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October 3, 1990

The Honorable Larry S. Tanimoto  
Mayor  
County of Hawaii  
25 Aupuni Street  
Hilo, Hawaii 96720

Dear Mayor Tanimoto:

I am pleased to accept the Final Environmental Impact Statement for the Kailua Park Expansion Project as satisfactory fulfillment of the requirement of Chapter 343, Hawaii Revised Statutes. This environmental impact statement will be a useful tool in the process of deciding if the action described therein should be allowed to proceed. My acceptance of the statement is an affirmation of the adequacy of that statement under the applicable laws and does not constitute an endorsement of the proposed action.

When the decision is made regarding the proposed action itself, I expect the proposing agency to consider if the societal benefits justify the environmental impacts which will likely occur. These impacts are adequately described in the statement and, together with the comments made by reviewers, provide useful analysis of the proposed action.

With kindest regards,

Sincerely,



JOHN WAIHEE

cc: Mr. George Yoshida

bcc: ✓ Hon. John C. Lewin

**KAILUA PARK EXPANSION PROJECT  
FINAL ENVIRONMENTAL IMPACT STATEMENT**

Prepared for:

**COUNTY OF HAWAII  
DEPARTMENT OF PARKS AND RECREATION  
25 AUPUNI STREET  
HILO, HAWAII 96720**

Prepared by:

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In Association with:

**James H. Pedersen  
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Telephone and Fax: (808) 967-7619**

**August, 1990**

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**CHAPTER 1.0**  
**INTRODUCTION**

# CHAPTER 1.0 INTRODUCTION

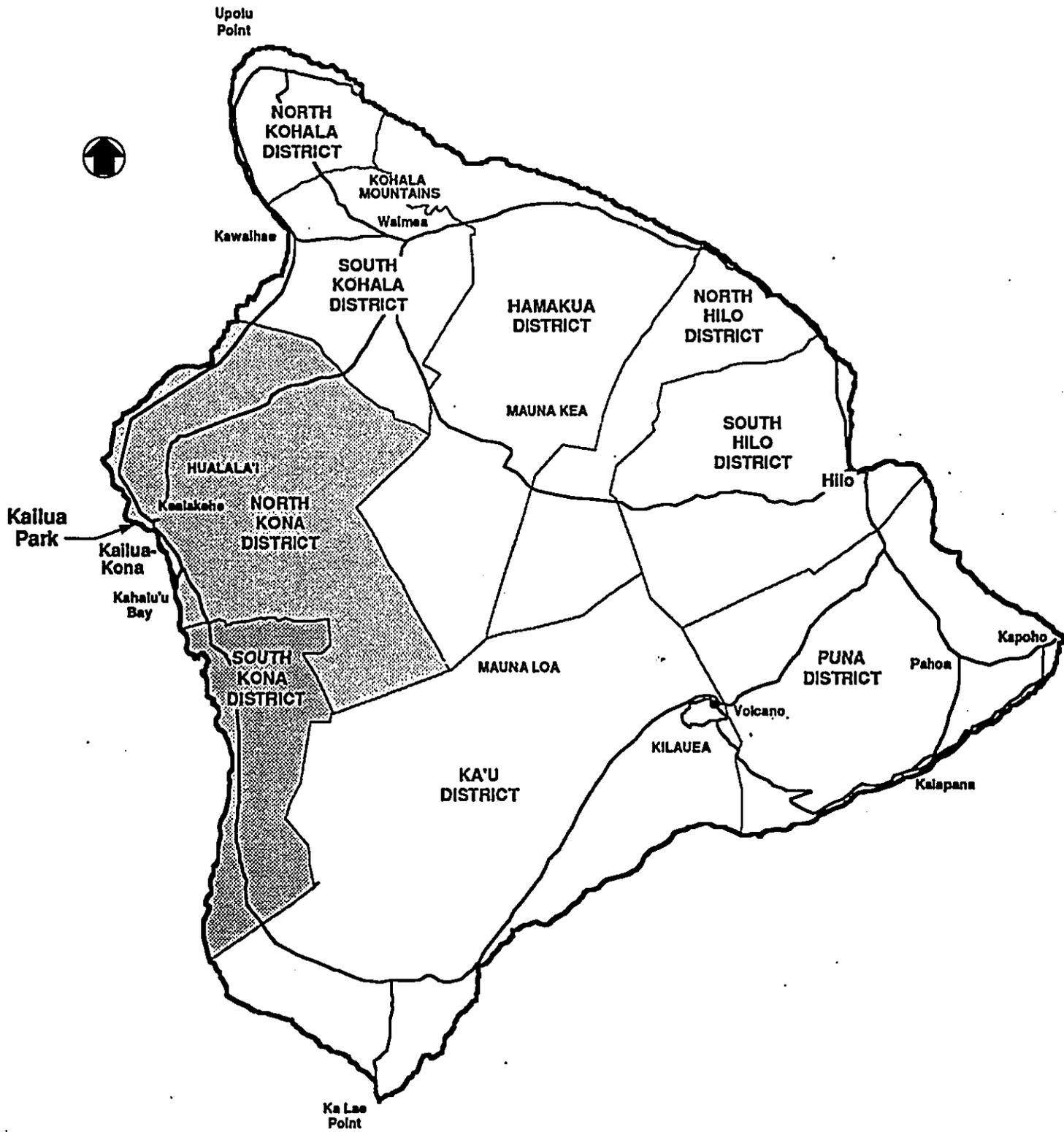
## 1.1 PURPOSE OF THE REPORT

The primary purpose of this environment impact statement is to satisfy the requirements of Chapter 343, Hawaii Revised Statutes. The final EIS will also be used a supporting document for pending use permit and special management area permit applications by the County of Hawaii Department of Parks and Recreation. Upon approval, mitigation measures documented in this EIS will ultimately be reflected in the detailed design and subsequent construction of the proposed project. In recognition of these regulatory requirements and intended uses of this document, the study objectives during preparation of the EIS were to:

1. identify, evaluate and determine reasonable project alternatives for providing expanded recreational opportunities in the Island of Hawaii's North and South Kona districts (Figure 1-1);
2. evaluate the characteristics and trends of the Old Kona Airport site and surrounding Kona community which influence the area's physical, biological, and cultural resources and the related built environment;
3. determine and analyze significant environmental consequences which are expected to result from the development of the selected project alternative; and
4. identify practical mitigative measures which can reduce the impact of the proposed expansion of Kailua Park.

This environmental impact statement replaces earlier information presented in the April, 1989 environmental assessment of the Kailua Park Master Plan. The County of Hawaii withdrew its former environmental assessment from public and agency review following a September, 1989 recommendation by the State Office of Environmental Quality Control (OEQC). Dr. Marvin Miura, director of State OEQC, recommended that the County of Hawaii prepare an environmental impact statement for the proposed project because the agency believed that "the impacts of this project will be significant" (Miura and Sakamoto, 1989). The issues raised by those agencies reviewing the former environmental assessment are included in Appendix A.

The draft EIS will also be circulated to all appropriate County, State and federal agencies; private organizations; and concerned individuals identified by the State Office of Environmental Quality Control. Consequently, this document will serve as a central source of information for reviewing agencies and organizations which have responsibility and/or interest in 1) the management of statewide resources, and 2) the evaluation of development actions that may affect Hawaii's natural and man-made resources.



**FIGURE 1-1**  
**REGIONAL LOCATION**  
**KAILUA PARK**  
**KAILUA-KONA, HAWAII**

## 1.2 SCOPE OF THE EIS

This EIS contains a combination of quantitative and qualitative analyses which were made to meet the information objectives outlined in section 1.1 of this EIS. These objectives are consistent with the State of Hawaii requirements for the preparation of environmental impact statements. These requirements are identified in Chapter 343 of the Hawaii Revised Statutes, and the administrative rules and regulations of the State Office of Environmental Quality Control.

A variety of issues are addressed in this EIS document. Project alternatives are identified and evaluated in the context of:

1. regional recreation demands;
2. the relationship of the proposed project to the proposed Kealahou Regional Sports Complex and other public recreational facilities in the North Kona area; and
3. the capacity of the Old Kona Airport site and other County park facilities to accommodate future recreational demands.

Anticipated traffic and noise levels in the vicinity of Kailua Park are evaluated. The impact of the expanded park facilities upon local infrastructure such as water and wastewater systems, is also discussed. The potential effects of the proposed park expansion upon existing archaeological and historical resources on the Old Kona Airport site are also identified.

## 1.3 REPORT ORGANIZATION

Chapter 1.0 outlines the general objectives of the EIS, the intended use of the information presented, the scope and emphasis of the environmental analyses, general project assessment methods, and the responsibility of EIS preparation.

Chapter 2.0 identifies and evaluates different project alternatives for providing expanded recreational opportunities in the Kona district. The planning issues influencing the selection of the more desirable project alternative are also examined.

Chapter 3.0 assesses the significant characteristics and trends influencing the physical, biological, and cultural resources, as well as the built environment, of the surrounding North Kona district;

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

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

#### **1.4 METHODOLOGY**

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

Available information was supplemented by an onsite reconnaissance of the Kailua Park site to document existing levels of recreational activity, the condition of existing facilities, and the location and type of existing land uses. Informal discussions were also made with selected County Parks and Recreation representatives which have responsibility for the management of Kailua Park facilities and programs.

Ambient noise measurements were made within and in the vicinity of Kailua Park on December 8 and 9, 1989, by Darby & Associates, Acoustical Consultants. This information was used, in part, as a basis for a related assessment of potential noise impacts from the proposed project. The entire noise impact report is included in Appendix B.

Barton-Aschman Associates, Inc., made vehicular traffic counts November 24 and 25, 1989, in the vicinity of Kailua Park. This information was obtained as part of its evaluation of potential vehicular traffic impacts from the proposed project. The complete vehicular traffic impact report is presented in Appendix E.

#### **1.5 AGENCY AND PUBLIC CONSULTATION**

Preparation of this environmental impact statement involved consultation with the following public agencies and private organizations:

##### **PUBLIC AGENCIES**

###### **County of Hawaii**

Department of Parks and Recreation  
Department of Public Works  
Department of Planning

###### **State of Hawaii**

Department of Land and Natural Resources  
Division of Parks & Outdoor Recreation  
Division of Historic Sites

## PRIVATE AGENCIES

Hawaii Visitors Bureau

### 1.6 RESPONSIBILITY OF EIS PREPARATION

Sidney Fuke & Associates was retained by the County of Hawaii Department of Parks and Recreation to prepare an EIS for the Kailua Park expansion project in November, 1989. This environmental impact statement was subsequently prepared by Sidney Fuke & Associates in association with James H. Pedersen, Planning Consultant.

Mr. Fuke has nineteen years of public planning and consulting experience in Hawaii. He served as a deputy director and director of planning for the County of Hawaii during a fourteen year career in public service. Subsequently, Mr. Fuke has represented numerous private development organizations in the preparation of environmental assessments and land use applications for various resort, residential, commercial and golf course development projects in Hawaii. He also prepared a Shoreline Access Management Plan and Public Access Guide for the Maui County Planning Department.

Mr. Jim Pedersen is a planning consultant with 19 years of professional experience associated with the evaluation and master planning of regional, community and site development projects throughout the Pacific Basin. These projects have involved his management and preparation of regional economic and infrastructure development plans; community development and redevelopment projects; economic and development feasibility studies; site and facility plans for specific transportation, recreation, residential, commercial and industrial development projects; and related environmental impact studies.

**CHAPTER 2.0**

**PROJECT ALTERNATIVES**

## CHAPTER 2.0 PROJECT ALTERNATIVES

### 2.1 PRIMARY ISSUES INFLUENCING ALTERNATIVE SELECTION

The development of recreational facilities and programs in Hawaii County's North Kona district is primarily influenced by:

1. changing recreational trends among visitors and residents;
2. the type, location and capacity of available recreational facilities and opportunities;
3. the extent of public access to local recreational opportunities; and
4. the type of land uses adjoining recreational facilities and opportunities.

#### 2.1.1 Recreational Trends Among Visitors and Residents

West Hawaii continues to grow in terms of resident population, as well as the number and length of stay of incoming visitors. This growth has outpaced the development of public recreational facilities in the North and South Kona districts which have expanded little since the late 1970's. Growing numbers of residents and "repeat" visitors, who are the primary users of public recreational facilities (Knox, 1989), have generated significantly higher levels of recreational participation in various recreational activities. The demand for recreational facilities has been further complicated by changing preferences in recreational activity among all resident age groups. In addition, visitors to Hawaii Island continue to travel more independently and are staying longer.

Population growth in West Hawaii is particularly evident in the North and South Kona districts. The resident population of North Kona was estimated to be approximately 22,770 in 1989 which represents an average annual growth rate of approximately 7 percent since 1980. South Kona's population rose to about 7,680 persons in 1989, or at an average annual growth rate of slightly over 3 percent per year since 1980 (Hawaii County Department of Research and Development, 1989). The increases in Kona's resident population, particularly the North Kona district, are indicative of a rapidly growing community as typical residential community growth rates in America average about 2 percent.

The number of westbound overnight visitors to Hawaii Island has been rising rapidly since 1986 which also marked the beginning of increased air service to Keahole Airport in North Kona. The Hawaii Visitors Bureau estimates that approximately 959,890 westbound visitors intended to stay at least one night or longer on the Big Island. This increase suggests an increased growth rate of approximately nine percent per year since 1985. The impact of an increasing number of visitor arrivals has been compounded by the visitor length of stay on the Big Island which is now 5 days compared to 4 days in 1980 (Higa, 1989).

Roughly half of the visitors to the Island of Hawaii are "repeat" visitors. In 1988, the proportion of frequent independent travelers grew to 84 percent compared to approximately 70 percent in 1984. This signals a continuing trend toward more independent travel; further, a significant proportion of visitors, already familiar with Hawaii, will likely spend some portion of their visit, e.g., at least one day, in local public recreational areas.

Recreational trends in West Hawaii include continued and growing participation in organized soccer, canoeing, softball and tennis, as well as other informal beach and ocean recreation activities such as parties and social gatherings, swimming, diving and volleyball (Borkowski, 1990). A detailed survey of Hawaii residents was administered by Community Resources, Inc. and Datametric Research in October, 1989. Results of this survey, which will provide considerable information concerning recreational participation, are expected to be available in March, 1990 (Knox, 1990).

### **2.1.2 Available Recreational Facilities and Opportunities**

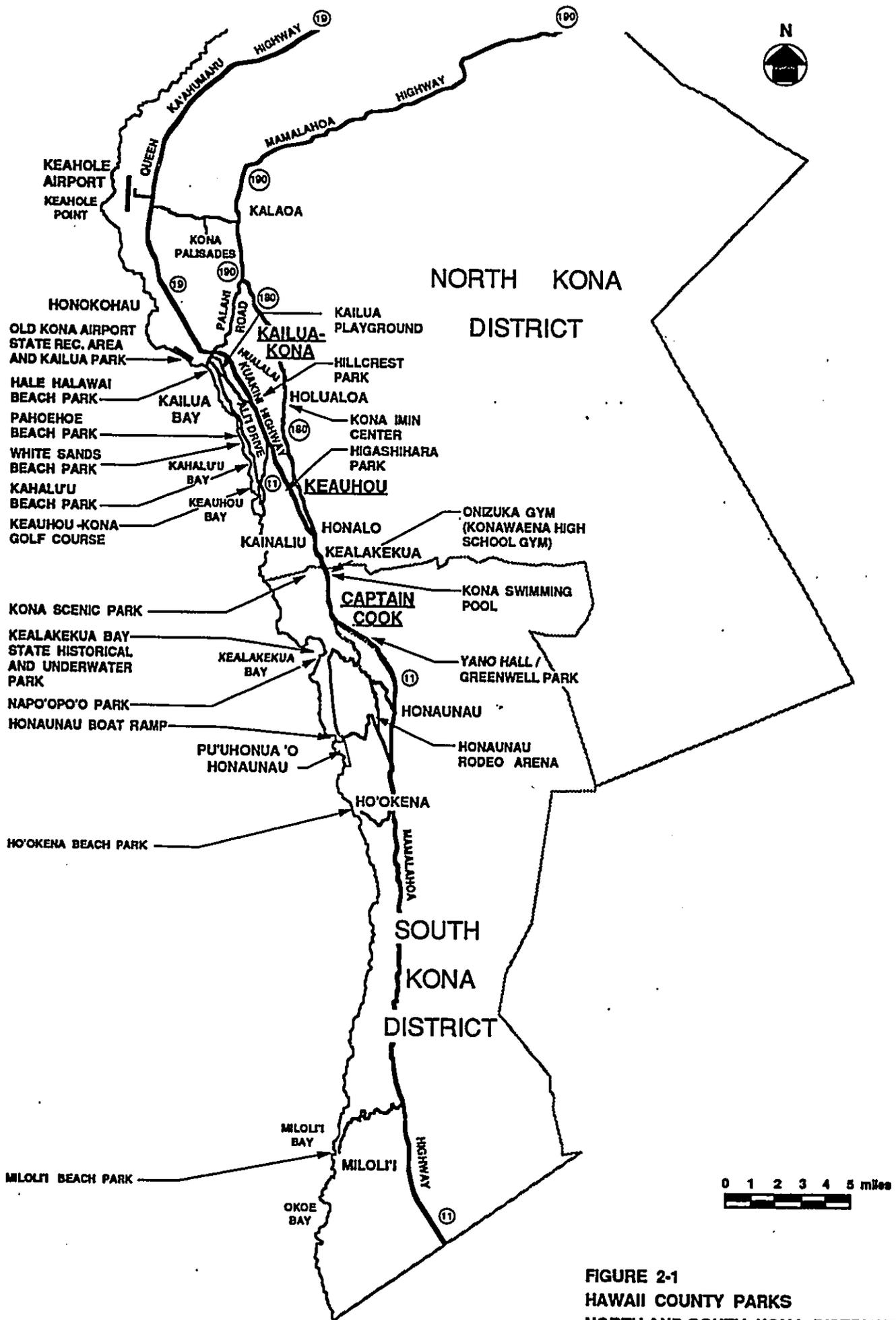
West Hawaii's resident population and visitors have access to a variety of public recreational opportunities, areas, and facilities (Figure 2-1). These facilities are provided by the County of Hawaii and the State of Hawaii. Recreational opportunities include beach and ocean activities, organized and informal court sports, organized and informal field games, social gatherings and meetings in pavilions and community halls, playgrounds and "tot lots", picnicking areas, and general open space areas.

#### **2.1.2.1 County of Hawaii**

The primary recreational agency serving the North and South Kona districts is the Hawaii County Department of Parks and Recreation which operates and maintains 17 public park facilities. The Department administers and operates organized recreation programs from six of the County's seventeen facilities, as well as at Konawaena High School's Onizuka Gym. In addition, the County supports the operation of numerous other private sports programs and social events at the County's other park facilities. In FY 1988-1989, resident and visitor recreation at the County's seventeen parks involved, at least, 1.06 million persons (Tables 2-1 through 2-3).

#### **2.1.2.2 State of Hawaii**

The State of Hawaii continues to operate and maintain two shoreline recreational areas in the North and South Kona district. The Old Kona Airport Recreation area is an 80- acre passive recreation area which includes one large community pavilion, two smaller picnic complexes, two restroom facilities, some 15 picnic sites, and portions of the former airport runway that provides vehicular access and parking. Some 34 acres on the south end of the Old Kona Airport site have been leased by the State of Hawaii to the County of Hawaii for its Kailua Park facility.



**FIGURE 2-1  
HAWAII COUNTY PARKS  
NORTH AND SOUTH KONA DISTRICTS**

TABLE 2-1

**ANNUAL RESIDENT PARTICIPATION  
ORGANIZED SPORT GAMES, PRACTICES AND INSTRUCTION  
COUNTY PARKS IN NORTH AND SOUTH KONA  
FY 1988-89**

<u>Facility</u>	Number of Participants					<u>Total</u>
	<u>P&amp;R Sport Games</u>	<u>Private Leag. Sport Games</u>	<u>Private Leag. Sport Prctes</u>	<u>P&amp;R Sports Instr.</u>	<u>P&amp;R Phys. Fitness</u>	
Kailua Park	6,824	12,459	31,260	646	1,872	53,061
Kailua Playground	NAp	NAp	NAp	NAp	NAp	0
Hale Halawai	NAp	NAp	NAp	NAp	NAp	0
White Sands Beach Park	NAp	NAp	NAp	NAp	NAp	0
Kahaluu Beach Park	NAp	NAp	NAp	NAp	NAp	0
Pahoehoe Beach Park	NAp	NAp	NAp	NAp	NAp	0
Kona Imin Center	765	2,738	89	2,000	2,908	8,500
Hillcrest Park	NAp	1,600	NAp	NAp	NAp	1,600
Higashihara Park	NAp	2,336	3,180	NAp	NAp	5,516
Kona Scenic Park	1,600	1,778	3,730	NAp	NAp	7,108
Yano Hall/Greenwell Park	2,702	15,408	13,010	2,225	538	33,883
Napoopoo Beach Park	NAp	NAp	NAp	NAp	NAp	0
Honaunau Boat Ramp	NAp	NAp	NAp	NAp	NAp	0
Honaunau Rodeo Arena	NAp	NAp	250	NAp	NAp	250
Hookena Beach Park	NAp	NAp	NAp	NAp	NAp	0
Milolii Beach Park	NAp	NAp	NAp	NAp	NAp	0
Kona Swimming Pool	NAp	NAp	NAp	2,715	NAp	2,715
<b>Individual Activity Totals</b>	<b>11,891</b>	<b>36,319</b>	<b>51,519</b>	<b>7,586</b>	<b>5,318</b>	<b>112,633</b>

Note: NAp - Not applicable.

Source: Borkowski, 1989.

TABLE 2-2

**ANNUAL RESIDENT PARTICIPATION  
ORGANIZED CULTURAL PROGRAMS  
COUNTY PARKS IN NORTH AND SOUTH KONA  
FY 1988-89**

Facility	Number of Participants					Total
	Arts/ Crafts	Music/ Dance	Per- formng Arts	Special Events	Misc	
Kailua Park	258	26	46	8,328	1,009	9,667
Kailua Playground	NAp	NAp	NAp	NAp	NAp	0
Hale Halawai	NAp	6,524	NAp	NAp	1,515	8,039
White Sands Beach Park	NAp	NAp	NAp	NAp	NAp	0
Pahoehoe Beach Park	NAp	NAp	NAp	NAp	NAp	0
Kahaluu Beach Park	NAp	NAp	NAp	NAp	NAp	0
Kona Imin Center	190	1,698	0	822	192	2,902
Hillcrest Park	NAp	NAp	NAp	NAp	NAp	0
Higashihara Park	NAp	NAp	NAp	NAp	NAp	0
Kona Scenic Park	NAp	NAp	NAp	NAp	NAp	0
Yano Hall/Greenwell Park	2,838	3,648	109	1,585	5,460	13,640
Napoopoo Beach Park	NAp	NAp	NAp	NAp	NAp	0
Honaunau Boat Ramp	NAp	NAp	NAp	NAp	NAp	0
Honaunau Rodeo Arena	NAp	NAp	NAp	NAp	NAp	0
Hookena Beach Park	NAp	NAp	NAp	NAp	NAp	0
Milolii Beach Park	NAp	NAp	NAp	NAp	NAp	0
Kona Swimming Pool	NAp	NAp	NAp	NAp	NAp	0
<b>Individual Activity Totals</b>	<b>3,286</b>	<b>11,896</b>	<b>155</b>	<b>10,735</b>	<b>8,176</b>	<b>34,248</b>

Note: NAp - Not Applicable

Source: Borkowski, 1989.

TABLE 2-3

ANNUAL RESIDENT AND VISITOR PARTICIPATION  
 INFORMAL RECREATION  
 COUNTY PARKS IN NORTH AND SOUTH KONA  
 FY 1988-89

Facility	Number of Participants						Total
	Casual Play/ Games	Social Activ- ities	Swim- ming	Fishng Snorkl Diving	Surf- ing	Other Beach	
Kailua Park	13,519	1,323	NAp	NAp	NAp	NAp	14,842
Kailua Playground	30,100	NAp	NAp	NAp	NAp	NAp	30,100
Hale Halawai	750	29,100	NAp	NAp	NAp	NAp	29,850
White Sands Beach Pk	NAp	NAp	30,069	50,412	4,370	170,775	255,626
Kahaluu Beach Park	NAp	31,750	60,138	100,824	8,741	341,549	543,002
Pahoehoe Beach Park	NAp	NAp	NAp	730	NAp	4,380	5,110
Kona Imin Center	3,658	12,824	NAp	NAp	NAp	NAp	16,482
Hillcrest Park	N/A	N/A	NAp	NAp	NAp	NAp	0
Higashihara Park	3,285	4,160	NAp	NAp	NAp	NAp	7,445
Kona Scenic Park	N/A	Nap	NAp	NAp	NAp	NAp	0
Yano Hall/Greenwell Pk	7,140	9,857	NAp	NAp	NAp	NAp	16,997
Napoopoo Beach Park	N/A	1,880	N/A	N/A	N/A	N/A	1,880
Honaunau Boat Ramp	N/A	N/A	N/A	N/A	N/A	N/A	0
Honaunau Rodeo Arena	N/A	3,570	NAp	NAp	NAp	NAp	3,570
Hookena Beach Park	N/A	N/A	N/A	N/A	NAp	1,040	1,040
Milolii Beach Park	N/A	N/A	N/A	N/A	NAp	N/A	0
Kona Swimming Pool	NAp	NAp	43,026	NAp	NAp	NAp	43,026
<b>Individual Activity Totals</b>	<b>58,452</b>	<b>94,464</b>	<b>133233</b>	<b>151,966</b>	<b>13,111</b>	<b>517,744</b>	<b>968,970</b>

Notes: NAp - Not applicable  
 N/A - Information not available

Source: Borkowski, 1989.

The State Division of Parks, Historic Sites, and Outdoor Recreation estimates that roughly 639,580 persons visited the State Recreation area (including Hawaii County's Kailua Park) during FY 1988-1989. The State estimates are based upon periodic counts of vehicles in the Recreation area and assuming that four persons are passengers in each vehicle. By deducting the County's documented 77,570 persons from the State's more general estimate, the State estimates suggest a resident and visitor participation of over 562,000 persons per year.

A second State recreation area is located in the South Kona district at Kealahou Bay Historical and Underwater Park (Figure 2-1). Abundant coral coverage and marine populations provide unique snorkeling and diving opportunities to both residents and visitors. Hawaiian burial caves, the Captain Cook monument, and other historical features provide interesting hiking and beach activities. The State maintains no records of recreational participation data for this recreational area.

The County of Hawaii maintains a one-lane small boat launching ramp along the Lower Kei Road in Honaunau, South Kona. However, the primary center of resident boating activity is at Honokahau Small Boat Harbor which provides moorage for approximately small boats and smaller charter vessels.

### **2.1.3 Recreational Participation and Public Access**

#### **2.1.3.1 Field Games**

The primary field games enjoyed by North and South Kona residents include soccer, softball and baseball, and football. Kona residents participate in these field-oriented sports in organized leagues administered by the County Department of Parks and Recreation and various private organizations. Statistics for FY 1988-1989 suggest that these programs involve the participation of some 57,000 persons for organized sport games (Table 2-1); however, these statistics reflect many of the same participants returning for several games during a sports league season. The actual number of participants for field games may be closer to some 3,000 persons per year (Borkowski, 1987).

Soccer occurs at one of three fields at Kailua Park and, to a lesser extent, at Kona Scenic Park. Multi-purpose fields at Kailua Park and Kona Scenic also accommodate organized football activity. Baseball and various forms of softball occur at Kailua Park and Greenwell Park. T-ball and pitchball also are played at Hillcrest and Higashihara Park.

#### **2.1.3.2 Court Sports**

The court sports that are most popular with Kona residents include tennis, basketball, and volleyball.

**Tennis:** Tennis activity occurs, for the most part, at Kailua Park where there are four regulation tennis courts. Tennis activity occurs throughout most of the day between 7 a.m. and 11 p.m. One adult tennis association is responsible for most of all organized tennis

tournaments. The Kona Jr. Tennis Association also encourages and organizes children's play on Saturday mornings, and organizes periodic tournaments.

A limited amount of tennis activity also takes place at Kailua Playground, Higashihara Park and Greenwell Park. One tennis court is available at each of these parks. The average amount of use at each park is as follows:

<u>Park</u>	<u>Average Number of Players/Day</u>
Kailua Playground	4
Higashihara Park	8-10
Greenwell Park	8

**Basketball and Volleyball:** Outdoor basketball courts are located at Kailua Park, Kailua Playground and Kailua Scenic Park. The Kailua Playground court receives the greatest activity which averages about 200-300 children and young adults per day. Kailua Scenic Park generally has 50 to 100 persons playing basketball at the one available court each day.

Significant indoor basketball and volleyball activity also occurs at Konawaena High School at the Onizuka Gym where the County administers organized league activity. In FY 1988-1989, indoor basketball leagues involved almost 400 residents while a volleyball league had some 270 participants.

#### **2.1.3.3 Skateboarding**

Skateboarding has been an extremely popular form of informal recreation for children and young adults in Kona for many years. However, in recent years, young Kona enthusiasts have followed the path of other national participants which have established a sport involving the attempt of various types of skateboard challenges and competitive events. These changing trends and continuing local interest have led to the establishment of an enclosed skateboarding facility at Higashihara Park. County representatives are already witnessing the participation of some 30 children and young adults per day even though participation is limited to daily reserved periods with required adult supervision.

#### **2.1.3.4 Bicycle Motocross (BMX)**

Similar to skateboarding, bicycle motocross has evolved from changes in bicycle design and the use of bicycles for bicycle stunts, challenges, and course racing events. The growing popularity of this sport in Kona led local enthusiasts to develop a BMX track at Kailua Park which is the only facility of its kind on the Island of Hawaii.

#### **2.1.3.5 Shoreline and Ocean Recreation**

Predominant shoreline and ocean recreation activities include snorkeling, diving, surfing, swimming, bodysurfing, boogey boarding, and general onshore activities, e.g. sunbathing. County lifeguard observations at Kahaluu Beach Park in FY 1988-1989 indicate that over

0.5 million people enjoyed the onshore and offshore environment of this shoreline recreation area (Table 2-3). Nearby White Sands beach receives roughly one half the volume, or approximately 250,000 park users per year. The summer months are the busiest use periods at both beach parks. Residents primarily use White Sands Beach Park while visitors tend to use Kahaluu Beach Park area.

Other less used locations include the Old Kona Airport Recreation Area, Kealakekua Bay, Hookena Beach Park, and Milolii Beach Park. With the exception of Kealakekua Bay, these areas are primarily used by residents of Kona. County lifeguarding supervisor, Mr. Bill Jackson, indicates that use of Hookena Beach Park is increasing significantly as Kona residents continue to seek less-crowded shoreline recreational areas.

The Old Kona Airport shoreline is used primarily for snorkeling, diving, and some shoreline fishing. Snorkeling and diving activity occurs in the vicinity of Pawai Bay where good access is available.

#### **2.1.4 The Capacity of Existing Recreational Facilities**

The capacity of existing recreational facilities to serve current and future community needs in North and South Kona is most realistically evaluated by comparing current and anticipated recreational participation with the "excess or additional capacity" of existing facilities and the amount of available, undeveloped parkland property. The unavailability of recent recreational participation data, obtained by Community Resources and Datametrics Research, severely hampers this analysis. However, some useful conclusions can be made on the basis of existing County recreational participation data and the observations of selected County parks and recreation personnel in the North and South Kona district.

##### **2.1.4.1 Additional or Excess Facility Capacity at County Parks**

Additional or excess facility capacity is available at some existing County Parks. The location, weather conditions, and variable court/field characteristics in Kona are significant factors which influence the public's use of any given park facility. Those parks, which are believed to contain "additional or excess" facility capacity, are summarized in Table 2-4.

TABLE 2-4

EXISTING COUNTY PARKS  
HAVING ADDITIONAL OR EXCESS FACILITY CAPACITY

<u>Park</u>	<u>Facilities Having Additional or Excess Capacity</u>
Kailua Park	Horseshoe Throwing, Bicycle Motocross, Informal field play
Kailua Playground	None
Hale Halawai	None
White Sands Beach	None
Pahoehoe Beach Park	Picnicking
Kahaluu Beach Park	Swimming, Snorkeling, Surfing and Beach Activities
Kona Imin Center	Community Center
Hillcrest Park	T-ball and Pitchball*
Higashihara Park	Tennis, Skateboarding, T-ball and Pitchball*
Kona Scenic Park	None
Yano Hall/Greenwell Park	None
Napoopoo Beach Park	Pavilion
Honaunau Boat Ramp	Fishing, Snorkeling and Diving
Honaunau Rodeo Arena	Cattle Roping/Horseriding
Hookena Beach Park	Swimming and Beach Activities
Milolii Beach Park	Swimming and Beach Activities
Kona Swimming Pool	Swimming

Notes: \* Hillcrest and Higashihara Parks both have designated softball fields; however, the short distance to the outfield fence limits the use of these fields to T-ball and pitchball.

Source: Borkowski, 1990; James Pedersen, Planning Consultant, 1990.

#### 2.1.4.2 Potential Parkland Area for Expanded Recreational Development

The County's recreational program supervisor for the North and South Kona district indicates that the available land area of the County's existing park areas are, for the most part, fully developed (Table 2-5). Those parks areas having potential expansion area could primarily provide more picnic pavilions which are in considerable demand for informal social gatherings (Borkowski, 1990).

The County of Hawaii also owns an additional parkland property in the South Kona district which remains undeveloped. A five-acre site at Manini Point in South Kona could be used to provide additional picnicking facilities, as well as recreational access for shoreline fishing, snorkeling and diving activities.

#### 2.1.4.3 Overall Recreational Needs and Preferences

County recreational program supervisors in the North and South Kona district have concluded that the primary recreational need is more open field area for soccer, football, softball and baseball. However, recreational participation statistics for informal recreation (Table 2-3) also indicate that there is a strong community demand for the use of county pavilions, picnic areas, and community centers for a wide variety of social gatherings and community events.

While court sports such as tennis, basketball and volleyball continue to grow in popularity and the amount of participation, the demand for additional court sports facilities is believed to be somewhat less than those for field games and social gatherings. It should be noted, however, that the basketball and volleyball programs of the County are being made available at Onizuka Gym. Since this facility is primarily operated and maintained by the State Department of Education for Konawaena High School, it cannot be assumed that these activities can be accommodated at Onizuka Gym in future years, particularly if the high school programs occur.

Consequently, the "*recreational needs*" of Kona focus upon a combination of outdoor and indoor recreational and leisure time activities. The continued in-migration of new residents to the Kona area will continue to increase the amount of participation and expand the range of recreational sports and activities.

In terms of location, County recreational officials have observed that the Kailua Park/Old Kona Airport Recreation Area represents the most preferred location for recreation in light of favorable weather conditions and multiple recreational opportunities that can meet the needs of all age groups. Smaller County park facilities, primarily constructed in the 1960's and 1970's, are generally viewed by the public as a second option unless they are motivated by reasons such as more convenient access or recreational opportunities unique to a particular site, e.g. Kahaluu Bay (Borkowski, 1990).

TABLE 2-5

EXISTING COUNTY PARK AREAS  
IN THE NORTH AND SOUTH KONA DISTRICTS  
HAVING POTENTIAL RECREATIONAL EXPANSION AREA

<u>Park</u>	<u>Potential Park Expansion Area</u>	<u>Potential Activities</u>
Kailua Park	Yes	Basketball, volleyball, soccer, softball, and tennis
Kailua Playground	No	None
Hale Halawai	No	None
White Sands Beach Park	No	Additional picnicking facilities and parking
Pahoehoe Beach Park	Yes	Additional picnicking
Kahaluu Beach Park	No	None
Kona Imin Center	Yes	Basketball and tennis
Hillcrest Park	Yes	Picnic pavilions and restrooms
Higashihara Park	Yes	Picnic pavilion/tables
Kona Scenic Park	No	None
Yano Hall/Greenwell Park	No	None
Napoopoo Beach Park	No	None
Honaunau Boat Ramp	No	None
Honaunau Rodeo Arena	Yes	Picnic pavilions and BBQ pits
Hookena Beach Park	Yes	Picnic pavilion and basketball
Milolii Beach Park	No	None
Kona Swimming Pool	No	None

Source: Borkowski, 1990

## **2.2 PROJECT ALTERNATIVES**

### **2.2.1 Development Objective**

The intention of the County of Hawaii, Department of Parks and Recreation, is to respond to increasing community demands for more recreational opportunities by developing expanded recreational facilities and continuing its related recreational programs.

### **2.2.2 Development Options**

Recognizing the development objectives of the County of Hawaii and various factors influencing recreational development in North and South Kona, three project alternatives have been identified and evaluated in conjunction with this project.

Alternative A: Short-Term Development of Gymnasium and Longer-Term Development of Additional Multi-Purpose Fields, Tennis Courts, and Swimming Pool at Kailua Park;

Alternative B: Expand court sport opportunities at smaller County Parks and lease the Old Kona Airport State Recreation Area

Alternative C: Expand County recreational facilities along the north-northwest side of the existing runway to include a new gymnasium and swimming pool. Additional tennis courts would be constructed at the present Kailua Park site; and

Alternative D: Delay Any Expansion of Kailua Park Until Further Recreational Demand Exists (No Project Option).

Each of these project alternatives are explored more fully in the following paragraphs.

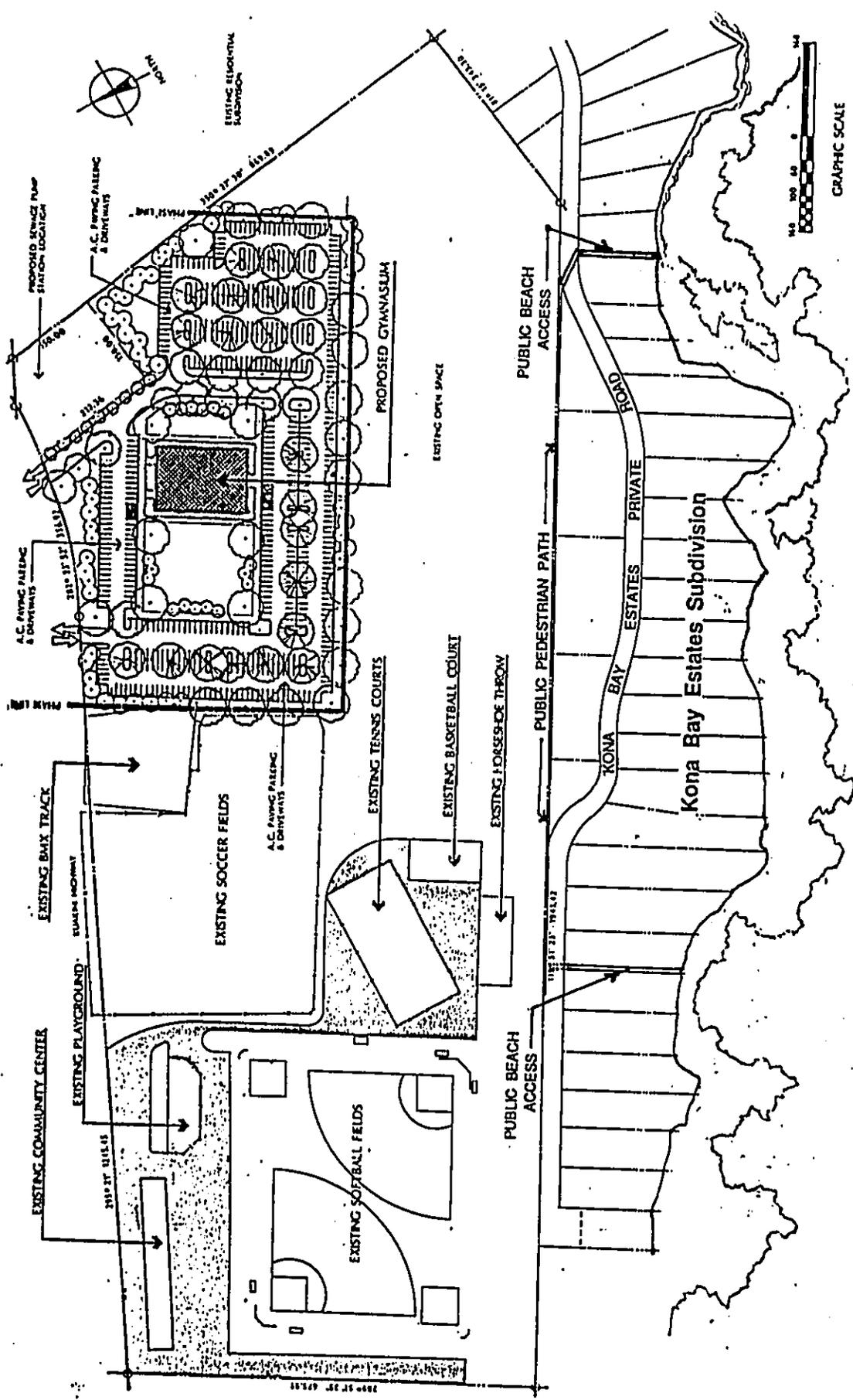
### **2.2.3 Alternative A**

The proposed Kailua Park Master Plan (Figure 2-2), prepared by Robert C. Smelker Associates, Architect, represents the scope of this project alternative. The proposed park expansion would use the remaining 20 acres on the County's 34-acre site which is leased from the State of Hawaii.

#### **2.2.3.1 Phase One**

As proposed, this development option would initially include the development of a new gymnasium (Figure 2-3). Construction of the gymnasium is scheduled to begin in FY 1990 as development funds have already been appropriated for the project (Miyao, 1990).





**KAILUA-KONA PARK MASTER PLAN PHASE 1**

Source: Smelker Associates, Architect, 1989

**FIGURE 2-3  
ALTERNATIVE A  
PROPOSED PHASE ONE DEVELOPMENT**

### **2.2.3.2 Phase Two**

The second phase of park expansion would consist of additional multi-purpose fields and tennis courts, and additional vehicular parking. These additional facilities have been generally scheduled for development during the FY 1990-FY 2000 period as development funds become available.

Related development activities include the relocation of the existing BMX track in order to increase the size of one of the park's existing soccer fields to minimum field dimensions for organized league competition. The master plan also indicates that the existing horseshoe pit will be relocated near the existing softball fields. However, County Parks and Recreation representatives indicate that this relocation may occur prior to the completion of Phase One development (Borkowski, 1990).

### **2.2.3.3 Phase Three**

The third and final phase of Alternative A would include the ultimate development of a swimming pool that would also have a seating capacity to accommodate 300 spectators (Smelker Associates, 1990). The pool would be designed and constructed to accommodate 8-lane swimming competition.

*"Sited adjacent to the gymnasium, the complex will have a shower and locker room facility acting as transition/connection to the gymnasium. This shower/locker facility will be able to serve users of both the gymnasium as well as the swimming pool complex. Outdoor lighting will be provided to accommodate night usage"* (Smelker Associates, 1990).

### **2.2.4 Alternative B**

Alternative B would involve the establishment of outdoor basketball and/or volleyball league play at Kailua Playground, Kona Scenic Park, and Kailua Park during daytime hours only. A non-regulation basketball and volleyball court would also be constructed at Kona Imin Center in Holualoa to provide additional informal basketball and volleyball opportunities.

A second aspect of this development option would be for the County of Hawaii to secure a lease for the entire Old Kona Airport State Recreation Area from the State of Hawaii. Such a lease would enable the County to operate and manage this area which can accommodate a wide variety of social gatherings and community events. As stated earlier in Section 2.1, these activities constitute a significant leisure time activity by Kona residents.

### **2.2.5 Alternative C**

Alternative C (Figure 2-4) would gradually develop some 20 acres on the northern side of the existing runway which is situated in the Old Kona Airport Recreation Area. Under this option, the County of Hawaii would lease additional acreage from the State to construct a gymnasium and swimming pool facility, and additional multi-purpose field area. Vehicular parking would be accommodated along the adjoining runway area.

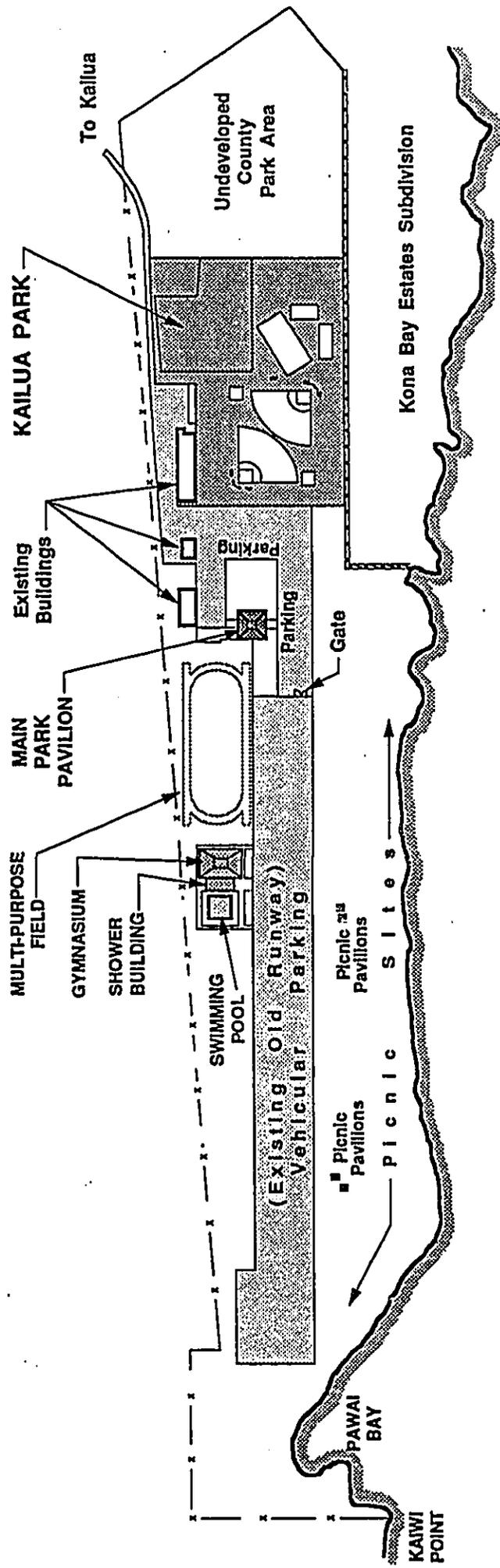


FIGURE 2-4  
ALTERNATE C  
PROPOSED KAILUA PARK  
MASTER PLAN

The long-term concept of this option would be to retain the open space quality of the makai portion of the Old Kona Airport Recreation Area while taking the advantage of presently unused and developable State property for more active recreational activities. The existing runway would be used to provide additional vehicular access and parking area at little or no development cost to the County. Passive recreational activities, managed by the State on the makai side of the runway, would continue to be supported by extensive vehicular parking available on the makai side of the runway.

#### **2.2.6 Alternative D**

Alternative D represents the "no project" option as this alternative would delay any further expansion of Kailua Park. No further expansion of the Park facilities would be considered.

### **2.3 COMPARISON OF PROJECT ALTERNATIVES**

Each of the project alternatives identified offers a varied development approach to providing increased recreational opportunities and expanded recreational facility development.

#### **2.3.1 Project Development Costs**

Alternative B is expected to cost the least (less than \$0.5 million) since this development option focuses primarily upon intensifying recreational program efforts and making limited facility construction at Kona Imin Center in Holualoa. In contrast, Alternatives A and C are expected to be quite similar inasmuch as the proposed facility development would only occur at alternate locations. Alternative D requires the least in the short term, but likely the most as facility construction work is delayed and local construction costs increase.

Preliminary cost estimates, developed by Smelker Associates, Architect for Alternative A, indicate a project cost of approximately \$3,087,000 for initial construction of the gymnasium and related site improvements and utility connections. Later development phases would cost approximately \$4.2 million (based upon first quarter, 1989 dollars). Total project cost: \$7.3 million.

Alternative C costs would be generally comparable to Alternative A since both options provide the same types of recreational facility construction. However, Alternative C would not require: 1) relocation of the existing BMX Track at Kailua Park; and 2) design and construction of additional vehicular parking area and access. Consequently, Alternative C may be, at least, \$0.5 million less than Alternative A.

#### **2.3.2 Recreational Program Development**

Alternatives A, B and C would each increase the amount and type of recreational programs in the North and South Kona districts. Alternative D would not expand or delete any recreational programs.

Alternatives A and C would increase recreational programs, particularly organized court sports and field games, at the County's Kailua Park or adjoining Old Kona Airport

Recreation Area. This development option would continue the present trend to accommodate the majority of organized recreational sports at the Old Kona Airport area where a diversity of recreational opportunities is available.

In contrast, Alternative B would attempt to decentralize court sports programs, i.e. basketball and volleyball, at various County parks in the area. Alternative B would not provide any programs or facilities that would address continuing community demands for more field game area. However, this development option does include a proposal to incorporate the main State events pavilion into the County's Kailua Park. It is believed that the availability of this facility to the County of Hawaii could expand the number and type of community events and recreational programs that could be coordinated or supported by the County Department of Parks and Recreation.

### 2.3.3 Recreational Participation

Alternative A would, in the short term, increase the amount of recreational participation in both organized programs and informal basketball and volleyball play. Eventually, later phases of development would encourage greater participation in organized programs and informal participation in swimming, gymnastics, tennis, soccer, and other field game sports. The expanding diversity of recreational opportunities at Kailua Park would also impact participation in other existing activities as the new facilities would increase more family or group visitation of the park.

Alternative B would increase the amount of participation in organized recreational programs at selected, smaller County parks where excess facility capacity is available or significant informal basketball and volleyball activity is occurring. No increased activity in field games would occur since this development option does not address the demand for additional field game area. However, an increase in social gatherings, recreational programs, and community events at the events pavilion may occur if the County Department of Recreation would assume the management responsibility for this State-owned facility.

Alternative C would generate similar increases in recreational participation for the same types of activities as Alternative A. The location of a gymnasium and swimming pool north and northwest of the present runway would, in contrast to Alternative A, stimulate recreational participation makai of the present runway where existing picnicking and passive leisure time activities are available. It is believed, for example, that adults bringing children to basketball or volleyball practices at the new gymnasium or swimming pool would be encouraged to wait for children onsite during the practice, rather than travelling back home and returning by car before a given sports practice ends.

Alternative D would not increase or decrease recreational participation in any activity. The level of recreational participation at most all facilities within the North and South Kona district has not yet created lengthy "waiting-times", e.g. tennis, which have significantly discouraged sizeable numbers of residents or visitors from participating in available recreational opportunities. One exception may be bodysurfing and swimming activities at Kahaluu Beach Park and White Sands Beach Park where crowded conditions are believed to discourage resident participation during the peak, summer month period.

### **2.3.4 Public Access to Recreational Opportunities**

Alternatives A and C would increase the accessibility to both outdoor and indoor recreational opportunities at Kailua Airport and the adjoining Old Kona Airport Recreation Area. Public recreational access would be significantly increased by the expanded development of recreational facilities and programs in a location, i.e. Kailua Park/Old Kona Airport Recreation Area, where 1) diverse recreational opportunities already exist; and 2) a sizeable amount of vehicular parking area is already available.

Alternative B would also increase public access to County public recreational programs for basketball and volleyball. While these programs would be established at parks where excess facility capacity exists, the amount of available vehicular parking at each of these parks is generally limited.

Alternative D would not, in the short term, increase or significantly decrease public access to recreational opportunities in the North and South Kona district. However, as the resident and visitor population grows, the amount of public access will be reduced. Eventually, decreased public access will gradually result in discouraged recreational participation in some recreational opportunities.

## **2.4 SELECTED PROJECT ALTERNATIVE**

### **2.4.1 Rationale for Alternative Selection**

The selected development option is Project Alternative A which is believed to represent the most practical and beneficial approach to accomplishing the stated development objective in Section 2.2.1. Alternative B, while more cost effective, does not address the need for more field game area and longer-term requirements for expanded court sport programs. Alternative D further delays the County's effort to address recreational demands of the North and South Kona district which ultimately would significantly increase the cost of facility development.

There is, however, little difference in the types and degree of impacts that would be generated by Alternatives C and A. Consequently, Alternative C should be considered another viable development option. Alternative C would reduce the potential impact of field games generating annoying noise levels to nearby residents of Kona Bay Estates. However, relocation of the multi-purpose field mauka of the runway might distress more Kona residents who may be attempting to enjoy the more peaceful, shoreline environment of the Old Kona Airport Recreation Area.

### **2.4.2 Project Description of Recommended Alternative A**

Section 2.2.3 provides a general description of this alternative and the anticipated project phasing despite inherent uncertainties concerning future project funding. Other aspects of this development option are presented in the following paragraphs which provide additional insight concerning the development of utility systems supporting the proposed park expansion.

The development of Project Alternative A will necessitate connection of, at least, the future gymnasium, swimming pool and tennis courts to the existing six-inch water transmission line and electrical transmission lines along Kuakini Highway. These connections will involve the installation of water laterals and distributions within the Park site. Secondly, a transformer will need to be modified or installed to convert available electrical distribution along Kuakini Highway to the designated operating voltage for the Park facility.

In terms of sewage collection, treatment and disposal, it will be necessary to ultimately connect the wastewater flow of all Park facilities to the future Kealakehe Pump Station. This facility will be constructed on the eastern corner of Kailua Park. Should the park facilities be developed prior to construction and operation of the pump station, the expanded park facilities will require the installation of onsite treatment facility which can serve as a temporary solution until the pump station is completed.

**CHAPTER 3.0**

**ENVIRONMENTAL SETTING**

## **CHAPTER 3.0 ENVIRONMENTAL SETTING**

### **3.1 LOCATION**

Kailua Park is situated on the northwest side of Kailua-Kona (Figure 3-1) within the 119-acre Old Kona Airport Recreation Area which is owned by the State of Hawaii and managed by the State Department of Land and Natural Resources. Within this area, the State of Hawaii has leased 35 acres to the County of Hawaii for the development and management of the County's Kailua Park (Figure 3-2). Approximately fourteen acres of the Kailua Park site have already been developed with recreational facilities. The undeveloped 20 acres are situated on the easternmost portion of the Kailua Park site.

### **3.2 PHYSICAL ENVIRONMENT**

#### **3.2.1 Geography**

Kailua Park is situated upon a coastal plain developed from pre-historic lava flows from Mauna Loa and more recent flows from Hualalai in 1800-1801. Exposed pahoehoe bedrock is common in the undeveloped southern portion of the park site. Limited areas containing a thin surface layer of volcanic ash and cinder material are scattered throughout the undeveloped areas of the site. These scattered areas are characterized by smaller trees such as kiawe, lantana and koa haole, occasional swordferns, as well as a variety of grasses, e.g. fountain grass.

The developed portions of the site has similar characteristics except for a thin overlay of topsoil, cinder and sand material that was imported during the initial development of Kailua Park and the earlier construction of the former Old Kona Airport. The perimeter and playing areas of the multi-purpose field and adjacent soccer fields have been landscaped with a variety of exotic trees and grasses.

Ground elevations at Kailua Park vary from three to 25 feet above mean sea level. Higher elevations are present on the mauka side of the Park site. Elevations decrease gradually within the site from north to south.

#### **3.2.2 Drainage and Flood Potential**

General soil and geologic characteristics suggest that the natural drainage of the Kailua Park is generally capable of percolating through existing bedrock and scattered areas where a thin soil overlay is present. During infrequent, high intensity storms, it is believed that excess surface water drains into small ponded areas that are presently undeveloped.

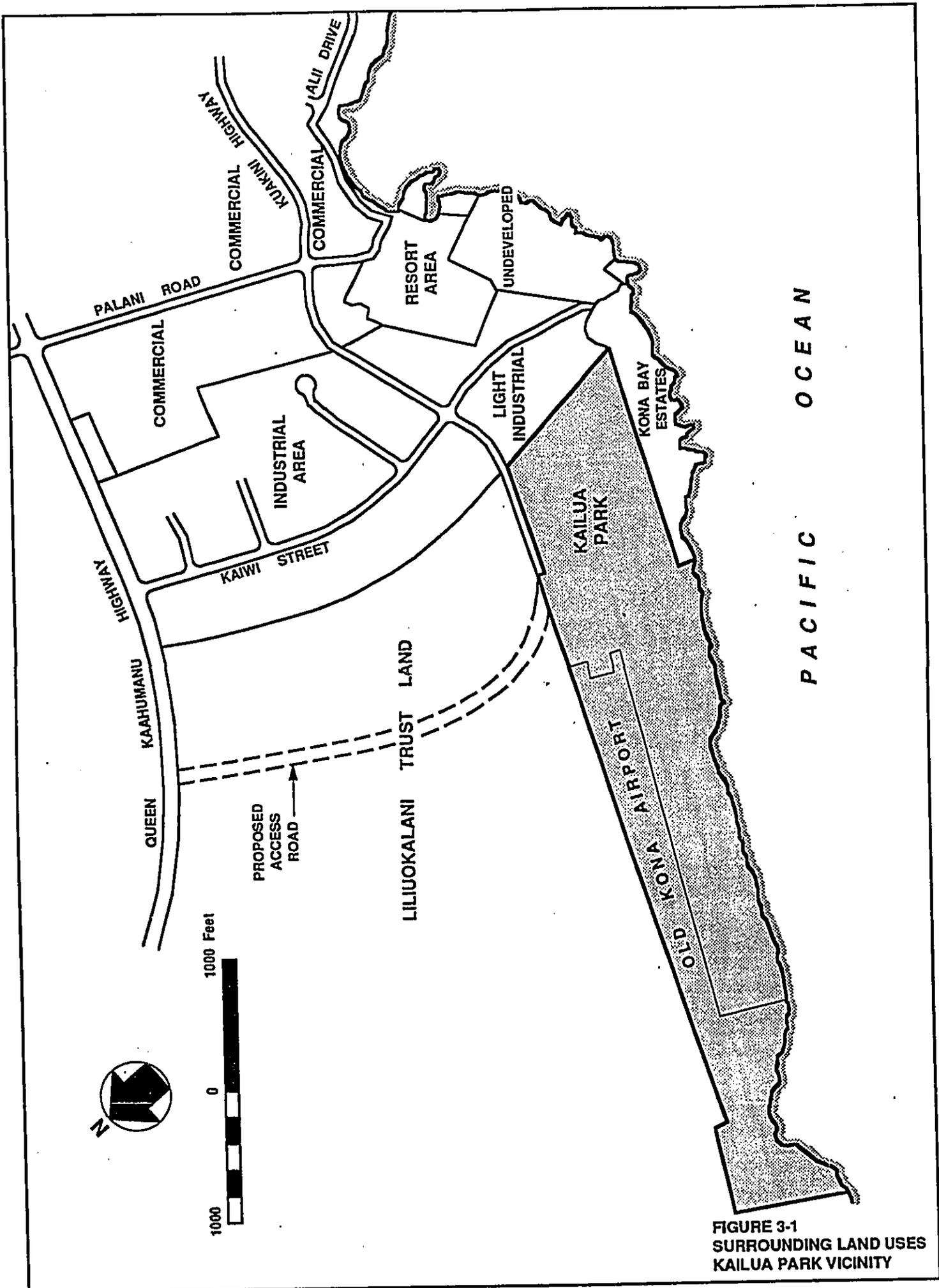


FIGURE 3-1  
SURROUNDING LAND USES  
KAILUA PARK VICINITY

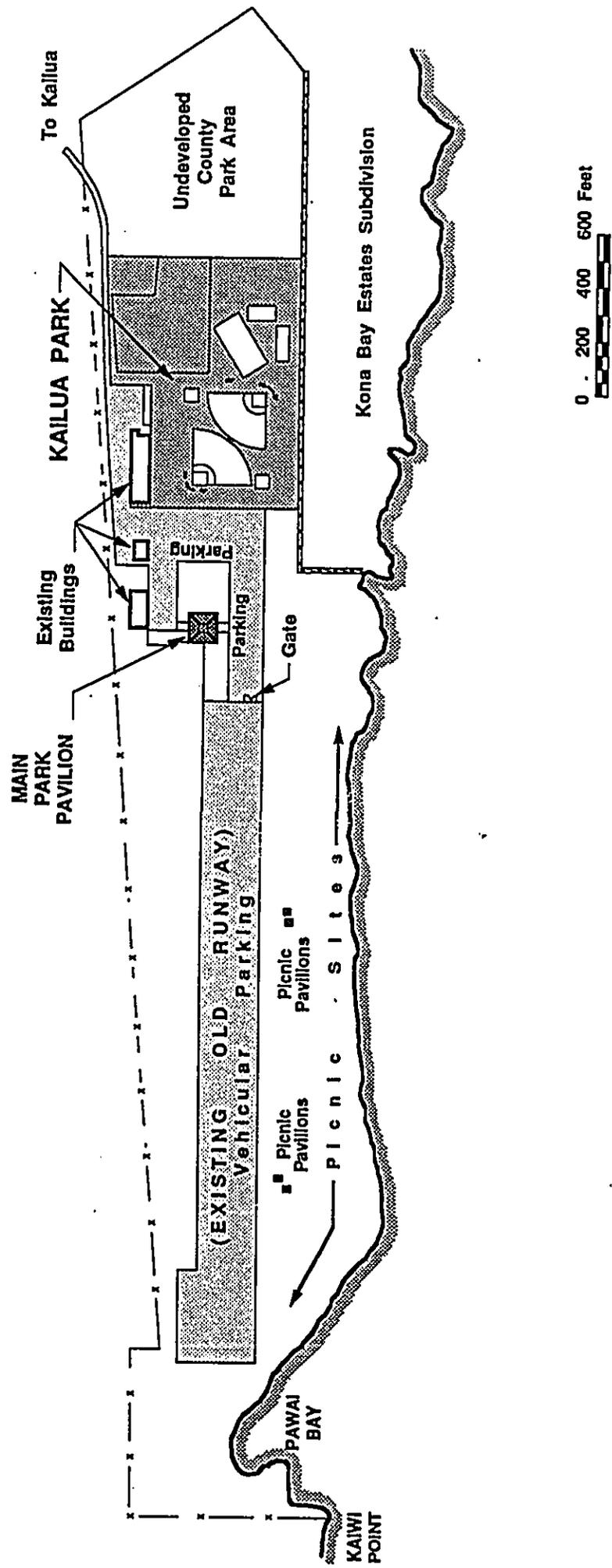


FIGURE 3-2  
 EXISTING OLD KONA AIRPORT  
 STATE RECREATION AREA

The existing Flood Insurance Map for the Kailua Park area was prepared by the U.S. Emergency Management Agency (FEMA) in September, 1988. The existing Flood Insurance Map for the North Kona district indicate that the Kailua Park site is situated within an area primarily designated as "Zone X". This designation represents an area which was determined to be outside of the 500-year flood plain established by FEMA.

A small portion of the Park site has also been designated as "AE" with estimated potential inundation levels ranging from eight to nine feet above mean sea level. For comparative purposes, it should be noted that Kailua-Kona has been affected by five tsunamis since 1946. These tsunamis have generated inundation levels ranging from 2 feet MSL in 1952 to roughly 11 feet MSL in 1946. Tsunamis generated in 1957 and 1960 brought about tsunami inundation levels of five and eight feet MSL, respectively.

### 3.2.3 Climate

Longer-term rainfall and temperature information is available for the Old Kona Airport area because of the site's prior use as public State airport facility. Historical surface wind data was also recorded at the Old Kona Airport; however, the information collected reflects monitoring during daylight hours only. Fortunately, comparable data is available from nearby Keahole Airport (Figure 3-1).

Historical records indicate that Kailua Park area receives "*...approximately 24 inches of rain annually with the greatest amounts of precipitation occurring during the months of January, May, June, July and August. Temperature levels vary from an average of 72.2 degrees Fahrenheit in the month of January to an average of 77.2 degrees Fahrenheit in the months of August and September*" (Neighbor Island Consultants, 1973).

Surface wind data recorded at the former Old Kona Airport indicates that southerly to westerly winds influence the site during the daytime hours. The predominant wind direction in the Old Kona Airport area is indicative of this area's leeward location and the general influence of both Mauna Loa and Mauna Kea. More recent information from nearby Keahole Airport indicates that nighttime winds (between 9 p.m. and 7 a.m.), are generally from the east or southeast. These winds are typically lighter than daytime winds.

### 3.2.4 Sound Levels at Kailua Park

Noise levels at Kailua Park were recently recorded and evaluated as part of an assessment of noise impact analysis for the Project Alternative A. The detailed findings of this analysis are documented in Appendix A. Measurements of onsite background noise levels were made on at three onsite and three offsite locations on December 8 (Friday) and 9 (Saturday), 1989 (see Figure 1 in Appendix A). The measurement locations included the following:

<u>Station</u>	<u>General Location</u>
A	West side of existing softball fields about 20 feet from bleachers
B	Between existing softball fields and tennis courts, about 60 feet from closest court
C	Entrance to lot #43, Kona Bay Estates subdivision
D	Entrance to lot #16, Kona Bay Estates subdivision
E	North side of Kawai Street, about 25 feet from the curb and 300 feet from the security entrance to Kona Bay Estates
F	Northeast corner of the existing soccer fields, about 30 feet from Kuakini Highway

Noise measurements made on December 8 and 9, 1989 indicate that average minimum background noise levels at the six locations ranges from 43 to 49 dBA. Dominant sounds in the vicinity of Kailua Park include the sounds of surf (particularly in Kona Bay Estates) and noise generated by wind blowing through trees and other vegetation.

Sound levels at Kailua Park are also influenced by daytime and nighttime recreational activity, as well as related vehicular traffic along Kuakini Highway. On Saturday, December 9, measurements were also made during moderate recreational activity which included organized soccer games and spectators on two fields and informal tennis play on four tennis courts. Spectator noise was clearly audible at measurement locations inside Kailua Park (Locations A, B and F). However, the noise from the sporting events, at nearby measurement locations outside of Kailua Park, "*...was generally masked by the sounds of surf and the noise generated by wind blowing through trees and other foliage*" (Darby and Associates, 1990).

Vehicular traffic along Kuakini Highway is the loudest source of noise at Kailua Park. This is evidenced by higher continuous noise levels (Leq) and maximum noise levels (Lmax). During the busier Saturday morning period, the Leq at measurement location F (in the vicinity of soccer fields and Kuakini Highway) was 63 dBA while the maximum noise level (Lmax) was 74 dBA.

### 3.3 BIOLOGICAL CHARACTERISTICS

The assessment of Kailua Park's terrestrial ecological included an onsite botanical assessment (Appendix F) and a review of available information. The onsite botanical survey, conducted by Char & Associates on August 6, 1990, investigated the 20 undeveloped acres of land within the County of Hawaii's 34-acre Kailua Park site.

Plant and animal life that have been observed in the Kailua Park are reflective of the coastal environmental conditions, limited rainfall, limited soils, and a large amount of exposed

bedrock. In general, the 20-acre undeveloped park area is an open scrubland, comprised of fountain grass and scattered shrubs. This environment provides limited wildlife habitat to transient birds and mammals that frequent the area.

### 3.3.1 Plant Life

Roughly 50 percent of the undeveloped park area has been subjected to earlier grading activity. These areas "...support a more weedy mixture of species along with the ever present fountain grass" (Char and Associates, 1990). In contrast, areas not subjected to prior grading activity "...support a denser cover of fountain grass...", ranging from 50 to 60 percent cover, as well as more woody species such as lantana. Larger shrubs of noni and Christmas berry are located in depressions (Char & Associates, 1990) containing a thin layer of pocket of volcanic ash or cinder where limited moisture and nutrients collect.

*"Native species found on the property are maiapilo, 'ilima, 'uhuloo, and koali-'awania (Impomoea indica). All are found in similar environmental habitats throughout the Hawaiian Islands. None are officially listed and endangered species; nor are any proposed or candidate for such status (U.S. Fish and Wildlife Service, 1989 and 1990)" (Char & Associates, 1990).*

### 3.3.2 Wildlife

Fauna is limited to mongoose, rats, mice, as well as stray, domesticated dogs and cats. These populations are likely increasing with the availability of discarded food scraps and other garbage that will be left by picnickers and other users of the both Kailua Park and the Old Kona Airport Recreation Area.

Recorded observations in the Old Kona Airport Recreation Area and Kailua Park area include sitings of the barred dove, the mynah, Kolea, and the Ulili (Neighbor Island Consultant, 1973; Environmental Impact Study Corporation, 1978). The Ulili, or wandering tattler, is "...an indigenous migratory waterbird typically observed along shoreline areas." (Environmental Impact Study Corporation, 1978).

It is believed that Kailua Park site probably does not provide any significant bird habitat because of the limited suitability of available cover, fresh water and food supply. However, the Kailua Park area likely does provide a resting and feeding area, grassy field areas, for a limited variety of exotic birds and possibly one or more indigenous bird species.

## 3.4 CULTURAL CHARACTERISTICS

### 3.4.1 Historical/Archaeological Sites

Archaeological Consultants of Hawaii conducted a walk-through reconnaissance survey of an undeveloped two-acre area within the Kailua Park site (TMK 7-5-05:07 portion) in July, 1987. Archaeological Consultants of Hawaii was unable to locate any historical or archaeological sites. However, the consultant did prepare a survey report (Appendix C) following its survey of the two-acre parcel.

The archaeological consultant report summarizes past archaeological work in the vicinity of the survey area which has included, in part, a survey conducted by Lovelace and Estioko-Griffin of the State Historic Sites Office in 1980. These archaeologists discovered two sites that included:

1. a low rock wall that extends 150 meters long which is approximately 180 meters east of the tennis courts at Kailua Park; and
2. a cluster of rock mounds (ahu) roughly 200 meters east of the Kailua Park boundary. The number, type and location of sites recorded by Estioko-Griffin eventually led Archaeological Consultants of Hawaii to recommend that 1) limited subsurface testing should be undertaken in selected areas of the site, and; 2) some monitoring should be conducted in non-soil and grass areas during future site preparation work. The focus of the recommendation concerning monitoring during any future site preparation, site clearing and grubbing, was to locate previously unrecorded sites, as well as potential exposed lava tube openings or sections (Archaeological Consultants of Hawaii, 1987).

In December, 1989, the State Historic Sites Office made another reconnaissance of the site and performed testing of selected archaeological features. A total of 22 archaeological features in six sites were recorded in the undeveloped portion (20 acres) of Kailua Park. Archaeological features that were located included clusters of rock mounds (ahu), walls, and a platform. State archaeologists, Smith and Yent, concluded from this survey that no significant archaeological sites or features are located within the Kailua Park site (Appendix D).

### **3.5 BUILT ENVIRONMENT**

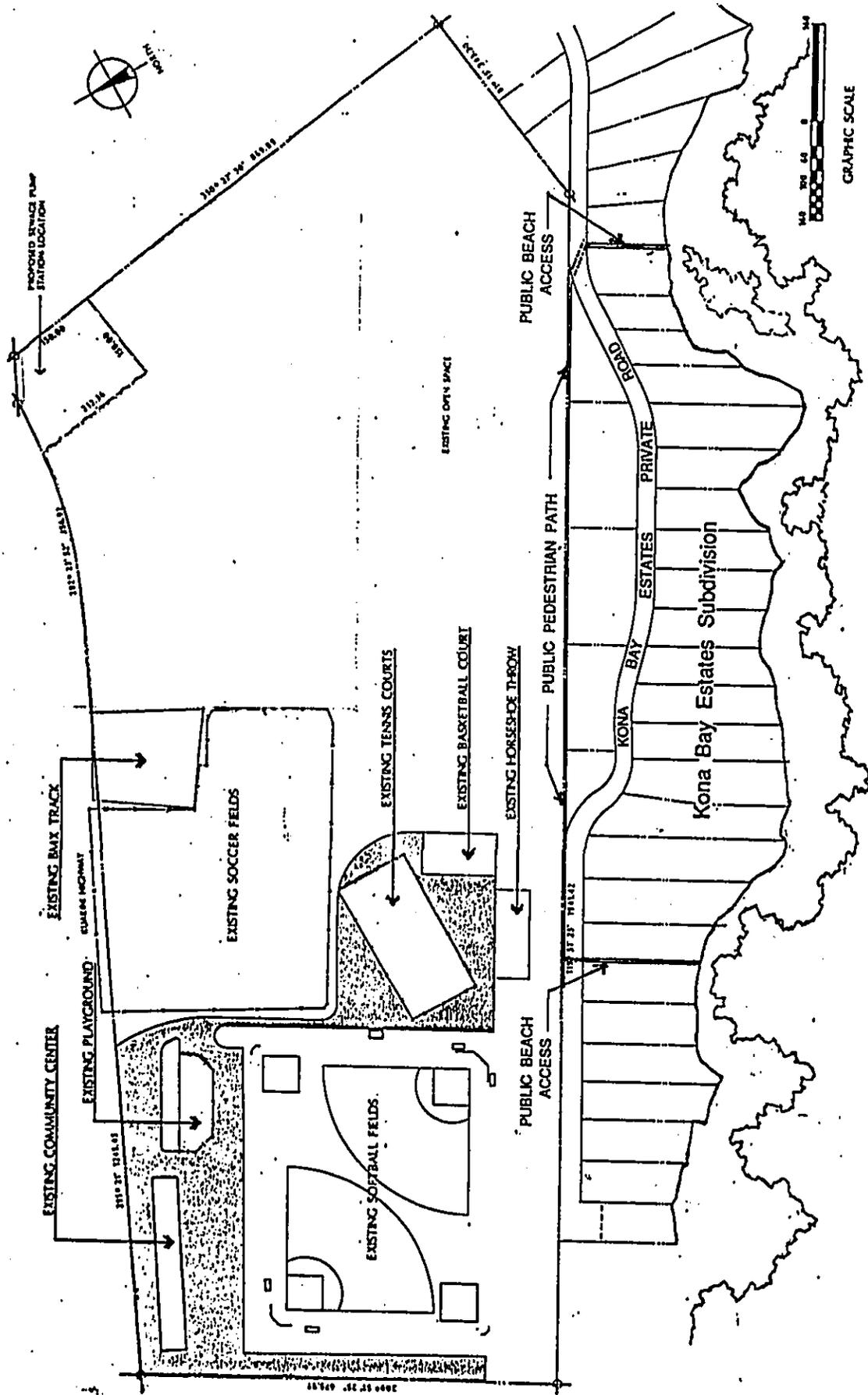
#### **3.5.1 Land Uses in the Vicinity of the Project Site**

##### **3.5.1.1 Kailua Park**

In 1977, the County of Hawaii was leased approximately 14 acres of the Old Kona Airport Recreation Area for the development of recreational facilities and opportunities. An additional 20 acres was incorporated into the State lease in 1987 and the existing lease was extended for a 40-year period.

Kailua Park presently includes a variety of recreational facilities and opportunities (Figure 3-3). The facilities are used for both organized and informal recreational activity (Table 3-1). Comparative resident participation information and related evaluations, presented in Chapter Two (Tables 2-1, 2-2, and 2-3), clearly indicate that Kailua Park is the focal point for court sports and field games in the North and South Kona districts.

Project Alternative A (Figure 2-2) represents the County of Hawaii's current development plan for this recreational park. Reconstruction of the former terminal building is also a high priority of the County Department of Parks and Recreation because this improvement would permit greater public use of the existing community center at Kailua Park.



**KAILUA-KONA PARK**

Source: Smelker Associates, Architect, 1989

**FIGURE 3-3  
EXISTING KAILUA PARK**

TABLE 3-1

AVAILABLE RECREATION FACILITIES AND USES  
AT KAILUA PARK

<u>Quantity</u>	<u>Facility</u>	<u>Type of Use</u>
3	Soccer fields	organized league play and team practices
4	Tennis courts	organized league tournaments and informal play
2	Softball fields	organized league play and informal play/practice
1	Football field	organized league play, informal play/practice
1	T-Ball field	organized league play and informal play/practice
1	Bicycle-Motocross track	informal bicycling practice and competitive events
1	Horseshoe throwing	informal play/practices, and competitive events
1	Former airport terminal building	storage and maintenance for Kai O'pua, Keauhou and Liliuokalani Canoe Clubs
1	Playground	informal childrens' play
1	Basketball court	occasional informal play

Source: Borkowski, 1990.

### **3.5.1.2 Old Kona Airport Recreation Area**

The Old Kona Airport was established as a State Beach Park in November, 1970. Subsequently, the County of Hawaii recommended that a major regional park be established at the Airport in its Hawaii County General Plan. With continued community interest in the development of the Park, the State Legislature approved cumulative appropriations totally \$930,000 during FY 1975-FY 1977 period.

The Old Kona Airport Recreation Area (Figure 3-2) provides a significant shoreline area for residents and visitors of Hawaii Island. The area provides two picnic complexes, some 15 picnic sites, and adjoining restroom facilities. The shoreline offers recreational access for snorkeling and diving (especially Pawai Bay), fishing, viewing of smaller fishes and invertebrates along the shoreline's intertidal zone, and sunbathing.

A large events pavilion is located near the center of the Old Kona Airport Recreation Area. The center was designed to accommodate larger social gatherings and community events. Existing activities and other potential uses of the Old Kona Airport are reflected in the current conceptual development plan for the Old Kona Airport Recreation Area (Figure 3-4). This plan was originally prepared in the mid-1970's by the State Department of Land and Natural Resources.

The southern terminus of the Ala Kahakai Trail, originally proposed in the early 1970's, is expected to be at the Old Kona Airport Recreation Area. Future trail users, walking northwest, will likely use available public parking along the old airport runway.

### **3.5.1.3 Kona Bay Estates**

Kona Bay Estates was developed in the early 1980's as an exclusive residential area. This residential subdivision contains 50 residential lots ranging from roughly 7,000 to 26,350 square feet in size. At the time of this report, approximately 10 homes have been developed in this area. The majority of the present owners are either part-time residents or absentee owners.

Kona Bay Estates also contains two public beach access points, as well as related public pedestrian path along the northern boundary of Kona Bay Estates. The pedestrian path adjoins the southern boundary of Kailua Park.

### **3.5.1.4 East of Kailua Park Site**

East of the Kailua Park site is presently undeveloped except for a small car dealership facility.

On the southeast side of Kaiwa Street, however, there are approximately three acres of undeveloped land. Under present zoning, approximately 100 apartment units could be developed in this area.



### 3.5.1.5 North of Kailua Park Site

Liliuokalani Trust owns several hundred acres north of Kailua Park and west of the Old Kona Airport Recreation Area. Hawaii County officials indicate that Liliuokalani Trust representatives have submitted no plans for the development of this property. County planners have expressed interest in the development of a primary vehicular road connection that would connect the Queen Kaahumanu Highway with Kuakini Highway (Kato, 1990).

### 3.5.2 Public Facilities and Services in the Vicinity of Kailua Park

#### 3.5.2.1 Roads and Traffic

**Existing Peak Hour Traffic:** Kuakini Highway is the primary two-lane roadway which provides access to Kailua Park. For the purposes of this EIS, a traffic analysis (Appendix E) was made of two roadway intersections along Kuakini Highway in order to determine existing peak hour traffic volumes and level of service. These intersections included Kuakini Highway's intersections at Kawai Street as well as Palani Road.

Barton-Aschman Associates, Inc. made traffic counts at these two intersections in mid-November, 1989 during morning, afternoon and Saturday peak hour periods. The information derived from traffic counts at these intersections indicate, at least, the following:

1. the greatest amount of incoming peak hour traffic to Kailua Park occurs on Saturday and the least occurs during weekday mornings;
2. about 60 percent of the incoming vehicular traffic to Kailua Park travels via Kuakini Highway during all peak hour periods; the remaining incoming vehicles travel via Kaiwi Street; and,
3. peak hour volumes range from about 45 vehicles on a typical weekday morning, 225 vehicles during a normal weekday afternoon, and 270 vehicles on a weekend afternoon.

**Existing Level of Service:** Using traffic count data and the analytical methods described in the 1985 Highway Capacity Manual, Barton-Aschman evaluated the operational capacity of the same two Kuakini Highway intersections. This analysis involved the calculation of a volume/capacity ratio which is related to a level of service.

*"Level of service is a term which denotes any of an infinite number of combinations of traffic operating conditions that may occur on a give lane or roadway when it is subjected to various traffic volumes. Level of service is a qualitative measure of the effect of a number of factors which include: speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort, and convenience" (Barton-Aschman Associates, 1990).*

*"There are six levels of service, A through F, which relate to the driving conditions from best to worse, respectively....In general, level of service A represents free-flow conditions with no congestion. Level of service F, on the other hand, represents severe congestion with stop-and-go conditions" (Barton-Aschman Associates, 1990).*

Corresponding to each level of service is a volume/capacity ratio (Table 3-2). This is the ratio of existing or projected traffic volumes to the capacity of the intersection. Capacity is defined as the maximum number of vehicles that can be accommodated by the roadway during a specified period of time. The capacity of particular roadway is dependent upon its physical characteristics such as the number of lanes, the operational characteristics of the roadway (one-way, two-way, turn prohibitions, bus stops, etc.), the type of traffic using the roadway (trucks, buses, etc.) and turning movements" (Barton-Aschman Associates, 1990).

By applying recent peak hour traffic data to this criteria, it can be concluded that the unsignalized Kaiwai Street-Kuakini intersection operates at a high level of service (LOS A) during the morning, evening, and Saturday peak hours. In contrast, the Palani Road-Kuakini intersection operates a LOS D during evening and Saturday peak hours and somewhat more efficiently (LOS C) during the weekday morning peak hour.

#### **3.5.2.2 Water, Wastewater, Power and Solid Waste Systems**

The project site is already served by these systems via the presence of a six-inch water transmission line and a 12.5 kilovolt electrical power distribution line along Kuakini Highway.

Given the location and elevation of the Kailua Park site, onsite sewage would have to be transported by force main to an existing sewage lift station approximately 0.25 mile from the Park. A second option is to install septic tanks and leach fields until such time that the proposed Kealakehe Pump Station is constructed adjacent to the eastern corner of the Park site.

#### **3.5.2.3 Police and Fire Protection**

Police protection in the vicinity of Kailua Park is served by the Hawaii County Police Department. The district office for the Police Department is at Kealakehe.

Fire suppression and emergency medical services are available via the Hawaii County Fire Department. An existing fire station is situated along Palani Road in Kailua-Kona.

### **3.6 RELATIONSHIP TO PLANS, POLICIES, AND REGULATORY CONTROLS**

#### **3.6.1 Hawaii State Plan, Hawaii Revised Statutes, Chapter 226**

The Hawaii State Plan provides a general guide for the short and long-term development of Hawaii. These guidelines are presented as a set of statements concerning regional development goals, objectives, policies, and priorities, concerning Hawaii's population, economy, environment, and man-made resources (Office of the Governor, Office of State Planning, 1988).

TABLE 3-2

INTERSECTION LEVEL OF SERVICE DEFINITIONS  
 KAILUA PARK TRAFFIC STUDY  
 JANUARY, 1990

<u>Level of Service</u>	<u>Interpretation</u>	<u>Volume to Capacity Ratio</u>	<u>Stopped Delay Per Vehicle (Seconds)</u>
A,B	Uncongested operations; all vehicles clear in a single signal cycle.	0.000-0.700	< 15.0
C	Light congestion; occasional backups on critical approaches.	0.701-0.800	15.1-25.0
D	Congestion on critical approaches, but intersection functional. Vehicles required to wait through more than one cycle during short peaks. No long standing lines formed.	0.801-0.900	25.1-40.0
E	Severe congestion with some long standing lines on critical approaches. Blockage of intersection may occur if traffic signal does not provide for protected turning movements.	0.901-1.000	40.1-60.0
F	Total breakdown with stop-and-go operation.	1.001+	> 60.0

Source: Barton-Aschman Associates, Inc., 1990.

A review of this information indicates that the following guidelines are considered relevant to the Kailua Park project:

#### **Social-Cultural Advancement-Leisure: Section 226-23**

The general development objective and policy statement 2 call for the provision of a wide range of activities and facilities to fulfill the recreational needs of all diverse and special groups effectively and efficiently. Policy statement 5 under this objective, is intended to ensure opportunities for everyone to and enjoy Hawaii's recreational resources. This section also promotes the concept of providing greater physical fitness programs and greater recreational opportunities for the appreciation of cultural and the arts.

#### **3.6.2 State Land Use Designations**

The Kailua Park site is located within an area designated for "urban" uses. Public park and recreation facilities and activities are permitted uses within these areas. The State Land Use Law and State Land Use Commission regulations defer decisions concerning uses in the designated State urban districts to each of the State's four counties.

#### **3.6.3 State Coastal Zone Management Program: Objectives and Policies**

Chapter 205A, Hawaii Revised Statutes, provides various objectives and policies for the State's coastal zone management area. The following are believed to be relevant to the Kailua Park Expansion Project:

1. "Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:
  - a. "Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation."
  - b. "Encouraging expanded public recreational use of county, State, and federally-owned or controlled shoreline lands and waters having recreational value."
2. "Ensure 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".
3. "Encourage those developments which are not coastal dependent to locate in inland areas".

#### **3.6.4 Rule 9 of the Hawaii County Planning Commission**

Rule 9 of the Hawaii County Planning Commission also reiterates the preceding objectives and policies of the Big Island's coastal zone areas. Section 9-7 of the Planning Commission rules stipulates that no development in the coastal areas will be approved by the Planning

Commission or the County Planning Director unless it is determined that a project does not generate any significant or adverse environmental effects.

### 3.6.5 Hawaii County General Plan

The revised County General Plan (April, 1987) recognizes that increasing community demands will be borne by existing recreational facilities and programs. The increased demand will be the result of an expanded resident population and a growing number of incoming visitors. The goals and policies of the plan concerning recreation promote the expansion of recreational opportunities for residents and visitors, as well as the making a more efficient use of existing recreational facilities. Further, the plan stresses the need to ensure that land uses adjoining recreation areas are compatible with community values, physical resources, and recreational development potential.

Since Kailua Park already functions as a district park, the standards cited in the Hawaii County Plan for district parks are relevant. Relevant standards include:

1. Provide diversified indoor and outdoor recreational activities during daytime and nighttime hours;
2. Locate district parks with a district that consists of several populated communities;
3. Locate district parks on sites having good topography;
4. Available facilities should typically include a gymnasium with office, storage, restrooms, showers; a center for community and recreational programs; swimming pool; play area and equipment for young children; basketball, tennis and volleyball courts; playing fields for soccer, baseball, softball and football; night lights, and adequate parking area.

In its evaluation of recreation in each island district, the Hawaii County Planning Department also identified the following recommended courses of action which have particular relevance to the proposed project.

1. *"Encourage the development of community and district recreational facilities, a gymnasium and community center with easy access for residents."*
2. *"Implement the development of the Kailua Park (Old Kona Airport) as a major regional or district park" (County of Hawaii, 1987).*

The long-term use of the Kailua Park site has been designated as "open" on the existing Land Use Pattern Allocation Guide map for the North Kona district. This General Plan designation suggests that the future use of the property would be appropriate for public recreational use and enjoyment.

### **3.6.6 Kona Regional Plan**

The Kona Regional Plan recommends that the Old Kona Airport area, as well as adjacent lands northwest of the area, be conserved for future open space, park and recreational purposes. Otherwise, this Plan recommends that both the State and the County should pursue implementation of the Hawaii County Recreation Plan as funding becomes available. The development priority identified by the Plan is recreational parks that provide community-wide facilities.

### **3.6.7 Hawaii County Zoning**

The Kailua Park site is presently zoned "ML-20" or for industrial use. This designation is inconsistent with objectives and courses of action outlined in the Hawaii County General Plan.

### **3.6.8 Kealakehe Regional Sports Complex Master Plan**

The County of Hawaii Recreation Plan, published in 1974, indicated a need for a Kona Regional Recreation Complex that would consist of an incremental development of a multi-use athletic complex. The complex would include ballfields, a track and football field arena, recreation building/gymnasium, an olympic-size swimming pool, vehicular parking and related support facilities (Aotani and Associates, 1973). The plan indicated that the regional sports complex was need to keep pace with increasing recreational demands of the community. Unfortunately, community recreational demands cited in the plan were based upon recreational park acreage per 1000 population which are, at best, general indicators of community recreational needs (James Pedersen, Planning Consultant, 1990).

Given the recommendations of the County Recreation Plan, the County of Hawaii retained R.M. Towill Corporation to prepare a master plan for a Kealakehe Regional Sports Complex. The proposed plan generally followed the range of facilities that were recommended by the County Recreation Plan. Additional recreational facilities proposed for the Kealakehe Regional Sports Complex included tennis courts, concert hall, exhibit hall and equestrian ring.

### **3.6.9 Hawaii County Recreation Plan**

In addition to recommendations concerning the Kona Regional Recreation Complex, the County Recreation Plan proposed the incremental development of a district park at the Old Kona Airport. Facilities initially envisioned for Kailua Park included a multi-use ballfield and picnic facilities on the beach. A proposed second phase of development was to include the renovation of existing buildings at the Old Airport into a combination game and meeting rooms, recreation offices, tennis courts, and a multi-purpose facility. In the longer term, additional park improvements would include a shoreline swimming area, camping areas and an archery range. In essence, the County had prepared plans for its development and eventual management of the State of Hawaii's 114-acre park site.

These plans were eventually abandoned when the State subsequently appropriated funds in FY 1985-1987 for the development of a State Beach Park at the Old Kona Airport. This policy resulted in the preparation of a new set of recreational development plans by the State Department of Land and Natural Resources.

### **3.6.10 Keahole to Kailua Development Plan**

The Keahole to Kailua Development Plan, under review since September, 1989, assumes that the Old Kona Airport will continue to be used as a primary public recreational area for outdoor recreation. Recognizing increasing demands for recreational opportunities in North and South Kona, the Plan calls for additional lands to be designated for future district park and shoreline park development. The general locations considered for these types of recreational areas were as follows:

- |                                   |   |
|-----------------------------------|---|
| <u>Development Alternative 1:</u> | District Park at Kealakehe  |
| <u>Development Alternative 2:</u> | District Park at Kealakehe mauka and a shoreline park at Kealakehe/Keahuolu makai     |
| <u>Development Alternative 3:</u> | District Park at Ooma II mauka makai and a shoreline park at Kealakehe/Keahuolu makai |
| <u>Development Alternative 4:</u> | District Park at Kealakehe mauka  |

Earlier drafts of the Plan also called for the development of a regional sports complex at Kealakehe or Keahuolu makai. However, the May 22, 1990 draft eliminates the regional sports complex from the Plan, but indicates that the complex could be accommodated in future areas designated for open/recreation.

**CHAPTER 4.0**

**ANTICIPATED ENVIRONMENTAL CONSEQUENCES  
AND PROPOSED MITIGATIVE MEASURES**

## CHAPTER 4.0

# ANTICIPATED ENVIRONMENTAL CONSEQUENCES AND PROPOSED MITIGATIVE MEASURES

### 4.1 PHYSICAL IMPACTS

#### 4.1.1 Alteration of Topography and Drainage

The topographic characteristics and drainage patterns, within the 20 undeveloped acres of Kailua Park, will change through the incremental excavation, grading and fill of lands. New site contours will ultimately range from approximately 20 feet above mean sea level (MSL) on the mauka side of the future swimming pool to roughly 8 to 10 feet MSL makai of the future multi-purpose field.

Future drainage flows will continue to generally flow in a north to south direction. However, the volume of surface flows will be altered through the development of new impermeable surfaces, e.g. vehicular parking areas and building roofs, which will reduce the former natural percolation of rainfall into the basaltic substrate. Proposed drywells within and along the perimeter of the vehicular parking area, serving the swimming pool and gymnasium complex, will be adequate to accommodate the anticipated increase in surface drainage flows.

#### 4.1.2 Increased Noise Levels in the Vicinity of Kailua Park

The incremental construction and ultimate use of expanded recreational facilities at Kailua Park will increase background noise levels within and outside of the Park boundaries. Noise-sensitive areas outside of the Park boundary will include the partially-developed Kona Bay Estates subdivision, potential apartment unit development east of the Park site, and potential residential development north of the Park site on Liliuokalani Trust lands.

The noise impact analysis, prepared for this project by Darby and Associates, outlines the potential impact which will be generated by the development and use of each proposed facility (Appendix B). The results of this analysis are presented in the following paragraphs.

##### 4.1.2.1 Multi-Purpose Field

The proposed multi-purpose field will not be lighted and play will be restricted to daytime hours. If bleachers are positioned on the makai side of the field, cheering and applauding by about 100 spectators could generate sound levels of 60 to 70 dBA at the closest residential property. It is recommended that bleachers are situated on the north side of the field since this mitigation would significantly reduce noise levels at nearby homes by, at least, 10 dBA.

#### **4.1.2.2 Tennis Courts**

Additional tennis courts are not expected to impact noise levels at nearby residential properties in Kona Bay Estates. The anticipated sound levels from the existing and new courts is not expected to exceed 45 to 50 dBA.

#### **4.1.2.3 Gymnasium**

The gymnasium will be used primarily for basketball and volleyball activities. While this facility will have a seating capacity for 1,000 spectators, it is expected that the number of spectators will typically be significantly less. Noise from the facility will easily emanate from the building as the gymnasium will be naturally-ventilated. Portable public address systems will frequently be used since no public address system will be provided in the facility. Despite the availability of potential noise sources, a full-capacity event inside the gymnasium would generate sound levels ranging from 80 to 90 dBA. The same conditions would generate 40 to 50 dBA levels along the Park site's eastern boundary.

#### **4.1.2.4 Other Facilities**

The activities at remaining facilities, i.e. soccer fields, BMX track, swimming pool, and the horseshoe throwing area are not expected to generate any significant impact on existing and potential noise-sensitive areas. The lack of potential impact is because these activities will attract a considerably smaller number of spectators. The location of soccer fields and the swimming pool are a considerable distance from the Park's southern boundary. Further, none of the activities will require the use of any public address equipment.

The proposed sewage pump station, near the east corner of the Park site may provide increased noise levels that potentially could annoy residents east of the Park site. If necessary, the design and development of this facility could incorporate noise control measures such as sound barrier walls, equipment enclosures, fan silencers.

#### **4.1.2.5 Vehicular Traffic**

Based upon vehicular traffic forecasts prepared by Barton-Aschman Associates, it was determined that the additional vehicular traffic generated by the proposed project will increase noise levels, in the vicinity of Kaiwi Street and Kuakini Highway, by not more than 1.5 to 2.0 dBA. The location of a vehicular parking area near the Park's eastern boundary may annoy future apartment residents. If so, it would be advisable to:

1. construct a sound barrier wall, at least six feet high, along the eastern boundary;
2. construct speed bumps along vehicular access roads and limit vehicle speeds to 10 miles per hour;
3. close the Park at 10 p.m. instead of 11 p.m.; and
4. establish administrative measures to control rowdy behavior and the use of louder car stereo systems.

#### **4.1.2.6 Construction Noise**

The incremental expansion of park facilities will produce an extended, yet intermittent intrusion of construction noise. Heavy equipment and jack hammers are expected to create the most prominent noise levels. Fortunately, the impact upon surrounding residents can be mitigated somewhat by the adherence to an established time of construction activity during daytime hours.

#### **4.1.3 Lights**

Nighttime activities in the park will include indoor activities within the gymnasium, swimming pool, as well as informal tennis play. Outside lighting will continue to annoy some residents living in Kona Bay Estates, as well as future residential properties north and east of the Park. Some residents living in Holualoa would also likely be annoyed by additional lighting from the Kailua Park facilities.

Mitigation of adjacent land uses can be best addressed through the establishment of taller, bushy trees along the perimeter of the Park. Such vegetation could screen much of the unwanted rays of light which are presently visible from the windows of various nearby homes.

The use of lights, which direct rays directly downward to playing and facility areas, could somewhat relieve the impact of light rays which otherwise might create additional light in the local atmosphere. This type of lighting is also preferred by local astronomical organizations on Mauna Kea which are concerned with the conservation of the island's unique photometric quality.

### **4.2 BIOLOGICAL IMPACTS**

#### **4.2.1 Flora**

The clearing and grubbing of some 20 acres of undeveloped land on the project site will result in a total loss of almost all existing vegetation on the project site. It is doubtful that site preparation activities will result in the loss of any endangered plant communities. However, this has not been confirmed by any thorough survey of the Park's floral resources.

The eventual construction of a new multi-purpose field will also result in the addition of new grassy field area. In addition, selected landscaping will also be incorporated throughout the Park site.

#### **4.2.2 Fauna**

The loss of all site vegetation will force the relocation of mammals and birds which presently frequent the site. However, it is expected that many of these mammals and birds will return to the Park area as a new grassy field and other landscaped areas are established in the Park. Given the characteristics of existing vegetation, it can also be concluded that proposed

grassy field areas will likely provide a more attractive environment for frequenting birds and mammals as maintained field areas will provide a greater food and water supply.

### **4.3 CULTURAL RESOURCES**

#### **4.3.1 Archaeological Resources**

While no significant archaeological sites or features were discovered during a recent survey by State archaeologists, it is believed that site preparation activities, e.g. clearing and grubbing, may encounter potential archaeological and historical sites below existing ground elevations, e.g. human burials. For this reason, it is recommended that project mitigation include appropriate instructions that would be incorporated into building contractor bid documents. Such instructions should require the contractor to: 1) cease work if burials are found during site preparation work; and 2) contact appropriate representatives of the State Historic Sites Office.

#### **4.3.2 Increased Recreational Participation**

Development of expanded recreational opportunities and facilities at Kailua Park will increase the level of participation at both Kailua Park and the adjoining Old Kona Airport Recreation area. This recreational area is already extremely attractive to residents and visitors of the North and South Kona district because of its accessibility, diversity of recreational opportunities, and favorable weather conditions.

##### **4.3.2.1 Kailua Park**

Proposed facilities will make existing opportunities such as basketball, volleyball, swimming, soccer and tennis even more available than present. Basketball, volleyball, and swimming activities will be considerably more accessible with the relocation of these activities from Konawaena High School, e.g. Onizuka Gym.

The addition of more soccer fields and tennis courts at Kailua Park will also increase the recreational accessibility of existing fields and courts. During peak use periods, there will be more available playing time for both informal tennis and soccer play. Private recreational leagues for field games and court sports will also be encouraged to schedule more teams, more games, and/or longer sport seasons.

##### **4.3.2.2 Old Kona Airport Recreation Area**

The diversity of active and more passive, shoreline recreation at the Old Kona Airport Recreation Area and Kailua Park represents a significant attraction to residents and visitors. This is especially true for families, or other social groups, that travel together to the Park. The satisfaction by an individual or group coming to the Park, is the ability to be able to participate or watch one or more activities that range from a quiet walk along the beach to an competitive soccer game. This diversity facilitates the leisure time of adults bringing younger children to the Park. Family members will be more willing to remain at the Park

area more frequently, and possibly for longer periods of time, if more diverse recreational opportunities are available for all family members.

#### 4.4 BUILT ENVIRONMENT

##### 4.4.1 Increased Vehicular Traffic Volumes

The traffic impact study, prepared by Barton-Aschman Associates, Inc., is presented in Appendix E. A summary of the more significant conclusions from this evaluation are presented in the following paragraphs.

##### 4.4.1.1 Criteria for Determining Significant Impacts

The criteria used to determine if the proposed project has a significant traffic impact, which needs project mitigation, is based upon traffic impact study guidelines used by other American cities since no local standards have been established by the County of Hawaii. *"Generally, these criteria are that if the level of service, without the project, is E or F, and the volume/capacity ratio (V/C) changes less than 0.020, the project's traffic impacts are considered insignificant. However, if the V/C ratio is greater than 0.020, then mitigation measures, which will reduce the V/C ration change to less than 0.020 must be identified. For this project, the 0.020 criterion has been used. IF the level of service with the project is D or better, then no mitigation measures need to be identified"* (Barton-Aschman Associates, Inc., 1990).

##### 4.4.1.2 Project-Related Impacts

Expansion of the Park facilities will generate limited increases in the future volume of vehicular traffic to and from Kailua Park. The park access will operate at level of service (LOS) A (Table 4-1) during all peak traffic conditions. While there are high numbers of turning movements, there is little through traffic which will impede such maneuvers.

The unsignalized, Kaiwi Street-Kuakini Highway intersection, should be signalized. Based upon existing traffic volumes, this intersection should be re-striped to establish an exclusive left-turn lane, as well as a through right lane on the north and west approaches. With this improvement, the intersection will operate at LOS A during the AM and PM peak hours; Saturday peak hours are expected to operate at LOS B. Without signalization, this intersection will operate at LOS A during the AM peak hours and at LOS B during PM and Saturday peak hours (Table 4-1).

The Palani Road-Kuakini intersection will not require any roadway improvements to mitigate anticipated traffic impacts. This intersection will operate at LOS B during the morning, LOS E during the evening peak hour, and LOS C during the Saturday peak hour. The change in the afternoon volume-to-capacity ratio is insignificant; consequently, no mitigation is necessary.

TABLE 4-1

1992 LEVEL OF SERVICE CONDITIONS  
KAILUA PARK TRAFFIC STUDY  
AUGUST, 1990

Intersection	AM Peak Hour		PM Peak Hour		Saturday Peak Hour	
	w/o Proj V/C LOS	w/Proj V/C LOS	w/o Proj V/C LOS	w/Proj V/C LOS	w/o Proj V/C LOS	w/Proj V/C LOS
Kuakini Hwy at Palani Rd	0.667 B	0.667 B	0.906 E	0.917 E	0.695 B	0.742 C
Kuakini Hwy at Kaiwi St (Signalized)	0.566 A	0.566 A	0.449 A	0.449 A	0.658 B	0.698 B
Kuakini Hwy at Kaiwi St (Unsignalized)	NA <sup>(4)</sup> A	NA A	NA B	NA B	NA B	NA B
Kuakini Hwy at Park Entrance	NA A	NA A	NA A	NA A	NA A	NA A
Queen Kaahumanu Hwy at Kaiwi (Unsignalized)	NA C	NA C	NA C	NA C	NA B	NA C

- (1) See Appendix C for calculations
- (2) V/C = Volume-to-Capacity Ratio
- (3) LOS = Level-of-Service
- (4) NA = Not Applicable

#### **4.4.1.3 Potential Impact of Alternative Roadway Access from Queen Kaahumanu Highway to Kuakini Highway**

During investigations made for this environmental impact statement, it was learned that some County planning officials are considering the desirability of developing a new primary access road between Queen Kaahumanu Highway and Kuakini Highway (Kato, 1990). The roadway corridor under consideration would be oriented in a north-south direction. The Kuakini Highway intersection of this road would likely be northwest of the Kailua Park entrance.

The limited impacts anticipated for the Kailua Park expansion project will not be warranted to mitigate the impacts of park expansion. However, such an improvement may have beneficial impacts on the Palani Road-Kuakini Highway intersection by diverting left-turns that are presently over capacity.

### **4.5 RELATIONSHIP TO EXISTING PLANS AND POLICIES**

#### **4.5.1 Coastal Zone Management Policies**

One of the coastal zone management policies relevant to the proposed project is the State's objective to reserve coastal recreation areas for shoreline-dependent recreational activities. The proposed development of a gymnasium, swimming pool, and multi-purpose field at Kailua Park represents a clear departure from one of the State's coastal zone management objectives and Rule 9 of the Hawaii County Planning Commission (see Chapter 3, Sections 3.6.3 and 3.6.4).

However, this inconsistency is not viewed as significant as the departure from this CZM objective does not adversely affect other coastal resources within the Old Kona Airport Recreation area, or would it discourage other shoreline dependent uses. The shoreline-dependent recreational opportunities in this area are, in essence, confined to the shoreline area makai of the remaining runway. The presence of the Kona Bay Estates subdivision discourages use of the adjacent rocky shoreline, makai of Kailua Park, despite the availability of public access rights-of-way to the shoreline.

The expanded use of Kailua Park site should rather be viewed as a unique development opportunity for expanding recreational opportunities to local residents. During, at least, the past 20 years, public and private planners, who have evaluated this area, have long recognized the potential use of the former runway for extensive vehicular parking. Given the size and configuration of the overall Old Kona Airport Recreation Area (including Kailua Park), the extensive vehicular parking capacity is capable of supporting a large number of recreational activities which are both shoreline and non-shoreline dependent.

Proposals for regional sports complexes in Kealakehe and other upland recreation sites in North Kona have been identified during the past 16 years. However, each of these proposals has "fallen" from further consideration because of extremely high land acquisition and site development costs, lack of access, and/or the lack of available recreational development funds. In the meantime, the absence of other primary sites for recreation not

dependent upon the shoreline has helped generate extensive community interest for expanded use of Kailua Park and the Old Kona Airport Recreation Area where available government funds can be used for facility construction, rather than land acquisition.

In addition to more favorable weather conditions for organized sports, the diversified opportunities within the Old Kona Airport Recreation Area (including Kailua Park) permits a family or group of friends, having varied recreational interests, to travel together to one recreational destination rather than two or more. From a transportation perspective, the presence of a significant destination for multi-use public recreation in North and South Kona helps reduce the regional impact of increased weekend traffic.

Despite the benefits of the present park site, the anticipated residential growth in both North and South Kona will likely generate recreational needs that will eventually surpass the capacity of Kailua Park. Consequently, the need for a second regional sports complex, providing more inland recreational opportunities, will ultimately be required. However, until demands warrant such a development, local recreational development priorities should be focused upon making prudent use of a significant public recreation area, i.e., Old Kona Airport Recreation Area and Kailua Park, which have considerable surplus capacity for greater recreational use. The excess capacity of the site should be focused on the 20 acres of undeveloped land in Kailua Park which are not conducive to shoreline dependent recreation, as well as the undeveloped area, mauka of the existing runway, in the adjacent Old Kona Airport Recreation Area (Figure 3-2).

## REFERENCES

## REFERENCES

- Aotani, Edward R. & Associates, Inc. County of Hawaii Recreation Plan. 1974. County of Hawaii. Honolulu, Hawaii.
- Aotani and Oka, Architects, Inc. Preliminary Report on the Recreation Plan for the County of Hawaii. May 1, 1973. County of Hawaii. Honolulu, Hawaii.
- Archaeological Consultants of Hawaii. "Archaeological Reconnaissance Survey of 2-Acre Parcel at Old Kona Airport, Kailua-Kona, Hawaii." August 9, 1987. Wilbert Chee, Planner. Haleiwa, Hawaii.
- Beimborn/Kekoa Associates. Preliminary Design Review, West Hawaii Sports Complex, January, 1986. West Hawaii Youth Steering Council. Kealahou, Hawaii.
- Borkowski, Adam R. Kona District Recreation Division Annual Report, Fiscal Year 1986-87. 1987. County of Hawaii, Department of Parks & Recreation. Kona, Hawaii.
- Borkowski, Adam R. Kona District Recreation Division Annual Report, Fiscal Year 1987-88. 1988. County of Hawaii, Department of Parks & Recreation. Kona, Hawaii.
- Borkowski, Adam R. Kona District Recreation Division Annual Report, Fiscal Year 1988-89. 1989. County of Hawaii, Department of Parks and Recreation. Kona, Hawaii.
- Building Design Systems, Inc. Program Report - Kailua Park, Kailua-Kona, Hawaii. November, 1978. County of Hawaii, Parks & Recreation Department. Hilo, Hawaii.
- County of Hawaii, Department of Parks and Recreation. County of Hawaii, Parks & Recreation Guide '88 - '89, December, January, February. 1988. County of Hawaii. Hilo, Hawaii.
- County of Hawaii, Department of Parks and Recreation. County of Hawaii, Parks & Recreation Guide '89, June, July, August. 1989. County of Hawaii. Hilo, Hawaii.
- County of Hawaii, Department of Parks and Recreation. County of Hawaii, Parks & Recreation Fall Guide '89, September, October, November. 1989. County of Hawaii. Hilo, Hawaii.
- County of Hawaii, Department of Parks and Recreation. County of Hawaii, Parks & Recreation Guide '89, March, April, May. 1989. County of Hawaii. Hilo, Hawaii.
- County of Hawaii, Planning Department. Draft Hawaii County General Plan, April, 1987. 1987. County of Hawaii. Hilo, Hawaii.

- County of Hawaii, Planning Department. The General Plan, County of Hawaii. January, 1971. County of Hawaii. Hilo, Hawaii.
- County of Hawaii, Department of Research and Development. 1989 County of Hawaii Data Book. October, 1989. County of Hawaii. Hilo, Hawaii.
- Darby & Associates. "Noise Impact Analysis, Kailua-Kona Park." January 22, 1990. James H. Pedersen Planning Consultant. Honolulu, Hawaii.
- Environment Impact Study Corporation. Revised Environmental Impact Statement for the State Park at the Old Kona Airport. July, 1978. State of Hawaii, Department of Land and Natural Resources. Honolulu, Hawaii.
- Giambelluca, Thomas W., Nullet, Michael A., and Schroeder, Thomas A. Rainfall Atlas of Hawaii, Water Resources Research Center Report R76. June, 1986. Honolulu, Hawaii.
- Hawaii County Office of Housing and Community Development. "OHCD Affordable Housing Fact Sheet." 1988. County of Hawaii. Hilo, Hawaii.
- Hawaii State Plan Policy Council. The Hawaii State Plan, 1988. 1988. State of Hawaii Office of State Planning. Honolulu, Hawaii.
- Hawaii Visitors Bureau. 1988 Westbound Visitors to Hawaii. 1989. Hawaii Visitors Bureau. Honolulu, Hawaii.
- LMLI Architects/Planners Inc., et al. Development Plan, Kailua Park, Kailua, Kona, Hawaii. July, 1974. County of Hawaii Parks & Recreation Department. Hilo, Hawaii.
- Loeffler, Kenneth. Recreation Division Annual Report, 1986-87. July 27, 1987. County of Hawaii Department of Parks & Recreation. Hilo, Hawaii.
- Neighbor Island Consultants. An Assessment of Environmental Impact Resulting From the Development of Kailua Park, Kailua-Kona, Hawaii. April, 1973. County of Hawaii. Hilo, Hawaii.
- Neighbor Island Consultants. Final Environmental Assessment of An Agency Action for the Old Kailua Airport Road Improvements. 1976. County of Hawaii. Hilo, Hawaii.
- Personal Communication. Mr. Keith Kato, Senior Planner, County of Hawaii Planning Department. January, 1990. Hilo, Hawaii.
- Personal Communication. Mrs. Higa, Hawaii Visitors Bureau. January, 1990. Honolulu, Hawaii.

Personal Communication. Mr. John Knox, President, Community Resources, Inc.  
January, 1990. Honolulu, Hawaii.

Personal Communication. Mr. Glen Miyao, senior planner, Hawaii County Department of  
Parks & Recreation. January, 1990. Hilo, Hawaii.

Smelker, Robert C., Associates. Master Plan of the Kailua Park, Kailua-Kona, Hawaii.  
June, 1989. County of Hawaii. Honolulu, Hawaii.

Towill, R. M., Corporation. Kealakehe Regional Sports Complex. 1976. County of  
Hawaii. Honolulu, Hawaii.

**APPENDIX A**

**COMMENTS AND CONCERNS OF PUBLIC AGENCIES,  
COMMUNITY ORGANIZATIONS AND INDIVIDUALS**

**SECTION 1**

**RESPONSES TO THE ENVIRONMENTAL ASSESSMENT**

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CHIEF CLERK  
OFFICE



STATE OF HAWAII  
OFFICE OF ENVIRONMENTAL QUALITY CONTROL  
415 SOUTH KING STREET, ROOM 104  
HONOLULU, HAWAII 96813

SEP 11 1989

11 21

3-11-89  
MARTIN T. YAMASHIRO, PH.D.  
DIRECTOR  
TELEPHONE NO.  
348-1313

review the environmental assessment. If you have any questions or concerns, please contact Mina Yonemura-Hayashi or Clyde Yamauchi at our office.

Sincerely,

*Mina Yonemura-Hayashi*  
MINA H. YONEMURA-HAYASHI  
Planner

*Clyde Yamauchi*  
CLYDE YAMAUCHI  
Chief Planner

September 1, 1989

Mr. Glenn Miyao  
Department of Parks and Recreation  
25 Aupuni St., Rm. 210  
Hilo, HI 96720

Dear Mr. Miyao:

Re: Kailua Park, Kailua-Kona, Hawaii

Thank you for speaking with me on the telephone today about this project. As I indicated in our conversation, we have reviewed the environmental assessment/negative declaration for the proposed Kailua Park, and offer the following comments:

1. The Dept. of Parks and Recreation should consult the State Department of Health regarding regulations for the proposed sewer leaching fields. In addition, the relationship to the UIC No Pass line needs to be disclosed.
2. Regarding expected noise and light impacts, we suggest that the Kailua Bay Estates community association or neighborhood board be consulted about the expected impacts and the proposed mitigating measures that will be taken.
3. A traffic study should be done to determine traffic impacts and traffic circulation patterns. Level of service (LOS) determinations need to be made, and mitigating measures, e.g., timing of games to avoid peak traffic times, or not scheduling more than one game at a time, defined.

We will publish the notice of negative declaration in our September 8, 1989 OEQC Bulletin. Thank you for the opportunity to

**JAMES H. PEDERSEN**  
**PLANNING CONSULTANT**

P.O. Box 22

Vulcann, Hawaii 96785

Telephone and Fax: (808) 967 - 7619

May 21, 1990

State Office of Environmental Quality Control  
465 South King Street, Room 104  
Honolulu, Hawaii 96813

Attention: Ms. Nina N. Yonemura-Hayashi  
Mr. Clyde Yamauchi

SUBJECT: Kailua Park Expansion Project  
Kailua-Kona, Hawaii

We have received your letter to Mr. Glen Miyao of the Hawaii County Department of Parks and Recreation concerning the environmental assessment for this project. We appreciate your taking the time to review the environmental assessment for this project which was prepared by Mr. Will Chee, environmental planner.

Your letter recommends that:

1. The Department of Parks and Recreation should consult with the State Department of Health concerning the underground injection control line and regulations relating to the use of sewer leaching fields.
2. The Kailua Bay Estates Community Association should be consulted about anticipated noise and light impacts and related mitigation measures.
3. A traffic study should be undertaken to determine traffic impacts and traffic circulation trends.

Consultation with the State Department of Health will occur to clarify any wastewater issues. Further, potential wastewater disposal issues will be discussed in the draft EIS and appropriate wastewater disposal regulations will be identified.

The Kailua Bay Estates Association will not be consulted about noise and light impacts; however, a noise impact study has been made since receipt of your letter. In addition, light impacts have been generally assessed. These analyses will be reflected in the draft EIS.

State Office of Environmental Quality Control  
May 21, 1990  
Page 2

A traffic study of the Kailua Park site was also been conducted in late 1989 to determine potential traffic impacts. The study results will be reflected in the draft EIS.

Regards,

  
Jim Pedersen  
Principal Planner

LT  
jm



STATE OF HAWAII  
OFFICE OF ENVIRONMENTAL QUALITY CONTROL  
41 SOUTH KING STREET, ROOM 141  
HONOLULU, HAWAII 96813

JOHN W. HAMIL  
Director

MARVIN T. MIURA, Ph.D.  
Director  
TELEPHONE NO.  
595-8115

Mr. Larry Tanimoto  
Department of Parks and Recreation  
County of Hawaii  
September 21, 1989  
Page 2

September 21, 1989

Thank you for providing us the opportunity of commenting on your project.

Mr. Larry Tanimoto, Director  
Department of Public Works  
County of Hawaii  
25 Aupuni Street  
Hilo, Hawaii 96720

SUBJECT: Comments on the Kailua Park Master Plan Preparation Notice

Mr. Larry Tanimoto:

The Hawaii County Planning Department is proposing a Keahole to Kailua Development Plan. The Development Plan calls for a 100 acre sports complex at Kealahou. The development of this complex should have been discussed as an alternative to the development of Kailua Park.

We have received concerns from residents of Hawaii, most notably Mrs. Kunitake, that the old Kailua-Kona Airport should be preserved for passive recreational uses, such as fishing and camping, rather than active uses, such as softball and soccer. The construction of tennis and basketball courts, gymnasium, and swimming pool are not in keeping with this passive recreation concept and these amenities could be located at Kealahou.

In light of the size of this project (35 acres), the types of facilities proposed, and the concerns raised, we believe that the impacts of this project will be significant and an environmental impact statement should be prepared.

Sincerely,  
*Marvin T. Miura*  
MARVIN T. MIURA, Ph.D.  
Director, Office of Environmental Quality Control  
ROY SAKAMOTO  
Environmental Technical Specialist

cc: Governor  
OSP  
DLHR  
Kunitake

JAMES H. PEDERSEN  
PLANNING CONSULTANT

P.O. Box 22

Volcano, Hawaii 96785

Telephone and Fax: (808) 967 - 7619

May 21, 1990

State Office of Environmental Quality Control  
465 South King Street, Room 104  
Honolulu, Hawaii 96813

Attention: Dr. Marvin Miura  
Mr. Roy Sakamoto

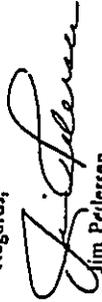
SUBJECT: Kailua Park Expansion Project  
Kailua-Kona, Hawaii

We are in receipt of your comments of dated September 21, 1989 to Mr. Larry Tanimoto concerning the draft environmental assessment for this project. As you may recall, the environmental assessment was prepared by Mr. Will Chiee, environmental planner.

Because of my involvement in the early master planning of the Old Kona Airport site in the early 1970s, I am familiar with the early planning objectives and concepts for this recreational area, as well as former lobbying efforts made by various members of the Kona community. The draft EIS will identify and discuss these development concepts.

Thanks for taking the time to document your concerns and evaluating the significance of this project.

Regards,



Jim Pedersen  
Principal Planner

cc: State Office of Environmental Quality Control

MEMORANDUM

PLANNING DEPARTMENT - County of Hawaii, Hilo, Hawaii 96720

To: Department of Parks & Recreation Attention: Glenn Miyao

From: *Mr. Duane Kanuha* Planning Director

Subject: EIA - Kailua Park

Date: February 4, 1989

'89 JUN 5 AM 10 47

PARKS RECEIVED

First of all, we apologize for our delayed response in providing you our comments on the EIA for the Kailua Park. We offer the following comments:

1. The subject property is situated within the County's SMA and Industrial zone district. An SMA and use permits are required for the proposed improvements. This should be noted in the EIA.
2. The EIA should stress the fact that the Kailua airport and regional complex are both considered in the Recreation Plan and that the development of the Kailua airport park with the proposed improvements does not necessarily mean abandoning the regional complex at Kealahou.
3. The EIA needs to address the traffic, pedestrian and bicycle circulation pattern for this area by discussing needed access alternatives for the proposed development, future expansion and for connection with the regional complex. Additional access in and out of this area needs to be discussed and addressed now. One road access into this area does not seem to be sufficient for the planned activities nor is the proposed mitigative measure a realistic one.

Thank you for the opportunity to review and comment on the EIA. Should you have any questions, please feel free to contact our office.

AK:RHY:cmd

JAMES H. PEDERSEN  
PLANNING CONSULTANT

P.O. Box 22

Vulcano, Hawaii 96785

Telephone and Fax: (808) 967 - 7619

May 21, 1990

Mr. Duane Kanuha  
Planning Director  
25 Aupuni Street  
Hilo, Hawaii 96720

Dear Mr. Kanuha:

SUBJECT: Kailua Park Expansion Project  
Kailua-Kona, Hawaii

We have received your letter of January 4, 1989, to Mr. Glen Miyao of the Hawaii County Department of Parks and Recreation, concerning the environmental assessment for this project. We appreciate your taking the time to review the environmental assessment for this project which was prepared by Mr. Will Chee, environmental planner.

We appreciate the information concerning existing zoning designations; this information will be presented in the draft EIS.

Past plans and policies concerning the Kealahou Regional Sports Complex, the County Recreation Plan, the Old Kona Airport area, and Kailua Park will be clarified in the draft EIS.

Since the receipt of your letter, a traffic impact study has been completed for this project. A portion of this study addresses the aspect of a potential second access to the Kailua Park site. Results and conclusions from the traffic study will be incorporated into the draft EIS.

Regards,

*Jim Pedersen*  
Jim Pedersen  
Principal Planner

cc: State Office of Environmental Quality Control

1/21/89 - [unclear] [unclear] [unclear]



75-5822 Neke Place • Kailua-Kona, Hawaii 96740 • Call Dick Dres: (808) 329-580

JAMES H. PEDERSEN  
Planning Consultant  
P.O. Box 22  
Volcano, Hawaii 96785

Dear Mr. Pedersen:

Regarding the attached EIS Preparation Notice from OEQC on the Kailua Park Expansion Project, dated: April 8, 1990.

It is commendable the Park Expansion Project is finally going to happen. My hope is the project is completed in my life-time.

While planning this worthwhile project it would be very beneficial to many in the Kona area (as well as Island-wide) if you planned also for an underwater park at the north end of the park. Underwater Parks are not expensive to develop and would certainly be a boon to this recreational area. Divers and Snorkelers are people, too, and their recreational needs are not, so far, addressed in the present planning stage.

Also, setting up shower facilities at the far north end of the park, near the dive/snorkle entry/exit point would certainly be desirable to all water-people who utilize the park. The showers (and restrooms) now in place are great and we are thankful for them - - and an extension of the water lines some 100 yards further north (for just showers) doesn't seem to be too much to ask.

Thank you for the opportunity to give a little in-put into the planning process. We admire the work that is being done to add to Kona's recreational opportunities and hope they continue and expand expeditiously.

Respectfully,

Dick Dresle

cc: Harvin T. Hura, Ph.D., Director  
OEQC Bulletin, Honolulu, HI

Roy Dameron, Co-Chairman, Kona Reefers Dive Club  
Kailua-Kona, HI

JAMES H. PEDERSEN  
PLANNING CONSULTANT  
P.O. Box 22  
Volcano, Hawaii 96785  
Telephone and Fax: (808) 967 - 7619

April 18, 1990

Dick and Phyllis Dresle  
Ocean Treasures  
75-5822 Neke Place  
Kailua-Kona, Hawaii 96740

Dear Mr. and Mrs. Dresle:

Subject: EIS Preparation Notice  
Kailua Park Expansion Project  
Kailua-Kona, Hawaii

Thank you for taking the time to review the EIS preparation notice for this project and providing your constructive recommendations concerning the development of an underwater park and related facilities at the north end of the Old Kona Airport Recreation Area.

The Kailua Park Expansion Project involves the development of approximately 20 acres on the south side of the Old Kona Airport Recreation area. Your recommendations refer to the land and inshore water area at the north end of the Old Kona Airport Recreation area that are administered by the State Department of Land and Natural Resources. Consequently, your recommendations are appropriate to the future planning of the Old Kona Airport area rather than the County of Hawaii's Kailua Park Expansion Project.

It is our belief that your recommendations have considerable merit given the available inshore water resources in the vicinity of Pawai Bay. Please consider forwarding your recommendations to:

Mr. Ralston Nagata  
Administrator  
Division of State Parks and Outdoor Recreation  
State Department of Land Natural Resources  
1151 Punchbowl Street, Room 310  
Honolulu, Hawaii 96813

Please also note that your letter will be incorporated into the draft environmental impact statement for the Kailua Park Expansion Project.

Regards,

Jim Pedersen  
Principal Planner

cc: State Office of Environmental Quality Control

**SECTION 2**

**COMMENTS AND RESPONSES TO THE DRAFT EIS**

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

**United States of America**

Department of Agriculture, Soil Conservation Service  
Department of the Army, Corps of Engineers  
Department of the Navy

**State of Hawaii**

Office of the Governor  
Office of State Planning  
Department of Accounting & General Services, Comptroller's Office  
Department of Business & Economic Development  
Energy Division  
Land Use Commission  
Department of Defense, Hawaii Air National Guard  
Department of Land and Natural Resources  
Housing Finance & Development Corporation

**County of Hawaii**

Department of Parks & Recreation  
Department of Public Works  
Department of Planning

**Community Organizations**

Kona Old Hawaii Trails Group

UNITED STATES  
DEPARTMENT OF  
AGRICULTURE

SOIL  
CONSERVATION  
SERVICE

P. O. BOX 50004  
HONOLULU, HAWAII  
96850

JUN 29 1990

JAMES H. PEDERSEN, PLANNING CONSULTANT  
P. O. Box 22  
Volcano, Hawaii 96785  
Telephone and Fax: 808-967-7619

June 26, 1990

July 10, 1990

Honorable John D. Waihee  
Governor, State of Hawaii  
State Capitol  
Honolulu, HI 96813

Dear Governor Waihee:

Subject: Draft Environmental Impact Statement (DEIS) -  
Kaliua Park Expansion Project, North Kona, Hawaii

We have no comments to offer at this time; however, we would appreciate the opportunity to review the final EIS.

Sincerely,

 ACTING

WARREN H. LEE  
State Conservationist

cc: Mr. Glen Miyao, Department of Parks and Recreation, County of Hawaii,  
25 Aupuni Street, Hilo, Hawaii 96720  
/ Mr. James E. Pedersen, Sidney Fuks & Associates, 100 Peahi Street,  
Suite 212, Hilo, Hawaii 96720  
Mr. Harvin T. Hiura, Director, Office of Environmental Quality Control,  
465 S. King Street, Room 104, Honolulu, Hawaii 96813

Mr. Warren M. Lee  
State Conservationist  
USDA Soil Conservation Service  
P. O. Box 50004  
Honolulu, HI 96850

Dear Mr. Lee:

Subject: Draft Environmental Impact Statement  
Kaliua Park Expansion Project  
North Kona, Hawaii

Thank you for your review of the draft EIS for this project. A final EIS will be forwarded to you for review.

Should you desire any further information, please contact us at your convenience.

Regards,



Jim Pedersen  
Principal Planner

cc: County of Hawaii, Dept. of Parks & Recreation  
State Office of Environmental Quality Control



DEPARTMENT OF THE ARMY  
U. S. ARMY ENGINEER DISTRICT, HONOLULU  
BUNLWAL 230  
FT. SHAFTER, HAWAII 96858-5440

JUN 29 1990

1/11

REPLY TO  
ATTENTION OF:

June 27, 1990

Planning Division

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

Dear Dr. Miura:

We have reviewed the Draft Environmental Impact Statement (DEIS) for the proposed Kailua Park Expansion Project, North Kona, Hawaii. The following comments are offered:

- a. Any filling of anchialine ponds or sinkholes would require a Department of the Army (DA) permit. For more information about DA regulatory requirements, please contact Operations Division at 438-9258.
- b. The flood zone information presented on page 3-4 of the DEIS is correct, except that "500-year flood plan" should be changed to "500-year flood plain".

Sincerely,

ORIGINAL SIGNED 27 JUN 1990

Kisuk Cheung  
Director of Engineering

Copies Furnished:

County of Hawaii  
Department of Parks and Recreation  
25 Aupuni Street  
Hilo, Hawaii 96720  
ATTN: Glen Miyao

Sidney Fuke & Associates  
100 Pauahi St., Suite 212  
Hilo, Hawaii 96720  
ATTN: James E. Pedersen

JAMES H. PEDERSEN, PLANNING CONSULTANT  
P. O. Box 22  
Volcann, Hawaii 96785  
Telephone and Fax: 808-967-7619

July 10, 1990

Kisuk Cheung  
Director of Engineering  
Department of the Army  
U. S. Army Engineer District, Honolulu  
Building 230  
Fort Shafter, Hawaii 96858-5440

Dear Mr. Cheung:

Subject: Draft Environmental Impact Statement  
Kailua Park Expansion Project  
North Kona, Hawaii

Thank you for your letter of June 27, 1990, offering comments on the Draft Environmental Impact Statement for the proposed Kailua Park Expansion Project.

For your information, the Kailua Park Expansion Project will not consist of any filling of anchialine ponds. Should these park plans be modified to include the filling of any pond areas, a Department of the Army Corps of Engineers dredge and fill permit application would be submitted.

Thank you also for the identification of a typographical error on page 3-4 of the DEIS. This error will be corrected in the final Environmental Impact Statement.

Sincerely,

*James H. Pedersen*  
James H. Pedersen  
Principal Planner

cc: County of Hawaii, Dept. of Parks & Recreation  
State Office of Environmental Quality Control



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

JUN 3 1990

MINUTE REFER TO

5090  
 Ser 00F2/1844  
 4 Jun 1990

JAMES H. PEDERSEN, PLANNING CONSULTANT  
 P. O. Box 22  
 Volcano, Hawaii 96785  
 Telephone and Fax: 808-967-7619

July 10, 1990

The Honorable John Waihee  
 Governor  
 State of Hawaii  
 State Capitol  
 Honolulu, Hawaii 96813

Dear Governor Waihee:

KAILUA PARK EXPANSION PROJECT

The Draft Environmental Impact Statement (DEIS) for Kailua Park Expansion Project, North Kona, Hawaii, has been reviewed, and we have no comments to offer. Since we have no further use for the DEIS, it is being returned to the Office of Environmental Quality Control.

Thank you for the opportunity to review the draft.

Sincerely,

*W. K. Liu*  
 W. K. LIU  
 Assistant Base Civil Engineer  
 By direction of  
 the Commander

Copy to:  
 County of Hawaii Dept of Parks and Recreation  
 Sidney Fute & Associates  
 OEQC (W/DEIS)

W. K. Liu, Assistant Base Civil Engineer  
 Department of the Navy  
 Naval Base Pearl Harbor  
 Box 110  
 Pearl Harbor, HI 96860-5020

Dear Mr. Liu:

Subject: Draft Environmental Impact Statement  
 Kailua Park Expansion Project  
 North Kona, Hawaii

We appreciate your taking the time to review the draft EIS for this project. Should you desire any further information, please contact us at your convenience.

Regards,

*Jim Pedersen*  
 Jim Pedersen  
 Principal Planner

cc: County of Hawaii, Dept. of Parks & Recreation  
 State Office of Environmental Quality Control

AUG 10 1990

1



**OFFICE OF STATE PLANNING**

Office of the Governor  
STATE CAPITAL, HONOLULU, HAWAII TELEPHONE (808) 548-5000

**JAMES H. PEDERSEN**  
PLANNING CONSULTANT  
P. O. Box 22  
Volcano, Hawaii 96785  
Telephone and Fax: 808-967-7619

August 13, 1990

Mr. Harold Matsumoto, Director  
Office of State Planning  
State Capital  
Honolulu, Hawaii 96813

Dear Mr. Matsumoto:

Subject: Draft Environmental Impact Statement  
Kailua Park Expansion Project  
North Kona, Hawaii

We appreciate the time that you and your staff have taken to review the draft EIS for this project. We have reviewed your concerns and have the following responses.

In the preparation of the final EIS, we have addressed the objectives and policies relating to the State Coastal Zone Management Program and related Rule 9 of the Hawaii County Planning Commission. Portions of chapters 3 and 4 in the final EIS have been revised to evaluate your concerns. In summary, it is our belief that development of recreational facilities at Kailua Park that are not shoreline dependent is justifiable and prudent in light of the following considerations:

1. Public demands for recreational facilities in the North and South Kona districts is increasing significantly.
2. Kailua Park is part of larger Old Kona Airport Recreation Area which contains considerable undeveloped shoreline area and adjacent pavement area that can support vehicular parking for a large number of recreational users and spectators.
3. Kailua Park is separated from the shoreline by a residential subdivision, Kona Bay Estates, which discourages public access to the shoreline. Existing public access points within the subdivision already provides public access; however, little use is presently made of these access points. The adjacent shoreline within the State recreation area proves to be considerably more attractive to both residents and visitors.
4. The development of non-shoreline-dependent facilities to an inland regional sports complex has been presented in various planning studies since the mid-1970's. The reality is that rising land acquisition and site development costs make this option considerably less desirable and feasible.

A bonnical survey was made by Char & Associates in early August, 1990. The survey generally confirmed our earlier analyses.

Regards,  
*Jim Pedersen*  
Jim Pedersen  
Principal Planner

cc: State Office of Environmental Quality Control

August 7, 1990

The Honorable John Waihee, Governor  
State of Hawaii  
c/o Office of Environmental Quality Control  
465 South King Street, Room 104  
Honolulu, Hawaii 96813

Dear Governor Waihee:

SUBJECT: Comments on the Draft Environmental Impact Statement  
Kailua Park Expansion Project  
TMK: 7-5-05: 07 and 83, North Kona, Hawaii

We have reviewed the Draft Environmental Impact Statement for the Kailua Park Expansion Project, in which the County of Hawaii, Department of Parks and Recreation, proposes to develop a new gymnasium in fiscal year (FY) 1990, multi-purpose fields, tennis courts, and additional vehicular parking in FY 1990-FY 2000, and a swimming pool after FY 2000. We offer the following comments for your consideration.

The subject property is the only major park area in Kailua-Kona which is situated along the shoreline. As such, special attention should be paid to the most suitable uses. We are concerned that the proposed uses of the site are not shoreline-dependent. It is our assessment that the types of park facilities proposed in Project Alternative A, gymnasium, multi-purpose fields, tennis courts, and swimming pool, could be established on inland sites. We believe that the Final Environmental Impact Statement should carefully address and evaluate the long-term impacts of developing these types of uses rather than reserving the area for shoreline-oriented/dependent recreation uses.

We also note that a flora survey was not conducted to determine whether any endangered plant species were present.

Thank you for the opportunity to comment. Should you have any questions, please contact me or the Land Use Division at 548-2066.

Sincerely,  
*Harold S. Matsumoto*  
Harold S. Matsumoto  
Director

cc: Dept. of Parks and Recreation  
✓ Sidney Fuke & Associates

JUN 5 1990

(P)1427.0

JUN 1 1990

The Honorable John Waihee  
Governor  
State of Hawaii  
Honolulu, Hawaii

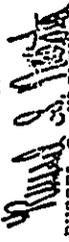
Dear Governor Waihee:

Subject: Kailua Park Expansion  
Draft EIS

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

Should there be any questions, please contact Mr. Cedric Takamoto of the Public Works Division at 548-7192.

Respectfully,

  
RUSSEL S. NAGATA  
State Comptroller

CT:jk  
cc: County of Hawaii, Department of Parks and Recreation  
✓ Sidney Fuke and Associates  
Dr. Marvin Hiura

JAMES II. PEDERSEN, PLANNING CONSULTANT  
P. O. Box 22  
Volcano, Hawaii 96785  
Telephone and Fax: 808-967-7619

July 10, 1990

Russel S. Nagata, State Comptroller  
State Dept. of Accounting & General Services  
1151 Punchbowl St.  
Honolulu, HI 96813

Dear Mr. Nagata:

Subject: Draft Environmental Impact Statement  
Kailua Park Expansion Project  
North Kona, Hawaii

We appreciate your taking the time to review the draft EIS for this project.

Should you desire any further information, please contact us at your convenience.

Regards,

  
Jim Pedersen  
Principal Planner

cc: County of Hawaii, Dept. of Parks & Recreation  
State Office of Environmental Quality Control



DEPARTMENT OF BUSINESS AND ECONOMIC DEVELOPMENT

INVEST DIVISION 335 MERCHANT ST. RM. 110 HONOLULU HAWAII 96813 FAX (808) 536-5143

JUN 18 1990

JOHN WATHEE  
GOVERNOR  
ROGER A. ULVELING  
DIRECTOR  
BARBARA BISH STANTON  
C.P.A.  
LESLIE S. MARUMURA  
C.P.A.

June 12, 1990

The Honorable John Wathee  
Governor, State of Hawaii  
State Capitol  
Honolulu, Hawaii 96813

Dear Governor Wathee:

Subject: OEIS Kailua Park Expansion Project  
North Kona, Hawaii

We wish to inform you that we have no comments to offer on the subject environmental impact statement.

Thank you for the opportunity to review the document.

Sincerely,

*R. A. Ulveling*  
for Roger A. Ulveling

RAU:PHK/hk

cc: County of Hawaii, Dept. of Parks and Recreation  
-Sidney Fuke & Associates  
Dr. Harvin T. Hura, OEQC

JAMES H. PEDERSEN, PLANNING CONSULTANT

P. O. Box 22  
Volcano, Hawaii 96785  
Telephone and Fax: 808-967-7619

July 10, 1990

Roger A. Ulveling, Director  
Energy Division  
State Dept. of Business & Economic Development  
335 Merchant St., Rm. 110  
Honolulu, HI 96813

Dear Mr. Ulveling:

Subject: Draft Environmental Impact Statement  
Kailua Park Expansion Project  
North Kona, Hawaii

We appreciate your taking the time to review the draft EIS for this project.  
Should you desire any further information, please contact us at your convenience.

Regards,

*Jim Petersen*  
Jim Petersen  
Principal Planner

cc: County of Hawaii, Dept. of Parks & Recreation  
State Office of Environmental Quality Control

STATE OF HAWAII  
DEPARTMENT OF BUSINESS  
AND ECONOMIC DEVELOPMENT

JUN 7 1990

JAY ARNOLD  
Governor

RONALD L. K. HIP  
Chairman

FREDERICK P. WITTENBERG  
Vice Chairman



LAND USE COMMISSION

Room 104, 818 Federal Building, 335 Merchant Street  
Honolulu, Hawaii 96813 Telephone: 548-0811

COMMISSION MEMBERS:

LAWRENCE F. CHAN  
SARAH S. ALIHOA  
ALICE K. HO  
ALICE T. HAJIJE  
ESTHER UEDA, JR.  
JAMES M. SALASO  
GLEN MIYAO

ESTHER UEDA  
Executive Officer

June 5, 1990

County of Hawaii  
Dept. of Parks and Recreation  
25 Aupuni Street  
Hilo, Hawaii 96720

ATTENTION: Glen Miyao

Dear Mr. Miyao:

Subject: Kailua Park Expansion Project Draft Environmental  
Impact Statement

We have no comments at this time except that the proposed  
improvements are located on lands designated within the State  
Land Use Urban District.

Thank you for the opportunity to comment.

Sincerely,

ESTHER UEDA  
Executive Officer

EU:to  
cc: Sidney Fuke & Associates  
OEQC

JAMES H. PEDERSEN, PLANNING CONSULTANT  
P. O. Box 22  
Volcano, Hawaii 96785  
Telephone and Fax: 808-967-7619

July 10, 1990

Esther Ueda, Executive Officer  
Land Use Commission  
State Dept. of Business & Economic Development  
335 Merchant St., Room 104  
Honolulu, HI 96813

Dear Ms. Ueda:

Subject: Draft Environmental Impact Statement  
Kailua Park Expansion Project  
North Kona, Hawaii

We appreciate your taking the time to review the draft EIS for this project. Section 3.6.2  
of the DEIS does recognize the project site as located in a State Land Use Urban District.

Should you desire any further information, please contact us at your convenience.

Regards,

Jim Pedersen  
Principal Planner

cc: County of Hawaii, Dept. of Parks & Recreation  
State Office of Environmental Quality Control



STATE OF HAWAII  
DEPARTMENT OF DEFENSE  
OFFICE OF THE ADJUTANT GENERAL  
394 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96813-1000

OTHER MAILING  
ADDRESS

JUN 20 1990  
ALETIS F. LUM  
MAIL ROOM  
ADJUTANT GENERAL  
STATE OF HAWAII  
OFFICE OF THE ADJUTANT GENERAL

May 31, 1990

Engineering Office

Honorable John Waihee, Governor  
State of Hawaii  
State Capitol  
Honolulu, Hawaii 96813

Dear Governor Waihee:

DBIS Kailua Park Expansion Project  
North, Kona, Hawaii

Thank you for providing us the opportunity to review the above subject project.

We have no comments to offer at this time regarding this project.

Sincerely,

*Jerry M. Matsuda*  
Jerry M. Matsuda  
Lieutenant Colonel  
Hawaii Air National Guard  
Contracting & Engineering Officer

cc: County of Hawaii, Hilo, HI  
✓ Sidney Fuke & Associates, Hilo, HI  
Dr. Marvin T. Miura, Ph.D., OEQC

NATIONAL GUARD  
America and its People

JAMES H. PEDERSEN, PLANNING CONSULTANT  
P. O. Box 22  
Volcano, Hawaii 96785  
Telephone and Fax: 808-967-7619

July 10, 1990

Lt. Colonel Jerry M. Matsuda  
Hawaii Air National Guard  
Contracting & Engineering Officer  
State Dept. of Defense  
3949 Diamond Head Road  
Honolulu, HI 96816-4495

Dear Lt. Colonel Matsuda:

Subject: Draft Environmental Impact Statement  
Kailua Park Expansion Project  
North Kona, Hawaii

We appreciate your taking the time to review the draft EIS for this project.

Should you desire any further information, please contact us at your convenience.

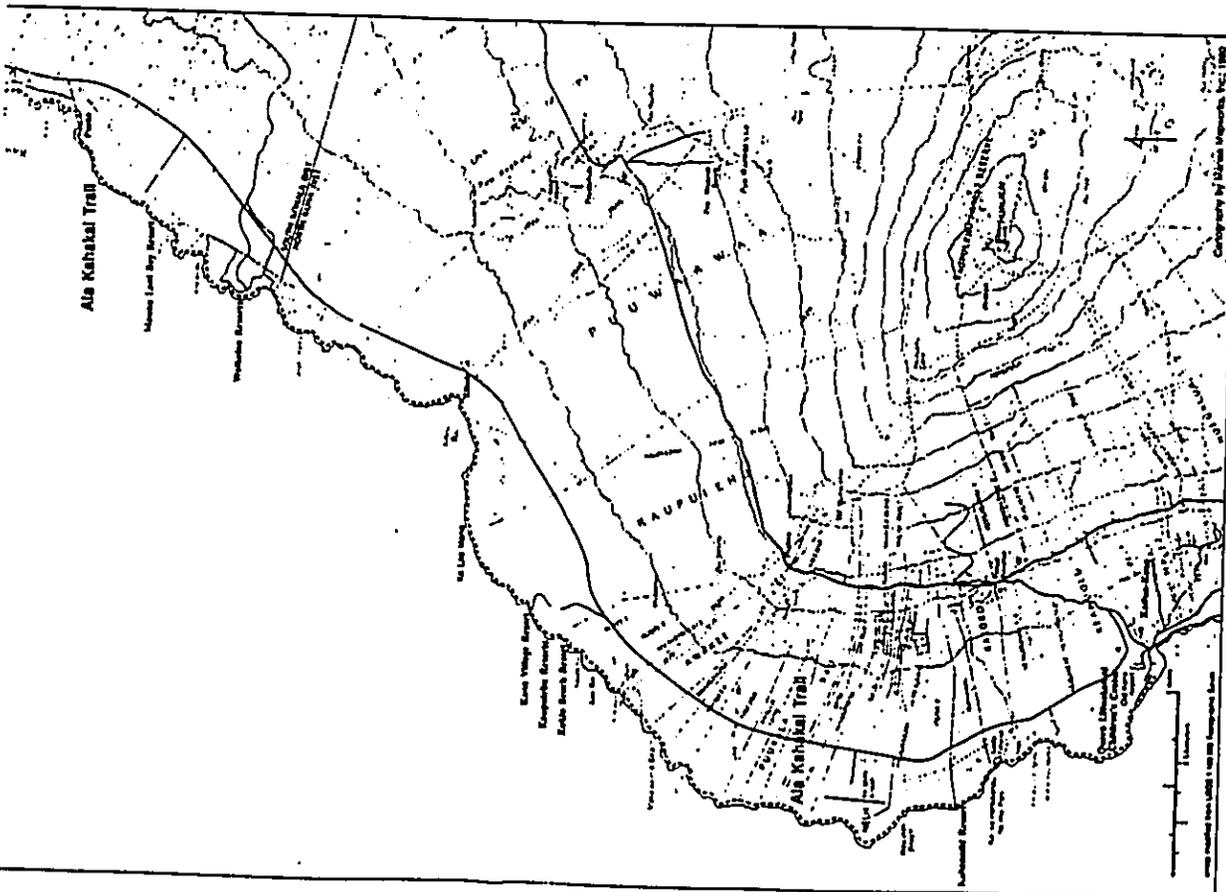
Regards,

*Jim Pedersen*  
Jim Pedersen  
Principal Planner

cc: County of Hawaii, Dept. of Parks & Recreation  
State Office of Environmental Quality Control



enclosure



JAMES H. PEDERSEN  
 PLANNING CONSULTANT  
 P. O. Box 22  
 Volcano, Hawaii 96785  
 Telephone and Fax: 808-967-7619

August 13, 1990

Mr. William W. Patsy, Chairperson  
 Board of Land and Natural Resources  
 State Department of Land and Natural Resources  
 P.O. Box 621  
 Honolulu, Hawaii 96809

Dear Mr. Patsy:

Subject: Draft Environmental Impact Statement  
 Kailua Park Expansion Project  
 North Kona, Hawaii

Thank you for taking the time to review the draft EIS for this project. We have reviewed your concerns and recommendations and have the following comments.

We are generally aware of the recent settlement between Kona Bay Estates Owners' Association and the State of Hawaii. We have revised Figures 2-2 and 2-3 to include existing public access points to the shoreline as well as the pedestrian path along the mauka boundary of Kona Bay Estates.

Existing conceptual plans for the proposed Kailua Park Expansion do include provisions for a restroom facility and vehicular parking. It is our understanding that you prefer to have these facilities in closer proximity to the public pedestrian path along the mauka boundary of Kona Bay Estates. The County Department of Parks and Recreation has indicated to me that it will consider these recommendations during the preparation of detailed plans and specifications for the project. It is my personal belief that the location of vehicular parking and a restroom facility closer to the pedestrian path will not significantly increase use of the shoreline makai of Kona Bay Estates.

Chapter 3 of the final EIS will include information concerning the Ala Kahakai trail and the related plans to use the Old Kona Airport runway for vehicular parking.

Regards,

*Jim Pedersen*  
 Jim Pedersen  
 Principal Planner

cc: State Office of Environmental Quality Control

JUN 23 1990 7



STATE OF HAWAII  
DEPARTMENT OF BUDGET AND FINANCE  
HOUSING FINANCE AND DEVELOPMENT CORPORATION  
SEVEN WATERFRONT PLAZA, SUITE 300  
500 ALA MOANA BOULEVARD  
HONOLULU, HAWAII 96813  
FAX (808) 548-6461

June 20, 1990

90:PLNG/2703 jt

JOSEPH K. CONANT  
EXECUTIVE DIRECTOR

WE WOULD REFER TO

JAMES H. PEDERSEN, PLANNING CONSULTANT  
P. O. Box 22  
Volcano, Hawaii 96785  
Telephone and Fax: 808-967-7619

July 10, 1990

Joseph K. Conant, Executive Director  
Housing Finance and Development Corporation  
State Department of Budget & Finance  
Seven Waterfront Plaza, Suite 300  
500 Ala Moana Boulevard  
Honolulu, HI 96813

Dear Mr. Conant:

To: The Honorable John Waihee  
Governor, State of Hawaii

From: Joseph K. Conant, Executive Director

Subject: DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR  
KAILUA PARK EXPANSION PROJECT

Subject: Draft Environmental Impact Statement  
Kailua Park Expansion Project  
North Kona, Hawaii

Thank you for the opportunity to review the subject draft  
EIS. We have no housing-related comments to offer.

Thank you for your review of the draft EIS for this project.

JT:aks

Should you desire any further information, please contact us at your convenience.

c: County of Hawaii, Dept. of Parks & Recreation  
Sidney Fuke & Associates  
Harvin T. Miura, Ph.D., OEQC

Regards,

*Jim Pedersen*  
Jim Pedersen  
Principal Planner

cc: County of Hawaii, Dept. of Parks & Recreation  
State Office of Environmental Quality Control



**Department of Parks and Recreation**

25 Aupuni Street, Rm. 210 • Hilo, Hawaii 96720 • (808) 961-8311

Larry S. Tsalimidas  
Mayor  
George Yoshida  
Director  
Juliette M. Tulang  
Deputy Director

JUL 3 1990

**JAMES H. PEDERSEN**  
**PLANNING CONSULTANT**

P. O. Box 22  
Volcano, Hawaii 96785  
Telephone and Fax: 808-967-7619

June 28, 1990

Mr. Sidney Fuke  
Planning Consultant  
100 Pauahi Street, Suite 212  
Hilo, Hawaii 96720

Subject: Kailua Park, North Kona

Dear Mr. Fuke:

Described below are two projects at Kailua Park which continue to receive high priority:

- 1) Reconstruction of former terminal building this 9,000+ sq. ft. facility presently houses a staff office, multi-purpose room, restrooms, maintenance storage, and three canoe club work areas.

Reconstruction of this facility would allow greater utilization as a multi-purpose community center. Estimated cost of this reconstruction is about \$750,000-\$1,000,000.

- 2) Construction of multi-purpose field

Proposed uses of this field include softball, soccer, football, and track. Estimated cost of this facility, including restrooms facilities, is about \$1,250,000 (civic \$750,000, landscaping and irrigation \$400,000, restroom \$100,000)

If any questions should arise, please do not hesitate to contact us.

Sincerely,

  
George Yoshida  
Director

July 23, 1990

Mr. George Yoshida  
Director  
Department of Parks and Recreation  
County of Hawaii  
25 Aupuni Street  
Hilo, Hawaii 96720

Dear Mr. Yoshida:

Subject: Draft Environmental Impact Statement  
Kailua Park Expansion Project  
North Kona, Hawaii

Thank you for taking the time to review the draft EIS and identify other development priorities for Kailua Park. This additional information will be reflected in Chapter Three (Section 3.5.1.2) of the final EIS.

Regards,

  
Jim Pedersen  
Principal Planner

cc: State Office of Environmental Quality Control

Larry S. Tanimoto  
Mayor  
Bruce C. McClure  
Chief Engineer  
Richard H. Nishimura  
Deputy Chief Engineer

JUL 6 1990

Department of Public Works

25 Aupuni Street, Rm. 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138



JAMES H. PEDERSEN  
PLANNING CONSULTANT  
P. O. Box 22  
Volcano, Hawaii 96785  
Telephone and Fax: 808-967-7619

July 23, 1990

Mr. David Murakami, P.E.  
Engineering Division  
County of Hawaii Dept. of Public Works  
25 Aupuni Street  
Hilo, Hawaii 96720

Dear Mr. Murakami:

Subject: Draft Environmental Impact Statement  
Kailua Park Expansion Project  
North Kona, Hawaii

Thank you for taking the time to review the draft EIS and document your concerns relating to this project.

We have discussed your recommendation concerning an expansion of the traffic study with representatives of Barton-Aschman and the County Department of Parks and Recreation. On the basis of these discussions, we will expand the traffic analysis which will be included in Appendix E of the final EIS.

We understand your recommendation concerning the desirability of a second vehicular access to Kailua Park. However, as you are aware, the feasibility of providing a second access from Queen Kaahumanu Highway to Kuakini Highway is dependent upon future land use development, related easements, through the Liiuokalani Trust lands north of the Old Kona Airport site.

In section 4.4.1.3, please also note our conclusion that the limited traffic impacts anticipated for the Kailua Park Expansion Project would not warrant the construction of a second primary access to the park site. However, it is recognized that a second primary access may have beneficial impacts upon the Palani Road-Kuakini intersection by diverting left-turns that are presently over capacity.

Regards,

*J. Pedersen*  
Jim Pedersen  
Principal Planner

cc: County Department of Parks and Recreation  
State Office of Environmental Quality Control

June 28, 1990

HONORABLE JOHNNIE WATHEE GOVERNOR  
STATE OF HAWAII  
STATE CAPITOL FIFTH FLOOR  
HONOLULU HI 96813

SUBJECT: DEIS  
KAILUA PARK EXPANSION PROJECT  
TRK: 7-5-5: 7

We have reviewed the subject document and our comments are as follows:

1. The traffic impact study should be expanded to include the intersection of Queen Kaahumanu and Kaiwi Street.
2. An alternate access to the park is desirable.

*Robert K. Yamabu*  
ROBERT K. YAMABU, Division Chief  
Engineering Division  
DHH:sah

cc: DPH Traffic Division  
Department of Parks & Recreation  
Planning Department  
Office of Environmental Quality Control  
Sidney Fuke  
Barton-Aschman - Honolulu

JUL 26 1990

Honorable John Waihee  
July 23, 1990  
Page 2

### Planning Department

25 Arapuni Street, Room 109 • Hilo, Hawaii 96710 • (408) 941-8288



July 23, 1990

Honorable John Waihee  
Governor, State of Hawaii  
c/o Office of Environmental Quality Control  
463 South King St., Rm 104  
Honolulu, HI 96813

Dear Governor Waihee:

#### Comments - DEIS Kailua Park

We have reviewed the Draft Environmental Impact Statement for the expansion of the Kailua Park and provide the following comments:

1. The purpose section of the DEIS needs to clarify that the triggering mechanism for compliance with Chapter 343, HRS, is that the proposed project involves the use of state lands and county funds. Further, that the Final DEIS will be used as a supporting document for the pending Use Permit and Special Management Area (SMA) Use Permit applications.
2. The DEIS failed to discuss the relationship of the project to the objectives and policies of the Hawaii Coastal Zone (CMZ) Program as specified in Chapter 205A, HRS, and Rule 5 of the Hawaii County Planning Commission relating to Special Management Area. The deficiency in not discussing this issue may hamper the public's opportunity in the review and evaluation of the project's impact on the environmental resources.
3. The draft Keahole to Kailua Development Plan has been under review by the public and government agencies since September 1989. The revised plan designated two areas for open space and recreational facilities where the Regional Sports Complex could be accommodated. The DEIS should have included discussion on this proposed complex as one of the alternatives to the project. It should be noted that this issue was not addressed in the DEIS, as suggested by the Office of Environmental Quality Control (September 21, 1989 comment letter).
4. In order to make a firm conclusion on any anticipated impacts to flora resources, a thorough flora survey should have been conducted and included in the DEIS.

5. The Final EIS should disclose that the Kona Regional Plan designates the subject area as Open for park and recreation purposes.
6. The traffic analysis of future conditions should extend beyond the opening date of the park (for 5 years).
7. The Kailua-Kuakini intersection is assumed to be signalized in the future and the analysis was performed on that basis. Is this signalization "committed," i.e., can we bank on it? If this is not certain, then an unsignalized intersection analysis should be conducted as well.
8. The level of service depicted for future conditions at Palani-Kuakini intersection do not coincide with the Highway Capacity Manual results which the consultant claims to be following. Based on Table 9-1 of the HCM the LOS would be:  

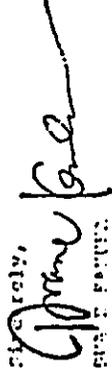
Kuakini-Palani	1992	1992
	w/o Project	w/ Project
All Peak Hour LOS	C	C
PM Peak Hour LOS	E	F
All Sat. Peak Hour LOS	D	D

The consultant should justify why the results reported in the analysis differs from the Highway Capacity Manual output.
9. Page 9 of the analysis, under Existing Level of Service Analysis, iter 2 reports the Palani-Kuakini intersection PM Peak at both LOS D and P. This cannot be both at the same time and therefore should be corrected.
10. Page 4-7: Table 4-1 is taken from the Traffic Study which incorrectly spells Kailua Street. This should be corrected throughout the document.
11. The project should have been described in a separate section of the document so as to better understand on what the proposed development includes.
12. Figures 2-1 and 3-1 are the same maps. The EIS should include a map reflecting the Kailua Park site in relation to the immediate surrounding area.

Honorable John Waihee  
July 23, 1990  
Page 3

JAMES H. PEDERSEN  
PLANNING CONSULTANT  
P. O. Box 22  
Volcano, Hawaii 96785  
Telephone and Fax: 808-967-7619

13. The final EIS should include a conceptual layout for Alternative C.
  14. The Kailua Park maps should show location of public access and parking to Kona Bay Estates.
  15. The maps showing Kona Bay Estates shorelines are incorrect and, as such, needs to be corrected.
  16. Page 3-14: There is no discussion on solid waste.
- Thank you for the opportunity to review and comment on the RPIS for the Kailua Park expansion.

Sincerely,  
  
James H. Pedersen  
Planning Consultant

Attached

cc: Dept. of Parks & Recreation  
Wayne Pule  
James H. Pedersen

August 13, 1990

Mr. Duane Kanuha, Director  
Planning Department  
25 Aupuni Street, Room 109  
Hilo, Hawaii 96720

Dear Mr. Kanuha:

Subject: Draft Environmental Impact Statement  
Kailua Park Expansion Project  
North Kona, Hawaii

We appreciate the time that you and your staff have devoted to reviewing the draft EIS for this project. We have reviewed your concerns and have the following responses.

1. We have revised Chapter 1 to expand upon the purpose of the final EIS.
2. An additional section concerning the Coastal Zone Management Policies and Objectives, and the related Rule 9 of the County Planning Commission, has been incorporated into section 3.6 of the final EIS.
3. A discussion of open space and recreation plans in the May, 1990 draft Keahole to Kailua Development Plan will be presented in section 3.6.7 of the final EIS.
4. Winona Char & Associates performed a botanical survey of the undeveloped portions (20 acres) of Kailua Park in early August, 1990 which confirmed our earlier findings. Chapter 3 of the final EIS has been revised to reflect the results of the survey. The survey report will be incorporated in the final EIS as Appendix F. A detailed flora survey is not necessary to adequately identify existing botanical resources or assess the potential impacts upon the botanical resources of the project site.
5. The designation of the project site as "Open" for park and recreation purposes is stated in the Kona Regional Plan. This information will be added to section 3.6.6 of the final EIS.
6. The rapid development of North Kona and the lack of short-term regional traffic forecasts does not permit the preparation of meaningful forecasts of future level of service in the vicinity of Kailua Park. Our discussions with traffic engineers in the Department of Public Works have not reflected any concerns regarding our approach to evaluating potential traffic impacts for this project.
7. A revised Figure 4-1 in the final EIS will reflect our earlier analysis of the Kaiwi-Kuakini intersection under both signalized and unsignalized conditions. More detailed analysis are also available in the computer calculations found in Appendix E of the draft or final EIS.

Mr. Duane Kanuha  
August 13, 1990  
Page 2

8. Table 9-1 of the Highway Capacity Manual provides level of service (LOS) criteria for signalized intersections. The HCM criteria used for this study correlates LOS with V/C ratios as indicated in Table 1 of Appendix E, rather than solely vehicle delay. This is a more common and accepted technique used by traffic planners in Hawaii.
9. A typographic error on page 9 (Item 2) of Appendix E in the draft EIS will be revised in the final EIS To clarify the existing LOS at the Palani-Kuakini intersection.
10. The incorrect spelling of Kaiwi Street in Table 4-1 will be changed and reflected in Table 4-1 of the final EIS.
11. Section 2.3 clearly describes the conceptual development plan for Alternative A of the proposed project in narrative form, as well as two supporting conceptual site plans for Kailua Park. Section 2.4 also indicates that Alternative A is the selected development option and explains the rationale for selection in the context of the two other project alternatives. As the County Department of Parks and Recreation proceeds with the preparation of its final design plans and specifications, more construction details will be available for your review.
12. A new Figure 3-1 has been prepared to illustrate general land uses in the vicinity of Kailua Park.
13. A conceptual layout has been prepared for Alternative C and will be included in Chapter 2 of the final EIS.
14. Figures 2-2 and 2-3 have been revised to include the location of two public right-of-way to the shoreline and a public pedestrian path along the mauka boundary of Kona Bay Estates.
15. The location of the shoreline along the makai boundary of Kona Bay Estates has been changed in Figures 2-2 and 2-3 of the final EIS.
16. Solid waste collection at Kailua Park is presently handled by the Department of Parks and Recreation. No data exists concerning the volume of solid waste material being collected and disposed.

Regards,

  
Jim Pedersen  
Principal Planner



July 3, 1990

The Honorable John Waihee, Governor  
c/o Marvin T. Miura, Director  
Office of Environmental Quality Control  
465 South King Street, Room 104  
Honolulu, Hawaii 96813

RE: Kailua Park Expansion Project, North Kona,  
Hawaii, TMK 7-5-03:06 and E3; Draft  
Environmental Impact Statement Comments

Dear Governor Waihee:

I am submitting these comments on behalf of my client, the Kona Old Hawaii Trails Group (KOHG), an association of Hawaiian residents whose goal is to identify, locate, preserve and protect ancient trails in the Kona area. Since 1985, KOHG has been engaged in active litigation to restore an old Hawaiian trail which runs laterally along the shoreline in the Kona Bay Estates subdivision, which is located makai of the proposed Kailua Park expansion project. This case is in the process of being settled with provisions, inter alia, to enhance an existing pedestrian easement located along the makai boundary of the subdivision.

However, one of my client's main concerns is to establish vehicular access and parking to a mauka/makai shoreline access located between lots 18 and 19 of the Kona Bay Estates subdivision which leads to the "baby pond" area. As you may know, this "baby pond" area is a sheltered sandy beach cove which is heavily used by Kona residents as a safe swimming area for young children. In fact, most of my clients and their children and grandchildren learned how to swim at this cove. There is presently a five-foot-wide pedestrian easement which runs from the tennis courts along the mauka boundary of the Kona Bay Estates subdivision to this shoreline access. However, this easement is approximately a quarter mile long, and it is difficult for elderly and very young people to walk this distance to reach the cove.

We therefore urge that any development plans for the park include the expansion of this easement to allow for vehicular access and parking immediately mauka of the baby pond shoreline access. In line with the State Parks Administrator's

The Hon. John Waihee, Governor  
7/3/90  
Page 2

January 2, 1990 comments to George Yoshida, we also support the relocation of one of the restrooms planned for the multipurpose field to this area for use by beach goers.

Thank you for this opportunity to comment. Should you have any questions, please do not hesitate to contact me.

Sincerely yours,

Livia Wang  
Staff Attorney

LW:klg/90.0158/8/mc  
cc: Hawaii County Department of Parks and Recreation, c/o  
James H. Pedersen, Planning Consultant.  
Hon. Harry S. Ruddle  
Hon. Russell Kokubun  
Josephine Kamoku  
Dona Hanaike, Esq.

**JAMES H. PEDERSEN  
PLANNING CONSULTANT**

P. O. Box 22

Volcano, Hawaii 96785

Telephone and Fax: 808-967-7619

July 23, 1990

Ms. Livin Wang  
Staff Attorney  
Kona Old Hawaii Trails Group  
c/o Native Hawaiian Legal Corporation  
1270 Queen Emma Street, Suite 1004  
Honolulu, Hawaii 96813

Dear Ms. Wang:

Subject: Draft Environmental Impact Statement  
Kailua Park Expansion Project  
North Kona, Hawaii

We are in receipt of your letter dated July 3, 1990 regarding this project. We appreciate your taking the time to document the concerns of the Kona Old Hawaii Trails Group.

Development plans for the Kailua Park Expansion Project do not include the construction of a vehicular access, parking area, or restrooms along the mauka boundary of Kona Bay Estates subdivision. Proposed vehicular access would be via Kuakini Highway and the mauka boundary of the existing Kailua Park. Vehicular parking will be situated adjacent to the future gymnasium and swimming pool facilities where the majority of future recreational activity is expected to occur. As planned, the proposed restroom facility, adjacent to the multi-purpose facility, will be located east of the multi-purpose field to provide convenient access for users and spectators at the field and persons walking to and from the vehicular parking area. However, as this project proceeds to a detailed design phase, your concerns will be further considered by the County Department of Parks and Recreation.

Regards,



Jim Pejerseh  
Principal Planner

cc: County of Hawaii, Department of Parks and Recreation  
State Office of Environmental Quality Control

**APPENDIX B**

**NOISE IMPACT ANALYSIS  
KAILUA PARK EXPANSION**



#89-39  
January 22, 1990

James H. Pedersen  
Planning Consultant  
P. O. Box 22  
Volcano, HI 96785

RE: KAILUA-KONA PARK MASTER PLAN

Dear Mr. Pedersen:

In this letter/report, we present our findings on environmental noise aspects of the subject project.

1. SUMMARY OF FINDINGS

- 1.1 Existing and potential noise-sensitive areas near the expanded Kailua-Kona Park include the partially-completed Kona Bay Estates residential development to the south of the park site, and possible future multi-family developments to the east. It is also conceivable that the land north of the proposed park owned by the Liliuokalani Trust, which is currently zoned industrial, could be rezoned for future residential development.
- 1.2 The average minimum background noise levels, measured at representative locations in existing and potential noise-sensitive areas on December 8 and 9, 1990, ranged from 43 dBA to 49 dBA. The dominant sounds were the sounds of surf (particularly in Kona Bay Estates) and the noise generated by wind blowing through trees and other foliage.
- 1.3 Noise from the existing soccer fields and tennis courts was inaudible or barely audible at existing and potential noise-sensitive areas south and east of the park site.
- 1.4 Because the existing and proposed facilities are provided mainly for recreational use, the numbers of spectators attending events, such as softball and volleyball games, is expected to be relatively small (i.e., less than 200 on most occasions).

- 1.5 The proposed multi-purpose field, which will be located next to the Kona Bay Estates residential development, will not be lighted and, thus, its use will be restricted to daylight hours. However, noise from the small numbers of spectators envisaged could still cause some impact on neighboring residents, unless the design provides for bleachers to be positioned on the north side of the multi-purpose field, only.
- 1.6 Noise from use of the other sporting and recreational facilities, including the tennis courts, swimming pool, gymnasium, soccer fields, BMX track and horseshoe pits, is not expected to cause any significant environmental impact.
- 1.7 Noise from the proposed sewage pump station, at the northeast corner of the park site, could potentially impact a possible future multi-family residential development to the east, unless the appropriate noise control measures (such as sound barrier walls, equipment enclosures, fan silencers, etc.) are incorporated into the design of the pump station.
- 1.8 Noise from the new car parking lot by the swimming pool/gymnasium complex could also impact a possible future multi-family residential development to the east. Recommended noise mitigation measures include a sound barrier wall at the eastern site boundary, speed bumps, and administrative controls, including closing the park site at 10 pm.
- 1.9 The additional traffic on Kuakini Highway and Kaiwai Street generated by the proposed park expansion should not cause any significant environmental noise impact.
- 1.10 The dominant noise source during construction activities, associated with expansion of the park site, will probably be earth moving equipment such as bulldozers and diesel powered trucks. Any noise impact from these activities on the adjacent residential areas should, however, be relatively short-term.

## 2. PROJECT DESCRIPTION

The proposed Kailua-Kona Park, located at the east end of the Old Kona Airport State Recreation Area, will comprise 34 acres of sporting and recreational facilities, 14 acres of which are already developed. Existing facilities which will be retained at their present locations include two soccer fields, two lighted softball fields and four lighted tennis courts. Two existing facilities, the bicycle motocross (BMX) track and the horseshoe pits, will be relocated within the development. Another existing facility, the basketball court, will be relocated next to the old Airport Terminal Building.

New facilities to be built on the expanded park site include four additional lighted tennis courts, a lighted swimming pool, a new soccer field, gymnasium, multi-purpose field, track and additional car parking areas. It is also proposed to build a sewage pump station at the northeast corner of the site.

On the southern boundary of the park is a partially-completed, single family residential development, Kona Bay Estates (which has a six foot high lava rock wall on its northern boundary). The park site is currently bounded to the east by vacant land, which could be used for future multi-family residential development. The land further east, i.e., the other side of Kaiwi Street, is zoned for apartment development. There are no other existing or potential noise-sensitive areas in the immediate vicinity of the proposed park, although it is conceivable that the land north of the proposed park owned by the Liliuokalani Trust, which is currently zoned industrial, could be rezoned for future residential development.

An additional 500 parking stalls for cars are to be provided at the park site. Access to the new and existing car parking areas will be from Kuakini Highway, a two-lane highway that terminates at the entrance to the old airport.

3. THE EXISTING ACOUSTICAL ENVIRONMENT

Ambient noise measurements were made at and near the park site on December 8 and 9, 1989. Noise levels were recorded over 10 minute sampling periods at Locations A through F, shown in Figure 1, using a Larson Davis Laboratory Model 800B Precision Integrating Sound Level Meter and a Quest Model 155 Precision Sound Level Meter. The measurement locations are described below:

- A. On the west side of the existing softball fields, about 20 ft from the bleachers.
- B. Between the existing softball fields and tennis courts, about 60 ft from the closest court.
- C. At the entrance to lot #43, Kona Bay Estates.
- D. At the entrance to lot #16, Kona Bay Estates.
- E. On the north side of Kaiwi Street, about 25 ft from the curb and 300 ft from the security entrance to Kona Bay Estates.
- F. At the northeast corner of the existing soccer fields, about 30 ft from Kuakini Highway.

Weather conditions during the measurements on the afternoon of Friday, December 8, 1989, were fine and clear, with a temperature of around 85° and wind from the NW at 5 to 10 mph. On the morning of Saturday, December 9, 1989, the weather was overcast with a temperature of about 80° and wind from the south at 5 to 10 mph.

The only existing sporting facilities that were being used during the first series of measurements (i.e., on the Friday afternoon) were two of the four tennis courts. On the Saturday morning, all four tennis courts and the two soccer fields were in use.

The noise measurement results, in terms of the Equivalent Continuous Noise Level (Leq), the minimum noise level (Lmin), the level exceeded for 90% of the time (L90) and the maximum noise level (Lmax), are presented in Table 1 and summarized below.

Location	Time	Measured Noise Levels - dBA			
		Leq	Lmin	L90	Lmax
A	Friday pm (12/8/89)	46	40	42	53
B	" "	50	42	44	61
C	" "	49	44	45	57
D	" "	46	42	43	51
E	" "	46	42	44	53
F	" "	57	39	41	69
A	Saturday am (12/9/89)	53	46	49	65
B	" "	54	45	48	67
C	" "	51	48	49	60
D	" "	48	45	46	52
E	" "	47	45	46	51
F	" "	63	49	55	74

On the Saturday morning, noise from the sporting events, particularly spectator noise associated with the soccer games, could be clearly heard at the measurement locations within the park site (A, B and F). However, at locations in the existing or potential noise-sensitive areas (C, D and E), noise from the sporting events was generally masked by the sounds of surf and the noise generated by wind blowing through trees and other foliage. The average minimum (L90) background noise levels at these locations varied from 43 dBA to 49 dBA.

4. NOISE STANDARDS AND GUIDELINES

There are no specific noise regulations or standards in the County of Hawaii which could be applied to the proposed development. However, noise limits in the Department of Health's (DOH)'s Community Noise Control for Oahu (Title 11, Chapter 43) provide some guidance. These regulations specify maximum allowable noise levels at property lines in single-family residential areas of 55 dBA during the daytime (7 am to 10 pm) and 45 dBA at night (10 pm to 7 am). The corresponding limits in multi-family residential areas are 5 dBA higher. These "allowable levels" must not be exceeded for more than 10% of the time in any 20-minute period, i.e., these criteria refer to the L10 noise levels.

It should be noted that these regulations were formulated primarily for assessing complaints against noise from agricultural, industrial and commercial equipment. Complaints against noise from people, e.g., from boisterous behavior, noisy parties, etc., are normally assessed subjectively by members of the Honolulu Police Department; if the noise is considered "unreasonable", the complaint will be upheld.

Studies have shown that community noise annoyance also depends on the relationship between the level of a potentially annoying noise and the background noise level. Environmental noise standards and criteria are, therefore, commonly based on the premise that community reaction can be minimized by ensuring that the level of an intrusive noise does not exceed the average minimum (L90) background noise level by more than about 5 dBA. This approach is also taken in the International Organization for Standardization (ISO) Recommendation R1996, "Assessment of Noise with Respect to Community Response", from which the following table is derived.

Amount in dBA by which the Noise Exceeds the Average Minimum (L90) Background Level	Estimated Community Reaction
0	None - no observed reaction
5	Little - sporadic complaints
10	Medium - widespread complaints
15	Strong - threats of community action
20	Very Strong - vigorous community action

Note that these data are based on people's subjective response to different changes in noise level, which can be summarized thus - an increase of 1 dBA or 2 dBA in the level of a noise is difficult to detect, an increase of 3 dBA to 5 dBA results in a small but noticeable change in loudness, while an increase of 10 dBA corresponds to an approximate doubling of loudness.

Thus, with the average minimum (L90) background noise levels in the closest existing and potential noise-sensitive areas in the range of approximately 40 dBA to 50 dBA, to ensure minimal environmental noise impact, the equivalent continuous noise level from sporting events at the park site would need to be limited to about 50 dBA at the southern and eastern site boundaries.

Ideally, noise from construction activities should also be in compliance with the same criteria, (i.e., no more than 5 dBA above the background noise) although this could be difficult to achieve in practice. However, because most construction activities are of relatively short-term duration, communities are generally more tolerant to a given level of construction noise than to the same level of noise from a more permanent fixture.

## 5. POTENTIAL IMPACTS AND DESCRIPTION OF CONTROLS

### 5.1 Multi-Purpose Field

This area, which will be located adjacent to the Kona Bay Estates residential development, will cater for a variety of activities, including softball, soccer, football and archery. It is understood that the multi-purpose field will not be lighted and, thus, its use will be restricted to daylight hours. Night softball games will continue to be played at the two existing softball fields.

Because the existing and proposed facilities are provided mainly for recreational use, the numbers of spectators attending events such as softball and football games are expected to be relatively small. For example, it is understood that only four sets of portable bleachers, seating a maximum of 120 people, would be provided at the multi-purpose field. There will be no public address system.

Nevertheless, if the bleachers are positioned on the south side of the multi-purpose field, the sounds of spectators cheering could be clearly audible, and may cause some annoyance, to the closest residents. For example, the sound generated by 100 spectators applauding and cheering could be 60 dBA to 70 dBA at the closest residential properties. Any noise impact could, however, be minimized if the design of the facility provides for bleachers to be positioned on the north side of the multi-purpose field, only. This should reduce the level of spectator noise

at the closest homes by at least 10 dBA.

#### 5.2 Tennis Courts

Four new lighted tennis courts will be provided next to the existing courts, adjacent to the western section of Kona Bay Estates. The estimated noise from the new and existing courts is, at most, 45 dBA to 50 dBA at the closest residences and, thus, their use is not expected to cause any undue annoyance.

#### 5.3 Gymnasium

The gymnasium, which will be used mainly for basketball and volleyball, will have a seating capacity of 1100 (but it is understood that the numbers of persons attending most events would normally be far less). Although there will be no permanent public address system, a portable p.a. system will most likely be used for occasions such as presentations and award nights. Warning bells or buzzers will also be used to signify the ends of game quarters, etc.

The gymnasium will be naturally-ventilated and, thus, interior sounds could readily emanate from the building through jalousie windows, louvers, etc. However, because of the distance to the nearest potential noise-sensitive area and the types of functions envisaged, there is not expected to be any significant environmental noise impact resulting from its use. For example, assuming a worst case scenario (i.e., a full house), the noise level inside the gymnasium when spectators are cheering or applauding or when the p.a. system is being used could be 80 dBA to 90 dBA. The resulting noise level at the eastern property line is estimated at 40 dBA to 50 dBA.

#### 5.4 Other Facilities

Even though the relocated horseshoe pits and BMX track will be right next to the site boundaries, because of the nature of the activities involved, use of these facilities is not expected to cause any significant impact on existing and potential noise-sensitive areas.

Use of the new soccer field and lighted swimming pool should not cause any significant environmental noise impact. It is understood that there will be no public address system at either facility.

Noise from the proposed sewage pump station, at the northeast corner of the park site, could potentially impact a possible future multi-family residential development to the east unless the appropriate noise control measures (which may include sound barrier walls, equipment enclosures, fan silencers, etc.) are incorporated into the design of the pump station.

### 5.5 Additional Traffic Generated by the Development

An additional 500 parking stalls are to be provided at the expanded park site. A small number of stalls will be provided next to the tennis courts but the majority of the additional parking spaces will be provided around the swimming pool/gymnasium complex. Some of these additional spaces will be located relatively close to a possible future multi-family residential development east of the park site.

Noise sources commonly associated with car parking lots of this type include conversation, slamming of car doors, revving of engines, vehicle movements and use of loud car stereo systems. To minimize any noise impact on potential noise-sensitive areas nearby, it is recommended that the following measures be taken:

1. Build a sound barrier wall at least 6 ft high along the eastern site boundary. The wall could be constructed from a number of materials including stone and wood; the main requirements are that the wall be solid (i.e., no gaps) and its weight should be at least 2 lbs/sq ft of surface area.
2. Incorporate speed bumps to limit vehicle speeds to 10 mph.
3. Close the park site at 10 pm, instead of the currently-proposed 11 pm.
4. Use administrative measures to control any rowdy behavior and the use of loud car stereos.

Based on projections in the traffic studies, the additional project-generated traffic on Kuakini Highway and Kawai Street will increase noise levels near these roadways by, at most, 1-1/2 dBA to 2 dBA. This is not a significant increase in terms of subjective response.

Thus, the additional on-road traffic generated by the proposed park expansion should not cause any significant environmental noise impact.

### 5.6 Construction Noise

Expansion of the park site will involve grubbing, grading, and the construction of infrastructure and buildings. The various construction phases of a development project may generate significant amounts of noise; the actual amounts are dependent upon the methods employed during each stage of the process. Typical construction equipment noise ranges in dBA are shown on Figure 2. Although earthmoving equipment, such as bulldozers and diesel powered trucks, will probably be the loudest equipment used during construction, earthmoving operations are expected to be of relatively short-term duration.

James H. Pedersen  
January 22, 1990

#89-39  
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Note that, on Oahu, in cases where construction noise exceeds, or is expected to exceed, the DOH's "allowable" property line limits, a permit must be obtained from the DOH to allow the operation of vehicles, construction equipment, power tools, etc. which emit noise levels in excess of the "allowable" limits. Required permit conditions for construction activities are:

"No permit shall allow construction activities creating excessive noise...before 7:00 am and after 6:00 pm of the same day."

"No permit shall allow construction activities which emit noise in excess of ninety-five dB(A)... except between 9:00 am and 5:30 pm of the same day."

"No permit shall allow construction activities which exceed the allowable noise levels on Sundays and on...[certain] holidays. Activities exceeding ninety-five dB(A) shall [also] be prohibited on Saturdays."

In addition, construction equipment and on-site vehicles or devices requiring an exhaust of gas or air must be equipped with mufflers.

Please call if you have any questions on this report.

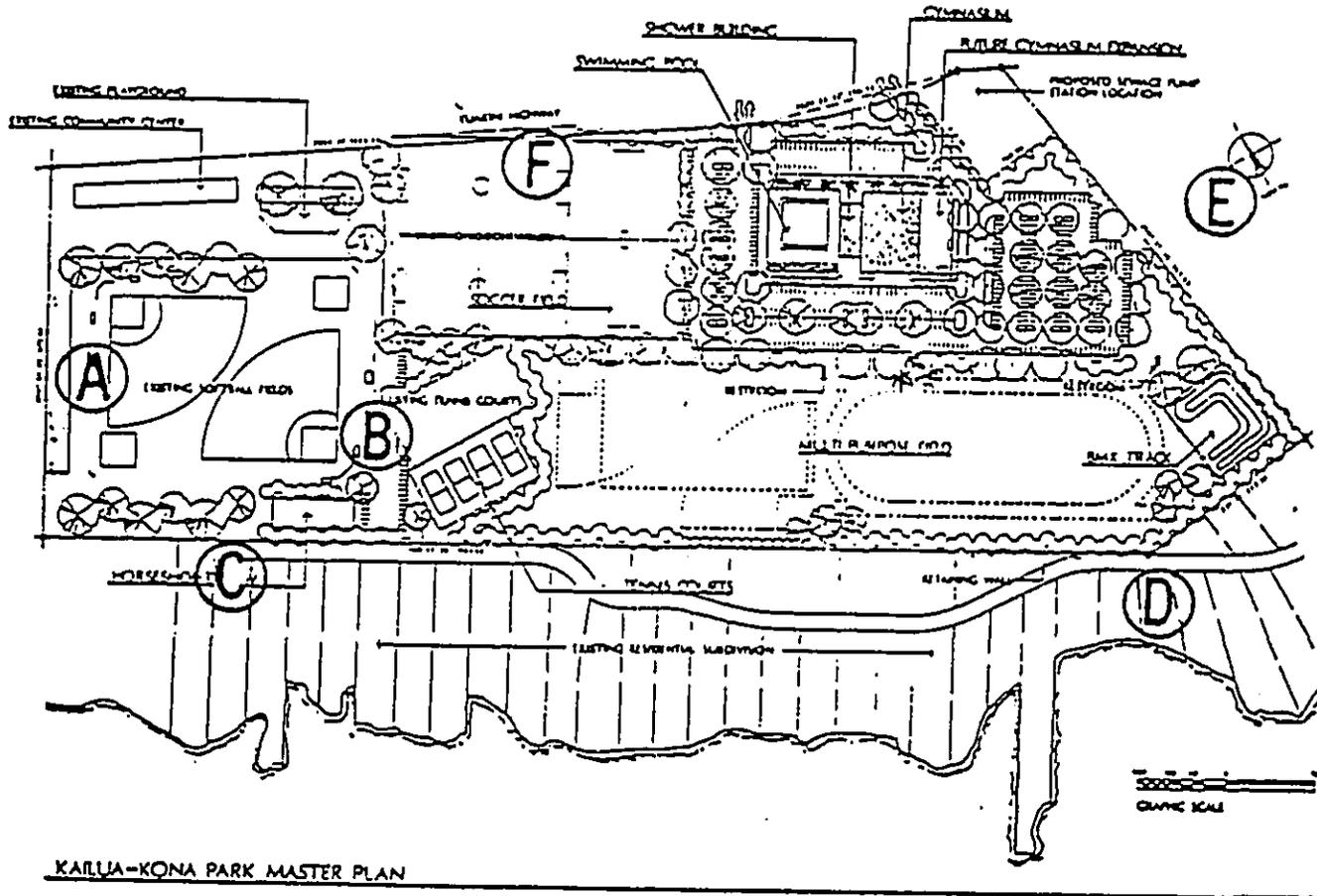
Sincerely,

  
John C. Shearer

TABLE 1  
 NOISE DATA RECORDED AT SIX LOCATIONS AT AND NEAR THE  
 PARK SITE ON FRIDAY, DECEMBER 8, 1989 AND SATURDAY, DECEMBER 9, 1989

*Location	Date	Time	Measured Noise Levels - dBA				Dominant Noise Sources
			Leq	Lmin	L90	Lmax	
A	12/8/89	2:46-2:56 pm	46	40	42	53	Surf, wind, birds
B	"	3:01-3:11 pm	50	42	44	61	Tennis, surf, wind birds
C	"	3:25-3:35 pm	49	44	45	57	Surf, wind, water sprinkler
D	"	3:43-3:53 pm	46	42	43	51	Surf, wind
E	"	4:07-4:17 pm	46	42	44	53	Wind, birds, traffic
F	"	4:25-4:35 pm	57	39	41	69	Traffic (38 vehicle movements on Kuakini Hwy)
A	12/9/89	8:58-9:08 am	53	46	49	65	Soccer, tennis
B	"	9:12-9:22 am	54	45	48	67	Soccer, tennis
C	"	9:33-9:43 am	51	48	49	60	Wind, surf
D	"	9:48-9:58 am	48	45	46	52	Wind, surf, birds
E	"	10:03-10:13 am	47	45	46	51	Surf, traffic, birds
F	"	10:17-10:27 am	63	49	55	74	Traffic (52 vehicle movements on Kuakini Hwy.), soccer

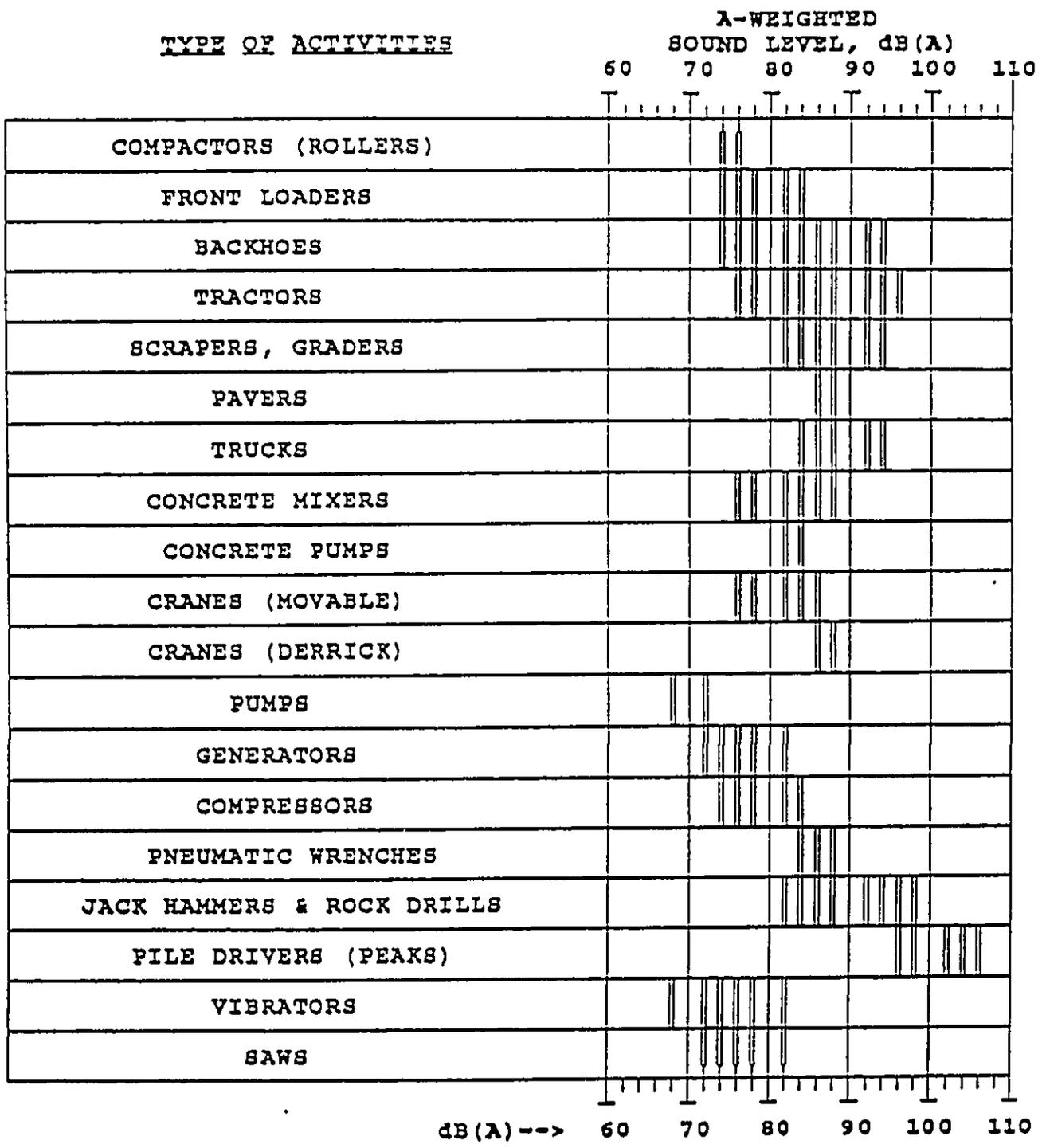
\* See Figure 1



KAILUA-KONA PARK MASTER PLAN



Figure 1 Site Plan Showing Noise Measurement Locations



CONSTRUCTION EQUIPMENT NOISE RANGES @ 50 FEET  
 NOTE: BASED ON LIMITED AVAILABLE DATA SAMPLES



Figure 2 Construction Equipment  
Noise Ranges @ 50'

**APPENDIX C**

**ARCHAEOLOGICAL CONSULTANTS OF HAWAII  
ARCHAEOLOGICAL RECONNAISSANCE SURVEY REPORT  
KAILUA PARK SITE**



JOSEPH KENNEDY  
Archaeologist

ARCHAEOLOGICAL CONSULTANTS  
of  
HAWAII

59-624 Pupukea Rd.  
Haleiwa, Hawaii 96712  
(808) 638-7442

Wilbert Chee  
Planner  
1585 Kapiolani Blvd. Suite 830  
Honolulu, Hawaii

8-9-87

Dear Mr. Chee:

At the request of your office, Archaeological Consultants of Hawaii, Inc. has conducted a walk through reconnaissance survey of a 2 acre parcel (a portion of TMK 7-5-05:07) located on the site of the Old Kona Airport.

The property in question is comprised of two basic environmental situations which are somewhat related. The northern section of the property is covered with a newer pahoehoe lava, while in the southern section the lava begins to break-up and gives way to older and weathered lava portions that feature pockets of soil and scattered exotic vegetation such as kiawe (*Prosopis pallida*) and koa haole (*Leucaena glauca*). There is no water on the property and very little rainfall.

In order to make a preliminary assessment of the archaeological value of the property it is necessary to review the previous work in the general area and if possible, on the property itself. The history of archaeological work in this general area dates back to 1919 when Stokes mentioned a number of sites near the subject property. These were four religious structures, two heiau and two ko'a. Reinecke (1930) lists seven sites for this area, which he refers to as 'Halepa'u'; they include a house platform and a papamu, a group of ruins centered around the ponds of Makeo, a walled platform an additional papamu and a petroglyph, a series of yard walls, a modern house platform, a graveyard and three old house platforms.

Newman (1970) reported four sites, the Lanihau petroglyphs, the Lanihau papamu, house and burials and a modern burial. His study was followed two years later by a survey conducted by a group known as Neighbor Island Consultants (1972). A total of 19 sites were listed -three planting pits, two bait mortars, two shelter caves, a walled enclosure, two petroglyphs sites, two grave sites (modern), two burials, two historic house sites, a papamu, a rock wall and some salt pans.

W. Chee  
8-9-87  
page 2

Some of the petroglyphs listed above appear to be the same later designated as site no 50-HA-d9-4 by Cox and Stasack of the Bishop Museum. The more inland cluster of petroglyphs was designated as Hawaii State Register of Historic Places Site No. 50-10-27-2000. Although this designation was made by Hawaii Foundation for History and the Humanities in June of 1973, it is not certain if this site has been legally recertified. It is worth noting at this point that none of sites are located within the limits of the subject parcel.

In June of 1979, Rosendahl conducted a reconnaissance of the Hilton Head Company Kona Property "B" Site which is located in a section makai of the subject parcel. He recorded over 30 sites in this section, including a number of human burials. A letter on file at DLNR concerning this project also raised the possibility of a historic cemetery located just off the limits of the Hilton Head property. Exactly where off the boundary was not determined at that time and remains to be resolved.

Earl Neller of the Department of Land and Natural Resources Historic Sites Division investigated the report of exposed human bones in the area. In this report he offered an outline for future work in the study area. These recommendations include a call for site mapping, archaeological testing and excavation and the restoration of some structures.

Later in 1980, the most comprehensive archaeological study of the area was conducted by Lovelace and Estioko-Griffin of the Historic Sites Section of DLNR. They recorded a total of 35 sites in the area, many of which match earlier descriptions. As far as this report is concerned, the portion of their survey called 'Sub-Area 4' is the most important. Sub-Area 4 covers much of same land as the subject parcel. On page 22 of their report, "Sub-Area 4 extends eastward from the east end of the runway/airport and County of Hawaii leased area to the eastern boundary of the State Park. On the north it is bounded by the Kuakini Highway. To the east a secondary paved road marks the boundary while the south is partially marked by a fence line which separates the park area from privately owned coastal areas. Sub-Area 4 is currently divided by a fence line (running mauka- makai and then westward) which does not coincide with the park boundary. West of this dividing fence line, lava formations and a grass vegetation has developed. Only one archaeological site, a wall was reported by Neighbor Island Consultants."

W. Chee  
8-9-87  
page 3

Estioko-Griffin and Lovelace found two sites on the property and this figure is a bit deceptive for Site 1980 -33 is comprised of nine separate ahu. Their descriptions are as follows: "Site number 1980-32 is a long low rock wall extending approximately 150 meter (c. 500ft.) in length which extends in a northeasterly direction from the south boundary of Sub area 4 at a point approximately 180 meters east of the County tennis courts. The rock wall appears disturbed at several points along its length. It is unclear whether the wall is prehistoric or historic in age. It should be noted that bulldozing in connection with airport construction probably took place in this sub area and that this activity may have affected the form and extent of the wall.

Site 1980-33 consists of a cluster of rock mounds (ahu) which occurs east of the rock wall (Site 1980-32 described above) and the fence line which cuts across Sub area 4 . These ahu are located approximately 200 meters east of the county park and between 70 and 100 meters of the southern boundary of Sub area 4. These rock mounds (9 counted) average between 1.0 and 1.5 meters across and 0.06-0.7 meters in height. Several of these are fairly well constructed; others appear to have partially collapsed. Two of the ahu, those which are located furthest east of the fence line, having sticks protruding from them. The function of these rock mounds is unclear; possibly they are land divisions or burial markers. his area

We were unable to locate any of the nine ahu or the long wall in the course of this investigation. Although there has already been several long descriptions from the Estioko-Griffin Lovelace survey, it is appropriate to quote directly from the recommendation section concerning Sub-Area 4. "Development Plans suggest that this sub area is to be used as a 'reserve area' and that a trail system will eventually be established. We recommend that the trail system be oriented and constructed so as to not affect the long rock wall (Site 1980-32) and the series of ahu (Site 1980-33) which were recorded during our reconnaissance survey.

W. Chee  
8-9-87  
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Prior to the development of this sub area we suggest that the sites be more accurately located and that several of the abu be recorded in detailed fashion and disassembled by archaeologists to insure there are no burials...signs advising walkers to stay on the trails should be posted for safety reasons."

While it does not appear that such designs or precautions will be possible in Sub-Area 4, this does not diminish the potential importance of the area in terms of its archaeological value.

First, review of archaeological work in the immediate area indicates that the subject parcel is located in an area of relatively high site frequency. While only two sites (with 10 features between them have been located, - and have subsequently been bulldozed) it would not be surprising to find more. The Estioko-Griffin Lovelace survey found 10 more than Neighbor Island Consultants did and they in turn located sites missed by Reinecke. When Rosendahl was relocating sites for construction workers he found several more while looking around for the ones he flagged the first time around. The archaeological record for this area not only demonstrates there are quite a few sites of differing functions but also that almost every survey conducted here has also missed sites. This is not at all uncommon in the initial archaeological discovery process.

Beyond this, there is also a very real possibility that ground disturbing activities may uncover a portion of a lava tube (even one with an entrance located well off the subject property.) As mentioned by several of the authors referred to earlier, human remains are also a concern in this area. In addition, the location (or confirmation) of a historic cemetery near the property is still an open question.

W. Chee  
8-9-87  
page 5

#### CONCLUSIONS AND RECOMMENDATIONS

These data are more than enough to recommend a two part program that should precede any further bulldozing, grading, trenching etc. Based on the information listed above, I believe the following recommendations may be presented with a note that they are seen as precautionary measures designed, in part, to prevent the further destruction of sites (which may remain unrecorded) on the property. I also suspect that the discovery of additional sites is more of a possibility than a probability, but nevertheless feel that the following measures are justified.

1. There should be some sort of limited subsurface testing in a selection of the areas that may permit this type of exercise. Results of this work should be presented in written form complete with recommendations for further work, if necessary.
2. After this has taken place, some monitoring should be conducted, especially in non soil and grass areas. The thrust of the monitoring would be focused on the identification of previously unrecorded sites (I have in mind how easy it might have been to miss the odd petroglyph scatter) and potentially exposed lava tube openings or sections. Again, a written report should be presented at the term of the ground clearing and grubbing.

If you have any questions regarding this preliminary report, please feel free to contact me.

Sincerely;



Joseph Kennedy

**APPENDIX D**

**STATE HISTORIC PRESERVATION OFFICE  
ARCHAEOLOGICAL RECONNAISSANCE SURVEY REPORT  
KAILUA PARK SITE**



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

WILLIAM W. PATY, CHAIRPERSON  
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DEPUTIES  
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RUSSELL N. FUKUMOTO

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

February 13, 1990

Mr. George Yoshida, Director  
County of Hawaii  
Department of Parks and Recreation  
25 Aupuni Street  
Hilo, Hawaii 96720

Dear Mr. Yoshida:

SUBJECT: Expansion of County Park, Old Kona Airport  
Chapter 6E Historic Preservation Compliance  
(County of Hawaii)  
Lanikai, North Kona, Hawaii  
TMK: 7-5-5: 7

Our department's Historic Preservation Program has reviewed the archaeological survey report (attached) recently completed by our State Parks archaeologists. Don Hibbard's memo to me (attached) documents archaeological clearance on the matter.

Sincerely,

A handwritten signature in dark ink, appearing to be "RN", written over the word "Sincerely,".

RALSTON H. NAGATA, Deputy State  
Historic Preservation Officer

Attachments (2)

JOHN WAINEE  
GOVERNOR OF HAWAII



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

WILLIAM W. PATY, CHAIRPERSON  
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CONVEYANCES  
FORESTRY AND WILDLIFE  
LAND MANAGEMENT  
STATE HISTORIC PRESERVATION  
STATE PARKS  
WATER AND LAND DEVELOPMENT

February 9, 1990

MEMORANDUM

TO: Ralston Nagata, Administrator, State Parks  
FROM: Don Hibbard, Director, Historic Preservation Program  
SUBJECT: Expansion of County Park, Old Kona Airport -- Chapter  
6E Historic Preservation Compliance (County of Hawaii)  
Lanikai, North Kona, Hawaii  
TMK: 7-5-5: 7

HISTORIC PRESERVATION PROGRAM CONCERNS:

The inventory survey report of this area, done by State Parks archaeologists, has been finished (Smith & Yent 1990. Mapping and Testing of Selected Archaeological Features in Old Kona Airport State Recreation Area, Lanikai, North Kona, Island of Hawai'i). We find that this report fully inventories the 6 historic sites. We agree with the significance evaluations; the sites were significant solely for their information content and adequate amounts of this information were recorded and recovered during the survey, making the sites "no longer significant". Thus, the project will have "no effect" on significant historic sites. Chapter 6E compliance is, thus, concluded.

DON HIBBARD

MAPPING AND TESTING OF SELECTED ARCHAEOLOGICAL  
FEATURES IN OLD KONA AIRPORT STATE RECREATION AREA,  
LANIHAU, NORTH KONA, ISLAND OF HAWAII,  
(TMK: 7-5-05:7).

Prepared by:  
Marc Smith and Martha Yent, Archaeologists,  
Division of State Parks, Outdoor Recreation and Historic Sites  
Department of Land and Natural Resources,  
State of Hawaii.

January 1990

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## 1. INTRODUCTION

The study area is located in the land of Lanihau, North Kona, on the island of Hawai'i (TMK: 7-5-05:7). During the 1980 archaeological survey, this area was identified as Subarea 4 (Estioko-Griffin and Lovelace, 1980:22), of Old Kona Airport State Recreation Area. This 25 acre parcel lies in the east end of the the park, bound on the east by the park boundary, the west by the County leased portion of the park, the north by Kuakini Highway, and the south by a stone wall along a private subdivision boundary (Figure 1).

Expansion plans proposed by the County for the east end of the park include a gymnasium, parking lot, multi-purpose field and BMX track. (Figure 2). If the facilities are developed as planned, the entire 25 acre parcel will be utilized.

Prior to parcel development, transit mapping and testing of previously recorded archaeological features was necessary. A tumbled basalt wall (site 1980-32), and a nearby cluster of nine ahu (site 1980-33), were recorded during a 1980 survey of the parcel by State Parks archaeologists A. Estioko-Griffin and G. W. Lovelace (1980).

1.1. Statement of Purpose. Archaeological investigations were conducted in December 1989, by M. Yent and M. Smith, Division of State Parks archaeologists. Two days were spent transit mapping and selectively testing features. The fieldwork was limited to the area of planned park expansion, Subarea 4, containing known archaeological features. The goal was to mitigate planned development by 1) completing inventory of sites present, including mapping and recording, 2) testing features to determine research potential, 3) determine significance, and 4) evaluate impact.

1.2. Site Significance. Kailua-Kona is one of the more historically important areas in Hawai'i (Barrere, 1975:1). Site of chiefly residences, first landfall of Christian missionaries, port for many early western traders, and final residence of Kamehameha I, Kailua-Kona was an early site for the assimilation of western culture in Hawai'i. Today, much of the archaeological record has been destroyed or is unavailable because of development in the village of Kailua-Kona. In this context, the existing sites in nearby Old Kona Airport State Recreation Park become increasingly important (Estioko-Griffin and Lovelace, 1980:96).

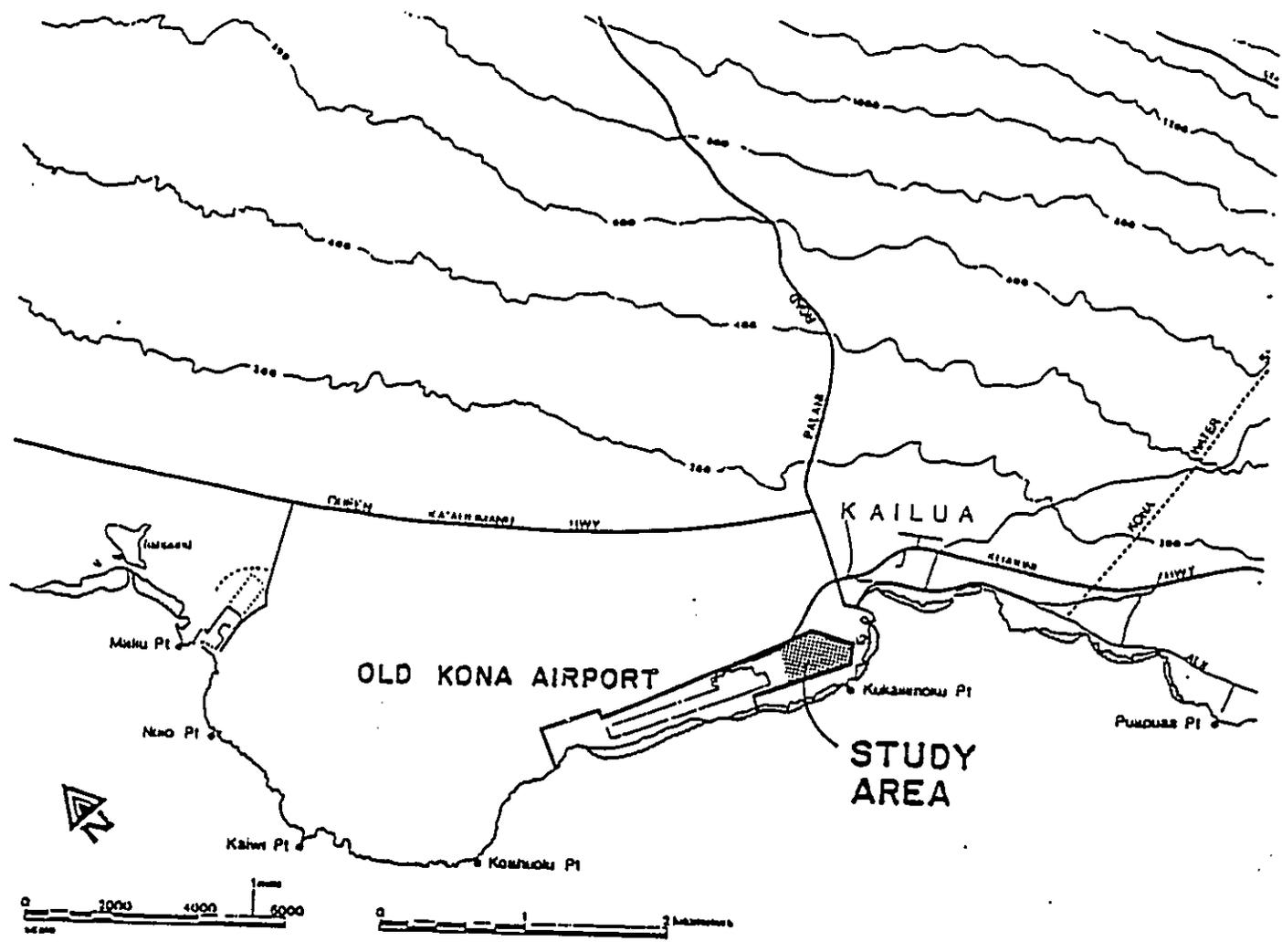


Figure 1. Old Kona Airport State Recreation Area.

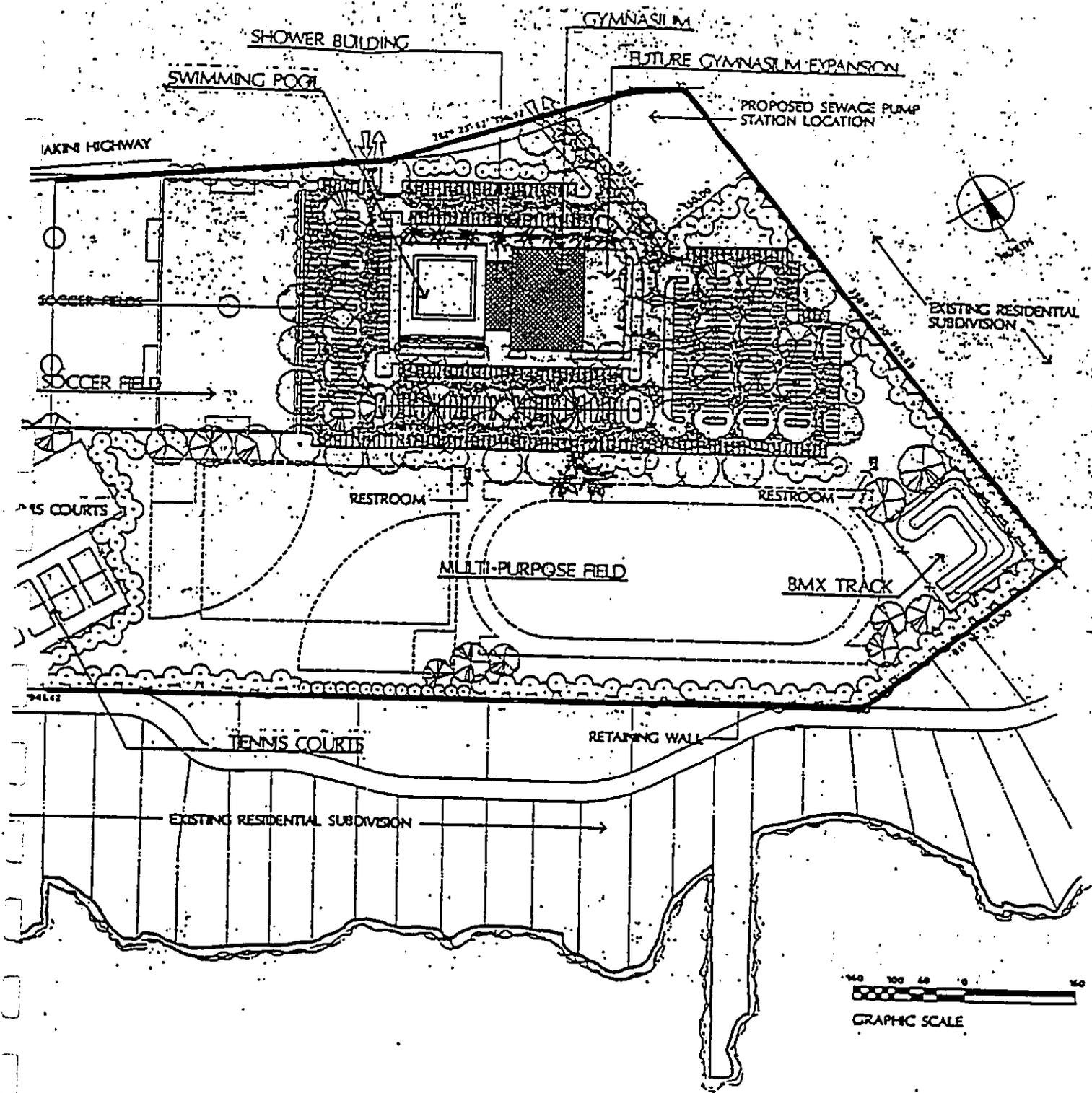


Figure 2. Study area, Subarea 4, Old Kona Airport Recreational Area, with proposed park facilities.

A range of prehistoric and historic sites still exists in the Old Kona Airport area, and mitigation of features within the study area could contribute information for a variety of research questions. These questions could be site specific in nature, or more topical and regional in scope. Site specific questions could include site age and function, utilized natural resources, and spatial organization and development of site structures. Comparison of study area sites with sites in adjacent areas of Old Kona Airport and nearby Kailua-Kona could address larger topical questions of prehistoric settlement patterns, population, regional resource utilization and trade, and western acculturation.

Also of concern was the possibility of burials in the study area. Previous fieldwork in the area has identified prehistoric and historic burials at Old Kona Airport, and several of the features in the study area have been identified as possible burials (Estioko-Griffin and Lovelace, 1980).

## 2. THE STUDY AREA

2.1. Environmental Setting. The Old Kona Airport is built upon a relatively level plain formed by lava from Hualalai crater. The elevations are generally 2 to 10 feet above sea level (Estioko-Griffin and Lovelace, 1980:4), with a topography of broken pahoehoe flows.

Because the study area is located on the leeward side of Hawai'i, the climate is primarily influenced by land-sea breezes. The moisture laden sea breeze is responsible for the coastal rainfall, which in the Lanihau area is approximately 65 cm annually (Springer, 1987:4). The rainfall is fairly evenly distributed throughout the year, averaging 5 cm monthly.

There is no fresh surface water in the study area. Historically however, there were numerous anchialine ponds and brackish seeps which have since been covered by the construction of the Old Kona Airport (Springer, 1987:6).

There are two vegetative patterns in the study area today. These exist on the east and west sides of a wire fence which crosses the area. The fence was constructed around the airport perimeter in 1950 (Estioko-Griffin and Lovelace, 1980:7), and the vegetative pattern probably results from airport maintenance practices.

On the west side of the fence is open pahoehoe/grassland with scattered fountain grass (Pennisetum setaceum) and endemic puapilo (Capparis sandwichiana), (Camara, 1987:52).

Occasionally, a noni (*Morinda citrifolia*) and Christmas berry (*Schinus terebinthifolius*) grow from breaks in the pahoehoe flow. The eastern side of the fence is marked by large kiawe (*Prosopis pallida*), opiuma (*Pithecellobium dulce*), and kolu (*Acacia farnesia*), in addition to the grasses, noni and Christmas berry.

Historically, the marine resources were utilized in the area. Off-shore exploitation of aku (*Katsuwonus pelamis*), 'opelu (*Decapterus pinnulatus*), ulua (*Crevalle*), kumu (*Parupeneus porphyreus*), weke (*Mulloidichthys samoensis*), manini (*Acanthurus sandwicensis*), palani (*Acanthurus dussumieri*), and kupipi (*Adudefduf sordidus*), were supplemented with fish from fishponds. These ponds, located north of the study area in Keahuolu, Honokohau and Kaloko and south of the study area in Lanihau, were natural features modified to encourage fish production (Springer, 1987:13). Fish propagated in the ponds included 'anae (*Mugil cephalus*), awa (*Chanos chanos*), o'io (*Albul vulpes*).

The anchialine and brackish pond environment also produced 'opae'ula (*Halocardinia rubra*, *Metabetaeus lehena*), which was important as bait. The chum made from 'opae'ula was especially preferred as 'opelu bait (Springer 1987:15).

2.2. Ethnographic and Historic Summary. For a more complete history of the Old Kona Airport location and surrounding area, the reader is referred to reports by Springer (1987), and Esitoko-Griffin and Lovelace (1980), as only a summary of their work is provided here.

It is believed that coastal settlement in Kona may have begun by A. D. 750, with several permanent settlements along the coast by A. D. 1100 (Kirch, 1979:198; Schilt, 1984:276). There is no dated coastal site in the vicinity of the study area, but dates from a charcoal sample and 19 volcanic glass sections excavated from a site a short distance mauka of the town of Kailua-Kona suggest a late 1100s occupation (Schilt, 1984:64). The site consists of a number of platforms, and the midden deposits suggest seasonal use of the area.

Settlements were concentrated along the shore, utilizing the abundant marine resources (Springer, 1987:28). Not until the late 1500s, was there evidence of expansion and development of the mauka garden systems. Fishponds north of the study area at Honokohau, Kaloko, Maka'eo, and Halepa'u were also probably in use at this time (Springer, 1987:29).

A possible indicator of the importance of nearby fishing grounds is the occurrence of the fishing ko'a at Halepa'u, north of the study area. Stokes (1919), also recorded 3 other

religious structures of undetermined use along the shoreline north of the study area but within the Old Kona Airport boundary, in Kawaluna, Palihiole, and Maka'eo.

Serving at times as the royal residence of Kamehameha I, then later as home for Liholiho (Kamehameha II), and John Adams Kuakini, Governor of the island of Hawai'i, nearby Kailua-Kona was a historically important location. The presence of the ruling chiefs of Hawai'i living in Kailua-Kona encouraged western contact in the area. As a primary point of western acculturation for Hawai'i, the area also probably suffered from the reduced native population caused by waves of epidemics which swept Hawai'i in early to mid 1800s (Schmitt, 1968:37).

During the Mahele (1848), the ahupua'a of Lanihau 1 (Lanihau-nui) was awarded to Lunalilo. Lunalilo established a trust to manage his estate to benefit Hawaiian elderly. It was through this trust that Lunalilo properties were sold to private individuals (Springer, 1987:35). The land of Lanihau 2 (Lanihau-iki) was awarded to Leleiohoku, with the property eventually going into the Liliuokalani Trust.

The Territory of Hawai'i acquired the parcels for the Kona Airport in 1948 from the Liliuokalani Trust and rancher, Frank Greenwell, owner of parcels in Lanihau 1 (Bureau of Conveyances, Liber 2183:459). Construction of the airport runway and facilities, and maintenance of glide paths during airport operations has been the greatest impact to the archaeological sites. Extensive bulldozing in the study area is evident, including bulldozer track scars on pahoehoe outcrops. The airport was in use until 1970.

Management of the Kona Airport as a State Park began in the early 1970s when the new airport at Keahole Point was completed. The County of Hawaii began construction of park facilities at the Old Kona Airport site in 1975. These facilities included tennis courts, BMX track, and soccer and baseball fields. The County of Hawai'i continues to expand the park facilities.

### 3. PREVIOUS ARCHAEOLOGY

A thorough summary of previous archaeology conducted in the Old Kona Airport State Recreation Area parcel has been written by State Parks archaeologists Estioko-Griffin and Lovelace (1980). The following summary focuses on the east end of the parcel, Subarea 4, the area that is planned for facilities expansion for the County of Hawai'i park.

The first survey in the area was done by J. G. F. Stokes of Bishop Museum in 1919. He recorded 2 ko'a and 2 heiau along

the shoreline west of the study area. While the structures were reported by Stokes, their locational information comes from a later survey by J. E. Reinecke in 1930. In addition, Reinecke identified 7 site areas within the area of Old Kona Airport State Recreation Park. Reinecke's additional sites included platforms, papamu, petroglyphs, historic house sites with yard walls, pens, and burials.

In 1970, T. S. Newman of the State Historic Preservation Office, inspected the coastal area of the Old Kona Airport and a privately owned parcel which is makai of the study area. No additional sites were located in this survey, as Newman's sites were correlated with sites previously located by Stokes and Reinecke (Estioko-Griffin and Lovelace, 1980:13).

In 1972 the County of Hawai'i hired the consulting firm of Neighbor Island Consultants, to do another survey of the Old Kona Airport. Of interest in this survey was a newly discovered feature in Subarea 4. The recorded feature was a large tumbled basalt wall, identified as site KA 18.

E. Neller, archaeologist with the State Historic Preservation Office responded to reports of burials being eroded in the park along the shoreline during January 1980. He reported a number of burials, and additional cultural material eroding from the shoreline fronting the old runway (Neller, 1980).

In 1980, an inventory survey with limited testing was conducted at the Old Kona Airport State Recreation Park by State Parks archaeologists A. Estioko-Griffin and G. Lovelace. During this survey, the previously identified sites were correlated. Subsurface testing was conducted at four sites in the western and middle portions of the parcel.

It is from these subsurface tests that we have the only chronometric dates for Old Kona Airport. These were 9 samples of sectioned volcanic glass from site 1980-29, Test Pit 7. The site is located along the shoreline, in a sand substrate, across the runway from the recently constructed park pavillion. Dates from the samples suggested deposition during late prehistoric or early historic time (Lovelace, 1980:19). All volcanic glass specimens were sourced to a trachyte pumice cone on the northwest slope of Pu'u Wa'awa'a (Lovelace, 1980:6).

Site 1980-29 consisted of two associated structural features, a rectangular enclosure upon which a "C-shape" structure was constructed, following the filling in of the enclosure by sediments. Subsurface cultural deposits were sampled by Test Pit 7, a unit 100 x 50 cm, excavated to a depth

of 85 cm. Three cultural strata were recorded (Strata II, III, and IV), believed to be related to three phases of occupation. Based on artifact types in the strata, Strata III and IV are prehistoric occupations and Strata II is a historic occupation. Traditional artifacts recovered include coral, pumice and sea urchin spine abraders, fishhooks and fishhook blanks, culturally modified bone, shell, and volcanic glass, and midden remains composed primarily of shell.

Intensive survey and testing of the private parcel immediately southeast of the study area (Jensen and Rosendahl, 1983), revealed numerous burials along the shoreline. Of particular note is the testing done of the rock wall (Feature N), which extends into the study area as feature 1980-32. Dismantling of the makai portion of the wall revealed no cultural material.

#### 4. MAPPING AND SELECTED TESTING OF FEATURES

4.1. Methodology. Archaeological sites identified in the southeast end of Old Kona Airport State Recreation Area were mapped using transit and metric stadia rod. Features were assigned a field number, which was later changed for compatibility with the Estioko-Griffin and Lovelace (1980), numbering system. All features were measured and photographed prior and during testing.

Features identified in the study area included ahu, a platform, walls, and filled paved crevices. Sinkholes in the study area were examined, but none exhibited any midden or other sign of human use.

Testing of all types of features was undertaken. The selection of features to be tested was based on feature integrity and feature type. All of the features tested had been constructed of piled basalt stones directly on smooth pahoehoe outcrops. When present, the exterior facing stones of the tested features were left intact; sampling consisting of removing interior rubble fill to the pahoehoe base. All tested features were restored to their original appearance.

Estioko-Griffin and Lovelace recorded two sites in the study area; a rock wall (1980-32), and a cluster of nine ahu (1980-33). Four of the ahu were identified by letter designations (A-D). Several recently discovered features and sites in Subarea 4 were added to the Estioko-Griffin and Lovelace (1980) site inventory, (Figure 3). Numbering of recently recorded sites is continuous with the Estioko-Griffin and Lovelace (1980) site numbering system. Additional ahu were added to site 1980-33 with letter designations E-Q. New sites

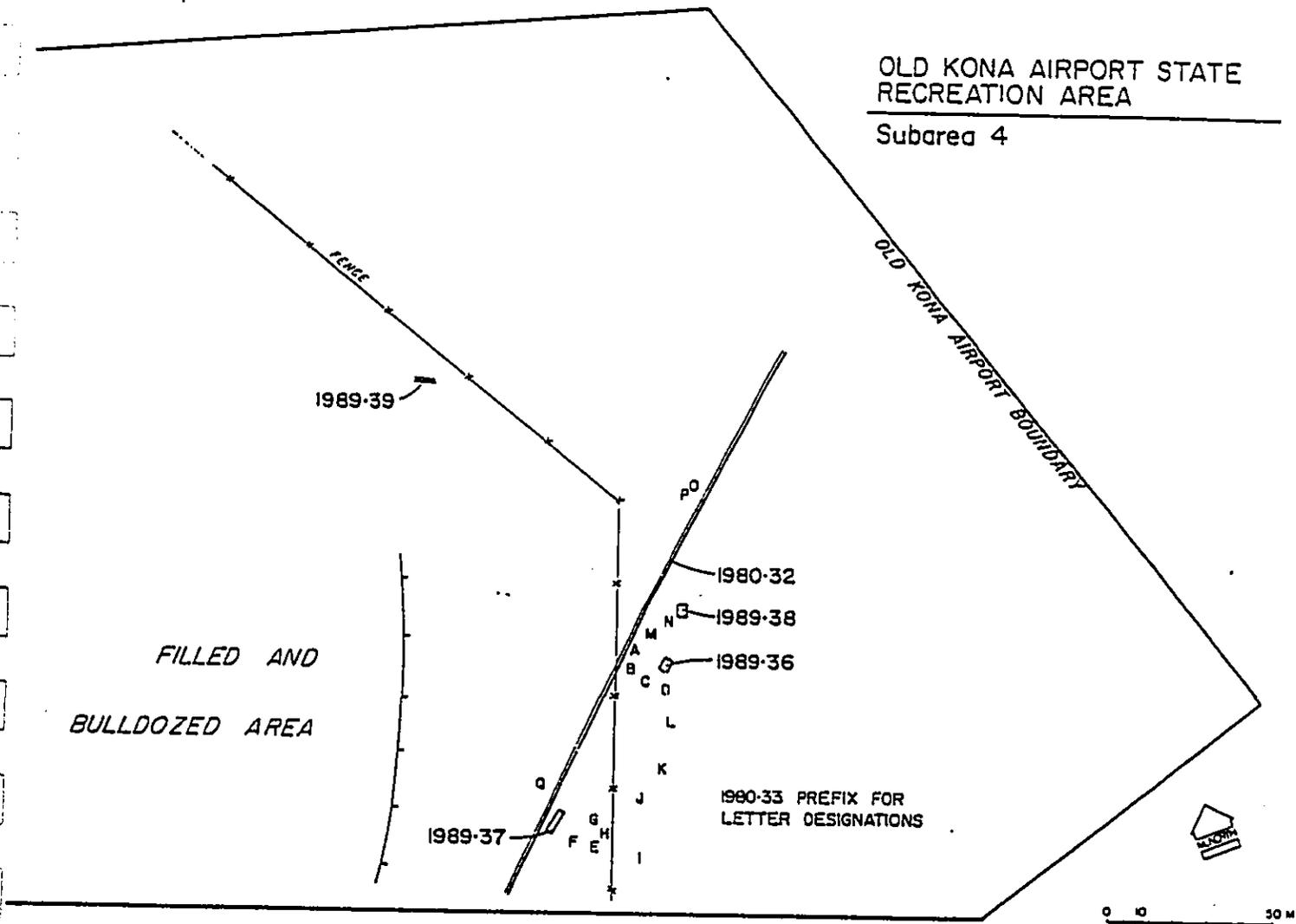


Figure 3. Location of features in Subarea 4, Old Kona Airport State Recreation Area.

were given the next consecutive numbers, 36-39, with a 1989 prefix.

4.2. Feature Descriptions. Identified features included a platform, ahu, walls, and filled paved crevices.

1980-32, wall (previously recorded by Neighbor Island Consultants [1973:57], as KA-19). A low rock wall, approximately 40-60 cm in height, 150-200 cm in width, running approximately 150 meters in a NE/SW direction (Figure 4). The wall is constructed of angular and subangular basalt cobbles and small boulders, with locally occurring scatters of coral cobbles in the fill.

The wall is low and disturbed at several points along its length. This may be a result of a variety of causes, including use of wall stones for the construction of nearby ahu and paved areas, bulldozing from airport construction/clearing activities, or more recent facilities construction by the County of Hawai'i in the park.

The wall was not tested in the study area, but it was tested by Jensen and Rosendahl (1983), in the adjacent private parcel. They reported that the wall (feature N), was



Figure 4. Photo of tumbled basalt wall, 1980-32, view to northeast (SP Roll No. 134:9).

dismantled to the pahoehoe base and there were no associated cultural materials.

1980-33/A, ahu. Ovoid rock ahu 100 cm in diameter by 60 cm in height, north side faced, south side tumbled into pahoehoe crevice (Fig. 5). Exterior facing of subangular basalt boulder with a fill of subangular vesicular basalt cobble fill and few coral pebbles. Constructed on smooth pahoehoe outcrop.

This ahu was tested by removing fill down to the pahoehoe surface (60 cm below top of ahu). Coral was present throughout the fill. The wall (1980-32), runs along the northwest side of the ahu, and the considerable coral in the collapsed wall and the ahu suggests the wall rock may have served as the source of building material.

1980-33/B, ahu. Ovoid shaped ahu 170 cm in diameter by 80 cm in height, adjacent to the wall (1980-32). Poorly

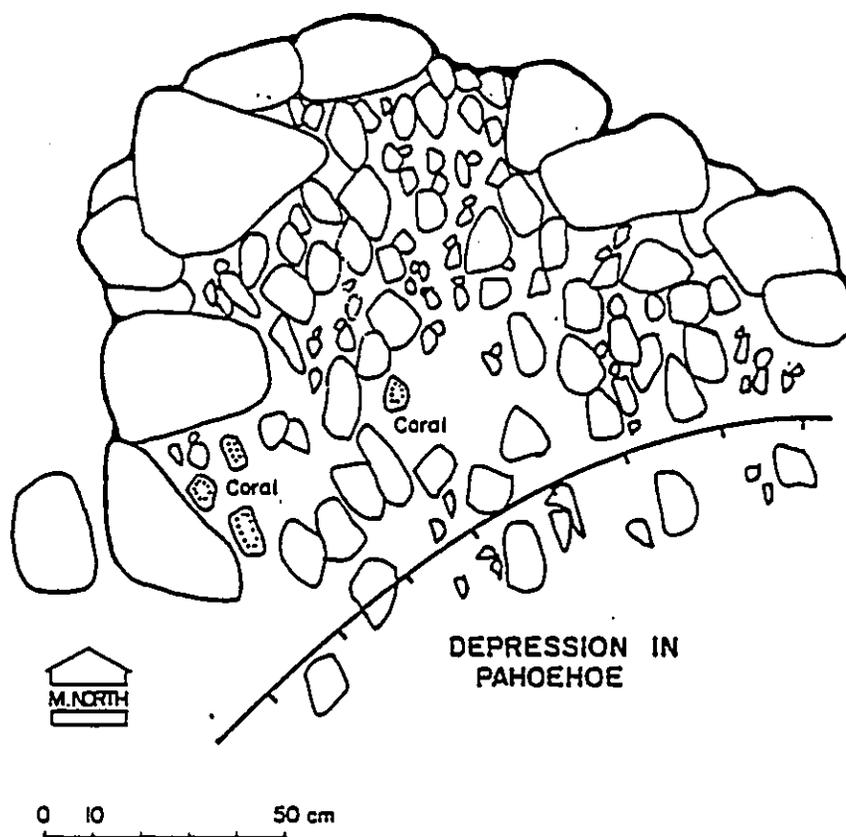


Figure 5. Feature 1980-33/A, partially collapsed, faced, rubble filled ahu.

constructed of loosely piled subangular basalt boulders and large cobbles, on smooth pahoehoe; no fill, partial facing. Again, the wall may have supplied the building material.

1980-33/C, ahu. Circular ahu, 160 cm in diameter and 80 cm in height. The exterior is faced with subangular basalt boulders with a fill of cobbles and small boulders. Several waterworn large pebbles in upper fill (Figures 6, 7 and 8).

Removed upper 20 cm of cobble fill and encountered a boulder fill with reddish brown stain. Small pebbles in cracks of the boulder fill. Urchin shell fragments at base of fill on top of smooth pahoehoe.

1980-33/D, ahu. Loosely stacked subangular basalt boulders, 190 cm in diameter by 60 cm in height, on smooth pahoehoe outcrop. No fill or cultural material.

1980-33/E, ahu. Disturbed ahu, approximately 130 cm in diameter and 40 cm in height, constructed of basalt cobbles with subangular vesicular pahoehoe rubble fill (Figure 9). Ahu is built on smooth pahoehoe.

Testing of the feature consisted of removal of fill. A single cowry shell fragment was recovered from the fill.

1980-33/F, ahu. Disturbed ahu. Large, subangular basalt boulders scattered on top of smooth pahoehoe. Poor condition.

1980-33/G, ahu. Circular stacked boulders, 130 cm in diameter and 45 cm in height, with open center. Built on smooth pahoehoe outcrop which is visible in the feature's center (Figure 10).

1980-33/H, ahu with associated paving. Stacked subangular basalt boulders 80 cm in diameter and 40 cm in height, on smooth pahoehoe, and adjacent to paved crevice feature. No fill present in ahu (see Figure 10).

Crevice is filled with angular and subangular basalt cobbles and small boulders.

1980-33/I, ahu with associated paving. Circular, stacked subangular basalt boulders, 180 cm in diameter and 55 cm in height, with no internal fill (Figure 11). Built on top of paved crevice.

1980-33/J, ahu. A nondescript pile of approximately 7 subangular basalt boulders on top of a smooth pahoehoe outcrop. Ahu is approximately 70 cm in diameter and 40 cm in height.

constructed of loosely piled subangular basalt boulders and large cobbles, on smooth pahoehoe; no fill, partial facing. Again, the wall may have supplied the building material.

1980-33/C, ahu. Circular ahu, 160 cm in diameter and 80 cm in height. The exterior is faced with subangular basalt boulders with a fill of cobbles and small boulders. Several waterworn large pebbles in upper fill (Figures 6, 7 and 8).

Removed upper 20 cm of cobble fill and encountered a boulder fill with reddish brown stain. Small pebbles in cracks of the boulder fill. Urchin shell fragments at base of fill on top of smooth pahoehoe.

1980-33/D, ahu. Loosely stacked subangular basalt boulders, 190 cm in diameter by 60 cm in height, on smooth pahoehoe outcrop. No fill or cultural material.

1980-33/E, ahu. Disturbed ahu, approximately 130 cm in diameter and 40 cm in height, constructed of basalt cobbles with subangular vesicular pahoehoe rubble fill (Figure 9). Ahu is built on smooth pahoehoe.

Testing of the feature consisted of removal of fill. A single cowry shell fragment was recovered from the fill.

1980-33/F, ahu. Disturbed ahu. Large, subangular basalt boulders scattered on top of smooth pahoehoe. Poor condition.

1980-33/G, ahu. Circular stacked boulders, 130 cm in diameter and 45 cm in height, with open center. Built on smooth pahoehoe outcrop which is visible in the feature's center (Figure 10).

1980-33/H, ahu with associated paving. Stacked subangular basalt boulders 80 cm in diameter and 40 cm in height, on smooth pahoehoe, and adjacent to paved crevice feature. No fill present in ahu (see Figure 10).

Crevice is filled with angular and subangular basalt cobbles and small boulders.

1980-33/I, ahu with associated paving. Circular, stacked subangular basalt boulders, 180 cm in diameter and 55 cm in height, with no internal fill (Figure 11). Built on top of paved crevice.

1980-33/J, ahu. A nondescript pile of approximately 7 subangular basalt boulders on top of a smooth pahoehoe outcrop. Ahu is approximately 70 cm in diameter and 40 cm in height.



Figure 6. Photo of basalt ahu, 1980-33/C, before removal of fill for testing, view to north (SP Roll No. 135:7).



Figure 7. Photo of basalt ahu, 1980-33/C, after removal of fill, view to north (SP Roll No. 135:8).

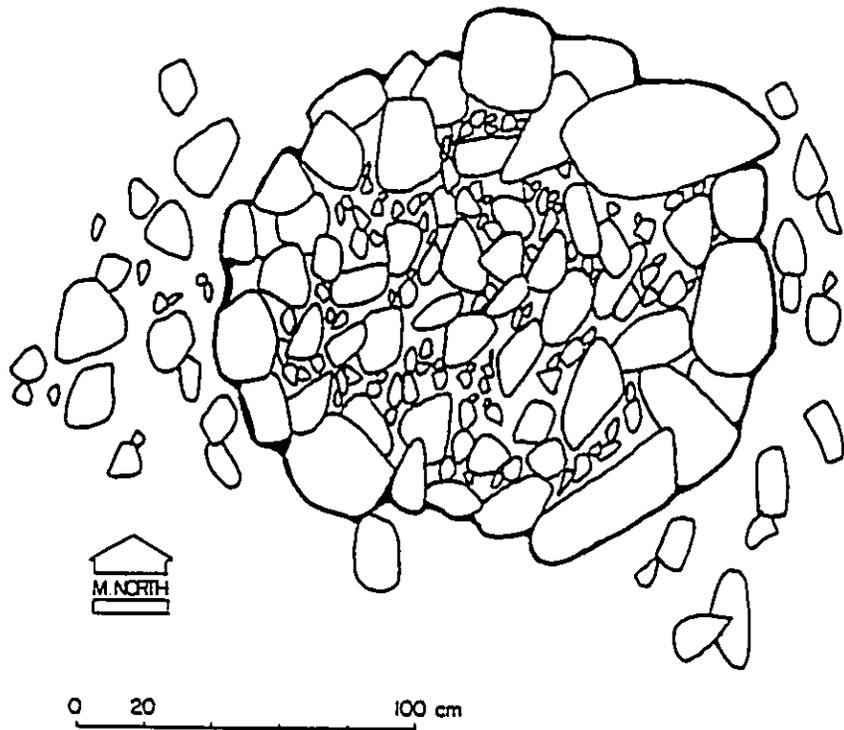


Figure 8. Feature 1980-33/C, circular, faced, rubble filled ahu.

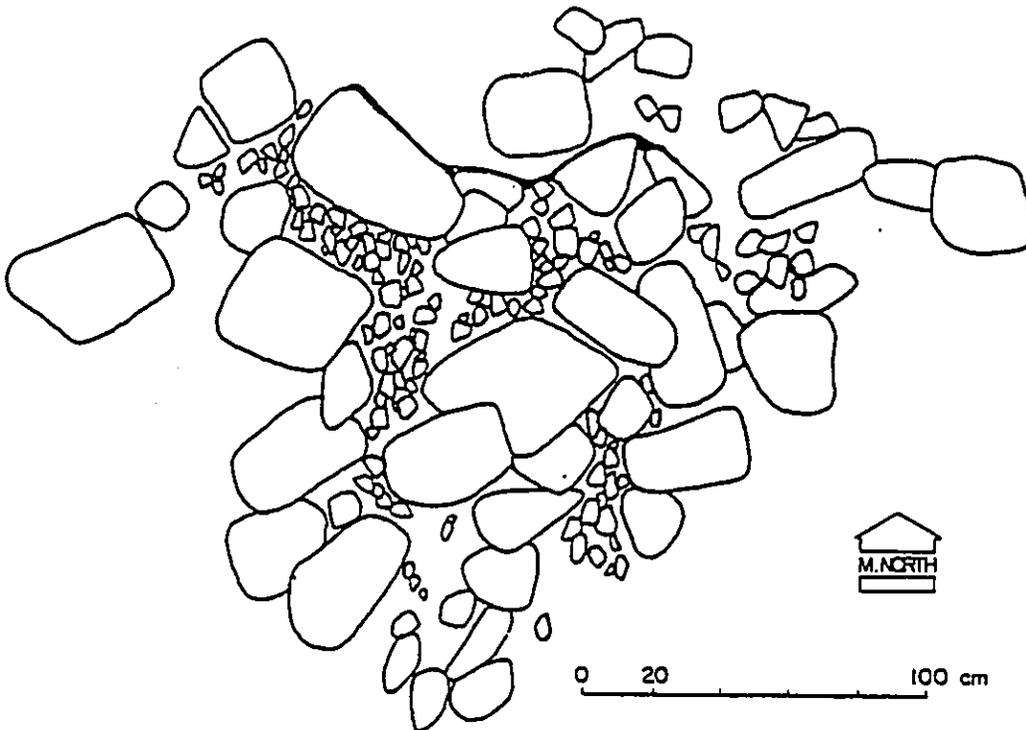


Figure 9. Feature 1980-33/E, Collapsed, rubble filled ahu.

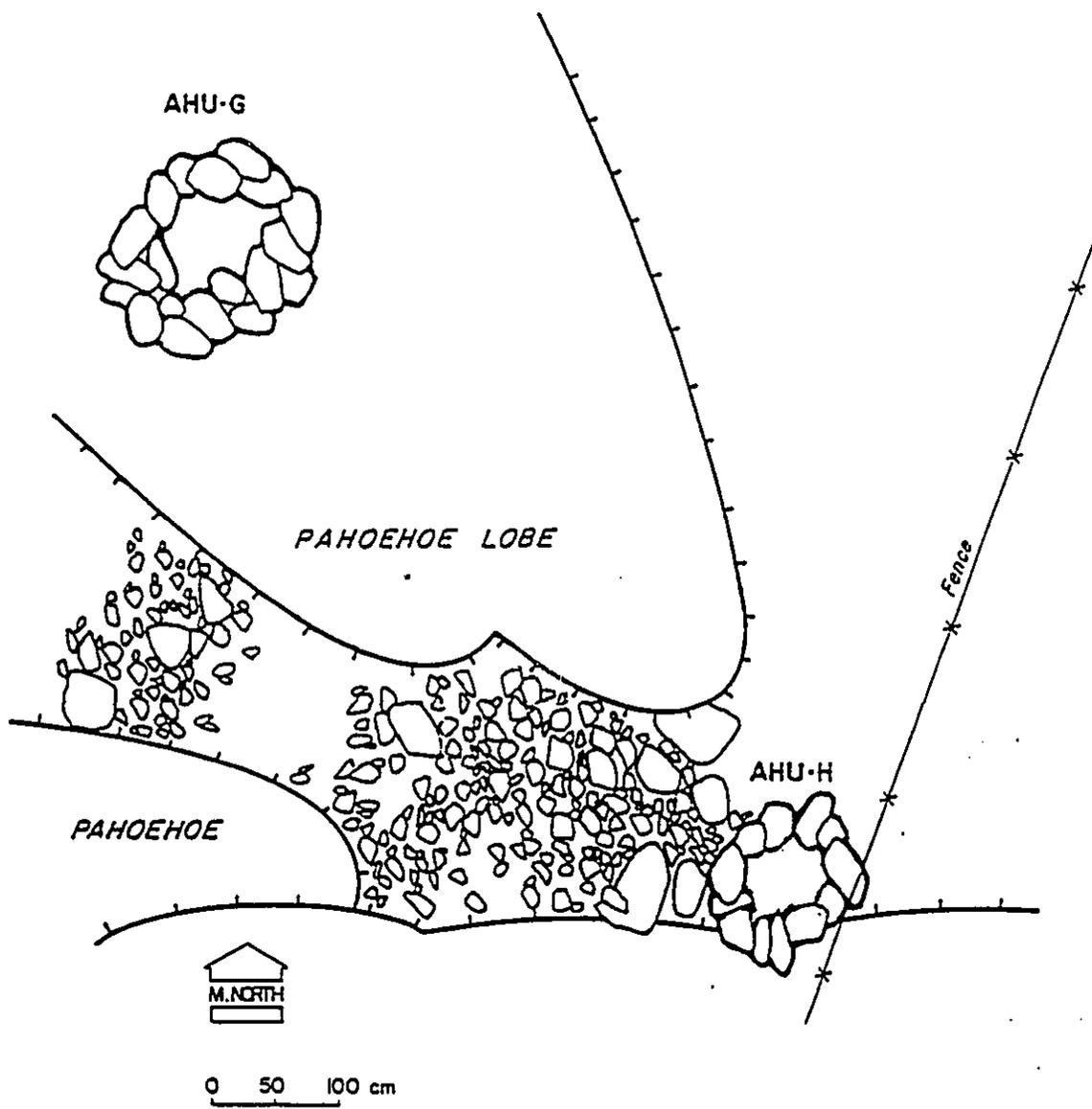


Figure 10. Feature 1980-33/G, circular, faced ahu with open center, and Feature 1980-33/H, circular, faced, rubble filled ahu build adjacent to rubble filled pahoehoe depression.

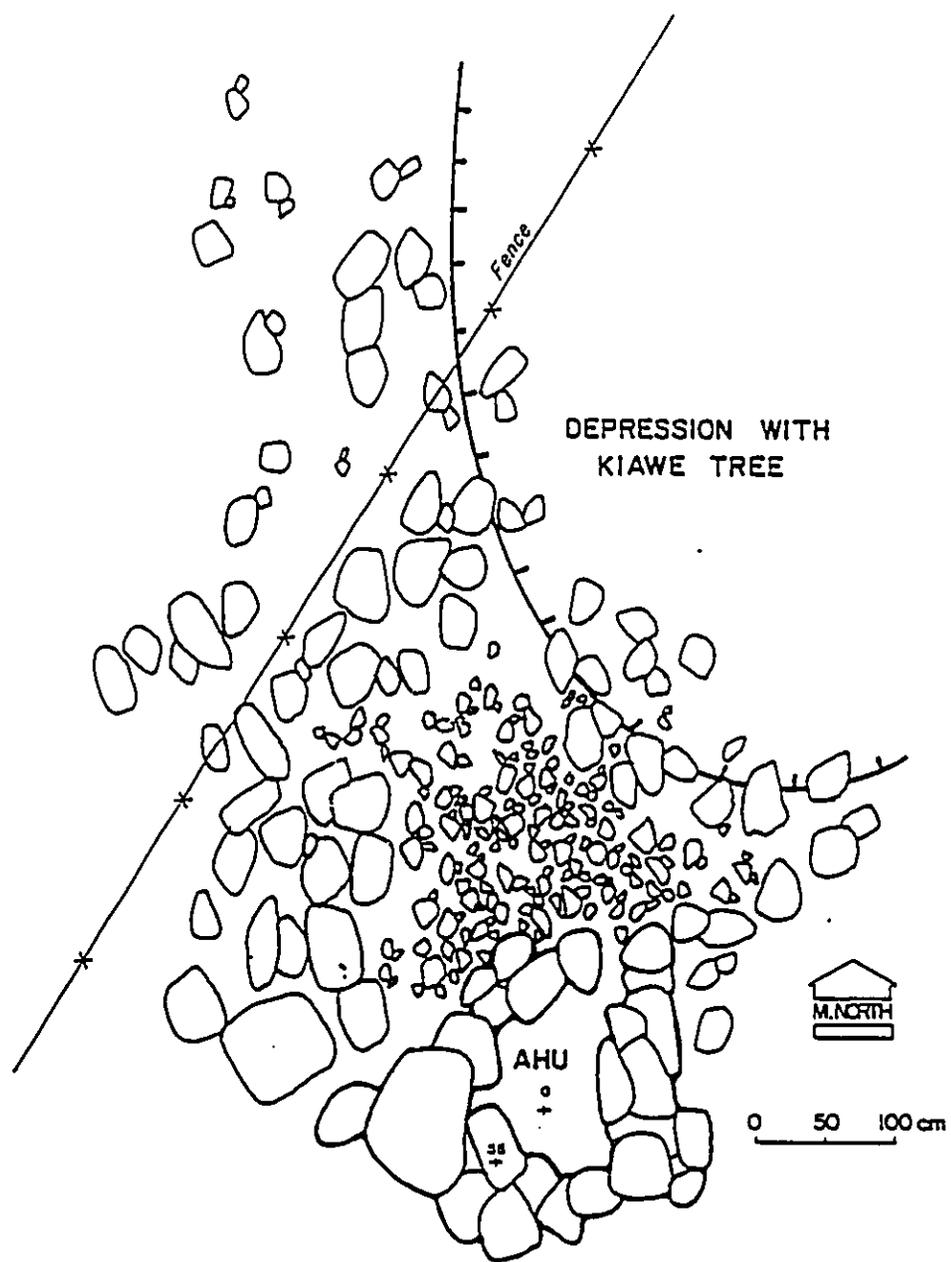


Figure 11. Feature 1980-33/1, circular, partially faced circular ahu with open center, build on paved area.

1980-33/K, ahu. A pile of approximately 12 subangular basalt boulders, 80 cm in diameter and 60 cm in height, on top of smooth pahoehoe outcrop. A single coral cobble present in the center of the pile, no fill.

1980-33/L, surveyor's ahu. Modern surveyor's ahu built on smooth pahoehoe outcrop. Ahu built over railroad spike driven into pahoehoe, upright wooden stake in center of ahu.

1980-33/M, ahu. Collapsed circular ahu, 120 cm in diameter and 40 cm in height, constructed with a subangular basalt boulder and cobble base and a small cobble fill. Several coral cobbles appear in fill. The north side of the ahu is collapsed.

1980-33/N, ahu. Nondescript pile of subangular basalt boulders, 90 cm in diameter and 40 cm in height, on pahoehoe outcrop.

1980-33/O, ahu. Loose pile of basalt cobbles, 50 cm in diameter and 30 cm in height, on a prominent smooth pahoehoe outcrop. A second small ahu of similar size and construction (1980-33/P), is approximately 3 meters to the west.

1980-33/P, ahu. Loose pile of basalt cobbles, 40 cm in diameter and 25 cm in height, on a prominent smooth pahoehoe outcrop.

1980-33/Q, ahu. A collapsed pile of basalt boulders and cobbles, 120 cm in diameter and 40 cm in height, scattered on a smooth pahoehoe outcrop.

1989-36, platform. Disturbed platform, approximately 2.6 x 2.6 meters, built of large basalt boulders and cobbles with smaller cobble fill on smooth pahoehoe outcrop. The north and east corners appear intact with a stacked facing three stones high (60-70 cm in height) at the east corner (Figure 12). Intact facing is also visible on the southeast and northeast sides. The remaining sides of the feature are collapsed, with no facing evident.

Excavation of a trench into the feature's center from the south corner, revealed an interior feature. A rectangular pit (approximately 80 cm NW/SE by 60 cm NE/SW), was lined on the west, north and east sides by large basalt boulders (Figure 13). The pit facing was not parallel to the remaining platform facing; pit orientation seemed rotated approximately 15 degrees counter-clockwise in the platform (Figure 14).

Construction of the platform consisted of an exterior facing of basalt boulders (on at least two sides), with a fill



Figure 12. Photo of collapsed platform, 1989-36, with facing on east corner, view to west (SP Roll No. 135:14).



Figure 13. Photo of interior feature of platform, 1989-36, with midden on pahoehoe base, view to north (SP Roll No. 135:17).

# CORRECTION

THE PRECEDING DOCUMENT(S) HAS  
BEEN REPHOTOGRAPHED TO ASSURE  
LEGIBILITY  
SEE FRAME(S)  
IMMEDIATELY FOLLOWING

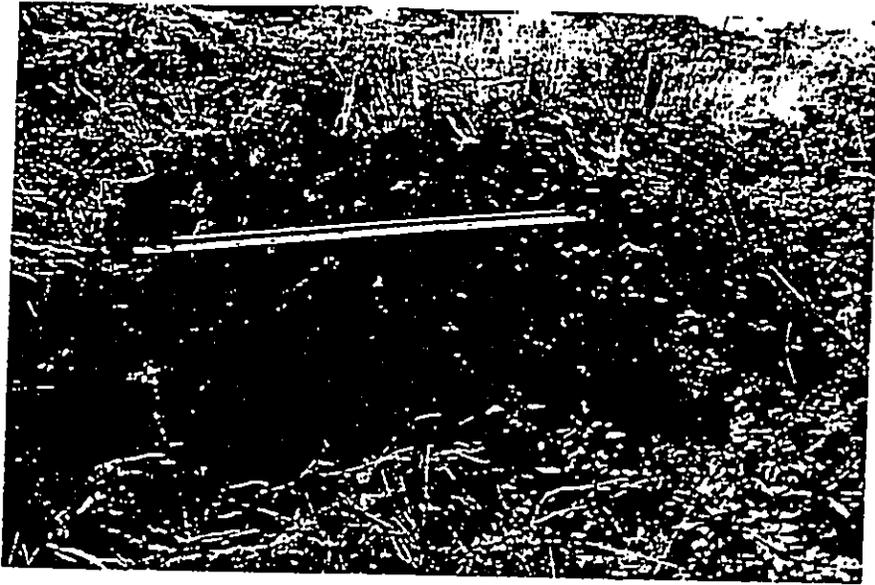


Figure 12. Photo of collapsed platform, 1989-36, with facing on east corner, view to west (SP Roll No. 135:14).

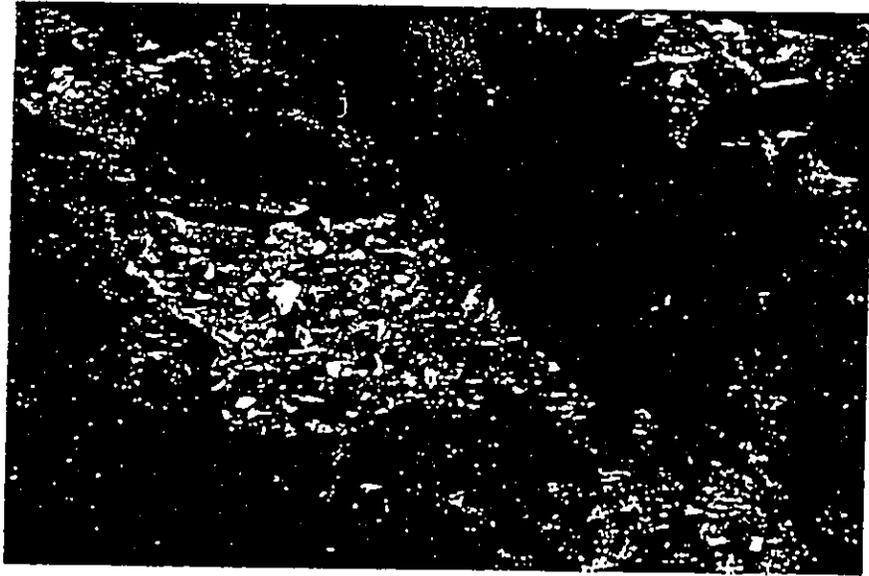


Figure 13. Photo of interior feature of platform, 1989-36, with midden on pahoehoe base, view to north (SP Roll No. 135:17).

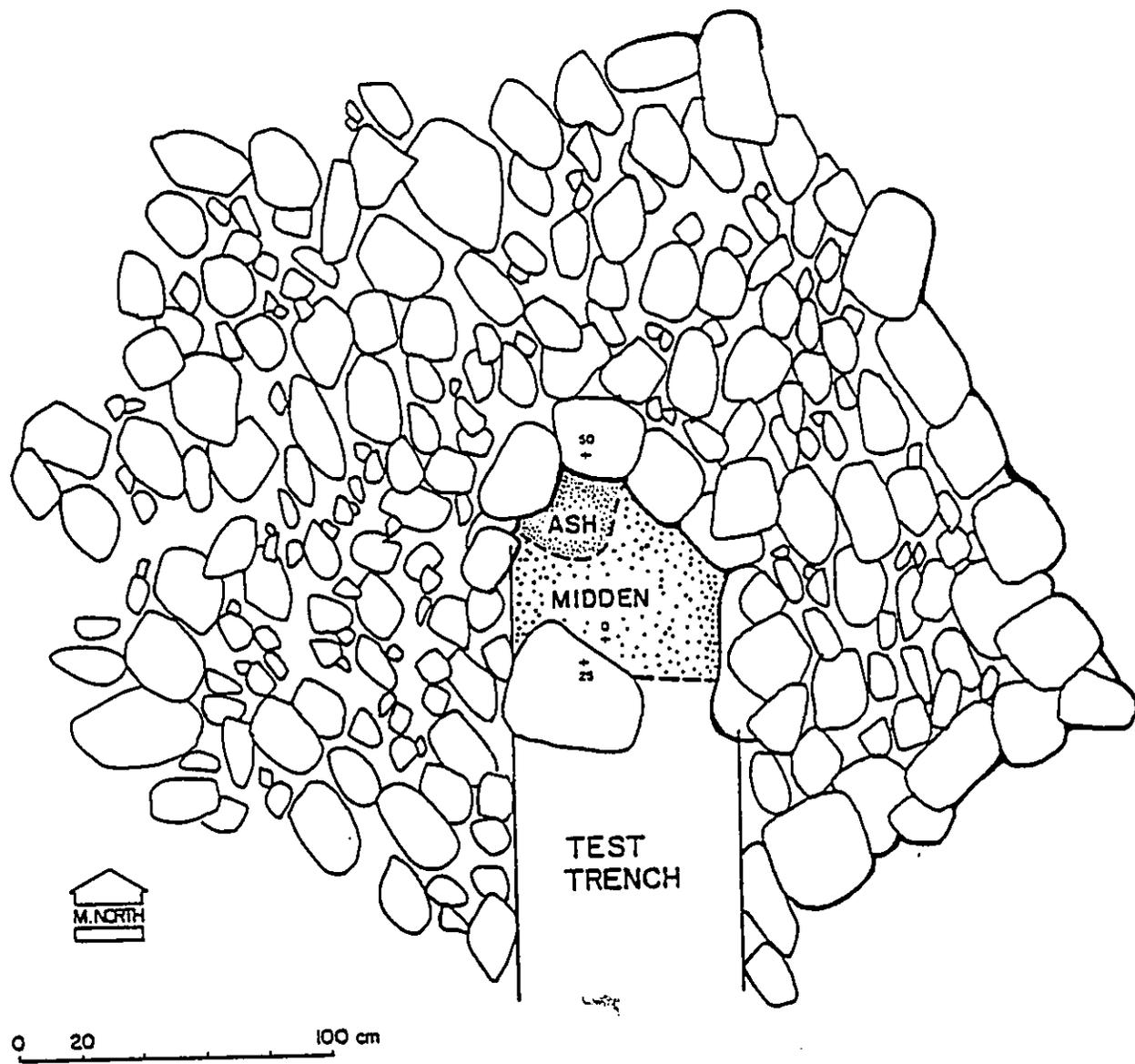


Figure 14. Feature 1989-36, collapsed rectangular platform, partial facing, with interior feature.

composed of a basalt boulder and cobble base. The surface of the platform was paved with smaller cobbles. Urchin shell and spines, and waterworn pebbles were recovered from the excavated platform fill. A small amount of midden bone and shell was recovered from the interior feature at the contact with the pahoehoe base. Midden included fragments of bird and fish bone, pencil urchin (shell and spines), cowry shell, coral, and slight charcoal flecking. The north corner of the pit had a concentration of a grey ashy sediment on the pahoehoe base.

1989-37, filled paved crevice area. A large crevice in the pahoehoe flow, 10 meters N/S by 5 meters E/W, has been filled with rubble creating two stepped terraces paved with basalt cobbles. A rectangular ahu, 200 cm E/W by 100 cm N/S, has been built at the north end of the feature on top of the highest terrace. Subangular basalt boulders and cobbles were used in the construction of the ahu, forming faced parallel walls, with a fill of angular basalt pebbles and small cobbles (Figure 15).

The two terraces are separated by an E/W boulder retaining wall which bisects the crevice. The upper terrace, at the north end of the feature, is approximately 40 cm higher than the paved surface on the southside of the retaining wall.

Two 1 meter square test pits (Test Pits 1 and 2), were excavated in the upper terrace, and one 1 meter square test pit (Test Pit 3), was excavated in the lower terrace (Figure 16).

The surface of the upper terrace (TP-1 and TP-2) was paved with a layer of subangular, vesicular pahoehoe cobbles. At approximately 10 cm below this surface, a layer of smaller basalt cobbles and pebbles with scattered coral pebbles was encountered. This second paved surface was stained a reddish brown. Also, small shell fragments and sand grains appeared in the pebble paved surface. The shell fragments included urchin, pipipi, conus, and crab shell.

Underlying the pebble paving, approximately 15 cm below surface (BS), the fill changes to large basalt boulders (Figure 17). The fill then shifts to mixed boulders and cobbles at approximately 55 cm BS. This boulder and cobble fill continues down to the original pahoehoe surface which marked the base of the test pit at 110 cm BS. Of particular interest was a white staining on the top of the fill rocks 15 cm - 55 cm BS. The white film is of unknown origin. It is powdery white, with no charcoal or firepit feature to suggest ash. Other cultural material found within the 15 cm - 55 cm layer was kukui nut shell, volcanic glass, shell fragments of isognomon, cowry, urchin, and coralline sand. At approximately 60 cm BS, the white staining ceases, as well as any cultural material. The



Figure 15. Photo of filled crevice, 1989-37, paved surface before testing, view to north (SP slide).

fill rocks are stained a reddish brown, a staining which continues to the base of the unit.

Test Pit 3, a 1 meter square pit was placed adjacent to the southside of the retaining wall, on the lower terrace. The stratigraphy was very different in that very little cultural material was recovered and there was no white staining of the fill.

The fill of the lower terrace was mixed cobbles and boulders, stained a reddish brown. Several isognomon shell fragments and coral cobbles were encountered at approximately 50 cm BS. The base of the unit, smooth pahoehoe, was first encountered in the west wall at 55 cm BS, and sloped steeply eastward to a depth of approximately 100 cm.

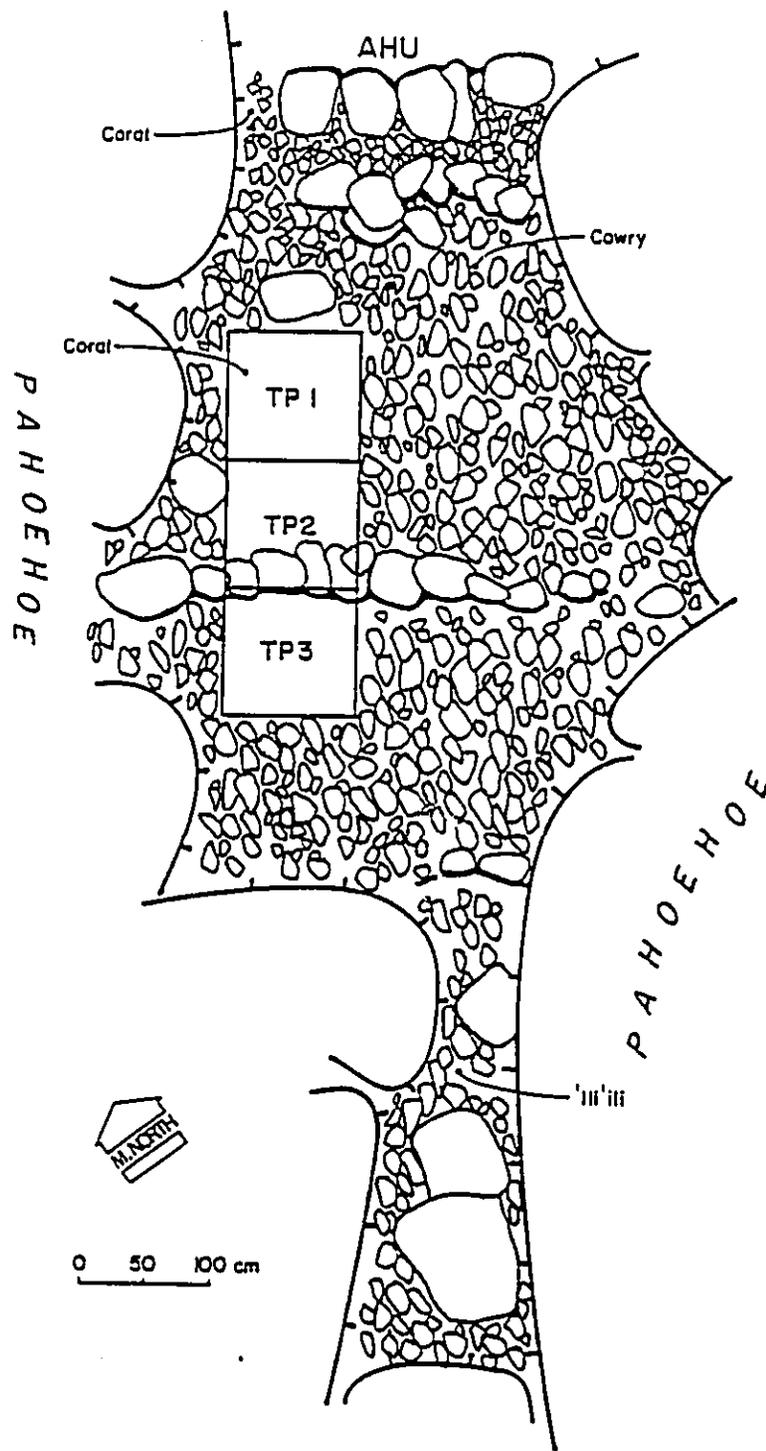


Figure 16. Feature 1989-37, terraces constructed of rubble fill in pahoehoe crevice with rectangular ahu.

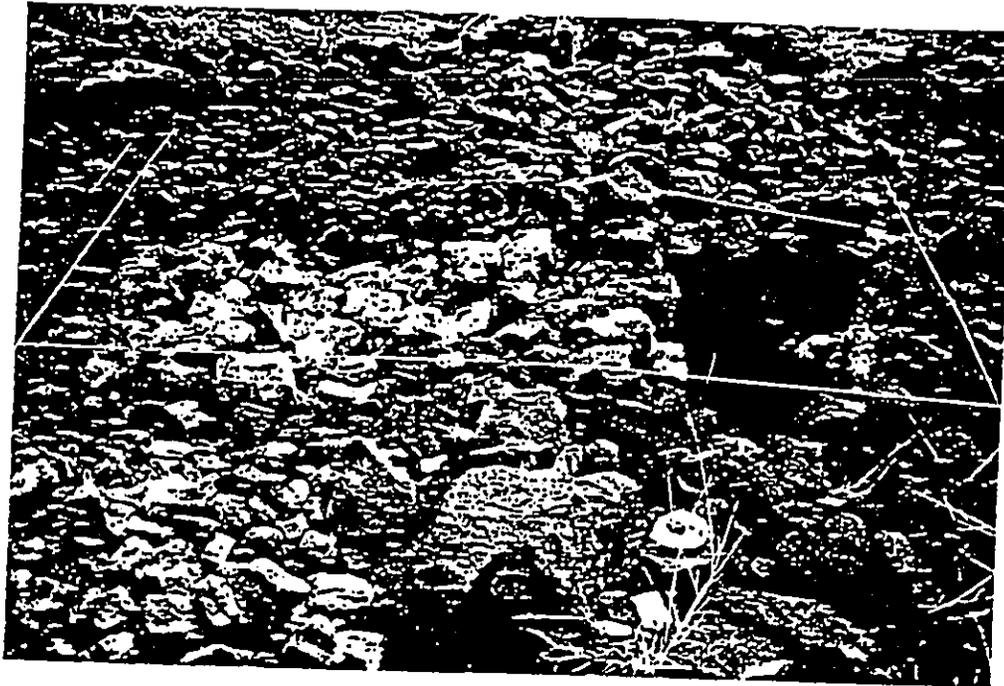


Figure 17. Photo of testing in progress, 1989-37, with white staining on fill of TP 1 and TP 2 (left side), view to east (SP slide).

1989-38, paved area. A shallow depression in the pahoehoe was filled with subangular vesicular basalt cobbles and small boulders (Figure 18). Paved area is irregularly shaped rectangle approximately 4 meters N/S by 4 meters E/W. In the SW corner was an area paved with smaller cobbles and pebbles. This was tested to the base of the paving, approximately 35 cm BS, to the smooth pahoehoe outcrop. A single cowry shell fragment on the surface of the fill was recorded.

1989-39, wall. Low wall constructed of subangular basalt cobbles, running E/W across a gently sloping pahoehoe outcrop (Figure 19). No soil deposition associated with the wall. Wall is approximately 30 cm to 40 cm high (one to two courses of stone), and 15 m long.

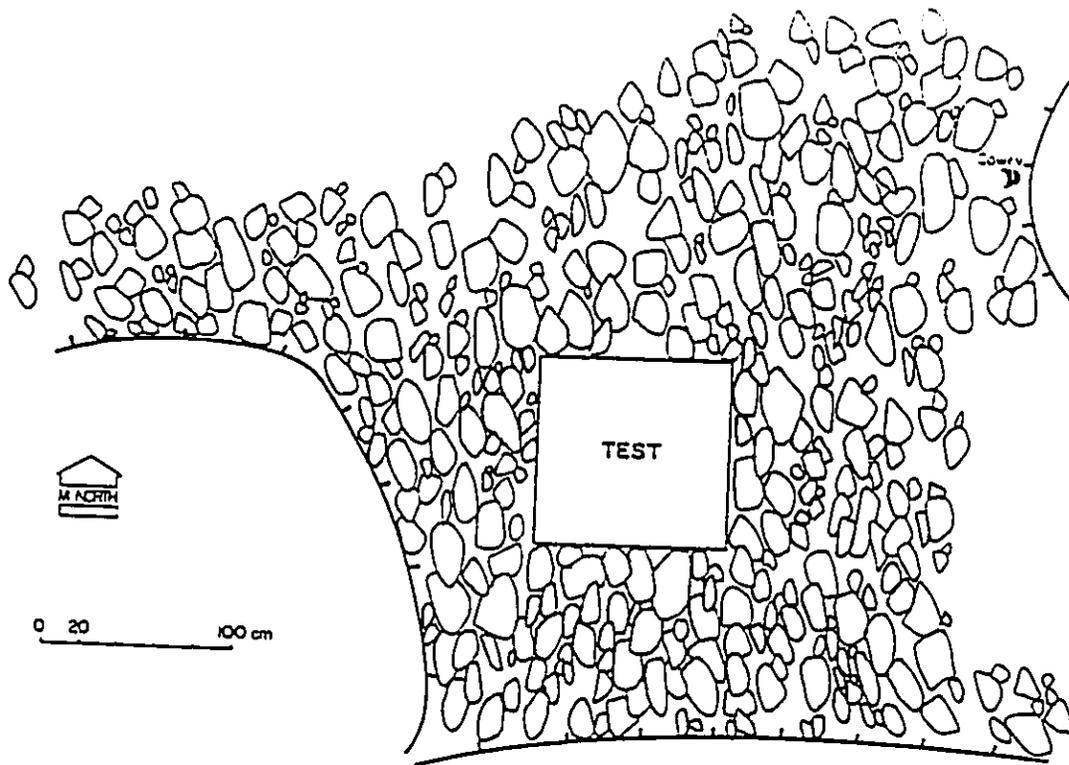


Figure 18. Feature 1989-38, rubble filled, paved area.

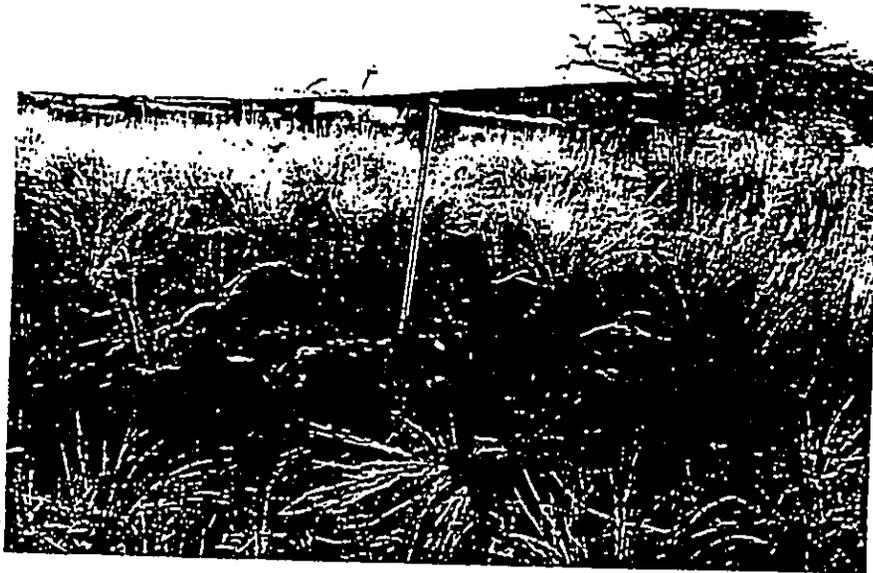


Figure 19. Photo of low retaining wall, 1989-39 (SP Roll No. 134:35).

## 5. SUMMARY

A total of 22 features, in 6 sites, were recorded in Subarea 4 of the Old Kona Airport State Recreation Area. The structures were constructed of local angular to subangular basalt cobbles and boulders with occasionally coral cobbles present in the features. A summary of the sites and features inventoried is presented in Table 1.

TABLE 1. Summary of Archaeological Sites Inventoried in Subarea 4, Old Kona Airport State Recreation Area.

SITE NO.	FEATURE TYPE	PLAN-VIEW	TESTED	(Field No.)
1980-32	wall	no	no	
1980-33/A	ahu	yes	yes	13
1980-33/B	ahu	no	no	12
1980-33/C	ahu	yes	yes	10
1980-33/D	ahu	no	no	9
1980-33/E	ahu	yes	yes	1
1980-33/F	ahu	no	no	2
1980-33/G	ahu	yes	no	3
1980-33/H	ahu/filled crevice	yes	no	4
1980-33/I	ahu/filled crevice	yes	no	5
1980-33/J	ahu	no	no	6
1980-33/K	ahu	no	no	7
1980-33/L	surveyor ahu	no	no	8
1980-33/M	ahu	no	no	14
1980-33/N	ahu	no	no	15
1980-33/O	ahu	no	no	16
1980-33/P	ahu	no	no	17
1980-33/Q	ahu	no	no	18
1989-36*	platform	yes	yes	11
1989-37	filled crevice	yes	yes	19
1989-38	filled crevice	yes	yes	p4
1989-39	wall	no	no	

\*Site numbers 34 and 35 have been previously used elsewhere in the Old Kona Airport area.

5.1. Sites. Two of the 6 recorded sites, 1980-32 and 1980-33, were identified previously by Estioko-Griffin and Lovelace (1980). Eight ahu were added to the 9 ahu originally recorded for site 1980-33. The 4 newly recorded sites 1989-36, 1989-37, and 1989-38 and 1989-39, each consist of a single feature.

Site 1980-32. This site consists of a single large wall which runs across the study area in a NE/SW direction. Because of the wall's large size, and the occurrence of coral cobbles in the rubble, it was initially thought the wall marked an ahupua'a boundary, or modern property line. Inspection of a number of area historical maps failed to show any correlation between the wall and known ahupua'a and property boundaries. At this time the function and age of the wall is not known.

Site 1980-33. This site was originally defined as a cluster of 9 basalt ahu (Estioko-Griffin and Lovelace, 1980). Four of the ahu had been assigned letter designations and photographed, but no additional information was recorded about the remaining structures. During the most recent survey, 8 additional ahu were recorded and added to site 1980-33 with letter designations used as identifiers.

These features had been identified in the past as possible burials, so three of the ahu were tested. Testing revealed an occasional coral cobble, waterworn stone, and shell and urchin fragments. One ahu was a historic surveyor's ahu constructed over a railroad spike driven into the pahoehoe with an upright wooden stake.

With the exception of the historic surveyor's ahu, the ages of the remaining ahu are unknown. The function of the ahu is not known.

Site 1989-36. This single platform is badly disturbed, but an interior feature contained a small amount of midden including bone, shell and ash at the contact between the feature fill and pahoehoe base. No historic material was found in the feature fill.

No datable material was collected so the age of the site is unknown, however the lack of historic material suggests a prehistoric use. The small amount of midden present, suggests a temporary habitation site. It is not known if the site was used intermittently, or represents a single event.

Site 1989-37. Two adjacent terraces were constructed by filling a crevice in the pahoehoe lava with basalt cobbles and boulders. The upper terrace was paved with smaller cobbles and

pebbles, and fill excavation produced a small amount of volcanic glass, shell and coral. Limited to the upper terrace, was a white staining of the rubble fill. Testing of the lower terrace produced only several fragments of shell. No historic material was present in the fill.

The volcanic glass flakes were the only datable material collected during the numerous tests in the study area. Until it can be dated, the age of the feature is speculative. Lack of historic material in the fill does suggest prehistoric age.

The difference in fill content and localized staining between the two terraces indicates a difference in use between the two terraces, or possibly a building sequence. The paucity of midden suggests a temporary habitation.

Site 1989-38. The site consists of a pahoehoe crevice filled with basalt cobbles. Testing of the fill produced only a single urchin shell fragment at the base of the fill.

The site is of unknown age and function.

Site 1989-39. The second wall is a low alignment of angular basalt cobbles, 2 stones high. The wall is constructed on a gently sloping pahoehoe outcrop, and there has been no soil or sediment deposition.

The site is of unknown age and function.

5.2. Feature Distribution. The spatial distribution of sites in Subarea 4 is shown in Figure 3. With the exception of 3 of the smallest ahu, and small wall, all of the features are located on the east side of the wall (site 1980-32). The features are also clustered near the wall.

It is unclear if this distribution results from recent land modifications or represents a distinct site. Bulldozer track scars visible on the smooth pahoehoe outcrops west and north of the features, suggest recent clearing and grading activities may have removed an unknown number of features, thus skewing the distribution of remaining features.

Distribution of sites within the area of Old Kona Airport suggests the space utilization was focused along the shore fronting the runway (Subarea 3), and in the protected bay at the west end of the runway (Subarea 1). This distribution pattern may reflect a marine resource focus for its inhabitants.

The 17 ahu recorded in Subarea 4 are the only ahu recorded for the Old Kona Airport area.

Testing did not reveal any burials in Subarea 4. Burials do occur throughout the Old Kona Airport area in sandy shore areas, lava cave shelters and in modern marked graves.

5.3. Research Potential. Following the most recent field work, the sites in Subarea 4 have been recorded with maps, photos, and narrative descriptions. Attempts at data recovery however, were generally nonproductive. Comparatively, sites in Subarea 4 do not have the data recovery potential as other features located elsewhere in the Old Kona Airport area. Demonstrated cultural remains from shoreline sand deposits in Subarea 3 (ie. 1980-27 and 1980-29), and protected bays as in Subarea 1 (ie. 1980-23), suggest more productive environments for data recovery exist elsewhere in the Old Kona Airport area.

Testing in Subarea 4 produced only limited datable material. Three volcanic glass flakes were recovered from the upper terrace fill of site 1989-37. The volume of charcoal present in the small midden deposit in the platform (site 1989-36) was inadequate for sampling.

5.4. Site Significance. The feature construction techniques are traditional Hawaiian; dry laid, often boulder faced with rubble fill. Ahu, walls, platforms, and filled and paved areas are traditional forms of architecture which are not unique to the study area. These building techniques and styles are in use today, but have a prehistoric origin.

Associated cultural material is often used to determine age and function of specific features. The paucity of associated material in any of the sites makes it difficult to assign the sites to any particular age, event, or function. Examination of historic documents and maps also failed to increase our knowledge about the sites.

It is determined that there are no significant historic sites in Subarea 4, Old Kona Airport State Recreation Area. Examination of historic documents and maps did not reveal any sites that were associated with any significant events or persons in the area. The construction style and form of all features is consistent with traditional Hawaiian rock construction, allowing only an ambiguous dating of the sites. Information regarding construction technique, style, and spatial relationships between features and sites has been recorded with maps, photos, and narrative descriptions.

Testing of features provided little additional information regarding age and function of sites. With the exception of the volcanic glass fragments from site 1989-37, no datable material was recovered.

## 6. RECOMMENDATIONS

The new facilities proposed in the east end of the Old Kona Airport State Recreation Park, would destroy all of the features recorded in Subarea 4 (Figure 20). The sites have been adequately recorded and tested, and based on this work it has been determined there are no historically significant sites in the study area. Therefore, no further archaeological work is being recommended, and preservation is not being recommended.

The volcanic glass from the terrace fill of 1989-37, was the only datable material recovered. It is recommended that the samples be held for future dating and sourcing, as a comparison to the volcanic glass samples from 1980-29. Currently there are no operating labs for hydration dating and sourcing of volcanic glass samples. A sample of the white stained cobbles from the upper terrace in site 1989-37 has also been retained for analysis.

The burials located previously along this coastal section of Lanihau are associated with the sand deposits along the shoreline and in the sinkholes. The testing of the ahu and paved crevice areas did not indicate that these are burial features. However, in the event that burials may be located during construction, it is recommended that the contractor be informed of the importance of reporting burials found during construction to the State Historic Sites Office for removal.

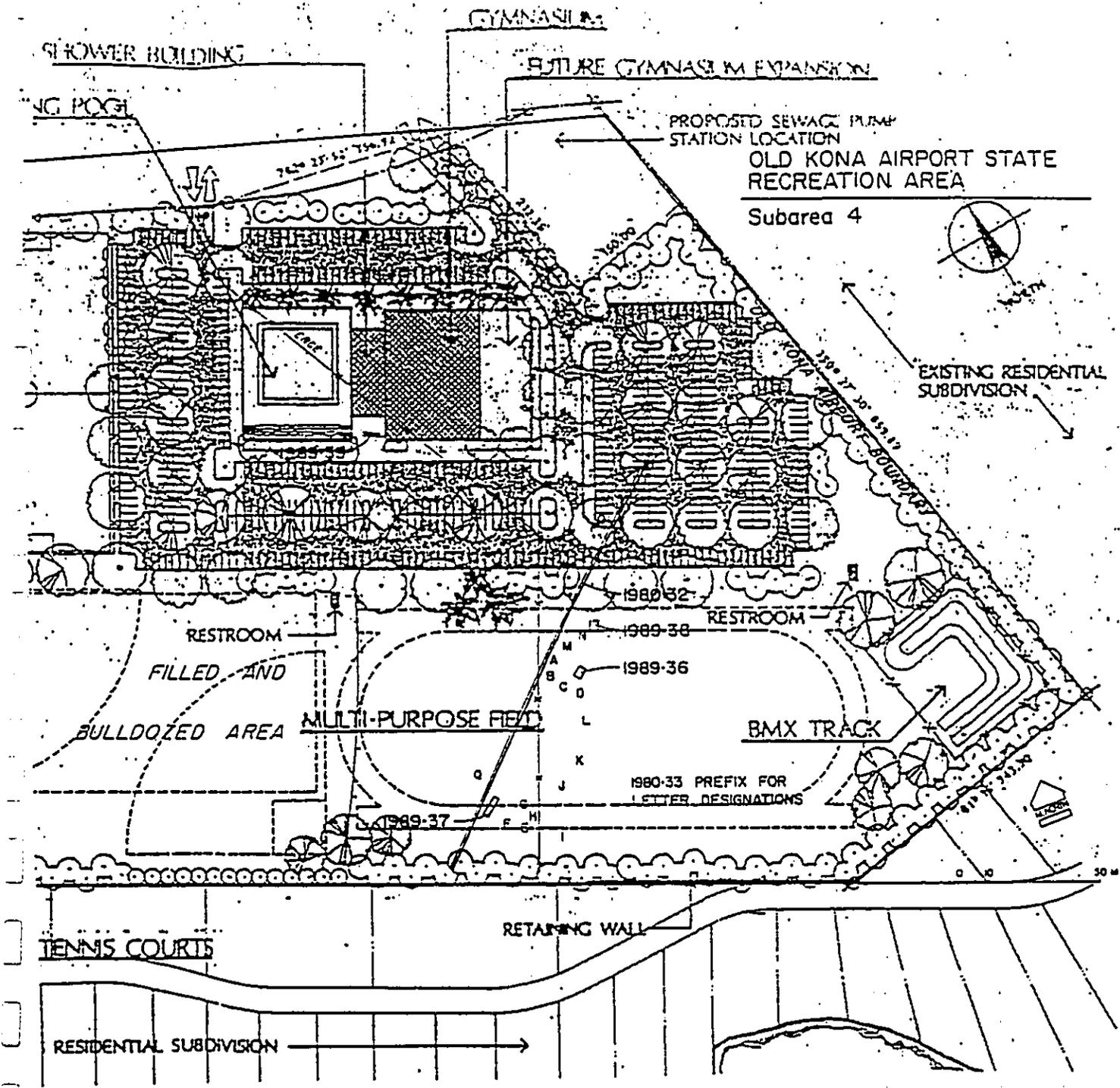


Figure 20. Site map of Subarea 4 superimposed on planned facilities map.

REFERENCES CITED

- Barrere, Dorothy B.  
1975 Kamehameha in Kona: Two Documentary Studies.  
Pacific Anthropological Records No. 23. Department  
of Anthropology, B. P. Bishop Museum, Honolulu.
- Camara, Bobby  
1987 Vegetation Survey Old Kona Airport State Park.  
Prepared for Sea Grant Extension Service,  
University of Hawai'i. Honolulu.
- Estioko-Griffin, Agnes and George W. Lovelace  
1980 Archaeological Reconnaissance of Old Kona Airport  
State Park Kailua-Kona, Island of Hawaii. Division  
of State Parks, Outdoor Recreation and Historic  
Sites, DLNR, Honolulu.
- Jensen, Peter M. and Margaret L. K. Rosendahl  
1983 Intensive Archaeological Survey and Testing  
Existing Residential Subdivision Site, Lanihau,  
North Kona, Island of Hawaii. Paul H. Rosendahl,  
Ph.D., Inc. Kurtistown, Hawaii.
- Kirch, Patrick Vinton  
1979 Marine Exploitation in Prehistoric Hawai'i,  
Archaeological Investigations at Kalahuipua'a,  
Hawai'i Island. Pacific Anthropological Records  
No. 29. Department of Anthropology, B. P. Bishop  
Museum. Honolulu.
- Lovelace, George W.  
1980 Interpretations and Comments on Volcanic Glass  
Research Report "Old Kona Airport" (Olson 1980).  
Division of State Parks, Outdoor Recreation and  
Historic Sites, DLNR, Honolulu.
- Neighbor Island Consultants  
1973 An Assessment of Environmental Impact Resulting  
from the Development of Kailua Park, Kailua-Kona,  
Hawaii. Prepared for the County of Hawaii, Hilo.
- Neller, Earl  
1980 An Archaeological Reconnaissance at the Old Kona  
Airport Beach Park, Keahuolo and Lanihau, Kona,  
Hawaii. State Historic Preservation Office,  
Honolulu.

Newman, T. Steil

1970 Report on reconnaissance at Old Kona Airport.  
Letter on file, Division of State Parks, Outdoor  
Recreation and Historic Sites, DLNR, Honolulu.

Reinecke, John E.

1930 Survey of Hawaiian Sites from Kailua, Kona to  
Kalahuipuaa, Kohala. B. P. Bishop Museum  
manuscript. Honolulu.

Schilt, Rose

1984 Subsistence and Conflict in Kona, Hawai'i: An  
Archaeological Study of the Kuakini Highway  
Realignment Corridor. Departmental Report Series  
84-1. Department of Anthropology, B. P. Bishop  
Museum, Honolulu.

Schmitt, Robert C.

1968 Demographic Statistics of Hawaii: 1778-1965.  
University of Hawaii Press. Honolulu.

Springer, Hannah Kihalani

1987 An Ethnohistorical Review of the Old Kona Airport  
State Park. Prepared for Sea Grant Extension  
Service, University of Hawai'i. Honolulu.

Stokes, John F. G.

1919 Notes on Hawaiian Heiaus. B. P. Bishop Museum  
manuscript. Honolulu.

**APPENDIX E**

**TRAFFIC IMPACT STUDY  
KAILUA PARK**

**TRAFFIC IMPACT STUDY  
FOR THE  
KAILUA PARK EXPANSION  
IN KAILUA-KONA, HAWAII**

**Prepared for  
SIDNEY M. FUKU**

**Prepared by  
BARTON-ASCHMAN ASSOCIATES, INC.  
Honolulu, Hawaii**

**August 1990**

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## **1. INTRODUCTION**

Barton-Aschman Associates Inc. has been retained by Sidney M. Fuke to conduct a traffic impact study for the proposed district park expansion in Kailua-Kona, Hawaii. The 34 acre park is located on the coast north of Kailua Bay, makai of Kuakini Highway.

The following report has been prepared to describe the traffic characteristics of the project and likely impacts to the adjacent roadway network. This introductory chapter discusses the location of the project, the proposed development, and the study methodology.

### **PROJECT LOCATION AND DESCRIPTION**

The location of the proposed project is shown in Figure 1. The project site is bounded by Kuakini Highway to the north, the ocean to the south, residential subdivisions to the east, and the existing county park to the west. This is the site of the old Kailua-Kona Airport. There are existing park or recreation-related uses adjacent to the site.

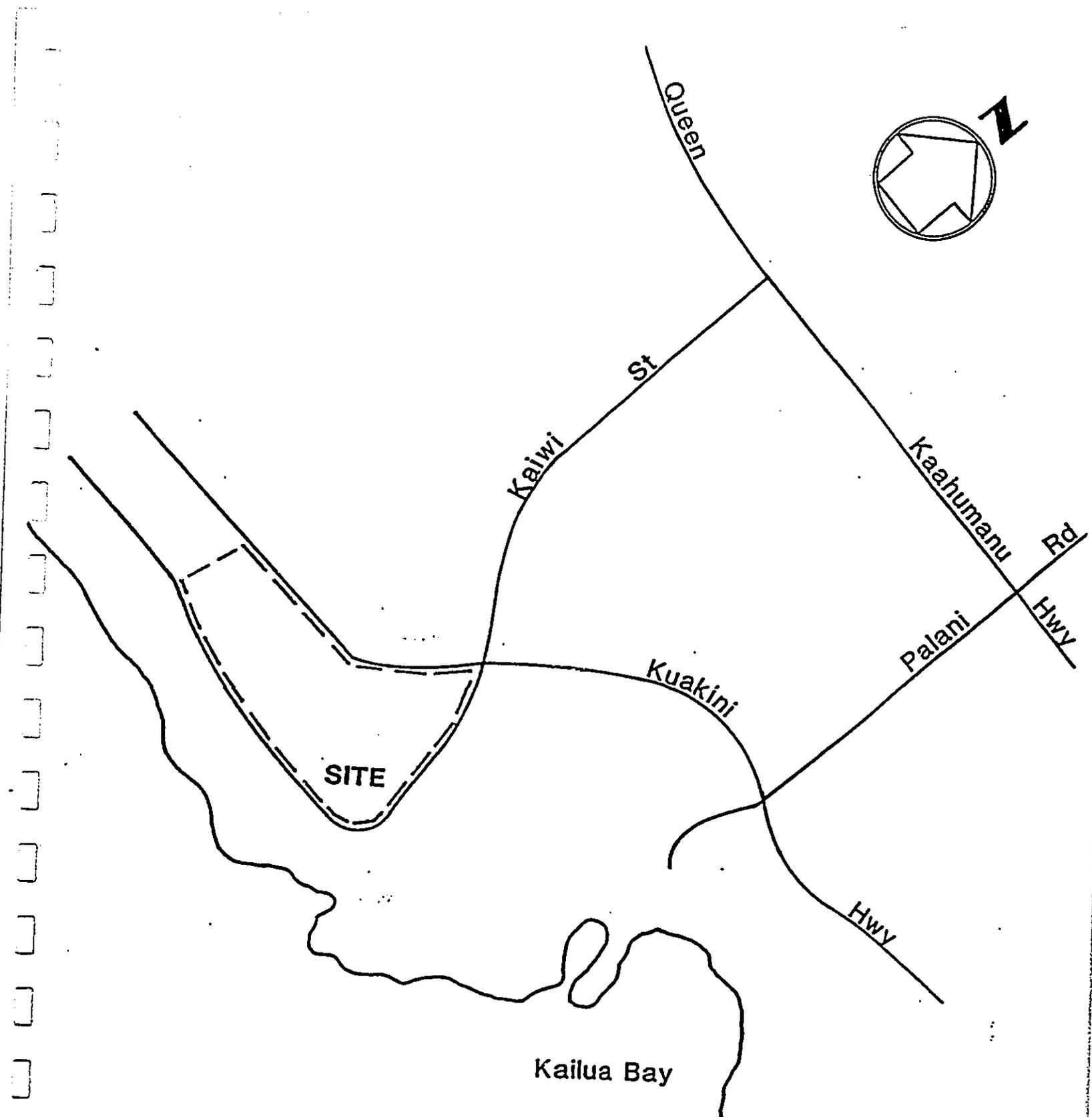


Figure 1  
SITE LOCATION

The proposed project is an expansion of the existing park and recreation facilities. These facilities, encompassing 14 acres, include two softball playing fields, four tennis courts, a BMX bike track, a horseshoe throwing area, a basketball court, football field, and soccer fields. The new facilities, to encompass 20 acres of presently undeveloped land, will include a gymnasium with seating for 1,500 spectators, a swimming pool and locker area, four additional tennis courts, expansion of the soccer fields, a large open multi-purpose field, and a regulation outdoor track. In addition, approximately 500 parking stalls will be provided.

## STUDY METHODOLOGY

In order to conduct this traffic study, a number of tasks were performed. They are discussed in the following paragraphs.

### 1. Data Collection

Prior to collection of any data, the Department of Public Works (DPW) for the County of Hawaii were contacted to determine the intersections to be studied, along with any particular concerns.

Traffic-related information was collected in order to analyze the existing traffic conditions and to estimate the future traffic volumes on the roadways adjacent to the study site without and with the project. The data collected included the following:

- development plan data;
- roadway network;
- existing morning (AM), afternoon (PM), and Saturday peak hour traffic volumes;
- traffic information for other planned projects; and
- previous traffic studies conducted for the adjacent area.

### 2. Analysis of Existing Traffic Conditions

Using the data collected, the existing traffic conditions in the vicinity of the project were determined. The operational method described in the 1985 Highway Capacity Manual (HCM) was used to determine the operating level or level-of-service at the study intersections. The level-of-service concept and the results of the analyses are presented in Chapter 2 of this report.

### 3. Determination of Future Cumulative Traffic Projections

It is assumed that construction and full utilization of the park will take two years. Thus, 1992 was used as the design year.

Future cumulative traffic without the project has two components. The first is background growth. The second is traffic generated by other planned projects in the vicinity and these volumes are referred to as "related project trips." The total future traffic without the project is the sum of existing plus background growth plus related project trips. These volumes are referred to as cumulative project trips. The assumptions used to estimate the 1992 cumulative trips and the resulting traffic projections are presented in Chapter 3 of this report.

### 4. Analysis of Project-Related Traffic Impacts

The next step in the traffic analysis of the project was to estimate the peak-hour (AM, PM, and Saturday) traffic that would be generated by the proposed development. This was done using trip generation rates from Trip Generation (Fourth Edition, 1987), an informational report prepared by the Institute of Transportation Engineers (ITE).

These trips were distributed and assigned to the various traffic movements at the study intersections. The project-generated traffic was then superimposed on 1992 cumulative traffic volumes to obtain cumulative plus project conditions. The HCM method was then used again to conduct a level-of-service analysis for this condition which was compared to cumulative conditions in order to determine the impact of this project. The resulting traffic projections and the conclusions of the analyses are presented in Chapters 4 and 5, respectively.

## **2. ANALYSIS OF EXISTING CONDITIONS**

This chapter presents and discusses the existing traffic conditions and volumes on the roadways in the vicinity of the proposed project, the level-of-service concept, and the results of the level-of-service analysis for existing conditions. The purpose of this analysis is to establish the base conditions for the determination of the project's impacts which will be described in Chapter 4.

The intersections which were analyzed to establish the base conditions were selected based upon the access routes to and departure routes from the project location. The intersections selected for analysis were discussed with DPW to insure that the scope of the study would include the areas they wanted in the study. The intersections analyzed are listed below:

Kaiwi Street and Kuakini Highway  
Palani Road and Kuakini Highway  
Queen Kaahumanu Highway and Kaiwi Street

These intersections and the street network are shown on Figure 1 on Page 2.

## EXISTING PEAK HOUR TRAFFIC VOLUMES

The existing AM, PM, and Saturday peak hour traffic volumes at the first two intersections were obtained from field counts conducted during November 1989. The existing volumes at the intersection of Queen Kaahumanu Highway and Kaiwi Street were obtained during July 1990. The existing traffic volumes are summarized for each of the peak hours on Figure 2.

## LEVEL-OF-SERVICE CONCEPT

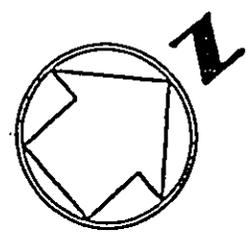
The operational method described in the 1985 Highway Capacity Manual (HCM) was used to analyze the operational efficiency of the intersections adjacent to the study site. This method involves the calculation of a volume-to-capacity (V/C) ratio which is related to a level-of-service.

"Level-of-service" (LOS) is a term which denotes any of an infinite number of combinations of traffic operating conditions that may occur on a given lane or roadway when it is subjected to traffic volumes. LOS is a qualitative measure of the effect of a number of factors which include:

- Speed,
- Travel Time,
- Traffic Interruptions,
- Freedom to Maneuver,
- Safety,
- Driving Comfort, and
- Convenience

There are six (6) levels-of-service, A through F, which relate to the driving conditions from best to worse, respectively. The characteristics of traffic operations for these levels of service are summarized in Table 1. In general, level of service A represents free-flow conditions with no congestion. level of service F, on the other hand, represents severe congestion with stop-and-go conditions.

Corresponding to each LOS shown in the table is a volume-to-capacity ratio. This is the ratio of either existing or projected traffic volumes to the capacity of the intersection. Capacity is defined as the maximum number of vehicles that can be accommodated by the roadway during



**LEGEND:**

- 00 - AM Peak Hour
- (00) - PM Peak Hour
- [00] - Saturday Peak Hour

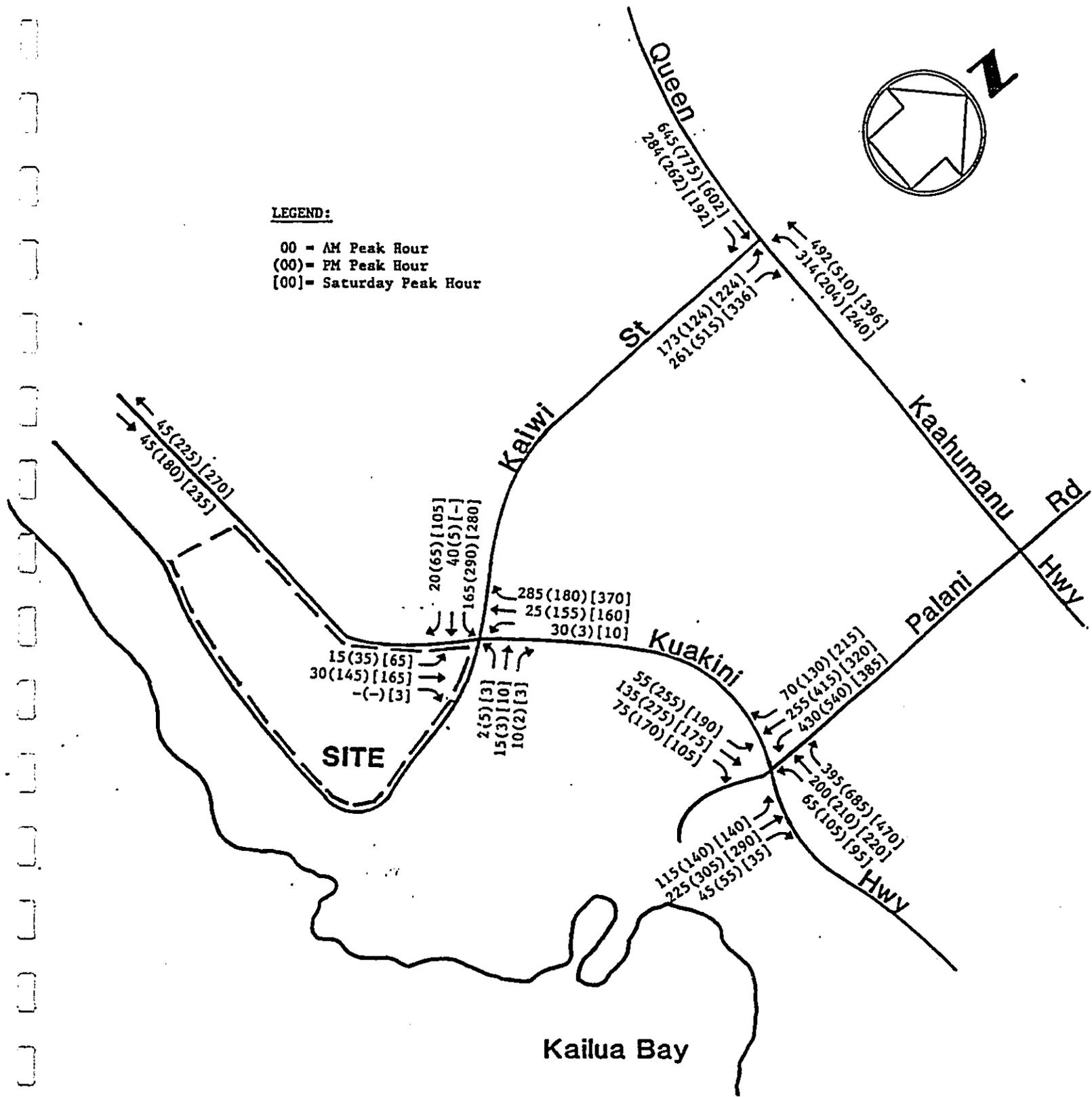


Figure 2

**EXISTING PEAK HOUR TRAFFIC VOLUMES**

**TABLE 1**  
**INTERSECTION LEVEL OF SERVICE DEFINITIONS**  
**TRAFFIC STUDY FOR KAILUA PARK**  
**August 1990**

Level of Service	Interpretation	Volume to Capacity Ratio	Stopped Delay Per Vehicle (Seconds)
A,B	Uncongested operations; all vehicles clear in a single signal cycle.	0.000-0.700	< 15.0
C	Light congestion; occasional backups on critical approaches.	0.701-0.800	15.1-25.0
D	Congestion on critical approaches, but intersection functional. Vehicles required to wait through more than one cycle during short peaks. No long standing lines formed.	0.801-0.900	25.1-40.0
E	Severe congestion with some long-standing lines on critical approaches. Blockage of intersection may occur if traffic signal does not provide for protected turning movements.	0.901-1.000	40.1-60.0
F	Total breakdown with stop-and-go operation.	1.001+	>60.0

**Notes:**

(1) Source: Highway Capacity Manual, 1985.

(2) Represents the ratio of calculated critical volume to Level-of-Service E capacity.

a specified period of time. The capacity of a particular roadway is dependent upon its physical characteristics such as the number of lanes, the operational characteristics of the roadway (one-way, two-way, turn prohibitions, bus stops, etc.), the type of traffic using the roadway (trucks, buses, etc.) and turning movements.

For unsignalized intersections, the method described in the 1985 Highway Capacity Manual calculates a level-of-service for each movement. In order to determine an overall LOS for the intersection, each movement is weighted by volume. Although some movements may experience a lower level of service as shown on the calculation sheets, the LOS presented in the tables represents a weighted value.

### EXISTING LEVEL OF SERVICE ANALYSIS

The results of the level-of-service analysis for existing traffic conditions are summarized below.

- (1) The unsignalized intersection of Kaiwi Street and Kuakini Highway operates at a high level of service (LOS A) during the AM, PM and Saturday peak hours.
- (2) The signalized intersection of Palani Road and Kuakini Highway operates at LOS C during the weekday AM and Saturday peak hours, and at LOS E during the PM peak hour. In order to improve the PM LOS E to acceptable conditions, some geometric improvements to the intersection are required. These include an additional left-turn lane on the north approach (creating dual left-turns), and an exclusive right-turn lane on the west approach. In addition, the eastbound departure lane needs to be widened to two lanes to accommodate the dual left turns from the north. With these improvements, the intersection will operate at LOS D during the PM peak hour.
- (3) The unsignalized intersection of Queen Kaahumanu Highway and Kaiwi Street operates at LOS B and C in the AM and PM peak hours, respectively. During the Saturday peak hour, the intersection operates at LOS C.

The calculations for the existing LOS data are presented in Appendix A.

### **3. PROJECTED BACKGROUND TRAFFIC CONDITIONS**

Cumulative traffic conditions are defined as the traffic conditions resulting from background growth and related projects in the area. The purpose of this chapter is to discuss the assumptions and data used to estimate 1992 cumulative traffic conditions.

#### **BACKGROUND TRAFFIC GROWTH RATE**

In order to evaluate the traffic impacts of the proposed project, it is necessary to estimate the future traffic conditions without the project. This future traffic is typically estimated by applying an annual growth rate to the existing traffic volumes.

Based on input from the County of Hawaii DPW, it was determined that the background growth rate may be expected to range from 1 to 1.5 percent per year. Therefore, a growth rate of 1.5 percent per year was used for this study. This is equivalent to a 3 percent growth over the next two years.

## **RELATED PROJECTS**

The second component in estimating cumulative traffic conditions is the traffic generated by other proposed projects in the vicinity. Related projects are defined as those projects that are under construction or have been approved for construction by the County and which would significantly impact traffic in the study area.

Based upon the information obtained from the County, the only project that may be constructed in the immediate vicinity of the park expansion is an apartment project on the east side of Kaiwi Street south of Kuakini Highway. Based on current zoning, approximately 100 units could be constructed on this site.

## **1992 CUMULATIVE TRAFFIC VOLUMES**

Future traffic volumes were obtained by superimposing background growth and related project traffic volumes onto existing traffic volumes. These volumes are summarized in tabular form in Appendix B.

#### **4. PROJECT-RELATED TRAFFIC IMPACTS**

This chapter discusses the methodology used to identify the traffic-related impacts of the proposed project. Generally, the process involves the determination of weekday and peak-hour trips that would be generated by the proposed project, distribution and assignment of these trips on the approach and departure routes, and finally, determination of the levels-of-service at affected intersections with the addition of project traffic.

##### **TRIP GENERATION**

Future traffic volumes for the proposed project were determined using trip generation equations contained in Trip Generation (Fourth Edition, 1987), an informational report prepared by the Institute of Transportation Engineers (ITE). The trip generation rates represent a national average of trip rates. Preliminary studies in Hawaii indicate that trip rates in the islands are lower than those in the ITE report for most land use categories because of higher vehicle occupancy rates and public transportation use. Therefore, ITE rates are most likely conservative and can be used with confidence.

The trip generation analysis is based on 20 acres to include the part of the park expansion scheduled for development. Trips generated by the project were rounded to the nearest 5 for analysis purposes.

The trip generation analysis and the resulting AM, PM and Saturday peak hour volumes are summarized in Table 2. Because Saturday is typically the peak day for recreational facilities, an analysis of Saturday peak hour conditions was conducted.

### **TRIP DISTRIBUTION**

The project-related trips were distributed based on the future distribution of population and the anticipated approach and departure routes to and from the project site. This information was obtained from previously conducted traffic studies for the area. The directions of approach and departure are shown on Figure 3.

### **TRIP ASSIGNMENT**

Using the trip generation and trip distribution previously discussed, site-generated traffic was assigned to the corresponding turning movements at the study intersections. The trip assignments for the AM, PM and Saturday peak hours are shown in Figure 4.

### **TOTAL PEAK HOUR TRAFFIC VOLUMES**

Future (1992) traffic volumes with the project were determined by superimposing the site-generated traffic on the 1992 cumulative traffic volumes presented in Chapter 3. The resulting traffic volumes are shown for the AM, PM and Saturday peak hours on Figure 5. The traffic projection worksheets are presented in Appendix B.

**TABLE 2**  
**PROJECT TRIP GENERATION ANALYSIS**  
**KAILUA PARK TRAFFIC STUDY**  
**AUGUST 1990**

<u>Time Period</u>	<u>Rate</u> <sup>(1) (2)</sup>	<u>Distribution</u>	<u>Trips</u> <sup>(3)</sup>
AM Peak Hour	2.431/acre	57% Inbound	30
		<u>43% Outbound</u>	20
		100% Total	50
PM Peak Hour	7.504/acre	26% Inbound	40
		<u>74% Outbound</u>	110
		100% Total	150
Saturday Peak Hour	10.669/acre	50% Inbound	110
		<u>50% Outbound</u>	105
		100% Total	215

Note: (1) Rate based on acreage  
(2) Area = 20 Acres |  
(3) Trips rounded to nearest 5



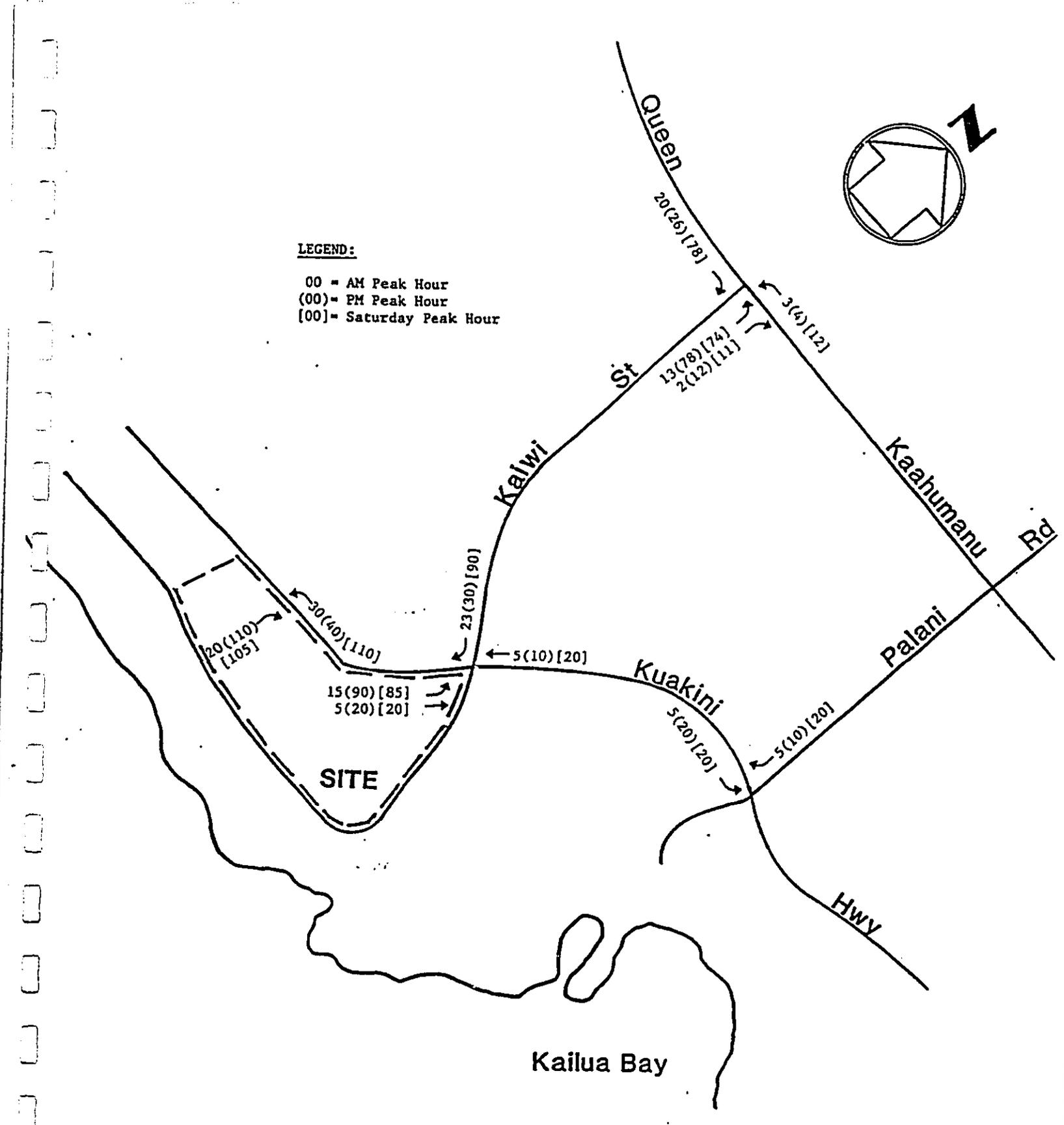


Figure 4  
**PROJECT-GENERATED PEAK HOUR  
 TRAFFIC VOLUMES**

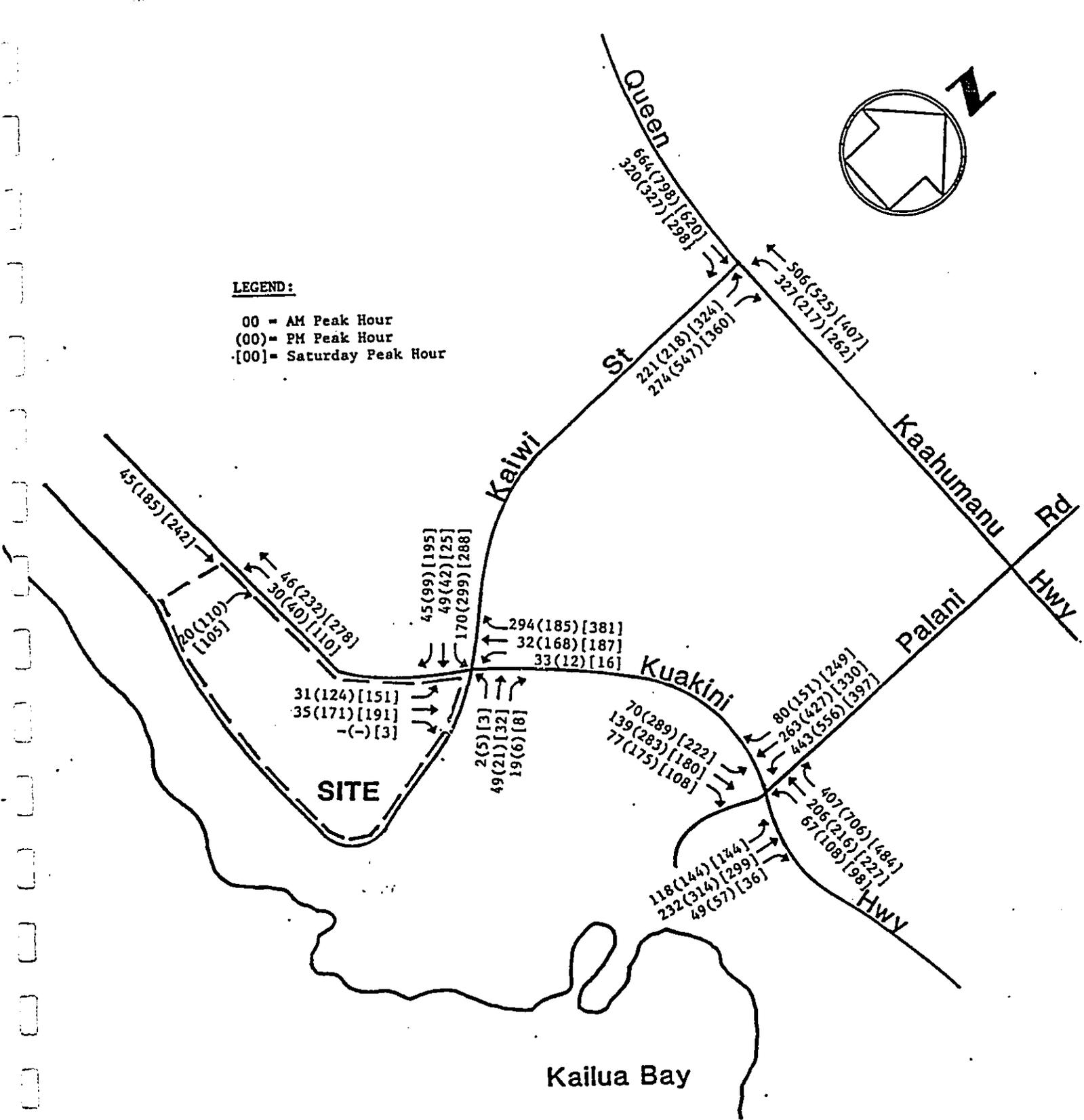


Figure 5  
**TOTAL PROJECTED PEAK HOUR  
 TRAFFIC VOLUMES**

## **5. SUMMARY OF IMPACTS AND MITIGATION MEASURES**

The purpose of this chapter is to present the results of the level-of-service analysis, which identify the project-related impacts. In addition, any mitigation measures necessary and feasible are identified.

### **DEFINITION OF SIGNIFICANT IMPACTS**

Criteria for determining if a project has a significant traffic impact for which mitigation measures must be investigated have been established based on traffic impact study guidelines used in various other cities. Generally, these criteria are that if the level of service without the project is E or F and the volume/capacity (V/C) ratio changes less than 0.020, the project's traffic impacts are considered insignificant. However, if the V/C ratio change is greater than 0.020, then mitigation measures which will reduce the V/C ratio change to less than 0.020 must be identified.

For this project, the 0.020 criterion has been used, as Kailua-Kona does not have an established policy. If the level-of-service with the project is D or better, then no mitigation measures need to be identified.

## PROJECT-RELATED TRAFFIC IMPACTS

The anticipated traffic impacts associated with the expansion of Kailua Park are quite minimal. The results of the analysis of 1992 conditions without and with the project are shown on Table 3. The unsignalized access driveway will operate at LOS A during all peak periods. Although there are high turning movements, there is little through traffic to impede such maneuvers.

The existing unsignalized intersection of Kaiwi Street and Kuakini Highway will operate at acceptable conditions with the project traffic distributed on the roadway network. For analysis purposes, this intersection was also analyzed assuming it was signalized. If signalized, the intersection should be restriped to include an exclusive left-turn lane plus a through- right lane on the north and west approaches based on existing volumes. There is adequate pavement width to accommodate these minor modifications. With these geometric improvements, the intersection will operate at LOS B or better in the future.

Improvements would be required at the intersection of Palani Road and Kuakini Highway to mitigate the project's traffic impacts. The intersection will operate at LOS B during the AM peak hour, LOS E during the PM peak hour, and LOS C during the Saturday peak hour. The change in the PM peak hour volume-to-capacity ratio is insignificant (or less than 0.02). Therefore, no mitigation to the intersection is necessary.

The intersection of Queen Kaahumanu Highway and Kaiwi Street operates under acceptable conditions with project traffic at LOS C during the AM, PM, and Saturday peak hours. No mitigation is necessary at this location.

## ADDITIONAL TRAFFIC ISSUES

One of the issues discussed during the scoping of this impact study was an alternative access scenario from Queen Kaahumanu Highway to the project site. Because of the minimal traffic impacts to the roadway network, such an improvement would not be warranted to mitigate the impacts of the park expansion. However, such an improvement may have positive impacts on the intersection of Palnai Road and Kuakini Highway by diverting vehicles turning left. This movement is currently over-capacity. This "mitigation" would be implemented to improve and existing deficiency and should not be charged against the project expansion.

**TABLE 3**  
**1992 LEVEL OF SERVICE CONDITIONS <sup>(1)</sup>**  
**KAILUA PARK TRAFFIC STUDY**  
**AUGUST 1990**

<u>Intersection</u>	<u>AM Peak Hour</u>		<u>PM Peak Hour</u>		<u>Saturday Peak Hour</u>	
	<u>w/o Proj</u>	<u>w/Proj</u>	<u>w/o Proj</u>	<u>w/Proj</u>	<u>w/o Proj</u>	<u>w/Proj</u>
	<u>V/C</u>	<u>LOS</u>	<u>V/C</u>	<u>LOS</u>	<u>V/C</u>	<u>LOS</u>
Kuakini Hwy at Palani Rd	0.667 B	0.667 B	0.906 E	0.917 E	0.695 B	0.742 C
Kuakini Hwy at Kaiwi St (Signalized)	0.566 A	0.566 A	0.449 A	0.449 A	0.658 B	0.698 B
Kuakini Hwy at Kaiwi St (Unsignalized)	NA <sup>(4)</sup> A	NA A	NA B	NA B	NA B	NA B
Kuakini Hwy at Park Entrance	NA A	NA A	NA A	NA A	NA A	NA A
Queen Kaahumanu Hwy at Kaiwi (Unsignalized)	NA C	NA C	NA C	NA C	NA B	NA C

- (1) See Appendix C for calculations  
(2) V/C = Volume-to-Capacity Ratio  
(3) LOS = Level-of-Service  
(4) NA = Not Applicable

The capacity analysis techniques used in this study do not consider bicycle or pedestrian traffic impacts except for the degree of usage (i.e. heavy or light). Bicyclists would be considered as pedestrians for analysis purposes because they would use the pedestrian crossing phase at the study intersections. As long as the roadway shoulders are sufficient to accommodate both pedestrians and bicycles, no interference with vehicular flow should occur under normal circumstances.

The proposed construction of Henry Street, a new roadway east of Palani Road, would greatly improve the level of operation of the intersection of Palani Road at Kuakini Highway. Henry Street would connect the two main distributors of traffic in Kailua-Kona, Queen Kaahumanu Highway and Kuakini Highway. This additional connection would result in a diversion of traffic from Palani Road and serve to more evenly distribute traffic on the surrounding roadway network.

**APPENDIX A**  
**EXISTING LEVEL OF SERVICE CALCULATIONS**

1985 HCM: SIGNALIZED INTERSECTIONS  
SUMMARY REPORT

\*\*\*\*\*  
INTERSECTION..KUAKINI/PALANI

AREA TYPE.....OTHER

ANALYST.....PJR

DATE.....

TIME.....EXISTING AM PEAK

COMMENT.....

	VOLUMES					GEOMETRY							
	EB	WB	NB	SB		EB	WB	NB	SB	EB	WB	NB	SB
LT	55	65	115	430	:	L	9.0	L	11.0	L	9.0	L	10.0
TH	135	200	225	255	:	T	9.0	T	10.0	TR	9.0	L	10.0
RT	75	0	45	0	:		9.0		12.0		12.0		10.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	GRADE (%)	HV (%)	ADJ PKG		PHF	PDS	PED. Y/N	BUT. min T	ARR. TYPE	
			Y/N	Nm						
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

		SIGNAL SETTINGS				CYCLE LENGTH = 90.0					
		PH-1	PH-2	PH-3	PH-4			PH-1	PH-2	PH-3	PH-4
EB	LT	X				NB	LT	X			
	TH		X				TH		X		
	RT		X				RT		X		
	PD						PD				
WB	LT	X				SB	LT	X			
	TH		X				TH		X		
	RT						RT				
	PD						PD				
GREEN		10.0	17.0	0.0	0.0	GREEN		30.0	21.0	0.0	0.0
YELLOW		3.0	3.0	0.0	0.0	YELLOW		3.0	3.0	0.0	0.0

		LEVEL OF SERVICE					
LANE	GRP.	V/C	G/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L	0.361	0.111	28.7	D	25.7	D
	T	0.619	0.189	24.5	C		
WB	L	0.396	0.111	29.0	D	37.6	D
	T	0.887	0.189	40.4	E		
NB	L	0.252	0.333	16.6	C	45.8	E
	TR	1.028	0.233	63.9	F		
SB	L	0.494	0.333	18.5	C	18.5	C

INTERSECTION: Delay = 32.8 (sec/veh) V/C = 0.711 LOS = C

1985 HCM: SIGNALIZED INTERSECTIONS  
SUMMARY REPORT

\*\*\*\*\*  
INTERSECTION..KUAKINI/PALANI  
AREA TYPE.....OTHER  
ANALYST.....PJR  
DATE.....  
TIME.....EXISTING PM PEAK  
COMMENT.....

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	WB	NB	SB				
LT	255	105	140	540	:	L	9.0	L	11.0	L	9.0	L	10.0
TH	275	210	305	415	:	TR	9.0	T	10.0	TR	9.0	T	10.0
RT	170	0	55	0	:		9.0		12.0		12.0		10.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	ADJUSTMENT FACTORS									
	GRADE (%)	HV (%)	ADJ Y/N	PKG Nm	BUSES Nb	PHF	FEDS	PED. Y/N	BUT. min T	ARR. TYPE
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

SIGNAL SETTINGS								CYCLE LENGTH = 128.0			
		PH-1	PH-2	PH-3	PH-4			PH-1	PH-2	PH-3	PH-4
EB	LT	X	X			NB	LT	X	W		
	TH		X	X			TH		W	X	
	RT		X	X			RT		W	X	
	PD						PD				
WB	LT	X				SB	LT	X	X		
	TH			X			TH		X	X	
	RT						RT		W		
	PD						PD				
GREEN		10.0	13.0	23.0	0.0	GREEN		13.0	30.0	27.0	0.0
YELLOW		0.0	3.0	3.0	0.0	YELLOW		0.0	3.0	3.0	0.0

LEVEL OF SERVICE							
	LANE GRP.	V/C	G/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L	1.035	0.180	92.7	F	61.2	F
	T	0.782	0.305	32.0	D		
WB	L	1.299	0.055	*	*	*	*
	T	0.979	0.180	67.2	F		
NB	L	0.304	0.336	24.0	C	20.4	C
	TR	0.681	0.469	19.0	C		
SB	L	2.644	0.078	*	*	*	*

INTERSECTION: Delay = \* (sec/veh) V/C = 0.979 LOS = F

1985 HCM: SIGNALIZED INTERSECTIONS  
SUMMARY REPORT

\*\*\*\*\*  
INTERSECTION..KUAKINI/PALANI  
AREA TYPE.....OTHER  
ANALYST.....PJR  
DATE.....  
TIME.....EXISTING SAT PEAK  
COMMENT.....

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	WB	NB	SB	EB	WB	NB	SB
LT	190	95	140	385	:	L	9.0	L	11.0	L	9.0	L	10.0
TH	175	220	290	415	:	T	9.0	T	10.0	TR	9.0	L	10.0
RT	105	0	35	0	:		9.0		12.0		12.0	L	10.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	GRADE (%)	HV (%)	ADJ Y/N	PKG Nm	ADJUSTMENT FACTORS					ARR. TYPE
					BLUSES Nb	PHF	PEDS	PED. Y/N	BUT. min T	
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

	SIGNAL SETTINGS				CYCLE LENGTH = 90.0			
	PH-1	PH-2	PH-3	PH-4	PH-1	PH-2	PH-3	PH-4
EB LT	X	X						
TH		X			NB LT	X		
RT		X			TH		X	
PD					RT		X	
WB LT	X				PD			
TH		X			SB LT	X		
RT					TH		X	
PD					RT			
GREEN	15.0	17.0	0.0	0.0	PD			
YELLOW	3.0	3.0	0.0	0.0	GREEN	26.0	20.0	0.0
					YELLOW	3.0	3.0	0.0

	LANE GRP.	LEVEL OF SERVICE					
		V/C	G/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L	0.033	0.389	12.9	B	22.3	C
	T	0.802	0.189	32.5	D		
WB	L	0.386	0.167	25.8	D	46.4	E
	T	0.976	0.189	55.2	E		
NB	L	0.353	0.289	19.5	C	*	*
	TR	1.287	0.222	*	*		
SB	L	0.510	0.289	20.7	C	20.7	C

INTERSECTION: Delay = \* (sec/veh) V/C = 0.737 LOS = \*

1985 HCM: UNSIGNALIZED INTERSECTIONS

\*\*\*\*\*

IDENTIFYING INFORMATION

---

AVERAGE RUNNING SPEED, MAJOR STREET..... 30  
 PEAK HOUR FACTOR..... 1  
 AREA POPULATION..... 150000  
 NAME OF THE EAST/WEST STREET..... Kuakini  
 NAME OF THE NORTH/SOUTH STREET..... Kaiwai  
 NAME OF THE ANALYST..... clc  
 DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89  
 TIME PERIOD ANALYZED..... Existing AM  
 OTHER INFORMATION: eamkk

INTERSECTION TYPE AND CONTROL

---

INTERSECTION TYPE: 4-LEG  
 MAJOR STREET DIRECTION: NORTH/SOUTH  
 CONTROL TYPE EASTBOUND: STOP SIGN  
 CONTROL TYPE WESTBOUND: STOP SIGN

TRAFFIC VOLUMES

---

	EB	WB	NB	SB
LEFT	15	30	2	165
THRU	30	25	15	40
RIGHT	0	285	10	20

NUMBER OF LANES AND LANE USAGE

---

	EB	WB	NB	SB
LANES	1	2	1	1

## ADJUSTMENT FACTORS

Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

## VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	0	0	0

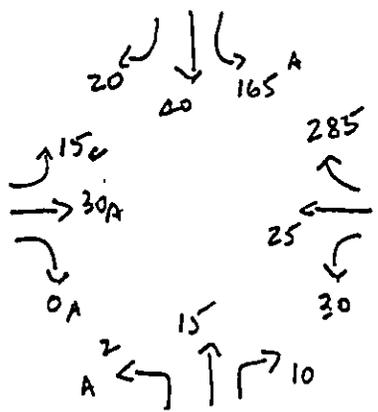
## CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
WB	5.50	5.50	0.00	5.50
EB	5.50	5.50	0.00	5.50
MAJOR LEFTS				
SB	5.00	5.00	0.00	5.00
NB	5.00	5.00	0.00	5.00
MINOR THROUGHGS				
WB	6.00	6.00	0.00	6.00
EB	6.00	6.00	0.00	6.00
MINOR LEFTS				
WB	6.50	6.50	0.00	6.50
EB	6.50	6.50	0.00	6.50

A-5

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTEN-	ACTUAL	SHARED	RESERVE		LOS
		TIAL CAPACITY c (pcph) P	MOVEMENT CAPACITY c (pcph) M		CAPACITY c (pcph) SH	c = c - v R SH	
MINOR STREET							
WB LEFT	33	655	557	> 959	557	> 618	524 > A A
THROUGH	28	755	660	>	660	>	632 > A
RIGHT	314	999	999		999		686 A
MINOR STREET							
EB LEFT	17	457	296	>	296	>	279 > C
THROUGH	33	759	663	> 469	663	> 419	630 > A A
RIGHT	0	998	998	>	998	>	998 > A
MAJOR STREET							
NB LEFT	2	1000	1000		1000		998 A
SB LEFT	182	1000	1000		1000		819 A



A-6

1985 HCM: UNSIGNALIZED INTERSECTIONS

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IDENTIFYING INFORMATION

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AVERAGE RUNNING SPEED, MAJOR STREET..... 30  
 PEAK HOUR FACTOR..... 1  
 AREA POPULATION..... 150000  
 NAME OF THE EAST/WEST STREET..... Kuakini  
 NAME OF THE NORTH/SOUTH STREET..... Kaiwai  
 NAME OF THE ANALYST..... clic  
 DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89  
 TIME PERIOD ANALYZED..... Existing PM  
 OTHER INFORMATION: epmkk

INTERSECTION TYPE AND CONTROL

---

INTERSECTION TYPE: 4-LEG  
 MAJOR STREET DIRECTION: NORTH/SOUTH  
 CONTROL TYPE EASTBOUND: STOP SIGN  
 CONTROL TYPE WESTBOUND: STOP SIGN

TRAFFIC VOLUMES

---

	EB	WB	NB	SB
LEFT	35	3	5	290
THRU	145	155	3	5
RIGHT	0	180	2	65

NUMBER OF LANES AND LANE USAGE

---

	EB	WB	NB	SB
LANES	1	2	1	1

## ADJUSTMENT FACTORS

Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

## VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	0	0	0

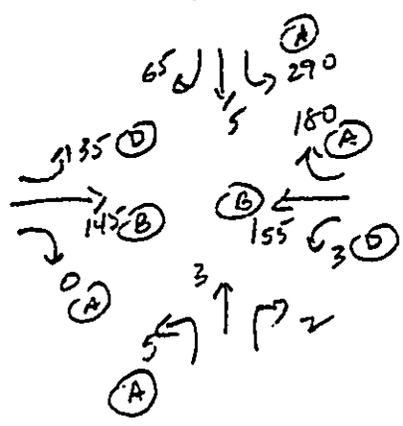
## CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
WB	5.50	5.50	0.00	5.50
EB	5.50	5.50	0.00	5.50
MAJOR LEFTS				
SB	5.00	5.00	0.00	5.00
NB	5.00	5.00	0.00	5.00
MINOR THROUGHS				
WB	6.00	6.00	0.00	6.00
EB	6.00	6.00	0.00	6.00
MINOR LEFTS				
WB	6.50	6.50	0.00	6.50
EB	6.50	6.50	0.00	6.50

A. S.

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTEN-	ACTUAL	SHARED		RESERVE		LOS
		TIAL CAPACITY c (pcph) p	MOVEMENT CAPACITY c (pcph) M	CAPACITY c (pcph) SH		CAPACITY c = c - v R SH		
MINOR STREET								
WB LEFT	3	483	301	> 670	301	> 302	297	> B C
THROUGH	171	648	485	>	485	>	314	> B
RIGHT	198	1000	1000		1000		802	A
MINOR STREET								
EB LEFT	39	383	199	>	199	>	161	> D
THROUGH	160	676	506	>	390	506	192	347 > D B
RIGHT	0	998	998	>	998	>	998	> A
MAJOR STREET								
NB LEFT	6	1000	1000		1000		995	A
SB LEFT	319	1000	1000		1000		681	A



1985 HCM: UNSIGNALIZED INTERSECTIONS

Page-1

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IDENTIFYING INFORMATION

---

AVERAGE RUNNING SPEED, MAJOR STREET..... 30  
 PEAK HOUR FACTOR..... 1  
 AREA POPULATION..... 150000  
 NAME OF THE EAST/WEST STREET..... Kuakini  
 NAME OF THE NORTH/SOUTH STREET..... Kaiwai  
 NAME OF THE ANALYST..... clc  
 DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89  
 TIME PERIOD ANALYZED..... Existing Saturday

OTHER INFORMATION: esatkk

INTERSECTION TYPE AND CONTROL

---

INTERSECTION TYPE: 4-LEG  
 MAJOR STREET DIRECTION: NORTH/SOUTH  
 CONTROL TYPE EASTBOUND: STOP SIGN  
 CONTROL TYPE WESTBOUND: STOP SIGN

TRAFFIC VOLUMES

---

	EB	WB	NB	SB
LEFT	65	10	3	280
THRU	165	160	10	0
RIGHT	3	370	3	105

NUMBER OF LANES AND LANE USAGE

---

	EB	WB	NB	SB
LANES	1	2	1	1

## ADJUSTMENT FACTORS

Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

## VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	0	0	0

## CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
WB	5.50	5.50	0.00	5.50
EB	5.50	5.50	0.00	5.50
MAJOR LEFTS				
SB	5.00	5.00	0.00	5.00
NB	5.00	5.00	0.00	5.00
MINOR THROUGH				
WB	6.00	6.00	0.00	6.00
EB	6.00	6.00	0.00	6.00
MINOR LEFTS				
WB	6.50	6.50	0.00	6.50
EB	6.50	6.50	0.00	6.50

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## CAPACITY AND LEVEL-OF-SERVICE

Page-3

MOVEMENT	FLOW-RATE v (pcph)	POTEN-	ACTUAL	SHARED		RESERVE		LOS
		TIAL CAPACITY c (pcph) P	MOVEMENT CAPACITY c (pcph) M	CAPACITY c (pcph) SH		CAPACITY c = c - v R SH		
MINOR STREET								
WB LEFT	11	447	271	>	747	271	>	164 260 > D C
THROUGH	176	620	472	>		472	>	296 > C
RIGHT	407	999	999			999		592 A
MINOR STREET								
EB LEFT	72	279	111	>		111	>	39 > E
THROUGH	182	666	507	>	254	507	>	-2 325 > F B
RIGHT	3	997	997	>		997	>	994 > A
MAJOR STREET								
NB LEFT	3	999	999			999		996 A
SB LEFT	308	1000	1000			1000		692 A

A-12

**APPENDIX B**  
**TRAFFIC PROJECTION WORKSHEETS**

KAILUA PARK TRAFFIC STUDY

PROJECT NUMBER 3291.01.01

TRAFFIC PROJECTION WORKSHEET

INTERSECTION 1. KUAKINI HIGHWAY AT PALANI DRIVE

NO	MVT	EXISTING			1993 CUMULATIVE TRIPS			PROJECT TRIPS					CUMULATIVE PLUS PROJECT TRIPS		
		AM	PM	SAT	AM	PM	SAT	XIN	XOUT	AM	PM	SAT	AM	PM	SAT
1	H-RT	70	130	215	74	143	227	20	0	6	8	22	80	151	249
2	TH	255	415	320	263	427	330	0	0	0	0	0	263	427	330
3	LT	430	540	385	443	556	397	0	0	0	0	0	443	556	397
4	E-RT	395	685	470	407	706	484	0	0	0	0	0	407	706	484
5	TH	200	210	220	206	216	227	0	0	0	0	0	206	216	227
6	LT	65	105	95	67	108	98	0	0	0	0	0	67	108	98
7	S-RT	48	55	35	49	57	36	0	0	0	0	0	49	57	36
8	TH	225	305	290	232	314	299	0	0	0	0	0	232	314	299
9	LT	115	140	140	118	144	144	0	0	0	0	0	118	144	144
10	H-RT	75	170	105	77	175	108	0	0	0	0	0	77	175	108
11	TH	135	275	175	139	283	180	0	0	0	0	0	139	283	180
12	LT	55	255	190	66	267	201	0	20	4	22	21	70	269	222
TOTAL		2068	3285		2141	3396	2731			10	30	43	2151	3426	2774

TRAFFIC PROJECTION WORKSHEET

INTERSECTION 2. KUAKINI HIGHWAY AT KAIHAI DRIVE

NO	MVT	EXISTING			1993 CUMULATIVE TRIPS			PROJECT TRIPS						CUMULATIVE PLUS PROJECT TRIPS		
		AM	PM	SAT	AM	PM	SAT	XIN	XOUT	AM	PM	SAT	AM	PM	SAT	
1	N-RT	20	65	105	21	67	108	80	0	24	32	88	45	99	196	
2	TH	40	5	0	49	42	25	0	0	0	0	0	49	42	25	
3	LT	165	290	280	170	299	288	0	0	0	0	0	170	299	288	
4	E-RT	285	180	370	294	185	381	0	0	0	0	0	294	185	381	
5	TH	25	155	160	26	160	165	20	0	6	8	22	32	168	187	
6	LT	30	3	10	33	12	16	0	0	0	0	0	33	12	16	
7	S-RT	10	2	3	19	6	8	0	0	0	0	0	19	6	8	
8	TH	15	3	10	49	21	32	0	0	0	0	0	49	21	32	
9	LT	2	5	3	2	5	3	0	0	0	0	0	2	5	3	
10	W-RT	0	0	3	0	0	3	0	0	0	0	0	0	0	3	
11	TH	30	145	165	31	149	170	0	20	4	22	21	35	171	191	
12	LT	15	35	65	15	36	67	0	80	16	88	84	31	124	151	
TOTAL		637	888		709	982	1266			50	150	215	759	1132	1481	

TRAFFIC PROJECTION WORKSHEET

INTERSECTION 3. KUAKINI HIGHWAY AT PARK ENTRANCE

NO	MVT	EXISTING			1993 CUMULATIVE TRIPS			PROJECT TRIPS					CUMULATIVE PLUS PROJECT TRIPS			
		AM	PM	SAT	AM	PM	SAT	%IN	%OUT	AM	PM	SAT	AM	PM	SAT	
1	N-RT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	TH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	LT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	E-RT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	TH	45	225	270	46	232	278	0	0	0	0	0	46	232	278	
6	LT	0	0	0	0	0	0	100	0	30	40	110	30	40	110	
7	S-RT	0	0	0	0	0	0	0	100	20	110	105	20	110	105	
8	TH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	LT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	W-RT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	TH	45	180	235	46	185	242	0	0	0	0	0	46	185	242	
12	LT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL		90	405		92	417	520	50	150	215			142	567	735	

**APPENDIX C**

**PROJECTED LEVEL OF SERVICE CALCULATIONS**

1985 HCM: SIGNALIZED INTERSECTIONS  
SUMMARY REPORT

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INTERSECTION..KUAKINI/PALANI

AREA TYPE.....OTHER

ANALYST.....FJR

DATE.....

TIME.....1991 AM W/O PROJECT

COMMENT.....

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	WB	NB	SB	EB	WB	NB	SB
LT	66	67	118	443	:	L	9.0	L	11.0	L	9.0	L	10.0
TH	139	206	232	263	:	T	9.0	T	10.0	TR	9.0	L	10.0
RT	77	0	49	0	:	R	9.0		12.0		12.0	1	10.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	ADJUSTMENT FACTORS									
	GRADE (%)	HV (%)	ADJ Y/N	PKG Nm	BUSES Nb	PHF	PEDS	PED. Y/N	BUT. min T	ARR. TYPE
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

	SIGNAL SETTINGS								CYCLE LENGTH = 80.0			
	PH-1	PH-2	PH-3	PH-4	PH-1	PH-2	PH-3	PH-4	PH-1	PH-2	PH-3	PH-4
EB	LT X				NB	LT X						
	TH X					TH			X			
	RT X					RT			X			
	PD					PD						
WB	LT X				SB	LT X						
	TH X					TH			X			
	RT					RT						
	PD					PD						
GREEN	29.0	0.0	0.0	0.0	GREEN	20.0	22.0	0.0	0.0			
YELLOW	3.0	0.0	0.0	0.0	YELLOW	3.0	3.0	0.0	0.0			

	LEVEL OF SERVICE							
	LANE	GRP.	V/C	B/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L		0.203	0.363	13.4	B	10.0	B
	T		0.266	0.363	11.7	B		
	R		0.128	0.613	4.2	A		
WB	L		0.195	0.363	13.3	B	13.2	B
	T		0.476	0.363	13.2	B		
NB	L		0.344	0.250	18.9	C	29.8	D
	TR		0.909	0.275	34.3	D		
SB	L		0.678	0.250	22.3	C	23.1	C
	T		0.801	0.275	24.5	C		

INTERSECTION: Delay = 20.9 (sec/veh) V/C = 0.667 LOS = **B**

1985 HCM: SIGNALIZED INTERSECTIONS  
SUMMARY REPORT

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INTERSECTION..KUAKINI/PALANI

AREA TYPE.....OTHER

ANALYST.....PJR

DATE.....

TIME.....1992 AM W/ PROJECT

COMMENT.....

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	WB	NB	SB				
LT	70	67	118	443	:	L	9.0	L	11.0	L	9.0	L	10.0
TH	139	206	232	263	:	T	9.0	T	10.0	TR	9.0	L	10.0
RT	77	0	49	0	:	R	9.0		12.0		12.0	T	10.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	ADJUSTMENT FACTORS									
	GRADE (%)	HV (%)	ADJ Y/N	PKG Nm	BUSES Nb	PHF	PEDS	PED. Y/N	BUT. min	ARR. TYPE
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

	SIGNAL SETTINGS				CYCLE LENGTH = 80.0			
	PH-1	PH-2	PH-3	PH-4	PH-1	PH-2	PH-3	PH-4
EB	LT X				NB	LT X		
	TH X					TH	X	
	RT X					RT	X	
	PD					PD		
WB	LT X				SB	LT X		
	TH X					TH	X	
	RT					RT		
	PD					PD		
GREEN	29.0	0.0	0.0	0.0	GREEN	20.0	22.0	0.0
YELLOW	3.0	0.0	0.0	0.0	YELLOW	3.0	3.0	0.0

	LEVEL OF SERVICE						
	LANE GRP.	V/C	G/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L	0.215	0.363	13.4	B	10.1	B
	T	0.266	0.363	11.7	B		
	R	0.128	0.613	4.2	A		
WB	L	0.195	0.363	13.3	B	13.2	B
	T	0.476	0.363	13.2	B		
NB	L	0.344	0.250	18.9	C	29.8	D
	TR	0.909	0.275	34.3	D		
SB	L	0.678	0.250	22.3	C	23.1	C
	T	0.801	0.275	24.5	C		

INTERSECTION: Delay = 20.9 (sec/veh) V/C = 0.667 LOS = B

1985 HCM: SIGNALIZED INTERSECTIONS  
SUMMARY REPORT

\*\*\*\*\*  
INTERSECTION..KUAKINI/PALANI  
AREA TYPE.....OTHER  
ANALYST.....PJR  
DATE.....  
TIME.....1992 PM W/O PROJECT  
COMMENT.....

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	WB	NB	SB	EB	WB	NB	SB
LT	225	105	140	540	:	L	9.0	L	11.0	L	9.0	L	10.0
TH	275	210	305	415	:	T	9.0	T	10.0	TR	9.0	L	10.0
RT	170	0	55	0	:	R	9.0		12.0		12.0	T	10.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

ADJUSTMENT FACTORS										
	GRADE (%)	HV (%)	ADJ Y/N	PKG Nm	BUSES Nb	PHF	PEDS	PED. Y/N	BUT. min T	ARR. TYPE
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

SIGNAL SETTINGS								CYCLE LENGTH = 121.0			
		PH-1	PH-2	PH-3	PH-4			PH-1	PH-2	PH-3	PH-4
EB	LT	X	X			NB	LT	X			
	TH		X	X			TH		X		
	RT		X	X			RT		X		
	PD						PD				
WB	LT	X				SB	LT	X			
	TH		X	X			TH		X		
	RT		X	X			RT				
	PD						PD				
GREEN		12.0	18.0	17.0	0.0	GREEN		23.0	39.0	0.0	0.0
YELLOW		0.0	3.0	3.0	0.0	YELLOW		3.0	3.0	0.0	0.0

LEVEL OF SERVICE								
	LANE	GRP.	V/C	G/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L		0.506	0.248	32.0	D	23.6	C
	T		0.607	0.314	24.0	C		
	R		0.344	0.504	11.8	B		
WB	L		0.955	0.074	91.6	F	45.2	E
	T		0.560	0.314	23.4	C		
NB	L		0.537	0.190	35.1	D	48.3	E
	TR		0.990	0.322	53.5	E		
SB	L		1.087	0.190	95.4	F	53.1	F
	T		1.079	0.322	78.0	F		

INTERSECTION: Delay = 57.1 (sec/veh) V/C = 0.906 LOS = E

1985 HCM: SIGNALIZED INTERSECTIONS

SUMMARY REPORT

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INTERSECTION..KUAKINI/PALANI

AREA TYPE.....OTHER

ANALYST.....PJR

DATE.....

TIME.....1992 PM <sup>ω/</sup> ~~4:30~~ PROJECT

COMMENT.....

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	WB	NB	SB	EB	WB	NB	SB
LT	289	108	144	556	:	L	9.0	L	11.0	L	9.0	L	10.0
TH	283	216	314	427	:	T	9.0	T	10.0	TR	9.0	L	10.0
RT	175	0	57	0	:	R	9.0		12.0		12.0	T	10.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	ADJUSTMENT FACTORS									
	GRADE (%)	HV (%)	ADJ Y/N	PKB Nm	BUSES Nb	PHF	PEDS	PED. Y/N	BLT. min	ARR. TYPE
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

SIGNAL SETTINGS								CYCLE LENGTH = 121.0								
PH-1				PH-2				PH-3				PH-4				
EB	LT	X		TH	X			NB	LT	X						
	TH			RT	X	X			TH		X					
	RT			PD		X			RT		X					
	PD								PD							
WB	LT	X		TH	X	X		SB	LT	X						
	TH			RT	X	X			TH		X					
	RT								RT							
	PD								PD							
GREEN		12.0		GREEN		23.0		GREEN		39.0		GREEN		0.0		0.0
YELLOW		0.0		YELLOW		3.0		YELLOW		3.0		YELLOW		0.0		0.0

LEVEL OF SERVICE								
	LANE	GRP.	V/C	G/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L		0.983	0.248	85.6	F	45.1	E
	T		0.624	0.314	24.3	C		
	R		0.354	0.504	11.8	B		
WB	L		0.982	0.074	99.6	F	49.0	E
	T		0.576	0.314	23.7	C		
NB	L		0.552	0.190	35.4	D	53.7	E
	TR		1.020	0.322	60.8	F		
SB	L		1.119	0.190	110.1	F	101.6	F
	T		1.110	0.322	90.0	F		

INTERSECTION: Delay = 69.3 (sec/veh) V/C = 0.71 LUS = E

C-4

1985 HCM: SIGNALIZED INTERSECTIONS  
SUMMARY REPORT

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INTERSECTION..KUAKINI/PALANI

AREA TYPE.....OTHER

ANALYST.....PJR

DATE..... SAT

TIME.....1992 PH W/O PROJECT

COMMENT.....

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	WB	NB	SB				
LT	190	95	140	385	:	L	9.0	L	11.0	L	9.0	L	10.0
TH	175	220	290	320	:	T	9.0	T	10.0	TR	9.0	L	10.0
RT	105	0	35	0	:	R	9.0		12.0		12.0	T	10.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	ADJUSTMENT FACTORS									
	GRADE (%)	HV (%)	ADJ Y/N	PKG. Nm	BUSES Nb	PHF	PEDS	PED. Y/N	EUT. min	ARR. TYPE
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

	SIGNAL SETTINGS				CYCLE LENGTH = 121.0			
	PH-1	PH-2	PH-3	PH-4	PH-1	PH-2	PH-3	PH-4
EB LT	X	X			NB LT	X		
EB TH		X	X		EB TH		X	
EB RT		X	X		EB RT		X	
EB PD					EB PD			
WB LT	X				SB LT	X		
WB TH		X	X		WB TH		X	
WB RT		X	X		WB RT			
WB PD					WB PD			
GREEN	12.0	18.0	17.0	0.0	GREEN	23.0	39.0	0.0
YELLOW	0.0	3.0	3.0	0.0	YELLOW	3.0	3.0	0.0

	LEVEL OF SERVICE							
	LANE	GRP.	V/C	G/C	DELAY	LDS	APP. DELAY	APP. LDS
EB	L		0.259	0.248	28.0	D	21.6	C
	T		0.386	0.314	21.1	C		
	R		0.212	0.504	10.8	B		
WB	L		0.864	0.074	71.4	F	38.2	D
	T		0.587	0.314	23.9	C		
NB	L		0.537	0.190	35.1	D	36.7	D
	TR		0.888	0.322	37.4	D		
SB	L		0.775	0.190	39.9	D	36.5	D
	T		0.832	0.322	32.2	D		

INTERSECTION: Delay = 33.3 (sec/veh.) V/C = 0.695 LDS = B

1985 HCM: SIGNALIZED INTERSECTIONS  
SUMMARY REPORT

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INTERSECTION..KUAKINI/PALANI

AREA TYPE.....OTHER

ANALYST.....PJR

DATE..... *Sep 01*

TIME.....1992 ~~TH~~ ~~WED~~ PROJECT

COMMENT.....

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	WB	NB	SB	EB	WB	NB	SB
LT	222	98	144	397	:	L	9.0	L	11.0	L	9.0	L	10.0
TH	180	227	299	330	:	T	9.0	T	10.0	TR	9.0	L	10.0
RT	110	0	36	0	:	R	9.0		12.0		12.0	T	10.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	ADJUSTMENT FACTORS									
	GRADE (%)	HV (%)	ADJ Y/N	PKG Nm	BUSES Nb	PHF	PEDS	PED. Y/N	BUI. min T	ARR. TYPE
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

	SIGNAL SETTINGS				CYCLE LENGTH = 121.0				
	PH-1	PH-2	PH-3	PH-4	PH-1	PH-2	PH-3	PH-4	
EB	LT X	TH X	RT X	PD X	NB	LT X	TH X	RT X	PD X
WB	LT X	TH X	RT X	PD X	SB	LT X	TH X	RT X	PD X
GREEN	12.0	18.0	17.0	0.0	GREEN	23.0	39.0	0.0	0.0
YELLOW	0.0	3.0	3.0	0.0	YELLOW	3.0	3.0	0.0	0.0

	LEVEL OF SERVICE							
	LANE	GRP.	V/C	G/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L		0.502	0.248	31.7	D	23.6	C
	T		0.397	0.314	21.3	C		
	R		0.222	0.504	10.9	B		
WB	L		0.892	0.074	76.6	F	40.0	E
	T		0.606	0.314	24.2	C		
NB	L		0.552	0.190	35.4	D	39.0	D
	TR		0.915	0.322	40.6	E		
SB	L		0.799	0.190	41.0	E	38.0	D
	T		0.858	0.322	34.2	D		

INTERSECTION: Delay = 35.0 (sec/veh) V/C = 0.742 LOS = C

1985 HCM: SIGNALIZED INTERSECTIONS  
SUMMARY REPORT

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INTERSECTION..Kuakini/Kawai  
AREA TYPE.....OTHER  
ANALYST.....clc  
DATE.....11/27/89  
TIME.....Projected AM  
COMMENT.....pamkk

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	WB	NB	SB	EB	WB	NB	SB
LT	15	33	2	170	:	L	10.0	LT	9.0	LTR	14.0	L	11.0
TH	31	26	49	49	:	TR	10.0	R	11.0		12.0	TR	11.0
RT	0	294	19	21	:		12.0		12.0		12.0		12.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	ADJUSTMENT FACTORS									
	GRADE (%)	HV (%)	ADJ Y/N	PKG Nm	BUSES Nb	PHF	PEDS	PED. Y/N	BUT. min	ARR. TYPE
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

SIGNAL SETTINGS								CYCLE LENGTH = 60.0							
PH-1				PH-2				PH-3				PH-4			
EB	LT	X						NB	LT		X				
	TH	X							TH		X				
	RT	X							RT		X				
	PD								PD						
WB	LT	X						SB	LT	X					
	TH	X							TH	X	X				
	RT	X							RT	X	X				
	PD								PD						

LEVEL OF SERVICE							
	LANE GRP.	V/C	G/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L	0.151	0.200	15.1	C	17.6	C
	TR	0.130	0.200	12.7	B		
WB	LT	0.204	0.200	13.0	B	9.9	B
	R	0.476	0.583	5.0	B		
NB	LTR	0.298	0.200	13.4	B	19.7	C
SB	L	0.300	0.383	9.9	B	8.0	B
	TR	0.101	0.583	3.6	A		

INTERSECTION: Delay = 12.6 (sec/veh) V/C = 0.566 LOS = B

1985 HCM: SIGNALIZED INTERSECTIONS

SUMMARY REPORT

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INTERSECTION..Kuakini/Kaiwai

AREA TYPE.....OTHER

ANALYST.....clc

DATE.....11/27/89

TIME.....Projected AM

COMMENT.....pamkk

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	LT	WB	NB	SB			
LT	31	33	2	170	:	L	10.0	LT	9.0	LTR	14.0	L	11.0
TH	35	32	49	49	:	TR	10.0	R	11.0		12.0	TR	11.0
RT	0	294	19	45	:		12.0		12.0		12.0		12.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	ADJUSTMENT FACTORS									
	GRADE (%)	HV (%)	ADJ Y/N	PKG Nm	BUSES Nb	PHF	PEDS	PED. Y/N	BUT. min T	ARR. TYPE
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

	SIGNAL SETTINGS				CYCLE LENGTH = 60.0			
	PH-1	PH-2	PH-3	PH-4	PH-1	PH-2	PH-3	PH-4
EB	LT	X			NB	LT	X	
	TH	X				TH	X	
	RT	X				RT	X	
	PD					PD		
WB	LT	X			SB	LT	X	
	TH	X				TH	X	X
	RT	X				RT	X	X
	PD					PD		

	LEVEL OF SERVICE						
	LANE GRP.	V/C	G/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L	0.312	0.200	16.1	C	17.5	C
	TR	0.147	0.200	12.8	B		
WB	LT	0.225	0.200	13.0	B	10.0	B
	R	0.476	0.583	5.0	B		
NB	LTR	0.298	0.200	13.4	B	19.7	C
SB	L	0.300	0.383	9.9	B	7.7	B
	TR	0.139	0.583	3.7	A		

INTERSECTION: Delay = 12.5 (sec/veh) V/C = 0.568 LOS = B

1985 HCM: SIGNALIZED INTERSECTIONS  
SUMMARY REPORT

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INTERSECTION..Kuakini/Kaiwai

AREA TYPE.....OTHER

ANALYST.....clc

DATE.....11/27/89

TIME.....Projected PM

COMMENT.....ppmkk

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	LT	WB	LTR	NB	L	SB	
LT	26	6	5	299	:	L	10.0	LT	9.0	LTR	14.0	L	11.0
TH	149	160	21	42	:	TR	10.0	R	11.0		12.0	TR	11.0
RT	0	185	6	67	:		12.0		12.0		12.0		12.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	ADJUSTMENT FACTORS									
	GRADE (%)	HV (%)	ADJ Y/N	PKG Nm	BUSES Nb	PHF	PEDS	PED. Y/N	BUT. min T	ARR. TYPE
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

		SIGNAL SETTINGS				CYCLE LENGTH = 60.0					
		PH-1	PH-2	PH-3	PH-4	PH-1	PH-2	PH-3	PH-4		
EB	LT	X				NB	LT	X			
	TH	X					TH	X			
	RT	X					RT	X			
	PD						PD				
WB	LT	X				SB	LT	X			
	TH	X					TH	X			
	RT	X					RT	X			
	PD						PD				

	LANE GRP.	LEVEL OF SERVICE					
		V/C	G/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L	0.079	0.433	7.6	B	11.9	B
	TR	0.288	0.433	7.2	B		
WB	LT	0.265	0.433	7.1	B	10.8	B
	R	0.404	0.433	7.8	B		
NB	LTR	0.062	0.433	6.4	B	19.8	C
SB	L	0.494	0.433	9.8	B	9.0	B
	TR	0.223	0.433	6.9	B		

INTERSECTION: Delay = 11.7 (sec/veh) V/C = 0.449 LOS = B

1985 HCM: SIGNALIZED INTERSECTIONS  
SUMMARY REPORT

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INTERSECTION..Kuakini/Kaiwai  
AREA TYPE.....OTHER  
ANALYST.....clc  
DATE.....11/27/89  
TIME.....Projected PM  
COMMENT.....ppmkk

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	LT	WB	LTR	NB	L	SB	
LT	124	12	5	299	:	L	10.0	LT	9.0	LTR	14.0	L	11.0
TH	171	168	21	42	:	TR	10.0	R	11.0		12.0	TR	11.0
RT	0	185	6	99	:		12.0		12.0		12.0		12.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	ADJUSTMENT FACTORS									
	GRADE (%)	HV (%)	ADJ Y/N	PKG Nm	BUSES Nb	PHF	PEDS	PED. Y/N	BUT. min T	ARR. TYPE
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

SIGNAL SETTINGS										CYCLE LENGTH = 60.0			
		PH-1	PH-2	PH-3	PH-4			PH-1	PH-2	PH-3	PH-4		
EB	LT	X				NB	LT	X					
	TH	X					TH	X					
	RT	X					RT	X					
	PD						PD						
WB	LT	X				SB	LT	X					
	TH	X					TH	X					
	RT	X					RT	X					
	PD						PD						

LEVEL OF SERVICE							
	LANE GRP.	V/C	G/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L	0.390	0.433	9.2	B	11.2	B
	TR	0.331	0.433	7.4	B		
WB	LT	0.288	0.433	7.2	B	10.7	B
	R	0.404	0.433	7.8	B		
NB	LTR	0.062	0.433	6.4	B	19.8	C
SB	L	0.495	0.433	9.8	B	9.0	B
	TR	0.292	0.433	7.2	B		

INTERSECTION: Delay = 11.4 (sec/veh) V/C = 0.449 LOS = B

1985 HCM: SIGNALIZED INTERSECTIONS  
SUMMARY REPORT

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INTERSECTION..Kuakini/Kaiwai  
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AREA TYPE.....OTHER  
ANALYST.....clc  
DATE.....11/27/89  
TIME.....Projected Saturday  
COMMENT.....psatkk

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	LT	WB	NB	SB			
LT	67	16	3	288	:	L	10.0	LT	9.0	LTR	14.0	L	11.0
TH	170	165	32	25	:	TR	10.0	R	11.0		12.0	TR	11.0
RT	3	381	8	109	:		12.0		12.0		12.0		12.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	ADJUSTMENT FACTORS									
	GRADE (%)	HV (%)	ADJ Y/N	PKG Nm	BUSES Nb	FHF	PEDS	PED. Y/N	BUT. min	ARR. TYPE
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

SIGNAL SETTINGS								CYCLE LENGTH = 60.0			
		PH-1	PH-2	PH-3	PH-4			PH-1	PH-2	PH-3	PH-4
EB	LT	X				NB	LT	X			
	TH	X					TH	X			
	RT	X					RT	X			
	PD						PD				
WB	LT	X				SB	LT	X			
	TH	X					TH	X			
	RT	X					RT	X			
	PD						PD				

LEVEL OF SERVICE							
	LANE GRP.	V/C	G/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L	0.372	0.433	9.3	B	11.5	B
	TR	0.335	0.433	7.4	B		
WB	LT	0.289	0.433	7.2	B	14.8	B
	R	0.831	0.433	16.3	C		
NB	LTR	0.083	0.433	6.5	B	19.0	C
SB	L	0.485	0.433	9.7	B	6.9	B
	TR	0.281	0.433	7.2	B		

INTERSECTION: Delay = 13.0 (sec/veh) V/C = 0.658 LOS = B

1985 HCM: SIGNALIZED INTERSECTIONS  
SUMMARY REPORT

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INTERSECTION..Kuakini/Kaiwai  
AREA TYPE.....OTHER  
ANALYST.....clc  
DATE.....11/27/89  
TIME.....Projected Saturday  
COMMENT.....psatkk

	VOLUMES				:	GEOMETRY							
	EB	WB	NB	SB		EB	WB	NB	SB				
LT	151	16	3	288	:	L	10.0	LT	9.0	LTR	14.0	L	11.0
TH	191	187	32	25	:	TR	10.0	R	11.0		12.0	TR	11.0
RT	3	381	8	196	:		12.0		12.0		12.0		12.0
RR	0	0	0	0	:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0
					:		12.0		12.0		12.0		12.0

	ADJUSTMENT FACTORS									
	GRADE (%)	HV (%)	ADJ Y/N	PKG Nm	BUSES Nb	PHF	PEDS	PED. Y/N	BUT. min	ARR. TYPE
EB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
WB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
NB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3
SB	0.00	2.00	Y	20	0	0.90	50	N	0.0	3

	SIGNAL SETTINGS				CYCLE LENGTH = 60.0			
	PH-1	PH-2	PH-3	PH-4	PH-1	PH-2	PH-3	PH-4
EB	LT	X			NB	LT	X	
	TH	X				TH	X	
	RT	X				RT	X	
	PD					PD		
WB	LT	X			SB	LT	X	
	TH	X				TH	X	
	RT	X				RT	X	
	PD					PD		

	LEVEL OF SERVICE						
	LANE GRP.	V/C	G/C	DELAY	LOS	APP. DELAY	APP. LOS
EB	L	0.910	0.433	41.6	E	21.7	C
	TR	0.376	0.433	7.6	B		
WB	LT	0.325	0.433	7.3	B	14.6	B
	R	0.831	0.433	16.3	C		
NB	LTR	0.083	0.433	6.5	B	19.0	C
SB	L	0.485	0.433	9.7	B	9.1	B
	TR	0.473	0.433	8.3	B		

INTERSECTION: Delay = 15.3 (sec/veh) V/C = 0.692 LOS = C

C-12

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IDENTIFYING INFORMATION

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AVERAGE RUNNING SPEED, MAJOR STREET..... 30  
 PEAK HOUR FACTOR..... 1  
 AREA POPULATION..... 150000  
 NAME OF THE EAST/WEST STREET..... Kuakini  
 NAME OF THE NORTH/SOUTH STREET..... Site Access  
 NAME OF THE ANALYST..... clc  
 DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89  
 TIME PERIOD ANALYZED..... Projected AM  
 OTHER INFORMATION: *saam* *w/o Project*

INTERSECTION TYPE AND CONTROL

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INTERSECTION TYPE: T-INTERSECTION  
 MAJOR STREET DIRECTION: EAST/WEST  
 CONTROL TYPE NORTHBOUND: STOP SIGN

TRAFFIC VOLUMES

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	EB	WB	NB	SB
LEFT	0	0	0	---
THRU	46	46	0	--
RIGHT	0	0	0	---

NUMBER OF LANES

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	EB	WB	NB	SB
LANES	1	2	1	---

## ADJUSTMENT FACTORS

Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURE RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	-

## VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

## CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS NB	5.50	5.50	0.00	5.50
MAJOR LEFTS WB	5.00	5.00	0.00	5.00
MINOR LEFTS NB	6.50	6.50	0.00	6.50

C-14

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTENTIAL CAPACITY c (pcph) P	ACTUAL MOVEMENT CAPACITY c (pcph) H		SHARED CAPACITY c (pcph) SH		RESERVE CAPACITY c = c - v R SH	LOS
MINOR STREET								
NB LEFT	0	828	828	>	828	>	828	A
RIGHT	0	998	998	>	998	>	998	A
MAJOR STREET								
WB LEFT	0	1000	1000		1000		1000	A

← 46  
→ 46

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IDENTIFYING INFORMATION

---

AVERAGE RUNNING SPEED, MAJOR STREET..... 30  
 PEAK HOUR FACTOR..... 1  
 AREA POPULATION..... 150000  
 NAME OF THE EAST/WEST STREET..... Kuakini  
 NAME OF THE NORTH/SOUTH STREET..... Site Access  
 NAME OF THE ANALYST..... clc  
 DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89  
 TIME PERIOD ANALYZED..... Projected AM  
 OTHER INFORMATION: saam *w/ Project*

INTERSECTION TYPE AND CONTROL

---

INTERSECTION TYPE: T-INTERSECTION  
 MAJOR STREET DIRECTION: EAST/WEST  
 CONTROL TYPE NORTHBOUND:

TRAFFIC VOLUMES

---

	EB	WB	NB	SB
LEFT	0	30	0	--
THRU	46	46	0	--
RIGHT	0	0	20	--

NUMBER OF LANES

---

	EB	WB	NB	SB
LANES	1	2	1	..

*C-16*

## ADJUSTMENT FACTORS

Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	----	---	---	-

## VEHICLE COMPOSITION

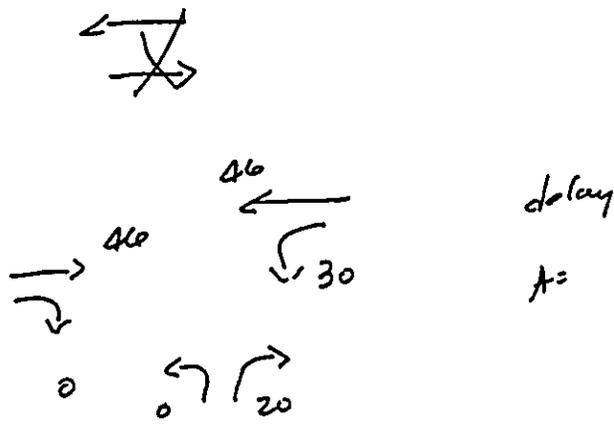
	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	----	---	---

## CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS NB	5.50	5.50	0.00	5.50
MAJOR LEFTS WB	5.00	5.00	0.00	5.00
MINOR LEFTS NB	6.50	6.50	0.00	6.50

C-17

MOVEMENT	FLOW-RATE v (pcph)	POTENTIAL CAPACITY c (pcph) P	ACTUAL MOVEMENT CAPACITY c (pcph) M	SHARED CAPACITY c (pcph) SH	RESERVE CAPACITY c = c - v R SH	LOS
MINOR STREET						
NB LEFT	0	798	782	> 782	> 782	A
RIGHT	22	998	998	> 998	> 976	A
MAJOR STREET						
WB LEFT	33	1000	1000	1000	967	A



C-18

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IDENTIFYING INFORMATION

-----

AVERAGE RUNNING SPEED, MAJOR STREET..... 30

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... Kuakini

NAME OF THE NORTH/SOUTH STREET..... Site Access

NAME OF THE ANALYST..... clc

DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89

TIME PERIOD ANALYZED..... Projected PM

OTHER INFORMATION: *sapm* *w/o Project*

INTERSECTION TYPE AND CONTROL

-----

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	0	0	0	--
THRU	185	232	0	--
RIGHT	0	0	0	--

NUMBER OF LANES

	EB	WB	NB	SB
LANES	1	2	1	--

*C-19*

## ADJUSTMENT FACTORS

Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	----	---	---	-

## VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	----	---	---

## CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS NB	5.50	5.50	0.00	5.50
MAJOR LEFTS WB	5.00	5.00	0.00	5.00
MINOR LEFTS NB	6.50	6.50	0.00	6.50

C-20

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTENTIAL CAPACITY c (pcph) P	ACTUAL MOVEMENT CAPACITY c (pcph) M		SHARED CAPACITY c (pcph) SH		RESERVE CAPACITY c = c - v R SH	LOS
MINOR STREET								
NB LEFT	0	549	549	>	549	>	549	> A
RIGHT	0	906	906	>	906	>	906	> A
MAJOR STREET								
WB LEFT	0	987	987		987		987	A

C-21

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IDENTIFYING INFORMATION

---

AVERAGE RUNNING SPEED, MAJOR STREET..... 30  
 PEAK HOUR FACTOR..... 1  
 AREA POPULATION..... 150000  
 NAME OF THE EAST/WEST STREET..... Kuakini  
 NAME OF THE NORTH/SOUTH STREET..... Site Access  
 NAME OF THE ANALYST..... clc  
 DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89  
 TIME PERIOD ANALYZED..... Projected PM  
 OTHER INFORMATION: *sapm* *w/ Project*

INTERSECTION TYPE AND CONTROL

---

INTERSECTION TYPE: T-INTERSECTION  
 MAJOR STREET DIRECTION: EAST/WEST  
 CONTROL TYPE NORTHBOUND: STOP SIGN

TRAFFIC VOLUMES

---

	EB	WB	NE	SB
LEFT	0	40	0	--
THRU	185	232	0	--
RIGHT	0	0	110	--

NUMBER OF LANES

---

	EB	WB	ND	SB
LANES	1	2	1	--

C-22

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	-----	---	---	--

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	-----	-----	-----

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS NB	5.50	5.50	0.00	5.50
MAJOR LEFTS WB	5.00	5.00	0.00	5.00
MINOR LEFTS NB	6.50	6.50	0.00	6.50

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTEN-TIAL CAPACITY	ACTUAL MOVEMENT CAPACITY		SHARED CAPACITY	RESERVE CAPACITY	LOS
		c (pcph) P	c (pcph) M		c (pcph) SH	c = c - v R SH	
MINOR STREET							
NB LEFT	0	522	508	>	508	508	> A
RIGHT	121	906	906	>	906	785	> A
MAJOR STREET							
WB LEFT	44	987	987		987	943	A

e-24

1985 HCM: UNSIGNALIZED INTERSECTIONS

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IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED, MAJOR STREET..... 30  
 PEAK HOUR FACTOR..... 1  
 AREA POPULATION..... 150000  
 NAME OF THE EAST/WEST STREET..... Kuakini  
 NAME OF THE NORTH/SOUTH STREET..... Site Access  
 NAME OF THE ANALYST..... clc  
 DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89  
 TIME PERIOD ANALYZED..... Projected Saturday  
 OTHER INFORMATION: sasat *w/o Project*

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: T-INTERSECTION  
 MAJOR STREET DIRECTION: EAST/WEST  
 CONTROL TYPE NORTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	0	0	0	--
THRU	235	278	0	--
RIGHT	0	0	0	---

NUMBER OF LANES

	EB	WB	NB	SB
LANES	1	2	1	--

C-25

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	---

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS NB	5.50	5.50	0.00	5.50
MAJOR LEFTS WB	5.00	5.00	0.00	5.00
MINOR LEFTS NB	6.50	6.50	0.00	6.50

C-26

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTENTIAL CAPACITY c (pcph) p	ACTUAL MOVEMENT CAPACITY c (pcph) M	SHARED CAPACITY c (pcph) SH	RESERVE CAPACITY c = c - v R SH	LOS
MINOR STREET						
NB LEFT	0	484	484	>	484	> A
RIGHT	0	855	855	>	855	> A
MAJOR STREET						
WB LEFT	0	952	952		952	A

C-27

1985 HCM: UNSIGNALIZED INTERSECTIONS

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IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED, MAJOR STREET..... 30

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... Kuakini

NAME OF THE NORTH/SOUTH STREET..... Site Access

NAME OF THE ANALYST..... clc

DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89

TIME PERIOD ANALYZED..... Projected Saturday

OTHER INFORMATION: sasat *w/ Project*

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	0	110	0	--
THRU	242	278	0	--
RIGHT	0	0	105	--

NUMBER OF LANES

	EB	WB	NB	SB
LANES	1	2	1	---

C-23

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	---

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS NB	5.50	5.50	0.00	5.50
MAJOR LEFTS WB	5.00	5.00	0.00	5.00
MINOR LEFTS NB	6.50	6.50	0.00	6.50

C-29

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTENTIAL CAPACITY c (pcph) P	ACTUAL MOVEMENT CAPACITY c (pcph) M		SHARED CAPACITY c (pcph) SH		RESERVE CAPACITY c = c R SH		LOS
MINOR STREET									
NB LEFT	0	408	374	>	374	>	374	>	B
RIGHT	116	848	848	>	848	>	733	>	A
MAJOR STREET									
WB LEFT	121	945	945		945		824		A

2-20

1985 HCM: UNSIGNALIZED INTERSECTIONS

IDENTIFYING INFORMATION

-----

AVERAGE RUNNING SPEED, MAJOR STREET..... 30

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... Kuakini

NAME OF THE NORTH/SOUTH STREET..... Site Access

NAME OF THE ANALYST..... clc

DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89

TIME PERIOD ANALYZED..... Projected AM

OTHER INFORMATION: saam w/o Project

INTERSECTION TYPE AND CONTROL

-----

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	0	0	0	--
THRU	46	46	0	--
RIGHT	0	0	0	--

NUMBER OF LANES

	EB	WB	NB	SB
LANES	1	2	1	--

C-31

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	-

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS NB	5.50	5.50	0.00	5.50
MAJOR LEFTS WB	5.00	5.00	0.00	5.00
MINOR LEFTS NB	6.50	6.50	0.00	6.50

C-32

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTENTIAL CAPACITY c (pcph) P	ACTUAL MOVEMENT CAPACITY c (pcph) M		SHARED CAPACITY c (pcph) SH		RESERVE CAPACITY c = c - v R SH	LOS
MINOR STREET								
NB LEFT	0	828	828	>	828	>	828	A
RIGHT	0	998	998	>	998	>	998	A
MAJOR STREET								
WB LEFT	0	1000	1000		1000		1000	A

← 46  
→ 46

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IDENTIFYING INFORMATION

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AVERAGE RUNNING SPEED, MAJOR STREET..... 30  
 PEAK HOUR FACTOR..... 1  
 AREA POPULATION..... 150000  
 NAME OF THE EAST/WEST STREET..... Kuakini  
 NAME OF THE NORTH/SOUTH STREET..... Site Access  
 NAME OF THE ANALYST..... clc  
 DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89  
 TIME PERIOD ANALYZED..... Projected AM  
 OTHER INFORMATION: saam *w/ Project*

INTERSECTION TYPE AND CONTROL

---

INTERSECTION TYPE: T-INTERSECTION  
 MAJOR STREET DIRECTION: EAST/WEST  
 CONTROL TYPE NORTHBOUND:

TRAFFIC VOLUMES

---

	EB	WB	NB	SB
LEFT	0	30	0	--
THRU	46	46	0	--
RIGHT	0	0	20	--

NUMBER OF LANES

---

	EB	WB	NB	SB
LANES	1	2	1	--

. c -34

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	-

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

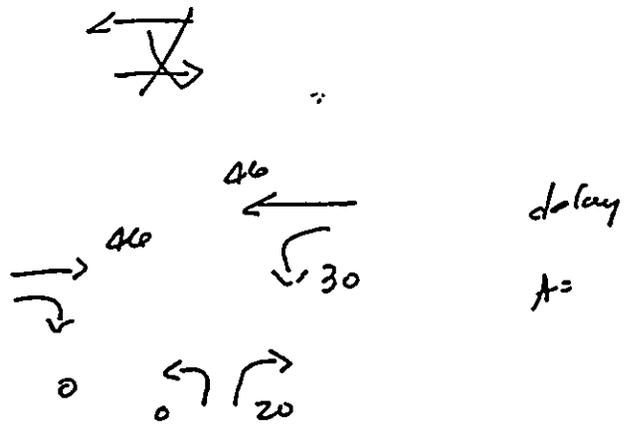
CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS NB	5.50	5.50	0.00	5.50
MAJOR LEFTS WB	5.00	5.00	0.00	5.00
MINOR LEFTS NB	6.50	6.50	0.00	6.50

C-35

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTEN-	ACTUAL	SHARED		RESERVE		LOS
		TIAL CAPACITY c (pcph) P	MOVEMENT CAPACITY c (pcph) M	CAPACITY c (pcph) SH	CAPACITY c (pcph) SH	C = c - v R SH		
MINOR STREET								
NB LEFT	0	798	782	>	782	>	782	> A
RIGHT	22	998	998	>	998	>	976	> A
MAJOR STREET								
WB LEFT	33	1000	1000		1000		967	A



C-36

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IDENTIFYING INFORMATION

-----

AVERAGE RUNNING SPEED, MAJOR STREET..... 30

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... Kuakini

NAME OF THE NORTH/SOUTH STREET..... Site Access

NAME OF THE ANALYST..... clc

DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89

TIME PERIOD ANALYZED..... Projected PM

OTHER INFORMATION: *sapm* *w/o project*

INTERSECTION TYPE AND CONTROL

-----

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	0	0	0	--
THRU	185	232	0	--
RIGHT	0	0	0	--

NUMBER OF LANES

	EB	WB	NB	SB
LANES	1	2	1	---

C-37

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	-----	---	---	-

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	-----	---	---

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS NB	5.50	5.50	0.00	5.50
MAJOR LEFTS WB	5.00	5.00	0.00	5.00
MINOR LEFTS NB	6.50	6.50	0.00	6.50

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTENTIAL CAPACITY c (pcph) P	ACTUAL MOVEMENT CAPACITY c (pcph) M		SHARED CAPACITY c (pcph) SH	RESERVE CAPACITY		LOS
						c = c - v R	SH	
MINOR STREET								
NB LEFT	0	549	549	>	549	>	549	> A
RIGHT	0	906	906	>	0	>	0	> A
MAJOR STREET								
WB LEFT	0	987	987		987		987	A

C-39

# CORRECTION

THE PRECEDING DOCUMENT(S) HAS  
BEEN REPHOTOGRAPHED TO ASSURE  
LEGIBILITY  
SEE FRAME(S)  
IMMEDIATELY FOLLOWING

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTEN-	ACTUAL		SHARED	RESERVE	LOS
		TIAL CAPACITY c (pcph) P	MOVEMENT CAPACITY c (pcph) M		CAPACITY c (pcph) SH	CAPACITY c = c - v R SH	
MINOR STREET							
NB LEFT	0	549	549	>	549	549	A
RIGHT	0	906	906	>	906	906	A
MAJOR STREET							
WB LEFT	0	987	987		987	987	A

C-39

1985 HCM: UNSIGNALIZED INTERSECTIONS

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IDENTIFYING INFORMATION

-----

AVERAGE RUNNING SPEED, MAJOR STREET..... 30

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... Kuakini

NAME OF THE NORTH/SOUTH STREET..... Site Access

NAME OF THE ANALYST..... clc

DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89

TIME PERIOD ANALYZED..... Projected PM

OTHER INFORMATION: *sapm* *01 Project*

INTERSECTION TYPE AND CONTROL

-----

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	0	40	0	--
THRU	185	232	0	--
RIGHT	0	0	110	--

NUMBER OF LANES

	EB	WB	NB	SB
LANES	1	2	1	--

C-40

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	-

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
NB	5.50	5.50	0.00	5.50
MAJOR LEFTS				
WB	5.00	5.00	0.00	5.00
MINOR LEFTS				
NB	6.50	6.50	0.00	6.50

C-41

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTEN-TIAL CAPACITY c (pcph) P	ACTUAL MOVEMENT CAPACITY c (pcph) M		SHARED CAPACITY c (pcph) SH	RESERVE CAPACITY c = c - v R SH	LOS
MINOR STREET							
NB LEFT	0	522	508	>	508	508	> A
RIGHT	121	906	906	>	906	785	>A
				>	906	785	> A
MAJOR STREET							
WB LEFT	44	987	987		987	943	A

C-42

1985 HCM: UNSIGNALIZED INTERSECTIONS

IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED, MAJOR STREET..... 30  
 PEAK HOUR FACTOR..... 1  
 AREA POPULATION..... 150000  
 NAME OF THE EAST/WEST STREET..... Kuakini  
 NAME OF THE NORTH/SOUTH STREET..... Site Access  
 NAME OF THE ANALYST..... clc  
 DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89  
 TIME PERIOD ANALYZED..... Projected Saturday  
 OTHER INFORMATION: sasat *w/o Project*

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: T-INTERSECTION  
 MAJOR STREET DIRECTION: EAST/WEST  
 CONTROL TYPE NORTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	0	0	0	--
THRU	235	278	0	--
RIGHT	0	0	0	--

NUMBER OF LANES

	EB	WB	NB	SB
LANES	1	2	1	--

C-43

## ADJUSTMENT FACTORS

Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	-

## VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

## CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
NB	5.50	5.50	0.00	5.50
MAJOR LEFTS				
WB	5.00	5.00	0.00	5.00
MINOR LEFTS				
NB	6.50	6.50	0.00	6.50

C-44

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTENTIAL CAPACITY c (pcph) P	ACTUAL MOVEMENT CAPACITY c (pcph) M		SHARED CAPACITY c (pcph) SH		RESERVE CAPACITY c = c - v R SH	LOS
MINOR STREET								
NB LEFT	0	484	484	>	484	>	484	> A
RIGHT	0	855	855	>	855	>	855	> A
MAJOR STREET								
WB LEFT	0	952	952		952		952	A

C-25

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IDENTIFYING INFORMATION

---

AVERAGE RUNNING SPEED, MAJOR STREET..... 30  
 PEAK HOUR FACTOR..... 1  
 AREA POPULATION..... 150000  
 NAME OF THE EAST/WEST STREET..... Kuakini  
 NAME OF THE NORTH/SOUTH STREET..... Site Access  
 NAME OF THE ANALYST..... clc  
 DATE OF THE ANALYSIS (mm/dd/yy)..... 11/27/89  
 TIME PERIOD ANALYZED..... Projected Saturday  
 OTHER INFORMATION: sasat *w/ Project*

INTERSECTION TYPE AND CONTROL

---

INTERSECTION TYPE: T-INTERSECTION  
 MAJOR STREET DIRECTION: EAST/WEST  
 CONTROL TYPE NORTHBOUND: STOP SIGN

TRAFFIC VOLUMES

---

	EB	WB	NB	SB
LEFT	0	110	0	--
THRU	242	278	0	--
RIGHT	0	0	105	--

NUMBER OF LANES

---

	EB	WB	NB	SB
LANES	1	2	1	---

C-46

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	-

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
NB	5.50	5.50	0.00	5.50
MAJOR LEFTS				
WB	5.00	5.00	0.00	5.00
MINOR LEFTS				
NB	6.50	6.50	0.00	6.50

C-47

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTEN-	ACTUAL	SHARED		RESERVE		LOS
		TIAL CAPACITY c (pcph) P	MOVEMENT CAPACITY c (pcph) M	CAPACITY c (pcph) SH	CAPACITY c (pcph) SH	CAPACITY c = c - v R SH		
MINOR STREET								
NB LEFT	0	408	374	>	374	>	374	> B
RIGHT	116	848	848	>	848	>	733	> A
MAJOR STREET								
WB LEFT	121	945	945		945		824	A

C-48

IDENTIFYING INFORMATION

-----

AVERAGE RUNNING SPEED, MAJOR STREET..... 30

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... QUEEN KAAHUMANU HWY

NAME OF THE NORTH/SOUTH STREET..... KAIWI STREET

NAME OF THE ANALYST..... SR

DATE OF THE ANALYSIS (mm/dd/yy)..... 8-4-90

TIME PERIOD ANALYZED..... AM PEAK HOUR

OTHER INFORMATION: QKWAMS2 **W/O PROJECT**

INTERSECTION TYPE AND CONTROL

-----

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND:

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	0	324	208	--
THRU	664	506	0	--
RIGHT	300	0	272	--

NUMBER OF LANES

	EB	WB	NB	SB
LANES	2	1	2	--

C-49

## ADJUSTMENT FACTORS

Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	-

## VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

## CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
NB	5.50	5.50	0.00	5.50
MAJOR LEFTS				
WB	5.50	5.50	0.00	5.50
MINOR LEFTS				
NB	7.00	7.00	0.00	7.00

C-50

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTEN-	ACTUAL	SHARED	RESERVE		LOS
		TIAL	MOVEMENT		CAPACITY		
		CAPACITY	CAPACITY	CAPACITY	c = c	- v	
		p	M	SH	R	SH	
MINOR STREET							
NB LEFT	229	75	0	0	-229		F
RIGHT	299	641	641	641	341		B
MAJOR STREET							
WB LEFT	356	347	347	347	-9		F

C-51

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IDENTIFYING INFORMATION

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AVERAGE RUNNING SPEED, MAJOR STREET..... 30  
 PEAK HOUR FACTOR..... 1  
 AREA POPULATION..... 150000  
 NAME OF THE EAST/WEST STREET..... QUEEN KAAHUMANU HWY  
 NAME OF THE NORTH/SOUTH STREET..... KAIWI STREET  
 NAME OF THE ANALYST..... SR  
 DATE OF THE ANALYSIS (mm/dd/yy)..... 8-4-90  
 TIME PERIOD ANALYZED..... AM PEAK HOUR  
 OTHER INFORMATION: QKWAMPR *W/ PROJECT*

INTERSECTION TYPE AND CONTROL

---

INTERSECTION TYPE: T-INTERSECTION  
 MAJOR STREET DIRECTION: EAST/WEST  
 CONTROL TYPE NORTHBOUND:

TRAFFIC VOLUMES

---

	EB	WB	NB	SB
LEFT	0	327	221	--
THRU	664	506	0	--
RIGHT	320	0	274	--

NUMBER OF LANES

---

	EB	WB	NB	SB
LANES	2	1	2	--

C-52

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	-

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS NB	5.50	5.50	0.00	5.50
MAJOR LEFTS WB	5.50	5.50	0.00	5.50
MINOR LEFTS NB	7.00	7.00	0.00	7.00

C - 53

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTEN-	ACTUAL	SHARED CAPACITY c (pcph) SH	RESERVE CAPACITY		LOS
		TIAL CAPACITY c (pcph) P	MOVEMENT CAPACITY c (pcph) M		c = c	- v	
-----							
MINOR STREET							
NB LEFT	243	75	0	0	-243		F
RIGHT	301	633	633	633	332		B
MAJOR STREET							
WB LEFT	360	338	338	338	-22		F

C-54

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IDENTIFYING INFORMATION

-----

AVERAGE RUNNING SPEED, MAJOR STREET..... 30

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... QUEEN KAAHUMANU HWY

NAME OF THE NORTH/SOUTH STREET..... KAIWI STREET

NAME OF THE ANALYST..... SR

DATE OF THE ANALYSIS (mm/dd/yy)..... 8-4-90

TIME PERIOD ANALYZED..... PM PEAK HOUR

OTHER INFORMATION:- QKWPM92 *W/O PROJECT*

INTERSECTION TYPE AND CONTROL

-----

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND:

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	0	215	140	--
THRU	798	525	0	--
RIGHT	301	0	535	--

NUMBER OF LANES

	EB	WB	NB	SB
LANES	2	1	2	--

C-55

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	---

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
NB	5.50	5.50	0.00	5.50
MAJOR LEFTS				
WB	5.50	5.50	0.00	5.50
MINOR LEFTS				
NB	7.00	7.00	0.00	7.00

C-56

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTEN-TIAL CAPACITY	ACTUAL MOVEMENT CAPACITY	SHARED CAPACITY	RESERVE CAPACITY	LOS
		c (pcph) P	c (pcph) M	c (pcph) SH	c = c - v R SH	
MINOR STREET						
NB LEFT	154	75	18	18	-136	F
RIGHT	589	592	592	592	3	E
MAJOR STREET						
WB LEFT	237	293	293	293	56	E

C-57

IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED, MAJOR STREET..... 30  
 PEAK HOUR FACTOR..... 1  
 AREA POPULATION..... 150000  
 NAME OF THE EAST/WEST STREET..... QUEEN KAAHUMANU HWY  
 NAME OF THE NORTH/SOUTH STREET..... KAIWI STREET  
 NAME OF THE ANALYST..... SR  
 DATE OF THE ANALYSIS (mm/dd/yy)..... 8-4-90  
 TIME PERIOD ANALYZED..... PM PEAK HOUR  
 OTHER INFORMATION: QKWPMPR *W/ P ROJECT*  
 INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: T-INTERSECTION  
 MAJOR STREET DIRECTION: EAST/WEST  
 CONTROL TYPE NORTHBOUND:

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	0	219	218	--
THRU	798	525	0	--
RIGHT	327	0	547	--

NUMBER OF LANES

	EB	WB	NB	SB
LANES	2	1	2	--

C-53

## ADJUSTMENT FACTORS

Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	-

## VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

## CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS NB	5.50	5.50	0.00	5.50
MAJOR LEFTS WB	5.50	5.50	0.00	5.50
MINOR LEFTS NB	7.00	7.00	0.00	7.00

C-59

## CAPACITY AND LEVEL-OF-SERVICE

Page-3

MOVEMENT	FLOW-RATE v (pcph)	POTEN-	ACTUAL	SHARED	RESERVE		LOS
		TIAL CAPACITY c (pcph) p	MOVEMENT CAPACITY c (pcph) M	CAPACITY c (pcph) SH	CAPACITY c = c - v R SH		
MINOR STREET							
NB LEFT	240	75	15	15	-225		F
RIGHT	502	582	582	582	-20		F
MAJOR STREET							
WB LEFT	241	283	283	283	42		E

c-60

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IDENTIFYING INFORMATION

-----

AVERAGE RUNNING SPEED, MAJOR STREET..... 30

PEAK HOUR FACTOR..... 1

AREA POPULATION..... 150000

NAME OF THE EAST/WEST STREET..... QUEEN KAAHUMANU HWY

NAME OF THE NORTH/SOUTH STREET..... KAIWI STREET

NAME OF THE ANALYST..... SR

DATE OF THE ANALYSIS (mm/dd/yy)..... 8-4-90

TIME PERIOD ANALYZED..... SAT PEAK HOUR

OTHER INFORMATION: .QKWSA92 *W/O PROJECT*

INTERSECTION TYPE AND CONTROL

-----

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND:

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	0	250	250	--
THRU	620	407	0	--
RIGHT	220	0	349	--

NUMBER OF LANES

	EB	WB	NB	SB
LANES	2	1	2	--

C-61

## ADJUSTMENT FACTORS

Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	-

## VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

## CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
NB	5.50	5.50	0.00	5.50
MAJOR LEFTS				
WB	5.50	5.50	0.00	5.50
MINOR LEFTS				
NB	7.00	7.00	0.00	7.00

C-62

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v (pcph)	POTEN-TIAL CAPACITY c (pcph)	ACTUAL MOVEMENT CAPACITY c (pcph)	SHARED CAPACITY c (pcph)	RESERVE CAPACITY c = c - v	LOS
		P	M	SH	R SH	
MINOR STREET						
NB LEFT	275	107	43	43	-232	F
RIGHT	384	686	686	686	302	B
MAJOR STREET						
WB LEFT	275	406	406	406	131	D

C-63

IDENTIFYING INFORMATION

---

AVERAGE RUNNING SPEED, MAJOR STREET..... 30  
 PEAK HOUR FACTOR..... 1  
 AREA POPULATION..... 150000  
 NAME OF THE EAST/WEST STREET..... QUEEN KAAHUMANU HWY  
 NAME OF THE NORTH/SOUTH STREET..... KAIWI STREET  
 NAME OF THE ANALYST..... SR  
 DATE OF THE ANALYSIS (mm/dd/yy)..... 8-4-90  
 TIME PERIOD ANALYZED..... SAT PEAK HOUR  
 OTHER INFORMATION: QKWSAPR *WI PROJECT*

INTERSECTION TYPE AND CONTROL

---

INTERSECTION TYPE: T-INTERSECTION  
 MAJOR STREET DIRECTION: EAST/WEST  
 CONTROL TYPE NORTHBOUND:

TRAFFIC VOLUMES

---

	EB	WB	NB	SB
LEFT	0	262	324	--
THRU	620	407	0	--
RIGHT	298	0	360	--

NUMBER OF LANES

---

	EB	WB	NB	SB
LANES	2	1	2	--

*C-64*

## ADJUSTMENT FACTORS

Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	---	---	---	-

## VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

## CRITICAL GAPS

	TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS				
NB	5.50	5.50	0.00	5.50
MAJOR LEFTS				
WB	5.50	5.50	0.00	5.50
MINOR LEFTS				
NB	7.00	7.00	0.00	7.00

C-65

CAPACITY AND LEVEL-OF-SERVICE

MOVEMENT	FLOW-RATE v(pcph)	POTEN-	ACTUAL	SHARED	RESERVE		LOS
		TIAL	MOVEMENT		CAPACITY	CAPACITY	
		c (pcph)	c (pcph)	c (pcph)	c = c - v		
		P	M	SH	R SH		
MINOR STREET							
NB LEFT	356	99	27				F
RIGHT	396	657	657	27	-329		C
				657	261		
MAJOR STREET							
WB LEFT	288	369	369	369	81		E

C-66

**APPENDIX F**

**BOTANICAL RESOURCES ASSESSMENT  
KAILUA PARK**

# CHAR & ASSOCIATES

Botanical/Environmental Consultants

4471 Puu Panini Ave.  
Honolulu, Hawaii 96816  
(808) 734-7828

August 1990

## BOTANICAL ASSESSMENT KAILUA PARK EXPANSION NORTH KONA DISTRICT, ISLAND OF HAWAI'I

### INTRODUCTION

In response to increasing community needs for more recreational opportunities, the County of Hawai'i, Department of Parks and Recreation is proposing to expand its recreational facilities at Kailua Park. The proposed park expansion would use the remaining 20 acres on the County's 34-acre site which is leased from the State of Hawai'i. Planned facilities include a gymnasium, swimming pool, and multi-purpose field. The 20 acres proposed for the new facilities is undeveloped and supports an open scrub composed primarily of fountain grass and scattered shrubs.

An assessment of the botanical resources on the undeveloped 20-acre portion of Kailua Park was conducted on 06 August 1990. The primary objectives of the field survey were to 1) provide a general description of the vegetation, and 2) search for threatened and endangered plant species protected by Federal and State laws. The scientific names used in this report follow Wagner et al. (1990).

### DESCRIPTION OF THE VEGETATION

The physiognomy is of an open scrubland composed of fountain grass (Pennisetum setaceum) and scattered shrubs. Kiawe trees (Prosopis

pallida) form a somewhat dense thicket just outside the project's boundary.

The substrate is weathered pahoehoe lava flow. Roughly about one-half of the 20-acre site has been bull-dozed during some time in the past. These dozed areas tend to support a more weedy mixture of species along with the ever present fountain grass. Locally abundant on these dozed areas are Natal redtop grass (Rhynchelytrum repens), Florida beggarweed (Desmodium tortuosum), 'uhaloa (Waltheria indica), indigo (Indigofera suffruticosa), and coat buttons (Tridax procumbens). Along the tennis court and BMX track, shrubs of pluchea (Pluchea symphytifolia) are common.

The areas not dozed support a denser cover of fountain grass, from 50 to 60% cover. The woody elements are also more numerous in these areas. Lantana (Lantana camara) is common; koa-haole (Leucaena leucocephala), 'ilima (Sida fallax), the native caper or maiapilo (Capparis sandwichiana), and klu (Acacia farnesiana) are occasional. Areas with depressions usually support larger shrubs of noni (Morinda citrifolia) and Christmas berry (Schinus terebinthifolius), 6 to 10 ft. tall. One small tree each of auto-graph tree (Clusia rosea) and tree heliotrope (Tournefortia argentea) are also found on the property. Locally common in cracks is sword fern (Nephrolepis multiflora).

#### DISCUSSION

The undeveloped 20-acre portion of Kailua Park is vegetated largely by introduced species, principally fountain grass. Native species found on the property are maiapilo, 'ilima, 'uhaloa, and koali-'awania (Ipomoea indica). All are found in similar environmental habitats throughout the Hawaiian Islands. None are officially listed threatened and endangered species; nor are any proposed or candidate for such status (U. S. Fish and Wildlife Service 1989, 1990).

The proposed park expansion will include more landscape plantings. It is recommended that the more ornamental native species, as well as plants originally of Polynesian introduction, be used wherever feasible. Among these are the maiapilo, wiliwili (Erythrina sandwicensis), 'ilima, milo (Thespesia populnea), and kou (Cordia subcordata).

#### References

- U. S. Fish and Wildlife Service. 1989. Endangered and threatened wildlife and plants. 50 CFR 17.11 & 17.12.
- U. S. Fish and Wildlife Service. 1990. Endangered and threatened wildlife and plants; Review of plant taxa for listing as Endangered and Threatened Species; Notice of review. Federal Register 55(35): 6184-6229.
- Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1990. Manual of the flowering plants of Hawai'i. Univ. of Hawai'i Press and B. P. Bishop Museum Press, Honolulu.