the PRG, these concentrations are "total" concentrations rather than toxicity leaching characteristic procedure (TCLP) concentrations that are used determination of hazardous waste for disposal purposes. Using a factor of 20 dilution factor which is used in the TCLP testing of soils, the average concentration of arsenic in soils using a TCLP test (e.g., average concentration/20) would be less than 1.5 miligrams per liter, the regulatory level established by the EPA (40 CFR Part 261 Table 1).

BES contacted Mr. Leslie Au with HDOH Hazard Evaluation and Emergency Response (HEER) office. Mr. Au indicated that the arsenic concentrations detected at the site are lower than those detected at other industrial sites in which the EPA did not require further action. He stated that he is not aware of any situations in Hawaii where these concentrations were treated as hazardous waste. He mentioned that

there was one site with a maximum of 66 mg/kg and an average of 32 mg/kg and that site was closed by the EPA with no further action required. He clarified that this site was an industrial site and that these numbers would not be allowed to close a residential property or development.

Similarly, BES has investigated another former sugar mill which also had an isolated area of arsenic-impacted soil. The average concentration of arsenic was approximately 80 mg/kg. BES reported these results to the HDOH HEER office. HDOH HEER was unconcerned by these concentrations.

6.0 RECOMMENDATIONS

There are two primary findings derived from this investigation: (1) TPH as oil and fluoranthene were detected above HDOH SALs at one location, FMT-1, located adjacent to the former molasses tank and (2) arsenic was detected at concentrations above the industrial PRG at four locations adjacent to the cane washer area.

In order to address the detected release of petroleum in the area around the molasses tank, BES recommends using test pits to obtain soil samples beneath the former AST location. These samples can be used to delineate the vertical and horizontal extent of the TPH as oil and fluoranthene contamination detected in the soil at FMT-1. Assuming that the impacted area is limited to soils within fifteen feet below ground surface and that the area is easily penetrable with an excavator bucket then the impacted soil can be excavated. If contaminant concentrations are within permissible limits, the impacted soil can then be transported to Nanakuli Landfill in Waianae, Hawaii or to a local thermal treatment facility. A report documenting field methods, extent of contamination, nature of contaminants, and the remedial process should be prepared by the environmental consultant and submitted to the HDOH HEER office.

In response to the arsenic detected in concentrations above the PRG in the area of the cane washer, because the average concentration of arsenic in the soils tested is below the regulatory level using the TCLP rule and assuming that the site will be used for industrial or commercial purposes, BES recommends no further action at this time. However, if the land use will be residential or used for child care purposes, BES recommends that a preliminary risk assessment be performed in order to assess the risk to human health.

7.0 LIMITATIONS

The Phase II Environmental Site Investigation of shallow subsurface soil of the Oahu Sugar Company's Waipahu Mill was conducted to obtain the greatest amount of environmental chemical data, covering the greatest area possible, within a reasonable budget. Based on the size of the property and the spacing of the sampling grid utilized, it is possible that isolated areas of the Mill could contain contaminated soil that was not detected in the Phase II investigation. Additionally, because of the ongoing groundwater investigation and remediation system project, groundwater quality was not addressed in the Phase II investigation. No claims as to the groundwater quality and conditions are made or implied.

The Phase II Site Investigation and the chemical analytes select for laboratory analysis were based on the our conversations with employees, site reconnaissance, and past experiences with sugar mills. BES did not evaluate every possible chemical contaminant at every sample point. To do so would have been cost prohibitive and is not in the standard of a well planned Phase II investigation. BES only investigated those chemicals that were reasonably suspected of having been used or stored in particular Mill locations. Consequently, random spills or malicious acts involving unknown chemicals or wastes not reportedly used or commonly known to be used at the Mill would not be detected.

Our professional services have been performed using that degree of care and skill ordinarily exercised under similar circumstances both other geologists and environmental scientists practicing in this field. No other warranty, expressed or implied, is made as to the professional advise in this report.

8.0 REFERENCES

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Appendix E

Archaeology Report

ARCHAEOLOGICAL INVENTORY SURVEY
AT WAIPAHU, WAIKELE, O`AHU
(9-4-2: por.4)

prepared by:

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96-P116

April 1996

TABLE OF CONTENTS

LIST OF FIGURES

1.0 INTRODUCTION

Pacific Legacy, Inc., under contract to AMFAC/JMB Hawaii, Inc., conducted an archaeological inventory survey in Waipahu, O'ahu. The project area consists of ca. 23 acres surrounding and including the Oahu Sugar Mill (TMK 9-4-2:por. 4) (Figure 1). The town of Waipahu is located in the traditional land division, (*ahupua'a*), of Waikele in the 'Ewa District.

The archaeological investigations entailed of two lines of inquiry: (1) archival research and (2) surface survey. The purpose of these investigations is to determine if any potentially significant archaeological resources are present on the project property.

The State Historic Preservation Division (SHPD) requires an archaeological inventory survey as part of the development permitting process. An archaeological inventory survey is the necessary first step in managing archaeological resources that may be present in a project area. The purpose of an archaeological inventory survey prior to development activities is to determine if potentially significant archaeological resources are present on a specific parcel of land. If potentially significant resources are present, then a set of procedures must be implemented to manage these resources and to mitigate any adverse effects of proposed development. These procedures are generally developed in a Historic Preservation Plan (HPP) after completing the archaeological inventory survey.

The archival research included a brief review of relevant archaeological research previously conducted in the project vicinity and historic records and maps. Data from the archival research was used to predict what types of archaeological sites, if any, could occur in the project area.

The surface survey was conducted by the author on 6 March 1996. The entire parcel was traversed on foot and examined for the presence of surface archaeological sites. The archaeological survey was limited to identifying traditional Hawaiian archaeological resources. Historic buildings and structures were outside the parameters of the current project.

1.1 Environmental Setting

The project area in Waipahu Town is located at the approximately 40 foot contour just inland (*mauka*) of Pearl Harbor's West Loch. Pearl Harbor is essentially a series of drowned river valleys created through a complex geologic history of changing sea level and island subsidence (Macdonald and Abbott 1970:356-358). The land area surrounding Waipahu slopes gently into the Pearl Harbor region, with steeper localized relief provided by the gulches of Waikele, Kipapa, and Panakauahi.

The soils in the area are Waipahu silty clay with 6-12 percent slopes (WzC) (Foote et al. 1972:134-135; map 53). This soil series consists of well drained soils on marine terraces that were developed in old alluvium derived from basic igneous rock. On the Waipahu silty clay, runoff is medium and the erosion hazard is moderate (Foote et al. 1972:134-135). Rainfall in Waipahu averages ca. 30 inches per year with most of the precipitation occurring between October and March (Armstrong 1983:62). The mean maximum temperature for the general area is between 80 and 88 degrees Fahrenheit and the mean minimum temperature is between 60 and 70 degrees Fahrenheit (Armstrong 1983:64). Vegetation in the project area is recently introduced exotic tree, bush, and grass species.

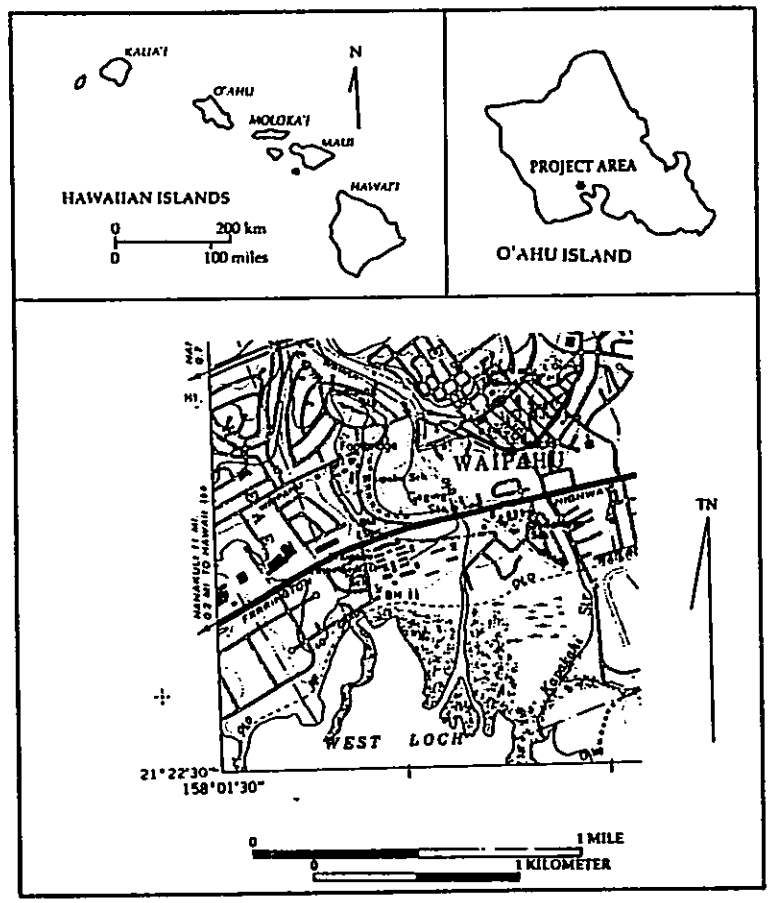

FIGURE 1. LOCATION OF PROJECT AREA.

2.0 ARCHIVAL RESEARCH RESULTS

2.1 Historical Summary

The area now known as Waipahu was originally called Waikele, which is the name for the entire *ahupua'a* (Sterling and Summers 1978:25). Literally, Waipahu means "bursting water" or "water burst forth from underground" (Pukui et al. 1974:227), the name of a spring located here (Sterling and Summers 1978:25). Waipahu Spring is an important traditional spot, the site where the shark goddess Kaahupahau bathed (Sterling and Summers 1978:25). McAllister noted that a pump had been erected atop this spring (presumably by the sugar company) when he visited the site in the early 1930s (McAllister 1933:106).

A "supernatural" stone, *poluku-pili*, that once belonged to the traditional gods Kane and Kanaloa was placed by these deities at the boundary between the *ahupua'a* of Waikele and Hō'ae'ae on the edge of a cliff (Sterling and Summers 1978:29).

In Waipahu there is a locale named Ka-puka-na-wai-o-Kahuku, or "outlet of water from Kahuku." This is where a tapa anvil that had been lost in Kahuku was found (Sterling and Summers 1978:25-26).

In 1897 the Oahu Sugar Company was established and the Waipahu Depot Road was built between the sugar mill and the railroad depot on the line that ran close to Pearl Harbor (Spencer Mason Architects 1990:3). The growth and development of Waipahu Town centered around the sugar mill. A plantation store, hospital and employee housing were built in close proximity. The reader is referred to Nedbalek's (1984) study for additional information regarding Waipahu's history.

2.2 Previous Archaeology

The first archaeological investigations in Waipahu were conducted by J. Gilbert McAllister (1933) who recorded two archaeological sites as part of his island-wide survey. These two sites were Mokoula Heiau (Site 127) and Hapupu Heiau, both of which were already destroyed when McAllister noted them (cf. Sterling and Summers 1978:25).

Cox and Stasack (1970:97), as part of their state-wide petroglyph study noted the presence of approximately 12 petroglyphs on boulders located on the north side of Waikele Stream, on the west edge of Waipahu town. Both triangular bodied human figure and dog elements were recorded.

In 1990, William Folk conducted a reconnaissance survey for the proposed widening of Waipahu Street, a portion of which borders the current project area. Folk recorded three historic-period dressed stone walls along Waipahu Street and

dressed curbstones along Waipahu Street and Makaaloha Street (Folk 1990:9). Folk recommended that these stone features be systematically recorded and if possible preserved in place (Folk 1990:12). Folk also suggested that the entire length of Waipahu Street was "archaeologically sensitive" because: (1) Waipahu is the site of the traditional Hawaiian village of Waikele and (2) buried archaeological deposits are often found in such areas despite modern land use (Folk 1990:10).

Folk supported his first point (that Waikele was a traditional village) by citing Sterling and Summers (1978:24-30). None of the passages on these pages state that Waikele was a traditional village. The citations simply state that the area was termed Waikele. We have no traditional information that there was a "village" situated in Waipahu.

Folk supported his second point with findings of Clark and Toenjes (1987) who found buried archaeological deposits under "paved highways...residential streets...[and] landscaped residential yards" (Clark and Toenjes 1987, as cited in Folk 1990:10). Clark and Toenjes' work was in the Spreckelsville area on Maui which is an active sand dune area, and where one might predict the burial of archaeological materials. This active sand dune area is geomorphically quite different from Waipahu.

In 1990, the firm of Spencer Mason Architects conducted a study of potentially historic properties along Waipahu Street for a proposed street widening project. The conclusions of this study, including discussions regarding a potential historic district. Are begin reevaluated and updated by Spencer Mason Architects.

In 1993 and 1994, Robert Spear conducted two reconnaissance surveys for the Waikele Industrial Subdivision located immediately north of the project area (Spear 1993; 1994). The area has been extensively disturbed and no archaeological sites were found.

3.0 ARCHAEOLOGICAL SURVEY RESULTS

Over 60 percent of the project area is covered by the sugar mill and associated machine buildings, and paved and graded roadways (Figures 2, 3, 4, 5, 6, and 7). The remaining ca. 40 percent of the project area is where the supervisors' residences were located. This residential area is referred to as Skill Village (Spencer Mason 1990:10, Map 4) (Figures 2, 8).

No traditional archaeological sites were observed on the surface in the project area. This is undoubtedly due to the highly developed industrial nature of the site that has persisted for about the last 100 years.

The possibility that there are subsurface deposits in the vicinity has been raised in a previous study (Folk 1990). An open excavation trench was observed in the area located to the northeast of the project area (Figure 9). This trench revealed that ca. 40 cm of fill has been deposited over the area. Much of this fill contains coral gravel which was observed scattered over most of the unpaved surface in the vicinity of the mill. The excavation trench also showed deeper disturbances (a pipe and wooden post) extending to almost a meter below surface. These data suggest that there may be a low likelihood that subsurface archaeological deposits exist in the project area. However, there is the possibility that buried historic period deposits (e.g., trash dumps, etc.) may be present in the project area.

The former housing area now supports only one residence, at 960 Makaaloha Street (Figure 8). All other dwellings have been torn down or removed. This area also has a low probability of containing subsurface archaeological deposits because of the years of intensive use, including numerous buried utility lines.

Dressed basalt wall segments are present along Waipahu Street. These wall segments range in height from ca. 0.2 to 3.0 m (Figures 10 and 11). The basalt boulders have been flaked and dressed to form rectangular blocks. It appears these walls were constructed without mortar.

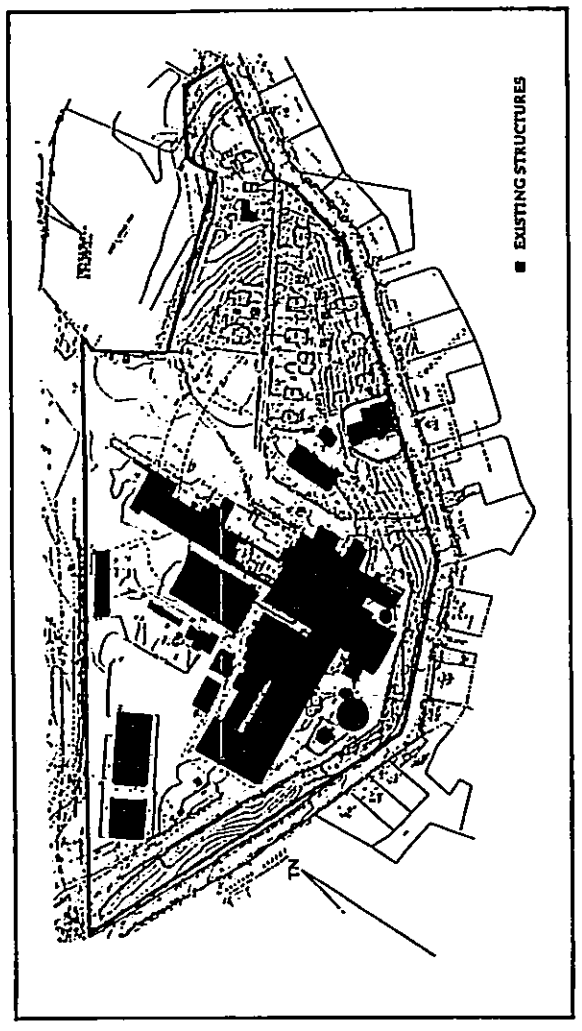

FIGURE 2. DETAILED MAP OF PROJECT AREA.

FIGURE 3. PHOTOGRAPH OF MILL AREA (view to northeast).

FIGURE 4. PHOTOGRAPH OF MILL AREA (view to east).

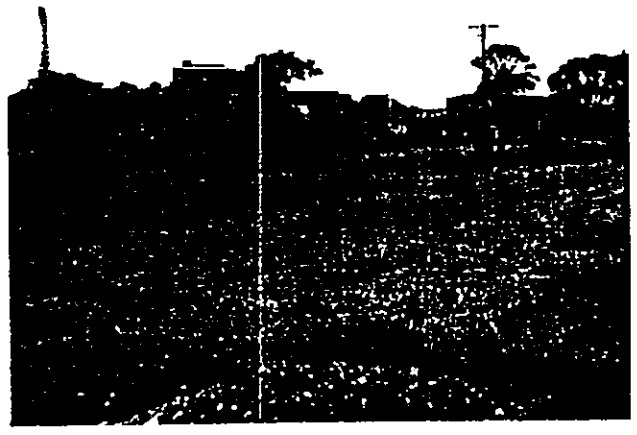

FIGURE 5. PHOTOGRAPH OF MILL AREA (view to southeast).

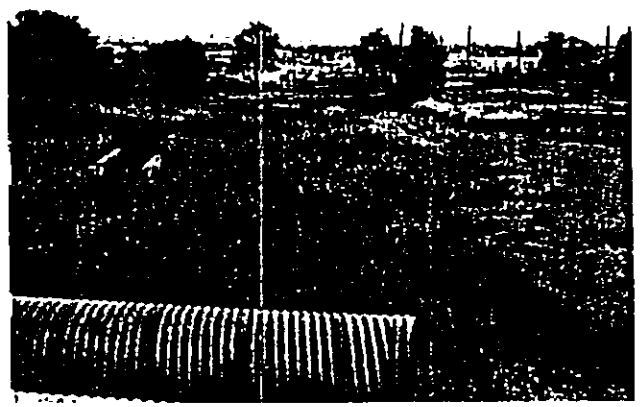

FIGURE 6. PHOTOGRAPH OF MILL AREA (view to south).

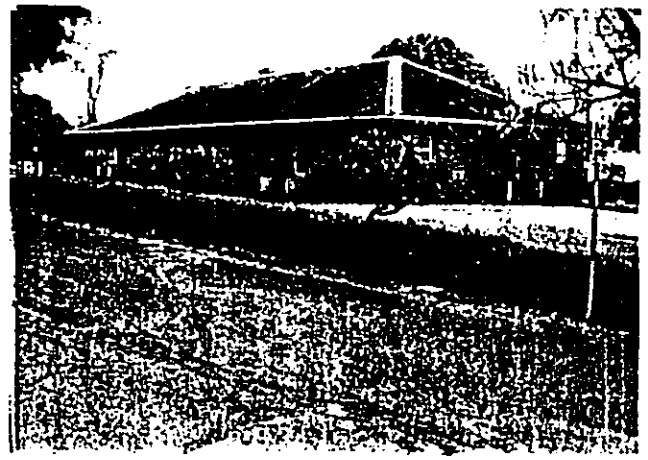

FIGURE 7. PHOTOGRAPH OF ADMINISTRATION BUILDING (view to north).

FIGURE 8. PHOTOGRAPH OF HOUSE AT 960 MAKAALOHA STREET (view to west).

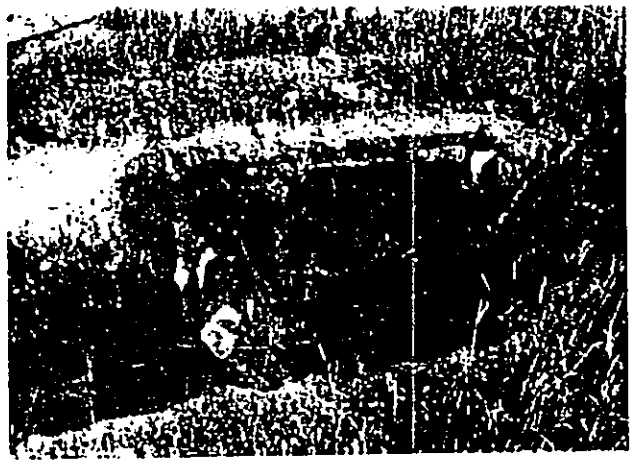

FIGURE 9. PHOTOGRAPH OF OPEN EXCAVATION TRENCH LOCATED TO THE NORTHEAST OF THE PROJECT AREA (view to northwest).

FIGURE 10. PHOTOGRAPH OF LOW WALL SEGMENT ALONG WAIPAHU STREET (view to west).

FIGURE 11. PHOTOGRAPH OF HIGH WALL SEGMENT ALONG WAIPAHU STREET (view to west).

4.0 DISCUSSION

No traditional archaeological sites were found in the project area and it appears unlikely that there will be potentially significant subsurface archaeological deposits of prehistoric age in the project area.

Consideration of the presence of significant historic period-era buildings and structures is outside of the scope of work for this project. These issues, including a potential historic district at the project area; are addressed by the Spencer Mason Architects 1990 study and its pending update.

The walls of dressed basalt boulders along Waipahu Street are likewise outside the scope of this project. These also should be studied and documented.

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Appendix E-1

Skilled Worker's Housing Study

EVALUATION & DESCRIPTION OF OAHU SUGAR CO. SKILLED WORKERS' HOUSES, WAIPAHU

Prepared for

AMFAC/JMB HAWAII, INC.

SPENCER MASON ARCHITECTS, INC.
1050 SMITH STREET
HONOLULU, HI 96817

May 1996

INTRODUCTION

The 18 plantation houses clustered near the mill on Waipahu and Makaaloha Street (Fig. 1) dated from 1909 through 1934, with the majority built circa 1921. With the exception of one house the skilled workers houses are now either relocated or demolished. This report is based on field inspections done in September and October 1995 just prior to the demolition of the last houses. At that time 15 houses remained (Fig. 1).

Because it was a supervisors' and skilled workers' village, there was more diversity of architectural designs that would be found in a grouping of field workers' housing. Most, however, had vertical tongue and groove siding, hip roofs, double-hung windows, and slat-screened post siding, hip roofs, double-hung windows, and slat-screened post foundations. The grouping was significant for the architecture itself and for the social history of class distinctions in the location and design of plantation housing. Descriptions and photographs of eight houses are included in this report. The eight houses were selected to include the most historically and architecturally significant houses and to include examples of each of the types of houses that were present.

Although almost all the houses are gone some important elements of the site remain. The wall that ran in front of the five houses located between the plantation store and Makaaloha Street still exists. It ranges in height from about one foot to four feet, using angular, flat-faced lava rocks, apparently laid without mortar. The date of the wall has not been determined, so its construction may be associated with either the building of Waipahu Street or with the development of the houses. The allee of mahogany tree that lines Makaaloha Street is very important, only one other example of an allee of mahogany trees is known on Oahu. The many fruit trees on the site create a park-like atmosphere for this part of the mauka side of Waipahu Street which is an essential part of the visual character of Waipahu town center.

Figure 1: MAP OF SKILLED WORKERS' HOUSES, 1995

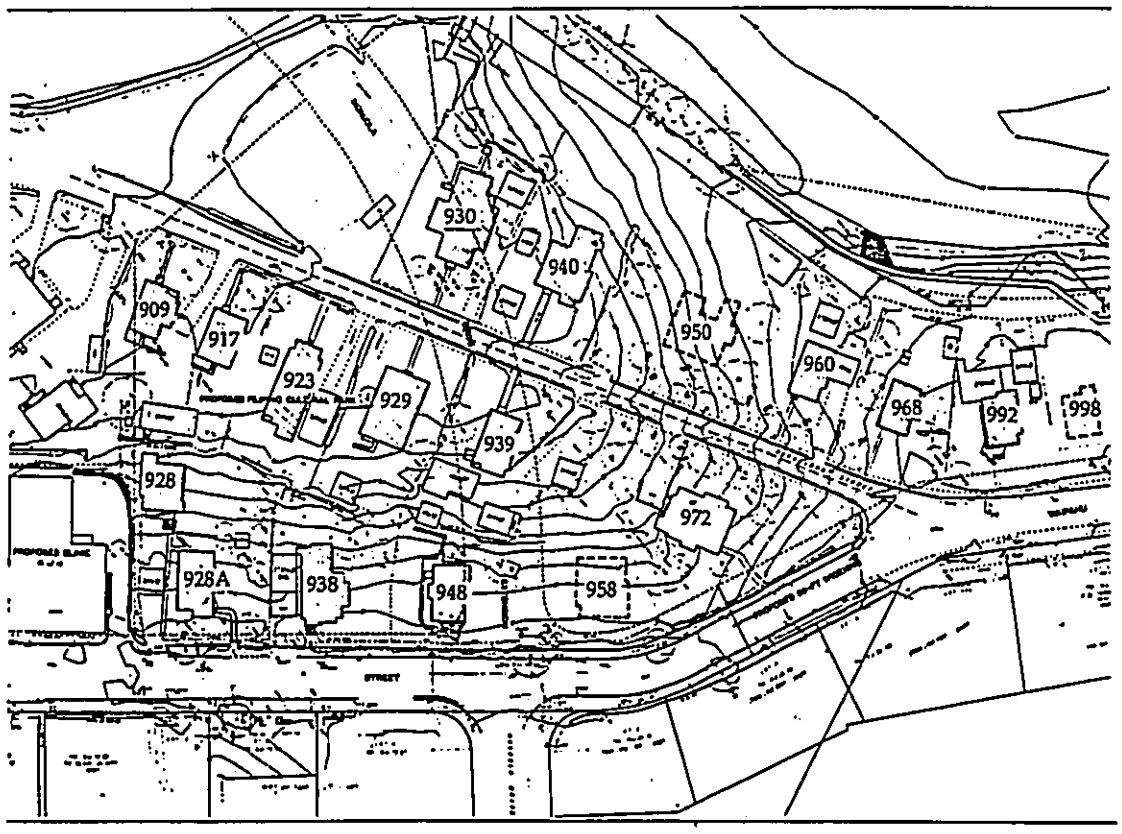

Figure 2: SKILLED WORKERS' HOUSES

	TMK	Address	Date
X	9-4-2: 4	94-928A Waipahu Street	1921
	9-4-2: 4	94-938 Waipahu Street	1924
X	9-4-2: 4	94-948 Waipahu Street	1909
	9-4-2: 4	94-958 Waipahu Street	1921-2 or '25
X	9-4-2: 4	94-972 Waipahu Street	1925
X	9-4-2: 4	94-968 Makaaloha Street	1921
	9-4-2: 4	94-992 Waipahu Street	1921
	9-4-2: 4	94-998 Waipahu Street	1922
	9-4-2: 4	94-930 Makaaloha Street	1934
	9-4-2: 4	94-940 Makaaloha Street	1921
	9-4-2: 4	94-950 Makaaloha Street	1921
X	9-4-2: 4	94-960 Makaaloha Street	1921
X	9-4-2: 4	94-909 Makaaloha Street	1921-2
	9-4-2: 4	94-917 Makaaloha Street	1921
X	9-4-2: 4	94-923 Makaaloha Street	1903
X	9-4-2: 4	94-929 Makaaloha Street	1903
	9-4-2: 4	94-939 Makaaloha Street	1903
	9-4-2: 4	94-928 Waipahu Street	1921

'X' in first column indicates houses which are described in this report.
The date information was obtained both from Zialcita's 1985 study of Oahu Sugar Company's records and the Tax Office records. For only one house was there disagreement in the records for date.

Figure 1: MAP OF SKILLED WORKERS' HOUSES, 1995

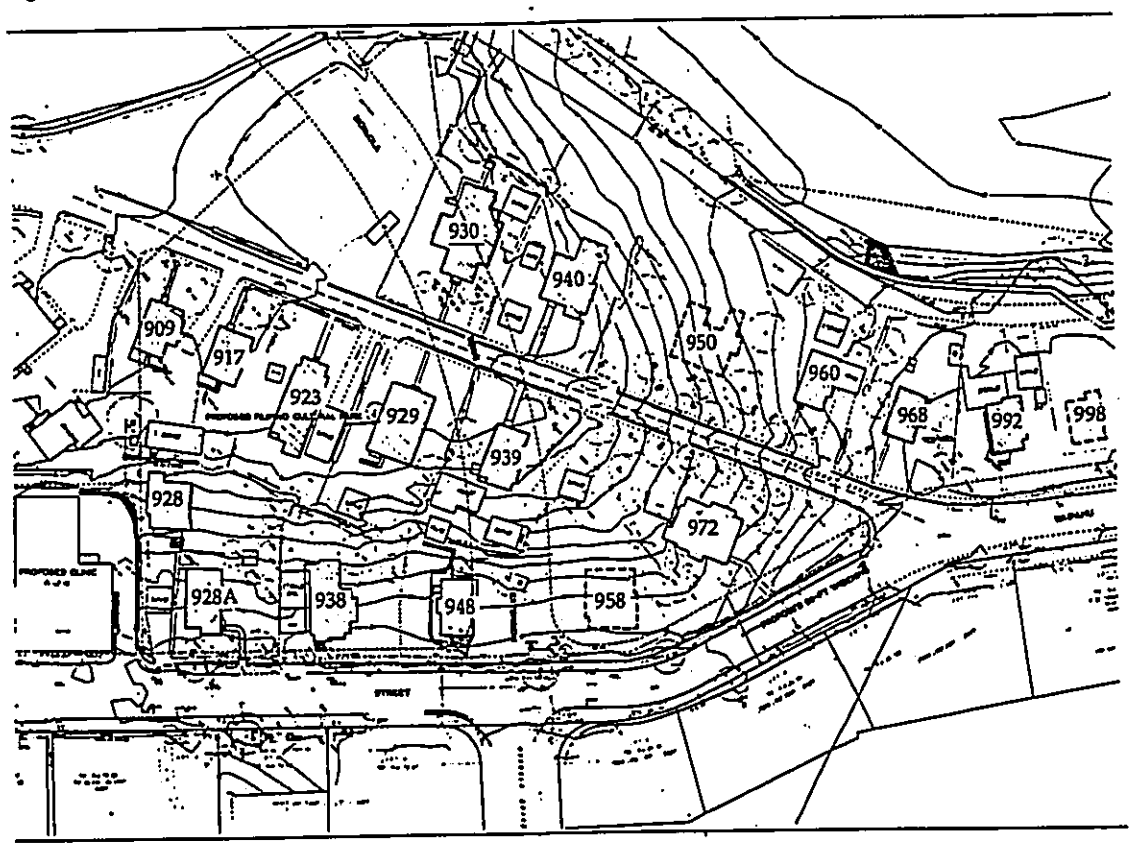

Figure 2: SKILLED WORKERS' HOUSES

	TMK	Address	Date
X	9-4-2: 4	94-928A Waipahu Street	1921
	9-4-2: 4	94-938 Waipahu Street	1924
X	9-4-2: 4	94-948 Waipahu Street	1909
	9-4-2: 4	94-958 Waipahu Street	1921-2 or '25
X	9-4-2: 4	94-972 Waipahu Street	1925
X	9-4-2: 4	94-968 Makaaloha Street	1921
	9-4-2: 4	94-992 Waipahu Street	1921
	9-4-2: 4	94-998 Waipahu Street	1922
	9-4-2: 4	94-930 Makaaloha Street	1934
	9-4-2: 4	94-940 Makaaloha Street	1921
	9-4-2: 4	94-950 Makaaloha Street	1921
X	9-4-2: 4	94-960 Makaaloha Street	1921
X	9-4-2: 4	94-909 Makaaloha Street	1921-2
	9-4-2: 4	94-917 Makaaloha Street	1921
X	9-4-2: 4	94-923 Makaaloha Street	1903
X	9-4-2: 4	94-929 Makaaloha Street	1903
	9-4-2: 4	94-939 Makaaloha Street	1903
	9-4-2: 4	94-928 Waipahu Street	1921

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The date information was obtained both from Zialcita's 1985 study of Oahu Sugar Company's records and the Tax Office records. For only one house was there disagreement in the records for date.

CORRECTION

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

Figure 1: MAP OF SKILLED WORKERS' HOUSES, 1995

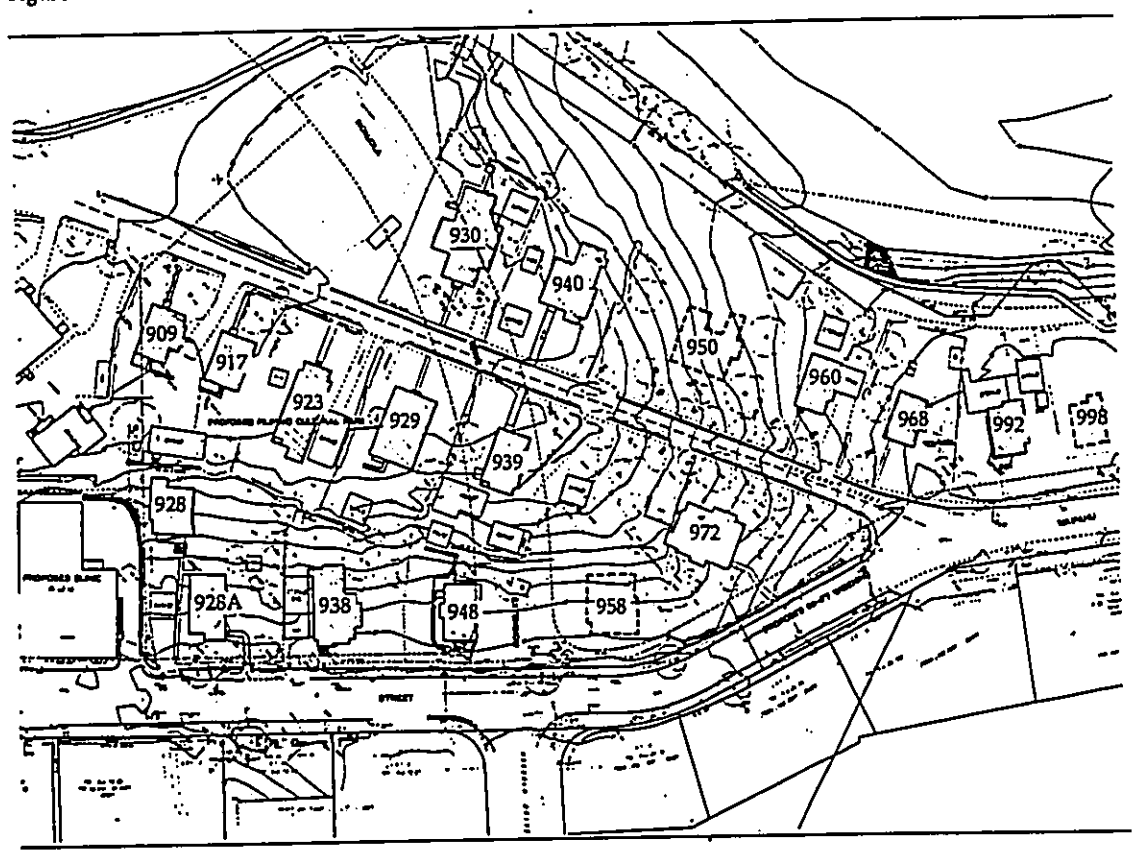

Figure 2: SKILLED WORKERS' HOUSES

	TMK	Address	Date
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X	9-4-2: 4	94-948 Waipahu Street	1909
	9-4-2: 4	94-958 Waipahu Street	1921-2 or '25
X	9-4-2: 4	94-972 Waipahu Street	1925
X	9-4-2: 4	94-968 Makaaloha Street	1921
	9-4-2: 4	94-992 Waipahu Street	1921
	9-4-2: 4	94-998 Waipahu Street	1922
	9-4-2: 4	94-930 Makaaloha Street	1934
	9-4-2: 4	94-940 Makaaloha Street	1921
	9-4-2: 4	94-950 Makaaloha Street	1921
X	9-4-2: 4	94-960 Makaaloha Street	1921
X	9-4-2: 4	94-909 Makaaloha Street	1921-2
	9-4-2: 4	94-917 Makaaloha Street	1921
X	9-4-2: 4	94-923 Makaaloha Street	1903
X	9-4-2: 4	94-929 Makaaloha Street	1903
	9-4-2: 4	94-939 Makaaloha Street	1903
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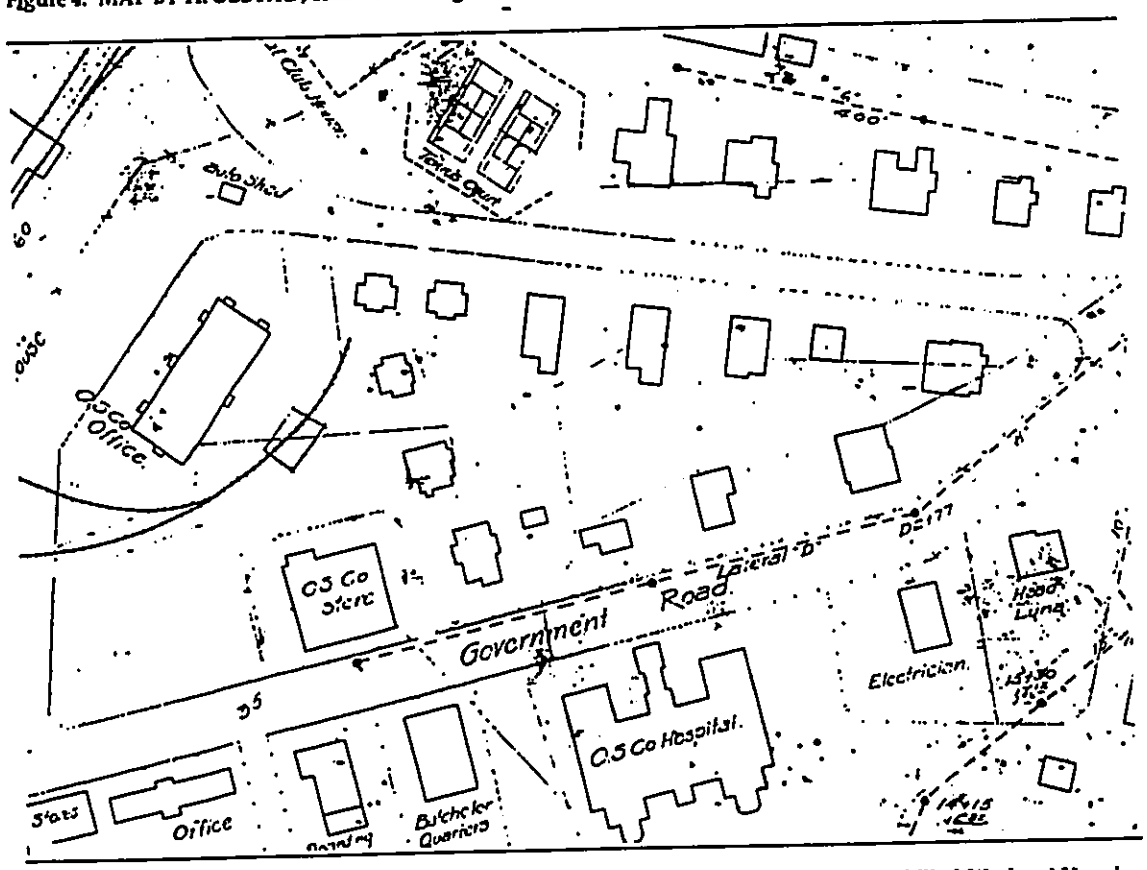
'X' in first column indicates houses which are described in this report.
The date information was obtained both from Zialcita's 1985 study of Oahu Sugar Company's records and the Tax Office records. For only one house was there disagreement in the records for date.

RECEIVED AS FOLLOWS

Figure 3: "PLAN OF PROPOSED WAIPAHU SEWER SYSTEM", OCTOBER 1920 - Oahu Sugar Co. Archives

Figure 4: MAP BY H. OLSTAD, 1924 - Oahu Sugar Co. Archives



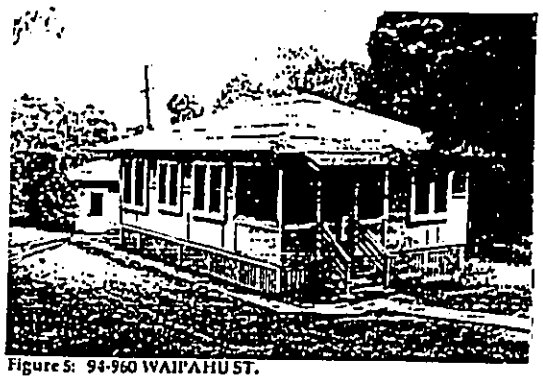


Figure 5: 94-960 WAIPAHU ST.

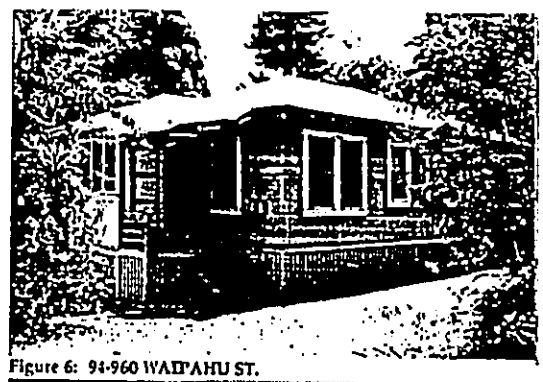


Figure 6: 94-960 WAIPAHU ST.

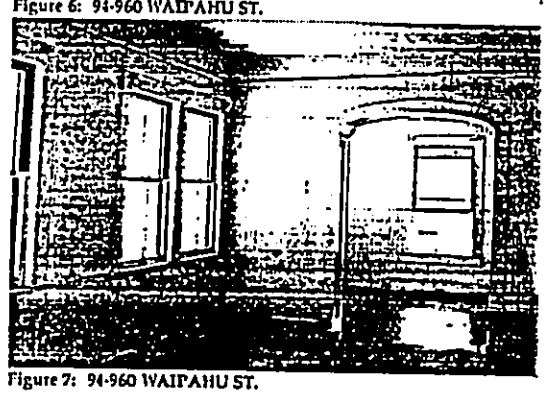


Figure 7: 94-960 WAIPAHU ST.

94-960 Waipahu Street Located at the bottom of the slope of Makaaloha Street this house dates from 1921. Although it is a small house its details are of high quality in design and craftsmanship. These include an arched cased opening connecting the two main rooms. The original porch has been enclosed at some time. At the time of the survey for this report it was in good condition. It is the now the only house that remains.

Figure 8: 94-968 WAIPAHU STREET

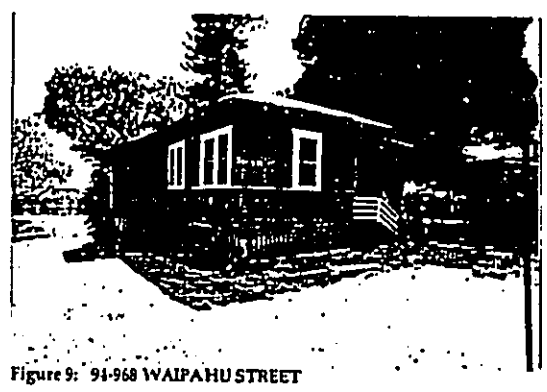


Figure 9: 94-968 WAIPAHU STREET

94-968 Waipahu Street Located on the curve of Makaaloha Street where it intersects Waipahu Street, this small, prototypical plantation house was similar in plan to the adjacent house, 94-960 but it retained its corner porch, rather that enclosing it. The other features of this housing type were also intact: tongue and groove siding with mid-height girt, double-hung windows with 2 over 2 panes, simple horizontal boards for porch railing and vertical lath for foundation screening. The multi-pane double door added a touch of elegance to this simple hip-roofed house.

Figure 10: 94-972 WAIPAHU STREET

94-972 Waipahu Street Located at the intersection of Waipahu and Makaaloha Streets, this 1925 house had the most commanding siting of the grouping, with its high foundation height and orientation to the corner. The entry stairs were under roof, supported by paneled columns. The three columns on the south corner of the house were much taller than the pairs springing from the top of the stair railing. The tiers of the stair railing were also paneled. The mulli-paned sidelights, double doors and quadruple windows on the main facade were also impressive. The hip roof was covered with asphalt shingles.

Figure 11: 94-972 WAIPAHU STREET

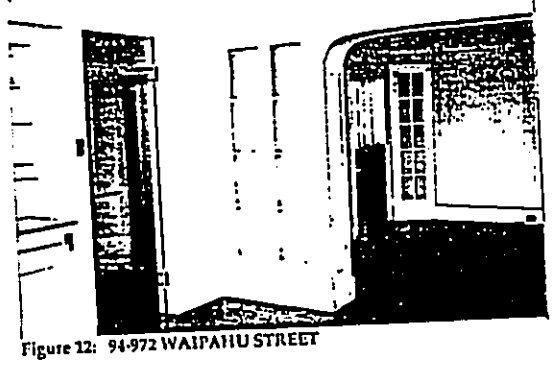


Figure 12: 94-972 WAIPAHU STREET

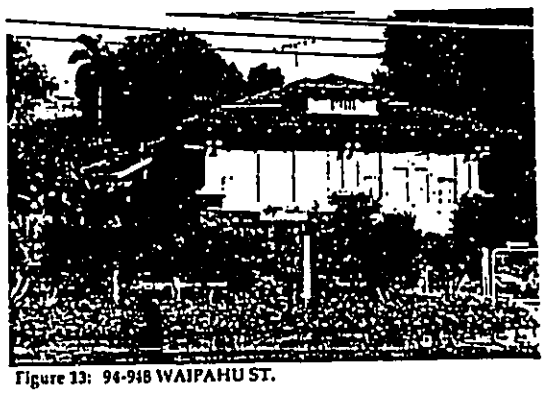


Figure 13: 94-948 WAIPAHU ST.

94-948 Waipahu Street This 1909 house was the earliest house located along Waipahu Street. It had several architectural features which distinguished it from the other houses in this cluster, including board and batten siding, hipped dormer vent, lava rock porch foundations, and squat porch columns with unusual projecting brackets.

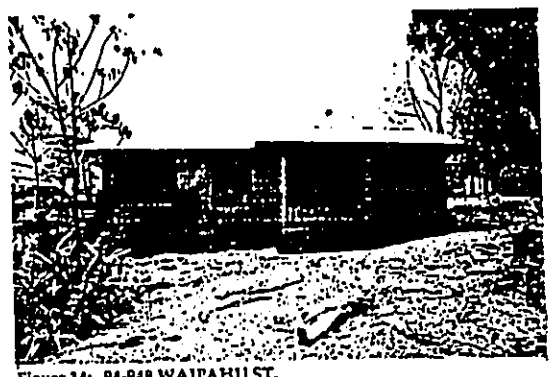


Figure 14: 94-948 WAIPAHU ST.

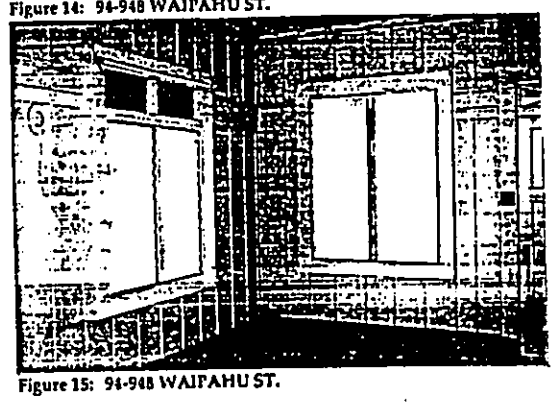


Figure 15: 94-948 WAIPAHU ST.

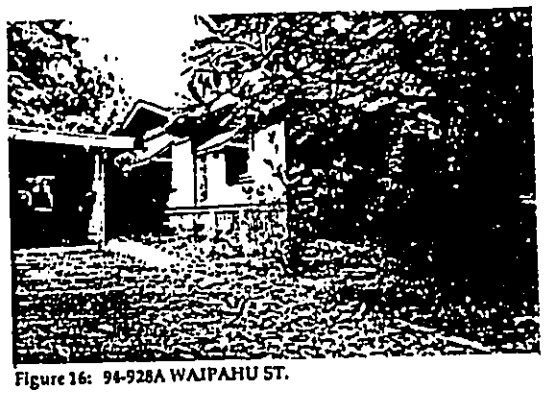


Figure 16: 94-928A WAIPAHU ST.

Figure 17: 94-928A WAIPAHU ST.

94-928A Waipahu Street On the tax records this house, as well as the one to its rear, are designated as nurses' cottages dating from 1921. This was a logical use, since the Waipahu Hospital was located almost directly across the street. Extensive vegetation obscured views of the house closest to the street, including a tree in the sidewalk in front of the house. The unusual features of the house included a front-facing gable roof with gable-topped louvered vent, and wide concrete stairs leading to a main entry, flanked by paneled pilaster forms, on a side facade.

Figure 18: 94-909 WAIPAHU ST.

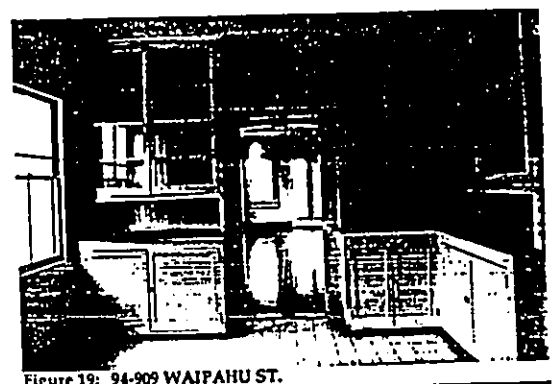


Figure 19: 94-909 WAIPAHU ST.

94-909 Waipahu Street Located at the top of Makaaloha Street on the makai side this house dates from 1921-2. A map dated 1920 (Fig. 3) shows that at that time a section of railway track ran through the site of this house. This House is interesting for its unusual single wall construction with a high girt at the level of the tops of the windows. The interior has built in glass fronted cabinets in the kitchen and on either side of the arched cased opening that links the front two rooms.

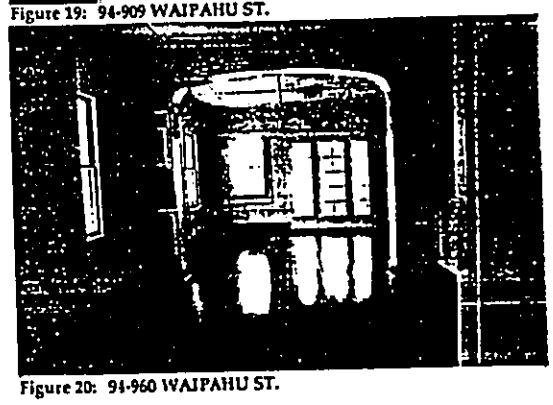


Figure 20: 94-960 WAIPAHU ST.

Figure 21: 94-923 WAIPAHU ST.

Figure 22: 94-923 WAIPAHU ST.

94-923 Waipahu Street Located on the makai side of Makaaloha Street towards the top of the hill, this house dates from 1903. The map dated 1920 (Fig. 3) shows this house as the one nearest to the O.S.Co Office building, subsequently other houses were built in-between. It also shows an extension to the Ewa side of the house which did not exist at the time of the survey. This was one of the most interesting houses of the group. It differs from all the others in the front elevation had a gable instead of a hipped roof, this gave the house the appearance of a hall.

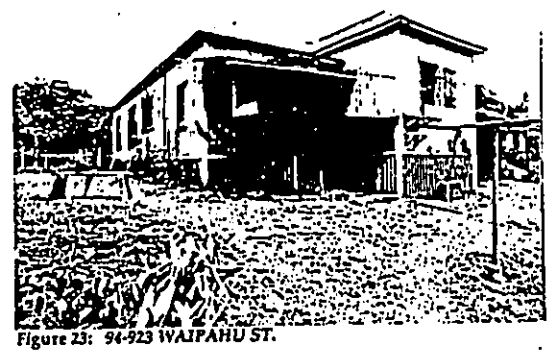


Figure 23: 94-923 WAIPAHU ST.

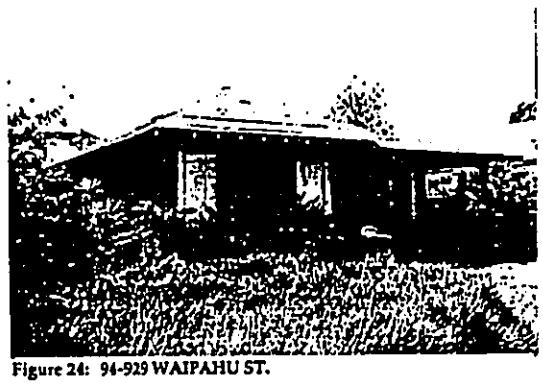


Figure 24: 94-929 WAIPAHU ST.

Figure 25: 94-929 WAIPAHU ST.

94-929 Waipahu Street This house also dates from 1903 and is indicated on the 1920 map as the Statistician's House. It had a generous lanai facing Makaaloha Street with square columns supporting the extended roof. The interior of the house also had high quality millwork.

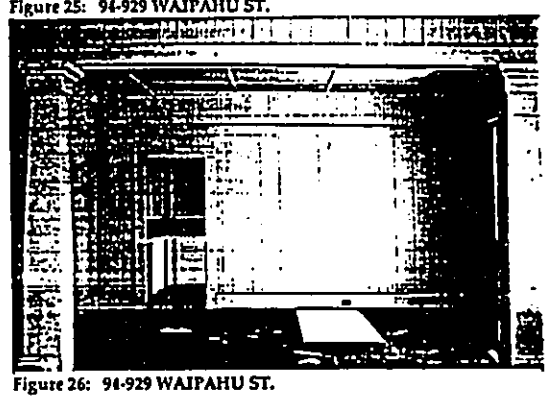


Figure 26: 94-929 WAIPAHU ST.

Appendix F

Traffic Impact Analysis Report

TRAFFIC IMPACT ANALYSIS REPORT

OAHU SUGAR COMPANY PROPERTY
WAIPAHU, HAWAII

MARCH 1996

Prepared for

AMFAC/JMB HAWAII, INC.

Prepared by

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS • SURVEYORS

TRAFFIC IMPACT ANALYSIS REPORT
FOR THE
OAHU SUGAR COMPANY PROPERTY

PREPARED FOR
AMFAC/JMB HAWAII, INC.

Prepared By
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
Engineers • Surveyors
Honolulu • Wailuku • Hilo, Hawaii

March 18, 1996

ATA AUSTIN TRUTEUAM & ASSOCIATES, INC
CIVIL ENGINEERS • SURVEYORS

TABLE OF CONTENTS

FIGURES

ATA AUSTIN TRUTEUAM & ASSOCIATES, INC
CIVIL ENGINEERS • SURVEYORS

TABLE OF CONTENTS
(CONTINUED)

FIGURES

TABLES

TABLE OF CONTENTS
(CONTINUED)

I. INTRODUCTION

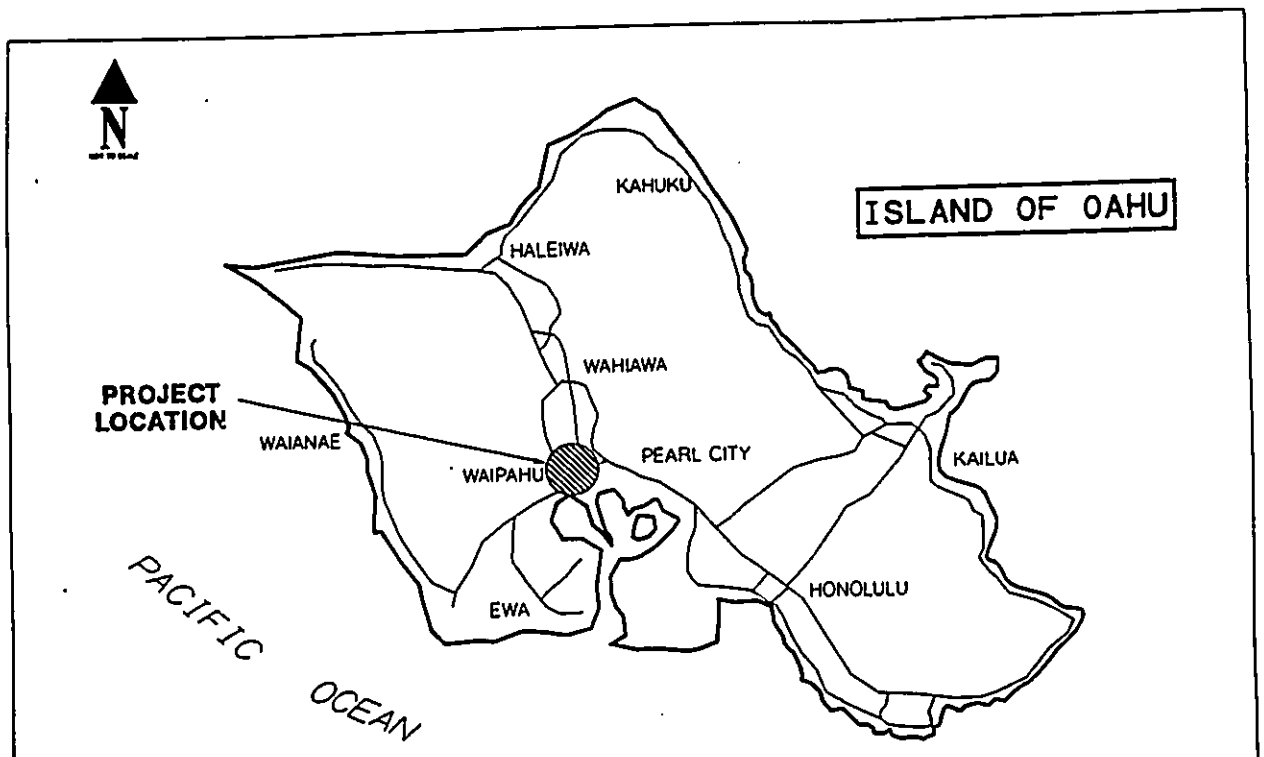
This report documents the findings of the traffic study conducted by Austin, Tsutsumi & Associates, Inc. (ATA) to evaluate the potential traffic impacts and circulation needs for the development of the Oahu Sugar Company Property in Waipahu.

PROJECT DESCRIPTION

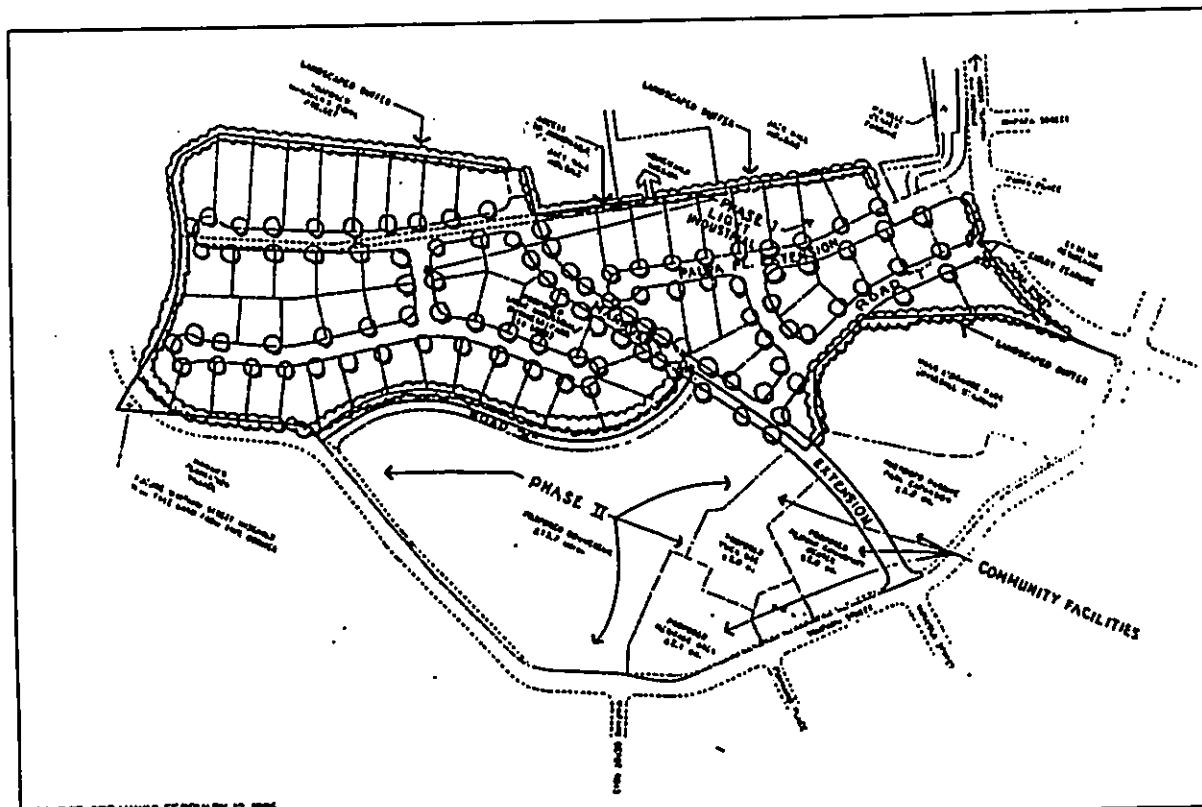
The Oahu Sugar Company (OSC) Project consists of the development of a 37-acre light industrial park with approximately 64 lots, and the development of an adjacent 20-acre commercial site. A portion of the 20-acre commercial site is proposed to include a number of community facilities including a YMCA, a Filipino community center, and a site for a Heritage Park/museum center near the existing smoke stack. The remaining portion of the site, approximately 3 acres, will be for the expansion of Hans L'Orange Park.

Figure 1 shows the general location of the project site in Waipahu, Oahu. Figure 2 shows the proposed site plan. The site is specifically identified as TMK: 9-4-02:04.

The layout of the light industrial park site and the associated roadways conform to the Waipahu Special Area Plan (SAP) as presented to the City Council in January 1996. In general, the Waipahu SAP calls for the extension of Manager's Drive from the bridge over the H-1 Freeway to Waipahu Street at Mokuola Street. In addition, new connecting roadways are proposed from Paiwa Street to Manager's Drive extension, following an alignment just mauka of Hans L'Orange Park's northern boundary and from Waipahu Street near the existing Auaili Street intersection to Manager's Drive extension.



AMFAC/JMB HAWAII, INC. OAHU SUGAR COMPANY PROPERTY	ATA AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS • SURVEYORS PROJECT LOCATION	FIGURE 1



SOURCE: PBR HAWAII, FEBRUARY 12, 1996

AMFAC/JMB HAWAII INC. OAHU SUGAR COMPANY PROPERTY	ATA AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS • SURVEYORS SITE MAP	FIGURE 2

Construction of the Project is expected to be phased. The first area to be developed is the light industrial subdivision and its associated roadways. The development of the light industrial subdivision will begin with the area between Paiwa Street and Manager's Drive extension, followed by the area west of Manager's Drive extension. As part of the Phase I development, the collector road between Manager's Drive extension and Paiwa Street (Road Y) and that portion of Manager's Drive extension within the Oahu Sugar Property to the Waipahu Street/Mokuola Street intersection will be constructed. Phase I of the Project is anticipated to be complete some time in the Year 2000. Although the timing of the "community facilities" is not certain at this time, for the purpose of this study, they are assumed to be completed along with the Phase I development by the Year 2000.

The subsequent Phase II of the Project will be the development of the commercial center along with the connecting roadway (Road X) between Waipahu Street (near Hawaii's Plantation Village) and Manager's Drive extension. The completion date of this phase of construction is not certain at this time but will more than likely be some time after the Year 2000.

STUDY METHODOLOGY

The purpose of the study is to analyze potential traffic impacts on the roadway system within the study area. Potential roadway improvements, which are required to allow the street system to accommodate the future traffic volumes after completion of the Project, are identified in this study.

It is anticipated that Phase I of the Project will be completed and fully occupied by the Year 2000. Although the commercial center is currently planned to be developed, it is not certain exactly when it will be completed and occupied. For the purpose of identifying overall traffic impacts and determining potential on-site and off-site roadway requirements, an overall but separate analysis of future conditions with Phase II of the proposed Project will also be analyzed for the Year 2000. Under this scenario, the City's 39.6-acre Manager's Drive Site development, located west of the future Manager's Drive extension and between the H-1 Freeway and the light industrial subdivision will also be included in the analysis.

Therefore, this traffic study will analyze the existing scenario and three scenarios for the Year 2000. The scenarios are as follows:

- Existing - The analysis of existing traffic conditions is intended to provide the traffic baseline conditions for the study. The existing conditions analysis includes assessment of land use, streets and highways, traffic volumes, and current operating conditions.

- Year 2000 Base (Without Project) - This is an analysis of future traffic conditions for the study area in the Year 2000 without Project generated traffic. The objective of this phase of the study is to forecast future traffic conditions for the study area in the Year 2000 without the Project, to serve as a basis against which Project impacts can be measured.

- Year 2000 With Phase I - This is an analysis of future traffic conditions with traffic expected to be generated by Phase I (industrial park) plus the community center/YMCA and the Hans L'Orange Park Expansion of the proposed Project in the Year 2000 added to Year 2000 Base traffic forecasts. This then identifies the traffic impacts of the proposed Phase I generated traffic on the Year 2000 traffic operating conditions.

- Year 2000 With Phases I and II and the City's Manager's Drive Site - This is an analysis of future traffic conditions with traffic expected to be generated by Oahu Sugar Company's Phases I and II and the City's Manager's Drive Site in the Year 2000 added to Year 2000 Base traffic forecasts. The purpose of this scenario is to identify the potential vehicular impacts due to the buildout of the subject area. Vehicular impacts identified will be used for planning potential on-site and off-site roadway improvements.

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Nine existing intersections and four future intersections have been identified within the study area to be analyzed during the AM and PM peak hours for each of the traffic scenarios described above. The thirteen intersections are:

Existing Intersections

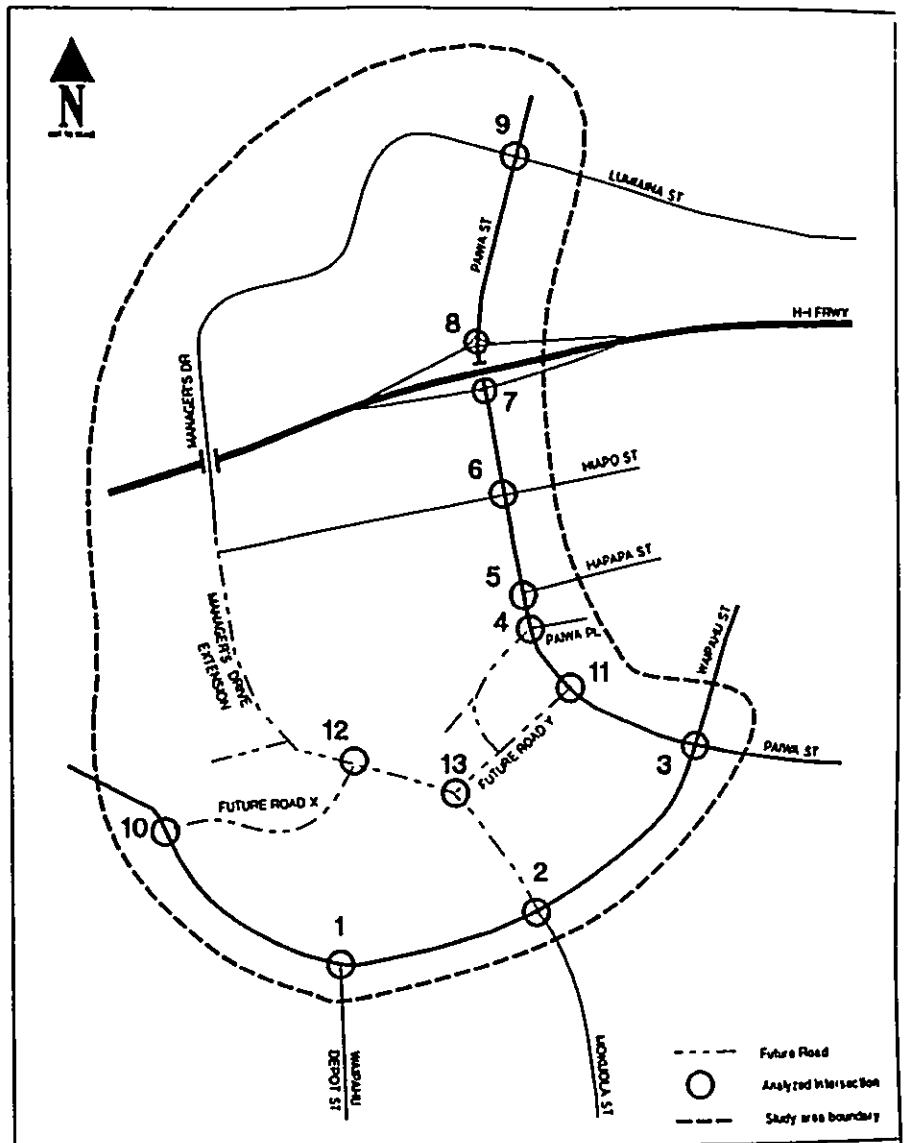
1. Waipahu Street and Waipahu Depot Street or "Depot Road" (signalized)
2. Waipahu Street and Mokuola Street (signalized)
3. Waipahu Street and Paiwa Street (signalized)
4. Paiwa Street and Paiwa Place (stop-controlled) - traffic signals are currently being installed and are expected to be in operation by April 1996
5. Paiwa Street and Hapapa Street (stop controlled) - traffic signals are currently being installed and are expected to be in operation by April 1996
6. Paiwa Street and Hiapo Street (signalized)
7. Paiwa Street and H-1 Eastbound Ramps (signalized)
8. Paiwa Street and H-1 Westbound Ramps (signalized)
9. Paiwa Street and Lumiaina Street (signalized)

Future Intersections

10. Waipahu Street and Road X
11. Paiwa Street and Road Y
12. Manager's Drive and Road X
13. Manager's Drive and Road Y

The four future intersections are associated with the proposed Project, and will, therefore, only be analyzed under "With Project" scenarios.

The study area is bounded by Lumiaina Street to the north, Paiwa Street to the east, Waipahu Street to the south and Waikele Stream to the west. Figure 3 shows the study area and the locations of the thirteen intersections mentioned above.



AMFAC/JMB HAWAII INC. OAHU SUGAR COMPANY PROPERTY	ATA AUSTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS • SURVEYORS STUDY AREA AND LOCATION OF ANALYZED INTERSECTIONS	FIGURE 3

II. EXISTING CONDITIONS

A field investigation was undertaken to develop a description of existing conditions and infrastructure within the study area. Information relevant to the study includes land use, an inventory of streets, traffic volumes, and current operating conditions on the roadway system.

EXISTING ROADWAY SYSTEM

This section describes the existing circulation system serving the study area, including number of travel lanes, street classifications, and traffic control devices. Brief descriptions of the facilities within the study area follow:

- H-1 Freeway - The H-1 Freeway is the main artery serving the primary urban area on Oahu. Within the study area, the H-1 Freeway runs east-west with four lanes (including an HOV lane) in each direction.

- Waipahu Street - Waipahu Street is a two-lane city street which runs east-west between Kunia Road and Kamehameha Highway. Waipahu Street is a major collector/distributor road through Waipahu Town serving residences, small commercial areas, parks and schools. On certain segments, Waipahu Street is a narrow street with curving alignments. Within the study area, Waipahu Street is signalized at Depot Road, Mokuola Street and Paiwa Street.

- Paiwa Street - Paiwa Street is a collector road which runs north-south between the newly developed Waikele community and Farrington Highway (south of Farrington Highway, it continues as Awanui Street). From the Waikele community (near the

Waikele Golf Club) to just south of the H-1 Eastbound Ramps, Paiwa Street is a four-lane, divided roadway fronting residential uses, a golf course and the Waikele Shopping Center. Between the H-1 Eastbound Ramps and Hiapo Street, Paiwa Street is an access restricted, four-lane, undivided collector road fronting mainly residential uses. South of Hiapo Street to Farrington Highway, Paiwa Street operates as a two-lane roadway. Within the study area, Paiwa Street is signalized at Waipahu Street, Hiapo Street, H-1 Eastbound Ramps, H-1 Westbound Ramps, and Lumiaina Street. Currently, traffic signals are being installed at Hapapa Street and at Paiwa Place. The traffic signals are expected to be in operation by April 1996.

- Waipahu Depot Street or "Depot Road" - Depot Road is a two-lane city street which runs north-south between Waipahu Street and Farrington Highway (and continues south beyond the police training facility on Waipio Peninsula). Within the study area, Depot Road serves mainly commercial uses.

- Mokuola Street - Mokuola Street is a two-lane city street which runs north-south between Waipahu Street and Farrington Highway (south of Farrington Highway, it continues as Awalau Street). Within the study area, Mokuola Street serves mainly residential uses as well as the Waipahu Civic Center and some commercial uses.

- Hapapa Street - Hapapa Street is a two-lane local street which runs east-west between Paiwa Street and Mahoe Street. Hapapa Street forms a T-intersection at Paiwa Street. Currently, traffic signals are being installed and are expected to be in operation by April of 1996. Hapapa Street serves residential uses.

- Hiapo Street - Hiapo Street is a two-lane, east-west collector street which begins west of Paiwa Street and extends east and southeast where it connects to Waipahu Street near the Waiawa Interchange. Within the study area, Hiapo Street serves mainly residential uses.

- Lumiaina Street - Lumiaina Street is an east-west collector street which runs from Kamehameha Highway through the Waikele community just north of the H-1

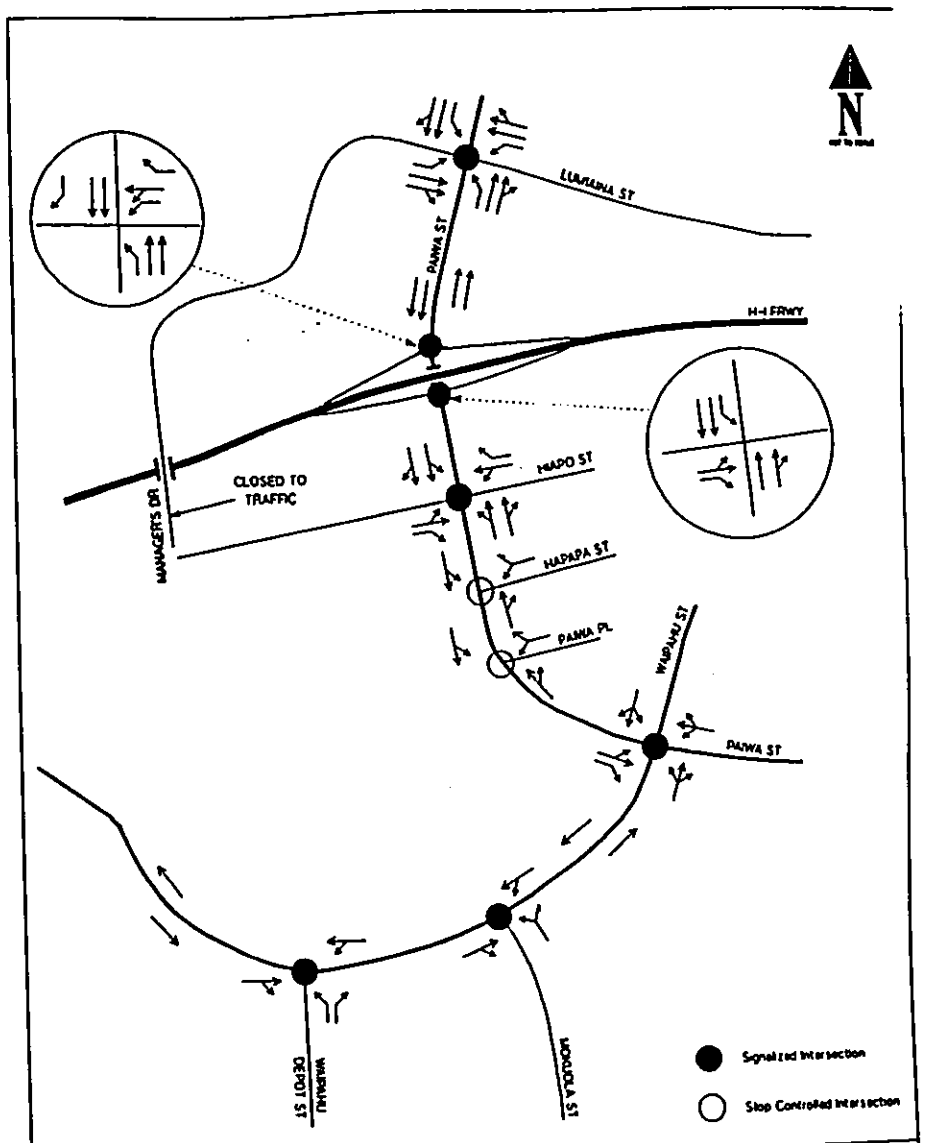
Freeway. It then continues south over and across the H-1 Freeway as Manager's Drive. Between Kamehameha Highway and just east of the Waikele Center/Factory Stores Outlet driveway, Lumiaina Street is four-lane, divided, restricted-access roadway serving both residential uses and the Waikele Shopping Center/Factory Stores Outlet. West of the Waikele Center/Factory Stores Outlet driveway, Lumiaina Street becomes a four-lane undivided roadway. West of Paiwa Street, Lumiaina Street narrows to a 60-foot right-of-way collector road serving residential areas where it connects to Manager's Drive at the H-1 Freeway overpass. At the present time, the Manager's Drive Bridge over the H-1 Freeway is closed to traffic. However, as part of the required traffic improvements for the Waikele Development, Amfac will widen the existing narrow bridge and construct Manager's Drive to Hiapo Street as a four-lane undivided road (60-foot collector road).

- Paiwa Place - Paiwa Place is an east-west local street with no outlet, serving only residential uses. Currently, construction is underway to extend Paiwa Place west of Paiwa Street as a 60-foot collector road to serve the future Waikele Center Employee Parking Lot as well as a portion of the Oahu Sugar Company light industrial subdivision. Installation of traffic signals is currently underway at this intersection and is expected to be in operation by April 1996.

Figure 4 shows the intersection configurations of the nine existing analyzed intersections.

EXISTING TRAFFIC VOLUMES

Weekday AM and PM peak period traffic counts were conducted by ATA as part of this study at eight of the nine existing intersections. Due to the fact that Paiwa Place is a dead-end street serving a fixed number of residential units, previous peak hour manual traffic counts into and out of Paiwa Place are used for this study. Previous counts taken at the Paiwa Street and Paiwa Place intersection were obtained from the May 1994, "Traffic Impact Report For The Proposed Amfac Industrial Subdivision" prepared by ATA. The results of the traffic counts are provided in Appendix A. Manual turning movement counts were conducted during the morning and evening

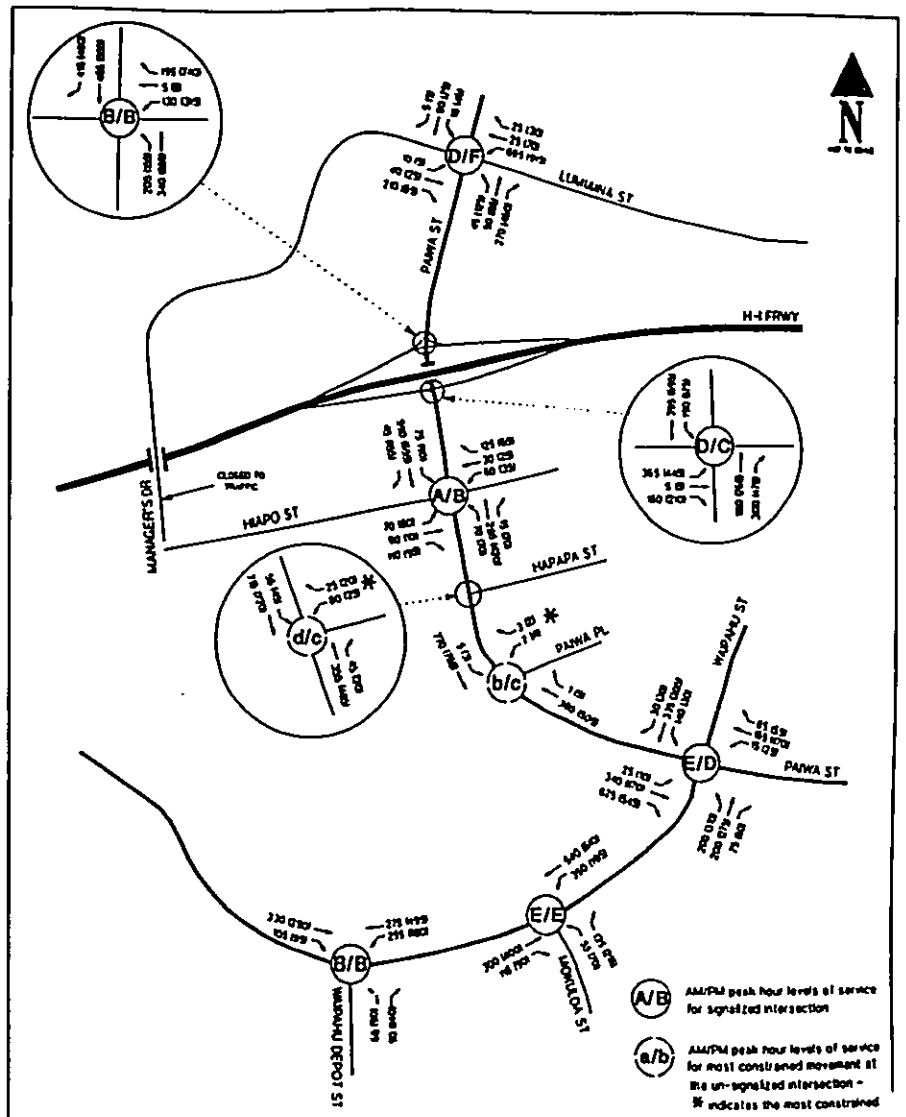


AMFAC/JMB HAWAII INC. OAHU SUGAR COMPANY PROPERTY	ATA AUSTIN TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS • SURVEYORS EXISTING INTERSECTION CONFIGURATIONS	FIGURE 4

peak periods of traffic on November 15 and 16, 1995, (Wednesday and Thursday), respectively. Twenty-four hour machine counts were conducted on the H-1 Eastbound and Westbound Ramps at Palwa Interchange and also on Palwa Street south of Hiapo Street to provide an indication of typical daily traffic volumes. The twenty-four hour machine count data at the Palwa Interchange Ramps were used to derive turning movement counts at the two H-1 Freeway Ramp intersections (intersections 7 and 8) at Palwa Street. Figure 5 summarizes the peak hour traffic counts at the nine existing analyzed intersections.

Based on the AM peak period traffic count data and visual observations during the morning peak period, traffic within the study area appears to flow well without any major congestion. At the intersection of Palwa Street and Waipahu Street, traffic is relatively heavy compared to the other intersections, although most vehicles clear the intersection within one cycle. It was also observed that, at the intersection of Palwa Street and Lumiaina Street, there is a heavy westbound left-turn demand from Lumiaina Street to southbound Palwa Street (695 vehicles during the AM peak hour). The majority of these vehicles were observed to be destined for the westbound H-1 Freeway.

Based on the PM peak period traffic count data and visual observations during the afternoon peak period, traffic within the study area generally flows well, with the exception of the intersection of Palwa Street and Lumiaina Street. The traffic count data shows that, during the PM peak hour, 915 vehicles were observed turning left from westbound Lumiaina Street to southbound Palwa Street. The westbound left-turn queue was observed to extend to the main entrance to the Waikele Shopping Center/Factory Outlet Stores. Traffic on Waipahu Street at the intersection of Waipahu Street and Palwa Street experiences more delay relative to the other intersections.



AMFAC/JMB HAWAII INC.	ATA AUSTIN TSUTSUMI & ASSOCIATES, INC. ENGINEERS • SURVEYORS	FIGURE
OAHU SUGAR COMPANY PROPERTY	YEAR 1995 EXISTING CONDITIONS	5

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EXISTING LEVEL OF SERVICE ANALYSIS

Level of service (LOS) is a qualitative measure used to describe the condition of traffic flow, ranging from free-flow conditions at LOS A to congested conditions at LOS F. The 1994 Highway Capacity Manual - Special Report 209 methods for calculating volume to capacity ratios, delays and corresponding levels of service were utilized in this study. Level of service definitions for signalized and unsignalized intersections are provided in Tables 1 and 2, respectively. Figure 5 also shows the levels of service at the nine existing intersections. Level of service calculations are provided in Appendix B.

A summary of the existing Year 1995 level of service results is shown in Table 3. During the AM peak hour, results show that two of the existing nine intersections are operating at unacceptable levels of service (LOS E or F). The two intersections are:

- Waipahu Street and Paiwa Street - Although the delay and corresponding level of service indicate that the intersection is operating at LOS D, the volume to capacity ratio (V/C) indicates that the demand is nearing the intersection's capacity (V/C = 0.97). This means that the calculated average delay of 31.7 seconds per vehicle is probably less than what is actually occurring. Field observations during the traffic counts verify that the operating level of the intersection during the AM peak period is more in the LOS E range rather than LOS D as calculated.

- Waipahu Street and Mokuola Street - The V/C indicates that the intersection's demand is nearing capacity (V/C = 0.96). The calculated average delay (32.4 seconds) and corresponding level of service (LOS D) may be better than what is actually occurring. Based on field observation, the intersection is operating on the borderline between LOS D and LOS E. Cause of the high V/C is primarily due to Waipahu Street being a narrow, two-lane roadway where the through traffic on Waipahu Street can be significantly delayed due to high turning volumes.

The results also show that during the PM peak hour, two of the nine analyzed intersections are operating at unacceptable levels of service (LOS E or F). The two intersections are:

TABLE 1
LEVEL OF SERVICE DEFINITIONS FOR SIGNALIZED INTERSECTION

LEVEL OF SERVICE	DELAY (SECONDS/VEHICLE)	DESCRIPTION
A	0.0 - 5.0	Little or no delay
B	5.1 - 15.0	Short traffic delay
C	15.1 - 25.0	Moderate traffic delay
D	25.1 - 40.0	Long traffic delay
E	40.1 - 60.0	Very long traffic delay
F	> 60.0	Failure - extreme congestion

SOURCE: "Highway Capacity Manual", Transportation Research Board, 1994.

TABLE 2
LEVEL OF SERVICE DEFINITIONS FOR UNSIGNALIZED INTERSECTION

LEVEL OF SERVICE	DELAY (SECONDS/VEHICLE)	DESCRIPTION
A	0.0 - 5.0	Little or no delay
B	5.1 - 10.0	Short traffic delay
C	10.1 - 20.0	Moderate traffic delay
D	20.1 - 30.0	Long traffic delay
E	30.1 - 45.0	Very long traffic delay
F	> 45.0	Failure - extreme congestion

SOURCE: "Highway Capacity Manual", Transportation Research Board, 1994.

TABLE 3
EXISTING 1995 INTERSECTION LEVEL OF SERVICE SUMMARY

INTERSECTIONS	AM PEAK HOUR			PM PEAK HOUR		
	V/C	DELAY	LOS	V/C	DELAY	LOS
1. WAIPAHU ST & DEPOT RD	0.63	8.1	B	0.68	11.5	B
2. WAIPAHU ST & MOKUOLA ST	0.96	31.7	E [b]	0.95	33.5	E [b]
3. WAIPAHU ST & PAIWA ST	0.97	32.4	E [b]	0.84	29.9	D
4. PAIWA ST & PAIWA PL [a]						
- SB LEFT-TURN	-	3.1	A	-	3.7	A
- WB APPROACH	-	10.0	B	-	12.2	C
5. PAIWA ST & HAPAPA ST [a]						
SB LEFT-TURN	-	3.4	A	-	3.8	A
WB APPROACH	-	25.2	D	-	17.0	C
6. PAIWA ST & HIAPO ST	0.30	4.2	A	0.49	11.9	B
7. PAIWA ST & H-1 EB RAMPS	0.52	25.7	D	0.68	24.0	C
8. PAIWA ST & H-1 WB RAMPS	0.26	9.7	B	0.36	9.4	B
9. PAIWA ST & LUMIAINA ST	0.61	38.0	D	0.94	62.1	F

[a] Stop-controlled intersection.
[b] Level of service based on V/C.

- Waipahu Street and Mokuola Street - The V/C indicates that the intersection's demand is nearing capacity (V/C = 0.95). The calculated average delay of 33.5 seconds and corresponding LOS D is probably better than what is actually occurring. Field observations during the traffic counts verify that the operating level of the intersection during the PM peak period is more in the LOS E range rather than LOS D.

- Paiwa Street and Lumiaina Street - The level of service results indicate that the intersection is operating at LOS F during the PM peak hour. The poor operating level of service is mainly due to the extremely heavy westbound demand from Lumiaina Street to Paiwa Street (915 left-turning vehicles during the PM peak hour).

III. FUTURE BASE PROJECTIONS AND ANALYSIS

In order to properly evaluate the potential impact of the Project on local traffic conditions, it is first necessary to develop forecasts of future traffic volumes in the study area under conditions without the proposed Project generated traffic. The forecasts for Year 2000 Base traffic without the proposed Project are based on yearly growth of existing traffic volumes and other known developments expected to be completed by the Year 2000 which could contribute traffic to the roadways within the study area. The following describes the methodology used in forecasting and the results of the Year 2000 Base traffic conditions.

BACKGROUND TRAFFIC GROWTH

The background growth rate, which was applied to existing traffic volumes to estimate Year 2000 Base conditions, is based on historical counts in the vicinity of the proposed Project site. Based on historical traffic counts, a 2.5% per year growth rate, or a factor of 1.125, was applied to the existing traffic counts to estimate Year 2000 Base traffic volumes.

OTHER DEVELOPMENT GENERATED TRAFFIC

Future developments (other than the Project) within the vicinity of the study area which could directly contribute traffic to the analyzed intersections are included in this study. The following summarizes the other developments assumed to be completed by the Year 2000:

- Waikele residential subdivision - currently there are approximately 375 single-family units and 552 multi-family units yet to be built and/or occupied. For the purpose of the traffic analysis, these units are expected to be occupied by the Year 2000.

- Waikele Center employee parking lot - the parking lot is located at the northwest quadrant of the Paiwa Street and Paiwa Place intersection. The parking lot is expected to provide 400 parking stalls. Access to and from the parking lot will be via the extension of Paiwa Place west of Paiwa Street.

- Church/Preschool - approximately 1,750 square-foot church/preschool, which will be located on the south-east corner of Waipahu Street and Mokuola Street, is expected to be constructed and occupied by the Year 2000.

- Waikele Elementary School - a 750-student elementary school located near Waikele residential area #15 is expected to be constructed and occupied by the Year 2000.

Figure 6 shows the locations of the other known developments in the vicinity of the Project. Table 4 summarizes the trip generation rates and the estimated trip generation from the known developments. The assignment of related project trips to specific streets and intersections was based on the available access into and out of the site and the availability of local routes to access the regional highway system. The trip assignment of the Waikele residential units is based on general commuter patterns with the majority accessing the eastbound H-1 Freeway. The church/preschool traffic assignment is based on the local residential distribution near the vicinity of the study area.

Roadway improvements which will be completed within the study area are traffic signals at the intersections of Paiwa Street/Hapapa Street and Paiwa Street/Paiwa Place which will be in operation by April 1996. Paiwa Street will be restriped to provide four lanes between Hiapo Street and Waipahu Street when the traffic signals are placed in operation.

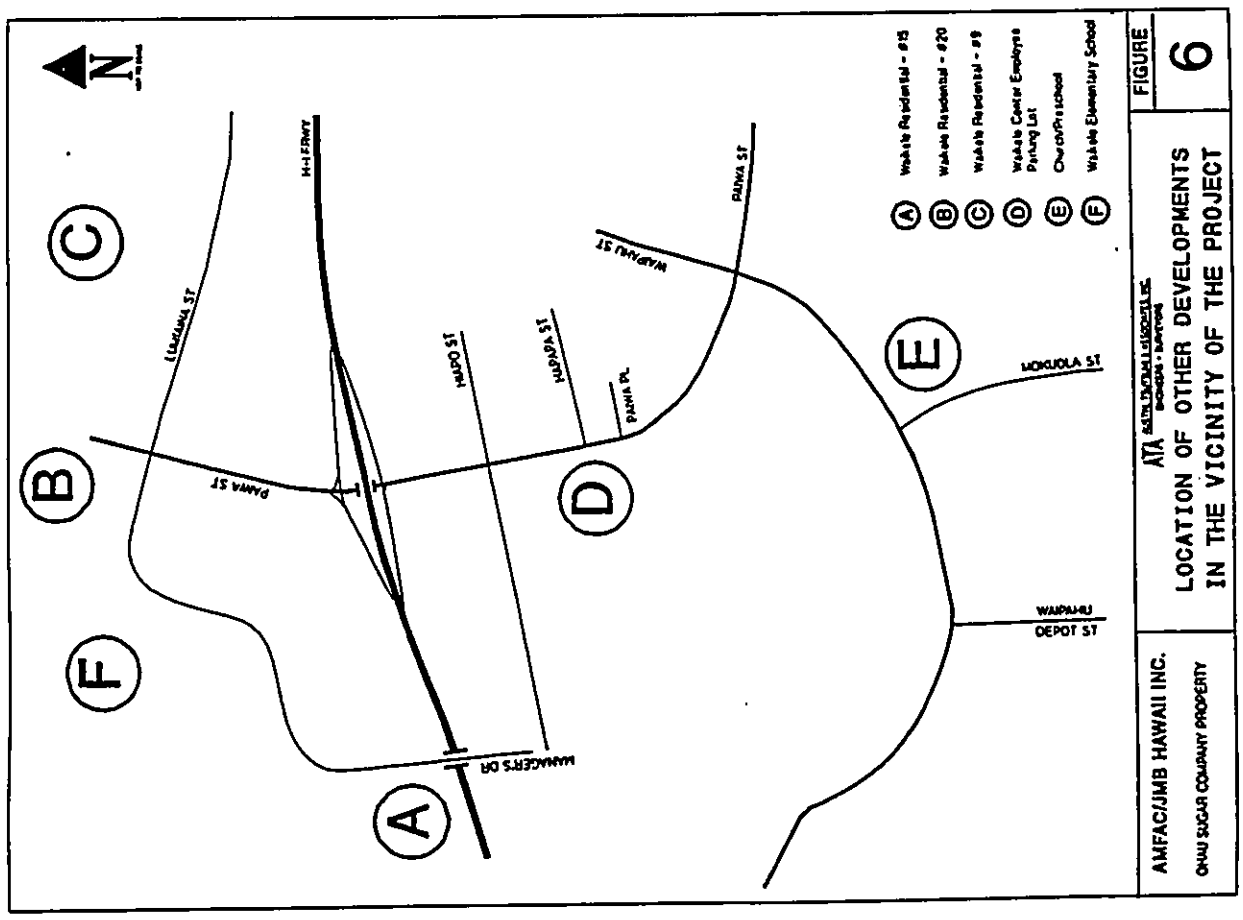
FUTURE BASE TRAFFIC VOLUMES AND LEVEL OF SERVICE ANALYSIS

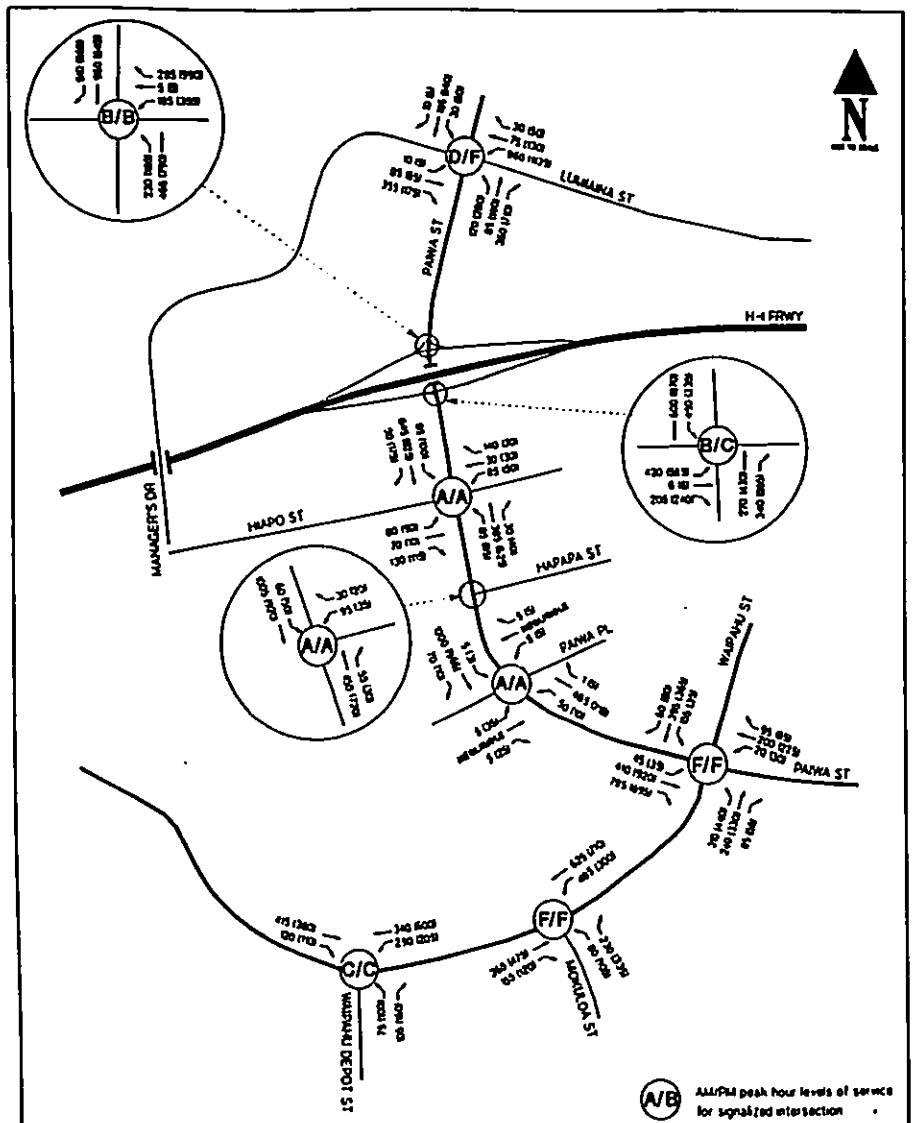
Based on the forecast parameters described above, Year 2000 Base (without project) traffic volumes are estimated. Figure 7 shows the projected Year 2000 Base traffic volumes at the nine

TABLE 4
RELATED PROJECT TRIP GENERATION RATES AND TRIP GENERATION

LAND USE	UNITS	DAILY	AM PEAK HOUR			PM PEAK HOUR		
			IN	OUT	TOTAL	IN	OUT	TOTAL
TRIP GENERATION RATES								
SINGLE FAMILY RESIDENTIAL	dwelling units	9.55	26%	74%	0.74	65%	35%	1.01
MULTI FAMILY RESIDENTIAL	dwelling units	5.86	17%	83%	0.44	66%	34%	0.55
DAY CARE CENTER	1,000 sf	79.26	54%	46%	15.17	46%	54%	15.58
ELEMENTARY SCHOOL	students	1.09	60%	40%	0.30	56%	44%	0.25
TRIP GENERATION								
WAIKELE RESIDENTIAL AREA								
SF RESIDENTIAL - PARCEL 9	180 DU	1,719	35	99	133	118	64	182
MF RESIDENTIAL - PARCEL 9	282 DU	1,653	21	103	124	102	53	155
MF RESIDENTIAL - PARCEL 15	270 DU	1,582	20	99	119	98	50	149
SF RESIDENTIAL - PARCEL 20	195 DU	1,862	38	107	144	128	69	197
CHURCH/PRESCHOOL (CORNER OF WAIPAHU ST/MOKUOLA ST)	27.6 KSF	1,395	144	123	267	126	148	274
WAIKELE CENTER EMPLOYEE PARKING LOT [a]	400 stalls	800	120	0	120	20	60	80
WAIKELE ELEMENTARY SCHOOL	750 std	818	135	90	225	105	82	188

[a] From June 1994 "Traffic Impact Report For The Amfac Industrial Subdivision", prepared by ATA.





AMFAC/JMB HAWAII INC. OAHU SUGAR COMPANY PROPERTY	ATA AUSTIN TSUTSUMI & ASSOCIATES, INC. ENGINEERS • SURVEYORS YEAR 2000 BASE (WITHOUT PROJECT) CONDITIONS	FIGURE 7

analyzed intersections. Figure 7 also shows the resulting levels of service at the nine analyzed intersections.

Based on the Year 2000 base traffic forecast and analysis, it is projected that three of the nine analyzed intersections will be operating at undesirable levels of service (LOS E or LOS F) during either the AM or PM peak hour, or both. The three intersections are:

- Waipahu Street and Mokuola Street - both AM and PM peak hours
- Waipahu Street and Paiwa Street - both AM and PM peak hours
- Paiwa Street and Lumiaina Street - PM peak hour only

The three intersections that are operating at undesirable levels of service under future base conditions (without Project) are the same three intersections that are currently operating at undesirable levels of service. Table 5 summarizes the V/C, delay and level of service results of the Year 2000 Base conditions.

RECOMMENDED BASE IMPROVEMENTS

The following are recommended Year 2000 "base improvements" to mitigate the poor operating conditions at the three intersections previously identified:

Waipahu Street and Mokuola Street

- Provide the westbound approach with an exclusive left-turn lane and one through lane.
- Provide the northbound approach with one exclusive left-turn lane and one exclusive right-turn lane.

With the recommended improvements, the intersection will operate at LOS B during both the AM and PM peak hours.

TABLE 5
YEAR 2000 BASE – WITHOUT PROJECT
INTERSECTION LEVEL OF SERVICE SUMMARY

INTERSECTION	EXISTING YEAR 1998						YEAR 2000 BASE					
	AM PEAK HOUR			PM PEAK HOUR			AM PEAK HOUR			PM PEAK HOUR		
	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS
1. WAIPAHU ST & DEPOT RD	0.63	8.1	B	0.66	11.5	B	0.80	34.0	C	0.77	26.7	C
2. WAIPAHU ST & MOKUOLA ST	0.66	31.7	E [a]	0.66	33.5	E [a]	1.16	33.6	F [a]	1.22	41.8	F [a]
3. WAIPAHU ST & PAIWA ST	0.57	22.4	E [a]	0.64	24.0	D	1.03	72.2	F	1.34	38.1	F [a]
4. PAIWA ST & PAIWA PL [b] - SB LEFT-TURN - WB APPROACH	- -	3.1 10.0	A B	- -	3.7 12.2	A C	0.42	2.7	A	0.30	3.1	A
5. PAIWA ST & HAPAPA ST [b] - SB LEFT-TURN - WB APPROACH	- -	3.4 25.2	A D	- -	3.9 17.0	A C	0.46	4.0	A	0.46	3.0	A
6. PAIWA ST & HAPO ST	0.38	4.2	A	0.49	11.0	B	0.43	4.9	A	0.53	3.9	A
7. PAIWA ST & H-1 EB RAMPS	0.52	23.7	D	0.66	24.0	C	0.86	14.5	B [a]	0.76	26.8	C [a]
8. PAIWA ST & H-1 WB RAMPS	0.36	9.7	B	0.36	9.4	B	0.48	7.0	B	0.47	7.5	B
9. PAIWA ST & LUMIAINA ST	0.81	36.0	D	0.94	62.1	F	0.97	31.6	D	1.11	46.8	F [a]

[a] LOS E or F based on volume to capacity ratio.
[b] Existing stop-controlled intersection analyzed as signalized intersection under future base conditions.
[c] Level of service improved from existing due to signal optimization.

Waipahu Street and Paiwa Street

- Provide the southbound approach with an exclusive left-turn lane, one through lane and one exclusive right-turn lane.
- Provide the northbound, eastbound and westbound approaches with one exclusive left-turn lane and one shared through and right-turn lane

With the recommended intersection improvements, the intersection will operate at LOS B during both the AM and PM peak hours.

Paiwa Street and Lumiaina Street

- Provide the northbound approach with one exclusive left-turn lane, two through lanes and one exclusive right-turn lane.
- Restripe to provide the westbound approach with one exclusive left-turn lane, one shared through and left-turn lane and one shared through and right-turn lane.

With the recommended intersection improvements, the intersection will operate at LOS B and D during the AM and PM peak hours, respectively. Table 6 summarizes the level of service results.

TABLE 6
YEAR 2000 BASE WITH BASE IMPROVEMENTS
INTERSECTION LEVEL OF SERVICE SUMMARY

INTERSECTION	EXISTING YEAR 1996				YEAR 2000 BASE				YEAR 2000 BASE WITH BASE IMPROVEMENTS			
	AM PEAK HOUR			PM PEAK HOUR					AM PEAK HOUR			PM PEAK HOUR	
	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS	
1. WAIPAHU ST & DEPOT RD	0.63	8.1	B	0.86	11.5	B	0.68	24.8	C	0.77	20.7	C	
2. WAIPAHU ST & MOKUOLA ST	0.96	31.7	E [4]	0.96	53.5	E [4]	1.10	53.6	F [4]	1.22	41.8	F [4]	
3. WAIPAHU ST & PANAA ST	0.87	22.4	E [4]	0.84	26.9	D	1.03	72.2	F	1.04	36.1	F [4]	
4. PANAA ST & PANAA PL [3] - EB LEFT-TURN - WB APPROACH	- -	3.1 16.9	A B	- -	3.7 12.2	A C	0.42	2.7	A	0.39	3.1	A	
5. PANAA ST & HAPAPA ST [3] - EB LEFT-TURN - WB APPROACH	- -	3.4 25.2	A D	- -	3.5 17.9	A C	0.46	4.6	A	0.48	2.6	A	
6. PANAA ST & HAPO ST	0.39	4.2	A	0.49	11.9	B	0.43	4.8	A	0.55	3.6	A	
7. PANAA ST & H-1 EB RAMPS	0.52	25.7	D	0.68	24.9	C	0.86	14.6	B [4]	0.79	20.6	C [4]	
8. PANAA ST & H-1 WB RAMPS	0.38	9.7	B	0.39	9.4	B	0.46	7.9	B	0.47	7.9	B	
9. PANAA ST & LUMAHAI ST	0.81	34.9	D	0.94	62.1	F	0.67	31.4	D	1.41	44.9	F [4]	
10. PANAA ST & KAMEHA ST							0.63	13.7	B	0.88	26.2	D	

[4] LOS E or F based on volume to capacity ratio.
[3] Existing stop-controlled intersection analyzed as signalized intersection under Year 2000 base conditions.
[4] Level of service improved from existing flow to signal optimization.

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IV. PROJECT GENERATED TRAFFIC VOLUMES

The development of traffic projections for the proposed Project involves traffic generation, trip distribution, and traffic assignment. A description of each process follows:

PROJECT GENERATED TRAFFIC

Trip generation estimates for the proposed project are developed by applying appropriate trip generation rates to the land use densities of the proposed Project. The trip generation rates are summarized in Table 7. These trip generation rates are based upon data from "Trip Generation" 5th Edition, Institute of Transportation Engineers (ITE), 1991. The projected vehicular trips expected to be generated by the project are also summarized in Table 7.

Phase I of the Project (industrial park) plus the community facilities and the Hans L'Orange Park expansion, are estimated to generate approximately 2,751 daily vehicular trips; 339 AM peak hour trips (with 264 trips entering and 75 trips exiting the Project site) and 377 PM peak hour trips (with 63 trips entering and 314 trips exiting the Project site).

Phase II of the Project (the commercial center) is estimated to generate approximately 7,338 daily vehicle trips; 168 AM peak hour trips (with 106 trips entering and 62 trips exiting the Project site) and 682 PM peak hour trips (with 341 trips entering and 341 trips exiting the Project site).

The total Project (Phases I and II) is estimated to generate approximately 10,089 daily vehicle trips; 507 AM peak hour trips (with 370 trips entering and 137 trips exiting the Project site) and 1,060 PM peak hour trips (with 404 trips entering and 655 trips exiting the Project site).

PROJECT TRAFFIC DISTRIBUTION

The directional distribution pattern developed for the proposed industrial park is based on the general residential distribution of the island with emphasis on the Central and Ewa region. This distribution pattern reflects the likely work commute pattern to and from the industrial park during the AM and PM peak hours. The distribution pattern is shown on Figure 8. The distribution pattern used for the distribution of commercial trips is shown on Figure 9. The distribution pattern for commercial trips is based primarily on residents in the Waikele community (about 50%) and the East Waipahu area (about 31%).

PROJECT TRAFFIC ASSIGNMENT

The trip distribution patterns identified in the previous section were used to assign the Project generated traffic to the street network. The assignment to specific streets and intersections was based on the available access into and out of the site and the availability of local routes to access the regional highway system. The resulting estimated Project generated peak hour traffic volumes, at each of the thirteen analyzed intersections for Phase I, are shown on Figure 10. Phases I and II generated traffic volumes are shown in Figure 11.

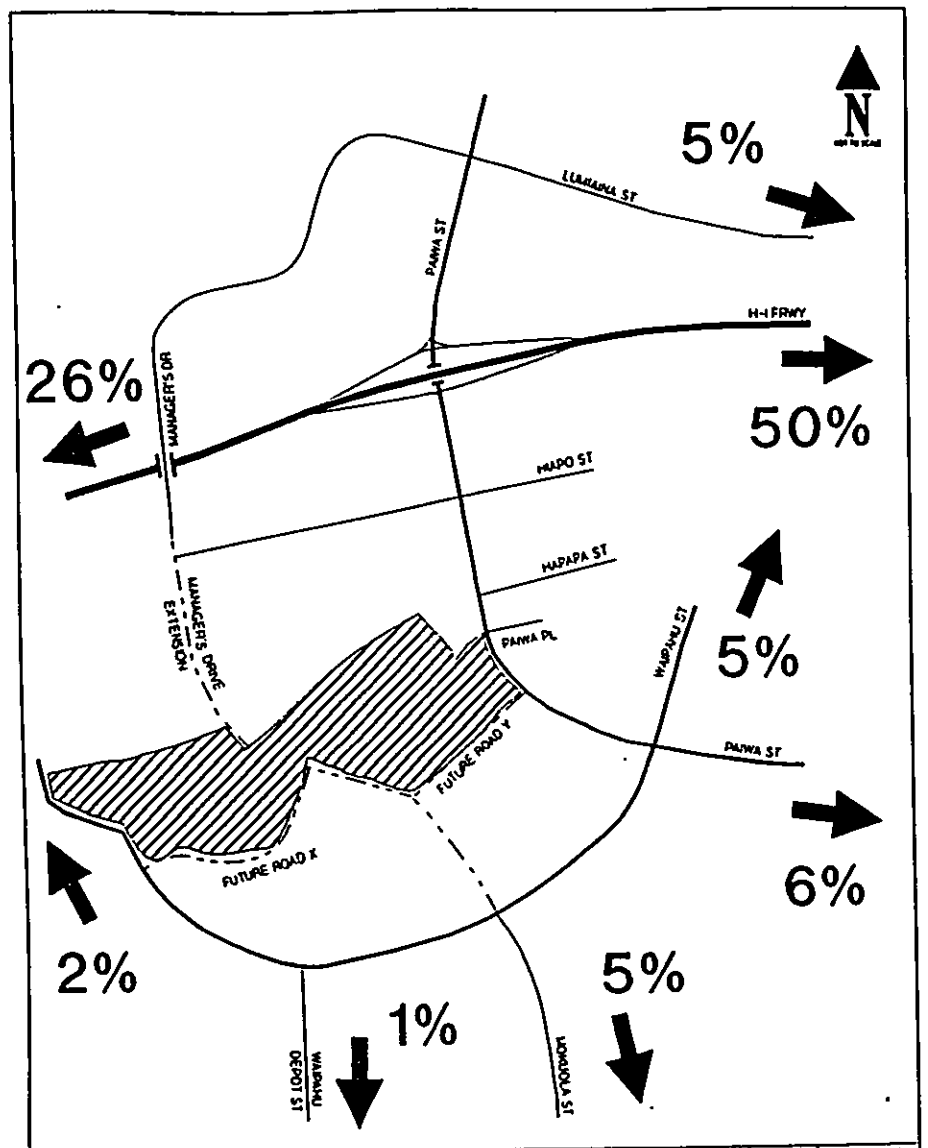
PROJECT TRIP GENERATION RATES AND TRIP GENERATION

TABLE 7

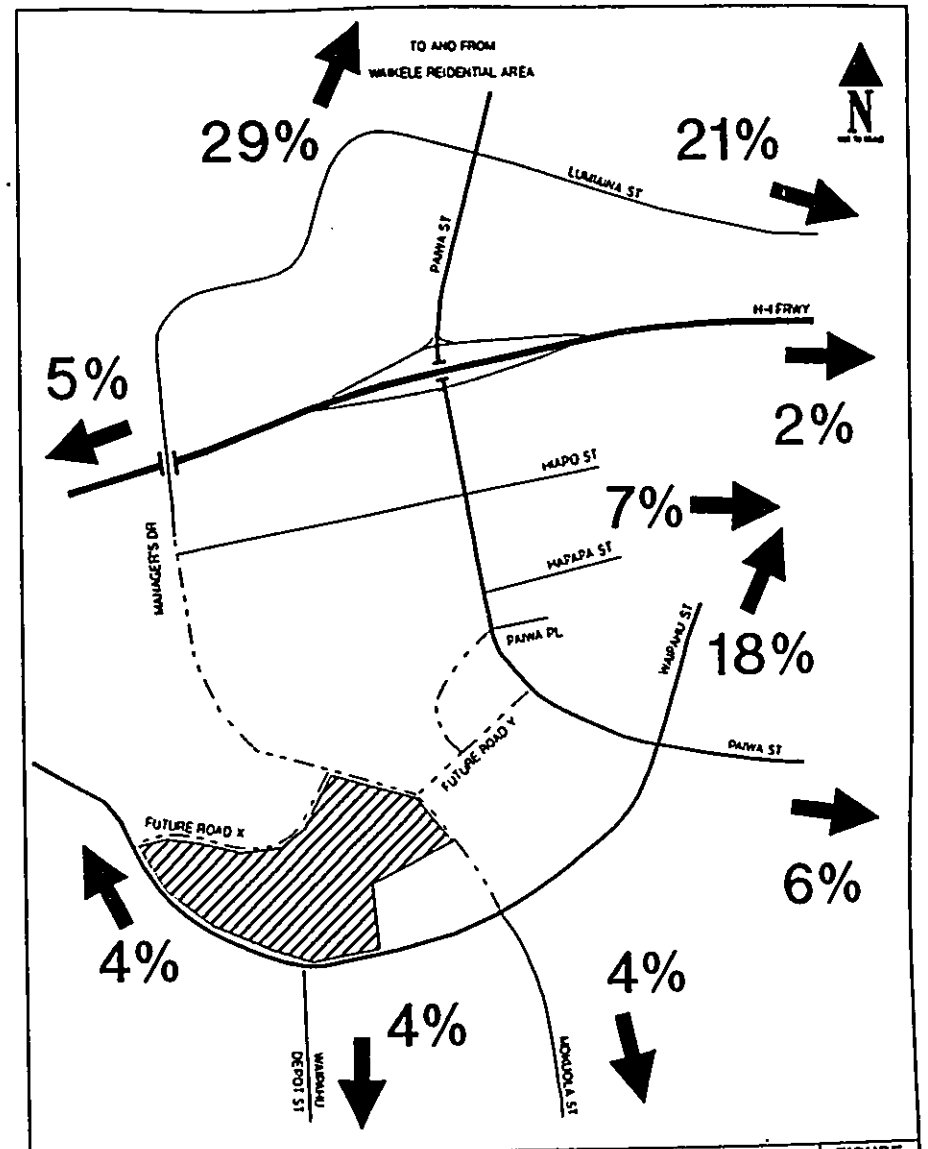
LAND USE	UNITS	DAILY	AM PEAK HOUR			PM PEAK HOUR		
			IN	OUT	TOTAL	IN	OUT	TOTAL
TRIP GENERATION RATES								
LIGHT INDUSTRIAL	1,000 sf	6.97	83%	17%	0.82	12%	88%	0.98
SHOPPING CENTER								
< 600 KSF	1,000 sf	[a]	63%	37%	[b]	-	-	-
> 600 KSF		-	-	-	-	50%	50%	[c]
COMMUNITY CENTER		-	-	-	-	50%	50%	[d]
CITY PARK	1,000 sf	10.40	62%	38%	1.08	28%	72%	1.38
	ACRES	30.00	72%	28%	2.87	35%	65%	3.14
TRIP GENERATION								
PHASE I								
LIGHT INDUSTRIAL - 1	178.3 KSF	1,243	135	29	164	21	154	175
LIGHT INDUSTRIAL - 2	86.7 KSF	604	66	14	80	10	75	85
LIGHT INDUSTRIAL - 3	6.5 KSF	45	5	1	6	1	6	6
LIGHT INDUSTRIAL - 4	2.5 KSF	17	2	0	2	0	2	2
COMMUNITY CENTER	71.7 KSF	746	48	29	77	28	71	99
PARK	3.2 AC	96	7	3	9	4	7	10
TOTAL PHASE I		2,751	264	73	339	63	314	378
PHASE II								
COMMERCIAL CENTER	106.2 KSF	7,338	106	62	168	341	341	682
TOTAL PHASE I AND II	-	10,089	370	137	507	404	655	1,060

Where:
Ln = Natural Logarithm
T = Time-way volume of traffic at land trip ends
X = area in 1,000 gross square feet of leasable area

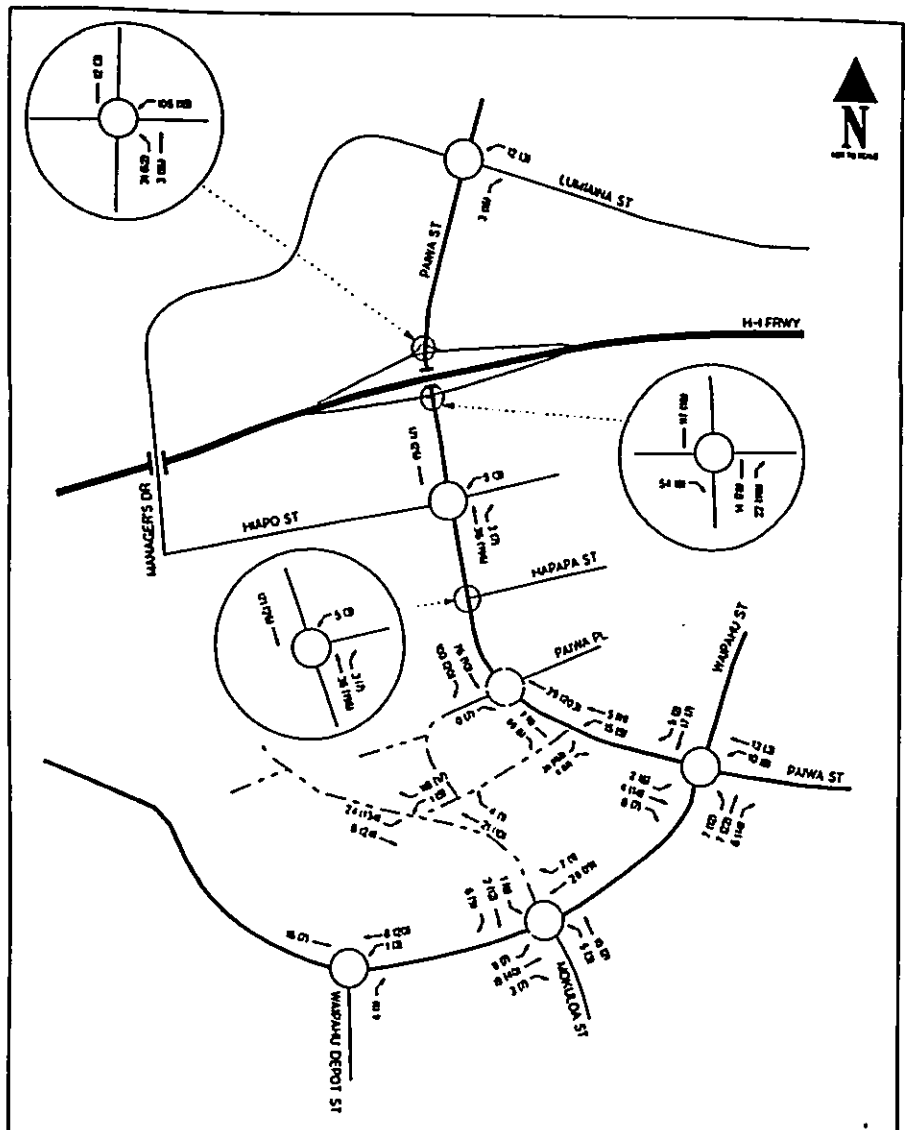
[a] Daily: Ln(T)=0.685Ln(X)+5.85
[b] AM: Ln(T)=0.569Ln(X)+2.378
[c] PM: Ln(T)=0.657Ln(X)+3.553
[d] Daily: Ln(T)=0.725Ln(X)+2.9075



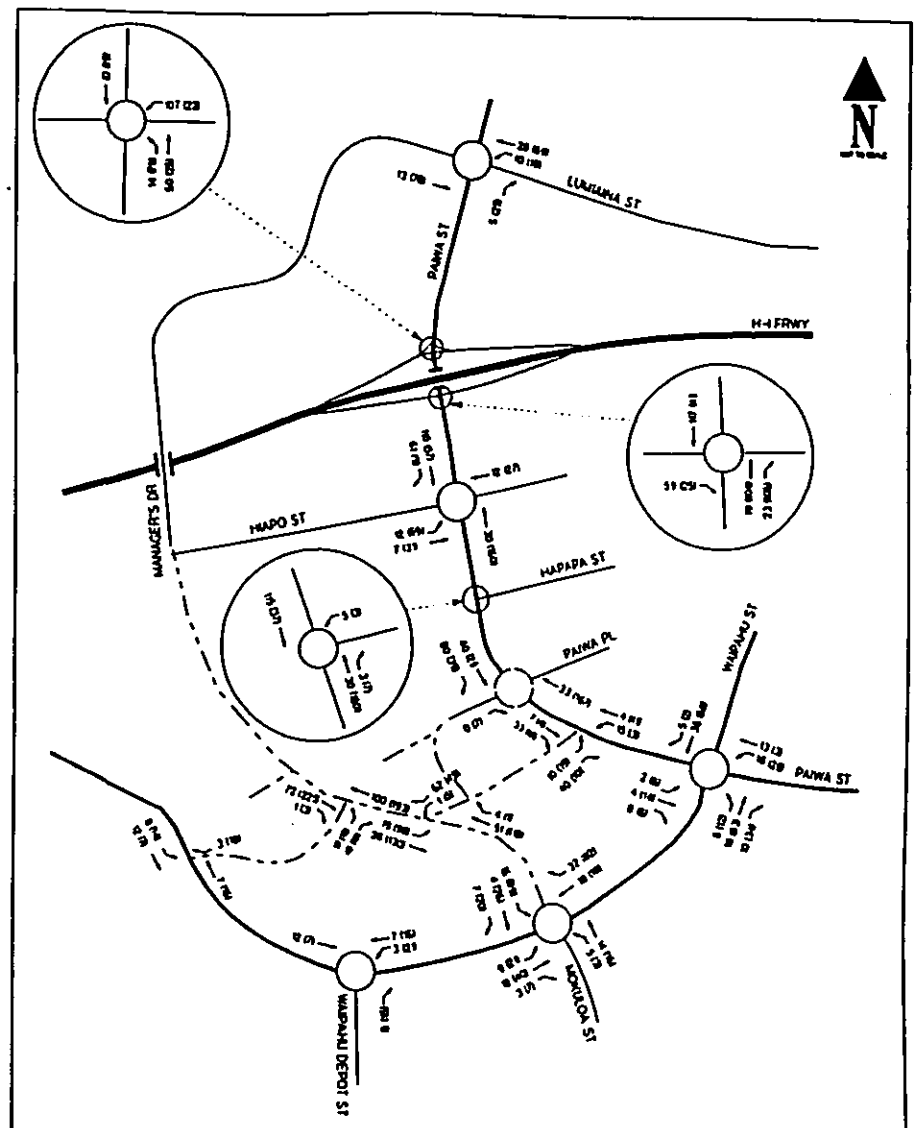
AMFAC/JMB HAWAII INC. OAHU SUGAR COMPANY PROPERTY	ATA GENERAL DISTRIBUTION PATTERN FOR INDUSTRIAL USE	FIGURE 8



AMFAC/JMB HAWAII INC. OAHU SUGAR COMPANY PROPERTY	ATA GENERAL DISTRIBUTION PATTERN FOR COMMERCIAL USE	FIGURE 9



AMFAC/JMB HAWAII INC.	ATA	FIGURE
OAHU SUGAR COMPANY PROPERTY	PHASE I ONLY TRAFFIC VOLUMES	10



AMFAC/JMB HAWAII INC.	ATA	FIGURE
OAHU SUGAR COMPANY PROPERTY	PHASES I AND II ONLY TRAFFIC VOLUMES	11

V. FUTURE WITH PROJECT ANALYSES

This section describes future operating conditions with the addition of project generated traffic to the future base traffic conditions.

PROJECT RELATED ROADWAY IMPROVEMENTS

Under future with Project conditions, roadway improvements associated with the proposed project are included in the analysis. The following summarizes the roadway improvements that are anticipated to be implemented in conjunction with the proposed Project:

- Manager's Drive Extension - from the Project's makai boundary at Waipahu Street, Mokuola Street will be extended mauka to the mauka Project boundary in alignment with the future extension of Manager's Drive from Hiapo Street. This improvement will be in conjunction with Phase I of the Project.

- Waipahu Street and Mokuola Street/Manager's Drive Intersection - along with the extension of Manager's Drive, the southbound approach will provide one exclusive left-turn lane and one shared through and right-turn lane. The eastbound approach will be improved to provide one exclusive left-turn lane and one shared through and right-turn lane. This improvement will be in conjunction with Phase I of the Project.

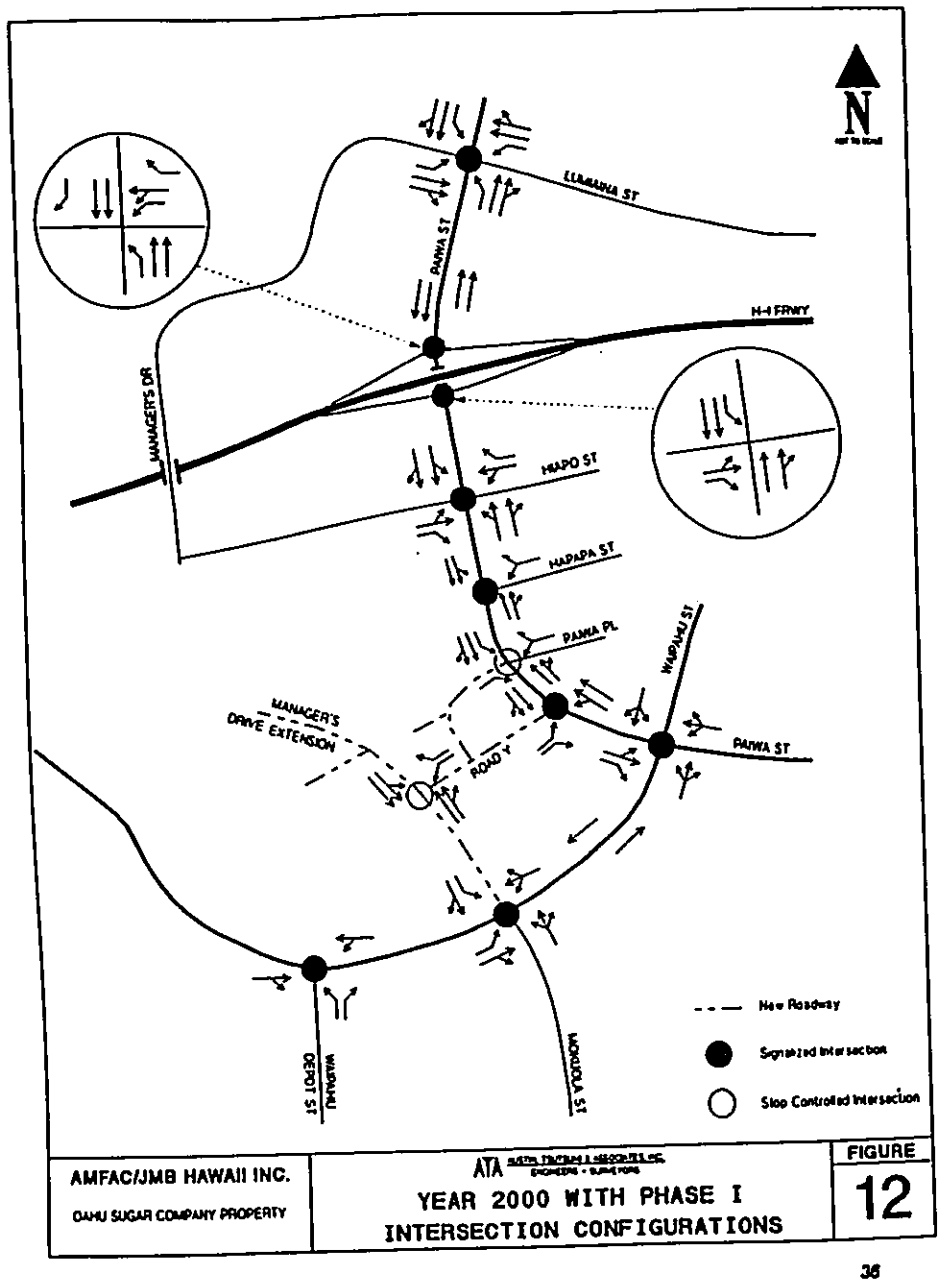
- Road Y - to conform to the current Waipahu Special Area Plan, a new 60-foot right-of-way east-west road will be constructed from Manager's Drive (just south of its intersection with Road X) to Paiwa Street (south of its intersection with Paiwa Place). The intersection of Road Y and Paiwa Street will be signalized. Along with the signalization of the Road Y/Paiwa Street intersection, the traffic signal system at

Paiwa Street and Paiwa Place will be removed and the west leg of the intersection will be restricted to right-turn in and right-turn out movements only. Egress from the proposed Project and the Waikele employee parking area will be shifted to the new intersection of Road Y and Paiwa Street. The intersection of Road Y and Manager's Drive will be controlled by stop-signs until such time as the intersection meets traffic signal warrants. This roadway will be constructed in conjunction with Phase I of the Project.

- Paiwa Street and Paiwa Place - with the proposed Road Y connection at Paiwa Street, the traffic signal system at Paiwa Street and Paiwa Place will be removed and the west-leg of Paiwa Place will be restricted to a right-turn in and right-turn out movements only. Traffic from the east-leg of Paiwa Place will continue to be allowed left and right-turns out of and into Paiwa Place. The intersection improvements currently being completed in conjunction with the Waikele Center employee parking lot creates exclusive left-turn lanes in the northbound and southbound direction on Paiwa Street. However, when Road Y eventually connects to Paiwa Street, the northbound left-turn into Paiwa Place will be restricted and the northbound exclusive left-turn lane will provide a sheltered area for westbound left-turning traffic out of the east-leg of Paiwa Place.

- Road X - to conform to the current Waipahu Special Area Plan, a new 60-foot right-of-way east-west road will be constructed between Waipahu Street (near the existing Auaili Street/Waipahu Street intersection) to the future extended Manager's Drive. The intersection of Waipahu Street and Road X is assumed to be signalized in this analysis. Road X's intersection with Manager's Drive will be controlled by stop-signs. This roadway will be constructed in conjunction with Phase II of the Project.

Figure 12 shows the proposed roadways under the Year 2000 with Phase I conditions.



AMFAC/JMB HAWAII INC. OAHU SUGAR COMPANY PROPERTY	ATA AUSTIN TSUTSUMI & ASSOCIATES INC YEAR 2000 WITH PHASE I INTERSECTION CONFIGURATIONS	FIGURE 12

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FUTURE WITH PHASE I CONDITIONS

The proposed Phase I Project generated traffic volumes were added to Year 2000 Base traffic volumes and redistributed based on the new roadways described previously. Figure 12 shows the intersection configurations under the Year 2000 with Phase I. The resulting Year 2000 with Phase I traffic volumes are shown on Figure 13.

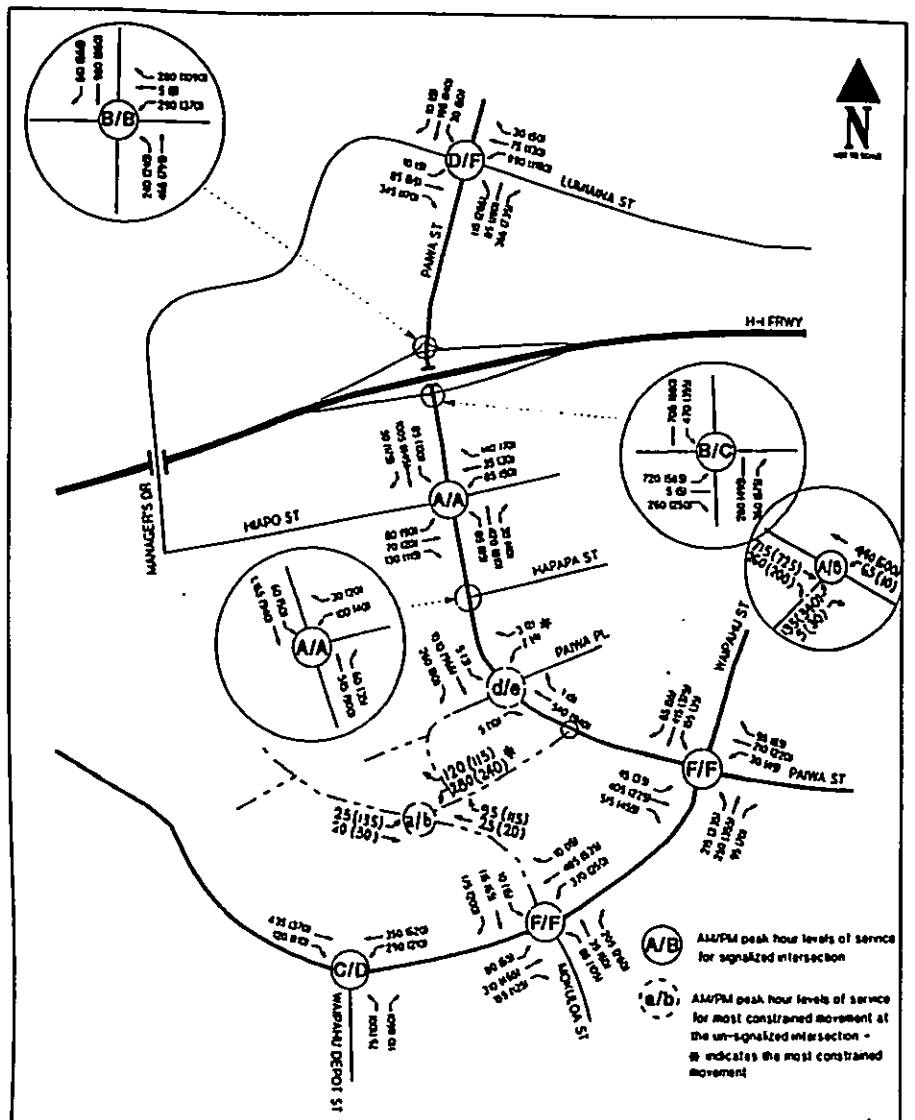
The Year 2000 With Phase I scenario was analyzed to determine the potential effect of the proposed Phase I Project on the roadway system. As also shown on Figure 13, the results indicate that four of the eleven analyzed intersections (intersections Waipahu Street/Road X and Manager's Drive/Road X do not exist under Phase I) will be operating at undesirable levels of service (LOS E or F). The remaining seven intersections are all operating at LOS D or better during both the AM and PM peak hours. The four intersections that are projected to operate at undesirable levels of service are:

- Waipahu Street and Mokuola Street - both AM and PM peak hours
- Waipahu Street and Paiwa Street - both AM and PM peak hours
- Paiwa Street and Lumiaina Street - PM peak hour only
- Paiwa Street and Paiwa Place - westbound approach during the PM peak hour only

Except for the intersection of Paiwa Street and Paiwa Place, all the intersections listed are the same intersections that were projected to operate at undesirable levels of service under Year 2000 Base conditions.

Analysis also shows that, with the recommended base improvements which were described in the Section III, the three intersections that are projected to operate at LOS E or F will improve to LOS D or better under the Year 2000 with Phase I of the proposed Project.

Although it is projected that traffic on the westbound approach from Paiwa Place to Paiwa Street will experience delays during the PM peak hour, it should be noted that a relatively low amount of vehicles is projected to be affected. Westbound left-turning vehicles from Paiwa Place will be offered a sheltered area (the northbound left-turn lane which will not be used when the west-leg



AMFAC/JMB HAWAII INC.	ATA AUSTIN TSUTSUMI & ASSOCIATES, INC CIVIL ENGINEERS • SURVEYORS	FIGURE
OAHU SUGAR COMPANY PROPERTY	YEAR 2000 WITH PHASE I TRAFFIC CONDITIONS	13

of Paiwa Place will be restricted to right-turn in and right-turn out) before merging into the southbound through traffic. No improvement to this intersection is recommended.

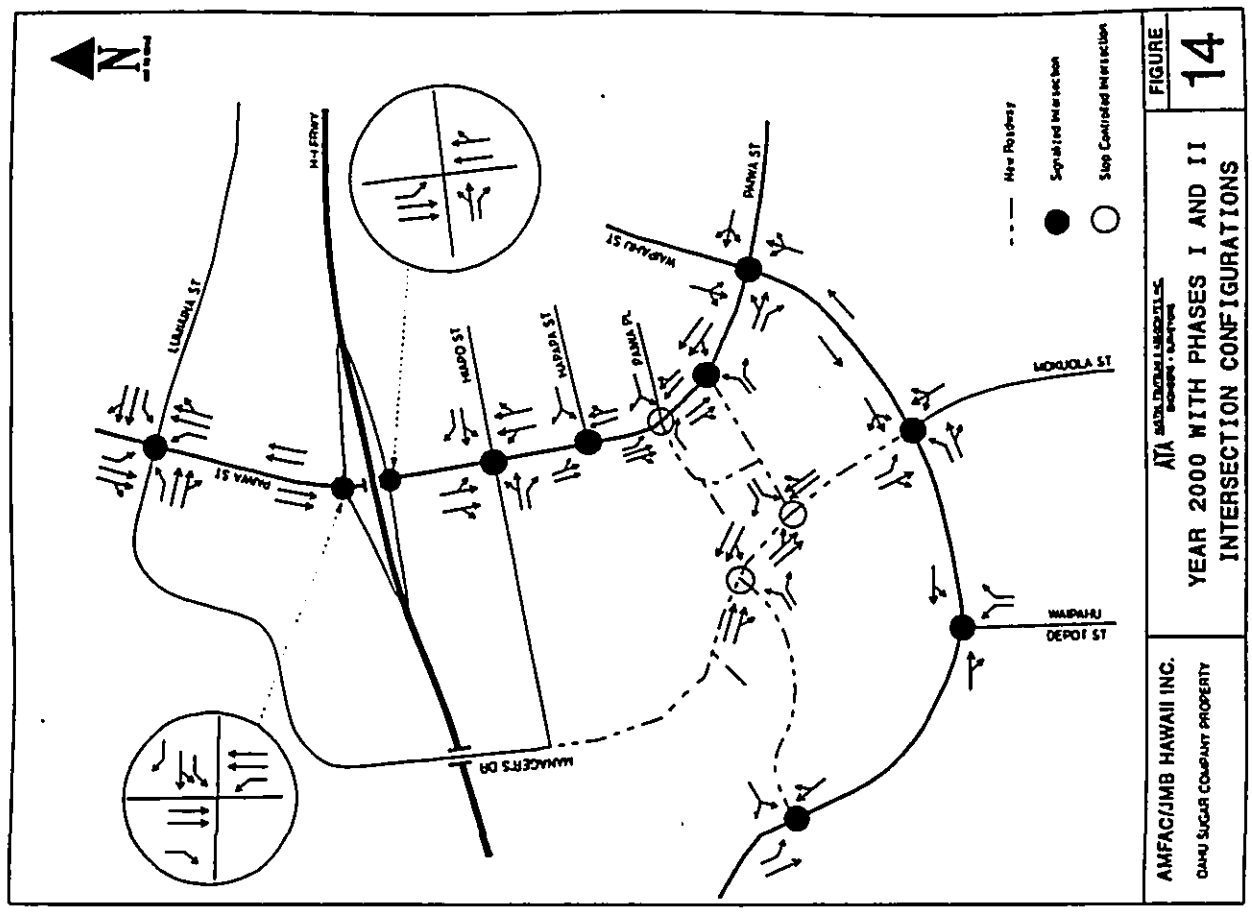
Table 8 summarizes the level of service results.

FUTURE WITH PHASES I AND II AND CITY'S MANAGER'S SITE CONDITIONS

Traffic operations for the Year 2000 with Phases I and II of the proposed Project and the City's Manager's Drive Site scenario were analyzed to determine the potential effect of the total buildout of the subject area on the roadway system. For the purpose of analyzing the full potential impacts due to the buildout of the subject area, the City's residential site, located west of the intersection of Manager's Drive and Hiapo Street is also included in this analysis along with the completion of the Manager's Drive extension between Hiapo Street and the proposed Project's northern property line (thus completing Manager's Drive extension from H-1 Freeway to Waipahu Street). For the purpose of this traffic analysis, it is assumed that the City's Manager's Drive Site will contain 225 single-family residential dwelling units. The site is estimated to generate 2,149 daily trips with 167 AM peak hour trips and 227 PM peak hour trips. Figure 14 shows the layout of the roadway network under this scenario. Figure 15 shows the projected traffic volumes and level of service results. The results indicate that four of the thirteen analyzed intersections will be operating at undesirable levels of service (LOS E or F). The four intersections are:

- Waipahu Street and Mokuola Street - both AM and PM peak hours
- Waipahu Street and Paiwa Street - both AM and PM peak hours
- Paiwa Street and Lumiaina Street - PM peak hour only
- Paiwa Street and Paiwa Place - westbound approach during the PM peak hour only

Except for the intersection of Paiwa Street and Paiwa Place, all the intersections listed are the same intersections that were projected to operate at undesirable levels of service under Year 2000 Base conditions.

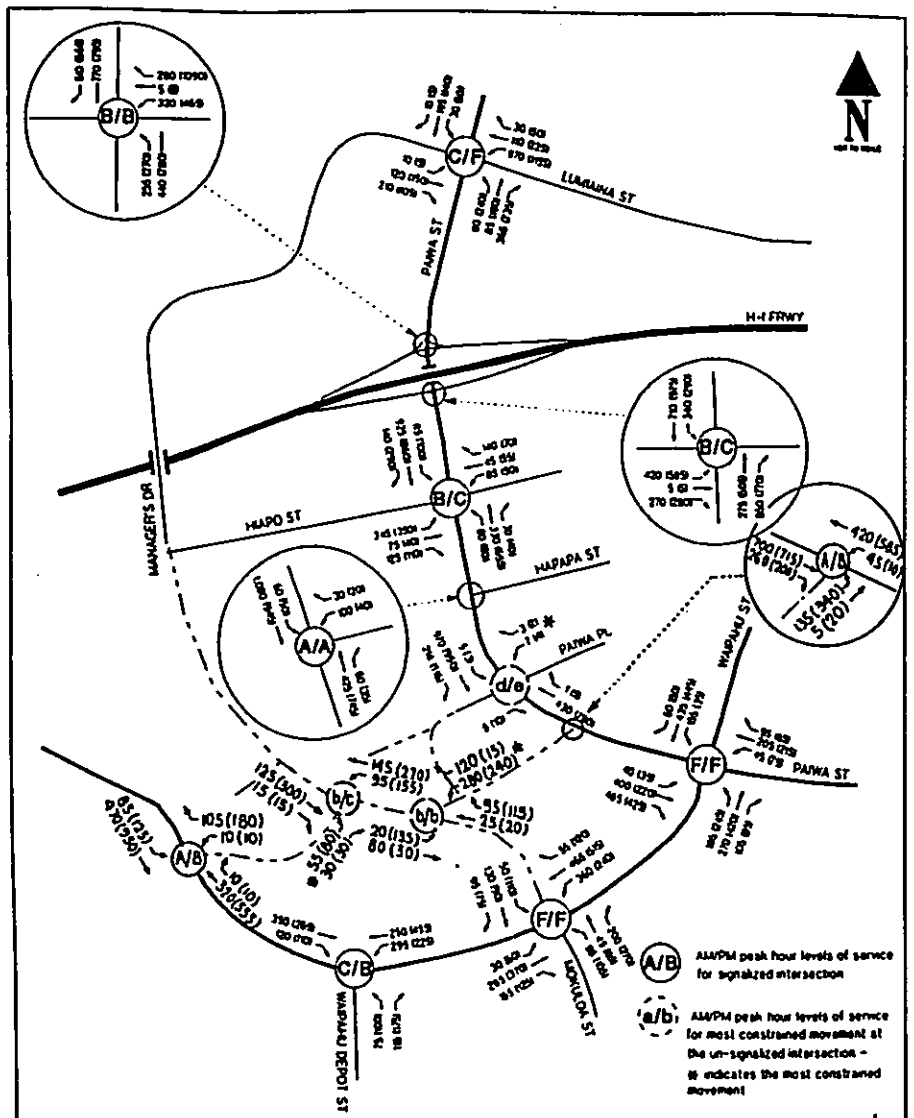


41

TABLE 8
YEAR 2000 WITH PHASE I – INTERSECTION LEVEL OF SERVICE SUMMARY

INTERSECTION	EXISTING YEAR 1995						YEAR 2000 BASE (W/O PROJECT)						YEAR 2000 WITH PHASE I						YEAR 2000 WITH PHASE I AND BASE IMPROVEMENTS					
	AM PEAK HOUR			PM PEAK HOUR			AM PEAK HOUR			PM PEAK HOUR			AM PEAK HOUR			PM PEAK HOUR			AM PEAK HOUR			PM PEAK HOUR		
	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS
1. WAIPAHU ST & DEPOT RD	0.68	8.1	B	0.66	11.6	B	0.88	24.0	C	0.77	20.7	C	0.84	23.0	C	0.79	20.7	D						
2. WAIPAHU ST & MOKUOLA ST	0.91	31.7	E [a]	0.86	20.5	E [a]	1.10	80.6	F [a]	1.22	41.0	F [a]	1.13	30.1	F [a]	1.21	31.2	F [a]	0.84	8.1	B	0.87	8.8	B
3. WAIPAHU ST & PAHIA ST	0.97	30.4	E [a]	0.84	20.9	D	1.03	72.2	F	1.34	36.1	F [a]	2.36	66.6	F	1.14	30.3	F [a]	0.86	11.3	B	0.87	10.4	B
4. PAHIA ST & PAHIA PL [b]							0.42	2.7	A	0.38	3.1	A												
- SB LEFT-TURN	-	3.1	A	-	3.7	A							-	4.1	A	-	6.6	B	NO IMPROVEMENTS RECOMMENDED					
- WB APPROACH	-	14.9	B	-	12.2	C							-	27.7	D	-	43.4	E						
- EB RIGHT-TURN	-	-	-	-	-	-							-	4.6	A	-	4.9	B						
5. PAHIA ST & HAPAPA ST [b]							0.40	4.0	A	0.40	2.8	A	0.51	4.6	A	0.45	2.7	A						
- SB LEFT-TURN	-	3.1	A	-	3.8	A																		
- WB APPROACH	-	20.2	D	-	17.6	C																		
6. PAHIA ST & HAPO ST	0.30	4.2	A	0.40	11.9	B	0.43	4.6	A	0.55	3.6	A	0.44	4.9	A	0.62	4.1	A						
7. PAHIA ST & H-1 EB RAMPS	0.58	20.7	D	0.66	24.0	C	0.86	14.5	B [a]	0.76	20.8	C [a]	0.66	15.1	B	0.86	22.1	C						
8. PAHIA ST & H-1 WB RAMPS	0.36	8.7	B	0.36	8.4	B	0.46	7.9	B	0.47	7.8	B	0.56	8.3	B	0.56	8.5	B						
9. PAHIA ST & LUMAHAI ST	0.61	26.0	D	0.94	62.1	F	0.87	31.6	D	1.41	46.8	F [a]	0.87	34.9	D	1.16	36.6	F [a]	0.84	14.2	B	0.89	20.5	D
10. WAIPAHU ST & ROAD X		N/A			N/A			N/A			N/A			N/A			N/A							
11. MANAGER'S DR & ROAD X		N/A			N/A			N/A			N/A			N/A			N/A							
- NB LEFT-TURN																								
- EB APPROACH																								
12. MANAGER'S DR & ROAD Y		N/A			N/A			N/A			N/A													
- SB LEFT-TURN													-	3.6	A	-	3.6	A						
- WB APPROACH													-	6.4	A	-	6.5	B						
13. PAHIA ST & ROAD Y		N/A			N/A			N/A			N/A		0.49	3.9	A	0.56	7.3	B						

[a] LOS E or F based on volume to capacity ratio.
[b] Existing stop-controlled intersection analyzed as signalized intersection under Year 2000 base conditions.
[c] Level of service improved from existing due to signal optimization.



AMFAC/JMB HAWAII INC. OAHU SUGAR COMPANY PROPERTY	ATA AUSTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS • SURVEYORS YEAR 2000 WITH PHASES I AND II TRAFFIC CONDITIONS	FIGURE 15

Analysis also shows that with the recommended base improvements which were described in Section III, with the exception of the Paiwa Street and Paiwa Place intersection, all intersections that are projected to operate at LOS E or F will improve to LOS D or better under the Year 2000 with Phase I and II of the proposed Project.

Although it is projected that the westbound approach from Paiwa Place to Paiwa Street will experience delays during the PM peak hour, it should be noted that a relatively low amount of vehicles is projected to be affected.

Table 9 summarizes the level of service results and Figure 16 shows the recommended base improvements along with the Year 2000 with Phases I and II intersection configurations.

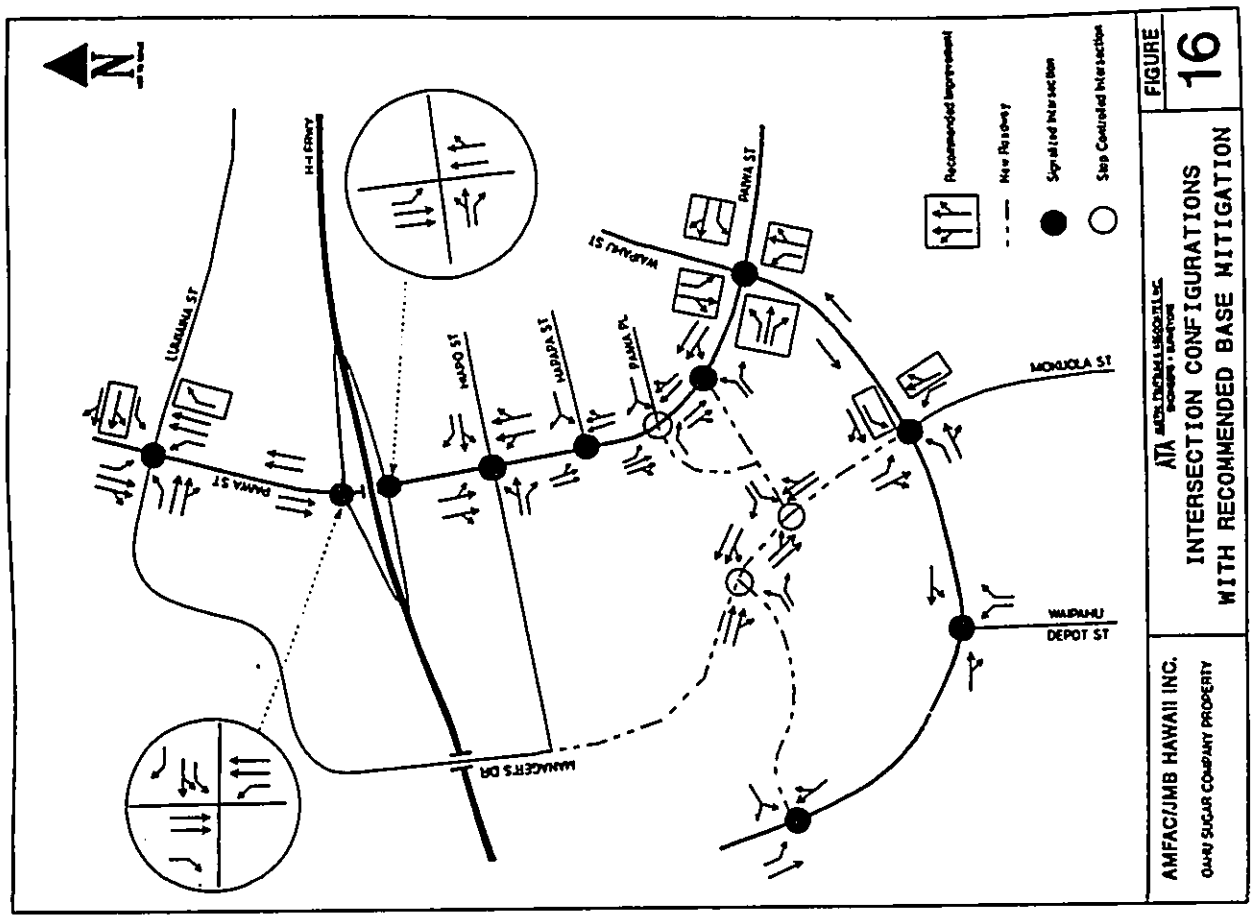


TABLE 9
YEAR 2000 WITH PHASES I AND II – INTERSECTION LEVEL OF SERVICE SUMMARY

INTERSECTION	EXISTING YEAR 1994						YEAR 2000 BASE (W/O PROJECT)						YEAR 2000 WITH PHASE I AND II						YEAR 2000 WITH PHASE I AND II WITH BASE IMPROVEMENTS					
	AM PEAK HOUR			PM PEAK HOUR			AM PEAK HOUR			PM PEAK HOUR			AM PEAK HOUR			PM PEAK HOUR			AM PEAK HOUR			PM PEAK HOUR		
	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS
1. WAIPAHU ST & DEPOT RD	0.69	6.1	B	0.89	11.5	B	0.80	34.8	C	0.77	20.7	C	0.79	16.3	C	0.88	8.8	B						
2. WAIPAHU ST & MOKUOLA ST	0.96	31.7	E [a]	0.96	35.6	E [a]	1.10	96.6	F [a]	1.22	61.6	F [a]	1.10	100.2	F [a]	1.13	36.3	F [a]	0.88	8.3	B	0.79	8.7	B
3. WAIPAHU ST & PAHIA ST	0.97	30.4	E [a]	0.84	20.9	D	1.06	72.2	F	1.34	96.1	F [a]	1.07	96.8	F	1.11	33.8	F [a]	0.89	8.9	B	0.83	8.4	B
4. PAHIA ST & PAHIA PL [b]							0.42	2.7	A	0.39	3.1	A							NO IMPROVEMENTS RECOMMENDED					
- SB LEFT-TURN	-	9.1	A	-	9.7	A							-	9.6	A	-	9.8	B						
- WB APPROACH	-	16.9	B	-	18.2	C							-	21.9	D	-	30.4	E						
- EB RIGHT-TURN	-	-	-	-	-	-							-	8.3	B	-	4.8	A						
5. PAHIA ST & HAPAPA ST [b]							0.40	4.8	A	0.40	2.8	A	0.40	4.7	A	0.42	2.8	A						
- SB LEFT-TURN	-	9.4	A	-	9.8	A																		
- WB APPROACH	-	26.2	D	-	17.8	C																		
6. PAHIA ST & HAPO ST	0.39	4.2	A	0.49	11.8	B	0.45	4.8	A	0.53	5.6	A	0.76	11.6	B	0.62	16.9	C						
7. PAHIA ST & H-1 EB RAMPS	0.90	26.7	D	0.86	24.8	C	0.86	14.3	B [a]	0.76	26.8	C [a]	0.87	14.3	B	0.80	21.1	C						
8. PAHIA ST & H-1 WB RAMPS	0.36	8.7	B	0.36	8.4	B	0.40	7.9	B	0.47	7.8	B	0.46	9.1	B	0.53	8.3	B						
9. PAHIA ST & LUMAHAI ST	0.81	26.8	D	0.84	66.1	F	0.87	51.6	D	1.41	46.8	F [a]	0.88	23.8	C	1.14	87.8	F [a]	0.89	13.8	B	0.8	26.3	B
10. WAIPAHU ST & ROAD X		N/A			N/A			N/A			N/A		0.32	3.7	A	0.42	8.8	B						
11. MANAGER'S DR & ROAD X		N/A			N/A			N/A			N/A													
- NB LEFT-TURN													-	2.7	A	-	3.8	A						
- EB APPROACH													-	8.7	B	-	12.8	C						
12. MANAGER'S DR & ROAD Y		N/A			N/A			N/A			N/A													
- SB LEFT-TURN													-	2.8	A	-	3.8	A						
- WB APPROACH													-	8.8	B	-	7.8	B						
13. PAHIA ST & ROAD Y		N/A			N/A			N/A			N/A		0.36	3.3	A	0.46	8.8	B						

[a] LOS E or F based on volume to capacity ratio.
[b] Existing stop-controlled intersection analyzed as signalized intersection under Year 2000 base conditions.
[c] Level of service improved from existing due to signal optimization.

V. SUMMARY OF FINDINGS AND RECOMMENDATIONS

This study was undertaken to analyze the potential traffic impacts of the Oahu Sugar Mill Industrial/Commercial Center. The following is the summary and recommendations of the study.

SUMMARY OF FINDINGS

- The proposed project will include thirty-seven acres of industrial use, twenty acres of commercial use (including a community center, YMCA, a historical park/museum and the expansion of the Hans L'Orange Park).

- Under existing conditions, the flowing three intersections are operating at undesirable levels of service (LOS E and F) during either the AM or PM peak hour, or both:

  1. Waipahu Street and Mokuola Street
  2. Waipahu Street and Paiwa Street
  3. Paiwa Street and Lumiaina Street

- Under the Year 2000 base (without Project) conditions, the same three intersections which are operating at undesirable levels of service under existing conditions will continue to operate at undesirable levels of service (LOS E or F).

- Phase I of the proposed Project (the industrial park) plus the community center with the YMCA and museum, and the Hans L'Orange Park expansion, is estimated to generate

2,751 daily vehicle trips, 339 AM peak hour vehicle trips and 378 PM peak hour vehicle trips.

- Under the Year 2000 with Phase I of the Project, with the exception of Paiwa Street and Paiwa Place, all the intersections that were projected to operate at undesirable levels of service under the Year 2000 Base conditions will also be operating at undesirable levels of service (LOS E or F). The four intersections are:

  1. Waipahu Street and Mokuola Street (both AM and PM peak hours)
  2. Waipahu Street and Paiwa Street (both AM and PM peak hours)
  3. Paiwa Street and Lumiaina Street (PM peak hour only)
  4. Paiwa Street and Paiwa Place (westbound approach during the PM peak hour only)

- Phase II of the proposed Project (commercial center) is estimated to generate 7,338 daily vehicle trips, 168 AM peak hour vehicle trips and 682 PM peak hour vehicle trips.

- Under the Year 2000 with Phases I and II and the City's Manager's Drive Site, with the exception of Paiwa Street and Paiwa Place, all the intersections that were projected to operate at LOS E or F under the Year 2000 Base conditions (without geometric improvements) will also be operating at undesirable levels of service (LOS E or F). The four intersections are:

  1. Waipahu Street and Mokuola Street (both AM and PM peak hours)
  2. Waipahu Street and Paiwa Street (both AM and PM peak hours)
  3. Paiwa Street and Lumiaina Street (PM peak hour only)
  4. Paiwa Street and Paiwa Place (westbound approach during the PM peak hour only)

- It is projected that traffic on the westbound approach from Paiwa Place to Paiwa Street will experience delays during the PM peak hour under the Year 2000 with Phase I and the Year 2000 with Phases I and II conditions, it should be noted that a relatively low amount of

vehicles are projected to be affected. Westbound left-turning vehicles from Paiwa Place will be offered a sheltered area before merging into the southbound through traffic.

RECOMMENDATIONS

- The following are the recommended "base improvements" to mitigate the undesirable operating conditions identified under the Year 2000 Base conditions (without Project):

  Waipahu Street and Mokuola Street
  - Provide the westbound approach with an exclusive left-turn lane and one through lane.
  - Provide the northbound approach with one exclusive left-turn lane and one exclusive right-turn lane.

  With the recommended geometric improvements, the intersection will operate at LOS B during both the AM and PM peak hours.

  Waipahu Street and Paiwa Street
  - Provide the southbound approach with an exclusive left-turn lane, one through lane and one exclusive right-turn lane.
  - Provide the northbound, eastbound and westbound approaches with one exclusive left-turn lane and one shared through and right-turn lane

  With the recommended geometric improvements, the intersection will operate at LOS B during both the AM and PM peak hours.

  Paiwa Street and Lumiaina Street
  - Provide the northbound approach with one exclusive left-turn lane, two through lanes and one exclusive right-turn lane.
  - Restripe to provide the westbound approach with one exclusive left-turn lane, one shared through and left-turn lane and one shared through and right-turn lane.

  With the recommended intersection improvements, the intersection will operate at LOS B and D during the AM and PM peak hours, respectively.

- The following are roadways that will be constructed in connection with the proposed Project that will also help overall traffic circulation in Waipahu:

  Road X - to conform to the current Waipahu Special Area Plan, a new 60-foot right-of-way east-west road will be constructed between Waipahu Street (near the existing Auaili Street/Waipahu Street intersection) to the future extended Manager's Drive. The intersection of Waipahu Street and Road X is assumed to be signalized in this analysis. Road X's intersection with Manager's Drive will be controlled by stop-signs. This roadway will be constructed in conjunction with Phase II of the Project.

  Road Y - to conform to the current Waipahu Special Area Plan, a new 60-foot right-of-way east-west road will be constructed from Manager's Drive (just south of its intersection with Road X) to Paiwa Street (south of its intersection with Paiwa Place). The intersection of Road Y and Paiwa Street will be signalized. Along with the signalization of the Road Y/Paiwa Street intersection, the traffic signal system at Paiwa Street and Paiwa Place will be removed and the west leg of the intersection will be restricted to right-turn in and right-turn out movements only. Egress from the proposed Project and the Waikele employee parking area will be shifted to the new intersection of Road Y and Paiwa Street. The intersection of Road Y and Manager's Drive will be controlled by stop signs until such time as the intersection meets traffic signal warrants. This roadway will be constructed in conjunction with Phase I of the Project.

  Manager's Drive Extension - From the Project's makai boundary at Waipahu Street, Mokuola Street will be extended mauka to the mauka Project boundary in alignment with the future extension of Manager's Drive from Hiapo Street. This improvement will be in conjunction with Phase I of the Project.

- In addition to the above roadways, the following intersection modifications will be required in connection with the proposed Project:

  1. Based on the roadway layout of the current Waipahu Special Area Plan, the traffic signal at the intersection of Paiwa Street and Paiwa Place is to be relocated to the

future intersection of Road Y at Paiwa Street. Therefore it is recommended that access to and from the Paiwa Place extension be restricted to right-turn in and right-turn out only.

2. Based on the projected traffic volumes at the intersection of Paiwa Street and the future Road Y intersection, the intersection will be required to be signalized and its northbound approach to provide one shared left-turn and two through lanes. The southbound approach to provide one through lane and one shared through and right-turn lane. The eastbound approach to provide one exclusive left-turn lane and one exclusive right-turn lane. Based on the analysis, an exclusive northbound left-turn lane and an exclusive southbound right-turn lane will not be required.

3. Based on the projected traffic volumes at the intersection of Waipahu Street and the future Road X, the intersection will be required to be signalized and provide one through lane and one exclusive right-turn lane in the northbound approach. The southbound approach to provide one exclusive left-turn lane and one through lane. The westbound approach to provide one shared left-turn and right-turn lane.

4. Based on the projected traffic volumes at the intersection of Waipahu Street and Mokuola Street/Manager's Drive Extension, the eastbound and southbound approaches will need to provide an exclusive left-turn lane and a shared through and right-turn lane.

5. Based on the projected traffic volumes on the future Manager's Drive extension at both the Road X and Road Y intersections, stop-signs controlling the approaches on Road X and Road Y will be sufficient until future traffic volumes warrant the installation of traffic signals. Provisions should be made to include conduits for possible future traffic signal installation should it be needed.

- With the recommended "base improvements" and roadway/intersection improvements related to the proposed Project, the intersections of Waipahu Street/Mokuola Street, Waipahu Street/Paiwa Street and Paiwa Street/Lumiaina Street will all be operating at LOS

D or better for both the AM and PM peak hours under the Year 2000 with Phase I and the Year 2000 with Phases I and II conditions.

REFERENCES

- Institute of Transportation Engineers, Trip Generation, 5th Edition, 1991.
- Transportation Research Board, Access Management Guidelines for Activity Centers - NCHRP Report 348, 1992.
- American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, 1990.
- Austin, Tsutsumi & Associates, Inc. Traffic Impact Report For The Proposed Amfac Industrial Subdivision, May 1994.

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

APPENDICES

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

APPENDIX A

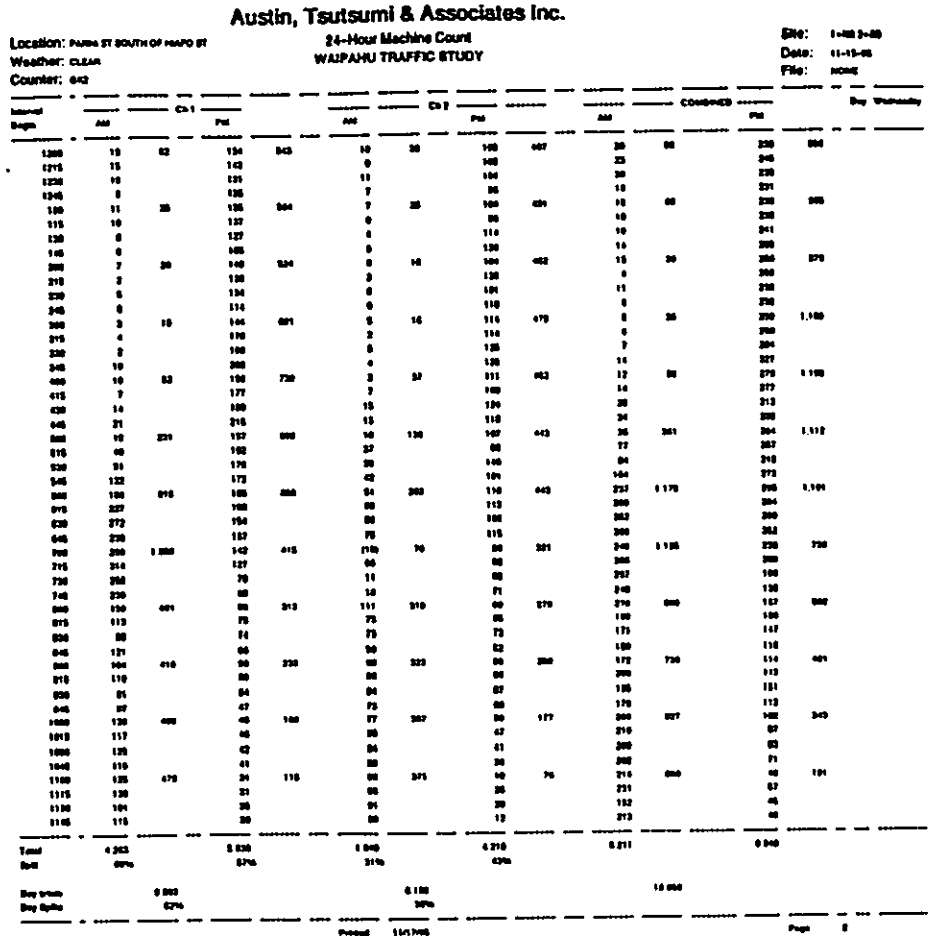
TRAFFIC COUNTS

Austin, Tsutsumi & Associates Inc.

Location: PARK ST SOUTH OF HAPO ST
Weather: CLEAR
Counter: 642

24-Hour Machine Count
WAIPAHU TRAFFIC STUDY

Site: 1-488 3-88
Date: 11-15-05
File: NONE



15-Nov-95

ATA INC.

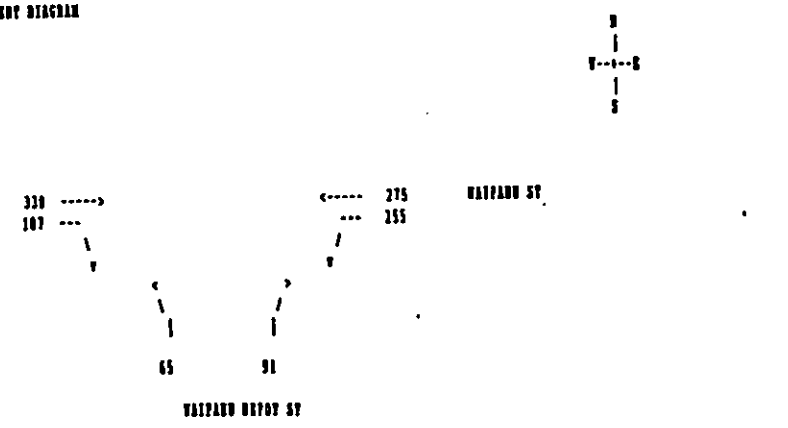
INTERSECTION COUNT SURVEY SUMMARY

North/South Street : WAIPAHU DEPOT ST
East/West Street : WAIPAHU ST
Weather : CLEAR

Period: AM
Date: 11-15-95
Day : WEDNESDAY

15 MINUTE PERIOD	WAIPAHU DEPOT ST NORTHBOUND LEFT	THRU	RGHT	SOUTHBOUND LEFT	THRU	RGHT	WAIPAHU ST EASTBOUND LEFT	THRU	RGHT	WESTBOUND LEFT	THRU	RGHT	TOTAL VOLUME 15 MIN	HOURLY
630 - 645	10	0	21	0	0	0	0	81	23	28	47	0	208	
645 - 700	12	0	18	0	0	0	0	73	13	49	51	0	207	
700 - 715	11	0	23	0	0	0	0	73	30	56	52	0	243	
715 - 730	15	0	23	0	0	0	0	81	27	67	86	0	299	957
730 - 745	25	0	20	0	0	0	0	92	27	77	63	0	312	1,061
745 - 800	16	0	17	0	0	0	0	86	23	55	76	0	269	1,123
800 - 815	14	0	17	0	0	0	0	50	21	58	82	0	242	1,122
815 - 830	10	0	19	0	0	0	0	39	26	41	43	0	178	1,001
PEAK 15 MINUTE PERIOD: 730 - 745	25	0	20	0	0	0	0	92	27	77	63	0	312	--
PEAK HOUR PERIOD: 700 - 800	65	0	91	0	0	0	0	330	107	255	275	0	--	1123
PEAK HOUR FACTOR: 700 - 800	0.65	-	0.81	-	-	-	-	0.90	0.89	0.83	0.82	-		
	0.74			-		-	0.92			0.88				

PEAK HOUR TURNING MOVEMENT DIAGRAM



16-Nov-95

ATA INC.

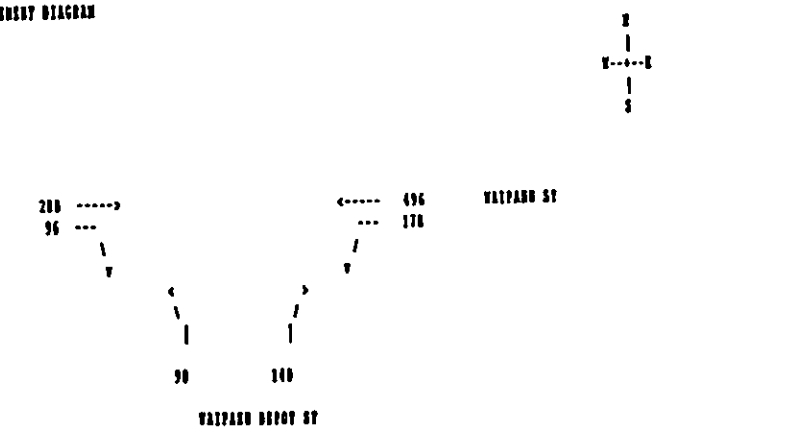
INTERSECTION COUNT SURVEY SUMMARY

North/South Street : WAIPAHU DEPOT ST
East/West Street : WAIPAHU ST
Weather : CLEAR

Period: PM
Date: 11-15-95
Day : THURSDAY

15 MINUTE PERIOD	WAIPAHU DEPOT ST NORTHBOUND LEFT	THRU	RGHT	SOUTHBOUND LEFT	THRU	RGHT	WAIPAHU ST EASTBOUND LEFT	THRU	RGHT	WESTBOUND LEFT	THRU	RGHT	TOTAL VOLUME 15 MIN	HOURLY
330 - 345	20	0	23	0	0	0	0	63	26	37	89	0	258	
345 - 400	25	0	31	0	0	0	0	61	16	48	127	0	308	
400 - 415	21	0	27	0	0	0	0	67	22	47	91	0	275	
415 - 430	17	0	38	0	0	0	0	65	25	53	107	0	305	1,150
430 - 445	30	0	37	0	0	0	0	72	25	47	130	0	341	1,233
445 - 500	26	0	38	0	0	0	0	71	19	41	162	0	337	1,262
500 - 515	17	0	27	0	0	0	0	76	27	37	117	0	301	1,288
515 - 530	26	0	30	0	0	0	0	69	19	35	119	0	302	1,281
PEAK 15 MINUTE PERIOD: 430 - 445	30	0	37	0	0	0	0	72	25	47	130	0	341	--
PEAK HOUR PERIOD: 415 - 515	90	0	140	0	0	0	0	280	96	178	496	0	--	1288
PEAK HOUR FACTOR: 415 - 515	0.75	-	0.92	-	-	-	-	0.95	0.89	0.84	0.87	-		
	0.86			-		-	0.93			0.92				

PEAK HOUR TURNING MOVEMENT DIAGRAM



ATA INC. 15-Nov-95

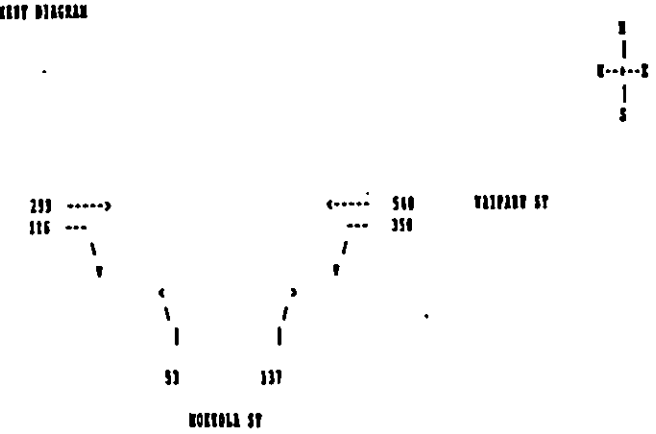
INTERSECTION COUNT SURVEY SUMMARY

North/South Street : MONROLA ST
East/West Street : WAIPAHU ST
Weather : CLEAR

Period: AM
Date: 11-15-95
Day : WEDNESDAY

15 MINUTE PERIOD	MONROLA ST NORTHBOUND LEFT	THRU	RGHT	MONROLA ST SOUTHBOUND LEFT	THRU	RGHT	WAIPAHU ST EASTBOUND LEFT	THRU	RGHT	WAIPAHU ST WESTBOUND LEFT	THRU	RGHT	TOTAL VOLUME 15 MIN	HOURLY
630 - 645	6	0	24	0	0	0	0	76	27	68	90	0	291	
645 - 700	8	0	20	0	0	0	0	59	30	61	88	0	276	
700 - 715	9	0	30	0	0	0	0	71	22	66	113	0	311	
715 - 730	15	0	27	0	0	0	0	83	27	74	150	0	376	1,252
730 - 745	4	0	45	0	0	0	0	84	42	94	139	0	408	1,369
745 - 800	20	0	35	0	0	0	0	66	32	135	103	0	381	1,476
800 - 815	10	0	30	0	0	0	0	66	15	67	142	0	330	1,495
815 - 830	5	0	38	0	0	0	0	43	37	40	83	0	226	1,345
PEAK 15 MINUTE PERIOD: 730 - 745	4	0	45	0	0	0	0	84	42	94	139	0	408	--
PEAK HOUR PERIOD: 715 - 815	53	0	137	0	0	0	0	299	116	350	560	0	--	1495
PEAK HOUR FACTOR: 715 - 815	0.55	-	0.76	-	-	-	-	0.89	0.69	0.76	0.90	-		
	0.81			-			0.82			0.95				

PEAK HOUR TURNING MOVEMENT DIAGRAM



ATA INC. 16-Nov-95

INTERSECTION COUNT SURVEY SUMMARY

North/South Street : MONROLA ST
East/West Street : WAIPAHU ST
Weather : CLEAR

Period: PM
Date: 11-15-95
Day : WEDNESDAY

15 MINUTE PERIOD	MONROLA ST NORTHBOUND LEFT	THRU	RGHT	MONROLA ST SOUTHBOUND LEFT	THRU	RGHT	WAIPAHU ST EASTBOUND LEFT	THRU	RGHT	WAIPAHU ST WESTBOUND LEFT	THRU	RGHT	TOTAL VOLUME 15 MIN	HOURLY
330 - 345	17	0	74	0	0	0	0	83	26	35	133	0	369	
345 - 400	23	0	48	0	0	0	0	95	20	42	159	0	387	
400 - 415	9	0	66	0	0	0	0	67	19	37	132	0	328	
415 - 430	17	0	63	0	0	0	0	95	25	48	151	0	379	1,463
430 - 445	10	0	48	0	0	0	0	99	22	46	156	0	389	1,483
445 - 500	10	0	58	0	0	0	0	105	18	50	170	0	419	1,515
500 - 515	19	0	68	0	0	0	0	102	23	53	134	0	399	1,516
515 - 530	16	0	75	0	0	0	0	80	16	48	149	0	374	1,581
PEAK 15 MINUTE PERIOD: 445 - 500	10	0	58	0	0	0	0	105	18	50	170	0	419	--
PEAK HOUR PERIOD: 415 - 515	72	0	217	0	0	0	0	481	88	193	611	0	--	1586
PEAK HOUR FACTOR: 415 - 515	0.95	-	0.80	-	-	-	-	0.95	0.88	0.93	0.90	-		
	0.83			-			0.98			0.92				

PEAK HOUR TURNING MOVEMENT DIAGRAM

ATA INC. 15-Nov-95

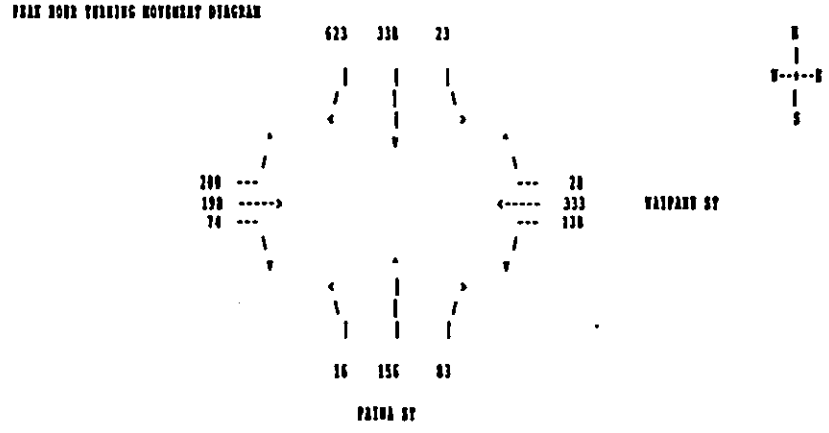
INTERSECTION COUNT SURVEY SUMMARY

North/South Street : PAIWA ST
East/West Street : WAIPAHU ST
Weather : CLEAR

Period: AM
Date: 11-15-95
Day : WEDNESDAY

15 MINUTE PERIOD	PAIWA ST NORTHBOUND LEFT	THRU	RGHT	PAIWA ST SOUTHBOUND LEFT	THRU	RGHT	WAIPAHU ST EASTBOUND LEFT	THRU	RGHT	WAIPAHU ST WESTBOUND LEFT	THRU	RGHT	TOTAL VOLUME 15 MIN	HOURLY
630 - 645	2	32	4	11	119	109	44	25	29	15	36	6	430	
645 - 700	4	22	10	4	123	103	43	37	23	20	42	3	436	
700 - 715	2	39	14	3	126	110	39	35	14	34	45	7	480	
715 - 730	4	39	34	3	92	149	42	50	24	37	76	0	550	1,910
730 - 745	6	36	25	6	86	171	56	57	24	39	73	7	500	2,056
745 - 800	5	33	10	7	95	161	46	47	14	41	101	6	574	2,196
800 - 815	3	48	6	7	65	142	56	44	12	21	83	7	494	2,210
815 - 830	0	25	4	4	21	84	41	32	12	4	31	5	271	1,923
PEAK 15 MINUTE PERIOD:														
730 - 745	6	36	25	6	86	171	56	57	24	39	73	7	584	--
PEAK HOUR PERIOD:														
715 - 815	16	156	83	23	338	623	200	198	74	138	333	28	--	2210
PEAK HOUR FACTOR:														
715 - 815	0.80	0.81	0.61	0.82	0.83	0.91	0.89	0.87	0.77	0.84	0.82	0.88		
		0.83			0.94			0.86			0.84			

PEAK HOUR TURNING MOVEMENT DIAGRAM



ATA INC. 16-Nov-95

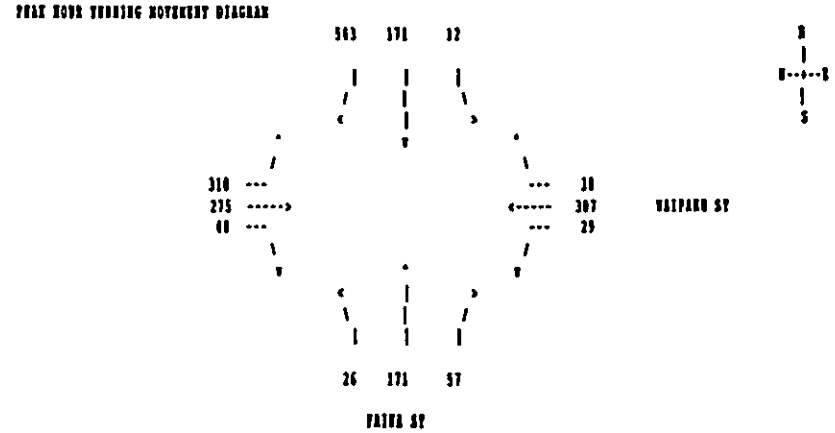
INTERSECTION COUNT SURVEY SUMMARY

North/South Street : PAIWA ST
East/West Street : WAIPAHU ST
Weather : CLEAR

Period: PM
Date: 11-15-95
Day : WEDNESDAY

15 MINUTE PERIOD	PAIWA ST NORTHBOUND LEFT	THRU	RGHT	PAIWA ST SOUTHBOUND LEFT	THRU	RGHT	WAIPAHU ST EASTBOUND LEFT	THRU	RGHT	WAIPAHU ST WESTBOUND LEFT	THRU	RGHT	TOTAL VOLUME 15 MIN	HOURLY
330 - 345	5	51	14	2	39	115	93	50	8	0	56	13	456	
345 - 400	4	58	9	2	56	151	95	53	9	9	82	2	530	
400 - 415	11	33	12	3	36	116	80	45	7	7	56	5	407	
415 - 430	7	37	13	2	45	127	70	50	13	0	92	7	473	1,870
430 - 445	6	47	16	3	37	146	77	70	8	9	88	9	508	1,920
445 - 500	6	47	15	5	45	155	70	63	15	7	57	10	459	1,893
500 - 515	7	40	13	2	46	115	89	86	12	5	70	4	493	1,939
515 - 530	10	29	7	5	33	110	67	73	6	9	78	5	440	1,940
PEAK 15 MINUTE PERIOD:														
345 - 400	4	58	9	2	56	151	95	53	9	9	82	2	530	--
PEAK HOUR PERIOD:														
415 - 515	26	171	57	12	171	563	310	275	48	29	307	30	--	1979
PEAK HOUR FACTOR:														
415 - 515	0.93	0.91	0.89	0.60	0.95	0.93	0.87	0.82	0.80	0.81	0.83	0.75		
		0.92			0.89			0.86			0.86			

PEAK HOUR TURNING MOVEMENT DIAGRAM



AEA INC. 16-Nov-95

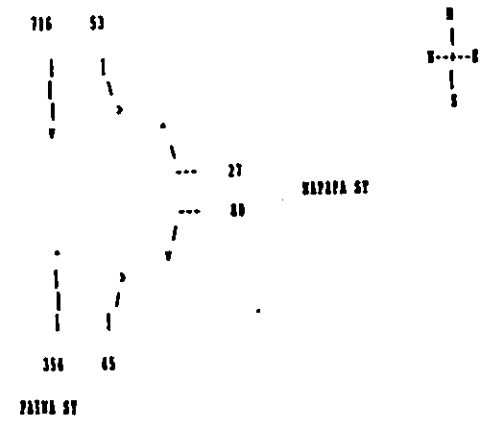
INTERSECTION COUNT SURVEY SUMMARY

North/South Street : PAIWA ST
East/West Street : HAPAPA ST
Weather : CLEAR

Period: AM
Date: 11-16-95
Day : THURSDAY

15 MINUTE PERIOD	PAIWA ST NORTHBOUND LEFT	THRU	RGHT	PAIWA ST SOUTHBOUND LEFT	THRU	RGHT	HAPAPA ST EASTBOUND LEFT	THRU	RGHT	HAPAPA ST WESTBOUND LEFT	THRU	RGHT	TOTAL VOLUME 15 MIN	HOURLY
630 - 645	0	82	1	0	196	0	0	0	0	6	0	5	290	
645 - 700	0	73	6	9	187	0	0	0	0	4	0	2	281	
700 - 715	0	77	4	7	156	0	0	0	0	15	0	3	262	
715 - 730	0	78	18	13	186	0	0	0	0	22	0	4	321	1,150
730 - 745	0	95	10	17	212	0	0	0	0	30	0	10	382	1,246
745 - 800	0	104	5	16	162	0	0	0	0	13	0	10	310	1,275
800 - 815	0	104	3	3	102	0	0	0	0	6	0	3	221	1,234
815 - 830	0	80	4	4	105	0	0	0	0	5	0	1	199	1,112
PEAK 15 MINUTE PERIOD: 730 - 745	0	95	10	17	212	0	0	0	0	30	0	10	382	--
PEAK HOUR PERIOD: 700 - 800	0	354	45	53	716	0	0	0	0	80	0	27	--	1275
PEAK HOUR FACTOR: 700 - 800	-	0.85	0.63	0.78	0.84	-	-	-	-	0.67	-	0.68		
		0.88			0.94			-			0.67			

PEAK HOUR TURNING MOVEMENT DIAGRAM



AEA INC. 17-Nov-95

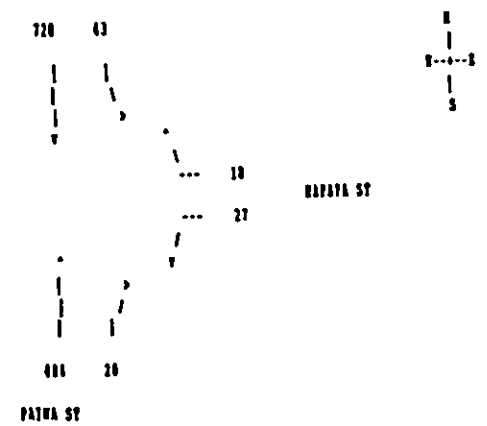
INTERSECTION COUNT SURVEY SUMMARY

North/South Street : PAIWA ST
East/West Street : HAPAPA ST
Weather : CLEAR

Period: PM
Date: 11-16-95
Day : THURSDAY

15 MINUTE PERIOD	PAIWA ST NORTHBOUND LEFT	THRU	RGHT	PAIWA ST SOUTHBOUND LEFT	THRU	RGHT	HAPAPA ST EASTBOUND LEFT	THRU	RGHT	HAPAPA ST WESTBOUND LEFT	THRU	RGHT	TOTAL VOLUME 15 MIN	HOURLY
330 - 345	0	120	6	10	156	0	0	0	0	3	0	6	295	
345 - 400	0	110	7	11	204	0	0	0	0	9	0	7	348	
400 - 415	0	134	5	11	169	0	0	0	0	8	0	9	327	
415 - 430	0	110	3	9	179	0	0	0	0	3	0	7	319	1,289
430 - 445	0	116	3	12	168	0	0	0	0	7	0	4	310	1,312
445 - 500	0	122	5	12	168	0	0	0	0	9	0	5	329	1,293
500 - 515	0	123	6	9	177	0	0	0	0	7	0	2	327	1,293
515 - 530	0	119	6	9	184	0	0	0	0	7	0	6	333	1,277
PEAK 15 MINUTE PERIOD: 345 - 400	0	110	7	11	204	0	0	0	0	9	0	7	348	--
PEAK HOUR PERIOD: 345 - 445	0	484	20	43	720	0	0	0	0	27	0	10	--	1312
PEAK HOUR FACTOR: 345 - 445	-	0.90	0.71	0.90	0.88	-	-	-	-	0.75	-	0.64		
		0.91			0.89			-			0.78			

PEAK HOUR TURNING MOVEMENT DIAGRAM



ATA INC. 16-Nov-95

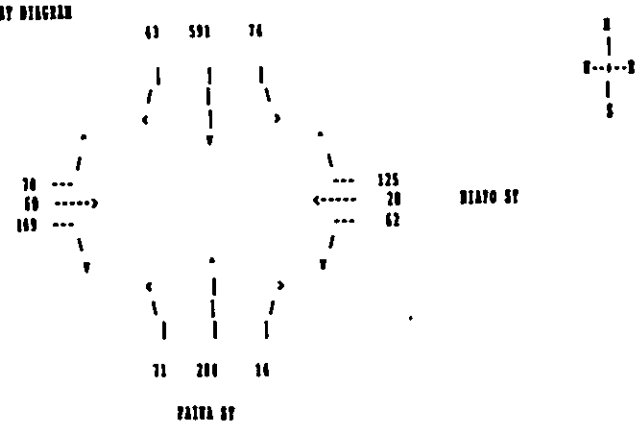
INTERSECTION COUNT SURVEY SUMMARY

North/South Street : PAIWA ST
East/West Street : HIAPO ST
Weather : CLEAR

Period: AM
Date: 11-16-95
Day : THURSDAY

15 MINUTE PERIOD	PAIWA ST NORTHBOUND LEFT	PAIWA ST NORTHBOUND THRU	PAIWA ST NORTHBOUND RGHT	PAIWA ST SOUTHBOUND LEFT	PAIWA ST SOUTHBOUND THRU	PAIWA ST SOUTHBOUND RGHT	HIAPO ST EASTBOUND LEFT	HIAPO ST EASTBOUND THRU	HIAPO ST EASTBOUND RGHT	HIAPO ST WESTBOUND LEFT	HIAPO ST WESTBOUND THRU	HIAPO ST WESTBOUND RGHT	TOTAL VOLUME 15 MIN	TOTAL VOLUME HOURLY
630 - 645	5	81	1	10	192	10	15	5	14	5	1	37	392	
645 - 700	12	65	3	14	155	9	16	8	29	5	2	20	330	
700 - 715	15	57	1	25	135	7	15	10	26	7	3	30	331	
715 - 730	16	67	6	21	162	9	15	16	29	15	5	40	401	1,462
730 - 745	16	81	5	16	148	16	28	28	44	31	6	30	449	1,519
745 - 800	20	79	2	12	146	11	12	6	10	9	14	25	350	1,531
800 - 815	19	79	3	15	82	19	13	2	13	5	16	17	283	1,483
815 - 830	10	54	5	11	96	14	8	4	10	2	5	8	227	1,309
830 - 845	0	0	0	0	0	0	0	0	0	0	1	0	1	861
PEAK 15 MINUTE PERIOD: 730 - 745	16	81	5	16	148	16	28	28	44	31	6	30	449	--
PEAK HOUR PERIOD: 700 - 800	71	286	14	74	591	43	70	68	109	62	28	125	--	1531
PEAK HOUR FACTOR: 700 - 800	0.74	0.88	0.58	0.74	0.91	0.67	0.63	0.56	0.62	0.50	0.58	0.78		
		0.88			0.92			0.88			0.88			

PEAK HOUR TURNING MOVEMENT DIAGRAM



ATA INC. 17-Nov-95

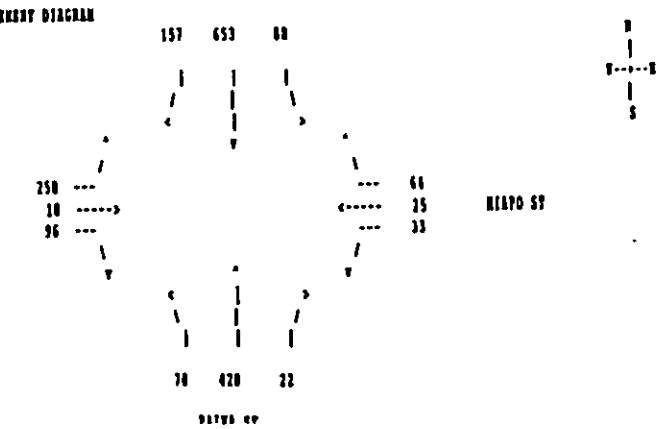
INTERSECTION COUNT SURVEY SUMMARY

North/South Street : PAIWA ST
East/West Street : HIAPO ST
Weather : CLEAR

Period: PM
Date: 11-16-95
Day : THURSDAY

15 MINUTE PERIOD	PAIWA ST NORTHBOUND LEFT	PAIWA ST NORTHBOUND THRU	PAIWA ST NORTHBOUND RGHT	PAIWA ST SOUTHBOUND LEFT	PAIWA ST SOUTHBOUND THRU	PAIWA ST SOUTHBOUND RGHT	HIAPO ST EASTBOUND LEFT	HIAPO ST EASTBOUND THRU	HIAPO ST EASTBOUND RGHT	HIAPO ST WESTBOUND LEFT	HIAPO ST WESTBOUND THRU	HIAPO ST WESTBOUND RGHT	TOTAL VOLUME 15 MIN	TOTAL VOLUME HOURLY
330 - 345	15	99	6	16	150	33	22	2	14	2	7	16	370	
345 - 400	15	105	6	20	180	43	18	3	22	6	5	20	445	
400 - 415	21	120	4	21	139	42	196	3	35	11	8	15	615	
415 - 430	19	92	6	20	168	48	20	4	14	10	7	16	416	1,846
430 - 445	15	103	8	27	162	32	26	8	25	6	5	13	420	1,896
445 - 500	25	92	4	10	163	43	27	3	24	8	3	16	428	1,871
500 - 515	20	91	3	17	161	22	33	2	26	7	8	15	405	1,661
515 - 530	21	82	4	16	163	27	19	6	21	8	5	21	373	1,618
PEAK 15 MINUTE PERIOD: 400 - 415	21	120	4	21	139	42	196	3	35	11	8	15	615	--
PEAK HOUR PERIOD: 345 - 445	70	420	22	88	653	157	258	10	96	33	25	64	--	1856
PEAK HOUR FACTOR: 345 - 445	0.83	0.88	0.69	0.81	0.89	0.91	0.33	0.63	0.69	0.75	0.78	0.80		
		0.88			0.91			0.39			0.96			

PEAK HOUR TURNING MOVEMENT DIAGRAM



17-Nov-95

ATA INC.

INTERSECTION COUNT SURVEY SUMMARY

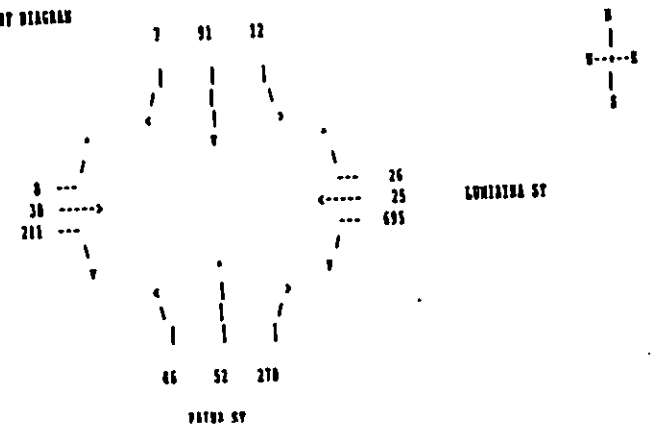
North/South Street : PAIWA ST
East/West Street : LOWLAIWA ST
Weather : CLEAR

Period: AM
Date: 11-16-95
Day : THURSDAY

15 MINUTE PERIOD	PAIWA ST NORTHBOUND LEFT	THRU	RGHT	PAIWA ST SOUTHBOUND LEFT	THRU	RGHT	LOWLAIWA ST EASTBOUND LEFT	THRU	RGHT	LOWLAIWA ST WESTBOUND LEFT	THRU	RGHT	TOTAL VOLUME 15 MIN	HOURLY
630 - 645	14	13	50	1	13	1	1	6	33	169	12	5	310	
645 - 700	21	16	69	1	20	3	4	14	62	213	9	7	439	
700 - 715	5	9	52	3	23	2	3	11	52	169	11	3	343	
715 - 730	10	8	69	4	26	2	1	7	56	172	1	5	361	1,661
730 - 745	10	19	80	4	22	0	0	6	61	161	4	11	338	1,491
745 - 800	22	22	51	4	15	0	1	4	29	123	6	10	287	1,329
800 - 815	20	18	55	3	16	3	2	6	17	103	9	5	255	1,241
815 - 830	14	5	57	9	17	0	1	3	22	98	5	2	233	1,113

PEAK 15 MINUTE PERIOD: 645 - 700	21	16	69	1	20	3	4	14	62	213	9	7	439	--
PEAK HOUR PERIOD: 645 - 745	46	52	270	12	51	7	8	38	211	695	25	26	--	1481
PEAK HOUR FACTOR: 645 - 745	0.55	0.68	0.84	0.75	0.88	0.58	0.50	0.68	0.85	0.82	0.57	0.59		
		0.84			0.86			0.80			0.81			

PEAK HOUR TURNING MOVEMENT DIAGRAM



17-Nov-95

ATA INC.

INTERSECTION COUNT SURVEY SUMMARY

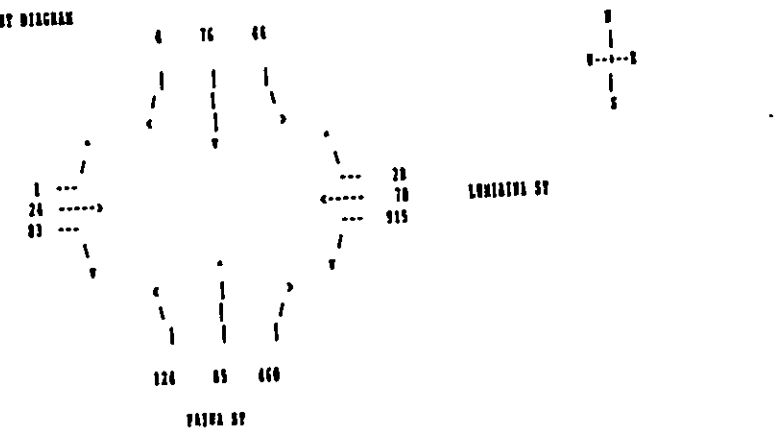
North/South Street : PAIWA ST
East/West Street : LOWLAIWA ST
Weather : CLEAR

Period: PM
Date: 11-16-95
Day : THURSDAY

15 MINUTE PERIOD	PAIWA ST NORTHBOUND LEFT	THRU	RGHT	PAIWA ST SOUTHBOUND LEFT	THRU	RGHT	LOWLAIWA ST EASTBOUND LEFT	THRU	RGHT	LOWLAIWA ST WESTBOUND LEFT	THRU	RGHT	TOTAL VOLUME 15 MIN	HOURLY
330 - 345	24	25	115	17	36	3	0	7	23	226	26	8	510	
345 - 400	34	21	113	3	13	0	0	7	21	231	18	7	458	
400 - 415	20	17	117	8	14	1	1	4	20	239	13	5	467	1,914
415 - 430	38	22	115	16	13	0	0	6	19	219	13	8	473	1,837
430 - 445	39	23	112	13	15	2	0	10	26	206	16	7	429	1,830
445 - 500	40	19	108	6	8	1	0	8	17	198	21	7	503	1,870
500 - 515	43	26	123	15	8	0	0	10	25	230	16	7	335	1,740
515 - 530	35	19	84	7	7	1	2	8	25	123	14	10		

PEAK 15 MINUTE PERIOD: 330 - 345	24	25	115	17	36	3	0	7	23	226	26	8	510	--
PEAK HOUR PERIOD: 330 - 430	124	85	460	44	76	4	1	24	83	915	78	28	--	1914
PEAK HOUR FACTOR: 330 - 430	0.82	0.85	0.98	0.65	0.53	0.33	0.25	0.86	0.90	0.96	0.67	0.88		
		0.96			0.55			0.90			0.97			

PEAK HOUR TURNING MOVEMENT DIAGRAM



Austin, Tsutsumi & Associates Inc.

Location: NI/PAIWA NB-OFF | 24-Hour Machine Count | Site: 1=WSB 2=NBB
Weather : CLEAR | WAIPAHU TRAFFIC STUDY | Date: 11/15/95
Counter : 18 | File: [none]

Interval Begin	Ch 1 AM		Ch 1 PM		Ch 2 AM		Ch 2 PM		COMBINED AM		COMBINED PM		Day : Wednesday
12:00	14	59	32	116	12	28	150	588	26	87	182	704	
12:15	17		22		4		136		21		158		
12:30	19		20		7		159		26		179		
12:45	9		42		5		143		14		185		
1:00	5	22	40	140	1	13	128	587	6	35	168	727	
1:15	8		42		8		148		16		190		
1:30	2		30		2		166		4		196		
1:45	7		28		2		145		9		173		
2:00	6	13	47	179	4	21	137	572	10	34	184	751	
2:15	0		28		5		145		5		173		
2:30	4		58		9		130		13		188		
2:45	3		46		3		160		6		206		
3:00	0	6	44	216	2	15	164	723	2	21	208	939	
3:15	4		52		5		178		9		230		
3:30	1		58		4		200		5		258		
3:45	1		62		4		181		5		243		
4:00	4	20	110	332	3	10	152	685	7	30	262	1,017	
4:15	4		62		1		159		5		221		
4:30	4		78		3		206		7		284		
4:45	8		82		3		168		11		250		
5:00	4	26	56	271	9	71	166	760	13	97	222	1,031	
5:15	3		72		15		172		18		244		
5:30	5		87		23		197		28		284		
5:45	14		56		24		225		38		281		
6:00	20	81	57	223	18	162	181	685	38	243	238	908	
6:15	17		76		36		165		53		241		
6:30	22		43		48		169		70		212		
6:45	22		47		60		170		82		217		
7:00	20	154	36	96	60	246	158	547	80	400	194	643	
7:15	44		20		64		140		108		160		
7:30	50		21		50		148		100		169		
7:45	40		19		72		101		112		120		
8:00	23	80	30	118	81	343	95	322	104	423	125	440	
8:15	16		24		87		101		103		125		
8:30	16		36		82		64		98		100		
8:45	25		28		93		62		118		90		
9:00	16	95	28	84	99	431	68	245	115	526	96	329	
9:15	26		19		96		71		122		90		
9:30	25		19		122		46		147		65		
9:45	28		18		114		60		142		78		
10:00	36	106	13	91	127	573	33	98	163	679	46	189	
10:15	32		26		152		36		184		62		
10:30	19		28		165		16		184		44		
10:45	19		24		129		13		148		37		
11:00	22	122	16	88	150	574	22	83	172	696	38	171	
11:15	41		20		133		14		174		34		
11:30	27		22		152		16		179		38		
11:45	32		30		139		31		171		61		
Totals	784		1,954		2,487		5,895		3,271		7,849		
Split %	24.0		24.9		76.0		75.1						
Day Totals		2,738				8,382				11,120			
Day Splits		24.6				75.4							
Peak Hour	7:15		4:00		10:15		5:15		11:00		5:15		
Volume	157		332		596		775		696		1,047		
Factor	0.79		0.75		0.90		0.86		0.97		0.92		

Austin, Tsutsumi & Associates Inc.

Location: NI/PAIWA NB-OFF | 24-Hour Machine Count | Site: 1=WSB 2=NBB
Weather : CLEAR | WAIPAHU TRAFFIC STUDY | Date: 11/16/95
Counter : 18 | File: [none]

Interval Begin	Ch 1 AM		Ch 1 PM		Ch 2 AM		Ch 2 PM		COMBINED AM		COMBINED PM		Day : Thursday
12:00	13	43	40	128	15	33	140	580	28	76	180	708	
12:15	12		32		9		142		21		174		
12:30	12		28		6		154		18		182		
12:45	6		28		3		144		9		172		
1:00	8	27	35	151	7	28	147	574	15	55	182	725	
1:15	8		48		10		130		18		178		
1:30	6		38		7		142		13		180		
1:45	5		30		4		155		9		185		
2:00	4	15	28	190	10	19	142	542	14	34	170	732	
2:15	6		34		6		130		12		164		
2:30	4		56		2		132		6		188		
2:45	1		72		1		138		2		210		
3:00	2	10	49	272	3	7	167	696	5	17	216	968	
3:15	4		63		1		167		5		230		
3:30	2		68		2		183		4		251		
3:45	2		92		1		179		3		271		
4:00	5	14	58	292	4	22	171	750	9	36	229	1,042	
4:15	3		90		8		194		11		284		
4:30	2		74		4		195		6		269		
4:45	4		70		6		190		10		260		
5:00	8	31	60	271	6	57	164	707	14	88	224	978	
5:15	6		92		6		162		12		254		
5:30	4		72		20		196		24		268		
5:45	13		47		25		185		38		232		
6:00	18	69	68	240	27	173	138	601	45	242	206	841	
6:15	8		70		46		156		54		226		
6:30	26		52		51		181		77		233		
6:45	17		50		49		126		66		176		
7:00	34	132	36	99	31	197	142	526	65	329	178	625	
7:15	34		24		39		129		73		153		
7:30	30		11		58		141		88		152		
7:45	34		28		69		114		103		142		
8:00	23	96	46	121	93	349	93	320	116	445	139	441	
8:15	32		26		76		79		108		105		
8:30	20		28		74		84		94		112		
8:45	21		21		106		64		127		85		
9:00	18	89	34	116	86	421	53	227	104	510	87	343	
9:15	21		20		107		62		128		82		
9:30	16		34		106		70		122		104		
9:45	34		28		122		42		156		70		
10:00	19	86	20	74	127	434	50	161	146	720	70	235	
10:15	33		20		159		46		192		66		
10:30	20		10		154		43		174		53		
10:45	14		24		194		22		208		46		
11:00	32	122	22	82	162	620	21	105	194	742	43	187	
11:15	32		16		146		27		178		43		
11:30	30		22		144		30		174		52		
11:45	28		22		168		27		196		49		
Totals	734		2,036		2,560		5,789		3,294		7,825		
Split %	22.3		26.0		77.7		74.0						
Day Totals		2,770				8,349				11,119			
Day Splits		24.9				75.1							
Peak Hour	7:00		3:45		10:15		4:00		10:15		3:45		
Volume	132		314		669		750		768		1,053		
Factor	0.97		0.85		0.86		0.96		0.92		0.93		

Austin, Tsutsumi & Associates Inc.

Location: H-1/PAIWA WB-ON RAMP | 24-Hour Machine Count | Site: 1=SUB 2=SUB
Weather : CLEAR | WAIPAHU TRAFFIC STUDY | Date: 11/15/95
Counter : ZB | File: [none]

Interval Begin	Ch 1 AM		Ch 1 PM		Ch 2 AM		Ch 2 PM		COMBINED AM		COMBINED PM		Day : Wednesday
12:00	7	29	90	422	6	32	36	124	13	61	126	546	
12:15	7		111		7		24		14		135		
12:30	6		104		12		36		18		140		
12:45	9		117		7		28		16		145		
1:00	4	15	91	427	5	13	34	165	9	28	125	592	
1:15	5		106		3		37		8		143		
1:30	2		110		1		52		3		162		
1:45	4		120		4		42		8		162		
2:00	3	8	98	422	2	5	48	164	5	13	146	586	
2:15	0		102		1		44		1		146		
2:30	2		104		2		38		4		142		
2:45	3		118		0		34		3		152		
3:00	1	10	97	427	6	18	38	184	7	28	135	611	
3:15	1		88		1		32		2		120		
3:30	4		107		5		54		9		161		
3:45	4		135		6		60		10		195		
4:00	7	40	116	424	3	22	32	144	10	62	148	568	
4:15	8		90		7		44		15		134		
4:30	13		91		10		36		23		127		
4:45	12		127		2		32		14		159		
5:00	18	131	133	496	12	66	29	159	30	197	162	655	
5:15	24		133		16		42		40		175		
5:30	36		107		16		41		52		148		
5:45	53		123		22		47		75		170		
6:00	80	500	123	452	34	233	35	167	114	733	158	619	
6:15	142		130		96		44		238		174		
6:30	140		103		68		39		208		142		
6:45	138		96		35		49		173		145		
7:00	122	413	96	388	64	220	46	160	186	633	142	548	
7:15	106		111		50		42		156		153		
7:30	98		90		54		38		152		128		
7:45	87		91		52		34		139		125		
8:00	84	296	102	393	45	133	30	155	129	427	132	548	
8:15	66		108		36		47		102		155		
8:30	76		85		26		48		102		133		
8:45	68		98		26		30		94		128		
9:00	54	244	88	346	38	106	30	146	92	350	118	492	
9:15	55		79		18		40		73		119		
9:30	62		80		32		46		94		126		
9:45	73		99		18		30		91		129		
10:00	70	280	44	161	22	98	30	98	92	378	74	259	
10:15	60		27		22		27		82		54		
10:30	70		52		32		20		102		72		
10:45	80		38		22		21		102		59		
11:00	83	330	17	59	30	117	9	45	113	447	26	104	
11:15	83		14		26		12		109		26		
11:30	69		12		23		14		92		26		
11:45	95		16		38		10		133		26		
Totals	2,294		4,417		1,063		1,711		3,357		6,128		
Split %	68.3		72.1		31.7		27.9						
Day Totals		6,711				2,774				9,485			
Day Splits		70.8				29.2							
Peak Hour	6:15		4:45		6:15		3:30		6:15		5:00		
Volume	542		500		263		190		805		655		
Factor	0.95		0.94		0.68		0.79		0.85		0.94		

Austin, Tsutsumi & Associates Inc.

Location: H-1/PAIWA WB-ON RAMP | 24-Hour Machine Count | Site: 1=SUB 2=SUB
Weather : CLEAR | WAIPAHU TRAFFIC STUDY | Date: 11/16/95
Counter : ZB | File: [none]

Interval Begin	Ch 1 AM		Ch 1 PM		Ch 2 AM		Ch 2 PM		COMBINED AM		COMBINED PM		Day : Thursday
12:00	9	23	91	397	10	34	24	114	19	57	115	511	
12:15	7		104		12		32		19		136		
12:30	4		98		6		30		10		126		
12:45	3		106		6		28		9		134		
1:00	7	14	102	414	2	15	34	132	9	29	136	546	
1:15	2		117		5		34		7		151		
1:30	1		96		4		28		5		124		
1:45	4		99		4		36		8		135		
2:00	3	19	88	397	1	4	34	176	4	23	122	573	
2:15	5		95		2		44		7		139		
2:30	5		106		0		54		5		160		
2:45	6		108		1		44		7		152		
3:00	5	23	98	430	4	17	50	172	9	40	148	602	
3:15	2		77		5		38		7		115		
3:30	6		136		2		44		8		180		
3:45	10		119		6		40		16		159		
4:00	3	38	116	452	2	22	54	161	5	60	170	613	
4:15	8		115		1		36		7		151		
4:30	12		130		13		24		25		154		
4:45	17		91		6		47		23		138		
5:00	16	127	96	463	19	78	34	170	35	205	130	633	
5:15	26		136		17		38		43		174		
5:30	31		116		20		49		51		165		
5:45	54		115		22		49		76		164		
6:00	94	505	114	462	46	247	34	150	140	752	148	612	
6:15	100		112		68		42		168		154		
6:30	165		124		75		44		220		168		
6:45	166		117		58		30		224		142		
7:00	113	415	98	358	64	204	26	118	177	619	124	476	
7:15	126		97		41		30		167		127		
7:30	82		81		46		30		128		111		
7:45	94		82		53		32		147		114		
8:00	71	267	99	314	42	144	22	104	113	411	121	418	
8:15	62		72		42		24		104		96		
8:30	64		63		26		29		90		92		
8:45	70		80		34		29		104		109		
9:00	60	252	91	312	25	86	30	142	85	338	121	454	
9:15	58		54		12		36		70		90		
9:30	68		98		14		40		82		138		
9:45	66		69		35		36		101		105		
10:00	62	292	58	191	20	88	28	100	82	380	86	291	
10:15	55		58		28		32		83		90		
10:30	86		41		26		18		112		59		
10:45	89		34		14		22		103		56		
11:00	68	320	14	57	31	80	17	55	99	400	31	112	
11:15	87		19		13		14		100		33		
11:30	86		6		16		8		102		14		
11:45	79		18		20		16		99		34		
Totals	2,295		4,247		1,019		1,594		3,314		5,841		
Split %	69.3		72.7		30.7		27.3						
Day Totals		6,542				2,613				9,155			
Day Splits		71.5				28.5							
Peak Hour	6:30		3:30		6:15		2:15		6:15		3:30		
Volume	550		486		265		192		789		660		
Factor	0.83		0.89		0.88		0.89		0.88		0.92		

Austin, Tsutsumi & Associates Inc.

Location: H1/PAIWA EB-OFF
Weather : CLEAR
Counter : 48

24-Hour Machine Count
WAIPAHU TRAFFIC STUDY

Site: 1=EBB 2=ESB
Date: 11/15/95
File: (none)

Day : Wednesday

Interval Begin	Ch 1 AM		Ch 1 PM		Ch 2 AM		Ch 2 PM		COMBINED AM		COMBINED PM	
12:00	6	12	80	356	4	9	34	210	10	21	114	566
12:15	2		84		0		56		2		140	
12:30	4		98		4		56		8		154	
12:45	0		94		1		64		1		158	
1:00	0	2	108	429	2	7	50	214	2	9	158	643
1:15	1		98		3		40		4		138	
1:30	1		115		0		56		1		171	
1:45	0		108		2		68		2		176	
2:00	0	22	130	537	4	22	90	350	4	44	220	887
2:15	4		146		6		108		10		254	
2:30	8		142		6		74		14		216	
2:45	10		119		6		78		16		197	
3:00	12	76	116	441	4	53	60	258	16	129	176	699
3:15	10		130		8		88		18		218	
3:30	20		97		15		52		35		149	
3:45	34		98		26		58		60		156	
4:00	34	366	115	489	28	365	67	295	62	731	182	784
4:15	70		126		60		72		130		198	
4:30	86		132		120		72		206		204	
4:45	176		116		157		84		333		200	
5:00	176	519	122	430	183	569	68	239	359	1,088	190	669
5:15	126		104		122		52		248		156	
5:30	87		128		114		65		201		193	
5:45	130		76		150		54		280		130	
6:00	134	424	108	330	216	506	42	159	350	930	150	489
6:15	138		80		196		36		334		116	
6:30	75		66		54		43		129		109	
6:45	77		76		40		38		117		114	
7:00	81	353	66	231	46	174	33	121	127	527	99	352
7:15	92		51		56		28		148		79	
7:30	80		64		29		20		109		84	
7:45	100		50		43		40		143		90	
8:00	74	349	30	142	22	141	24	100	96	490	54	242
8:15	114		44		32		28		146		72	
8:30	56		32		42		30		98		62	
8:45	105		36		45		18		150		54	
9:00	113	434	26	72	32	150	31	84	145	584	57	156
9:15	112		15		34		17		146		32	
9:30	102		16		40		20		142		36	
9:45	107		15		44		16		151		31	
10:00	105	395	20	47	40	153	9	44	145	548	29	91
10:15	104		8		40		14		144		22	
10:30	90		4		37		12		127		16	
10:45	96		15		36		9		132		24	
11:00	96	381	3	17	49	171	6	20	145	552	9	37
11:15	92		8		36		2		128		10	
11:30	93		3		42		6		135		9	
11:45	100		3		44		6		144		9	
Totals	3,333		3,521		2,320		2,094		5,653		5,615	
Split %	59.0		62.7		41.0		37.3					
Day Totals	6,854				4,414				11,268			
Day Splits	60.8				39.2							
Peak Hour	4:45		2:00		5:30		2:00		5:30		2:00	
Volume	565		537		676		350		1,165		887	
Factor	0.80		0.92		0.78		0.81		0.83		0.87	

Austin, Tsutsumi & Associates Inc.

Location: H1/PAIWA EB-OFF
Weather : CLEAR
Counter : 48

24-Hour Machine Count
WAIPAHU TRAFFIC STUDY

Site: 1=EBB 2=ESB
Date: 11/16/95
File: (none)

Day : Thursday

Interval Begin	Ch 1 AM		Ch 1 PM		Ch 2 AM		Ch 2 PM		COMBINED AM		COMBINED PM	
12:00	4	20	103	403	0	10	42	180	4	30	145	583
12:15	2		128		4		48		6		176	
12:30	7		74		2		46		9		120	
12:45	7		98		4		44		11		142	
1:00	0	4	80	418	2	9	54	247	2	13	134	665
1:15	2		98		6		50		8		148	
1:30	2		128		1		74		3		202	
1:45	0		112		0		69		0		181	
2:00	2	22	129	478	4	18	78	298	6	40	207	776
2:15	4		116		3		110		7		224	
2:30	9		120		0		56		9		176	
2:45	7		115		11		54		18		169	
3:00	7	68	105	458	6	45	71	250	13	113	176	708
3:15	18		124		7		66		25		190	
3:30	20		122		12		60		32		182	
3:45	23		107		20		53		43		160	
4:00	31	435	98	429	28	388	48	220	59	823	146	649
4:15	110		120		108		58		218		178	
4:30	120		118		112		52		232		170	
4:45	174		93		140		62		314		155	
5:00	124	350	100	363	118	364	70	220	242	714	170	583
5:15	80		100		70		47		150		147	
5:30	60		105		96		64		156		169	
5:45	86		58		80		39		166		97	
6:00	82	348	66	214	90	284	34	126	172	632	100	340
6:15	84		53		92		36		176		89	
6:30	92		56		50		30		142		86	
6:45	90		39		52		26		142		65	
7:00	70	365	53	171	40	161	38	138	110	526	91	309
7:15	102		36		47		24		149		60	
7:30	112		34		40		44		152		78	
7:45	81		48		34		32		115		80	
8:00	86	416	48	124	28	134	31	116	114	550	79	240
8:15	128		30		33		30		161		60	
8:30	104		24		34		24		138		50	
8:45	98		22		39		29		137		51	
9:00	108	443	26	73	46	148	21	65	154	591	47	138
9:15	98		24		42		12		140		36	
9:30	133		10		30		20		163		30	
9:45	104		13		30		12		134		25	
10:00	103	412	18	46	40	146	15	37	143	558	33	83
10:15	105		6		42		8		147		14	
10:30	110		10		32		8		142		18	
10:45	94		12		32		6		126		18	
11:00	85	391	5	13	34	150	4	23	119	541	9	36
11:15	128		2		34		9		162		11	
11:30	88		2		37		4		125		6	
11:45	90		4		45		6		135		10	
Totals	3,274		3,190		1,857		1,920		5,131		5,110	
Split %	63.8		62.4		36.2		37.6					
Day Totals	6,464				3,777				10,241			
Day Splits	63.1				36.9							
Peak Hour	4:15		1:30		4:15		1:30		4:15		1:30	
Volume	528		483		478		331		1,006		814	
Factor	0.76		0.94		0.85		0.75		0.80		0.91	

Austin, Tsutsumi & Associates Inc.

Location: H-1/PAHIA ST EB ON-RAMP
Weather: CLEAR
Counter: LEOPOLD-STEVENS

24-Hour Machine Count
WAIPAHU TRAFFIC STUDY

Site: 1-EB ON
Date: 11-10-05
File: NONE

Interval Begin	Ch 1 AM		Ch 1 PM		Ch 2 AM		Ch 2 PM		COMBINED AM		COMBINED PM		Day	Thursday
1200	15	30	157	997	-	0	-	0	15	30	157	997		
1215	11		138		-		-		11		138			
1230	6		158		-		-		6		158			
1245	7		88		-		-		7		158			
100	9	30	146	918	-	0	-	0	9	30	146	918		
115	12		170		-		-		12		170			
130	4		136		-		-		4		136			
145	6		167		-		-		6		167			
200	11	30	146	889	-	0	-	0	11	30	146	839		
215	14		149		-		-		14		149			
230	10		170		-		-		10		170			
245	8		135		-		-		8		135			
300	5	22	168	838	-	0	-	0	5	22	168	838		
315	12		146		-		-		12		146			
330	2		152		-		-		2		152			
345	7		166		-		-		7		166			
400	10	105	156	836	-	0	-	0	10	105	156	836		
415	21		156		-		-		21		156			
430	16		165		-		-		16		165			
445	16		158		-		-		16		158			
500	20	522	146	966	-	0	-	0	20	522	146	966		
515	102		146		-		-		102		146			
530	156		157		-		-		156		157			
545	288		166		-		-		288		166			
600	138	810	162	916	-	0	-	0	138	810	162	914		
615	137		134		-		-		137		134			
630	136		134		-		-		136		134			
645	174		169		-		-		174		169			
700	136	844	139	481	-	0	-	0	136	844	139	481		
715	158		134		-		-		158		134			
730	164		166		-		-		164		166			
745	166		98		-		-		166		98			
800	536	971	164	371	-	0	-	0	536	971	164	371		
815	435		85		-		-		435		85			
830	315	514	85	284	-	0	-	0	315	514	85	284		
845	199		85		-		-		199		85			
900	473	748	85	248	-	0	-	0	473	748	85	248		
915	275		85		-		-		275		85			
930	111	386	85	117	-	0	-	0	111	386	85	117		
945	75		32		-		-		75		32			
1000	136		32		-		-		136		32			
Total	4,044		3,570		0		0		4,044		3,570			
Split	100%		100%		0%		0%							
Day totals		8,720				0				8,720				
Day Splits		100%				0%								

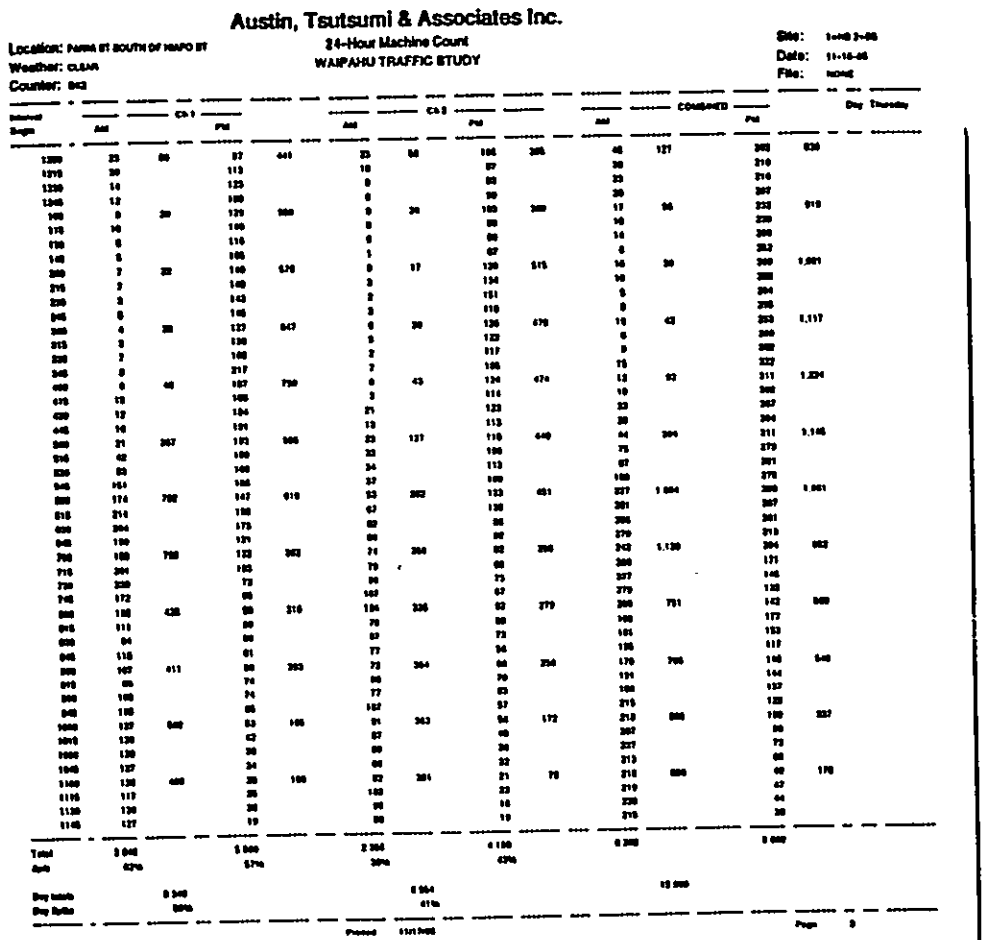
Austin, Tsutsumi & Associates Inc.

Location: H-1/PAHIA ST EB ON-RAMP
Weather: CLEAR
Counter: LEOPOLD-STEVENS

24-Hour Machine Count
WAIPAHU TRAFFIC STUDY

Site: 1-EB ON
Date: 11-10-05
File: NONE

Interval Begin	Ch 1 AM		Ch 1 PM		Ch 2 AM		Ch 2 PM		COMBINED AM		COMBINED PM		Day	Thursday
1200	21	42	154	997	-	0	-	0	21	42	154	997		
1215	14		138		-		-		14		138			
1230	15		158		-		-		15		158			
1245	6		158		-		-		6		158			
100	9	30	139	923	-	0	-	0	9	30	139	839		
115	12		162		-		-		12		162			
130	5		146		-		-		5		146			
145	9		166		-		-		9		166			
200	9	19	158	888	-	0	-	0	9	19	158	888		
215	9		388		-		-		9		388			
230	4		156		-		-		4		156			
245	5		178		-		-		5		178			
300	4	25	151	886	-	0	-	0	4	25	151	886		
315	7		143		-		-		7		143			
330	9		133		-		-		9		133			
345	8		178		-		-		8		178			
400	10	103	166	917	-	0	-	0	10	103	166	917		
415	12		152		-		-		12		152			
430	22		155		-		-		22		155			
445	47		146		-		-		47		146			
500	66	478	136	884	-	0	-	0	66	478	136	884		
515	95		175		-		-		95		175			
530	139		139		-		-		139		139			
545	178		168		-		-		178		168			
600	191	854	172	868	-	0	-	0	191	854	172	868		
615	173		158		-		-		173		158			
630	168		168		-		-		168		168			
645	222		168		-		-		171		168			
700	88	691	168	845	-	0	-	0	88	491	168	845		
715	115		168		-		-		115		168			
730	142		134		-		-		142		134			
745	436		161		-		-		136		161			
800	477	973	74	273	-	0	-	0	124	477	74	273		
815	496		199		-		-		496		199			
830	320		88		-		-		320		88			
845	199		78		-		-		199		78			
900	473	748	85	248	-	0	-	0	473	748	85	248		
915	275		85		-		-		275		85			
930	111	386	85	117	-	0	-	0	111	386	85	117		
945	75		32		-		-		75		32			
1000	136		32		-		-		136		32			
Total	4,044		3,570		0		0		4,044		3,570			
Split	100%		100%		0%		0%							
Day totals		8,720				0				8,720				
Day Splits		100%				0%								



Austin, Tsutsumi & Associates Inc.

24-Hour Machine Count

WAIPAHU TRAFFIC STUDY

Location: PAIWA ST SOUTH OF HAPO ST
Weather: CLEAR
Counter: 843

Site: 1-HR 3-HR
Date: 11-16-06
File: NONE

Day: Thursday

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

APPENDIX B

. EXISTING LOS CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST

METROAREA	NONCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	.0	.0	3.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	91	0

Movement Parameters

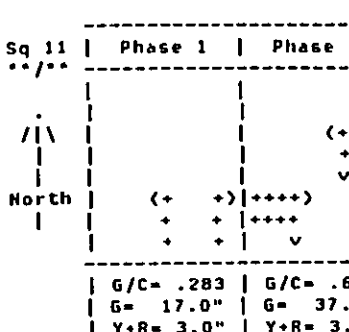
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	0	0	0	275	255	91	0	65	107	330	0
WIDTHS	.0	.0	.0	.0	12.0	.0	11.0	.0	11.0	.0	12.0	.0
LANES	0	0	0	0	1	0	1	0	1	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	NO
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	0	0	0	1065	0	1172	0	1465	0	1572	0

Phasing Parameters

SEQUENCES	11	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	NO	NO	NO	NO	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	17.00	37.00					
YELLOWTIMES	3.00	3.00					
CRITICALS	0	0					
EXCESS	0						

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST
Degree of Saturation (v/c) .63 Vehicle Delay 8.1 Level of Service



C= 60 sec G= 54.0 sec = 90.0% Y= 6.0 sec = 10.0% Ped= .0 sec = .

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	90% Ma Queue
NB Approach								10.0	B+	
RT	11/1	.003	.300	300	352	1	.003	9.5	B+	25 f
LT	11/1	.073	.300	385	440	68	.155	10.0	B+	40 f
WB Approach								11.3	B	
LT+TH	12/1	.556	.633	647	674	557	.826	11.3	B	172 f
EB Approach								3.9	A	
TH+RT	12/1	.327	.633	977	995	460	.462	3.9	A	142 f

AMFAC - WAIPAHU TRAFFIC STUDY
1995 - EXISTING CONDITIONS
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

12/08/95
10:18:56

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	.0	.0	3.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	140	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	0	0	0	496	178	140	0	90	96	288	0
WIDTHS	.0	.0	.0	.0	12.0	.0	11.0	.0	11.0	.0	12.0	.0
LANES	0	0	0	0	1	0	1	0	1	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	NO
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	0	0	0	1238	0	1172	0	1465	0	1570	0

Phasing Parameters

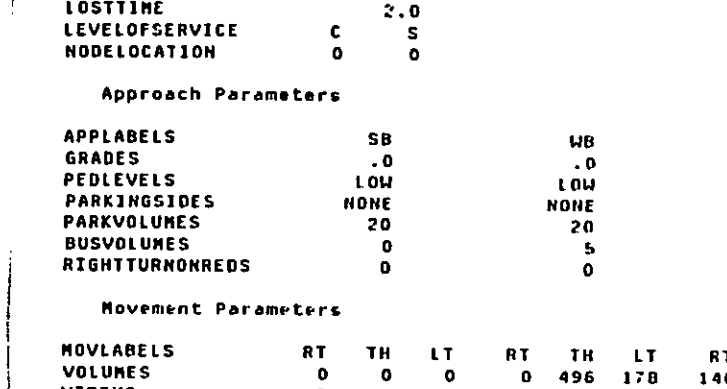
SEQUENCES	11	ALL					
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE	NONE
OVERLAPS	NO	NO	NO	NO	OFFSET	.00	1
CYCLES	60	180	10		PEDTIME	.0	0
GREENTIMES	17.00	37.00					
YELLOWTIMES	3.00	3.00					
CRITICALS	0	0					
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
1995 - EXISTING CONDITIONS
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

12/08/
10:19:

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST
Degree of Saturation (v/c) .68 Vehicle Delay 11.5 Level of Service



C= 60 sec G= 54.0 sec = 90.0% Y= 6.0 sec = 10.0% Ped= .0 sec = .(

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	LOS	90% Ma> Queue
NB Approach								10.2	B	
RT	11/1	.003	.300	300	352	1	.003	9.5	B+	25 ft
LT	11/1	.096	.300	385	440	95	.216	10.2	B	56 ft
WB Approach								16.1	C+	
LT+TH	12/1	.596	.633	760	784	709	.904	16.1	C+	219 ft
EB Approach								3.7	A	
TH+RT	12/1	.293	.633	977	995	404	.406	3.7	A	125 ft

AMFAC - WAIPAHU TRAFFIC STUDY
1995 - EXISTING CONDITIONS
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

12/08/95
10:40:05

SIGNAL94/TEAPAC(V1 L1.4) - Summary of Parameter Values

Intersection Parameters for Int # 2 - WAIPAHU ST & MOKUOLA ST

METROAREA	NONCBD
LOSTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	.0	.0	2.0	.0
GRADES	LOW	LOW	LOW	LOW
PEDLEVELS	NONE	NONE	BOTH	NONE
PARKINGSIDES	20	20	20	20
PARKVOLUMES	0	5	0	5
BUSVOLUMES	0	0	0	0
RIGHTTURNONREDS				

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	0	0	0	540	350	137	0	53	116	299	0
WIDTHS	.0	.0	.0	.0	12.0	.0	.0	12.0	.0	.0	12.0	.0
LANES	0	0	0	0	1	0	0	1	0	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	0	0	0	1216	0	0	992	0	0	1562	0

Phasing Parameters

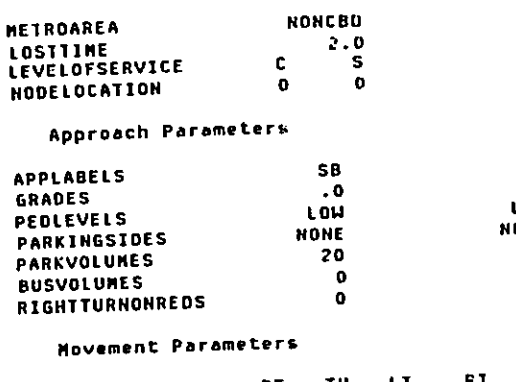
SEQUENCES	11	ALL			LEADLAGS	NONE NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00 1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0 0
CYCLES	60	180	10			
GREENTIMES	17.52	34.48				
YELLOWTIMES	4.00	4.00				
CRITICALS	8	5				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
1995 - EXISTING CONDITIONS
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

12/08/
10:40:

SIGNAL94/TEAPAC(V1 L1.4) - Capacity Analysis Summary

Intersection Averages for Int # 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) .96 Vehicle Delay 31.7@ Level of Service
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	L S	90% Queue
NB Approach								13.6	B	
LT+TH+RT	12/1	.252	.325	274	323	200	.619	13.6	*B	114 f
WB Approach								48.3@	E+	
LT+TH	12/1	.776	.608	711	739	936	1.267	48.3@	*E+	309 f
EB Approach								4.4	A	
TH+RT	12/1	.315	.608	928	950	437	.460	4.4	A	144 f

AMFAC - WAIPAHU TRAFFIC STUDY 12/08/95
1995 - EXISTING CONDITIONS 10:42:01
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 2 - WAIPAHU ST & MOKUOLA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	0	

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	0	0	0	611	197	217	0	72	88	401	0
WIDTHS	.0	.0	.0	.0	12.0	.0	.0	12.0	.0	.0	12.0	.0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	0	0	0	1162	0	0	991	0	0	1591	0
LANES	0	0	0	0	1	0	0	1	0	0	1	0

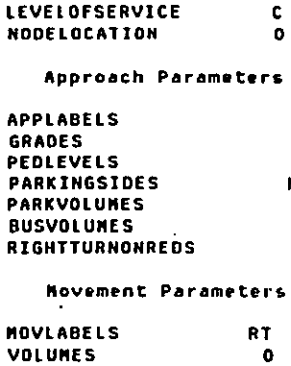
Phasing Parameters

SEQUENCES	11	ALL					
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE	NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00	1
CYCLES	60	180	10		PEDTIME	.0	0
GREENTIMES	17.52	34.48					
YELLOWTIMES	4.00	4.00					
CRITICALS	8	5					
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY 12/08/
1995 - EXISTING CONDITIONS 10:42:
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) .95 Vehicle Delay 33.5@ Level of Service
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .(

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	90% Ma Queue
NB Approach								38.6	D	
LT+TH+RT	12/1	.356	.325	273	322	304	.944	38.6	*D	173 f
WB Approach								49.0@	E+	
LT+TH	12/1	.743	.608	678	706	850	1.204	49.0@	*E+	281 f
EB Approach								4.9	A	
TH+RT	12/1	.357	.608	946	967	515	.533	4.9	A	170 f

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	300	0	0	0

Movement Parameters

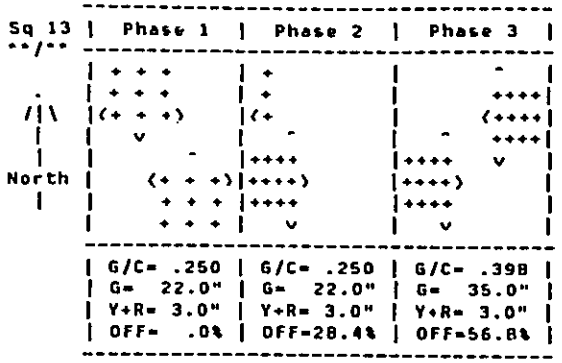
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	623	338	23	28	333	138	83	156	16	74	198	200
WIDTHS	11.0	12.0	.0	.0	12.0	.0	.0	12.0	.0	.0	12.0	.0
LANES	1	1	0	0	1	0	0	1	0	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1766	0	0	664	0	0	1160	0	0	1577	0

Phasing Parameters

SEQUENCES	13					
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	22.00	22.00	35.00			
YELLOWTIMES	3.00	3.00	3.00			
CRITICALS	0	0	0			
EXCESS	0					

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) .97 Vehicle Delay 32.4@ Level of Service
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 88 sec G= 79.0 sec = 89.8% Y= 9.0 sec = 10.2% Ped= .0 sec =

Lane Group	Width/ Lanes	q/C Reqd	q/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Q Queue
SB Approach								18.5	C+	
RT	11/1	.319	.545	674	726	340	.468	8.3	B+	191 f
LT+TH	12/1	.273	.261	359	462	380	.823	27.6	D+	347 f
NB Approach								37.7	D	
LT+TH+RT	12/1	.300	.261	221	303	268	.884	37.7	D	245 f
WB Approach								75.6@	F	
LT+TH+RT	12/1	.824	.409	217	272	525	1.930	75.6@	F	384 f
EB Approach								4.1	A	
LT+TH+RT	12/1	.368	.693	1071	1093	497	.455	4.1	A	189 f

AMFAC - WAIPAHU TRAFFIC STUDY 02/06/96
1995 - EXISTING CONDITIONS 15:41:05
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	215	0	0	0

Movement Parameters

	SB			WB			NB			EB		
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	543	171	12	30	307	29	57	171	26	48	275	310
WIDTHS	11.0	12.0	.0	.0	12.0	.0	.0	12.0	.0	.0	12.0	.0
LANES	1	1	0	0	1	0	0	1	0	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1790	0	0	1267	0	0	1469	0	0	826	0

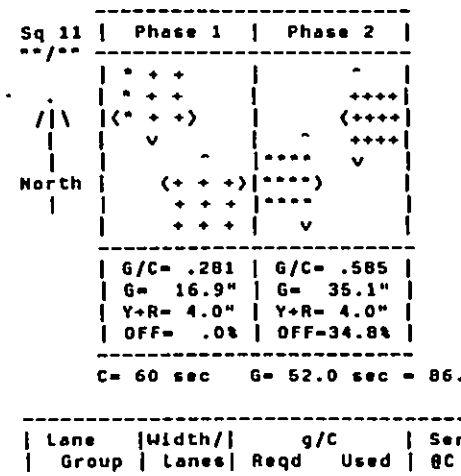
Phasing Parameters

SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	NO	NO	NO	NO	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	16.89	35.11				
YELLOWTIMES	4.00	4.00				
CRITICALS	1	11				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY 02/06/
1995 - EXISTING CONDITIONS 15:41:
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) .84 Vehicle Delay 26.9@ Level of Service
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Ba Queue
SB Approach								17.1	C+	
RT	11/1	.300	.315	366	419	345	.823	20.9	*C	199 f
LT+TH	12/1	.140	.315	508	564	193	.342	10.3	B	112 f
NB Approach								12.4	B	
LT+TH+RT	12/1	.221	.315	409	463	267	.577	12.4	B	154 f
WB Approach								4.5	A	
LT+TH+RT	12/1	.345	.618	759	784	386	.492	4.5	A	124 f
EB Approach								53.7@	E	
LT+TH+RT	12/1	.823	.618	480	611	666	1.303	53.7@	*E	214 f

ATA Inc. STOP CONTROLLED T-INTERSECTION LEVEL OF SERVICE ANALYSIS 1996 HCM

Major Street: PAIWA ST
Minor Street: PAIWA PL
Peak Hour: AM
Scenario: EXISTING - NOV 1995

Print Date: 04-Jan
Analyst: BC
File Name: PAIPAI-A
Intersection: 4

Peak Hour Factor: 1.00

MAJOR STREET			
Num of Lanes - V2:	1	V2	350 ----------) (--------- 770 V5
Excl RT - V3 (Y/N):	N	V3	5 ----- ----- 5 V4
Stop/Yield - V3 (Y/N):	N		\ /
% Grade - V2,V3:	0		v v MAJOR STREET:
			PAIWA ST
Num of Lanes - V5:	1		( )
Excl LT - V4 (Y/N):	N		\ /
% Grade - V4,V5:	0		| |
			| |
MINOR STREET			5 5 NORTH---)
Num of Lanes - V7,V9:	1		
Shared Lane (Y/N):	y		V7 V9
% Grade - V7&V9:	0		MINOR STREET: PAIWA PL

VOLUME ADJUSTMENTS

MOVEMENT NO.	2	3	4	5	7	9
VOLUME, V (vph)	350	5	5	770	5	5
VOLUME, v (pcph)	350	5	6	770	6	6

STEP 1: RT FROM MINOR STREET - V9

Conflicting Flows:	Vc,9 = 1/2*V3+V2 =	3	+ 350	=	353 vph
Potential Capacity:	Cp,9 =				918 pcph
Movement Capacity:	Cm,9 = Cp,9 =				918 pcph

STEP 2: LT FROM MAJOR STREET - V4

Conflicting Flows:	Vc,4 = V3+V2 =	5	+ 350	=	355 vph
Potential Capacity:	Cp,4 =				1161 pcph
Movement Capacity:	Cm,4 = Cp,4 =				1161 pcph
Prob. of Queue-free State:	pq,4 = 1-v4/Cm,4 =				1.00
Major Left Shared Lane					
Prob. of Queue-free State:	p*q,4 =				0.99

STEP 3: LT FROM MINOR STREET - V7

Conflicting Flows:	Vc,7 = 1/2V3+V2+V5+V4 =	1128 vph
Potential Capacity:	Cp,7 =	235 pcph
Capacity Adjustment Factor		
Due To Impeding Movements:	f7=pq,4=	0.99
Movement Capacity:	Cm,7 = Cp,7 =	233 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

Movement	v(vcph)	cm(pcph)	csh (pcph)	AVG TOTAL DELAY	LOS
MINOR LEFT TURN (7)	6	233	SHRD	SHRD	SHRD
MINOR RIGHT TURN (9)	6	918	372	10.0	B
MAJOR LEFT TURN (4)	6	1161	------	3.1	A

AVERAGE MINOR APPROACH DELAY = 10.0 sec/veh | AVERAGE TOTAL INTERSECTION DELAY = 0.1 sec/veh
LEVEL OF SERVICE = B | LEVEL OF SERVICE = A

ATA Inc. STOP CONTROLLED T-INTERSECTION LEVEL OF SERVICE ANALYSIS 1996 HCM

Major Street: PAIWA ST
Minor Street: PAIWA PL
Peak Hour: PM
Scenario: EXISTING - NOV 1995

Print Date: 04-Jan
Analyst: BC
File Name: PAIPAI-P
Intersection: 4

Peak Hour Factor: 1.00

MAJOR STREET			
Num of Lanes - V2:	1	V2	505 ----------) (--------- 765 V5
Excl RT - V3 (Y/N):	N	V3	5 ----- ----- 5 V4
Stop/Yield - V3 (Y/N):	N		\ /
% Grade - V2,V3:	0		v v MAJOR STREET:
			PAIWA ST
Num of Lanes - V5:	1		( )
Excl LT - V4 (Y/N):	N		\ /
% Grade - V4,V5:	0		| |
			| |
MINOR STREET			5 5 NORTH---)
Num of Lanes - V7,V9:	1		
Shared Lane (Y/N):	y		V7 V9
% Grade - V7&V9:	0		MINOR STREET: PAIWA PL

VOLUME ADJUSTMENTS

MOVEMENT NO.	2	3	4	5	7	9
VOLUME, V (vph)	505	5	5	765	5	5
VOLUME, v (pcph)	505	5	6	765	6	6

STEP 1: RT FROM MINOR STREET - V9

Conflicting Flows:	Vc,9 = 1/2*V3+V2 =	3	+ 505	=	508 vph
Potential Capacity:	Cp,9 =				766 pcph
Movement Capacity:	Cm,9 = Cp,9 =				766 pcph

STEP 2: LT FROM MAJOR STREET - V4

Conflicting Flows:	Vc,4 = V3+V2 =	5	+ 505	=	510 vph
Potential Capacity:	Cp,4 =				988 pcph
Movement Capacity:	Cm,4 = Cp,4 =				988 pcph
Prob. of Queue-free State:	pq,4 = 1-v4/Cm,4 =				0.99
Major Left Shared Lane					
Prob. of Queue-free State:	p*q,4 =				0.99

STEP 3: LT FROM MINOR STREET - V7

Conflicting Flows:	Vc,7 = 1/2V3+V2+V5+V4 =	1276 vph
Potential Capacity:	Cp,7 =	193 pcph
Capacity Adjustment Factor		
Due To Impeding Movements:	f7=pq,4=	0.99
Movement Capacity:	Cm,7 = Cp,7 =	191 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

Movement	v(vcph)	cm(pcph)	csh (pcph)	AVG TOTAL DELAY	LOS
MINOR LEFT TURN (7)	6	191	SHRD	SHRD	SHRD
MINOR RIGHT TURN (9)	6	766	385	12.2	C
MAJOR LEFT TURN (4)	6	988	------	3.7	A

AVERAGE MINOR APPROACH DELAY = 12.2 sec/veh | AVERAGE TOTAL INTERSECTION DELAY = 0.1 sec/veh
LEVEL OF SERVICE = C | LEVEL OF SERVICE = A

ATA Inc. STOP CONTROLLED T-INTERSECTION LEVEL OF SERVICE ANALYSIS 1994 HCM

Major Street: PAIWA ST
Minor Street: HAPAPA
Peak Hour: AM
Scenario: EXISTING - 11/16/95

Print Date: 08-Dec
Analyst: BC
File Name: PAIMAP-A
Intersection: #5

```
Peak Hour Factor:     1.00 |
--------MAJOR STREET-------- | V2    354 ----------)              (--------- 716     V5
   Num of Lanes - V2:    1 |
  Excl RT - V3 (Y/N):    N | V3     45 -----                        -----  53     V4
Stop/Yield - V3 (Y/N):    N |              \                      /
     % Grade - V2,V3:     0 |               v                    v     MAJOR STREET:
                            |                                          PAIWA ST
   Num of Lanes - V5:    1 |                     (          )
  Excl LT - V4 (Y/N):    N |                      \        /
     % Grade - V4,V5:     0 |                       |      |
                            |                       |      |
--------MINOR STREET-------- |                       88     27                NORTH---)
 Num of Lanes - V7,V9:    1 |
   Shared Lane (Y/N):     y |                      V7     V9
     % Grade - V7&V9:     0 |              MINOR STREET: HAPAPA
```

VOLUME ADJUSTMENTS

MOVEMENT NO.	2	3	4	5	7	9
VOLUME, V (vph)	354	45	53	716	88	27
VOLUME, v (pcph)	354	45	58	716	88	30

STEP 1: RT FROM MINOR STREET - V9

Conflicting Flows:	Vc,9 = 1/2*V3+V2 =	23	+	354	=	377 vph
Potential Capacity:	Cp,9 =					892 pcph
Movement Capacity:	Cm,p = Cp,9 =					892 pcph

STEP 2: LT FROM MAJOR STREET - V4

Conflicting Flows:	Vc,4 = V3+V2 =	45	+	354	=	399 vph
Potential Capacity:	Cp,4 =					1107 pcph
Movement Capacity:	Cm,4 = Cp,4 =					1107 pcph
Prob. of Queue-free State:	po,4 = 1-v4/Cm,4 =					0.95
Major Left Shared Lane						
Prob. of Queue-free State:	p*o,4 =					0.90

STEP 3: LT FROM MINOR STREET - V7

Conflicting Flows:	Vc,7 = 1/2V3+V2+V5+V4 =					1146 vph
Potential Capacity:	Cp,7 =					230 pcph
Capacity Adjustment Factor						
Due To Impeding Movements:	f7=po,4=					0.98
Movement Capacity:	Cm,7 = Cp,7 =					266 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

Movement	v(vcph)	cm(pcph)	csh (pcph)	AVG TOTAL DELAY	LOS
MINOR LEFT TURN (7)	88	266	SUMD	SUMD	SUMD
MINOR RIGHT TURN (9)	30	892	258	25.2	D
MAJOR LEFT TURN (4)	58	1107	------	3.4	A

AVERAGE MINOR APPROACH DELAY = 25.2 sec/veh | AVERAGE TOTAL INTERSECTION DELAY = 2.4 sec/veh
LEVEL OF SERVICE = D | LEVEL OF SERVICE = A

ATA Inc. STOP CONTROLLED T-INTERSECTION LEVEL OF SERVICE ANALYSIS 1994 HCM

Major Street: PAIWA ST
Minor Street: HAPAPA
Peak Hour: PM
Scenario: EXISTING - 11/16/95

Print Date: 08-Dec
Analyst: BC
File Name: PAIMAP-P
Intersection: #5

```
Peak Hour Factor:     1.00 |
--------MAJOR STREET-------- | V2    484 ----------)              (--------- 720     V5
   Num of Lanes - V2:    1 |
  Excl RT - V3 (Y/N):    N | V3     20 -----                        -----  43     V4
Stop/Yield - V3 (Y/N):    N |              \                      /
     % Grade - V2,V3:     0 |               v                    v     MAJOR STREET:
                            |                                          PAIWA ST
   Num of Lanes - V5:    1 |                     (          )
  Excl LT - V4 (Y/N):    N |                      \        /
     % Grade - V4,V5:     0 |                       |      |
                            |                       |      |
--------MINOR STREET-------- |                       27     10                NORTH---)
 Num of Lanes - V7,V9:    1 |
   Shared Lane (Y/N):     y |                      V7     V9
     % Grade - V7&V9:     0 |              MINOR STREET: HAPAPA
```

VOLUME ADJUSTMENTS

MOVEMENT NO.	2	3	4	5	7	9
VOLUME, V (vph)	484	20	43	720	27	10
VOLUME, v (pcph)	484	20	47	720	30	20

STEP 1: RT FROM MINOR STREET - V9

Conflicting Flows:	Vc,9 = 1/2*V3+V2 =	10	+	484	=	494 vph
Potential Capacity:	Cp,9 =					778 pcph
Movement Capacity:	Cm,p = Cp,9 =					778 pcph

STEP 2: LT FROM MAJOR STREET - V4

Conflicting Flows:	Vc,4 = V3+V2 =	20	+	484	=	504 vph
Potential Capacity:	Cp,4 =					986 pcph
Movement Capacity:	Cm,4 = Cp,4 =					986 pcph
Prob. of Queue-free State:	po,4 = 1-v4/Cm,4 =					0.95
Major Left Shared Lane						
Prob. of Queue-free State:	p*o,4 =					0.91

STEP 3: LT FROM MINOR STREET - V7

Conflicting Flows:	Vc,7 = 1/2V3+V2+V5+V4 =					1257 vph
Potential Capacity:	Cp,7 =					198 pcph
Capacity Adjustment Factor						
Due To Impeding Movements:	f7=po,4=					0.91
Movement Capacity:	Cm,7 = Cp,7 =					181 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

Movement	v(vcph)	cm(pcph)	csh (pcph)	AVG TOTAL DELAY	LOS
MINOR LEFT TURN (7)	30	181	SUMD	SUMD	SUMD
MINOR RIGHT TURN (9)	20	778	263	17.0	C
MAJOR LEFT TURN (4)	47	986	------	3.0	A

AVERAGE MINOR APPROACH DELAY = 17.0 sec/veh | AVERAGE TOTAL INTERSECTION DELAY = 0.0 sec/veh
LEVEL OF SERVICE = C | LEVEL OF SERVICE = A

AMFAC - WAIPAHU TRAFFIC STUDY
1995 - EXISTING CONDITIONS
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

12/08/95
10:58:09

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 6 - PAIWA ST & HIAPA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS		.0	.0	.0
GRADES	.0	MODER	MODER	MODER
PEDLEVELS	MODER	BOTH	NONE	NONE
PARKINGSIDES	NONE	20	20	20
PARKVOLUMES	20	0	5	0
BUSVOLUMES	5	74	0	71
RIGHTTURNONREDS	0			

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	43	591	74	125	28	62	14	284	71	109	60	70
WIDTHS	.0	24.0	.0	10.0	12.0	.0	.0	24.0	.0	10.0	12.0	.0
LANES	0	2	0	1	1	0	0	2	0	1	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3072	0	1050	1371	0	0	2553	0	1312	1532	0

Phasing Parameters

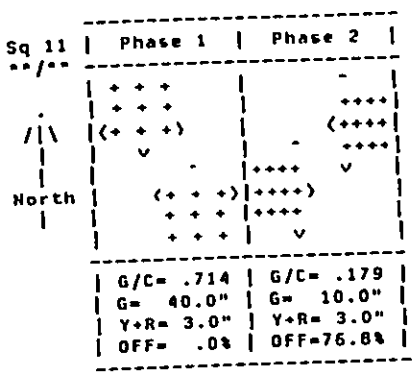
SEQUENCES	11	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	40.00	10.00					
YELLOWTIMES	3.00	3.00					
CRITICALS	0	0					
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
1995 - EXISTING CONDITIONS
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

12/08/
10:58:

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 6 - PAIWA ST & HIAPA ST
Degree of Saturation (v/c) .30 Vehicle Delay 4.2 Level of Service



C= 56 sec G= 50.0 sec = 89.3% Y= 6.0 sec = 10.7% Ped= .0 sec = .

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate BC (vph)	Service Rate BE (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Queue
								1.7	A	
SB Approach										
LT+TH+RT	24/2	.262	.732	2249	2249	745	.331	1.7	A	79 f
								1.5	A	
NB Approach										
LT+TH+RT	24/2	.178	.732	1869	1869	389	.208	1.5	A	41 f
								12.7	B	
WB Approach										
RT	10/1	.082	.196	160	205	54	.262	12.5	B	34 f
LT+TH	12/1	.099	.196	217	269	94	.349	12.9	B	59 f
								13.3	B	
EB Approach										
RT	10/1	.052	.196	207	258	40	.155	12.1	B	25 f
LT+TH	12/1	.121	.196	247	301	137	.455	13.6	B	87 f

AMFAC - WAIPAHU TRAFFIC STUDY
1995 - EXISTING CONDITIONS
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

12/08/95
11:00:34

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 65 - PAIWA ST & HIAPA ST

METROAREA	NONCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	BOTH	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	64	0	70

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	157	653	88	64	25	33	22	420	70	96	10	258
WIDTHS	.0	24.0	.0	10.0	12.0	.0	.0	24.0	.0	10.0	12.0	.0
LANES	0	2	0	1	1	0	0	2	0	1	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	2847	0	1050	1033	0	0	2394	0	1312	1404	0

Phasing Parameters

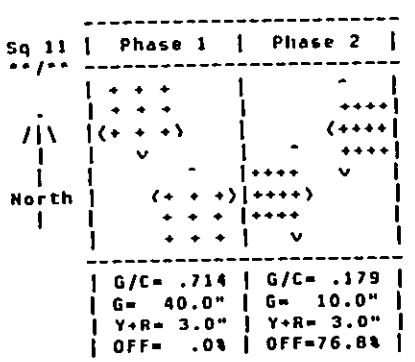
SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	40.00	10.00				
YELLOWTIMES	3.00	3.00				
CRITICALS	0	0				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
1995 - EXISTING CONDITIONS
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

12/08/
11:00:

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 65 - PAIWA ST & HIAPA ST
Degree of Saturation (v/c) .49 Vehicle Delay 11.9 Level of Service



C= 56 sec G= 50.0 sec = 89.3% Y= 6.0 sec = 10.7% Ped= .0 sec = .'

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	L S	90% Ma Queue
SB Approach								2.1	A	
LT+TH+RT	24/2	.348	.732	2085	2085	945	.453	2.1	A	100 f
NB Approach								1.7	A	
LT+TH+RT	24/2	.250	.732	1753	1753	539	.307	1.7	A	57 f
WB Approach								12.7	B	
RT	10/1	.003	.196	160	205	1	.005	11.7	B	25 f
LT+TH	12/1	.092	.196	157	201	61	.300	12.7	B	39 f
EB Approach								59.2	E	
RT	10/1	.038	.196	207	258	27	.105	11.9	B	25 f
LT+TH	12/1	.240	.196	224	276	283	1.025	63.7	F	179 f

SIGNAL94/TRAPAC(V1 11.4) - Summary of Parameter Values

Intersection Parameters for Int # 7 - FAIRFAX ST & N-1 EB RAMPS

METHODAREA	HCM2K
LOSTTIME	2.0
LEVELOFSERVICE	C
NODELOCATION	0

Approach Parameters

APPLABELS	SB	WB	EB	NB
GRADES	.0	.0	.0	-2.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNOVERRIDS	0	0	0	161

Movement Parameters

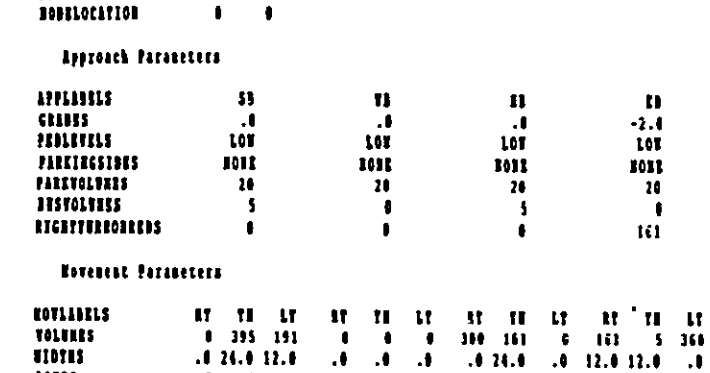
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	395	191	0	0	0	300	161	6	161	5	360
WIDTHS	.0	24.0	12.0	.0	.0	.0	.0	24.0	.0	12.0	12.0	.0
LANES	0	2	1	0	0	0	0	2	0	1	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHRFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIGREENS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
STOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3688	1770	0	0	0	0	3289	0	1550	1559	0

Phasing Parameters

SEQUENCES	21	ALL					
PERMISSIVES	NO	NO	NO	NO	LEADLAGS	NONE	NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00	1
CYCLES	60	100	10		PEDTIME	.0	0
GREENTIMES	25.00	30.00	15.00				
YELLOWTIMES	6.00	6.00	4.00				
CRITICALS	3	0	11				
EXCESS	0						

SIGNAL94/TRAPAC(V1 11.4) - Capacity Analysis Summary

Intersection Averages for Int # 7 - FAIRFAX ST & N-1 EB RAMPS
Degree of Saturation (v/c) .52 Vehicle Delay 25.70 Level of Service B
0 expect more delay due to extreme v/c's (see EVALMAYS)



C= 82 sec G= 70.0 sec = 85.41 Y=12.0 sec = 14.61 Ped= .0 sec = .01

Lane Group	Width/ Lanes	Reqd g/C	Used g/C	Service Rate (vph)	Adj (vph)	Volume	v/c	Delay	LOS	95% Max Queue
SB Approach								5.7	B+	
TH	24/2	.153	.366	2766	2766	416	.152	2.0	A	61 ft
LT	12/1	.167	.329	500	583	201	.345	13.6	B*	155 ft
NB Approach								11.8	B	
TH+RT	24/2	.195	.390	1283	1283	507	.395	11.8	B*	178 ft
SB Approach								35.81	D	
RT	12/1	.029	.207	234	322	1	.003	16.7	C+	25 ft
LT+TH	12/1	.300	.207	235	323	304	1.105	76.0	E*	351 ft

SIGNAL94/TRAPAC[V1 11.4] - Summary of Parameter Values

Intersection Parameters for Int # 7 - PAIWA ST & N-1 SB RAMPS

EXTRAAREA	SOSCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	N N

Approach Parameters

APPLABELS	SB	WB	EB	SB
GRADES	.0	.0	.0	-2.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNCODES	0	0	0	175

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	695	175	0	0	0	475	267	0	211	5	478
WIDTHS	.0	24.0	12.0	.0	.0	.0	.0	24.0	.0	12.0	12.0	.0
LANES	0	2	1	0	0	0	0	2	0	1	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHRFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MERGEMINS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
USTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3688	1770	0	0	0	0	3278	0	1554	1553	0

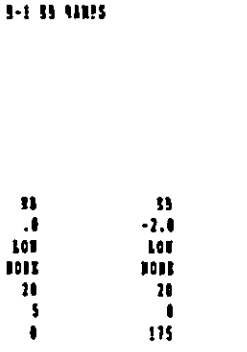
Phasing Parameters

SEQUENCES	21	ALL					
PERMISSIVES	NO	NO	NO	NO	LEADLAGS	NONE	NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00	1
CYCLES	60	100	10		PERTIME	.0	0
GREENTIMES	25.00	30.00	15.00				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	3	5	11				
EXCESS	0						

SIGNAL94/TRAPAC[V1 11.4] - Capacity Analysis Summary

Intersection Averages for Int # 7 - PAIWA ST & N-1 SB RAMPS
Degree of Saturation (v/c) .68 Vehicle Delay 24.0% Level of Service C
0 expect more delay due to extreme v/c's (see EVALUATE)

Sq 21	Phase 1	Phase 2	Phase 3
/			



G/C= .385	G/C= .366	G/C= .183
G= 25.0*	G= 30.0*	G= 15.0*
Y+R= 4.0*	Y+R= 4.0*	Y+R= 4.0*
OFF= .0%	OFF=35.4%	OFF=76.8%

C= 82 sec G= 78.0 sec = 85.4% Y=12.0 sec = 14.6% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate PC (vph)	Service Rate HV (vph)	Adj Volume	v/c	HCM Delay	LOS	95% Max Queue
SB Approach								4.6	A	
TH	24/2	.236	.746	2746	2746	732	.267	2.2	A	100 ft
LT	12/1	.157	.329	500	583	186	.316	13.6	*B	142 ft
EB Approach								13.6	B	
TH+RT	24/2	.274	.350	1199	1279	781	.611	13.6	*B	276 ft
WB Approach								31.9#	F	
RT	12/1	.064	.207	234	322	38	.118	17.1	C+	35 ft
LT+TH	12/1	.374	.207	235	323	500	1.573	76.0#	*F	464 ft

SIGNAL94/TRAPAC[V1 11.4] - Summary of Parameter Values

Intersection Parameters for Int # 4 - PAIWA ST & H-1 WB RAMPS

METRICAREA	DOWNTOWN
LOOPTIME	2.0
LEVELOFSERVICE	C S
DOUBLECYCLE	0 0

Approach Parameters

	SB	WB	EB	EB
APPLABELS	SB	WB	EB	EB
GRADES	-2.0	-2.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNOVERLAPS	0	0	0	0

Movement Parameters

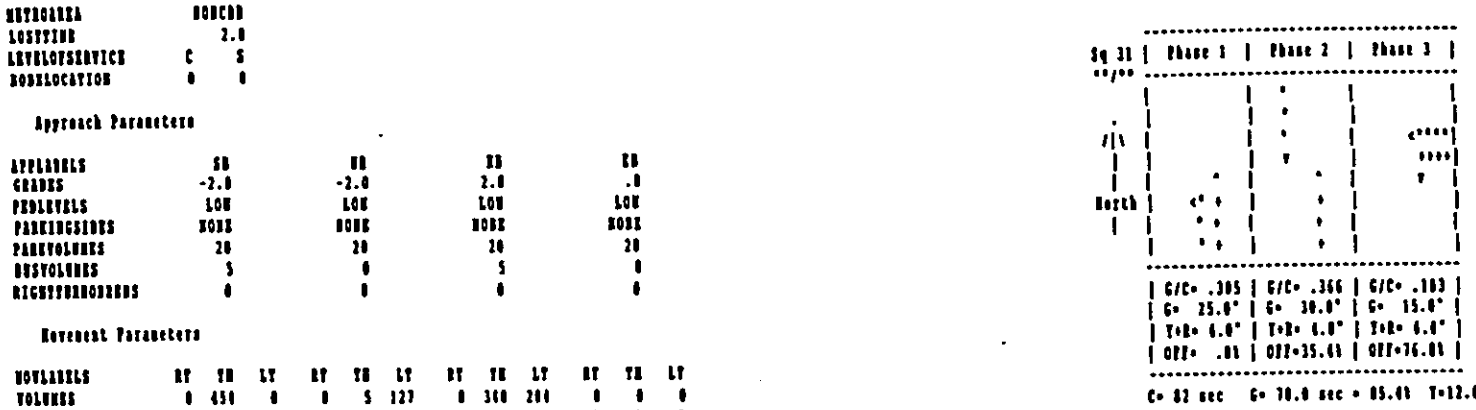
	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	450	0	0	5	127	0	360	200	0	0	0
WIDTHS	.0	24.0	.0	.0	12.0	12.0	.0	24.0	12.0	.0	.0	.0
LANES	0	2	0	0	1	1	0	2	1	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3725	0	0	1577	1554	0	3651	1752	0	0	0

Phasing Parameters

SEQUENCES	31	ALL					
PERMISSIVES	NO	NO	NO	NO	LEADLAGS	NONE	NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00	1
CYCLES	60	180	10		PEDTIME	.0	0
GREENTIMES	25.00	30.00	15.00				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	0	2	5				
EXCESS	0						

SIGNAL94/TRAPAC[V1 11.4] - Capacity Analysis Summary

Intersection Averages for Int # 4 - PAIWA ST & H-1 WB RAMPS
Degree of Saturation (v/c) .26 Vehicle Delay 9.7 Level of Service B+



Lane Group	Width/ Lanes	q/C Reqd	Used	Service Rate OC (vph)	OR (Volume)	Adj v/c		HCM Delay	LOS	95% Max Queue
SB Approach								11.3	B	
TH	24/2	.167	.350	1376	1450	470	.323	11.3	*B	166 ft
WB Approach								6.0	B+	
TH	24/2	.138	.744	2716	2716	356	.132	1.9	A	53 ft
LT	12/1	.177	.329	494	577	215	.373	13.0	*B	166 ft
NB Approach								17.5	C+	
TH	12/1-1	.092	.207	230	327	71	.217	17.5	*C+	65 ft
LT	12/1+1	.090	.207	234	322	60	.211	17.5	C+	62 ft

SIGNAL94/TRAPAC[V1 01.4] - Summary of Parameter Values

Intersection Parameters for Int 4 - PAIWA ST & H-1 WB RAMPS

APPAREA	BOTH
LOSTYIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	-2.0	-2.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNOKRUNS	0	0	0	0

Movement Parameters

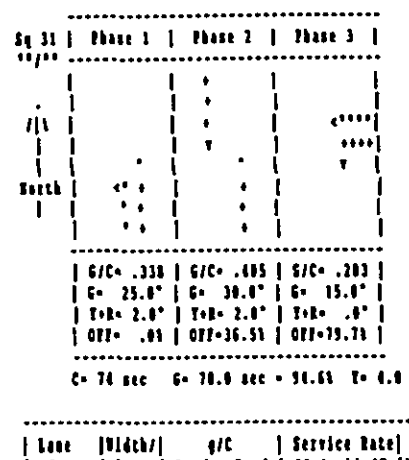
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	556	0	0	5	309	0	556	154	0	0	0
WIDTHS	.0	20.0	.0	.0	12.0	12.0	.0	24.0	12.0	.0	.0	.0
LANES	0	2	0	0	1	1	0	2	1	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPRECENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NOSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	PERM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3725	0	0	1564	1556	0	3651	1752	0	0	0

Phasing Parameters

SEQUENCES	31						
PERMISSIVES	NO	NO	NO	NO	LEADLAGS	NONE	NONE
OVERLAPS	NO	NO	NO	NO	OFFSET	.00	1
CYCLES	60	180	10		PERPIME	.0	0
GREENTIMES	25.00	36.00	15.00				
YELLOWTIMES	2.00	2.00	.00				
CRITICALS	9	5	5				
EXCESS	0						

SIGNAL94/TRAPAC[V1 01.4] - Capacity Analysis Summary

Intersection Averages for Int 4 - PAIWA ST & H-1 WB RAMPS
Degree of Saturation (v/c) .36 Vehicle Delay 9.4 Level of Service B



C= 74 sec G= 70.0 sec = 94.6% Y= 4.0 sec = 5.4% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	Reqd g/C	Used g/C	Service Rate EC [vph]	Service Rate CR [vph]	Adj Volume	v/c	MCK Delay	LOS	95% Max Queue
SB Approach								10.1	B	
TH	24/2	.187	.405	1453	1510	585	.387	10.1	B	181 ft
XB Approach								3.7	A	
TH	24/2	.191	.770	2813	2813	585	.208	1.5	A	70 ft
LT	12/1	.336	.338	521	592	162	.274	11.6	B	112 ft
WB Approach								20.8	C	
TH	12/1+	.150	.176	201	274	169	.615	21.1	C	145 ft
LT	12/1+	.150	.176	199	272	161	.598	20.5	C	138 ft

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1995 - EXISTING CONDITIONS
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

12/08/95
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SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 9 - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	-2.0	.0	2.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	7	91	12	26	25	695	270	52	46	211	38	8
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	0	2	1	0	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REDCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3663	1787	0	3227	1770	0	2901	1752	0	2922	1770

Phasing Parameters

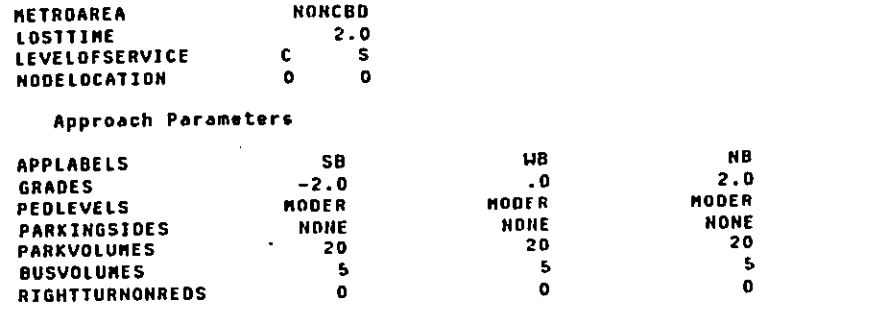
SEQUENCES	45						
PERMISSIVES	NO	NO	NO	NO		LEADLAGS	NONE NONE
OVERLAPS	NO	NO	NO	NO		OFFSET	.00 1
CYCLES	60	180	10			PEDTIME	.0 0
GREENTIMES	6.00	38.00	5.00	120.00	28.00		
YELLOWTIMES	2.00	2.00	2.00	2.00	2.00		
CRITICALS	0	0	0	0	0		
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
1995 - EXISTING CONDITIONS
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

12/08/
11:21:

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 9 - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) .61 Vehicle Delay 38.0 Level of Service



C=207 sec G=197.0 sec = 95.2% Y=10.0 sec = 4.8% Ped= .0 sec = .(

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Ma. Queue
SB Approach								47.9	E+	
TH+RT	24/2	.397	.184	1	573	103	.153	45.9	E+	122 f
LT	12/1	.391	.029	1	1	13	.250	64.0	F	37 f
NB Approach								63.1	F	
TH+RT	24/2	.426	.184	1	443	339	.636	52.2	E	403 f
LT	12/1	.397	.029	1	1	48	.941	139.6	F	136 f
WB Approach								17.3	C+	
TH+RT	24/2	.394	.726	2251	2339	53	.023	5.2	B+	25 f
LT	12/1	.553	.614	915	1086	732	.674	18.2	C+	823 f
EB Approach								58.0	E	
TH+RT	24/2	.417	.135	1	288	262	.663	57.8	E	330 f
LT	12/1	.390	.024	1	1	8	.186	64.2	F	25 f

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1995 - EXISTING CONDITIONS
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

12/08/95
11:22:47

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 9& - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	-2.0	.0	2.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	4	76	44	28	70	915	460	85	124	83	24	1
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	0	2	1	0	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3682	1787	0	3434	1770	0	2895	1752	0	2986	1770

Phasing Parameters

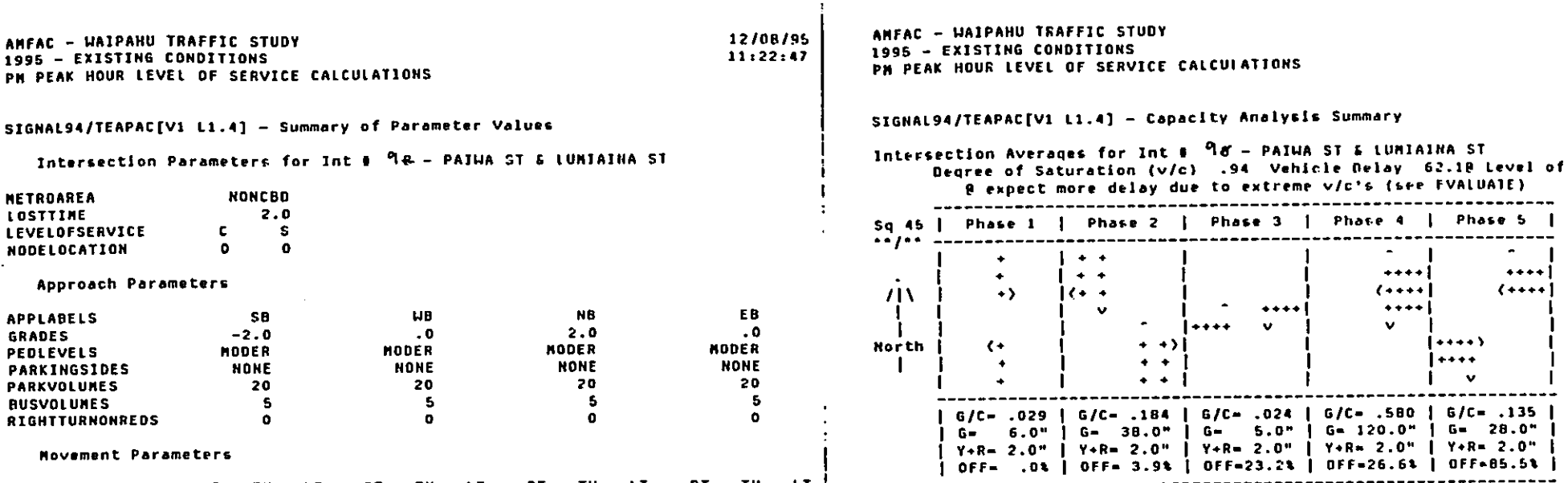
SEQUENCES	45						
PERMISSIVES	NO	NO	NO	NO		LEADLAGS	NONE NONE
OVERLAPS	NO	NO	NO	NO		OFFSET	.00 1
CYCLES	60	180	10			PEDTIME	.0 0
GREENTIMES	6.00	38.00	5.00	120.00	28.00		
YELLOWTIMES	2.00	2.00	2.00	2.00	2.00		
CRITICALS	0	0	0	0	0		
EXCESS	.0						

AMFAC - WAIPAHU TRAFFIC STUDY
1995 - EXISTING CONDITIONS
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

12/08/
11:23:

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 9& - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) .94 Vehicle Delay 62.1@ Level of Service
@ expect more delay due to extreme v/c's (see EVALUATE)



C=207 sec G=197.0 sec = 95.2% Y=10.0 sec = 4.8% Ped= .0 sec = .

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	LOS	90% Queue
SB Approach								72.4	F	
TH+RT	24/2	.396	.184	1	576	84	.124	45.6	E+	100 ft
LT	12/1	.396	.029	1	1	46	.885	121.4	F	130 ft
NB Approach								116.2@	F	
TH+RT	24/2	.454	.184	1	441	573	1.079	100.3@	F	681 ft
LT	12/1	.412	.029	1	1	131	2.569	185.6@	F	370 ft
WB Approach								26.1	D+	
TH+RT	24/2	.398	.725	2400	2488	103	.041	5.2	B+	41 ft
LT	12/1	.631	.614	915	1086	963	.887	28.4	D+	1083 ft
EB Approach								52.1	E	
TH+RT	24/2	.400	.135	1	295	112	.277	52.0	E	141 ft
LT	12/1	.389	.024	1	1	1	.023	63.7	F	25 ft

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

APPENDIX B

• YEAR 2000 BASE LOS CALCULATIONS

02/06/9
14:09:2

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	.0	.0	3.0	.0
GRADES	LOW	LOW	LOW	LOW
PEDLEVELS	NONE	NONE	BOTH	NONE
PARKINGSIDES	20	20	20	20
PARKVOLUMES	0	5	0	5
BUSVOLUMES	0	0	102	0
RIGHTTURNONREDS				

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	
VOLUMES	0	0	0	0	341	290	105	0	73	120	417	
WIDTHS	.0	.0	.0	.0	12.0	.0	11.0	.0	11.0	.0	12.0	
LANES	0	0	0	0	1	0	1	0	1	0	1	
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.(
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.(
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	
ACTUATIONS	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4
MINIMUMS	5.0	5.0	5.0	5.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	19
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.(
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.(
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.(
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NO
SATURATIONFLOWS	0	0	0	0	1825	0	1172	0	1465	0	1578	

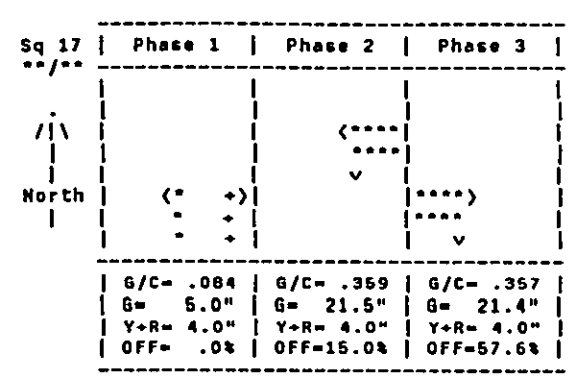
Phasing Parameters

SEQUENCES	17	ALL			LEADLAGS	NONE	NO
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	
OVERLAPS	NO	NO	NO	NO	PEDTIME	.0	
CYCLES	60	180	10				
GREENTIMES	5.02	21.63	21.44				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	9	5	11				
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY 02/06/96
2000 - BASE 14:09:31
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST
Degree of Saturation (v/c) .89 Vehicle Delay 24.0 Level of Service C



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% .Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
NB Approach								17.1	C+	
RT	11/1	.008	.117	94	130	3	.022	16.1	C+	25 ft
LT	11/1	.082	.117	123	166	77	.448	17.2	*C+	57 ft
WB Approach								24.4	C	
LT+TH	12/1	.391	.392	668	716	664	.927	24.4	*C	340 ft
EB Approach								24.5	C	
TH+RT	12/1	.389	.391	568	617	565	.916	24.5	*C	290 ft

AMFAC - WAIPAHU TRAFFIC STUDY 02/06/
2000 - BASE CONDITIONS 14:13:.
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST

METROAREA	NONCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	3.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	159	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	
VOLUMES	0	0	0	0	598	203	161	0	101	108	362	
WIDTHS	.0	.0	.0	.0	12.0	.0	11.0	.0	11.0	.0	12.0	
LANES	0	0	0	0	1	0	1	0	1	0	1	
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.-
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	
ACTUATIONS	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	19
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.(
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.(
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.(
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NO
SATURATIONFLOWS	0	0	0	0	1017	0	1172	0	1465	0	1576	

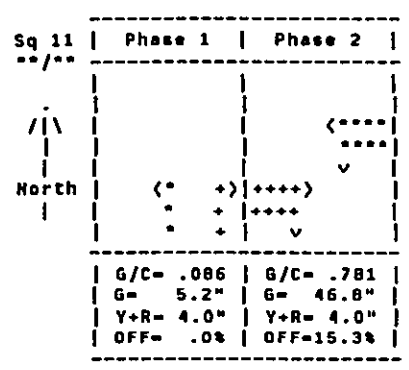
Phasing Parameters

SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NO
OVERLAPS	NO	NO	NO	NO	OFFSET	.00
CYCLES	60	180	10		PEDTIME	.0
GREENTIMES	5.17	46.83				
YELLOWTIMES	4.00	4.00				
CRITICALS	9	5				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY 02/06/96
2000 - BASE CONDITIONS 14:13:39
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST
Degree of Saturation (v/c) .77 Vehicle Delay 20.7 Level of Service C



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
NB Approach								20.2	C	
RT	11/1	.006	.119	96	133	2	.014	15.1	C+	25 ft
LT	11/1	.105	.119	125	170	106	.606	20.3	*C	79 ft
WB Approach								32.2	D+	
LT+TH	12/1	.835	.814	819	828	843	1.018	32.2	*D+	132 ft
EB Approach								1.1	A	
TH+RT	12/1	.348	.814	1283	1283	495	.386	1.1	A	78 ft

AMFAC - WAIPAHU TRAFFIC STUDY 02/06/96
2000 - BASE CONDITIONS 14:15:21
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 2 - WAIPAHU ST & MOKUOLA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	0	0	0	625	484	229	0	78	153	363	0
WIDTHS	.0	.0	.0	.0	12.0	.0	.0	12.0	.0	.0	12.0	.0
LANES	0	0	0	0	1	0	0	1	0	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	0	0	0	1691	0	0	991	0	0	1557	0

Phasing Parameters

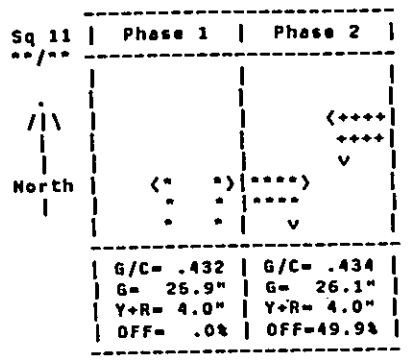
SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	25.93	26.07				
YELLOWTIMES	4.00	4.00				
CRITICALS	8	11				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/06/96
14:15:31

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) 1.16 Vehicle Delay 33.6@ Level of Service D
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
NB Approach								11.5	B	
LT+TH+RT	12/1	.374	.466	419	461	323	.701	11.5	*B	146 ft
WB Approach								50.1@	E	
LT+TH	12/1	.693	.468	752	791	1167	1.475	50.1@	E	524 ft
EB Approach								11.4	B	
TH+RT	12/1	.381	.468	688	728	543	.746	11.4	*B	244 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/06/96
14:17:02

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 2 - WAIPAHU ST & MOKUOLA ST

METROAREA	NONCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	0	0	0	708	302	337	0	103	118	473	0
WIDTHS	.0	.0	.0	.0	12.0	.0	.0	12.0	.0	.0	12.0	.0
LANES	0	0	0	0	1	0	0	1	0	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	0	0	0	1825	0	0	991	0	0	1585	0

Phasing Parameters

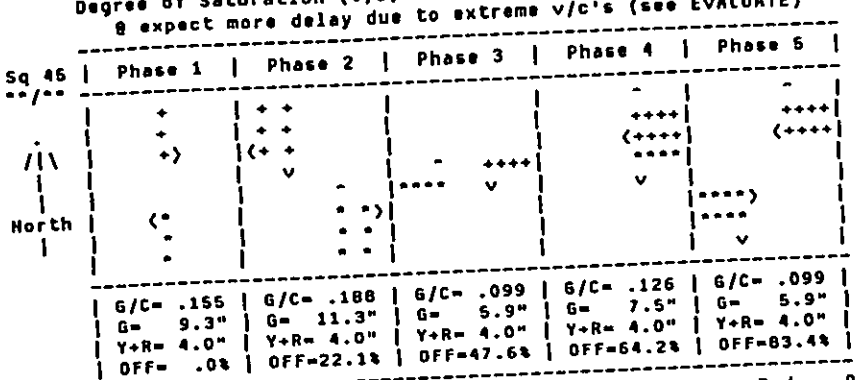
SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	120	10		PEDTIME	.0 0
GREENTIMES	30.62	21.38				
YELLOWTIMES	4.00	4.00				
CRITICALS	8	11				
EXCESS	0					

02/06/96
14:49:16

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 1 - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) 1.41 Vehicle Delay 46.0@ Level of Service E+
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 40.0 sec = 66.7% Y=20.0 sec = 33.3% Ped= .0 sec = .0%

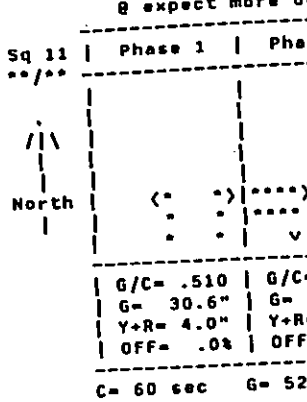
Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								12.5	B	
TH+RT	24/2	.058	.222	747	819	151	.184	12.3	B	50 ft
LT	12/1	.056	.188	275	336	61	.182	13.3	B	42 ft
NB Approach								51.7@	E	
TH+RT	24/2	.340	.222	583	653	947	1.450	57.6@	*E	311 ft
LT	12/1	.203	.188	268	329	294	.894	33.0	*D	201 ft
WB Approach								51.0@	E	
TH+RT	24/2	.074	.325	1064	1118	188	.168	9.4	B+	54 ft
LT	12/1	.680	.325	519	574	1196	2.084	57.5@	*E	681 ft
EB Approach								18.1	C+	
TH+RT	24/2	.106	.132	328	400	252	.630	18.2	*C+	92 ft
LT	12/1	.002	.132	177	233	. 1	.004	14.6	*B	25 ft

02/06/96
14:17:11

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) 1.22 Vehicle Delay 41.8@ Level of Service E+
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
NB Approach								16.8	C+	
LT+TH+RT	12/1	.507	.544	503	539	463	.859	16.8	*C+	178 ft
WB Approach								53.1@	E	
LT+TH	12/1	.593	.390	662	711	1063	1.495	53.1@	E	547 ft
EB Approach								41.3	E+	
TH+RT	12/1	.422	.390	569	618	622	1.006	41.3	*E+	320 ft

ANFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/06/96
14:20:11

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	300	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	786	409	47	62	397	155	93	201	18	83	241	309
WIDTHS	11.0	12.0	.0	.0	12.0	.0	.0	12.0	.0	.0	12.0	.0
LANES	1	1	0	0	1	0	0	1	0	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1396	0	0	619	0	0	626	0	0	387	0

Phasing Parameters

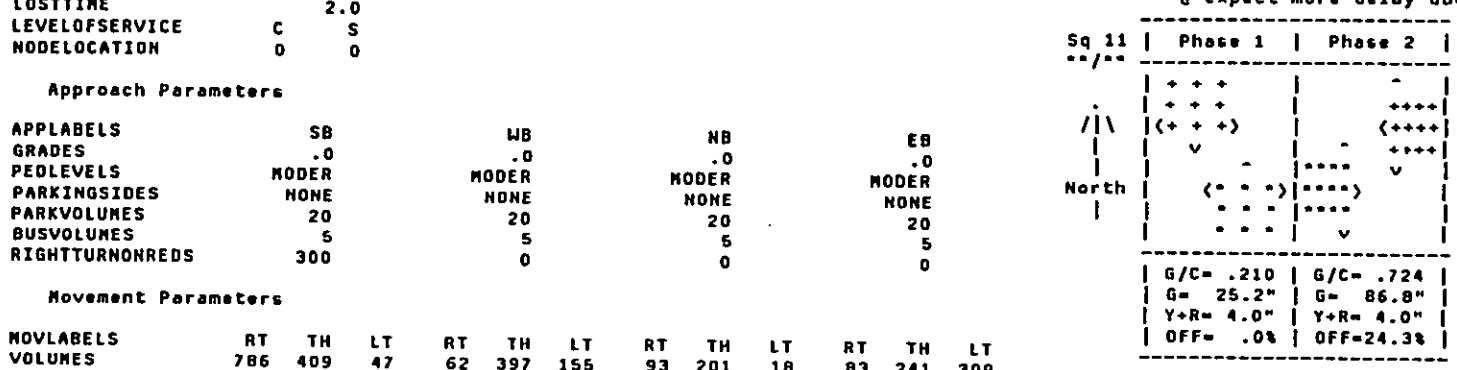
SEQUENCES	11	ALL					
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE	NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00	1
CYCLES	60	120	10		PEDTIME	.0	0
GREENTIMES	25.16	86.84					
YELLOWTIMES	4.00	4.00					
CRITICALS	8	11					
EXCESS	0						

ANFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/06/96
14:20:20

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) 1.83 Vehicle Delay 77.2@ Level of Service F
@ expect more delay due to extreme v/c's (see EVALUATE)



C=120 sec G=112.0 sec = 93.3% Y= 8.0 sec = 6.7% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								86.0@	F	
RT	11/1	.461	.226	88	290	512	1.701	86.5@	F	660 ft
LT+TH	12/1	.427	.226	93	305	480	1.519	85.5@	F	626 ft
NB Approach								106.9@	F	
LT+TH+RT	12/1	.610	.226	39	127	329	2.317	106.9@	*F	429 ft
WB Approach								58.3@	E	
LT+TH+RT	12/1	1.000	.740	421	458	646	1.410	58.3@	E	283 ft
EB Approach								67.8@	F	
LT+TH+RT	12/1	1.000	.740	252	286	666	2.329	67.8@	*F	292 ft

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	300	0	0	0

Movement Parameters

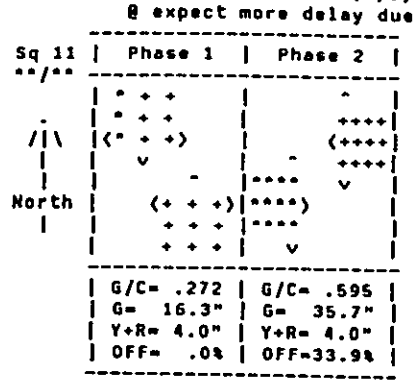
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	693	216	34	60	364	33	64	226	29	54	331	442
WIDTHS	11.0	12.0	.0	.0	12.0	.0	.0	12.0	.0	.0	12.0	.0
LANES	1	1	0	0	1	0	0	1	0	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1665	0	0	1140	0	0	1451	0	0	593	0

Phasing Parameters

SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	16.33	35.67				
YELLOWTIMES	4.00	4.00				
CRITICALS	1	11				
EXCESS	0					

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) 1.34 Vehicle Delay 36.1@ Level of Service D
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								36.7	D	
RT	11/1	.350	.305	363	407	414	1.017	52.5	*E	242 ft
LT+TH	12/1	.194	.305	453	509	263	.517	11.9	B	154 ft
NB Approach								17.3	C+	
LT+TH+RT	12/1	.271	.305	388	443	336	.758	17.3	C+	197 ft
WB Approach								6.4	B+	
LT+TH+RT	12/1	.460	.628	690	716	481	.672	6.4	B+	151 ft
EB Approach								59.3@	E	
LT+TH+RT	12/1	1.000	.628	340	372	870	2.339	59.3@	*E	273 ft

AMFAC WAIPAHU TIAR
2000 BASE CONDITIONS
AM PEAK HOUR

02/06/96
14:53:11

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 4 - PAIWA ST & PAIWA PL

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	SB	WB	NB	EB
GRADES	.0	.0	.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	72	1001	5	3	0	7	1	485	48	1	0	0
WIDTHS	.0	24.0	.0	.0	12.0	.0	.0	24.0	.0	.0	12.0	.0
LANES	0	2	0	0	1	0	0	2	0	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3459	0	0	1561	0	0	2518	0	0	1381	0

Phasing Parameters

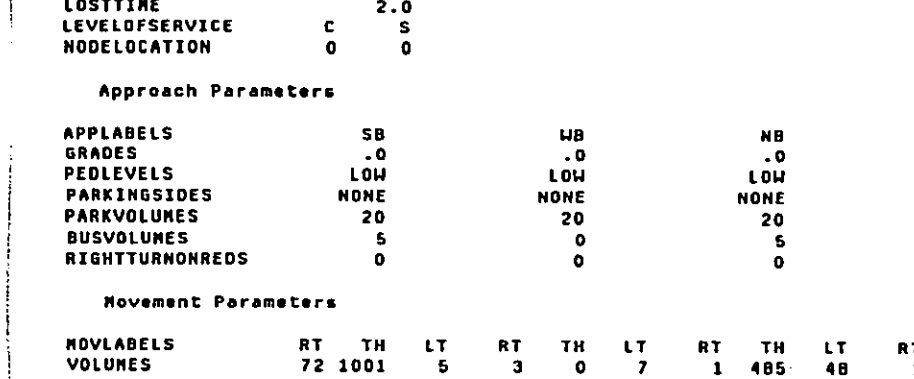
SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	39.78	12.22				
YELLOWTIMES	4.00	4.00				
CRITICALS	2	6				
EXCESS	0					

AMFAC WAIPAHU TIAR
2000 BASE CONDITIONS
AM PEAK HOUR

02/06/96
14:53:22

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 4 - PAIWA ST & PAIWA PL
Degree of Saturation (v/c) .42 Vehicle Delay 2.7 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								2.8	A	
LT+TH+RT	24/2	.343	.696	2408	2408	1135	.471	2.8	*A	145 ft
NB Approach								2.3	A	
LT+TH+RT	24/2	.250	.696	1753	1753	563	.321	2.3	A	72 ft
WB Approach								11.4	B	
LT+TH+RT	12/1	.015	.237	312	370	10	.027	11.4	B	25 ft
EB Approach								11.3	B	
TH+RT	12/1	.003	.237	271	327	1	.003	11.3	B	25 ft

AMFAC WAIPAHU TIAR
2000 BASE CONDITIONS
PM PEAK HOUR

02/06/96
14:54:43

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 4 - PAIWA ST & PAIWA PL

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	8

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	12	966	3	2	0	4	5	713	8	24	0	36
WIDTHS	.0	24.0	.0	.0	12.0	.0	.0	24.0	.0	.0	12.0	.0
LANES	0	2	0	0	1	0	0	2	0	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3487	0	0	1472	0	0	3256	0	0	1530	0

Phasing Parameters

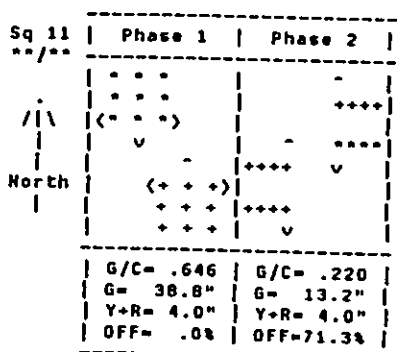
SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	38.77	13.23				
YELLOWTIMES	4.00	4.00				
CRITICALS	2	6				
EXCESS	0					

AMFAC WAIPAHU TIAR
2000 BASE CONDITIONS
PM PEAK HOUR

02/06/96
14:54:53

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 4 - PAIWA ST & PAIWA PL
Degree of Saturation (v/c) .39 Vehicle Delay 3.1 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								2.9	A	
LT+TH+RT	24/2	.312	.680	2370	2370	1033	.436	2.9	*A	140 ft
NB Approach								2.6	A	
LT+TH+RT	24/2	.255	.680	2213	2213	764	.345	2.6	A	103 ft
WB Approach								10.8	B	
LT+TH+RT	12/1	.011	.254	317	374	6	.016	10.8	B	25 ft
EB Approach								11.2	B	
LT+TH+RT	12/1	.060	.254	330	388	55	.142	11.2	B	36 ft

AMFAC WAIPAHU TIAR
2000 BASE CONDITIONS
AM PEAK HOUR

02/06/96
14:25:48

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 4 - PAIWA ST & HAPAPA ST

METROAREA	NONCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	.0	.0	.0	.0
GRADES	LOW	LOW	LOW	LOW
PEDLEVELS	NONE	BOTH	NONE	NONE
PARKINGSIDES	20	20	20	20
PARKVOLUMES	5	0	5	0
BUSVOLUMES	0	0	0	0
RIGHTTURNONREDS				

Movement Parameters

	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
MOVLABELS	0	1006	60	30	0	97	57	483	0	0	0	0
VOLUMES	.0	24.0	.0	.0	12.0	.0	.0	24.0	.0	.0	.0	.0
WIDTHS	0	2	0	0	1	0	0	2	0	0	0	0
LANES	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UTILIZATIONS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
TRUCKPERCENTS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
PEAKHOURFACTORS	3	3	3	3	3	3	3	3	3	3	3	3
ARRIVALTYPES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
ACTUATIONS	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
REQCLEARANCES	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
MINIMUMS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
IDEALSATFLOWS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
GROUPTYPES	0	3150	0	0	1001	0	0	3621	0	0	0	0
SATURATIONFLOWS												

Phasing Parameters

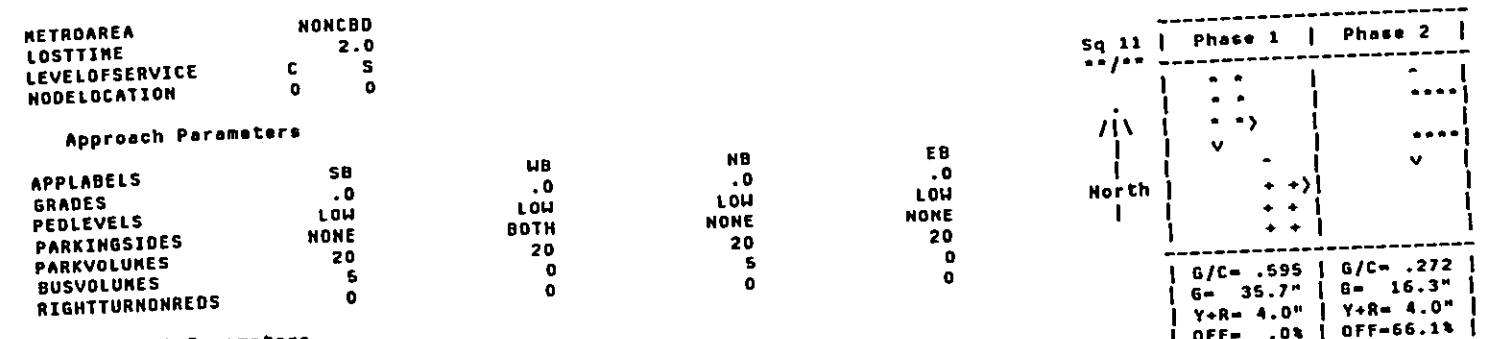
SEQUENCES	11	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	35.67	16.33					
YELLOWTIMES	4.00	4.00					
CRITICALS	2	5					
EXCESS	0						

AMFAC WAIPAHU TIAR
2000 BASE CONDITIONS
AM PEAK HOUR

02/06/96
14:26:12

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 4 - PAIWA ST & HAPAPA ST
Degree of Saturation (v/c) .46 Vehicle Delay 4.6 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
								4.5	A	
SB Approach										
LT+TH	24/2	.371	.628	1978	1978	1122	.567	4.5	A	176 ft
								3.2	A	
NB Approach										
TH+RT	24/2	.178	.628	2273	2273	568	.250	3.2	A	89 ft
								11.5	B	
WB Approach										
LT+TH+RT	12/1	.180	.305	267	306	134	.438	11.5	B	78 ft

AMFAC WAIPAHU TIAR
2000 BASE CONDITIONS
PM PEAK HOUR

02/06/96
14:27:31

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 4 - PAIWA ST & HAPAPA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	BOTH	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	921	48	20	0	36	30	719	0	0	0	0
WIDTHS	.0	24.0	.0	.0	12.0	.0	.0	24.0	.0	.0	.0	.0
LANES	0	2	0	0	1	0	0	2	0	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	2969	0	0	1003	0	0	3662	0	0	0	0

Phasing Parameters

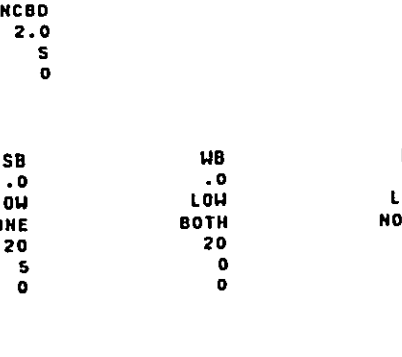
SEQUENCES	11	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	40.30	11.70					
YELLOWTIMES	4.00	4.00					
CRITICALS	2	6					
EXCESS	0						

AMFAC WAIPAHU TIAR
2000 BASE CONDITIONS
PM PEAK HOUR

02/06/96
14:28:02

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 4 - PAIWA ST & HAPAPA ST
Degree of Saturation (v/c) .40 Vehicle Delay 2.8 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								2.7	A	
LT+TH	24/2	.360	.705	2093	2093	1020	.487	2.7	*A	127 ft
NB Approach								2.2	A	
TH+RT	24/2	.235	.705	2582	2582	789	.306	2.2	A	98 ft
WB Approach								12.4	B	
LT+TH+RT	12/1	.094	.228	180	229	59	.258	12.4	B	38 ft

AMFAC - WAIPAHU TRAFFIC STUDY 02/06/96
2000 - BASE CONDITIONS 14:29:47
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 5 - PAIWA ST & HIAPO ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	BOTH	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	83	0	86

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	48	844	83	141	32	84	28	387	86	130	68	79
WIDTHS	.0	24.0	.0	10.0	12.0	.0	.0	24.0	.0	10.0	12.0	.0
LANES	0	2	0	1	1	0	0	2	0	1	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	2993	0	1050	1288	0	0	2202	0	1312	1469	0

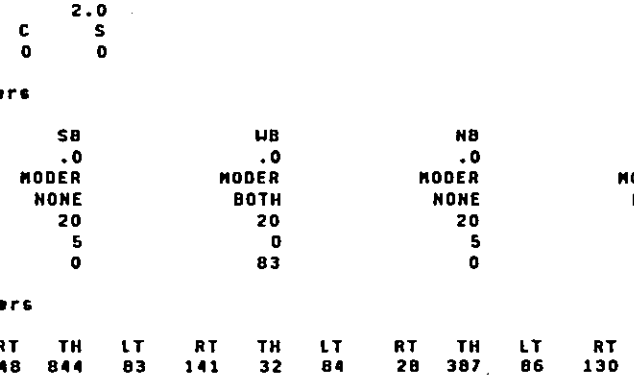
Phasing Parameters

SEQUENCES	11	ALL					
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE	NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00	1
CYCLES	60	180	10		PEDTIME	.0	0
GREENTIMES	38.14	13.86					
YELLOWTIMES	4.00	4.00					
CRITICALS	2	11					
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY 02/06/96
2000 - BASE CONDITIONS 14:29:59
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 5 - PAIWA ST & HIAPO ST
Degree of Saturation (v/c) .43 Vehicle Delay 4.9 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate BC (vph)	Service Rate BE (vph)	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								3.4	A	
LT+TH+RT	24/2	.359	.669	2002	2002	1026	.512	3.4	*A	143 ft
NB Approach								2.9	A	
LT+TH+RT	24/2	.268	.669	1473	1473	527	.358	2.9	A	74 ft
WB Approach								11.7	B	
RT	10/1	.093	.264	227	277	61	.220	11.2	B	38 ft
LT+TH	12/1	.132	.264	286	340	122	.359	11.9	B	76 ft
EB Approach								11.8	B	
RT	10/1	.060	.264	292	347	46	.133	10.9	B	29 ft
LT+TH	12/1	.142	.264	331	388	155	.399	12.1	*B	96 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/06/96
14:31:26

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 5 - PAIWA ST & HIAPO ST

METROAREA	NONCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	.0	.0	.0	.0
GRADES	MODER	MODER	MODER	MODER
PEDLEVELS	NONE	BOTH	NONE	NONE
PARKINGSIDES	20	20	20	20
PARKVOLUMES	5	0	5	0
BUSVOLUMES	0	72	0	86
RIGHTTURNONREDS				

Movement Parameters

	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
MOVLABELS	177	827	99	72	28	50	40	625	86	114	11	91
VOLUMES	.0	24.0	.0	10.0	12.0	.0	.0	24.0	.0	10.0	12.0	.0
WIDTHS	0	2	0	1	1	0	0	2	0	1	1	0
LANES	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UTILIZATIONS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
TRUCKPERCENTS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
PEAKHOURFACTORS	3	3	3	3	3	3	3	3	3	3	3	3
ARRIVALTYPES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
ACTUATIONS	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
REQCLEARANCES	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
MINIMUMS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
IDEALSATFLOWS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
GROUPTYPES	0	2540	0	1050	1459	0	0	2231	0	1312	1370	0
SATURATIONFLOWS												

Phasing Parameters

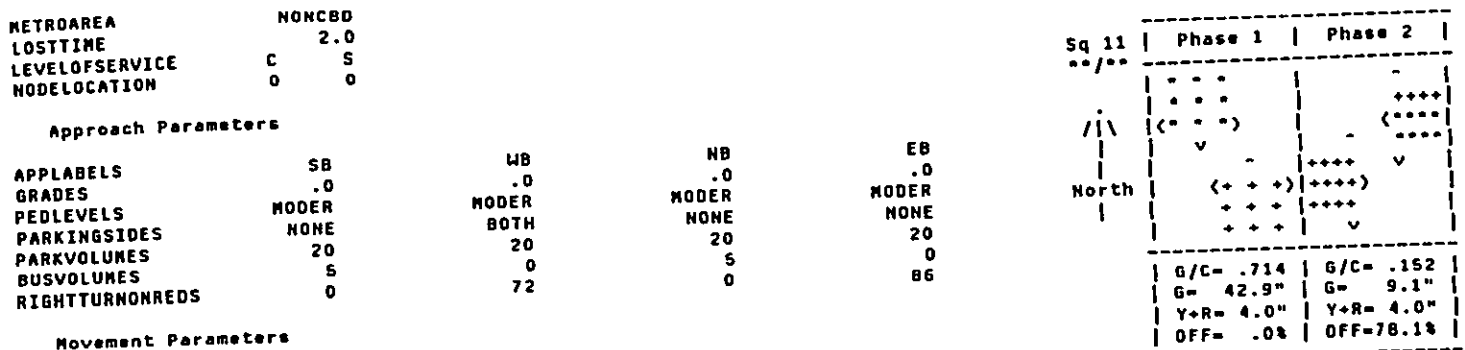
SEQUENCES	11	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	42.85	9.15					
YELLOWTIMES	4.00	4.00					
CRITICALS		2	5				
EXCESS		0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/06/96
14:31:36

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 5 - PAIWA ST & HIAPO ST
Degree of Saturation (v/c) .53 Vehicle Delay 3.6 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
								2.7	A	
SB Approach										
LT+TH+RT	24/2	.469	.748	1899	1899	1161	.611	2.7	*A	124 ft
								2.1	A	
NB Approach										
LT+TH+RT	24/2	.377	.748	1668	1668	791	.474	2.1	A	84 ft
								13.8	B	
WB Approach										
RT	10/1	.003	.186	147	192	1	.005	12.9	B	25 ft
LT+TH	12/1	.086	.186	215	271	82	.303	13.8	*B	56 ft
								14.3	B	
EB Approach										
RT	10/1	.042	.186	191	244	29	.119	13.1	B	26 ft
LT+TH	12/1	.113	.186	200	255	108	.424	14.6	B	74 ft

AMFAC WAIPAHU TIAR
2000 BASE CONDITIONS
AM PEAK HOUR

02/06/96
14:33:35

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 6 - PAIWA ST & H-1 EB RAMPS

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	-2.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES.	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	599	451	0	0	0	338	271	0	205	6	420
WIDTHS	.0	24.0	12.0	.0	.0	.0	.0	24.0	.0	12.0	12.0	.0
LANES	0	2	1	0	0	0	0	2	0	1	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3688	1770	0	0	0	0	3332	0	1554	1559	0

Phasing Parameters

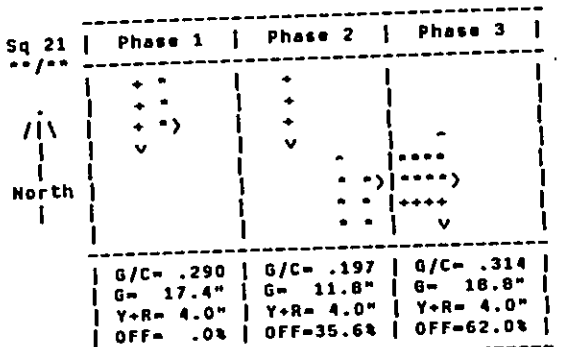
SEQUENCES	21	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	17.39	11.80	18.81				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	3	8	11				
EXCESS	0						

AMFAC WAIPAHU TIAR
2000 BASE CONDITIONS
AM PEAK HOUR

02/06/96
14:33:45

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 6 - PAIWA ST & H-1 EB RAMPS
Degree of Saturation (v/c) .65 Vehicle Delay 14.5 Level of Service B



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								10.5	B	
TH	24/2	.192	.586	2163	2163	631	.292	4.0	A	110 ft
LT	12/1	.301	.323	516	572	475	.830	19.1	*C+	271 ft
NB Approach								19.9	C+	
TH+RT	24/2	.214	.230	696	766	641	.837	19.9	*C+	208 ft
EB Approach								15.9	C+	
RT	12/1	.176	.347	486	539	216	.401	9.9	B+	119 ft
LT+TH	12/1	.323	.347	488	541	448	.828	18.8	*C+	247 ft

AMFAC WAIPAHU TIAR
2000 + BASE
PM PEAK HOUR

02/06/96
14:35:30

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 6 - PAIWA ST & H-1 EB RAMPS

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	.0	.0	.0	-2.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	870	334	0	0	0	555	431	0	241	6	585
WIDTHS	.0	24.0	12.0	.0	.0	.0	.0	24.0	.0	12.0	12.0	.0
LANES	0	2	1	0	0	0	0	2	0	1	1	0
UTILIZATIONS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3688	1770	0	0	0	0	3327	0	1554	1558	0

Phasing Parameters

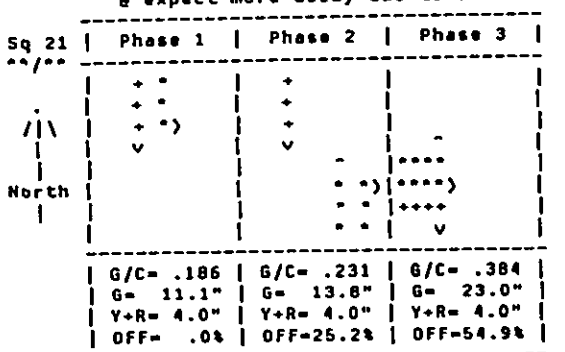
SEQUENCES	21	ALL				
PERMISSIVES	NO	NO	NO	NO	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	11.14	13.83	23.03			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	3	8	11			
EXCESS	0					

AMFAC WAIPAHU TIAR
2000 + BASE
PM PEAK HOUR

02/06/96
14:35:40

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 6 - PAIWA ST & H-1 EB RAMPS
Degree of Saturation (v/c) .76 Vehicle Delay 20.8@ Level of Service C
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								10.8	B	
TH	24/2	.243	.516	1901	1903	827	.435	6.0	B+	169 ft
LT	12/1	.214	.219	326	387	317	.819	23.4	*C	209 ft
NB Approach								37.6@	D	
TH+RT	24/2	.299	.264	813	878	937	1.067	37.6@	*D	291 ft
EB Approach								15.4	C+	
RT	12/1	.185	.417	603	649	229	.353	7.9	B+	113 ft
LT+TH	12/1	.392	.417	604	650	661	.863	18.4	*C+	276 ft

AMFAC WAIPAHU TIAR
2000 BASE CONDITIONS
AM PEAK HOUR

02/06/96
14:37:15

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 7 - PAIWA ST & H-1 WB RAMPS

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	-2.0	-2.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	510	962	0	69	6	185	0	465	230	0	0	0
WIDTHS	.0	24.0	.0	.0	12.0	12.0	.0	24.0	12.0	.0	.0	.0
LANES	0	2	0	0	1	1	0	2	1	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	FFLW	NORM	NORM	FFLW	NORM	DOPT	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3725	0	0	1573	1554	0	3651	1752	0	0	0

Phasing Parameters

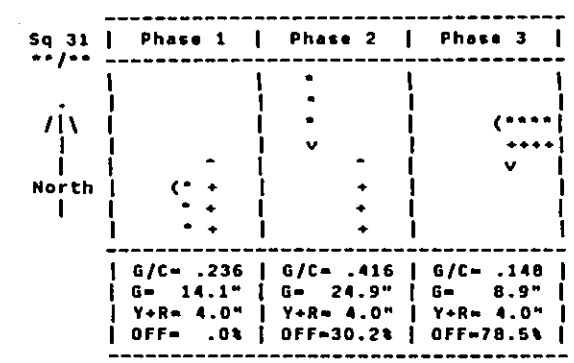
SEQUENCES	31	ALL				
PERMISSIVES	NO	NO	NO	NO	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	14.15	24.95	8.91			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	9	2	5			
EXCESS	0					

AMFAC WAIPAHU TIAR
2000 BASE CONDITIONS
AM PEAK HOUR

02/06/9
14:37:2.

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 7 - PAIWA ST & H-1 WB RAMPS
Degree of Saturation (v/c) .46 Vehicle Delay 7.9 Level of Service B



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								8.5	B+	
TH	24/2	.288	.449	1653	1673	1013	.605	8.5	*B+	235 ft
NB Approach								5.2	B+	
TH	24/2	.155	.752	2744	2744	489	.178	1.4	A	51 ft
LT	12/1	.173	.269	412	471	242	.514	12.8	*B	149 ft
WB Approach								14.2	B	
TH	12/1-	.096	.182	228	286	103	.360	14.2	*B	71 ft
LT	12/1+	.093	.182	225	283	98	.346	14.2	B	68 ft

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 7 - PAIWA ST & H-1 WB RAMPS

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	SB	WB	NB	EB
GRADES	-2.0	-2.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

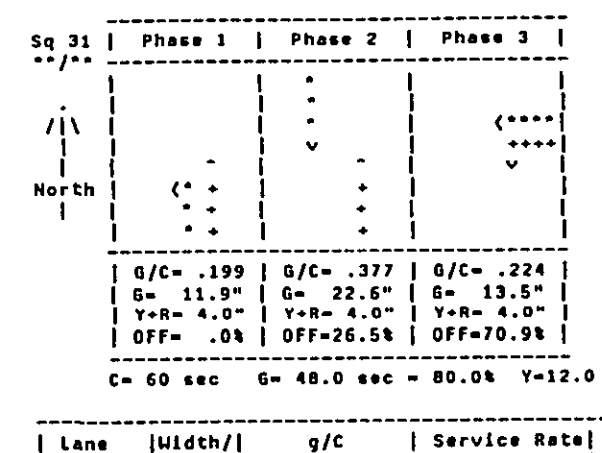
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	566	844	0	259	6	355	0	792	185	0	0	0
WIDTHS	.0	24.0	.0	.0	12.0	12.0	.0	24.0	12.0	.0	.0	.0
LANES	0	2	0	0	1	1	0	2	1	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	FFLW	NORM	NORM	FFLW	NORM	DOPT	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3725	0	0	1564	1554	0	3651	1752	0	0	0

Phasing Parameters

SEQUENCES	31	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.00	1
OVERLAPS	NO	NO	NO	NO	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	11.91	22.63	13.46				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	9	2	5				
EXCESS	0						

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 7 - PAIWA ST & H-1 WB RAMPS
Degree of Saturation (v/c) .47 Vehicle Delay 7.8 Level of Service B+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate BC (vph)	Service Rate BE (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								9.3	B+	
TH	24/2	.256	.411	1498	1529	888	.581	9.3	*B+	221 ft
NB Approach								4.7	A	
TH	24/2	.247	.676	2467	2467	834	.338	2.7	A	114 ft
LT	12/1	.145	.232	345	406	195	.480	13.6	*B	126 ft
WB Approach								12.9	B	
TH	12/1-	.161	.258	345	403	195	.484	12.9	*B	122 ft
LT	12/1+	.155	.258	342	400	185	.463	12.8	B	116 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/06/96
14:47:26

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 8 - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS		.0	2.0	.0
GRADES	-2.0	MODER	MODER	MODER
PEDLEVELS	MODER	NONE	NONE	NONE
PARKINGSIDES	NONE	20	20	20
PARKVOLUMES	20	5	5	5
BUSVOLUMES	5	0	0	0
RIGHTTURNONREDS	0			

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	8	195	30	32	75	961	360	87	119	357	87	9
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	0	2	1	0	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3691	740	0	3416	1770	0	2931	939	0	2962	1770

Phasing Parameters

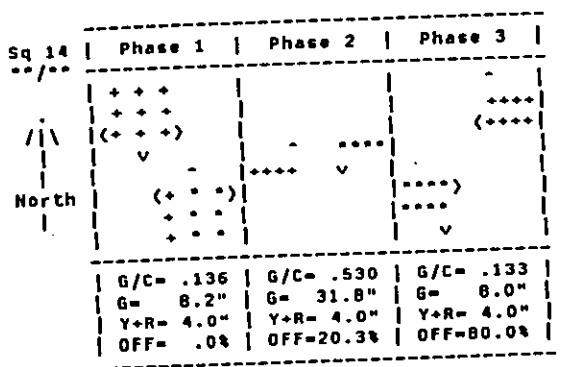
SEQUENCES	14	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.00	1
OVERLAPS	NO	NO	NO		PEDTIME	.0	0
CYCLES	60	120	10				
GREENTIMES	8.17	31.82	8.01				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	8	6	11				
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/06/9
14:47:36

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 8 - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) .87 Vehicle Delay 31.6 Level of Service D+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								14.3	B	
TH+RT	24/2	.077	.170	549	626	213	.340	14.3	B	75 ft
LT	12/1	.000	.170	87	118	32	.256	14.2	B	25 ft
NB Approach								34.9	D	
TH+RT	24/2	.185	.170	424	497	471	.948	36.1	*D	165 ft
LT	12/1	.182	.170	115	153	125	.786	30.3	D+	88 ft
WB Approach								32.0	D+	
TH+RT	24/2	.049	.167	494	570	113	.198	13.9	B	40 ft
LT	12/1	.584	.564	972	997	1012	1.015	34.0	*D	372 ft
EB Approach								35.6	D	
TH+RT	24/2	.183	.167	421	494	468	.947	36.2	*D	164 ft
LT	12/1	.013	.564	972	997	9	.009	3.7	A	25 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/06/96
14:49:05

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

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 8 - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	-2.0	.0	2.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	5	139	58	48	130	1136	710	190	279	177	63	1
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	0	2	1	0	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3695	1787	0	3443	1770	0	2945	1752	0	3021	1770

Phasing Parameters

SEQUENCES	45						
PERMISSIVES	NO	NO	NO	NO		LEADLAGS	NONE	NONE
OVERLAPS	NO	NO	NO	NO		OFFSET	.00	1
CYCLES	60	120	10			PEDTIME	.0	0
GREENTIMES	9.28	11.30	5.94	7.54	5.94			
YELLOWTIMES	4.00	4.00	4.00	4.00	4.00			
CRITICALS	9	8	12	6	11			
EXCESS	0							

APPENDIX B

• YEAR 2000 WITH PHASE I LOS CALCULATIONS

AMFAC - WAIPAHU TRAFFIC STUDY 02/21/96
2000 - SCENARIO A 14:36:35
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT RD

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	3.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	109	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	0	0	0	349	291	109	0	73	120	433	0
WIDTHS	.0	.0	.0	.0	12.0	.0	11.0	.0	11.0	.0	12.0	.0
LANES	0	0	0	0	1	0	1	0	1	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	NO
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	0	0	0	1825	0	1172	0	1465	0	1580	0

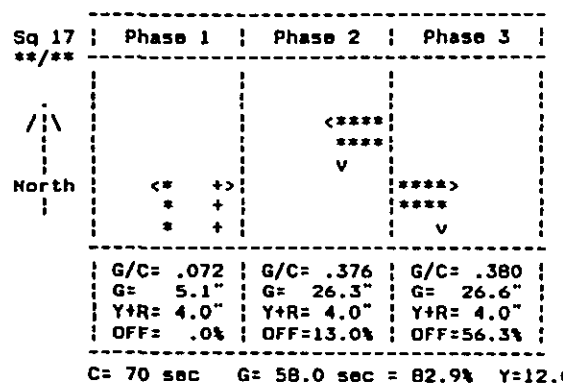
Phasing Parameters

SEQUENCES	17	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	NO	NO	NO	NO	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	5.07	26.32	26.61			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	9	5	11			
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY 02/21/96
2000 - SCENARIO A 14:36:40
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT RD
Degree of Saturation (v/c) .88 Vehicle Delay 23.6 Level of Service C



C= 70 sec G= 58.0 sec = 82.9% Y=12.0 sec = 17.1% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
NB Approach								21.8	C	
RT	11/1	.004	.101	71	108	1	.008	18.3	C+	25 ft
LT	11/1	.088	.101	93	139	77	.520	21.9	*C	68 ft
WB Approach								23.8	C	
LT+TH	12/1	.401	.405	682	739	673	.911	23.8	*C	394 ft
EB Approach								23.8	C	
TH+RT	12/1	.405	.409	590	646	582	.901	23.8	*C	339 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
14:38:38

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	3.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	147	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	0	0	0	618	210	162	0	101	108	369	0
WIDTHS	.0	.0	.0	.0	12.0	.0	11.0	.0	11.0	.0	12.0	.0
LANES	0	0	0	0	1	0	1	0	1	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	NO
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	0	0	0	973	0	1172	0	1465	0	1577	0

Phasing Parameters

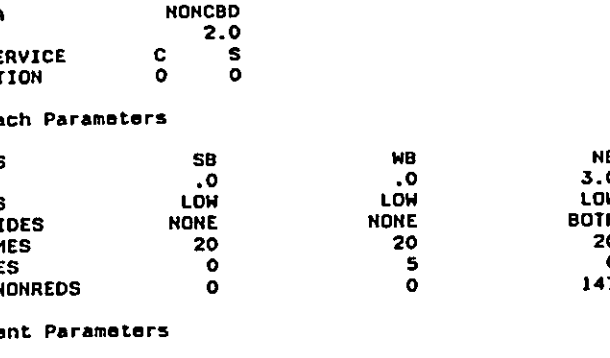
SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	NO	NO	NO	NO	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	5.35	66.65				
YELLOWTIMES	4.00	4.00				
CRITICALS	9	5				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
14:38:43

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST
Degree of Saturation (v/c) .79 Vehicle Delay 26.7 Level of Service D+



C= 80 sec G= 72.0 sec = 90.0% Y= 8.0 sec = 10.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
NB Approach								37.5	D	
RT	11/1	.044	.092	53	97	16	.148	21.7	C	25 ft
LT	11/1	.123	.092	69	124	106	.785	39.9	*D	108 ft
WB Approach								40.0	D	
LT+TH	12/1	.900	.858	827	835	872	1.044	40.0	*D	139 ft
EB Approach								.8	A	
TH+RT	12/1	.365	.858	1353	1353	502	.371	.8	A	80 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 SCENARIO A
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
12:37:23

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int 0 2 - WAIPAHU ST & MOKUOLA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	175	115	11	11	484	371	207	33	83	156	312	79
WIDTHS	12.0	12.0	.0	.0	12.0	.0	12.0	12.0	.0	.0	12.0	12.0
LANES	1	1	0	0	1	0	1	1	0	0	1	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1539	1811	0	0	585	0	1219	1264	0	0	1720	312

Phasing Parameters

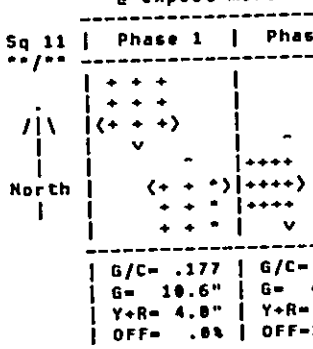
SEQUENCES	11	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	10.61	41.39					
YELLOWTIMES	4.00	4.00					
CRITICALS	7	5					
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 SCENARIO A
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
12:37:32

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int 0 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) 1.21 Vehicle Delay 30.1@ Level of Service D+
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								14.6	B	
RT	12/1	.156	.210	265	323	184	.570	15.5	C+	123 ft
LT+TH	12/1	.183	.210	319	381	133	.349	13.3	B	89 ft
NB Approach								24.7	C	
RT	12/1	.223	.210	203	256	218	.852	30.5	*D+	145 ft
LT+TH	12/1	.135	.210	212	266	122	.459	14.3	B	81 ft
WB Approach								55.0@	E	
LT+TH+RT	12/1	1.000	.723	396	423	912	2.156	55.0@	*E	213 ft
EB Approach								2.2	A	
TH+RT	12/1	.319	.723	1244	1244	492	.395	2.2	A	115 ft
LT	12/1	.187	.723	198	225	83	.369	2.5	A	25 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
12:39:57

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 2 - WAIPAHU ST & MOKUOLA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREOS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	200	66	15	14	536	248	281	58	186	125	464	63
WIDTHS	12.0	12.0	.0	.0	12.0	.0	12.0	12.0	.0	.0	12.0	11.0
LANES	1	1	0	0	1	0	1	1	0	0	1	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1539	1727	0	0	537	0	1219	1461	0	0	1758	286

Phasing Parameters

SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES		
OVERLAPS	YES	YES	YES	YES		
CYCLES	60	180	10			
GREENTIMES	13.01	38.99				
YELLOWTIMES	4.00	4.00				
CRITICALS	7	5				
EXCESS	0					

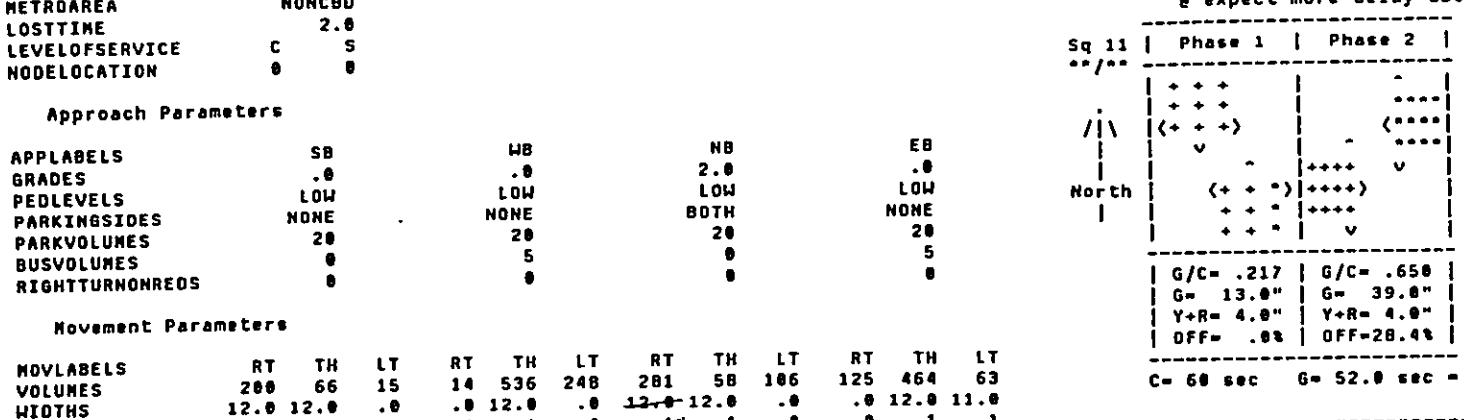
LEADLAGS	NONE	NONE
OFFSET	.00	1
PEDTIME	.0	0

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
12:40:02

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) 1.21 Vehicle Delay 31.2@ Level of Service D+
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								13.2	B	
RT	12/1	.174	.250	327	385	211	.548	13.9	B	133 ft
LT+TH	12/1	.075	.250	372	432	85	.197	11.5	B	54 ft
NB Approach								34.3	D	
RT	12/1	.207	.250	252	305	296	.970	46.7	*E+	187 ft
LT+TH	12/1	.156	.250	309	366	173	.473	13.1	B	109 ft
WB Approach								50.5@	E	
LT+TH+RT	12/1	1.000	.683	338	367	840	2.289	50.5@	*E	224 ft
EB Approach								3.3	A	
TH+RT	12/1	.381	.683	1196	1201	620	.516	3.3	A	166 ft
LT	11/1	.000	.683	168	195	66	.338	2.9	A	25 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
14:23:38

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	156	0	0	0

Movement Parameters

	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
MOVLABELS												
VOLUMES	513	407	45	65	484	371	93	212	30	95	252	223
WIDTHS	11.0	12.0	.0	.0	12.0	.0	.0	12.0	.0	.0	12.0	.0
LANES	1	1	0	0	1	0	0	1	0	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1264	0	0	546	0	0	374	0	0	332	0

Phasing Parameters

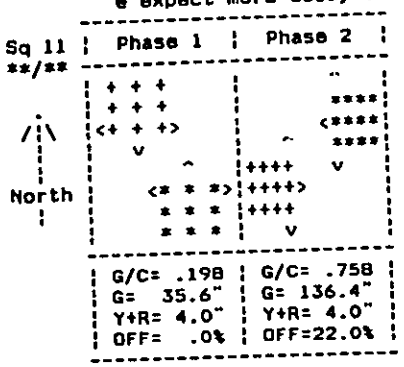
SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	35.62	136.38				
YELLOWTIMES	4.00	4.00				
CRITICALS	8	5				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
14:23:42

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) 2.38 Vehicle Delay 88.8@ Level of Service F
@ expect more delay due to extreme v/c's (see EVALUATE)



C=180 sec G=172.0 sec = 95.6% Y= 8.0 sec = 4.4% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								105.0@	F	
RT	11/1	.459	.209	1	239	376	1.353	104.3@	F	752 ft
LT+TH	12/1	.513	.209	1	226	475	1.799	105.5@	F	951 ft
NB Approach								145.7@	F	
LT+TH+RT	12/1	.994	.209	1	56	353	4.526	145.7@	*F	706 ft
WB Approach								63.2@	F	
LT+TH+RT	12/1	1.000	.769	377	420	968	2.305	63.2@	*F	566 ft
EB Approach								73.8@	F	
LT+TH+RT	12/1	1.000	.769	218	255	600	2.353	73.8@	F	351 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
14:27:30

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	.0	.0	.0	.0
GRADES	MODER	MODER	MODER	MODER
PEDLEVELS	NONE	NONE	NONE	NONE
PARKINGSIDES	20	20	20	20
PARKVOLUMES	5	5	5	5
BUSVOLUMES	235	0	0	0
RIGHTTURNONREDS				

Movement Parameters

	SB			WB			NB			EB		
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	455	226	37	57	376	33	64	221	43	72	356	341
WIDTHS	11.0	12.0	.0	.0	12.0	.0	.0	12.0	.0	.0	12.0	.0
LANES	1	1	0	0	1	0	0	1	0	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1632	0	0	1150	0	0	1351	0	0	666	0

Phasing Parameters

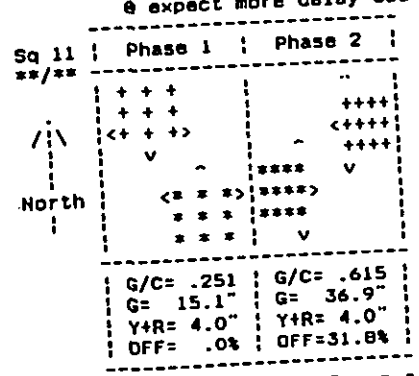
SEQUENCES	11	ALL	YES	YES	LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	10		PEDTIME	.0	0
CYCLES	60	180					
GREENTIMES	15.08	36.92					
YELLOWTIMES	4.00	4.00					
CRITICALS	8	11					
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
14:27:42

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) 1.14 Vehicle Delay 30.3@ Level of Service D+
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
								13.8	B	
SB Approach										
RT	11/1	.216	.285	325	379	232	.612	14.1	B	140 ft
LT+TH	12/1	.206	.285	407	464	277	.597	13.5	B	167 ft
								29.3	D+	
NB Approach										
LT+TH+RT	12/1	.296	.285	330	385	345	.896	29.3	*D+	208 ft
								5.7	B+	
WB Approach										
LT+TH+RT	12/1	.464	.649	722	746	491	.658	5.7	B+	145 ft
								56.1@	E	
EB Approach										
LT+TH+RT	12/1	1.000	.649	402	432	810	1.875	56.1@	*E	240 ft

ATA Inc. TWO-WAY STOP CONTROLLED INTERSECTION LEVEL OF SERVICE ANALYSIS

Major Street: PAINA ST
Minor Street: PAINA PL
Scenario: YEAR 2000 - SCENARIO A
Peak Hour: AM

Peak Hour Factor: 1.00

---------MAJOR STREET---------
Num of Lanes - V2: 2
Excl LT - V1 (Y/N): N
Excl RT - V3 (Y/N): N
Stop/Yield - V3 (Y/N): N
Grade - V1,V2,V3: 0

Num of Lanes - V5: 2
Excl LT - V4 (Y/N): N
Excl RT - V6 (Y/N): N
Stop/Yield - V6 (Y/N): N
Grade - V4,V5,V6: 0

---------MINOR STREET---------
Num of Lanes - V8: 1
Grade - V7,V8,V9: 0
Shared Lane-V7,8,9: 3
(0:N,1:LT,2:TR,3:LTR)

Num of Lanes - V11: 1
Grade - V10,V11,V12: 0
Shared Lane-V10,11,12: 0
(0:N,1:LT,2:TR,3:LTR)

V12 V11 V10

0 0 .

V1 0 -----
V2 539 -------
V3 1 -----

---- 1200 V5
---- 1029 V4
---- 5 V6

MAJOR STREET
PAINA ST

MINOR STREET - PAINA PL

VOLUME ADJUSTMENTS

MOVEMENT NO.	1	2	3	4	5	6	7	8	9	10	11	12
HOURLY FLOW RATE, v(vph)	0	539	1	0	1029	1200	0	0	0	0	0	0
VOLUME, v (pcph)	0	539	1	0	1029	1200	0	0	0	0	0	0

STEP 1: RT FROM MINOR STREET

Conflicting Flows:	Vc9 = 2/2 V5 + V2 =	2206 vph	Vc12 = 2 2 Vc + V5 =	4235 vph
Potential Capacity:	Cp,9 =	1210 pcph	Cp,12 =	1103 pcph
Movement Capacity:	Cm,9=Cp,9=	1016 pcph	Cm,12=Cp,12=	1103 pcph
Prob. of Queue-free State:	Pq,9=1-v9/Cm,9=	1.00	Pq,12=1-v12/Cm,12=	1.00

STEP 2: LT FROM MAJOR STREET

Conflicting Flows:	Vc,4 = V2 + V3 =	540 vph	Vc,1 = V5 + Vc =	2236 vph
Potential Capacity:	Cp,4 =	870 pcph	Cp,1 =	1057 pcph
Movement Capacity:	Cm,4=Cp,4=	870 pcph	Cm,1=Cp,1=	1057 pcph
Prob. of Queue-free State:	Pq,4=1-v4,Cm4=	0.99	Pq,1=1-v1 Cm1=	1.00
Major Left Shared Lane Prob. of Queue-free State	Pq,4=	0.99	Pq,1=	1.00

----continued ----

STEP 3: TH FROM MINOR STREET

Conflicting Flows:	Vc,6 = 1.2V2+V2+V1+Vc+V5+V4 =	1814 vph	Vc,11 = 1 2Vc+V5+V4+C+V2+V1 =	1864 vph
Potential Capacity:	Cp,6 =	95 pcph	Cp,11 =	117 pcph
Capacity Adj Factor:	f6 = Cp,6*Pp,6 =	1.00	f11 = Cp,6*Pp,6 =	1.00
Movement Capacity:	Cm,6 = Cp,6*f6 =	94 pcph	Cm,11 = Cp,11*f11 =	101 pcph
Prob. of Queue-free State:	Pp,6 = 1-v6/Cm,6 =	1.00	Pp,11 = 1-v11 Cm,1 =	1.00

STEP 4: LT FROM MINOR STREET

Conflicting Flows:	Vc,7 = 1.2V3+V2+V1+2Vc+V5+V4+ 1.2+V11+V1,2 =	1550 vph	Vc,10 = 1 2Vc+V5+.+V1 2V2+V2+V1 + 2+V5+V4 =	2083 vph
Potential Capacity:	Cp* =	130 pcph	Cp,10 =	85 pcph
Major Left, Minor Through Impedance Factor:	fP* Pp=0.11*11 =	0.99	f*10=Pp.8*E =	1.00
Major Left, Minor Through Adjusted Impedance Factor:	f*7 =	0.99	f*10 =	1.00
Capacity Adjustment Factor:	f17 = 0 1-Pp0.12 =	0.99	*10 = 0 1-Pp0.* =	1.00
Movement Capacity:	Cm,7 = f7*Cp,7 =	157 pcph	Cm,10 = f10*Cp,1. =	85 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

MOVEMENT	vi(pcph)	ci(pcph)	cmi(pcph)	AVG TOTAL DELAY	LOS	LEVEL OF SERVICE CRITERIA
MINOR LEFT TURN (7)	0	107	SHRD	SHRD	--	
MINOR THROUGH (8)	0	94	101	27.*	D	
MINOR RIGHT TURN (9)	1	1010	SHRD	SHRD	----	
MINOR LEFT TURN (10)	0	85	--NA--	41.6	E	
MINOR THROUGH (11)	0	111	--NA--	33.2	E	
MINOR RIGHT TURN (12)	0	101	--NA--	9.9	A	
MAJOR LEFT (1)	0	157	--NA--	10.0	A	
MAJOR LEFT (4)	0	870	--NA--	9.1	A	
MINOR APPROACH (7)(8)(9)	-	-	-	27.*	D	
MINOR APPROACH (10)(11)(12)	-	-	-	ERR	ERR	
MAJOR APPROACH (1)(2)(3)	-	-	-	0.1	----	
MAJOR APPROACH (4)(5)(6)	-	-	-	0.0	A	
TOTAL INTERSECTION (1-12)	-	-	-	ERR	ERR	

LEVEL OF SERVICE CRITERIA	
	AVG TOTAL DELAY (SEC/VEH)
A	0-10
B	10-15
C	15-25
D	25-35
E	35-50
F	50+

ATA Inc. TWO-WAY STOP CONTROLLED INTERSECTION LEVEL OF SERVICE ANALYSIS

Major Street: PAINA ST
Minor Street: PAINA PL
Scenario: YEAR 2000 - SCENARIO A
Peak Hour: PM

Peak Hour Factor: 1.00

---------MAJOR STREET---------
Num of Lanes - V2: 2
Excl LT - V1 (Y/N): N
Excl RT - V3 (Y/N): N
Stop/Yield - V3 (Y/N): N
Grade - V1,V2,V3: 0

Num of Lanes - V5: 2
Excl LT - V4 (Y/N): N
Excl RT - V6 (Y/N): N
Stop/Yield - V6 (Y/N): N
Grade - V4,V5,V6: 0

---------MINOR STREET---------
Num of Lanes - V8: 1
Grade - V7,V8,V9: 0
Shared Lane-V7,8,9: 3
(0=N,1=LT,2=TR,3=LTR)

Num of Lanes - V11: 1
Grade - V10,V11,V12: 0
Shared Lane-V10,11,12: 0
(0=N,1=LT,2=TR,3=LTR)

V1: 0 -----
V2 942 -------
V3 5 -----

MAJOR STREET
PAINA ST

MINOR STREET - PAINA PL

VOLUME ADJUSTMENTS

MOVEMENT NO.	1	2	3	4	5	6	7	8	9	10	11	12
HOURLY FLOW RATE, V(vph)	0	942	5	5	942	82	4	0	2	0	0	0
VOLUME, v (pcph)	0	942	5	5	942	82	4	0	2	0	0	0

STEP 1: RT FROM MINOR STREET

Conflicting Flows:	vc9 = v2 V3 + V2 =	474 vph	vc12 = v2 V6 + V5 = 525 vph
Potential Capacity:	Cp,9 =	797 pcph	Cp,12 = 752 pcph
Movement Capacity:	Cm,9=Cp,9:	797 pcph	Cm,12=Cp,12: 752 pcph
Prb. of Queue-free State:	po,9=1-v9/Cm,9:	1.00	po,12=1-v12/Cm,12: 1.00

STEP 2: LT FROM MAJOR STREET

Conflicting Flows:	vc,4 = V2 + V3 =	947 vph	vc,1 = V5 + V6 = 1047 vph
Potential Capacity:	Cp,4 =	532 pcph	Cp,1 = 470 pcph
Movement Capacity:	Cm,4:Cp,4:	532 pcph	Cm,1:Cp,1: 470 pcph
Prb. of Queue-free State:	po,4=1-v4/Cm4:	0.99	po,1=1-v1/Cm1: 1.00
Major Left Shared Lane Prob. of Queue-free State	p*o,4:	0.98	p*o,1: 1.00

PAGE 1 OF 2

----continued ----

Major Street: PAINA ST
Minor Street: PAINA PL
Scenario: YEAR 2000 - SCENARIO A
Peak Hour: PM

DATE: 21-Dec-9
Analyst: BC
File Name: PAIPA1-F
Intersection Intersection #: 12

STEP 3: TH FROM MINOR STREET

Conflicting Flows:	vc,6 = 1/2v3+v2+V1+Vo+V5+V4 = 1396 vph	vc,11 = 1 2v6+V5+v4+v3+V2+V1 = 1357 vph
Potential Capacity:	Cp,6 = 74 pcph	Cp,11 = 78 pcph
Capacity Adj Factor:	f8 = po,4*po,1 = 0.98	f11 = po,4*po,1 = 0.98
Movement Capacity:	Cm,6 = Cp,6*f8 = 73 pcph	Cm,11 = Cp,11*f11 = 77 pcph
Prob. of Queue-free State:	po,6 = 1-v6.Cm,6 = 1.00	po,11 = 1-v11/Cm,11 = 1.00

STEP 4: LT FROM MINOR STREET

Conflicting Flows:	vc,7 = 1/2v3+V2+V1+1/2Vo+V5+V4 = 1/2(v2+V1+V12) = 1414 vph	vc,10 = 1 2v6+V5+v4+1 2(v3+V2+V1+ 1 2(v6+V5) = 1357 vph
Potential Capacity:	Cp7 = 63 pcph	Cp10 = 69 pcph
Major Left, Minor Through Impedance Factor:	p*7:po,11*f11 = 0.98	p*10:po,6*f6 = 0.98
Major Left, Minor Through Adjusted Impedance Factor:	p*7 = 0.99	p*10 = 0.99
Capacity Adjustment Factor:	f7 = p*7*po,12 = 0.97	f10 = p*10*po,7 = 0.96
Movement Capacity:	Cm,7 = f7*Cp,7 = 61 pcph	Cm,10 = f10*Cr,10 = 66 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

MOVEMENT	v(pcph)	c(pcph)	c(sh)(pcph)	AVG TOTAL DELAY	LOS
MINOR LEFT TURN (7)	4	61	SHARE	SHFD	--
MINOR THROUGH (8)	2	73	84	43.4	E
MINOR RIGHT TURN (9)	2	797	SHFD	SHFD	----
MINOR LEFT TURN (10)	0	66	--NA--	28.1	F
MINOR THROUGH (11)	0	77	--NA--	20.3	F
MINOR RIGHT TURN (12)	11	752	--NA--	4.9	A
MAJOR LEFT (1)	0	470	--NA--	7.7	A
MAJOR LEFT (4)	0	532	--NA--	6.8	A
MINOR APPROACH (7)(8)(9)	-	-	-	43.4	E
MINOR APPROACH (10)(11)(12)	-	-	-	8.9	A
MAJOR APPROACH (1)(2)(3)	-	-	-	0.6	----
MAJOR APPROACH (4)(5)(6)	-	-	-	0.0	A
TOTAL INTERSECTION (1-12)	-	-	-	0.2	A

LEVEL OF SERVICE CRITERIA

LEVEL OF SERVICE	AVG TOTAL DELAY SEC/VEH
A	<5
B	5 to <10
C	10 to <20
D	20 to <30
E	30 to <45
F	>45

AMFAC WAIPAHU TIAR
2000 - SCENARIO A
AM PEAK HOUR

02/21/96
13:00:25

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # - 4 - PAIWA ST & HAPAPA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS		.0	.0	.0
GRADES	.0	LOW	LOW	LOW
PEDLEVELS	LOW	BOTH	NONE	NONE
PARKINGSIDES	NONE	20	20	20
PARKVOLUMES	20	0	5	0
BUSVOLUMES	5	0	0	0
RIGHTTURNONREDS	0			

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	1167	60	30	0	102	60	515	0	0	0	0
WIDTHS	.0	24.0	.0	.0	12.0	.0	.0	24.0	.0	.0	.0	.0
LANES	0	2	0	0	1	0	0	2	0	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3157	0	0	1001	0	0	3621	0	0	0	0

Phasing Parameters

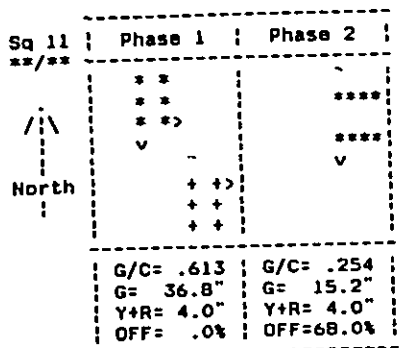
SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	36.78	15.22				
YELLOWTIMES	4.00	4.00				
CRITICALS	2	5				
EXCESS	0					

AMFAC WAIPAHU TIAR
2000 - SCENARIO A
AM PEAK HOUR

02/21/96
13:00:51

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 4 - PAIWA ST & HAPAPA ST
Degree of Saturation (v/c) .51 Vehicle Delay 4.6 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								4.6	A	
LT+TH	24/2	.420	.646	2041	2041	1291	.633	4.6	*A	192 ft
NB Approach								2.9	A	
TH+RT	24/2	.188	.646	2341	2341	605	.258	2.9	A	90 ft
WB Approach								12.5	B	
LT+TH+RT	12/1	.186	.287	238	287	139	.484	12.5	*B	84 ft

AMFAC WAIPAHU TIAR
2000 - SCENARIO A
PM PEAK HOUR

02/21/96
13:02:36

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 4 - PAIWA ST & HAPAPA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	BOTH	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	940	48	20	0	39	37	902	0	0	0	0
WIDTHS	.0	24.0	.0	.0	12.0	.0	.0	24.0	.0	.0	.0	.0
LANES	0	2	0	0	1	0	0	2	0	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	2651	0	0	1002	0	0	3663	0	0	0	0

Phasing Parameters

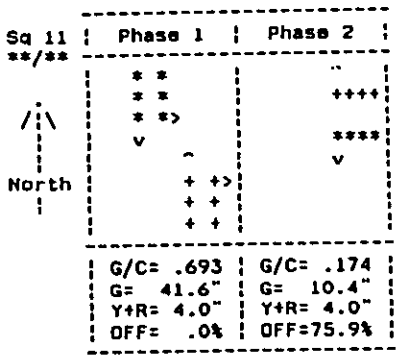
SEQUENCES	11	ALL					
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE	NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00	1
CYCLES	60	180	10		PEDTIME	.0	0
GREENTIMES	41.56	10.44					
YELLOWTIMES	4.00	4.00					
CRITICALS	2	6					
EXCESS	0						

AMFAC WAIPAHU TIAR
2000 - SCENARIO A
PM PEAK HOUR

02/21/96
13:02:45

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 4 - PAIWA ST & HAPAPA ST
Degree of Saturation (v/c) .45 Vehicle Delay 2.7 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								2.6	A	
LT+TH	24/2	.408	.726	1924	1924	1040	.541	2.6	*A	120 ft
NB Approach								2.0	A	
TH+RT	24/2	.287	.726	2659	2659	988	.372	2.0	A	114 ft
WB Approach								13.2	B	
LT+TH+RT	12/1	.098	.207	160	206	62	.298	13.2	B	41 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
13:04:48

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 5 - PAIWA ST & HIAPO ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	BOTH	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	86	0	83

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	48	1005	83	141	37	84	28	419	86	130	71	79
WIDTHS	.0	24.0	.0	10.0	12.0	.0	.0	24.0	.0	10.0	12.0	.0
LANES	0	2	0	1	1	0	0	2	0	1	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3016	0	1050	1255	0	0	2187	0	1312	1457	0

Phasing Parameters

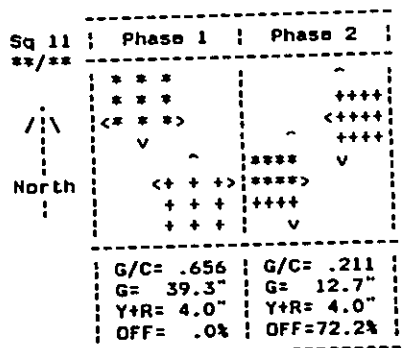
SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	39.34	12.66				
YELLOWTIMES	4.00	4.00				
CRITICALS	2	11				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
13:05:00

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 5 - PAIWA ST & HIAPO ST
Degree of Saturation (v/c) .48 Vehicle Delay 4.9 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								3.4	A	
LT+TH+RT	24/2	.409	.689	2078	2078	1196	.576	3.4	*A	157 ft
NB Approach								2.6	A	
LT+TH+RT	24/2	.285	.689	1507	1507	561	.372	2.6	A	74 ft
WB Approach								12.5	B	
RT	10/1	.089	.244	207	257	58	.226	11.8	B	37 ft
LT+TH	12/1	.140	.244	253	307	127	.414	12.8	B	81 ft
EB Approach								12.7	B	
RT	10/1	.063	.244	266	321	49	.153	11.5	B	31 ft
LT+TH	12/1	.145	.244	299	356	158	.444	13.0	*B	101 ft

AMFAC - WAIPAHU TRAFFIC STUDY 02/21/96
2000 - SCENARIO A 13:09:07
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 5 - PAIWA ST & HIAPO ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	SB	WB	NB	EB
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	BOTH	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	72	0	86

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	177	846	99	72	31	50	40	808	86	114	18	91
WIDTHS	.0	24.0	.0	10.0	12.0	.0	.0	24.0	.0	10.0	12.0	.0
LANES	0	2	0	1	1	0	0	2	0	1	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	2212	0	1050	1443	0	0	2260	0	1312	1348	0

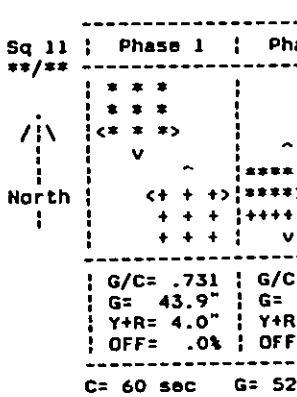
Phasing Parameters

SEQUENCES	11	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	43.85	8.15					
YELLOWTIMES	4.00	4.00					
CRITICALS	2	11					
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY 02/21/96
2000 - SCENARIO A 13:09:16
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 5 - PAIWA ST & HIAPO ST
Degree of Saturation (v/c) .62 Vehicle Delay 4.0 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								3.2	A	
LT+TH+RT	24/2	.544	.764	1690	1690	1181	.699	3.2	*A	117 ft
NB Approach								2.3	A	
LT+TH+RT	24/2	.452	.764	1727	1727	984	.570	2.3	A	98 ft
WB Approach								14.6	B	
RT	10/1	.003	.169	131	174	1	.006	13.4	B	25 ft
LT+TH	12/1	.090	.169	189	244	86	.352	14.6	B	60 ft
EB Approach								15.7	C+	
RT	10/1	.042	.169	170	221	29	.131	13.7	B	25 ft
LT+TH	12/1	.121	.169	175	227	115	.504	16.1	*C+	81 ft

AMFAC WAIPAHU TIAR
2000 - SCENARIO A
AM PEAK HOUR

02/21/96
12:00:59

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 6 - PAIWA ST & H-1 EB RAMPS

METROAREA	NONCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	.0	.0	.0	-2.0
GRADES	LOW	LOW	LOW	LOW
PEDLEVELS	NONE	NONE	NONE	NONE
PARKINGSIDES	20	20	20	20
PARKVOLUMES	5	0	5	0
BUSVOLUMES	0	0	0	0
RIGHTTURNONREDS				

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	706	469	0	0	0	360	281	0	259	6	420
WIDTHS	.0	24.0	12.0	.0	.0	.0	.0	24.0	.0	12.0	12.0	.0
LANES	0	2	1	0	0	0	0	2	0	1	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3688	1770	0	0	0	0	3328	0	1554	1559	0

Phasing Parameters

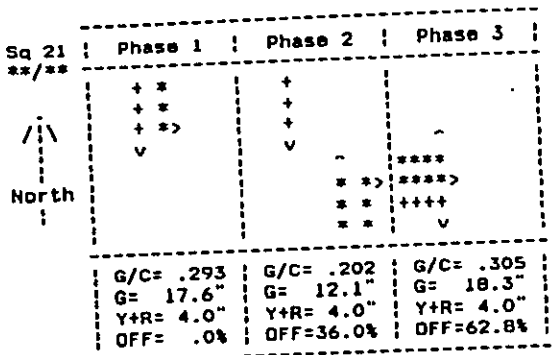
SEQUENCES	21	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	17.59	12.10	18.31				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	3	8	11				
EXCESS	0						

AMFAC. WAIPAHU TIAR
2000 - SCENARIO A
AM PEAK HOUR

02/21/96
12:01:08

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 6 - PAIWA ST & H-1 EB RAMPS
Degree of Saturation (v/c) .68 Vehicle Delay 15.1 Level of Service C+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
								10.6	B	
SB Approach										
TH	24/2	.221	.595	2194	2194	743	.339	4.0	A	127 ft
LT	12/1	.312	.327	523	578	494	.855	20.6	*C	281 ft
								21.2	C	
NB Approach										
TH+RT	24/2	.224	.235	713	782	675	.863	21.2	*C	218 ft
								16.9	C+	
EB Approach										
RT	12/1	.213	.338	473	526	273	.519	11.0	B	152 ft
LT+TH	12/1	.323	.338	475	528	448	.848	20.5	*C	250 ft

AMFAC WAIPAHU TIAR
2000 - SCENARIO A
PM PEAK HOUR

02/21/96
12:02:48

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 6 - PAIWA ST & H-1 EB RAMPS

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	.0	.0	.0	-2.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	881	356	0	0	0	673	496	0	249	6	585
WIDTHS	.0	24.0	12.0	.0	.0	.0	.0	24.0	.0	12.0	12.0	.0
LANES	0	2	1	0	0	0	0	2	0	1	1	0
UTILIZATIONS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3688	1770	0	0	0	0	3319	0	1554	1558	0

Phasing Parameters

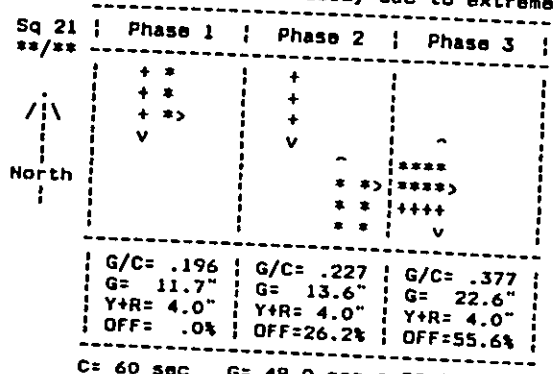
SEQUENCES	21	ALL					
PERMISSIVES	NO	NO	NO	NO	LEADLAGS	NONE	NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00	1
CYCLES	60	180	10		PEDTIME	.0	0
GREENTIMES	11.74	13.61	22.65				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	3	8	11				
EXCESS	0						

AMFAC WAIPAHU TIAR
2000 - SCENARIO A
PM PEAK HOUR

02/21/96
12:02:56

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 6 - PAIWA ST & H-1 EB RAMPS
Degree of Saturation (v/c) .86 Vehicle Delay 22.1@ Level of Service C
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								11.0	B	
TH	24/2	.246	.523	1927	1927	837	.434	5.8	B+	169 ft
LT	12/1	.226	.229	344	405	338	.835	23.9	*C	220 ft
NB Approach								37.9@	D	
TH+RT	24/2	.350	.260	798	864	1111	1.286	37.9@	*D	347 ft
EB Approach								16.3	C+	
RT	12/1	.190	.411	592	639	237	.371	8.1	B+	118 ft
LT+TH	12/1	.392	.411	593	640	561	.877	19.7	*C+	279 ft

AMFAC WAIPAHU TIAR
2000 - SCENARIO A
AM PEAK HOUR

02/21/96
13:27:14

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 7 - PAIWA ST & H-1 WB RAMPS

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	-2.0	-2.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	510	982	0	312	6	290	0	464	241	0	0	0
WIDTHS	.0	24.0	.0	.0	12.0	12.0	.0	24.0	12.0	.0	.0	.0
LANES	0	2	0	0	1	1	0	2	1	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	FFLW	NORM	NORM	FFLW	NORM	DDPT	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3725	0	0	1567	1554	0	3651	1752	0	0	0

Phasing Parameters

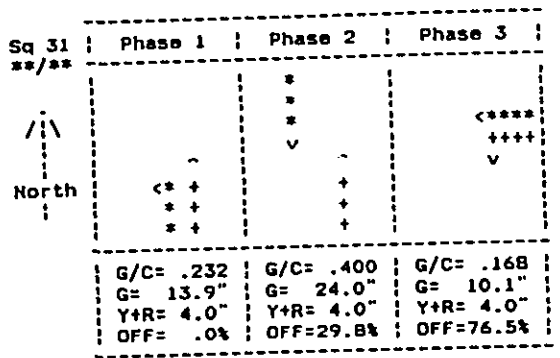
SEQUENCES	31	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	13.91	24.01	10.08				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	9	2	5				
EXCESS	0						

AMFAC WAIPAHU TIAR
2000 - SCENARIO A
AM PEAK HOUR

02/21/96
13:27:37

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 7 - PAIWA ST & H-1 WB RAMPS
Degree of Saturation (v/c) .50 Vehicle Delay 8.8 Level of Service B+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
								9.2	B+	
SB Approach										
TH	24/2	.294	.434	1590	1615	1034	.640	9.2	*B+	247 ft
								5.6	B+	
NB Approach										
TH	24/2	.155	.732	2673	2673	488	.183	1.6	A	55 ft
LT	12/1	.180	.265	405	465	254	.546	13.3	*B	157 ft
								14.8	B	
WB Approach										
TH	12/1-	.136	.201	257	315	159	.505	14.9	*B	107 ft
LT	12/1+	.132	.201	255	313	152	.486	14.7	B	102 ft

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 7 - PAIWA ST & H-1 WB RAMPS

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	O	O

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	-2.0	-2.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

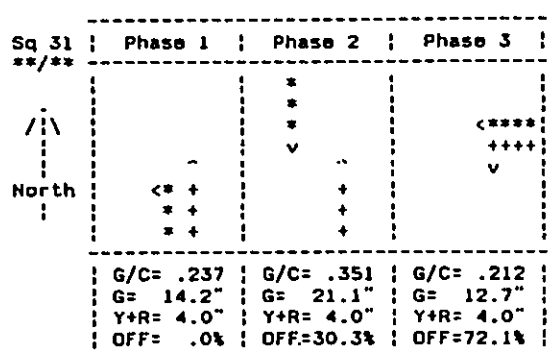
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	566	862	0	1109	6	370	0	795	247	0	0	0
WIDTHS	.0	24.0	.0	.0	12.0	12.0	.0	24.0	12.0	.0	.0	.0
LANES	0	2	0	0	1	1	0	2	1	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	FFLW	NORM	NORM	FFLW	NORM	DOPT	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3725	0	0	1564	1554	0	3651	1752	0	0	0

Phasing Parameters

SEQUENCES	31	ALL					
PERMISSIVES	NO	NO	NO	NO	LEADLAGS	NONE	NONE
OVERLAPS	NO	NO	NO	NO	OFFSET	.00	1
CYCLES	60	180	10		PEDTIME	.0	0
GREENTIMES	14.20	21.09	12.71				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	9	2	5				
EXCESS	0						

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 7 - PAIWA ST & H-1 WB RAMPS
Degree of Saturation (v/c) .50 Vehicle Delay 8.5 Level of Service B+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Pad= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								10.4	B	
TH	24/2	.261	.385	1395	1433	907	.633	10.4	*B	235 ft
NB Approach								5.0	B+	
TH	24/2	.248	.688	2512	2512	837	.333	2.5	A	110 ft
LT	12/1	.183	.270	414	473	260	.550	13.2	*B	160 ft
WB Approach								13.7	B	
TH	12/1-	.167	.245	326	384	203	.529	13.8	*B	129 ft
LT	12/1+	.160	.245	323	381	192	.504	13.5	B	122 ft

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2000 - SCENARIO A
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
13:19:33

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 8 - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

	SB	WB	NB	EB
APPLABELS		.0	2.0	.0
GRADES	-2.0	MODER	MODER	MODER
PEDLEVELS	MODER	NONE	NONE	NONE
PARKINGSIDES	NONE	20	20	20
PARKVOLUMES	20	5	5	5
BUSVOLUMES	5	0	0	0
RIGHTTURNONREDS	0			

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	8	195	30	32	75	991	384	87	115	347	87	9
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	0	2	1	0	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3691	604	0	3416	1770	0	2922	919	0	2966	1770

Phasing Parameters

SEQUENCES	14	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.00	1
OVERLAPS	NO	NO	NO	NO	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	10.45	38.15	9.39				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	8	6	11				
EXCESS	0						

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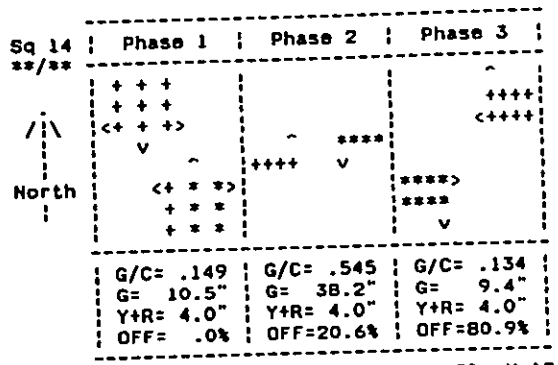
2000 - SCENARIO A
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
13:19:41

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 8 - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) .87 Vehicle Delay 34.9 Level of Service D



C= 70 sec G= 58.0 sec = 82.9% Y=12.0 sec = 17.1% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate eC (vph)	Service Rate eE	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
								16.4	C+	
SB Approach										
TH+RT	24/2	.082	.178	556	657	213	.324	16.3	C+	86 ft
LT	12/1	.000	.178	69	99	32	.296	16.6	C+	26 ft
								36.9	D	
NB Approach										
TH+RT	24/2	.201	.178	428	520	496	.954	39.1	*D	201 ft
LT	12/1	.189	.178	113	157	121	.738	28.2	D+	98 ft
								36.3	D	
WB Approach										
TH+RT	24/2	.054	.163	458	556	113	.203	16.4	C+	47 ft
LT	12/1	.604	.574	985	1015	1043	1.028	38.5	*D	438 ft
								38.4	D	
EB Approach										
TH+RT	24/2	.185	.163	390	483	457	.946	39.1	*D	188 ft
LT	12/1	.015	.574	985	1015	9	.009	4.1	A	25 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
13:24:03

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 8 - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	-2.0	.0	2.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	5	139	58	48	130	1161	745	190	266	170	63	1
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	0	2	1	0	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3695	389	0	3443	1074	0	2938	1259	0	3027	1189

Phasing Parameters

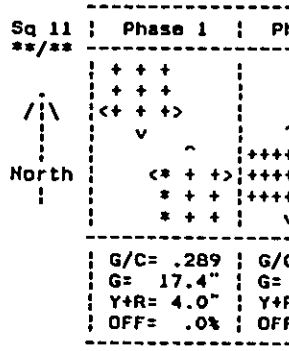
SEQUENCES	11	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.00	1
OVERLAPS	NO	NO	NO	NO	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	17.36	34.64					
YELLOWTIMES	4.00	4.00					
CRITICALS	9	6					
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
13:24:49

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 8 - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) 1.15 Vehicle Delay 36.4@ Level of Service D
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								10.3	B	
TH+RT	24/2	.058	.323	1139	1192	151	.127	9.3	B+	43 ft
LT	12/1	.000	.323	93	119	61	.488	12.9	B	35 ft
NB Approach								39.0	D	
TH+RT	24/2	.352	.323	892	948	984	1.038	45.9	E+	281 ft
LT	12/1	.266	.323	354	406	280	.690	14.8	*B	160 ft
WB Approach								43.7@	E+	
TH+RT	24/2	.074	.611	2103	2103	188	.089	3.1	A	31 ft
LT	12/1	.986	.611	627	656	1222	1.863	50.0@	*E+	401 ft
EB Approach								3.2	A	
TH+RT	24/2	.104	.611	1849	1849	245	.133	3.2	A	40 ft
LT	12/1	.000	.611	698	726	1	.001	2.9	A	25 ft

ATA Inc. STOP CONTROLLED T-INTERSECTION LEVEL OF SERVICE ANALYSIS 1994 HCM

Major Street: MANAGER'S DRIVE
Minor Street: ROAD Y
Peak Hour: AM
Scenario: YEAR 2000 - SCENARIO A

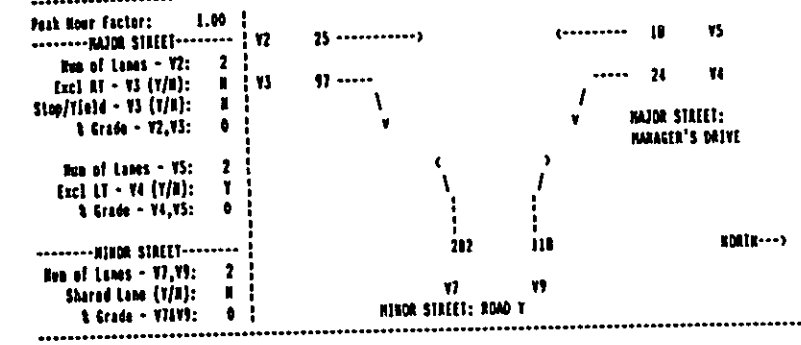
Print Date: 21-Feb
Analyst: BC
File Name: MANRDY-A
Intersection: 12

Peak Hour Factor: 1.00

--------MAJOR STREET--------
Num of Lanes - V2: 2
Excl RT - V3 (Y/N): N
Stop/Yield - V3 (Y/N): N
% Grade - V2,V3: 0

Num of Lanes - V5: 2
Excl LT - V4 (Y/N): Y
% Grade - V4,V5: 0

--------MINOR STREET--------
Num of Lanes - V7,V9: 2
Shared Lane (Y/N): N
% Grade - V7&V9: 0



VOLUME ADJUSTMENTS

MOVEMENT NO.	2	3	4	5	7	9
VOLUME, V (vph)	25	97	24	18	202	118
VOLUME, v (pcph)	25	97	26	18	310	130

STEP 1: RT FROM MINOR STREET - V9

Conflicting Flows:	Vc,9 = 1/2*V3+V2 =	49	+	25	=	74 vph
Potential Capacity:	Cp,9 =					1271 pcph
Movement Capacity:	Ca,p = Cp,9 =					1271 pcph

STEP 2: LT FROM MAJOR STREET - V4

Conflicting Flows:	Vc,4 = V3+V2 =	97	+	25	= 122 vph
Potential Capacity:	Cp,4 =				1474 pcph
Movement Capacity:	Ca,4 = Cp,4 =				1474 pcph
Prob. of Queue-free State:	po,4 = 1-v4/Ca,4 =				0.98
Major Left Shared Lane Prob. of Queue-free State:	p*o,4 =				NA

STEP 3: LT FROM MINOR STREET - V7

Conflicting Flows:	Vc,7 = 1/2V3+V2+V5+V4 =				116 vph
Potential Capacity:	Cp,7 =				893 pcph
Capacity Adjustment Factor Due To Impeding Movements:	I7=po,4=				0.98
Movement Capacity:	Ca,7 = Cp,7 =				877 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

Movement	v(vph)	v/c	c(m)(pcph)	csh (pcph)	AVG TOTAL DELAY	LOS
MINOR LEFT TURN (7)	310	0.35	877	--NA--	6.3	B
MINOR RIGHT TURN (9)	130	0.10	1271	--NA--	3.2	A
MAJOR LEFT TURN (4)	26	0.02	1474	------	2.5	A

AVERAGE MINOR APPROACH DELAY = 5.4 sec/veh
LEVEL OF SERVICE = A

AVERAGE TOTAL INTERSECTION DELAY = 4.0 sec/veh
LEVEL OF SERVICE = A

ATA Inc. STOP CONTROLLED T-INTERSECTION LEVEL OF SERVICE ANALYSIS 1994 HCM

Major Street: MANAGER'S DRIVE
Minor Street: ROAD Y
Peak Hour: PM
Scenario: YEAR 2000 - SCENARIO A

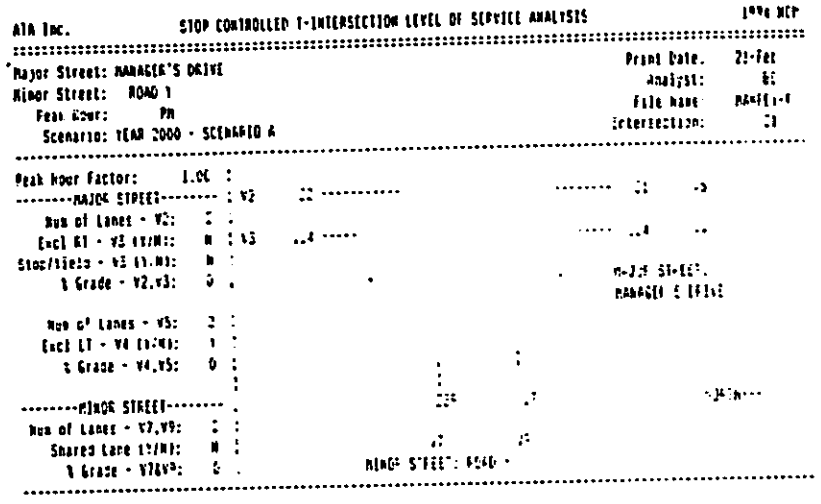
Print Date: 21-Feb
Analyst: BC
File Name: MANRDY-A
Intersection: 12

Peak Hour Factor: 1.00

--------MAJOR STREET--------
Num of Lanes - V2: 2
Excl RT - V3 (Y/N): N
Stop/Yield - V3 (Y/N): N
% Grade - V2,V3: 0

Num of Lanes - V5: 2
Excl LT - V4 (Y/N): Y
% Grade - V4,V5: 0

--------MINOR STREET--------
Num of Lanes - V7,V9: 2
Shared Lane (Y/N): N
% Grade - V7&V9: 0



VOLUME ADJUSTMENTS

MOVEMENT NO.	2	3	4	5	7	9
VOLUME, V (vph)	22	114	14	24	239	17
VOLUME, v (pcph)	22	114	14	24	263	19

STEP 1: RT FROM MINOR STREET - V9

Conflicting Flows:	Vc,9 = 1.2*V3+V2 =	92	+	22	=	114 vph
Potential Capacity:	Cp,9 =					1263 pcph
Movement Capacity:	Ca,p = Cp,9 =					1263 pcph

STEP 2: LT FROM MAJOR STREET - V4

Conflicting Flows:	Vc,4 = V3+V2 =	114	+	22	= 136 vph
Potential Capacity:	Cp,4 =				1469 pcph
Movement Capacity:	Ca,4 = Cp,4 =				1469 pcph
Prob. of Queue-free State:	po,4 = 1-v4/Ca,4 =				0.98
Major Left Shared Lane Prob. of Queue-free State:	p*o,4 =				NA

STEP 3: LT FROM MINOR STREET - V7

Conflicting Flows:	Vc,7 = 1.2V3+V2+V5+V4 =				284 vph
Potential Capacity:	Cp,7 =				735 pcph
Capacity Adjustment Factor Due To Impeding Movements:	I7=po,4=				0.98
Movement Capacity:	Ca,7 = Cp,7 =				684 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

Movement	v(vph)	v/c	c(m)(pcph)	csh (pcph)	AVG TOTAL DELAY	LOS
MINOR LEFT TURN (7)	263	0.38	684	--NA--	8.9	A
MINOR RIGHT TURN (9)	19	0.02	1263	--NA--	2.4	A
MAJOR LEFT TURN (4)	147	0.10	1469	------	2.8	A

AVERAGE MINOR APPROACH DELAY = 8.5 sec/veh
LEVEL OF SERVICE = A

AVERAGE TOTAL INTERSECTION DELAY = 4.7 sec/veh
LEVEL OF SERVICE = A

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V] L1.41 - Summary of Parameter Values

Intersection Parameters for Int # [illegible]

METROAREA	NONCBD
LOSTTIME	[illegible]
LEVELOFSERVICE	C [illegible]
NODELOCATION	[illegible]

Approach Parameters

APPLABELS	SB	NB	[illegible]	[illegible]
GRADES	[illegible]	[illegible]	[illegible]	[illegible]
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	[illegible]	[illegible]	[illegible]	[illegible]
BUSVOLUMES	5	[illegible]	[illegible]	[illegible]
RIGHTTURNONREDS	[illegible]	[illegible]	[illegible]	[illegible]

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	262	71[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WIDTHS	0	24.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LANES	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
UTILIZATIONS	1.00	1.00	1.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TRUCKPERCENTS	2.0	2.0	2.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	[illegible]	[illegible]	[illegible]
ARRIVALTYPES	3	3	3	[illegible]	[illegible]	3	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	[illegible]	[illegible]	4.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	[illegible]	[illegible]	[illegible]
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NSTOPFACTORS	1.00	1.00	1.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	[illegible]
SATURATIONFLOWS	0	3517	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Phasing Parameters

SEQUENCES	11	ALL					
PERMISSIVES	YES	YES	YES	[illegible]	[illegible]	NONE	NONE
OVERLAPS	YES	YES	YES	YES	[illegible]	[illegible]	
CYCLES	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	
GREENTIMES	37.64	14.36					
YELLOWTIMES	4.00	4.00					
CRITICALS	[illegible]	12					
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V] L1.41 - Capacity Analysis Summary

Intersection Averages for Int # [illegible]
Degree of Saturation (v/c) [illegible] Level of Service [illegible]

Sq 11 | Phase 1 | Phase 2
North

	Phase 1	Phase 2
G/C	.627	.239
G	37.6"	14.4"
Y+R	4.0"	4.0"
OFF	.0%	69.4%

C= 60 sec G= 52.0 sec [illegible]

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	L O S	90% Max Queue
SB Approach										
TH+RT	24/2	.309	.627	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NB Approach										
LT+TH	24/2	.251	.627	1578	1576	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
EB Approach										
RT	12/1	.007	.273	363	420	4	.010	16.[illegible]	[illegible]	24 ft
LT	12/1	.128	.273	362	420	111	.315	11.5	[illegible]	58 ft

CORRECTION

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

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC(V) 11.41 - Summary of Parameter Values

Intersection Parameters for Int # [illegible]

METROAREA	NONE
COSTTIME	[illegible]
LEVELOFSERVICE	[illegible]
MODELOCATION	[illegible]

Approach Parameters

APPLABELS	SB	NB	EB	WB
GRADES	[illegible]	[illegible]	[illegible]	[illegible]
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	[illegible]	[illegible]	[illegible]	[illegible]
BUSVOLUMES	[illegible]	[illegible]	[illegible]	[illegible]
RIGHTTURNPEDS	[illegible]	[illegible]	[illegible]	[illegible]

Movement Parameters

MOVLABELS	RT	TH	LT	LT	TH	RT	[illegible]					
VOLUMES	[illegible]											
WIDTHS	[illegible]											
LANES	[illegible]											
UTILIZATIONS	[illegible]											
TRUCKPERCENTS	[illegible]											
PEAKHOURFACTORS	[illegible]											
ARRIVALTYPES	[illegible]											
ACTUATIONS	[illegible]											
REQCLEARANCES	[illegible]											
MINIMUMS	[illegible]											
IDEALSATFLOWS	[illegible]											
FACTORS	[illegible]											
DELAYFACTORS	[illegible]											
NSTOPFACTORS	[illegible]											
GROUPTYPES	[illegible]											
SATURATIONFLOWS	[illegible]											

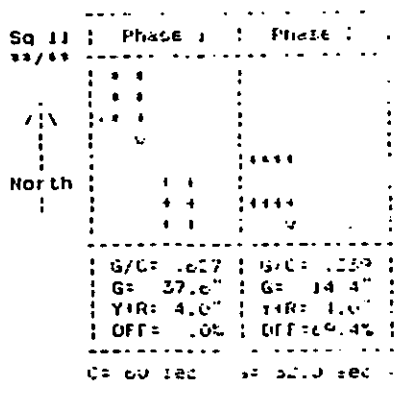
Phasing Parameters

SEQUENCES	[illegible]						
PERMISSIVES	[illegible]						
OVERLAPS	[illegible]						
CYCLES	[illegible]						
GREENTIMES	[illegible]						
YELLOWTIMES	[illegible]						
CRITICALS	[illegible]						
EXCESS	[illegible]						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94.TEAPAC(V) 11.41 - Capacity Analysis Summary

Intersection Averages for Int # [illegible]
Degree of Saturation (V/C) [illegible]



Cm= 60 sec [illegible]

Lane Group	Width: Lanes	Flow: Prod	Flow: Used	Sat. Flow Rate: Perm	Sat. Flow Rate: Shar	Sat. Flow Rate: Prot	Volume	v/c	Delay: Del	Delay: LOS	95% Back of Queue
SB Approach											
TH+RT	24.2	.309	.661	2321	2321	1000	411	.[illegible]	[illegible]	[illegible]	[illegible]
NB Approach											
LT+TH	24.2	.251	.661	1578	1578	550	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
EB Approach											
RT	12.1	.007	.273	363	420	4	.010	10.1	B	2"	11
LT	12/1	.128	.273	363	420	114	345	11.5	B	96	[illegible]

RECEIVED AS FOLLOWS

RECEIVED AS FOLLOWS

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.41 - Summary of Parameter Values

Intersection Parameters for Int # [illegible] - Waipahu [illegible]

METROAREA	NONCBD	
LOSTTIME	[illegible]	
LEVELOFSERVICE	C	[illegible]
NODELOCATION	[illegible]	[illegible]

Approach Parameters

APPLABELS	SB	NB	EB	[illegible]
GRADES	[illegible]	[illegible]	[illegible]	[illegible]
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	[illegible]	[illegible]	[illegible]	[illegible]
BUSVOLUMES	[illegible]	[illegible]	[illegible]	[illegible]
RIGHTTURNONREDS	0	[illegible]	[illegible]	[illegible]

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	200	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WIDTHS	[illegible]	24.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LANES	0	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
UTILIZATIONS	1.00	1.00	1.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TRUCKPERCENTS	2.0	2.0	2.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PEAKHOURFACTORS	.95	.95	.95	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ARRIVALTYPES	3	3	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ACTUATIONS	YES	YES	YES	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
REQCLEARANCES	4.0	4.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MINIMUMS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
IDEALSATFLOWS	1900	1900	1900	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FACTORS	1.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DELAYFACTORS	1.00	1.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NSTOPFACTORS	1.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	[illegible]	3550										

Phasing Parameters

SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES		
OVERLAPS	YES	YES	YES	YES		
CYCLES	60	180	15			
GREENTIMES	27.06	24.94				
YELLOWTIMES	4.00	4.00				
CRITICALS	2	12				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.41 - Capacity Analysis Summary

Intersection Averages for Int # [illegible] - Waipahu [illegible]
Degree of Saturation (v/c) .50 Vehicle Delay [illegible] Level of Service B[illegible]

Sq 11	Phase 1	Phase 2
/		
North		
	G/C= .451	G/C= .415
	G= 27.1"	G= 24.9"
	Y+R= 4.0"	Y+R= 4.0"
	OFF= .0%	OFF=51.8%

C= 60 sec G= 52.0 sec [illegible] Ped= [illegible]

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph) @E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach									
TH+RT	24/2	.292	.484	1700	1719	[illegible]	[illegible]	[illegible]	[illegible]
NB Approach									
LT+TH	14/2	.225	.484	1505	1524	[illegible]	[illegible]	[illegible]	[illegible]
EB Approach									
RT	12/1	.041	.449	646	691	34	.005	[illegible]	[illegible]
LT	12/1	.271	.449	648	691	159	.323	[illegible]	[illegible]

AUSTIN TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

APPENDIX B

• YEAR 2000 WITH PHASES I AND II LOS CALCULATIONS

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
17:21:10

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	.0	.0	3.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	158	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	0	0	0	248	294	113	0	73	120	351	0
WIDTHS	.0	.0	.0	.0	12.0	.0	11.0	.0	11.0	.0	12.0	.0
LANES	0	0	0	0	1	0	1	0	1	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	NO
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	0	0	0	1825	0	1172	0	1465	0	1569	0

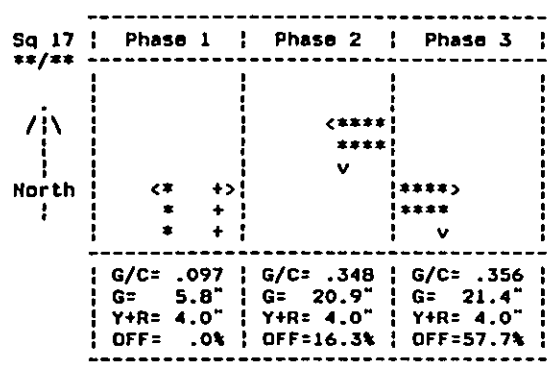
Phasing Parameters

SEQUENCES	17	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	NO	NO	NO	NO	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	5.79	20.85	21.35				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	9	5	11				
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY 02/21/96
2000 - SCENARIO B 17:21:18
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST
Degree of Saturation (v/c) .79 Vehicle Delay 16.2 Level of Service C+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
NB Approach								16.3	C+	
RT	11/1	.003	.130	107	146	1	.007	14.7	B	25 ft
LT	11/1	.082	.130	139	186	77	.405	16.3	*C+	57 ft
WB Approach								16.2	C+	
LT+TH	12/1	.342	.381	645	695	570	.820	16.2	*C+	298 ft
EB Approach								16.2	C+	
TH+RT	12/1	.350	.389	562	611	495	.810	16.2	*C+	255 ft

AMFAC - WAIPAHU TRAFFIC STUDY 02/21/96
2000 SCENARIO B 17:19:41
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	3.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	158	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	0	0	0	457	225	177	0	101	108	263	0
WIDTHS	.0	.0	.0	.0	12.0	.0	11.0	.0	11.0	.0	12.0	.0
LANES	0	0	0	0	1	0	1	0	1	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	NO
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	0	0	0	1113	0	1172	0	1465	0	1558	0

Phasing Parameters

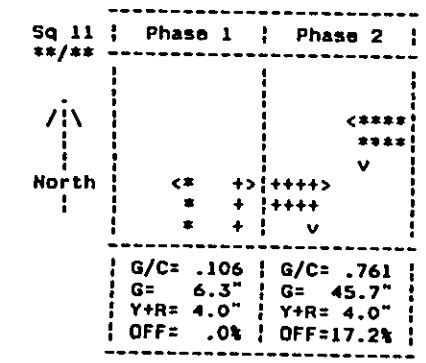
SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	NO	NO	NO	NO	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	6.35	45.65				
YELLOWTIMES	4.00	4.00				
CRITICALS	9	5				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 SCENARIO B
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
17:19:46

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 1 - WAIPAHU ST & WAIPAHU DEPOT ST
Degree of Saturation (v/c) .62 Vehicle Delay 5.8 Level of Service B+



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
NB Approach								16.9	C+	
RT	11/1	.035	.139	117	157	20	.123	14.6	B	25 ft
LT	11/1	.105	.139	152	201	106	.520	17.4	*C+	77 ft
WB Approach								6.4	B+	
LT+TH	12/1	.666	.794	876	884	718	.812	6.4	*B+	125 ft
EB Approach								1.1	A	
TH+RT	12/1	.288	.794	1238	1238	391	.316	1.1	A	68 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 SCENARIO B
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
13:11:04

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 2 - WAIPAHU ST & MOKUOLA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
MODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
MOVLABELS												
VOLUMES	93	130	48	55	467	359	198	46	83	156	284	29
WIDTHS	12.0	12.0	.0	.0	12.0	.0	~~12.0~~	12.0	.0	.0	12.0	12.0
LANES	1	1	0	0	1	0	1	1	0	0	1	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1539	1636	0	0	655	0	1219	1044	0	0	1713	311

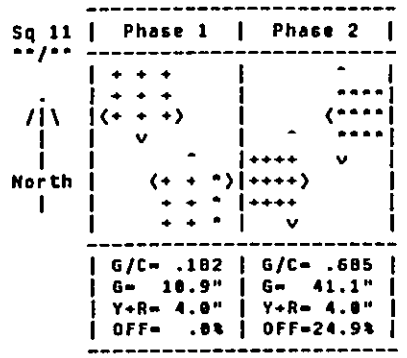
Phasing Parameters

SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	10.91	41.09				
YELLOWTIMES	4.00	4.00				
CRITICALS	7	5				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY 02/25/96
2000 SCENARIO B 13:12:02
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) 1.16 Vehicle Delay 30.2# Level of Service D+
expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								14.1	B	
RT	12/1	.094	.215	273	331	98	.296	12.9	B	65 ft
LT+TH	12/1	.150	.215	293	352	188	.534	14.7	B	124 ft
NB Approach								21.7	C	
RT	12/1	.215	.215	289	262	208	.794	24.8	*C	138 ft
LT+TH	12/1	.175	.215	176	224	135	.600	16.8	C+	89 ft
WB Approach								53.2#	E	
LT+TH+RT	12/1	1.000	.718	444	478	928	1.974	53.2#	*E	221 ft
EB Approach								2.2	A	
TH+RT	12/1	.304	.718	1229	1238	463	.376	2.2	A	118 ft
LT	12/1	.000	.718	196	223	31	.139	1.7	A	25 ft

AMFAC - WAIPAHU TRAFFIC STUDY 02/25/96
2000 - SCENARIO B 13:15:56
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 2 - WAIPAHU ST & MOKUOLA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	#	#

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	76	91	112	120	514	238	269	85	186	125	371	59
WIDTHS	12.0	12.0	.0	.0	12.0	.0	~~12.0~~	12.0	.0	.0	12.0	11.0
LANES	1	1	0	0	1	0	1	1	0	0	1	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1539	1117	0	0	721	0	1219	1068	0	0	1745	290

Phasing Parameters

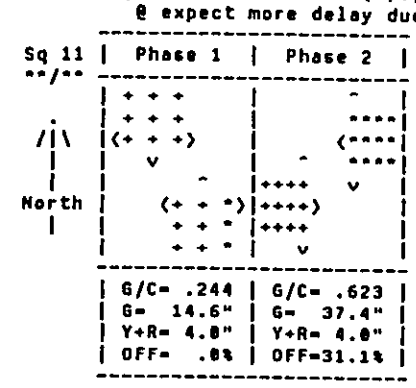
SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.0# 1
CYCLES	60	1##	1#		PEDTIME	.0 0
GREENTIMES	14.64	37.36				
YELLOWTIMES	4.00	4.00				
CRITICALS	7	5				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
13:16:19

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) 1.13 Vehicle Delay 29.2@ Level of Service D+
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								15.2	C+	
RT	12/1	.080	.277	370	427	80	.187	10.7	B	49 ft
LT+TH	12/1	.230	.277	250	310	214	.690	16.9	C+	130 ft
NB Approach								21.3	C	
RT	12/1	.276	.277	285	338	283	.837	24.6	*C	172 ft
LT+TH	12/1	.235	.277	245	296	201	.679	16.7	C+	123 ft
WB Approach								54.3@	E	
LT+TH+RT	12/1	1.000	.656	444	473	918	1.941	54.3@	*E	266 ft
EB Approach								3.5	A	
TH+RT	12/1	.331	.656	1135	1145	523	.457	3.5	A	152 ft
LT	11/1	.000	.656	162	198	62	.326	3.3	A	25 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
16:58:05

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	130	0	0	0

Movement Parameters

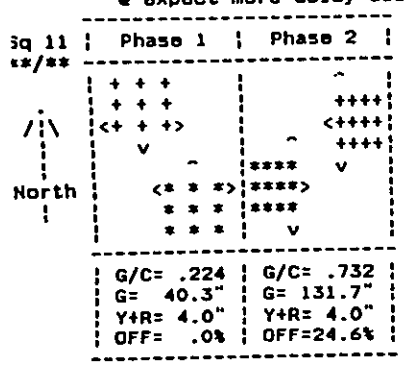
	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
MOVLABELS												
VOLUMES	484	402	40	58	444	155	93	205	46	111	273	186
WIDTHS	11.0	12.0	.0	.0	12.0	.0	.0	12.0	.0	.0	12.0	.0
LANES	1	1	0	0	1	0	0	1	0	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1439	0	0	756	0	0	256	0	0	434	0

Phasing Parameters

SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	40.33	131.67				
YELLOWTIMES	4.00	4.00				
CRITICALS	8	11				
EXCESS	0					

IGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) 2.10 Vehicle Delay 89.6@ Level of Service F
@ expect more delay due to extreme v/c's (see EVALUATE)



C=180 sec G=172.0 sec = 95.6% Y= 8.0 sec = 4.4% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								99.2@	F	
RT	11/1	.458	.235	1	277	373	1.192	100.2@	F	722 ft
LT+TH	12/1	.480	.235	1	302	465	1.376	98.5@	F	900 ft
NB Approach								156.6@	F	
LT+TH+RT	12/1	1.000	.235	1	43	362	6.033	156.6@	*F	701 ft
WB Approach								59.7@	E	
LT+TH+RT	12/1	.931	.743	510	562	691	1.230	59.7@	E	450 ft
EB Approach								70.0@	F	
LT+TH+RT	12/1	1.000	.743	278	322	600	1.863	70.0@	*F	391 ft

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	170	0	0	0

Movement Parameters

	SB			WB			NB			EB		
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	423	222	33	52	448	33	64	216	77	101	424	243
WIDTHS	11.0	12.0	.0	.0	12.0	.0	.0	12.0	.0	.0	12.0	.0
LANES	1	1	0	0	1	0	0	1	0	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1664	0	0	1181	0	0	1234	0	0	739	0

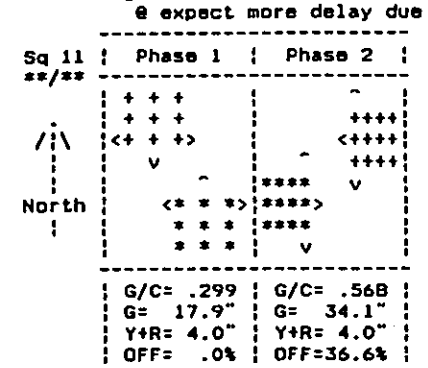
Phasing Parameters

SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	17.94	34.06				
YELLOWTIMES	4.00	4.00				
CRITICALS	8	11				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY 02/21/96
2000 - SCENARIO B 17:06:04
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) 1.12 Vehicle Delay 30.2@ Level of Service D+
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								11.6	B	
RT	11/1	.241	.332	391	443	266	.600	12.4	B	150 ft
LT+TH	12/1	.198	.332	499	553	269	.486	10.9	B	151 ft
NB Approach								30.1	D+	
LT+TH+RT	12/1	.346	.332	359	410	375	.915	30.1	*D+	211 ft
WB Approach								10.1	B	
LT+TH+RT	12/1	.508	.601	681	710	562	.792	10.1	B	189 ft
EB Approach								56.5@	E	
LT+TH+RT	12/1	1.000	.601	411	444	808	1.820	56.5@	*E	272 ft

ATA Inc. TWO-WAY STOP CONTROLLED INTERSECTION LEVEL OF SERVICE ANALYSIS 1994 HCM

Major Street: PAIWA ST
Minor Street: PAIWA PL
Scenario: YEAR 2000 - SCENARIO B
Peak Hour: AM
Print Date: 21-Feb-96
Analyst: BC
File Name: PAIPAI-A
Intersection #: 11

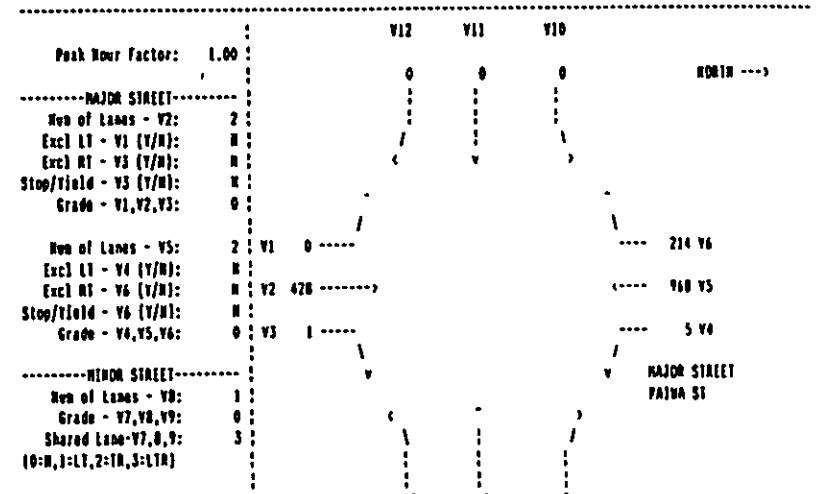
Peak Hour Factor: 1.00

MAJOR STREET
Num of Lanes - V2: 2
Excl LT - V1 (Y/N): N
Excl RT - V3 (Y/N): N
Stop/Yield - V3 (Y/N): N
Grade - V1,V2,V3: 0

Num of Lanes - V5: 2
Excl LT - V4 (Y/N): N
Excl RT - V6 (Y/N): N
Stop/Yield - V6 (Y/N): N
Grade - V4,V5,V6: 0

MINOR STREET
Num of Lanes - V8: 1
Grade - V7,V8,V9: 0
Shared Lane-V7,8,9: 3
(0=N,1=LT,2=TR,3=LTR)

Num of Lanes - V11: 1
Grade - V10,V11,V12: 0
Shared Lane-V10,11,12: 0
(0=N,1=LT,2=TR,3=LTR)



VOLUME ADJUSTMENTS

MOVEMENT NO.	1	2	3	4	5	6	7	8	9	10	11	12
HOURLY FLOW RATE, V(vph)	0	428	1	5	960	214	7	0	3	0	0	0
VOLUME, v (pcph)	0	428	1	6	960	214	8	0	3	0	0	0

STEP 1: RT FROM MINOR STREET

Conflicting Flows:	Vc9 = 1/2 V3 + V2 = 215 vhp	Vc12 = 1/2 V6 + V5 =	591 vhp
Potential Capacity:	Cp,9 = 1078 pcph	Cp,12 =	695 pcph
Movement Capacity:	Cm,9:Cp,9: 1078 pcph	Cm,12:Cp,12:	695 pcph
Prb. of Queue-free State:	pq,9:1-v9/Cm,9: 1.00	pq,12:1-v12/Cm,12:	1.00

STEP 2: LT FROM MAJOR STREET

Conflicting Flows:	Vc,4 = V2 + V3 = 429 vhp	Vc,1 = V5 + V6 =	1182 vhp
Potential Capacity:	Cp,4 = 1009 pcph	Cp,1 =	398 pcph
Movement Capacity:	Cm,4:Cp,4: 1009 pcph	Cm,1:Cp,1:	398 pcph
Prb. of Queue-free State:	pq,4:1-v4/Cm4: 0.99	pq,1:1-v1/Cm1:	1.00
Major Left Shared Lane Prob. of Queue-free State	p*q,4: 0.99	p*q,1:	1.00

----continued ----

ATA Inc. TWO-WAY STOP CONTROLLED INTERSECTION LEVEL OF SERVICE ANALYSIS 1994 HCM

Major Street: PAIMA ST
Minor Street: PAIMA PL
Scenario: YEAR 2000 - SCENARIO B
Peak Hour: AM

DATE: 21-Feb-96
Analyst: BC
File Name: PAIPAI-A
Intersection Intersection #: 11

STEP 3: TH FROM MINOR STREET

Conflicting Flows:	Vc,8 = 1/2V3+V2+V11+V6+V5+V4 = 1616 vph	Vc,11 = 1/2V6+V5+V4+V3+V2+V1 = 1509 vph
Potential Capacity:	Cp,8 = 124 pcph	Cp,11 = 143 pcph
Capacity Adj Factor:	f8 = po,4*po,1 = 0.99	f11 = po,4*po,1 = 0.99
Movement Capacity:	Cm,8 = Cp,8*f8 = 123 pcph	Cm,11 = Cp,11*f11 = 141 pcph
Prob. of Queue-free State:	po,8 = 1-v8/Cm,8 = 1.00	po,11 = 1-v11/Cm,11 = 1.00

STEP 4: LT FROM MINOR STREET

Conflicting Flows:	Vc,7 = 1/2V3+V2+V11+1/2V6+V5+V4+ 1/2(V11+V12) = 1402 vph	Vc,10 = 1/2V6+V5+V4+1/2V3+V2+V1+ 1/2(V8+V9) = 1508 vph
Potential Capacity:	Cp7 = 135 pcph	Cp10 = 115 pcph
Major Left, Minor Through Impedance Factor:	p''7=po,11*f11 = 0.99	p''10=po,8*f8 = 0.99
Major Left, Minor Through Adjusted Impedance Factor:	p'7 = 0.99	p'10 = 0.99
Capacity Adjustment Factor:	f7 = p'7*po,12 = 0.99	f10 = p'10*po,9 = 0.99
Movement Capacity:	Cm,7 = f7*Cp,7 = 133 pcph	Cm,10 = f10*Cp,10 = 114 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

MOVEMENT	v(pcph)	cm(pcph)	csh(pcph)	AVG TOTAL DELAY	LOS
MINOR LEFT TURN (7)	0	133	SHRD	SHRD	--
MINOR THROUGH (8)	0	123	175	21.9	D
MINOR RIGHT TURN (9)	3	1078	SHRD	SHRD	----
MINOR LEFT TURN (10)	0	114	--NA--	31.6	E
MINOR THROUGH (11)	0	141	--NA--	25.5	D
MINOR RIGHT TURN (12)	0	695	--NA--	5.2	B
MAJOR LEFT (1)	0	398	--NA--	9.1	B
MAJOR LEFT (4)	6	1009	--NA--	3.6	A
MINOR APPROACH (7)(8)(9)	-	-	-	21.9	D
MINOR APPROACH (10)(11)(12)	-	-	-	ERR	ERR
MAJOR APPROACH (1)(2)(3)	-	-	-	0.0	----
MAJOR APPROACH (4)(5)(6)	-	-	-	0.0	A
TOTAL INTERSECTION (1-12)	-	-	-	ERR	ERR

LEVEL OF SERVICE CRITERIA

LEVEL OF SERVICE	AVG TOTAL DELAY (SEC/VEH)
A	<=5
B	>5 and <=10
C	>10 and <=20
D	>20 and <=30
E	>30 and <=45
F	>45

ATA Inc. TWO-WAY STOP CONTROLLED INTERSECTION LEVEL OF SERVICE ANALYSIS 1994 HCM

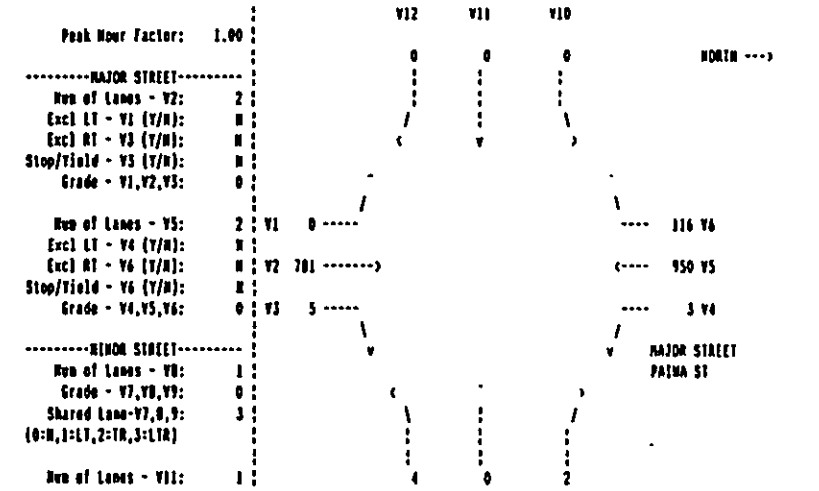
Major Street: PAIMA ST
Minor Street: PAIMA PL
Scenario: YEAR 2000 - SCENARIO B
Peak Hour: PM

Print Date: 21-Feb-96
Analyst: BC
File Name: PAIPAI-P
Intersection #: 11

Peak Hour Factor: 1.00

MAJOR STREET
- Num of Lanes - V2: 2
- Excl LT - V1 (Y/N): N
- Excl RT - V3 (Y/N): N
- Stop/Yield - V3 (Y/N): N
- Grade - V1,V2,V3: 0
- Num of Lanes - V5: 2
- Excl LT - V4 (Y/N): N
- Excl RT - V6 (Y/N): N
- Stop/Yield - V6 (Y/N): N
- Grade - V4,V5,V6: 0

MINOR STREET
- Num of Lanes - V8: 1
- Grade - V7,V8,V9: 0
- Shared Lane-V7,8,9: 3 (0:N,1:LT,2:TR,3:LTR)
- Num of Lanes - V11: 1
- Grade - V10,V11,V12: 0
- Shared Lane-V10,11,12: 0 (0:N,1:LT,2:TR,3:LTR)



VOLUME ADJUSTMENTS

MOVEMENT NO.	1	2	3	4	5	6	7	8	9	10	11	12
HOURLY FLOW RATE, V(vph)	0	781	5	3	950	116	4	0	2	0	0	0
VOLUME, v (pcph)	0	781	5	3	950	116	4	0	2	0	0	0

STEP 1: RT FROM MINOR STREET

Conflicting Flows:	Vc9 = 1/2 V3 + V2 = 393 vph	Vc12 = 1/2 V6 + V5 = 533 vph
Potential Capacity:	Cp,9 = 875 pcph	Cp,12 = 743 pcph
Movement Capacity:	Cm,9:Cp,9: 875 pcph	Cm,12:Cp,12: 743 pcph
Prb. of Queue-free State:	po,9:1-v9/Cm,9: 1.00	po,12:1-v12/Cm,12: 1.00

STEP 2: LT FROM MAJOR STREET

Conflicting Flows:	Vc,4 = V2 + V3 = 786 vph	Vc,1 = V5 + V6 = 1066 vph
Potential Capacity:	Cp,4 = 649 pcph	Cp,1 = 459 pcph
Movement Capacity:	Cm,4:Cp,4: 649 pcph	Cm,1:Cp,1: 459 pcph
Prb. of Queue-free State:	po,4:1-v4/Cm4: 1.00	po,1:1-v1/Cm1: 1.00
Major Left Shared Lane Prob. of Queue-free State	p*o,4: 0.99	p*o,1: 1.00

----continued ----

ATA Inc. TWO-WAY STOP CONTROLLED INTERSECTION LEVEL OF SERVICE ANALYSIS 1994 HCM

Major Street: PAIWA ST
Minor Street: PAIWA PL
Scenario: YEAR 2000 - SCENARIO B
Peak Hour: PM

DATE: 21-Feb-96
Analyst: BC
File Name: PAIPAI-P
Intersection Intersection #: 11

STEP 3: TH FROM MINOR STREET		
Conflicting Flows:	Vc,8 = 1/2V3+V2+V1+V6+V5+V4 : 1853 vph	Vc,11 = 1/2V6+V5+V4+V3+V2+V1 : 1797 vph
Potential Capacity:	Cp,8 = 90 pcph	Cp,11 = 97 pcph
Capacity Adj Factor:	f8 = po,4*po,1 = 0.99	f11 = po,4*po,1 = 0.99
Movement Capacity:	Cm,8 = Cp,8*f8 = 89 pcph	Cm,11 = Cp,11*f11 = 96 pcph
Prob. of Queue-free State:	po,8 = 1-v8/Cm,8 = 1.00	po,11 = 1-v11/Cm,11 = 1.00
STEP 4: LT FROM MINOR STREET		
Conflicting Flows:	Vc,7 = 1/2V3+V2+V1+1/2V6+V5+V4+ 1/2(V11+V12) = 1737 vph	Vc,10 = 1/2V6+V5+V4+1/2V3+V2+V1+ 1/2(V8+V9) = 1792 vph
Potential Capacity:	Cp7 = 82 pcph	Cp10 = 76 pcph
Major Left, Minor Through Impedance Factor:	p''7:po,11*f11 = 0.99	p''10:po,8*f8 = 0.99
Major Left, Minor Through Adjusted Impedance Factor:	p'7 = 0.99	p'10 = 0.99
Capacity Adjustment Factor:	f7 = p'7*po,12 = 0.99	f10 = p'10*po,9 = 0.99
Movement Capacity:	Cm,7 = f7*Cp,7 = 82 pcph	Cm,10 = f10*Cp,10 = 75 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

MOVEMENT	v(pcph)	cm(pcph)	csh(pcph)	AVG TOTAL DELAY	LOS
MINOR LEFT TURN (7)	4	82	SHRD	SHRD	--
MINOR THROUGH (8)	8	89	117	32.4	E
MINOR RIGHT TURN (9)	2	875	SHRD	SHRD	----
MINOR LEFT TURN (10)	0	75	--NA--	47.9	F
MINOR THROUGH (11)	0	96	--NA--	37.4	E
MINOR RIGHT TURN (12)	0	743	--NA--	4.8	A
MAJOR LEFT (1)	0	459	--NA--	7.8	B
MAJOR LEFT (4)	3	649	--NA--	5.6	B
MINOR APPROACH (7)(8)(9)	-	-	-	32.4	E
MINOR APPROACH (10)(11)(12)	-	-	-	ERR	ERR
MAJOR APPROACH (1)(2)(3)	-	-	-	0.0	----
MAJOR APPROACH (4)(5)(6)	-	-	-	0.0	A
TOTAL INTERSECTION (1-12)	-	-	-	ERR	ERR

LEVEL OF SERVICE CRITERIA

LEVEL OF SERVICE	AVG TOTAL DELAY (SEC/VEH)
A	<=5
B	>5&<=10
C	>10&<=20
D	>20&<=30
E	>30&<=45
F	>45

AMFAC WAIPAHU TIAR
2000 - SCENARIO B
AM PEAK HOUR

02/21/96
16:21:26

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 4 - PAIWA ST & HAPAPA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	BOTH	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	1080	60	30	0	102	60	423	0	0	0	0
WIDTHS	.0	24.0	.0	.0	12.0	.0	.0	24.0	.0	.0	.0	.0
LANES	0	2	0	0	1	0	0	2	0	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3208	0	0	1001	0	0	3609	0	0	0	0

Phasing Parameters

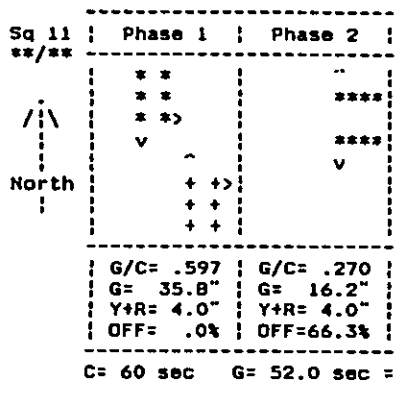
SEQUENCES	11	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	35.80	16.20					
YELLOWTIMES	4.00	4.00					
CRITICALS	2	5					
EXCESS	0						

AMFAC WAIPAHU TIAR
2000 - SCENARIO B
AM PEAK HOUR

02/21/96
16:21:34

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 4 - PAIWA ST & HAPAPA ST
Degree of Saturation (v/c) .48 Vehicle Delay 4.7 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								4.6	A	
LT+TH	24/2	.387	.630	2021	2021	1200	.594	4.6	*A	187 ft
NB Approach								3.1	A	
TH+RT	24/2	.162	.630	2273	2273	508	.223	3.1	A	79 ft
WB Approach								11.7	B	
LT+TH+RT	12/1	.186	.303	255	304	139	.457	11.7	*B	82 ft

AMFAC WAIPAHU TIAR
2000 - SCENARIO B
PM PEAK HOUR

02/21/96
16:22:44

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 4 - PAIWA ST & HAPAPA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	BOTH	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	946	48	20	0	39	37	744	0	0	0	0
WIDTHS	.0	24.0	.0	.0	12.0	.0	.0	24.0	.0	.0	.0	.0
LANES	0	2	0	0	1	0	0	2	0	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	2905	0	0	1002	0	0	3658	0	0	0	0

Phasing Parameters

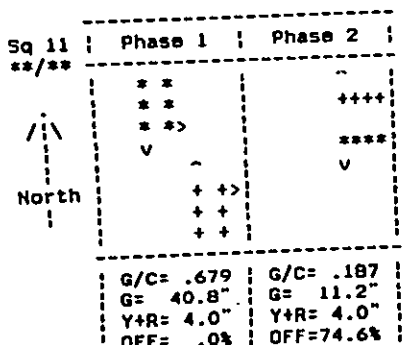
SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	40.75	11.25				
YELLOWTIMES	4.00	4.00				
CRITICALS	2	6				
EXCESS	0					

AMFAC WAIPAHU TIAR
2000 - SCENARIO B
PM PEAK HOUR

02/21/96
16:22:50

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 4 - PAIWA ST & HAPAPA ST
Degree of Saturation (v/c) .42 Vehicle Delay 2.8 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								2.7	A	
LT+TH	24/2	.376	.713	2070	2070	1047	.506	2.7	*A	127 ft
NB Approach								2.1	A	
TH+RT	24/2	.244	.713	2606	2606	822	.315	2.1	A	100 ft
WB Approach								12.7	B	
LT+TH+RT	12/1	.098	.221	172	220	62	.281	12.7	B	41 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
16:26:00

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 5 - PAIWA ST & HIAPO ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	.0	.0	.0	.0
GRADES	MODER	MODER	MODER	MODER
PEDLEVELS	NONE	BOTH	NONE	NONE
PARKINGSIDES	20	20	20	20
PARKVOLUMES	5	0	5	0
BUSVOLUMES	0	58	0	56
RIGHTTURNONREDS				

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	139	925	83	141	44	84	28	332	80	123	75	346
WIDTHS	.0	24.0	.0	10.0	12.0	.0	.0	24.0	.0	10.0	12.0	.0
LANES	0	2	0	1	1	0	0	2	0	1	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3049	0	1050	855	0	0	2124	0	1312	1168	0

Phasing Parameters

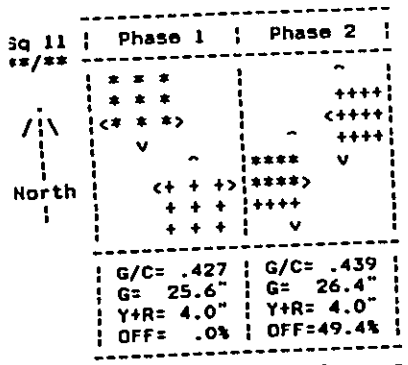
SEQUENCES	11	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	25.63	26.37					
YELLOWTIMES	4.00	4.00					
CRITICALS	2	11					
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
16:26:11

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 5 - PAIWA ST & HIAPO ST
Degree of Saturation (v/c) .70 Vehicle Delay 11.6 Level of Service B



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								13.4	B	
LT+TH+RT	24/2	.409	.461	1378	1404	1207	.860	13.4	*B	275 ft
NB Approach								7.5	B+	
LT+TH+RT	24/2	.247	.461	941	978	462	.472	7.5	B+	105 ft
WB Approach								6.3	B+	
RT	10/1	.122	.473	455	496	87	.175	5.9	B+	39 ft
LT+TH	12/1	.209	.473	363	404	134	.332	6.6	B+	60 ft
EB Approach								13.3	B	
RT	10/1	.085	.473	579	620	71	.115	5.7	B+	32 ft
LT+TH	12/1	.419	.473	511	552	443	.803	14.5	*B	197 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
16:28:23

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 5 - PAIWA ST & HIAPO ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	.0	.0	.0	.0
GRADES	MODER	MODER	MODER	MODER
PEDLEVELS	NONE	BOTH	NONE	NONE
PARKINGSIDES	20	20	20	20
PARKVOLUMES	5	0	5	0
BUSVOLUMES	0	70	0	55
RIGHTTURNONREDS				

Movement Parameters

	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
MOVLABELS	290	858	99	72	55	50	40	657	79	108	42	348
VOLUMES	.0	24.0	.0	10.0	12.0	.0	.0	24.0	.0	10.0	12.0	.0
WIDTHS	0	2	0	1	1	0	0	2	0	1	1	0
LANES	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UTILIZATIONS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
TRUCKPERCENTS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
PEAKHOURFACTORS	3	3	3	3	3	3	3	3	3	3	3	3
ARRIVALTYPES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
ACTUATIONS	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
REQCLEARANCES	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
MINIMUMS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
IDEALSATFLOWS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
GROUPTYPES	0	2471	0	1050	1128	0	0	2200	0	1312	1207	0
SATURATIONFLOWS												

Phasing Parameters

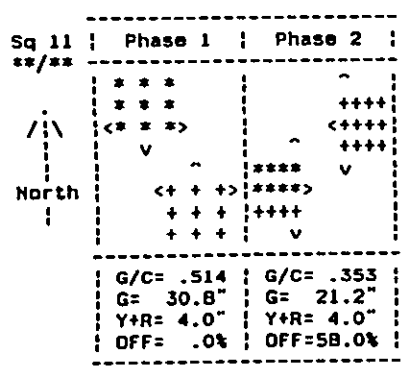
SEQUENCES	11	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	30.82	21.18					
YELLOWTIMES	4.00	4.00					
CRITICALS	2	11					
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
16:28:30

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 5 - PAIWA ST & HIAPO ST
Degree of Saturation (v/c) .82 Vehicle Delay 16.9 Level of Service C+



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								21.9	C	
LT+TH+RT	24/2	.539	.547	1335	1351	1312	.971	21.9	*C	251 ft
NB Approach								7.4	B+	
LT+TH+RT	24/2	.393	.547	1183	1203	817	.679	7.4	B+	156 ft
WB Approach								8.1	B+	
RT	10/1	.006	.386	359	406	2	.005	7.3	B+	25 ft
LT+TH	12/1	.139	.386	388	436	111	.255	8.2	B+	57 ft
EB Approach								21.4	C	
RT	10/1	.070	.386	458	507	56	.110	7.6	B+	29 ft
LT+TH	12/1	.380	.386	418	466	410	.880	23.3	*C	212 ft

AMFAC WAIPAHU TIAR
2000 - SCENARIO B
AM PEAK HOUR

02/21/96
16:18:47

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 6 - PAIWA ST & H-1 EB RAMPS

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	SB	WB	NB	EB
GRADES	.0	.0	.0	-2.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	708	338	0	0	0	548	274	0	268	6	420
WIDTHS	.0	24.0	12.0	.0	.0	.0	.0	24.0	.0	12.0	12.0	.0
LANES	0	2	1	0	0	0	0	2	0	1	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REDCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3688	1770	0	0	0	0	3261	0	1554	1559	0

Phasing Parameters

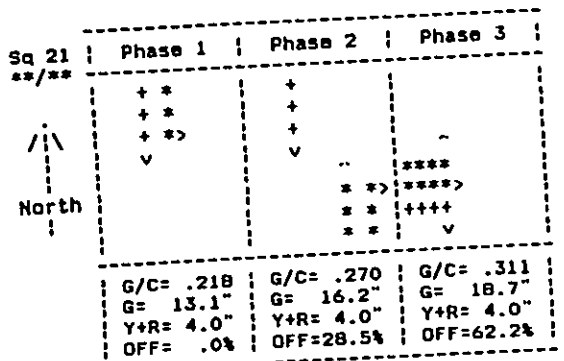
SEQUENCES	21	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	13.11	16.21	18.68				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	3	8	11				
EXCESS	0						

02/21/96
16:19:00

AMFAC WAIPAHU TIAR
2000 - SCENARIO B
PM PEAK HOUR

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 6 - PAIWA ST & H-1 EB RAMPS
Degree of Saturation (v/c) .67 Vehicle Delay 14.3 Level of Service B



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Pad= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @c (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								9.4	B+	
TH	24/2	.222	.589	2171	2171	745	.343	4.1	A	129 ft
LT	12/1	.236	.252	386	446	356	.798	20.4	*C	225 ft
NB Approach								19.0	C+	
TH+RT	24/2	.284	.303	932	990	865	.874	19.0	*C+	254 ft
EB Approach								16.1	C+	
RT	12/1	.219	.345	483	536	282	.526	10.9	B	156 ft
LT+TH	12/1	.323	.345	484	537	448	.834	19.3	*C+	248 ft

02/21/96
16:19:38

AMFAC WAIPAHU TIAR
2000 - SCENARIO B
PM PEAK HOUR

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 6 - PAIWA ST & H-1 EB RAMPS

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	.0	.0	.0	-2.0
GRADES	LOW	LOW	LOW	LOW
PEDLEVELS	NONE	NONE	NONE	NONE
PARKINGSIDES	20	20	20	20
PARKVOLUMES	5	0	5	0
BUSVOLUMES	0	0	0	0
RIGHTTURNONREDS				

Movement Parameters

	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
MJVLABELS	0	974	291	0	0	0	770	505	0	281	6	585
VOLUMES	.0	24.0	12.0	.0	.0	.0	.0	24.0	.0	12.0	12.0	.0
WIDTHS	0	2	1	0	0	0	0	2	0	1	1	0
LANES	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
UTILIZATIONS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
TRUCKPERCENTS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PEAKHOURFACTORS	3	3	3	3	3	3	3	3	3	3	3	3
ARRIVALTYPES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
ACTUATIONS	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
REQCLEARANCES	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
MINIMUMS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
IDEALSATFLOWS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
GROUPTYPES	0	3688	1770	0	0	0	0	3301	0	1554	1558	0
SATURATIONFLOWS												

Phasing Parameters

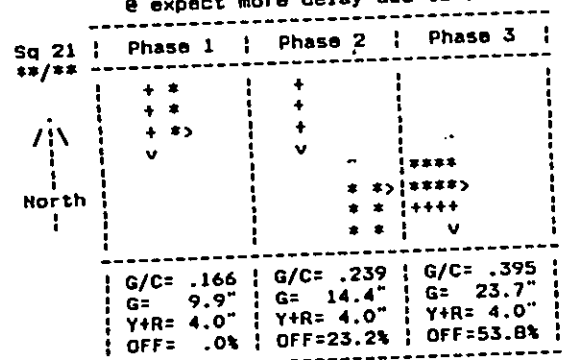
SEQUENCES	21	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	9.93	14.35	23.72				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	3	8	11				
EXCESS	0						

AMFAC WAIPAHU TIAR
2000 - SCENARIO B
PM PEAK HOUR

02/21/96
16:19:45

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 6 - PAIWA ST & H-1 EB RAMPS
Degree of Saturation (v/c) .89 Vehicle Delay 21.1@ Level of Service C
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph) @E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach							10.1	B	
TH	24/2	.268	.505	1856	1861	925	.497	6.5	B+	193 ft
LT	12/1	.191	.199	291	352	276	.784	22.3	*C	186 ft
NB Approach							37.2@	D	
TH+RT	24/2	.380	.273	836	900	1211	1.346	37.2@	*D	371 ft
EB Approach							13.7	B	
RT	12/1	.209	.429	621	666	267	.401	7.9	B+	129 ft
LT+TH	12/1	.392	.429	623	668	561	.840	16.4	*C+	270 ft

AMFAC WAIPAHU TIAR
2000 - SCENARIO B
AM PEAK HOUR

02/21/96
16:43:57

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 7 - PAIWA ST & H-1 WB RAMPS

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	-2.0	-2.0	2.0	.0
GRADES	LOW	LOW	LOW	LOW
PEDLEVELS	NONE	NONE	NONE	NONE
PARKINGSIDES	20	20	20	20
PARKVOLUMES	5	0	5	0
BUSVOLUMES	0	0	0	0
RIGHTTURNONREDS				

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	510	770	0	291	6	318	0	442	256	0	0	0
WIDTHS	.0	24.0	.0	.0	12.0	12.0	.0	24.0	12.0	.0	.0	.0
LANES	0	2	0	0	1	1	0	2	1	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	FFLW	NORM	NORM	FFLW	NORM	DOPT	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3725	0	0	1566	1554	0	3651	1752	0	0	0

Phasing Parameters

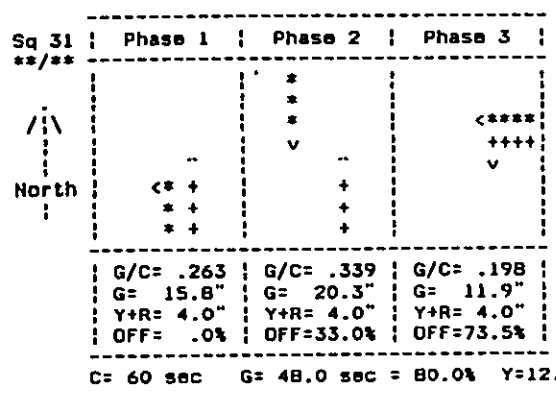
SEQUENCES	31	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	15.79	20.32	11.89				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	9	2	5				
EXCESS	0						

AMFAC WAIPAHU TIAR
2000 - SCENARIO B
AM PEAK HOUR

02/21/96
16:44:02

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 7 - PAIWA ST & H-1 WB RAMPS
Degree of Saturation (v/c) .46 Vehicle Delay 9.1 Level of Service B+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								10.2	B	
TH	24/2	.237	.372	1345	1386	811	.585	10.2	*B	215 ft
NB Approach								5.7	B+	
TH	24/2	.149	.702	2563	2563	465	.181	2.0	A	58 ft
LT	12/1	.189	.297	462	520	269	.517	12.1	*B	160 ft
WB Approach								13.6	B	
TH	12/1-	.147	.231	303	362	175	.483	13.7	*B	113 ft
LT	12/1+	.142	.231	302	360	166	.461	13.5	B	108 ft

AMFAC WAIPAHU TIAR
2000 - SCENARIO B
PM PEAK HOUR

02/21/96
16:45:36

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 7 - PAIWA ST & H-1 WB RAMPS

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	-2.0	-2.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	566	794	0	1090	6	466	0	779	272	0	0	0
WIDTHS	.0	24.0	.0	.0	12.0	12.0	.0	24.0	12.0	.0	.0	.0
LANES	0	2	0	0	1	1	0	2	1	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	FFLW	NORM	NORM	FFLW	NORM	DOPT	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3725	0	0	1562	1554	0	3651	1752	0	0	0

Phasing Parameters

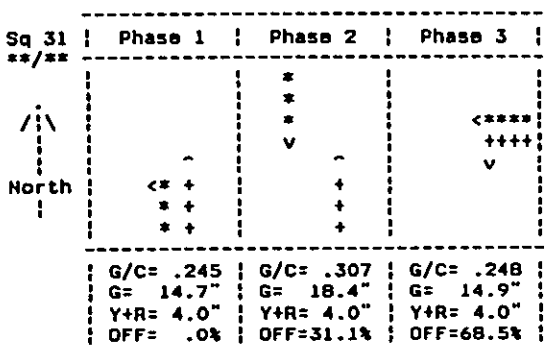
SEQUENCES	31	ALL				
PERMISSIVES	NO	NO	NO	NO	LEADLAGS	NONE NONE
OVERLAPS	NO	NO	NO	NO	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	14.68	18.44	14.88			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	9	2	5			
EXCESS	0					

AMFAC WAIPAHU TIAR
2000 - SCENARIO B
PM PEAK HOUR

02/21/96
16:45:40

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 7 - PAIWA ST & H-1 WB RAMPS
Degree of Saturation (v/c) .53 Vehicle Delay 9.3 Level of Service B+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								11.8	B	
TH	24/2	.243	.341	1220	1269	836	.659	11.8	*B	232 ft
NB Approach								5.7	B+	
TH	24/2	.244	.652	2381	2381	820	.344	3.1	A	120 ft
LT	12/1	.198	.278	428	487	286	.587	13.4	*B	174 ft
WB Approach								13.2	B	
TH	12/1-	.201	.281	382	439	255	.581	13.4	*B	155 ft
LT	12/1+	.193	.281	380	437	242	.554	13.0	B	147 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
16:31:58

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 8 - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	-2.0	.0	2.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

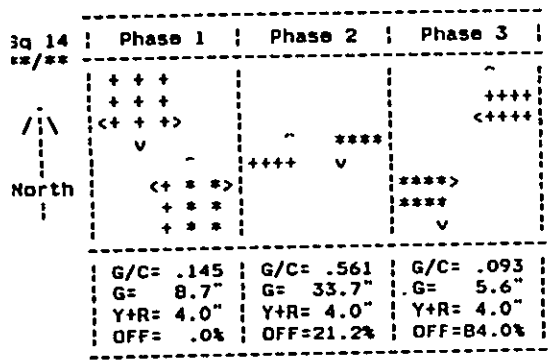
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	8	195	30	32	110	971	365	87	91	210	120	9
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	0	2	1	0	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3691	701	0	3483	1770	0	2929	948	0	3112	1770

Phasing Parameters

SEQUENCES	14	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.00	1
OVERLAPS	NO	NO	NO	NO	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	8.73	33.68	5.59				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	8	6	11				
EXCESS	0						

IGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 8 - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) .82 Vehicle Delay 23.9 Level of Service C



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								14.0	B	
TH+RT	24/2	.077	.179	583	660	213	.323	14.0	B	74 ft
LT	12/1	.000	.179	87	118	32	.256	13.9	B	25 ft
NB Approach								27.7	D+	
TH+RT	24/2	.187	.179	452	524	476	.908	29.7	*D+	165 ft
LT	12/1	.146	.179	125	165	96	.565	17.7	C+	66 ft
WB Approach								22.3	C	
TH+RT	24/2	.061	.127	365	441	150	.340	15.6	C+	55 ft
LT	12/1	.590	.595	1032	1052	1022	.971	23.3	*C	349 ft
EB Approach								29.9	D+	
TH+RT	24/2	.135	.127	321	394	347	.881	30.6	*D+	128 ft
LT	12/1	.013	.595	1032	1052	9	.009	3.2	A	25 ft

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 8 - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	-2.0	.0	2.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	5	139	58	48	223	1155	735	190	241	108	152	1
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	0	2	1	0	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3695	421	0	3527	1022	0	2940	1259	0	3312	1003

Phasing Parameters

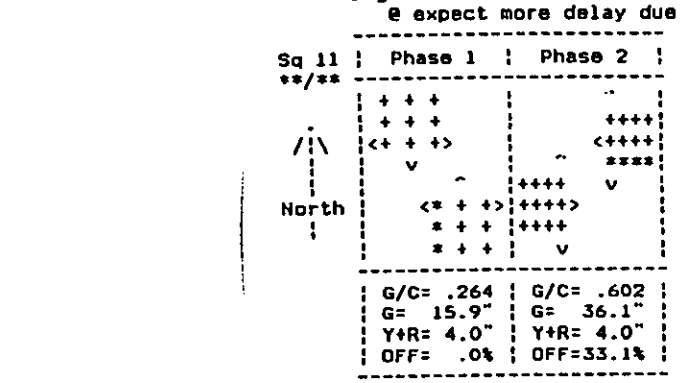
SEQUENCES	11	ALL				
PERMISSIVES	NO	NO	NO	NO	LEADLAGS	NONE NONE
OVERLAPS	NO	NO	NO	NO	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	15.87	36.13				
YELLOWTIMES	4.00	4.00				
CRITICALS	9	6				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
16:37:41

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 8 - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) 1.14 Vehicle Delay 37.0@ Level of Service D
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Pad= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Read	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								11.0	B	
TH+RT	24/2	.058	.298	1042	1100	151	.137	10.0	B+	45 ft
LT	12/1	.000	.298	92	119	61	.488	13.6	B	36 ft
NB Approach								44.5@	E+	
TH+RT	24/2	.349	.298	815	875	974	1.113	52.1@	E	288 ft
LT	12/1	.245	.298	322	375	254	.677	15.3	*C+	150 ft
WB Approach								40.7@	E+	
TH+RT	24/2	.102	.636	2242	2242	286	.128	2.8	A	44 ft
LT	12/1	.988	.636	623	650	1216	1.871	49.6@	*E+	374 ft
EB Approach								2.8	A	
TH+RT	24/2	.105	.636	2105	2105	274	.130	2.8	A	42 ft
LT	12/1	.000	.636	609	637	1	.002	2.6	A	25 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
17:09:53

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 10 - WAIPAHU ST & ROAD X

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	.0	-3.0	.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	469	87	106	0	10	10	321	0	0	0	0
WIDTHS	.0	12.0	11.0	11.0	.0	11.0	11.0	12.0	.0	.0	.0	.0
LANES	0	1	1	1	0	1	1	1	0	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	1825	727	1510	0	1510	1458	1863	0	0	0	0

Phasing Parameters

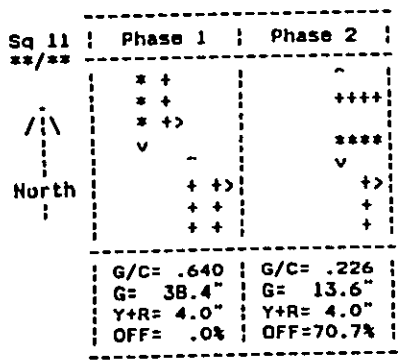
SEQUENCES	11	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	38.42	13.58					
YELLOWTIMES	4.00	4.00					
CRITICALS	2	6					
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
17:09:58

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 10 - WAIPAHU ST & ROAD X
Degree of Saturation (v/c) .32 Vehicle Delay 3.7 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								2.9	A	
TH	12/1	.303	.674	1225	1230	494	.402	3.0	*A	136 ft
LT	11/1	.181	.674	462	490	92	.188	2.4	A	25 ft
NB Approach								2.5	A	
RT	11/1	.018	1.000	1458	1458	11	.008	.0	A	25 ft
TH	12/1	.215	.674	1251	1255	338	.269	2.6	A	93 ft
WB Approach								11.5	B	
RT	11/1	.106	.260	335	392	112	.286	11.6	B	70 ft
LT	11/1	.017	.260	335	392	11	.028	10.7	*B	25 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
17:11:15

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 10 - WAIPAHU ST & ROAD X

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	-3.0	.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	373	123	178	0	10	10	557	0	0	0	0
WIDTHS	.0	12.0	11.0	11.0	.0	11.0	11.0	12.0	.0	.0	.0	.0
LANES	0	1	1	1	0	1	1	1	0	0	0	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	1825	1711	1510	0	1510	1458	1863	0	0	0	0

Phasing Parameters

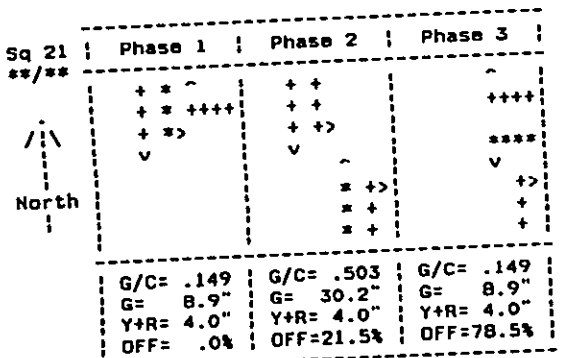
SEQUENCES	21	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	8.92	30.17	8.92			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	3	8	6			
EXCESS	0					

02/21/96
17:11:22

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 10 - WAIPAHU ST & ROAD X
Degree of Saturation (v/c) .42 Vehicle Delay 5.0 Level of Service B+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
								1.9	A	
SB Approach										
TH	12/1	.249	.751	1372	1372	393	.286	1.6	A	82 ft
LT	11/1	.023	.182	390	431	129	.299	3.0	*A	27 ft
								6.6	B+	
NB Approach										
RT	11/1	.018	.751	1093	1096	11	.010	1.2	A	25 ft
TH	12/1	.344	.536	971	999	586	.587	6.7	*B+	229 ft
								8.4	B+	
WB Approach										
RT	11/1	.161	.397	552	600	187	.312	8.1	B+	95 ft
LT	11/1	.017	.182	218	275	11	.040	13.1	*B	25 ft

ATA Inc. STOP CONTROLLED T-INTERSECTION LEVEL OF SERVICE ANALYSIS 1994 HCM

Major Street: MANAGER'S DRIVE
Minor Street: ROAD X
Peak Hour: AM
Scenario: YEAR 2000 - SCENARIO B

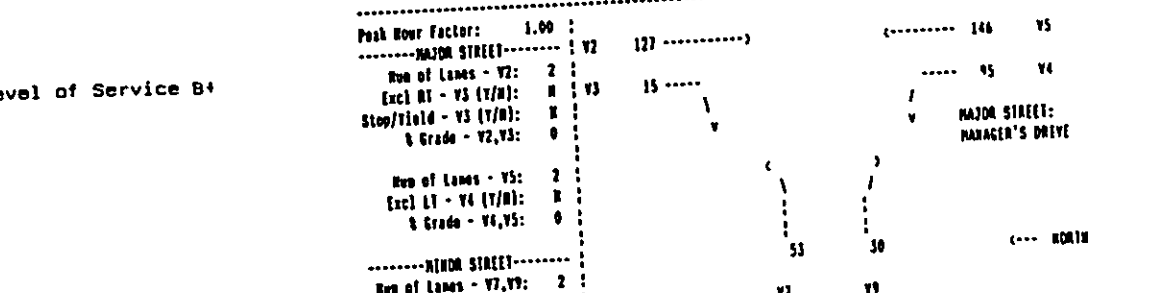
Print Date: 21-Feb
Analyst: BC
File Name: MANDX-A
Intersection: -10

Peak Hour Factor: 1.00

--------MAJOR STREET--------
Num of Lanes - V2: 2
Excl RT - V3 (Y/N): N
Stop/Yield - V3 (Y/N): N
% Grade - V2,V3: 0

Num of Lanes - V5: 2
Excl LT - V4 (Y/N): N
% Grade - V4,V5: 0

--------MINOR STREET--------
Num of Lanes - V7,V9: 2
Shared Lane (Y/N): N
% Grade - V7&V9: 0



VOLUME ADJUSTMENTS

MOVEMENT NO.	2	3	4	5	7	9
VOLUME, V (vph)	127	15	95	146	53	30
VOLUME, v (pcph)	127	15	105	146	58	33

STEP 1: RT FROM MINOR STREET - V9
Conflicting Flows: Vc,9 = 1/2*V3+V2 = 8 + 127 = 135 vph
Potential Capacity: Cp,9 = 1184 pcph
Movement Capacity: Cm,9 = Cp,9 = 1184 pcph

STEP 2: LT FROM MAJOR STREET - V4
Conflicting Flows: Vc,4 = V3+V2 = 15 + 127 = 142 vph
Potential Capacity: Cp,4 = 1438 pcph
Movement Capacity: Cm,4 = Cp,4 = 1438 pcph
Prob. of Queue-free State: po,4 = 1-v4/Cm,4 = 0.93
Major Left Shared Lane Prob. of Queue-free State: p*o,4 = 0.92

STEP 3: LT FROM MINOR STREET - V7
Conflicting Flows: Vc,7 = 1/2*V3+V2+V5+V4 = 376 vph
Potential Capacity: Cp,7 = 609 pcph
Capacity Adjustment Factor Due To Impeding Movements: f7=po,4= 0.92
Movement Capacity: Cm,7 = Cp,7 = 563 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

Movement	v(vph)	cm(pcph)	csh (pcph)	AVG TOTAL DELAY	LOS
MINOR LEFT TURN (7)	58	563	--NA--	7.1	B
MINOR RIGHT TURN (9)	33	1184	--NA--	3.1	A
MAJOR LEFT TURN (4)	105	1438	------	2.7	A

AVERAGE MINOR APPROACH DELAY = 5.7 sec/veh
LEVEL OF SERVICE = B

AVERAGE TOTAL INTERSECTION DELAY = 1.7 sec/veh
LEVEL OF SERVICE = A

ATA Inc. STOP CONTROLLED T-INTERSECTION LEVEL OF SERVICE ANALYSIS 1994 HCM

Major Street: MANAGER'S DRIVE
Minor Street: ROAD X
Peak Hour: PM
Scenario: YEAR 2000 - SCENARIO B

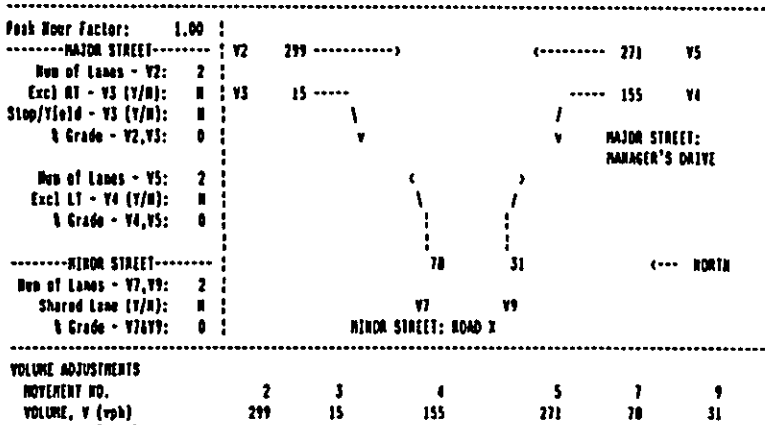
Print Date: 21-Feb
Analyst: BC
File Name: MANRDX-P
Intersection: 18

Peak Hour Factor: 1.00

--------MAJOR STREET--------
Num of Lanes - V2: 2
Excl RT - V3 (Y/N): N
Stop/Yield - V3 (Y/N): N
% Grade - V2,V3: 0

Num of Lanes - V5: 2
Excl LT - V4 (Y/N): N
% Grade - V4,V5: 0

--------MINOR STREET--------
Num of Lanes - V7,V9: 2
Shared Lane (Y/N): N
% Grade - V7&V9: 0



VOLUME ADJUSTMENTS

MOVEMENT NO.	2	3	4	5	7	9
VOLUME, V (vph)	299	15	155	271	78	31
VOLUME, v (pcph)	299	15	171	271	86	34

STEP 1: RT FROM MINOR STREET - V9

Conflicting Flows:	Vc,9 = 1/2*V3+V2 =	8	+ 299	=	307 vph
Potential Capacity:	Cp,9 =				968 pcph
Movement Capacity:	Cm,p = Cp,9 =				968 pcph

STEP 2: LT FROM MAJOR STREET - V4

Conflicting Flows:	Vc,4 = V3+V2 =	15	+ 299	=	314 vph
Potential Capacity:	Cp,4 =				1163 pcph
Movement Capacity:	Cm,4 = Cp,4 =				1163 pcph
Prob. of Queue-free State:	po,4 = 1-v4/Cm,4 =				0.85
Major Left Shared Lane Prob. of Queue-free State:	p*o,4 =				0.84

STEP 3: LT FROM MINOR STREET - V7

Conflicting Flows:	Vc,7 = 1/2V3+V2+V5+V4 =	733 vph
Potential Capacity:	Cp,7 =	360 pcph
Capacity Adjustment Factor Due To Impeding Movements:	f7=po,4:	0.84
Movement Capacity:	Cm,7 = Cp,7 =	303 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

Movement	v(vcph)	cm(pcph)	csh (pcph)	AVG TOTAL DELAY	LOS
MINOR LEFT TURN (7)	86	303	--NA--	16.5	C
MINOR RIGHT TURN (9)	34	968	--NA--	3.9	A
MAJOR LEFT TURN (4)	171	1163	------	3.6	A

AVERAGE MINOR APPROACH DELAY = 12.9 sec/veh
LEVEL OF SERVICE = C

AVERAGE TOTAL INTERSECTION DELAY = 2.5 sec/veh
LEVEL OF SERVICE = A

ATA Inc. STOP CONTROLLED T-INTERSECTION LEVEL OF SERVICE ANALYSIS 1994 HCM

Major Street: MANAGER'S DRIVE
Minor Street: ROAD Y
Peak Hour: AM
Scenario: YEAR 2000 - SCENARIO B

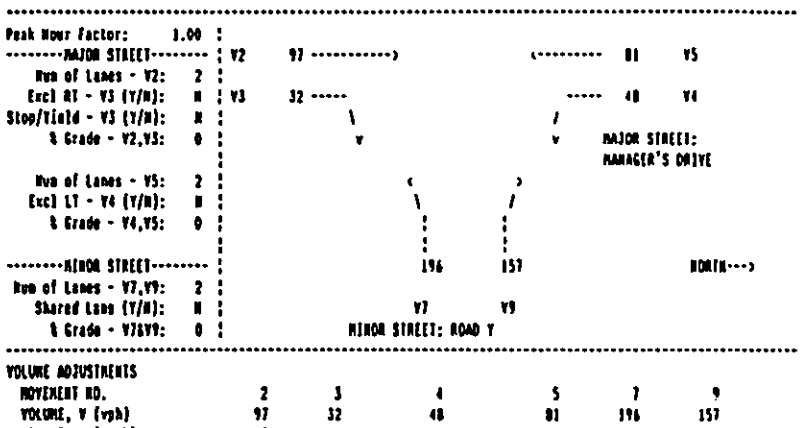
Print Date: 21-Feb
Analyst: BC
File Name: MANRDY-A
Intersection: 21

Peak Hour Factor: 1.00

--------MAJOR STREET--------
Num of Lanes - V2: 2
Excl RT - V3 (Y/N): N
Stop/Yield - V3 (Y/N): N
% Grade - V2,V3: 0

Num of Lanes - V5: 2
Excl LT - V4 (Y/N): N
% Grade - V4,V5: 0

--------MINOR STREET--------
Num of Lanes - V7,V9: 2
Shared Lane (Y/N): N
% Grade - V7&V9: 0



VOLUME ADJUSTMENTS

MOVEMENT NO.	2	3	4	5	7	9
VOLUME, V (vph)	97	32	48	81	196	157
VOLUME, v (pcph)	97	32	53	81	216	173

STEP 1: RT FROM MINOR STREET - V9

Conflicting Flows:	Vc,9 = 1/2*V3+V2 =	16	+ 97	=	113 vph
Potential Capacity:	Cp,9 =				1214 pcph
Movement Capacity:	Cm,p = Cp,9 =				1214 pcph

STEP 2: LT FROM MAJOR STREET - V4

Conflicting Flows:	Vc,4 = V3+V2 =	32	+ 97	=	129 vph
Potential Capacity:	Cp,4 =				1462 pcph
Movement Capacity:	Cm,4 = Cp,4 =				1462 pcph
Prob. of Queue-free State:	po,4 = 1-v4/Cm,4 =				0.96
Major Left Shared Lane Prob. of Queue-free State:	p*o,4 =				0.96

STEP 3: LT FROM MINOR STREET - V7

Conflicting Flows:	Vc,7 = 1/2V3+V2+V5+V4 =	247 vph
Potential Capacity:	Cp,7 =	741 pcph
Capacity Adjustment Factor Due To Impeding Movements:	f7=po,4:	0.96
Movement Capacity:	Cm,7 = Cp,7 =	714 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

Movement	v(vcph)	cm(pcph)	csh (pcph)	AVG TOTAL DELAY	LOS
MINOR LEFT TURN (7)	216	714	--NA--	7.2	B
MINOR RIGHT TURN (9)	173	1214	--NA--	3.5	A
MAJOR LEFT TURN (4)	53	1462	------	2.6	A

AVERAGE MINOR APPROACH DELAY = 5.5 sec/veh
LEVEL OF SERVICE = B

AVERAGE TOTAL INTERSECTION DELAY = 3.5 sec/veh
LEVEL OF SERVICE = A

ATA Inc. STOP CONTROLLED T-INTERSECTION LEVEL OF SERVICE ANALYSIS 1994 HCM

Major Street: MANAGER'S DRIVE — Print Date: 21-Feb
Minor Street: ROAD Y — Analyst: BC
Peak Hour: PM — File Name: MANRD1-P
Scenario: YEAR 2000 - SCENARIO B — Intersection: 21

Peak Hour Factor: 1.00

MAJOR STREET		V2	196	----------)	(----------	174	V5
Num of Lanes - V2:	2						
Excl RT - V3 (Y/N):	N	V3	69	-----	-----	129	V4
Stop/Yield - V3 (Y/N):	N			\	/		
% Grade - V2,V3:	0			v	v		MAJOR STREET: MANAGER'S DRIVE
Num of Lanes - V5:	2				( )		
Excl LT - V4 (Y/N):	N				\ /		
% Grade - V4,V5:	0				: :		
					: :		
MINOR STREET					111 203		NORTH--->
Num of Lanes - V7,V9:	2						
Shared Lane (Y/N):	N				V7 V9		
% Grade - V7&V9:	0			MINOR STREET: ROAD Y			

VOLUME ADJUSTMENTS

MOVEMENT NO.	2	3	4	5	7	9
VOLUME, V (vph)	196	69	129	174	111	203
VOLUME, v (pcph)	196	69	142	174	122	223

STEP 1: RT FROM MINOR STREET - V9

Conflicting Flows:	Vc,9 = 1/2*V3+V2 =	35 + 196 =	231 vph
Potential Capacity:	Cp,9 =		1058 pcph
Movement Capacity:	Ca,9 = Cp,9 =		1058 pcph

STEP 2: LT FROM MAJOR STREET - V4

Conflicting Flows:	Vc,4 = V3+V2 =	69 + 196 =	265 vph
Potential Capacity:	Cp,4 =		1235 pcph
Movement Capacity:	Ca,4 = Cp,4 =		1235 pcph
Prob. of Queue-free State:	po,4 = 1-v4/Cm,4 =		0.89
Major Left Shared Lane Prob. of Queue-free State:	p*o,4 =		0.88

STEP 3: LT FROM MINOR STREET - V7

Conflicting Flows:	Vc,7 = 1/2*V3+V2+V5+V4 =		534 vph
Potential Capacity:	Cp,7 =		483 pcph
Capacity Adjustment Factor Due To Impeding Movements:	f7=po,4=		0.88
Movement Capacity:	Ca,7 = Cp,7 =		424 pcph

DELAY AND LEVEL OF SERVICE SUMMARY

Movement	v(vcph)	ca(pcph)	csh (pcph)	AVG TOTAL DELAY	LOS
MINOR LEFT TURN (7)	122	424	--NA--	11.9	C
MINOR RIGHT TURN (9)	223	1058	--NA--	4.3	A
MAJOR LEFT TURN (4)	142	1235	------	3.3	A

AVERAGE MINOR APPROACH DELAY = 7.0 sec/veh — LEVEL OF SERVICE = B
AVERAGE TOTAL INTERSECTION DELAY = 3.1 sec/veh — LEVEL OF SERVICE = A

AMFAC - WAIPAHU TRAFFIC STUDY — 02/21/96
2000 - SCENARIO B — 17:13:39
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 9 - PAIWA ST & ROAD Y

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	-3.0	.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	0	5	0
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	260	678	0	0	0	0	0	393	45	4	0	68
WIDTHS	.0	24.0	.0	.0	.0	.0	.0	24.0	.0	12.0	.0	12.0
LANES	0	2	0	0	0	0	0	2	0	1	0	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3510	0	0	0	0	0	2560	0	1539	0	1539

Phasing Parameters

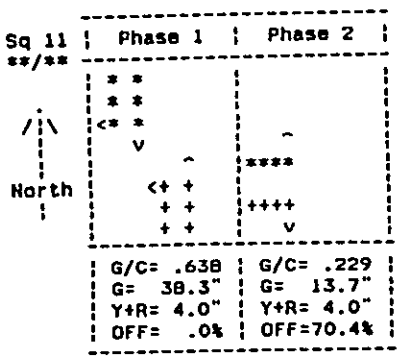
SEQUENCES	11	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	38.26	13.74				
YELLOWTIMES	4.00	4.00				
CRITICALS	2	12				
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
17:13:44

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 9 - PAIWA ST & ROAD Y
Degree of Saturation (v/c) .36 Vehicle Delay 3.3 Level of Service A



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								3.0	A	
TH+RT	24/2	.298	.671	2355	2355	988	.420	3.0	*A	137 ft
NB Approach								2.6	A	
LT+TH	24/2	.207	.671	1718	1718	461	.268	2.6	A	64 ft
EB Approach								11.1	B	
RT	12/1	.007	.262	346	404	4	.010	10.6	B	25 ft
LT	12/1	.074	.262	346	404	72	.178	11.1	*B	45 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/21/96
17:15:18

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 9 - PAIWA ST & ROAD Y

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS		.0	.0	.0
GRADES	.0	LOW	LOW	LOW
PEDLEVELS	LOW	NONE	NONE	NONE
PARKINGSIDES	NONE	20	20	20
PARKVOLUMES	20	0	5	0
BUSVOLUMES	5	0	0	0
RIGHTTURNONREDS	0			

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	232	687	0	0	0	0	0	494	8	32	0	288
WIDTHS	.0	24.0	.0	.0	.0	.0	.0	24.0	.0	12.0	.0	12.0
LANES	0	2	0	0	0	0	0	2	0	1	0	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3526	0	0	0	0	0	3229	0	1539	0	1539

Phasing Parameters

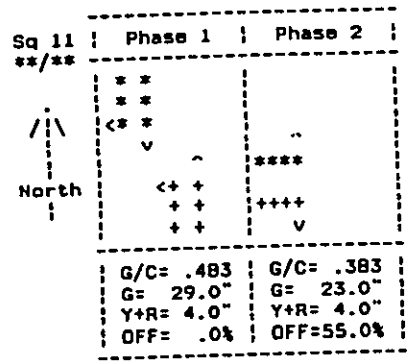
SEQUENCES	11	ALL			LEADLAGS	NONE NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00 1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0 0
CYCLES	60	180	10			
GREENTIMES	29.00	23.00				
YELLOWTIMES	4.00	4.00				
CRITICALS	2	12				
EXCESS	0					

02/21/96
17:15:22

MFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 9 - PAIWA ST & ROAD Y
Degree of Saturation (v/c) .45 Vehicle Delay 6.5 Level of Service B+



C= 60 sec G= 52.0 sec = 86.7% Y= 8.0 sec = 13.3% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								6.5	B+	
TH+RT	24/2	.291	.517	1818	1822	967	.531	6.5	*B+	197 ft
NB Approach								5.4	B+	
LT+TH	24/2	.187	.517	1660	1669	528	.316	5.4	B+	108 ft
EB Approach								8.5	B+	
RT	12/1	.041	.417	595	641	34	.053	6.7	B+	25 ft
LT	12/1	.235	.417	595	641	303	.473	8.6	*B+	149 ft

APPENDIX B

. YEAR 2000 BASE WITH BASE IMPROVEMENTS LOS CALCULATIONS

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE + BASE MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
14:18:52

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int 0 2 - WAIPAHU ST & MOKUOLA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	0	0	0	625	484	229	0	78	153	363	0
WIDTHS	.0	.0	.0	.0	12.0	12.0	12.0	.0	12.0	.0	12.0	.0
LANES	0	0	0	0	1	1	1	0	1	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	0	0	0	1825	1770	1219	0	1524	0	1557	0

Phasing Parameters

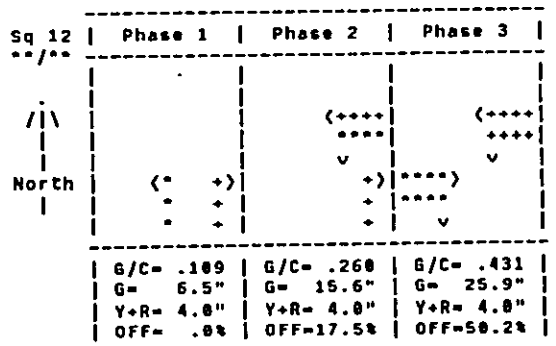
SEQUENCES	12	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	6.53	15.61	25.86			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	9	6	11			
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE + BASE MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
14:18:57

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int 0 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) .61 Vehicle Delay 8.2 Level of Service B+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
NB Approach								9.3	B+	
RT	12/1	.242	.469	530	572	241	.421	7.1	B+	108 ft
LT	12/1	.082	.142	163	215	82	.378	15.6	*C+	59 ft
WB Approach								6.4	B+	
TH	12/1	.388	.791	1444	1444	658	.456	1.5	A	116 ft
LT	12/1	.241	.294	604	644	589	.798	12.7	*B	199 ft
EB Approach								11.6	B	
TH+RT	12/1	.381	.464	682	723	543	.751	11.6	*B	245 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE + BASE MIT
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
14:17:34

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 2 - WAIPAHU ST & MOKUOLA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

	SB			WB			NB			EB		
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	0	0	0	708	302	337	0	103	118	473	0
WIDTHS	.0	.0	.0	.0	12.0	12.0	12.0	.0	12.0	.0	12.0	.0
LANES	0	0	0	0	1	1	1	0	1	0	1	0
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	0	0	0	1825	1770	1219	0	1524	0	1585	0

Phasing Parameters

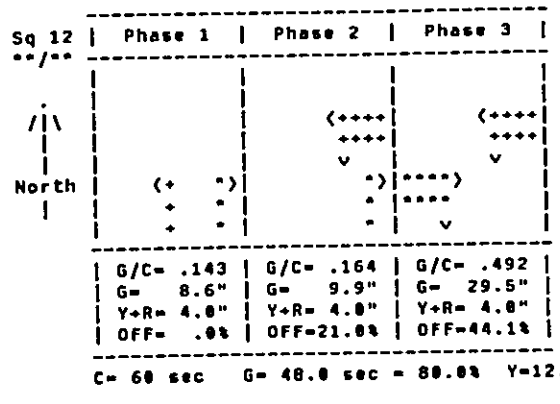
SEQUENCES	12	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	100	10		PEDTIME	.0 0
GREENTIMES	8.50	9.87	29.55			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	7	7	11			
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE + BASE MIT
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
14:17:41

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) .64 Vehicle Delay 7.9 Level of Service B+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	95% Max Queue
NB Approach								13.3	B	
RT	12/1	.334	.488	458	497	355	.714	12.9	*B	177 ft
LT	12/1	.183	.176	212	269	108	.401	14.7	B	75 ft
WB Approach								4.4	A	
TH	12/1	.432	.757	1382	1382	745	.539	2.3	A	153 ft
LT	12/1	.131	.198	432	474	318	.671	9.5	B+	110 ft
EB Approach								9.8	B+	
TH+RT	12/1	.422	.526	800	833	622	.747	9.8	*B+	249 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS WITH MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
13:53:06

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	300	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	706	409	47	62	397	155	93	201	10	83	241	309
WIDTHS	11.0	12.0	12.0	.0	12.0	12.0	.0	12.0	12.0	.0	12.0	12.0
LANES	1	1	1	0	1	1	0	1	1	0	1	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1863	498	0	1765	1770	0	1684	368	0	1711	1770

Phasing Parameters

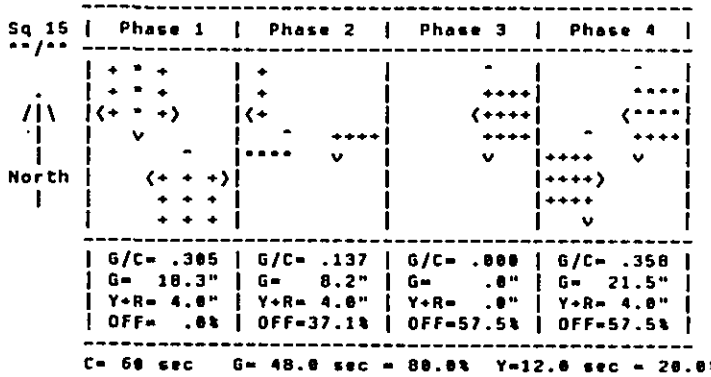
SEQUENCES	15	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	120	10				
GREENTIMES	18.27	8.22	.00	21.51			
YELLOWTIMES	4.00	4.00	.00	4.00			
CRITICALS	2	12	0	5			
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS WITH MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
13:53:11

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) .63 Vehicle Delay 10.6 Level of Service B



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								10.8	B	
RT	11/1	.419	.542	687	721	512	.710	8.9	B+	198 ft
TH	12/1	.264	.338	575	629	431	.685	13.2	*B	241 ft
LT	12/1	.000	.338	129	163	49	.295	9.7	B+	27 ft
NB Approach								11.1	B	
TH+RT	12/1	.220	.338	515	569	310	.545	11.3	B	173 ft
LT	12/1	.000	.338	92	118	19	.153	9.0	B+	25 ft
WB Approach								10.8	B	
TH+RT	12/1	.306	.392	643	692	483	.698	12.0	*B	248 ft
LT	12/1	.011	.170	456	485	163	.336	4.2	A	56 ft
EB Approach								10.6	B	
TH+RT	12/1	.235	.392	622	671	341	.508	9.5	B+	175 ft
LT	12/1	.133	.170	388	425	325	.765	11.8	*B	123 ft

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int 0 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	300	0	0	0

Movement Parameters

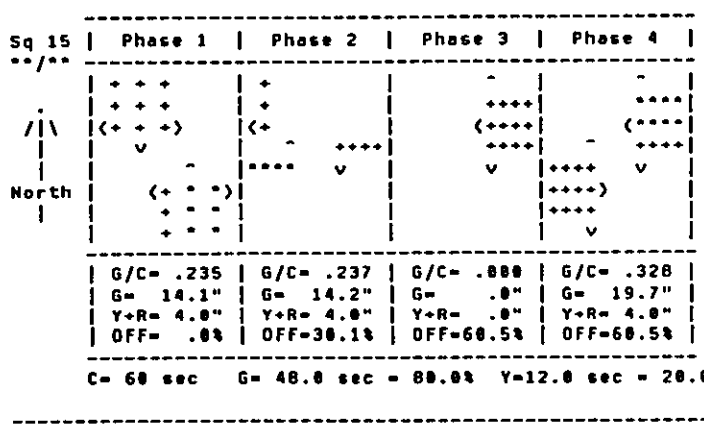
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	693	216	34	60	364	33	64	226	29	54	331	442
WIDTHS	11.0	12.0	12.0	.0	12.0	12.0	.0	12.0	12.0	.0	12.0	12.0
LANES	1	1	1	0	1	1	0	1	1	0	1	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1863	464	0	1762	1770	0	1727	679	0	1762	1770

Phasing Parameters

SEQUENCES	15	ALL					
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE	NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00	1
CYCLES	60	180	10		PEDTIME	.0	0
GREENTIMES	14.07	14.24	.00	19.68			
YELLOWTIMES	4.00	4.00	.00	4.00			
CRITICALS	8	12	0	5			
EXCESS	0						

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int 0 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) .62 Vehicle Delay 11.2 Level of Service B



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								8.3	B+	
RT	11/1	.350	.572	732	762	414	.543	5.8	B+	149 ft
TH	12/1	.155	.268	439	499	227	.455	12.3	B	148 ft
LT	12/1	.000	.268	90	110	36	.290	11.6	B	25 ft
NB Approach								14.6	B	
TH+RT	12/1	.212	.268	404	463	305	.659	15.0	*C+	188 ft
LT	12/1	.000	.268	140	179	31	.170	10.9	B	25 ft
WB Approach								12.2	B	
TH+RT	12/1	.286	.361	585	637	446	.700	13.0	*B	240 ft
LT	12/1	.000	.271	565	603	35	.058	2.9	A	25 ft
EB Approach								11.5	B	
TH+RT	12/1	.264	.361	585	637	405	.636	11.8	B	218 ft
LT	12/1	.214	.271	566	603	465	.771	11.2	*B	181 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS W/MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/26/96
13:10:14

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int 0 8 - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	-2.0	.0	2.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	8	195	30	32	75	961	360	87	119	357	87	9
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	12.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	1	2	1	0	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	DOPT	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3691	1395	0	3277	1770	1364	3688	1041	0	2962	1770

Phasing Parameters

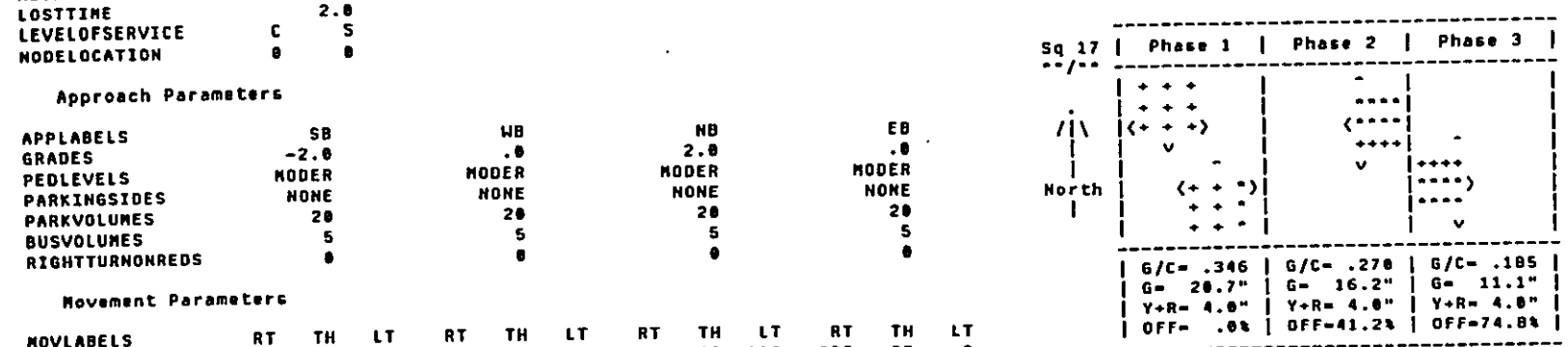
SEQUENCES	17	ALL				
PERMISSIVES	NO	NO	NO	NO	LEADLAGS	NONE. NONE
OVERLAPS	NO	NO	NO	NO	OFFSET	.00 1
CYCLES	60	120	10		PEDTIME	.0 0
GREENTIMES	20.73	16.17	11.09			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	7	5	11			
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - BASE CONDITIONS W/MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/26/96
13:10:20

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int 0 8 - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) .63 Vehicle Delay 13.7 Level of Service B



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	95% Max Queue
SB Approach								7.9	B+	
TH+RT	24/2	.077	.379	1359	1398	213	.152	7.9	B+	56 ft
LT	12/1	.000	.379	478	528	32	.061	7.7	B+	25 ft
NB Approach								11.9	B	
RT	12/1	.317	.379	468	517	379	.733	14.0	*B	199 ft
TH	24/2	.039	.379	1358	1397	92	.066	7.7	B+	25 ft
LT	12/1	.165	.379	347	394	125	.317	8.7	B+	65 ft
WB Approach								14.7	B	
TH+RT	24/2-	.253	.383	934	992	763	.769	14.9	*B	224 ft
LT	12/1+	.239	.383	479	536	362	.675	14.2	B	213 ft
EB Approach								16.8	C+	
TH+RT	24/2	.103	.218	576	646	468	.724	16.9	*C+	154 ft
LT	12/1	.013	.218	325	386	9	.023	11.9	B	25 ft

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int 0 8 - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

	SB	WB	NB	EB
APPLABELS		.0	2.0	.0
GRADES	-2.0	MODER	MODER	MODER
PEDLEVELS	MODER	NONE	NONE	NONE
PARKINGSIDES	NONE	20	20	20
PARKVOLUMES	20	5	5	5
BUSVOLUMES	5	0	0	0
RIGHTTURNONREDS	0			

Movement Parameters

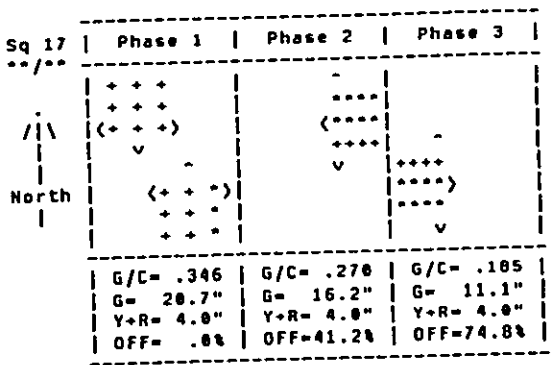
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	195	30	32	75	961	360	87	119	357	87	9
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	12.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	1	2	1	0,	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	DOPT	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3691	1395	0	3277	1770	1364	3688	1041	0	2962	1770

Phasing Parameters

SEQUENCES	17	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.0	1
OVERLAPS	NO	NO	NO	NO	PEDTIME	.0	0
CYCLES	60	120	10				
GREENTIMES	20.73	16.17	11.09				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	7	5	11				
EXCESS	0						

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int 0 8 - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) .63 Vehicle Delay 13.7 Level of Service B



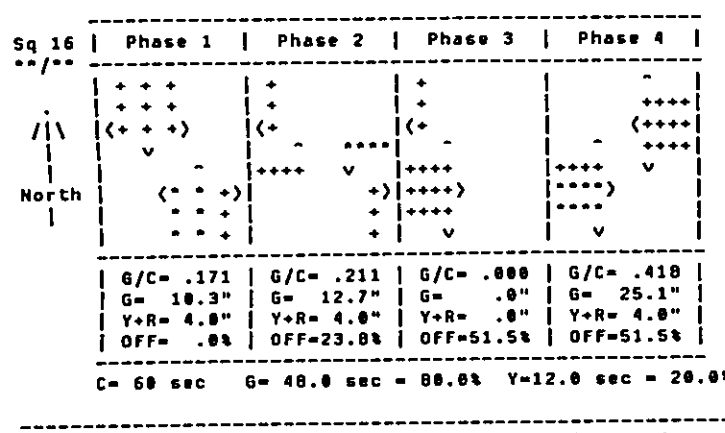
C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	98% Max Queue
SB Approach								7.9	B+	
TH+RT	24/2	.077	.379	1359	1398	213	.152	7.9	B+	56 ft
LT	12/1	.000	.379	478	528	32	.061	7.7	B+	25 ft
NB Approach								11.9	B	
RT	12/1	.317	.379	468	517	379	.733	14.0	*B	199 ft
TH	24/2	.039	.379	1358	1397	92	.066	7.7	B+	25 ft
LT	12/1	.165	.379	347	394	125	.317	8.7	B+	65 ft
WB Approach								14.7	B	
TH+RT	24/2-	.253	.303	934	992	763	.769	14.9	*B	224 ft
LT	12/1+	.239	.303	479	536	362	.675	14.2	B	213 ft
EB Approach								16.8	C+	
TH+RT	24/2	.183	.218	576	646	468	.724	16.9	*C+	154 ft
LT	12/1	.013	.218	325	386	9	.023	11.9	B	25 ft

AMFAC - WAIPAHU TRAFFIC STUDY 02/25/96
2000 SCENARIO A W/BASE MIT 14:27:18
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) .54 Vehicle Delay 9.1 Level of Service B+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								9.1	B+	
RT	12/1	.156	.482	703	742	184	.248	5.9	B+	80 ft
LT+TH	12/1	.104	.205	306	368	133	.361	13.5	B	89 ft
NB Approach								9.6	B+	
RT	12/1	.223	.482	548	588	218	.371	6.5	B+	95 ft
LT+TH	12/1	.143	.205	190	242	122	.504	15.1	*C+	82 ft
WB Approach								9.4	B+	
TH+RT	12/1	.318	.451	779	820	521	.635	9.3	B+	241 ft
LT	12/1	.173	.244	517	556	391	.703	9.4	*B+	144 ft
EB Approach								8.4	B+	
TH+RT	12/1	.319	.451	735	776	492	.634	9.4	*B+	228 ft
LT	12/1	.000	.244	515	556	83	.149	2.7	A	25 ft

AMFAC - WAIPAHU TRAFFIC STUDY 02/25/96
2000 - SCENARIO A W/BASE MIT 14:31:13
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 2 - WAIPAHU ST & MOKUOLA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	200	66	15	14	536	248	281	58	106	125	464	63
WIDTHS	12.0	12.0	.0	.0	12.0	12.0	12.0	12.0	.0	.0	12.0	11.0
LANES	1	1	0	0	1	1	1	1	0	0	1	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1539	1695	0	0	1817	1770	1219	1397	0	0	1758	1711

Phasing Parameters

SEQUENCES	14	ALL			LEADLAGS	NONE NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00 1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0 0
CYCLES	60	180	10			
GREENTIMES	11.27	7.54	29.19			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	8	6	11			
EXCESS	0					

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

APPENDIX B

• YEAR 2000 WITH PHASE I AND BASE IMPROVEMENTS LOS CALCULATIONS

AMFAC - WAIPAHU TRAFFIC STUDY
2000 SCENARIO A W/BASE MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
14:27:10

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int 0 2 - WAIPAHU ST & KOKUOLA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	175	115	11	11	484	371	207	33	83	156	312	79
WIDTHS	12.0	12.0	.0	.0	12.0	12.0	12.0	12.0	.0	.0	12.0	12.0
LANES	1	1	0	0	1	1	1	1	0	0	1	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1539	1800	0	0	1818	1778	1219	1182	0	0	1720	1778

Phasing Parameters

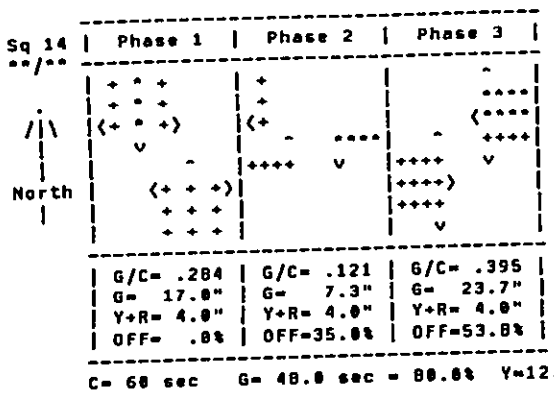
SEQUENCES	16	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	100	10				
GREENTIMES	10.27	12.65	.00	25.07			
YELLOWTIMES	4.00	4.00	.00	4.00			
CRITICALS	8	6	0	11			
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A W/BASE MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
14:39:07

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) .66 Vehicle Delay 11.3 Level of Service B



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	L S	98% Max Queue
SB Approach								11.3	B	
RT	11/1	.322	.505	634	672	376	.560	7.4	B+	157 ft
TH	12/1	.263	.317	533	590	428	.725	14.8	*B	247 ft
LT	12/1	.000	.317	185	134	47	.338	10.7	B	27 ft
NB Approach								12.3	B	
TH+RT	12/1	.226	.317	479	535	321	.600	12.5	B	185 ft
LT	12/1	.000	.317	92	118	32	.258	10.1	B	25 ft
WB Approach								12.9	B	
TH+RT	12/1	.356	.429	716	768	577	.759	12.5	*B	278 ft
LT	12/1	.128	.154	439	467	391	.837	13.5	*B	126 ft
EB Approach								8.0	B+	
TH+RT	12/1	.250	.429	686	738	365	.500	8.5	B+	176 ft
LT	12/1	.082	.154	359	397	235	.592	7.2	B+	76 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A W/ BASE MIT
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
14:49:51

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	235	0	0	0

Movement Parameters

	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
MOVLABELS												
VOLUMES	455	226	37	57	376	33	64	221	43	72	356	341
WIDTHS	11.0	12.0	12.0	.0	12.0	12.0	.0	12.0	12.0	.0	12.0	12.0
LANES	1	1	1	0	1	1	0	1	1	0	1	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1863	455	0	1767	1770	0	1726	661	0	1750	1770

Phasing Parameters

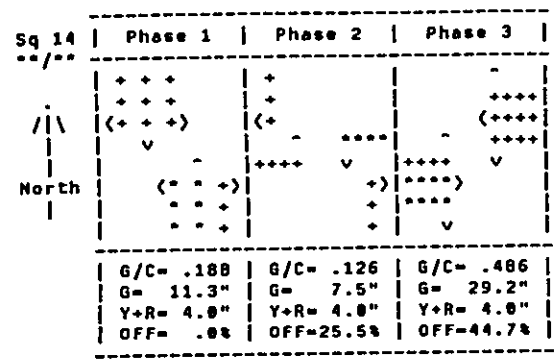
SEQUENCES	15	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00	1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0	0
CYCLES	60	120	10				
GREENTIMES	15.31	10.63	.00	22.06			
YELLOWTIMES	4.00	4.00	.00	4.00			
CRITICALS	0	12	0	5			
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A W/BASE MIT
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
14:31:19

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) .57 Vehicle Delay 8.8 Level of Service B+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								9.2	B+	
RT	12/1	.174	.414	589	636	211	.332	7.8	B+	104 ft
LT+TH	12/1	.076	.221	315	375	85	.227	12.4	B	56 ft
NB Approach								12.0	B	
RT	12/1	.287	.414	458	504	296	.587	10.1	B	146 ft
LT+TH	12/1	.162	.221	253	309	173	.560	15.1	*C+	114 ft
WB Approach								7.8	B+	
TH+RT	12/1	.348	.520	914	945	579	.613	7.4	B+	234 ft
LT	12/1	.097	.159	365	405	261	.644	8.5	*B+	88 ft
EB Approach								7.8	B+	
TH+RT	12/1	.381	.520	882	914	628	.678	8.3	*B+	251 ft
LT	11/1	.000	.159	352	392	66	.168	2.9	A	25 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A W/BASE MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
14:39:02

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	156	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	513	407	45	65	484	371	93	212	30	95	252	223
WIDTHS	11.0	12.0	12.0	.0	12.0	12.0	.0	12.0	12.0	.0	12.0	12.0
LANES	1	1	1	0	1	1	0	1	1	0	1	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1863	438	0	1773	1770	0	1689	392	0	1703	1770

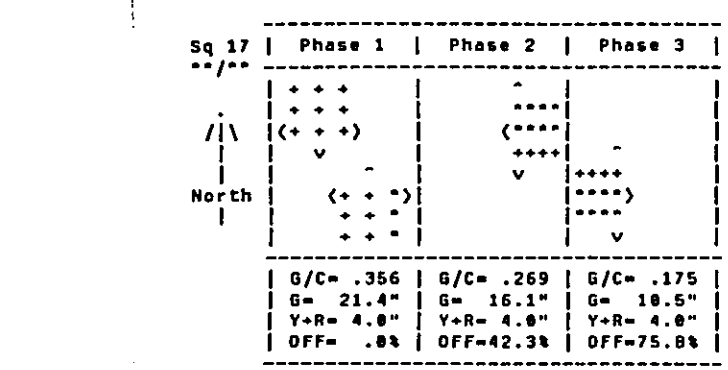
Phasing Parameters

SEQUENCES	14	ALL			LEADLAGS	NONE NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00 1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0 0
CYCLES	60	120	10			
GREENTIMES	17.01	7.26	23.73			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	2	6	5			
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY 02/25/96
2000 - SCENARIO A W/BASE MIT 14:57:06
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int 8 8 - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) .64 Vehicle Delay 14.2 Level of Service B



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	95% Max Queue
SB Approach								7.6	B+	
TH+RT	24/2	.077	.398	1401	1438	213	.148	7.7	B+	55 ft
LT	12/1	.000	.398	494	543	32	.059	7.4	B+	25 ft
NB Approach								12.3	B	
RT	12/1	.335	.398	482	531	404	.761	14.7	*B	208 ft
TH	24/2	.039	.398	1400	1437	92	.064	7.4	B+	25 ft
LT	12/1	.161	.398	359	486	121	.298	8.3	B+	62 ft
WB Approach								15.2	C+	
TH+RT	24/2-	.260	.302	931	998	784	.792	15.5	*C+	231 ft
LT	12/1+	.245	.302	478	535	372	.695	14.7	B	219 ft
EB Approach								17.5	C+	
TH+RT	24/2	.179	.208	547	618	457	.739	17.6	*C+	153 ft
LT	12/1	.013	.208	307	368	9	.024	12.2	B	25 ft

AMFAC - WAIPAHU TRAFFIC STUDY 02/25/96
2000 - SCENARIO A W/BASE MIT 14:53:28
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int 8 8 - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	-2.0	.0	2.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	5	139	58	48	130	1161	745	190	266	170	63	1
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	12.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	1	2	1	0	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	DOPT	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3695	1107	0	3310	1770	1364	3688	1197	0	3027	1770

Phasing Parameters

SEQUENCES	17	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.00	1
OVERLAPS	NO	NO	NO	NO	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	24.55	16.62	6.83				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	7	6	11				
EXCESS	0						

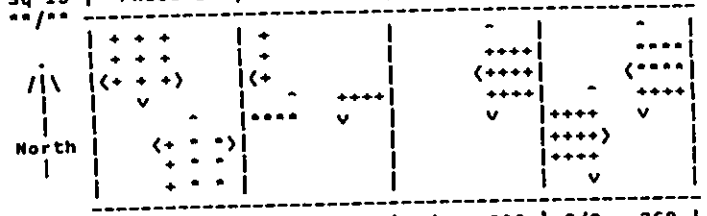
AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A W/ BASE MIT
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
14:49:57

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int 0 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) .57 Vehicle Delay 10.4 Level of Service B

Sq 15 **/**



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	95% Max Queue
SB Approach								8.7	B+	
RT	11/1	.216	.532	674	709	232	.327	5.2	B+	92 ft
TH	12/1	.161	.288	478	537	238	.443	11.6	B	143 ft
LT	12/1	.000	.288	97	125	39	.298	11.1	B	25 ft
NB Approach								13.0	B	
TH+RT	12/1	.210	.288	440	498	300	.682	13.4	*B	180 ft
LT	12/1	.000	.288	149	189	45	.236	10.6	B	27 ft
WB Approach								10.3	B	
TH+RT	12/1	.291	.401	661	708	456	.644	10.8	*B	230 ft
LT	12/1	.000	.210	457	496	35	.071	3.3	A	25 ft
EB Approach								10.4	B	
TH+RT	12/1	.291	.401	654	702	451	.642	10.8	B	228 ft
LT	12/1	.153	.210	458	496	359	.724	9.9	*B+	134 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A W/BASE MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
14:56:58

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int 0 0 - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD
LOSTTIME	2.0
LEVELOFSERVICE	C S
NODELOCATION	0 0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	-2.0	.0	2.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
MOVLABELS												
VOLUMES	0	195	30	32	75	991	384	87	115	347	87	9
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	12.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	1	2	1	0	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	DOPT	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3691	1395	0	3276	1770	1364	3688	1043	0	2966	1770

Phasing Parameters

SEQUENCES	17	ALL			LEADLAGS	NONE	NONE
PERMISSIVES	NO	NO	NO	NO	OFFSET	.00	1
OVERLAPS	NO	NO	NO	NO	PEDTIME	.0	0
CYCLES	60	180	10				
GREENTIMES	21.37	16.13	10.49				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	7	5	11				
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 SCENARIO B W/ BASE MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
15:08:54

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 2 - WAIPAHU ST & MOKUOLA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS	.0	.0	2.0	.0
GRADES	LOW	LOW	LOW	LOW
PEDLEVELS	NONE	NONE	BOTH	NONE
PARKINGSIDES	20	20	20	20
PARKVOLUMES	0	5	0	5
BUSVOLUMES	0	0	0	0
RIGHTTURNONREDS				

Movement Parameters

	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
MOVLABELS	93	130	48	55	467	359	198	46	83	156	284	29
VOLUMES	12.0	12.0	.0	.0	12.0	12.0	12.0	12.0	.0	.0	12.0	12.0
WIDTHS	1	1	0	0	1	1	1	1	0	0	1	1
LANES	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
UTILIZATIONS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
TRUCKPERCENTS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
PEAKHOURFACTORS	3	3	3	3	3	3	3	3	3	3	3	3
ARRIVALTYPES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
ACTUATIONS	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
REQCLEARANCES	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
MINIMUMS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
IDEALSATFLOWS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
GROUPTYPES	1539	1608	0	0	1792	1770	1219	1065	0	0	1713	290
SATURATIONFLOWS												

Phasing Parameters

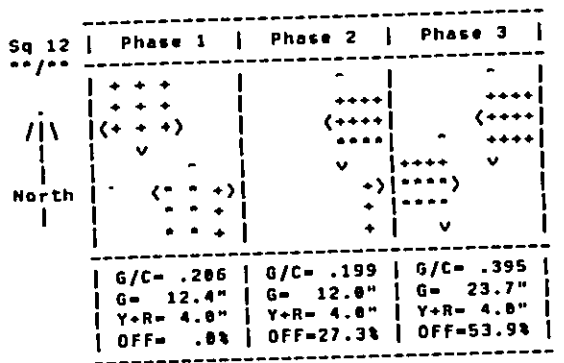
SEQUENCES	12	ALL			LEADLAGS	NONE NONE
PERMISSIVES	YES	YES	YES	YES	OFFSET	.00 1
OVERLAPS	YES	YES	YES	YES	PEDTIME	.0 0
CYCLES	60	180	10			
GREENTIMES	12.36	11.97	23.67			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	8	6	11			
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 SCENARIO B W/ BASE MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
15:09:00

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) .52 Vehicle Delay 8.3 Level of Service B+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

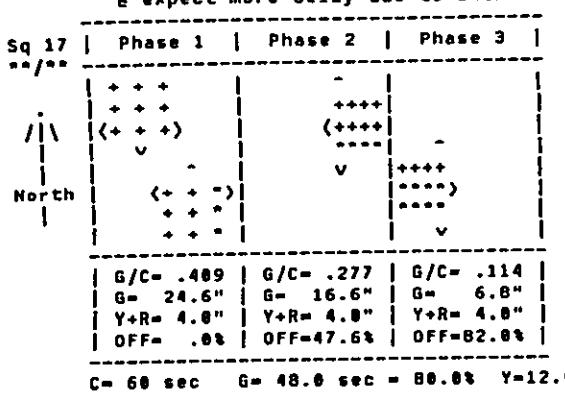
Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E (vph)	Adj Volume	v/c	HCM Delay	L S	95% Max Queue
SB Approach								13.0	B	
RT	12/1	.094	.239	310	368	98	.266	12.1	B	63 ft
LT+TH	12/1	.152	.239	326	385	188	.488	13.5	B	121 ft
NB Approach								9.2	B+	
RT	12/1	.215	.505	570	616	208	.338	5.8	B+	87 ft
LT+TH	12/1	.171	.239	285	255	135	.529	14.5	*B	87 ft
WB Approach								5.6	B+	
TH+RT	12/1	.337	.694	1242	1244	550	.442	2.8	A	142 ft
LT	12/1	.165	.233	496	536	378	.705	9.8	*B+	148 ft
EB Approach								9.8	B+	
TH+RT	12/1	.304	.428	689	733	463	.632	10.0	*B+	223 ft
LT	12/1	.000	.428	95	119	31	.258	7.3	B+	25 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO A W/BASE MIT
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
14:53:34

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int 0 8 - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) .83 Vehicle Delay 26.5@ Level of Service D+
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E (vph)	Adj Volume	v/c	HCM Delay	LOS	90% Max Queue
SB Approach								6.3	B+	
TH+RT	24/2	.058	.443	1612	1635	151	.092	6.3	B+	35 ft
LT	12/1	.000	.443	446	490	61	.124	6.4	B+	29 ft
NB Approach								36.7@	D	
RT	12/1	.595	.443	560	604	784	1.298	54.5@	*E	369 ft
TH	24/2	.073	.443	1609	1632	200	.123	6.4	B+	47 ft
LT	12/1	.279	.443	486	530	280	.528	8.7	B+	132 ft
WB Approach								22.1	C	
TH+RT	24/2-	.307	.310	970	1027	956	.931	23.4	C	278 ft
LT	12/1+	.290	.310	492	549	454	.827	19.4	*C+	264 ft
EB Approach								16.5	C+	
TH+RT	24/2	.104	.147	372	445	245	.551	16.5	*C+	88 ft
LT	12/1	.002	.147	202	260	1	.004	14.1	B	25 ft

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

APPENDIX B

• YEAR 2000 WITH PHASES I AND II WITH BASE IMPROVEMENTS LOS CALCULATIONS

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B W/ BASE MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
15:22:49

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	130	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	484	402	40	50	444	155	93	205	46	111	273	186
WIDTHS	11.0	12.0	12.0	.0	12.0	12.0	.0	12.0	12.0	.0	12.0	12.0
LANES	1	1	1	0	1	1	0	1	1	0	1	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1863	473	0	1774	1770	0	1686	374	0	1696	1770

Phasing Parameters

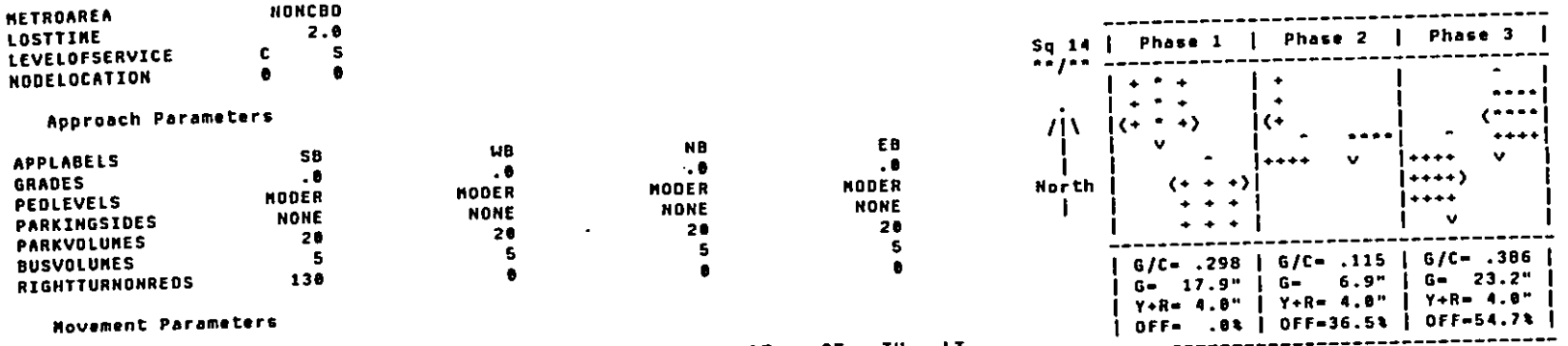
SEQUENCES	14	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	120	10		PEDTIME	.0 0
GREENTIMES	17.90	6.93	23.17			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	2	6	5			
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B W/ BASE MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
15:22:55

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) .59 Vehicle Delay 9.9 Level of Service B+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								10.4	B	
RT	11/1	.320	.514	647	684	373	.545	7.1	B+	153 ft
TH	12/1	.268	.332	563	618	423	.684	13.4	*B	238 ft
LT	12/1	.000	.332	121	153	42	.268	9.7	B+	25 ft
NB Approach								11.5	B	
TH+RT	12/1	.222	.332	504	559	314	.562	11.6	B	177 ft
LT	12/1	.000	.332	92	118	48	.387	11.0	B	27 ft
WB Approach								9.8	B+	
TH+RT	12/1	.329	.420	699	744	528	.710	11.5	*B	258 ft
LT	12/1	.025	.149	387	419	163	.389	4.5	*A	55 ft
EB Approach								8.3	B+	
TH+RT	12/1	.273	.420	666	711	484	.568	9.4	B+	198 ft
LT	12/1	.059	.149	350	387	196	.506	6.1	B+	66 ft

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 2 - WAIPAHU ST & MOKUOLA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

APPLABELS	SB	WB	NB	EB
GRADES	.0	.0	2.0	.0
PEDLEVELS	LOW	LOW	LOW	LOW
PARKINGSIDES	NONE	NONE	BOTH	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	0	5	0	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

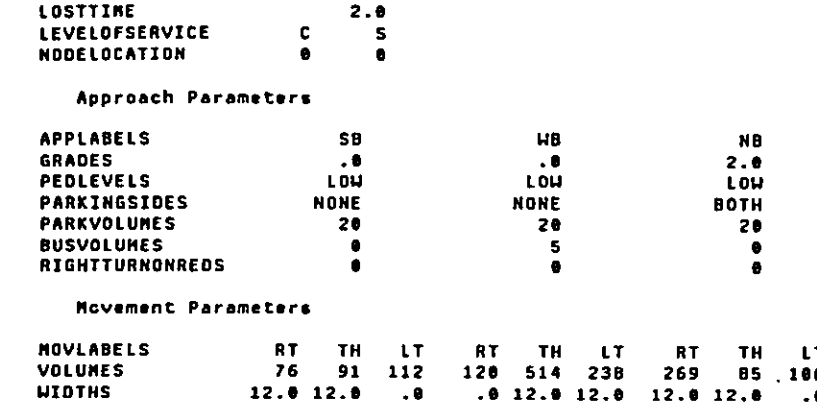
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	76	91	112	120	514	238	269	85	106	125	371	59
WIDTHS	12.0	12.0	.0	.0	12.0	12.0	12.0	12.0	.0	.0	12.0	11.0
LANES	1	1	0	0	1	1	1	1	0	0	1	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1539	1124	0	0	1766	1770	1219	1065	0	0	1745	276

Phasing Parameters

SEQUENCES	12	ALL					
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE	NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00	1
CYCLES	60	180	10		PEDTIME	.0	0
GREENTIMES	16.69	7.19	24.12				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	2	6	11				
EXCESS	0						

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 2 - WAIPAHU ST & MOKUOLA ST
Degree of Saturation (v/c) .59 Vehicle Delay 8.7 Level of Service B+



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	95% Max Queue
SB Approach								12.5	B	
RT	12/1	.080	.311	424	479	80	.167	9.7	B+	46 ft
LT+TH	12/1	.237	.311	299	350	214	.611	13.6	*B	124 ft
NB Approach								9.6	B+	
RT	12/1	.276	.498	568	607	283	.466	6.8	B+	120 ft
LT+TH	12/1	.236	.311	282	332	201	.605	13.6	B	117 ft
WB Approach								5.8	B+	
TH+RT	12/1	.405	.622	1083	1098	667	.607	5.2	B+	213 ft
LT	12/1	.090	.153	357	395	251	.635	7.6	*B+	80 ft
EB Approach								10.7	B	
TH+RT	12/1	.331	.435	717	760	523	.688	10.7	*B	249 ft
LT	11/1	.000	.435	92	115	62	.517	11.1	B	30 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO 8 W/BASE MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
15:33:25

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int 8 8 - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	-2.0	.0	2.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	0	195	30	32	110	971	365	87	91	210	120	9
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	12.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	1	2	1	0	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	OOPT	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3691	1395	0	3347	1770	1364	3688	1846	0	3112	1770

Phasing Parameters

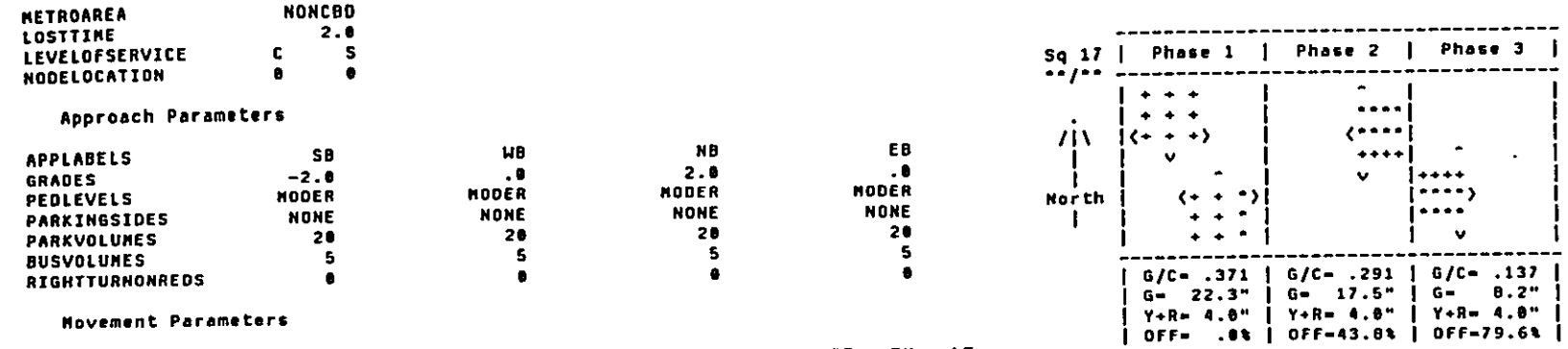
SEQUENCES	17	ALL				
PERMISSIVES	NO	NO	NO	NO	LEADLAGS	NONE NONE
OVERLAPS	NO	NO	NO	NO	OFFSET	.00 1
CYCLES	60	180	10		PEDTIME	.0 0
GREENTIMES	22.28	17.49	8.23			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	7	5	11			
EXCESS	0					

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO 8 W/BASE MIT
AM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
15:33:31

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int 8 8 - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) .59 Vehicle Delay 12.6 Level of Service B



C= 60 sec G= 48.8 sec = 80.8% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	@E	Adj Volume	v/c	HCM Delay	LOS	95% Max Queue
SB Approach								7.3	B+	
TH+RT	24/2	.077	.405	1461	1494	213	.143	7.3	B+	53 ft
LT	12/1	.000	.405	517	564	32	.057	7.0	B+	25 ft
NB Approach								10.6	B	
RT	12/1	.321	.405	585	552	384	.696	12.2	*B	193 ft
TH	24/2	.039	.405	1460	1493	92	.062	7.0	B+	25 ft
LT	12/1	.133	.405	377	423	96	.227	7.6	B+	48 ft
WB Approach								13.3	B	
TH+RT	24/2-	.257	.325	1033	1087	795	.731	13.4	*B	226 ft
LT	12/1+	.247	.325	520	575	377	.656	13.1	B	215 ft
EB Approach								16.9	C+	
TH+RT	24/2	.135	.171	457	531	347	.653	17.0	*C+	121 ft
LT	12/1	.013	.171	242	302	9	.030	13.4	B	2[illegible] ft

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int # 3 - WAIPAHU ST & PAIWA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	.0	.0	.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	170	0	0	0

Movement Parameters

MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	423	222	33	52	448	33	64	216	77	101	424	243
WIDTHS	11.0	12.0	12.0	.0	12.0	12.0	.0	12.0	12.0	.0	12.0	12.0
LANES	1	1	1	0	1	1	0	1	1	0	1	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	1332	1863	467	0	1779	274	0	1723	673	0	1740	1770

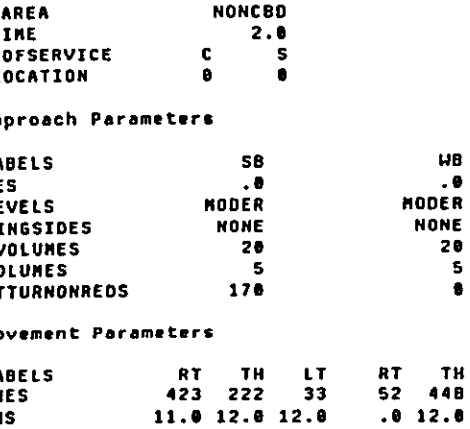
Phasing Parameters

SEQUENCES	13	ALL				
PERMISSIVES	YES	YES	YES	YES	LEADLAGS	NONE NONE
OVERLAPS	YES	YES	YES	YES	OFFSET	.00 1
CYCLES	60	120	10		PEDTIME	.0 0
GREENTIMES	15.13	7.69	25.19			
YELLOWTIMES	4.00	4.00	4.00			
CRITICALS	8	12	5			
EXCESS	0					

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int # 3 - WAIPAHU ST & PAIWA ST
Degree of Saturation (v/c) .53 Vehicle Delay 8.4 Level of Service B+

Sq 13 **/**



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @c (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	L S	90% Max Queue
SB Approach								9.2	B+	
RT	11/1	.241	.488	680	640	266	.416	6.8	B+	117 ft
TH	12/1	.159	.285	473	532	234	.440	11.7	B	141 ft
LT	12/1	.000	.285	98	127	35	.263	11.0	B	25 ft
NB Approach								13.1	B	
TH+RT	12/1	.206	.285	434	492	294	.598	13.4	*B	177 ft
LT	12/1	.143	.285	150	190	81	.422	12.2	B	49 ft
WB Approach								9.4	B+	
TH+RT	12/1	.327	.453	765	806	527	.654	9.6	*B+	243 ft
LT	12/1	.000	.453	96	119	35	.282	7.0	B+	25 ft
EB Approach								4.8	A	
TH+RT	12/1	.348	.648	1115	1127	552	.490	3.8	A	164 ft
LT	12/1	.092	.161	371	418	256	.624	7.1	*B+	76 ft

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B W/BASE MIT
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
15:31:17

SIGNAL94/TEAPAC[V1 L1.4] - Summary of Parameter Values

Intersection Parameters for Int 0 B - PAIWA ST & LUMIAINA ST

METROAREA	NONCBD	
LOSTTIME	2.0	
LEVELOFSERVICE	C	S
NODELOCATION	0	0

Approach Parameters

	SB	WB	NB	EB
APPLABELS				
GRADES	-2.0	.0	2.0	.0
PEDLEVELS	MODER	MODER	MODER	MODER
PARKINGSIDES	NONE	NONE	NONE	NONE
PARKVOLUMES	20	20	20	20
BUSVOLUMES	5	5	5	5
RIGHTTURNONREDS	0	0	0	0

Movement Parameters

	SB			WB			NB			EB		
MOVLABELS	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT
VOLUMES	5	139	58	48	223	1155	735	190	241	108	152	1
WIDTHS	.0	24.0	12.0	.0	24.0	12.0	12.0	24.0	12.0	.0	24.0	12.0
LANES	0	2	1	0	2	1	1	2	1	0	2	1
UTILIZATIONS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
TRUCKPERCENTS	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
PEAKHOURFACTORS	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
ARRIVALTYPES	3	3	3	3	3	3	3	3	3	3	3	3
ACTUATIONS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REQCLEARANCES	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
MINIMUMS	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
IDEALSATFLOWS	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
FACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DELAYFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NSTOPFACTORS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GROUPTYPES	NORM	NORM	NORM	NORM	NORM	DOPT	NORM	NORM	NORM	NORM	NORM	NORM
SATURATIONFLOWS	0	3695	1107	0	3485	1770	1364	3688	1197	0	3312	1770

Phasing Parameters

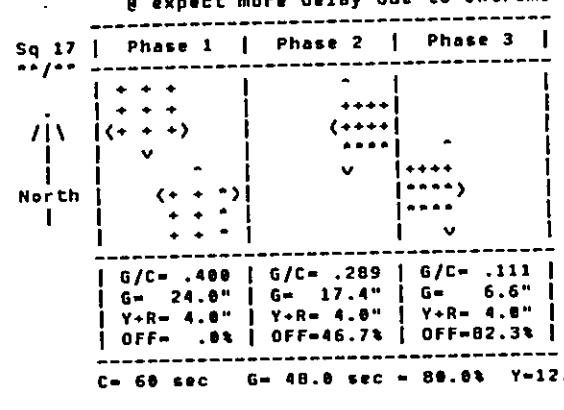
SEQUENCES	17	ALL					
PERMISSIVES	NO	NO	NO	NO	LEADLAGS	NONE	NONE
OVERLAPS	NO	NO	NO	NO	OFFSET	.00	1
CYCLES	60	120	10		PEDTIME	.0	0
GREENTIMES	24.00	17.36	6.64				
YELLOWTIMES	4.00	4.00	4.00				
CRITICALS	7	6	11				
EXCESS	0						

AMFAC - WAIPAHU TRAFFIC STUDY
2000 - SCENARIO B W/BASE MIT
PM PEAK HOUR LEVEL OF SERVICE CALCULATIONS

02/25/96
15:31:23

SIGNAL94/TEAPAC[V1 L1.4] - Capacity Analysis Summary

Intersection Averages for Int 0 B - PAIWA ST & LUMIAINA ST
Degree of Saturation (v/c) .84 Vehicle Delay 26.3@ Level of Service D+
@ expect more delay due to extreme v/c's (see EVALUATE)



C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

Lane Group	Width/ Lanes	g/C Reqd	g/C Used	Service Rate @C (vph)	Service Rate @E	Adj Volume	v/c	HCM Delay	LOS	95% Max Queue
SB Approach								6.5	B+	
TH+RT	24/2	.058	.433	1576	1601	151	.094	6.5	B+	36 ft
LT	12/1	.000	.433	436	480	61	.127	6.6	B+	29 ft
NB Approach								37.5@	D	
RT	12/1	.588	.433	546	591	774	1.310	55.0@	*E	370 ft
TH	24/2	.073	.433	1573	1598	200	.125	6.6	B+	48 ft
LT	12/1	.257	.433	474	519	254	.489	8.5	B+	121 ft
WB Approach								21.6	C	
TH+RT	24/2-	.316	.323	1044	1098	1018	.927	22.3	C	291 ft
LT	12/1+	.306	.323	515	571	484	.848	20.2	*C	276 ft
EB Approach								16.7	C+	
TH+RT	24/2	.105	.144	402	477	274	.574	16.7	*C+	99 ft
LT	12/1	.002	.144	197	255	1	.004	14.2	B	25 ft

Appendix G

Acoustic Study

ACOUSTIC STUDY
FOR THE
AMFAC COMMERCIAL AND PARK PROJECT
WAIPAHU, CENTRAL OAHU

Prepared for:

AMFAC / JMB HAWAII, INC.

Prepared by:

Y. EBISU & ASSOCIATES
1126 12th Avenue, Room 305
Honolulu, Hawaii 96816

NOVEMBER 1996

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I. SUMMARY

The existing and future traffic noise levels in the vicinity of the proposed AMFAC Commercial and Park Project in Waipahu were evaluated for their potential impacts and their relationship to current FHA/HUD noise standards. The traffic noise level increases along three access roadways to the project site were calculated. These three roadways were: Paiwa Street; Waipahu Street; and the proposed Manager's Drive Extension. By CY 2000, increases in traffic noise of 0.1 to 2.7 Ldn units are predicted to occur as a result of project plus non-project traffic.

Along Paiwa Street, traffic noise levels are expected to increase by 0.1 to 1.9 Ldn, as a result of both project and non-project traffic. Project traffic noise contributions along Paiwa Street should range between 0 and 0.2 Ldn. Along Waipahu Street, traffic noise levels are expected to increase by 0.2 to 2.7 Ldn, with project traffic contributions ranging from 0 to 0.5 Ldn. These levels of traffic noise increases resulting from project generated traffic are not considered to be significant, and are not expected to generate adverse noise impacts.

Unavoidable, but temporary, noise impacts may occur during the construction of the proposed project, particularly during the excavation activities on the project site. Because construction activities are predicted to be audible within the project and at adjoining properties, the quality of the acoustic environment may be degraded to unacceptable levels during periods of construction. Mitigation measures to reduce construction noise to inaudible levels will not be practical in all cases, but the use of quiet equipment and the implementation of the State Department of Health construction noise permit procedures are recommended as mitigation measures.

CHAPTER II. PURPOSE

The primary objective of this study was to describe the existing and future traffic noise environment in the environs of the proposed AMFAC Commercial and Park Project in Waipahu on the island of Oahu. Traffic noise level increases and impacts associated with the proposed development were to be determined within the project site as well as along the public roadways expected to service the project traffic. A specific objective was to determine future traffic noise level increases associated with both project and non-project traffic, and the potential noise impacts associated with these increases. Assessments of possible future impacts from short term construction noise at the project site were also included as noise study objectives. Recommendations for minimizing identified noise impacts were also to be provided as required.

CHAPTER III. NOISE DESCRIPTORS AND THEIR RELATIONSHIP TO LAND USE COMPATIBILITY

The noise descriptor currently used by federal agencies (such as FHA/HUD) to assess environmental noise is the Average Day–Night Sound Level (Ldn). This descriptor incorporates a 24–hour average of instantaneous A–Weighted Sound Levels as read on a standard Sound Level Meter. By definition, the minimum averaging period for the Ldn descriptor is 24 hours. Additionally, sound levels which occur during the nighttime time hours of 10:00 PM to 7:00 AM are increased by 10 decibels (dB) prior to computing the 24–hour average by the Ldn descriptor. A more complete list of noise descriptors is provided in APPENDIX B to this report.

Table 1, derived from Reference 1, presents current federal noise standards and acceptability criteria for residential land uses. Land use compatibility guidelines for various levels of environmental noise as measured by the Ldn descriptor system are shown in Figure 1. As a general rule, noise levels of 55 Ldn or less occur in rural areas, or in areas which are removed from high volume roadways. In urbanized areas, which are shielded from high volume streets, Ldn levels generally range from 55 to 65 Ldn, and are usually controlled by motor vehicle traffic noise. Residences which front major roadways are generally exposed to levels of 65 Ldn, and as high as 75 Ldn when the roadway is a high speed freeway. In the project area, traffic noise levels are typically greater than 65 Ldn along the Rights–of–Way due to the large volume of traffic on the primary access roadways to the project site.

For the purposes of determining noise acceptability for funding assistance from federal agencies (FHA/HUD and VA), an exterior noise level of 65 Ldn or lower is considered acceptable. This standard is applied nationally (Reference 2), including Hawaii. Because of our open–living conditions, the predominant use of naturally ventilated dwellings, and the relatively low exterior–to–interior sound attenuation afforded by these naturally ventilated structures, an exterior noise level of 65 Ldn does not eliminate all risks of noise impacts. Because of these factors, and as recommended in Reference 3, a lower level of 55 Ldn is considered to be the "Unconditionally Acceptable" (or "Near–Zero Risk:) level of exterior noise. However, after considering the cost and feasibility of applying the lower level of 55 Ldn, government agencies such as FHA/HUD and VA have selected 65 Ldn as a more appropriate regulatory standard.

For commercial, industrial, and other non–noise sensitive land uses, exterior noise levels as high as 75 Ldn are generally considered acceptable. Exceptions to this occur when naturally ventilated office and other commercial establishments are exposed to exterior levels which exceed 65 Ldn.

On the island of Oahu, the State Department of Health (DOH) regulates noise from on–site mechanical equipment and construction activities. Unavoidably loud construction activities are regulated through the issuance of permits for allowing excessive noise during limited time periods. State DOH noise regulations are expressed

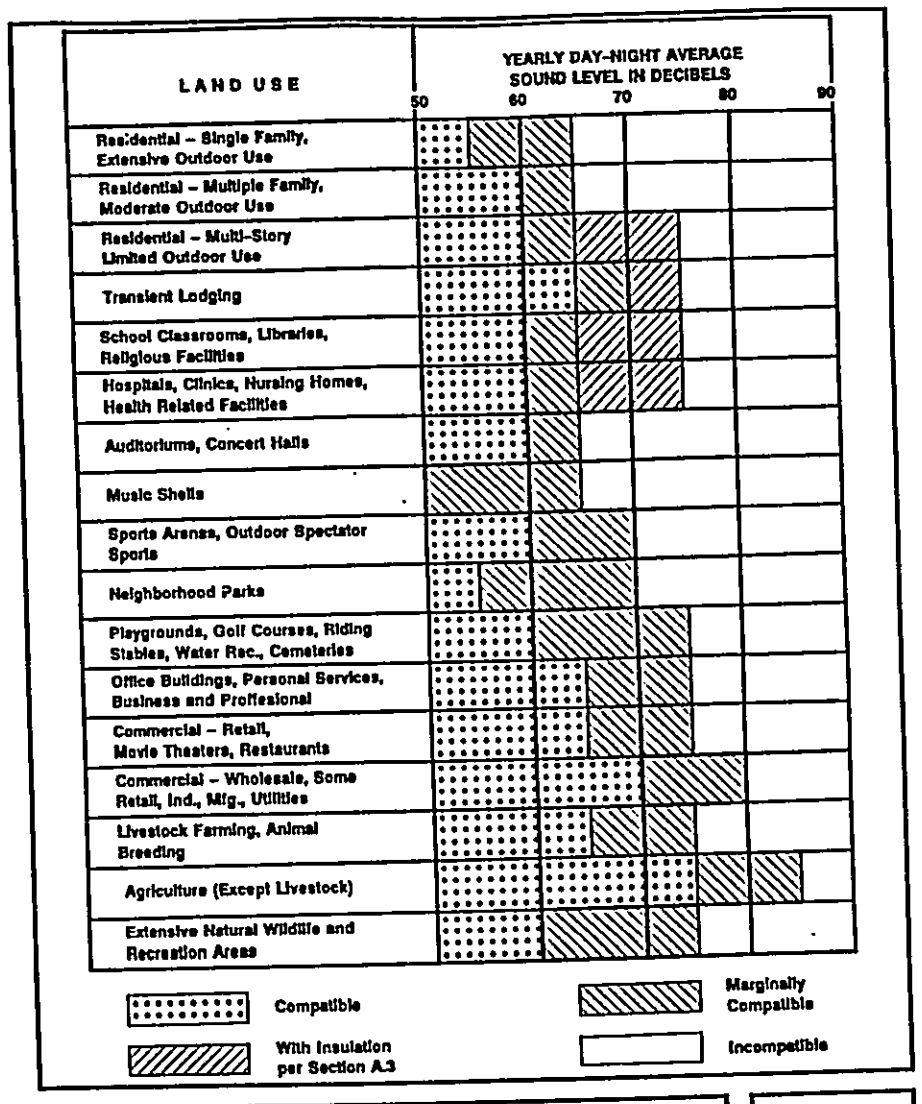
TABLE 1

EXTERIOR NOISE EXPOSURE CLASSIFICATION (RESIDENTIAL LAND USE)

NOISE EXPOSURE CLASS	DAY–NIGHT SOUND LEVEL	EQUIVALENT SOUND LEVEL	FEDERAL (1) STANDARD
Minimal Exposure	Not Exceeding 55 Ldn	Not Exceeding 55 Leq	Unconditionally Acceptable
Moderate Exposure	Above 55 Ldn But Not Above 65 Ldn	Above 55 Leq But Not Above 65 Leq	Acceptable(2)
Significant Exposure	Above 65 Ldn But Not Above 75 Ldn	Above 65 Leq But Not Above 75 Leq	Normally Unacceptable
Severe Exposure	Above 75 Ldn	Above 75 Leq	Unacceptable

Notes: (1) Federal Housing Administration, Veterans Administration, Department of Defense, and Department of Transportation.

(2) FHWA uses the Leq instead of the Ldn descriptor. For planning purposes, both are equivalent if: (a) heavy trucks do not exceed 10 percent of total traffic flow in vehicles per 24 hours, and (b) traffic between 10:00 PM and 7:00 AM does not exceed 15 percent of average daily traffic flow in vehicles per 24 hours. The noise mitigation threshold used by FHWA for residences is 67 Leq.



LAND USE COMPATIBILITY
WITH YEARLY DAY–NIGHT AVERAGE SOUND LEVEL
AT A SITE FOR BUILDINGS AS COMMONLY CONSTRUCTED
(Source: American National Standards Institute S12.40–1990)

FIGURE 1

in maximum allowable property line noise limits rather than Ldn (see Reference 4). Although they are not directly comparable to noise criteria expressed in Ldn, State DOH noise limits for residential, commercial, and industrial lands equate to approximately 55, 60, and 76 Ldn, respectively.

It should be noted that the noise compatibility guidelines and relationships to the Ldn noise descriptor may not be applicable to impulsive noise sources such as pile drivers. The use of penalty factors (such as adding 10 dB to measured sound levels or the use of C–Weighting filters) have been proposed. However, the relationships between levels of impulsive noise sources and land use compatibility have not been as firmly established as have the relationships for non–impulsive sources. The State DOH limits for impulsive sounds which exceed 120 impulses in any 20 minute period are 10 dB above the limits for non–impulsive sounds. If impulsive sounds do not exceed 120 impulses in any 20 minute time period, there are no regulatory limits on their sound levels under the State DOH regulations.

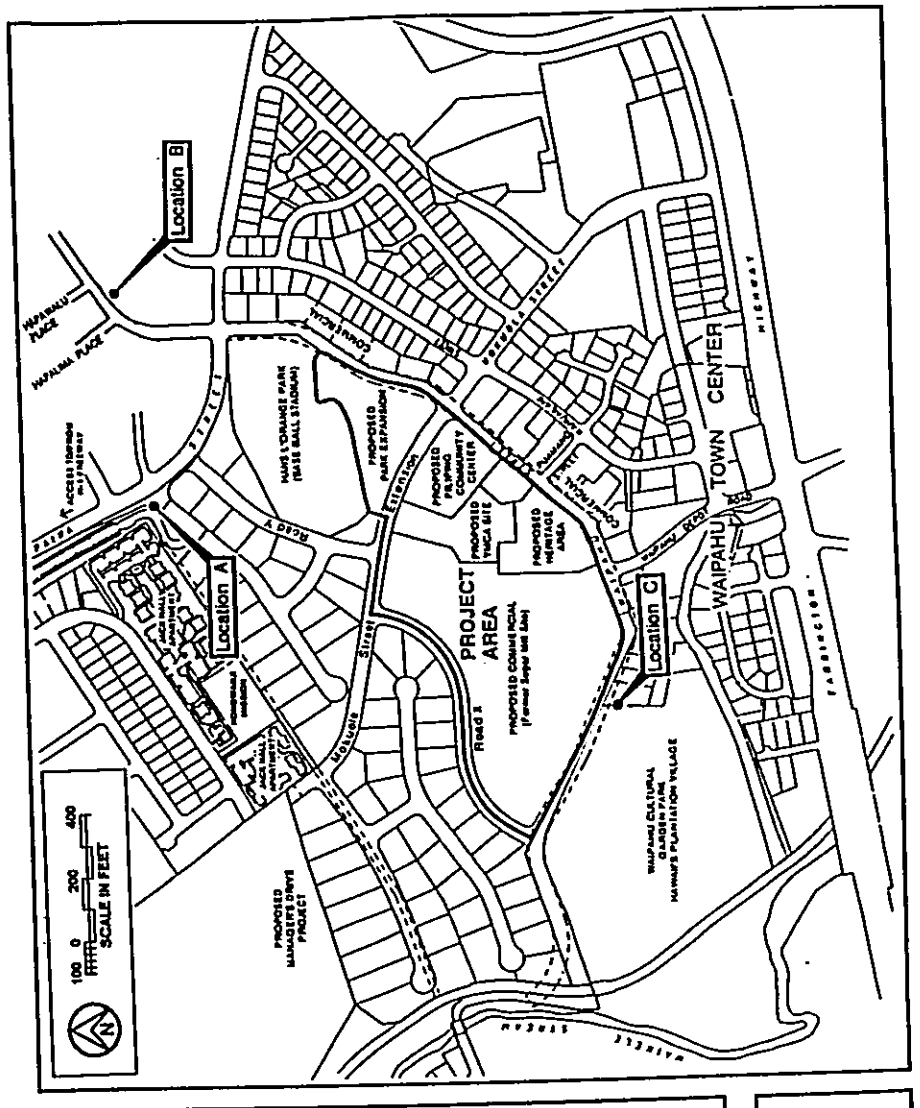
CHAPTER IV. GENERAL STUDY METHODOLOGY

Existing traffic noise levels were measured at three locations in the project environs to provide a basis for developing the project's traffic noise contributions along the roadways which will service the proposed development. The locations of the measurement sites are shown in Figure 2. Noise measurements were performed during the month of November 1996. The results of the traffic noise measurements were compared with calculations of existing traffic noise levels to validate the computer model used.

Traffic noise calculations for the existing conditions as well as noise predictions for the Year 2000 were performed using the Federal Highway Administration (FHWA) Noise Prediction Model (Reference 5). Traffic data entered into the noise prediction model were: hourly traffic volumes, average vehicle speeds, estimates of traffic mix, and hard ground propagation loss factor. The traffic assignments for the project (Reference 6), and Hawaii State Department of Transportation traffic counts on Waipahu Street at Waikele Stream Bridge (Reference 7) were the primary sources of data inputs to the model. For existing and future traffic on all roadways, it was assumed that the average noise levels, or Leq(h), during the AM or PM peak hour were equal to the 24-hour Ldn along the roadway. These assumptions were based on computations of both the hourly Leq and the 24-hour Ldn of traffic noise along Waipahu Street (see Figure 3).

Traffic noise calculations for both the existing and future conditions in the project environs were developed for ground level and elevated receptors without the benefit of shielding effects. Traffic noise levels were calculated for future conditions with and without the proposed commercial and park project. The forecasted changes in traffic noise levels over existing levels were calculated for both future scenarios, and noise impact risks evaluated. The relative contributions of non-project and project traffic to the total noise levels were also calculated, and an evaluation of possible traffic noise impacts was made.

Calculations of average exterior and interior noise levels from construction activities were performed for typical naturally ventilated and air conditioned dwellings. Predicted noise levels were compared with existing background ambient noise levels, and the potential for noise impacts was assessed. Potential noise impacts from construction activities were discussed, and mitigation measures recommended.

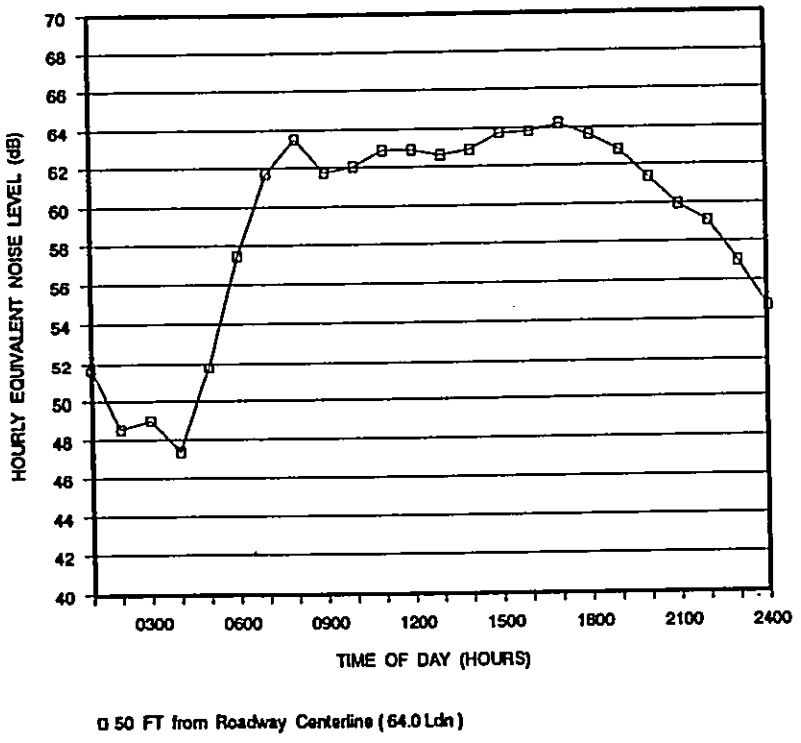


LOCATIONS OF NOISE MEASUREMENT SITES

FIGURE 2

FIGURE 3

HOURLY VARIATIONS OF TRAFFIC NOISE AT 50 FT SETBACK DISTANCE FROM THE CENTERLINE OF WAIPAHU STREET AT WAIKELE STREAM BRIDGE (APRIL 8, 1996)



CHAPTER V. EXISTING NOISE ENVIRONMENT

The results of the November 1996 traffic and background ambient noise measurements are summarized in Table 2, with measurement locations identified in Figure 2. Sites "A" thru "C" were all located at street level. The traffic noise measurement results, and their comparisons with computer model predictions are summarized in Table 2. As shown in Table 2, correlation between measured and predicted traffic noise levels was considered to be good.

The existing traffic noise levels along the primary access roadways to the project site are in the "Significant Exposure, Normally Unacceptable" category at 65 to 70 Ldn.

Results of calculations of existing (CY 1995) traffic noise levels during the PM peak hour period are shown in Table 3. The results of the calculations apply at 50 FT distances from the centerlines of the roadway sections in the project environs. Calculated setback distances from these roadways to the existing 60, 65, and 70 Ldn contours are shown in Table 4. The traffic noise levels shown in the tables only apply when unobstructed line-of-sight conditions exist to the roadways. These conditions would generally occur at short (50 to 100 FT) distances to a roadway, within any flat, open space along the roadway, and at distant, but elevated locations above the roadway. The existing traffic noise levels shown in the tables and figures should be reduced by 3 to 5 dB (or Ldn) if partial shielding (line-of-sight obstruction) exists between the roadway and the receptor location. If the receptor is located behind a major obstruction (large building), the noise levels in the tables and figures should be reduced by 5 to 10 dB.

TABLE 2

TRAFFIC NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	--Hourly Traffic Volume-- AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
A. 50 FT from the center-line of Paiwa Street. (11/18/96)	1515 TO 1600	35	1,047	10	6	63.3	64.4
A. 50 FT from the center-line of Paiwa Street. (11/18/96)	1600 TO 1700	35	871	5	4	62.8	63.2
B. 50 FT from the center-line Waipahu Street. (11/20/96)	1600 TO 1700	35	631	9	9	63.8	63.6
C. 25 FT from the center-line of Waipahu Street. (11/18/96)	1600 TO 1700	32	608	9	16	66.4	66.5

TABLE 3

COMPARISONS OF EXISTING (CY 1995) AND FUTURE (CY 2000)
TRAFFIC NOISE LEVELS ALONG ROADWAYS SERVICING THE PROJECT
(PM PEAK HOUR AND 50 FT FROM ROADWAY CENTERLINE)

LOCATION	SPEED (MPH)	VPH	**** HOURLY LEQ IN dB **** AUTO	MT	HT	ALL VEH
EXISTING (CY 1995) PM PEAK HR. TRAFFIC:						
Paiwa St. North of H-1 Freeway	35	2,038	65.6	57.3	63.1	67.9
Paiwa St. North of Haipo St.	35	1,555	64.4	56.1	61.9	66.7
Paiwa St. from Haipo to Hapapa St.	35	1,283	63.6	55.3	61.1	65.9
Paiwa St. from Hapapa St. to Paiwa Pl.	35	1,263	63.5	55.2	61.0	65.8
Paiwa St. from Paiwa Pl. to Road "Y"	35	1,279	63.5	55.3	61.1	65.9
Paiwa St. from Road "Y" to Waipahu St.	35	1,235	63.4	55.1	60.9	65.7
Waipahu St. North of Paiwa St.	35	705	60.9	54.4	60.3	64.1
Waipahu St. from Paiwa to Mokuloa St.	32	1,465	62.6	56.3	62.5	66.0
Waipahu St. from Mokuloa to Waipahu Depot	32	1,138	61.5	55.2	61.4	64.9
Waipahu St. from Waipahu Depot to Road "X"	32	970	60.8	54.5	60.7	64.2
Waipahu St. North of Road "X"	32	970	60.8	54.5	60.7	64.2
Manager's Drive Extension	N/A	N/A	N/A	N/A	N/A	N/A
FUTURE CONDITIONS (CY 2000) PM PEAK HR. TRAFFIC:						
Paiwa St. North of H-1 Freeway	35	2,898	67.1	58.6	64.6	69.4
Paiwa St. North of Haipo St.	35	2,428	66.3	58.0	63.9	68.7
Paiwa St. from Haipo to Hapapa St.	35	1,778	65.0	56.7	62.5	67.3
Paiwa St. from Hapapa St. to Paiwa Pl.	35	1,808	65.1	56.8	62.6	67.4
Paiwa St. from Paiwa Pl. to Road "Y"	35	1,795	65.0	56.7	62.5	67.4
Paiwa St. from Road "Y" to Waipahu St.	35	1,260	63.5	55.2	61.0	65.8
Waipahu St. North of Paiwa St.	35	1,050	62.6	56.2	62.0	65.8
Waipahu St. from Paiwa to Mokuloa St.	32	1,665	63.2	56.8	63.0	66.6
Waipahu St. from Mokuloa to Waipahu Depot	32	1,185	61.7	55.4	61.5	65.1
Waipahu St. from Waipahu Depot to Road "X"	32	1,228	61.8	55.5	61.7	65.3
Waipahu St. North of Road "X"	32	1,810	63.5	57.2	63.4	67.0
Manager's Drive Extension	35	665	60.7	52.4	58.2	63.0

Notes:

1. The following assumed traffic mix of autos, medium trucks, and heavy vehicles were used for existing and future peak hour conditions along Paiwa Street and Manager's Drive: 98% autos; 1% medium trucks; and 1% heavy trucks and buses.

2. The following assumed traffic mix of autos, medium trucks, and heavy vehicles were used for existing and future peak hour conditions along Waipahu Street: 97% autos; 1.5% medium trucks; and 1.5% heavy trucks and buses.

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TABLE 4

EXISTING AND CY 2000 DISTANCES TO 60, 65, AND 70 LDN CONTOURS

STREET SECTION	60 Ldn SETBACK (FT) EXISTING	60 Ldn SETBACK (FT) CY 2000	65 Ldn SETBACK (FT) EXISTING	65 Ldn SETBACK (FT) CY 2000	70 Ldn SETBACK (FT) EXISTING	70 Ldn SETBACK (FT) CY 2000
Paiwa St. North of H-1 Freeway	168	213	78	99	36	46
Paiwa St. North of Halpo St.	141	189	65	88	30	41
Paiwa St. from Halpo to Hapapa St.	124	154	57	71	27	33
Paiwa St. from Hapapa St. to Paiwa Pl.	122	156	57	72	26	34
Paiwa St. from Paiwa Pl. to Road "Y"	123	155	57	72	27	33
Paiwa St. from Road "Y" to Waipahu St.	121	122	56	57	26	28
Waipahu St. North of Paiwa St.	94	122	44	57	20	26
Waipahu St. from Paiwa to Mokuloa St.	126	138	59	64	27	30
Waipahu St. from Mokuloa to Waipahu Depot	107	110	50	51	23	24
Waipahu St. from Waipahu Depot to Road "X"	96	112	45	52	21	24
Waipahu St. North of Road "X"	96	145	45	68	21	31
Manager's Drive Extension	N/A	80	N/A	37	N/A	17

Notes:

(1) All setback distances are from the roadways' centerlines.
(2) See TABLE 3 for traffic volume, speed, and mix assumptions.
(3) Setback distances are for unobstructed line-of-sight conditions.
(4) Soft ground conditions assumed along all roadways.

CHAPTER VI. FUTURE TRAFFIC NOISE ENVIRONMENT

Predictions of future traffic noise levels were made using the traffic volume assignments of Reference 6 for CY 2000 with and without the proposed project. The future projections of project plus non-project traffic noise levels on the roadways which would service the project are shown in Table 3 for the PM peak hour of traffic. As indicated in Table 3, traffic noise levels are predicted to increase by 0.1 to 2.7 dB during the PM peak hour, with the largest increase expected along the section of Waipahu Street northwest of Road "X". These predictions assume that average vehicle speeds and traffic mix will not change from current conditions. The dominant noise sources in the project environs will continue to be traffic noise from all access roadways to the project site and H-1 Freeway to the north. Table 4 summarizes the predicted setback distances to the 60, 65, and 70 Ldn traffic noise contour lines along the roadways servicing the project and attributable to both project plus non-project traffic by CY 2000. The setback distances in Table 4 do not include the beneficial effects of noise shielding from buildings, or the detrimental effects of additive contributions of noise from intersecting streets or reflections from building walls. As indicated in Table 4, setback distances of 37 to 99 FT to the 65 Ldn contour from the centerlines of the roadways are predicted to occur in CY 2000.

Table 5 presents the predicted increases in traffic noise levels associated with non-project and project traffic by CY 2000, and as measured by the Ldn descriptor system. As indicated in Table 5, the larger increases in traffic noise along the primary access roadways to the project are predicted to be associated with non-project traffic rather than project traffic. Minimal increases ranging from 0.0 to 0.5 Ldn in traffic noise levels are expected to result from project traffic along existing roadways. These changes will be difficult to measure and are considered to be insignificant. Along the future section of Manager's Drive Extension, traffic noise increases are expected to be larger due to the relatively low initial traffic volumes along that roadway.

TABLE 4

EXISTING AND CY 2000 DISTANCES TO 60, 65, AND 70 LDN CONTOURS

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Waipahu St. North of Road "X"	96	145	45	68	21	31
Manager's Drive Extension	N/A	80	N/A	37	N/A	17

Notes:

(1) All setback distances are from the roadways' centerlines.
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TABLE 5

CALCULATIONS OF PROJECT AND NON-PROJECT NOISE CONTRIBUTIONS (CY 2000)

STREET SECTION	NOISE LEVEL INCREASE (Leq) DUE TO: AMBIENT TRAFFIC	PROJECT TRAFFIC
Paiwa St. North of H-1 Freeway	1.5	0.1
Paiwa St. North of Haipo St.	1.8	0.1
Paiwa St. from Haipo to Hapapa St.	1.2	0.2
Paiwa St. from Hapapa St. to Paiwa Pl.	1.4	0.2
Paiwa St. from Paiwa Pl. to Road "Y"	1.3	0.1
Paiwa St. from Road "Y" to Waipahu St.	0.1	0.0
Waipahu St. North of Paiwa St.	1.2	0.5
Waipahu St. from Paiwa to Mokuloa St.	0.1	0.4
Waipahu St. from Mokuloa to Waipahu Depot	0.1	0.1
Waipahu St. from Waipahu Depot to Road "X"	1.0	0.0
Waipahu St. North of Road "X"	2.6	0.1
Manager's Drive Extension	59.7	3.3

CHAPTER VII. DISCUSSION OF PROJECT RELATED NOISE IMPACTS AND POSSIBLE MITIGATION MEASURES

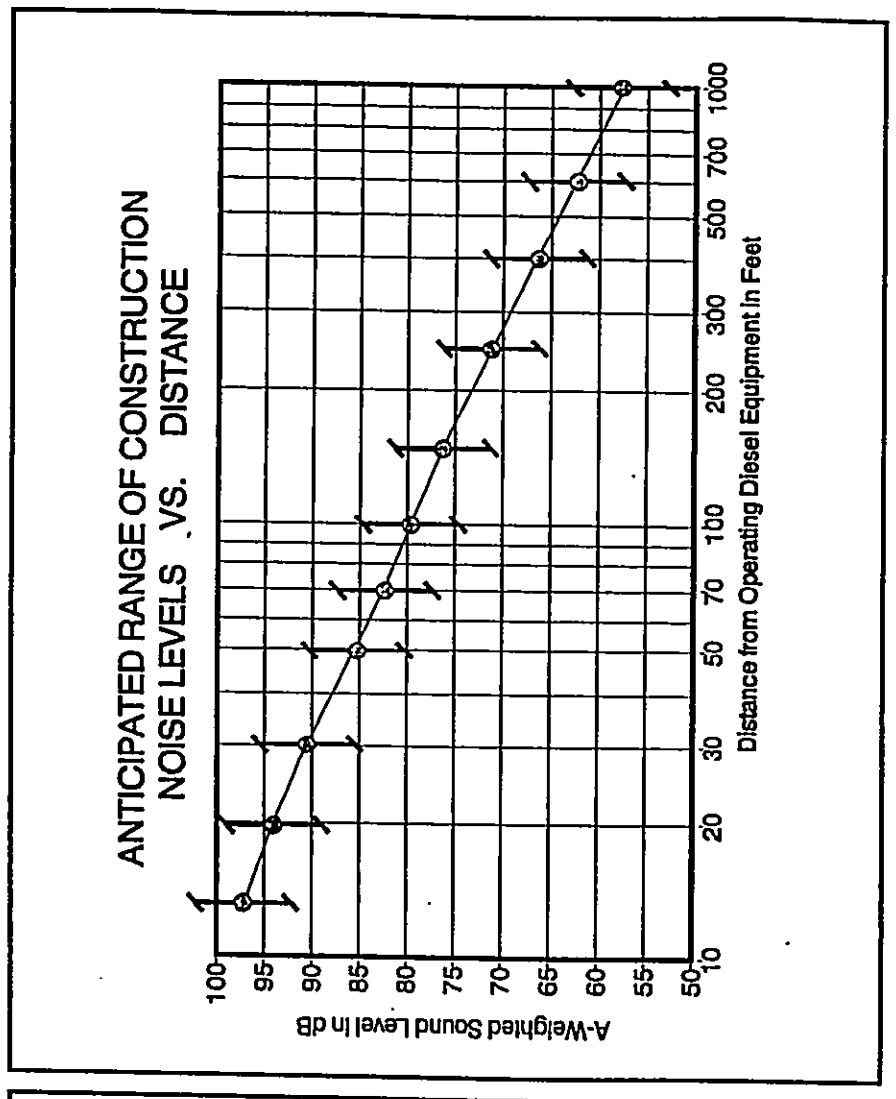
Traffic Noise. Risks of adverse noise impacts from project traffic are expected to be low due to the nature of the project and due to the very small increases in traffic noise expected from project traffic. Moderate increases in traffic noise levels are expected in the project area due to non-project traffic, and minimal increases in traffic noise levels are expected from the proposed Commercial and Park Project. For these reasons, traffic noise mitigation measures should not be required.

On-Site Sources. The retail/commercial areas are expected to be separated from existing residential areas by adequate buffers comprised of parks, existing commercial developments, and future light industrial developments. The separation distances should be adequate to minimize potential noise conflicts between the project's commercial tenants and existing noise sensitive developments.

Audible tire squeal noise from the circulation and parking areas of the project are possible. Tire squeal noise can usually be controlled though the use of a brushed or other coarse finish on the circulation driveways, and this type of treatment is recommended as a mitigation measure.

Mechanical equipment, such as air conditioning chillers or cooling towers, kitchen exhaust fans, and garage ventilation fans are the primary on-site noise sources expected to be located on the project site. This equipment, singly or together, has the potential of exceeding the allowable property line noise limits of the State DOH noise regulations (Reference 4). The State DOH noise limits which apply along the property boundaries of business districts are 60 dB and 50 dB during the daytime and nighttime periods, respectively. Typical noise levels of untreated mechanical equipment are significantly higher (by at least 10 dB) than the allowable DOH noise limits, such that sound attenuation treatment of the mechanical equipment will probably be required for compliance with DOH regulations. Compliance with the DOH noise limits should minimize risks of adverse noise impacts on neighboring properties and within the project area.

General Construction Noise. Audible construction noise will probably be unavoidable during the entire project construction period. The total time period for construction is unknown, but it is anticipated that the actual work will be moving from one location on the project site to another during that period. Actual length of exposure to construction noise at any receptor location will probably be less than the total construction period for the entire project. Typical levels of exterior noise from construction activity (excluding pile driving activity) are shown in Figure 4. The impulsive noise levels of impact pile drivers are approximately 15 dB higher than the levels shown in Figure 4, while the intermittent noise levels of vibratory pile drivers are at the upper end of the noise level ranges depicted in the figure. Typical levels of construction noise in-



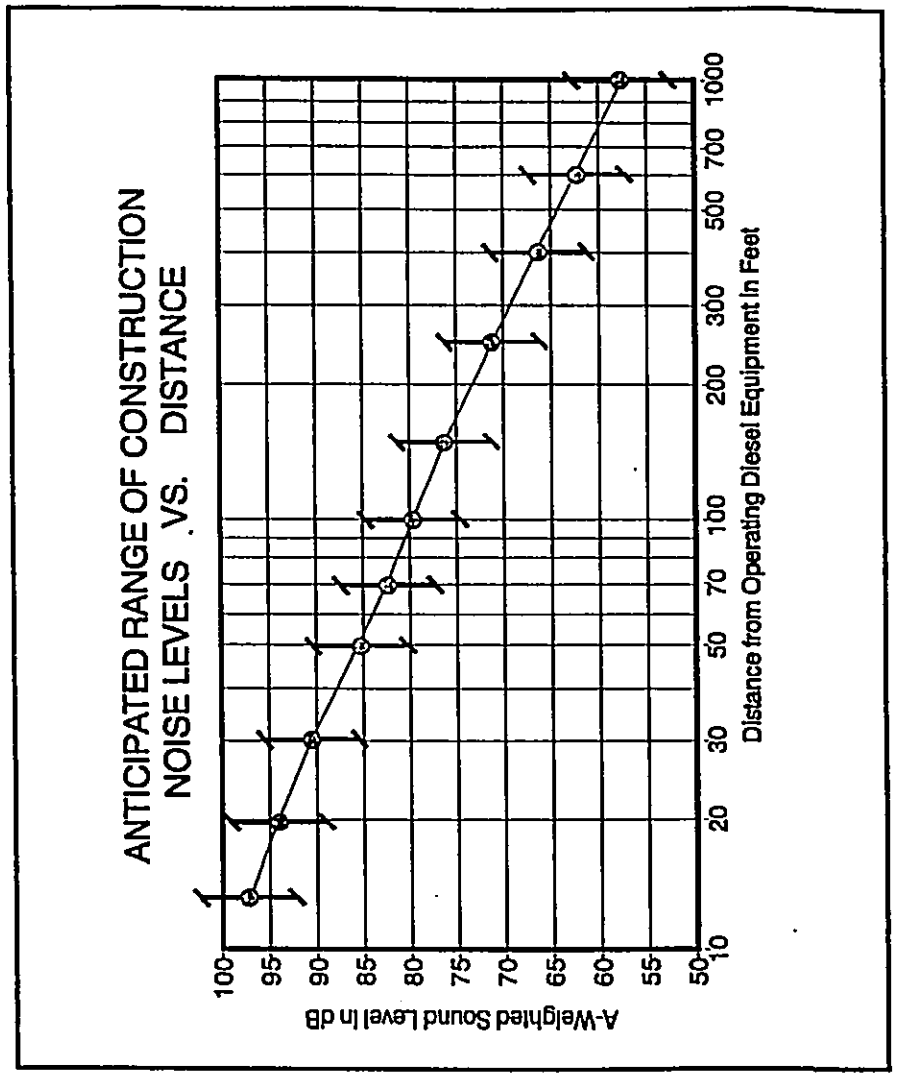
CONSTRUCTION NOISE LEVELS VS. DISTANCE

FIGURE 4

side naturally ventilated and air conditioned structures are approximately 10 and 20 dB less, respectively, than the levels shown in Figure 4. The existing residential and commercial buildings across Waipahu Street are predicted to experience the highest noise levels during construction activities due to their proximity to the project site. Adverse impacts from construction noise are not expected to be in the "public health and welfare" category due to the temporary nature of the work, the business/commercial character of most of the adjacent properties, and due to the administrative controls available for regulation of construction noise. Instead, these impacts will probably be limited to the temporary degradation of the quality of the acoustic environment in the immediate vicinity of the project site.

Mitigation of construction noise to inaudible levels will not be practical in all cases due to the intensity of construction noise sources (80 to 90+ dB at 50 FT distance), and due to the exterior nature of the work (grading and earth moving, trenching, concrete pouring, hammering, etc.). The use of properly muffled construction equipment should be required on the job site, and heavy equipment staging areas should be located away from existing residences.

The incorporation of State Department of Health construction noise limits and curfew times, which are applicable on the island of Oahu (Reference 4), is another noise mitigation measure which is normally applied to construction activities, primarily to minimize construction noise impacts on residences. Table 6 depicts the allowed hours of construction for normal construction noise which exceed the allowable State DOH limits at the project's property line. Noisy construction activities are not allowed on holidays, Sundays, during the early morning, and during the late evening periods under the DOH permit procedures.



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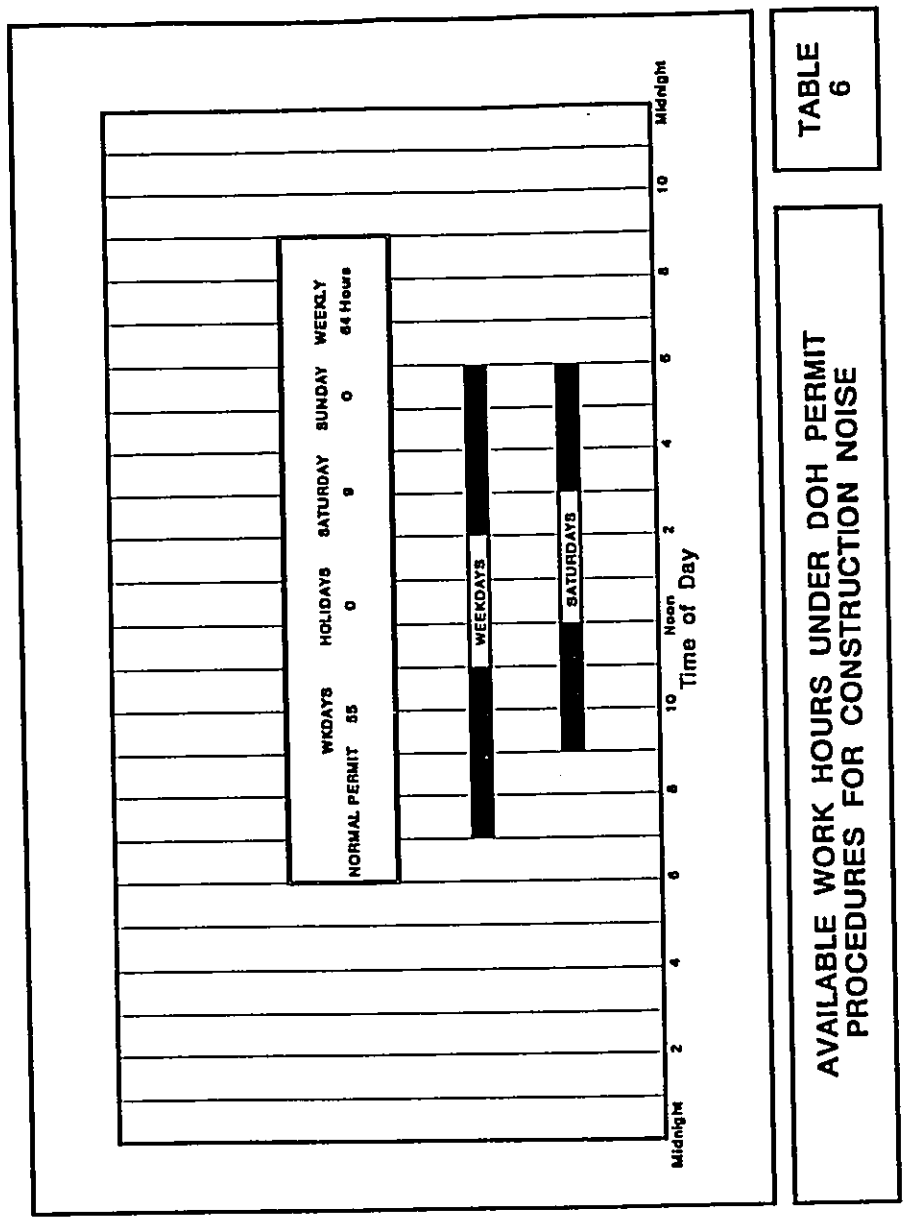

APPENDIX A. REFERENCES

(1) "Guidelines for Considering Noise in Land Use Planning and Control"; Federal Interagency Committee on Urban Noise; June 1980.

(2) "Environmental Criteria and Standards, Noise Abatement and Control, 24 CFR, Part 51, Subpart B"; U.S. Department of Housing and Urban Development; April 1, 1995.

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(4) "Title 11, Administrative Rules, Chapter 46, Community Noise Control;" Hawaii State Department of Health; September 23, 1996.

(5) Barry, T. and J. Reagan, "FHWA Highway Traffic Noise Prediction Model"; FHWA-RD-77-108, Federal Highway Administration; Washington, D.C.; December 1978.

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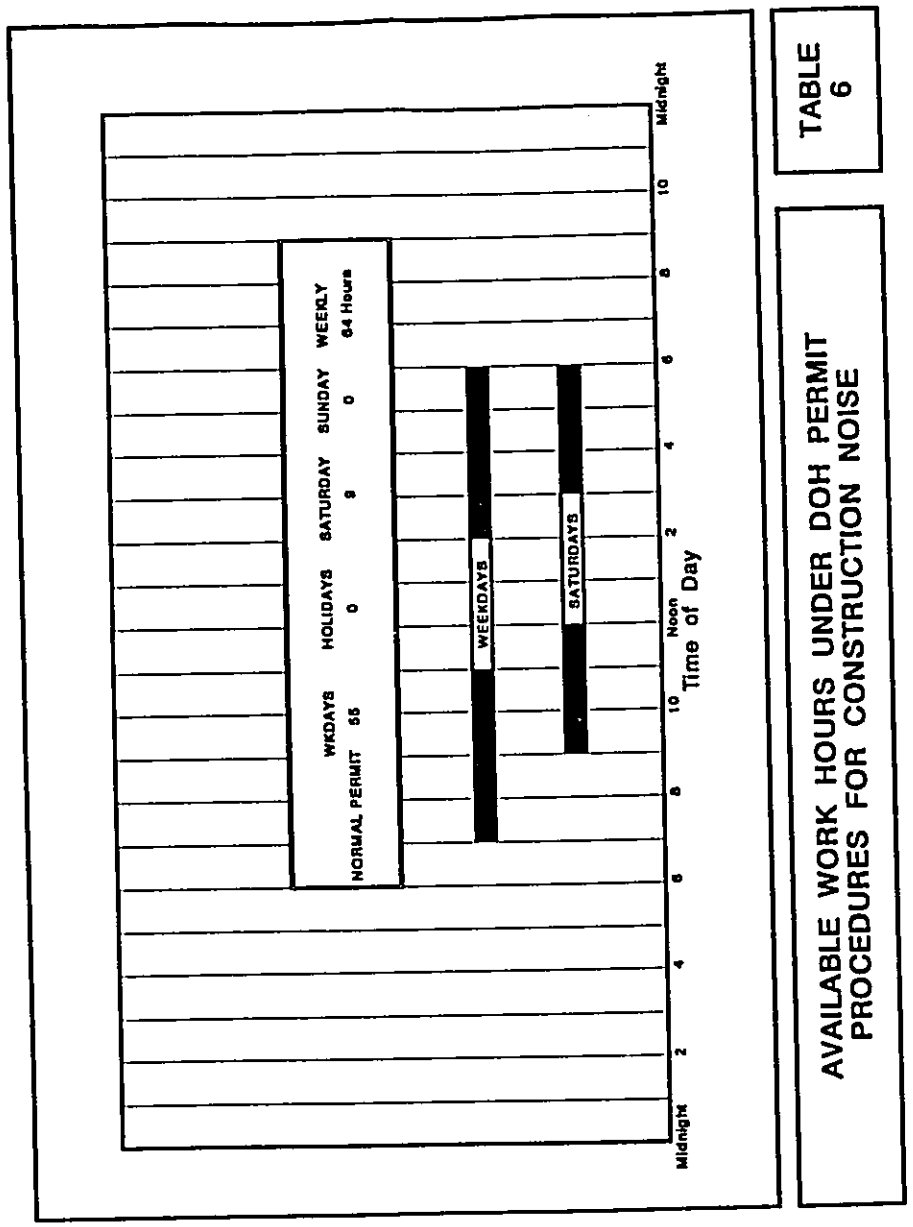

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APPENDIX B

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

Descriptor Symbol Usage

The recommended symbols for the commonly used acoustic descriptors based on A-weighting are contained in Table I. As most acoustic criteria and standards used by EPA are derived from the A-weighted sound level, almost all descriptor symbol usage guidance is contained in Table I.

Since acoustic nomenclature includes weighting networks other than "A" and measurements other than pressure, an expansion of Table I was developed (Table II). The group adopted the ANSI descriptor-symbol scheme which is structured into three stages. The first stage indicates that the descriptor is a level (i.e., based upon the logarithm of a ratio), the second stage indicates the type of quantity (power, pressure, or sound exposure), and the third stage indicates the weighting network (A, B, C, D, E.....). If no weighting network is specified, "A" weighting is understood. Exceptions are the A-weighted sound level and the A-weighted peak sound level which require that the "A" be specified. For convenience in those situations in which an A-weighted descriptor is being compared to that of another weighting, the alternative column in Table II permits the inclusion of the "A". For example, a report on blast noise might wish to contrast the LCdn with the LAdn.

Although not included in the tables, it is also recommended that "Lpn" and "LepN" be used as symbols for perceived noise levels and effective perceived noise levels, respectively.

It is recommended that in their initial use within a report, such terms be written in full, rather than abbreviated. An example of preferred usage is as follows:

The A-weighted sound level (LA) was measured before and after the installation of acoustical treatment. The measured LA values were 85 and 75 dB respectively.

Descriptor Nomenclature

With regard to energy averaging over time, the term "average" should be discouraged in favor of the term "equivalent". Hence, Leq, is designated the "equivalent sound level". For Ld, Ln, and Ldn, "equivalent" need not be stated since the concept of day, night, or day-night averaging is by definition understood. Therefore, the designations are "day sound level", "night sound level", and "day-night sound level", respectively.

The peak sound level is the logarithmic ratio of peak sound pressure to a reference pressure and not the maximum root mean square pressure. While the latter is the maximum sound pressure level, it is often incorrectly labelled peak. In that sound level meters have "peak" settings, this distinction is most important.

"Background ambient" should be used in lieu of "background", "ambient", "residual", or "indigenous" to describe the level characteristics of the general background noise due to the contribution of many unidentifiable noise sources near and far.

With regard to units, it is recommended that the unit decibel (abbreviated dB) be used without modification. Hence, DBA, PNdB, and EPNdB are not to be used. Examples of this preferred usage are: the Perceived Noise Level (Lpn was found to be 75 dB. Lpn = 75 dB). This decision was based upon the recommendation of the National Bureau of Standards, and the policies of ANSI and the Acoustical Society of America, all of which disallow any modification of bel except for prefixes indicating its multiples or submultiples (e.g., deci).

Noise Impact

In discussing noise impact, it is recommended that "Level Weighted Population" (LWP) replace "Equivalent Noise Impact" (ENI). The term "Relative Change of Impact" (RCI) shall be used for comparing the relative differences in LWP between two alternatives.

Further, when appropriate, "Noise Impact Index" (NII) and "Population Weighed Loss of Hearing" (PHL) shall be used consistent with CHABA Working Group 69 Report Guidelines for Preparing Environmental Impact Statements (1977).

APPENDIX B (CONTINUED)

TABLE I

A-WEIGHTED RECOMMENDED DESCRIPTOR LIST

TERM	SYMBOL
1. A-Weighted Sound Level	L_A
2. A-Weighted Sound Power Level	L_{WA}
3. Maximum A-Weighted Sound Level	L_{max}
4. Peak A-Weighted Sound Level	L_{Apk}
5. Level Exceeded x% of the Time	L_x
6. Equivalent Sound Level	L_{eq}
7. Equivalent Sound Level over Time (T) (1)	$L_{eq(T)}$
8. Day Sound Level	L_d
9. Night Sound Level	L_n
10. Day-Night Sound Level	L_{dn}
11. Yearly Day-Night Sound Level	$L_{dn(Y)}$
12. Sound Exposure Level	L_{SE}

(1) Unless otherwise specified, time is in hours (e.g. the hourly equivalent level is $L_{eq(1)}$). Time may be specified in non-quantitative terms (e.g., could be specified a $L_{eq(WASH)}$ to mean the washing cycle noise for a washing machine).

SOURCE: EPA ACOUSTIC TERMINOLOGY GUIDE, BNA 8-14-78, NOISE REGULATION REPORTER.

APPENDIX B (CONTINUED)

TABLE II

RECOMMENDED DESCRIPTOR LIST

TERM	A-WEIGHTING	ALTERNATIVE[1] A-WEIGHTING	OTHER[2] WEIGHTING	UNWEIGHTED
1. Sound (Pressure)[3] Level	L_A	L_{pA}	L_B, L_{pB}	L_p
2. Sound Power Level	L_{WA}		L_{WB}	L_W
3. Max. Sound Level	L_{max}	L_{Amax}	L_{Bmax}	L_{pmax}
4. Peak Sound (Pressure) Level	L_{Apk}		L_{Bpk}	L_{pk}
5. Level Exceeded x% of the time	L_x	L_{Ax}	L_{Bx}	L_{px}
6. Equivalent Sound Level	L_{eq}	L_{Aeq}	L_{Beq}	L_{peq}
7. Equivalent Sound Level[4] Over Time(T)	$L_{eq(T)}$	$L_{Aeq(T)}$	$L_{Beq(T)}$	$L_{peq(T)}$
8. Day Sound Level	L_d	L_{Ad}	L_{Bd}	L_{pd}
9. Night Sound Level	L_n	L_{An}	L_{Bn}	L_{pn}
10. Day-Night Sound Level	L_{dn}	L_{Adn}	L_{Bdn}	L_{pdn}
11. Yearly Day-Night Sound Level	$L_{dn(Y)}$	$L_{Adn(Y)}$	$L_{Bdn(Y)}$	$L_{pdn(Y)}$
12. Sound Exposure Level	L_S	L_{SA}	L_{SB}	L_{Sp}
13. Energy Average value over (non-time domain) set of observations	$L_{eq(e)}$	$L_{Aeq(e)}$	$L_{Beq(e)}$	$L_{peq(e)}$
14. Level exceeded x% of the total set of (non-time domain) observations	$L_{x(e)}$	$L_{Ax(e)}$	$L_{Bx(e)}$	$L_{px(e)}$
15. Average L_x value	L_x	L_{Ax}	L_{Bx}	L_{px}

(1) "Alternative" symbols may be used to assure clarity or consistency.

(2) Only B-weighting shown. Applies also to C,D,E,.....weighting.

(3) The term "pressure" is used only for the unweighted level.

(4) Unless otherwise specified, time is in hours (e.g., the hourly equivalent level is Leq(1). Time may be specified in non-quantitative terms (e.g., could be specified as Leq(WASH) to mean the washing cycle noise for a washing machine.

Appendix H

Air Quality Impact Analysis

AIR QUALITY IMPACT ANALYSIS
Amfac Commercial and Park Development
Waipahu, Hawaii

Prepared For
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December 1996

TABLE OF CONTENTS

LIST OF FIGURES

TABLE OF CONTENTS (Continued)

LIST OF TABLES

ACRONYMS

$\mu g/m^3$	Micrograms per Cubic Meter
°F	Degrees Fahrenheit
Amfac	Amfac Property Development Corporation
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
DBEDT	Department of Business, Economic Development & Tourism
DOH	Hawaii State Department of Health
EPA	U.S. Environmental Protection Agency
H_2S	Hydrogen Sulfide
HAR	Hawaii Administrative Rules
HC	Hydrocarbons
LOS	Level of Service
mph	Miles per Hour
mps	Meters per Second
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
O_3	Ozone
Pb	Lead
PM	Particulate Matter
PM_{10}	Particulate Matter Less Than 10 Microns in Diameter
ppm	Parts per Million
SAAQS	State Ambient Air Quality Standards
SO_2	Sulfur dioxide
TMK	Tax Map Key

EXECUTIVE SUMMARY

Amfac Property Development Corporation (Amfac) proposes to develop 23.3 acres of land owned by the Oahu Sugar Company, Limited in Waipahu, Oahu. The site is located in the Central Oahu Development Plan area, Tax Map Key (TMK) 9-4-02:04, and is referred to as the Amfac Commercial and Park Development Project, hereinafter referred to as the Project.

This Project is referred to as Phase II and is a part of a larger development. Phase I involves the development of 37 acres of light industrial subdivisions and is anticipated to be completed by the year 2000. This report does not address Phase I; however traffic analysis data from Phase I has been used as a base for the year 2000. Phase II, development of 20.3 acres of land for the commercial and park areas, is anticipated to also be completed in the year 2000 (Austin Tsutsumi & Associates).

This report focuses on worst-case air quality conditions for morning and evening peak hours in the years:

- 1995 (existing conditions)
- 2000 (without Phase II of Project)
- 2000 (with Phases I and II of Project)

Short-term pollutant impacts of the Project are considered to be those associated with construction activities. While localized pollutant increases are expected to occur, they are not considered significant. The amount of fugitive dust generated per month is expected to be less than U.S. Environmental Protection Agency (EPA) estimates for construction operations. As a result, fugitive dust impacts to the air quality during the construction phase of the Project will be localized, temporary, and considered insignificant.

Long-term pollutant impacts of the proposed Project are considered to be those associated with everyday use of the Project. The most significant long-term emission sources are motor vehicles, with the most significant tailpipe emission being Carbon Monoxide (CO).

For the 1-hour air dispersion modeling scenarios, there are no potential violations of the National Ambient Air Quality Standards (NAAQS). However, both evening scenarios without Project (Phase I only) and with Project (Phases I and II) in the year 2000 suggest that an exceedance of the State Ambient Air Quality Standards (SAAQS) will occur. For the 8-hour dispersion modeling scenarios, there are no potential violations of the NAAQS. However, all scenarios, including the base year 1995, suggest that an exceedance of the SAAQS will occur.

Although the modeling results indicate that the Project is expected to slightly exceed the SAAQS for CO in some scenarios, implementation of the mitigation measures recommended in the traffic analysis report and in this report will significantly reduced the CO impact to ambient air quality. These mitigation measures are designed to reduce motor vehicle trip generation that can be incorporated into the overall Project strategy. Implementation of the following measures are suggested:

- implement traffic flow improvement measures, such as proper signalization and road widening for intersections with poor LOS ratings;
- encourage ride-sharing/car pooling or use of public transportation by employees;
- limit the number of passenger parking spaces to promote the use of shuttle services and public transportation;
- discourage idling vehicles at drop-off points;
- implement bicycle lanes for bicycling; or
- encourage walking.

Indirect pollutant impacts beyond those associated with construction and traffic are considered to be insignificant.

SECTION 1
INTRODUCTION

Amfac Property Development Corporation (Amfac) proposes to develop 23.3 acres of land owned by the Oahu Sugar Company, Limited in Waipahu, Oahu. The site is located in the Central Oahu Development Plan area, Tax Map Key (TMK) 9-4-02:04, and is referred to as the Amfac Commercial and Park Development Project, hereinafter referred to as the Project (See Figure 1).

The proposed Project involves the development of lands formerly occupied by the Oahu Sugar Mill into commercial and community facilities (20.3 acres), and a park (3 acres). The development of the commercial area will include a Young Men's Christian Association (YMCA), Heritage Area, and Filipino Community Center. The development of the park area will be to improve and expand the existing Hans L'Orange Park, home of the Hawaii Winter Baseball League's franchise West Oahu Cane Fires team (Amfac Property Development Corporation).

This Project is referred to as Phase II and is a part of a larger development. Phase I involves the development of 37 acres of light industrial subdivisions and is anticipated to be completed by the year 2000. This report does not address Phase I; however traffic analysis data from Phase I has been used as a base for the year 2000. Phase II, development of 20.3 acres of land for the commercial and park areas, is anticipated to also be completed in the year 2000 (Austin Tsutsumi & Associates).

This report focuses on the air quality conditions for worst-case morning and evening peak hours in the years:

- 1995 (existing conditions)
- 2000 (without Phase II of Project)
- 2000 (with Phases I and II of Project)

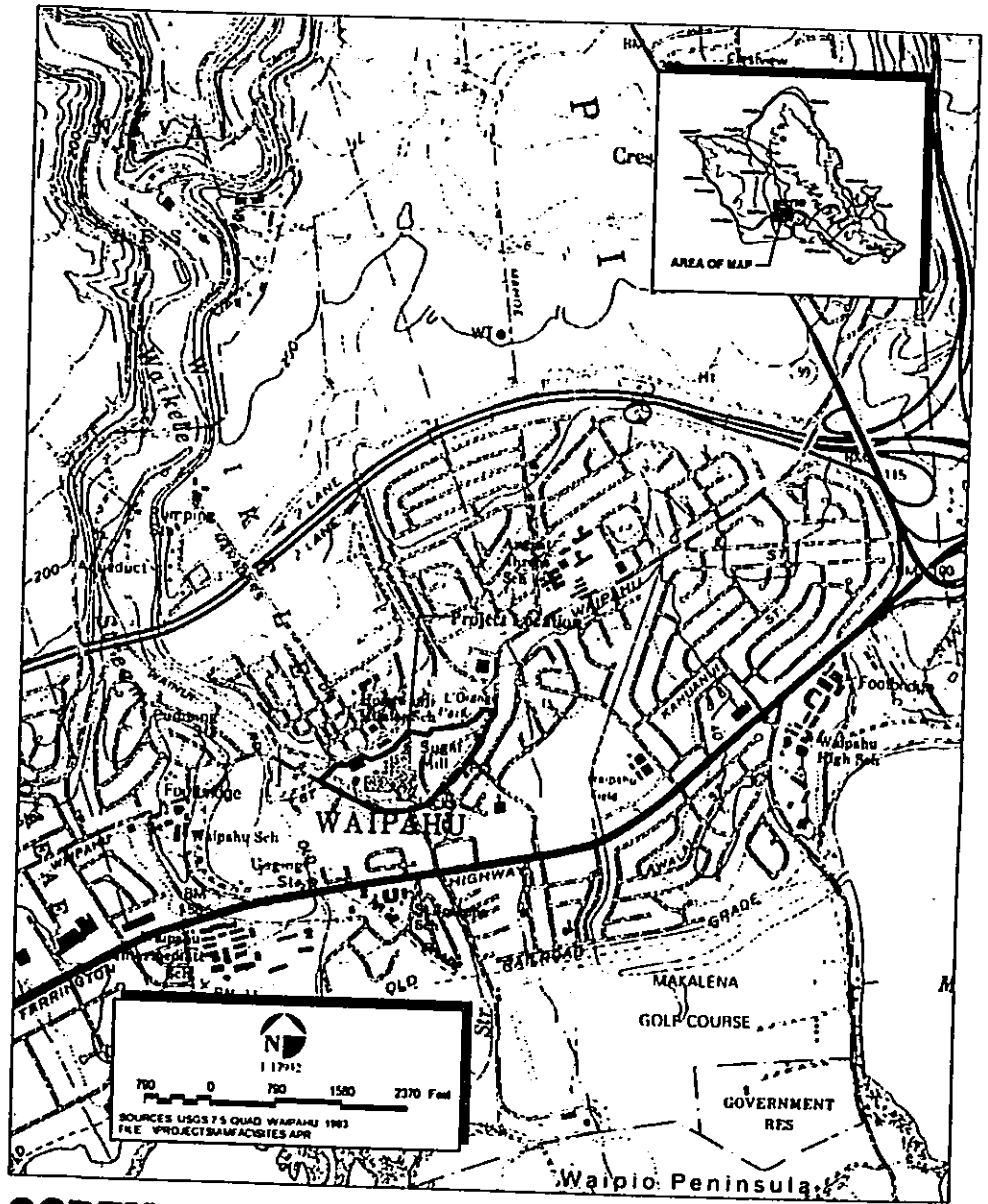

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FIGURE 1

AMFAC COMMERCIAL AND PARK DEVELOPMENT
PROJECT LOCATION

Impacts to the air quality that exceed either the National Ambient Air Quality Standards (NAAQS) or the State Ambient Air Quality Standards (SAAQS) would constitute a significant impact. Impacts to the air quality that do not exceed either the NAAQS or SAAQS would be considered insignificant.

The overall development is an "indirect source" of air pollution as defined in the Federal Clean Air Act (CAA) because its primary association with air pollution is due to its inherent generation of motor vehicle traffic as a result of commercial activities. Thus, the focus of this report is on the development's potential to impact air quality due to increased traffic volume. This report also addresses the short-term impacts due to on-site construction activities, and the indirect impacts off-site due to increased demand for electrical energy. Over 90 percent of the energy generated in the State of Hawaii is by combustion of fossil fuel (Department of Business, Economic Development & Tourism (DBEDT) 1993).

The remaining sections of this report are summarized in the following sections. Section 2 describes the environmental background and regulatory setting. Section 3 discusses the potential environmental impacts of the Project. Section 4 discusses appropriate mitigation measures when deemed necessary. References are presented in Sections 5.

SECTION 2
ENVIRONMENTAL AND REGULATORY BACKGROUND

This section addresses the environmental and regulatory background that is pertinent to the Project. A summary of the existing air quality and physical conditions (i.e., meteorology, climate, and topography) affecting air pollution dispersion at the Project site and surrounding area is presented. Applicable regulations governing the NAAQS and SAAQS are also discussed.

2.1 Climatology and Meteorology

The Island of Oahu is located within the North Pacific trade wind band. The trade winds are controlled by a semipermanent high pressure system that is located north-northeast of the Hawaiian Islands. Wind circulation generated by this high pressure system is clockwise and outward from the center. The prevailing winds arrive from the northeast to east direction. The winds are more persistent in the summer than in the winter, averaging 90 and 50 percent, respectively, and stronger in the afternoon than at night (University of Hawaii 1983).

The National Weather Service monitors meteorological conditions at the Honolulu International Airport, located approximately 5 miles southeast of the Project site. The average temperature during the coolest month of the year is 72.6 degrees Fahrenheit (72.6°F). The average temperature during the warmest month of the year is 81°F. The lowest and highest temperature of record is 53°F and 94°F, respectively. Average annual precipitation is 23 inches (DBEDT 1993). Although Waipahu is located further inland and on slightly higher elevation, the meteorological data at the airport is representative, with only slight variability in forecast. Table 2-1 provides data on climatic normals, means, and extremes at the Honolulu International Airport.

2.2 Topography

The Project will cover 23.3 acres of land in Waipahu, Hawaii. The property is bordered by Waipahu Street to the east, west, and south, and Hans L'Orange Park and the former

Table 2-1

CLIMATIC NORMALS, MEANS, AND EXTREMES FOR THE HONOLULU INTERNATIONAL AIRPORT

Subject	Honolulu
Normal temperatures (°F):	
Daily maximum	84.2
Daily minimum	69.7
Monthly:	
Coolest month	72.6
Warmest month	81.0
Annual	77.0
Extreme temperatures (°F):	
Record highest	94
Record lowest	53
Precipitation (inches):	
Normal (annual average)	23.47
Maximum monthly	20.79
Minimum monthly	trace
Relative humidity (percent):	
8 am	72
2 pm	56
Wind speed (miles per hour):	
Mean	11.4
Fastest observed, 1 minute	46
Mean number of days:	
Clear	89.3
Partly cloudy	179.9
Cloudy	96.0
Precipitation 0.01 inch or more	99.0
Percent of possible sunshine	69

Source: Department of Business, Economic Development, & Tourism, 1993.

Oahu Sugar Company staging and storage area to the north. Topographic maps indicate that the land for the Project is generally flat. Ground elevation rises from approximately 30 feet above mean sea level (MSL) on the southern boundary to about 65 feet above MSL on the northern boundary. Soils are classified as Waipahu silty clay with 0 to 12 percent slopes (U.S. Department of Agriculture, Soil Conservation Service). Figure 1 provides a topographic view of the Project site.

2.3 Regulatory Setting

The Federal CAA (amended November 15, 1990) set forth NAAQS, with States retaining the option to develop more stringent standards. These standards represent the maximum levels of pollution considered safe, with an adequate margin of safety, to protect the public health and welfare. The six pollutants (criteria pollutants) for which NAAQS have been established are sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter less than 10 microns in diameter (PM_{10}), and lead (Pb). SAAQS were established for these same pollutants in Chapter 11-59 of the Hawaii Administrative Rules (HAR), Ambient Air Quality Standards (HAR 1993). In the amendment of Chapter 11-59, the SAAQS for particulate matter (PM) was removed and a new standard for PM_{10} was implemented to match the NAAQS for PM_{10}. The State of Hawaii also adopted a hydrogen sulfide (H_2S) standard as well. Both NAAQS and SAAQS are summarized in Table 2-2.

2.4 Ambient Air Quality Levels

In evaluating the compliance of a new source with applicable standards, ambient background concentrations of the criteria pollutants are added to the maximum predicted concentrations resulting from implementation of the Project, and compared with existing NAAQS and SAAQS. Typically, the maximum background concentrations recorded within the previous three years are used to represent baseline conditions for the air quality analysis. However, ambient CO concentrations have never been monitored by the Department of Health (DOH) - Clean Air Branch at or near the proposed Project site.

Therefore, the maximum annual average ambient CO concentration level (2 parts per million (ppm)) detected within the last three years at the DOH monitoring site in downtown Honolulu has been used as background data. The DOH monitoring site in downtown Honolulu is the closest monitoring station to the Project site (Ibaan, 1996).

While there are no nearby ambient concentration data available for the criteria pollutants, it is safe to assume that the air quality relative to these pollutants is good. This assumption is based on the fact that the State of Hawaii is presently considered by the U.S. Environmental Protection Agency (EPA) to be in attainment for all criteria pollutants (i.e., not violating the NAAQS or SAAQS) as codified in the Code of Federal Regulations (CFR) - Title 40 §81.312 (US Code of Federal Regulations).

Table 2-2

STATE AND FEDERAL AMBIENT AIR QUALITY STANDARDS
(micrograms per cubic meter [µg/m³])

Air Pollutant	Averaging Period	Air Standards		Hawaii Emergency Episode Levels		
		Hawaii	Federal Primary[a]	Federal Secondary[b]	Alert	Warning	Emergency
Carbon Monoxide (CO)	1 hour	10,000	40,000	40,000	--	--	--
	8 hour	5	10	10	17,000	34,000	46,000
Nitrogen Dioxide (NO_2)	1 hour	--	--	--	1,130	2,260	3,000
	24 hour	--	--	--	282	565	750
	Annual	70	100	100	--	--	--
Particulate Matter (PM_{10})[f]	24 hour	150	150	150	350	420	500
	Annual	50	50	50	--	--	--
Ozone (O_3)	1 hour	100	235	235	400	800	1,000
Sulfur Dioxide (SO_2)	3 hour	1,300	--	1,300	--	--	--
	24 hour	365	365	--	800	1,600	2,100
	Annual	80	80	--	--	--	--
Lead (Pb)	Calendar Quarter	1.5	1.5	1.5	--	--	--
Hydrogen Sulfide (H_2S)	1 hour	35	--	--	--	--	--

a Designed to prevent adverse effects on public health.
b Designed to prevent adverse effects on public welfare including effects on comfort, visibility, vegetation, animals, aesthetics values, and soiling and deterioration of materials.
c Particulate Matter which is 10 microns or less in diameter.
-- No regulatory standard or episode threshold level.

Therefore, the maximum annual average ambient CO concentration level (2 parts per million (ppm)) detected within the last three years at the DOH monitoring site in downtown Honolulu has been used as background data. The DOH monitoring site in downtown Honolulu is the closest monitoring station to the Project site (Ibaan, 1996).

While there are no nearby ambient concentration data available for the criteria pollutants, it is safe to assume that the air quality relative to these pollutants is good. This assumption is based on the fact that the State of Hawaii is presently considered by the U.S. Environmental Protection Agency (EPA) to be in attainment for all criteria pollutants (i.e., not violating the NAAQS or SAAQS) as codified in the Code of Federal Regulations (CFR) - Title 40 §81.312 (US Code of Federal Regulations).

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	8 hour	5	10	10	17,000	34,000	46,000
Nitrogen Dioxide (NO_2)	1 hour	--	--	--	1,130	2,260	3,000
	24 hour	--	--	--	282	565	750
	Annual	70	100	100	--	--	--
Particulate Matter (PM_{10})[c]	24 hour	150	150	150	350	420	500
	Annual	50	50	50	--	--	--
Ozone (O_3)	1 hour	100	235	235	400	800	1,000
Sulfur Dioxide (SO_2)	3 hour	1,300	--	1,300	--	--	--
	24 hour	365	365	--	800	1,600	2,100
	Annual	80	80	--	--	--	--
Lead (Pb)	Calendar Quarter	1.5	1.5	1.5	--	--	--
Hydrogen Sulfide (H_2S)	1 hour	35	--	--	--	--	--

a Designed to prevent adverse effects on public health.
b Designed to prevent adverse effects on public welfare including effects on comfort, visibility, vegetation, animals, aesthetics values, and soiling and deterioration of materials.
c Particulate Matter which is 10 microns or less in diameter.
-- No regulatory standard or episode threshold level.

SECTION 3
POTENTIAL ENVIRONMENTAL IMPACTS

This section describes the potential environmental impacts of the Project. Impacts have been broken down into three groups: short-term, long-term, and indirect. Each of these groups is discussed below.

3.1 Short-Term Pollutant Impacts

Short-term pollutant impacts of the Project are considered to be those associated with construction activities. Emission sources primarily include tailpipe emissions from heavy-duty construction equipment and workers' vehicles, and fugitive dust generated during demolition and construction activities, particularly site clearing and land grading.

During the construction of the Project, various types of equipment (i.e., scrapers, dozers, and water trucks) will be utilized. The operation of the heavy-duty construction equipment will result in the emission of SO_2, oxides of nitrogen (NO_x), hydrocarbons (HC), CO, and PM_{10}. Typically, diesel-powered equipment will emit more NO_x, SO_2, and PM_{10} than gasoline powered equipment. The latter, however, will emit more HC and CO. In addition, exhaust emissions from workers' vehicles will add to the total pollutants emitted. While localized increases of these pollutants are expected to occur, they are not considered significant.

Fugitive dust generation (i.e., PM) from clearing vegetation and other heavy-duty construction operations is estimated at 1.2 tons per acre per month of activity (EPA 1985). According to the Amfac Commercial and Park Development Application for Development Plan Amendment dated October 1996, 23.3 acres of land will be disturbed during the lifetime of the development. Development is anticipated to begin in the last quarter of 1998 and be completed by the end of the year 2000. This conservative timeline indicates that 0.86 acres of land will be disturbed per month, correlating to 1.03 tons per month of fugitive dust generation. Therefore, the amount of fugitive dust generated per month is expected to be less than EPA estimates for construction operations. As a result,

fugitive dust impacts to the air quality during the construction phase of the Project will be localized, temporary, and are considered insignificant.

3.2 Long-Term Pollutant Impacts

Long-term pollutant impacts of the proposed Project are considered to be those associated with everyday use of the development. The most significant long-term emission sources are motor vehicles, with the most significant tailpipe emission being CO.

High short-term concentrations of CO, known as "hot spots", can occur at locations where traffic is congested, such as at intersections and along highways. For this Project, the intersection of Waipahu Street and Paiwa Street was modeled because this intersection operates at a Level of Service (LOS) that is rated as one of the worst intersections in the area (Austin Tsutsumi & Associates). The intersection currently operates at a LOS "E" rating in the morning and "D" rating in the evening, and is expected to operate at a LOS "F" rating during both morning and evening peak traffic hours in the future with and without Phase II of the Project. Consequently, traffic at this intersection was modeled for both morning and evening peak hour traffic volumes. Air quality impacts were predicted using the existing 1995 traffic data, projected 2000 traffic data assuming Phase II of the Project is not built, and projected 2000 traffic data assuming that Phase II of the Project is built. The modeling results provide the worst-case scenario of CO concentration levels to be produced with or without the Project.

The CAL3QHC air quality model developed by the EPA was used to analyze the potential air quality impacts at specific receptors surrounding the intersection of concern. CAL3QHC is presently listed in Supplement B to the EPA Guideline on Air Quality Models (Revised) as the preferred air quality model to use for mobile air pollution emissions (EPA 1987, EPA 1990a).

Vehicle emissions were generated for 1995 and 2000 using MOBILE 5.0 emission factors, assuming the national average vehicle mix (EPA 1993a). The idle emission factors were generated by the MOBILE 4.1 model, as recommended in CAL3QHC documentation, and were adjusted for site-specific conditions (EPA 1993b, EPA 1995).

The DOH has indicated that the average miles traveled per gallon per vehicle in the State of Hawaii is higher than the national average. This higher average is due to a higher number of fuel efficient vehicles (most likely rental cars) in operation. Therefore, using the national vehicle mix emission rates is conservative. Different emission factors were used for the estimated speeds approaching the intersection (i.e., 25 miles per hour (mph)) along both Waipahu Street and Paiwa Street. The MOBILE emission rates were used as input into CAL3QHC.

The CAL3QHC model is designed to calculate CO concentrations at signalized intersections. The model generates an appropriate emission rate for the intersection based on the number of vehicles per hour that pass along the queue.

The maximum one hour average concentration of CO was estimated based on the worst-case meteorological conditions of a wind speed of 1.0 meters per second (mps) and a stability class of D. This stability class is considered appropriate for the study involved. Wind directions for the modeling analysis were selected at one degree increments. Receptors (i.e., locations where the ambient CO concentrations are calculated) were placed outside of the mixing zone, 12 feet from the roadways.

For the one hour dispersion modeling scenarios, there are no potential violations of the NAAQS. However, both evening scenarios without Project (Phase I only) and with Project (Phases I and II) in the year 2000 indicate an exceedance of the SAAQS. The results shown in Table 3-1 list the maximum predicted 1-hour CO concentrations for the wind direction that caused the highest overall concentration.

Based on EPA guidelines, a persistence factor of 0.7 was used to estimate the eight hour average CO concentration from the predicted one hour values (EPA 1985). For the eight hour dispersion modeling scenarios, there are no potential violations of the NAAQS. However, all scenarios, including the base year 1995, indicate an exceedance of the SAAQS. The results shown in Table 3-2 list the maximum predicted eight hour CO concentrations for the wind direction that caused the highest overall concentration.

Table 3-1
MAXIMUM PREDICTED 1-HOUR CO CONCENTRATIONS
(parts per million (ppm))

Year	Ambient	Base Year	Without Project (Phase I only)	With Project (Phases I and II)	Total Concentration	SAAQS	NAAQS
1995 am	2.00	6.9			8.9	9.0	35.0
pm	2.00	6.9			8.9	9.0	35.0
2000 am	2.00		5.1		7.1	9.0	35.0
pm	2.00		8.4		10.4	9.0	35.0
2000 am	2.00			4.8	6.8	9.0	35.0
pm	2.00			8.3	10.3	9.0	35.0

Note: 1-hour CO SAAQS of 9 ppm is equivalent to 10,000 µg/m3.
1-hour CO NAAQS of 35 ppm is equivalent to 40,000 µg/m3.

Table 3-2
MAXIMUM PREDICTED 8-HOUR CO CONCENTRATIONS
(ppm)

Year	Ambient	Base Year	Without Project (Phase I only)	With Project (Phases I and II)	Total Concentration	SAAQS	NAAQS
1995 am	1.40	4.8			6.2	4.5	9.0
pm	1.40	4.8			6.2	4.5	9.0
2000 am	1.40		3.6		5.0	4.5	9.0
pm	1.40		5.9		7.3	4.5	9.0
2000 am	1.40			3.4	5.8	4.5	9.0
pm	1.40			5.8	6.2	4.5	9.0

Note: 8-hour CO SAAQS of 4.5 ppm is equivalent to 5,000 µg/m3.
8-hour CO NAAQS of 9 ppm is equivalent to 10,000 µg/m3.

The modeling results indicate that the Project is expected to slightly exceed the SAAQS for CO in some scenarios. However, implementation of the mitigation measures recommended in the traffic analysis report and in this report will significantly reduce the ambient air quality impact from CO. One interesting note regarding the difference between existing conditions and future conditions is that the projected improvements in vehicular emissions expected in future years outweighs the increased traffic expected in the year 2000. In other words, predicted CO concentrations are expected to remain relatively the same or decrease.

Other air pollution sources (primarily combustion sources) will also contribute to regional air quality background concentrations. Commercial combustion sources like boilers and water heaters will emit primarily NO_x, although smaller quantities of pollutants such as reactive organic gases, CO, SO_2, and PM are also produced. Such impacts are very Project specific and, therefore, were not quantified for this analysis. However, these impacts are generally not considered significant in attainment areas.

3.3 Indirect Pollutant Impacts

The Project will have additional air quality impacts beyond those associated with construction and traffic. For example, street lights have no direct emissions of air pollutants. However, these lighting fixtures will increase energy demand from power generating facilities. This increased demand, though minimal, will also contribute to the regional air pollution background. However, total air pollution generated will have little impact in the area and will remain below the NAAQS and SAAQS. Therefore, impacts beyond those associated with construction and traffic are considered to be insignificant.

As the population on the Island of Oahu grows, increased demand will dictate that the Hawaiian Electric Company (HECO) be able to provide additional electricity. Though HECO is presently investigating increasing electrical output on the Island of Oahu, currently the majority of the island's electricity is generated by burning fuel oil which emits SO_2, NO_x, PM, and HC. The impact from these emissions will be external to the Project, but because additional electrical demands will be generated by the Project, a portion of these emissions are considered attributable to the Project. This increase in electrical demand as a result of the Project will have little impact in the area and pollutant

concentrations are expected to remain below the NAAQS and SAAQS. Therefore, impacts associated with electrical demand from the Project are considered to be insignificant.

SECTION 4
MITIGATION MEASURES

This section describes various mitigation measures that can be employed to minimize or reduce the potentially adverse air quality impacts from the Project. The mitigation measures vary according to impact type. The following subsections discuss mitigation measures for short-term, long-term, and indirect pollutant impacts.

4.1 SHORT-TERM MEASURES

Fugitive dust and heavy equipment use are the primary short-term emission sources. Fugitive dust emissions can be mitigated by ensuring that appropriate brush clearing and construction operations are practiced. These include:

- minimizing the number of concurrent brush clearing and construction activities; and
- watering, which can minimize fugitive dust emissions by fifty percent.

Onsite personnel should determine the locations and application times for watering, based on construction activities and local meteorological conditions.

Although the exhaust emissions from the construction equipment are not expected to be significant, the following measures can be taken to reduce potential impacts. These measures include:

- utilizing electrical equipment; or
- fuel burning equipment with air pollution control technologies applied (i.e., source catalytic converter and fuel injection timing retard).

4.2 LONG-TERM MEASURES

There are mitigation measures designed to reduce motor vehicle trips that can be incorporated into the overall Project strategy. Implementation of the following measures are suggested:

- implement traffic flow improvement measures, such as proper signalization and road widening for intersections with poor LOS ratings;
- encourage ride-sharing/car pooling or use of public transportation by employees;
- limit the number of passenger parking spaces to promote the use of shuttle services and public transportation;
- discourage idling vehicles at drop-off points;
- implement bicycle lanes for bicycling; or
- encourage walking.

4.3 INDIRECT MEASURES

Although the indirect air pollution sources are not considered to be significant, energy conservation measures can be employed to minimize the emissions from electrical power generation brought about by the Project. Energy conservation measures include:

- passive solar water heating;
- low pollutant emitting systems for water heating; and
- developing integrated energy systems that provided services to more than one unit by a centralized system and building design.

When building design is taken into account, energy conservation measures can be significant in reducing emissions. Examples of these techniques include:

- avoidance of large glass areas;
- efficient use of shading;
- maximizing natural light;
- placement of high usage rooms to avoid summer heat; and
- proper use of attic fans or other ventilation systems.

SECTION 5
REFERENCES

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Appendix I

Economic / Fiscal Analysis

SMS

Research
Consulting
Financial Consulting
Training
Database Marketing
Socio-Economic Studies

December 20, 1996

Mr. Timothy E. Johns
General Manager, Oahu and Kauai Development
Amfac/JMB Hawaii, Inc.
700 Bishop Street, 21st Floor
Honolulu, HI 96813

RE: Fiscal Impacts of Development,
Amfac Commercial and Park Proposal

Dear Mr. Johns,

This letter provides calculations of the impact of development of the Amfac Commercial and Park Proposal for 23.3 acres of land in Waipahu, Oahu (part of TMK 9-4-02:04). Estimates are provided for the City and County of Honolulu and for the State of Hawaii

We find that the project would result in a net gain for the State of Hawaii of some $2.1 million, and would yield increased revenues to the City and County of Honolulu amounting to some $160,000 annually by the time of project buildout. The City and County revenues would continue to go to the City and County for the life of the project.

ASSUMPTIONS

Based on the EIS Notice of Preparation for the project, SMS Research and Marketing Services, Inc. assumes that

- Total construction cost of the project is $20 million;
- 13.7 acres will be developed eventually in Commercial use; and
- The remaining 9.6 acres will be in non-profit uses (land made available for a park; community facilities) on which only minimal real property taxes will be assessed.

SMS affiliations:
Allan Barter Associates
Customer Insight Company
Donnelly Marketing Inc.
International Survey Research
Simmons Market
Research Bureau, Inc.

SMS / 1042 Fort Street Mall, Suite 200 / Honolulu, Hawaii 96813
Telephone (808) 537-3356 / FAX (808) 537-2686 / Compuserve 73444,1373 / Internet info@smshawaii.com

STATE REVENUES

The State of Hawaii will receive revenues from both construction and operations at the site. Taxes on operations (excise tax, workers' and corporate income tax) arguably could be raised from similar operations elsewhere in the event the project were not built. Hence, only taxes on construction are counted here as fiscal impacts of the project. Those taxes (in 1996 dollars) would amount to some $2.1 million:

STATE REVENUES FROM PROJECT CONSTRUCTION

CONSTRUCTION SPENDING	$20.0	million
CORPORATE INCOME TAX (1)	$0.1	
EXCISE TAX		
Construction Spending (2)	$0.8	
Construction-Related Workforce Spending (3)	$0.5	
PERSONAL INCOME TAX (4)	$0.7	
CONVEYANCE TAXES (5)	$0.0	
Total	$2.1	million

NOTES:
(1) Calculated at 0.25% of construction spending, based on historical ratios between business receipts and tax collections (State Department of Taxation, 1992; Tax Foundation of Hawaii, 1992).
(2) Calculated at 4.167% of direct construction spending.
(3) Calculated at 4.167% of total workforce income spent on taxable items. Share of income calculated from 1988-1990 study of Oahu consumers (U.S. Bureau of Labor Statistics, reported in DBEDT, 1993). Wages estimated from average 1995 wages by industry. (Hawaii Department of Labor and Industrial Relations, 1996)
(4) Calculated at 4.04% of wages.
(5) Calculated at $1 per thousand dollars in real estate sales. For this analysis, assumed not to apply to the project.

To the extent that the allocation of land for park use supports the Hawaii Winter Baseball League, making its growth more feasible, the project makes a new contribution to the economy, and hence to excise and income tax revenues, over and above the revenues counted above.

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STATE COSTS

The proposed project would not depend on any new State construction or contribution. Presumably, it would lower State expenses, to the extent that provision of new jobs will lower the level of unemployment in the surrounding area. Consequently, State costs are treated here as nil.

CITY AND COUNTY REVENUES

Real property tax revenues are the main source of income for the City and County. At the project site, real property tax revenues would change due to:

- Dedication of much of the property to community facilities, on which no or minimal ($100/year) taxes are paid;
- Commercial, not industrial use of the remaining acreage; and
- Development of the commercial area.

These revenues would change upon redesignation, since commercial land has a higher value than industrial land. With construction and occupancy of the commercial area, real property values and tax revenues would increase. At buildout, taxes on the property would come to about $320,000 annually. Taxes would continue at or above that level indefinitely.

REAL PROPERTY TAXES FROM THE PROJECT, AT BUILDOUT

	LAND	BUILDINGS
VALUE		
Commercial [1]	$20.89	$16.59 millions
TAX RATE		
Commercial	$8.51	$8.51 per $1,000 value
TAXES		
Commercial	$0.18	$0.14 millions
Total Annual Taxes		$0.32 million

NOTES: Calculations do not include community facilities, on the assumption that these would be largely or wholly tax-exempt.

[1] Land value estimated at $35/square foot, based on valuation of Waipahu area commercial sites. Improved value from estimated construction costs.

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The above calculation is in 1996 dollars, and assumes that tax rates will not increase. The dollar value of future tax revenues, at the time they are assessed and collected, will no doubt be greater than shown.

For 1995-1996, the City and County assessed taxes on the project site amounting nearly to about $160,000 annually. While the assessment was challenged, and subsequent assessments will doubtless be lower, it serves as a maximal estimate of revenues that could be gathered by the City and County without the project. The increase in tax revenues with the project would then come to about $160,000 annually, as of project buildout.

One alternative mentioned in the EIS Notice of Preparation involved industrial use of the Commercial area. With that alternative, land values in the project site would be higher than at present, but lower than with commercial development. Presumably the improved value of the area would also be lower. Based on land values alone, the industrial alternative would yield some $25,000 less in City and County revenues annually than would the Preferred Alternative.

CITY AND COUNTY COSTS

Project development would involve little or no cost to the City and County. While some new services (e.g., police protection on the project site) will be needed, these will be in response to anticipated growth of commercial markets on Oahu, not importation of a new market. As a result, the additional services are an impact of continuing population and economic growth. The project locates that demand for services, it does not create it.

City and County costs attributable to the project accordingly are judged to be minimal or nil.

• • •

The comments in this letter consist of an independent consultant's judgment, based on publicly available information and accepted practice. We will be glad to provide further information on request.

Sincerely,

John Kirkpatrick
Vice President

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Appendix J

Preliminary Water System Study

MASTER PLAN

PRELIMINARY WATER SYSTEM STUDY

OAHU SUGAR COMPANY PROPERTY

WAIPAHU, OAHU, HAWAII

TAX MAP KEY: 9-4-2: 4

PREPARED FOR:

AMFAC/JMB HAWAII, INC.
700 BISHOP STREET
HONOLULU, HAWAII 96813

PREPARED BY:

COMMUNITY PLANNING, INC.
745 FORT STREET, SUITE 400
HONOLULU, HAWAII 96813

MARCH, 1996

TABLE OF CONTENTS

I. PURPOSE OF REPORT

The purpose of this report is to prepare a water master plan for the redevelopment of the Oahu Sugar Company property in Waipahu.

This report will serve as a basis for implementing water system improvements for the proposed redevelopment projects as shown on the present development plan prepared by PBR-Hawaii. See EXHIBIT 1 - PROPOSED LAND USE PLAN.

In addition, this report will document the proposed conversion of the existing municipal water service for the Waikele Golf Course to a private non-potable water system and proposed reallocation of a portion of the municipal water use to the mill site redevelopment projects.

II. EXECUTIVE SUMMARY

The Oahu Sugar Company property consists of approximately 61 acres and includes a concentration of structures formerly used for industrial, commercial and office purposes along its frontage on Waipahu Street and an open area at the back of the property formerly used for movement and storage of haul cane trucks and equipment. See EXHIBIT 1.

Water for the project area is presently provided by a private water system with wells in the adjoining Waikele Gulch. The master plan proposes that water for the redevelopment of the Oahu Sugar Company property be provided by the municipal Board of Water Supply system. The private water system, on the other hand, will be redirected and used for irrigation of the existing Waikele Golf Course. Subsequently, municipal water service for irrigation of the golf course can be discontinued by removal of the existing 6-inch water meter on Lumiaina Street. Therefore, the water source allocation for the golf course of 0.5584 mgd can be reallocated to the proposed Oahu Sugar Company development projects.

The Oahu Sugar Company property is in the Board of Water Supply's "228" water service area and municipal 12- and 16-inch water mains are located in the adjoining Paiwa and Waipahu Streets. The proposed water system improvements are shown on EXHIBIT 3. Based on the estimated average daily water demand of 0.180 mgd for the proposed project development and existing and proposed water system facilities, the existing municipal pipeline system has adequate capacity to accommodate the proposed project.

Further, it is assumed that the storage requirement for the proposed sugar mill site redevelopment of 0.27 mgd can be accommodated by the existing or proposed municipal "228" storage reservoir system provided the appropriate facility charge is paid.

III. EXISTING WATER SUPPLY AND DISTRIBUTION SYSTEM

Currently the Oahu Sugar Company property is served by a private system whose wells are located in the adjacent Waikele Gulch.

Service to the mill area by the private system will be terminated. However, water from the private wells will be redirected for irrigation use to the existing Waikele Golf Course (see EXHIBIT 3), subject to obtaining the appropriate approvals and/or permits. Consequently, the owner, Amfac and/or its subsidiaries, upon subsequent termination of the use of municipal water in the golf course, will request that the Board of Water Supply reallocate a portion of that potable water to the proposed redevelopment project at the Oahu Sugar Company property.

Municipal water is presently available to the Oahu Sugar Company property from the Board of Water Supply's "228" water system. The municipal system which includes a 16-inch transmission/distribution water main in Waipahu Street fronting the mill site is shown on EXHIBIT 3.

IV. MASTER PLAN

A. The master plan for the Oahu Sugar Company property, as shown on EXHIBIT 1, involves the subdivision of the lot into approximate areas of the proposed uses as follows:

Land Use	Area (acres)
Commercial/Museum/YMCA/ Community Center/Clinic	20.3
Light Industrial	28.4
Park Expansion	3.2
Access/Streets	9.1
TOTAL	61.0

B. Several existing buildings on the Oahu Sugar Company property will remain. These include the administration building, human resource building, and the Waipahu Store building. They will be disconnected from the private water system and reconnected by a 1-inch meter to the Board of Water Supply system in Waipahu Street. See EXHIBIT 3.

C. The Waikele Golf Course will be reconnected to the private water system with well source located in Waikele Gulch and, therefore, municipal service can be discontinued by removal of the 6-inch turbine meter on Lumiaina Street. See EXHIBIT 3.

D. The developer will pay the appropriate water system facilities charges for resource development, transmission and daily storage.

V. BOARD OF WATER SUPPLY'S POTABLE WATER SYSTEM DESIGN CRITERIA

As stated in the Water System Standards (1985), the following criteria is used in determining minimum requirements for the potable water system:

A. Consumption Guidelines

Unit Consumptions - The unit consumptions for the projected land uses are shown below:

Table 1
Unit Consumption

Land Use	Average Daily Demand (gallons/acre)
Commercial	3,000
Light Industrial	4,000
Park Expansion	4,000

B. Demand Factors

1. Maximum Daily Demand = 1.5 x Average Daily Demand.
2. Peak Hour Demand = 3.0 x Average Daily Demand.

C. Pipeline Size

1. Maximum daily flow plus fire flow with a residual pressure of 20 psi at critical fire hydrant. (For light industrial usage, the requirement is 4,000 gpm for 3 hours.)
2. Peak hour flow with a minimum pressure of 40 psi.
3. In determining the carrying capacity of the mains, the friction factors "C" values to be applied are:

Table 2
Pipe Friction Factors, "C"

Diameter	"C"
8 inch, 12 inch	110
16 inch, 20 inch	120
24 inch and larger	130

4. Maximum velocity in main (without fire flow) is 6 feet per second.
5. Maximum static pressure shall not exceed 125 psi.

D. Reservoir Capacity

The following criteria was used in the analysis:

1. Meet maximum day consumption. Reservoir full at the beginning of the 24-hour period with no source input to the reservoir.
2. Meet maximum day rate plus fire flow for duration of fire. Reservoir three-fourths full at start of fire, with credit for incoming flow from pumps, one maximum size pump out of service.

VI. POTABLE WATER SYSTEM ANALYSIS

The existing water consumption for the Waipahu Reservoir #1 was obtained from the Water Systems Planning Section of the Honolulu Board of Water Supply and is based on the average day demand for December, 1994. (See Appendix for Board of Water Supply hydraulic model of the Ewa Water System.) The demands which did not fall on a node used in the simulation were moved to the nearest node in the model.

The existing consumption demands are as follows:

Average Daily Demand = 2.52 mgd
Maximum Daily Demand = 3.77 mgd
Peak Hour Demand = 7.55 mgd

The proposed demand for the Oahu Sugar Company property is based on the unit consumptions stated above and the following land use areas:

Land Use	Area (acres)	Average Day Demand
Commercial/Museum/ YMCA/Community Center/Clinic	20.4	61,110 gpd
Light Industrial	28.4	112,000 gpd
Park Expansion	3.2	6,400 gpd*
Access Street	9.1	0
Totals	61.0	179,510 gpd

*Note: Assumed that one-half of the park expansion will be a parking lot.

The maximum day demand and the peak hour flow are 269,300 gpd and 538,500 gpd, respectively.

These figures include the buildings to be serviced by the proposed 1-inch meter. The demands were converted to gpm and added to the hydraulic model performed on KYPIPE.

The appendix includes all appropriate pipeline sizing calculations for maximum day plus fire flow as well as peak hour flow.

For the maximum day flow plus fire flow at nodes 25 and 28, the residual pressures were 24 and 25 psi, respectively. For the peak hour demand, the residual pressure at node 24 was 48 psi.

According to the construction plans for Lumiaina and Lumiauau Streets, the 6-inch turbine meter for Waikele Golf Course was expected to provide an average day demand of 848,500 gpd from the Board of Water Supply's "395" water system.

It was found that the reservoir criteria number 1 governed and the required reservoir capacity for the development is summarized below:

Criteria 1 Maximum Day Consumption for 24 Hours

	Maximum Day Demands
Oahu Sugar Mill	0.27 mgd

Reservoir capacity = 0.27 mgd x 1 day = 0.27 MG

Criteria 2 reservoir three-fourths full and maximum day plus fire flow for duration of fire.

Note: It is assumed that the existing reservoir is adequately sized for fire flow of 4,000 gpm for 3 hours.

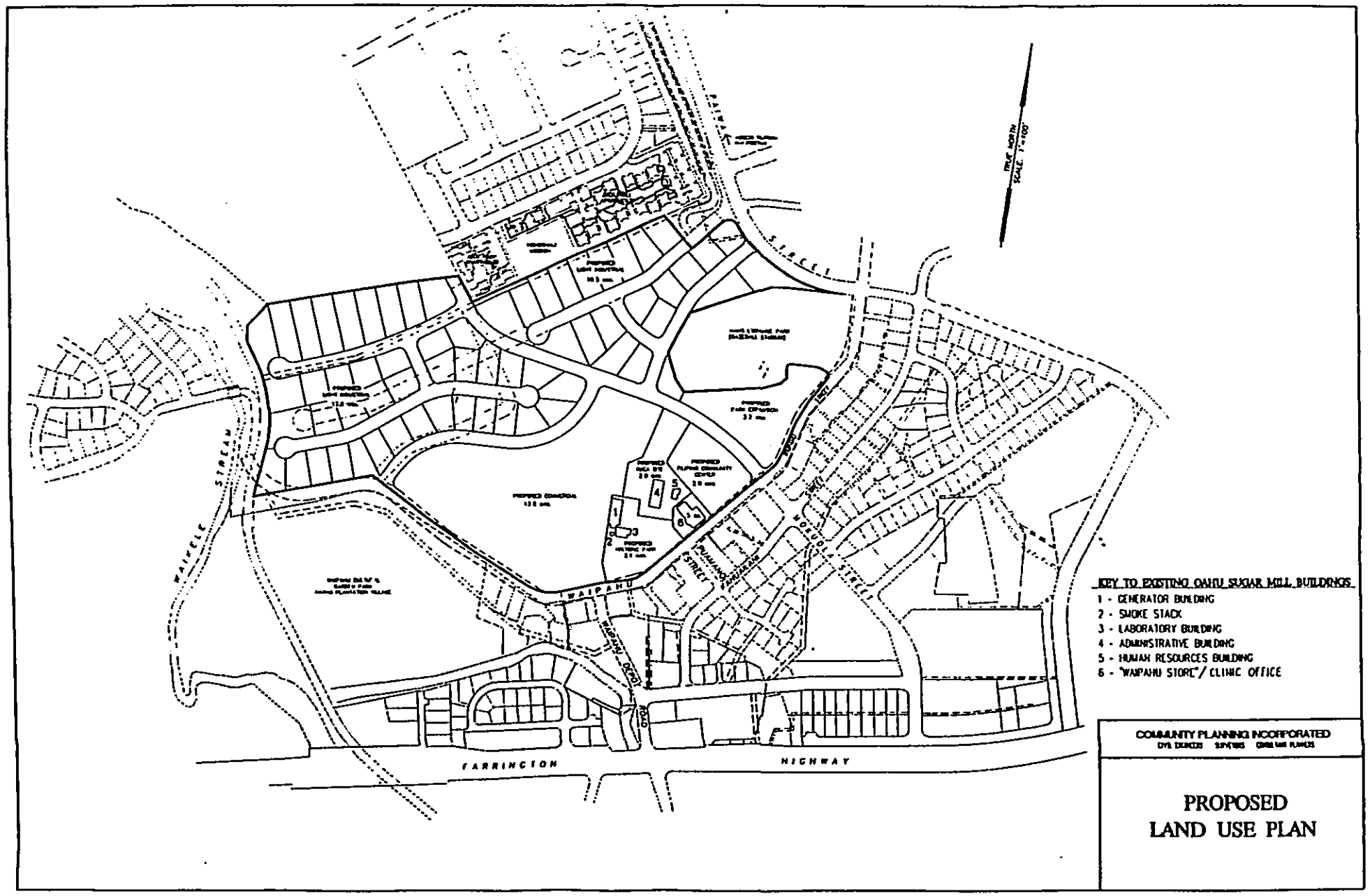
Maximum day demands = 0.27 MGD

3/4 reservoir = 0.27 MGD * 3 hours * 1/24

Reservoir capacity = 0.045 MG

Criteria 1 governs.

Required reservoir capacity = 0.27 MG



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Last Date Plotted: 5 Mar 1996

EXHIBIT 1

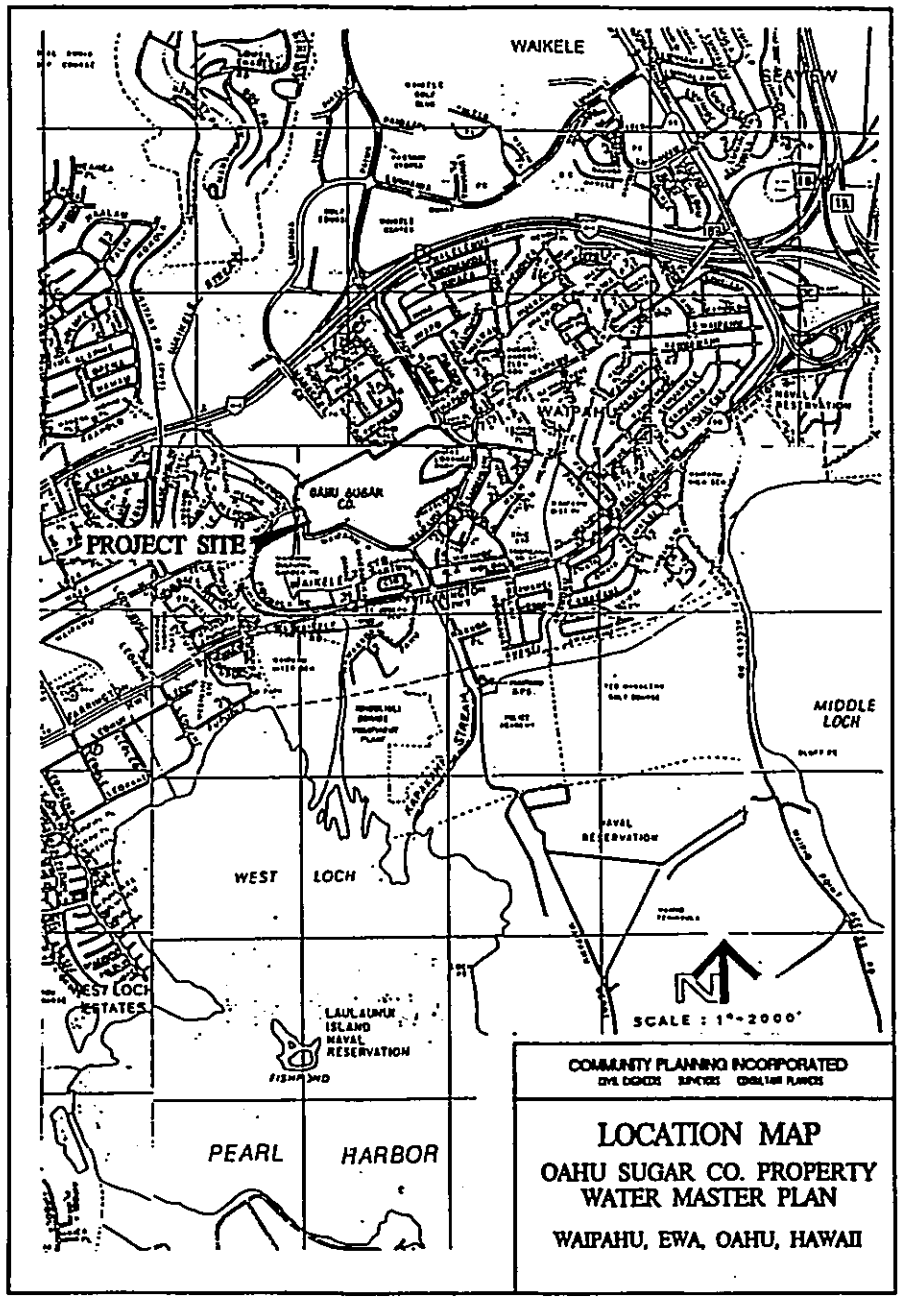
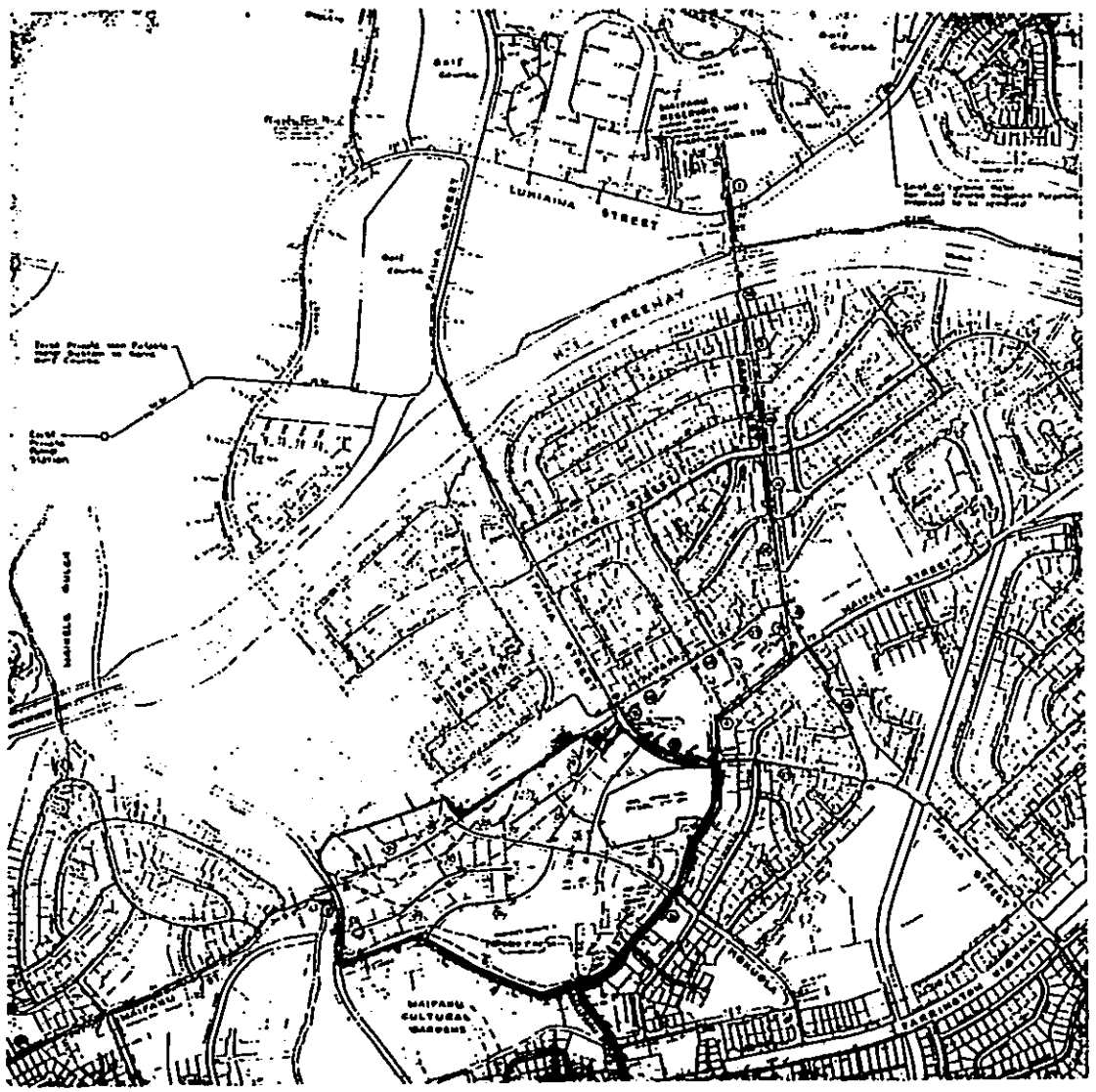

WAIKELE
EWA VILLAGES
WAIPAHU
WAIPAHU RESERVATION
OAHU SUGAR CO.
PROJECT SITE
MIDDLE LOCH
NAVAL RESERVATION
WEST LOCH
WEST LOCH ESTATES
LAULAUNUI ISLAND NAVAL RESERVATION
FISHPOND
PEARL HARBOR
SCALE : 1"=2000'
COMMUNITY PLANNING INCORPORATED
LOCATION MAP
OAHU SUGAR CO. PROPERTY
WATER MASTER PLAN
WAIPAHU, EWA, OAHU, HAWAII

EXHIBIT 2



WATER MASTER PLAN

Scale: 1" = 400'

LEGEND

COMMUNITY PLANNING INCORPORATED

WATER MASTER PLAN

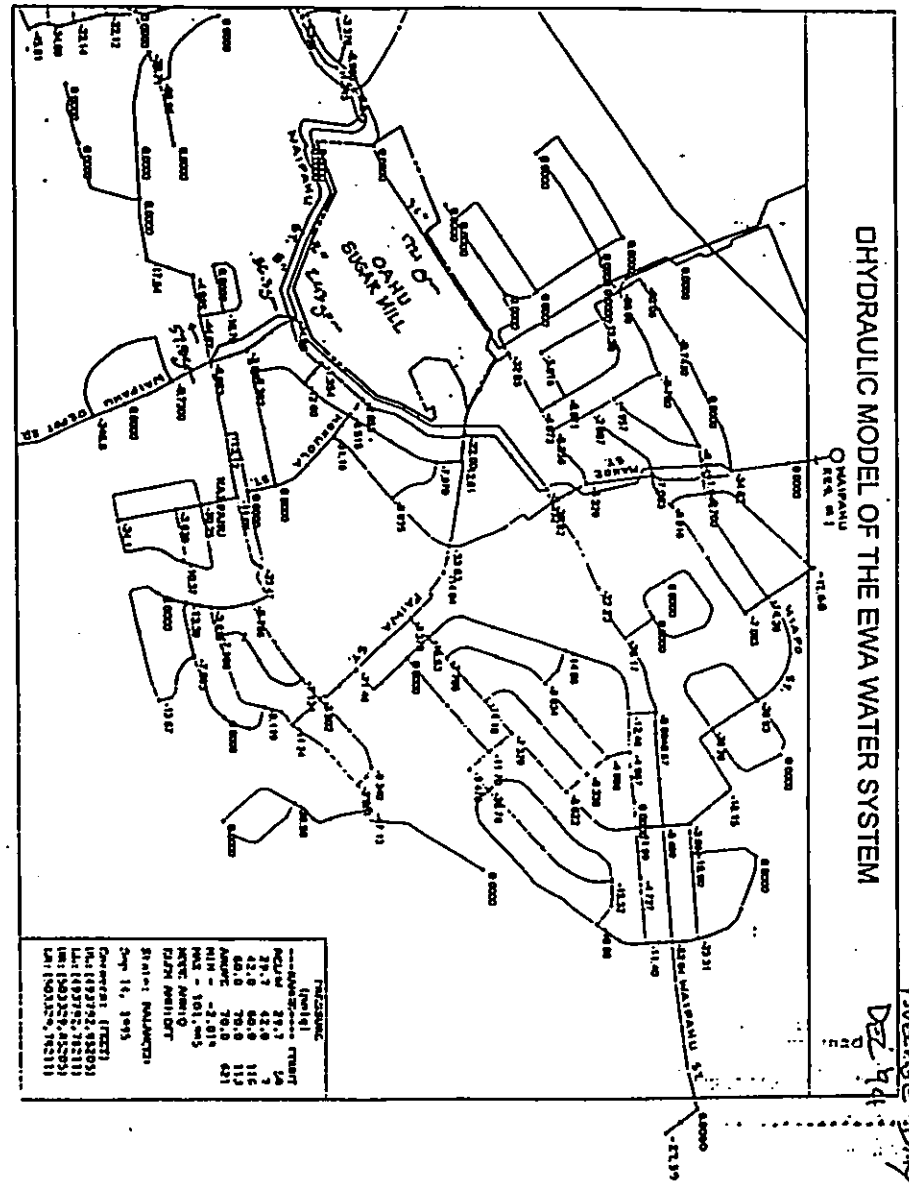
EXHIBIT 3

OAHU SUGAR CO. PROPERTY

APPENDIX

FLOW CALCULATIONS

1. HYDRAULIC MODEL OF THE EWA WATER SYSTEM BY THE BOARD OF WATER SUPPLY
2. SUMMARY OF ORIGINAL DATA
3. PEAK HOUR FLOW ANALYSIS
4. MAXIMUM DAY WITH FIRE FLOW ANALYSIS



KYPIPE2

Comprehensive Computer Modeling
of Pipe Networks

KYPIPE2 S/N: 1783000026
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Date : 2/07/96
Time : 15:29:42
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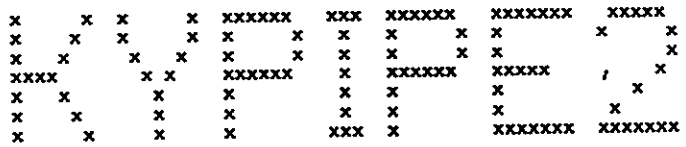
Output file: PAHU4.OUT



Full Microcomputer Implementation
by
Haestad Methods, Inc.

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SUMMARY OF ORIGINAL DATA

UNITS SPECIFIED

FLOWRATE..... = gallons/minute
HEAD (HGL)..... = feet
PRESSURE..... = psig

PIPELINE DATA

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE

PIPE NUMBER	NODE NOS. #1	#2	LENGTH (ft)	DIAMETER (in)	ROUGHNESS COEFF.	MINOR LOSS COEFF.	FGN-HGL (ft)
1-FG	0	22	600.0	20.0	120.00	0.00	228.00
2	1	2	500.0	24.0	130.00	0.00	
3	2	3	1670.0	20.0	120.00	0.00	
4	3	4	1000.0	16.0	120.00	0.00	
5	4	5	1000.0	16.0	120.00	0.00	
6	5	6	500.0	16.0	120.00	0.00	
7	6	7	500.0	16.0	120.00	0.00	
8	7	8	1150.0	16.0	120.00	0.00	
9	8	9	1500.0	16.0	120.00	0.00	
10	2	10	500.0	12.0	110.00	0.00	
11	10	11	450.0	12.0	110.00	0.00	
12	11	12	600.0	12.0	110.00	0.00	
13	12	13	600.0	12.0	110.00	0.00	
14	13	14	200.0	12.0	110.00	0.00	
15	14	15	650.0	12.0	110.00	0.00	
16	15	30	300.0	12.0	110.00	0.00	
17	4	16	1100.0	8.0	110.00	0.00	
18	16	17	1100.0	12.0	110.00	0.00	
19	17	12	350.0	12.0	110.00	0.00	
20	30	4	500.0	12.0	110.00	0.00	
21	20	31	400.0	12.0	110.00	0.00	
22	20	21	400.0	12.0	110.00	0.00	
23	19	20	350.0	12.0	110.00	0.00	
24	19	30	700.0	12.0	110.00	0.00	
25	18	19	200.0	12.0	110.00	0.00	
26	22	1	700.0	16.0	120.00	0.00	
27	18	23	250.0	12.0	110.00	0.00	
28	8	23	1250.0	12.0	110.00	0.00	
29	23	26	700.0	16.0	120.00	0.00	
30	26	24	300.0	16.0	120.00	0.00	
31	24	25	600.0	12.0	110.00	0.00	
32	24	27	250.0	12.0	110.00	0.00	
33	27	29	700.0	12.0	110.00	0.00	
34	27	28	450.0	12.0	110.00	0.00	
35	5	18	700.0	12.0	110.00	0.00	

JUNCTION NODE DATA

*** GEOMETRIC VERIFICATION (*3*) SUCCESSFUL ***

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	CONNECTING PIPES			
1		0.00	147.00	2	26		
2		285.90	129.00	2	3	10	
3		16.20	0.00	3	4		
4		158.10	38.00	4	5	17	20
5		641.10	35.00	5	6	35	
6		61.20	39.00	6	7		
7		1053.00	28.00	7	8		
8		0.00	33.00	8	9	28	
9		26.70	25.00	9			
10		653.70	110.00	10	11		
11		69.00	86.00	11	12		
12		15.90	70.00	12	13	19	
13		33.30	0.00	13	14		
14		49.80	0.00	14	15		
15		98.40	66.50	15	16		
16		1298.10	0.00	17	18		
17		782.40	0.00	18	19		
18		57.00	63.00	25	27	35	
19		10.70	64.00	23	24	25	
20		17.40	76.00	21	22	23	
21		26.50	74.00	22			
22		0.00	0.00	1	26		
23		85.50	66.00	27	28	29	
24		18.30	88.00	30	31	32	
25		39.80	75.00	31			
26		7.60	83.00	29	30		
27		12.30	75.00	32	33	34	
28		38.60	70.00	34			
29		33.00	70.00	33			
30		16.40	63.00	16	20	24	
31		13.50	70.00	21			

OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT.

SYSTEM CONFIGURATION

NUMBER OF PIPES .....(p) = 35
NUMBER OF JUNCTION NODES .....(j) = 31
NUMBER OF PRIMARY LOOPS .....(l) = 4
NUMBER OF FIXED GRADE NODES .....(f) = 1
NUMBER OF SUPPLY ZONES .....(z) = 1

CASE 1. PEAK HOUR DEMAND

HYDRAULIC ANALYSIS PROCEEDING - SIMULATIONS CONTINUE UNTIL ACCURACY < 0.00500
Regular Simulation - Case = 1

****
SIMULATION RESULTS
****

THE RESULTS ARE OBTAINED AFTER FIVE TRIALS WITH AN ACCURACY = 0.00082

SIMULATION DESCRIPTION (LABEL)

SIMULATION OF EAST WAIPAHU AREA FED FROM THE WAIPAHU 1 RESERVOIR
FEBRUARY 5, 1996
PROPOSED PEAK HOUR CONDITION

PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (gpm)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1-FG	0	22	5619.40	3.59	0.00	0.00	5.74	5.98
2	1	2	5619.40	1.06	0.00	0.00	3.99	2.12
3	2	3	3302.72	3.73	0.00	0.00	3.37	2.23
4	3	4	3286.52	6.56	0.00	0.00	5.24	6.56
5	4	5	1716.74	1.97	0.00	0.00	2.74	1.97
6	5	6	919.77	0.31	0.00	0.00	1.47	0.62
7	6	7	858.57	0.27	0.00	0.00	1.37	0.55
8	7	8	-194.43	0.04	0.00	0.00	0.31	0.03
9	8	9	26.70	0.00	0.00	0.00	0.04	0.00
10	2	10	2030.78	6.42	0.00	0.00	5.76	12.83
11	10	11	1377.08	2.81	0.00	0.00	3.91	6.25
12	11	12	1308.08	3.41	0.00	0.00	3.71	5.68
13	12	13	-286.00	0.20	0.00	0.00	0.81	0.34
14	13	14	-319.30	0.08	0.00	0.00	0.91	0.42
15	14	15	-369.10	0.35	0.00	0.00	1.05	0.55
16	15	30	-467.50	0.25	0.00	0.00	1.33	0.85
17	4	16	502.31	7.65	0.00	0.00	3.21	6.95
18	16	17	-795.79	2.49	0.00	0.00	2.26	2.26
19	17	12	-1578.19	2.82	0.00	0.00	4.48	8.04
20	30	4	-909.37	1.45	0.00	0.00	2.58	2.90
21	20	31	13.50	0.00	0.00	0.00	0.04	0.00
22	20	21	26.50	0.00	0.00	0.00	0.08	0.00
23	19	20	57.40	0.01	0.00	0.00	0.16	0.02
24	19	30	-425.46	0.50	0.00	0.00	1.21	0.71
25	18	19	-357.36	0.10	0.00	0.00	1.01	0.51
26	22	1	5619.40	12.40	0.00	0.00	8.97	17.72
27	18	23	456.23	0.20	0.00	0.00	1.29	0.81
28	8	23	-221.13	0.26	0.00	0.00	0.63	0.21
29	23	26	149.60	0.02	0.00	0.00	0.24	0.02
30	26	24	142.00	0.01	0.00	0.00	0.23	0.02
31	24	25	39.80	0.01	0.00	0.00	0.11	0.01
32	24	27	83.90	0.01	0.00	0.00	0.24	0.04
33	27	29	33.00	0.00	0.00	0.00	0.09	0.01
34	27	28	38.60	0.00	0.00	0.00	0.11	0.01
35	5	18	155.87	0.08	0.00	0.00	0.44	0.11

JUNCTION NODE RESULTS

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (gpm)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1		0.00	212.01	147.00	65.01	28.17
2		285.90	210.95	129.00	81.95	35.51
3		16.20	207.22			
4		158.10	200.66	38.00	162.66	70.48
5		641.10	198.68	35.00	163.68	70.93
6		61.20	198.37	39.00	159.37	69.06
7		1053.00	198.10	28.00	170.10	73.71
8		0.00	198.14	33.00	165.14	71.56
9		26.70	198.14	25.00	173.14	75.03
10		653.70	204.53	110.00	94.53	40.96
11		69.00	201.72	86.00	115.72	50.15
12		15.90	198.31	70.00	128.31	55.60
13		33.30	198.52			
14		49.80	198.60			
15		98.40	198.95	66.50	132.45	57.40
16		1298.10	193.01			
17		782.40	195.50			
18		57.00	198.61	63.00	135.61	58.76
19		10.70	198.71	64.00	134.71	58.37
20		17.40	198.70	76.00	122.70	53.17
21		26.50	198.70	74.00	124.70	54.04
22		0.00	224.41			
23		85.50	198.41	66.00	132.41	57.38
24		18.30	198.38	88.00	110.38	47.83
25		39.80	198.38	75.00	123.38	53.46
26		7.60	198.39	83.00	115.39	50.00
27		12.30	198.38	75.00	123.38	53.46
28		38.60	198.37	70.00	128.37	55.63
29		33.00	198.37	70.00	128.37	55.63
30		16.40	199.21	63.00	136.21	59.02
31		13.50	198.70	70.00	128.70	55.77

SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE NUMBER	FLOWRATE (gpm)
1	5619.40

NET SYSTEM INFLOW = 5619.40
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 5619.40

CASE 2. MAX DAY WITH FIRE FLOW AT NODE 25

DATA CHANGES FOR NEXT SIMULATION

DEMAND CHANGES

DEMAND TYPE = 1 - GDF = 0.500

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE:

JUNCTION NUMBER	DEMAND (gpm)
25	4019.90

Regular Simulation - Case = 2

****
SIMULATION RESULTS
****

THE RESULTS ARE OBTAINED AFTER THREE TRIALS WITH AN ACCURACY = 0.00273

SIMULATION DESCRIPTION (LABEL)

SIMULATION OF EAST WAIPAHU AREA FED FROM THE WAIPAHU #1 RESERVOIR
FEBRUARY 5, 1996
PROPOSED MAX DAY AND FIRE FLOW AT NODE 25

PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	NODE NOS. #2	FLOWRATE (gpm)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1-FG	0	22	6809.70	5.12	0.00	0.00	6.95	8.53
2	1	2	6809.70	1.51	0.00	0.00	4.83	3.03
3	2	3	4570.76	6.81	0.00	0.00	4.67	4.08
4	3	4	4562.66	12.05	0.00	0.00	7.28	12.05
5	4	5	3344.99	6.78	0.00	0.00	5.34	6.78
6	5	6	1799.18	1.08	0.00	0.00	2.87	2.15
7	6	7	1768.58	1.04	0.00	0.00	2.82	2.08
8	7	8	1242.08	1.24	0.00	0.00	1.98	1.08
9	8	9	13.35	0.00	0.00	0.00	0.02	0.00
10	2	10	2095.99	6.80	0.00	0.00	5.95	13.61
11	10	11	1769.14	4.47	0.00	0.00	5.02	9.94
12	11	12	1734.64	5.75	0.00	0.00	4.92	9.58
13	12	13	794.73	1.35	0.00	0.00	2.25	2.26
14	13	14	778.08	0.43	0.00	0.00	2.21	2.17
15	14	15	753.18	1.33	0.00	0.00	2.14	2.04
16	15	30	703.98	0.54	0.00	0.00	2.00	1.80
17	4	16	108.30	0.45	0.00	0.00	0.69	0.41
18	16	17	-540.75	1.22	0.00	0.00	1.53	1.11
19	17	12	-931.95	1.06	0.00	0.00	2.64	3.03
20	30	4	-1030.33	1.83	0.00	0.00	2.92	3.65
21	20	31	6.75	0.00	0.00	0.00	0.02	0.00
22	20	21	13.25	0.00	0.00	0.00	0.04	0.00
23	19	20	28.70	0.00	0.00	0.00	0.08	0.00

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (gpm)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
24	19	30	-1726.11	6.65	0.00	0.00	4.90	9.50
25	18	19	-1692.06	1.83	0.00	0.00	4.80	9.15
26	22	1	6809.70	17.71	0.00	0.00	10.87	25.29
27	18	23	2888.82	6.16	0.00	0.00	8.19	24.65
28	8	23	1228.73	6.33	0.00	0.00	3.49	5.06
29	23	26	4074.80	6.84	0.00	0.00	6.50	9.77
30	26	24	4071.00	2.93	0.00	0.00	6.50	9.75
31	24	25	4019.90	27.27	0.00	0.00	11.40	45.45
32	24	27	41.95	0.00	0.00	0.00	0.12	0.01
33	27	29	16.50	0.00	0.00	0.00	0.05	0.00
34	27	28	19.30	0.00	0.00	0.00	0.05	0.00
35	5	18	1225.25	3.52	0.00	0.00	3.48	5.03

JUNCTION NODE RESULTS

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (gpm)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1		0.00	205.18	147.00	58.18	25.21
2		142.95	203.66	129.00	74.66	32.35
3		8.10	196.85			
4		79.05	184.80	38.00	146.80	63.61
5		320.55	178.02	35.00	143.02	61.98
6		30.60	176.95	39.00	137.95	59.78
7		526.50	175.91	28.00	147.91	64.09
8		0.00	174.66	33.00	141.66	61.39
9		13.35	174.66	25.00	149.66	64.85
10		326.85	196.86	110.00	86.86	37.64
11		34.50	192.39	86.00	106.39	46.10
12		7.95	186.64	70.00	116.64	50.54
13		16.65	185.28			
14		24.90	184.85			
15		49.20	183.52	66.50	117.02	50.71
16		649.05	184.36			
17		391.20	185.57			
18		28.50	174.50	63.00	111.50	48.32
19		5.35	176.33	64.00	112.33	48.68
20		8.70	176.33	76.00	100.33	43.48
21		13.25	176.33	74.00	102.33	44.34
22		0.00	222.88			
23		42.75	168.34	66.00	102.34	44.35
24		9.15	158.57	88.00	70.57	30.58
25		4019.90	131.30	75.00	56.30	24.40
26		3.80	161.50	83.00	78.50	34.02
27		6.15	158.57	75.00	83.57	36.21
28		19.30	158.57	70.00	88.57	38.38
29		16.50	158.57	70.00	88.57	38.38
30		8.20	182.98	63.00	119.98	51.99
31		6.75	176.33	70.00	106.33	46.08

SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE NUMBER	FLOWRATE (gpm)
1	6809.70

NET SYSTEM INFLOW = 6809.70
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 6809.70

CASE 3. MAX DAY DEMAND WITH FIRE FLOW AT NODE 28

D A T A C H A N G E S F O R N E X T S I M U L A T I O N

D E M A N D C H A N G E S

DEMAND TYPE = 1 - GDF = 0.500

THE FOLLOWING SPECIFIC DEMAND CHANGES ARE MADE:

JUNCTION NUMBER	DEMAND (gpm)
28	4019.30

Regular Simulation - Case = 3

****
S I M U L A T I O N R E S U L T S
****

THE RESULTS ARE OBTAINED AFTER TWO TRIALS WITH AN ACCURACY = 0.00000

S I M U L A T I O N D E S C R I P T I O N (L A B E L)

SIMULATION OF EAST WAIPAHU AREA FED FROM THE WAIPAHU/1 RESERVOIR
FEBRUARY 5, 1996
PROPOSED MAX DAY AND FIRE FLOW AT NODE 28

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE FG -FIXED GRADE NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (gpm)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1-FG	0	22	6809.70	5.12	0.00	0.00	6.95	8.53
2	1	2	6809.70	1.51	0.00	0.00	4.83	3.03
3	2	3	4570.75	6.81	0.00	0.00	4.67	4.08
4	3	4	4562.65	12.05	0.00	0.00	7.28	12.05
5	4	5	3344.97	6.78	0.00	0.00	5.34	6.78
6	5	6	1799.11	1.07	0.00	0.00	2.87	2.15
7	6	7	1768.51	1.04	0.00	0.00	2.82	2.08
8	7	8	1242.01	1.24	0.00	0.00	1.98	1.08
9	8	9	13.35	0.00	0.00	0.00	0.02	0.00
10	2	10	2096.00	6.80	0.00	0.00	5.95	13.61
11	10	11	1769.15	4.47	0.00	0.00	5.02	9.94
12	11	12	1734.65	5.75	0.00	0.00	4.92	9.58
13	12	13	794.73	1.35	0.00	0.00	2.25	2.26
14	13	14	778.08	0.43	0.00	0.00	2.21	2.17
15	14	15	753.18	1.33	0.00	0.00	2.14	2.04
16	15	30	703.98	0.54	0.00	0.00	2.00	1.80
17	4	16	108.28	0.45	0.00	0.00	0.69	0.41
18	16	17	-540.77	1.22	0.00	0.00	1.53	1.11
19	17	12	-931.97	1.06	0.00	0.00	2.64	3.03
20	30	4	-1030.35	1.83	0.00	0.00	2.92	3.65
21	20	31	6.75	0.00	0.00	0.00	0.02	0.00
22	20	21	13.25	0.00	0.00	0.00	0.04	0.00
23	19	20	28.70	0.00	0.00	0.00	0.08	0.00

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (gpm)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
24	19	30	-1726.13	6.65	0.00	0.00	4.90	9.50
25	18	19	-1692.08	1.83	0.00	0.00	4.80	9.15
26	22	1	6809.70	17.71	0.00	0.00	10.87	25.29
27	18	23	2888.89	6.16	0.00	0.00	8.19	24.65
28	8	23	1228.66	6.32	0.00	0.00	3.49	5.06
29	23	26	4074.80	6.84	0.00	0.00	6.50	9.77
30	26	24	4071.00	2.93	0.00	0.00	6.50	9.75
31	24	25	19.90	0.00	0.00	0.00	0.06	0.00
32	24	27	4041.95	11.48	0.00	0.00	11.47	45.91
33	27	29	16.50	0.00	0.00	0.00	0.05	0.00
34	27	28	4019.30	20.45	0.00	0.00	11.40	45.43
35	5	18	1225.31	3.52	0.00	0.00	3.48	5.03

JUNCTION NODE RESULTS

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (gpm)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
1		0.00	205.18	147.00	58.18	25.21
2		142.95	203.66	129.00	74.66	32.35
3		8.10	196.85			
4		79.05	184.80	38.00	146.80	63.61
5		320.55	178.02	35.00	143.02	61.98
6		30.60	176.95	39.00	137.95	59.78
7		526.50	175.91	28.00	147.91	64.09
8		0.00	174.66	33.00	141.66	61.39
9		13.35	174.66	25.00	149.66	64.85
10		326.85	196.86	110.00	86.86	37.64
11		34.50	192.39	86.00	106.39	46.10
12		7.95	186.64	70.00	116.64	50.54
13		16.65	185.28			
14		24.90	184.85			
15		49.20	183.52	66.50	117.02	50.71
16		649.05	184.36			
17		391.20	185.57			
18		28.50	174.50	63.00	111.50	48.32
19		5.35	176.33	64.00	112.33	48.68
20		8.70	176.33	76.00	100.33	43.48
21		13.25	176.33	74.00	102.33	44.34
22		0.00	222.88			
23		42.75	168.34	66.00	102.34	44.35
24		9.15	158.57	88.00	70.57	30.58
25		19.90	158.57	75.00	83.57	36.21
26		3.80	161.50	83.00	78.50	34.02
27		6.15	147.09	75.00	72.09	31.24
28		4019.30	126.65	70.00	56.65	24.55
29		16.50	147.09	70.00	77.09	33.41
30		8.20	182.98	63.00	119.98	51.99
31		6.75	176.33	70.00	106.33	46.08

SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM FIXED GRADE NODES
(-) OUTFLOWS FROM THE SYSTEM INTO FIXED GRADE NODES

PIPE NUMBER	FLOWRATE (gpm)
1	6809.70

NET SYSTEM INFLOW = 6809.70
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 6809.70

****KYPIPE SIMULATION COMPLETED****

DATE: 2/7/1996
TIME: 15:29:44

Appendix J-1

Board of Water Supply Letter

BOARD OF WATER SUPPLY

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

August 27, 1996

Mr. Bernard P. Kea
Community Planning, Inc.
745 Fort Street, Suite 400
Honolulu, Hawaii 96813-4177

Dear Mr. Kea:

Subject: Your Request of August 15, 1996 Regarding the Proposed Oahu Sugar Mill Industrial Subdivision, TMK: 9-4-2: Portion 4

We confirm that water is available to the proposed industrial subdivision from the remaining Waipahu Wells II allocations. We will delete our source requirement for the proposed subdivision based on the golf course conversion to a nonpotable system.

Attached for your information is a copy of our revised comments to the Department of Land Utilization. Also, the August 21, 1996 revised Waikele Tabulation is attached.

If you have any questions, please contact Joseph Kaakua at 527-6123.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

Attachments

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU

COPY

August 27, 1996

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

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

SUBJECT: YOUR MEMORANDUM DATED APRIL 26, 1996 REGARDING THE PROPOSED ZONE CHANGE FOR THE OAHU SUGAR MILL IN WAIPAHU, TMK: 9-4-2: PORTION 4

The following supersedes our comments of May 15, 1996.

The developer will be required to:

1. Install the necessary water system improvements to serve the proposed industrial subdivision.

2. Submit the construction drawings for our review and approval.

The availability of water to the proposed project will be confirmed when the construction drawings are submitted for our review and approval. When water is made available, the applicant will be required to pay our Water System Facilities Charges for transmission and daily storage.

If a three-inch or larger meter is required, the construction drawings showing the installation of the meter should be submitted for our review and approval.

If you have any questions, please contact Merele Leong at 527-6122.

cc: Bernard P. Kea (Community Planning, Inc.)

WAIKELE TABULATION

8/21/98 8:20 AM

PROJECT NAME	TMK	LETTER DATED	UNITS AREA	AVG DAY DEMAND GPD	CUMULATIVE ALLOC/DEMAND GPD
ALLOCABLE AMOUNT					2,000,000
WAIKELE AREA 3 (SUNSET POINTE)		3/19/91	139 (SF)	69,500	69,500
WAIKELE PARCEL II		4/1/91	54 (TH)	21,600	91,100
WAIKELE AREA 5	9-4-7:13	5/15/91	114 (SF)	57,000	148,100
HOOMAKA			244 (TH)	97,600	245,700
WAIKELE AREA 4	9-4-7:13	3/18/94	84 (SF)	42,000	287,700
WAIKELE 13	9-4-7:13		136 (MF)	54,400	342,100
WAIKELE 12	9-4-7:13	2/5/92	80 (MF)	32,000	374,100
PARK BY AREA 2			5 ACRES	20,000	394,100
WAIKELE 7 & 8 CLUSTER AREA 3	9-4-7:12	6/1/92	206 (MF)	82,400	476,500
WAIKELE 6 CLUSTER III-A	9-4-7:48	8/6/92	60 (MF)	24,000	500,500
WAIKELE CLUSTER II			117 (SF)	58,500	559,000
WAIKELE COMMUNITY PARK III	9-4-7:32	12/15/92		81,000	640,000
WAIKELE CLUSTER 14		12/14/92	228 (MF)	91,200	731,200
WAIKELE CENTER AREA B	9-4-7:32	10/16/92		42,000	773,200
WAIKELE GOLF COURSE CLUBHOUSE				20,000	793,200
NAVY WATER METER		4/13/93		41,000	834,200
WAIKELE CENTER AREA A				55,680	889,880
WAIKELE CENTER AREA C				44,100	933,980
GOLF COURSE		MP EST.		569,000	1,502,980
WAIKELE 17 CLUSTER	9-4-7:53	6/15/93)CP)	204 (MF)	81,600	1,584,580
WAKELE 16 A & B	9-4-7:64	7/21/93	126 (SF)	63,000	1,647,580
WAIKELE 18A	9-4-7:65	1/19/94(CP)	21 (SF)	10,500	1,658,080
WAIKELE 10A	9-4-7:47	5/20/94(CP)	35 (SF)	17,500	1,675,580
WAIKELE 10B MFLR		5/20/94(CP)	18 (MFLR	47,200	1,722,780
WAIKELE 9B		5/20/94(CP)	82 (MFLR	112,800	1,835,580
PARKING LOT	9-4-66:70	8/2/94(MTR AP)		15,650	1,851,230
WAIKELE 18B	9-4-7:65	2/16/94(CP)	45 (SF)	22,500	1,873,730
WAIKELE 20 CLUSTER	9-4-7:66	0/25/94(CL AP	195 (SF)	97,500	1,971,230
LUMIAUAU ST. IRRIGATION	9-4-7:47&10	1/20/95(CP)		12,000	1,983,230
WAIKELE 9A	-4-7:POR4	4/10/95(CP)	165 (SF)	82,500	2,065,730
WAIKELE 9C	-4-7:POR4	12/26/95(CP)	17 (SF)	8,500	2,074,230
WAIKELE DRAINAGE S/D	9-4-2:288		3.88 LNDSC	15,564	2,089,794
WAIKELE FIRE STATION	9-4-7: 75	8/17/1996(CP)	.889 AC	2,067	2,091,861
SCHOOL		8/17/96 (CP)	8 ACRES	48,000	2,139,861
AMFAC-OAHU SUGAR MILLS	9-4-2:4			181,200	2,321,061
TOTAL ALLOCATION FOR WAIKELE DEVELOPMENT					2,321,061
AVG DAY W/O GOLF COURSE					1,752,061
UNALLOCATED PROJECTS:					
AREA 15			245(SF)	122,500	122,500
PARK			4 ACRES	16,000	138,500
TOTAL UNALLOCATED PROJECTS					138,500
TOTAL DEMAND					1,890,561
AVAILABLE FOR ADD'L DEVELOPMENT					109,439

Appendix K

Preliminary Sewer System Study

MASTER PLAN
PRELIMINARY SEWER SYSTEM STUDY
OAHU SUGAR COMPANY PROPERTY
WAIPAHU, EWA, OAHU, HAWAII

TAX MAP KEY: 9-04-02: 4

PREPARED FOR

AMFAC/JMB HAWAII, INC.
700 BISHOP STREET, 21ST FLOOR
HONOLULU, HAWAII 96813

PREPARED BY

COMMUNITY PLANNING, INC.
745 FORT STREET, SUITE 400
HONOLULU, HAWAII 96813

MARCH, 1996

. TABLE OF CONTENTS

I. PURPOSE OF REPORT

The purpose of this report is to prepare a wastewater master plan for the redevelopment of the Oahu Sugar Company property in Waipahu.

This report will serve as the basis for implementing wastewater system improvements for the proposed redevelopment projects as shown on the present master plan by PBR-Hawaii. See EXHIBIT 1 - PROPOSED LAND USE PLAN.

II. EXECUTIVE SUMMARY

The Oahu Sugar Company property in Waipahu consists of approximately 61 acres and includes a concentration of structures formerly used for industrial, commercial and office purposes along its frontage on Waipahu Street and an open area at the back of the property formerly used for movement and storage of cane haul trucks and equipment.

The Oahu Sugar Company harvested its last sugar crop in 1995 and the site is proposed to be used for an industrial subdivision; a commercial center with a historical park built around the smoke stack, former generator and laboratory buildings; a YMCA site (former administration and human resources buildings); an office building (existing Waipahu Store building); a new Filipino community center; and expansion of Hans L'Orange park. The proposed master plan is shown in EXHIBIT 1.

The Oahu Sugar Company property is in the Waipahu Sewerage Pump Station tributary and is serviced by the Honouliuli Sewerage Treatment Plant. See EXHIBIT 2 - LOCATION MAP, for the relative location of the project site to the pump station and treatment plant. The existing municipal wastewater collection system in the vicinity of the mill site is shown in EXHIBIT 3 - WASTEWATER MASTER PLAN.

The proposed land use will generate an average daily flow of 0.46 million gallons per day (mgd) with a peak flow of 1.71 mgd. The existing municipal wastewater collection system is adequate to accommodate this discharge.

The City's Honouliuli Sewerage Treatment Plant's secondary treatment improvements are scheduled to be completed by December 31, 1996, after which additional connections to the City's system can be made. The first phase of the proposed master plan development will be completed in 1997.

III. EXISTING WASTEWATER COLLECTION SYSTEM

The Oahu Sugar Company property is located in Waipahu on Waipahu Street adjacent to the Hans L'Orange Park. The

property is located in the Waipahu Sewage Pump Station (SPS) tributary and is serviced by the Honouliuli Sewerage Treatment Plant. See EXHIBIT 2 - LOCATION MAP. EXHIBIT 3 - WASTEWATER MASTER PLAN, shows the existing wastewater collection system in the vicinity of the development site. The sewer main in Waipahu Depot Road runs from Waipahu Street (SMH 0259) to the Waipahu SPS, located at the end of Waipahu Depot Road. The size of the main begins at 8 inches and increases to 42 inches before entering the Waipahu SPS. Currently, the City's Department of Wastewater Management's Public Service Section indicates there are no sewer connections in the 8-inch section of the sewer between sewer Manholes 0259 and 0164. To the east of Waipahu Depot Road, other existing sewer laterals which may service the proposed land use are on Puamano Street (SMH 0322), Mokuola Street (SMH 0295) and Waipahu Street (SMH 0293). These laterals are 8 inches in diameter and eventually tie into the 15-inch main at the edge of the residential subdivisions, entering Hikimoe Street and connecting to SMH 0158 on Waipahu Depot Road. According to the Department of Wastewater Management's Public Service Section, these laterals are flowing at about 30 percent capacity. In addition, there is the 36-inch Mililani effluent line which runs from Paiwa Street into Waipahu Street before turning into Puamano Street, down Kahuailani, Hikimoe then in Farrington Highway and down Waipahu Depot Road before discharging into the SPS. The Public Service Section indicated that this line is currently flowing at capacity. In Paiwa Street there is a 15-inch sewer main which is currently flowing 32 percent of its capacity. The Paiwa Street sewer line also flows to the Waipahu SPS.

To the west of Waipahu Depot Road is an existing main, ranging from 10 to 15 inches, running through the Waipahu Cultural Garden Park and the Waipahu Shopping Center. The 15-inch main connects to the sewer main in Waipahu Depot Road at sewer Manhole 0164. The Public Service Section indicated that this line is currently flowing at approximately 44 percent capacity.

IV. MASTER PLAN

A. The master plan for the Oahu Sugar Company property as shown on EXHIBIT 1 - PROPOSED LAND USE, involves the subdivision of the lot into the approximate areas of the proposed uses as follows:

Table 1
LAND USE AREAS

Land Use	Area (acres)
Commercial	13.8
Historic Park	2.0
YMCA	2.0
"Waipahu Store" Office Building	0.5
Community Center	2.0
Light Industrial	28.4
Park Expansion	3.2
Access Streets	9.1
	61.0

B. Several existing buildings on the Oahu Sugar Company property will remain. These include the former generator and laboratory buildings for the historic park, the former administration and human resources buildings for the YMCA, and the "Waipahu Store" office building. The sewer laterals serving the administration, human resources and "Waipahu Store" buildings will be intercepted by a new 8-inch sewer line in Waipahu Street and connected to the existing 8-inch sewer line in Mokuola Street.

C. A portion of the light industrial lots east of the Mokuola Street extension will be connected to the existing 15-inch sewer line in Paiwa Street. The remaining lots will be connected to the existing 8-inch sewer line in Mokuola Street.

D. The portion of the light industrial lots west of the Mokuola Street Extension will be connected to the existing 10- and 12-inch sewer lines running along Waipahu Street which connect to the 15-inch sewer line running through the Waipahu Cultural Garden Park.

E. The commercial area will be connected to the existing sewer main in Waipahu Depot Road.

F. The project will be developed in three increments. The first increment will be tributary Areas 1 and 2; the second increment will be tributary Areas 3 and 4; and the third increment will be tributary Area 5.

V. WASTEWATER DESIGN CRITERIA

The "Design Standards of the Department of Wastewater Management, Volume 1," Department of Wastewater Management, City and County of Honolulu, dated July 1993 (DWWM Design Standards), will be used to establish design criteria for the development.

A. Quantity of Wastewater: The average daily flow is based on 80 gallons/capita per day. Table 2 below establishes the equivalent population densities for the proposed land uses.

Table 2
EQUIVALENT POPULATION DENSITY

Land Use	Equivalent Population
Community Business	140 capita per acre (cpa)
General Industry	100 cpa

The sewer lines will be designed to carry the design peak flow as defined in the DWWM Design Standards.

B. Maximum Flow Factor: The maximum flow factor is the Babbit Flow Factor, MF = 5/(p^0.2), where p = population in thousands.

C. Hydraulics of Sewers: The size of the sewer line will be based on Manning's Formula (V = (1.486/n)*R^2/3*s^/2), using the "n" values given in Table 3 below.

Table 3
VALUES OF "n"

Pipe Diameter	"n" Value
Less than or equal to 18"	0.015
Greater than 18"	0.013

VI. WASTEWATER SYSTEM ANALYSIS

The existing wastewater flows at selected locations in the existing sewer collection system were obtained from the DWWM's Public Service Section. Tributary areas of the master plan were identified for probable connection points in the existing sewer collection system. The new flows were combined with the existing flows to check the capacity of the existing sewer lines to accommodate the additional flows. EXHIBIT 3 - WASTEWATER MASTER PLAN, shows the proposed sewer system and the tributary areas for the proposed connection points to the City's collection system. Based on the equivalent population above, the proposed land use will generate an average daily flow of 0.46 MGD and a peak flow of 1.71 MGD. The computation of wastewater quantity and hydraulic calculations of the City's sewer system is included in the appendix. The City's existing collection system is adequate to accommodate the proposed development.

According to the DWWM's Public Service Section, the Honouliuli Sewerage Treatment Plant's secondary treatment

improvements are scheduled for completion by the end of 1996. Therefore, connection to the Honouliuli system will be allowed in 1997. The first phase of this development will be the eastern portion of the light industrial lots next to Paiwa Street. This phase will be completed in 1997.

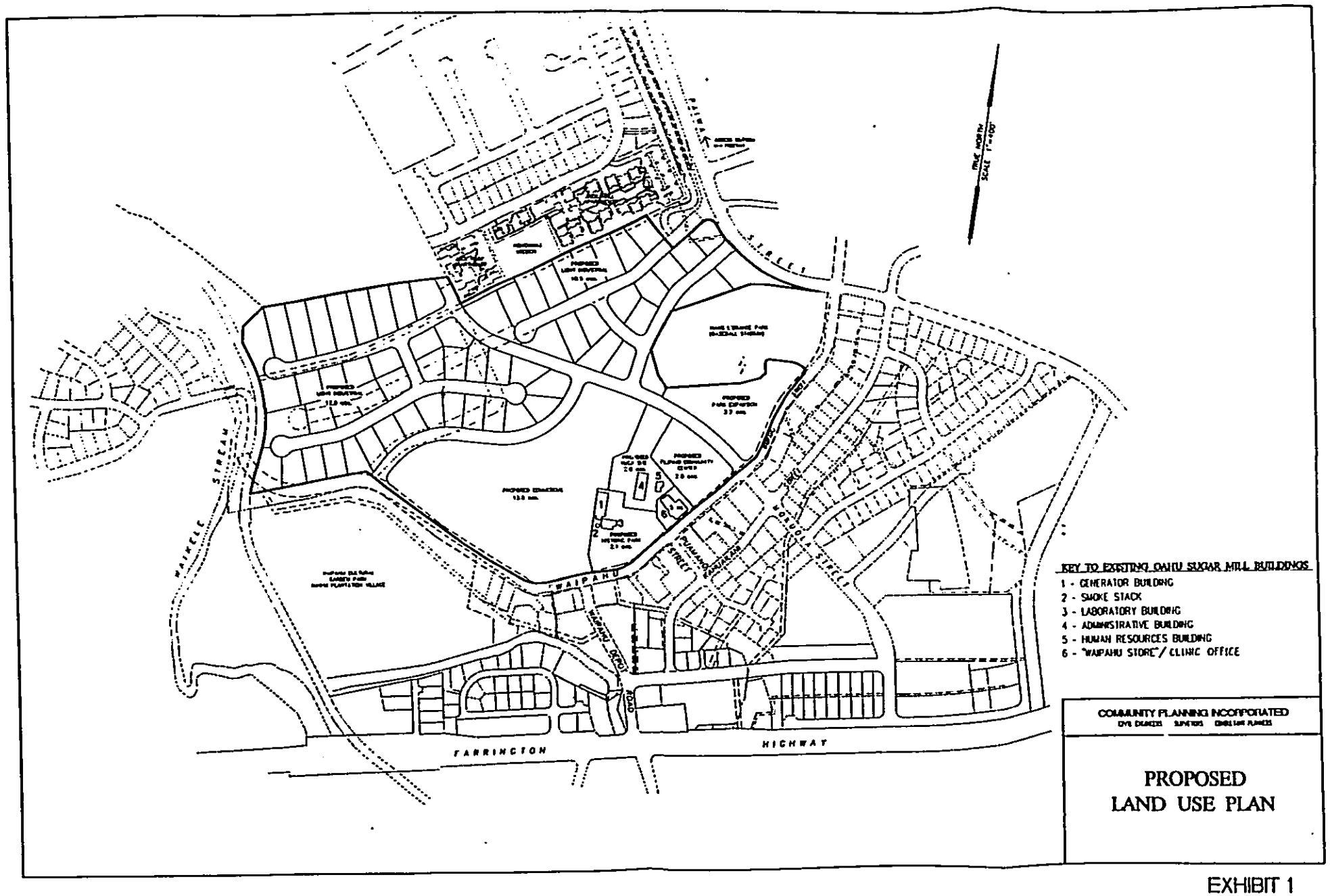

FARRINGTON
HIGHWAY
WAIPAHU
KEY TO EXISTING OAHU SUGAR MILL BUILDINGS
1 - GENERATOR BUILDING
2 - SMOKE STACK
3 - LABORATORY BUILDING
4 - ADMINISTRATIVE BUILDING
5 - HUMAN RESOURCES BUILDING
6 - "WAIPAHU STORE"/ CLINIC OFFICE
COMMUNITY PLANNING INCORPORATED
PROPOSED
LAND USE PLAN

EXHIBIT 1

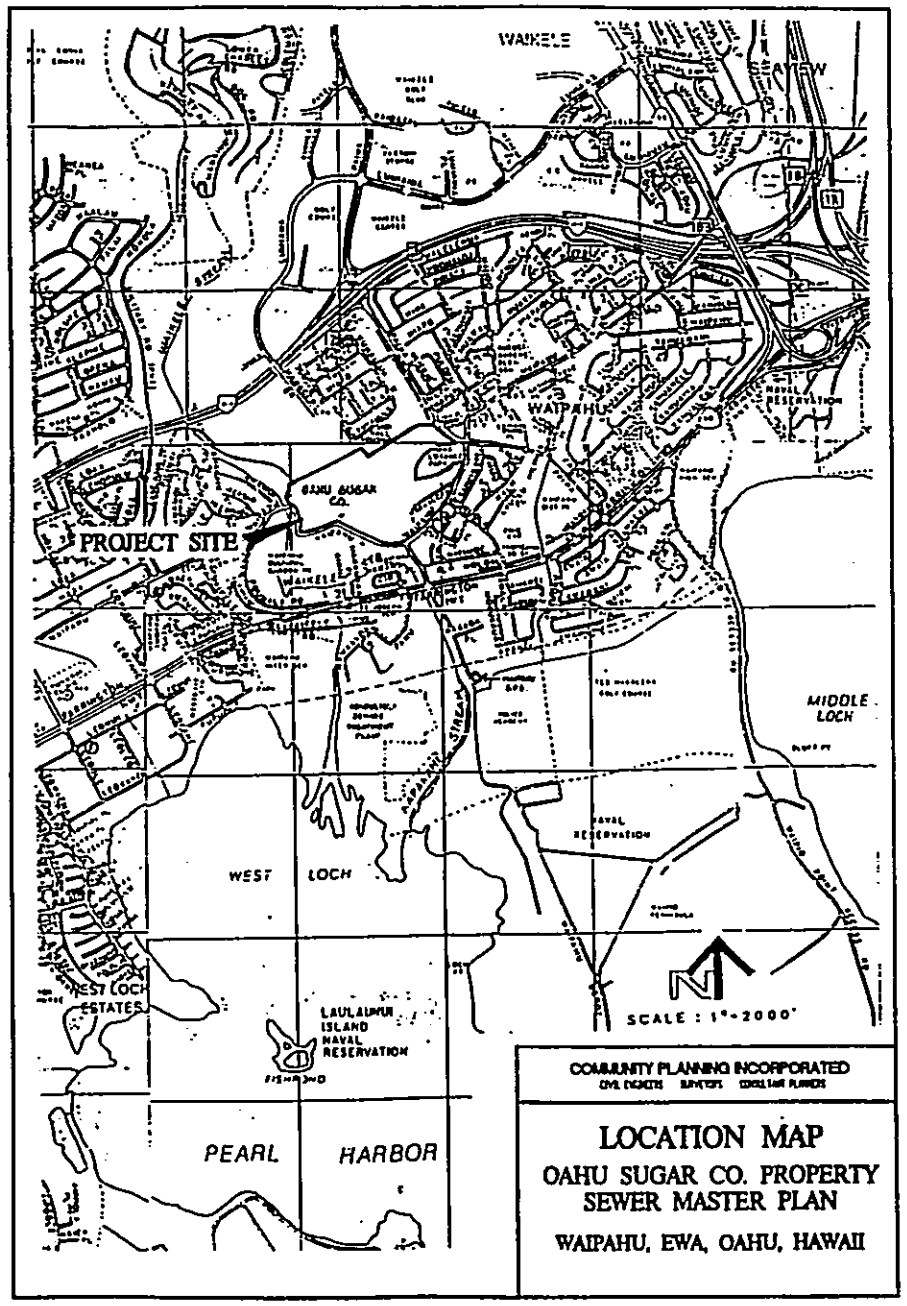

WAIKELE
WAIPAHU
OAHU SUGAR CO.
PROJECT SITE
MIDDLE LOCH
NAVAL RESERVATION
WEST LOCH
WEST LOCH ESTATES
LAULAUNUI ISLAND NAVAL RESERVATION
PEARL HARBOR
SCALE : 1"=2000'
COMMUNITY PLANNING INCORPORATED
LOCATION MAP
OAHU SUGAR CO. PROPERTY
SEWER MASTER PLAN
WAIPAHU, EWA, OAHU, HAWAII

EXHIBIT 2

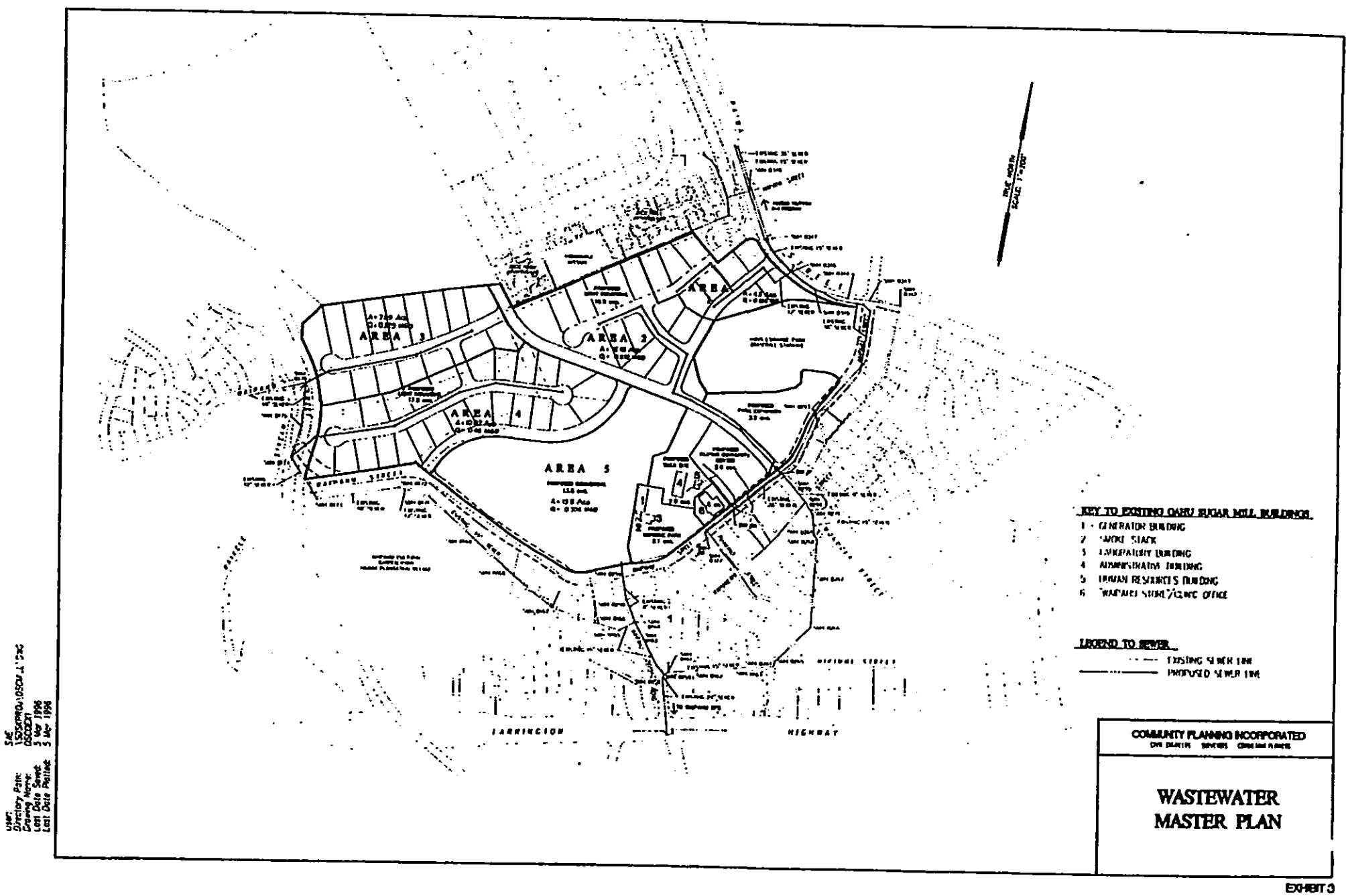

AREA 1
AREA 2
AREA 3
AREA 4
AREA 5
KEY TO EXISTING OAHU SUGAR MILL BUILDINGS
1 - GENERATOR BUILDING
2 - SMOKE STACK
3 - LABORATORY BUILDING
4 - ADMINISTRATIVE BUILDING
5 - HUMAN RESOURCES BUILDING
6 - WAREHOUSE/CLERKS OFFICE
LEGEND TO SEWER
EXISTING SEWER LINE
PROPOSED SEWER LINE
COMMUNITY PLANNING INCORPORATED
WASTEWATER
MASTER PLAN

EXHIBIT 3

APPENDIX

APPENDIX A-1

COMMUNITY PLANNING, INC.
PROJECT: OAHU SUGAR MILL
SUBJECT: SEWER MASTER PLAN
DATE: 02/15/96
BY: DSK

COMPUTATION OF WASTEWATER QUANTITY

SEWER:
DISTRICT: WAIPAHU
PROJECT: OAHU SUGAR MILL MASTER PLAN
REF. MAPS: PLANNING DEPT. SEWER MASTER PLAN

SEWER LOCATION DISTRICT	POINT	TRIBUTARY AREA INCR. (ACRES)	TOTAL	TRIB. EQUIV. POP. RESID. (UNITS)	UNIT CAPITA	TOTAL (CAPITA)	COMMENT
COMMERCIAL		13.80		140.0		1,932	
HSTRC PRK		2.00		140.0		280	
YMCA		2.00		140.0		280	
WAIPAHU STORE		0.50		140.0		70	
COMMUNITY CTR		2.00		140.0		280	
LT INDTRL		28.40		100.0		2,840	
PARK EXP		3.20		0.0		0	
ACCESS STS		9.10		0.0		0	
		61.00				5,682	

AVE WW FLOW 80GCD (MGD)	MAX FLOW FACTOR (5/P^0.2)	MAX FLOW (MGD)	DRY WTHR FLOW 5.00 GCD (MGD)	DSGN AVE FLOW (MGD)	DSGN MAX FLOW (MGD)	WET WTHR FLOW 1250.00 GAD (MGD)	DSGN PEAK FLOW (MGD)
0.455	3.532	1.606	0.028	0.483	1.634	0.076	1.710

WASTEWATER FLOW COMPS

APPENDIX A-2A

COMMUNITY PLANNING, INC.
PROJECT: OAHU SUGAR MILL
SUBJECT: SEWER MASTER PLAN
DATE: 02/15/96, rev. 02/24/96
BY: DSK

COMPUTATION OF WASTEWATER QUANTITY

SEWER: 15" ON PAIWA ST. - TRIBUTARY AREA 1
DISTRICT: WAIPAHU
PROJECT: OAHU SUGAR MILL SEWER MASTER PLAN
REF. MAPS: PLANNING DEPT. SEWER MASTER PLAN

SEWER LOCATION DISTRICT	POINT (SMH)	TRIBUTARY AREA INCR. (ACRES)	TRIBUTARY AREA TOTAL	TRIB. EQUIV. POP. RESID. (UNITS)	UNIT CAPITA	TOTAL (CAPITA)	COMMENT
LT. INDSTRL	0346	4.50			100.0	450	
		4.50				450	

WASTEWATER FLOW COMPS

AVE WW FLOW 80GCD (MGD)	MAX FLOW FACTCR (5/P^0.2)	MAX FLOW (MGD)	DRY WTHR DSGN AVE FLOW 5.00 GCD (MGD)	DSGN AVE FLOW (MGD)	DSGN MAX FLOW (MGD)	WET WTHR FLOW 1250.00 GAD (MGD)	DSGN PEAK FLOW (MGD)
0.036	5.000	0.180	0.002	0.038	0.182	0.006	0.188

APPENDIX A-2B

COMPUTATION OF WASTEWATER FLOW

SEWER: 15" SEWER LINE IN PAIWA ST (EXISTING CONDITIONS)
DISTRICT: WAIPAHU
REFERENCE MAPS: CITY PLANNING DEPT. SEWER MASTER PLAN

PAGE: 1 of 2
COMPUTED BY: DSK
DATE: 2/14/96

SEWER LOCATION: DISTRICT OR STREET	POINT (SMH)	TRIBUTARY AREA (ACRES): INCREMENT	TRIBUTARY AREA (ACRES): TOTAL	TRIBUTARY EQUIVALENT POPULATION: RESIDENTIAL: INCREMENT	RESIDENTIAL: TOTAL	"OTHER": INCREMENT	"OTHER": TOTAL	TOTAL: INCREMENT	TOTAL: TOTAL	AVERAGE WASTEWATER FLOW (MGD)	MAX FLOW FACTOR	WASTEWATER FLOW COMPUTATION: MAX FLOW (MGD)	DRY WEATHER DESIGN FLOW (MGD)	DESIGN AVE. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	WET WEATHER DESIGN FLOW (MGD)	DESIGN PEAK FLOW (MGD)	EXISTING / ULTIMATE SEWER STUDY: PIPE DIAMETER (IN)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)
Waipahu St/ Waipahu Ext	0346		110.		2574		2128		4702	0.374	3.17	1.376	0.020	0.40	1.43	1.57	1.59	15	1.75	5.5	4.79
	0346																1.59	15	1.75	5.5	4.79
	0345																1.59	15	3.19	6.7	6.46
	0347																1.59	15	1.75	5.5	4.79
	0346																1.59	15	5.0	7.7	8.09

REMARKS: (1) Obtained information from Public Services Section - figure between Hapapa St & Waipahu

APPENDIX A-2B

COMPUTATION OF WASTEWATER FLOW

SEWER: 15" SEWERLINE IN PAUWA ST. (EXISTING CONDITION)
DISTRICT: WAIPAHU TRIBUTARY AREA 1
REFERENCE MAPS:

PAGE: 2 of 2
COMPUTED BY: DSK
DATE: 2/19/96

SEWER LOCATION		TRIBUTARY AREA (ACRES)		TRIBUTARY EQUIVALENT POPULATION						WASTEWATER FLOW COMPUTATION								[ ] EXISTING [ ] ULTIMATE SEWER STUDY				
				RESIDENTIAL		*OTHER		TOTAL														
DISTRICT ZONE OR STREET	SMH POINT	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	AVERAGE WASTEWATER FLOW @ ___ GPCD (MGD)	MAX FLOW FACTOR	MAX FLOW (MGD)	REMAINING DEVELOPMENT @ ___ GPCD (MGD)	DESIGN AVE. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	REMAINING DEVELOPMENT @ ___ GPCD (MGD)	DESIGN PEAK FLOW (MGD)	PIPE DIAMETER (IN)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)	% Full
	0394																					
																	1.54	15	6.1	8.5	8.94	17.2
WAIPAHU ST	0343																					
																	1.54	15	2.05	5.7	5.18	29.7
	0342																					

REMARKS: *

APPENDIX A-2C

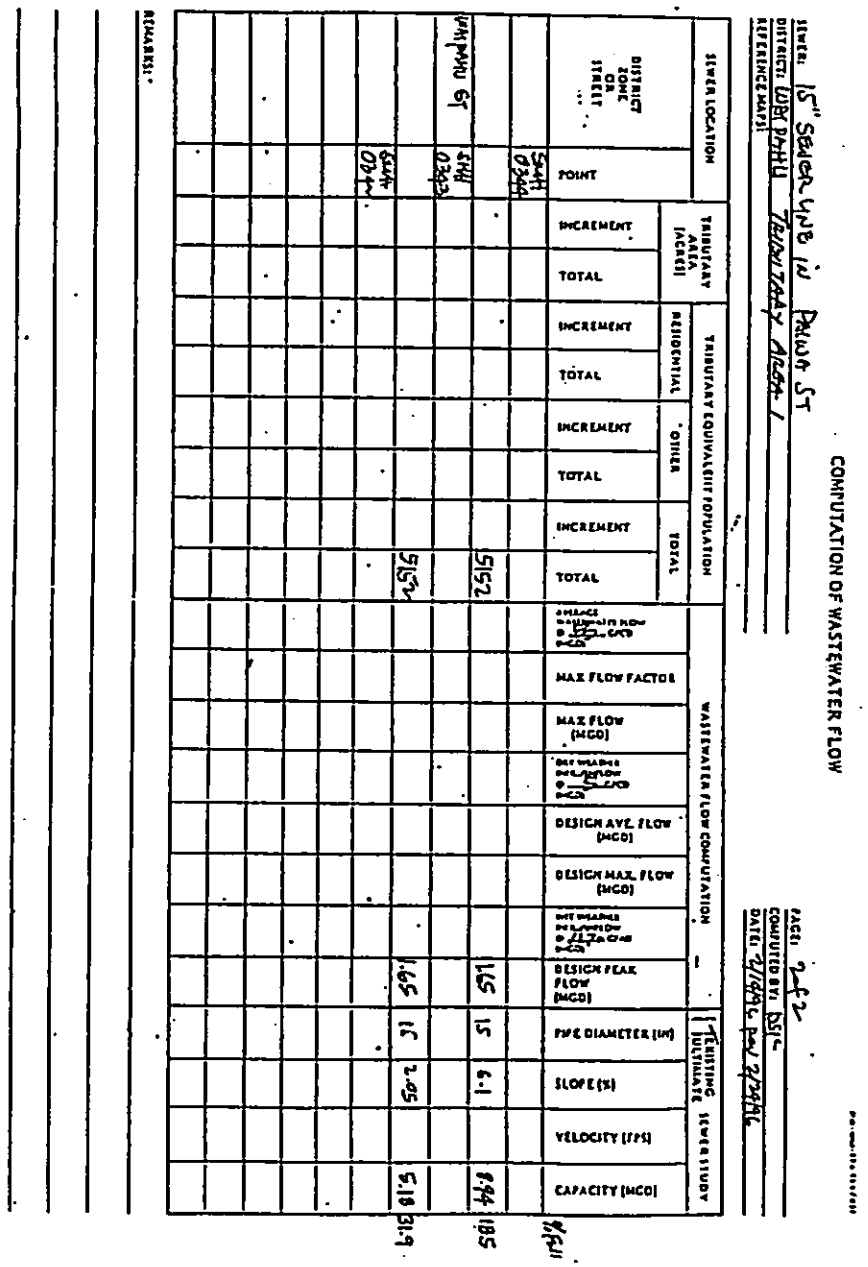
COMPUTATION OF WASTEWATER FLOW

SEWER: 15" SEWERLINE IN PAUWA ST. (Proposed Master Plan)
DISTRICT: WAIPAHU TRIBUTARY AREA 1
REFERENCE MAPS:

PAGE: 1 of 2
COMPUTED BY: DSK
DATE: 2/19/96 Rev. 2/24/96

SEWER LOCATION		TRIBUTARY AREA (ACRES)		TRIBUTARY EQUIVALENT POPULATION						WASTEWATER FLOW COMPUTATION								[ ] EXISTING [ ] ULTIMATE SEWER STUDY				
				RESIDENTIAL		*OTHER		TOTAL														
DISTRICT ZONE OR STREET	SMH POINT	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	AVERAGE WASTEWATER FLOW @ ___ GPCD (MGD)	MAX FLOW FACTOR	MAX FLOW (MGD)	REMAINING DEVELOPMENT @ ___ GPCD (MGD)	DESIGN AVE. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	REMAINING DEVELOPMENT @ ___ GPCD (MGD)	DESIGN PEAK FLOW (MGD)	PIPE DIAMETER (IN)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)	% Full
HAPAPA ST/ WAIPAHU ESTATES	SMH 0348		110		2574 (1)		2428 (1)		4702 (1)													
										0.376	3.67	1.379	.026	0.40	1.403	.137	1.54 (1)	15	1.75		4.79 (1)	32.2
	SMH 0347						2428															
																	1.54	16	1.75		4.79	32.2
12" LATERAL FROM OSM	SMH 0396	4.50	114.5		2574	450	2878	450														
									5152	.412	3.602	1.484	.026	.438	1.510	.143	1.65	15	3.19		6.96	25.6
	SMH 0345																					
									5152	.412	3.602	1.484	.026	.438	1.510	.143	1.65	15	5.0		8.09	20.4
	SMH 0344																					

REMARKS: (1) Obtained information by DWWM Public Service Section. flow between Hapapa St & Waipahu St.



APPENDIX A-2C

COMPUTATION OF WASTEWATER FLOW

APPENDIX A-3A

COMMUNITY PLANNING, INC.
PROJECT: OAHU SUGAR MILL
SUBJECT: SEWER MASTER PLAN
DATE: 02/15/96, rev. 02/24/96
BY: DSK

COMPUTATION OF WASTEWATER QUANTITY

SEWER: 8" ON MOKUOLA ST. - TRIBUTARY AREA 2
DISTRICT: WAIPAHU
PROJECT: OAHU SUGAR MILL SEWER MASTER PLAN
REF. MAPS: PLANNING DEPT. SEWER MASTER PLAN

SEWER LOCATION DISTRICT	POINT (SMH)	TRIBUTARY AREA INCR. (ACRES)	TOTAL	TRIB. EQUIV. POP. RESID. (UNITS)	UNIT CAPITA	TOTAL (CAPITA)	COMMENT
LT. INDSTRL	0295	5.95		100.0		595	
YMCA	0295	2.00		140.0		280	
WAIPAHU STR	0295	0.50		140.0		70	
COMM. CTR	0295	2.00		140.0		280	
HIST. PRK	0295	2.00		140.0		280	
		12.45				1,505	

WASTEWATER FLOW COMPS

AVE WW FLOW 60GCD (MGD)	MAX FLOW FACTOR (5/P^0.2)	MAX FLOW (MGD)	DRY WTHR DSGN AVE FLOW 5.00 GCD (MGD)	DSGN MAX FLOW (MGD)	WET WTHR DSGN AVE FLOW (MGD)	DSGN MAX FLOW 1250.00 GAD (MGD)	DSGN PEAK FLOW (MGD)
0.120	4.607	0.555	0.008	0.128	0.562	0.016	0.578

APPENDIX A-3B

COMPUTATION OF WASTEWATER FLOW

SEWER: Mokuola St. (Existing Condition)
DISTRICT: WAIPAHU TRIBUTARY AREA 2
REFERENCE MAPS: TMK, CITY PLANNING COMMISSION SEWER MP.

PAGE: 1 of 1
COMPUTED BY: DSK
DATE: 8/23/95

SEWER LOCATION		TRIBUTARY AREA (ACRES)		TRIBUTARY EQUIVALENT POPULATION						WASTEWATER FLOW COMPUTATION								EXISTING / ULTIMATE SEWER STUDY				
				RESIDENTIAL		OTHER		TOTAL														
DISTRICT ZONE OR STREET	SMK POINT	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	AVERAGE WASTEWATER FLOW @ 80 GPCD (MGD)	MAX FLOW FACTOR	MAX FLOW (MGD)	INFILTRATION @ 1,000 GPD/AC (MGD)	DESIGN AVE. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	INFILTRATION @ 1,500 GPD/AC (MGD)	DESIGN PEAK FLOW (MGD)	PIPE DIAMETER (IN)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)	% Full
Mokuola St	0295	.34	.34	4	4	0	0		4													
									4	.00032	5.0	.016	.00005	.00037	.01605	.0004	.0169	8	5.94		1.67	0.9
	0294	2.87	3.21	12		95		107														
									111	.009	5.0	.045	.0005	.0095	.046	.0004	.05	8	8.87		2.01	2.5
	0271	16.23	39.1 (1)	520	536 (1)	339	434 (1)															
								859	970 (1)	.078	5.0	.388	.005	.083	.393	.049	.442 (1)	15	.24		1.80	24
	0269	9.46	48.54	296	832	-	434	296														
		.13	48.69	4	836	-	434	4	1270	.102	4.77	.486	.006	.108	.492	.06	0.55	15	.24		1.80	30
	0268																					

REMARKS: (1) DATA OBTAINED FROM DWWM PUBLIC SERVICE SECTION.

A-9

APPENDIX A-3C

COMPUTATION OF WASTEWATER FLOW

SEWER: 8" ON Mokuola ST (PROPOSED MASTER PLAN)
DISTRICT: WAIPAHU TRIBUTARY AREA 2
REFERENCE MAPS: CITY PLANNING COMMISSION SEWER MP.

PAGE: 1 of 2
COMPUTED BY: DSK
DATE: 2/15/96 TO 2/29/96

SEWER LOCATION		TRIBUTARY AREA (ACRES)		TRIBUTARY EQUIVALENT POPULATION						WASTEWATER FLOW COMPUTATION								EXISTING / ULTIMATE SEWER STUDY				
				RESIDENTIAL		OTHER		TOTAL														
DISTRICT ZONE OR STREET	(SMK) POINT	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	AVERAGE WASTEWATER FLOW @ 80 GPCD (MGD)	MAX FLOW FACTOR	MAX FLOW (MGD)	INFILTRATION @ 1,000 GPD/AC (MGD)	DESIGN AVE. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	INFILTRATION @ 1,500 GPD/AC (MGD)	DESIGN PEAK FLOW (MGD)	PIPE DIAMETER (IN)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)	% Full
HISTORIC PARK	NEW 1B	2.0				280																
			2.0						280	.022	5.0	.112	.001	.023	.113	.003	.12	8	.99		.96	26.1
YMCA / WAIPAHU STUDIO	NEW 1A	2.5	4.5			350																
COMMUNITY CTR.		2.0	6.5			280		630	910	.073	5.0	.364	.005	.078	.369	.008	.38	8	.99		.96	826
Light Industrial	NEW 1	5.95				595																
			12.45					595	1505	.120	4.607	.553	.007	.127	.561	.016	.58	8	5.0		1.51	38.2
Mokuola St	0295	.34		4																		
			12.79					4	1509	.121	4.606	.557	.008	.129	.565	.016	.58	8"	5.94		1.67	34.8
	0294	2.87		12		95																
						15		107	1616													

REMARKS:

A-10

APPENDIX A-4A

COMMUNITY PLANNING, INC.
PROJECT: OAHU SUGAR MILL
SUBJECT: SEWER MASTER PLAN
DATE: 02/15/95, rev. 02/24/96
BY: DSK

COMPUTATION OF WASTEWATER QUANTITY

SEWER: 15" IN WAIPAHU CULTURAL GARDENS - TRIBUTARY AREAS 3
DISTRICT: WAIPAHU
PROJECT: OAHU SUGAR MILL SEWER MASTER PLAN
REF. MAPS: PLANNING DEPT. SEWER MASTER PLAN

SEWER LOCATION DISTRICT	POINT (SMH)	TRIBUTARY AREA INCR. (ACRES)	TRIBUTARY AREA TOTAL	TRIB. EQUIV. POP. RESID. (UNITS)	UNIT CAPITA	TOTAL (CAPITA)	COMMENT
LT. INDSTRL	0176	7.89			100.0	789	
		7.89				789	

WASTEWATER FLOW COMPS

AVE WW FLOW 80GCD (MGD)	MAX FLOW FACTOR (5/P^0.2)	MAX FLOW (MGD)	DRY WTHR FLOW 5.00 GCD (MGD)	DSGN AVE FLOW (MGD)	DSGN MAX FLOW (MGD)	WET WTHR FLOW 1250.00 GAD (MGD)	DSGN PEA FLOW (MGD)
0.063	5.000	0.316	0.004	0.067	0.320	0.010	0.329

APPENDIX A-3C

COMPUTATION OF WASTEWATER FLOW

SEWER: 8" on Makaula St. (Proposed Master Plan)
DISTRICT: Waipahu - Tributary Area 2
REFERENCE MAP(S): City Planning Department Sewer MP.

DISTRICT ZONE OR STREET	SEWER LOCATION POINT	TRIBUTARY AREA (ACRES) INCREMENT	TRIBUTARY AREA (ACRES) TOTAL	TRIBUTARY EQUIVALENT POPULATION RESIDENTIAL INCREMENT	RESIDENTIAL TOTAL	OTHER INCREMENT	OTHER TOTAL	TOTAL INCREMENT	TOTAL TOTAL	AVERAGE WASTEWATER FLOW 80 GPCD	MAX FLOW FACTOR	MAX FLOW (MGD)	DRY WEATHER FLOW 5.00 GPCD (MGD)	DESIGN AVE. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	WET WEATHER FLOW 1250.00 GPAD (MGD)	DESIGN PEAK FLOW (MGD)	PIPE DIAMETER (IN)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)	EXISTING / ULTIMATE SEWER STUDY
Makaula ST	0249	2.87							1616	.129	4.542	.586	.008	.137	.594	.020	.614	8	8.87	2.01	90.3	
			15.46																			
	0231	36.23																				
			52.09	520		334		854		.198	4.711	.842	.012	.210	.838	.045	.90	15	.29		1.80	50.0
	0249	9.96			341				959													
		.13	61.48	.4																		
								300	2775	.222	4.933	.905	.014	.236	.914	.077	1.00	15	.24		1.80	55.6

PAGE: 2 of 2
COMPUTED BY: DSK
DATE: 2/15/96, rev 2/24/96

COMMUNITY PLANNING, INC.
PROJECT: OAHU SUGAR MILL
SUBJECT: SEWER MASTER PLAN
DATE: 02/15/96, rev. 02/24/96
BY: DSK

COMPUTATION OF WASTEWATER QUANTITY

SEWER: 15" IN WAIPAHU CULTURAL GARDENS - TRIBUTARY AREAS 4
DISTRICT: WAIPAHU
PROJECT: OAHU SUGAR MILL SEWER MASTER PLAN
REF. MAPS: PLANNING DEPT. SEWER MASTER PLAN

SEWER LOCATION DISTRICT	POINT (SMH)	TRIBUTARY AREA INCR. (ACRES)	TRIBUTARY AREA TOTAL	TRIB. EQUIV. POP. RESID. (UNITS)	UNIT CAPITA	TOTAL (CAPITA)	COMMENT
LT. INDSTRL	0174	10.07			100.0	1,007	
		10.07				1,007	

AVE WW FLOW 80GCD (MGD)	MAX FLOW FACTOR (5/P^0.2)	WASTEWATER FLOW COMPS MAX FLOW (MGD)	DRY WTHR FLOW 5.00 GCD (MGD)	DSGN AVE FLOW (MGD)	DSGN MAX FLOW (MGD)	WET WTHR FLOW 1250.00 GAD (MGD)	DSGN PEAK FLOW (MGD)
0.081	4.993	0.402	0.005	0.086	0.407	0.013	0.420

APPENDIX A-4B

COMPUTATION OF WASTEWATER FLOW

SEWER: 15" Sewer Line through Waipahu Cultural Gardens Area (Existing Gravity)
DISTRICT: Waipahu - Tributary Areas 3 & 4
REFERENCE MAPS: City Planning Dept. Sewer Maps

SEWER LOCATION: DISTRICT LOCATION OR STREET	POINT	TRIBUTARY AREA (ACRES): INCREMENT	TOTAL	TRIBUTARY EQUIVALENT POPULATION: RESIDENTIAL: INCREMENT	TOTAL	OTHER: INCREMENT	TOTAL	TOTAL: INCREMENT	TOTAL	WASTEWATER FLOW COMPUTATION	EXISTING SEWER STUDY: EXISTING OR ESTIMATE
Hono-Kunawai St. Proj.	SMH 0176		60.9						1032	AVERAGE WASTEWATER FLOW GENERATED	
										MAX FLOW FACTOR	
										MAX FLOW (MGD)	
										DRY WEATHER INFILTRATION 5 (1) 35(2) GAD	
	0175		60.9						1032	DESIGN AVE. FLOW (MGD)	
										DESIGN MAX. FLOW (MGD)	
										WET WEATHER INFILTRATION 1250(1) 750(2) GAD	
										DESIGN PEAK FLOW (MGD)	
	0174		60.9						1032	PIPE DIAMETER (IN)	
										SLOPE (%)	
										VELOCITY (FPS)	
										CAPACITY (MGD)	
Waipahu Cultural Gardens Park	0173		60.9						1032	AVERAGE WASTEWATER FLOW GENERATED	
										MAX FLOW FACTOR	
										MAX FLOW (MGD)	
										DRY WEATHER INFILTRATION 5 (1) 35(2) GAD	
										DESIGN AVE. FLOW (MGD)	
										DESIGN MAX. FLOW (MGD)	
										WET WEATHER INFILTRATION 1250(1) 750(2) GAD	
										DESIGN PEAK FLOW (MGD)	
										PIPE DIAMETER (IN)	
										SLOPE (%)	
										VELOCITY (FPS)	
										CAPACITY (MGD)	
	0172									AVERAGE WASTEWATER FLOW GENERATED	
										MAX FLOW FACTOR	
										MAX FLOW (MGD)	
										DRY WEATHER INFILTRATION 5 (1) 35(2) GAD	
										DESIGN AVE. FLOW (MGD)	
										DESIGN MAX. FLOW (MGD)	
										WET WEATHER INFILTRATION 1250(1) 750(2) GAD	
										DESIGN PEAK FLOW (MGD)	
										PIPE DIAMETER (IN)	
										SLOPE (%)	
										VELOCITY (FPS)	
										CAPACITY (MGD)	

REMARKS:

PAGE 1 of 3
COMPUTED BY: DSK
DATE: 2/24/96

APPENDIX A-4B

COMPUTATION OF WASTEWATER FLOW

SEWER: 15" SEWER LINE THROUGH WAIPAHU CULTURAL GARDENS PARK (EXISTING COND.)
DISTRICT: WAIPAHU - TRIBUTARY AREAS 3 & 4
REFERENCE MAPS: CITY PLANNING COMMISSION - SEWER MASTER PLAN

PAGE: 2 of 3
COMPUTED BY: DSK
DATE: 7/24/96

SEWER LOCATION		TRIBUTARY AREA (ACRES)		TRIBUTARY EQUIVALENT POPULATION						WASTEWATER FLOW COMPUTATION								EXISTING / ULTIMATE SEWER STUDY			
				RESIDENTIAL		OTHER		TOTAL													
DISTRICT ZONE OR STREET	POINT	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	AVERAGE WASTEWATER FLOW @ ___ GPCD	MAX FLOW FACTOR	MAX FLOW (MGD)	DRY WEATHER I/I ALLOWANCE @ 5 GPAD	DESIGN AVG. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	WET WEATHER I/I ALLOWANCE @ 1250 GPAD	DESIGN PEAK FLOW (MGD)	PIPE DIAMETER (IN)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)
	0172																				
			60.4						103(1)	.083	4.77	.41	.005	.085	.415	.076	.49	12	.31		1.12
	0171																				
			60.4						103(1)								.49	15	.22		1.69
	0169																				
			60.4						103(1)								.49	12	1.03		2.02
	0160	16.0				10		10													
			60.4(1) 16.0(2)						103(1) 10(2)	.083	4.96	.41	.006	.091	.426	.124	.54	15	.22		1.70
	0167																				

REMARKS: (1) Applied Dry Weather I/I & Wet Weather I/I of 5gpcd & 1250 gpad, respectively
(2) Applied Dry Weather I/I & Wet Weather I/I of 35gpcd & 2750gpad, respectively

APPENDIX A-4B

COMPUTATION OF WASTEWATER FLOW

SEWER: 15" SEWER LINE THROUGH WAIPAHU CULTURAL GARDENS PARK (EXISTING COND)
DISTRICT: WAIPAHU - TRIBUTARY AREAS 3 & 4
REFERENCE MAPS: CITY PLANNING COMMISSION SEWER MASTER PLAN

PAGE: 3 of 3
COMPUTED BY: DSK
DATE: 7/24/96

SEWER LOCATION		TRIBUTARY AREA (ACRES)		TRIBUTARY EQUIVALENT POPULATION						WASTEWATER FLOW COMPUTATION								EXISTING / ULTIMATE SEWER STUDY			
				RESIDENTIAL		OTHER		TOTAL													
DISTRICT ZONE OR STREET	POINT	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	AVERAGE WASTEWATER FLOW @ ___ GPCD	MAX FLOW FACTOR	MAX FLOW (MGD)	DRY WEATHER I/I ALLOWANCE @ 5(1) 35(2) GPAD	DESIGN AVG. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	WET WEATHER I/I ALLOWANCE @ 1250(1) 2750(2) GPAD	DESIGN PEAK FLOW (MGD)	PIPE DIAMETER (IN)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)
3 Residences (Existing) 7-14-9:17	0167	.76(3) .89		12		10		22													
									103(2) 32(2)	.085	4.94	.42	.006	.091	.426	.124	.55	15	.24		1.79
	0166	.36				15		15													
									103(2) 97(3)	.086	4.92	.42	.007	.093	.427	.125	.55	15	.26		1.85
	0165	.63 .13				50		50													
			60.4(1) 18.76(3)					(3)	103(2) 97(3)	.090	4.88	.44	.009	.099	.449	.127	.75(3)	15	1.24		4.04
	0164																				
			60.4(1) 18.76(3)						103(2) 97(3)	.090	4.88	.44	.009	.099	.449	.127	.75(3)	15	.26		1.85
	0163																				

REMARKS: (1) Applied Dry Weather I/I and Wet Weather I/I of 5gpcd & 1250gpad, respectively.
(2) Applied Dry Weather I/I and Wet Weather I/I of 35gpcd & 2750gpad, respectively
(3) Data From City DWWM, Public Service Section: Total ED. Pop = 1129, AR = 0.75MGD.

APPENDIX A-4C

COMPUTATION OF WASTEWATER FLOW

SEWER: 15" SEWER LINE THROUGH WAIPAHU CULTURAL GARDENS PARK (PROPOSED M.P.)
DISTRICT: WAIPAHU - TRIBUTARY AREAS 3 & 4
REFERENCE MAPS: CITY PLANNING COMMISSION, SEWER MASTER PLAN

PAGE: 1 of 4
COMPUTED BY: DSK
DATE: 2/25/96

SEWER LOCATION: DISTRICT ZONE OR STREET	(SMH) POINT	TRIBUTARY AREA (ACRES): INCREMENT	TRIBUTARY AREA (ACRES): TOTAL	TRIBUTARY EQUIVALENT POPULATION: RESIDENTIAL INCREMENT	RESIDENTIAL TOTAL	OTHER INCREMENT	OTHER TOTAL	TOTAL INCREMENT	TOTAL TOTAL	WASTEWATER FLOW COMPUTATION: AVERAGE WASTEWATER FLOW @ ___ GPCD	MAX FLOW FACTOR	MAX FLOW (MGD)	DRY WEATHER INFILTRATION @ ___ GPAD (1) 5 (2) 35	DESIGN AVG. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	WET WEATHER INFILTRATION @ ___ GPAD (1) 1250 (2) 2750	DESIGN PEAK FLOW (MGD)	EXISTING / ULTIMATE SEWER STUDY: PIPE DIAMETER (IN)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)	
WAIPAHU ST / KUAHOI ST	0177		60.4						1032 (1)	.083	4.97	.91	.005	.005	.415	.076	.49	10				9.16
			60.4			TRIB. AREA 3			1032 (1)	.083	4.97	.91	.005	.005	.415	.076	.49	10				
WAIPAHU ST NEAR WAIKELE STR. BRIDGE	0176	7.89				789		789														
			68.29						1821 (1)	.146	4.44	.648	.009	.155	.657	.085	.74	10	.41		.82	70.3
WAIPAHO ST	0175																					
			68.29			TRIB. AREA 4			1821 (1)								.74	10	.41		.82	70.3
	0174	10.07				1007		1007														
			78.36						2828 (1)	.226	4.06	.919	.014	.240	.933	.098	1.03	10	1.28		1.40	73.6
WAIPAHU CUL. GARDENS PARK	0173																					

REMARKS: (1) Applied Dry Weather I/I & Wet Weather I/I of 5 gpcd & 1250 gpad, respectively.
(2) Applied Dry Weather I/I & Wet Weather I/I of 35 gpcd & 2750 gpad, respectively.

A-17

APPENDIX A-4C

COMPUTATION OF WASTEWATER FLOW

SEWER: 15" SEWER LINE THROUGH WAIPAHU CULTURAL GARDENS PARK (PROPOSED M.P.)
DISTRICT: WAIPAHU - TRIBUTARY AREAS 3 & 4
REFERENCE MAPS: CITY PLANNING COMMISSION, SEWER MASTER PLAN.

PAGE: 2 of 4
COMPUTED BY: DSK
DATE: 2/25/96

SEWER LOCATION: DISTRICT ZONE OR STREET	(SMH) POINT	TRIBUTARY AREA (ACRES): INCREMENT	TRIBUTARY AREA (ACRES): TOTAL	TRIBUTARY EQUIVALENT POPULATION: RESIDENTIAL INCREMENT	RESIDENTIAL TOTAL	OTHER INCREMENT	OTHER TOTAL	TOTAL INCREMENT	TOTAL TOTAL	WASTEWATER FLOW COMPUTATION: AVERAGE WASTEWATER FLOW @ ___ GPCD	MAX FLOW FACTOR	MAX FLOW (MGD)	DRY WEATHER INFILTRATION @ ___ GPAD (1) 5 (2) 35	DESIGN AVG. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	WET WEATHER INFILTRATION @ ___ GPAD (1) 1250 (2) 2750	DESIGN PEAK FLOW (MGD)	EXISTING / ULTIMATE SEWER STUDY: PIPE DIAMETER (IN)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)	
	0173																					
			78.36 (1)						2828 (1)	.226	4.06	.919	.014	.240	.933	.098	1.03	12	.31		1.14	70.9
	0172																					
			78.36 (1)						2828 (1)								1.03	12	.31		1.14	70.9
	0171																					
			78.36 (1)						2828 (1)								1.03	15	.22		1.69	60.7
	0169																					
			78.38 (1)						2828 (1)	.226	4.06	.919	.014	.240	.933	.098	1.03	12	1.03		2.02	51.0
	0168	16.0																				

REMARKS: (1) Applied Dry Weather I/I & Wet Weather I/I of 5 gpcd & 1250 gpad, respectively.
(2) Applied Dry Weather I/I & Wet Weather I/I of 35 gpcd & 2750 gpad, respectively.

A-18

APPENDIX A-4C

COMPUTATION OF WASTEWATER FLOW

SEWER: 15" SEWER LINE IN WAIPAHU CULTURAL GARDENS PARK (PROPOSED M.P.)
DISTRICT: WAIPAHU - TRIBUTARY AREA 3 & 4
REFERENCE MAPS: CITY PLANNING COMMISSION, SEWER MASTER PLAN

PAGE: 3 of 4
COMPUTED BY: DSC
DATE: 2/28/96

SEWER LOCATION		TRIBUTARY AREA (ACRES)		TRIBUTARY EQUIVALENT POPULATION						WASTEWATER FLOW COMPUTATION								EXISTING / ULTIMATE SEWER STUDY			
				RESIDENTIAL		OTHER		TOTAL													
DISTRICT ZONE OR STREET	POINT	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	AVERAGE INFILTRATION FLOW @ 250 GPAD	MAX FLOW FACTOR	MAX FLOW (MGD)	DRY WEATHER I/I ALLOWANCE @ 5 GPCD (1) 35 GPCD (2)	DESIGN AVE. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	WET WEATHER I/I ALLOWANCE @ 1250 GPAD (1) 2750 GPAD (2)	DESIGN PEAK FLOW (MGD)	PIPE DIAMETER (IN)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)	
WAIPAHU CULTURAL GARDENS	0168	16.0				10		10													
			78.34(1) 16.0(2)						10(2)	.227	4.06	.921	.014	.241	.935	.142	1.08	15	.22		1.69	63.9
3 Bds. 9-14-3:17	0167	.76 .84		12		10		22													
			78.34(1) 7.6(2)						32(2)	.229	4.05	.928	.015	.244	.943	.146	1.09	15	.24		1.79	60.9
9-4-3:17	0166	.36				15		15													
			78.34(1) 17.94(2)						49(2)	.230	4.05	.931	.016	.246	.947	.147	1.09	15	.26		1.85	58.9
BIG WAY SUPERMKT 9-4-13:14,15	0165	.03 .13				50		50													
			78.34(1) 18.72(2)						97(2)												

REMARKS: (1) Applied Dry Weather I/I & Wet Weather I/I of 5 gpcd & 1250 gpad, respectively.
(2) Applied Dry Weather I/I & Wet Weather I/I of 35 gpcd & 2750 gpad, respectively.

APPENDIX A-4C

COMPUTATION OF WASTEWATER FLOW

SEWER: 15" SEWER LINE IN WAIPAHU CULTURAL GARDENS PARK (PROPOSED MP)
DISTRICT: WAIPAHU TRIBUTARY AREA 3 & 4
REFERENCE MAPS: CITY PLANNING COMMISSION, SEWER MASTER PLAN

PAGE: 4 of 4
COMPUTED BY: DSC
DATE: 2/25/96

SEWER LOCATION		TRIBUTARY AREA (ACRES)		TRIBUTARY EQUIVALENT POPULATION						WASTEWATER FLOW COMPUTATION								EXISTING / ULTIMATE SEWER STUDY			
				RESIDENTIAL		OTHER		TOTAL													
DISTRICT ZONE OR STREET	POINT	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	AVERAGE INFILTRATION FLOW @ 250 GPAD	MAX FLOW FACTOR	MAX FLOW (MGD)	DRY WEATHER I/I ALLOWANCE @ 5 GPCD (1) 35 GPCD (2)	DESIGN AVE. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	WET WEATHER I/I ALLOWANCE @ 1250 GPAD (1) 2750 GPAD (2)	DESIGN PEAK FLOW (MGD)	PIPE DIAMETER (IN)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)	
	0165																				
			78.34(1) 18.72(2)			Kam. Tun Area 5			28(2) 97(2)	.234	4.03	.944	.018	.252	.962	.149	1.11	15	1.24		4.04	27.5
WAIPAHU DEPT BUILD	0164	13.80				1932			49(2) 97(2)	.389	3.64	1.416	.027	.416	1.443	.167	1.61	15	.26		1.85	87.0
			92.14(1) 18.72(2)																		
	0163																				

REMARKS: (1) Applied Dry Weather I/I & Wet Weather I/I of 5 gpcd & 1250 gpad, respectively.
(2) Applied Dry Weather I/I & Wet Weather I/I of 35 gpcd & 2750 gpad, respectively.

APPENDIX A-5B

COMPUTATION OF WASTEWATER FLOW

SEWER: 8" MAIN IN WAIPAHU DEPOT ROAD (EXISTING CONDITION)
DISTRICT: WAIPAHU TRIBUTARY AREA 5
REFERENCE MAPS: City SEWER MASTER PLAN - WAIPAHU

PAGE: 1 of 1
COMPUTED BY: DSK
DATE: 8/28/95, rev 2/24/96

SEWER LOCATION		TRIBUTARY AREA (ACRES)		TRIBUTARY EQUIVALENT POPULATION						WASTEWATER FLOW COMPUTATION								[✓] EXISTING [ ] ULTIMATE SEWER STUDY				
				RESIDENTIAL		OTHER		TOTAL														
DISTRICT ZONE OR STREET	POINT	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	AVERAGE DRY WEATHER FLOW @ ___ GCD (MGD)	MAX FLOW FACTOR	MAX FLOW (MGD)	WET WEATHER INFILTRATION @ ___ GAD (MGD)	DESIGN AVE. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	WET WEATHER INFILTRATION @ ___ GAD (MGD)	DESIGN PEAK FLOW (MGD)	PIPE DIAMETER (IN)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)	% FULL
SMH 0259																						
		No present flow from Mill															0	8	7.12		2.04	0
0258																						
		No present flow from Mill															0	8	6.60		1.74	0
0164		79.4																				
									1129[1]	.07	4.88	0.44	.04	.13	.48	.24	.75	15	.26		1.85	40.5
0163																						

REMARKS: (1) Figures obtained from DPW/WW - Public Service Section

A-22

APPENDIX A-5A

COMMUNITY PLANNING, INC.
PROJECT: OAHU SUGAR MILL
SUBJECT: SEWER MASTER PLAN
DATE: 02/15/96, rev. 02/24/96
BY: DSK

COMPUTATION OF WASTEWATER QUANTITY

SEWER: 8" IN WAIPAHU DEPOT ROAD - TRIBUTARY AREA 5
DISTRICT: WAIPAHU
PROJECT: OAHU SUGAR MILL SEWER MASTER PLAN
REF. MAPS: PLANNING DEPT. SEWER MASTER PLAN

SEWER LOCATION		TRIBUTARY AREA		TRIB. EQUIV. POP.			
DISTRICT	POINT (SMH)	INCR. (ACRES)	TOTAL	RESID. (UNITS)	UNIT CAPITA	TOTAL (CAPITA)	COMMENT
COMMERCIAL	0259	13.80			140.0	1,932	
			13.80			1,932	

WASTEWATER FLOW COMPS

AVE WW FLOW 80GCD (MGD)	MAX FLOW FACTOR (5/P^0.2)	MAX FLOW (MGD)	DRY WTHR FLOW 5.00 GCD (MGD)	DSGN AVE FLOW (MGD)	DSGN MAX FLOW (MGD)	WET WTHR FLOW 1250.00 GAD (MGD)	DSGN PEAK FLOW (MGD)
0.155	4.383	0.677	0.010	0.164	0.687	0.017	0.704

APPENDIX A-5C

COMPUTATION OF WASTEWATER FLOW

SEWER: 8" SEWER MAIN IN WAIPAHU DEPOT ROAD (PROPOSED MASTER PLAN)
DISTRICT: WAIPAHU TRIBUTARY AREA 5
REFERENCE MAPS: CITY PLANNING COMMISSION SEWER MP

PAGE: 1 of 1
COMPUTED BY: DSC
DATE: 12/16/96, rev 12/24/96

SEWER LOCATION		TRIBUTARY AREA (ACRES)		TRIBUTARY EQUIVALENT POPULATION						WASTEWATER FLOW COMPUTATION								EXISTING / ULTIMATE SEWER STUDY				
				RESIDENTIAL		OTHER		TOTAL														
DISTRICT ZONE OR STREET	STA / POINT	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	INCREMENT	TOTAL	UNIT CONTRIBUTION @ 275 GPD/AC	MAX FLOW FACTOR	MAX FLOW (MGD)	INFILTRATION @ 5 GPD/AC (I)	DESIGN AVG. FLOW (MGD)	DESIGN MAX. FLOW (MGD)	INFILTRATION @ 1250 GPD/AC (I)	DESIGN PEAK FLOW (MGD)	PIPE DIAMETER (in)	SLOPE (%)	VELOCITY (FPS)	CAPACITY (MGD)	%Full
WAIPAHU ST / WAIPAHU DEPOT RD	0291	13.80				1932		1932														
			13.80						1932	.155	4.36	.679	.010	.165	.689	.017	.706	8	9.12		2.04	34.6
WAIPAHU DEPOT ROAD	0258																					
									1932								.706	8	6.60		1.74	40.6
	0169	97.03						2925														
			119.83						4857	.389	3.64	1.416	.029	.413	1.44	.139	1.58	15	.26		1.85	100%
	0163																					

REMARKS: (1) Applied Dry Weather & Wet Weather I/I of 5 gpad & 1250 gpad, respectively
(2) Applied Dry Weather & Wet Weather I/I of 35 gpad & 2750 gpad, respectively

Appendix K-1

Department of Wastewater Management Letter

DEPARTMENT OF WASTEWATER MANAGEMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 3RD FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 527-6663 • FAX: (808) 527-6675

JEREMY HARRIS
MAYOR

FELIX B. LIMTIACO, P.E.
DIRECTOR

CHERYL K. OKUMA-SEPE, ESQ.
DEPUTY DIRECTOR

In reply refer to:
WCC 96-82

September 24, 1996

RECEIVED
SEP 25 1996
COMMUNITY PLANNING, INC.

Mr. Bernard P. Kea
Community Planning, Inc.
745 Fort Street, Suite 400
Honolulu, Hawaii 96813

Dear Mr. Kea:

Subject: Oahu Sugar Company Property Sewer Master Plan
Revised on July 17, 1996

We have reviewed and approve the subject sewer master plan with the revised sheets 1, 4, and 5 submitted on July 17, 1996. As indicated, the developer will provide an interconnection between the existing 24-inch sewer line and 36-inch Mililani effluent sewer line in Waipahu Depot Road to bypass the inadequate 30-inch sewer line section. However, sewage capacity reservation is contingent on submittal and approval of a "Sewer Connection Application" form. Also, connections to the Waipahu Wastewater Pump Station (WWPS) are being done on a case by case basis until a final determination is made as to the capacity of the Waipahu WWPS.

Please submit two more complete copies of this wastewater master plan for our files.

If you have any questions, please contact Ms. Tessa Yuen of the Service Control Branch at 523-4956.

Very truly yours,

FELIX B. LIMTIACO
Director

Appendix L

Preliminary Drainage System Study

MASTER PLAN
PRELIMINARY DRAINAGE SYSTEM STUDY
OAHU SUGAR COMPANY PROPERTY
WAIPAHU, EWA, OAHU, HAWAII

TAX MAP KEY: 9-04-02: 4

PREPARED FOR

AMFAC/JMB HAWAII, INC.
700 BISHOP STREET, 21ST FLOOR
HONOLULU, HAWAII 96813

PREPARED BY

COMMUNITY PLANNING, INC.
745 FORT STREET, SUITE 400
HONOLULU, HAWAII 96813

MARCH 1996

TABLE OF CONTENTS

I. PURPOSE OF REPORT

The purpose of this report is to prepare a drainage master plan for the redevelopment of the Oahu Sugar Company property in Waipahu.

This report will serve as the basis for implementing drainage system improvements for the proposed redevelopment projects as shown on the present master plan by PBR-Hawaii. See EXHIBIT 1 - PROPOSED LAND USE PLAN.

II. EXECUTIVE SUMMARY

The Oahu Sugar Company property in Waipahu consists of approximately 61 acres and includes a concentration of structures formerly used for commercial, industrial and office purposes along its frontage on Waipahu Street and an open area at the back of the property formerly used for movement and storage of cane haul trucks and equipment.

The Oahu Sugar Company harvested its last sugar crop in 1995 and the site is proposed to be used for an industrial subdivision, a commercial center with a historical park built around the smoke stake, former power plant and laboratory buildings, a YMCA site (former administration and human resources buildings), an office/commercial building (existing Waipahu Store building), a new Filipino community center, and expansion of Hans L'Orange Park. The proposed master plan is shown in EXHIBIT 1.

The City's Storm Drainage Standards, available city records, and site topographic maps were used to estimate the storm drainage runoff from the property for both the existing conditions and the proposed development master plan. The runoff quantities were then compared to the capacity of the existing municipal drainage systems in the vicinity.

Storm runoff from the Oahu Sugar Company property flows to three drainageways in the vicinity of the property. These drainageways are the Waikele Stream, the Kapakahi Stream and the Kahu/Wailani Stream Drainage Channel which eventually drain into Pearl Harbor. See EXHIBIT 2 - LOCATION MAP, for the relative location of the project site to these drainageways. The property is outside of the floodway as defined by the Federal Emergency Management Agency's (FEMA) as shown on EXHIBIT 3 - FLOOD ZONE. The existing drainage collection system in the vicinity of the property is shown in EXHIBIT 4 - EXISTING DRAINAGE SYSTEM.

The proposed drainage plan for the development is to limit the amount of runoff to the existing Mokuola Street drain system to the present amount of flow, thereby maintaining the same total discharge in the existing drainage system to Wailani Stream. It was estimated that the increase in runoff to this system was less than 1 cfs and detention

techniques can be employed in the grading design of the park expansion and the community center to reduce and/or eliminate this relatively small increase. In addition, storm runoff that was pumped to the Waipio Peninsula will be diverted to the Waikele Stream. In diverting storm runoff to Waikele Stream, the flow to the Waipahu Street drain system will be reduced. The total area and runoff flowing into Waikele Stream for the existing condition and the proposed condition are 6.71 acres and 12.1 cfs and 76.52 acres and 154.0 cfs, respectively. The additional drainage area to Waikele Stream is small when compared to its total drainage area of 45 square miles.

The design discharges for the Paiwa Street drainage system were updated to conform to the revised rainfall intensities specified in the current City Drainage Standards. The original design discharge from the property was 62.7 cfs from 18.3 acres. The total drainage area and discharge for the existing condition and the proposed condition are estimated at 16.01 acres and 32.3 cfs and 16.59 acres and 51.7 cfs, respectively. Therefore, the Paiwa Street drain will be adequate to accommodate the runoff from the eastern portion of the industrial subdivision. See EXHIBIT 5 - PROPOSED DRAINAGE SYSTEM.

III. EXISTING DRAINAGE SYSTEM

The Oahu Sugar Company property is located in Waipahu on Waipahu Street adjacent to the Hans L'Orange Park. The property is located on a knoll so that storm runoff drains into three drainageways in the area. These drainageways are the Waikele Stream, the Kapakahi Stream, and the Kahu/Wailani Drainage Channel. All three of these drainageways drain into Pearl Harbor. See EXHIBIT 2 - LOCATION MAP.

The property lies outside the flood zone as defined by the FEMA Insurance Rate Map as shown in EXHIBIT 3 - FLOOD INSURANCE RATE MAP. The Waikele and the Kapakahi Streams are in the flood zone.

EXHIBIT 4 shows the existing drainage systems in the vicinity of the site. The major drain systems are the Paiwa Street 96-inch drain line draining into the Kahu Drainage Channel and the Waipahu/Mokuola Streets 24- and 36-inch drain line draining into the Wailani Stream Channel.

IV. MASTER PLAN

A. The master plan for the Oahu Sugar Company property as shown on EXHIBIT 1 - PROPOSED LAND USE, involves the subdivision of the lot into the approximate areas of the proposed uses as follows:

Table 1
LAND USE AREAS

Land Use	Area (acres)
Commercial	13.8
Historic Park	2.0
YMCA	2.0
"Waipahu Store" Office/ Commercial Building	0.5
Community Center	2.0
Light Industrial	28.4
Park Expansion	3.2
Access/Streets	9.1
Total	61.0

B. Several existing buildings on the Oahu Sugar Company property will remain. These include the former generator building and laboratory buildings for the historic park, the former administration and human resources buildings for the YMCA, and the "Waipahu Store" building.

C. Runoff from the historic park, YMCA, community center, park expansion, and a portion of the light industrial lots east of the Mokuola Street extension will flow to the Waipahu Street/Mokuola Street drainage system.

D. Runoff from the commercial site and the light industrial subdivision west of the Mokuola Street extension will flow to Waikele Stream. There will be three outlets to Waikele Stream.

E. Runoff from the major portion of the light industrial subdivision east of the Mokuola Street extension will flow to the Paiwa Street drainage system.

F. The project will be developed in three increments. The first increment will be the industrial subdivision east of the Mokuola Street extension and the historic park, YMCA and park expansion. The second increment will be the industrial subdivision west of the Mokuola Street extension, and the third increment will be the commercial lot.

V. STORM DRAINAGE DESIGN CRITERIA

The "Storm Drainage Standards" of the Department of Public Works, City and County of Honolulu, dated May 1988 (Drainage Standards), will be used to establish design criteria for the development.

A. Hydrology: Runoff was based on the storm recurrence interval of ten years and using the Rational Formula:

Q = CIA

where, Q = Storm runoff rate (cfs)

C = Runoff coefficient

I = Rainfall intensity (i) corrected for a duration equal to the time of concentration (Tc)

The runoff coefficients shown in Table 2 below were used for the described conditions in the determination of runoff from recently made topographic maps of the property and for the proposed developments.

Table 2
RUNOFF COEFFICIENTS

Surface	"C" Value
Grassed	0.55
Bare Dirt	0.55
Asphalt Paving	0.85
Shingle/Composition Roofs	0.85
Metal Roofs	0.90
Concrete Walks, Slabs	0.90
CRM Walls	0.80
Single Family Lots	0.60
Multi-Family Lots	0.75
Commercial Lots	0.80
Industrial Lots	0.80

In the estimation of runoff from the development, a runoff per acre (CI) was used based on a time of concentration of 10 minutes and applying the correction factor (2.3) to the rainfall intensity and the runoff coefficients. Thus, for the light industrial and commercial areas,

CI(10) = 0.80 x (1.82"/hr) x 2.3 = 3.35 cfs/ac.

A comparison of this runoff factor with the 3.6 cfs/ac. at the Waikele Commercial Center and 3.33 cfs/acre for the Paiwa Street Drain Improvements indicate this factor is reasonable.

B. Hydraulics Grade Line Computations: The sizes of the drain lines will be based on the procedure outlined in the DPW Drainage Standards. For pipe flow, Manning's Formula (V = (1.486/n)*R^2/3*s^1/2) is used with the "n" values given in Table 3 below.

Table 3
VALUES OF "n"

Material	"n" Value
Reinforced Concrete Box Culvert	0.015
Reinforced Concrete Circular Pipe	0.013

VI. EXISTING STORM DRAINAGE SYSTEM ANALYSIS

EXHIBIT 4 shows the existing storm drainage systems in the vicinity of the Oahu Sugar Company property.

Review of the City's Department of Public Works' Drainage Section files for the Kahu and Wailani Stream Drainage Channel revealed that flows were determined by Plate 6 of the City's Drainage Standards and, therefore, provided no information for runoff from smaller areas.

Using recently made topographic maps of the site, the hydrology of the existing site was prepared. The storm runoff from the property is generated from eight drainage areas. These drainage areas are shown on the Runoff Map for the Existing Conditions in the appendix. Hydrologic calculations for the existing condition are also included in the appendix. The following are brief descriptions of the drainage areas and their drainage systems. Drainage Area I includes the property east of the mill structures, Hans L'Orange Park, Waipahu Street from the entry road to Paiwa Street, the residential areas below Waipahu Street, and the new Waipahu Civic Center. This drainage area is 34.1 acres, of which 11.36 acres are from the Oahu Sugar Company property. The estimated 10-year runoff quantity from this drainage area was 102.1 cfs, of which 32.9 cfs were generated from the property.

The storm runoff from Drainage Area I is collected in the Waipahu/Mokuola Street system which includes concrete ditches, grated inlets, catch basins, drain manholes and pipes ranging from 18 to 48 inches. A branch main with catch basins near the Waipahu Store building runs through the Salvation Army lot to Kahuailani Street which then connects to the 18-inch drain line in Mokuola Street. This 18-inch drain line runs parallel to a 36-inch drain line, increases to 24 inches before it connects to the 36-inch drain line at DMH A-2 at Kauolu Street. The runoff is discharged into Wailani Stream Drainage Channel from the Waipahu Civic Center property. Prior to 1977, the runoff from Hans L'Orange Park and a portion of the Oahu Sugar Company property, flowed to Kahuailani Street and discharged into Wailani Stream further upstream from the Mokuola Street drain. In 1977, the City diverted the Hans L'Orange Park runoff to Mokuola Street by their Waipahu Street/Kahuailani Street Relief Drain Project. In 1987, the Mokuola Street extension was constructed by the Hawaii Housing Authority

for elderly and low income housing projects extending the drain system to Wailani Stream. A review of the as-built construction drawings of Mokuola Street indicates an inadequate freeboard at the existing DMH (A-2) where the 24- and 36-inch drain lines meet. Since the runoff map and the hydraulic calculations were not available, the runoffs from the street were taken from the as-built drawings and estimated contributions from the civic center. This runoff was added to that of Drainage Area I.

Drainage Area II consists of 23.68 acres on the property and 10.74 acres off-site, totalling 34.42 acres. The property includes the majority of the mill facilities and a portion of the open area in the back of the mill. The off-site areas draining into the property include a portion of the Hongwanji and Jack Hall Housing, Manager's Drive roadway from the H-1 overpass to the property, a portion of the Waipahu Estates Unit 4 park, and a portion of the City's lot, mauka of the property. The 10-year runoff quantity from this drainage area was estimated at 86.16 cfs, of which 61.27 cfs were contributed from the property. An old drawing entitled "Oahu Sugar Company, Ltd., Map-Mill Yard Vicinity, C. E. Dept." shows that the ditch water is piped to the pump house. However, according to Mr. Elmer Nii, the plant supervisor, the pipe is blocked and the ditch overflows after it fills with storm runoff. When the ditch overflows, the runoff will sheet flow to Waipahu Street at the back entry at Kopaa Street.

The drainage system for Drainage Area II is a network of drain inlets, interceptor ditches and gutters in and around the mill structures. The runoff is channelized to a pump house near the steam generator building. The pump house contains an 11 mgd (17 cfs) pump which pumps the collected runoff through a 36-inch mud line in Waipahu Depot Road to the existing desilting basins in Waipio Peninsula.

Drainage Area III is 2.56 acres, of which 2.39 acres are on the property and 0.24 acre is off-site. This drainage area includes one-half of the roof of the automotive repair building and the slopes fronting Waipahu Street and a portion of Waipahu Street. The 10-year runoff quantity from the third drainage area was estimated at 7.05 cfs, of which 2.39 cfs were contributed by the property. The runoff is collected in a system which consists of a grated inlet, a short concrete channel, catch basins, a drain manhole, 18- to 24-inch diameter pipes, and a headwall. The collected runoff is discharged into Kapakahi Stream in the Waipahu Cultural Gardens Park.

Drainage Area IV is the slopes along Waipahu Street from the back entry road near Waipahu Depot Road and a portion of Waipahu Street. This drainage area is 2.23 acres consisting of 1.61 acres on the property and 0.62 acre off-site. The runoff quantity for the 10-year storm was estimated at 7.46

cfs, of which 3.96 cfs were contributed from the property. The runoff sheet flows to a drainage system consisting of a catch basin and a 2.58 feet x 2.25 feet box drain in Waipahu Street. The catch basin is located on the mauka side of the street and the box drain crosses Waipahu Street and enters a drainage easement, in favor of Oahu Sugar Company, over three properties (Tax Map Key: 9-4-13: 14, 16 and 17) to Kapakahi Stream near the Big Way Supermarket on Waipahu Depot Road.

Drainage Area V is an open area of 11.58 acres, of which 0.55 acre is off-site and from the City's lot. The runoff surface flows to Waipahu Street and eventually in the Waipahu Cultural Garden Park. The 10-year runoff from this site is estimated at 22.0 cfs with 21.0 cfs contributed from the property.

Drainage Area VI is another open area of 5.99 acres, of which 2.54 acres are off-site and from the City's lot. The runoff surface flows onto an existing cane haul road and eventually flows to Waikele Stream at a location upstream of the Waipahu Street bridge. The 10-year runoff was estimated at 10.1 cfs with 6.03 cfs contributed from the property.

Drainage Area VII is the slopes, within the property, along Waipahu Street which runs adjacent to Waikele Stream. The runoff surface flows into Waikele Stream. The 10-year runoff was estimated at 2.02 cfs.

Drainage Area VIII consists of 11.03 acres, of which 9.27 acres are the on-site, open area between Hans L'Orange Park and the Jack Hall Housing. Off-site runoff is contributed into the site from a portion of the Jack Hall Housing and a small area of slope created by the access road to the Waikele Commercial Center's employee parking project. The total runoff estimated from this drainage area was 19.0 cfs, and 15.1 cfs were contributed from the site. The runoff flows to an existing field inlet (P1-b) which is piped to the 96-inch drainage system at Catch Basin P1 on Paiwa Street. In reviewing the as-built construction drawings for the Paiwa Street Improvement District and Drainage Improvements, two other field inlets were connected to a 30-inch drain line to Catch Basin P2. These field inlets served the former cane haul road, and an 18-inch drain line from the Jack Hall Housing is connected to one of the field inlets. The Jack Hall drain line is in an easement from the connection at Catch Basin P2 to the Jack Hall Housing property line. Currently, the 30-inch drain line has been modified by the construction of the access road to the Waikele Commercial Center's employee parking.

VII. PROPOSED STORM DRAINAGE SYSTEM ANALYSIS

EXHIBIT 5 shows the proposed drainage system in the development. The drainage areas for the proposed condition

is shown on the Runoff Map for the Proposed Conditions which is included in the appendix together with the hydrological calculations for those areas. Hydrologic calculations for the proposed conditions are also included in the appendix. The following are brief descriptions of the drainage areas and the drainage systems which will serve these areas.

Drainage Area I remains essentially unchanged. This drainage area will include the park expansion, the community center, the YMCA and one industrial lot abutting Hans L'Orange Park. With the new developments, the drainage area will be slightly smaller at 33.48 acres and give a larger 10-year runoff of 102.25 cfs verses the existing condition of 33.59 acres and 102.12 cfs, respectively. Similarly, the contributing area from the property decreased from 11.36 acres to 11.25 acres, but the runoff increased from 32.89 cfs to 33.03 cfs. During the design of the grading of the park expansion and the community center/YMCA, detention techniques can be used to reduce the flow from the property. Therefore, the project will not increase the runoff into the existing Waipahu/Mokuola Streets drainage system.

The proposed Drainage Area II will be reduced in area from 34.42 acres to 17.93 acres and the runoff will be diverted from the Waipio Peninsula to the Waikele Stream. A portion of Drainage Area III will be absorbed into Drainage Area II. This drainage area will encompass the commercial area and a portion of the light industrial lots on the lower west side of the Mokuola Street extension. This runoff will be piped to Waikele Stream. The 10-year runoff was estimated at 60.1 cfs. The off-site drainage areas will be diverted to the proposed Drainage Area V.

The proposed Drainage Area III will be reduced in area as a portion of the drainage area will become part of the proposed Drainage Area II and portion of the slope along Waipahu Street is graded down to meet the grades of the new road connection with Waipahu Street. The existing catch basins will remain to intercept flow from this drainage area.

Drainage Area IV will absorb a portion of Drainage Area II covering half of the generator building roof. Also, the area will be reduced by grading the slopes along Waipahu Street as described above for Drainage Area III. This area will be absorbed into Drainage Area II and reduce the runoff from the slope. It was estimated that the total runoff will decrease from 7.46 cfs to 6.33 cfs and the area will decrease from 2.23 acres to 2.09 acres.

The runoff will continue to surface flow to the catch basin in Waipahu Street just west of Waipahu Depot Road. A portion of the commercial area will be located in this drainage area.

The proposed Drainage Area V will increase in area from 11.58 acres to 22.22 acres. Under the existing conditions, Drainage Area V flowed overland from the property to Waipahu Street and into the Waipahu Cultural Gardens Park. The proposed Drainage Area V will absorb the off-site drainage areas from Drainage Area II which includes the Hongwanji and Jack Hall Housing, the existing Manager's Drive, a portion of the Waipahu Estates 4 park, and a portion of the City's lot. The total off-site area is 11.34 acres. A portion of the light industrial lots west of the Mokuola Street extension is in this drainage area. The total 10-year runoff was estimated at 61.6 cfs with 36.45 cfs contributed from the property. A portion of this Drainage Area III will continue to flow overland into Waipahu Street and the Waipahu Cultural Gardens Park. This area was designated Drainage Area VA, which is located on the slopes along Waipahu Street and is 0.77 acre with a 10-year runoff of 2.2 cfs.

The existing condition runoff of Drainage Area VI drained onto a cane haul road then entered Waikele Stream at some point upstream of the Waipahu Street bridge. In the proposed Drainage Area VI, the off-site area will be diverted by a cut-off ditch at the mauka property line and piped into the drainage system serving the lots in the upper portion of the western industrial subdivision.

The runoff will be piped to Waikele Stream just downstream of the Waipahu Bridge. The total area of this drainage area is 10.80 acres with 8.24 acres on-site. The total 10-year runoff was estimated at 31.2 cfs with 27.59 cfs contributed from on-site.

The area of proposed Drainage Area VII will be reduced due to grading of the industrial lots near the slope. The area will decrease from 0.72 acre to 0.42 acre and correspondingly, the surface runoff will decrease from 2.0 cfs to 1.2 cfs. The runoff will continue to surface flow over Waipahu Street to Waikele Stream.

In Drainage Area VIII, there are two catch basins in the Paiwa Street drainage system where connections can be made. The drainage area was divided into two areas, the mauka area (VIIIA) consisting of the off-site area of a portion of the Jack Hall Housing and a sloped area from the access road to the Waikele Commercial Center's employee parking. In addition, this new drainage system will intercept the existing 18-inch drain line from the Jack Hall Housing before connecting to the new DMH 1-C installed in the Paiwa Street intersection improvement project. The interception of this line will allow the abandonment of the 30-inch drain line which cuts the roadside lot in half. Drainage Area VIIIA is 7.5 acres with a 10-year runoff of 21.1 cfs.

Drainage Area VIIIB will connect to the existing Field Inlet P1-b located near the Hans L'Orange Park CRM wall. The inlet is connected to CB P1 with a 36-inch drain line. The design area and flow to this inlet were 15.3 acres and 51.9 cfs, respectively. The estimated area and runoff from Drainage VIIIB were 9.09 acres and 30.45 cfs. The entire area is a portion of the industrial lots east of the Mokuola Street extension.

The Paiwa Street drainage system was designed in the early seventies using the 1969 Drainage Standards. In the current Drainage Standards the rainfall intensity in Plates 1 and 2 are about 20 percent less than the 1969 Standards. Therefore, to update the design discharges in the drainage system to the current standard will lower the design discharges and consequently lower the hydraulic grade line (HGL). The appendix includes the original and updated HGL calculations from the Kahu Channel to CB P2. The HGL was found to be lower at the connection points CB P1 and CB P2, which indicates that the Paiwa Street Drainage system is adequate to handle the flows from the eastern portion of the industrial subdivision.

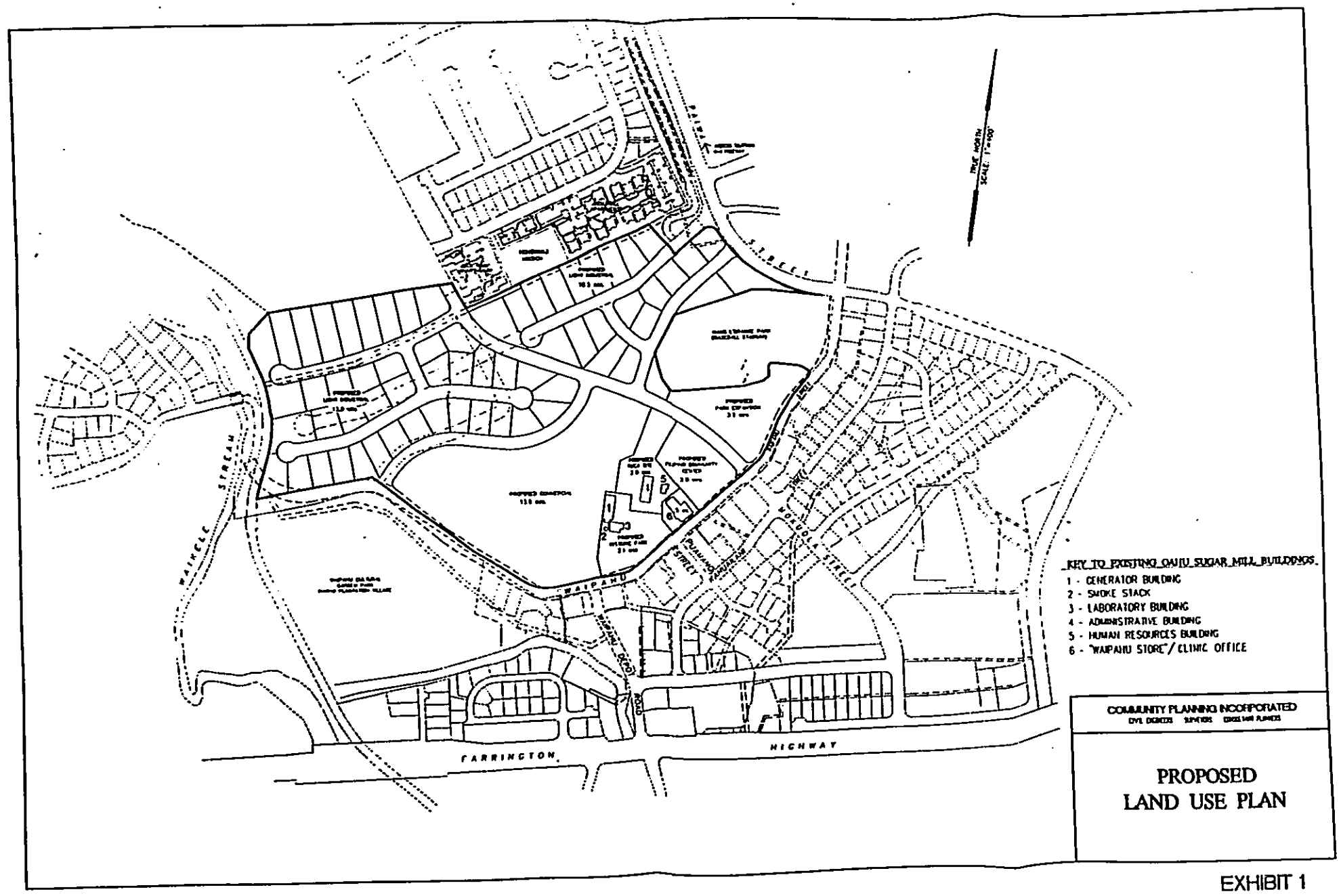
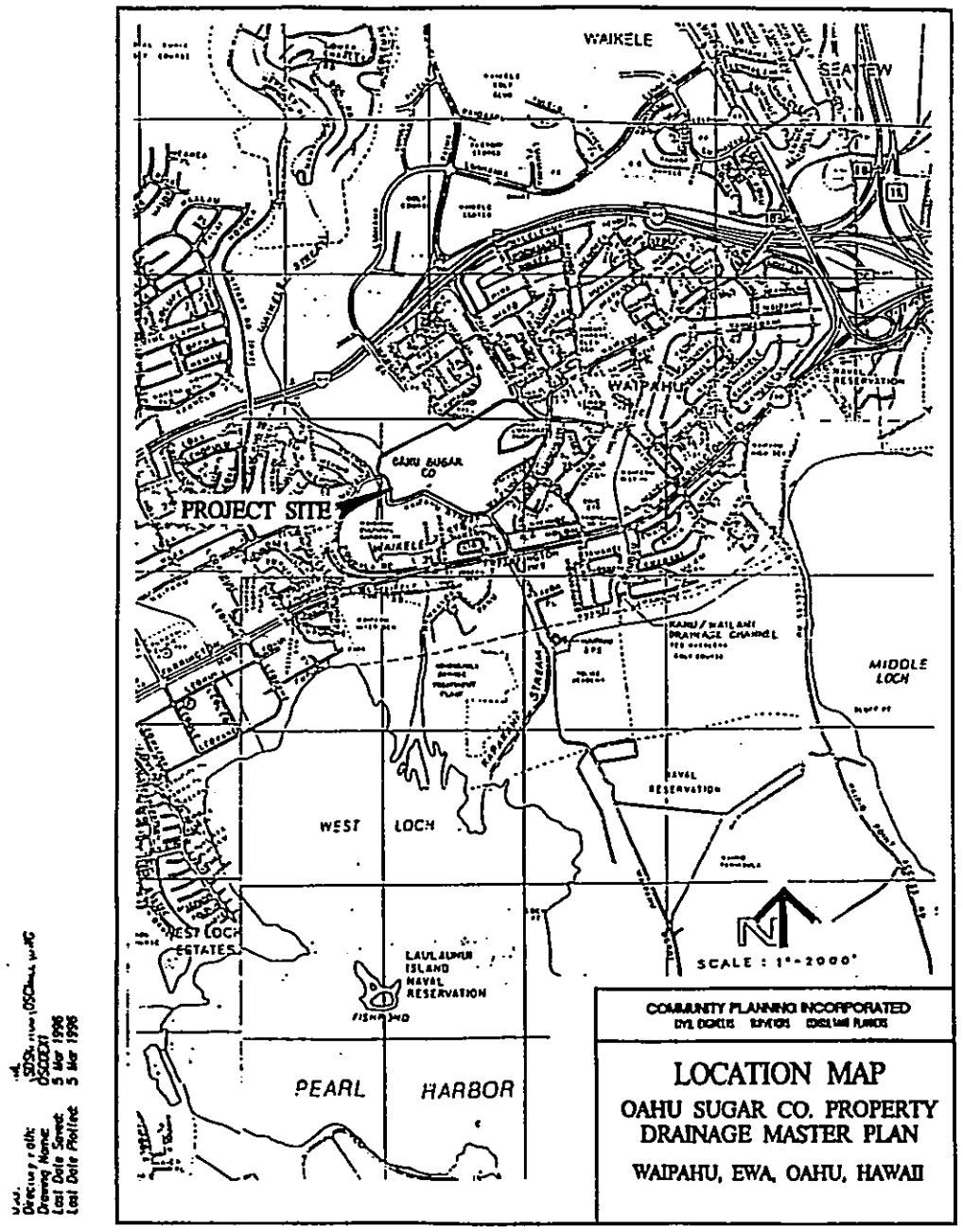

TRUE NORTH
SCALE 1"=600'
KEY TO EXISTING OAHU SUGAR MILL BUILDINGS
1 - GENERATOR BUILDING
2 - SMOKE STACK
3 - LABORATORY BUILDING
4 - ADMINISTRATIVE BUILDING
5 - HUMAN RESOURCES BUILDING
6 - "WAIPAHU STORE"/ CLINIC OFFICE
WAIPAHU
FARRINGTON
HIGHWAY
COMMUNITY PLANNING INCORPORATED
CIVIL ENGINEERS SURVEYORS CONSULTANT PLANNERS
PROPOSED
LAND USE PLAN

EXHIBIT 1



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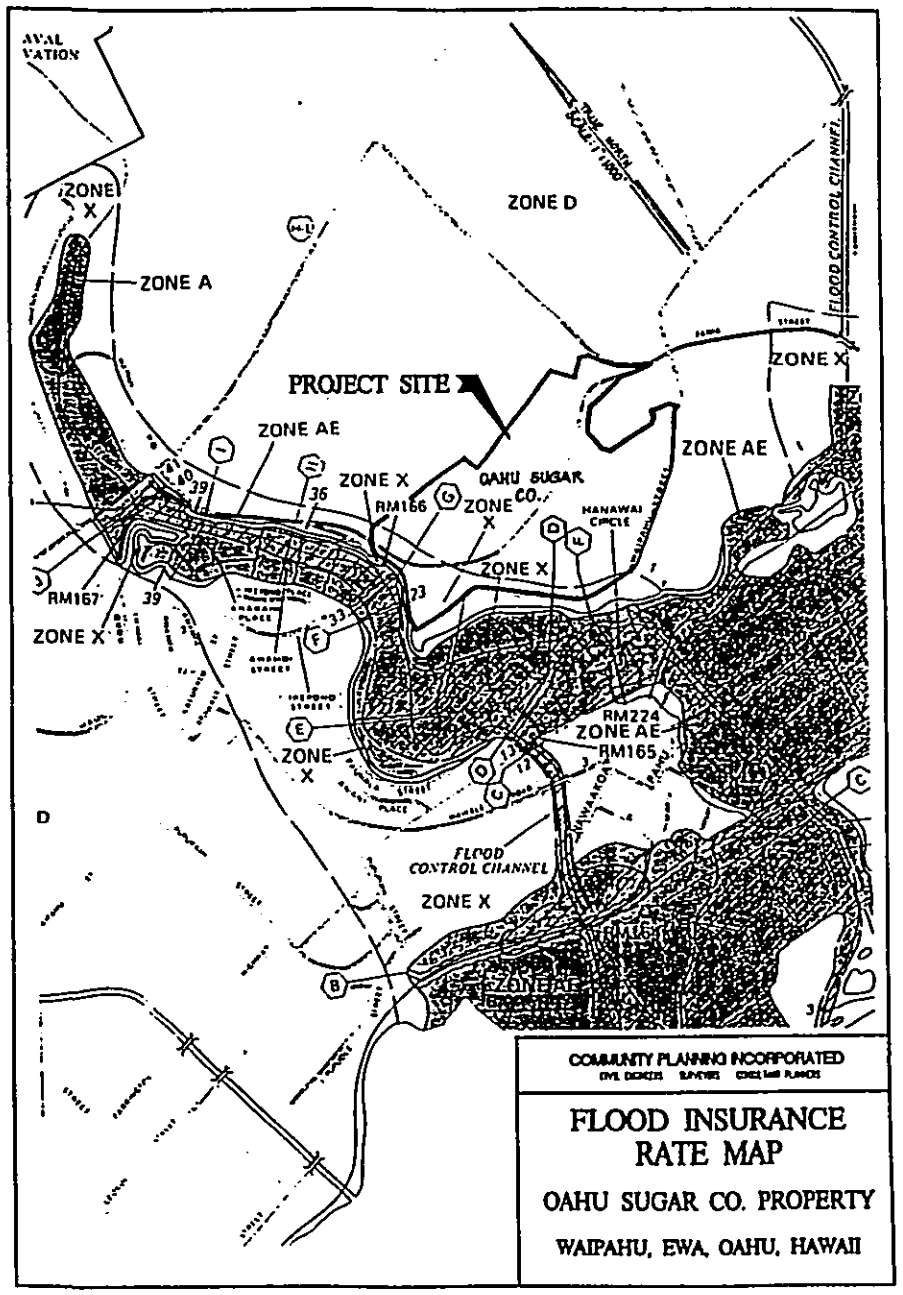
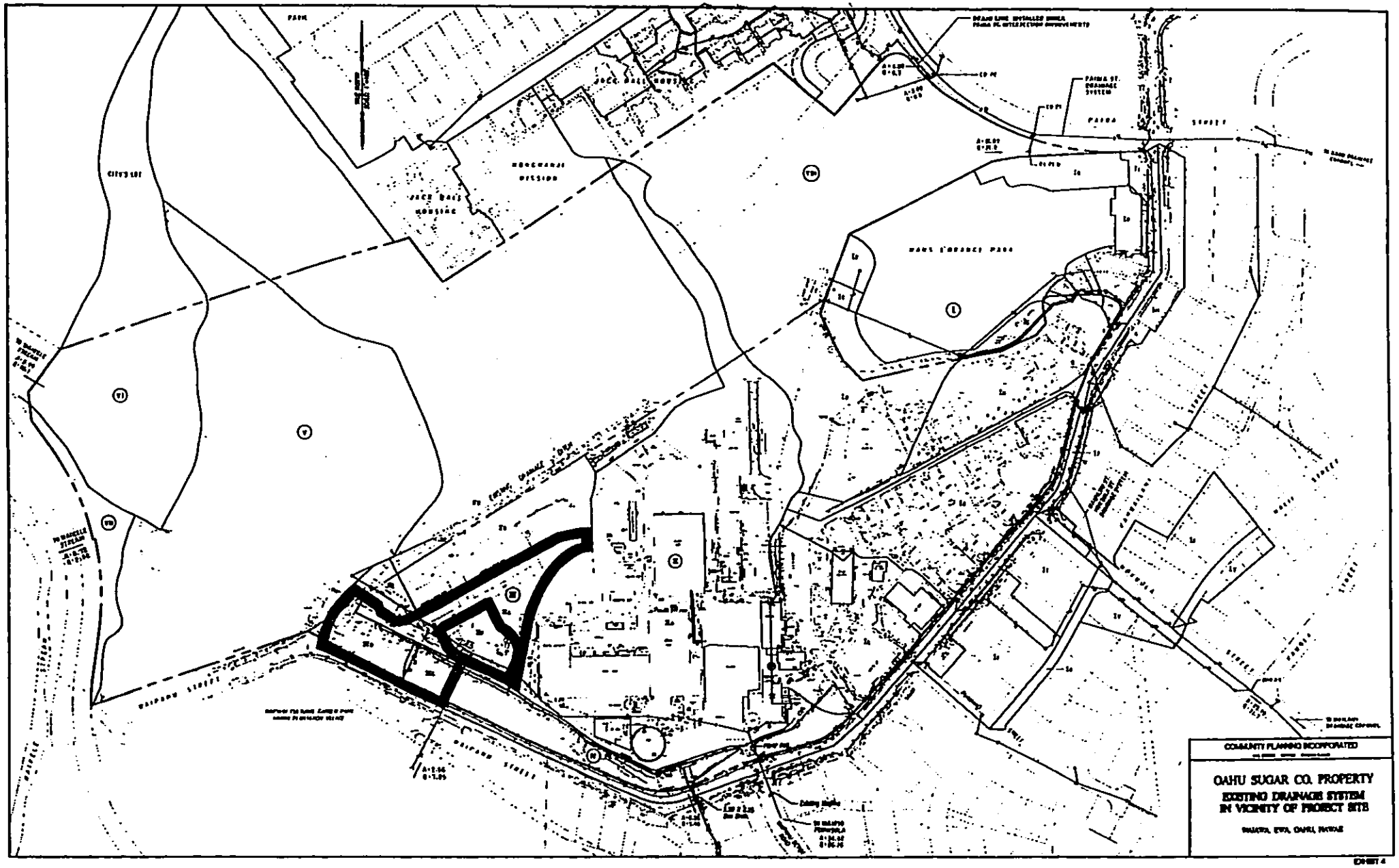
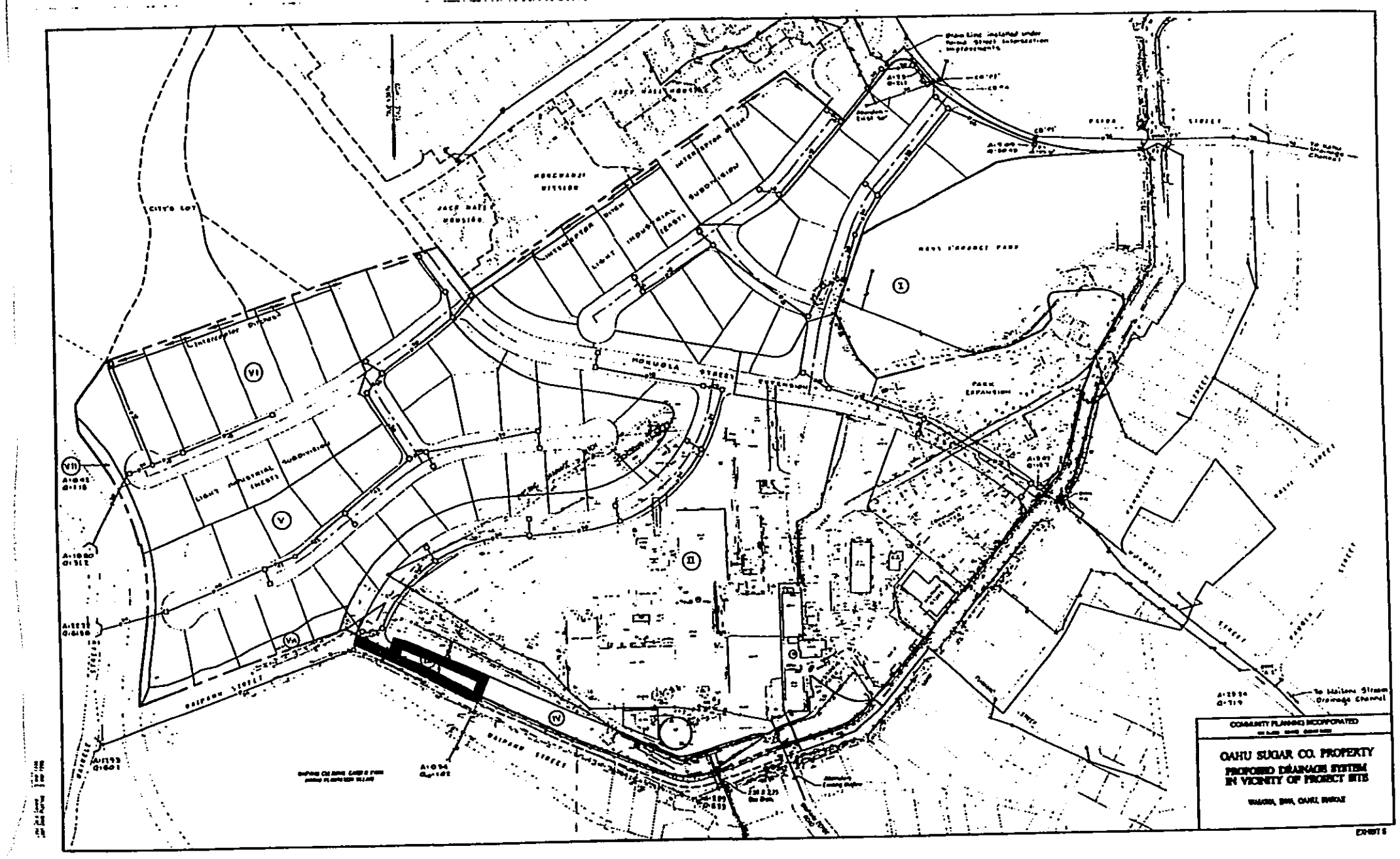


EXHIBIT 3


COMMUNITY PLANNING INCORPORATED
OAHU SUGAR CO. PROPERTY
EXISTING DRAINAGE SYSTEM
IN VICINITY OF PROJECT SITE
EXHIBIT 4


COMMUNITY PLANNING INCORPORATED
OAHU SUGAR CO. PROPERTY
PROPOSED DRAINAGE SYSTEM
IN VICINITY OF PROJECT SITE
EXHIBIT 6

APPENDIX

APPENDIX A-1

HYDROLOGY FOR EXISTING CONDITION

Oahu Sugar Mill Infrastructure

EXISTING DRAINAGE: Hans L'Orange Park / Akipaiki St / Makaala St

I DRAINAGE AREAS – WAIPAHU / MOKAOLA ST. DRAINAGE SYSTEM.

1. HANS L'ORANGE PARK.

			C	CxA
A. G1 #1 TOTAL AREA = 192,423 SF = 4.42 Ac				
Bleacher pad	3264	Conc.	× .90	2938
Basketball Court	7200	Ac	.85	6120
Dugouts 2 @ 140	280	Tin Roof	.90	252
Rest Room	1920	Roof	.85	1633
Playing Field	179759	grassed	.55	98867
				109,810

Equiv. $\bar{C} = \frac{109810}{192,423} = 0.57$

$S = \frac{55.6 - 36.}{610} = 0.03196$ ft/ft

$T_c = 20$ min. ∴ CF = 1.6.

$i_2 = 1.82$"/hr ∴ $I_{10} = 2.91$

$Q_{10} = 0.57 \times 2.91 \times 4.42\,Ac = 7.33$ cfs. ←

B. G1 #2 — Hans L'Orange Park

				Total
Total	19,077		115608	134,685
Grassed Field	19,077	.55		
Ac Pavt			25015	.95
House			1375	.55
Garage			470	.15
Shed			70	.55
Conc Slab			270	.90
Dirt Area			88434	.60
	19,077			

$\bar{C} = \frac{\text{total}}{\text{total area}} = 0.86$

Oahu Sugar Mill Infrastructure

EXISTING DRAINAGE: Hans L'Orange Park / Akipaiki St / Makaala St

1. HANS L'Orange Park (Cont'd.)

B. G1 #2

$S_1 = \frac{(55.5 - 40.00)}{430} = 0.03605$ (from L'Orange Park)

$S_2 = \frac{(66.5 - 77.00)}{595} = 0.04563$ (CPS Typ.)

$T_{c_1} = 20$ min. ∴ CF = 1.7.

$T_{c_2} = 10$ min. CF = 2.29

∴ USE $T_c = 10$ min CF = 2.29

$i_{10} = 1.82$ $I_{10} = 2.29 \times 1.82 = 4.18$"/hr.

$Q_{10} = 0.64 \times 3.09\,Ac \times 4.18$"/hr $= 8.26$ cfs ←

Double: $\frac{25179}{35671} \times 8.26 = 5.84$ cfs; $8.26 - 5.84 = 1.00$ cfs

C. Surface Flow to Conc Ditch

Total 4320 + 576 = 9936 = 0.23 Ac

GRP	465	× .80	372
Conc. Channel	1186	× .90	1067
Playing Field	8283	× 55	4556
			5995

$\bar{C} = \frac{5995}{9732} = 0.60$

Half equiv type

$S = \frac{35.4 - 32.5}{56} = .0875$ down grass

$T_c = 10$ min CF = 2.3.

$i_{10} = 1.82$ $I_{10} = 1.82 \times 2.3 = 4.19$

$Q_{10} = 0.60 \times 0.23\,Ac \times 4.19 = 0.58$ cfs. ←

OAHU SUGAR MILL INFRASTRUCTURE

DSK 9/19/95

EXISTING DRAINAGE: Hans L'Orange Park / Waipahu St / Hokuola St

1. Hans L'Orange Park (Cont'd)

D. Surface Runoff into Conc. Ditch

Total Area = 1810 sf = 0.04 Ac

C = 0.55

Ref: Topo; offsite area: 16 x 28 x 9.5 = 133 sf

S = (39.8 - 30.7) / 60 = 0.1483 dense grass

Tc = 9.5 min ∴ Cf = 2.8, I_{10} = 2.8 x 1.82"/hr = 5.10

Q_{10} = 0.55 x 0.04 x 5.10 = 0.11 cfs ←

onsite, offsite = 0.10

E. Surface Runoff into GI #3

Total Area = 4537 sf / 43560 = 0.10 Ac.

C = 0.55

S_1 = .1376 dense grass Tc = 11 min

S_2 = .01 Av. grass Tc = 11 min

Tc = 11 min, Cf = 2.4, I_{10} = 1.82"/hr x 2.4 = 4.37"/hr

Q_{10} = 0.55 x 0.10 Ac x 4.37"/hr = 0.24 cfs ←

F. Surface Runoff into GI #4

Total Area = 9263 sf / 43560 = 0.21 Ac

C = 0.55

Ref. Drainage 13F/12

S = (55.6 - 47.70) / (60.4 ft) = .1287, dense grass, Tc = 12 min, Cf = 2.2

I_{10} = 1.82 x 2.2 = 4.00

Q_{10} = 0.55 x 0.21 Ac x 4.00 = 0.46 cfs ←

OAHU SUGAR MILL INFRASTRUCTURE

DSK 9/20/95

EXISTING DRAINAGE: Hans L'Orange Park / Waipahu St / Hokuola St

1. Hans L'Orange Park Cont'd

G. Surface Runoff to Entry Parking Lot DI.

Total Area = 27,660 sf / 43560 = 0.63 Ac

AC Paving 14,510 x 0.85 = 12334

Grassed 13,150 x 0.55 = 7233

C̄ = 19567 / 27660 = 0.71

Ref. Drainage 13F/6 & 13F/12

S = (45.8 - 37.40) / 400 = .02875, Tc = 11 min, Cf = 2.4

I_{10} = 1.82 x 2.4 = 4.37"/hr

Q_{10} = 0.71 x 0.63 Ac x 4.37"/hr = 1.95 cfs ←

H. Surface Runoff → DI in Parking Lot #2

Total Area = 9060 sf / 43560 = 0.21 Ac

C = 0.85

S = .02580, Tc = 8 min, Cf = 2.5

I_{10} = 1.82 x 2.5 = 4.55"/hr

Q_{10} = 0.85 x 0.21 Ac x 4.55"/hr = 0.81 cfs ←

I. Surface Runoff to Drain Inlet @ CRM Retaining Wall

Total Area = 4841 sf / 43560 = 0.11 Ac

C = 0.55 Av. grass surf.

S = .04667, Tc = 12 min, Cf = 2.2

I_{10} = 1.82 x 2.2 = 4.00

Q_{10} = 0.55 x 0.11 Ac x 4.00 = 0.24 cfs

OAHU SUGAR MILL INFRASTRUCTURE

DSK 9/20/95

EXISTING DRAINAGE: HANS L'ORANGE PARK / WAIPAHU ST / HOKUALA ST

1. HANS L'ORANGE PARK (CONT'D)

J. DRAIN INLET #3 Ref Dwg File No 13-8-3-22 Waipahu St / Drain Kahuailani

Total Area = 19235 / 43560 = 0.44 Ac.

AC PAVT.	5359	× .85 =	4555
CONC WALK.	391	× .8 =	313
GRASSED	13485	× .55 =	7417
		$\bar{C}$ =	12285 / 19235 = 0.64

Ref. Topo

$\bar{S}_g = \frac{35.6 - 29.8}{160} = 0.035$. Ave Grass T_c = 13.7 min Cf = 2

$\bar{S}_p = \frac{32.5 - 29.8}{205} = 0.01317$ AC Pavt T_c = 5 min

∴ use T_c = 13.7 min Cf = 2.1

I_{10} = 1.82 × 2.1 = 3.82

Q_{10} = 0.64 × 0.44 Ac × 3.82 = 1.08 cfs. ←

offsite area 2046 sf / 43560 = 0.05 Ac. Q_{10} = 2046 × 0.55 / 12285 × 1.08 = 0.11 cfs

K. DRAIN INLET #4 Ref. DPW Dwg. File No. 13-8-3-22 Waipahu St / Kahuailani St Drain

Total Area: 6979 sf / 43560 = 0.16 Ac

AC Pavt	962	× .85 =	818
Conc DW	35	× .90 =	32
GRASSED	5982	× 0.55 =	3290
		$\bar{C}$	4140 / 6979 = 0.59

923 sf onsite

$\bar{S} = \frac{38.1 - 30.0}{100}$ 0.081, Ave Grass T_c = 9.5 cf = 2.3

I_{10} = 1.82"/hr × 2.3 = 4.19

Onsite Contribution A1 923/43560 = 0.02 Ac

Q_{10} = 0.59 × 0.16 Ac × 4.19 = 0.4 cfs. ←

Q_{10} = 923 × 0.55 / 4140 × 0.4 = 0.05 cfs.

Oahu Sugar Mill Infrastructure

DSK 9/17/95

EXISTING DRAINAGE: Hans L'Orange Park / Waipahu St / Hokuala St

2. WAIPAHU ST. INLETS.

L. CB at Entrance of Kupehe Road.

Total Area - 11,491 / 43560 = 0.26 Ac.

C 0.85 AC Pavt & Sidewalks.

cf topo

$\bar{S} = \frac{38.2 - 32.2}{350} = .01823$, T_c = 225, cf = 2.5

I_{10} = 1.82 × 2.5 = 4.55"/hr

Q_{10} = 0.85 × 0.26 Ac × 4.55 = 1.01 cfs.

M. GI #2 (DPW Waipahu / Kahuailani Relief Drain)

Total Area = 33,426 / 43560 = 0.88 Ac

C 0.85 AC Pavt & Sidewalks.

$\bar{S} = \frac{36.8 - 27.9}{(\ldots)/635} = 0.0140$, T_c = 9 min T_c = 2.9

I_{10} = 1.82 × 2.4 = 4.37"/hr

Q_{10} = 0.85 × 0.88 Ac × 4.37"/hr = 3.27 cfs ←

N. EXISTING CB @ MAKAALOHA ST.

TOTAL AREA = 106,857 / 43560 = 2.45 Ac

4735 sf offsite

AC Pavt & Sidewalk		16,501	× .85 =	14026
Conc. Walk	90 + 267 + 104 + 98 + 75 + 261 + 64	831	× .9 =	748
Conc. Slab.	312 + 272 + 170 + 235	989	× .9 =	890
Houses.	1285 + 28 ...	7379	× .8 =	5903
Grassed Area.		31157	× 0.55 =	40,436
			$\bar{C}$ =	66,303 / ...

OAHU SUGAR MILL INFRASTRUCTURE

DSK 9/20/95

EXISTING DRAINAGE: Hans L'Orange Park / Waipahu St / Mokuola St.

2. WAIPAHU ST. INLETS (CONT'D)

N. EXISTING CB @ MAKAALAE ST. (CONT'D) Honolulu side

CPI Topo. $S_1 = \frac{65.0 - 28.3}{330} = .1113$. AC. PAVT. Tc 4.2 min

$S_2 = \frac{57.8 - 28.3}{(980+245)} = .0406$ Avg grassed. Tc = 15 min cf = 1.97

use 15 min. $I_{10} = 1.82 \times 1.97 = 3.58$ "/hr.

$Q_{10} = 0.62 \times 2.45$ Ac $\times 3.58$ "/hr = 5.44 cfs

offsite Contribution: Area = 4639 sf/43560 = 0.11 Ac; Q_{10} = 4639 sf × 0.85 / 106,663 × 5.44 cfs = 0.32 cfs
onsite Area 2.45 − 0.11 = 2.34 Ac; Q_{10} = 5.44 cfs − 0.32 cfs = 5.12 cfs

O. EXISTING CB @ MAKAALAE ST (EWA side)

Total Area = 156,830 sf/43520 = 3.60 Ac.

12,227 sf onsite Waipahu St.

AC PAVT.	19723 + 292 + 603 + 1952 + 1050 − 306 + 664	20,194	×.85	= 17165
Conc. Walks	73 + 93 + 157 + 87 + ...	1390	×.90	= 1252
Conc. Slabs	100 + 132	256	×.90	= 230
House Roofs	625 + 280 + 1136 + 1170 + 922 + 765 + 2470 + 399 + 472 + 193 + 552 + 1112 + 409 + 2051 + 1236 + 1893 + 872 + 1035 + 119 + 1365 + 892	21,019	×.80	= 16815
Grassed Area		113,981	×.55	= 62,691
			$\bar{C}$	98317/156,830 = 0.63

CPI Topo. $S = \frac{64.7 - 29.3}{1010} = 0.03504$ — Avg grass, Ac Area 75%, Tc = 5 min, Cp = 2.96

$I_{10} = 1.82 \times 2.96 = 5.38$

$Q_{10} = 0.63 \times 3.60 \times 5.38 = 12.2$ cfs

offsite contribution: Area = 12,227/43560 = 0.28; Q_{10} = 12,227 × 0.85 / 98,317 × 12.2 = 1.29 cfs
onsite Area 3.60 − 0.28 = 3.32 Ac; Q_{10} = 12.2 cfs − 1.29 cfs = 10.91 cfs

OAHU SUGAR MILL INFRASTRUCTURE

DSK 9/20/95

EXISTING DRAINAGE: Hans L'Orange Park / Waipahu St / Mokuola St

2. WAIPAHU STREET CB's

P. CB #1 (DPW — Waipahu St/Kahuaiki St; Mkai of Drain)

Total Area: 7214/43560 = 0.16 Ac

C = 0.85 AC PAVT.

Topo. $S = \frac{38.5 - 30.2}{275} = .01564$ Tc = 6.0 min cp = 2.6

$I_{10} = 1.82 \times 2.6 = 4.73$

$Q_{10} = 0.85 \times 0.16$ Ac $\times 4.73$ "/hr = 0.65 cfs

Q. CB Near Waipahu Store' BLDG

Total Area = 138,591 sf / 43560 = 3.18 Ac

9591 sf in Waipahu St.

AC. PAVT	22,737 + ...	×.85	...
Bldg Roofs	7915 + 609 + 1210 + 5784 + 752 + 297 + 2636 + 162	19494 × .85	= 16,561
Misc. Roofs	2720 + 2456 + 322	5498 × .90	= 4998
Conc. Slabs	...	2299 × .90	= 2070
Conc. Walk	720 + 653	1377 × .80	= 1102
Grassed		43761 × .55	= 24,069
		$\bar{C}$ = 105,067/138	

$\bar{C}$ = 0.76

$S = \frac{68.6 - 35.5}{650 + 100} = 0.04535$ At [illegible] Tc = 10 min

$I_{10} = 1.82 \times 2.3 = 4.19$ "/hr

Q_{10} = 0.76 × 3.18 Ac × 4.19 "/hr = 10.13 cfs

offsite .20 Ac ... 9591 sf × 0.85 / 105,067 × 10.13 = 0.79 cfs

onsite ... Q = 10.13 − 0.79 = ...

OAHU SUGAR MILL INFRASTRUCTURE

DSK 9/26/95

EXISTING DRAINAGE: Hans L'Orange Park / Waipahu St / Makaola St.

R. CB in front of Salvation Army BLDG. on Waipahu St.

Waipahu St ROW	4951 SF	C=0.85
Portion Kawewa Store	2126 SF	C=0.85
ROW.	7077/43560 = 0.16 Ac	

cpi top. Slope $\frac{37.7-35.5}{190} = 0.01158$ AC part. TC=6 min, Q=2.6

$I_{10} = 1.82 \times 2.6 = 4.73$"/hr

$Q_{10} = 0.85 \times 0.16 Ac \times 4.73$"/hr $= 0.6$ cfs

3. KAHUAILANI / MOKUOLA ST CB's #1's.

5. CB back of POST OFFICE

TOTAL AREA	61,164 / 43560 = 1.40 Ac	
Portion Highway market	22,807 x 0.88 =	20070
Salvation Army Lot	19,650 x 0.88 =	17292
Portion Post Office	10,465 x 0.88 =	9209
Remainder Kahuailani St ROW: 8252 x 0.85 =		7006

$\bar{C} = 53577/61164 = 0.88$.

Ref. CPI Typ. Pkg. Kahuailani St Widen. Dpw 12-9-1-96

$S = \frac{37.8-26.2}{(980')} = 0.02335$, panel. TC = 7 min C = 2.5

$I_{10} = 1.82 \times 2.5 = 4.55$"/hr

$Q_{10} = 0.88 \times 1.40 Ac \times 4.55$"/hr $= 5.60$ cfs ←

OAHU SUGAR MILL INFRASTRUCTURE

DSK 9/26/95

I EXISTING DRAINAGE: Hans L'Orange Park / Waipahu St / Makaola St.

3. Kahuailani St / Makaola Cont'd

I. CB @ Kahuailani / Makaola St. Intersection (Mauka)

Total Area = 44,723 SF / 43560 = 1.03 Ac

CHEVRON ST. Gas / Ac	21,043 x 0.90 =	18939
Portion Post Office	6,218 x 0.88 =	5472
Waipahu St / Makaola / Kahuailani	17,462 x 0.85 =	14843
$\bar{C}$ =	39,254 / 44723 = 0.88	

cpi top. CPI pkg. 12-9-1-96 $S = \frac{36.1-24.15}{460} = 0.025978$, panel TC = 7 min C = 2.5

$I_{10} = 1.82 \times 2.5 = 4.55$"/hr

$Q_{10} = 0.88 \times 1.03 Ac \times 4.55$"/hr $= 4.12$ cfs.

U. CPE Kahuailani St. Intersection (Makai)

Total Area = 11,111 SF / 43560 = 0.26 Ac PAVD. ROW. C = 0.85.

Ref. Waipahu St

$S = \frac{30.13-21.45}{460} = 0.01886$, Panel TC = 7 min C

$I_{10} = 1.82 \times 2.5 = 4.55$

$Q_{10} = 0.85 \times 0.26 Ac \times 4.55$"/hr $= 1.01$ cfs. ←

V. CB ACROSS MAIN ST.

TOTAL AREA =	18896 / 43560 = 0.43 Ac	
ST. HOUSE:	12,170 x 0.60 =	7302
ROADWAY	6676 x 0.85 =	5675
$\bar{C}$	12977 / 18846 = 0.69	

OAHU SUGAR MILL INFRASTRUCTURE

DSK 9/26/95

I EXISTING DRAINAGE · HANS L'ORANGE PARK/WAIPAHU ST/MOKUOLA ST.

3. Kahuailani St./Mokuola (Cont'd)

V. CB ACROSS NALII ST.

$S = \frac{25.29 - 14.18}{250} = 0.0444$ Assume for Grass. Tc=16 min

cf = 1.9 $I_{10} = 1.82 \times 1.9 = 3.46$ "/h

$Q_{10} = 0.69 \times 0.43 \times 3.46$ "/hr $= 1.03$ cfs ←

OAHU SUGAR MILL INFRASTRUCTURE

DSK 9/26/95

I EXISTING DRAINAGE: HANS L'ORANGE PARK/WAIPAHU ST/MOKUOLA ST.

3. Kahuailani/Mokuola Sts. (Cont'd)

W. Mokuola St/Kiso Store (portion)

Total Area = 6840 sf/43560 = 0.16 Ac

Kiso Store 1246 × 0.9 = 1121

ROW 5594 × 0.85 = 4755

$\bar{C}$ = 5876/6840 = 0.86

$S = \frac{25.1 - 24.0}{180} = 0.06167$ paved. Tc = 5 min cf = 3.0

$I_{10} = 1.82 \times 3.0 = 5.46$

$Q_{10} = 0.85 \times 0.16Ac \times 5.46 = 0.74$ cfs

X. Mokuola & Nalii Intersection DI - Mauka Side

Total Area = 60,191/43560 = 1.38 Ac

Sf. Houses 45,322 × 0.6 = 27,193

R.O.W 14867 × 0.85 = 12,637

$\bar{C}$ = 39,832/60191 = 0.6

~~$S = \frac{24.0 - 15.00}{250} = 0.03643$ paved Tc = 5 min cf = 2.7~~

~~$I_{10} = 1.82 \times 2.7 = 4.91$~~

~~$Q_{10} = 0.66 \times 1.38Ac \times 4.91 = 4.47$ cfs~~

Ref. OLD Field Tape Datum: 7'' ... DIV 10-16-4-37 ... $S = \frac{16.11 - 14.51}{451} = .003727$ ... Tc = 15 min cf = 2.0

$I_{10} = 1.82 \times 2.0 = 3.64$

$Q_{10} = 0.66 \times 1.38Ac \times 3.64 = 3.32$ cfs

OAHU SUGAR MILL INFRASTRUCTURE

I. EXISTING DRAINAGE: HANS L'ORANGE PARK, MOKUOLA/CIVIC CENTER

A. MOKUOLA / CIVIC CENTER

INLET AT CIVIC CENTER

AREA = 1.69 ACRES

USING C = 0.9

T_c LESS THAN 5MIN

C_f = 2.8

i_{10} = 1.8

$Q_{10} = 1.69 \times 0.9 \times 2.8 \times 1.8$

$Q_{10} = 8.6$

INLET AT CIVIC CENTER ROOF DRAIN INTO INLET.

AREA = 0.26 ACRES

USING SAME VALUES AS PREVIOUS

$Q_{10} = 0.26 \times 0.9 \times 2.8 \times 1.8$

$Q_{10} = 1.18$

COMMUNITY PLANNING, INC.
PROJECT: OAHU SUGAR MILL INFRASTRUCTURE
SUBJECT: I. HANS L'ORANGE PARK, MILL PROPERTY EAST OF MILL, WAIPAHU ST.
DATE: 09/26/95
BY: DSK

DRAINAGE AREA	AREA (ACRE)	RUNOFF COEF.	TIME OF CONC. (MIN.)	CORR. FACTOR	I(10)	Q(10) (CFS)	Q(50) (CFS)
A	4.42	0.57	24	1.6	2.91	7.34	9.55
B	3.09	0.64	10	2.3	4.17	8.24	10.73
C	0.23	0.60	10	2.3	4.19	0.58	0.75
D	0.04	0.55	10	2.9	5.10	0.11	0.15
E	0.10	0.55	11	2.4	4.37	0.24	0.31
F	0.21	0.55	12	2.2	4.00	0.46	0.60
G	0.63	0.71	11	2.4	4.37	1.95	2.54
H	0.21	0.65	9	2.5	4.55	0.81	1.06
I	0.11	0.55	12	2.2	4.00	0.24	0.31
J	0.44	0.64	14	2.1	3.82	1.08	1.40
K	0.16	0.59	10	2.3	4.19	0.40	0.51
L	0.26	0.85	7	2.5	4.55	1.01	1.31
M	0.88	0.85	9	2.4	4.37	3.27	4.25
N	2.45	0.62	15	2.0	3.59	5.45	7.09
O	3.50	0.63	5	3.0	5.39	12.22	15.91
P	0.15	0.55	6	2.8	4.73	0.54	0.54
Q	2.19	0.75	10	2.1	3.19	10.12	13.17
R	0.16	0.35	6	2.9	4.72	0.64	0.64
S	1.40	0.35	7	2.5	4.55	5.61	7.30
T	1.03	0.39	7	2.5	4.55	4.12	5.37
U	0.25	0.85	7	2.5	4.55	1.01	1.31
V	0.43	0.69	16	1.9	3.46	1.03	1.34
W	0.16	0.55	2	3.0	5.46	0.75	0.99
X	1.38	0.65	15	2.1	3.64	2.32	4.22
Y	0.36	0.71	6	2.2	4.37	1.12	1.45
	25.35					71.74	93.41
MOKUOLA EXT						3.18	10.55
SDMH A-2	1.33					3.61	11.21
CB A-4	3.56					3.84	5.00
SDMH A-5	1.20					8.57	11.16
FI CC	1.89	0.9	5	2.5	5.04	1.18	1.54
ROOF DRN	0.26	0.9	5	2.8	5.04		
	33.59					102.12	133.98

Oahu Sugar Mill Infrastructure

CSK 9/21/95

II EXISTING DRAINAGE: Mill Complex to Pump House - Pump to Kaipio Peninsula

1. Mill Complex

Mill Building: Total Area: 483,603 SF/43560 = 11.10 Ac.

Mill Bldg Roofs: Storage 4459 + 1056 = 5515

Tank	1075	
Dresser	46401	
Boiling House	22,710	
Sugar Room	20,887	
General Whse	13,962	
Shop/Storage	5336	
Caustic Soda Tank	630	
Tank	318	
Fabrication Shop	7779	
Welding Shop	3321	
Welding Shop	1200	
Blacksmith Shop	1054	
[illegible]	695	
Storage [illegible]	1520	
Service Station	2310	
Machine Shop	23,085	
Cane Wash	21,250	190,551
Pump House	610	Shed 250
Tank	613	190,551 x .90 = 171,7[illegible]
Tank	4873	[illegible] 2,970 / 193,521 [illegible]
Oil Tank	820	
Roof Overhang	4779	
Silo Foundat.	558	
Silo [illegible]	597	
	190,551	

Oahu Sugar Mill Infrastructure

CSK 9/2[illegible]

II EXISTING DRAINAGE: Mill Complex to Pump House - Pump to Kaipio Peninsula

1. Mill Complex (Cont'd)

Conc. Slabs, Cane Recv. Area: 9442 + 8071 + 1356

other 3677 + 661 + 68 [illegible]

+77 - 119 + 57 + 28,579 + 80 = 53,290 x .90 = [illegible]

6368 + 350

AC Pavt. 3552 + 3263 - 6309 + 7088 + 28[illegible] = 48,771 x .85 = [illegible]

Gravel [illegible] [illegible] = 2077 x [illegible]

Grass & Dirt 191659 x .55 = 105,4[illegible]

Σ [illegible] 365,5[illegible]

483,[illegible]

Σ = 0.76

In the drainage area, runoff waters are intercepted by drain inlets, & cutoff ditches and transported to the pump sta. located at [illegible] depot level. Assume a time of concentration of 10 min.

$S = \frac{66 - 57.2}{[illegible]} = .01$ Tc: [illegible] for Tc = 10 min Cf = 2.

$I_{10} = 1.82 \times 2.3 = 4.19$

$Q_{10} = 0.76 \times 11.10 \times 4.19 = $ 35.35 cfs. [illegible] = 17[illegible]

Offsite Hongwanji $\frac{(35 \times 27.5)}{43560} = .01$ Ac

$Q_{10} = \frac{.01 \times .55}{8.4} \times 35.35 = .02$ cfs. ∴ on Site = 35.35 - .02 = 35.33 c[illegible]

OAHU SUGAR MILL - DRAINAGE MASTER PLAN

DSK 2/29/96

II. EXISTING DRAINAGE - MILL COMPLEX TO PUMP HOUSE

D. OFFSITE AREA INTO DITCH (Mauka of Ditch)

Ref: (1) Topographic Map of Proposed Industrial Lots by Austin Tsutsumi & Assoc.

(2) Grading plan for Manager's Drive Housing Development by Hida Okamoto & Assoc.

		C	CxA	
Total Area = 20.80 Ac				
Hongwanji & Jack Hall (2.29) Ac		x .75	1.72	5.34
Jack Hall (.90) Ac		x .75	.68	
Manager's Drive (2.01) Ac		x .85	1.71	5.41
Park Area (.62) Ac		x .55	.34	1.15
Open Area 14.98 Ac		x .55	8.24	
			12.69	

$\bar{C} = \frac{12.69}{20.80} = .61$

$\bar{S} = \frac{147-66}{2300} = 0.0352$, $T_c = 16$ min, $Cf = 1.9$

$I = 1.9 \times 1.82 = 3.46$, $CI = .61 \times 3.46 = 2.11$ cfs/Ac

$Q_{10} = 2.11$ cfs/Ac $\times$ 20.80 Ac $= 43.89$ cfs

Onsite open Area 459091 sf / 43560 = 10.54 Ac ... 43.89 ... 7.85 offsite

E. WASA PARK

Total Area 9995 / 43560 = 0.23 Ac

(923) Conc. Slab 3751 x .9 = 3376

(3411) Dirt 6244 x .55 = 3434

$\bar{C} = 6810/9995 = 0.68$

CPI topo $\bar{S} = \frac{63.5 - 60.6}{140} = 0.0207$, Paved, $T_c = 5$ min, $Cf = 2.7$

$I_{10} = 1.82 \times 2.7 = 4.91$, $CI_{10} = 0.68 \times 4.91 = 3.34$ cfs

$Q_{10} = 3.34$ cfs/Ac $\times$ 0.23 Ac $= 0.77$ cfs

Onsite $\frac{3378 \times .9 + 7933 \times .55}{43560} \times 4.91 = 0.5$ .51 cfs offsite .23 cfs

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Oahu Sugar Mill Infrastructure

DSK 9/21/95

II. EXISTING DRAINAGE - Mill Complex to Pump House -

2. DITCH MAUKA OF AUTOMOTIVE REPAIR SHOP

B. Automotive Repair Shop - D1. Dr

Total Area = 68,538 / 43560 = 1.57 Ac

Roofs 13482 sf x .9 = 12,134

Concrete 8082 + 203 + 433 = 8712 x 0.9 = 7846

(6361 offsite) Dirt 46338 x 0.55 = 25,486

46339 - 6361 = 39977 onsite

$\bar{C}$ = 45[illegible] / 68538

$\bar{C}$ = 0.66

CPI topo $\bar{S} = \frac{64.8 - 62.[illegible]}{[illegible]} = .006879$ Paved/Landscaping T_c = 10 min Cf 2

$I_{10} = 1.82 \times 2.3 = 4.21$

1.[illegible] offsite Contribution

$Q_{10} = 0.66 \times 1.57$ Ac $\times$ 4.21 = 4.37 cfs

onsite [illegible] 4.06 onsite .31 offsite

C. SERVICE STATION TO DITCH

Total Area = 17,3[illegible] / 43560 = 0.4[illegible] Ac

[illegible]

$\bar{C}$ 1.0393 [illegible]

CPI topo $\bar{S}$ = [illegible]

[illegible] $\times$ 4.00 = .70 cfs onsite

.26 cfs offsite

Oahu Sugar Mill Infrastructure

II EXISTING DRAINAGE: Mill Complex to Pump House - Pump to Waipio Peninsula

F Drain Box near Restroom.

TOTAL AREA = 13,765 SF / 43560 = 0.32 Ac

Restroom:	AC	× .85	=	12
Conc Slab	91	× .9	=	82
Container	320	× .9	=	288
Open Area. 260 + 87.	347	× .8	=	278
Bare Ground (Unif)	13161	× .55	=	7194

C = 7,956 SF / 13,765 SF

C = 0.57

$\bar{S} = \frac{62.58 - 57.8}{120} = 0.0395$, Bare Ground T_c = 7 min, C_f = 2.5

$I_{10} = 1.82 \times 2.55 = 4.64$ in/hr

$Q_{10} = 0.57 \times 0.32 \text{ Ac} \times 4.64$ in/hr = 0.85 cfs

Onsite/Offsite Contribution

	Area		Q10	
	Onsite	Offsite	Onsite	Offsite
A	11.09	.01	35.33	.02
B	1.92	.15	4.06	.51
C	.39	.11	.70	.36
D	10.90	10.38	49.82	24.17
E	.18	.09	.51	.23
F	.32	0	0.85	0
Subtotal	23.63	10.74	61.27	24.89

Total: 34.82 Ac 86.16 cfs

C = 2.52 cfs/Ac

COMMUNITY PLANNING, INC.
PROJECT: OAHU SUGAR MILL INFRASTRUCTURE
SUBJECT: II. MILL COMPLEX TO PUMP STA./PUMP TO WAIPIO PENINSULA
DATE: 02/28/96
BY: DSK

DRAINAGE AREA	AREA (ACRE)	RUNOFF COEF.	TIME OF CONC. (MIN.)	CORR. FACTOR	I(10)	Q(10) (CFS)	Q(50) (CFS)
A	11.10	0.76	10	2.3	4.19	35.31	45.98
B	1.57	0.66	10	2.3	4.19	4.34	5.65
C	0.40	0.60	11	2.2	4.00	0.96	1.25
D	20.80	0.61	16	1.9	3.46	43.88	57.13
E	0.23	0.69	5	2.7	4.91	0.77	1.00
F	0.32	0.57	7	2.5	4.64	0.85	1.10
	34.42					86.10	112.12

Oahu Sugar Mill Infrastructure

DSC

III EXISTING DRAINAGE: DRAINLINES THROUGH HAMAKUA CULTURAL PARK

A. Drain Box Near Auto Repair Shop

Total Area	66,861 ft²/43560 = 1.53 Ac.	
Conc.	.7572 × 0.90 =	6.815
Info Roof (retail)	13,982 × 0.90 =	12.134
AC. Part	12,909 × 0.85	10,973
Dirt Bare Ground	32898 × 0.55	18,094
	C̄ =	48016/66861
	C̄ = 0.72.	

S̄ = (69 − 56.5)/(820 + 15) = 0.01515 Bare ground Tc = 15 min CF = 1.95

I_{10} = 1.82 in/hr × 1.95 = 3.55 in/hr

Q_{10} = 0.72 × 1.53 Ac × 3.55 = 3.91 cfs ←

B. CB #1 in Waipahu St.

Total Area =	29082 SF/43560 = 0.67 Ac	
AC within ROW (original ROW)	4789 × .85 =	4071.
AC part on site	2521 × .85 =	2143
AC part offsite	1390 × .85 =	1181.
Bare Ground offsite	1730 × 0.55 =	952
Conc walls	792 sq ft × .8 =	634
Heavy Grass/weed Cover onsite (Landscape)	17476 × 0.55 =	9584
	C̄ =	18,912/29052 = 0.65

S̄ = (60 − 34.2)/345 = .0748 avg, parcel Tc = 5 min CF = 2.7

I_{10} = 1.82 × 2.7 = 4.91 in/hr

Q_{10} = 0.65 × 0.67 Ac × 4.91 in/hr = 2.14 cfs ←

Contributing onsite (4071 + 634 + 952)/29082 × 4.91 = 1.61 cfs

offsite 0.53 cfs.

Oahu Sugar Mill Infrastructure

DSC

III EXISTING DRAINAGE: DRAIN LINE THROUGH HAMAKUA CULTURAL PARK

C. CB #2 in Waipahu St.

Total Area = 15,897 SF/43560 = 0.36 Ac

CBM walls	= 29082 − 13637	× 80 =	510
Dam Box	= 28	× .90 =	25
AC. Part (Roads)	2960	× .85 =	2071
Heavy grass/cover onsite	12772	× 0.55 =	7025
		C̄ = 7625.7/15897 =	0.61

S = (38.2 − 31.7)/220 = 0.11136, base vegetation = 97', Comput. '22. Tc = 7.5 min

CF = 2.5, I_{10} = 1.82 × 2.5 = 4.55

Q_{10} = 0.61 × 0.36 Ac × 4.55 = 1.00 cfs. ←

onsite contrib 2071/0.151 × 1.0 = 6.00 cfs

onsite contribution 10 − 0.00 = 0.18 cfs

Summary onsite / offsite ...

	onsite	offsite	Areas onsite	Areas offsite
A	0	3.91	1.53	0
B	1.61	0.53	0.49	.18
C	0.18	0.00	.30	.06
	2.79'	4.44	2.32 Ac	0.24 Ac

OAHU SUGAR MILL INFRASTRUCTURE

DSK 7/22/95

IV EXISTING DRAINAGE THROUGH TRASS LOTS TO KAPAKAHI STREAM.

A. CB IN WAIPAHU ST. & 2'6"x2'3" BOX DRAIN

TOTAL AREA (WAIPAHU ST PORTION) 96,976 SF / 43560 = 2.23 Ac

AC PAVT 26,735 SF x 0.85 = 22,725

CRM RETAINING WALL 801+275+2164 = 3240 x .80 = 2,592

Pumphouse Metal Roof 94 SF x 0.90 = 85

Heavy Ground Cover on Slope (Hedelia) 66,907 SF x 0.55 = 36,799

$\bar{C}$ 62,201 / 96976 = 0.64

$\bar{S}$ = (18.4 - 3.2) / (340) (85) = .0445, T_c = 9 min, cf = 2.4

Roof Runoff

I_{10} = 1.82 x 2.4 = 4.37 "/hr

Q_{10} = 0.64 x 2.23 Ac x 4.37 = 6.20 cfs

onsite area: 1.61 A, Q_{10} = 3.96 cfs

offsite: Area .62 Ac, Q_{10} = 2.28 cfs

B. Flow into Kalawa GT as sheetflow.

offsite TOTAL AREA (railway st) = 14,072 SF / 43560 = 0.33 Ac

Q_{10} = 0.85 x 0.33 Ac x 4.37 "/hr = 1.23 cfs

COMMUNITY PLANNING, INC.
PROJECT: OAHU SUGAR HILL INFRASTRUCTURE
SUBJECT: III. DRAINLINE THROUGH WAIPAHU CULTURAL PARK
DATE: 09/26/95
BY: DSK

DRAINAGE AREA	AREA (ACRE)	RUNOFF COEF.	TIME OF CONC. (MIN.)	CORR. FACTOR	I(10)	Q(10) (CFS)	Q(50) (CFS)
A	1.53	0.72	15	2.0	3.55	3.91	5.09
B	0.67	0.65	5	2.7	4.91	2.14	2.79
C	0.36	0.61	8	2.5	4.55	1.00	1.30
	2.56					7.05	9.18

COMMUNITY PLANNING, INC.
PROJECT: OAHU SUGAR MILL INFRASTRUCTURE
SUBJECT: IV. SURFACE DRAIN THROUGH 3 LOTS TO KAPAKAHI STREAM.
DATE: 09/26/95, REV. 11/01/95
BY: DSK

DRAINAGE AREA	AREA (ACRE)	RUNOFF COEF.	TIME OF CONC. (MIN.)	CORR. FACTOR	I(10)	Q(10) (CFS)	Q(50) (CFS)
A	2.23	0.64	9	2.4	4.37	6.23	8.12
B	0.33	0.85	9	2.4	4.37	1.23	1.60
	2.56					7.46	9.71

OAHU SUGAR MILL.

DSK 2/28/96

V EXISTING DRAINAGE AREA

DRAINAGE AREA INTO KAPAKAHI ST TO KAPAKAHI CULTURAL GARDEN PARK

AREA Open Space 9.34 Ac
2.24 Ac
11.58 Ac.

C = 0.55.

$\bar{S} = \frac{100 - 44}{1130} = 0.0496$ $T_c = 16.5$ Min $\therefore$ Cf = 1.9.

$I_{10} = 1.82 \times 1.9 = 3.46$ "/hr

$Q_{10} = .55 \times 3.46 \times 11.58$ Ac $= \frac{22.02}{1.15}$ cfs.
1.91

OFFSITE .55 Ac

Q_{10} = 1.05 cfs offsite

OAHU SUGAR MILL

DSK 2/26/96

VI EXISTING DRAINAGE AREA

DRAINAGE AREA ONTO EXISTING CANE HAUL ROAD

TOTAL AREA A = 5.99 Ac.

Ac. past Cane Haul Road $23,569 SF / 43,560 = 0.54 Ac \times .85 = 0.46 Ac$

Open Space $5.45 Ac \times 0.55 = 3.0 A.$

$\bar{C} \quad \frac{3.46 Ac}{5.99} = 0.58$

$\bar{S} = \frac{110 - 61}{1760 + 460} = 0.0335$, $T_c = 24 min$ $C_f = 1.6$

Pervious Surface & Bare Soil

$I = 1.82 in/hr \times 1.6 = 2.91$, $CI = .58 \times 2.91 = 1.67 cfs/Ac$

$\therefore Q_{10} = 1.69 cfs/Ac \times 5.99 Ac = 10.12 cfs.$

OFFSITE (2.5± Acres)

OFFSITE $Q_{10} = \frac{2.5 \pm .5}{3.0} \times 10.12 cfs = 2.09 cfs$

ONSITE : $10.12 cfs - 4.09 cfs = 6.03 cfs$

OAHU SUGAR MILL

DSK 2/26/96

EXISTING CONDITIONS

VII SLOPE ALONG KIAPAHU ST. ADJACENT TO WAIKELE STREAM.

AREA = 0.72 Ac.

Open Area = C = 0.55.

$\bar{S} = \frac{71 - 28}{135} = 31.85\%$ $T_c = 5 min$ $C_f = 2.8$

$I = 1.82 \times 2.8 = 5.10 in/hr$

$CI = 5.10 \times 0.55 = 2.80 cfs/Ac$

$Q_{10} = 0.72 \times 2.80 cfs/Ac = 2.02 cfs$

OAHU "IGAK HILL DRAINAGE"

DGL 2/28/76

EXISTING CONDITION

VIII. EXISTING DRAINAGE

WITH THE CONSTRUCTION OF WCC'S EMPLOYEE PARKING & PAIWA ST. INTERSECTION, ALL THE RUNOFF ON THE SUGAR MILL PROPERTY TENDS TO FLOW TO FT. P16.

OFF SITE: JACK HALL HSG 1.64 Ac × 0.75 = 1.23

SLOPE ON ACRES P.O: $\frac{5150}{93120}$ = .12 Ac × 0.55 = .07

SUGAR MILL AREA 9.27 Ac

AC. CONTRIB TO $\frac{865 \text{ Ac}}{93120}$ = 0.20 Ac × 0.85 = .17

BARE DIRT 9.07 × 0.55 = 4.99

Tot. 11.03 6.46 Ac

$C = \frac{6.46}{11.03} = 0.59$

$S = \frac{9c-4.9}{1c-5} = 0.031$, Tc = 20 min ∴ CF 1.6

$I_{10} = 1.82$ in/hr × 1.6 = 2.91 in/hr

CI = 0.59 × 2.91 = 1.72 cfs/Ac

$Q_{10} = 11.03 \text{ Ac} \times 1.72 \text{ cfs/Ac} = 18.95 \text{ cfs}$

for the Paiwa St. I.D. & DRAINAGE PROJECT, FT P16 was expected to drain 15.3 Ac @ 51.9 cfs

DESIGN CI = $\frac{51.9}{15.3}$ = 3.4 cfs/Ac. (Apartment) based on $i_{10} = 2.3$ in/hr 1969 City Drainage Standards. 1988 Drainage Standards $C_{10} = 1.8$ for Industrial Zoned Areas. Tc = 10 min CF = 2.3 C = 0.8

CI = 0.8 × 1.82 (2.3) = 3.35 cfs/Ac

$Q_{10 \text{ orifice}} = \frac{.17 + 4.99}{6.46} \times 18 \text{ cfs} = 15.10 \text{ cfs}$

OAHU "IGAK HILL DRAINAGE MASTER PLAN

DGL 2/28/76

EXISTING CONDITION

VIII EXISTING DRAINAGE

FLOW INTO CB P-2 @ PAIWA ST. STATION 21+30.

W/ 30" RCP @ 1.17% Q_{full} = 45 cfs.

PAIWA ST ID & DRAINAGE, THE 30" Culvert has a drainage area of 3.0 Acres & flow of 10.8 cfs.

Existing 30" Drain lowered & flatted Slope to 1%

1. 18" DRAIN LINE FROM JACK HALL HSG connect to existing 30" drain line

Design A = 3.44 Ac Q_{10} = 10.9 cfs. (8 Ac)

2. Austin, Tsutsumi Assoc. i_{10} = 2.4 in/hr

from employee park Hydro Q_{10} = $\frac{4.17 \text{ Ac}}{A = 1.58}$ = 17.97 cfs. 4.42 cfs 13.31 cfs

3.48 Ac @

1.58 in/hr

4.79 Ac 13.31 cfs. C2 = 2.67 cfs

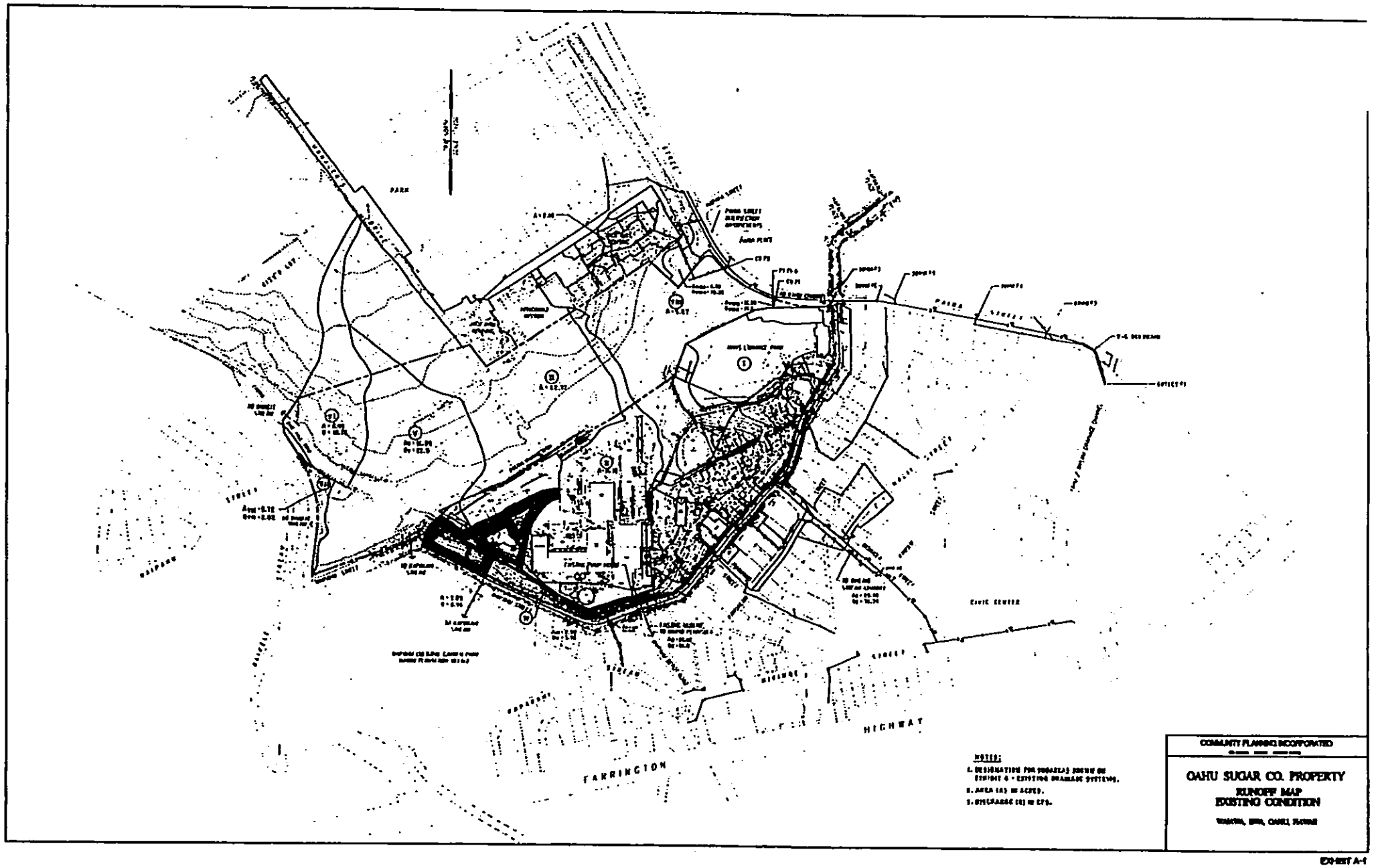

PARK
FARRINGTON
HIGHWAY
Civic Center
NOTES:
COMMUNITY PLANNING INCORPORATED
OAHU SUGAR CO. PROPERTY
RUNOFF MAP
EXISTING CONDITION

EXHIBIT A-1

APPENDIX A-2

HYDROLOGY FOR PROPOSED MASTER PLAN

OAHU'S KAM MILL

DSK 2/20/76

HYDROLOGY PROPOSED CONDITION

I. DRAINAGE TO WAIPAHU ST./ MOKUOLA ST. DRAINAGE SYSTEM.

A. DETERMINE RUNOFF FROM HANS L'ORANGE PARK. FROM EXISTING CONDITIONS DETERMINE FLOW FROM EXISTING PARK INTO DITCH SYSTEM.

DRAINAGE AREA	AREA FROM OSM (Ac)	RUNOFF FROM OSM (cfs)
B	2.65	7.26
D	.003	.01
K	.02	.05
J	.05	.11
TOTALS	7.72 Ac	7.43 cfs
EXISTING CONDITIONS	8.69 Ac	18.40 cfs
	- 3.72 Ac	- 7.43 cfs
FROM PARK	4.97 Ac	10.97 cfs

FOR FUTURE PARK W/ C = 0.60 $I_{10} = (2.3)(1.82) = 4.19$ "/hr @ T_c = 10 min.

$\therefore CI_{10} = 0.60 \times 4.19 = 2.51$ cfs/Ac

NEW PARK = 3.2 Acres x 2.51 cfs = 8.03 cfs

NEW AREA + Q	4.97 Ac	10.97 cfs
Add	+ 3.200 Ac	8.03
	8.17 Ac	19.00 cfs

B. DRAINAGE AREA "N"

FOR THIS DRAINAGE AREA, THE ONSITE RUNOFF WILL GO TO THE PARK EXPANSION, COMMUNITY CTR., YMCA & STREET. ∴ ONLY CONTRIBUTION LEFT TO END EAST OF MAKAAKUHA ST WILL BE FROM

OSM - MANAGE MASTER DLN

DSK 2/29/96

HYDROLOGY - PROPOSED CONDITION

I. DRAINAGE TO WAIPAHU/MAKAOLA ST SYS (CONT'D)

B. DRAINAGE AREA "N" CNTO (FROM EXISTING CONDITION)

WAIPAHU ST : A = 0.11 Ac

Q_{10} = .32 cfs.

C. DRAINAGE AREA "O" CB WEST OF MAKAALOHA ST.

THE ONSITE RUNOFF WILL GO TO THE PARK EXPANSION COMMUNITY CTR. YMCA. ONLY CONTRIBUTION TO THE CB WILL BE FROM WAIPAHU ST:

A = 0.28 Ac

Q = 1.29 cfs

D. COMMUNITY CTR & PORTION OF YMCA - FLOW TO MUKUOLA ST. EXTENSION

A = 130,461 SF / 43560 = 3.13 Ac

Assume C = 0.70, T_c = 10 min ∴ CI = 2.93"/hr

Q_{10} = 3.13 Ac × 2.93"/hr = 9.17 cfs.

E INDUSTRIAL LOT & STREET

AREA = 89539 / 43560 = 1.94 Ac.

FOR INDUSTRIAL AREA C = 0.8, T_c = 10 min I_{10} = 1.82 × 2.3 = 4.19"/hr

∴ CI = 0.8 × 4.19"/hr = 3.35 cfs/Ac

Q_{10} = 3.35 cfs/Ac × 1.94 Ac = 6.5 cfs

COMMUNITY PLANNING, INC.
PROJECT: OAHU SUGAR MILL INFRASTRUCTURE
SUBJECT: I. HANS L'ORANGE PARK, MILL PROPERTY EAST OF MILL, WAIPAHU ST.
ONSITE/OFFSITE DRAINAGE AREAS - PROPOSED CONDITION
DATE: 03/04/96
BY: DSK

DRAINAGE AREA	AREA (ACRE)	ONSITE AREA (ACRES)	ONSITE Q(10) (CFS)	ONSITE Q(50)	OFFSITE AREA (ACRE)	OFFSITE Q(10) (CFS)	OFFSITE Q(50) (CFS)
A	4.42	0.00	0.00	0.00	4.42	7.33	9.55
B	0.44	0.00	0.00	0.00	0.44	1.00	1.30
C	0.23	0.00	0.00	0.00	0.23	0.58	0.76
D	0.04	0.000	0.00	0.00	0.037	0.10	0.13
E	0.10	0.00	0.00	0.00	0.10	0.24	0.31
F	0.21	0.00	0.00	0.00	0.21	0.46	0.60
G	0.65	0.00	0.00	0.00	0.62	1.95	2.54
H	0.21	0.00	0.00	0.00	0.31	0.81	1.05
I	0.11	0.00	0.00	0.00	0.11	0.24	0.31
J	0.39	0.00	0.00	0.00	0.39	0.97	1.26
K	0.14	0.00	0.00	0.00	0.14	0.35	0.46
L	0.26	0.00	0.00	0.00	0.26	1.01	1.32
M	0.88	0.00	0.00	0.00	0.88	3.27	4.26
N	0.11	0.00	0.00	0.00	0.11	0.32	0.43
O	0.28	0.00	0.00	0.00	0.28	1.29	1.68
P	0.16	0.00	0.00	0.00	0.16	0.64	0.83
Q	2.19	2.95	9.43	12.25	0.20	0.70	0.91
R	0.16	0.00	0.00	0.00	0.16	0.64	0.83
S	1.40	0.00	0.00	0.00	1.40	5.60	7.29
T	1.03	0.00	0.00	0.00	1.03	4.12	5.37
U	0.25	0.00	0.00	0.00	0.25	1.01	1.32
V	0.43	0.00	0.00	0.00	0.43	1.02	1.24
W	0.16	0.00	0.00	0.00	0.16	0.74	0.96
X	1.39	0.00	0.00	0.00	1.39	5.32	4.32
Y	0.36	0.00	0.00	0.00	0.35	1.12	1.45
SUBTOTAL	16.97	2.95	9.43	12.25	13.99	38.94	50.59
PARK	2.20	2.20	8.03				
CONCTR	3.13	3.13	9.17				
IND/ST	1.94	1.94	6.40				
	25.227	11.25	33.03				

OSM – WAHIAWA MASTER PLAN

DSK 2/28/96

HYDROLOGY – PROPOSED CONDITION

III. DRAINLINE THROUGH WAHIAWA CULTURAL GARDENS PARK AREA WILL BE REDUCED BY DIVERSION AS PART OF AREA II

TOTAL AREA = 14,951/43560 = 0.34 Ac

DRAINAGE AREA TO CB#2 = 6,994/43560 = 0.16 Ac

" " " CB#1 7,787/43560 = 0.18 Ac

$C I^{*}$

TO CB#2 Q_{10} = 0.16 Ac × 2.78 cfs/Ac = 0.45 cfs

Q_{10} = 0.19 Ac × 3.17 cfs/Ac = 0.57 cfs

1.02 cfs

CI values from EXISTING CONDITION, for AREA III

OSM – DRAINAGE MASTER PLAN

DSK 2/28/96

II. FURTHER FLOW TO WAIPIO PENINSULA DIVERTED TO WAIKELE STREAM.

COMMERCIAL / INDUSTRIAL AREA

A = 781,179/43560 = 17.93 Ac

CI_{10} = 3.35 cfs/Ac

Q_{10} = 17.93 cfs/Ac × 3.35 cfs/Ac = 60.07 cfs

COMMERCIAL AREA = 594710 SF/43560 = 13.92 Ac

COMMERCIAL AREA: PORTION OF TOTAL =

$q_{10} = \frac{13.92}{17.93} \times 60.07\ cfs = 46.97\ cfs$

q_{10} (INDUSTRIAL AREA) = 15.10 cfs

OSM - "DRAINAGE MASTER PLAN"

DSK 2/29/96

HYDROLOGY - PROPOSED CONDITION

V. DRAINAGE AREA V FLOWED OVERLAND TO KAPAKAHI STREAM. THE PROPOSED AREA I WILL INTERCEPT THE OFFSITE AREAS THAT FLOWED INTO AREA II UNDER THE EXISTING CONDITIONS.

A. OFFSITE AREAS.	A.	CI_{10} :	Q_{10}
1. Honowahi + Jack Hall (Portion) HSG	2.29 A	2.72 cfs/Ac	6.22 cfs
2. Jack Hall HSG	.90 Ac	2.73 cfs/Ac	2.45 cfs
3. Existing Manager's Drive	2.73 A.	3.14 cfs/Ac	8.57 cfs

Ac. Part 2.01 Ac x .85 = 1.71

Part 0.67 Ac x .55 = .34

2.73 Ac 2.05

$\bar{C} = \frac{2.05}{2.73}$ Ac = 0.75

$\bar{S} = \frac{197 - 88}{1030} = 0.0362$

T_c = 10 min ∴ CF = 2.3

$CI_{10} = 0.75 \times (1.82 \text{ in/hr}) \times (2.3) = 3.14$

4. Former Plantation Housing Area flow into cutoff ditch

C = 0.55, $\bar{S} = \frac{120 - 94}{760} = 0.0342$, T_c = 32 min CF = 1.45

∴ $CI_{10} = 0.55 \times (1.82 \text{ in/hr}) \times (1.45) = 1.45$ cfs/Ac

∴ $Q_{10} = 5.42$ Ac x 1.42 cfs/Ac = 7.87 cfs.

B. Industrial Area to Wahiawa Stream (Lower West)

A = 473,912 SF / 43560 = 10.88 Ac

$CI_{10} = 3.35$ cfs/Ac

$Q_{10} = 10.88$ Ac x 3.35 cfs/Ac = 36.45 cfs

C. Total Q_{10} to Wahiawa Stream	Onsite	Offsite	Total
Onsite Area: 10.99 Ac.	Offsite Area: 11.34 Ac.	36.45 cfs	25.11 cfs:	61.56 cfs

OSM - "DRAINAGE MASTER PLAN"

DSK 2/29/96

HYDROLOGY - PROPOSED CONDITION

IV. DRAINAGE AREA IV - AREA REDUCED ON THE SLOPE & PORTION OF AREA II ADDED

A. REDUCTION OF SLOPE AREA

Area Reduced = 18,405 SF / 43560 = 0.42 Ac

FLOW CONTRIBUTION FROM SLOPE IN EXISTING CONDITION

36,799 / 62,201 x 6.24 cfs = 3.69 cfs contribution from slope

Amount Reduced = $\frac{18405}{36799}$ x 3.69 cfs = 1.85 cfs

B. ADD 0.28 Ac FROM AREA II - 1/2 OF POWER PLANT ROOF.

0.28 Ac

1/2 Power Plant Roof, 2710 / 43560	.06 Ac x .90	= 0.05
Area to be Grassed after Bldg. 1 Demolished	0.22 Ac x .55	= 0.12
		.17

$\bar{C} = \frac{0.17}{.28} = 0.61$

∴ $Q_{10} = 0.61 \times 4.19$ cfs/Ac x 0.28 Ac = 0.72 cfs

C. TOTAL Q_{10} IN AREA IV - PROPOSED CONDITION

ORIGINAL Q_{10}:	7.46 cfs
less slope	(-1.85) cfs
add	.72 cfs
	6.33 cfs ∴ 1.13 cfs less than exist.

D. REUSE AREA 2.33 Ac - Original Area

- .42 Ac

+ .28 Ac

2.09 Ac

OSM : "DRAINAGE MASTER PLAN"

DSK 2/27/96

V A. AREA OF SLOPE ALONG WAIPAHU ST TO FLOW OVERLAND TO KAPAKAHI STREAM (PART OF DRAINAGE AREA V EXIST CONDITIONS).

AREA OF SLOPE 33650/43560 = 0.77 Ac

SLOPE WITHIN PROPERTY 23336

C = 0.55 , Tc = 5min ∴ CF = 2.8

CI_{10} = 0.55 × 1.82"/hr × 2.8 = 2.80 cfs/Ac

Q_{10} = 0.77 Ac × 2.80 cfs/Ac = 2.16 cfs

ONSITE AREA 2.56 Ac

$\frac{23336}{33650}$ × 2.16 cfs = 1.50 cfs. CONTRIBUTION FROM ONSITE

OFFSITE .66 cfs

OSM : "DRAINAGE MASTER PLAN"

DSK 2/27/96

HYDROLOGY - PROPOSED CONDITIONS

VI EXISTING FLOW FROM THIS AREA TO WAIKELE STREAM OVER EXISTING CANE HAUL ROAD. FLOW ENTERED WAIKELE STREAM UPSTREAM OF WAIPAHU ST. BRIDGE. OVERT FLOWS TO DOWNSTREAM OF WAIPAHU ST. BRIDGE. PORTIONS OF AREAS II & V WILL BE DIVERTED INTO THIS DRAINAGE AREA.

A. OFFSITE AREA - CUT OFF DITCH

AREA = 2.56 Ac

S = $\frac{123-76}{1000}$ = 0.047

Tc = 20min plate 3. CF = 1.4

EXIST. CONDITION POOR GRASSED SURFACE

CI_{10} = 0.55 × 1.4 × 1.82"/hr = 1.40 cfs/Ac

Q_{10} = 2.56 Ac × 1.40 cfs/Ac = 3.59 cfs.

B INDUSTRIAL AREA TO WAIKELE STREAM (Upper West)

AREA = 359,044/43560 = 8.24 Ac

CI_{10} = 3.35 cfs

Q = 8.24 Ac × 3.35 cfs = 27.59 cfs

C. TOTAL Q_{10} to WAIKELE STREAM = 31.17 cfs

OSM DRAINAGE MASTER PLAN

DSK 3/03/96

HYDROLOGY – PROPOSED CONDITIONS

VII. EXISTING RUNOFF FROM THE SLOPES ALONG WAIPAHU STREET WHICH RUN PARALLEL TO WAIKELE STREAM. THE PROPOSED CONDITION WILL REDUCE THE AREA OF THE SLOPE BY GRADING OF THE INDUSTRIAL SUBDIVISION

NOW AREA of Slopes. A: 18315 SF/43560 = 0.42 Ac

OPEN AREA C: 0.55

USE T_c = 5 min CF = 2.0

$\therefore Q_{10}$ = 0.42 Ac × 0.55 × 1.82 × 2.8 = 1.18 cfs

EXISTING	SURFACE	AREA: 0.7	C: 2.0	
PROPOSED	CONC PIPE	AREA: 0.6	C:	Q: 118
	Diff	.35 Ac		0.84 cfs

OAHU KSAK MILL DRAINAGE MASTER PLAN

DSK 2/29/96

VIII PAIWA ST. DRAINAGE AREA

2. CONNECTION TO P-1

EXISTING 36" DL to EX-P1a : 36"ø @ 1% Qc: 65 cfs.

DESIGN FOR A: 15.3 Ac Q: 51.9 cfs

VIII B INDUSTRIAL SUBD 395,771/43560 = 9.09 Ac.

Q_{10} = 9.09 Ac × 3.35 cfs/Ac = 30.45 cfs

3 OPTIONS TO CONNECT AMI & Industrial LOTS to P-1 ..... leaving Only Paiwa St Improvement & Employee parking to P-2

Undeveloped OFFSITE	1.76 Ac	4.67 cfs
IND AREA VIII A	2.34 Ac	7.84 cfs
	9.10 Ac	12.51 cfs
IND AREA VIII B	9.09 Ac	30.45 cfs
	13.19 Ac	42.96 cfs

OAHU S. HALE DRAINAGE MASTER PLAN

DSK 2/27/96

HYDROLOGY - PROPOSED CONDITION:

VIII PAIWA ST. DRAINAGE AREA

1. CONNECTION TO DMH-P2

CB-P2 WAS CONNECTED TO A DMH UNDER THE "EMPLOYEE PARKING & PAIWA ST INTERSECTION IMPR." PROJECTS

A. CUTOFF DITCH ALONG HAUKEA PL. (OFFSITE)

JACK HALL 18"DL 1.51 Ac × 2.72 cfs/Ac = 4.11 cfs

.13 Ac × 2.72 cfs/Ac = 0.35 cfs

EMPLOYEE PARKING SLOPE .12 Ac × 1.71 cfs/Ac = 0.21 cfs

1.76 Ac 4.67 cfs

B. INDUSTRIAL AREA VIII A. ONSITE.

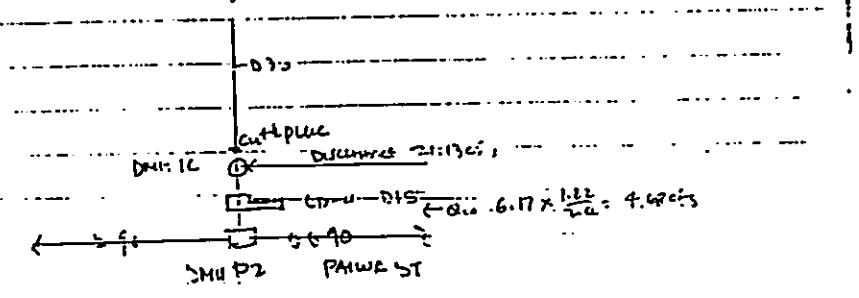
2.34 Ac × 3.35 cfs/Ac = 7.84 cfs

C. INTERCEPT JACK HALL 18" D.L. (OFFSITE)

3.9 Ac 10.9 cfs × $\frac{1.82}{2.72}$ = 8.62 8.62 cfs

TOTAL AREA = 7.5 Ac 21.13 cfs

REPLACE EXISTING 30" DL CROSSING NE IND. LOT. CONNECT TO NEW DMH 1C (EMPLOYEE PARKING)



APPENDIX A-3

HYDRAULIC COMPUTATIONS

PAIWA STREET DRAIN LINE

1. ORIGINAL HGL COMPUTATIONS
2. UPDATED HGL COMPUTATIONS
3. PROPOSED CONDITIONS HGL COMPUTATIONS

OAHU STORM DRAIN - DRAINAGE

BSK 3/02/92

REVISE HYDRAULIC CALCS FOR PAIWA ST. DRAIN UNDER THE I.D.

1. REVISE DESIGN FLOWS BASED ON CURRENT DPW DRAINAGE STD.

A. THE ORIGINAL DRAINAGE FLOWS UNDER THE I.D. PROJECT WERE DEVELOPED UNDER THE 1969 DPW DRAINAGE STANDARDS (SEE PLATES 1 & 2 FOR RAINFALL INTENSITY OF 1-HR RAINFALL. $T_m = 10$ yr & $T_m = 50$ yr, RESPECTIVELY ARE HIGHER THAN THE CURRENT (1988) PLATES 1 & 2.

B. BASED ON THE 1988 PLATES 1 & 2, THE i/12 i VALUES IN THE VICINITY OF THE PROJECT AREA ARE 1.82"/hr AND 2.37"/hr, RESPECTIVELY. THE 1969 PLATES GAVE VALUES OF 2.3"/hr AND 2.9"/hr, RESPECTIVELY.

C. ASSUMING THE DRAINAGE AREAS REMAINED THE SAME, THE DESIGN FLOWS AT EACH DRAIN INLET WERE REDUCED BY THE RATIO OF THE CURRENT i/12 AND THE 1969 i/12. THEN THE HGL FOR THE PIPE SYSTEM WAS RECALCULATED TO CB P1 & CB P2 WHERE CONNECTIONS FROM THIS PROJECT WOULD BE MADE. IN REVIEWING THE "PAIWA ST & DRAIN IMPROVEMENTS, DRAINAGE MAP" BY CPL AUG 1973, THE DRAINAGE AREAS ARE RELATIVELY THE SAME AS OUTLINED IN THE DRAINAGE MAP.

RUNOFF CALCULATIONS FOR PAIWA STREET AND DRAIN (Waipahu)

Q = CIA Q/A = CI

i_{10} = 2.9 ; i_{50} = 2.9

DATE: 8/23/71
COMPUTED: R.S.
CHECKED:

RUNOFF AREAS	ACRES	ANTICIPATED DEVELOPMENT	L GRASS	L PAVED	K	S GRASS	S PAVED	X	T_c			CORR. FACTOR	I T_m=10	I T_m=50	C	CI T_m=10	CI T_m=50	REMARKS
		Residential	100'	300'		1.5%	2%		13.5	1.25	14.75	2.0	4.6	5.0	0.65	3.0	3.8	
		Apartment	300'	200'		7%	2%		15.0	1.0	16.0	1.45	4.5	5.7	0.75	3.4	4.3	
		Industrial	300'	200'		1%	2%		15.0	1.0	16.0	2.05	4.7	5.9	0.80	3.8	4.7	
		HIGHWAY									5(min)	2.8	6.4	8.1	0.8	5.1	6.5	

APPENDIX A-3

HYDRAULIC COMPUTATIONS

PAIWA STREET DRAIN LINE

1. ORIGINAL HGL COMPUTATIONS

APPENDIX A-3

HYDRAULIC COMPUTATIONS

PAIWA STREET DRAIN LINE

2. UPDATED HGL COMPUTATIONS

COMMUNITY PLANNING INC

PROJECT PAIWA ST. & DRAIN IMPROVEMENTS BY R.S.

SYSTEM ALONG PAIWA STREET ALIGNMENT CHECKED BY

C : (Tm = 10)
I : (Tm =)

DATE 8/16/73 REV. R.S. SHT

Main Line Struc. No.	Main Line A Ac	Main Line Q cfs			Branch Line Entering Structure A Ac	Branch Line Entering Structure Q cfs	Design Tc Min	Rainfall Intensity In/Hr	Cumulative Area Acres	Design Q cfs	Pipe Dia In	Pipe Length Ft	Design Slope Data So Ft/Ft	Cap cfs	Dn Ft	Vn fps	Dc Ft	Friction Slope Data Sf Ft/Ft	Vf fps	Hf Ft	Manhole Losses A Ft	B Ft	C Ft	D Ft	Entrance Control Loss H/D Ft/Ft	H Ft	Invert	HGL Lower	HGL Upper
																											[illegible]		[illegible]
CB P1	0.2	12			8.3	55½																							
									6½	3½	15	24	0.016		5.5	5.2		0.0065	1.7	0.06									
CB P1a	0²	3½																			–	–	–	–	0.6	0.9	46.9	47.0	47.6
																											[illegible]		[illegible]
CB P1	0.2	12			0½	3½																							
									15½	51½	36	50	0.01		5.0	10²		0.006	7.3	1.30									
F.I. P1b	15½	51½																			0.15	-	0.30	0.1	1.95	3.75	46.5	[illegible]	48.65
											36		0.05		1.2	19²													
Future																													
CB P2	0.2	12			[illegible]	[illegible]																					[illegible]		[illegible]
									13	4½	18	46	0.01		0.55	5.7		0.0015	2.3	0.07									
CB P2a	13	4½																			-	-	-	-	0.71	1.1	59.7	[illegible]	[illegible]
~~SB~~	~~0.2~~	~~13~~			~~1½~~	~~[illegible]~~																					[illegible]		[illegible]
									~~3²~~	~~10²~~	~~24~~	~~[illegible]~~	~~0.01~~		~~1.0~~	~~7.1~~		~~[illegible]~~	~~5.4~~	~~0.09~~							[illegible]		[illegible]
~~F.I. P2c~~	~~32~~	~~10²~~																			~~.06~~				~~.06~~	~~1.7~~	~~[illegible]~~	~~51.0~~	~~[illegible]~~
CB P2	0.2	12			1½	4½																					[illegible]	~~51.0~~	[illegible]
									3²	10²	30	100	[illegible]		[illegible]	6.8		0.0006	2.2	0.06							[illegible]		60.1
F.I. P2c	0²	1.8																					.42	.2	.14	1.6	57.2	60.59	61
									2.5	9²	30	180	0.01		0.8	6.8		0.0004	1.8	[illegible]									
F.I. P2b	25	98																			~	~	~	~	.56	1.4	60.0	61.[illegible]	

COMPUTED BY OSK
CHECKED BY ______

PIPE SYSTEM ANALYSIS

PROJECT Pahwa St. & Drain Improvements. Update
SYSTEM Kahu Canal to CB P2

C=	"i"	Tc	CF	I	CI
T=10	1.92				
T=50					

n = 0.013 (RCP)
n = 0.015 (R.C. Box Drain)

DATE 03/02/96

SHT 1 OF 3 SHTS

MAIN LINE STRUCT NO.	MAIN LINE A acs	MAIN LINE Q cfs	BRANCH LINE ENTERING STRUCTURE #	BRANCH A	BRANCH Q	CUMULATIVE AREA (ACRES)	DESIGN Q (cfs)	PIPE SIZE	PIPE LENGTH	DESIGN SLOPE DATA S_o ft/ft	CAP cfs	D_n ft	V_n fps	FRICTION SLOPE DATA S_f ft/ft	V_f fps	H_f ft	MANHOLE LOSSES A	B	C	D	ENTRANCE CONTROL LOSS H/D	H	INVERT	HGL DOWN	HGL UP	OVERFLOW ELEVATION	REMARKS
																							1.19		9.0		[illegible]
OUTLET #1																											
						180²	473.1	8x6 Box	241.32	0.01	681	3.82	15.49	.0045	9.90	1.17	Contraction Loss Neg. See Calcs below						3.6	10.17	10.17	14.4	Full Flow in Box. Top [illegible]
Conn to 96" RCP																											
						180²	473.1	96	191.64	.045	1938	2.45	31.80	.0027	9.4	.49											
																	.26	.15	.18	.06	1.00	8.0	11.77	14.46	20.01	23.6	
SDMH#3			20	11⁰	27.1																						
						169²	446.1	96	357	0.013	1040	3.66	19.50	.0024	8.87	.86											
																	.23	.01	.15	0.04	.99	7.92	16.41	20.07	24.98	27.7	
SDMH#4			15	0⁸	1.9																						Full Flow
						168²	444.2	96	410	0.012	999	3.70	19.29	.0024	8.83	.98											
																	.23	.03	.15	0.00	.99	7.92	21.33	25.46	29.90	33.6	
SDMH#5			13	2³	5.5																						Full Flow
						166²	439.7	96	92	.0247	1433	3.04	25.06	.0023	8.73	.21											
																	.22	0.00	.15	0.00	.98	7.84	23.60	29.61	29.90	34.5	
SDMH#6																											
						166²	438.7	96	225	.014	1080	3.55	20.36	.0023	8.73	.52											
																	.22	.18	.15	.08	.98	7.84	26.75	30.30	34.82	38.2	
SDMH#7			18	13¹⁵	35.4																						
						153¹⁵	403.3	96	292	.019	1801	2.57	20.89	.0020	8.02	.55											
																	.18	.20	.12	.07	.94	7.52	38.46 [illegible] 37.75 [illegible]	40.33	45.46	49.6	
CB P1	0²	.79	36	15.7 .78	51.9 .79																						
						137²⁵	360.7	96	276	.049	2019	2.29	30.37	.0016	7.18												
																	.15	0.00	.12	0.00	.86	6.88	[illegible]	54.29	59.00	62.8	
CB P2	0³	.79	30	.85 3.0	1.5 8.5																						
						133⁵	350.1	90	276	.017		3.06	20.15	.0021	7.94	.57											
CB P3	0²	.95		8²	19.7																						

Contraction Loss at Connection of 96" RCP with 8x6 Box Drain.
Ref. King & Brater, Handbook of Hydraulics, 5th Ed., 1963
1. p. 6-21 Minor Losses:
Eq (6-37) $h_2 = \frac{0.7(V_1 - V_2)^2}{2g}$
where V_2 = Velocity in Smaller Pipe
2. Assume V_1 & V_2 are full flow as manhole losses per DPW Drainage S[illegible]
3. $H = \frac{0.7(9.4 - 9.9)^2}{2(32.2)} = 0.0027'$ ∴ Negligible

COMMUNITY PLANNING INC

COMPUTED BY DSK
CHECKED BY ______

PIPE SYSTEM ANALYSIS

PROJECT Pahwa St. & Drain Improvements (Update)
SYSTEM CB P1 to FI P1-6

C=	"i"	Tc	CF	I	CI
T=10					
T=50					

DATE 03/02/96

SHT 2 OF 3 SHTS

MAIN LINE STRUCT NO.	MAIN LINE A acs	MAIN LINE Q cfs	BRANCH LINE ENTERING STRUCTURE #	BRANCH A	BRANCH Q	CUMULATIVE AREA (ACRES)	DESIGN Q (cfs)	PIPE SIZE	PIPE LENGTH	DESIGN SLOPE DATA S_o ft/ft	CAP cfs	D_n ft	V_n fps	FRICTION SLOPE DATA S_f ft/ft	V_f fps	H_f ft	MANHOLE LOSSES A	B	C	D	ENTRANCE CONTROL LOSS H/D	H	INVERT	HGL DOWN	HGL UP	OVERFLOW ELEVATION	REMARKS
																							[illegible] 37.75 [illegible]		45.46	49.6	
CB P1	0²	.79		0²	2.45																						
						15³	41.2	36	50	.01	66.7	1.7	9.92	.0035	5.8												
																	.05	.5	.06	0.00	1.04	3.12	44.50	46.20	46.87	50.	
FI DH6	15³	41½																									

COMMUNITY PLANNING INC

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PROJECT PAIWA ST. & DRAIN IMPROVEMENTS BY K.S. C: ____ (Tm=10) i: ____ (Tm=) n=0.013 (RCP) n=0.015 (R.C. Box Mon) DATE 8/16/73 [illegible] REV. R.S. [illegible] REV. SHT. 1

SYSTEM KAHI CANAL TO WAIPAHU STREET CHECKED BY ____

Main Line Struct. No.	A Ac		CA		Branch Line Entering Structure A Ac	Q cfs	Design Tc Min	Rainfall Intensity in/hr	Cumulative Area Acres	Design Q cfs	Pipe Dia In	Pipe Length Ft	Design Slope Data S_o ft/ft	Cap cfs	D_n ft	V_n fps	D_c ft	Friction Slope Data S_f ft/ft	V_f fps	H_f ft	Manhole Losses A ft	B ft	C ft	D ft	Entrance Control Loss H/D ft/ft	H ft	Invert	HGL Lower	HGL Upper	Overflow Elevation
Outlet #1																											1.19		[illegible]	
			9.91						180	597	[illegible]	641.32	0.01	681	[illegible]	[illegible]		0.0077	12.6	1.86										
Conn. to 96" RCP																					Total Loss = 4.5 [illegible]						3.6	10.86	13.2	16.4
			9.91						180	597	96	1816	0.045	1400	5.0	75		0.0043	11.9	1.76										
SDMH #3					11	38															0.06	0.35	1.29	0.03	1.34	9.92	8.77	18.77	22.00	23.6
			3.33						169	563	96	357	0.013	1030	0.3	21		.004	8.3	1.43										
SDMH #4					0	2															0.17	–	0.11	–	1.18	9.4	16.41	25.00	26.06	27.7
			3.33						168	561	96	410	0.02	1.05	4.4	21		.004	11.2	1.64										
SDMH #5					2.2	6															0.17	0.07	0.35	0.02	1.18	9.6	21.33	26.06	31.0	33.6
			3.33						166	558	96	92	[illegible]	[illegible]	[illegible]	[illegible]		0.0098	11.0	0.75										
SDMH #6					–	–															0.96	–	0.26	–	1.16	9.88	[illegible]	31.0	[illegible]	34
			3.33						166	556	96	235	[illegible]	[illegible]	[illegible]	21		0.0038	11.0	0.86										
SDMH #7					[illegible]	[illegible]															0.36	0.05	0.20	0.1	1.16	9.28	[illegible]	[illegible]	[illegible]	38
			3.33						[illegible]	[illegible]	96	252	0.079		2.7	81		[illegible]	[illegible]	0.70										

(CONTINUED ON SHEET # 4)

COMMUNITY PLANNING INC

PROJECT PAIWA ST. & DRAIN IMPROVEMENTS BY R.S. C: ____ (Tm=10) i: ____ (Tm=) DATE 8/16/73 [illegible] REV. R.S. [illegible] SHT. 4

SYSTEM [illegible] PAIWA STREET EXTENSION CHECKED BY ____

Main Line Struct. No.	A Ac	Q cfs	CxI	CxI	Branch Line Entering Structure A Ac	Q cfs	Design Tc Min	Rainfall Intensity in/hr	Cumulative Area Acres	Design Q cfs	Pipe Dia In	Pipe Length Ft	Design Slope Data S_o ft/ft	Cap cfs	D_n ft	V_n fps	D_c ft	Friction Slope Data S_f ft/ft	V_f fps	H_f ft	Manhole Losses A ft	B ft	C ft	D ft	Entrance Control Loss H/D ft/ft	H ft	Invert	HGL Lower	HGL Upper	Overflow Elevation
																											[illegible]		[illegible]	38
SDMH #7	–	–			[illegible]	[illegible]																								
									[illegible]	[illegible]	96	282	0.039		2.2	3.0		0.0032	[illegible]	0.9										
CB P1	0.2	1			[illegible]	[illegible]															0.31	–	0.19	0.15	1.1	8.8	[illegible]	[illegible]	[illegible]	49
									[illegible]	[illegible]	90	276	0.049		2.7	32.8			10.3											
CB P3	0.3	1			7.2	108															0.31	0.02	0.31	0.03	1.13	8.5	[illegible]	[illegible]	60.84	[illegible]
									133	402	90	276	0.017		4.5	22.0			10.0											
CB P4	0.1	1			8	26															0.35	–	0.35	0.35	1.11	8.3	[illegible]	[illegible]	66.56	68
									124	416	84	158	0.005		5.3	11.0		0.0061	10.8	0.65										
SDMH P5	–	–		3.72	58	217															0.35	0.05	0.35	0.90	1.2	6.6	[illegible]	[illegible]	[illegible]	71
									66	198	60	141	0.015		2.8	18.0		0.0058	10.1											
SDMH P5'	–	–			5	17															1.40	–	0.27	0.15	1.35	6.75	[illegible]	[illegible]	73.37	75
									60	181	54	151	0.03		1.2	22.0		0.0082	11.4											
CB P6	0.1	1			1	9															1.40	0.02	0.27	0.12	1.6	7.2	[illegible]	75.4	80.69	85
									59	177	54	430	0.0507		2.0	27.0		0.018	11.2											
CB P7	0.3	0.6			0.3	2															0.18	1.02	0.25	0.06	1.55	7.0	[illegible]	99.5	104.77	[illegible]
									58	174	56	242	0.012		3.13	16.0		0.0078	11.0	1.59										
SDMH P8	–	–			7	8															0.96	0.03	0.26	0.06	1.53	6.9	[illegible]	105.82	107.37	117
									55	166	54	209	0.005		4.5	10.4		0.007	10.4	1.66										
CB P9	0.1	1			15	47															0.33	0.08	0.66	0.38	1.44	6.5	[illegible]	111.35	112.80	114
									39	117	48	315	0.005		6.0	9.3		0.0066	9.3	2.02										
CB P10	0.3	0.1			7	21															0.56	1.09	0.48	0.15	1.39	5.6	[illegible]	112.6	115.31	118
									31	95	48	403	0.005					0.0043	7.6	1.73										

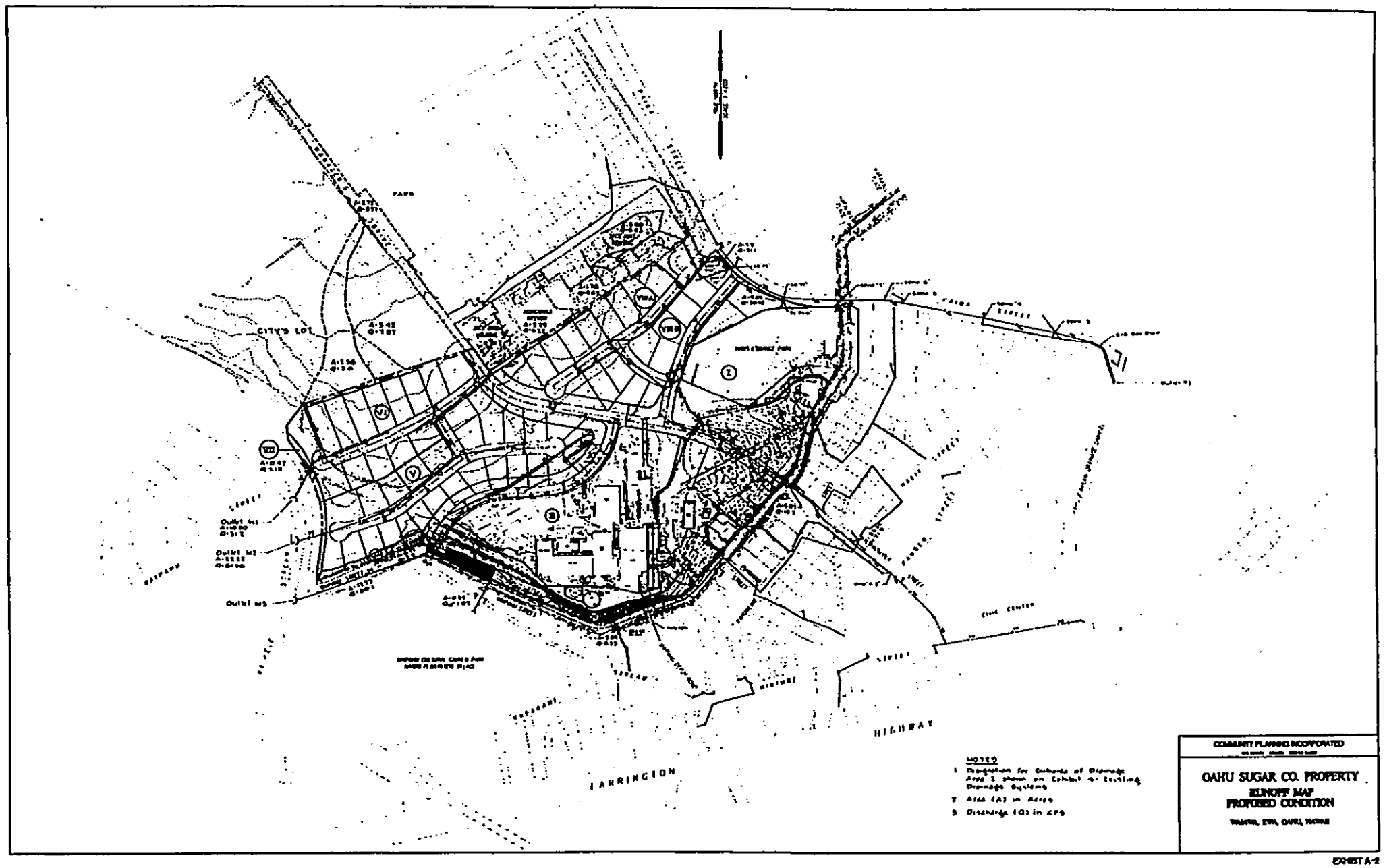
PARK
CITY'S LOT
Outlet #1
Outlet #2
Outlet #3
HIGHWAY
FARRINGTON
NOTES
1 Designation for Subareas of Drainage Area I shown on Exhibit A- Existing Drainage Systems
2 Area (A) in Acres
3 Discharge (Q) in CFS
COMMUNITY PLANNING INCORPORATED
OAHU SUGAR CO. PROPERTY
RUNOFF MAP
PROPOSED CONDITION

EXHIBIT A-2

APPENDIX A-3

HYDRAULIC COMPUTATIONS

PAIHA STREET DRAIN LINE

3. PROPOSED CONDITIONS HGL COMPUTATIONS

PIPE SYSTEM ANALYSIS

PROJECT Paiha St Drain Improvements (Update)
SYSTEM CB P2 to F2 P2-6

C	i	T_c	CF	I	CI
T_c=10	1.8				
T_c=30					

DATE 03/02/96

COMPUTED BY CJC
CHECKED BY
SHT 3 OF 3 SH

MAIN LINE			BRANCH LINE ENTERING STRUCTURE			CUMULATIVE AREA (acres)	DESIGN Q (cfs)	PIPE SIZE	PIPE LENGTH	DESIGN SLOPE DATA				FRICTION SLOPE DATA			MANHOLE LOSSES				ENTRANCE CONTROL LOSS		INVERT	HGL		OVERFLOW ELEVATION	REMARK
STRUCTURE	A ocs	Q cfs	#	A	Q					S_o ft/ft	CAP cfs	D_n ft	V_n fps	S_f ft/ft	V_f fps	H_f ft	A	B	C	D	H/D	H		DOWN	UP		
CBP2	.3	.79		1	3.14																						
							8.54	30	100	.0117	44.4	8.74	6.98	.0014	1.74	.04							57.24(1) 57.09(2)		60.36	62.3	Top of Pipe
F1P2-6	.5	1.92																									Full Flow
							7.12	30	80	.01	41.0	0.7	6.77	.0007	1.45	.02	.82	.01	0.00	0.00	.51	1.28	58.2	60.40	60.43	63.2	
F1P2-6	7.5	7.12															.01	.83	0.00	0.00	.46	1.15	58.0	60.45	60.99	64.2	Full Flow

COMMUNITY PLANNING INC

PIPE SYSTEM ANALYSIS

COMPUTED BY: [illegible]
CHECKED BY: ______

PROJECT: Pauoa St & Drain Improv (Proposed Grd)
SYSTEM: Kahu Canal to CB P2

C=	"i"	Tc	CF	I	CI
T=10	1.82				
T=50					

n=0.013 RCP
n=0.015 RC Box Drain

DATE: 03/05/96

SHT 1 OF 1 SHTS

MAIN LINE			BRANCH LINE ENTERING STRUCTURE			CUMULATIVE AREA (ACRES)	DESIGN Q (cfs)	PIPE SIZE	PIPE LENGTH	DESIGN SLOPE DATA				FRICTION SLOPE DATA			MANHOLE LOSSES				ENTRANCE CONTROL LOSS		INVERT	HGL		OVERFLOW ELEVATION	REMARKS
STRUCT NO.	A acs	Q cfs	#	A	Q					S_o ft/ft	CAP cfs	D_n ft	V_n fps	S_f ft/ft	V_f fps	H_f ft	A	B	C	D	H/D	H		DOWN	UP		
OUTLET #1																							1.19		9.0		Assume HGL [illegible]
							[illegible]	[illegible]	244.32	[illegible]	[illegible]			.0044		[illegible]											
CONNECT 1																	CONTRACTION LOSS [illegible]						3.6	10.18	10.18		
							474.5	96	181.64	[illegible]	[illegible]	[illegible]	[illegible]	.0027	9.44	[illegible]											
SDMH #3				11.3	27.1												[illegible]	[illegible]	0.17	0.07	1.84	8.33	11.77	14.47	20.33		
							447.4	96	357	[illegible]	[illegible]	3.67	9.01	[illegible]	8.90	0.86											
SDMH #4				0.5	19												0.23	0.01	0.15	0.0	.99	7.92	16.41	21.19	24.48		
							445.5	96	410	.012	[illegible]	3.74	[illegible]	.0024	[illegible]	[illegible]											
SDMH #5				2.4	5.5												[illegible]	[illegible]	[illegible]	0.0	.98	7.84	21.33	25.46	29.32		
							439.98	96	92	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]											
SDMH #6																	0.22	0.00	[illegible]	0.0	.98	7.84	23.60	29.53	29.90		
							439.93	96	225	.014	1080	[illegible]	[illegible]	.0023	8.75	[illegible]											
SDMH #7				13.19	35.4												0.22	0.18	0.15	[illegible]	.98	7.84	26.75	32.11	34.84		
							404.6	96	282	.029	1501	[illegible]	28.91	.0020	8.05	0.56											
CB P1	0.37	.79		9.09	30.5												[illegible]	0.15	0.12	0.07	.95	7.60	[illegible]	[illegible]	45.54		
				[illegible]	[illegible]	141.49	372.5	96	276	.049		2.33	30.65	.0017	7.41	0.47											
MH P2				7.5	21.1												0.18	[illegible]	0.12	[illegible]	.87	6.96	[illegible]	54.33	59.13		
				[illegible]	[illegible]	133.5	350.1	90	276	.017		[illegible]	[illegible]	.0021	7.92	0.58											
CB P3	0.5	.95		8.5	19.7																						