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Mayor

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LLOYD P.C.W. LEE, P.E.
Engineering Division

DAVID WISSMAR, P.E.
Solid Waste Division

BRIAN HASHIRO, P.E.
Highways Division

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND WASTE MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

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OFC. OF ENVIRONMENTAL QUALITY CONTROL

September 28, 1995

Mr. Gary Gill
Director
STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
220 South King Street, 4th Floor
Honolulu, HI 96813

SUBJECT: MAUI CENTRAL PARK ROADWAY, PAPA AVENUE EXTENSION AND RELATED DRAINAGE IMPROVEMENTS
TMK: (2)3-7-01:POR. 2 AND (2)3-8-07:POR. 1, POR. 40, 117 AND 125
FEDERAL AID PROJECT NO. STP-0900(37)

Dear Mr. Gill:

In accordance with the requirements of Chapter 343, Hawaii Revised Statutes and Chapter 200 of Title 11, Administrative Rules of the State Department of Health, a Final Environmental Assessment has been prepared for the subject project.

Notice of availability of the Draft Environmental Assessment for the project was published in the August 23, 1995 edition of the OEQC Bulletin.

As the proposing agency, the County of Maui, Department of Public Works and Waste Management has determined that there will be no significant impacts as a result of the project. Accordingly, we are filing the Final Environmental Assessment as a negative declaration.

Enclosed are one (1) copy of the OEQC Bulletin Publication Form and four (4) copies of the Final Environmental Assessment. We respectfully request that notice of the Final Environmental Assessment be published in the next edition of the OEQC Bulletin.

Sincerely,

Charles Jencks
Director of Public Works & Waste Management

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Enclosures

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1995-10-23-MA-FEA Maui Central Park Roadway, Papa Ave.
Extension & Related Drainage Improvements

OCT 23 1995

FILE COPY

Final
Environmental Assessment

Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements

Prepared for

County of Maui, Dept. of Public Works and Waste Management

October 1995

MUNEKIYO & ARAKAWA, INC.

Final Environmental Assessment

Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements

Prepared for

County of Maui, Dept. of Public Works and Waste Management

October 1995

MUNEKIYO & ARAKAWA, INC.

CONTENTS

LIST OF FIGURES

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Preface

The County of Maui, Department of Public Works and Waste Management, proposes to construct traffic and related drainage improvements for the Maui Central Park Roadway and Papa Avenue Extension in Kahului, Maui, Hawaii (TMK (2)3-7-1:por. 2 and (2)3-8-7:por. 1, por. 40, por. 117, and por. 125). Pursuant to 23 CFR 771, U.S. Department of Transportation, Federal Highway Administration, Environmental Impact and Related Procedures; Council on Environmental Quality, Regulations for Implementing the National Environmental Policy Act, 40 CFR 1500-1508; Chapter 343, Hawaii Revised Statutes; and Chapter 200, of Title 11, Administrative Rules, Environmental Impact Statement Rules, this Environmental Assessment documents the project's technical characteristics, environmental impacts and alternatives, and advances findings and conclusions relative to the project.

Summary

Applicant and Landowner

The applicant for the Maui Central Park Roadway, Papa Avenue Extension, and related drainage improvements is the County of Maui, Department of Public Works and Waste Management. Landowners are the County of Maui and the State of Hawaii.

Contact Person

For further information, contact Charles Jencks, Director of Public Works and Waste Management, 200 South High Street, Wailuku, Hawaii 96793, or telephone (808) 243-7835.

Property Location and Description

The Maui Central Park Roadway, Papa Avenue Extension, and related drainage improvements are proposed to be located in Kahului, Maui, Hawaii (TMK (2)3-7-1:por. 2 and (2)3-8-7:por. 1, por. 40, por. 117, and por. 125). The project area extends from the vicinity of Kanaloa Avenue, south of the Maui Zoological and Botanical Gardens, to Kahului Beach Road, between Maui Community College (MCC) and the Maui Arts and Cultural Center (MACC). Lands extending from the Papa Avenue and Kaahumanu Avenue intersection to the proposed Roadway are also included in the scope of the project. The lands underlying the proposed right-of-way are primarily owned by the County of Maui. A land exchange between the State of Hawaii and County is presently being coordinated for lands under the jurisdiction of the State.

The proposed project will traverse lands that are vacant and primarily vegetated with haole koa, kiawe, bermuda grass, fingergrass, and other low lying shrubs.

Proposed Action

Originally proposed as a four-lane divided parkway from Kahului Beach Road to Kanaloa Avenue, the Maui Central Park Roadway is currently proposed as a four-lane divided roadway from Kahului Beach Road to the proposed Papa Avenue Extension, and a two-lane roadway from the Papa Avenue Extension to Kanaloa Avenue.

With a pavement width of 32 feet, a two-lane, asphalt concrete section of the roadway was completed in early 1994 to provide access to the MACC. In addition to a 16-foot wide landscaped median with concrete curbs, existing improvements include a 10-foot wide shoulder consisting of a 6-foot wide concrete sidewalk and grass landscaping. Defined by a 90-foot right-of-way, the existing segment measures approximately 1,000 feet and extends from Kahului Beach Road to the MACC entrance.

Adjoining the existing median, proposed improvements within this section include a two-lane, 24-foot wide asphalt concrete roadway with concrete curb and gutter and a 7-1/2 foot wide concrete sidewalk.

A four-lane roadway within a 100-foot right-of-way is proposed from the MACC entrance to the proposed Papa Avenue Extension. Approximately 500-feet in length, the proposed roadway section will also include a 16-foot wide landscaped median with concrete curbs on both sides. Two (2) asphalt concrete roadways with concrete curbs and gutters will adjoin each side of the median. With a curb-to-curb width of 32-feet, each roadway will abut a 10-foot wide shoulder consisting of a concrete sidewalk and grass landscaping.

Defined by a 60-foot right-of-way, a two-lane asphalt concrete roadway section is proposed from the Papa Avenue Extension to Kanaloa Avenue, a distance of approximately 1,700 feet. With a pavement width of 44 feet, proposed improvements include two (2) 14-foot wide travel lanes with adjoining 8-foot wide parking lanes and concrete curbs and gutters. In addition, an 8-foot wide bikeway is proposed along each side of the roadway.

Measuring approximately 1,050 feet, the Papa Avenue Extension is proposed as a two-lane collector road within a 60-foot right-of-way. With a pavement width of 36 feet, proposed improvements include two (2) 12-foot wide, asphalt concrete travel lanes with adjoining 6-foot wide paved shoulders and 12-foot wide grassed drainage swales. Adjoining the MCC dormitories, an existing 350-foot section of Papa Avenue will also be widened and resurfaced to match the proposed Extension.

An existing 800-foot section of Papa Avenue, south of the Papa and Kaahumanu Avenue intersection, will also be widened to include an additional south bound travel lane with adjoining 6-foot wide bikelane and 4-foot wide paved shoulder.

Proposed drainage improvements include the installation of roadway catch basins from the MACC entrance to Kanaloa Avenue. Runoff will be conveyed through 24-inch and 30-inch diameter underground culverts and allowed to pond in natural low lying areas beyond the County-owned right-of-way. The culverts and drainage areas will be sized to accommodate a one-hour storm with a recurrence interval of 50-years. It should be noted that drainage catch basins along the 90-foot right-of-way were previously installed in connection with the development of the existing 1,000-foot roadway section.

Located within the right-of-way, 12-foot wide grassed drainage swales will convey runoff along the Papa Avenue Extension to catch basins near the Maui Central Park Roadway's intersection with the proposed Extension.

Additional drainage improvements include a 72-inch diameter underground drainline to convey future flows. Beginning at the southeast corner of the Papa and Kaahumanu Avenue intersection, the drainline will cross under Kaahumanu Avenue, proceed in a northerly direction along the Papa Avenue Extension, and connect to a proposed 20-foot wide, open concrete drainage channel.

In addition, one (1) 72-inch and three (3) 60-inch diameter drainlines are proposed at the Maui Central Park Roadway's intersection with the Papa Avenue Extension. These drainlines will parallel the Roadway, cross beneath the Extension, and connect to the concrete drainage channel.

The proposed concrete drainage channel will adjoin the Maui Central Park Roadway to the south and terminate at a 7-acre retention basin, south of the Roadway's intersection with Kahului Beach Road.

The additional drainage improvements implement the recommendations of the Kahului Drainage Master Plan and are designed to accommodate anticipated flows. Considered a component of the Kahului Drainage Master Plan, the flows conveyed by the additional improvements will be deferred until adjoining master-planned drainage system improvements have been developed.

Determination

The proposed project will traverse lands which are currently undeveloped. As such, the proposed project will not involve the displacement or relocation of any residents or structures. In addition, the U.S. Army Corps of Engineers has indicated that there are no wetlands or other waters of the U.S. located within the project area.

Construction of the proposed project will involve short-term environmental impacts typically associated with construction activities. These include air quality and noise impacts. Dust control measures such as watering and sprinkling will be undertaken to minimize dust. Construction activities are also anticipated to be limited to daylight hours. Impacts generated from construction activities are not considered adverse.

From a long-term perspective, the proposed project is not anticipated to result in adverse environmental impacts. Based on the recent development of other projects in the area, such as MCC's Building "J" and Building "S", as well as the MACC and

YMCA, there are no rare, endangered, or threatened species of flora or fauna anticipated within the project area. In addition, the State Historic Preservation Division (SHPD) has indicated that there were no historic sites located in the project area. Accordingly, the proposed project will have "no effect" on historic sites. In the event any human remains or artifacts are encountered during construction, applicable procedures to ensure compliance with Chapter 6E, HRS, will be followed.

On a short-term basis, construction related employment is anticipated to have a positive effect on the local economy. The proposed project will have a positive impact on peak period traffic operations by redistributing traffic and reducing the demands at congested intersections. The roadways will also serve to help distribute traffic whenever there are special events at the War Memorial complex or at the Maui Central Park. Pedestrian crossings, integrated with drainage culverts, are proposed to traverse the open concrete drainage channel along the Maui Central Park Roadway and provide access between the MACC and MCC campus. In addition, the proposed Roadway will also be designed to permit future vehicular access to MCC facilities. The proposed drainage system improvements implement recommendations established by the Kahului Drainage Master Plan. It is therefore anticipated that there will be no adverse drainage impacts as a result of the project.

In addition, the project is not anticipated to have adverse impacts upon medical, police, and fire protection services as well as other infrastructure systems.

In light of the foregoing findings, it is concluded that the proposed action will not result in any adverse environmental effects.

Chapter I

Project Overview

I. PROJECT OVERVIEW

A. PROPERTY LOCATION, EXISTING USE, AND LAND OWNERSHIP

The County of Maui, Department of Public Works and Waste Management (DPWWM), proposes to construct traffic and related drainage improvements for the proposed Maui Central Park Roadway and Papa Avenue Extension in Kahului, Maui, Hawaii (TMK (2)3-7-01: por. 2 and (2)3-8-07: por. 1, por. 40, por. 117, and por. 125). See Figure 1.

In 1985, the Maui Central Park Master Plan was created to serve as a guide for land use development within the Maui Central Park, as well as provide recreational facilities and open space resources for the use and enjoyment of the community. The Maui Central Park District was subsequently established by Maui County zoning in 1986, and is generally defined by Kahului Beach Road to the north, Maui Community College to the east, Kaahumanu Avenue to the south, and Kanaloa Avenue to the west. As identified in the master plan, the proposed project will involve roadway and related drainage improvements to lands within the Maui Central Park. The proposed traffic improvements will extend from the Maui Arts and Cultural Center (MACC) access road and proceed in a westerly direction to Kanaloa Avenue in the vicinity of the Central Maui Youth Center. An existing 800-foot segment of Papa Avenue, south of the Kaahumanu and Papa Avenue intersection, will be widened and extended in a northerly direction to link with the proposed Roadway.

The proposed traffic and drainage improvements will traverse level and moderately sloping, undeveloped lands which are currently vegetated with haole koa, kiawe, bermuda and fingergrass, and other low lying shrubs. Two (2) existing drainage retention basins, constructed in support of MACC and Maui Community College (MCC) facilities development, are also situated within the project area.

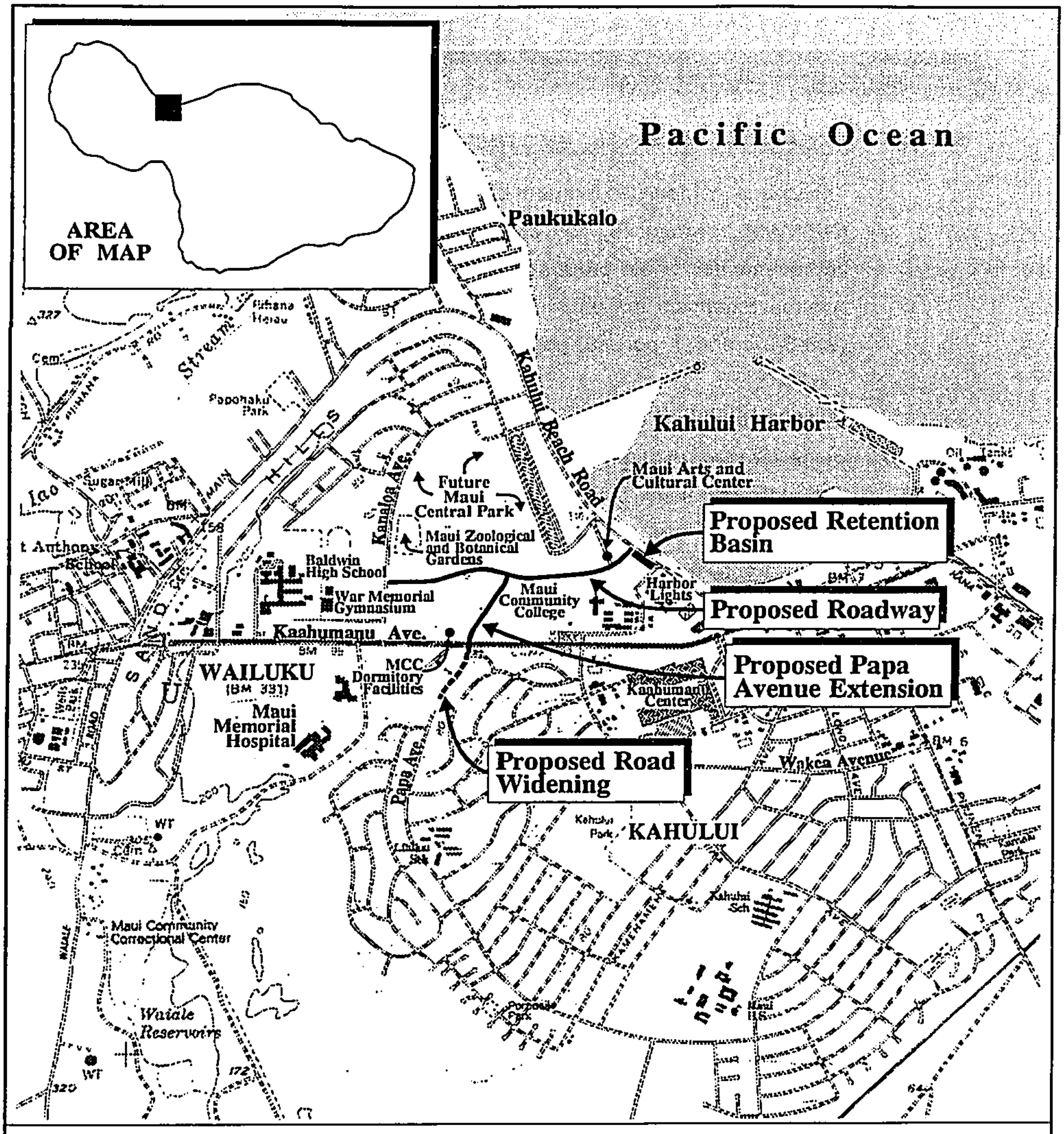


Figure 1 Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements

Regional Location Map

MUNEKIYO & ARAKAWA, INC

Prepare for: County of Maui, Dept. of Public Works and Waste Management

The County of Maui is the landowner of the parcels identified by TMK (2)3-7-01:por. 2 and (2)3-8-07:por. 1 and por. 117. The lands underlying TMK (2)3-8-07:por. 40 and por. 125 are owned by the State of Hawaii. A land exchange involving the State and County is currently being coordinated for lands under the ownership of the State.

B. PROPOSED ACTION

1. Project Need

The Maui Central Park Roadway is anticipated to provide a landscaped entryway to the Maui Central Park, a regional facility which will eventually span the area to the north of the proposed Roadway up to the limits of existing development along Kanaloa Avenue and Kahului Beach Road.

As reflected in Table 1, existing AM and PM peak hour traffic conditions at the following intersections reflect the following levels of service.

Table 1

EXISTING AM AND PM PEAK HOUR TRAFFIC - LEVELS OF SERVICE		
Intersection	**AM**	**PM**
Kaahumanu Avenue/Kahului Beach Road	E	D
Kaahumanu Avenue/Kanaloa Avenue	D	E
Kaahumanu Avenue/Papa Avenue	B	C
Kaahumanu Avenue/Wakea Avenue	C	D

According to the Highway Capacity Manual, Level of Service (LOS) is defined as "a qualitative measure describing operational conditions within a traffic stream". In determining LOS, factors such as speed, delay, safety, driver comfort, traffic interruptions, vehicle density, and freedom to maneuver are considered. LOS

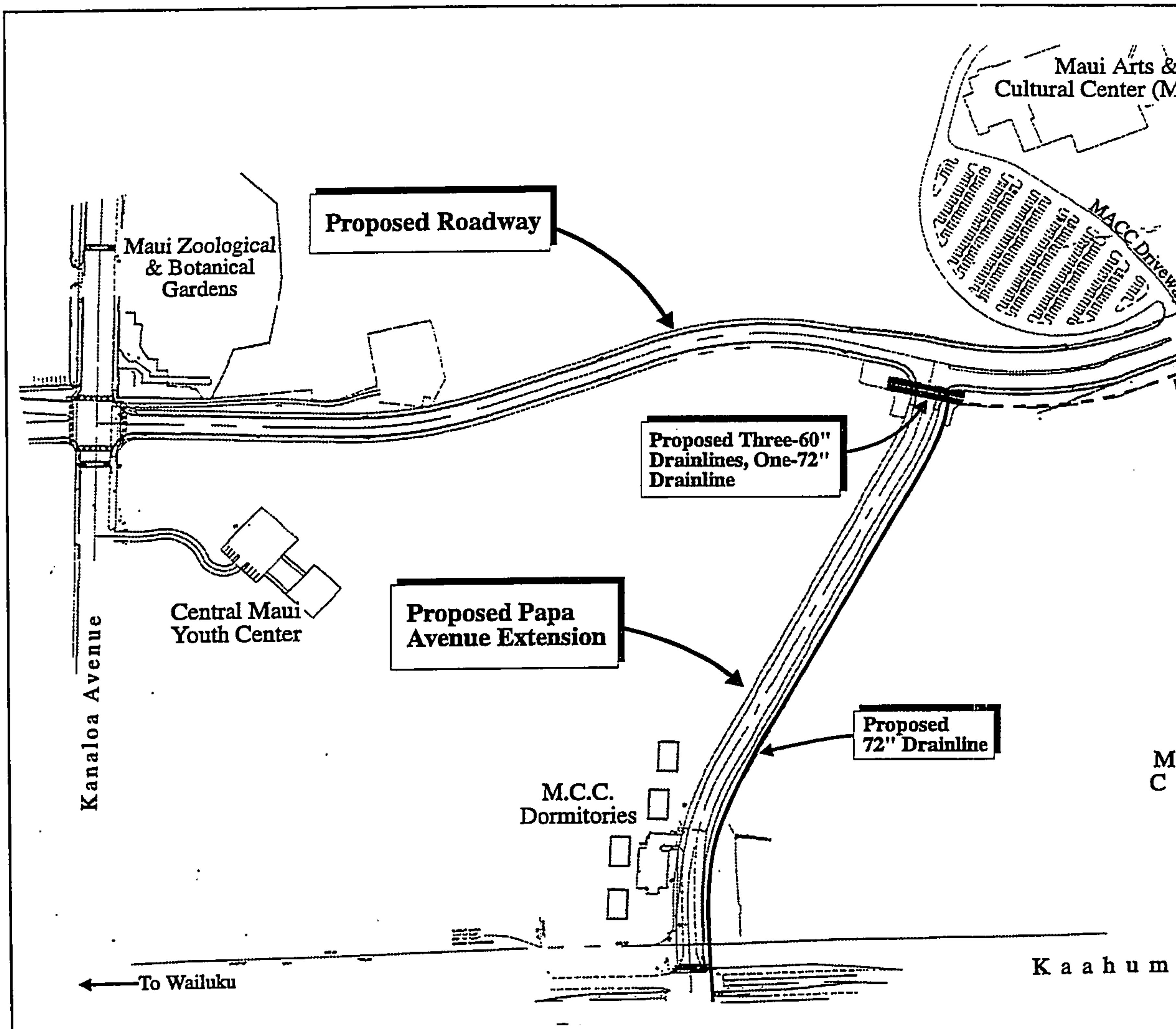
"A", "B", and "C" are considered satisfactory levels of service. LOS "D" is generally considered a "desirable minimum" operating level of service, while LOS "E" and LOS "F" are considered undesirable and unacceptable conditions, respectively.

The proposed Roadway and Papa Avenue Extension are projected to divert some existing traffic from neighboring arterial and collector roads. This would help improve levels of service at a number of key intersections within the Wailuku-Kahului region. During special events at the War Memorial complex, Baldwin High School, MCC, and the MACC, the proposed project will aid in dispersing and transporting traffic from this area.

The proposed road widening improvements along the existing 800-foot section of Papa Avenue, south of the Kaahumanu Avenue intersection, will be implemented to facilitate the movement of traffic along the proposed Papa Avenue Extension and Kaahumanu Avenue. The development of the proposed road widening improvements will involve construction within the County right-of-way. Drainage improvements are also proposed in connection with recommendations established by the Kahului Drainage Master Plan.

2. ***Proposed Improvements***

Originally proposed as a four-lane divided parkway from Kahului Beach Road to Kanaloa Avenue, the Maui Central Park Roadway is currently proposed as a four-lane divided roadway from Kahului Beach Road to the proposed Papa Avenue Extension, and a two-lane roadway from the Papa Avenue Extension to Kanaloa Avenue. See Figure 2.

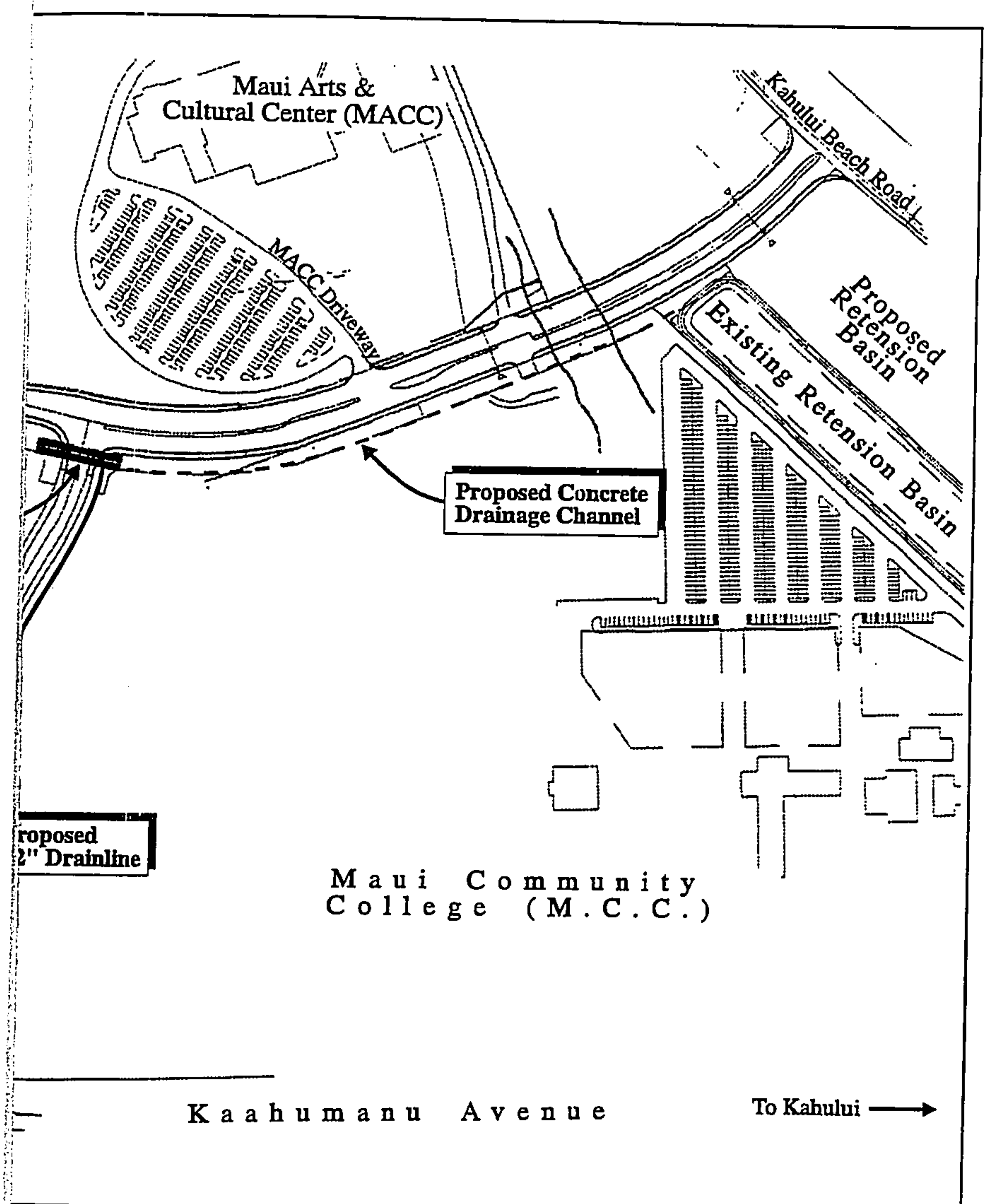


Source: Sato & Associates, Inc.

Figure 2

Maui Central Park Roadway, Papa Av
Extension and Related Drainage Improv
Site Plan

Prepared for: County of Maui, Dept. of Public Works and Waste Management



Roadway, Papa Avenue
Drainage Improvements
e Plan

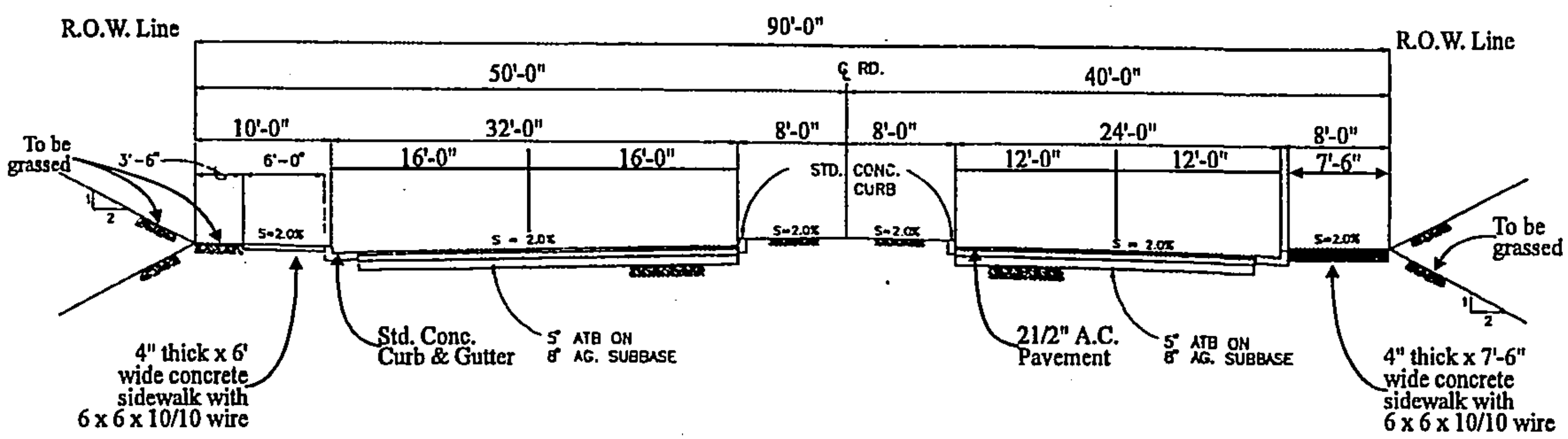
NOT TO SCALE

With a pavement width of 32 feet, a two-lane, asphalt concrete section of the roadway was completed in early 1994 to provide access to the MACC. In addition to a 16-foot wide landscaped median with concrete curbs, existing improvements include a 10-foot wide shoulder consisting of a 6-foot wide concrete sidewalk and grass landscaping. Defined by a 90-foot right-of-way, the existing section measures approximately 1,000 feet and extends from Kahului Beach Road to the MACC entrance.

Adjoining the existing median, proposed improvements within this section include a two-lane, 24-foot wide asphalt concrete roadway with concrete curb and gutter and a 7-1/2 foot wide concrete sidewalk. See Figure 3.

A four-lane roadway within a 100-foot right-of-way is proposed from the MACC entrance to the proposed Papa Avenue Extension. Approximately 500 feet in length, the proposed roadway will also include a 16-foot wide landscaped median with concrete curbs on both sides. Two (2) asphalt concrete roadways with concrete curbs and gutters will adjoin each side of the median. With a curb-to-curb width of 32 feet, each roadway will abut a 10-foot wide shoulder consisting of a concrete sidewalk and grass landscaping. See Figure 4.

Defined by a 60-foot right-of-way, a two-lane asphalt concrete roadway is proposed from the Papa Avenue Extension to Kanaloa Avenue, a distance of approximately 1,700 feet. With a pavement width of 44 feet, proposed improvements include two (2) 14-foot wide travel lanes with adjoining 8-foot wide parking lanes and concrete curbs and gutters. In addition, an 8-foot wide bikeway is proposed along each side of the roadway. See Figure 5.



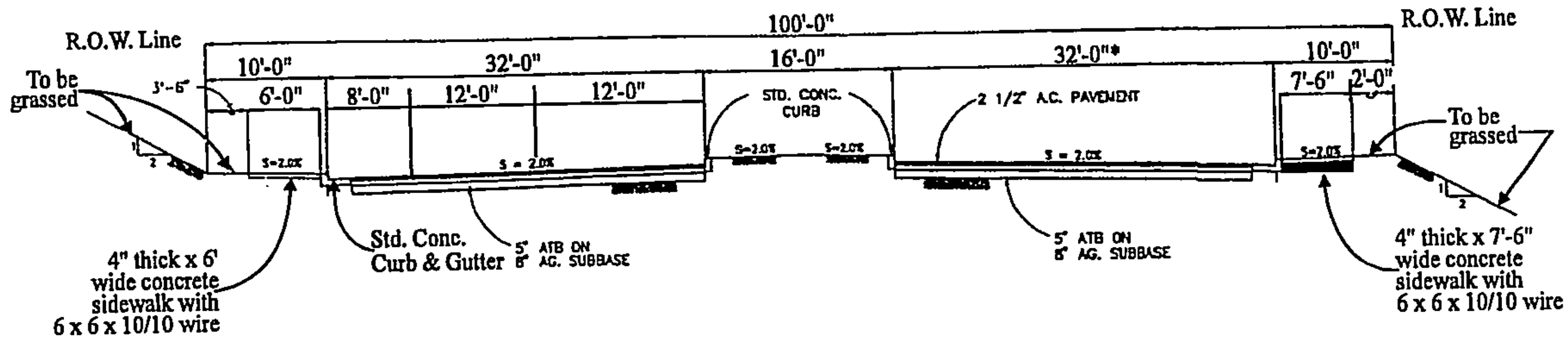
Source: Sato & Associates, Inc.

Figure 3 Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements
Typical 90-Foot Roadway Section

MUNEKIYO & ARAKAWA, INC.

Prepared for: County of Maui, Dept. of Public Works and Waste Management

NOT TO SCALE



*Location of 12-foot travel lane varies due to transitions

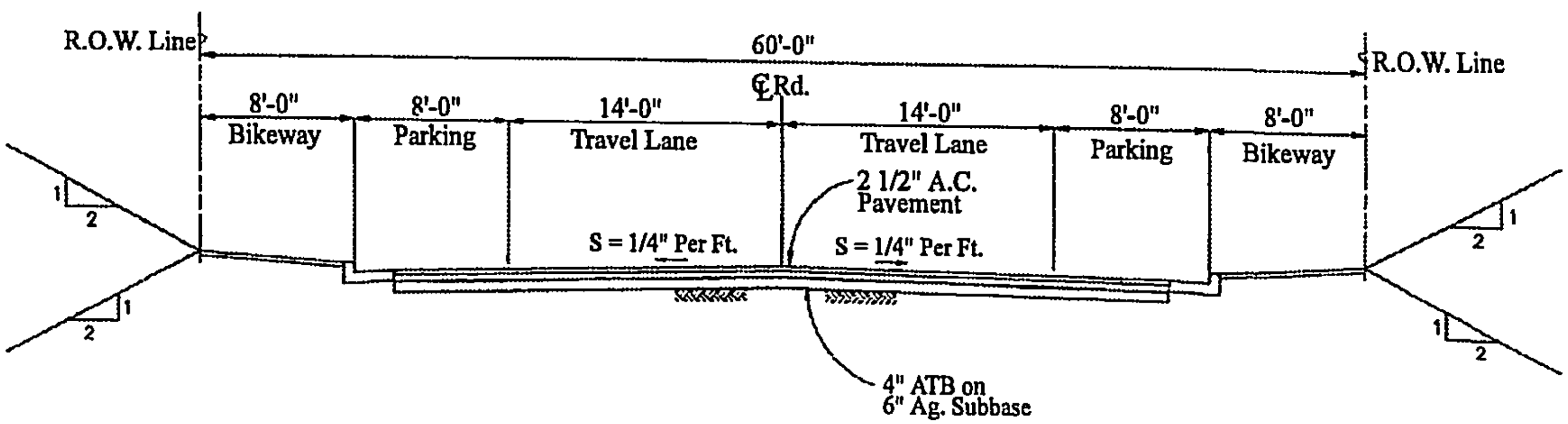
Source: Sato & Associates, Inc.

Figure 4 Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements

Typical 100-Foot Roadway Section

NOT TO SCALE

Prepared for: County of Maui, Dept. of Public Works and Waste Management



Source: Sato & Associates, Inc.

Figure 5 Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements
Typical 60-Foot Roadway Section

Prepared for: County of Maui, Dept. of Public Works and Waste Management

NOT TO SCALE

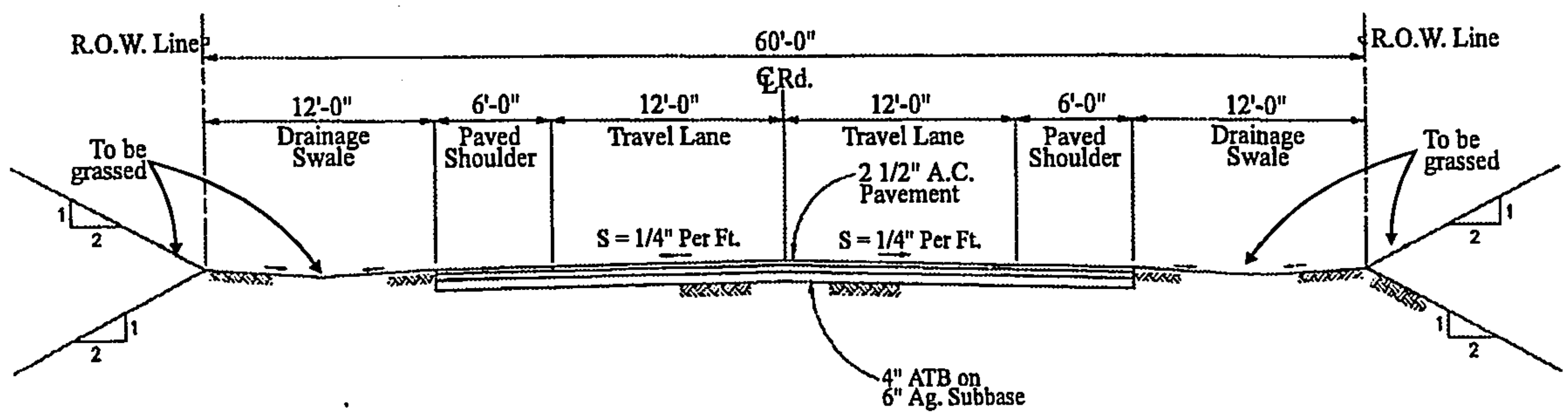
Measuring approximately 1,050 feet, the Papa Avenue Extension is proposed as a two-lane collector road within a 60-foot right-of-way. With a pavement width of 36 feet, proposed improvements include two (2) 12-foot wide, asphalt concrete travel lanes with adjoining 6-foot wide paved shoulders and 12-foot wide grassed drainage swales. Adjoining the MCC dormitories, an existing 350-foot section of Papa Avenue will also be widened and resurfaced to match the proposed Extension. See Figure 6.

It should be noted that the design speed for the proposed traffic improvements will be 30 miles per hour (mph).

An existing 800-foot section of Papa Avenue, south of the Papa and Kaahumanu Avenue intersection, will also be widened to include an additional south bound travel lane with adjoining 6-foot wide bikelane and 4-foot wide paved shoulder. See Figure 7.

Proposed drainage improvements include the installation of roadway catch basins from the MACC entrance to Kanaloa Avenue. Runoff will be conveyed through 24-inch and 30-inch diameter underground culverts. Ponding will be allowed to occur in the area of a future retention basin which the County of Maui intends to own and maintain. The culverts and drainage areas will be sized to accommodate a one-hour storm with a recurrence interval of 50-years. It should be noted that drainage catch basins along the 90-foot right-of-way were previously installed in connection with the development of the existing 1,000-foot roadway section. Refer to Figure 2.

Located within the right-of-way, 12-foot wide grassed drainage swales will convey runoff along the Papa Avenue Extension to

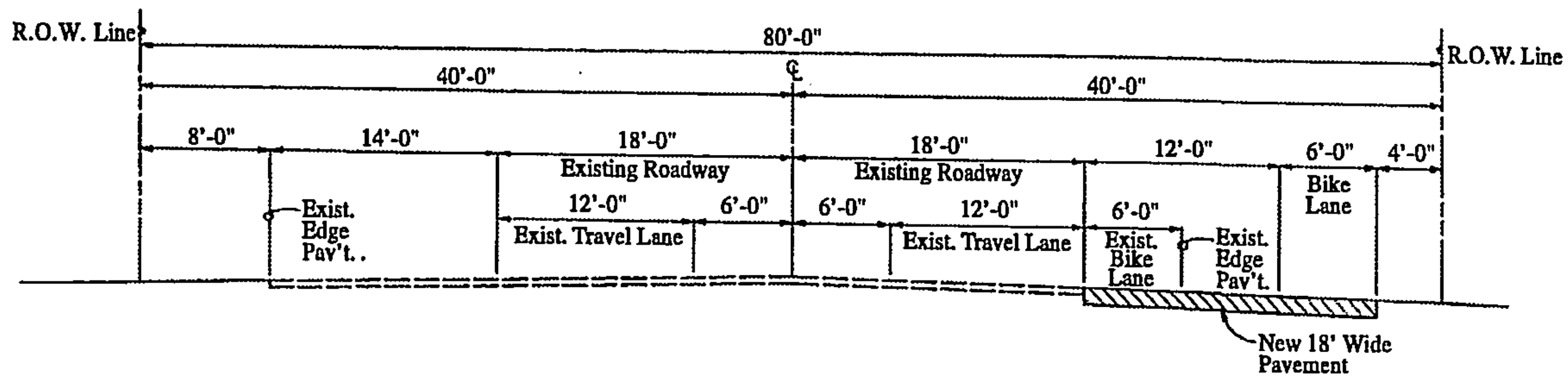


Source: Sato & Associates, Inc.

Figure 6 Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements
Papa Avenue Extension - Typical 60-Foot Roadway Section

Prepared for: County of Maui, Dept. of Public Works and Waste Management

NOT TO SCALE



Source: Sato & Associates, Inc.

Figure 7 Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements
Papa Avenue Road Widening - Typical 80-Foot Section

Prepared for: County of Maui, Dept. of Public Works and Waste Management

NOT TO SCALE

catch basins near the Maui Central Park Roadway's intersection with the proposed Extension. Refer to Figure 2 and Figure 6.

Additional drainage improvements include a 72-inch diameter underground drainline to convey future flows. Beginning at the southeast corner of the Papa and Kaahumanu Avenue intersection, the drainline will cross under Kaahumanu Avenue, proceed in a northerly direction along the Papa Avenue Extension, and connect to a proposed 20-foot wide, open concrete drainage channel. Refer to Figure 2.

In addition, one (1) 72-inch and three (3) 60-inch diameter drainlines are proposed at the Maui Central Park Roadway's intersection with the Papa Avenue Extension. These drainlines will parallel the Roadway, cross beneath the Extension, and connect to the concrete drainage channel. Refer to Figure 2.

The proposed concrete drainage channel will adjoin the Maui Central Park Roadway to the south and terminate at a proposed 7-acre retention basin, south of the Roadway's intersection with Kahului Beach Road. Refer to Figure 2.

The additional drainage improvements implement the recommendations of the Kahului Drainage Master Plan and are designed to accommodate anticipated flows. Considered a component of the Kahului Drainage Master Plan, the flows conveyed by the additional improvements will be deferred until adjoining master-planned drainage system improvements have been developed.

Since Federal funds and State and County lands are involved in the project, a joint Environmental Assessment is being prepared pursuant to the requirements of 23 CFR 771 and 40 CFR 1500-1508 of the Federal Highway Administration (FHWA) and Chapter 343, Hawaii Revised Statues.

The project area falls within Maui County's Special Management Area (SMA). The portion of the Maui Central Park Roadway fronting the MACC was granted an SMA approval in connection with the SMA Use Permit application for the MACC.

An SMA Use Permit application must be reviewed and approved by the Maui Planning Commission for the remainder of the Maui Central Park Roadway improvements, as well as the Papa Avenue Extension, road widening, and drainage system improvements.

The total cost of the project's improvements is estimated to be $4.1 million. Assuming all other applicable permits are obtained, construction of the proposed improvements would commence upon the receipt of Federal Intermodal Surface Transportation Efficiency Act (ISTEA) funds administered by the Statewide Transportation Improvement Program (STIP). The STIP provides matching Federal ISTEA funds for all roads not functionally classified as local or rural minor collectors. Depending on the receipt of STIP funding, project implementation is targeted for Fiscal Years 1995 to 1996.

Chapter II

Description of the Existing Environment

II. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. *PHYSICAL ENVIRONMENT*

1. *Surrounding Land Uses*

The project area is located in Kahului, Maui's center of commerce, and includes the Island's only deep water port and the second busiest airport in the State. With its proximity to Kahului Harbor and Airport, the Kahului region has emerged as the focal point for heavy industrial, light industrial, and commercial wholesale and retail activities and services. Kahului is considered Central Maui's commercial district with Kaahumanu Center, Maui Mall and Kahului Shopping Center, located within a mile from the project area.

To the southeast of the proposed roadway corridors are the MCC campus and Harbor Lights condominium, while to the north is the MACC. The War Memorial complex is located to the west of the Maui Central Park Roadway site, while the MCC dormitories abut the Papa Avenue Extension to the west. Ala Lani Methodist Church, Emmanuel Lutheran Church, and residences of Kahului's Sixth Increment, adjoin the existing segment of Papa Avenue proposed for road widening improvements. In addition, the proposed roadway corridors will traverse vacant lands that are vegetated by haole koa, kiawe, and various low lying shrubs. The development of the Papa Avenue road widening improvements will also involve construction within the County right-of-way.

2. *Climate*

Like most areas of Hawaii, Maui's climate is relatively uniform year-round. Characteristic of Hawaii's climate, the project area experiences mild and uniform temperatures, moderate humidity and relatively consistent northeasterly tradewinds. Variations in the Island's climate is largely left to local terrain.

Average temperatures in the project area (based on temperatures recorded at Kahului Airport) range from the low 60s to the high 80s. August is historically the warmest month, while January and February are the coolest. Rainfall in the project area averages approximately twenty (20) inches per year. Winds in the Kahului region are predominantly out of the north and northeast.

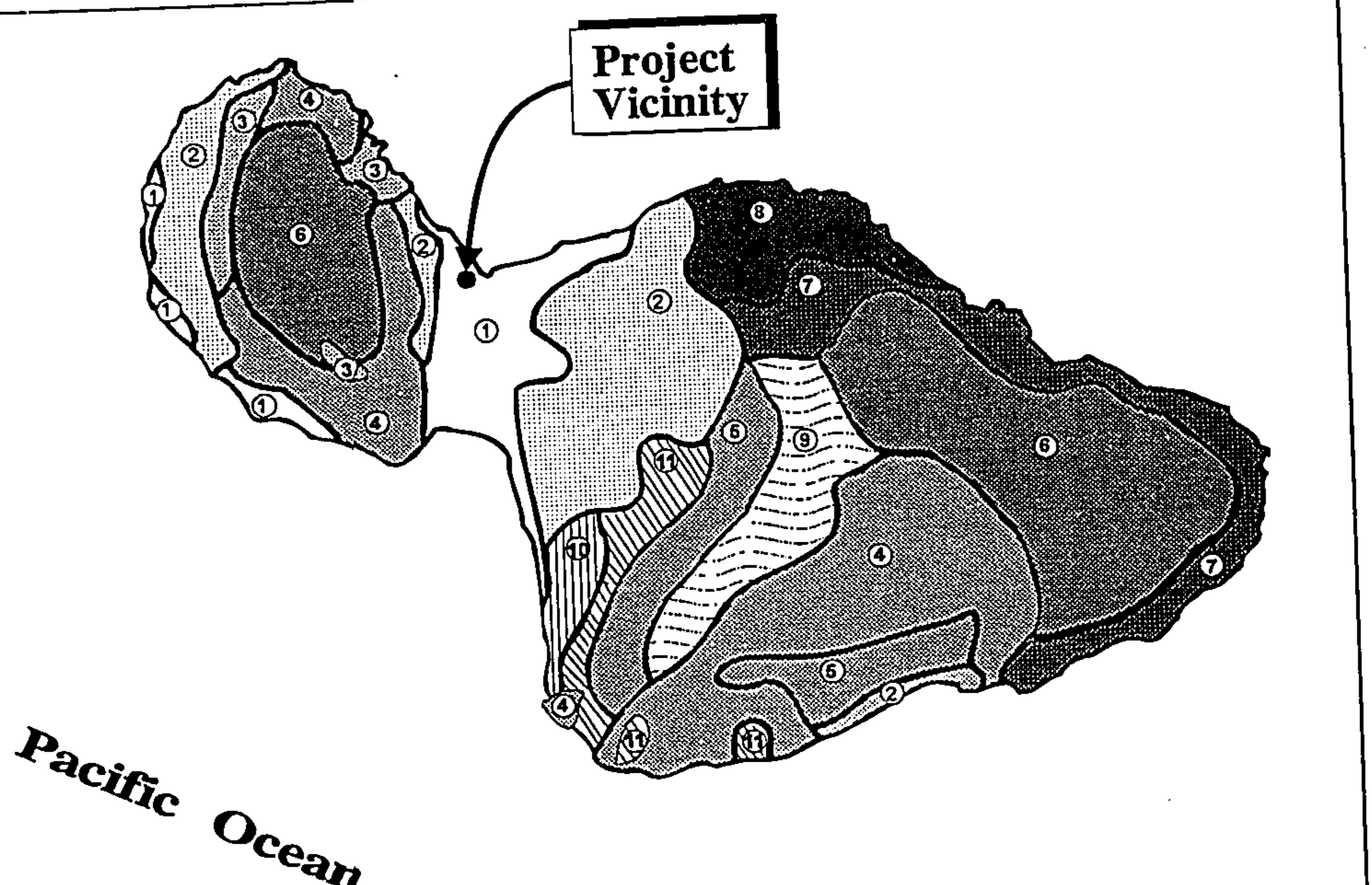
3. *Topography and Soil Characteristics*

The project area is defined by a declining northeasterly slope towards Kahului Beach Road. Sand dunes define the topography to the west of the Maui Central Park Roadway and Papa Avenue Extension intersection. Terrain within the vicinity of the Papa Avenue Extension generally slopes to the north and is characterized by a slope of approximately two (2) percent. Elevations within the project area range from 50 feet to 38 feet.

Underlying the project area and surrounding lands are soils belonging to the Pulehu-Ewa-Jaucas association. See Figure 8. This soil association is characteristically deep and well-drained and located on alluvial fans and in basins. The soil type specific to the project area is of the Puuone Series' Puuone Sand classification (PZUE). See Figure 9. PZUE soils are predominant in the Kahului region and are typified by a sandy surface layer and a cemented sand underlayment. Vegetation associated with this series include bermuda grass, kiawe, and lantana.

LEGEND

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



Map Source: USDA Soil Conservation Service

Figure 8 Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements
Soil Association Map

Prepared for: County of Maui, Dept. of Public Works and Waste Management

NOT TO SCALE

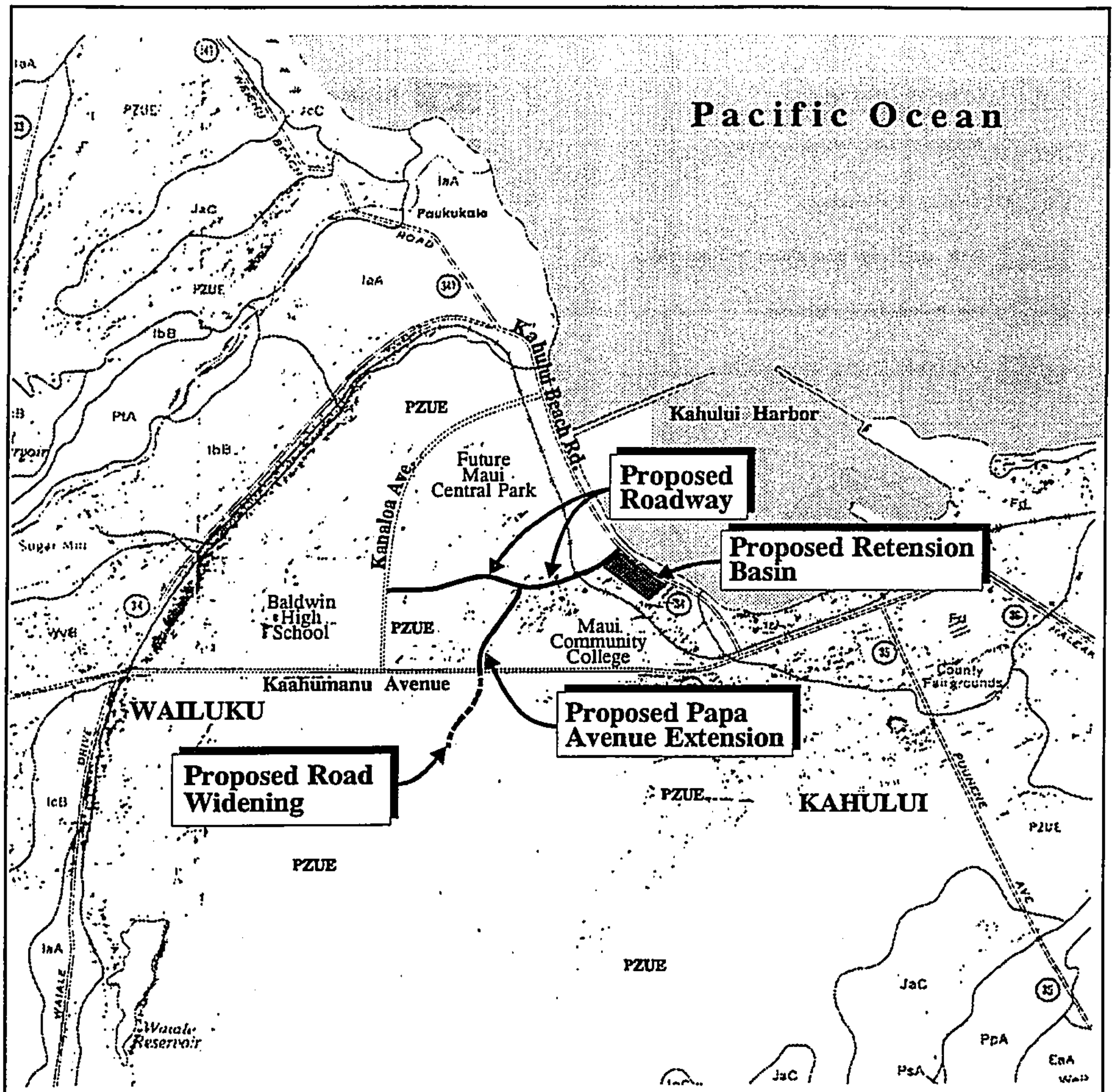


Figure 9 Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements

Soil Classifications Map

1000 4000
0 2000 Feet

Prepared for: County of Maui, Dept. of Public Works and Waste Management

MUNEKIYO & ARAKAWA, INC.

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

Most of the project area is situated within lands that are designated Zone "C" by the Flood Insurance Rate Map. See Figure 10. Zone "C" is an area of minimal flooding. However, the northeastern extent of the project area is designated as Zone "A-4" (areas inundated by the 100-year flood with a base elevation of seventeen (17) feet above mean sea level) and "V-23" (areas inundated by the 100-year coastal flood with velocity hazards and a base flood elevation of seventeen (17) to eighteen (18) feet above mean sea level).

5. ***Flora and Fauna***

The proposed project will traverse vacant lands that are vegetated with haole koa, kiawe, bermuda grass, fingergrass, and other low lying shrubs.

Fauna and avifauna that are found in the vicinity of the project area are typical of Kahului's urban setting. Fauna typically found in the vicinity include mongoose, cats, dogs, and rats. Avifauna typically include mynas, several types of doves, house sparrows, and francolin.

6. ***Archaeological Resources***

An archaeological inventory survey was previously conducted for the area encompassed by the proposed roadway corridors. See Appendix A-1. The field work consisted of a 100 percent surface survey and the excavation of 54 trenches within the corridors of the roadways. Test trenches were excavated either by backhoe or a mechanical excavator.

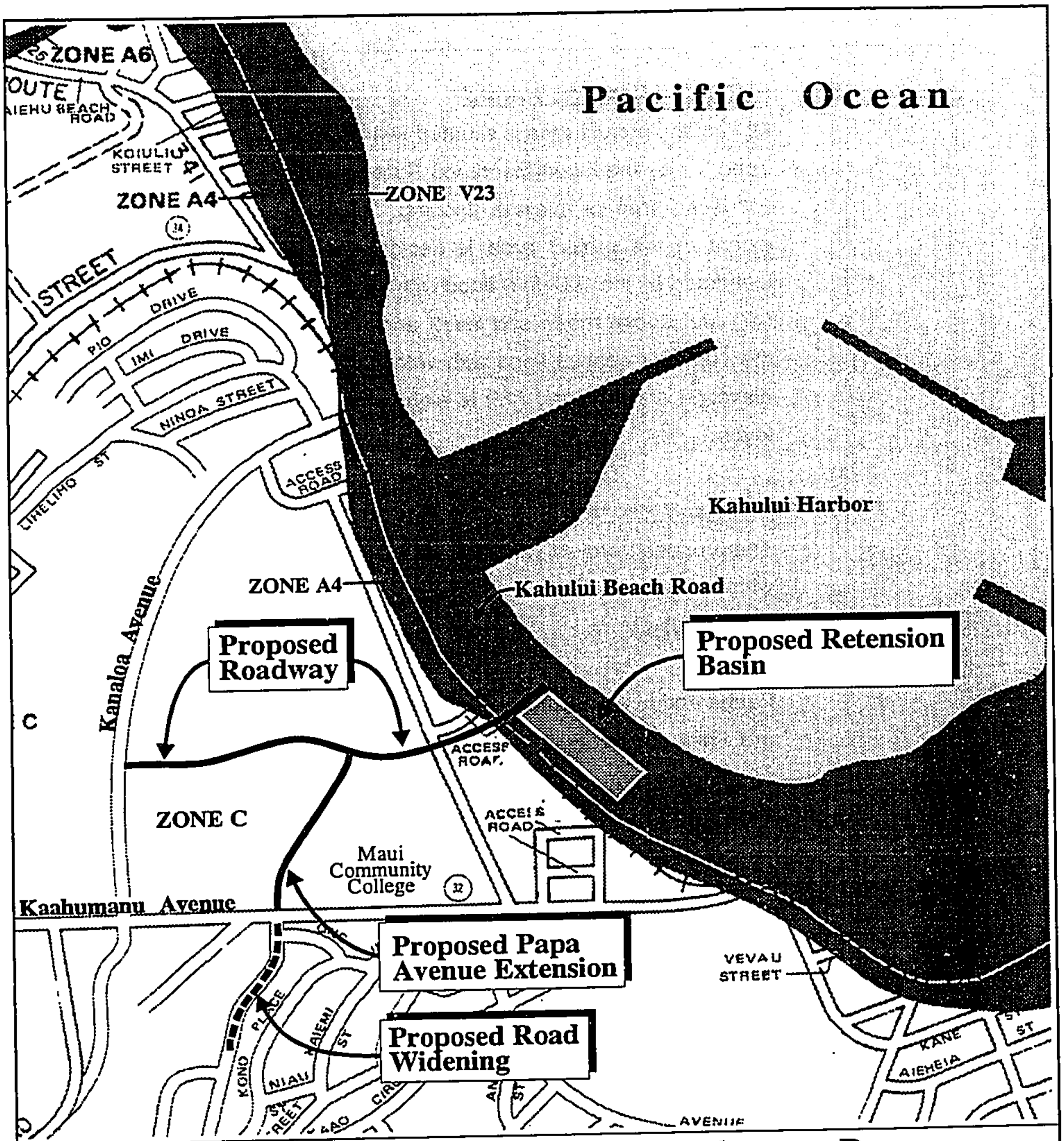


Figure 10 Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements
Flood Insurance Rate Map

Prepared for: County of Maui, Dept. of Public Works and Waste Management

There were no surface features or pre-contact type artifacts recovered during the archaeological survey of the subject property. There were no human burials or human remains encountered.

Subsurface features encountered during mechanical excavation were few and limited to modern historical deposits. There were two (2) features discovered on the subject property.

The first feature consisted of a small pit which contained 25 intact, machine made bottles, associated with copper tubing, oxidized metal in an unidentifiable state, with a large piece of rubber material which encased some of these bottles. Twenty (20) of the bottles were clear and retained their black, plastic screw top caps. Two (2) modern machine made soda bottles were associated with this feature. All bottles appeared modern and less than 50 years old. Accordingly, this feature is not considered vital to the interests of historic preservation.

The second feature was the upper end of a charred wood post or beam, which may have been squared. The shape of the post and its undecomposed state suggest that it is less than 50 years old. It is expected that a wooden post, much older than 50 years, would have decomposed in the aerobic conditions within the sand.

An archaeological inventory survey was recently conducted for the area encompassed by the proposed retention basin. See Appendix A-2. The field work consisted of a pedestrian surface survey and subsurface excavation. The pedestrian survey did not reveal any surface evidence of archaeological features. The study area had been modified in relatively recent times and due to extensive surface disturbance, subsurface testing with a backhoe was initiated.

A total of 23 test trenches were excavated during the subsurface testing phase, with preliminary results revealing that the study area had been filled in modern times.

Initial results from the survey revealed that the study area had been extensively filled in the relatively recent past. No evidence of material culture remains were located during the pedestrian survey and subsurface testing of the parcel.

7. ***Air Quality***

Air quality in the Wailuku-Kahului region is considered good as point sources (e.g., Maui Electric Power Plant, HC&S Mill) and non-point sources (e.g., automobile emissions) of emission do not generate high concentrations of pollutants. The relatively high quality of air can also be attributed to the region's constant exposure to winds which quickly disperse concentrations of emissions. This rapid dispersion is evident during sugar cane burning operations in fields southeast of Kahului's residential district.

8. ***Noise***

Traffic noise generated by vehicles traveling along Kahului Beach Road and Kanaloa, Kaahumanu and Papa Avenues, is the predominant source of background noise in the vicinity of the project. To the east, Kahului Harbor operations occasionally add to the background noise levels in the surrounding region.

9. ***Scenic and Open Space Resources***

Scenic resources to the west of the project area include Iao Valley and the West Maui Mountains. Looking southeast, Haleakala is clearly visible. To the northeast, lies Kahului Harbor and the Pacific Ocean, while to the south lies Kahului's commercial district.

B. *SOCIO-ECONOMIC ENVIRONMENT*

1. ***Population***

The population of the County of Maui has exhibited relatively strong growth over the past decade with the July 1992 resident population estimated to be 108,000, a 51 percent increase over the July 1980 population of 71,600 (Maui County Data Book, December 1994). Growth in the County is expected to continue, with resident population projections to the years 2000 and 2010 estimated to be 112,349 and 133,459 respectively (Community Resources, Inc., January 1994).

The Wailuku-Kahului Community Plan region is anticipated to follow the Countywide pattern of population growth, with the region's 1990 population of 32,816 expected to rise to 40,452 by the year 2000 and to 48,132 by the year 2010 (Community Resources, Inc., January 1994).

2. ***Economy***

As noted previously, the Kahului region is the Island's center of commerce. Combined with neighboring Wailuku, the region's economic character encompasses a broad range of commercial, service, and governmental activities. In addition, the region is surrounded by agricultural lands which include macadamia nut orchards and sugar cane and pineapple fields. This vast expanse of agricultural land, managed by Hawaiian Commercial & Sugar (HC&S) and Wailuku Agribusiness, is considered a key component of the local economy.

C. *PUBLIC SERVICES*

1. *Recreational Facilities*

The Wailuku-Kahului region provides a full range of recreational opportunities, including shoreline and boating activities at Kahului Harbor and nearby beach parks, and individual and organized athletic activities available at numerous County parks and the War Memorial complex. The project area is in close proximity to County facilities such as Kahului Community Center and Kanaha Beach Park, as well as Iao Valley State Park. In addition, the proposed project will provide access for the Maui Central Park.

2. *Police and Fire Protection*

Police protection for the Wailuku-Kahului region is provided by the Maui Police Department's (MPD) headquarters in Wailuku, approximately 0.3 mile from the project's Kanaloa Avenue intersection. The region is served by the MPD's Wailuku patrol division.

Fire prevention, suppression, and protection services for the Wailuku-Kahului region are provided by the Maui Fire Department's (MFD) Wailuku Station, approximately 1.0 mile from the Maui Central Park Roadway's intersection at Kanaloa Avenue. In addition, the MFD's new Kahului Station (located on Dairy Road), is approximately 2.2 miles from the project's Kahului Beach Road intersection.

3. ***Solid Waste***

Single-family residential solid waste collection service is provided by the County of Maui on a once-a-week basis. Residential solid waste collected by County crews is transported to the County's 55-acre Central Maui Landfill, located four (4) miles southeast of the Kahului Airport. The Central Maui Landfill also accepts commercial waste from private collection companies.

4. ***Health Care***

Maui Memorial Hospital, the Island's only major medical facility, also services the Wailuku-Kahului region. Acute, general and emergency care services are provided by the 145-bed facility. In addition, numerous privately operated medical/dental clinics and offices are located in the area to serve the region's residents.

5. ***Schools***

The Wailuku-Kahului region is served by the State Department of Education's (DOE) public school system as well as several privately operated schools. DOE facilities in the Kahului area include Lihikai and Kahului Schools (Grades K-6), Maui Waena Intermediate School (Grades 7-8), and Maui High School (Grades 9-12). Existing facilities in the Wailuku area include Wailuku Elementary School (Grades K-6), Iao Intermediate School (Grades 7-8), and Baldwin High School (Grades 9-12). Maui Community College, a branch of the University of Hawaii, serves as the Island's only higher education facility.

D. *INFRASTRUCTURE*

1. *Roadways*

Kaahumanu Avenue and Kahului Beach Road are the major roadways linking Kahului with Wailuku. These roadways are heavily utilized during the peak commuter traffic hours. Kanaloa Avenue provides a cross link between Kaahumanu Avenue and Kahului Beach Road.

Kaahumanu Avenue is a two-way, four- to six-lane, divided State arterial highway. All of the intersections within the study area are controlled by traffic-actuated traffic signal systems, which are supervised by a master controller for coordinated operations. Each of the intersections is channelized to provide for separate left-turn lanes and right-turn deceleration lanes on the Kaahumanu Avenue roadway approaches to each of the intersections. The traffic signal systems function on a protected/permissive mode for left-turning vehicles on Kaahumanu Avenue.

Kahului Beach Road is a two-way, two-lane State collector road. It begins at Kaahumanu Avenue and ends at the Lower Main Street and Waiehu Beach Road intersection, about 0.2 mile north of the Kanaloa Avenue intersection. It should be noted that Kahului Beach Road is currently being widened to accommodate four-lanes.

Between Kaahumanu Avenue and the War Memorial complex, Kanaloa Avenue is a two-way, four-lane County collector road. Kanaloa Avenue then narrows to a two-lane roadway from the War Memorial complex to its intersection with Kahului Beach Road.

The Kahului Beach Road and Kanaloa Avenue intersection is controlled by a three-phase, traffic-actuated signal system.

Traversing the town of Kahului, Papa Avenue is a two-way, two- to four-lane County collector road which proceeds in a southeasterly direction to link Kaahumanu Avenue with Puunene Avenue, a State arterial highway.

2. ***Wastewater***

Domestic wastewater generated in the Wailuku-Kahului region is conveyed to the County's Wailuku-Kahului Wastewater Reclamation Facility located one-half mile south of Kahului Harbor. The design capacity of the facility is 6.0 million gallons per day (mgd). Average daily flow currently processed through the plant is approximately 6.28 mgd (telephone conversation with Dave Taylor, Wastewater Reclamation Division, March 1995).

3. ***Water***

The Wailuku-Kahului region is served by the Board of Water Supply's (BWS) domestic water system. Water drawn from the Iao Aquifer System is conveyed to this region for distribution and consumption. The Iao Aquifer, which serves the Central Maui region, has an estimated sustainable yield of 20 mgd. Recent estimates place the monthly average withdrawal from the aquifer at approximately 19 mgd (telephone conversation with Ellen Kraftsow, Department of Water Supply, March 1995).

4. ***Drainage***

Currently, the area encompassed by the proposed project is predominantly unimproved and vegetated with haole koa, kiawe, bermuda and fingergrass, and other low lying shrubs. The project area slopes in a northeasterly direction from Kanaloa Avenue toward Kahului Beach Road. The area's rolling sand dunes provide natural depressions and areas for storm water ponding and disposal.

Two (2) existing drainage retention basins, constructed in support of MACC and MCC facilities development, are situated to the southeast of the Roadway's intersection with Kahului Beach Road.

The retention basin developed in connection with the MACC and MCC improvements measures approximately three (3) acres. Controlled flows from the retention basins are then discharged into Kahului Harbor through four (4) drainage outlets located along Kahului Beach Road, between the Maui Central Park Roadway and Kaihee Street.

Chapter III

Potential Impacts and Mitigation Measures

III. POTENTIAL IMPACTS AND MITIGATION MEASURES

A. PHYSICAL ENVIRONMENT

1. Surrounding Land Uses

The proposed traffic improvements will provide access to the MACC and the Maui Central Park.

The proposed project is not anticipated to have an adverse effect on surrounding land uses and activities.

2. Topography

The proposed project will involve the clearing, grubbing and grading of lands that are presently undeveloped. Excavation and filling will be required for the construction of the roadways. In general, however, finished contours will follow existing grades to minimize earthwork costs and maintain existing drainage patterns which tie into the immediate surrounding lands.

While terrain within the corridors will be locally modified to meet design requirements for roadway grades, the proposed traffic and drainage improvements will not disturb the relatively flat slope that is characteristic of the Kahului region.

3. Flora and Fauna

Based upon the recent development of other projects in the area, such as MCC's Building "J" and Building "S", as well as the MACC and YMCA, there are no rare, endangered, or threatened species of flora or fauna anticipated in the project area. The proposed project is not anticipated to have an adverse impact upon these environmental features.

In addition, consultation with the U.S. Army Corps of Engineers indicated that there are no wetlands or other waters of the U.S. situated within the project area. See Appendix B.

4. ***Archaeological Resources***

A previous archaeological inventory survey (Appendix A-1) was conducted for the area encompassed by the proposed roadway corridors and was accepted by the State Historic Preservation Division (SHPD). See Appendix A-3. There were no notable surface features identified during the survey. Two (2) features were identified in the subsurface excavation, a trash pit containing bottles and associated materials, and a wooden post. Neither feature is considered important to the interests of historic preservation.

No notable historic materials were encountered on the roadway corridors. Future construction activities along these corridors will have "no effect" on historic resources.

A separate archaeological inventory survey (Appendix A-2) was also completed for the area encompassed by the proposed retention basin expansion and was accepted by the SHPD. See Appendix A-4. Initial results from the survey revealed that the study area had been extensively filled in the relatively recent past. No evidence of material culture remains were located during the pedestrian survey and subsurface testing of the parcel. Accordingly, the SHPD determined that the development of the retention basin would have "no effect" on historic sites. The SHPD also indicated that realigning the Papa Avenue Extension 20 to 50 feet east of its original alignment to address noise-related concerns by MCC, would also result in "no effect" to historic sites. See Appendix A-5.

In case human remains or artifacts are encountered during construction, applicable procedures to ensure compliance with Chapter 6E, HRS, will be followed.

5. ***Air Quality***

Air quality impacts attributed to the project will include dust generated by short-term, construction-related activities. Site work such as grading and utilities and roadway construction for example, will generate airborne particulates. Dust control measures such as regular watering and sprinkling will be implemented as needed to minimize wind-blown emissions.

The proposed traffic improvements will provide and facilitate access to the MACC as well as the Maui Central Park. The MACC and the Maui Central Park site adjoin the project area and are projected to generate a relatively small portion of overall traffic activity in the Kahului region. The proposed project is not anticipated to be detrimental to local air quality.

6. ***Noise***

As with air quality, ambient noise conditions will be impacted by construction activities. Audible construction noise will probably be unavoidable during the construction period. Noise sensitive properties which would experience high levels of noise during construction are the existing Maui Community College student dormitories, adjacent to the Papa Avenue Extension, and areas of the Maui Central Park situated along the proposed Roadway. To aid in the mitigation of noise impacts, construction activities will be conducted during the daylight hours only.

In general, the project will not generate long-term adverse noise conditions. Future traffic noise levels along the existing sections of Papa Avenue, Kaahumanu Avenue, Kanaloa Avenue, and Kahului Beach Road are expected to remain similar to existing levels following completion of the project. Thus, traffic noise mitigation measures along the existing roadways are not considered necessary. See Appendix C.

The greatest increases in traffic noise levels are expected to occur within the Maui Central Park complex, along the Maui Central Park Roadway and Papa Avenue Extension. This is due to the relatively low existing background ambient noise levels within the interior areas of the Maui Central Park which are removed from the existing roadways surrounding the park. Traffic noise contributions from the Maui Central Park Roadway are predicted to be less than 50 dB at the MACC, and adverse noise impacts are not expected at that location.

To address concerns by MCC, the Papa Avenue Extension was realigned 20 to 50 feet east of its original alignment to mitigate noise level impacts to the MCC dormitories. The realignment is anticipated to reduce traffic noise levels in the vicinity of the dormitories by 2 dB to 3 dB. As a result, future traffic noise levels at the student dormitory buildings closest to the Papa Avenue Extension are expected to range from 60 to 58 Ldn, which is below FHA/HUD and FHWA noise abatement guidelines.

Traffic noise mitigation measures are not required due to the relatively low-to-moderate traffic noise levels predicted along the new section of Papa Avenue. However, should noise mitigation measures be desired at the dormitories, there are a number of alternatives, including construction of a 6-foot wall between the dormitory buildings and the Papa Avenue Extension, reduction of vehicle speeds along the Extension, closure and air conditioning of the dormitory units, or sound attenuating windows installed in place of existing dormitory windows.

7. *Scenic and Open Space Resources*

As an at-grade roadway, the proposed project improvements will not adversely impact the scenic and visual character of the surrounding area. The proposed project is located mauka of Kahului Beach Road and will not encroach into view corridors along the shoreline. In addition, the proposed traffic and drainage improvements will traverse lands that are currently undeveloped. As such, the proposed project will not involve the displacement or relocation of any residents or structures.

B. *SOCIO-ECONOMIC ENVIRONMENT AND PUBLIC SERVICES*

1. *Population and the Economy*

On a short-term basis, the project will support construction and construction-related employment. Accordingly, the project will have a beneficial impact on the local economy during the period of construction. In addition, the proposed traffic and drainage improvements will traverse lands that are currently undeveloped. As such, the proposed project will not involve the development or relocation of any residents or structures.

The proposed traffic improvements would provide and facilitate access to the Maui Central Park and the MACC as well as provide additional traffic capacity within the Wailuku-Kahului region. The proposed project is not anticipated to have an adverse impact upon the local economy or population.

2. ***Police, Fire, and Medical Services***

Medical, police and fire protection services are not expected to be adversely impacted by the proposed project. The project will not extend existing service area limits for emergency services.

3. ***Solid Waste***

A solid waste management plan will be developed in coordination with the Solid Waste Division of the County Department of Public Works and Waste Management (DPWWM) for the disposal of clearing and grubbing material from the site during construction.

C. *INFRASTRUCTURE*

1. *Roadways*

Based on the development of a four-lane divided parkway, a traffic assessment report was originally prepared for the project. See Appendix D-1. The report notes that the new roadways will have a positive impact on peak period traffic operations by redistributing traffic and reducing the demands at the congested intersections. The roadways will also serve to help distribute traffic whenever there are special events at the War Memorial complex or at the Maui Central Park.

Based on consultation with the project's traffic consultant, the proposed traffic improvements are anticipated to result in the following estimated average daily traffic (ADT) volumes (personal communication with Ted Kawahigashi, Austin, Tsutsumi & Associates, Inc., July 1995). See Table 2.

Table 2

PROJECTED AVERAGE DAILY TRAFFIC VOLUMES		
	Average Daily Traffic Volumes	
Roadway Segment	Year 1995	Year 2015
Maui Central Park Roadway between Kahului Beach Road and Papa Avenue Extension	2,500	3,500
Maui Central Park Roadway between Papa Avenue Extension and Kanaloa Avenue	3,000	4,200
Papa Avenue Extension	5,000	7,000

The design speed of the proposed roadways will be 30 mph. Overall, the projected levels of service are anticipated to improve as a result of the proposed traffic improvements. Refer to Appendix D-1.

The Maui Central Park Roadway will also be designed to permit future vehicular access to MCC facilities. Pedestrian crossings, integrated with drainage culverts, are proposed to traverse the open concrete drainage channel along the Maui Central Park Roadway and provide access between the MACC and MCC campus.

The conclusions of the traffic assessment are as follows:

1. The proposed improvements will not adversely impact traffic operations on the existing streets in the vicinity of the project.

2. The new roadways offer motorists alternative routes of getting from point to point in the Kahului area.

3. The critical intersections for travel between Wailuku and Kahului remain the same (i.e., the Kaahumanu Avenue/Kanaloa Avenue/Mahalani Street intersection and the Kahului Beach Road/Kanaloa Avenue intersection). Until the master planned roadways by the State Department of Transportation/County of Maui Island-Wide Highway Master Plan are implemented, all traffic between these two population centers must funnel through the two critical intersections.

A subsequent letter resulting from a meeting of the Maui Central Park Advisory Committee indicated that when the overall traffic circulation on the existing arterial roadways adjacent to the Maui Central Park is considered, a two-lane connecting roadway, rather than the originally proposed four-lane divided parkway, would be more appropriate for the roadway section between the Papa Avenue Extension and Kanaloa Avenue. See Appendix D-2.

The recommendations contained in the traffic assessment and the Maui Central Park Advisory Committee letter are proposed to be implemented, as appropriate, in connection with the development of the project. Refer to Appendices D-1 and D-2.

2. *<u>Wastewater</u>*

There will be no net increase in the average daily flow of wastewater for the Kahului Wastewater Treatment Facility as a result of the proposed traffic improvements. As such, the project is not anticipated to have an adverse impact upon the region's wastewater system.

3. ***Water***

Water for landscaping of the project will be furnished by the domestic system servicing the area.

4. ***Drainage and Erosion Control***

Due to the lack of adequate storm drainage facilities in certain developed areas of Kahului, drainage problems can result in property damage, hazardous driving conditions, and the expenditure of public funds for the ensuing maintenance and cleanup.

The Kahului Drainage Master Plan identified five (5) drainage areas, consisting of 2,031 acres, within the Kahului area. Encompassing 705 acres, Area 1 includes five (5) subareas ranging in size from 93 acres to 215 acres. Subarea 1C consists of 93 acres, and includes the project area and lands occupied by MCC, the MACC, and the Harbor Lights condominium.

Proposed drainage improvements include the installation of roadway catch basins from the MACC entrance to Kanaloa Avenue. See Appendix E. Runoff will be conveyed through 24-inch and 30-inch diameter underground culverts and allowed to pond in natural low lying areas beyond the right-of-way. The culverts and drainage areas will be sized to accommodate a one-hour storm with a recurrence interval of 50 years. It should be noted that drainage catch basins along the 90-foot right-of-way were previously installed in connection with the development of the existing 1,000-foot roadway section.

Located within the right-of-way, 12-foot wide grassed drainage swales will convey runoff along the Papa Avenue Extension to catch basins near the Maui Central Park Roadway's intersection with the proposed Extension. Developed peak runoff for the proposed roadways is calculated at 26.7 cubic feet per second (cfs).

Additional drainage improvements include a 72-inch diameter underground drainline to convey future flows. Beginning at the southeast corner of the Papa and Kaahumanu Avenue intersection, the drainline will cross under Kaahumanu Avenue, proceed in a northerly direction along the Papa Avenue Extension, and connect to a proposed 20-foot wide, open concrete drainage channel.

In addition, one (1) 72-inch and three (3) 60-inch diameter drainlines are proposed at the Maui Central Park Roadway's intersection with the Papa Avenue Extension. These drainlines will parallel the Roadway, cross beneath the Extension, and connect to the concrete drainage channel.

The proposed concrete drainage channel will adjoin the Maui Central Park Roadway to the south and terminate at a proposed 7-acre retention basin, south of the Roadway's intersection with Kahului Beach Road.

The capacity of the proposed retention basin is estimated to be 35.2 acre-feet. Projected runoff entering the retention basin from the concrete channel and the existing headwall located south of the Roadway is anticipated to be 22.0 cfs and 6.2 cfs, respectively. The estimated volume required as a result of these flows is projected to be 39,600 cf (cubic feet) and 11,160 cf, respectively. Based on the Grading and Drainage Report prepared by Austin, Tsutsumi & Associates, Inc. for MCC's Building "J", the total runoff entering the existing retention basin is 540,000 cf. The existing total volume required for the proposed retention basin is estimated at 13.6 acre-feet. This will result in an additional storage of 21.6 acre-feet and enable runoff entering the retention basin to be stored on site. Accordingly, no runoff is anticipated to be discharged from the retention basin. The freeboard of the proposed retention basin will be approximately six (6) feet.

The additional drainage improvements implement the recommendations of the Kahului Drainage Master Plan and are designed to accommodate anticipated flows. Considered a component of the Kahului Drainage Master Plan, the flows conveyed by the additional improvements will be deferred until adjoining master-planned drainage system improvements have been developed.

The proposed drainage improvements will be designed to produce no adverse effect to downstream and adjacent properties. In addition, all drainage improvements will conform to, and be coordinated with, applicable governmental standards and agencies.

Chapter IV

Relationship to Governmental Plans, Policies and Controls

IV. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES AND CONTROLS

A. STATE LAND USE DISTRICTS

Chapter 205, Hawaii Revised Statutes, relating to the Land Use Commission, establishes the four major land use districts in which all lands in the State are placed. These districts are designated "Urban", "Rural", "Agricultural", and "Conservation". The subject parcel is within the "Urban" district. See Figure 11. The proposed action involves the use of the property for traffic and related drainage improvements. The proposed use of the property is consistent with "Urban" district provisions.

B. MAUI COUNTY GENERAL PLAN

The Maui County General Plan (1990 Update) sets forth broad objectives and policies to help guide the long-range development of the County. As stated in the Maui County Charter:

> "The purpose of the General Plan is to recognize and state the major problems and opportunities concerning the needs and the development of the County and the social, economic and environmental effects of such development and set forth the desired sequence, patterns and characteristics of future development."

The proposed action is in keeping with the following General Plan objective and policy:

Objective: To develop a program for anticipating and enlarging the local street and highway systems in a timely response to planned growth.

Policy: Ensure that transportation facilities are anticipated and programmed for construction in order to support planned growth.

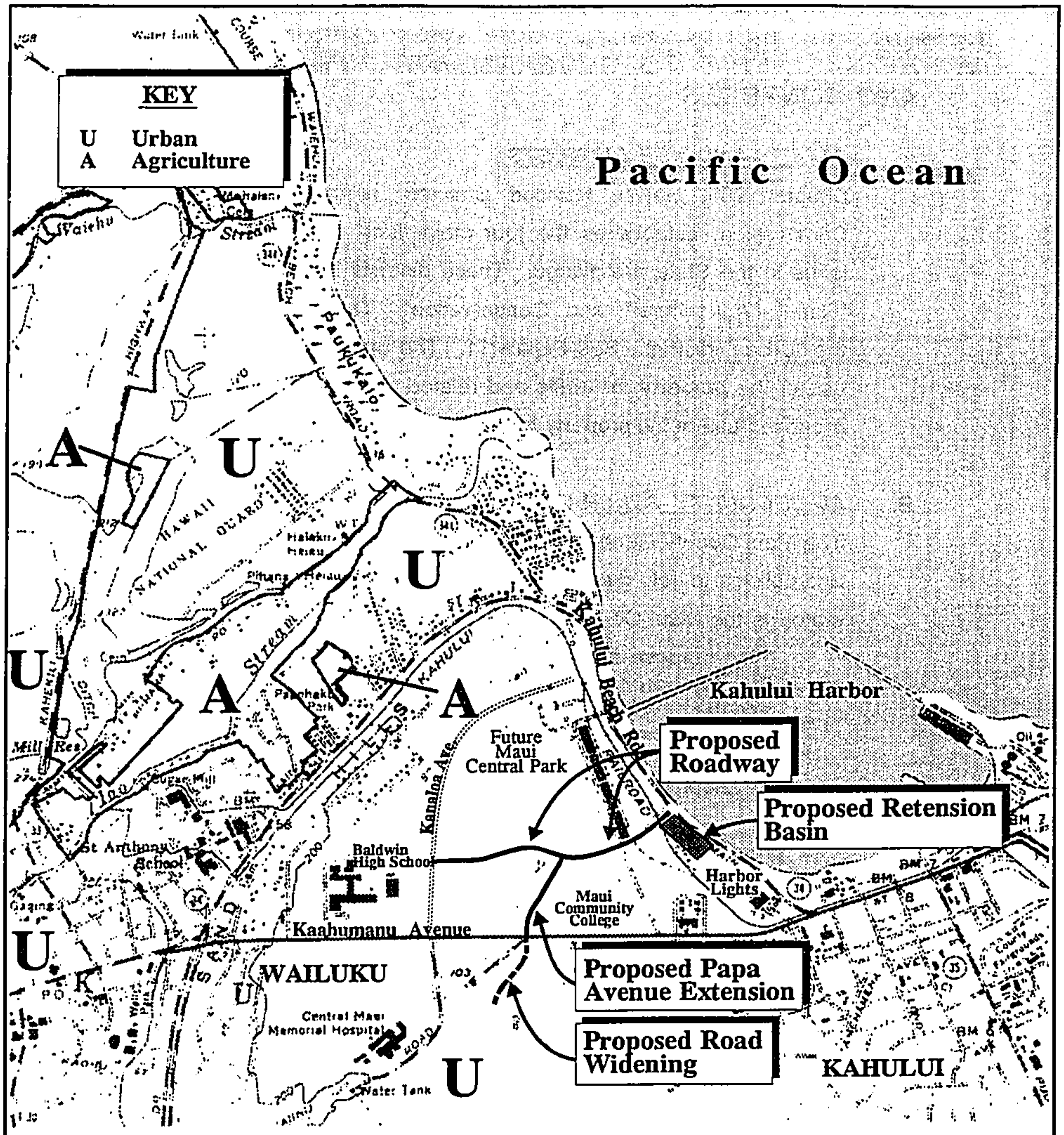


Figure 11 Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements
State Land Use District Designations

Prepared for: County of Maui, Dept. of Public Works and Waste Management

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C. *WAILUKU-KAHULUI COMMUNITY PLAN*

The subject parcel is located in the Wailuku-Kahului Community Plan region which is one of nine Community Plan regions established in the County of Maui. Planning for each region is guided by the respective Community Plans, which are designed to implement the Maui County General Plan. Each Community Plan contains recommendations and standards which guide the sequencing, patterns and characteristics of future development in the region.

Land use guidelines are set forth by the Wailuku-Kahului Community Plan Land Use Map. See Figure 12. The proposed Maui Central Park Roadway and a small portion of the Papa Avenue Extension are designated "Park", while the remainder of the Papa Avenue Extension is designated "Public/Quasi-Public" by the Community Plan.

The proposed project is consistent with the Wailuku-Kahului Community Plan.

D. *SPECIAL MANAGEMENT AREA OBJECTIVES AND POLICIES*

Pursuant to Chapter 205A, Hawaii Revised Statutes, and the Rules and Regulations of the Planning Commission of the County of Maui, projects located within the SMA are evaluated with respect to SMA objectives, policies and guidelines. This section addresses the project's relationship to applicable coastal zone management considerations, as set forth in Chapter 205A and the Rules and Regulations of the Planning Commission.

1. *Recreational Resources*

Objective: Provide coastal recreational resources accessible to the public.

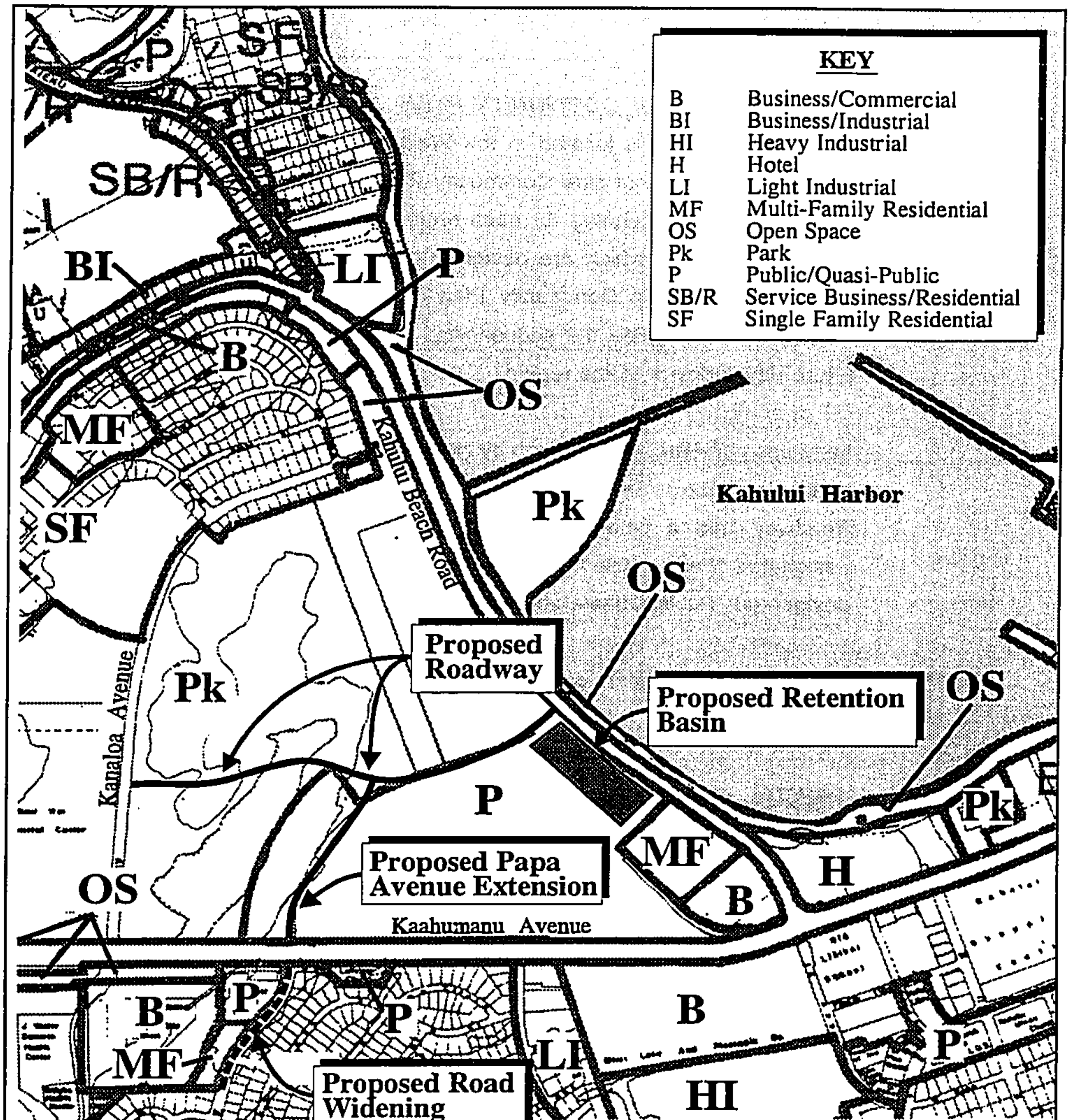
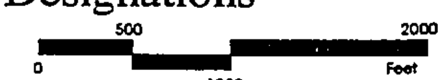


Figure 12 Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements
Wailuku-Kahului Community Plan Land Use Designations



MUNEKIYO & ARAKAWA, INC.

Prepared for: County of Maui, Dept. of Public Works and Waste Management

Policies:

a. Improve coordination and funding of coastal recreation planning and management; and

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

    i. Protecting coastal resources uniquely suited for recreation activities that cannot be provided in other areas;

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

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

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

    v. Ensuring public recreational use of County, State, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

    vi. Adopting water quality standards and regulating point and non-point sources of pollution to protect and where feasible, restore the recreational value of coastal waters; and

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

Response: The proposed project will not impact coastal recreational resources. Access to shoreline areas will remain unaffected by the proposed action.

2. ***Historical/Cultural Resources***

Objective: Protect, preserve and where desirable, restore those natural and man-made historic and prehistoric resources in the coastal zone management areas that are significant in Hawaiian and American history and culture.

Policies:

a. Identify and analyze significant archaeological resources;

b. Maximize information retention through preservation of remains and artifacts or salvage operations; and

c. Support State goals for protection, restoration, interpretation and display of historic resources.

Response: Archaeological surveys conducted within the project area did not reflect any notable findings. The proposed project is considered to have no adverse affect on historical or cultural resources.

3. ***Scenic and Open Space Resources***

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

Policies:

a. Identify valued scenic resources in the coastal zone management area;

b. Insure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural land forms and existing public views to and along the shoreline;

c. Preserve, maintain and, where desirable, improve and restore shoreline open space and scenic resources; and

d. Encourage those developments which are not coastal dependent to locate in inland areas.

Response: The proposed project will not impact coastal scenic and open space resources and is not anticipated to affect scenic view corridors.

4. ***Coastal Ecosystems***

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

Policies:

a. Improve the technical basis for natural resource management;

b. Preserve valuable coastal ecosystems of significant biological or economic importance;

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

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

Response: The development of the proposed improvements is not anticipated to affect coastal ecosystems. Appropriate soil mitigation measures will be implemented during the construction of the project to minimize the disruption of coastal water ecosystems.

5. ***Economic Uses***

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

Policies:

a. Concentrate coastal dependent development in appropriate areas;

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

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

i. Utilization of presently designated locations is not feasible;

ii. Adverse environmental effects are minimized; and

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

Response: The proposed project is an integral element of the development of the Maui Central Park. During the short-term, construction related employment will benefit the local economy. Upon completion, the project is not expected to have an effect on coastal dependent development.

6. ***Coastal Hazards***

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

Policies:

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

b. Control development in areas subject to storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

c. Ensure that developments comply with requirements of the *Federal Flood Insurance Program;*

d. Prevent coastal flooding from inland projects; and

e. Develop a coastal point and nonpoint source and pollution control program.

Response: Most of the project area is situated within lands that are designated Zone "C", areas of minimal flooding. The northeastern extent of the project area is located in lands designated Zone "A4", areas of 100-year flooding, and Zone "V23", areas inundated by the 100-year coastal flood with velocity. The proposed drainage improvements implement the recommendations established by the Kahului Drainage Master Plan and are anticipated to resolve some of the drainage problems associated with Kahului's low lying areas.

7. ***Managing Development***

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

Policies:

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

b. Facilitate timely processing of applications for development permits and resolve overlapping of conflicting permit requirements; and

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

Response: All aspects of development will be conducted in accordance with applicable Federal, State, and County requirements. Opportunities for reviewing the proposed action are available through the early consultation, and public notification, review, and comment processes.

8. Public Participation

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

Policies:

a. Maintain a public advisory body to identify coastal management problems and to provide policy advise and assistance to the coastal zone management program;

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

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

Response: As previously noted, opportunities for agency and public review of the proposed action are provided through Federal and State notification, review, and comment processes, as well as the County Special Management Area permitting process.

9. ***Beach Protection***

Objective: Protect beaches for public use and recreation.

Policies:

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

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

c. Minimize the construction of public erosion-protection structures seaward of the shoreline.

Response: The expansion of the existing drainage retention basin is proposed to occur in an area set back approximately 200 feet from the shoreline and is designed to conserve open space and minimize loss due to erosion.

Chapter V

Summary of Adverse Environmental Effects Which Cannot Be Avoided

V. SUMMARY OF ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

The proposed development of the traffic and drainage improvements will result in some construction-related impacts as described in Chapter III, Potential Impacts and Mitigation Measures.

Potential effects include noise-generated impacts occurring from site preparation and construction activities. In addition, there may be temporary air quality impacts associated with dust generated from construction activities, and exhaust emissions discharged by construction equipment.

Accordingly, the proposed project is not anticipated to create any long-term, adverse environmental effects.

Chapter VI

Alternatives to the Proposed Action

VI. ALTERNATIVES TO THE PROPOSED ACTION

PREFERRED ALTERNATIVE

The construction of the Maui Central Park Roadway, Papa Avenue Extension, and related drainage improvements are essential to the development of the Maui Central Park.

The proposed traffic improvements are designed to provide and facilitate access to the Maui Central Park. The proposed roadways are not anticipated to generate new traffic; however, they are anticipated to redistribute peak period traffic and alleviate congestion at major intersections. Consequently, motorists may utilize these roadways to minimize traffic delays and improve travel time. Additionally, the proposed roadways will alleviate traffic conditions by providing alternate travel routes during special events at the War Memorial complex or at the Maui Central Park, and provide another access to MCC.

The proposed drainage improvements implement the recommendations established by the Kahului Drainage Master Plan. For motorists, flooded streets generate hazardous driving conditions and make travel difficult. Flood waters and debris also pose potential threats to life, safety, and public health. In addition, the effects of flooding are reflected in private and public property damage, disruption of commerce and routine activities, and results in the expenditure of public funds for flood maintenance and cleanup. The proposed drainage improvements are anticipated to mitigate adverse drainage conditions created by heavy rains and the lack of adequate storm drainage facilities within the Kahului area.

NO ACTION ALTERNATIVE

The proposed improvements are essential to the development of the Maui Central Park and the Kahului Drainage Master Plan.

In light of the established need for the proposed improvements, the "no action alternative" does not represent a responsible option in addressing the transportation and drainage system requirements for the Kahului region.

Chapter VII

Irreversible and Irretrievable Commitments of Resources

VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The proposed development of the traffic and drainage improvements would involve the commitment of fuel, labor, funding, and material resources.

Development of the proposed project will involve the commitment of land for roadway and drainage improvements which will preclude other land use options for the site. This commitment of land resources is consistent with existing and future land uses in and around the project area.

Chapter VIII

Findings and Conclusions

VIII. FINDINGS AND CONCLUSION

The proposed project would involve the construction of the Maui Central Park Roadway, extending from Kanaloa Avenue to Kahului Beach Road, as well as an extension of Papa Avenue, from Kaahumanu Avenue to the Maui Central Park Roadway. An existing 800-foot segment of Papa Avenue, south of the Kaahumanu and Papa Avenue intersection, is proposed to be widened to facilitate the movement of traffic along the Papa Avenue Extension and Kaahumanu Avenue.

Proposed drainage system improvements, recommended by the Kahului Drainage Master Plan, will transport surface runoff to a new 7-acre retention basin in the vicinity of the Roadway's intersection with Kahului Beach Road.

The proposed project will traverse lands which are currently undeveloped. As such, the proposed project will not involve the displacement or relocation of any residents or structures. In addition, the U.S. Army Corps of Engineers has indicated that there are no wetlands or other waters of the U.S. within the project site.

Construction of the proposed project will involve short-term environmental impacts typically associated with construction activities. These include air quality and noise impacts. Dust control measures such as watering and sprinkling will be undertaken to minimize dust. Construction activities are also anticipated to be limited to daylight hours. Impacts generated from construction activities are not considered adverse.

From a long-term perspective, the proposed project is not anticipated to result in adverse environmental impacts. As evidenced by recent development in the area, no rare, endangered species of flora and fauna are anticipated within the project area. Based on the SHPD, construction activities should have "no effect" on historic resources. In case human remains or artifacts are encountered during construction, applicable procedures to ensure compliance with Chapter 6E, HRS, will be followed.

On a short-term basis, construction related employment is anticipated to have a positive effect on the local economy.

The proposed project will have a positive impact on peak period traffic operations by redistributing traffic and reducing the demands at congested intersections. The recommendations established by the traffic assessment and a letter resulting from a meeting of the Maui Central Park Advisory Committee, are proposed to be implemented, as appropriate, in connection with the development of the project. The roadways will also serve to help distribute traffic whenever there are special events at the War Memorial complex or at the Maui Central Park. In addition, the Maui Central Park Roadway will also be designed to permit future vehicular access to MCC facilities. The proposed drainage system improvements implement the recommendations established by the Kahului Drainage Master Plan which is intended to improve drainage conditions in the Kahului area.

The project is not anticipated to have adverse impacts upon medical, police, and fire protection services as well as other infrastructure systems.

In light of the foregoing findings, it is concluded that the proposed action will not result in any adverse environmental effects.

Chapter IX

Agencies and Organizations Consulted During the Preparation of the Environmental Assessment

IX. AGENCIES AND ORGANIZATIONS CONSULTED DURING THE PREPARATION OF THE ENVIRONMENTAL ASSESSMENT

1. Department of the Army
   U.S. Army Engineer District, Hnl.
   Attn: Operations Division
   Bldg. T-1, Room 105
   Fort Shafter, HI 96858-5440

2. State of Hawaii
   Department of Agriculture
   635 Mua Street
   Kahului, HI 96732

3. State of Hawaii
   Department of Health
   54 High Street
   Wailuku, HI 96793

4. State of Hawaii
   Department of Land and Natural Resources
   P. O. Box 621
   Honolulu, HI 96809

5. State of Hawaii
   Department of Land and Natural Resources
   State Historic Preservation Division
   33 South King Street, 6th Floor
   Honolulu, HI 96813

6. State of Hawaii
   Department of Transportation
   Highways Division
   650 Palapala Drive
   Kahului, HI 96732

7. County of Maui
   Department of Parks and Recreation
   200 South High Street
   Wailuku, HI 96793

8. County of Maui
   Department of Planning
   250 South High Street
   Wailuku, HI 96793

9. County of Maui
   Police Department
   55 Mahalani Street
   Wailuku, HI 96793

10. County of Maui
    Department of Public Works and Waste Management
    200 South High Street
    Wailuku, HI 96793

11. County of Maui
    Department of Water Supply
    200 South High Street
    Wailuku, HI 96793

12. Maui Arts and Cultural Center
    101 Kaahumanu Ave., Suite A-A
    Kahului, HI 96732

13. Maui Community College
    310 Kaahumanu Avenue
    Kahului, HI 96732

14. Mr. James Lawrence
    Kahului Town Association
    P. O. Box 156
    Kahului, HI 96732

Chapter X

Applicable Governmental Permits

X. APPLICABLE GOVERNMENTAL PERMITS

The following regulatory permits and construction approvals are required for the development of the proposed project:

1. County of Maui, Special Management Area Use Permit.
2. County of Maui, Grading and Grubbing Permit.
3. State of Hawaii, Department of Transportation, Highways Division, Permit *to Perform Wok on State Highways.*
4. County of Maui, Department of Public Works and Waste Management, Permit to Perform Work on County Highways.

Chapter XI

Letters Received During the Draft Environmental Assessment Comment Period

XI. LETTERS RECEIVED DURING THE DRAFT ENVIRONMENTAL ASSESSMENT COMMENT PERIOD

LETTERS RECEIVED DURING THE DRAFT ENVIRONMENTAL ASSESSMENT COMMENT PERIOD		
Federal Agencies	**Date of Letter**	**Date of Response**
Department of Agriculture, Natural Resource Conservation Service	9/5/95	Response not required
Department of the Army, Corps of Engineers	9/13/95	Response not required
State Agencies	**Date of Letter**	**Date of Responses**
Department of Business, Economic Development and Tourism	9/7/95	Response not required
Department of Health, Maui District	9/11/95	Response not required
Department of Education	9/14/95	Response not required
Maui County Agencies	**Date of Letter**	**Date of Response**
Maui Police Department	8/30/95	Response not required
Maui Fire Department	9/12/95	Response not required
Others	**Date of Letter**	**Date of Response**
Maui Electric Company, Ltd.	9/12/95	Response not required
▪ The Notice of Availability of the Draft EA appeared in August 23, 1995 edition of the OEQC Bulletin. The 30-day comment period deadline on the Draft EA expired Septembher 22, 1995.		

United States Department of Agriculture
Natural Resources Conservation Service
210 Imi Kala Street
Suite 209
Wailuku, HI
96793-2100

September 5, 1995

'95 SEP -6 P12:25
DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

Mr. David W. Blane, Director
Planning Department
County of Maui
250 S. High Street
Wailuku, Hawaii 96793

Dear Mr. Blane,

Subject: Maui Central Park Roadway; TMK: 3-7-01: 2
I.D. No. 95/SM1-0016

I have no comments on the subject application. Thank you for the opportunity to comment.

Sincerely,

Neal S. Fujiwara
Neal S. Fujiwara
District Conservationist

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

REPLY TO ATTENTION OF

September 13, 1995

Planning Division

Mr. Larry Brooks, Planner
Planning Department
County of Maui
250 South High Street
Wailuku, Maui 96793

9/18/95

Dear Mr. Brooks:

Thank you for the opportunity to review and comment on the Environmental Assessment for the Maui Central Park Roadway, Maui (TMK 3-7-1: 2). The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. We do not have any additional comments to offer regarding DA permit requirements beyond those provided in our previous letter dated April 20, 1993 (NP93-038).

b. The flood hazard information presented on page 19 of the environmental assessment is correct.

Sincerely,

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

BENJAMIN J. CAYETANO
GOVERNOR

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

ESTHER UEDA
EXECUTIVE OFFICER

'95 SEP 11 P4:00

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

September 7, 1995

Mr. David W. Blane
Director of Planning
Planning Department
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Mr. Blane:

Subject: Special Management Area Permit Application for the Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements

We have reviewed the subject application received with your memorandum dated August 25, 1995, and confirm that the project site as shown on figure 11 of the draft Environmental Assessment appears to be located within the State Land Use Urban District.

We have no other comments to offer at this time.

Should you have any questions, please feel free to call me or Kathy Yonamine of our office at 587-3822.

Sincerely,

Esther Ueda

ESTHER UEDA
Executive Officer

EU:KY:th

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, MAUI, HAWAII 96793

LAWRENCE MIIKE
DIRECTOR OF HEALTH

LAWRENCE HART, M.D., M.P.H.
DISTRICT HEALTH OFFICER

'95 SEP 12 P12:09

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

September 11, 1995

Mr. David W. Blane
Director
Department of Planning
County of Maui
250 S. High Street
Wailuku, Hawaii 96793

Dear Mr. Blane:

Subject: 95/SM1-0016, Maui Central Park Roadway, TMK: 3-7-001: 002, Kahului, Maui, Hawaii

Thank you for the opportunity to review and comment on the subject application. Our comments are as follows:

In reference to the solid waste management plan and the removal of "grubbed" material, the applicant should be advised that open burning will not be allowed.

If you have any questions regarding the above, please call me at 243-5255.

Sincerely,

HERBERT S. MATSUBAYASHI
Chief Sanitarian, Maui

xc: EPO

Benjamin J. Cayetano
GOVERNOR

'95 SEP 20 P1:06

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

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

SEP 25 1995

HERMAN M. AIZAWA, PH.D.
SUPERINTENDENT

[redacted]

OFFICE OF THE SUPERINTENDENT

September 14, 1995

Mr. David W. Blane
Planning Director
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Mr. Blane:

SUBJECT: Maui Central Park Roadway
I.D. No.: 95/SM1-0016
TMK: 3-7-001: 002

We have reviewed the subject application and have no comment on the proposed roadway, extension, and drainage improvements.

Thank you for the opportunity to respond.

Sincerely,

Herman M. Aizawa, Ph.D.
Superintendent

HMA:hy

cc: A. Suga, OBS
R. Murakami, MDO

LINDA CROCKETT LINGLE
MAYOR

OUR REFERENCE
YOUR REFERENCE

POLICE DEPARTMENT

COUNTY OF MAUI

55 MAHALANI STREET
WAILUKU, HAWAII 96793
AREA CODE (808) 244-6400
FAX NO. (808) 244-6411

HOWARD H. TAGOMORI
CHIEF OF POLICE

LANNY TIHADA
DEPUTY CHIEF OF POLICE

August 30, 1995

'95 AUG 31 A9:56
DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

MEMORANDUM

TO : DIRECTOR, PLANNING DEPARTMENT

FROM : HOWARD H. TAGOMORI, CHIEF OF POLICE

SUBJECT : I.D. No.: 95/SM1-0016
TMK: 3-7-001:002
Project Name: MAUI CENTRAL PARK ROADWAY
Applicant Name: DEPARTMENT OF PUBLIC WORKS & WASTE MANAGEMENT

/ No recommendation or special condition is necessary or desired.

— Refer to attachment(s).

Assistant Chief Charles Hall
for: HOWARD H. TAGOMORI
Chief of Police

LINDA CROCKETT LINGLE
Mayor

BRIAN W. MISKAE
Planning Director

'95 SEP 12 P12:10

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

COUNTY OF MAUI
PLANNING DEPARTMENT

250 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793

TRANSMITTAL

TO: State Agencies:
X Dept of Health, Maui
X Dept of Health, Honolulu
X Dept of Transportation,
X Statewide Planning Office (3)copies
X DLNR (2 copies)
X DLNR-Historic Preservation Div.
X DLNR-Maui Office
— Dept of Agriculture, Honolulu
— Dept of Agriculture, Maui
X DAGS, Survey Division (SMA Only)
X DOE,Office of Business Services
X Office of State Planning
X State Land Use Commission
— DBEDT
— Dept of Hawaiian Homes Land
— Office of Hawaiian Affairs
— Dept of Labor
— Dept of Human Services, Maui
— Civil Defense (CPA/CIZ only)

Date: August 25, 1995
County Agencies:
— DPW, LUCA (3 copies)
— Dept of Public Works
X Water Department
X Parks and Recreation
X Fire Dept
X Police Department
— Human Concerns
— Corporation Counsel
— County Clerk
— Mayor's Office
— Finance Dept

Federal:
X Natural Resources Conservatn Servce
X Army Corps of Engineers
X Fish & Wildlife Service

Others:
X Maui Electric Company
X Hawaiian Telephone Co.

SUBJECT: I.D. No.: 95/SM1-0016
TMK: 3-7-001:002
Project Name: MAUI CENTRAL PARK ROADWAY
Applicant: DEPARTMENT OF PUBLIC WORKS & WASTE MANAGEMENT

TRANSMITTED TO YOU ARE THE FOLLOWING:
X Application
X Project Plans
X Environmental Assessment
— Shoreline Map
— Previous Agency Comments
— Traffic Report
— Archaeological Report
— Infrastructure Report
— Drainage Report
— Soils Report
— Housing Agreements
— Unilateral Agreement
— Draft Ordinances

THESE ARE TRANSMITTED AS CHECKED BELOW:
X For Your Comment/Recommendation
— For Your Approval/Signature
— As Requested
— For Your Information
— For Appropriate Attention

Please Submit Your Comments/Recommendations By September 29, 1995

Remarks:

If additional clarification is required please contact me at 243-7735.

MPD No comment at this time. JRP

Planner: LARRY BROOKS
for DAVID W. BLANE
Planning Director

LB:cmp
cc: Colleen Suyama, Planning Program Manager-Land Use Management
Project File
Applicant
(G:\PLANNING\ALL\MAKA\TRANSMIT.PRK

RECEIVED

v11?

Maui Electric Company, Ltd. • 210 West Kamehameha Avenue • PO Box 398 • Kahului, Maui, HI 96732-0398 • (808) 871-8461

'95 SEP 14 A10:50

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

September 12, 1995

Mr. David Blane
Planning Director
County of Maui
Maui Planning Department
250 So. High Street
Wailuku, HI 96793

Dear Mr. Blane:

Subject: Maui Central Park Roadway

Thank you for allowing us to comment on the above subject:

In reviewing the information transmitted and our records, Maui Electric Company (MECO) at this time has no objections to the proposed project.

MECO has received a service request (M125803) for the proposed project and is currently working with the project's consultant.

If you have any questions or concerns, please call Fred Oshiro at 872-3202.

Sincerely,

for
Edward Reinhardt
Manager, Engineering

FO:llk

References

References

Community Resources, Inc. Maui County Community Plan Update Program Socio-Economic Forecast Report, January 1994.

County of Maui, The General Plan of the County of Maui, September 1990 Update.

County of Maui, Wailuku-Kahului Community Plan, December 1987.

County of Maui, Office of Economic Development, Maui County Data Book, December 1994.

Michael T. Munekiyo Consulting, Inc., Application for Special Management Area Permit - Maui Community College Buildings "J" and "S", January 1993.

Michael T. Munekiyo Consulting, Inc., Final Environmental Assessment - Maui Central Park Parkway and Papa Avenue Extension, July 1993.

Michael T. Munekiyo Consulting, Inc., Application for Special Management Area Permit - Maui Community College Building "J" Phase II, January 1994.

Munekiyo & Arakawa, Inc., Application for Special Management Use Permit - Aircraft Rescue and Fire Fighting Training Facility at Kahului Airport, April 1995.

Personal communication with Ted Kawahigashi, Austin, Tsutsumi & Associates, Inc., July 1995.

Ronald M. Fukumoto Engineering, Inc., Kahului Drainage Master Plan, May 1992.

Telephone conversation with Dave Taylor, Wastewater Reclamation Division, March 1995.

Telephone conversation with Ellen Kraftsow, Department of Water Supply, March 1995.

University of Hawaii, Land Study Bureau, Detailed Land Classification Island of Maui, May 1967.

University of Hawaii, Department of Geography, Atlas of Hawaii, Second Edition, 1983.

U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii, August 1972.

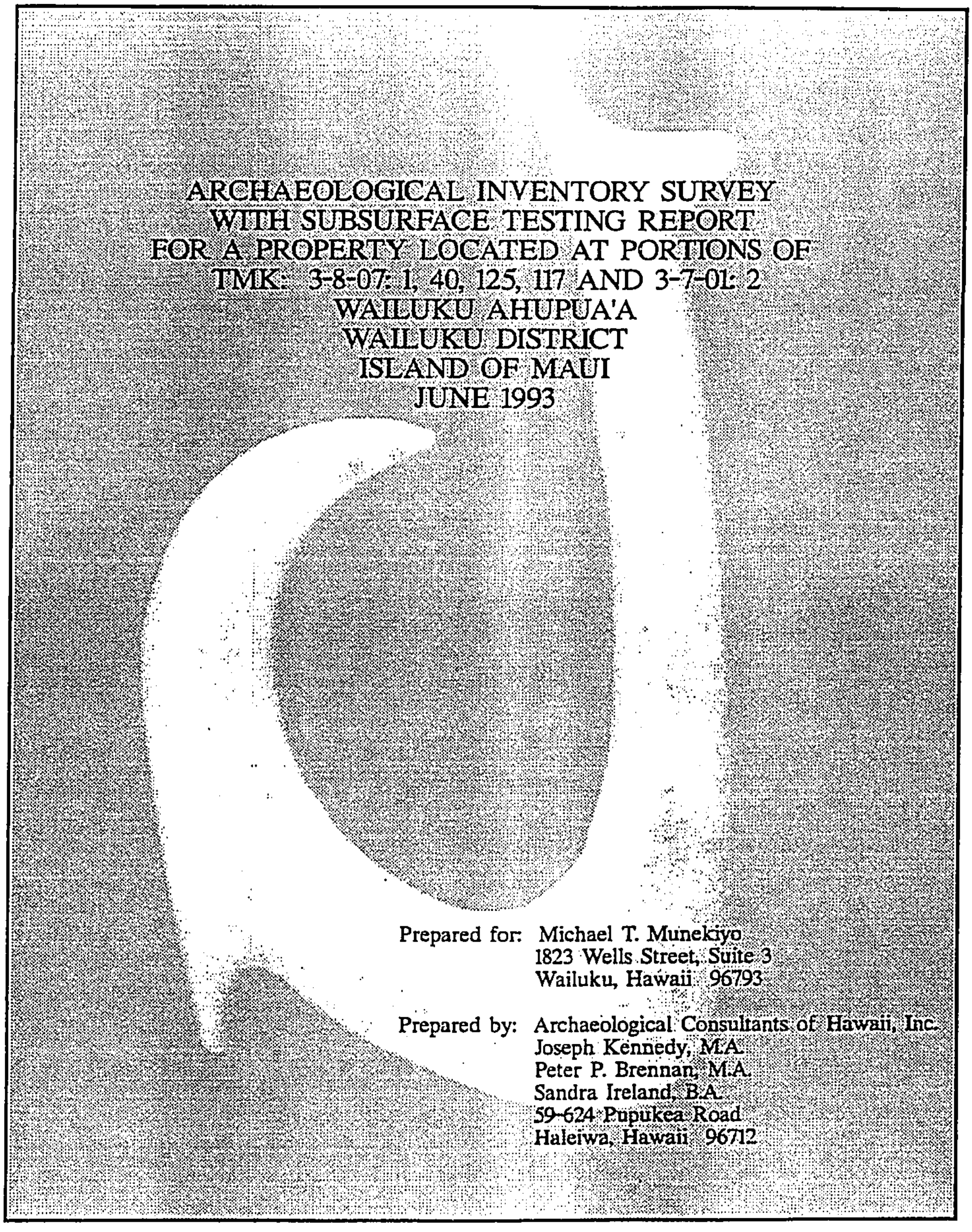
Appendices

Appendices A-1 through A-4

Archaeological Documentation

Appendix A-1

Archaeological Inventory Survey



ARCHAEOLOGICAL INVENTORY SURVEY WITH SUBSURFACE TESTING REPORT FOR A PROPERTY LOCATED AT PORTIONS OF TMK: 3-8-07: 1, 40, 125, 117 AND 3-7-01: 2

WAILUKU AHUPUA'A
WAILUKU DISTRICT
ISLAND OF MAUI
JUNE 1993

Prepared for: Michael T. Munekiyo
1823 Wells Street, Suite 3
Wailuku, Hawaii 96793

Prepared by: Archaeological Consultants of Hawaii, Inc.
Joseph Kennedy, M.A.
Peter P. Brennan, M.A.
Sandra Ireland, B.A.
59-624 Pupukea Road
Haleiwa, Hawaii 96712

Table of Contents

List of Illustrations

ARCHAEOLOGICAL INVENTORY SURVEY WITH SUBSURFACE TESTING REPORT FOR A PROPERTY LOCATED AT PORTIONS OF TMK: 3-8-07: 1, 40, 125, 117 AND 3-7-01: 2; WAILUKU AHUPUA'A, WAILUKU DISTRICT, ON THE ISLAND OF MAUI

Abstract

At the request of Michael T. Munekiyo Consulting, Inc., an archaeological inventory survey with subsurface testing was conducted on the subject property. The construction of the Maui County Road Project is imminent and involves the building of two roads. The road corridors constitute the subject property for the current investigations. Archaeological testing is needed to determine the presence or absence of significant historical resources within the corridors of the two roads before construction occurs. Due to the large percentage of sand dunes covering the property it was expected that human burials might be present. A 100% surface survey was conducted within the boundaries of the Maui County Road Project, and no significant surface features were identified. Fifty-four test trenches were excavated mechanically, either by backhoe or mechanical excavator. No significant cultural resources were discovered during the testing and no human burials were identified. Materials recovered on the property date to the last 50 years and are not significant to the interests of historic preservation.

The results of the archaeological testing indicate that it is unlikely that significant cultural resources are present on the subject property within the defined boundaries of the Maui County Road Project. Therefore, Archaeological Consultants of Hawaii, Inc., concludes that future construction activities within the corridors of the 'Road Project' will have 'no effect' on significant historic resources and no further archaeological mitigation is required. In the event that a human burial is encountered during construction activities the State Historic Preservation Division and the Maui Burial Council should be contacted immediately.

Section 1: Introduction

The subject property is located at TMK: 3-8-07: 1, 40, 125, 117 (portions), and TMK: 3-7-01: 2(por.); in the ahupua'a of Wailuku, in the district of Wailuku, on the island of Maui (see Map 1). At present the property is owned by the County of Maui. Archaeological Consultants of Hawaii, Inc., was contracted by Michael T. Munekiyo Consulting Inc., to conduct an inventory level survey with subsurface testing along corridors for the Maui County Road Project.

The Maui County Road Project involves the construction of two roads crossing the subject land parcel. Located on the property are aeolian deposited sand dunes. The proposed corridors of the two roads will bisect these dunes. In the Hawaiian Islands, human burials are known to have been discovered in sand dunes. Due to the absence of surface markers indicating the presence of burials, the State Historic Preservation Office required subsurface testing on the property. Thus, the ultimate goals of this survey were to identify significant cultural resources, if any, on the subject property, and to determine if isolated or clustered burials were present.

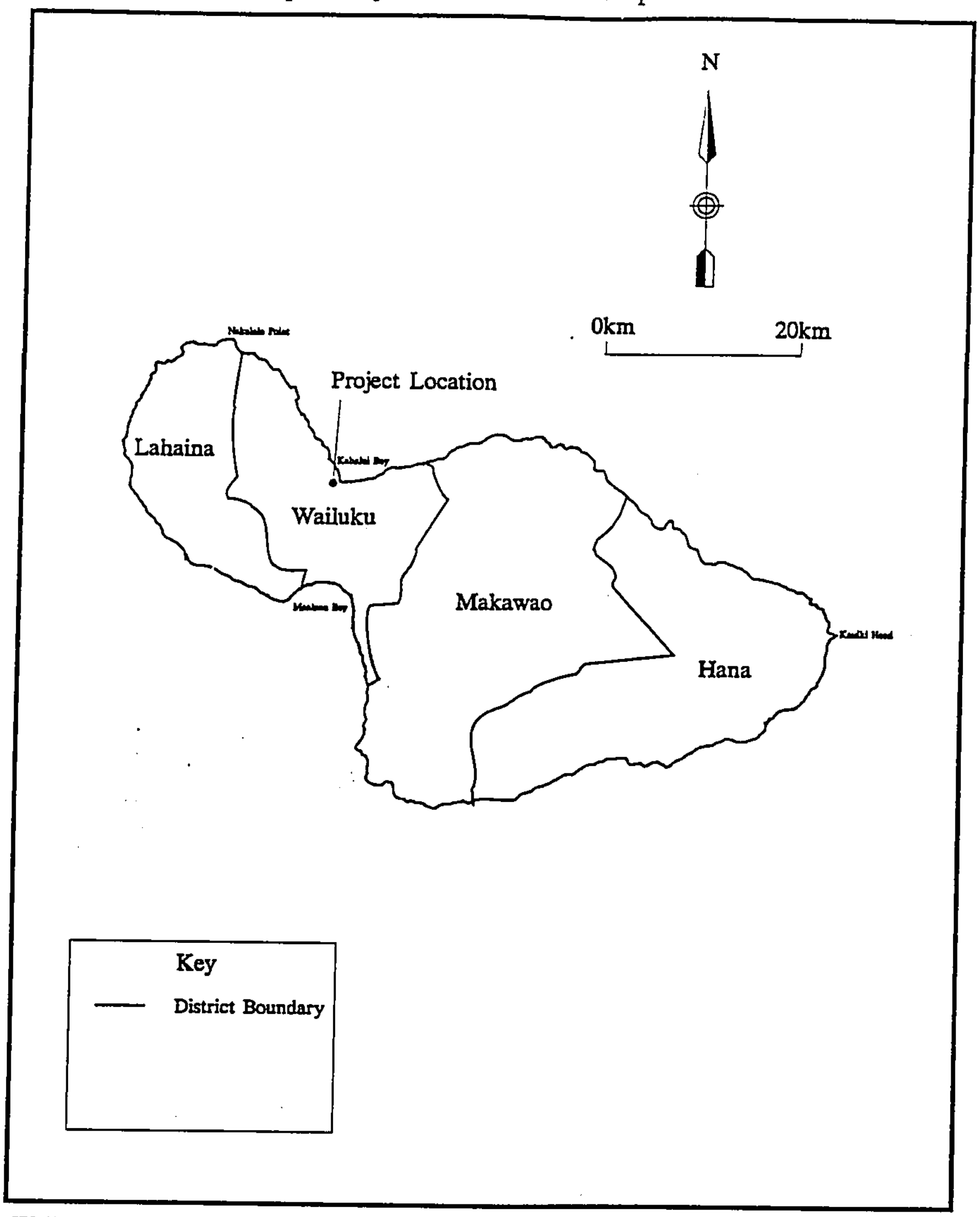
The eastern portion of the subject property and road corridor begin approximately 60m west and inland of Kahului Harbor. The close proximity to the coast would suggest that Hawaiians may have used this area while exploiting the nearby coastal resources. Archaeological finds associated with use of the coast are possible.

This report contains a detailed description of the location and environment of the subject property which the Maui County Road Project will transect. It also summarizes the historical background, land use patterns and previous archaeological research in the area and ahupua'a of Wailuku. Included is a description of the archaeological field methods and findings, and an assessment of the archaeological significance of the findings.

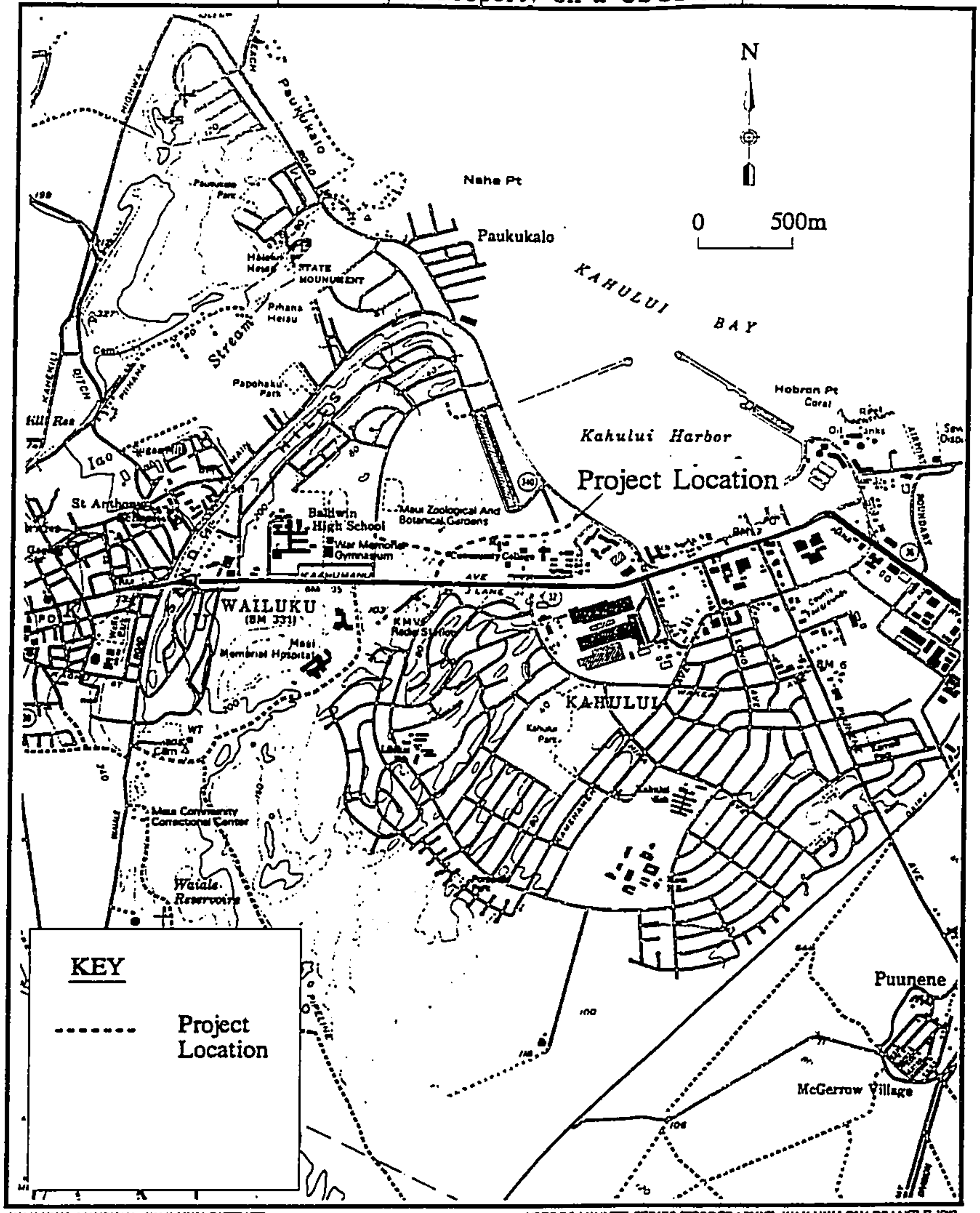
Section 2: Physical Location

The subject property which the Maui County Road Project will transect is located on the northeast coast of Maui near Kahului Harbor at geographic grid coordinates 20 53'45'N and 156 29'15'W, and at UTM coordinates 2313000mN and 7615000mE. According to the survey map prepared by Richard M. Sato & Assoc., Inc. the road project is located between 1 and 22 meters above mean sea level (AMSL), and approximately 60 to 1100 meters inland and west of the Kahului Harbor shoreline (see Map 2). This area receives between 20 to 30 inches of rain annually (Armstrong 1973: 56).

Map 1: Project Location on a Map of Maui



Map 2: Subject Property on a USGS Map



The Maui County Road Project involves the construction of two roads bisecting several portions of land parcels known as the subject property (see above for TMK numbers). The primary corridor for the project traverses the property in a east to west direction, and passes just south of the Maui Community Arts and Cultural Center and north of the Maui Community College. This corridor is presently termed the Maui Central Parkway (see Map 3). It covers a distance of 990.6m and is 45.7m wide. The eastern boundary of the 'parkway' corridor borders Kahului Beach Road and it's western boundary is Kanaloa Road.

The secondary corridor for the road project on the subject property is presently known as the Papa Extension. The Papa Extension begins its north-south course at its midroute intersection with the Maui Central Parkway's east-west traverse (see Map 3). The secondary corridor passes directly east of the Maui Community College Dormitories and terminates at its southern boundary with Ka'ahumanu Avenue. The corridor covers a distance of 417.6m and is 45.7m wide (see Map 3).

The entire subject property is geologically part of the Kula series of lava flows. It lies in an area of both oxisols and entisols. Oxisols are very stable and occur as lowland soils on old geomorphic surfaces. Entisols are weakly developed soils usually found in old beach sand or volcanic ash in Hawaii (Armstrong 1973: 40-41).

The general landscape of the subject property ranges from low lying sand dunes in the east near the harbor, to high coastal dunes in the west. The soils of the Kahului coastal region are described as sandhills with the characteristic Puuone sand series present along with patches of Jaucas sand (Foote et al., 1972: 117 and Sheet 99). The soils encountered on the subject property range from primarily aeolian sand with a variety of color and textural variations, through mixes of silt, loam, and loamy clay. Some humus soil has formed on the surface due to the vegetative decay. In many of the undisturbed areas root penetration and matting is intense due to dense vegetative growth. The soils and stratigraphy are discussed in detail below (refer to Section 7 and Appendix A).

For ease in describing the locations and stratigraphy of trenches across the subject property, the corridor of the Maui County Road Project has been divided into six geographical zones (see Map 3). Each zone has been sub-divided on the basis of its topography or on the basis of recent land uses.

Zone 1 appears to be a disturbed, low lying, sand dune system that was previously leveled, and ranges in elevation from 1.83m to 3.66m AMSL. This zone is near the harbor and

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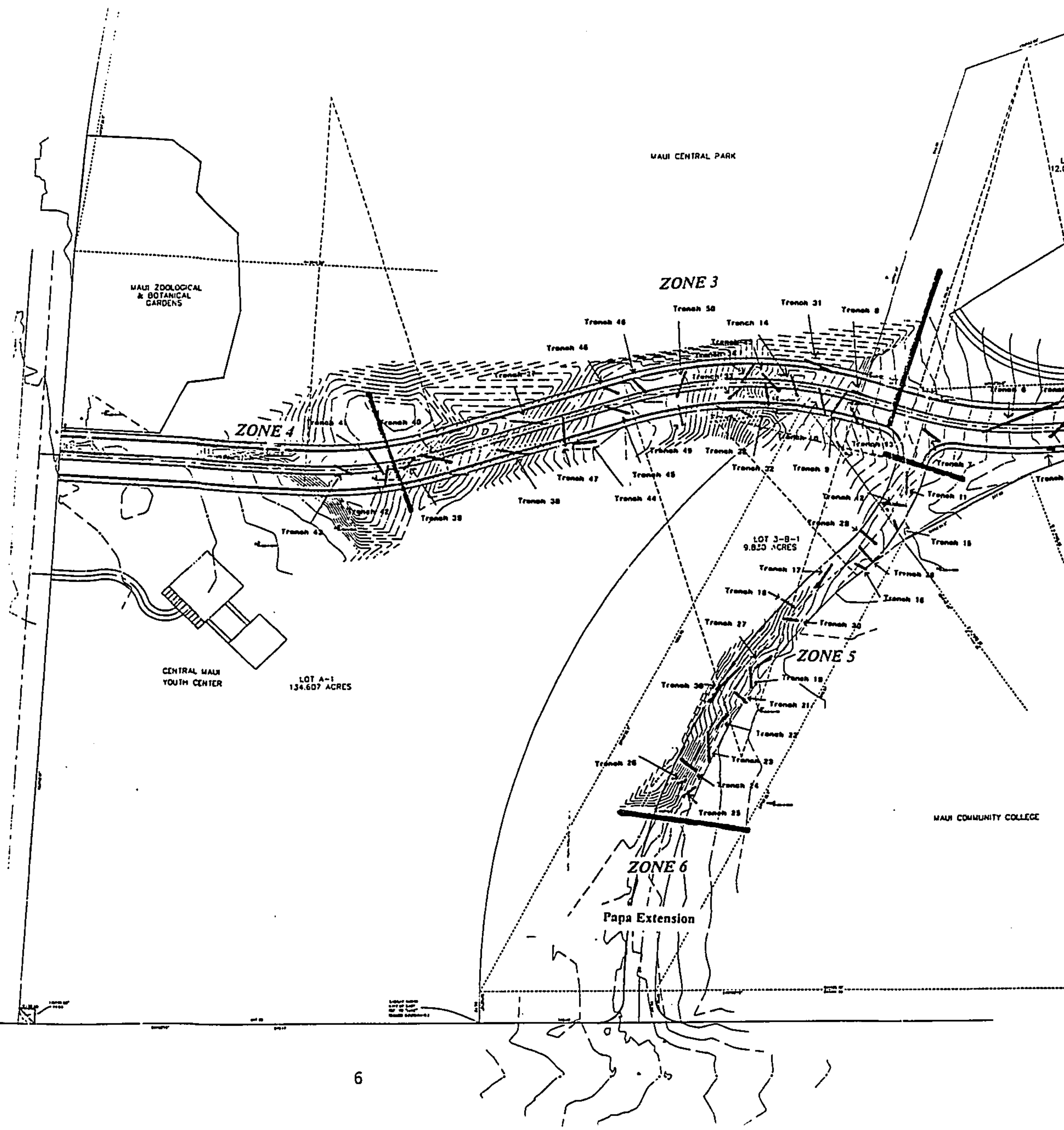

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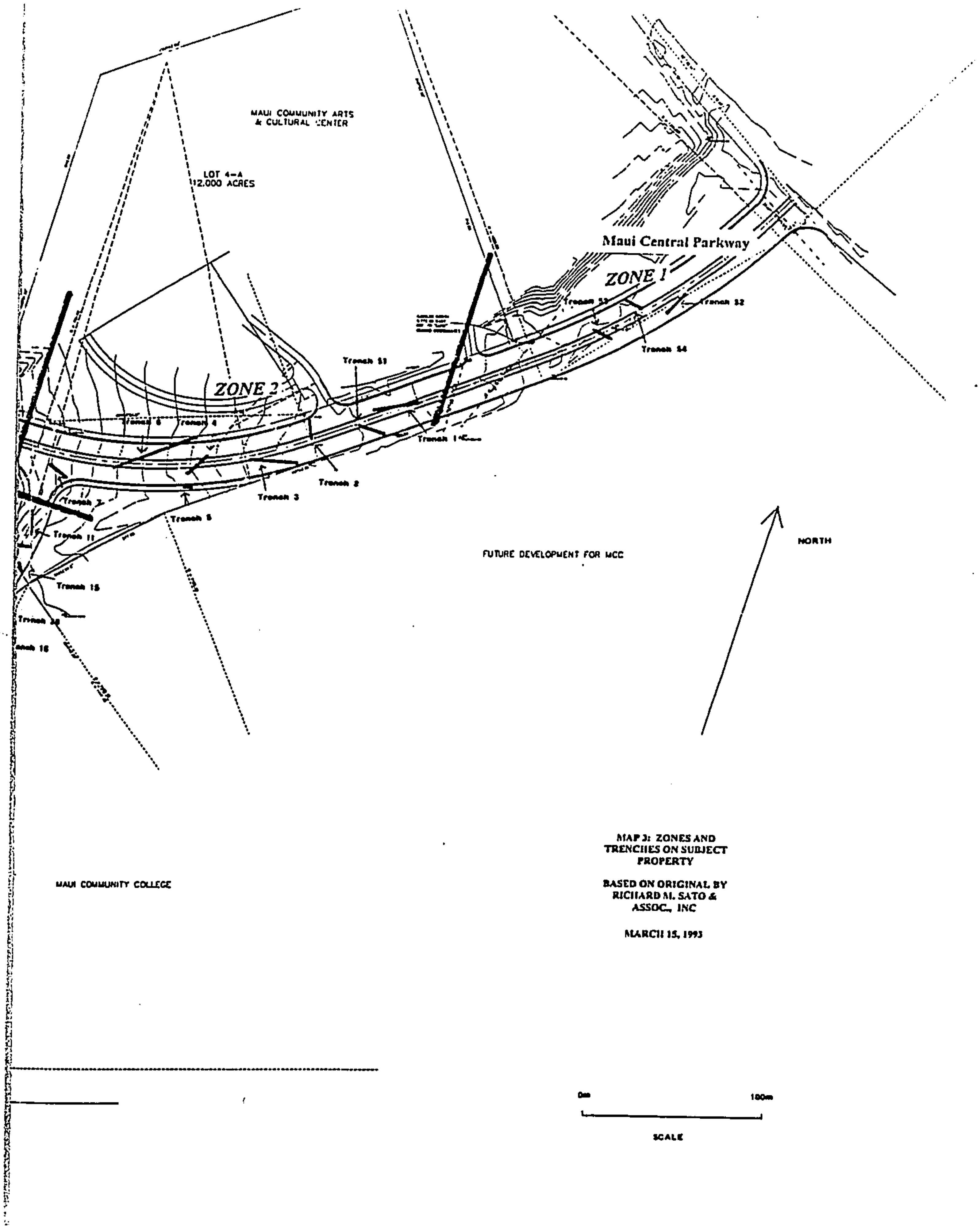


MAP 3: ZONES AND TRENCHES ON SUBJECT PROPERTY

BASED ON ORIGINAL BY RICHARD M. SATO & ASSOC., INC

MARCH 15, 1993

borders Kahului Beach Road to the east. The vegetative cover consists of a heavy growth of soft fiber and woody plants. The dominant species include haole koa (Leucaena leucocephala), growing in thick short stands, castor bean (Ricinus communis), kiawe (Prosopis pallida), and a type of low lying grass. A group of coconut palms (Cocos nucifera), are located near the beach road. Other exotic species of plants are present but in small numbers.

Zone 2 is a broad gently sloping area of coastal dunes which has been subjected to intense modification by heavy equipment. Vegetative cover in Zone 2 has been removed and the sand dune leveled and graded. A live sewer line and a water line transect Zone 2 between Trench 53 of Zone 1 and Trench 1 of Zone 2 (see map 3). Several subsurface trenches indicated evidence of earth-filling activities. This zone gently rises from an elevation of 3.66m AMSL in the east to 12.49m AMSL in the west where Zone 3 begins.

Zone 3 is a moderate to steep sloped zone of large coastal dunes some of which have been disturbed by earth moving machinery. Some of the dunes have been cut and their slopes modified to aid in filling and leveling parts of Zone 2. A few subsurface trenches indicated evidence of earth-filling activities. An archery course weaves through the low lying areas of this dune system. Trails and narrow road tracks lead to target boards placed randomly atop wooden structures or tacked on large kiawe trees. Areas located on slopes and atop the dunes are less impacted. The elevation of this zone ranges from 6.1m to 18.9m AMSL.

Vegetation in Zone 3 ranges from thick to dense, with kiawe (Prosopis pallida), mixed with a low lying grass as the dominant species. Several other exotic species are present such as Lantana camara, and morning glory (Ipomoea indica). In open areas near the apex of dunes ʻilima (Sida fallax), is present interspersed among the grasses. One lonely specimen of Nama sandwicensis, an endemic to the Hawaiian Islands, is located near the apex of the highest dune in Zone 3.

The topography of Zone 4 is very disturbed and fluctuates in elevation. This zone is the furthest area west of Kahului Harbor and borders Kanaloa Road. The area has undergone intense modification by heavy equipment. A steep man-made hill (19.8m AMSL), has been constructed from various types of fill removed from other properties around Maui, and is located to the northeast of the Central Maui Youth Center. A man-made drainage ditch, which flows intermittently, descends from Kanaloa Road easterly into a low basin between the modified hill and the high dunes of Zone 3. The drainage ditch and the steep hill of filled material was determined to be unsuitable for archaeological testing. Maui Zoological and Botanical Gardens lies to the northwest of Zone 4. Part of a plant nursery erected adjacent to the Botanical Gardens overlaps onto the right of way of the Central Maui Parkway. The basin has recently been graded and there is very little vegetation, aside from the occasional exotic weed sprouting on the surface.

The remaining vegetative cover of Zone 4 is sparse. The man-made hill is covered sparsely in a low lying grass and haole koa (Leucaena leucocephala). The basin has no vegetative cover and the surface sand is exposed. The banks of the drainage ditch are covered in a thicket of grass sporadically interspersed with kiawe (Prosopis pallida).

Zone 5 covers the entire Papa Extension excluding the southern portion adjacent to Ka'ahumanu Road and the Maui Community College Dormitories. Zone 5 is part of the same high coastal dune range of Zone 3 but, the corridor transects the dune system in a north to south direction. The dune system appears more disturbed in this zone. A refuse pile of organic material and modern trash has been dumped at the base of one of the dunes. Mining of part of the dune range located 18m west and outside of the Maui Road Project corridor has taken place. The vegetative cover in Zone 5 is similar to that of Zone 4, but is less dense. Elevation ranges from 10.9m to 22.0m AMSL, and some of the dunes are steeply sloped.

Zone 6 is located at the southern end of the Papa Extension corridor and crosses over a leveled area landscaped and maintained as a recreational area for the residents of the Maui Community College Dormitories. This area has been heavily impacted by human development and is considered unsuitable for archaeological testing.

Section 3: Historical Background

The subject parcel is part of the Wailuku District and Wailuku Ahupua'a. Wailuku District includes the entire eastern flank of the West Maui Mountains, and all of the flat land on the isthmus between West and East Maui, including the coastal portions of Kahului and Maalaea Bays (see Map 1). Wailuku Ahupua'a is a relatively large political and economic land unit of Wailuku District, comprising nearly half of its land area. It includes the coastal area of Kahului Bay from Kapukaulua to Paukukalo, all of 'Iao Valley, and the northern half of the isthmus between Haleakala and the West Maui Mountains.

Early references to Wailuku note it as a gathering place and residence of important chiefs and their retinues (I'i 1959:135). The pre-contact history of the ahupua'a indicates that the western portion of the ahupua'a supported the majority of the population and agriculture, because it was moist and had permanent streams. In contrast, the eastern portion of Wailuku Ahupua'a seems to have been little used in pre-contact times because of its relatively dry, barren condition.

This section details the land use history of the eastern portion of the ahupua'a of Wailuku. The subject parcel is located in the eastern half of this ahupua'a, an area that was little utilized for habitation or agriculture until late in the 19th century when portions of the ahupua'a were put into sugarcane production. For a detailed description of the land use history of the western portion of Wailuku Ahupua'a refer to (Kennedy et al. 1992).

Section 3.1: Pre-European Contact History

In chants recorded by Fornander in the mid-1800's occasional references to Wailuku can be found. Maui place names are listed within the tradition of Lonoikamakahiki, where Wailuku Ahupua'a is numbered tenth, as one of the divisions of Wailuku District. Other place names listed as divisions of Wailuku include Nuailua, Makaiwa, the uplands of Halehaku, and Waipio; all of which are located on the windward coast of Haleakala, at a considerable distance from the Wailuku District of the late prehistoric period. In several chants, Wailuku is referred to as a locality of flying and sometimes dark clouds, a sheltered and shady valley locale, the place of an iaiki rain, and a "broad plain where councils are held" (Fornander in Silva n.d.:3-7).

In legends, Wailuku is remembered as a burial place of chiefs, and an area of much warfare. In one tradition, Wailuku takes its name from a legendary battle fought between owls and men. A cruel act was committed by a man and the owls punished him by flocking to Wailuku and descending upon him. The battle place is called Wailuku, (literally, "water of destruction")(Pukui-Curtis 1974:179 in Silva n.d.:9).

In another tradition, Wailuku is the name of a chiefess of the ancient past. In the legend of Lepeamoa, Mauinui (the high chief of Maui) challenged his brother-in-law, an Oahu chief, to a cockfight:

> As Mauinui possesses a rooster of extraordinary powers he fully expects to win. At his urging the stakes were set exceedingly high; to the winner belongs the privilege of claiming all property and the life of the opponent. Kakuhihewa, however, is able to enlist the help of two demi-gods, Lepeamoa and Kauilani, and they assure his victory. Kakuhihewa then refuses his right to take Mauinui's life and his island and peace between the dominions of Maui and Oahu are established (Westervelt 1973:204-245, in Silva n.d.:7).

In another story about ancient times, Wakalama, principal chief of the windward side of Maui, lived in Wailuku. He rescued five foreigners from a shipwreck, and took them into his court. One foreigner had an extraordinary sword, and became a captain of Wakalana's warriors. In a battle between Hawaii and Maui, this sword was taken by warriors from Hawaii Island. This sword became known as "the lost knife of Wailuku", and was eventually bartered for the return of the High Chief of Hawaii, captured and held captive in Maui (Kalakaua 1975:177-205).

An early chief of Wailuku, Hua, was known for his wickedness and detested by his people. During a period of severe drought, he died of starvation. When he fell, his people allowed his bones to be bleached in the sun and rattle in the wind. This is the origin of a saying, "The bones of Hua rattle in the sun" (Fornander 1918-19:V:516, in Silva n.d.:8).

In the 16th century two major fresh water fishponds were reportedly constructed near Kahului; Kanaha and Mau'oni. The date for the construction of the ponds is based on a story related by Kamakau (1961:42):

> Keawe-nui-a'Umi sailed from Hilo to Kapu'ekahi in Hana and from Hana to Kahului of Wailuku. There the chief of Hawaii met Kiha-a-Pi'i-lani, ruler of Maui. Kiha-a-Pi'i-lani was building walls of the pond of Mau'oni. A wide expanse of water lay between Kaipu'ula and Kanaha, and the sea swept into Mau'oni.

Fornander (in Walker 1931) suggests that Kiha-a-Pi'i-lani lived around 1550, thus giving the sixteenth century date. The ponds may have been expanded or modified in the early eighteenth century by Ka-pi'i-oho-o-ka-lani, an Oahu high chief, who named the ponds after his children (Summers as quoted in Kikuchi 1973).

The Kanaha Pond is still in existence today and is an important wildlife sanctuary, being a critical habitat for the endangered Hawaiian Stilt. Mau'oni Pond was not noted on a 1903 Hawaiian Government Survey map (Dodge 1885), nor on any subsequent maps examined.

During the seventeenth and eighteenth centuries, a period of frequent warfare within and between Maui, Oahu, and Hawai'i Islands, Wailuku was the center of political and military power on Maui. High Chief Pi'ilani, who had unified the districts of Maui by war, had two sons, Lono-a-Pi'ilani and Kiha-a-Pi'ilani, who fought for political control of the island after the death of their father (Speakman 1978:9).

Two battles fought at Wailuku involved Kiha-a-Pi'ilani. The first was fought in 'Iao Valley, and Kiha-a-Pi'ilani barely escaped alive. The second battle was fought with the assistance of Hawai'i Island warriors, and Kiha-a-Pi'ilani was victorious, eventually becoming ruler of Maui (Thrum 1923:77-86, in Silva n.d.:9).

Around 1700, one chief, Kekaulike, a descendant of the Pi'ilani chiefs, established through war a powerful and united 'kingdom' on Maui. In 1736 Kekaulike, residing at Kaupo and fatally ill, heard that Hawai'i Island chief Alapa'i was preparing to attack Maui. Kekaulike and his retinue fled in his double hulled war canoe to West Maui where they landed below Kula. The dying king was carried overland to Haleki'i Heiau near Wailuku. His body was burned, his ashes tossed into 'Iao Stream, and his bones were hidden in a cave near Haleki'i Heiau. He was the last ali'i to be interred there (Speakman 1978:13).

Before he died, Kekaulike had designated one of his sons, Kamehameha-nui, as his successor. However, another son, Ka-uki, challenged his half brother and a battle for succession ensued. The major and final battle in this war took place at Pu'unene on the plains of Wailuku just south of Kahului. Ka-uki fought in alliance with the ruling chief of Oahu and although there was a great slaughter on both sides, peace was made and Kamehameha-nui's rule was confirmed. There then ensued a period of peace on Maui for over 30 years (Speakman 1978: 13 & 14).

During the reign of Kamehameha-nui's successor and brother, the powerful King Kahekili (from 1765 to 1790), warfare between Maui and Hawai'i became intense once again. Wailuku was the site of Kalanihale, the royal residence of Kahekili. In the mid 1770's, Kalani'opu'u of Hawai'i marched with his well trained (Alapa) forces towards Wailuku. Kahekili hid his defending troops in the sand dunes above Haleki'i Heiau, where they surprised Kalani'opu'u's warriors. A battle took place seaward of the sand dunes, and the Alapa were slaughtered (Speakman 1978:16-17). An account of this battle was published in "Paradise of the Pacific" in September of 1900. It included a description of Wailuku at that time, received from a native Hawaiian of "considerable age":

> The district was called Nawaieha (the four streams) and was famous throughout the group, not only for the magnificence of Kahekili's court but for the vastness of it products. The shores of Kahului harbor, from Waihee Point to Haiku, were surrounded with the grass huts of the fishermen and of those connected with the innumerable war canoes of the king. Myriads of cocoanut trees lined the beach from Kahakuloa to Wailuku, the trunks of many of which are found in the marshes at Wailuku at this day, the trees having been

destroyed by a conquering army from Hawaii. (Paradise of the Pacific, Sept. 1900, in Silva n.d.:10).

Neither Handy (1940), nor Handy and Handy (1972) mention the Kahului area, or any area in the eastern portion of the ahupua'a, as being major areas for habitation or agriculture.

The Alaloa or 'Long Road' was a paved way that ran around the whole island and was built by Kiha-a-Pi'ilani in 1516 after his conquest and unification of the island. However, between Hamakua and Waiehu the road was located on the beach (Handy & Handy 1972). Thus, there would be no traces of it within this section of the ahupua'a.

The pre-contact history of the ahupua'a indicates that the western portion of the ahupua'a supported the majority of the population and agriculture. The only mention of habitation sites in the eastern portion that could be found is that referring to the fishermen's huts fronting Kahului Bay. Mention of place names in the eastern portion of the ahupua'a is also relatively rare. This pattern could reflect the environmental differences within the ahupua'a. The western portion is relatively moist and has permanent streams, while the eastern portion is drier with no permanent streams.

Section 3.2: Post European Contact History

The post-contact history begins with the arrival of Captain Cook off the north shore of Maui on November 26th, 1778. Cook was returning from his search for the north-west passage after visiting Kaua'i earlier in the year. He first sighted Maui off the Hamakua coast and headed north-west along the coast towards Kahului at a distance of approximately three miles offshore. Cook gave the following description of his encounters near Kahului:

> At Noon the coast extended from S 81 degrees E to N 56 degrees West, a low flat like isthmus bore S 42 degrees W the nearest shore being 3 or 4 Miles distant. ...Seeing some Canoes coming off to us I brought to: as soon as they got a long side many of the people who conducted them came into the Ships without the least hesitation. ... We got from these people in exchange for nails and pieces of iron a quantity of Cuttle fish: fruit and roots they brought very little, but told us they had plenty ashore, as also hogs and fowls. ...Having no doubt that these people would come off with produce the next day, I kept plying off all night and in the Morning stood close in shore. At first but a few people visited us, but towards noon we had the company of a good many who brought with them bread fruit, Potatoes, Tarra or eddy roots, a few plantains and small pigs, all of which they exchanged for Nails and iron

tools; indeed we had nothing else to give them (Beaglehole 1969: 474-5).

Captain Clerke, the captain of the Discovery, the ship accompanying the Resolution, made the following observations of the encounter:

> One of the Aree's or principal People came on board, and made me a present of 2 small hogs: one of his Attendants had 2 large, long Iron Skewers; I was not master enough of the language to learn the proper history of them, as where he got them ... but its pretty clear from them having them at all, either that their connections do extend to where European exchanges have taken place, or that Europeans have some time or other been in the neighbourhood (Beaglehole 1969:475).

This first day off Maui, "five or six hundred" persons came out to the ships in canoes and began trading. On the second day, Cook brought his ships closer to shore and continued trading. Kahekili had heard from his brother Ka'eo, the ruling Chief of Kaua'i, of Cook's visit ten months earlier to that island; so, when he saw the tall ships approaching, he decided to pay Cook an official visit in his royal canoe. Kahekili, accompanied by ten lesser chiefs in red feather cloaks, approached the Discovery, and were received by Captain Charles Clerke. Reciprocal presents were exchanged in the Captain's cabin, including Kahekili's red and yellow feather (i'iwi and mamo) cloak (Speakman 1978:22-25). The journals of Cook's expedition unfortunately do not give any description of the land in this area.

By 1786 Kahekili controlled Maui, Moloka'i, Lana'i and Oahu. He also had an agreement with Ka'eokulani, the ruler of Kaua'i. In 1790 Kamehameha launched his bid for control of all the Hawaiian Islands from Hawaii Island. He landed at Kahului and joined battle with the ali'i prince, the son of Kahekili who was waiting there. Thefders retred into 'Iao Valley (Speakn 1978:52-54). It has been reported that the name Kahului means 'the gathering place' and became attached to this area as a result of Kamehameha gathering his forces there (Burns 1991:47).

The battle of Kepaniwai (literally, "damming of the waters"), was a massacre of Maui forces by Kamehameha I and his warriors from Hawai'i. The Maui forces were led by Kalanikapule, son of Kahekili, and the Hawaii forces were accompanied by John Young, Isaac Davis, and a cannon. This was the first battle in Hawai'i in which gun powder was used. During the battle, women, children, and the elderly were sent up the side of 'Iao Valley where they looked down upon the slaughter. After the battle of Kepaniwai, Maui was added to the domain of Kamehameha the Great (Kamakau 1961:148).

The post-contact history of land use in this section of the _ahupua'a_ is the history of the development of the sugar industry. The following account of that history is based on Speakman (1978) except where otherwise referenced.

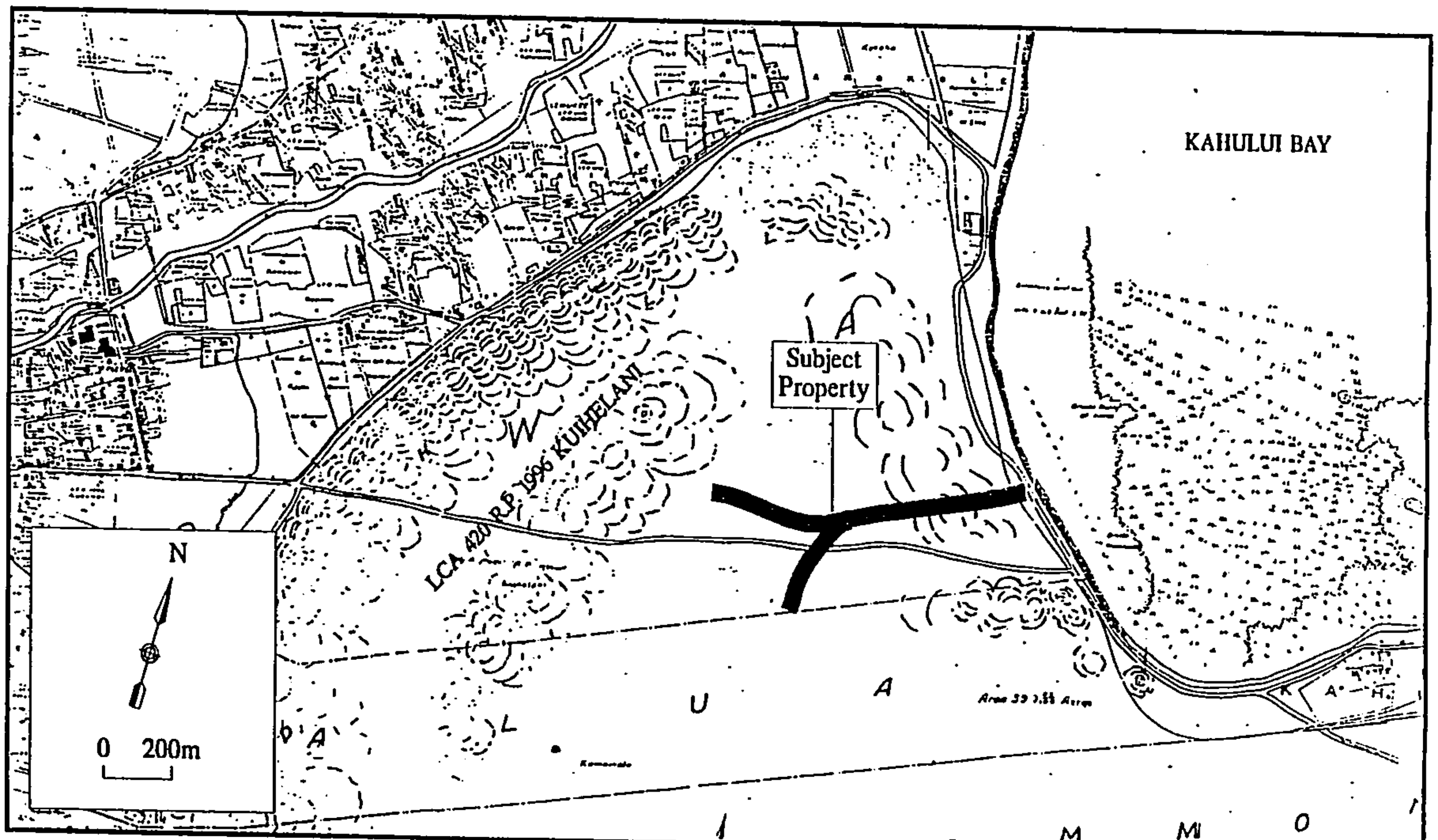
The first commercial sugar production on Maui had begun at Wailuku in 1828 when two Chinese merchants established the Hungtai Sugar Works. Over the next half century, sugar production continued to develop in the western half of the _ahupua'a_, mainly centered on Wailuku and Waihe'e. Sugar production did not begin in the eastern portion of the _ahupua'a_ until after the reciprocity treaty between Hawai'i and the United States became effective on September 9th, 1876, and after the arrival of Claus Spreckels. The treaty gave a great boost to sugar prices and production in Hawai'i and within five years exports of sugar had quadrupled. The higher prices allowed expansion of the industry into more marginal drier areas such as the eastern portion of the _ahupua'a_.

Exclusive ownership of land by the King had ended in 1847. A search of the native and foreign registers and testimonies showed that numerous Land Commission Awards (L.C.A.'s) were awarded in the western portion of the _ahupua'a_. Portions of two L.C.A.'s were located in this eastern section of the _ahupua'a_. L.C.A. #7713:23 was awarded to Princess Victoria Kamamalu. This L.C.A. represented the former _ili_ of Kalua and consisted of 391 acres stretching from the town of Wailuku to include a small portion of the western part of Kahului bordering the bay. L.C.A. #420 took up the major part of the _ili_ of Owa which was the land north of Kalua and stretched from Wailuku Stream in the west, to Kahului Bay in the east. The subject property is entirely located on this L.C.A. (see Map 4). This L.C.A. was awarded to Kuihelani whose claim derived from Auwae who had been the _konohiki_. The testimony described a stone house and walls at the western end of the L.C.A. near Wailuku, but did not give any information about the eastern end near Kahului Bay. The subject property is located on the eastern end of this L.C.A., and unfortunately no information regarding land use was presented.

South of the subject property, a large portion of land (24,000 acres) stretched from Wailuku in the west to Paia in the east and known as the Ka'a lands, or Wailuku Commons, was designated as crown lands. A description of these lands in the 1860's is contained in Burns (1991:72):

> The land around Puunene was a complete desert, a great, barren stretch of sand and dust spread from Wailuku to Paia, except for a little cattle grazing land around the present location of Spreckelsville.

Map 4: Map of Land Commission Award 420 to Kuihelani



Wailuku Ahupua'a, Wailuku District

source: M.D. Monsarrat 1882

Another description is given in Baldwin (1915:47):

> Central Maui was once a bare waste where little existed besides the prickly pear, the razor back hog and the wild indigo.

An 1882 map of Kahului Harbor (Monsarratt 1882) designated the area south of Kahului as 'Wailuku Commons' and showed it to be vacant. Apparently this portion of the ahupua'a was designated as crown lands following the Mahele. The same map showed numerous L.C.A.'s further to the west in the vicinity of Wailuku and 'Iao Valley. The town of Kahului itself, was depicted as consisting of about 20 buildings with E. Bailey and T. Hobron being the only names shown. Bailey was a missionary who had arrived in Maui in 1837, eventually settling in Wailuku, where he was involved in a wide range of activities including the manufacture of sugar. Hobron had set up a cane plantation at Waihe'e in the 1860's and was involved in running a schooner between Kahului and Honolulu. A wharf was also shown on Monsarrat's map.

Spreckels developed a friendship with King Kalakaua, and through him secured purchase and lease, in 1878, of 40,000 acres of the dry plains that make up the eastern portion of Wailuku Ahupua'a. Among the leased lands were the Wailuku Commons. Spreckels later used a contested claim to one half of the crown lands of all Hawai'i, which he had purchased from Princess Ruth Ke'elikolani for $10,000, in 1880, as a bargaining tool to get control in fee simple of the Wailuku Commons in 1882 as Grant 3343. He also secured water rights for the northern slope of Haleakela and the right to transport the water to his lands on the isthmus to irrigate the sugar cane. For this purpose he constructed a huge ditch which delivered 60 million gallons of water a day. King Kalakaua dismissed a cabinet which had held up the granting of these rights and in return Spreckels loaned the King $40,000.

In 1882 Spreckels founded the Hawaiian Commercial and Sugar Company (HC&S). Meanwhile, his cane fields on the isthmus were expanding so rapidly that they had outstripped the supply of water from the existing ditch. In the same year he leased water rights from the Waihee Sugar Company and constructed another ditch to bring water from the west Maui mountains to the isthmus. In the course of a few years Spreckels had totally transformed the landscape of Wailuku Commons. A state-of-the-art sugar mill was developed at a site near Spreckelsville and railways developed to bring the cane to the mill.

Concomitant with the development of the sugar industry in the ahupua'a was the rise of Kahului as a major port. As early as 1840 there may have been a small jetty about where the Maui Palms hotel is now located (Burns 1991:47). By the mid-1870's T. H. Hobron was running a schooner, the Ka Moi, between Honolulu and Kahului (Thomas 1983). Spreckels built a HC&S store, office, and shipping facilities at Kahului around 1877 (Burns 1991:47). In 1879 a small commercial landing was opened in Kahului for the sugar trade (Goodfellow 1991). Soon afterwards, Spreckels' Oceanic Steamship Lines began operating between Kahului and North America. Kahului was by far the major shipping point for the sugar from the Maui plantations. In 1904 Samuel Wilder built the first harbor breakwater wall at Kahului and had part of the bay dredged (Goodfellow 1991). Fill from the dredging was used to form the land on which the main business section now sits (Burns 1991:48). Even in 1914 Kahului was still the only port in Maui where a ship could tie up at a wharf and was therefore the cheapest port on Maui (Thomas 1983:133).

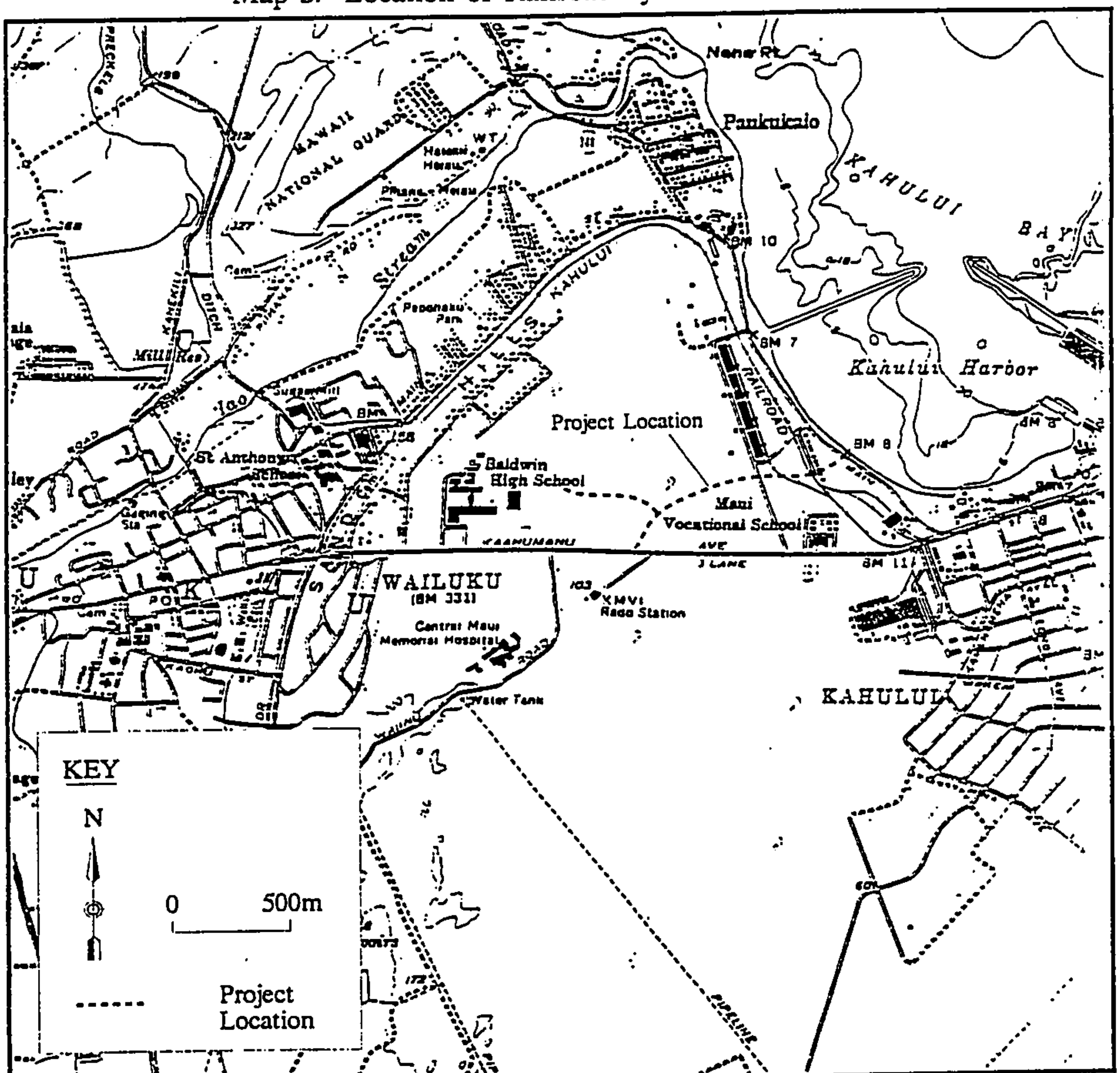
In 1881 the first commercial and passenger railroad in Hawai'i was founded by Thomas Hobron. It ran from Wailuku to Kahului and had its headquarters on the shore of Kahului Bay (Goodfellow 1991). The Kahului Railroad System expanded with the sugar industry over the years and continued its passenger service until 1936 (Schmitt 1977:425). According to (Fredricksen, September 1988, p.8) the railroad remained in commercial service until the mid 1960's when it was dismantled. The track-bed of this rail system traversed a eastern portion of the subject parcel near Kahului Harbor (see Map 5).

An 1885 Hawaiian Government Survey Map which was updated in 1903 (Dodge 1885) depicted the eastern portion of Wailuku Ahupua'a as being Grant 3343 to C. Spreckels. All of this area was designated as HC&S sugar plantation except the area immediately south and west of Kahului. Also shown on this map were schools at Kahului, Pu'unene and south of Spreckelsville; and post offices at Kahului and Pu'unene. A mill was shown at Pu'unene and a reservoir near Pu'unene. The Pu'unene mill was built in 1900 to replace the Spreckelsville mill (Burns 1991:59).

An 1896 map (Howell 1896) of Kahului showed that the town had expanded substantially since Monsarratt's 1882 map but still not as far as the project area. Buildings represented on the 1896 map included a wharf, a school, Kahului Railroad, the Kahului store of H.C.&S.Co., Maui Telephone office, Chinese and Japanese stores, shops, warehouses, a Customs House, a saloon, a fishery, a lumberyard, an office, and the Maui Soda Works. The fishery, Chinese and Japanese stores, school, church, and soda works were all added after the 1882 map (Jackson 1882).

In 1897 friction developed between Spreckels, whose HC&S owned all the land around Kahului Harbor, and Wilder, who owned the Kahului Railroad Company. Spreckels denied the railroad access to the port and Wilder in turn instigated

Map 5: Location of Railroad System in Kahului



WAILUKU AHUPUA'A, WAILUKU DISTRICT

source: USGS (Topographic); Wailuku Quadrangle 1955 legal proceedings. The situation was not resolved until 1899 when HC&S, then out of Spreckels control, bought the railroad. In the legal vacuum of these two years a squalid squatter's town sprang up and bubonic plague broke out in 1900. Kahului was burnt to the ground in order to control the plague outbreak. Modern Kahului dates from this time (Burns 1991:48).

The 1922 HTS & USGS Survey Map (Paia and Kihei Quadrangles) shows the area south and west of Kahului as being vacant. Kahului, Pu'unene, and Spreckelsville are the only towns shown. Kahului has expanded since the 1896 map and two breakwaters are shown in the harbor. Throughout the eastern portion of the <u>ahupua'a</u> are scattered 13 sugar camps, many reservoirs and numerous railway lines used for hauling cane. The greatest concentration of camps is around present day Pu'unene with some being designated as Spanish, Portuguese, and Chinese. An alfalfa mill and a dairy are shown about half a mile south-east of Kahului.

In 1898 Spreckels lost control of HC&S, but even today the sugar plantation which he founded is still the principal land use in the area and the largest sugar producer on Maui. In 1942 the Government annexed 3,800 acres at Pu'unene and Kahului for the construction of naval air stations. The Kahului N.A.S. subsequently became the site of the present airport.

According to testimony given by Mr. Jack Crouse in 1992 in a interview with Xamanek Researches on Maui the 18th Service Battalion (U.S.M.C.) built a camp between the Maui Community College campus and Kanaloa Road in 1944. Also a group of Quonset huts was built along Kahului Beach Road by the U.S. Navy, and turned over to Kahului Railroad Company in 1947. These huts were used privately and commercially until they were removed in the 1980's (Fredericksen and Fredericksen 1992: 5).

In 1948 plans were unveiled by HC&S for the development of 'Greater Kahului' which was to occupy the "barren sand hills covered with <u>kiawe</u>" south of the existing town (Burns 1991:49). The goal was to provide the opportunity for company employees to own their own houses and to also sell fee simple lots to the general public to create a balanced and unsegregated community. Kahului has continued to expand since the war as a commercial and residential center.

During the historic period, Kahului has been subjected to a number of tsunami. A 1923 tsunami destroyed the wharf at Kahului Harbor and inflicted $1.5 million damage. An even worse tsunami was experienced in 1946. Other less serious tsunami hit in 1952 and 1957. It would be safe to assume that the area was affected by tsunami in pre-contact times, even though no references to these could be found in the oral history.

Section 4: Previous Archaeology

A number of archaeological surveys have been conducted in the vicinity of the subject parcel and project area. Many of these surveys have produced limited evidence of indigenous Hawaiian use or culturally significant materials. This is surprizing since the nearby coastal resources should have attracted Hawaiians to the area. Also the large sand dunes of the area would seemingly have been desirable for human burials. For a detailed account of archaeological projects in this eastern portion of the Wailuku Ahupua'a see the report (Kennedy et al. 1992).

Two of the archaeological surveys conducted in the Kahului area probably included a portion of the subject property. Xamanek Researches surveyed the land parcel TMK: 3-8-07: 40 & 43 for the expansion of the Maui Community College Campus and Retention Basin. A portion of the corridor for the Maui County Road Project on the subject property included TMK: 3-8-07: 40. Xamanek Researches reported no significant cultural resources or burials, and concluded that due to severe disturbance from previous construction activities it was unlikely that significant historical resources were present (Fredericksen and Fredericksen 1992a).

Archaeological Consultants of Hawaii, Inc., conducted an inventory survey for the Maui Community Arts and Cultural Center located on property TMK 3-8-07 which lies to the adjacent north and includes a portion of the subject property and survey. No significant cultural resources were discovered. Kennedy attributed the lack of cultural materials to the previous leveling of coastal dunes (Kennedy 1990).

The first archaeological project to find significant archaeological artifacts in the Wailuku and Kahului area was reported by a B. P. Bishop Museum survey team in 1971. Site 50-50-04-1172 known as the Lower Main Street Midden Site contained shell midden, charcoal, water worn stones, and three pre-contact type artifacts. These artifacts were identified as a coral file, a possible hammerstone, and the end of a hammerstone (Connoly 1973). This site is located approximately 1/2km northwest of the subject property.

The most significant archaeological find in the nearby coastal Kahului area was recently reported by Xamanek Researches in a December 1992 Inventory Survey and January 1993 Data Recovery Plan for the Nisei Veterans Memorial Center (TMK 3-8-07:123). This property is located approximately 1300m north of the subject property. Xamanek's archaeological project reported three sites. Site 50-50-04-3119 B produced pre-contact artifacts, shell midden, and a radiocarbon date of 1790 +/-70 RCYBP. The artifacts were identified as a basalt hammerstone, a basalt polishing stone, a basalt flake, and a basalt pecking stone. These artifacts occurred in a grey sand deposit which was directly underlain by sterile, yellow, lithified sand. (Fredericksen and Fredericksen 1992b). This type of archaeological find is to be expected from a coastal resource area.

Xamanek Researches reported that Site 50-50-04-3120 produced numerous artifacts, a single human phalange, a pronograde vertabra, bird bone, and shell midden. The artifacts included two pieces of worked bone, two coral files, two opihi shell scrapers, several adze fragments, a coral pestle, an awl, and one unfinished fishhook (Fredericksen and Fredericksen 1993). Again these artifacts are consistent with the expected finds for a coastal region.

Remnants of the old Kahului Railroad System were found and reported by Xamanek Researches for State Site 50-50-04-3112 during their data recovery. Since it was well known that the rail system traversed this property it was expected that this find was possible.

The archaeological survey and research on the property of the Nisei War Memorial Center lead Xamanek Researches to ascertain that:

> this parcel contains the remnants of an ancient sand dune that has remained undisturbed because the Railroad Bed constituted the major use of the parcel, thus protecting the subsurface layers within the dune (Fredericksen and Fredericksen 1993: 2).

They state that this is the last portion of the undisturbed sand dune on the coast of Kahului Bay.

Section 5: Land Use Patterns

The following summary of prehistoric and historic land use patterns in the eastern portion of Wailuku Ahupua'a is based on the mythological, ethnographic, historical, and archaeological data presented above.

While there is an abundance of evidence indicating that the western portion of Wailuku Ahupua'a was an important political, religious, population, and agricultural center in pre-contact times, there is very little similar evidence for the eastern portion of the ahupua'a. The only mythological and ethnographic accounts of the area are the description of Kahului Bay as being ringed by fishermen's huts in the mid-eighteenth century and a battle occurring at Pu'unene around the same time.

The large number of archaeological studies conducted in this section of the ahupua'a have produced little evidence of intensive use by indigenous Hawaiians in the past. The studies undertaken have centered in three areas; Kahului Airport and surrounding areas, the commercial districts of Kahului and Wailuku, and the Wailuku sand dunes. In none of the three areas have any prehistoric structural remains been found. In the airport area close to the coast, there is evidence of a prehistoric cultural layer on a former beach. This beach, or strand line, is now located several hundred meters inland from the sea, probably due to coastal progradation as a result of rapid beach accretion and dune development. In the Wailuku sand dunes area, human skeletal remains have been found at a number of sites, although no other cultural materials have been found associated with them. In the Kahului coastal area cultural materials associated with coastal resource exploitation have been found, but the findings have been limited.

Several recent studies have attempted to address the question of the paucity of archaeological sites in this area. In the light of the above review, a number of possible reasons can be advanced:

i) pre-contact settlement may have been restricted to the immediate coastal areas by the dryness and sandy soils of much of the interior portion of this section of the ahupua'a.

ii) the lack of structural remains in the sand dune areas could be attributable to the natural absence of basalt building materials. If people were living in these areas, their residences may have been made of less permanent materials.

iii) natural and human disturbances may have hidden or destroyed evidence of occupation, especially in the coastal areas. Much of the current land near the harbor consists of fill dredged from the harbor in historic times. Tsunami may have destroyed or covered evidence of occupation, and the progradation of beaches and the development of dunes may also have covered sites.

Given Xamaneck Researches' recent work, the absence of significant findings in the eastern area of the ahupua'a can probably be attributed to extensive historic disturbances. Their findings, which included an exceptionally early radiocarbon date in cultural association, were discovered in areas which had been protected underneath railway line structures. Given that this railway line extended across the eastern portion of the project site, it was speculated that archaeological sites might still be present in this area.

In post-contact times, the evidence points to limited use of this section of the ahupua'a until the development of the sugar industry. Sugar cane became the dominant crop in this area following the introduction of irrigation in the 1880's. The development of the sugar industry contributed to the development of Kahului as a port and residential area, and the founding of sugar towns such as Pu'unene and Spreckelsville. Sugar was grown everywhere except in the Wailuku sand dunes which extended for approximately eight miles inland from Kahului Bay.

The subject property lies entirely upon L.C.A. #420, although no information is given regarding the eastern portion of this award. Thus, the absence of specified land uses does not inform the current research as to expected finds.

Other land use activities in post-contact times for this section of the Wailuku Ahupua'a involve military activities during World War II. The U.S. Navy built and occupied air fields and camps around the Kahului and Pu'unene area. As noted in the Post Contact History (Section 3.2) oral reports by Jack Crouse indicate that the Marines built a camp in the area between the present Maui Community College Campus and Kanaloa Road.

Activities associated with the Kahului Railroad certainly impacted this section of the ahupua'a. The railroad enabled ease of transportation for people and commercial products adding to the agricultural development (sugar industry) and growth of the Kahului area.

Present land use in the vicinity of the subject property involves construction and development of various projects by the State of Hawaii and County of Maui. At present the Maui Community College campus is in operation and there are various associated modification and construction projects in process. The County of Maui is building the Maui Community Arts and Cultural Center, and this project is presently under construction and should be completed in 1994. The Maui Zoological and Botanical Gardens are complete and open to the public. The Central Maui Youth Center is new and operating as well. The Maui Road Project once completed will allow easy access to all of these developments.

Section 6: Methodology

An archaeological inventory survey with subsurface testing was conducted between March 22 and April 2, 1993. Joseph Kennedy, M.A., was the Principal Investigator. Tina Mangieri, B.A., and Sandra Ireland, B.A., assisted as field supervisors for the project.

The corridor of the Maui County Road Project on the subject property was surveyed and flagged by Richard M. Sato & Assoc., Inc.. Upon arriving at the property the length of the survey corridor was traversed. All station locations and center line pins were located and used as reference points for determining the boundaries and limits of archaeological testing. After establishing the project boundaries and areas unsuitable for testing, a 100% surface survey was conducted. Members of the field crew made pedestrian sweeps, at intervals of 5.0m, in a north to south direction across the proposed corridor for the Maui Central Parkway. Pedestrian sweeps were made in an east to west direction at 3.0m intervals across the proposed route of Papa Extension. The sweeps across the road project were made until 100% of the surface had been examined.

Portions of the proposed project were determined ineligible for testing. These were the areas that had been previously and severely impacted by heavy machinery and other human development. These areas included: the artificial hillock and drainage ditch in Zone 4, the disturbed coastal area of Zone 1 near Kahului Beach Road and Kahului Harbor, and the western portion of Papa Extension which was impacted by the development of Maui Community College Dormitories. Elimination of the impacted areas of the roadway corridor reduced the area of archaeological survey from 1,410m by 45.7m (4,620 x 150 feet) to 1,310m by 45.7m (4300 x 150 ft).

Given the absence of surface features and historic records to guide the subsurface excavations, it was necessary to adopt a sampling strategy. A grid composed of squares 30m (100 ft) by 30m (100 ft) was superimposed over the field survey map supplied by Richard M. Sato & Assoc., Inc.. The intention of this methodology was to obtain the greatest possible coverage of sampled grid squares. The exact locations of individual test trenches within the grid squares were arbitrarily determined by the field crew. Trench locations were determined by the need to obtain maximum coverage of the Maui Road Project corridor, and a representative sampling of various portions of the different zones on the dunes.

Subsurface testing of the archaeological inventory survey consisted of the mechanical excavation of 54 trenches, averaging 15 meters in length, and placed within the reduced Road Project corridor of 4300 x 150ft. These trenches gave a 100% coverage of the grid squares. The trench locations were mapped using tape and compass from fixed points which appeared on the survey site map. All trench lengths and orientations are plotted to scale (See Map 3). The trenches range between 1.5 to 3.0m in depth. Depth was limited by stability of the trench walls. The width of the trenches ranged from 90 to 150cm.

At least one archaeologist monitored the excavation of all trenches. A backhoe was employed for the digging of 34 of the trenches. In areas inaccessible to the backhoe a mechanical excavator was employed.

Descriptions were made of the stratigraphy in all trenches. Profiles were drawn of one wall for each trench. Soil samples of strata were subject to laboratory examination for their physical characteristics and Munsell colors. In the event that cultural materials were encountered in a trench, the back fill was screened through 1/4 inch mesh. All significant cultural features would be depicted in at least one profile.

Section 7: Stratigraphy

The sediment layers within each trench were labeled sequentially within each trench. The upper case, roman numerals increase with depth. Sedimentary deposits which were not spatially limited and discontinuous within the trench wall profile were labeled as lens. The trench and stratigraphic descriptions are presented in Appendix A as "Table 1: Trench Descriptions".

It was not possible to construct a practical and useful generalized stratigraphic profile for the property. Instead the stratigraphy is summarized within discussions of the topographic zones.

A large percentage of the subject property had been previously disturbed from past and present construction activities, and this affected the stratigraphy of many of the test trenches. Zone 1, Zone 2, and Zone 4 proved to be the most disturbed areas of the subject property. Zone 3 and Zone 5 were areas of the subject property where the large coastal dunes still seemed to be intact. These two zones proved to be less disturbed, and in many of the trenches, a natural layering of soils was present.

Zone 1 was partially impacted from the construction activities at the Maui Community Arts and Cultural Center. The northwest section of this zone was not excavated due to the subsurface presence of a sewer line and a water line transecting the corridor. The eastern section of Zone 1 was not excavated either due to its close proximity to another sewer line and impact from the construction of Kahului Beach Road.

Three trenches were excavated in Zone 1. These trenches were dug in areas least impacted by development and construction activities although, they were located on what appeared to be a mechanically leveled beach dune. The surface of this leveled area was covered in a dense thicket of low haole koa and grass, which suggested recent disturbance. Each trench exhibited similar subsurface stratigraphy. In the three trenches a dark, loamy sand with dense root matting (Layer I) overlay a thick layer of very fine to fine, grey brown sand (Layer II) (refer to Appendices A & B - Table 1 and Figure 1). Layer II was homogeneous, and was not banded like some natural deposits on this property.

Zone 2 seemed also to have been mechanically disturbed. All vegetative cover had been removed. All of the trenches excavated exhibited some characteristics of earth-filling activities. Many of the trenches contained a mixture of loamy sand material, the upper depths of which included a scattering of modern trash. Varying sizes and concentrations of basalt rocks were also scattered throughout these loamy sand deposits (refer to Appendix A). The presence of these loamy sands at depth in a number of trenches in this zone (Trenches 1, 51, 4, 5, and 6) confirmed the initial field interpretation that this area had been extensively disturbed.

Trench 3 and Trench 51, within Zone 2, were the only test trenches on the property which contained cultural features (see Appendix B - Figures 2 and 3, and refer to Section 8). Neither of these two features were considered historically significant.

Zone 3, or the high coastal dunes, appeared to be the least impacted by human activities of all the zones defined on the subject property. The high elevated slopes of the dunes in the eastern section of Zone 3 were probably the least disturbed of all the dune environments. Trenches excavated into these slopes contained deep deposits of very fine, fine, and medium sized, calcareous sands overlayed by a surface layer of very fine loamy sand associated with roots and other organic material. Particularly prominent in most of the trenches (Trenches 9, 10, 14, 35, 32, 36, 34, and 48) was the banding, or layering of different sand sizes and color (see Appendix B - Figure 4 for a representative profile). Of the trenches in this zone, Trench 36 was the only one contaminated by modern trash, and this was present only in the surface layer and did not continue to deeper layers (Appendix B - Figure 5).

A change in the stratigraphic sequences in Zone 3 occurred in the basin, or trough, between the slopes of two prominent dunes (refer to Appendix A - Trenches 44 through 46; and Appendix B - Figure 6 for a representative profile). This basin had been impacted by the development and activities of the Maui Archery Course. Generally, a layer of clay loam or a layer of silty clay was overlaid by sand which was, in turn, overlaid by a surface layer of loamy sand.

A consistent pattern appeared in the stratigraphy near the apex of the dune ridge in the western section of Zone 3 (refer to Appendix A - Trenches 37 through 40 and Appendix B-Figure 7). Cemented, partially lithified, sand interspersed with pockets of fine sand occurred as the surface layer in the trenches located near the ridge. A layer of very fine, weakly cemented sand was present beneath the surficial layer. At the base of the trenches, a layer of fine to medium, loose sand was encountered.

The stratigraphic pattern within Zone 3 suggested that the dunes had not been subject to the disturbances of Zones 1 and 2. The upper dunes, in places, contained thick deposits of sorted sand. The lower basin, or trough, encountered a relatively thin sand deposit overlaying a terrestrially dominated sediment. This terrestrial deposit, whether clay loam or silty clay, was probably the pre-existing sediment, formed prior to the formation of dunes in this area. Of note, in the higher dune is the cementation of the upper sand deposit. It might be expected that this process would occur at greater depth, rather than at the surface, within the dune. However, this apparent anomaly could be explained by the upward percolation of water and the solutes it contains, the evaporation of the water at the surface, and the crystallization of these solutes forming a cemented deposit with the natural sands.

Zone 4 had been severely impacted by the development of Maui Community Youth Center and in consequence, only the eastern portion of this zone was mechanically tested (refer to Appendix A and Appendix B - see Figure 8 for a representative profile). Trenches 41 through 42 contained a deep deposit of very fine, compact to cemented, yellowish sand. The layers which overlay this deposit varied between trenches. The variation was probably due to recent filling and grading operations.

Zone 5 contained no clear overall pattern in the stratigraphy (refer to Appendix A). As in Zone 3, deep deposits of stratified calcareous sands, ranging in color and particle size, were overlaid by a surface layer of very fine loamy sand. The microbanding in the basal deposits in many of these trenches indicated that they had been naturally deposited. The variations in the upper soil deposits indicated that they had been disturbed during previous developments at the Maui Community College. Modern trash and materials associated with development such as plastic or asphalt occurred in a surface layer of very fine loamy sand for four trenches (See Appendices A & B -Trenches 11, 15, 16 and 19; and Figure 9).

Zone 6, due to the extensive disturbances it had been subject to, it was considered unsuitable for subsurface testing.

Section 8: Archaeological Findings

There were no surface features encountered on the subject property. This was expected in areas which had, evidently, been previously disturbed by earth moving activities. The large coastal dunes in the western portion of the property, although not seemingly disturbed, did not contain any significant surface finds.

A small number of the test trenches contained a scattering of modern trash, primarily consisting of glass sherds, bits of oxidized metal, and plastic. These trenches were located in areas of the property which seemed disturbed by previous grading and filling activities (Zones 1, 2, and 4). Given the age of this material, and degree of disturbance of its location, it was determined that these artifacts were insignificant to the interest of historic preservation.

Subsurface features encountered during mechanical excavation were few and limited to modern historical deposits. The two features encountered were found in Zone 2 which was one of the most heavily disturbed zones of the five zones tested on the subject property (refer to Section 7).

Feature 1 - Trench 3, Zone 2

Feature 1 consisted of a small pit which contained 25 intact, machine made bottles, associated with copper tubing, oxidized metal in an unidentifiable state, and a large piece of rubber material which encased some of these bottles. The feature occurred at a depth between 70 and 100cmbs in the south face of Trench 3, and 4m from the western terminus of the trench. The pit was approximately 1m long (see Appendix B - Figure 3).

Twenty of the bottles were clear and retained their black, plastic screw top caps. Two modern machine made soda bottles were associated with this feature. All bottles appeared modern and less than 50 years old. Thus, this feature is not significant to the interests of historic preservation.

Feature 2 - Trench 51, Zone 2

Feature 2 was the upper end of a charred wood post or beam, which may have been squared, although this was difficult to ascertain. The charred post or beam was found at the base of Trench 51, at a depth of 150cmbs, and was located within a layer of fine loamy sand (see Appendix B - Figure 2). The base of the post was not exposed, for it extended into the base of the trench which had already been excavated to an unstable depth. A charcoal flecked sediment lens (Lens A) was encountered above this feature. This lens extended for most of the trench length.

The squared shape of this post and its undecomposed state suggested that it was less than 50 years old. In addition, this trench was excavated in Zone 2, which has evidently undergone mechanical disturbance, and thus the position of the post, at the base of the trench, does not necessarily signify an old age of deposition. It would be expected that a wooden post, much older than 50 years, would have decomposed in the aerobic conditions within the sand.

Section 9: Interpretation of Findings

During the current investigations two features were encountered in Zone 2, however, both these features were interpreted to be modern. The lack of significant, surface and subsurface, findings on the subject property was not unexpected given the previous archaeological work conducted in the area. Two surveys conducted on adjacent land did not encounter significant historic sites (Fredericksen and Fredericksen 1992a, Kennedy et al. 1990). The excavations on the property indicated that much of it had been heavily disturbed (Zones 1, 2, and 4). However, the portions of the property which were initially interpreted not to have been disturbed historically, did not contain sites either.

In review, it is possible that the areas initially thought not to have been historically disturbed, may have been eroded. As a result, the upper sediment deposits which may have contained significant materials may have been removed. This interpretation would be supported by the presence of lithified deposits at the surface in Zone 3. The lithified dune, might be expected to have formed at greater depths, as opposed to at the surface, of the dune. Thus, the non-lithified portion of the dune may have eroded; through aeolian action, through mammalian and anthropogenic degradation, or through a combination of these processes.

Dunes are sensitive environments which, after minimal disturbances, can be subject to catastrophic erosion. Given their sensitivity, the activities of people and the animals they domesticate upon the vegetation and the dune deposition could easily have resulted in rapid aeolian erosion initiated by blowouts. A scenario of rapidly eroding dune sand, together with the cultural materials it contains, would explain the lack of archaeologically significant finds in this area. This hypothetical interpretation would most likely apply to post-European arrival times, although it could be applied earlier. The post-European interpretation is supported by Fredericksen and Fredericksen's work further up the coast, where early cultural deposits were encountered beneath an historic railroad bed, but nowhere else on the property (1992b and 1993). Their findings would suggest that the majority of dune erosion has occurred since the railroad bed protective cover was built in the late nineteenth century.

In summary, the lack of significant archaeological sites on the subject property and its vicinity can probably be attributed to the largely anthropogenic degradation of the dunes in this area, as opposed to the absence of cultural activities having occurred in this area at different times in the past. The dunes have been disturbed directly by mechanical and other, probable, activities, and indirectly by anthropogenically initiated aeolian erosion. Consequently, the sediments which contained archaeologically significant materials have also been removed. It cannot be ruled out that there were no cultural activities in this dune area at any time in the past, although this would seem unlikely.

Section 10: Conclusions

This surface survey with subsurface testing was conducted on a road corridor for the Maui County Road Project. An inventory survey, covering 100% of the subject property, did not identify a significant surface feature. Given the lack of surface findings, the lack of information on the L.C.A. in which the road corridor is located, and the disturbance of the area at which the railroad had crossed the property (Zone 1), there was no archaeological information to guide the subsurface testing. In total, 54 trenches of varying length and depth were excavated across the property. Two features were identified, a trash pit (Feature 1) and a wooden post (Feature 2), but neither were considered significant to the interests of historic preservation.

No significant historic materials were encountered on the road corridor. Future construction activities along this road corridor will have "no effect" on significant historic resources. The developer and land owner should be aware that interment of the dead in sand deposits was a common burial practice among pre-European contact Hawaiians. Thus, even though a human burial was not encountered during the current investigations, it is possible that they are present on the property. In the event that a human burial is encountered during future construction activities, the State Historic Preservation Division and the Maui Island Burial Council should be contacted immediately.

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APPENDIX A

TABLE 1: TRENCH DESCRIPTIONS

TABLE 1: TRENCH DESCRIPTIONS

TRENCH	ELEVATION (meters AMSL)	LENGTH (meter)	LAYER	DEPTH (cm)	MUNSELL	SOIL TYPE
ZONE 1						
52	3.05-3.05	13.0	I	0-25	(10YR 4/2) dark greyish brown	very fine loamy sand; fine to coarse roots heavy root matting; abrupt, wavy boundary
			II	25-150	(10YR 5/2) greyish brown	very fine to fine sand; sparse roots; abrupt, wavy boundary
54	3.05-3.66	9.3	I	0-20	(10YR 3/2) very dark greyish brown	very fine loamy sand; fine to coarse roots heavy root mat; abrupt wavy boundary
			II	20-160	(10YR 5/2) greyish brown	very fine to fine sand
53	3.66-3.66	13.7	I	0-20	(10YR 4/2) dark greyish brown	very fine loamy sand with fine to coarse roots, heavy root mat, abrupt, wavy boundary
			II	20-180	(10YR 5/2) greyish brown	very fine to fine sand
ZONE 2						
1	5.18-5.79	25.2	I	0-80	(7.5YR 3/3) dark brown	very fine to fine loamy sand; abrupt, wavy boundary
			II	80-93	(10YR 2/2) very dark brown	fine loamy sand, 1-3cm subangular basalt inclusions; abrupt, wavy boundary
			III	93-150	(7.5YR 3/3) dark brown	fine loamy sand; medium to coarse roots
51	5.79-6.10	13.0	I	0-60	(7.5YR 3/3) dark brown	very fine loamy sand with gravel fill, plastic, glass, aluminum; clear, wavy boundary
			II	60-130	(7.5YR 4/4) dark brown	fine loamy sand; gradual, wavy boundary
			III	130-150	(7.5YR 3/3) dark brown	fine loamy sand w/ charcoal streak, burned wooden post at maximum depth (Feature 2)
			Lens A	40-60	(7.5YR 3/3) dark brown	very fine to fine loamy sand with scattered charcoal flecking
2	6.40-6.40	12.7	I	0-60	(2.5YR 3/4) dark reddish brown	fine loamy sand; abrupt, wavy boundary
			II	60-80	(5YR 3/4) dark reddish brown	fine sand, weakly cemented; abrupt, wavy boundary
			III	80-165	(10YR 4/6) dark yellowish brown	fine sand
3	6.70-7.32	27.0	I	0-40	(7.5YR 3/3) dark brown	very fine loamy sand; abrupt, wavy boundary
			II	40-160	(5YR 4/6) yellowish red	fine sand
			Feature 1	90-130	(7.5YR 3/4) dark brown	modern bottle pit associated with sandy clay loam

TRENCH	ELEVATION (meters AMSL)	LENGTH (meter)	LAYER	DEPTH (cm)	MUNSELL	SOIL TYPE
ZONE 2						
4	8.23-8.53	17.3	I	0-75	(7.5YR 3/3) dark brown	very fine to fine loamy sand; abrupt, wavy boundary
			II	75-90	(5YR 3/2) dark reddish brown	very fine loamy sand; abrupt, wavy boundary
			III	90-105	(5YR 3/4) dark reddish brown	very fine loamy sand, weakly cemented; abrupt, wavy boundary
			IV	105-130	(7.5YR 3/2) dark brown	fine sandy loam, compacted, 3-9cm subangular to angular basalt inclusions, abrupt, smooth boundary
			V	130-150	(7.5YR 3/3) dark brown	fine sandy loam, weakly cemented
5	8.84-8.84	5.0	I	0-150	(7.5YR 3/3) dark brown	fine sandy loam associated with modern trash
6	8.53-10.36	46.7	I	0-45	(7.5YR 4/6) strong brown	very fine loamy sand, fine to medium roots; abrupt, wavy boundary
			II	45-65	(5YR 3/4) dark reddish brown	very fine to fine loamy sand, medium roots, weakly cemented; abrupt, wavy boundary
			III	65-80	(7.5YR 3/3) dark brown	fine sandy loam with fine to coarse roots; abrupt, wavy boundary; shredded tire
			IV	80-100	(10YR 2/2) very dark brown	very fine sandy clay loam forming clumps with fine to coarse roots; abrupt, wavy boundary
			V	100-150	(7.5YR 3/3) dark brown	very fine loamy sand; fine to coarse roots
7	10.97-12.49	14.0	I	0-150cm	(7.5YR 3/3) dark brown	very fine to fine sand
ZONE 3						
8	14.02-15.84	11.3	I	0-120	(10YR 4/6) dark yellowish brown	very fine to fine sand, cemented; abrupt, wavy boundary
			II	120-155	(7.5YR 3/4) dark brown	very fine sand, weakly cemented; abrupt, broken boundary
			III	155-220	(5YR 5/8) yellow red	fine sand, compact, cemented, microbands
13	14.32-16.46	11.0	I	0-125	(10YR 4/6) dark yellowish brown	very fine loamy sand, fine to coarse roots; abrupt, wavy boundary
			II	125-155	(7.5YR 3/4) dark brown	very fine sand, weakly cemented; abrupt wavy boundary
			III	155-220	(5YR 5/8) yellowish red	fine to medium sand, cemented, microbands

TRENCH ZONE 3	ELEVATION (meters AMSL)	LENGTH (meter)	LAYER	DEPTH (cm)	MUNSELL	SOIL TYPE
9	16.46-16.46	18.7m	I	0-18	(5YR 5/4) reddish brown	very fine loamy sand; medium to coarse roots, heavy root matting; abrupt, wavy boundary
			II	18-55	(7.5YR 6/4) light brown	very fine, compacted sand; abrupt, smooth boundary
			III	55-62	(5YR 5/3) reddish brown	very fine to fine loose sand; compact; abrupt, smooth boundary
			IV	62-72	(5YR 4/2) dark reddish grey	very fine to fine loose sand; compact; abrupt, smooth boundary
			V	72-80	(7.5YR 5/6) strong brown	very fine to fine loose sand, compact; abrupt, smooth boundary
			VI	80-170	(5YR 5/3) reddish brown (7.5YR 5/6) strong brown	very fine to fine, reddish brown, loose sand with alternating <20cm bands of fine to medium ,strong brown, loose sand; abrupt, smooth boundary
10	17.37-18.90	20.3	I	0-40	(5YR 5/3) reddish brown	very fine loamy sand; fine to coarse roots, heavy root matting; abrupt, wavy boundary
			II	40-80	(5YR 6/2) pinkish grey	very fine sand, loose; abrupt, wavy boundary
			III	80-110	(5YR 4/6) yellowish red	very fine sand, weakly cemented; abrupt, wavy boundary
			IV	110-150	(5YR 5/8) yellowish red	fine to medium sand, weakly cemented
31	17.68-18.29	18.4m	I	0-45	(7.5YR 4/2) dark brown	very fine loamy sand; fine to coarse roots, heavy root matting; abrupt, wavy boundary
			II	45-95	(7.5YR 5/2) brown	very fine to fine loose sand; abrupt, wavy boundary
			III	95-190	(7.5YR 5/4) brown	fine loose sand; abrupt, wavy boundary
			IV	190-230	(5YR 5/8) yellowish red	fine to medium, compact, sand
14	20.11-20.11	13.7	I	0-30	(7.5YR 4/2) dark brown	very fine loamy sand with medium to coarse roots; heavy root matting; abrupt, wavy boundary
			II	30-50	(5YR 6/2) pinkish grey	very fine compact sand; abrupt, wavy boundary
			III	50-65	(7.5YR 5/6) strong brown	very fine to fine sand, weakly cemented; abrupt, wavy boundary
			IV	65-120	(10YR 4/4) dark yellowish brown	very fine to fine sand, weakly cemented; abrupt,wavy boundary
			V	120-130	(5YR 4/6) yellowish red	very fine to fine loose sand, abrupt, wavy boundary
			VI	130-160	(7.5YR 5/8) strong brown	very fine loamy sand, weakly cemented, abrupt wavy boundary

TRENCH	ELEVATION (meters AMSL)	LENGTH (meter)	LAYER	DEPTH (cm)	MUNSELL	SOIL TYPE
ZONE 3						
35	16.46-18.29	14.0	I	0-50	(7.5YR 3/2) dark brown	very fine loamy sand; fine to coarse roots, medium root matting; abrupt, wavy boundary
			II	50-130	(7.5YR 5/2) brown	very fine to fine loose sand; abrupt, wavy boundary
			III	130-150	(5YR 6/2) pinkish grey	very fine to fine loose sand; abrupt, wavy boundary
			IV	150-200	(7.5YR 5/6) strong brown	fine to medium, loose sand; abrupt, wavy boundary
			V	200-220	(5YR 6/2) pinkish grey	fine loose sand: abrupt, wavy boundary
			VI	220-300	(5YR 5/2) reddish grey	fine loose sand
32	17.68-18.29	20.2	I	0-40	(7.5YR 4/2) dark brown	very fine loamy sand; medium to coarse roots, heavy root matting; abrupt, wavy boundary
			II	40-85	(7.5YR 5/2) brown	very fine to fine compact sand, cemented, microbands: abrupt, smooth boundary
			III	85-135	(5YR 6/2) pinkish grey	fine compact sand; abrupt, smooth boundary
			IV	135-185	(7.5YR 5/2) brown	very fine sand, weakly cemented, compact; abrupt, smooth boundary
			V	185-200	(7.5YR 5/8) strong brown	fine loose sand; abrupt, smooth boundary
			VI	200-225	(7.5YR 5/2) brown	fine sand, compact; abrupt, smooth boundary
			VII	225-240	(5YR 5/6) yellowish red	fine to medium sand, compact
36	11.58-18.29	22.5	I	0-40	(7.5YR4/2) dark brown	very fine loamy sand; medium to coarse roots, heavy root matting; clear, wavy boundary beer and soda bottles, metal scraps
			II	40-85	(7.5YR 5/2) brown	very fine to fine sand, compact; abrupt, smooth boundary
			III	85-120	(5YR 6/2) pinkish grey	fine sand, compact, abrupt, smooth boundary
			IV	120-130	(7.5YR 5/8) strong brown	fine loose sand; abrupt, smooth boundary
			V	130-190	(5YR 4/2) dark reddish grey	fine sand, compact; abrupt, smooth boundary
			VI	190-220	(5YR 6/2) pinkish grey	fine sand, compact; abrupt, smooth boundary
			VII	220-250	(5YR 4/6) yellowish red	fine to medium sand, compact

TRENCH	ELEVATION (meters AMSL)	LENGTH (meter)	LAYER	DEPTH (cm)	MUNSELL	SOIL TYPE
ZONE 3						
34	15.24-15.24	18.0	I	0-50	(7.5YR 4/2) dark brown	very fine loamy sand with medium to coarse roots; clear wavy boundary
			II	50-130	(7.5YR 5/2) brown	very fine to fine sand, compact; abrupt, smooth boundary
			III	130-150	(5YR 5/2) reddish grey	fine sand, compact; abrupt, smooth, boundary
			IV	150-200	(7.5YR 5/8) strong brown	fine sand, compact; abrupt, smooth boundary
			V	200-220	(5YR 4/2) dark reddish grey	fine sand, compact; abrupt, smooth boundary
			VI	220-300	(5YR 6/8) *reddish yellow*	fine to medium sand, compact
33	13.41-14.60	9.0	I	0-40	(10YR 3/3) dark brown	very fine loamy sand with medium to coarse roots; gradual, wavy boundary
			II	40-150	(10YR 5/4) yellowish brown	very fine sand, loose
49	8.84-9.14	12.8	I	0-25	(7.5YR 3/2) dark brown	very fine loamy sand; medium to coarse roots, heavy root matting; clear wavy boundary
			II	25-150	(10YR 5/3) brown	very fine to fine sand; medium roots; microbands, weakly cemented; abrupt, smooth boundary
			III	150-170	(10YR 5/3) brown	very fine sand, largely cemented
50	8.84-9.14	19.3m	I	0-60	(10YR 3/3) dark brown	very fine silty sand with medium to coarse roots; heavy root matting; clear, wavy boundary
			II	60-150	(10YR 5/4) yellowish brown	very fine to fine sand; medium roots; microbands, weakly cemented, abrupt, smooth boundary
			III	150-180	(10YR 6/4) light yellowish brown	very fine sand, largely cemented
48	8.53-8.84	15.2	I	0-40	(10YR 3/4) dark yellowish brown	very fine loamy sand with medium to coarse roots; heavy root matting; clear, wavy boundary
			II	40-100	(10YR 5/3) brown	very fine to fine sand, weakly cemented, microbands; abrupt, wavy boundary
			III	100-140	(10YR 3/4) dark yellowish brown	fine loamy sand, loose; abrupt, wavy boundary
			IV	140-170	(5YR 4/6) yellowish red	fine loamy sand, loose; abrupt, wavy boundary
			V	170-180	(7.5YR 5/6) strong brown	fine compact sand; abrupt, wavy boundary
			VI	180-190	(7.5YR 6/8) reddish yellow	fine to medium sand, loose

TRENCH	ELEVATION (meters AMSL)	LENGTH (meters)	LAYER	DEPTH (cm)	MUNSELL	SOIL TYPE
ZONE 3						
46	8.23-8.53	11.0	I	0-20	(7.5YR 3/2) dark brown	very fine loamy sand with medium to coarse roots, heavy root root matting; clear, wavy boundary
			II	20-70	(7.5YR 4/4) dark brown	very fine to fine loamy sand; few coarse roots; abrupt, smooth boundary
			III	70-90	(5YR 4/6) yellowish red	very fine to fine loamy sand, compact; abrupt, smooth boundary
			IV	90-125	(10YR 6/6) brownish yellow	fine to medium sand, loose; abrupt, wavy boundary
			V	125-150	(7.5YR 4/3) dark brown	very fine sandy loam with mineralized coral flecks <9cm; compact
45	7.92-7.92	16.5	I	0-50	(7.5YR 3/2) dark brown	very fine loamy sand with medium roots, medium root matting; abrupt, wavy boundary
			II	50-100	(7.5YR 6/3) light brown	very fine to fine loose sand; abrupt, wavy boundary
			III	100-150	(5YR 2.5/2) dark reddish brown	silty clay, compact
44	7.62-8.84	11.0	I	0-60	(7.5YR 4/4) dark brown	loamy sand with medium to coarse roots; abrupt, wavy boundary
			II	60-110	(10YR 6/3) pale brown	very fine to fine loamy sand; abrupt, wavy boundary
			III	110-120	(5YR 8/1) white	very fine sand, weakly cemented; very abrupt, smooth boundary
			IV	120-160	(5YR 3/3) dark reddish brown	very fine clay loam; compact
47	9.14-10.97	19.0	I	0-60	(7.5YR 4/4) dark brown	very fine loamy sand with medium to coarse roots; abrupt, wavy boundary
			II	i 60-80 ii 60-165	(10YR 6/3) pale brown	very fine to fine sand with coral chunks >10cm associated with coarse roots; abrupt, irregular and broken boundary
			III	i 80-156 ii absent	(10YR 6/6) brownish yellow	fine sand, loose; abrupt, irregular boundary
			IV	156-180 ii 165-180	(10YR 6/6) brownish yellow	very fine to fine sand, moderately cemented
37	12.19-16.46	18.2	I	0-10	(7.5YR 6/6) reddish yellow	fine sand and lithified sand; little to no roots; abrupt, smooth to wavy boundary
			II	10-150	(7.5YR 4/6) strong brown	very fine to fine sand, weakly cemented; abrupt, smooth boundary; microbands
			III	150-250	(7.5YR 5/8) strong brown	fine sand, loose

ZONE 3 CONTINUED

TRENCH	ELEVATION (meters AMSL)	LENGTH (meter)	LAYER	DEPTH (cm)	MUNSELL	SOIL TYPE
38	12.19-15.85	20.1	I	0-20	(7.5YR 6/6) reddish yellow	lithified sand and fine sand; abrupt, wavy boundary
			II	20-150	(7.5YR 4/6) strong brown	very fine to fine sand, weakly cemented; abrupt, smooth boundary
			III	150-260	(7.5YR 5/8) strong brown	fine sand, loose
40	15.24-18.90	16.2	I	0-20	(10YR 5/1) grey	lithified sand and fine sand
			II	20-40	(7.5YR 5/2) brown	lithified sand and fine sand
			III	40-200	(7.5YR 5/2) brown	very fine to fine sand, weakly cemented; abrupt, smooth, boundary
			IV	200-300	(7.5YR 5/8) strong brown	fine to medium sand, loose
39	14.93-15.54	8.0	I	0-20	(10YR 5/3) brown	lithified sand and fine sand
			II	20-40	(7.5YR 5/2) brown	lithiified sand and fine sand
			III	40-200	(7.5YR 5/2) brown	very fine sand, compact, weakly cemented; abrupt, smooth boundary
			IV	200-300	(7.5YR 5/8) strong brown	fine sand, loose
ZONE 4						
42	12.80-13.11	14.6	I	0-140	(5YR 4/6) yellowish red	very fine loamy sand; no roots; abrupt, wavy boundary
			II	140-280	(10YR 4/4) dark yellowish brown	very fine sand flecked with dark organic material:medium roots; abrupt, wavy boundary
			III	280-285	(10YR 6/3) pale brown	very fine sand , weakly cemented
41	12.80-12.80	19.0	I	0-75	(10YR 6/3) pale brown	very fine sand; abrupt, wavy boundary
			II	75-90	(10YR 2/1) black	very fine sandy loam; medium to coarse roots; abrupt, wavy boundary
			III	90-130	(5YR 4/6) yellowish red	very fine loamy sand; abrupt, wavy boundary
			IV	130-250	(10YR 4/4) dark yellowish brown	very fine sand; compact
43	12.80-13.10	11.0	I	0-80	(10YR 5/3) brown	very fine loamy sand; clear, smooth boundary
			II	80-140	(5YR 4/3) reddish brown	very fine to fine, loamy sand with medium to coarse roots; abrupt, wavy boundary
			III	140-280	(10YR 5/4) yellowish brown	fine sand; loose; abrupt, boundary
			IV	280-300	(10YR 5/4) yellowish brown	cemented sand

TRENCH	ELEVATION (meters AMSL)	LENGTH (meter)	LAYER	DEPTH (cm)	MUNSELL	SOIL TYPE
ZONE 5						
11	10.97-12.80	16.3	I	0-50	(7.5YR 3/2) dark brown	very fine loamy sand with modern trash and >5cm subangular basalt inclusions; abrupt, broken boundary
			II	0-50	(10YR 4/4) dark yellowish brown	very fine sand; few, coarse roots; abrupt, wavy boundary
			III	50-100	(7.5YR 5/3) brown	very fine sand, weakly cemented; abrupt wavy boundary
			IV	100-150	(10YR 4/4) dark yellowish brown	very fine, loose sand
12	10.97-12.50	14.7	I	0-40	(7.5YR 3/2) dark brown	very fine loamy sand; fine to medium roots, heavy root matting; clear, wavy boundary
			II	40-110	(7.5YR 5/3) brown	very fine sand; abrupt, wavy boundary
			III	110-150	(7.5 YR 5/3) brown	very fine, sand; weakly cemented
15	10.67-10.67	4.8	I	0-180	(7.5YR 3/2) dark brown	very fine loamy sand with plastic and assorted modern trash; clear, wavy boundary
			II	180-220	(7.5YR 4/4) dark brown	very fine loamy sand; fine to medium roots; abrupt, wavy boundary
			III	220-310	(7.5YR 6/4) light brown	very fine to fine, loose sand; abrupt, wavy boundary
			IV	310-360	(7.5YR 6/4) light brown	very fine to fine, compact, sand; weakly cemented
29	11.58-12.80	13.8	I	0-60	(7.5YR 3/2) dark brown	very fine loamy sand; medium roots, moderate root matting; abrupt, wavy boundary
			II	60-118	(7.5YR 5/3) brown	very fine sand; abrupt, wavy boundary
			III	118-185	(7.5 YR 5/4) brown	very fine, compact, sand; abrupt, wavy boundary
			IV	185-260	(7.5 YR 5/6) strong brown	fine to medium, loose sand
28	11.58-12.19	11.3	I	0-60	(7.5YR 3/2) dark brown	very fine loamy sand with medium roots; abrupt, wavy boundary
			II	60-125	(7.5YR 5/4) brown	very fine, compact sand; abrupt, smooth boundary
			III	125-185	(7.5YR 5/2) brown	very fine, compact sand; abrupt, smooth boundary
			IV	185-260	(7.5YR 6/6) reddish yellow	fine to medium, loose sand

TRENCH	ELEVATION (meters AMSL)	LENGTH (meter)	LAYER	DEPTH (cm)	MUNSELL	SOIL TYPE
ZONE 5						
16	11.28-11.89	8.6	I	0-80	(7.5YR 3/2) dark brown	very fine loamy sand; modern glass sherds, bottle bases
			II	80-120	(7.5YR 4/2) dark brown	very fine loamy sand; fine to medium roots, moderate root matting; abrupt, wavy, boundary
			III	120-230	(7.5YR 6/4) light brown	very fine to fine, loose sand
17	12.80-12.80	17.7	I	0-50	(10YR 3/4) dark yellowish brown	very fine loamy sand with fine to coarse roots; heavy root matting; diffuse, wavy boundary
			I	50-110	(10YR 3/4) dark yellowish brown	very fine loamy sand; no roots; abrupt, wavy boundary
			II	110-180	(7.5YR 6/3) light brown	very fine, compact sand; abrupt, wavy boundary
			III	180-210	(5YR 5/8) yellow red	fine to medium, loose sand
18	13.41-13.41	9.7	I	0-50	(10YR 3/4) dark yellowish brown	very fine loamy sand with medium roots, heavy root matting; diffuse, wavy boundary
			II	50-190	(10YR 3/4) dark yellowish brown	very fine loamy sand with no roots; abrupt, wavy boundary
			III	190-205	(5YR 5/8) yellowish red	fine loose sand; abrupt, wavy boundary
			IV	205-250	(7.5YR 6/3) light brown	fine loose sand; abrupt, wavy boundary
			V	250-280	(5YR 5/8) yellowish red	fine to medium, loose sand
20	13.11-15.85	9.0	I	0-65	(10YR 3/3) dark brown	very fine loamy sand with medium roots, heavy root matting; abrupt, wavy boundary
			II	65-110	(7.5YR 5/2) brown	very fine to fine, loose sand; clear, smooth boundary
			III	110-140	(7.5YR 5/4) brown	very fine to fine sand, weakly cemented; abrupt smooth boundary
			IV	140-200	(5YR 5/8) yellow red	fine to medium sand, weakly cemented
27	14.02-14.02	13.5	I	0-50	(10YR 4/3) dark brown	very fine loamy sand with medium roots, heavy root matting; clear, irregular boundary
			II	50-93	(10YR 5/3) brown	very fine to fine, loose sand; abrupt, wavy boundary
			III	93-200	(7.5YR 5/8) strong brown	fine to medium sand, moderately cemented

TRENCH ZONE 5	ELEVATION (meters AMSL)	LENGTH (meter)	LAYER	DEPTH (cm)	MUNSELL	SOIL TYPE
19	14.02-15.24	14.1	I	0-60	(10YR 4/3) dark brown	very fine loamy sand with medium roots, broken pieces of asphalt; abrupt, wavy boundary
			II	60-130	(10YR 5/3) brown	very fine loose sand; clear, wavy boundary
			III	130-170	(5YR 5/6) yellowish red	fine loose sand
21	13.41-14.63	9.4	I	0-48	(10YR 4/3) dark brown	very fine loamy sand; fine to medium roots, heavy root matting; clear, wavy boundary
			II	48-120	(10YR 5/3) brown	very fine, loose sand; abrupt, wavy boundary
			III	120-180	(5YR 5/6) yellowish red	fine to medium, loose sand
30	16.46-17.68	29.1	I	0-55	(10YR 5/3) brown	very fine loamy sand; fine to coarse roots, heavy root matting; clear, wavy boundary
			II	55-103	(10YR 5/4) yellowish brown	very fine loose sand; abrupt, smooth boundary
			III	103-125	(7.5YR 5/8) strong brown	fine to medium sand; abrupt, smooth boundary
			IV	125-230	(10YR 6/4) light yellow brown (7.5YR 5/8) strong brown	very fine, yellow brown sand, weakly cemented, alternating with 5-10cm bands of strong brown, weakly cemented, fine sand
22	15.24-16.45	10.0	I	0-20	(10YR 4/3) dark brown	very fine loamy sand; fine to medium roots; abrupt, wavy boundary
			II	20-200	(10YR 6/4) light yellow brown (7.5YR 5/8) strong brown	very fine, compact, yellow brown sand alternating with <10cm bands of loose, fine, strong brown sand
23	14.33-18.29	19.4	I	0-55	(10YR 4/3) dark brown	very fine loamy sand with medium to coarse roots; abrupt, wavy boundary
			II	55-300	(10YR 5/3) brown (7.5YR 5/8) strong brown	very fine, compact, brown sand alternating with <10cm bands of loose, fine, strong brown sand
24	15.24-21.37	13.7	I	0-30	(7.5YR 6/3) light brown	very fine sand with lithified sand at apex of slope; abrupt, smooth boundary
			II	30-100	(10YR 6/3) pale brown	very fine sand; weakly cemented; abrupt, smooth boundary
			III	100-300	(10YR 5/3) brown (7.5YR 6/6) reddish yellow	very fine, compact, brown sand alternating with <10cm bands of fine, loose, reddish yellow sand
26	16.46-18.29	5.3	I	0-40	(7.5YR 5/4) brown	very fine loamy sand; abrupt, wavy boundary
			II	40-200	(10YR 5/3) brown (7.5YR 6/6) reddish yellow	very fine, compact, brown sand alternating with <20cm bands of fine, loose, reddish yellow sand

TRENCH ZONE 5	ELEVATION (meters AMSL)	LENGTH (meter)	LAYER	DEPTH (cm)	MUNSELL	SOIL TYPE
25	14.33-15.85	10.6	I	0-200	(7.5YR 4/3) dark brown	very fine loamy sand with medium to coarse roots in top 45 cm; abrupt wavy boundary
			II	200-300	(7.5YR 6/3) light brown (7.5YR 5/8) strong brown	very fine to fine, light brown, compact, sand alternating with <10 cm bands of fine, loose, strong brown sand

KEY TO TABLE 1.

Trench = Trench number
Elevation = Elevation of trench above mean sea level (AMSL) in meters
Length = Length of trench in meters
Layer = Stratigraphical layer of soil from profile of each trench
Depth = Maximum depth below surface in centimeters
Munsell = Nomenclature of soil colors according to the Munsell Soil Color Charts
Soil Type = Description of physical characteristics of soil and layer description including;

1. Size of granular particles of soil
   - very fine = <1mm
   - fine = 1-2mm
   - medium = 2-5mm

2. Textural Properties of Soil
   - sand: not sticky, not plastic and loose
   - loamy sand: not sticky, not plastic and loose
   - sandy loam: not sticky, not plastic, friable and soft
   - sandy clay loam: sticky, moderately plastic, firm and slightly hard
   - clay loam: sticky, moderately plastic, firm and hard
   - silty clay: very sticky, very plastic, firm and hard

3. Root Size Diameter
   - fine = < 0.50cm
   - medium = 0.50cm - 5.0cn
   - coarse = >5.0cm

4. Distinctness of boundary of soil layer
   - very abrupt = < 1mm thick
   - abrupt = 1mm - 2.5cm
   - clear = 2.5cm -7.5cm
   - gradual = 7.5cm - 12.5cm
   - diffuse = > 12.5cm thick

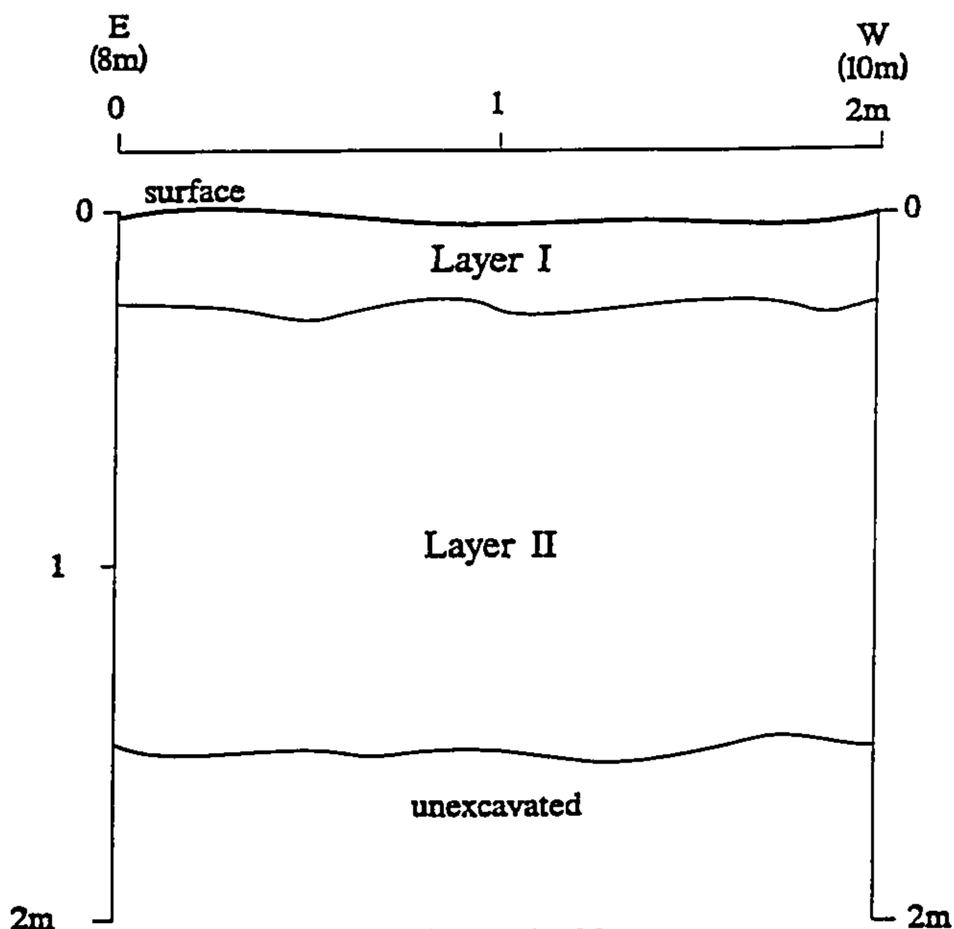
5. Topography of boundary
   - smooth: nearly a plane
   - wavy: pockets with width > depth
   - irregular: pockets with depth > width
   - broken: discontinuous

6. Microbands: Lens of fine to medium sand interbedded with lens of very fine to fine sand. Sometimes differing in color.

APPENDIX B

REPRESENTATIVE PROFILES

Figure 1: Trench 52, North Face



Total Length 13.0m
Profile between 8-10m, E to W

Layer I: 10YR 4/2, Dark greyish brown; very fine loamy sand, fine to coarse roots heavy root matting.

Layer II: 10YR 5/2, Greyish brown; very fine to fine sand; sparse roots.

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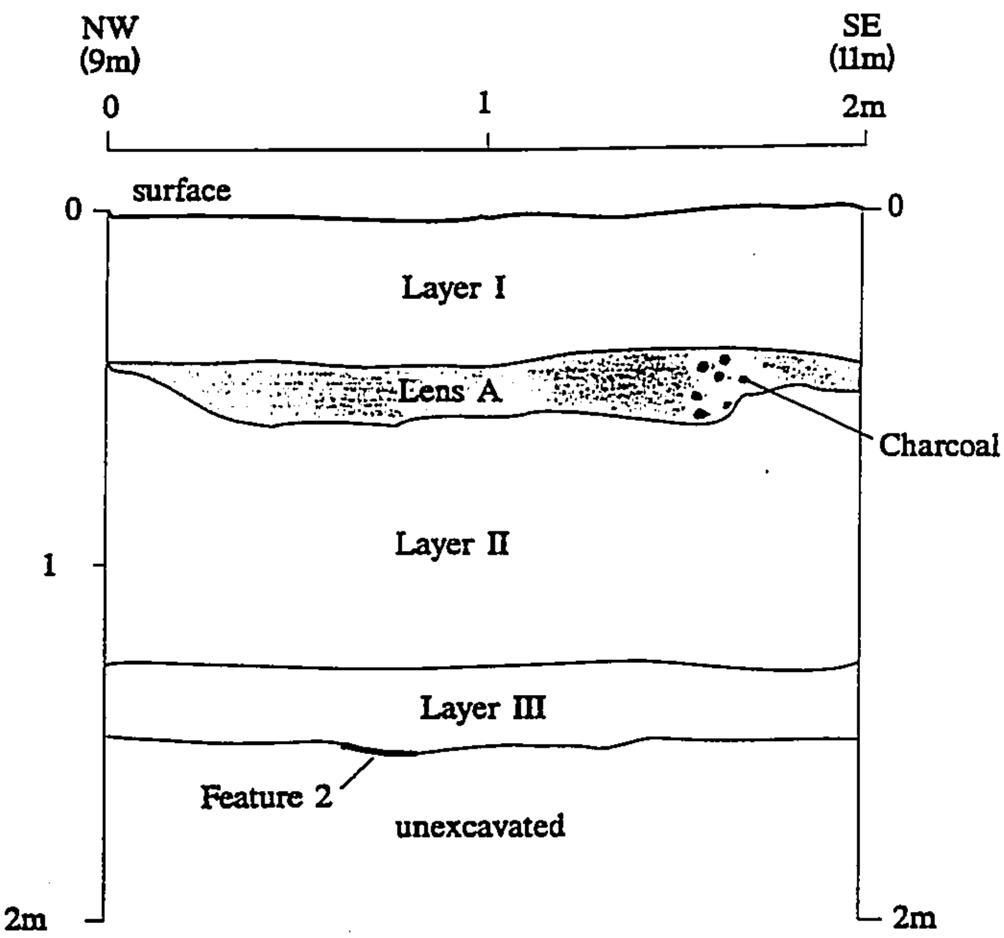
Figure 2: Trench 51, Northeast Face



Total Length 13.0m
Profile between 9-11m, NW to SE

Layer I: 7.5YR 3/3, Dark brown; very fine loamy sand with gravel fill, glass, aluminum.

Layer II: 7.5YR 4/4, Dark brown; fine loamy sand.

Layer III: 7.5YR 3/3, Dark brown; fine loamy sand, burned wooden post at maximum depth. (Feature 2)

Lens A: 7.5YR 3/3, Dark brown, very fine to fine loamy sand with scattered charcoal flecking.

Feature 2: Charred wood.

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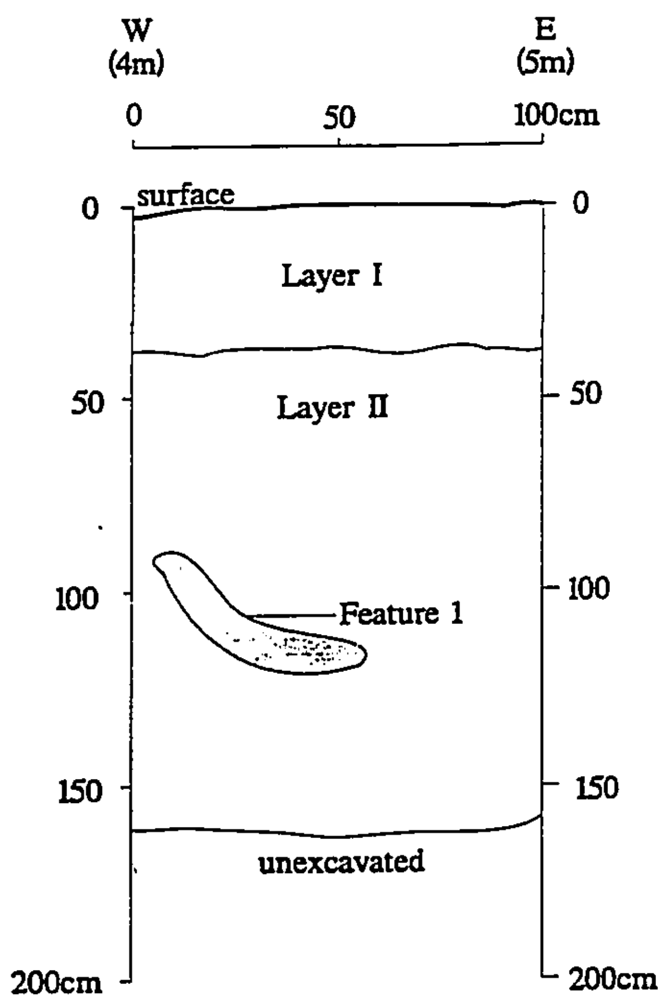
Figure 3: Trench 3, South Face



Total Length 27m
Profile Between 4-5m, W to E

Layer I: 7.5YR 3/3, Dark brown; very fine loamy sand.

Layer II: 5YR 4/6, Yellowish red; fine sand.

Feature 1: 7.5YR 3/4, Dark brown; modern trash pit associated with sandy clay loam.

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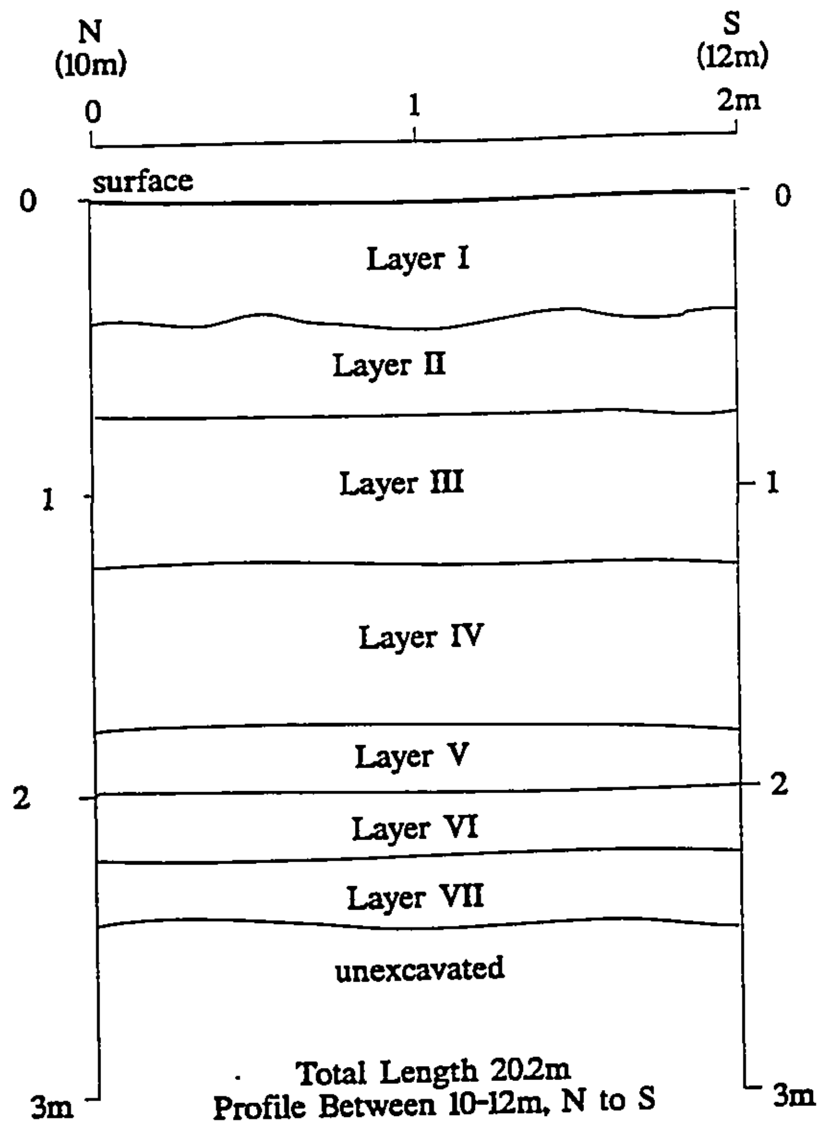
Figure 4: Trench 32, West Face



Layer I: 7.5YR 4/2, Dark brown; very fine loamy sand; medium to coarse roots, heavy root matting.

Layer II: 7.5YR 5/2, Brown; very fine to fine compact sand, cemented; microbands.

Layer III: 5YR 6/2, Pinkish grey; fine compact sand.

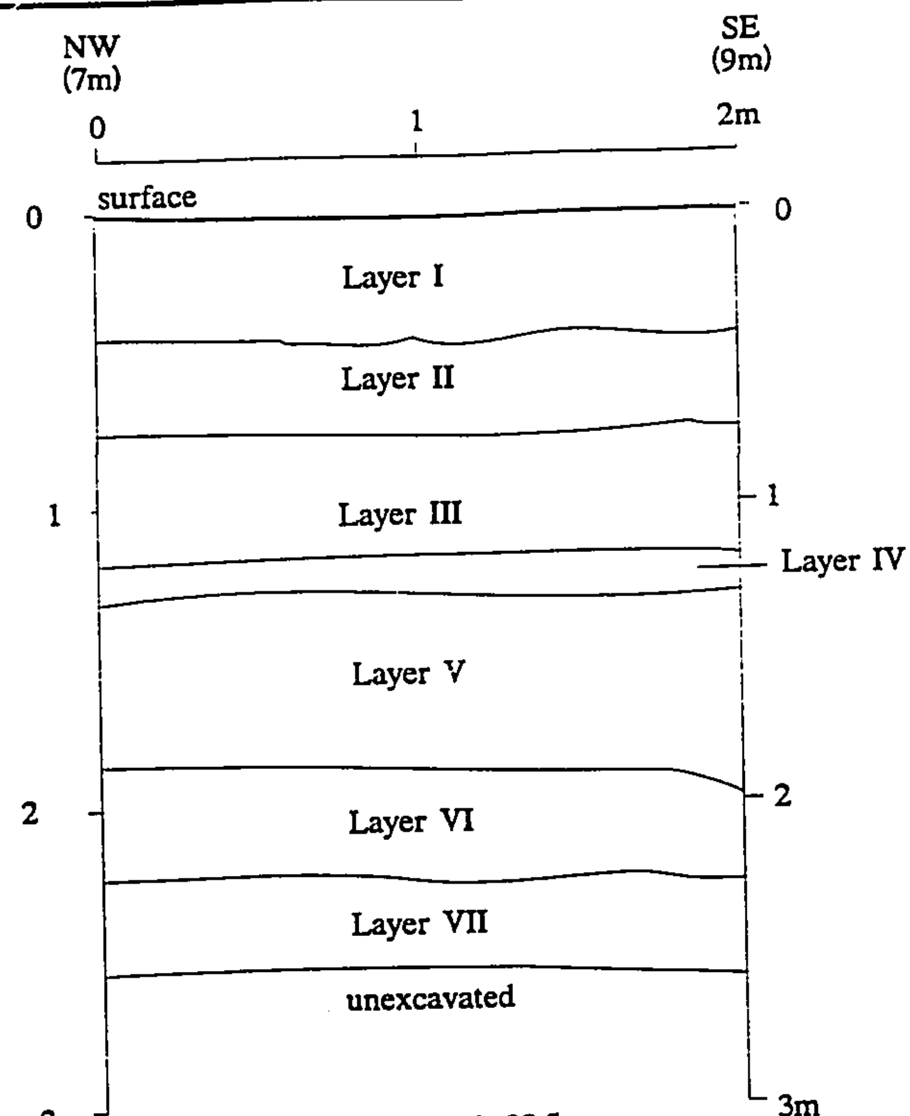
Layer IV: 7.5YR 5/2, Brown; very fine sand, weakly cemented, compact.

Layer V: 7.5YR 5/8, Strong brown; fine loose sand.

Layer VI: 7.5YR 5/2, Brown; fine sand.

Layer VII: 5YR 5/6, Yellowish red; fine to medium sand.

Figure 5: Trench 36, Northeast Face



Total Length 22.5m
Profile Between 7-9m, NW to SE

Layer I: 7.5YR 4/2, Dark brown; very fine loamy sand; medium to coarse roots, beer and soda bottles, metal scraps.

Layer II: 7.5YR 5/2, Brown; very fine to fine sand, compact .

Layer III: 5YR 6/2, Pinkish grey; fine sand.

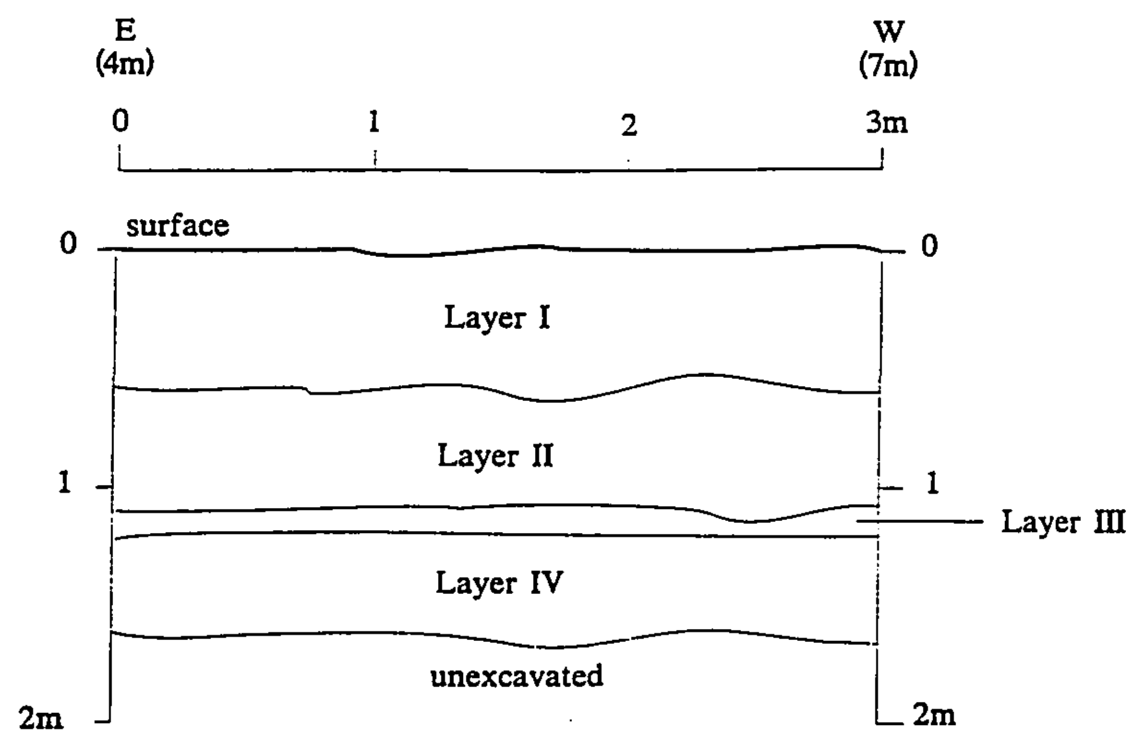
Layer IV: 7.5YR 5/8, Strong brown; fine loose sand.

Layer V: 5YR 4/2, Dark reddish grey; fine sand compact.

Layer VI: 5YR 6/2, Pinkish grey; fine sand, compact.

Layer VII: 5YR 4/6, Yellowish red; fine to medium sand, compact.

Figure 6: Trench 44, South Face



Total Length 11.0m
Profile Between 4-7m, E to W

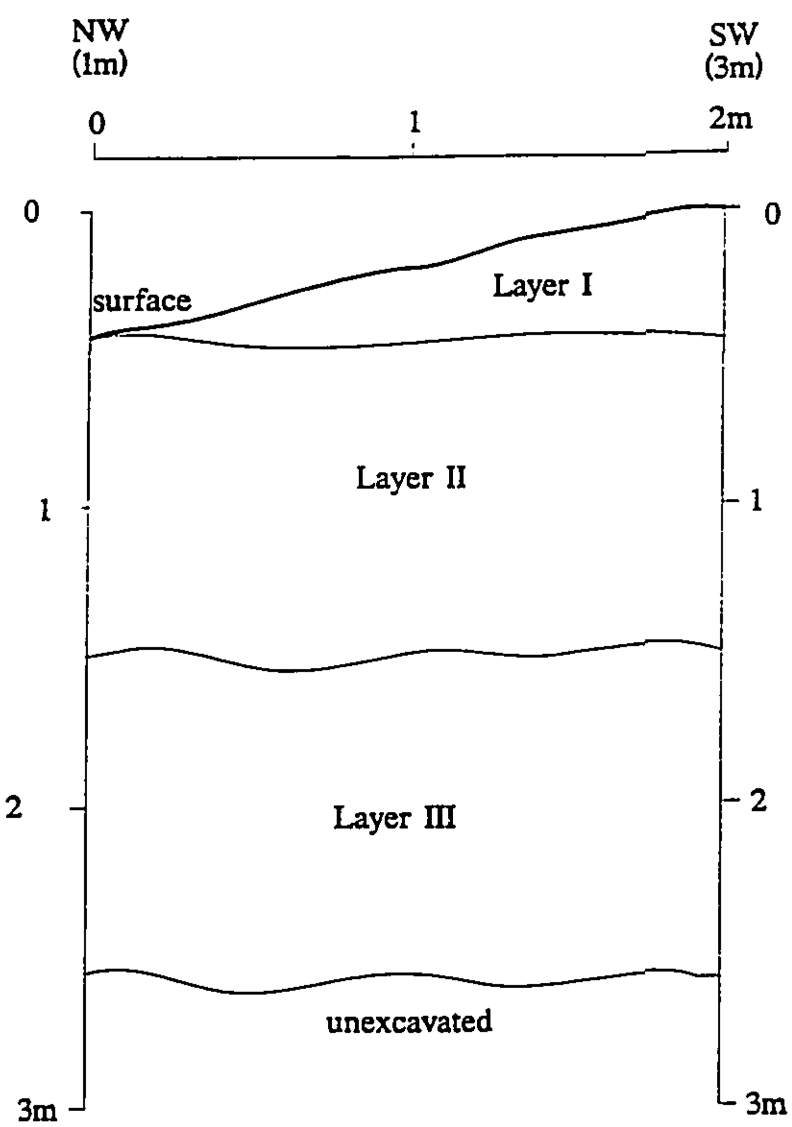
Layer I: 7.5YR 4/4, Dark brown; loamy sand with medium to coarse roots; abrupt, wavy boundary.

Layer II: 10YR 6/3, Pale brown; very fine to fine loamy sand;

Layer III: 5YR 8/1, White; very fine sand, weakly cemented;

Layer IV: 5YR 3/3, Dark reddish brown; very fine clay loam; compact.

Figure 7: Trench 38, Northeast Face



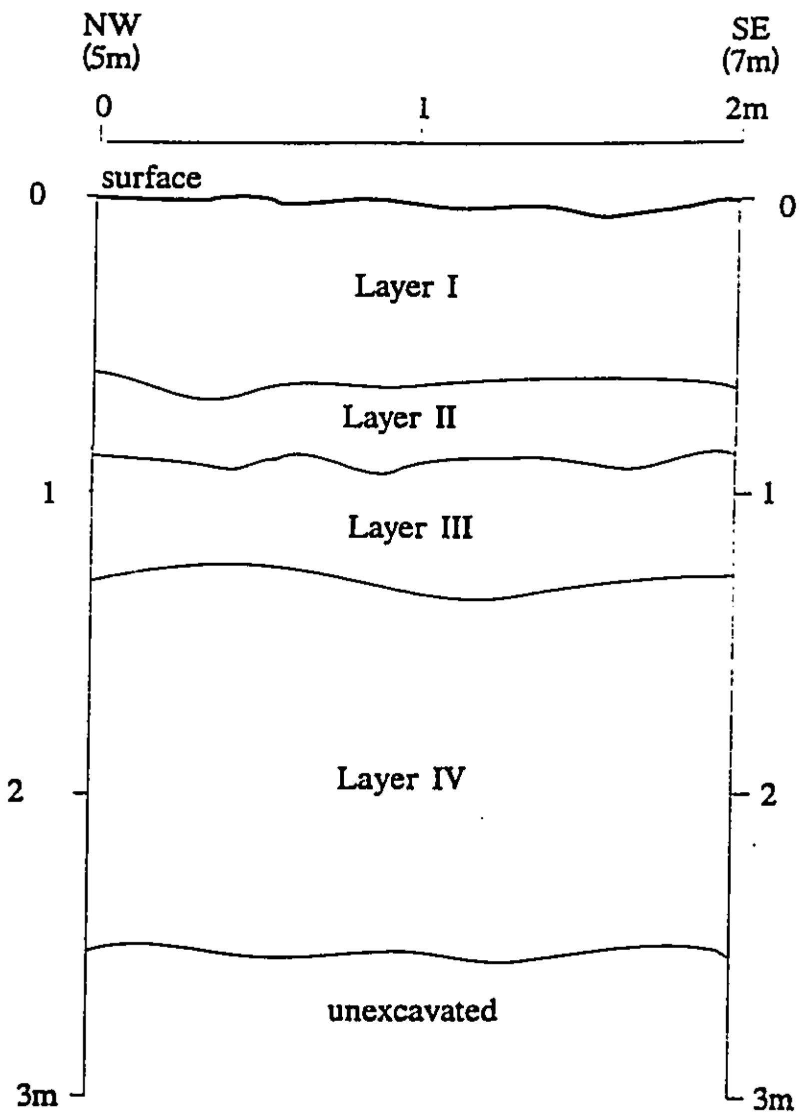
Total Length 20.1m
Profile Between 1-3m, NW to SW

Layer I: 7.5YR 6/6, Reddish yellow; lithified sand and fine sand.

Layer II: 7.5YR 4/6, Strong brown; very fine to fine sand, weakly cemented.

Layer III: 7.5YR 5/8, Strong brown; fine sand, loose.

Figure 8: Trench 41, Northeast Face



Total Length 19.0m
Profile Between 5-7m, NW to SE

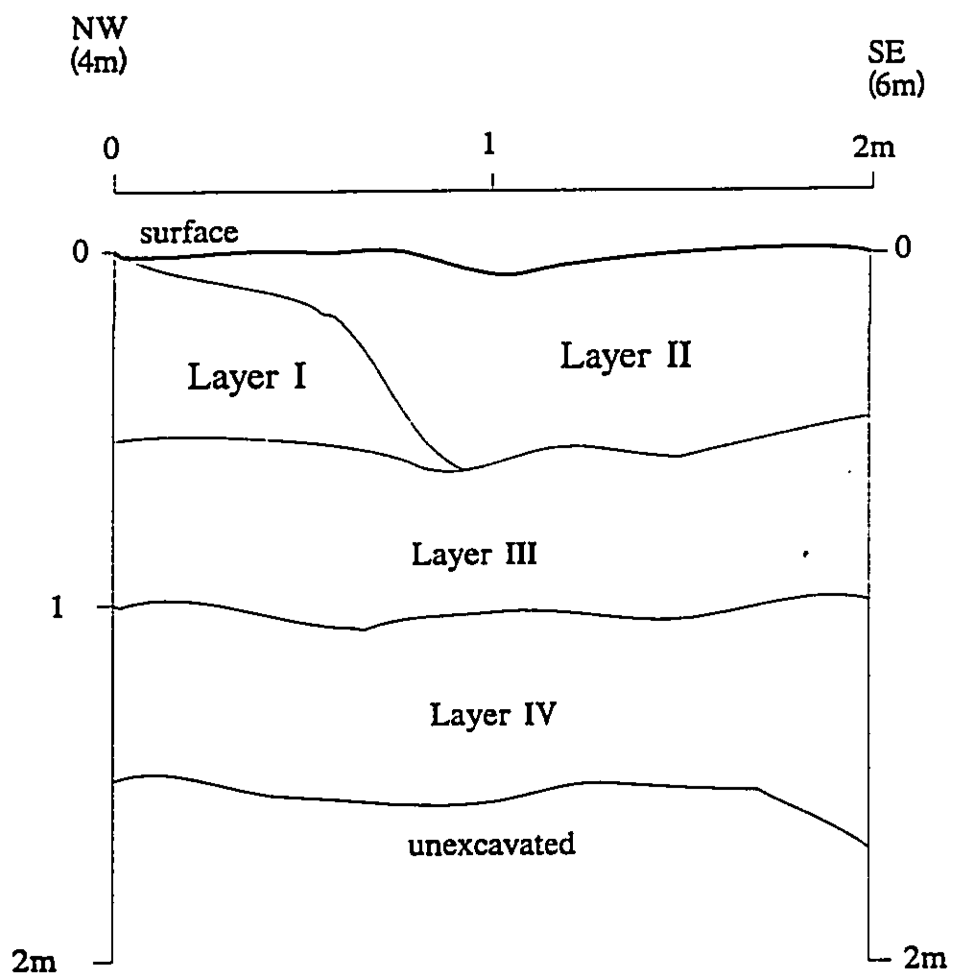
Layer I: 10YR 6/3, Pale brown; very fine sand.

Layer II: 10YR 2/1, Black; very fine sandy loam; medium to coarse roots.

Layer III: 5YR 4/6, Yellowish red; very fine loamy sand.

Layer IV: 10YR 4/4, Dark yellowish brown; very fine sand.

Figure 9: Trench 11, West Face



Total Length 16.3m
Profile between 4-6m, NW to SE

Layer I: 7.5YR 3/2, Dark brown; very fine loamy sand with modern trash and >5cm subangular baslt inclusions.

Layer II: 10YR 4/4, Dark yellowish brown; very fine sand; few, coarse roots.

Layer III: 7.5YR 5/3, Brown very fine sand, weakly cemented.

Layer IV: 10YR 4/4, Dark yellowish brown, Very fine, loose sand.

Appendix A-2

Supplemental Archaeological Inventory Survey

AN INVENTORY SURVEY OF A 10-ACRE PARCEL OF LAND, MAUI CENTRAL PARK PARKWAY, WAILUKU *AHUPUA'A*, WAILUKU DISTRICT, MAUI ISLAND (TMK: 3-8-07: 125)

Prepared for:

Munekiyo & Arakawa, Inc.
Wailuku, Hawaii

Prepared by:

Xamanek Researches
Pukalani, Hawaii

Erik M. Fredericksen
Walter M. Fredericksen
Demaris L. Fredericksen

September 1994

ABSTRACT

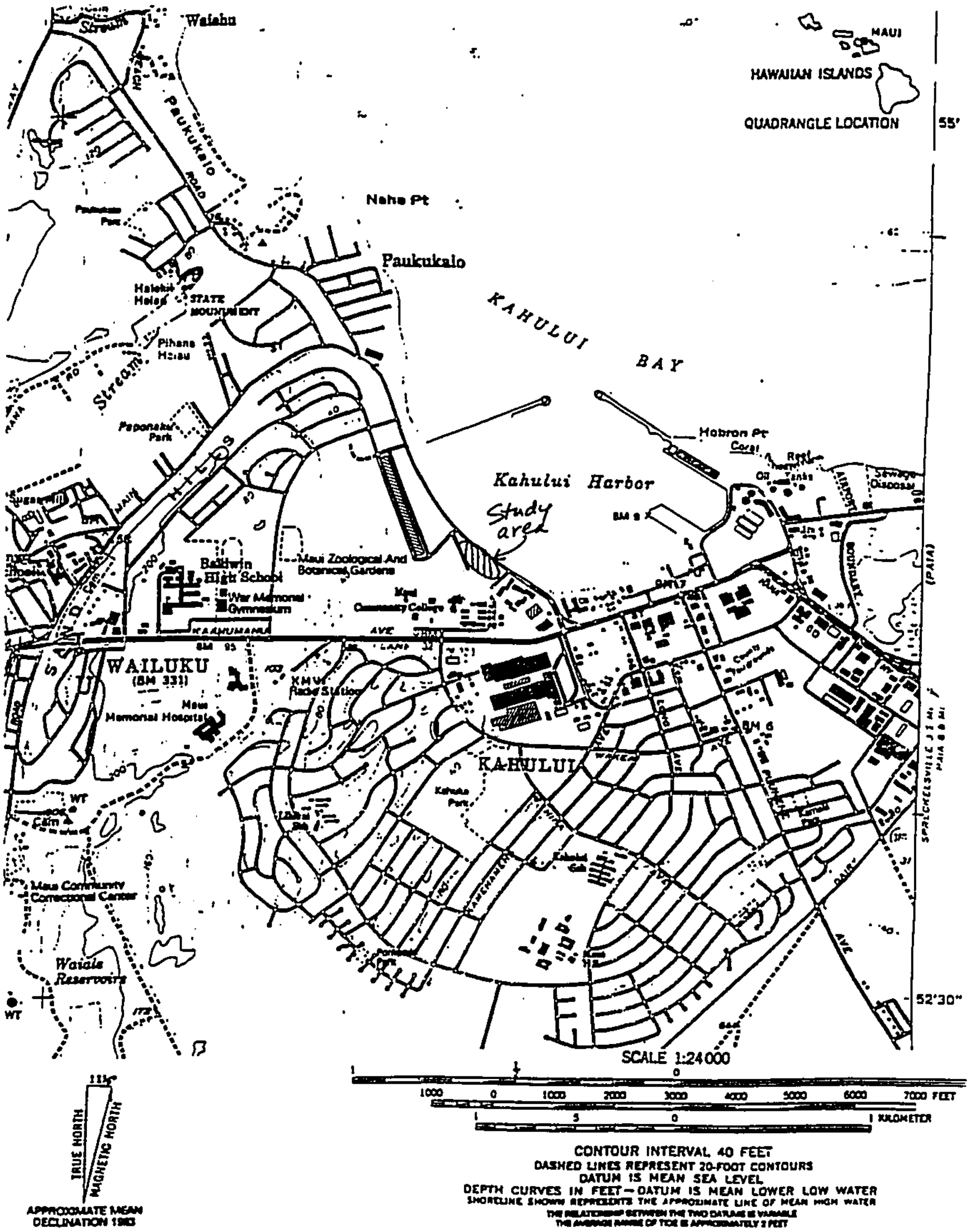
An archaeological inventory survey was conducted on a 10 acre parcel of land which is part of the Maui Central Park Parkway in Wailuku *ahupua'a,* Wailuku District, Maui Island (TMK: 3-8-07: 125). This survey consisted of a 100% surface reconnaissance and subsurface testing with a backhoe.

A total of 23 backhoe test trenches were excavated. All trenches contained fill material to depths of at least 0.4 to as much as 2.2 mbs. In all instances this fill contained modern debris. In nearly 70% of the test trenches, an apparently intact beach stratum was encountered, between 0.5 and 2.2 mbs. Visual inspection of backfill from this layer, and spot checking with 1/8 inch screen, indicated that this stratum is sterile.

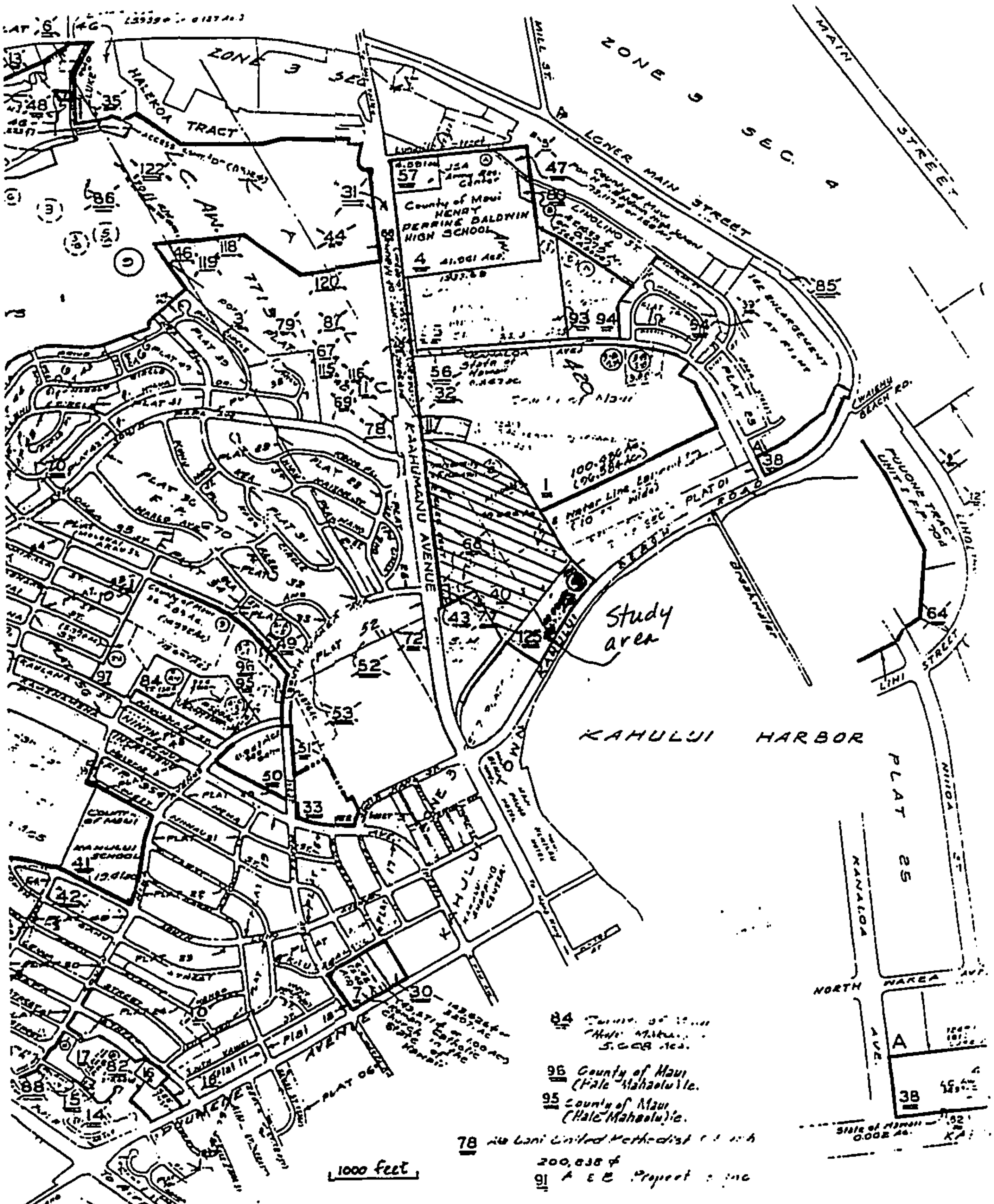
During the course of the inventory level survey, no evidence of significant disturbed or *in situ* cultural materials was found. No further archaeological work is recommended for the survey parcel.

TABLE OF CONTENTS

LIST OF MAPS, FIGURES AND PHOTOGRAPHS



Map 1 - Topographic Map, U.S.G.S., Wailuku Quadrangle, 1983.



Map 2 - Tax Map, Zone 3, Section 8, Plat 7, Tax Maps Bureau, State of Hawaii.

Note: All parcels owned by Alexander & Baldwin, Inc. unless otherwise noted.

Owner's, lessee's & vendee's names recorded on this tax map print may not be current. Please refer to ownership history sheets and field books for current owners.

SUBJECT TO CHANGE MAR

INTRODUCTION

In mid-July, 1994, we were contacted by Munekiyo & Arakawa, Inc., regarding an archaeological inventory survey for TMK 3-8-07: 125, an approximately 10 acre parcel of land contiguous to the University of Hawaii, Maui Community College (MCC) parking lot and retention basin. The parcel lies between the campus and Kahului Beach Road, which forms the northeastern border of the subject parcel (Figure 1). This portion of the State of Hawaii, University of Hawaii property will be incorporated into the Maui Central Park Parkway construction, and will serve as an additional retention basin location for protection against the occurrence of future flood damage.

In 1992, two of the authors undertook an archaeological inventory survey of 2 parcels (TMK 3-8-07: 40 & 43) to be used for the planned parking lot expansion and retention basin at the University of Hawaii, Maui Community College Campus (Fredericksen & Fredericksen, December 1992a). Subsequent to the completion of this project, the parking lot expansion and retention basin have been constructed. Though contiguous to the parcel originally surveyed for the parking lot and retention basin, it was not included in the original project scope. The additional requirements made by the planned Maui Central Park Parkway project required that an archaeological inventory survey be conducted for this parcel as well.

Our proposal was submitted on July 17, 1994, and accepted soon afterward. Fieldwork was carried out between August 12 through 17. Following analysis of the field data, a preliminary summary field report was prepared and submitted for use during permit application processes, pending completion of this final report.

SURVEY AREA

The parcel is part of the large *ahupua'a* of Wailuku, located at Owa and Kalua, Kahului, Wailuku, Maui, Hawaii. It is further described as TMK 3-8-07: 125 (Map 2). The geographical relationship of the parcel to surrounding lands is shown on U.S.G.S. Topographic Map, Wailuku Quadrangle, 1983 (Map 1).

The subject parcel lies to the northeast of Maui Community College campus parking lot and retention basin. Kahului Beach Road defines the *makai*, or northeastern

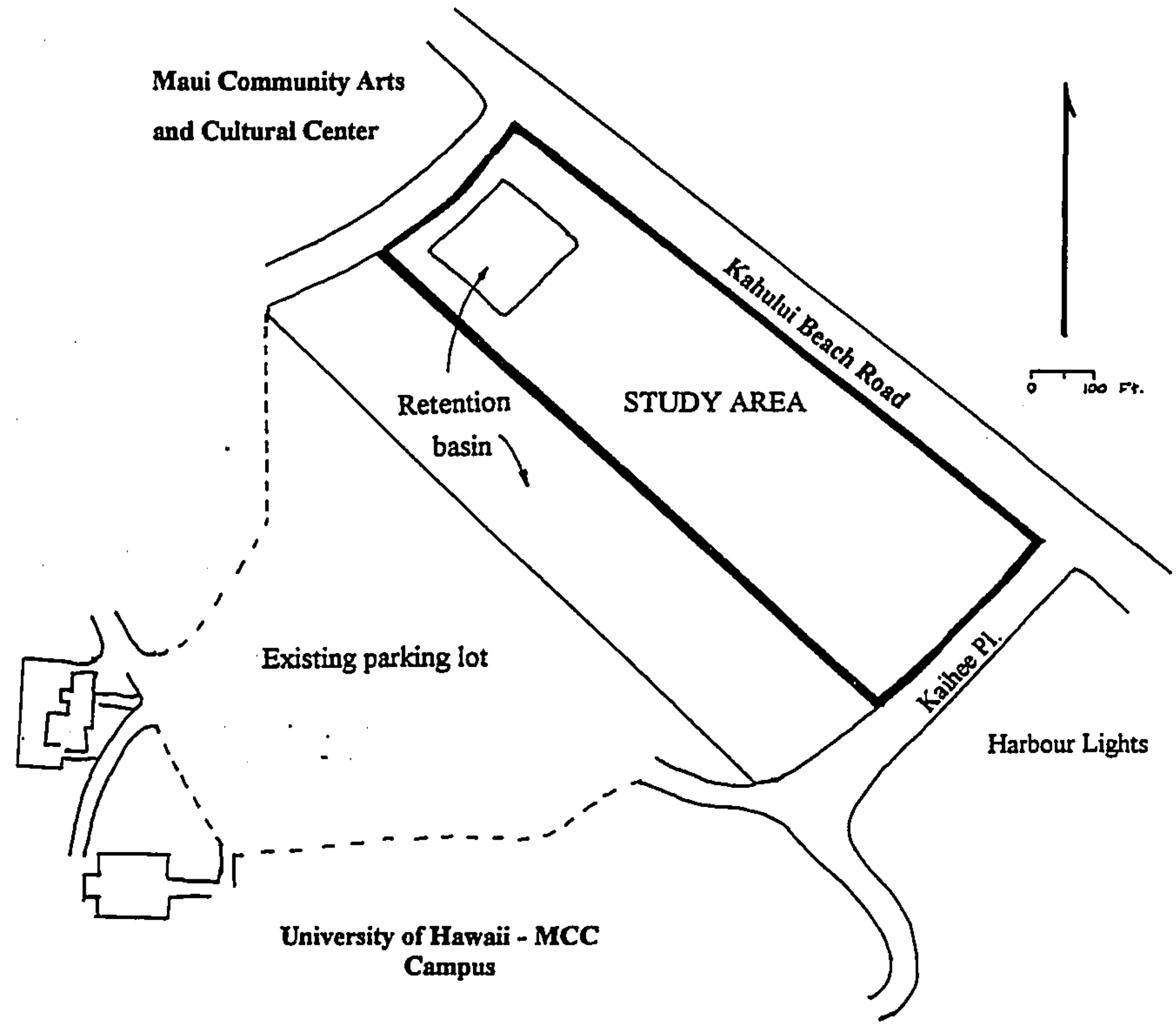


FIGURE 1 - Sketch map of the study area location

border of the study parcel (Photo 1). To the southeast, Harbor Lights apartment complex forms a border to the parcel, while the Maui Arts and Cultural Center property forms the northwestern border.

Historically, considerable land disturbance has occurred in the vicinity of the subject parcel. Early in this century, efforts were made to fill the low-lying, swampy area with landfill material, in hopes of improving the land and making it more suitable for habitation purposes (The Maui News, June 8, 1907). Dredge-fill removed from Kahului Harbor during its construction was deposited on the site area. During the Second World War, the 18th Battalion, 4th Marines built and maintained a camp which extended over and beyond the survey parcel. The results of the land modification by the military, which included road and building construction, as well as landscaping projects were substantial (Information derived from oral history recorded from J. Crouse, a former U.S. Marine stationed at the camp during W.W.II: 1992).

At the time of this survey, portions of the parcel had been grubbed in relatively recent times. Many of the mature palm trees which once lined the main road at the former USMC Base camp and the old Kahului Railroad tracks, had been removed and replanted on the Maui Arts and Cultural Center grounds, to the northwest.

Prior to the present survey and our previous survey of this area, considerable land excavation had been completed on the subject parcel as part of the present Kahului Beach Road construction. It is described in the report on the archaeological inventory survey of TMK 3-8-07: 40 & 43 (Fredericksen & Fredericksen, December 1992a, p. 3):

> "Near the southeast border to the Harbor Lights Complex, elevations are uneven, alternating from 6 to 8 feet to 6 to 10 feet, creating a "washboard" effect from southwest to northeast, with Kaihee Place at an elevation of 12 feet. This part of the parcel is presently quite swamp-like. Kahului Beach Road also has an elevation of ca. 12 feet. Land between the subject parcel and Kahului Beach Road (both part of Lot 1A, same TMK) exhibits an elevation on average of ca. 6-7 feet with a berm to 12 feet at the *mauka* Kahului Beach Road border. An additional berm on the *mauka* side of the low area (rises) to ca. 8-9 feet above sea level. This low-lying land serves as a catchment for storm runoff, with four pipe-culverts passing under Kahului Beach Road and the beach into Kahului Harbor for drainage."

In addition to the above noted disturbances, a retention basin approximately 50 meters square has been recently constructed near the northwestern boundary of the subject parcel. This basin rests approximately at the ground water table.

NATURAL HISTORY

Geologically, the present MCC Campus lies on part of the Kula Series of lava flows. It is an interface area, with **entisols** being the dominant soil types, derived from volcanic/beach sand, along with **oxisols**, which are exceptionally stable lowland soils (University of Hawaii, 1983, pp. 39-41).

In a general discussion of sand hills near the ocean composed of Puuone Sand (PZUE), Foote (1972, p. 117) describes:

> "In a representative profile the surface layer is grayish-brown calcareous sand c. 20 inches thick. This is underlain by grayish-brown, cemented sand. The soil is moderately alkaline in the surface .... permeability is rapid above the cemented layer. Runoff is slow, and the hazard of wind erosion is moderate to severe."

However, there is no apparent in place soil other than the subsurface beach layer. Everything else appears to be fill material. Recent land clearing for the Parking Lot and Retention Basin construction has obliterated any signs of former military construction activity, or the large house that had been present on a portion of the study parcel (Photo 6). During the previous archaeological work, numerous concrete foundation remains from the military base were discovered, mapped and described (Fredericksen & Fredericksen, December 1992a, pp. 3, 5-8, 11-12).

Remnants of formerly large, coastal dunes are located west and north of the subject parcel. Indications from studies on the parcel show it was formerly a low, swampy area, with any duning activity occurring inland from it. Present elevations range from c. 5 feet AMSL along the Kahului Beach Road border to c. 10 feet AMSL along the *mauka*, or southwestern border, contiguous to the existing retention basin perimeter.

Although much of the vegetative cover of the parcel had been removed by the time of the present study, some overstory and understory plants still remain. Many of the mature palm trees (Cocos nucifera) present on the parcel during the nearby 1992 inventory survey study were removed and transplanted to the grounds of the Maui Arts and Cultural Center (Photo 5).

Vegetation observed on the subject parcel included common *kiawe* (Prosopis pallida) trees, some castor bean (Ricinus communis), scattered *koa haole* (Leucaena leucocephala), lantana (Lantana camara), morning glory (Ipomoea indica), *'uhaloa* (Waltheria americana), and moderate buffelgrass (Cenchrus ciliaris) cover.

BACKGROUND HISTORICAL RESEARCH

Land use history is presented in our earlier report, detailing the study on contiguous parcels to the west of the present study parcel (Fredericksen & Fredericksen, December 1992a). A summary is presented below.

Some details on land use history for Wailuku *ahupua'a* during pre- and post-contact times is presented in studies of two parcels done by Kennedy, et al. (September 1992a and September 1992b). The eastern portion of the large *ahupua'a* of Wailuku, in which the subject parcel is located, has been reported as being little used in precontact times for either habitation or agriculture because of its fairly barren landscape (Kennedy, 1992a, pp. 11-14).

In further discussing the apparent low habitation in the area, Kennedy goes on to state (Ibid., p. 8):

> "The only mention of habitation sites in the eastern portion that could be found is that referring to the fishermen's huts fronting Kahului Bay."

Although the *ahupua'a* of Wailuku was a large one in area, it was not particularly heavily populated. Cordy (1978, p. 59), drawing on census data, lists the 1831-32 population for Wailuku as 2,256 persons.

Following the Great Mehele of 1848, Wailuku was declared Crown Land, to be used in support of the royal "state and dignity". Ruth Ke'elikolani, half-sister to Lot, King Kamehameha V, inherited the *ahupua'a* from him on his death in 1872. She sold one-half of the Crown Lands of Hawaii to Claus Spreckels in 1882, in order to settle her debts to him. Spreckels already held a lease for 16,000 acres of Wailuku *ahupua'a* (dating from 1878) so in 1882, King Kalakaua gave Spreckels Land Grant 3343, a 24,000 acre portion of the southeastern section of the *ahupua'a*. in return for the surrender of his claim to one-half the Crown Lands of Hawaii (Adler, 1966, pp. 262-264).

The present study area lies to the north of Grant 3343, on 2 LCAs. One is LCA 7713, awarded to Princess Victoria Kamamalu. [1] This represents the former *ili* of Kalua, and consisted of 391 acres, extending from Wailuku Town to Kahului Bay. The other is LCA 420 to Kuihelani, consisting of 743.4 acres. This was the major part of the *ili* of Owa, and stretched from Wailuku Stream to Kahului Bay. The claim of Kuihelani was derived from the *konohiki*, Auwae.

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[1] Victoria Ka'ahumanu Kamamalu (1838-1866) was the daughter of Kinau and Kekuanaoa, and sister to Kamehameha IV and V. Ruth Ke'elikolani (1826-1883) was the daughter of Kekuanaoa and Pauahi, making her their half-sister (Day, 1984, p. 66; 111).

The Kahului Railroad Company acquired portions of the land during the 1870's, building the railroad bed that would serve their growing transportation network. By 1899, Alexander & Baldwin controlled much of the *ahupua'a*, utilizing it mainly for pasturage and some agriculture. Prior to World War II, a plantation camp, "Raw Fish" Camp was established nearby the subject parcel. It actually sat where the present Harbor Lights complex is located today (Personal communication, Ernest Rezents, Professor emeritus, 1992).

During World War II, the subject parcel served as part of the land utilized by the USMC, 18th Service Battalion camp. The mission of the 18th Service Battalion was to provide supplies for the 4th Marine Division and to be responsible for the dispersal and disposal of military equipment and supplies on Maui following the conclusion of the war. Surplus material was shipped to the Mainland and elsewhere.

U.S. Navy "SeaBees" built a series of Quonset huts on the Marine Camp at the *mauka* or southwestern side of Kahului Beach Road. The huts were part of the office/storage space needed for the camp. The Kahului Railroad track ran parallel between the huts and Kahului Beach Road, facilitating off-loading of trains delivering goods from ships in Kahului Harbor. A photo (Photo 7) shows some of the damage to portions of the Camp caused by the infamous 1946 Tsunami.

When the mission of the Marine Camp concluded in 1947, the Kahului Railroad Company acquired the land shortly thereafter, continuing to use the Quonset huts in their operations until they terminated service in 1965. After 1965, private businesses utilized the huts for storage until they were destroyed and removed during the mid-1980's. Map 4 shows the route of the Railroad in 1955.

In 1965, the State of Hawaii, University of Hawaii established campuses on most of the outer islands, including Maui. The Maui Technical School campus was converted to the University of Hawaii, Maui Community College campus, and classes were first offered during the Fall semester, 1967. The campus has grown and continues to offer the first and second year University of Hawaii curriculum and a growing number of upper-level courses, along with numbers of community college program courses in business education and other vocational areas.

The campus includes some 57 acres of land, including the subject parcel now in the process of being modified for further campus development. When completed, the renovation will provide academic accommodation for upwards of 6,000 students.

BACKGROUND ARCHAEOLOGICAL RESEARCH

Consultation with the State Historic Preservation Division (SHPD), Department of Land and Natural Resources (DLNR), and perusal of the literature indicates that no previous archaeological work has been undertaken on the subject parcel. A number of surveys have been completed on nearby parcels, however.

Donham (1990) surveyed the Maui Palms Hotel site, a parcel which lies nearby the subject parcel to the east. Two potential historic sites were determined to be contained in introduced land fill, and thus not archaeological sites.

The contiguous property to the north of the subject parcel is the site of the Maui Arts and Cultural Center. Kennedy (1990) surveyed this parcel and reported that no sites were located during subsurface survey.

Four surveys were conducted along Kahului Beach Road and Lower Main Street within two kilometers of the subject parcel (Fredericksen, et al., December 1990, January 1992, November 1992 and December 1992b). Two survey areas are located on Lower Main Street c. 2 kilometers north and west of the subject parcel. Both sites lie along the former Kahului Railroad track-bed at the base of the large Sand Hills dune. Nothing remains of the track-bed on one site (TMK 3-4-39: 77, December 1990) and only a portion c. 15 meters long remains on the other site (TMK 3-4-39: 82, January 1992). Neither of these sites produced evidence of any precontact archaeological materials.

The other two surveyed parcels are located *mauka* of Lower Main Street; they are contiguous to each other and about 1.0 kilometer to the north of the subject parcel. The nearer of the two sites is TMK 3-8-07: 38 (A & B Properties, OWA Subdivision) while the farther, contiguous site is TMK 3-8-07: 123 (The Nisei Veterans Memorial Center).

At the Nisei Veterans Memorial Center, three sites were identified in the 1992 survey, Site 50-04-3119, a historic surface refuse site, with a precontact subsurface element; another subsurface precontact cultural deposit (Site 3120)[2]; and the Kahului Railroad Trackbed (Site 3112). A very early radiocarbon date of 1790 $\pm$ 70 RCYBP (Stuiver and Pearson calibrated date: 233-410 AD.) was recovered from the subsurface stratum of Site 3119, but subsequent excavation failed to find a corroborating date. Instead, the 11 additional Carbon 14 dates obtained all fell into a several hundred year temporal bracket between c. AD 1280 and 1650. Cultural materials recovered included midden, a one-piece fishhook, coral files, volcanic glass flakes and cores, basalt flakes and hammerstones. Recovered artifacts are consistent with expected finds in coastal dune

[2]While subsurface Sites 3119 and 3120 were originally given different site numbers because of the physical distance separating them, subsequent data recovery research revealed that they are both part of the same cultural feature. Now Site 3119 is used to refer to the surface historic refuse site, and Site 3120 the subsurface precontact site.

cultural deposits, i.e., representing activities related to coastal resource exploitation (Fredericksen & Fredericksen, December 1992b).

During subsequent data recovery work at this large habitation site, extensive cultural deposits were discovered and recorded. A number of human burials (at least 5 or more) were also discovered, which brought on-site work to a halt. The mitigation for the human remains is still being determined by the SHPD (Data recovery report is in preparation).

The OWA Subdivision parcel contiguous to the east of the Nisei Veterans Memorial Center parcel, contains historic materials and remnants of the track-bed for the Kahului Railroad (Site 3112) and the Makaweli Rock Crusher Mill (Site 3135). No clearly precontact archaeological sites were discovered (Fredericksen & Fredericksen, November 1992).

Finally, a survey party from Bernice P. Bishop Museum identified an archaeological site producing midden and 3 precontact artifacts in 1972 (Site 1172). This is about 1.5 km. from the study area in the cut-profile of the large sand dune along Lower Main Street. Although recommended, no further work has been done at this site (Connolly, 1973).

Summary of Settlement Patterns

The *ahupua'a* of Wailuku is large, extending through several geographic zones from the sea to the mountain rim. Water availability in the western portion resulted in a heavier population density than in the drier, more barren eastern portion (Cordy, 1978, p. 59).

The subject parcel lies near to and was once, it appears, part of the beach at what is now Kahului Harbor. Such locations were described by Kirch (1985) as "coastal living zones" and in prehistoric times these were areas where habitation dwellings might be expected to be found, especially in dry areas with nearby freshwater source (s). Elevated dunes would have been the main "dry areas" in beach coastal areas. Kahului Bay was swampy, *mauka* of the coastal dunes, becoming "barren lands" inland in the eastern part of the *ahupua'a.*

The subject parcel has been extensively altered by historic land use, ranging from being built up with fill material in the early part of the century, to being graded and leveled by railroad and military activity later on. Any precontact sites, therefore, were unlikely to remain.

However, some of the archaeological work completed in this general coastal area indicates that there were substantial settlements present which had been occupied over a long period of time. Site 3120, in particular, shows a well-established, habitation site utilized for several centuries. Activities focused on near-shore and beach subsistence related to the marine environment. Also, numbers of human burials were discovered in the site, probably in association with family dwellings--a not unusual precontact practice.

ARCHAEOLOGICAL FIELD METHODS

The archaeological inventory survey was performed in two phases. A pedestrian survey covering 100% of the study area was performed by field personnel. The c. 10 acre parcel was transected along roughly N-S lines. During the course of the surface walk-over, it became evident that much of the parcel had been disturbed in the past. Because of extensive modification at the study area, subsurface testing with a backhoe was selected.

The second phase of the inventory survey consisted of 23 mechanically excavated test trenches on accessible areas of the subject property (Map 3). All backhoe test trenches were 5 meters in length by 0.7 meter in width, and ranged from c. 1.2 to 2.4 mbs. Backfill was visually inspected by field personnel. In addition, some soil was spot checked with 1/8 inch hardware mesh screen. It was not possible to effectively test much beyond the ground water table because of unstable soil conditions.

All mapping on the study area was carried out with a hand held electronic compass and metric survey tapes. Descriptive notes were recorded in the field, and photographs were taken with T-Max 400 film.

ARCHAEOLOGICAL FIELD RESULTS

The pedestrian survey yielded no surface evidence of intact archaeological features. Modern historic debris observed during the walk-over included tires, bottles, cans, metal, wood, concrete, and plastic. During this phase of the inventory survey, it became apparent that most of the subject property had been modified in relatively recent times. Although several portions of the study parcel were quite densely vegetated, it did not appear that any undisturbed areas existed on the subject property.

The subsurface testing phase of the survey consisted of 23 backhoe test trenches (BTT) excavated on accessible areas of the property. Ground water was located in all test trenches except BTT #2 and #22 which were abandoned at 1.2 and 2.2 mbs, respectively, because fill cobbles and boulders prevented further excavation progress. In general, ground water was encountered between c. 1.2 and 1.8 mbs.

No evidence of *in situ* cultural deposits was found during subsurface testing on the subject parcel. It appears that the study area has been filled to various depths during relatively recent times. Subsurface test results indicate that much of this fill material consists of brown (10 YR 6/3) sand mixed with modern debris including metal, paper, wood, concrete, tires, and construction waste. The fill in tested areas ranged from c. 0.4 to 1.9 meter thick. Underlying this fill is an apparently intact beach stratum composed of waterworn basalt rock, coral, and light brownish gray (10 YR 6/2) sand. Visual inspection of backfill and spot checking with 1/8 inch screen suggest that this layer is sterile. In all trenches where this beach stratum was present, it extended beyond maximum excavation depth. This layer tended to be less disturbed on the northeastern or *makai* portion of the parcel, closest to the littoral zone. See Table 1 for a summary of subsurface test results for the study area. A brief discussion of backhoe test trench results follows below. Refer to Map 3 for BTT locations.

Backhoe Test Trench #1

This trench was excavated in close proximity to the recently completed retention basin that lies between the subject parcel and the Maui Community College parking lot (Photo 3). Trench dimensions were 5.0 meters in length by 0.7 meter in width by c. 1.5 meters in depth. BTT #1 was oriented N-S. One light brown (7.5 YR 6/4) sand fill layer containing modern construction debris was encountered in BTT #1. Ground water was present at 1.2 mbs. The trench was abandoned at c. 1.5 mbs when it caved in. No profile was drawn.

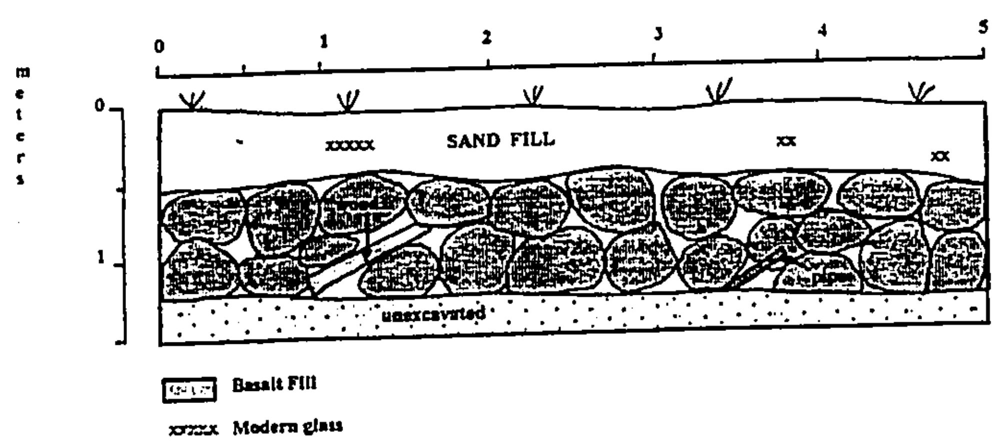

Figure 2 - North Face Profile, BTT #2

Backhoe Test Trench #2

This unit was placed near the southeastern corner of the study area and was oriented E-W. Trench dimensions were 5.0 meters long by 0.7 meter wide by 1.2 meters deep. A light brown (7.5 YR 6/4) sand fill layer c. 45-55 cm. thick capped a boulder fill layer (Figure 2). Layer I brown sand fill contained modern material including brown bottle glass, plastic, wood, and metal. The underlying boulder fill layer also contained modern material primarily comprised of construction waste. Excavation in BTT #2 was abandoned at c. 1.2 mbs because of very difficult digging conditions.

Backhoe Test Trench #3

BTT #3 was excavated c. 12 meters northwest of BTT #2. Trench orientation was E-W. This unit contained a sand fill layer and an apparently intact beach stratum (Figure 3). Trench dimensions were 5.0 meters in length by 0.7 meter in width by 2.2 meters in depth. Layer I (c. 0 to 45 cmbs) consisted of light brown (7.5 YR 6/4) sand fill

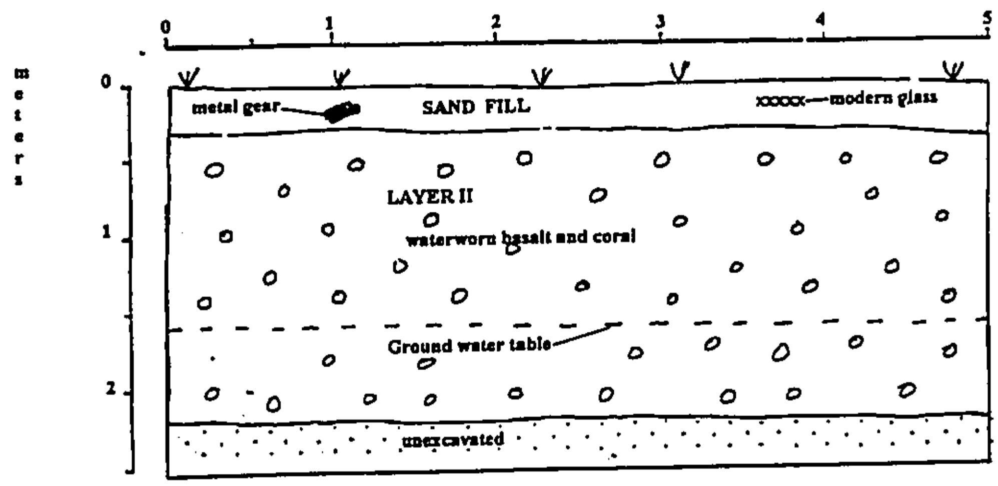

Figure 3 - North Face Profile BTT #3

which contained modern material similar to that found in BTTs #1 and #2. Layer II extended below the ground water table which was encountered at c. 1.6 mbs. This layer contained a beach stratum consisting of light brownish gray (10 YR 6/2) sand, waterworn basalt rocks and coral. Excavation was abandoned at c. 2.2 mbs when the trench began to collapse. Visual observation of backfill from this layer and spot checking with 1/8 inch mesh screen indicates that it does not contain cultural material. Rather, this stratum appears to be an intact littoral layer. It is quite probable that this portion of the north shore of Maui was regularly impacted by the ocean prior to the construction of Kahului

Harbor in the early 20th century. This beach stratum appeared to continue beyond the maximum depth of each of the 16 trenches where it was located.

Backhoe Test Trench #4

BTT #4 was placed near the recently completed retention basin that borders the study area. It was oriented E-W. Trench dimensions were 5 meters by 0.7 meter by 1.7 meters deep. This test unit contained one fill layer consisting of the light brown (7 YR 6/4) sand found in TUs #1, #2 and #3. This fill contained modern construction debris. Ground water was encountered at c. 1.5 mbs and excavation was halted at c. 1.7 mbs when the unit began to cave in. No profile was drawn.

Backhoe Test Trench #5

BTT #5 contained stratigraphy similar to BTT #3 (see Figure 3). The unit was laid out E-W, and its dimensions were 5 meters long by 0.7 meter wide by 2.1 meters deep. However, Layer I light brown sand fill extended to c. 1.2 mbs. Layer I contained construction debris. The common Layer II beach stratum was under the fill layer. Ground water was encountered at 1.6 mbs and excavation halted at 2.1 mbs. No unit profile was recorded.

Backhoe Test Trench #6

This N-S oriented trench revealed stratigraphy similar to BTTs #3 and #5 (see Figure 3). BTT #6 was 5 meters long by 0.7 meter wide by 2.1 meters deep. The light brown sand fill which contained historic material was c. 1.9 m. thick and capped the beach stratum. Ground water was encountered at about 1.7 mbs, and excavation was halted at 2.1 mbs when the trench collapsed. No unit profile was drawn.

Backhoe Test Trench #7

BTT #7 contained one sand fill layer overlying the beach stratum. Stratigraphy was similar to BTTs #3, #5 and #6 (see Figure 3). This trench was oriented in a N-S direction, and was 5 meters long by 0.7 meter wide by 2.2 meters deep. Layer I light brown sand fill was c. 1.6 meters thick and contained modern historic material. The beach stratum appeared undisturbed and was still present when excavation was halted at c. 2.2 mbs. Ground water was present at c. 1.7 mbs. No unit profile was drawn.

Backhoe Test Trench #8

This trench was placed near the retention basin which borders the study area to the southwest. This unit was oriented E-W, and was 5 meters long by 0.7 meter wide by 2.1 meters deep. One pale brown (10 YR 6/3) sand fill layer with yellowish brown (10 YR 5/4) sand banding was present to the bottom of the excavation. This fill contained modern debris such as wood, metal, bottle glass, concrete, and plastic sheeting. The ground water table was present at c. 1.7 mbs, and excavation was halted at 2.1 mbs when the trench walls became unstable. No profile was drawn.

Backhoe Test Trench #9

BTT #9 was placed near the center of the study area, and oriented N-S. Trench dimensions were 5 meters by 0.7 meter by 2.4 meters deep. It contained banded sand fill ranging from pale brown (10 YR 6/3) to brownish yellow (10 YR 6/6), overlying the previously noted beach stratum (Figure 4). The sand fill contained modern construction debris and was about 1.5 meters thick. The beach layer appeared to be intact and was still present at 2.4 mbs when the trench was abandoned because of unstable conditions (Photo 4). Ground water was first encountered at 1.7 mbs.

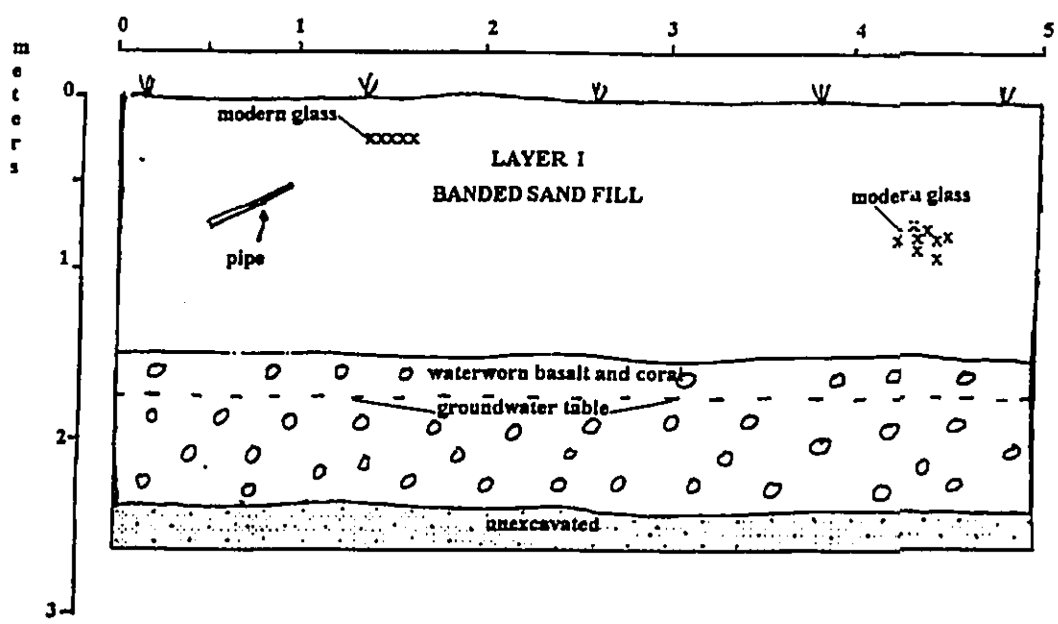

FIGURE 4 - East Face Profile, BTT #9

Backhoe Test Trench #10

This trench was also located near the center of the parcel, and oriented N-S. Its dimensions were 5 meters long by 0.7 meter wide by 2.3 meters deep. Stratigraphy was similar to BTT #9 (see Figure 4). A banded sand fill layer c. 1.8 meters thick covered the intact beach layer. Ground water was present at c. 1.6 mbs. The beach stratum extended to the bottom of BTT #10 at 2.3 mbs. No trench profile was recorded.

Backhoe Test Trench #11

BTT #11 was excavated near the parcel border with the large retention basin that lies next to the Maui Community College parking lot. This trench contained 2 fill layers. The trench was oriented E-W, and its dimensions were 5 meters by 0.7 meter by 1.9 meters deep. A mixed fill layer containing material from a disturbed beach layer, sand, and construction waste about 1 meter thick capped a lower layer of construction and tree grubbing debris (Figure 5). Ground water was located at 1.6 mbs. Excavation was halted at 1.9 mbs.

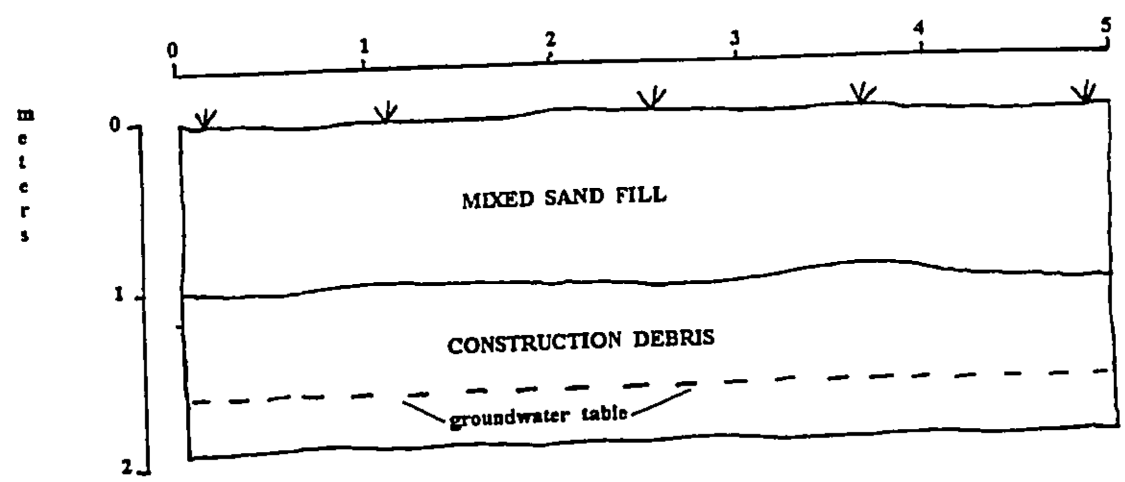

FIGURE 5 - North Face Profile, BTT #11

Backhoe Test Trench #12

Stratigraphy was similar to BTTs #3, #5, #6 and #7 (see Figure 3). BTT #12 was excavated near BTTs #10 and #11, at the center of the study area. This trench was oriented N-S, and measured 5 meters by 0.7 meter by 2 meters deep. The thick Layer I sand fill extended to c. 1.6 mbs and contained modern material including tires, metal, wood, plastic, and concrete. Ground water was present at the boundary of the fill layer and the intact beach layer at c. 1.6 mbs. Excavation was halted at 2.0 mbs when the trench partially collapsed. No trench profile was recorded.

Backhoe Test Trench #13

BTT #13 was located on the *makai* or northeastern half of the study area, near Kahului Beach Road. Trench orientation was N-S. Dimensions were 5 meters by 0.7 meter by 1.8 meters deep. Stratigraphy was similar to other trenches which contained the intact Layer II beach stratum (see Figure 3). Layer I consisted of light brown sand fill with modern historic material to c. 0.4 mbs. Layer II beach stratum extended from 0.4 to the bottom of BTT #13 at c. 1.8 mbs. Ground water was present at 1.6 mbs, and excavation was terminated when the trench collapsed. No trench profile was recorded.

Backhoe Test Trench #14

This unit was excavated about 15 meters southeast of BTT #13, and was oriented N-S. It measured 5 meters by ט.7 meter by 1.9 meters deep. Two soil layers were encountered during excavation. A relatively thick layer of sand fill capped the intact beach stratum (Figure 6). The yellowish brown (10 YR 5/4) sand fill was c. 1.4 meters thick and contained some modern debris. The top 10-20 cm. of the beach layer was mixed with the overlying sand fill layer. Ground water was present c. 1.6 mbs. Excavation was halted at 1.9 mbs when the trench began to collapse.

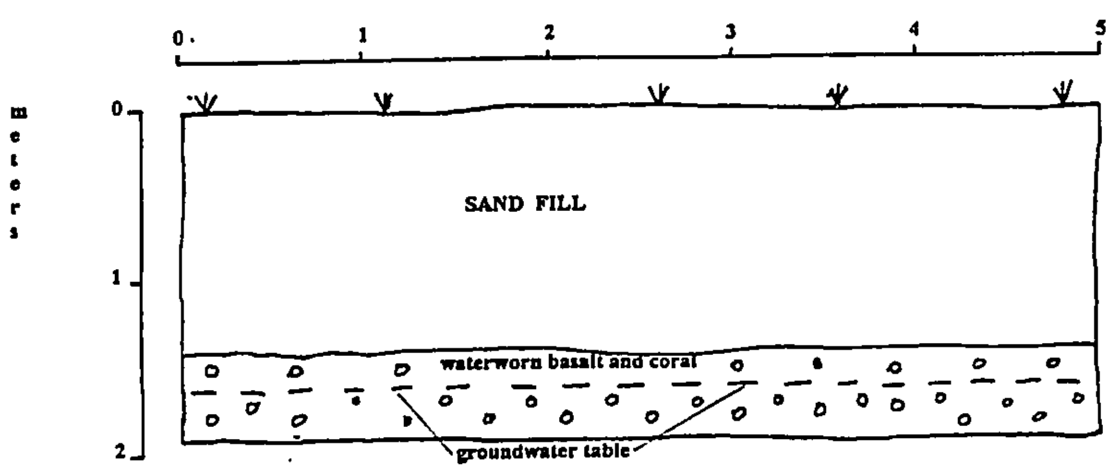

FIGURE 6 - East Face Profile, BTT #14

Backhoe Test Trench #15

BTT #15 was also located on the northeastern or *makai*, portion of the subject parcel, near Kahului Beach Road. Trench orientation was N-S. BTT #15 measured 5 meters by 0.7 meter by 1.9 meters deep. Stratigraphy was similar to BTT #14 (see Figure 6). However, Layer I consisting of yellowish brown sand fill was only about 0.5 meter thick and contained some modern material including glass, metal, wood, and plastic. Layer II was comprised of waterworn rocks, coral and the common brown sand. Ground water was located at 1.7 mbs, and excavation was halted at c. 1.9 mbs due to unstable trench conditions. No trench profile was drawn.

Backhoe Test Trench #16

This trench was excavated in the interior of the parcel, adjacent to a wooded area. This trench was oriented N-S. Trench dimensions were 5 meters by 0.7 meter by 1.9 meters deep. Stratigraphy was similar to trenches on the *makai* or northeastern side of the survey area (see Figure 6). A relatively thin sand fill layer c. 0.4 meter thick capped the common beach stratum present in the majority of trenches. This yellowish brown sand fill contained some modern material such as metal, plastic, paper, and glass. Ground water was located at 1.9 mbs. This trench was abandoned after it began to collapse at c. 2.3 mbs.

Backhoe Test Trench #17

BTT #17 contained 2 sand fill layers overlying the common beach stratum (Figure 7). It was oriented N-S and measured 5 meters by 0.7 meter by 2.1 meters deep. Layer I light brown (7.5 YR 6.4) sand contained modern debris, and was c. 0.5 meter thick. Layer II (c. 0.5 to 1.1 mbs) light gray (10 YR 7/2) sand also contained some modern debris. Layer III, the beach stratum in this trench was somewhat sandier than in other areas. However, this stratum appeared to be intact and undisturbed. Ground water was encountered at 1.8 mbs. Excavation was halted at c. 2.1 mbs after the trench began to collapse.

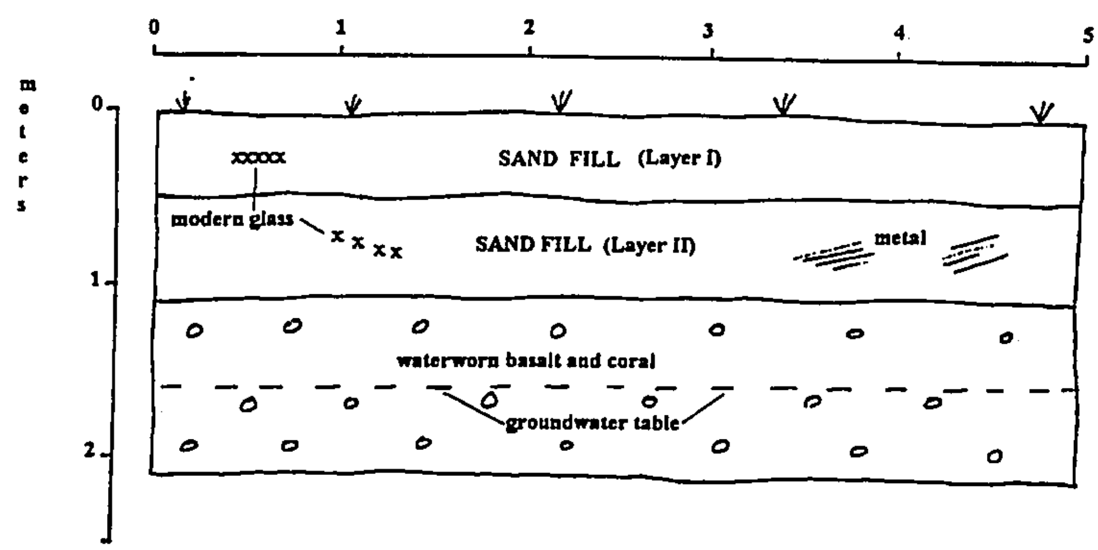

FIGURE 7 - East Face Profile, BTT #17

Backhoe Test Trench #18

This trench was excavated into a sand bank on the *makai* or Kahului Beach Road side of the subject property. Trench orientation was N-S, and it measured 5 meters by 0.7 meter by c. 2.6 meters deep. A sand fill layer c. 0.5 to 1.2 meters thick covered the intact beach stratum (Figure 8). This fill layer was brown (10 YR 6/3) and had modern debris in it. The beach stratum was sandier than in most tested areas. However, there were still many waterworn rocks and coral cobbles clearly visible in the profile and backfill. Ground water was present at c. 1.7 mbs, and the unit was abandoned at 2.2 to 2.6 mbs when it caved in.

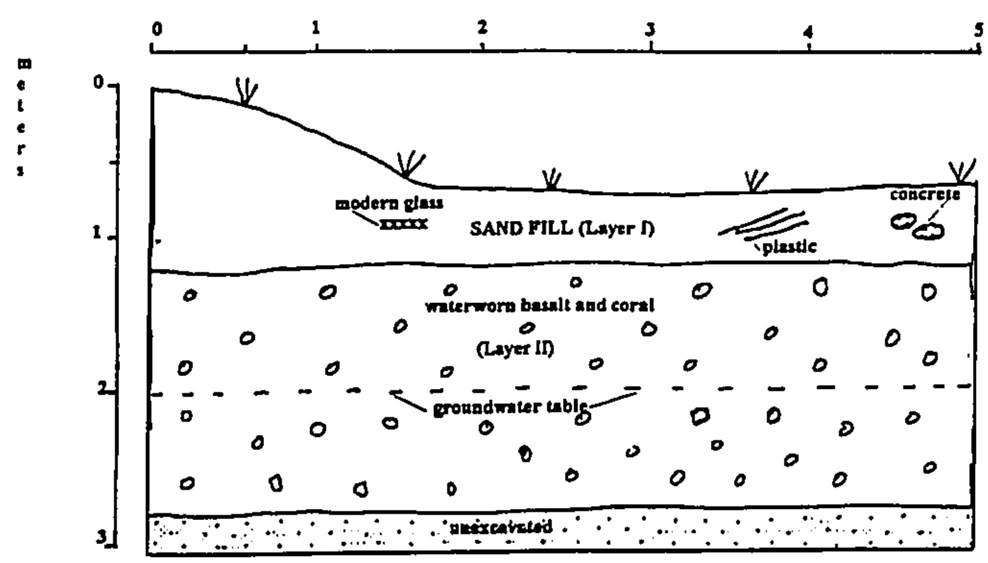

FIGURE 8 - West Face Profile, BTT #18

Backhoe Test Trench #19

This trench was excavated near the collection basin at the northwestern end of the study area and oriented E-W. Dimensions were 5 meters by 0.7 meter by 1.8 meters deep. Stratigraphy was similar to BTT #3 and several other tested areas (see Figure 3). A light brown sand fill layer c. 0.5 meter thick capped the beach stratum. Layer I fill contained some modern debris in it. The Layer II beach stratum extended from c. 0.5 to the bottom of the unit at 1.8 mbs. Ground water was located at c. 1.5 mbs. Excavation was halted because of unstable soil conditions.

Backhoe Test Trench #20

Trench orientation was N-S and it was excavated near the small retention basin at the northwestern end of the study parcel. Trench dimensions were 5 meters by 0.7 meter by 2.2 meters deep. This unit contained reddish yellow (7.5 YR 6/6) sand fill mixed with construction debris to the bottom of BTT #20. Ground water was encountered at about 2 mbs, and excavation was abandoned c. 2.2 mbs. No trench profile was drawn.

Backhoe Test Trench #21

BTT #21 measured 5 meters by 0.7 meter by 1.9 meters deep and was oriented N-S. This unit contained a sandy fill layer which graded into fill layer consisting of beach stratum material mixed with construction debris. The brown (7.5 YR 5/4) sandy Layer I was c. 0.6 meter thick and contained modern material. The underlying fill layer of construction debris and beach stratum material extended to the bottom of the unit. Ground water was encountered at 1.8 mbs and the trench was abandoned at 2.2 mbs. No profile was drawn.

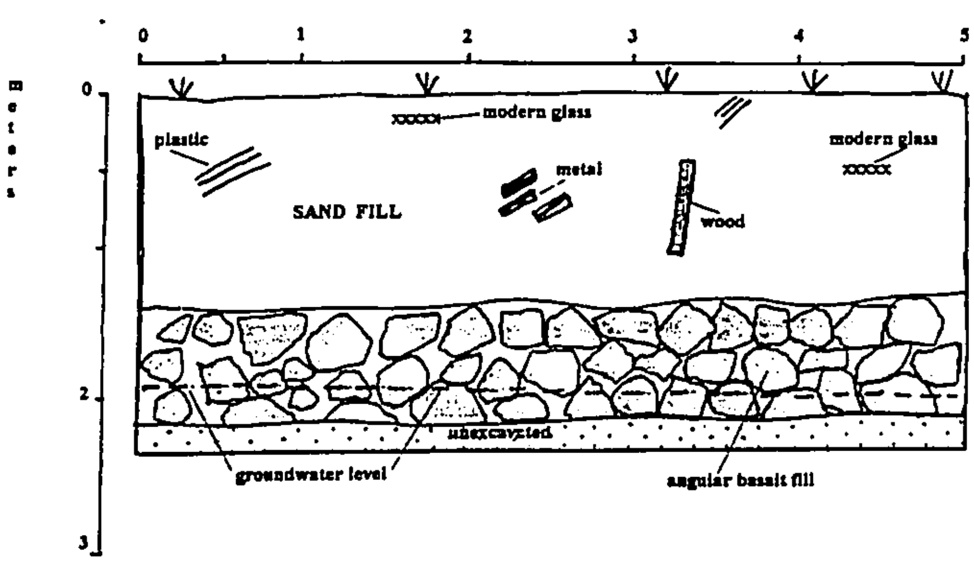

FIGURE 9 - East Face Profile, BTT #22

Backhoe Test Trench #22

This trench was oriented to the north and placed next to the small retention basin on the study parcel. Trench dimensions were 5 meters by 0.7 meter by 2.2 meters deep. BTT #22 contained 2 fill layers (Figure 9). Layer I light reddish brown (5 YR 6/3) sand contained construction debris and was about 1.2 meters thick. It overlaid a gravel and angular basalt rock fill layer which apparently extended beyond the bottom of the trench. Ground water was present c. 1.9 mbs. The trench was abandoned at 2.2 mbs.

Backhoe Test Trench #23

This trench was placed near the center of the property, and was oriented N-S. It measured 5 meters by 0.7 meter by 1.9 meters deep. Stratigraphy was similar to most trenches containing the beach stratum (see Figure 3). It consisted of light brown sand fill c. 1.4 meters thick which contained modern material such as metal, plastic, paper, wood, and bottle glass. This sand fill capped a sandy beach layer which extended to the limits of the trench. Ground water was encountered at 1.6 mbs and excavation was halted at c. 1.9 mbs after the trench collapsed. No unit profile was completed.

SUMMARY AND CONCLUSIONS

Results from the 23 excavated backhoe test trenches indicate that the property has been extensively modified in relatively recent times. All test trenches contained fill material to depths of at least 0.4 to as much as 2.2 mbs. In all instances, this upper fill layer contained modern debris. In nearly 70% of the trenches, an apparently intact beach stratum was encountered between 0.5 and 2.2 mbs. This stratum consisted of waterworn basalt and coral pebbles and light brownish gray (10 YR 6/2) sand. Visual inspection of backfill from this layer in addition to spot checking with 1/8 inch screen suggests that this stratum is sterile.

During the course of the inventory level survey, no evidence of significant disturbed or *in situ* cultural materials was found. While it was not possible to thoroughly test the beach stratum because of unstable soil conditions, it appears very unlikely that this littoral layer contains any significant material cultural remains. No further archaeological work is recommended for the subject parcel.

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Xamanek Researches, Pukalani, Hawaii.

December 1992a — An Archaeological Inventory Survey for the Parking Lot Expansion and Retention Basin on Maui Community College Campus (TMK 3-8-07: 40 & 43), *Ahupua'a* of Wailuku, District of Wailuku, Island of Maui, prepared for Gima, Yoshimori, Miyabara, Deguchi, Inc., Wailuku, by Xamanek Researches, Pukalani, Hawaii.

December 1992b — An Inventory Survey of a Parcel of Land (TMK 3-8-07: 123), Kahului, Maui, Hawaii, prepared for Nisei Veterans Memorial Center, Kahului, Hawaii, by Xamanek Researches, Pukalani, Hawaii.

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TABLE 1

Summary of Backhoe Test Trench Results

BTT #	DEPTH (mbs)	STRATA	RESULTS
1	1.5	sand fill with coral; ground water (g.w.) at 1.2 mbs	modern historic debris
2	1.2	sand fill and boulder fill	modern historic fill
3	2.2	sand fill to 0.4 mbs, then beach stratum; g.w. at 1.6 mbs	modern historic debris in fill. beach stratum sterile
4	1.7	sand fill; g.w. at 1.5 mbs	modern historic debris in fill
5	2.1	sand fill to c. 1.2 mbs. then beach stratum; g.w. at 1.6 mbs	modern historic fill; beach stratum sterile
6	2.2	grayish sand fill to c. 1.9 mbs. then beach stratum; g.w. at 1.7 mbs	modern historic fill; beach stratum sterile
7	2.2	sand fill to c. 1.6 mbs. then possible beach stratum/fill; g.w at 1.7 mbs	modern historic debris in sand fill
8	2.1	banded sand fill; g.w. at 1.7 mbs	modern historic debris in fill
9	2.4	banded sand fill to 1.5 mbs. then beach stratum; g.w. at 1.7 mbs	modern historic debris in fill; beach layer sterile
10	2.3	banded sand fill to c. 1.8 mbs, then beach stratum; g.w. at 1.6 mbs	modern historic debris in fill; beach layer sterile
11	1.9	beach stratum fill on top of construction and tree grubbing debris; g.w. at 1.6 mbs	modern historic debris
12	2.0	light gray sand fill to c. 1.6 mbs. then beach stratum; g.w. at 1.6 mbs	modern historic debris. beach layer sterile
13	1.8	light gray sand fill to c. 0.4 mbs. then beach stratum; g.w. at 1.6 mbs	modern historic material, beach layer sterile
14	1.9	sand fill to c. 1.4 mbs. then beach stratum; g.w. at 1.6 mbs	some modern historic material. beach layer sterile
15	1.9	sand fill to c. 0.5 mbs, then beach stratum; g.w. at 1.7 mbs	modern historic material in fill, beach layer sterile
16	2.3	sand fill to c. 0.4 mbs. then beach stratum; g.w. at 1.9 mbs	modern historic material in fill, beach layer sterile

Xamanek Researches, Pukalani, Hawaii.

December 1992a An Archaeological Inventory Survey for the Parking Lot Expansion and Retention Basin on Maui Community College Campus (TMK 3-8-07: 40 & 43), *Ahupua'a* of Wailuku, District of Wailuku, Island of Maui, prepared for Gima, Yoshimori, Miyabara, Deguchi, Inc., Wailuku, by Xamanek Researches, Pukalani, Hawaii.

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University of Hawaii, Geography Department
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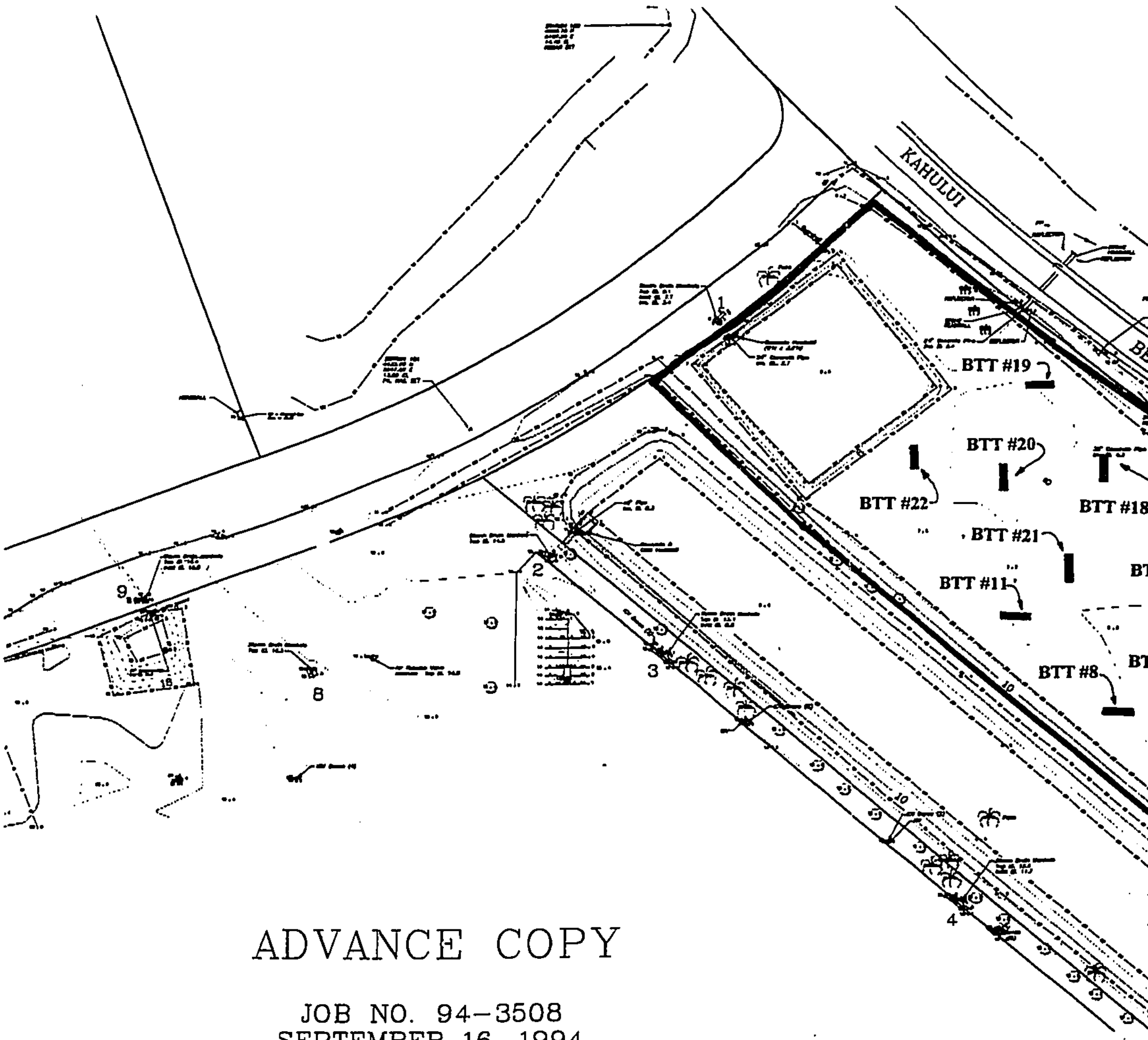
TABLE 1 (cont.)

BTT#	DEPTH (mbs)	STRATA	RESULTS
17	2.1	light brown sand fill to c. 0.5 mbs. overlying light gray sand to c. 1.1 mbs, then beach stratum; g.w. at 1.8 mbs	modern historic material in fill layers; beach layer sterile
18	2.6	sand fill to c. 0.8 mbs, then sandy beach stratum; g.w. at 1.7 mbs	modern historic material; beach layer sterile
19	1.8	sand fill to c. 0.5 mbs, then sandy beach stratum; g.w. at 1.5 mbs	modern historic material in sand fill, beach stratum sterile
20	2.2	mixed construction debris and sand fill; g.w. at 2.0 mbs	modern historic material
21	1.9	mixed sandy fill to c. 0.6 mbs, then disturbed beach stratum; g.w. at 1.8 mbs	modern debris to bottom of unit
22	2.2	mixed fill material, then angular basalt gravel and cobble fill; g.w. at 1.9 mbs	modern fill
23	1.9	sand fill to c. 1.4 mbs, then sandy beach stratum; g.w. at 1.6 mbs	some modern material in sand fill, beach layer sterile



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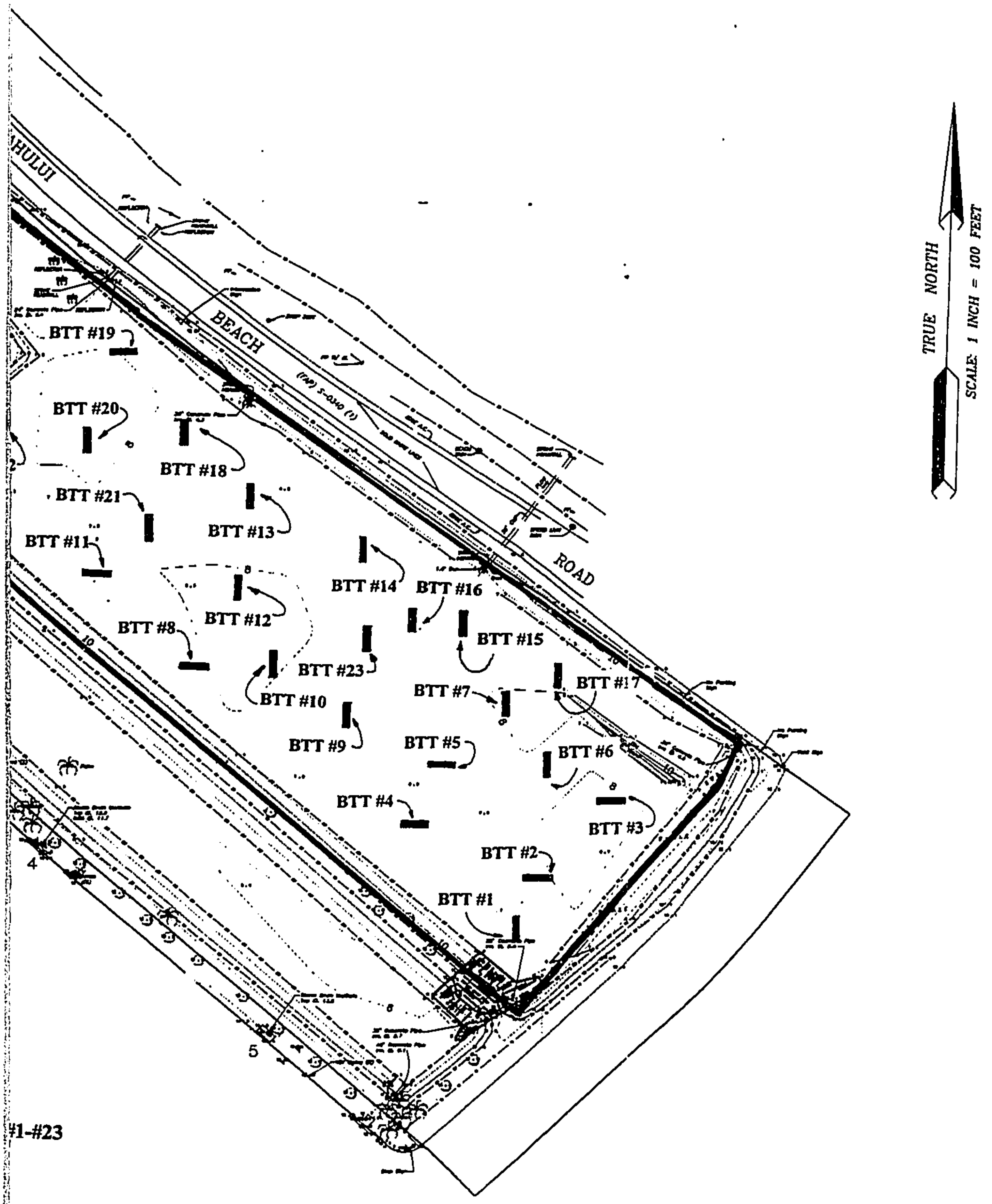
Map 3 - Topographic map of the study area including locations of BTTs #1-#23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BEACH
ROAD
BTT #19
BTT #20
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BTT #21
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BTT #15
BTT #8
BTT #23
BTT #10
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TRUE NORTH
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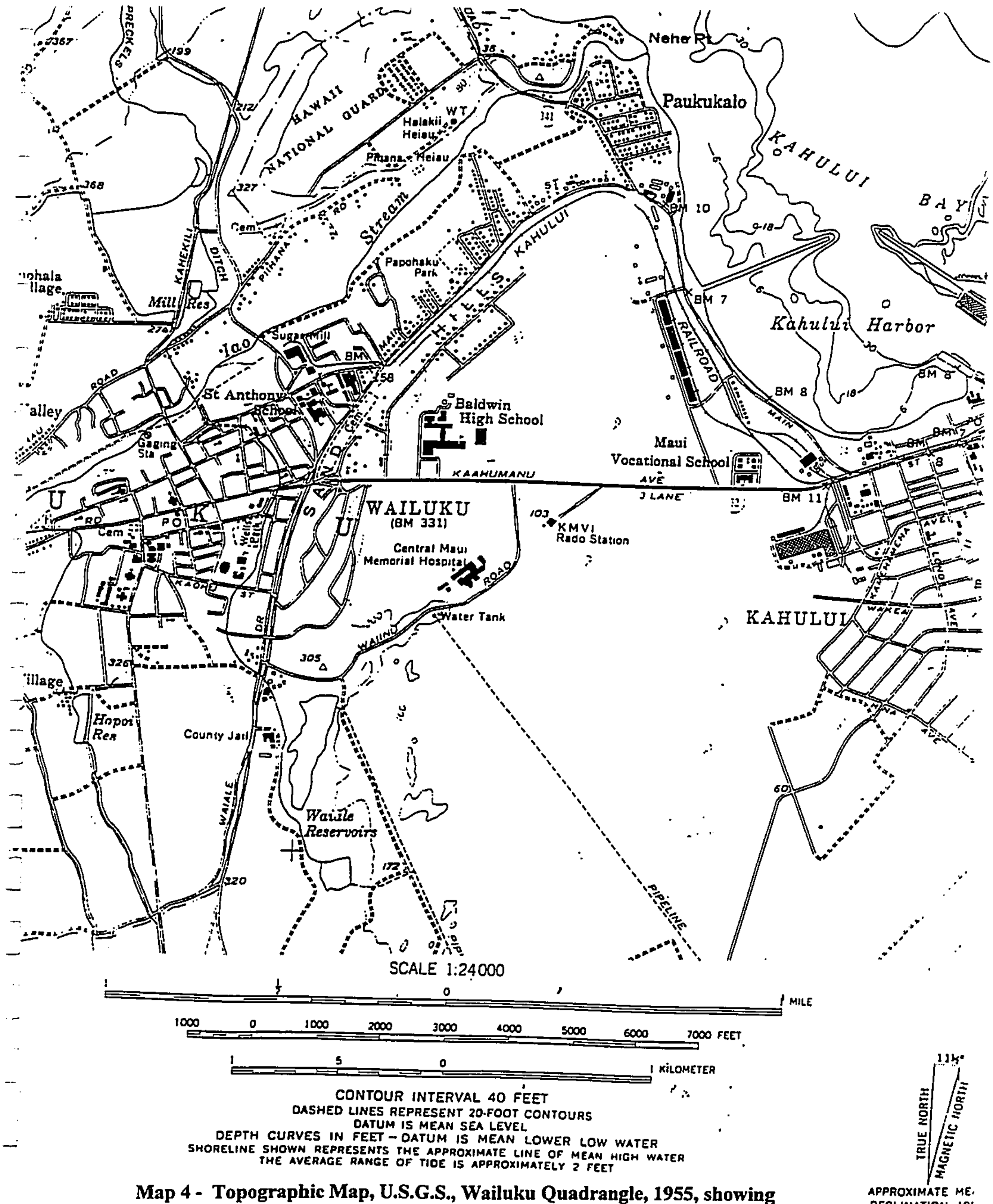
#1-#23



Map 4 - Topographic Map, U.S.G.S., Wailuku Quadrangle, 1955, showing Kahului Railroad Line.

Photo 1 - The study area, view to the northeast. Note retention basin in foreground

Photo 2 - Excavation in process, view to the east. Kahului Beach Road to the left of backhoe.

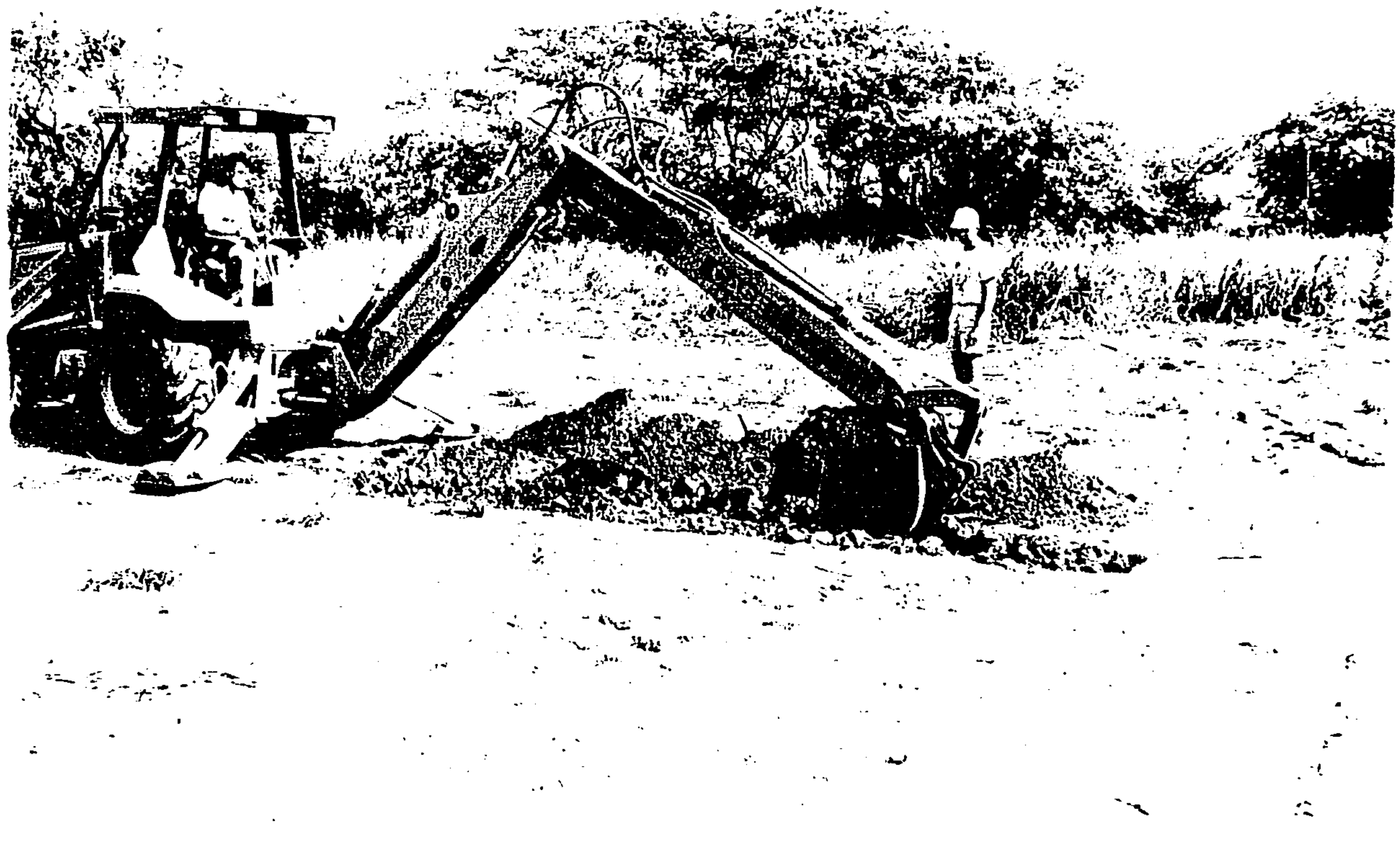


Photo 3 - Excavation of BTT #1 in process. View to the north.

Photo 4 - Backhoe test trench #9, excavation completed. View to the north.

Photo 5 - Line of coconut trees in 1992, which once lined the entrance to the Marine Corps base and Kahului Railroad Line.

Photo 6 - View of the *makai* side of the study parcel showing damage done the 1946 tsunami, and the large house located there (Maui Historical Society Archives)

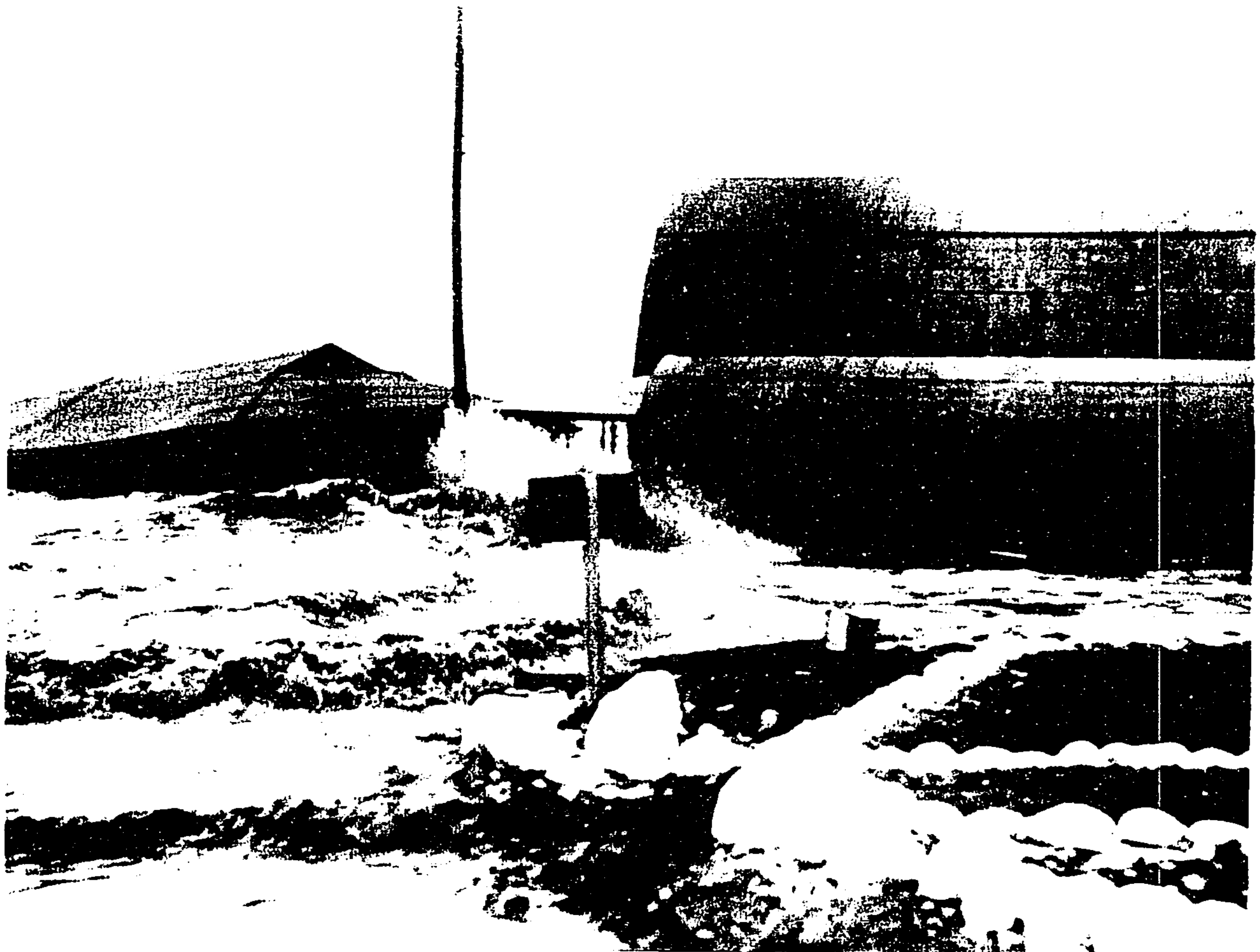


Photo 7 - Quonset huts which were part of the USMC Base, with house displaced by the 1946 tsunami (Maui Historical Society Archives).

Appendix A-3

Letter from State Historic Preservation Division Dated August 30, 1993 Regarding Roadway Corridors

DOCUMENT CAPTURED AS RECEIVED

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

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

August 30, 1993

Ms. Kehaulani P. Dacanay
Archaeological Consultants of Hawaii
59-624 Pupukea Road
Haleiwa, Hawaii 96712

LOG NO: 9276
DOC NO: 9308AG51

Dear Ms. Dacanay:

SUBJECT: **Historic Preservation Review of an Archaeological Report**
Kahului, Wailuku, Maui
TMK: 3-8-07: 1, 40, 125; 3-7-01: 2

Thank you for submitting a revised copy of your company's report entitled *Archaeological Inventory Survey with Subsurface Testing Report for a Property Located at Portions of TMK: 3-8-07: 1, 40, 125, 117 and 3-7-01: 2*. The editorial changes recommended in our review of the draft copy have been made. We now find this report acceptable.

Please contact Annie Griffin at 587-0013 if you have any questions.

Sincerely,

DON HIBBARD, Administrator
State Historic Preservation Division

AG:111

Appendix A-4

Letter from State Historic Preservation Division Dated February 8, 1995 Regarding Retention Basin Site

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

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

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CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

February 8, 1995

Mr. Erik Fredericksen
Ms. Demaris Fredericksen
Xamanek Researches
P.O. Box 131
Pukalani, Hawaii 96788

LOG NO: 13846
DOC NO: 9502SC02

Dear Mr. Fredericksen:

SUBJECT: **Historic Preservation Review of a Revised Report on the Inventory Survey of a 10-Acre Parcel at Maui Central Parkway Wailuku, Maui TMK: 3-8-07:125**

Thank you for the prompt submission of revisions to the draft inventory survey report on the 10-Acre parcel at Maui Central Parkway (*An Inventory Survey of a 10-Acre Parcel of Land, Maui Central Park Parkway, Wailuku Ahupua'a, Wailuku District, Maui Island [TMK: 3-8-07:125].* 1994. By Erik Fredericksen, Walter M. Fredericksen and Demaris L. Fredericksen.)

The revisions and corrections have been acceptably made, and we can now conclude that the inventory survey has been successfully completed. No historic sites were found on the subject parcel. Therefore, in our opinion, the proposed undertakings will have "no effect" on significant historic sites.

Please contact Theresa Donham on Maui at 243-5169, or Sara Collins on Oahu at 587-0013, if you have any questions.

Sincerely,

DON HIBBARD, Administrator
State Historic Preservation Division

SC:ab

Appendix A-5

Letter from State Historic Preservation Division Dated November 14, 1994 Regarding Papa Avenue Extension Realignment

JOHN WAIHEE
GOVERNOR OF HAWAII

NOV 18 1994

KEITH AHUE, CHAIRPERSON
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STATE PARKS
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STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

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

November 14, 1994

Milton Arakawa
Munekiyo & Arakawa, Inc.
1823 Wells Street, Suite 3
Wailuku, Hawaii 96793

LOG NO.: 13109
DOC NO.: 9411KD04

Dear Mr. Arakawa:

SUBJECT: **Historic Preservation Review of the Papa Avenue Extension Realignment, Plan A Wailuku, Wailuku District, Island of Maui**
TMK: 3-8-07: 40

Thank you for the opportunity to comment on the proposed realignment for a section of the Papa Avenue extension. The portion of the proposed road to be realigned is located north of Kaahumanu Avenue and involves a c. 0.97 acre area. The realignment will result in a relatively straight road, as opposed to a slightly curved road as originally planned.

An archaeological inventory survey with subsurface backhoe trenching was conducted on the original Papa Avenue extension and the Maui Central Park Parkway (*Archaeological Inventory Survey with Subsurface Testing Report for a Property Located at Portions of TMK: 3-8-07: 1, 40, 125 and 117 and 3-7-01:2, Wailuku Ahupua'a, Wailuku district, Island of Maui*, J. Kennedy, P.P. Brennan, S. Ireland 1993).

During the inventory survey, a corridor 150 feet wide was examined by pedestrian survey, and 54 backhoe trenches were excavated, 20 of which were along the Papa Avenue extension. No evidence of historic sites was identified within the surveyed and tested corridor.

Most of the realignment corridor is within 75 feet of the centerline of the original corridor, and was included in the 150 foot wide pedestrian survey corridor. A short portion of the realignment corridor (c. 200 feet) extends 30 feet beyond the 150 foot corridor that was surveyed. One of the backhoe trenches (Trench 25) excavated during the survey extended well into the area of the realignment corridor, and a number of trenches were quite close.

Based on the location of the realignment corridor in relation to the original survey area for the Papa Street extension, on the absence of identified sites anywhere along the survey corridor, and on the negative findings of the backhoe trench survey, we believe that the realignment will have "no effect" on historic sites.

If you have any questions, please contact Ms. Theresa K. Donham at 243-5169.

Sincerely,

DON HIBBARD, Administrator
Historic Preservation Division

Appendix B

Letter from Department of the Army Dated April 20, 1993 Regarding Wetlands

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

April 20, 1993

REPLY TO
ATTENTION OF
Operations Division

Mr. Michael T. Munekiyo, A.I.C.P.
Michael T. Munekiyo Consulting, Inc.
1823 Wells Street, Suite 3
Wailuku, Hawaii 96793

Dear Mr. Munekiyo:

This is to acknowledge receipt of your letter dated April 12, 1993 requesting a review of the video tape for the proposed Maui Central Park Parkway and Papa Avenue Extension.

Based on the video tape and information you provided, it appears that there are no wetlands or other waters of the U.S. on the project site. Since no work will be done in waters of the U.S., a Department of the Army (DA) permit is not required.

File No. NP93-038 has been assigned to this project. Please refer to this number in future correspondence. Should you have any questions please contact my staff at 438-9258.

Sincerely,

for Warren Kanai
Michael T. Lee
Chief, Operations Division

Appendix C

Noise Study

ACOUSTIC STUDY
FOR THE
MAUI CENTRAL PARK MASTER PLAN PROJECT
KAHULUI, MAUI, HAWAII

Prepared for:

MICHAEL T. MUNEKIYO CONSULTING, INC.

Prepared by:

Y. EBISU & ASSOCIATES
1126 12th Avenue, Room 305
Honolulu, Hawaii 96816

APRIL 1995

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I. SUMMARY

This study evaluated the potential noise impacts in the immediate vicinity of and attributable to the proposed construction of the South Papa Avenue extension and Parkway within the Maui Central Park complex on the island of Maui, Hawaii. The possible changes in traffic volumes and noise levels along the existing roadways surrounding the Maui Central Park were also investigated.

Existing noise sensitive properties along South Papa Avenue, Kaahumanu Avenue, Kanaloa Avenue, and Kahului Beach Road are not expected to be adversely impacted by the extension of South Papa Avenue and the construction of the new Parkway within the Maui Central Park grounds. The reason for this conclusion is that the traffic volumes and noise levels along the existing roadways are not anticipated to increase significantly as the result of the construction of the two new roadways within the Maui Central Park. A redistribution of traffic volumes among the existing roadways is expected to occur, but the differential volumes and resulting changes in traffic noise levels are anticipated to be 0.5 dB or less, which are considered to be insignificant.

The greatest increase in traffic noise levels are expected to occur within the Maui Central Park complex, along the new extension of South Papa Avenue and along the new Parkway. This is due to the relatively low existing background ambient noise levels within the interior areas of the Maui Central Park which are removed from the existing roadways.

Traffic noise contributions from the new Parkway are predicted to be less than 50 dB at the future Maui Community Arts and Cultural Center, and adverse traffic noise impacts are not expected at that location. Traffic noise levels at the two student dormitory buildings fronting the South Papa Avenue extension are expected to increase by approximately 3 to 8 dB as a result of the South Papa Avenue extension. This degree of increase is considered to be large, but traffic noise mitigation measures are not required by FHA/HUD or FHWA standards for residences. Traffic noise mitigation measures are not normally required at these dormitories due to the relatively low (60 Ldn or less) traffic noise levels predicted along the new section of South Papa Avenue. The effectiveness of various noise mitigation measures were identified for use if reduction of traffic noise is required in the future.

CHAPTER II. NOISE DESCRIPTORS AND THEIR RELATIONSHIP TO LAND USE COMPATIBILITY

A general consensus has developed for use of the Day-Night Sound Level (Ldn) in describing environmental noise in general, and for relating the acceptability of the noise environment for various land uses. The Day-Night Sound Level represents the 24-hour average sound level for a typical day, with nighttime noise levels (10:00 P.M. to 7:00 A.M.) increased by 10 decibels prior to computation of the 24-hour average.

The Ldn descriptor employs a process of averaging instantaneous A-Weighted sound levels as read on a standard Sound Level Meter, which are normally referred to as meter readings in dBA. A brief description of the acoustic terminology and symbols used are provided in **APPENDIX B**. The average noise level during a one hour period is called the hourly equivalent sound level, and is designated as Leq(h) or Leq. The maximum A-Weighted sound level occurring during an intermittent event (or single event) is referred to as the Lmax value. The mathematical product (or integral) of the instantaneous sound level times the duration of the event is known as the Sound Exposure Level, or Lse, and is analogous to the energy of the time varying sound levels associated with the intermittent noise event. Current noise standards and criteria which associate land use compatibility or adverse health and welfare effects with various levels of environmental noise are normally described in terms of Ldn rather than the single event (Lmax or Lse) noise descriptors. The reasons for this are based on the relatively good correlation between the cumulative Ldn descriptor and annoyance reactions of the exposed population. However, at very low levels of environmental noise (55 Ldn or less), other attitudinal variables and biases (besides noise) of the exposed population tend to influence annoyance reactions, and the correlation between annoyance reactions and Ldn levels deteriorates.

TABLE 1, extracted from **Reference 1**, categorizes the various

TABLE 1

EXTERIOR NOISE EXPOSURE CLASSIFICATION (RESIDENTIAL LAND USE)

NOISE EXPOSURE CLASS	DAY-NIGHT SOUND LEVEL	EQUIVALENT SOUND LEVEL	FEDERAL(1) STANDARD
Minimal Exposure	Not Exceeding 55 L_{dn}	Not Exceeding 55 L_{eq}	Unconditionally Acceptable
Moderate Exposure	Above 55 L_{dn} But Not Above 65 L_{dn}	Above 55 L_{eq} But Not Above 65 L_{eq}	Acceptable(2)
Significant Exposure	Above 65 L_{dn} But Not Above 75 L_{dn}	Above 65 L_{eq} But Not Above 75 L_{eq}	Normally Unacceptable
Severe Exposure	Above 75 L_{dn}	Above 75 L_{eq}	Unacceptable

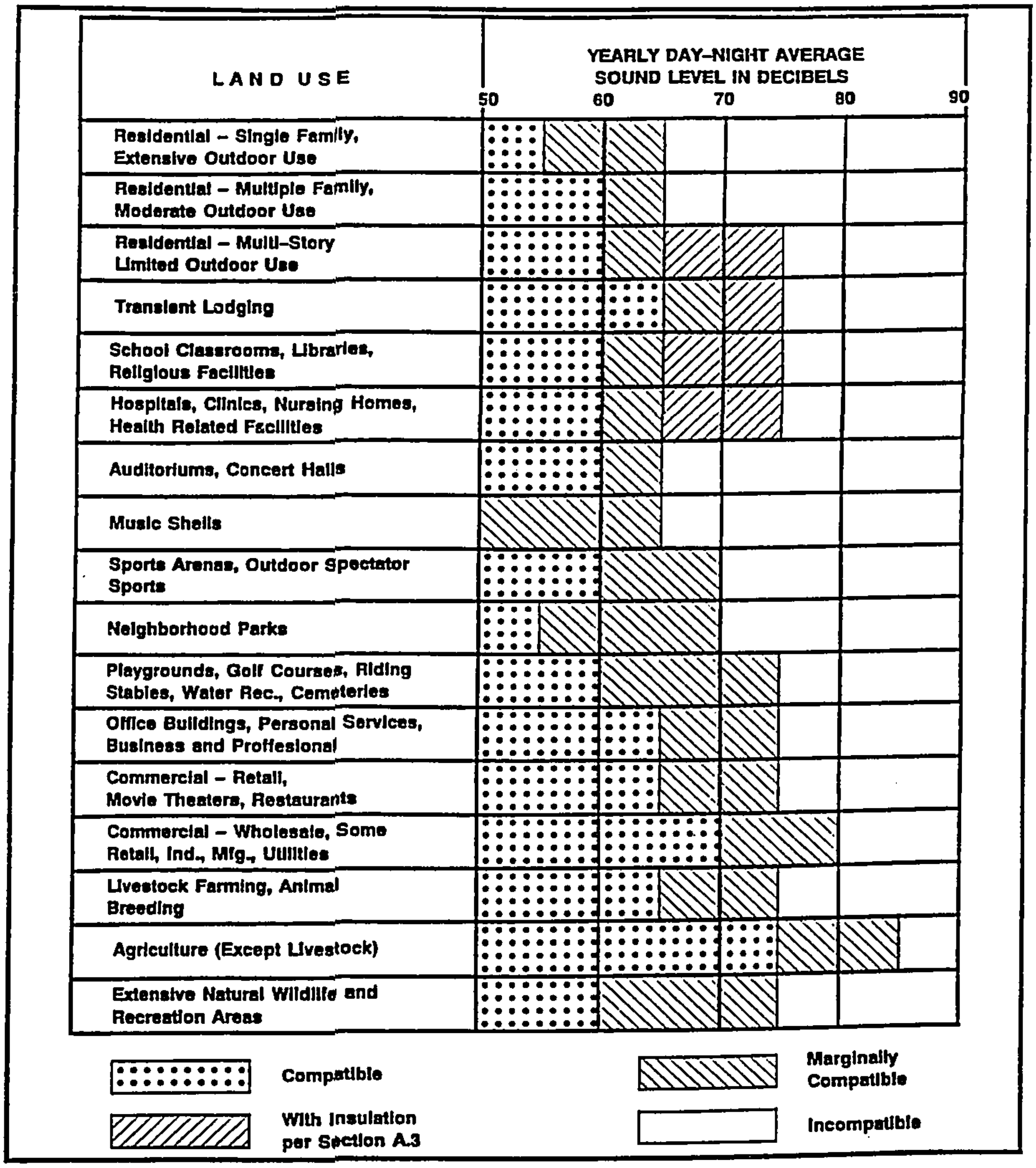
Notes: (1) Federal Housing Administration, Veterans Administration, Department of Defense, and Department of Transportation.

(2) FHWA uses the L_{eq} instead of the L_{dn} descriptor. For planning purposes, both are equivalent if: (a) heavy trucks do not exceed 10 percent of total traffic flow in vehicles per 24 hours, and (b) traffic between 10:00 PM and 7:00 AM does not exceed 15 percent of average daily traffic flow in vehicles per 24 hours. The noise mitigation threshold used by FHWA for residences is 67 L_{eq}.

Ldn levels of outdoor noise exposure with severity classifications. Land use compatibility guidelines for various levels of environmental noise as measured by the Ldn descriptor system are shown in **FIGURE 1.** A general consensus among federal agencies has developed whereby residential housing development is considered acceptable in areas where exterior noise does not exceed 65 Ldn. This value of 65 Ldn is used as a federal regulatory threshold for determining the necessity for special noise abatement measures when applications for federal funding assistance are made.

Federal agencies (HUD and EPA) recognize 55 Ldn as a desirable goal for exterior noise in residential areas for protecting the public health and welfare with an adequate margin of safety (**References 2 and 3**). Although 55 Ldn is significantly quieter than 65 Ldn, the lower level has not been adopted for regulatory purposes by federal agencies due to economic and technical feasibility considerations.

The U.S. Federal Highway Administration (FHWA) uses the Leq or L10 descriptors rather than the Ldn noise descriptor in assessing highway noise impacts and noise mitigation requirements (**Reference 4**). The L10 descriptor represents the noise level exceeded ten percent of the time during the peak traffic hour of interest. The Leq is normally evaluated during the peak traffic hour. For traffic noise levels in the project area, the Leq and Ldn levels are essentially identical (within 1 dB). **TABLE 2**, which was extracted from **Reference 4**, presents the current FHWA Noise Abatement Criteria which are normally applied in evaluations of potential noise impacts on federally-sponsored roadway improvement projects. In general, the 67 Leq threshold for Activity Category B is applied at all residences in the vicinity of these roadway improvement projects. Where use of the 67 Leq threshold would result in a significant increase in background ambient noise levels at residences which are located in quiet communities, the FHWA 57 Leq criteria can be used as a more conservative noise abatement threshold.



LAND USE COMPATIBILITY
WITH YEARLY DAY–NIGHT AVERAGE SOUND LEVEL
AT A SITE FOR BUILDINGS AS COMMONLY CONSTRUCTED
(Source: American National Standards Institute S12.40–1990)

FIGURE 1

TABLE 2

FHWA NOISE ABATEMENT CRITERIA
[Hourly A—Weighted Sound Level——Decibels (dBA)]

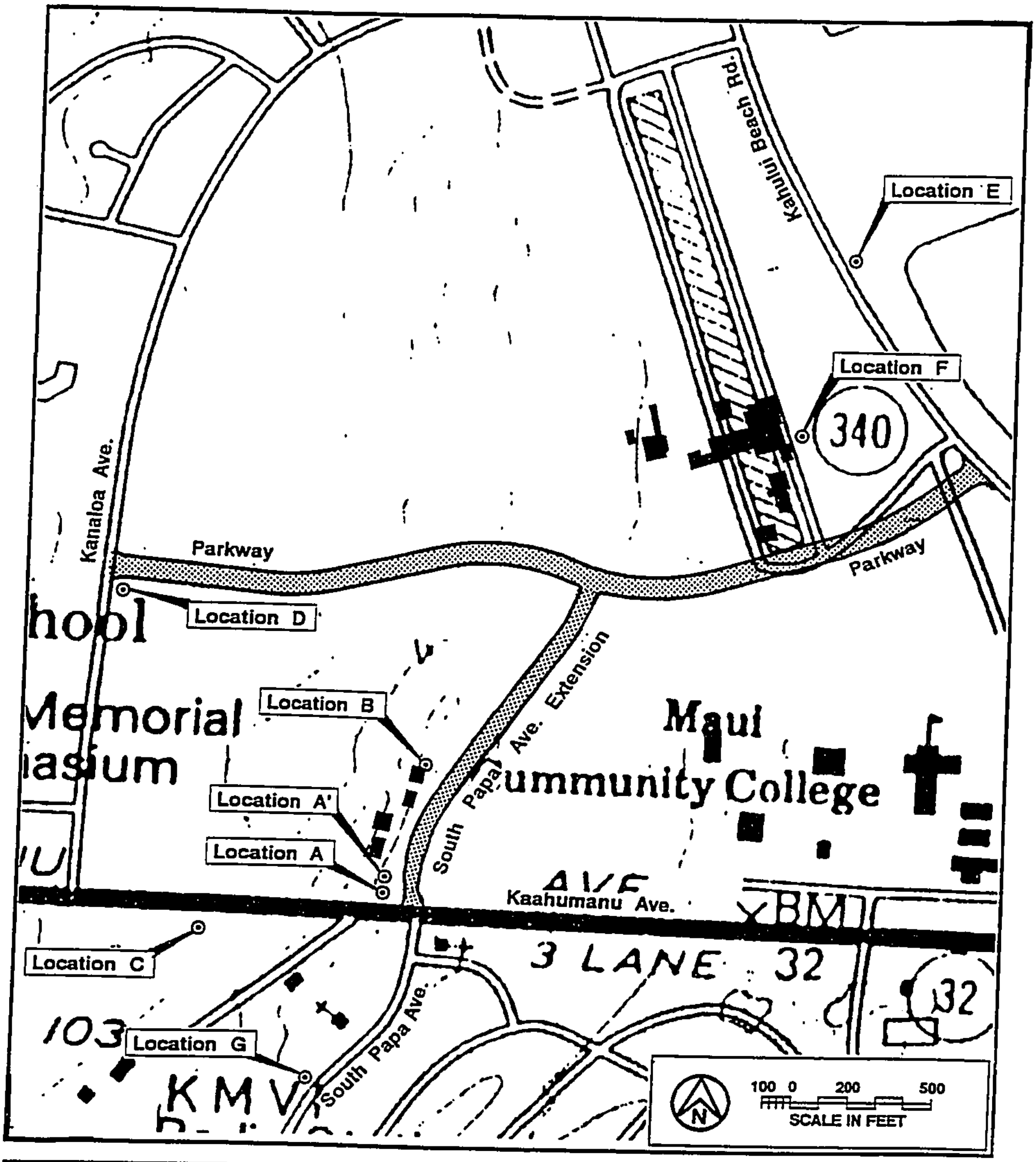
ACTIVITY CATEGORY	LEQ (H)	DESCRIPTION OF ACTIVITY CATEGORY
A	57 (Exterior)	Lands on which serenity and quiet are of extra—ordinary significance and serve an important public need and where the preservation of those qualities is essential if the areas are to continue to serve their intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, activity sports areas, parks, residences, motels, hotels, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	------	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

CHAPTER III. GENERAL STUDY METHODOLOGY

Existing traffic noise levels were measured at eight locations in the project environs to provide a basis for describing the existing traffic noise levels and for calibrating the Federal Highway Administration (FHWA) Highway Noise Model. The FHWA model was used to predict the traffic noise levels along the existing and future roadway sections servicing the Maui Central Park environs. The noise measurements were performed during the month of March 1993. The noise measurement Locations A thru G are shown in **FIGURE 2**, and the measurement results are included in **TABLE** 3 and **FIGURES 3 thru 10. TABLE** 3 also includes a comparison of the measured traffic noise levels with predictions of the FHWA Highway Noise Model.

The Federal Highway Administration (FHWA) Traffic Noise Prediction Model **(Reference 5)** was used as the primary method of calculating the existing and future traffic noise levels, with model parameters adjusted to reflect terrain, ground cover, and local shielding conditions. The measured traffic noise levels at Locations A thru G were compared with model predictions to insure that measured and calculated noise levels for the existing conditions were consistent and in general agreement. As indicated in **TABLE** 3, spot counts of existing traffic volume were obtained during the measurement period and were used to generate the Equivalent Sound Level (Leq) predictions shown in the table. The agreement between measured and predicted traffic noise levels was considered to be good and sufficiently accurate to justify use of the highway noise model to formulate the existing and future traffic noise contours.

The potential noise impacts associated with the planned construction of the South Papa Avenue extension and Parkway within the Maui Central Park were examined. Future traffic noise levels for CY 1994 conditions with and without the implementation of the Maui Central Park Master Plan Project were developed along the existing and new roadways in the environs of the park project.



LOCATIONS OF NOISE MEASUREMENT SITES

FIGURE 2

TABLE 3

TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	--Hourly Traffic Volume-- AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
A. 75 FT from the center-line of Kaahumanu Ave. (3/18/93)	0700 TO 0730	44	2,702	41	25	68.2	67.9
A'. 115 FT from the center-line of Kaahumanu Ave. (3/18/93)	1655 TO 1745	39	3,173	19	5	60.7	60.7
B. 550 FT from the center-line of Kaahumanu Ave. (3/18/93)	1040 TO 1113	40	N/A	N/A	N/A	44.1	N/A
C. 100 FT from the center-line of Kaahumanu Ave. (3/18/93)	1400 TO 1500	40	3,532	33	36	64.5	64.3
D. 60 FT from the center-line of Kanaloa Ave. (3/18/93)	1600 TO 1630	40	790	2	0	63.2	62.8

TABLE 3 (CONTINUED)

TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

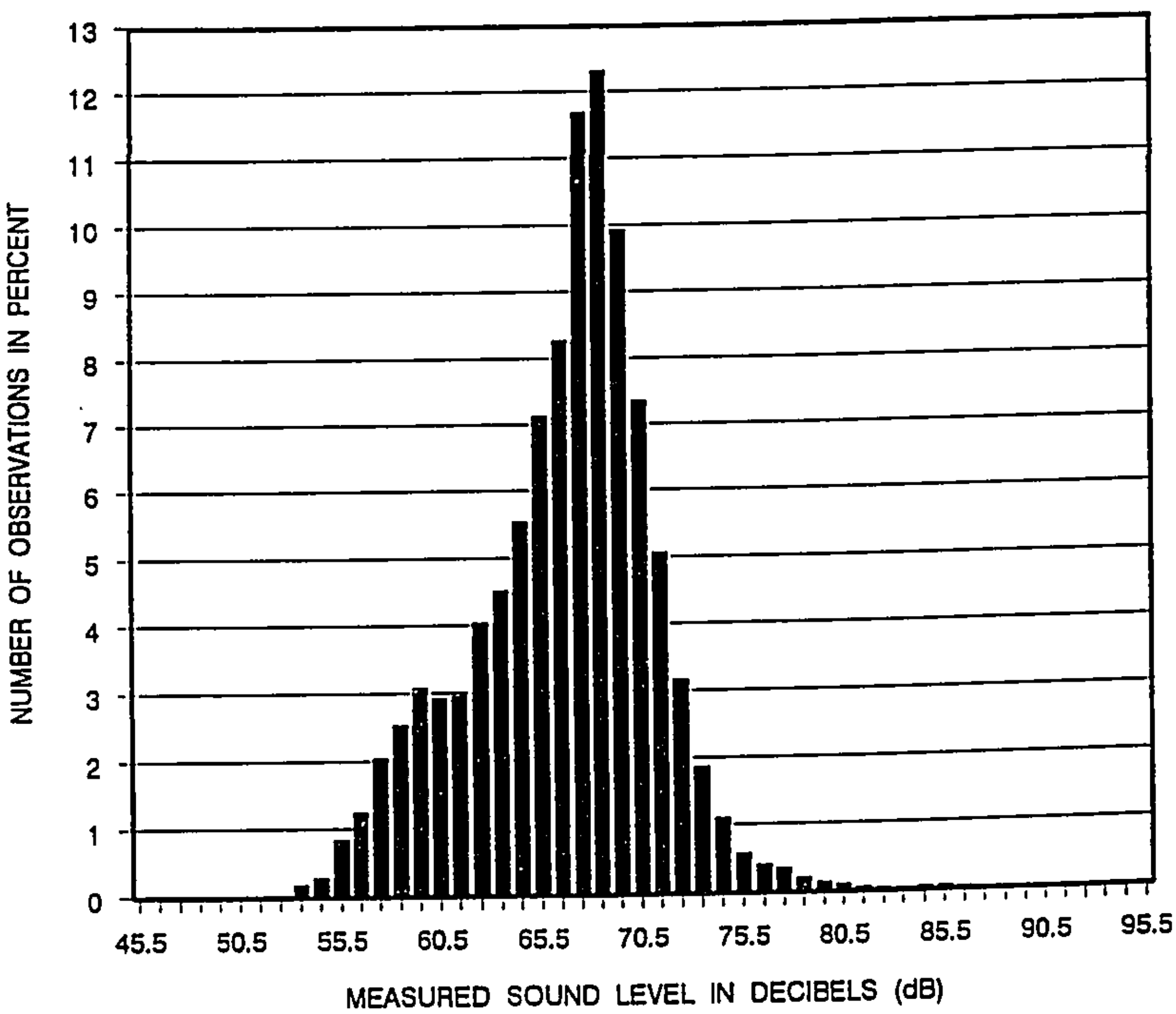
LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	--Hourly Traffic Volume-- AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
E. 50 FT from the center-line of Kahului Beach Rd. (3/17/93)	1617 TO 1700	40	2,077	18	11	67.0	67.4
F. 500 FT from the center-line of Kahului Beach Rd. (3/17/93)	2127 TO 2200	40	N/A	N/A	N/A	46.3	N/A
G. 55 FT from the center-line of S. Papa Ave. (3/19/93)	0700 TO 0800	36	1,149	10	11	64.5	64.0

FIGURE 3

HISTOGRAM OF MEASURED SOUND LEVELS AT LOCATION "A"

DATE: MARCH 18, 1993
TIME: 0700-0735 HOURS

METER RESPONSE: FAST

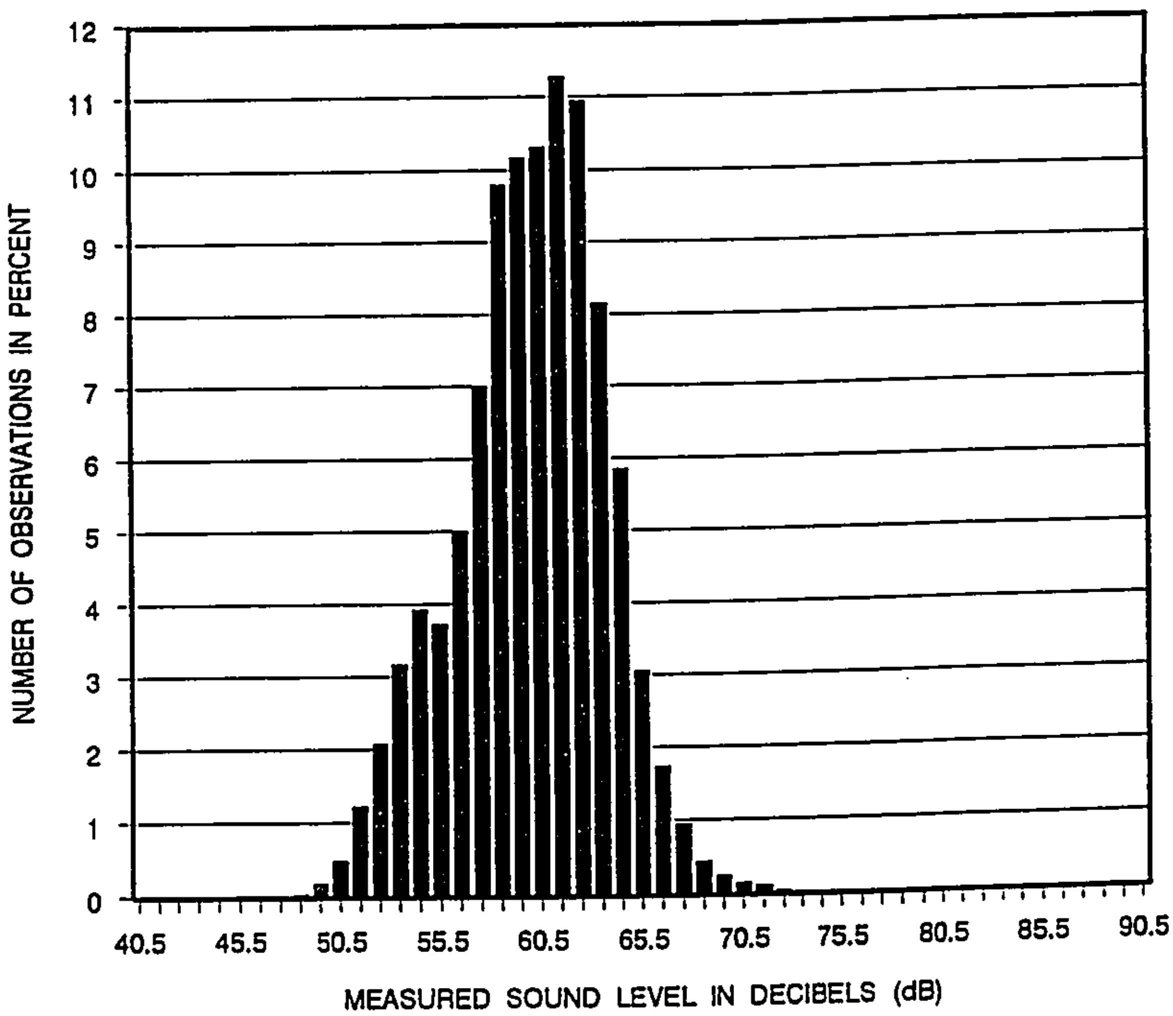


Lmax: 90.8 dBA
L10: 71.0 dBA
L50: 66.5 dBA
Leq: 68.2 dBA
Lmin: 52.4 dBA

FIGURE 4

HISTOGRAM OF MEASURED SOUND LEVELS AT LOCATION "A"

DATE: MARCH 18, 1993 METER RESPONSE: FAST
TIME: 1655-1745 HOURS

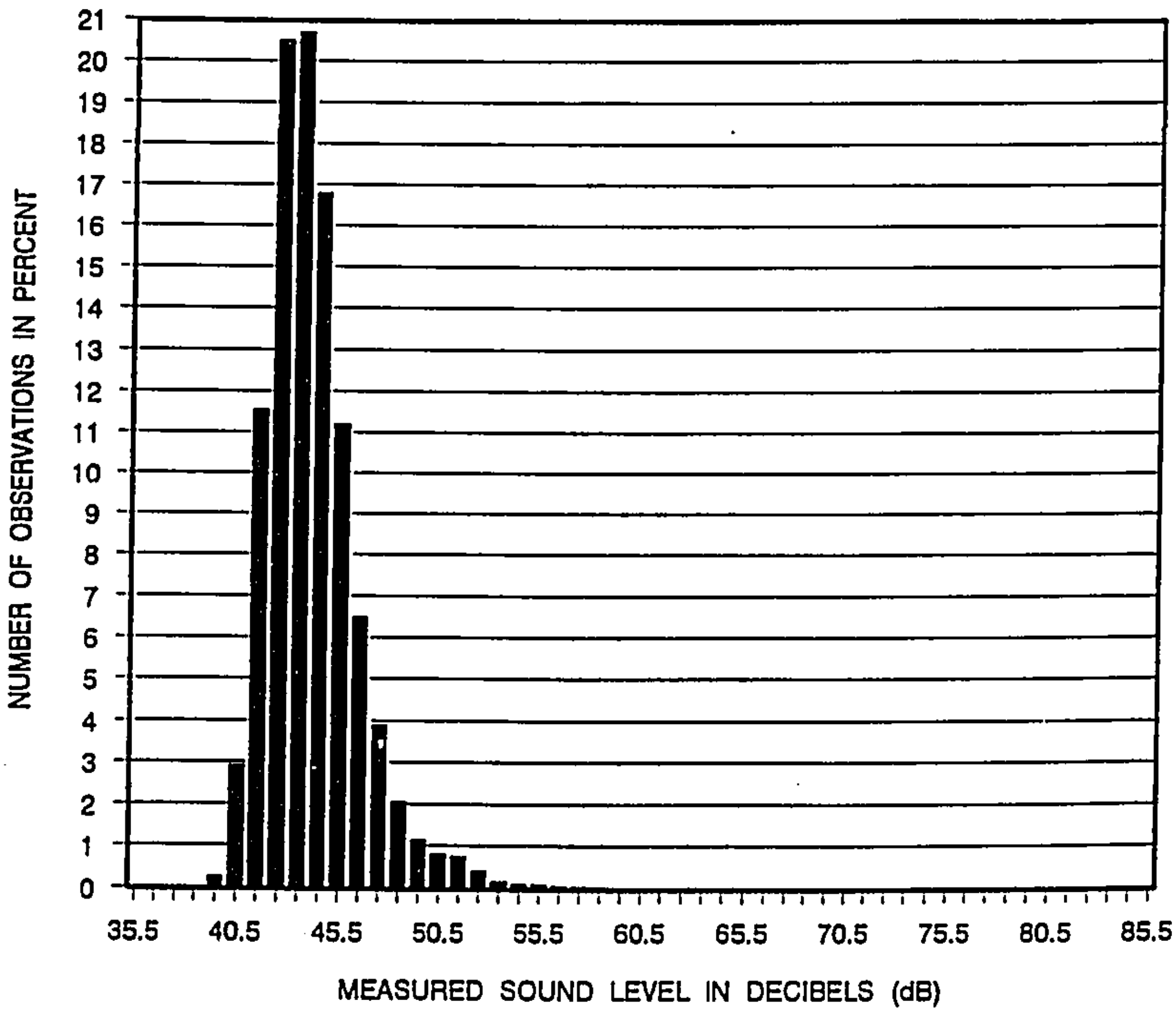


Lmax: 72.1 dBA
L10: 63.5 dBA
L50: 59.5 dBA
Leq: 60.7 dBA
Lmin: 47.7 dBA

FIGURE 5

HISTOGRAM OF MEASURED SOUND LEVELS AT LOCATION "B"

DATE: MARCH 18, 1993 METER RESPONSE: FAST
TIME: 1040-1113 HOURS



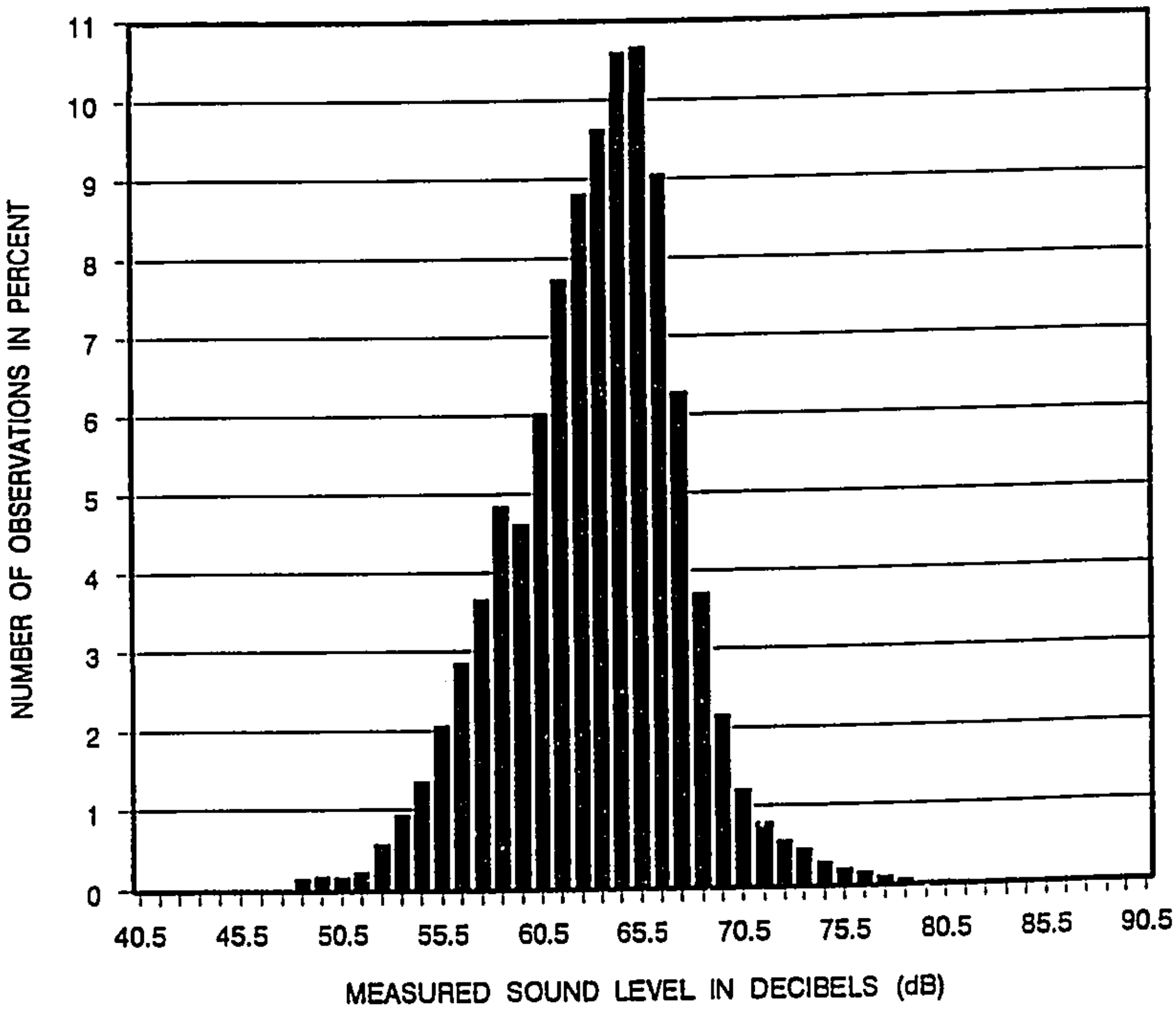
Lmax: 59.1 dBA
L10: 46.0 dBA
L50: 43.0 dBA
Leq: 44.1 dBA
Lmin: 38.6 dBA

FIGURE 6

HISTOGRAM OF MEASURED SOUND LEVELS AT LOCATION "C"

DATE: MARCH 18, 1993
TIME: 1400-1500 HOURS

METER RESPONSE: FAST

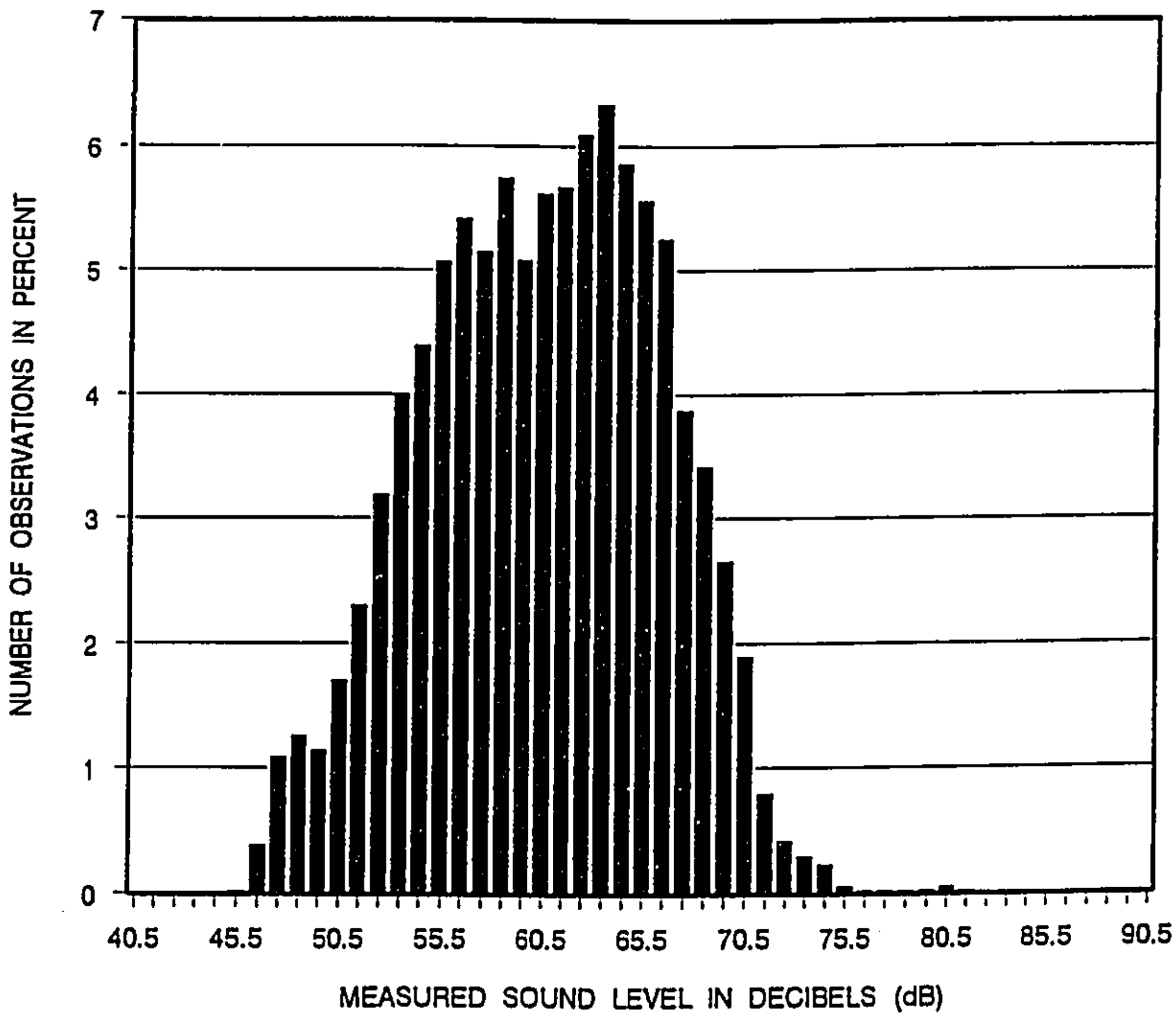


Lmax: 82.8 dBA
L10: 67.0 dBA
L50: 63.0 dBA
Leq: 64.5 dBA
Lmin: 47.1 dBA

FIGURE 7

HISTOGRAM OF MEASURED SOUND LEVELS AT LOCATION "D"

DATE: MARCH 18, 1993 METER RESPONSE: FAST
TIME: 1600-1632 HOURS



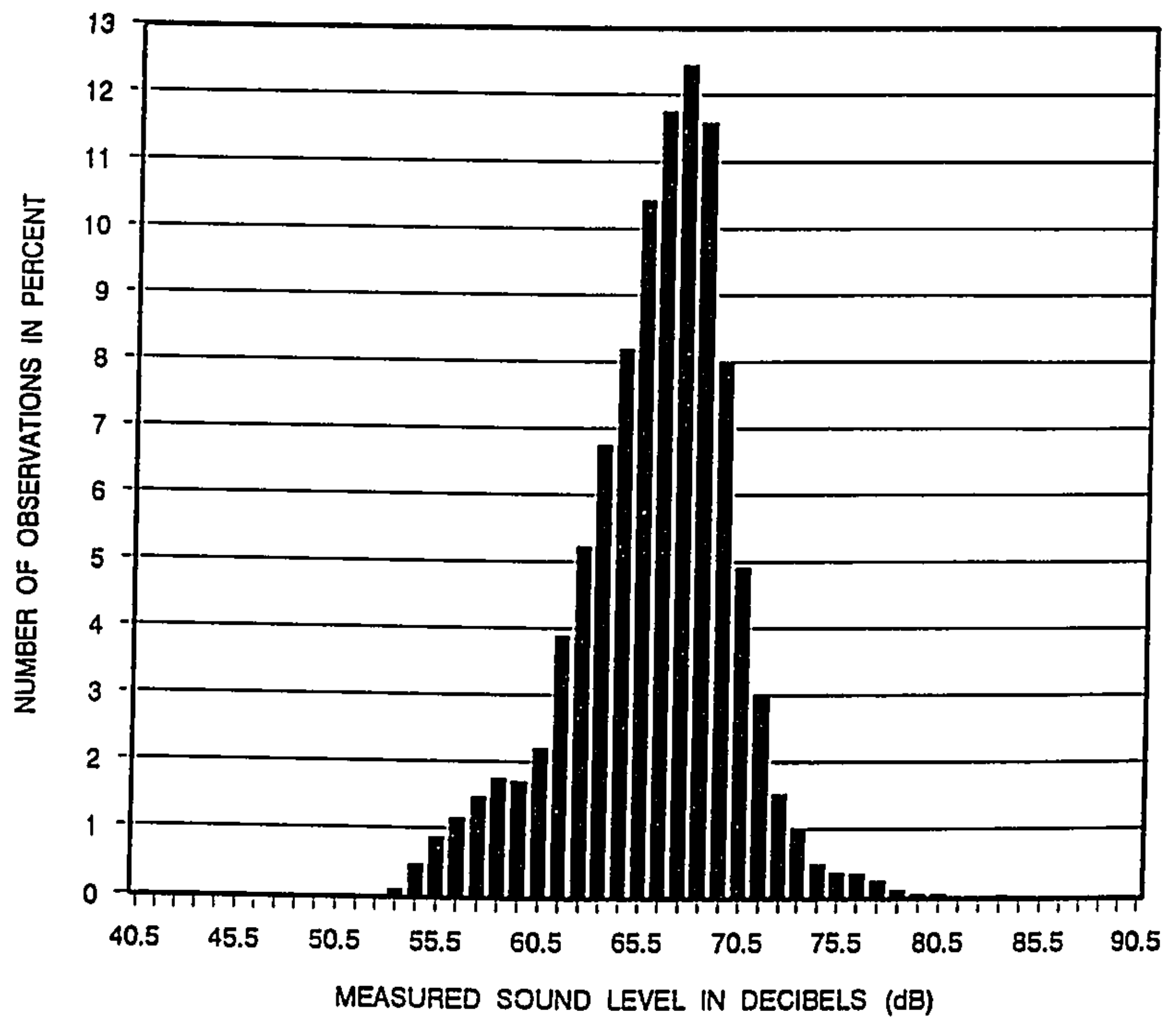
Lmax: 80.7 dBA
L10: 67.0 dBA
L50: 60.0 dBA
Leq: 63.2 dBA
Lmin: 44.8 dBA

FIGURE 8

HISTOGRAM OF MEASURED SOUND LEVELS AT LOCATION "E"

DATE: MARCH 17, 1993
TIME: 1617-1700 HOURS

METER RESPONSE: FAST



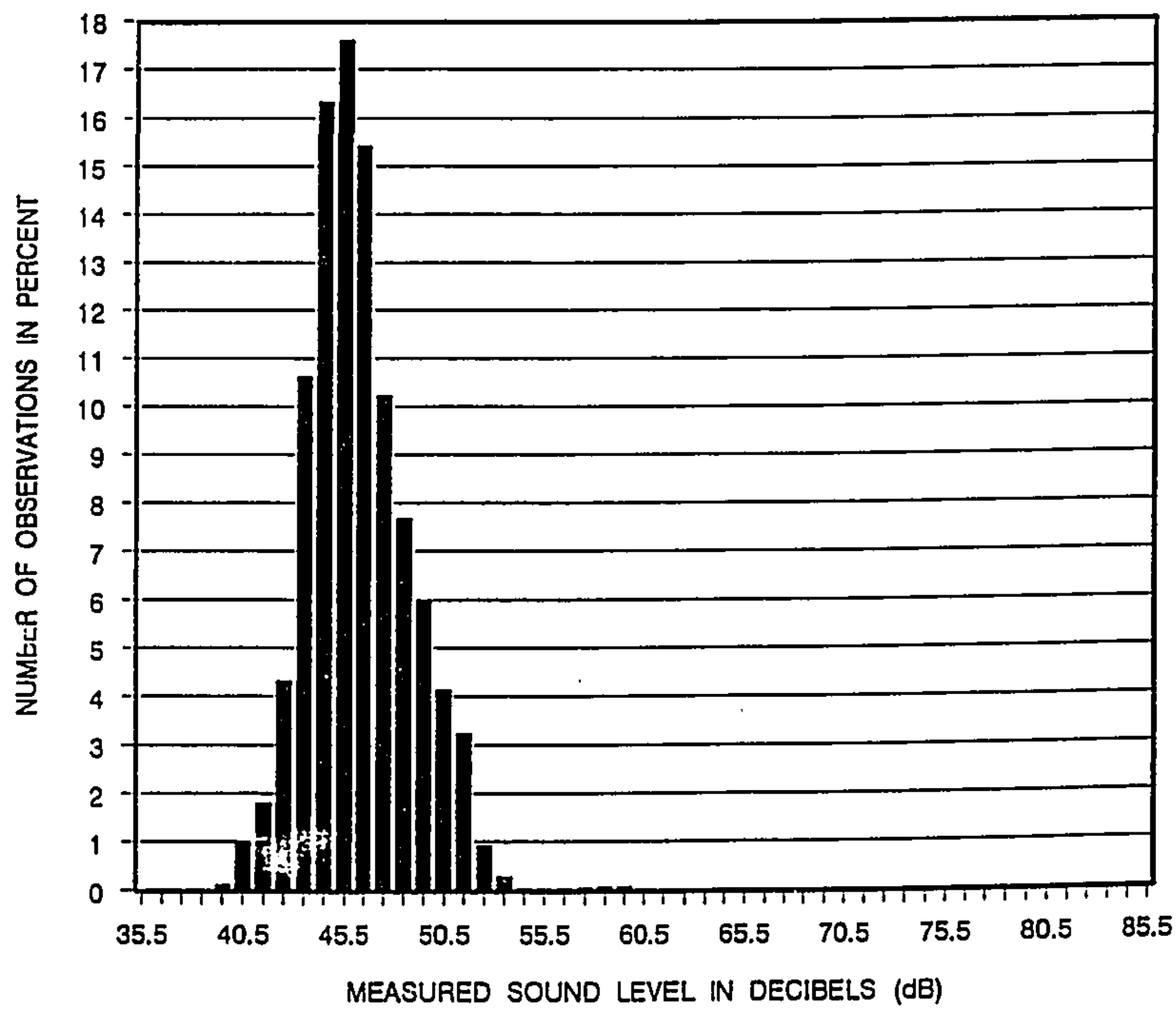
Lmax: 84.6 dBA
L10: 69.5 dBA
L50: 66.0 dBA
Leq: 67.0 dBA
Lmin: 52.2 dBA

FIGURE 9

HISTOGRAM OF MEASURED SOUND LEVELS AT LOCATION "F"

DATE: MARCH 17, 1993
TIME: 2127-2200 HOURS

METER RESPONSE: FAST



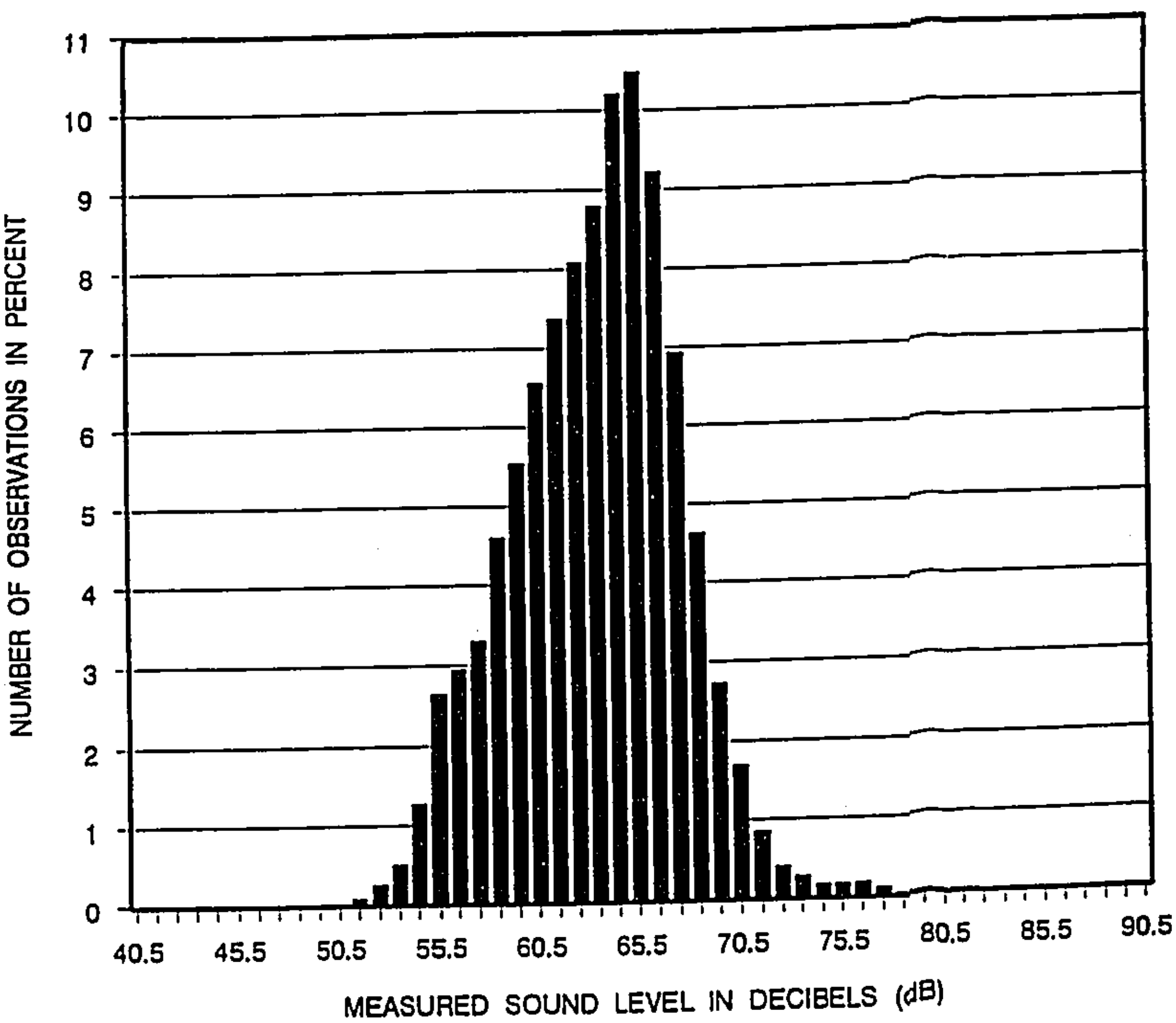
Lmax: 59.2 dBA
L10: 49.0 dBA
L50: 45.0 dBA
Leq: 46.3 dBA
Lmin: 38.8 dBA

FIGURE 10

HISTOGRAM OF MEASURED SOUND LEVELS AT LOCATION "G"

DATE: MARCH 19, 1993
TIME: 0700–0800 HOURS

METER RESPONSE: FAST



Lmax: 79.7 dBA
L10: 67.5 dBA
L50: 63.0 dBA
Leq: 64.5 dBA
Lmin: 50.5 dBA

References 6 and 7 were used to develop the existing (CY 1992) and future (CY 1994) peak hour traffic volumes with and without the project along the roadways surrounding and within the park complex. **References 8 thru 10** and **FIGURES 11 thru 14** were used to estimate the relationships between the AM peak hour Leq's and the 24-hour Ldn's along the roadways of interest. Traffic vehicle mixes along the existing roadways were assumed to be remain constant between CY 1992 and CY 1994. The Day-Night Sound Level (Ldn) noise descriptor was used in addition to the hourly Leq descriptor to evaluate potential traffic noise impacts and to allow for direct comparisons of the existing and future traffic noise levels with the 65 Ldn FHA/HUD noise standard.

The predicted CY 1994 traffic noise levels at noise sensitive receptors in the project environs were evaluated. The predicted future traffic noise levels were compared with existing noise levels as well as with the 65 Ldn FHA/HUD noise abatement criteria to identify specific locations where noise abatement measures might be necessary. These evaluations were performed for near term conditions with and without implementation of the Maui Central Park Project, and did not include evaluations of noise increases due to future traffic growth within the project area. Evaluations of potential noise impacts and possible mitigation measures at the existing Maui Community College student dormitory buildings were also performed due to the anticipated increase in traffic noise from the South Papa Avenue extension.

FIGURE 11

HOURLY VARIATIONS OF TRAFFIC NOISE LEVELS AT 100 FT DISTANCE FROM THE CENTERLINE OF SOUTH PAPA AVE. AT KAAHUMANU AVE. (4/24/91)

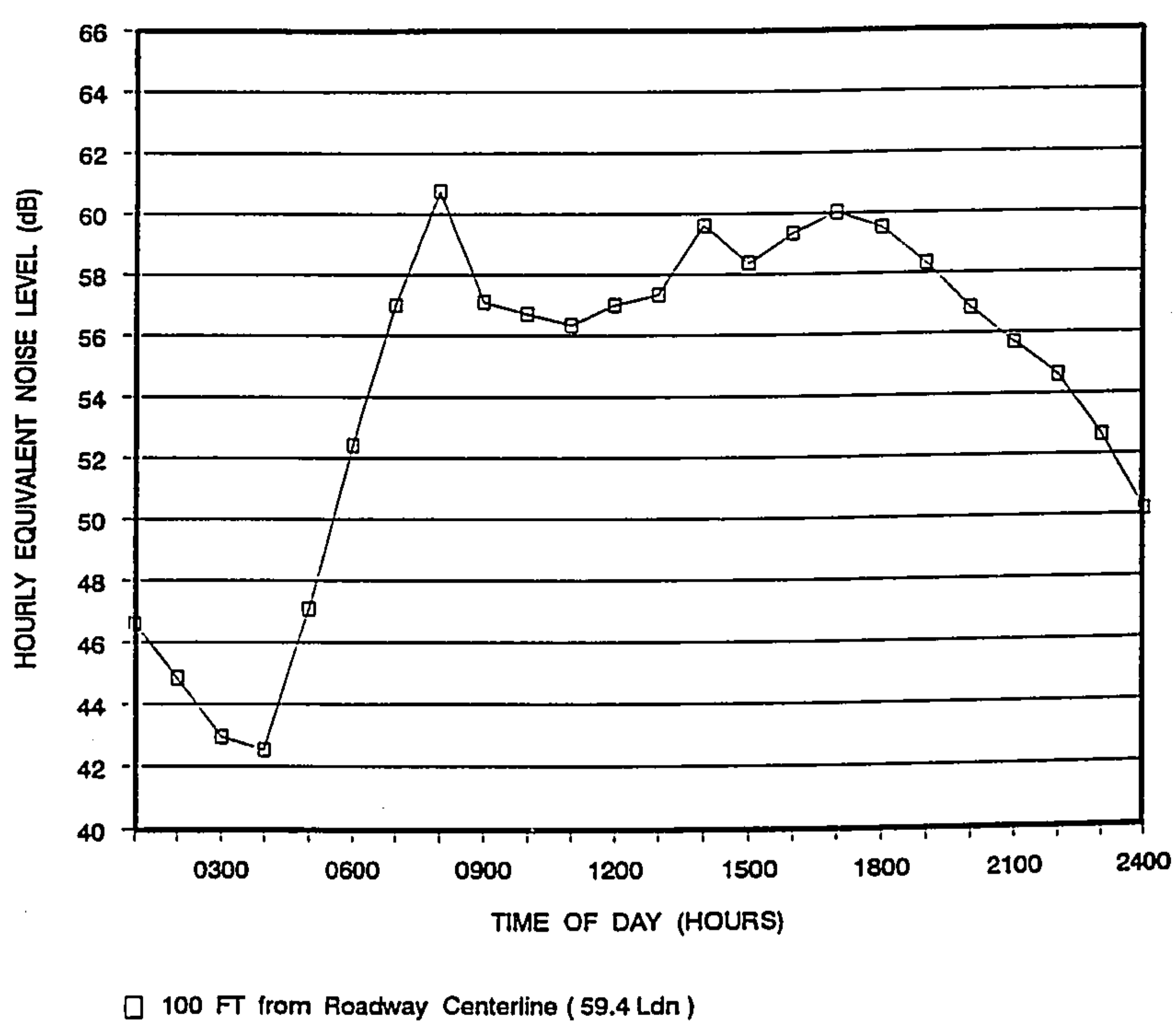
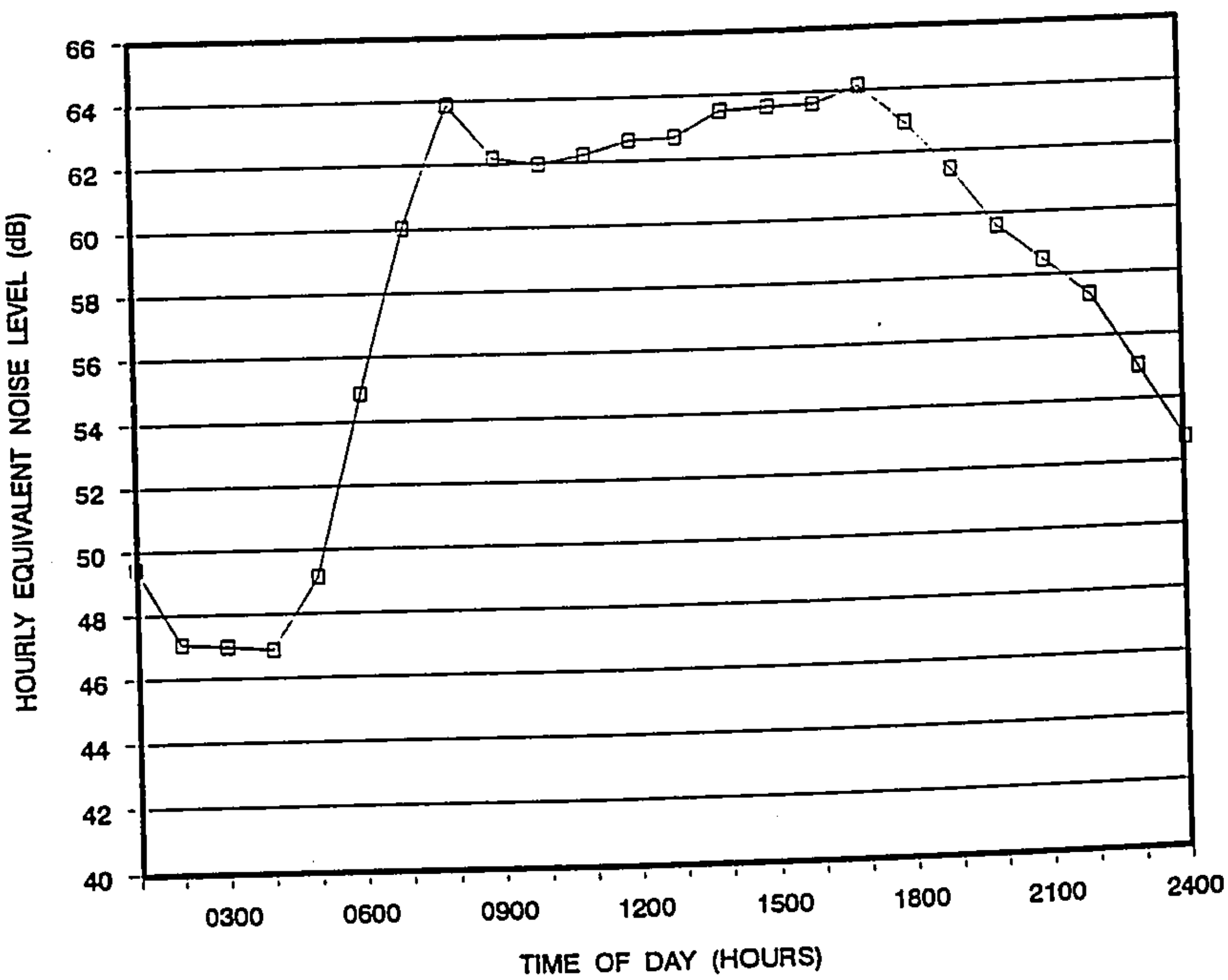


FIGURE 12

HOURLY VARIATIONS OF TRAFFIC NOISE LEVELS AT 100 FT DISTANCE FROM THE CENTERLINE OF KAAHUMANU AVE. AT SOUTH PAPA AVE. (4/24/91)



□ 100 FT from Roadway Centerline (63.0 Ldn)

FIGURE 13

HOURLY VARIATIONS OF TRAFFIC NOISE LEVELS AT 100 FT DISTANCE FROM THE CENTERLINE OF KANALOA AVE. AT KAHULUI BEACH RD. (4/24/91)

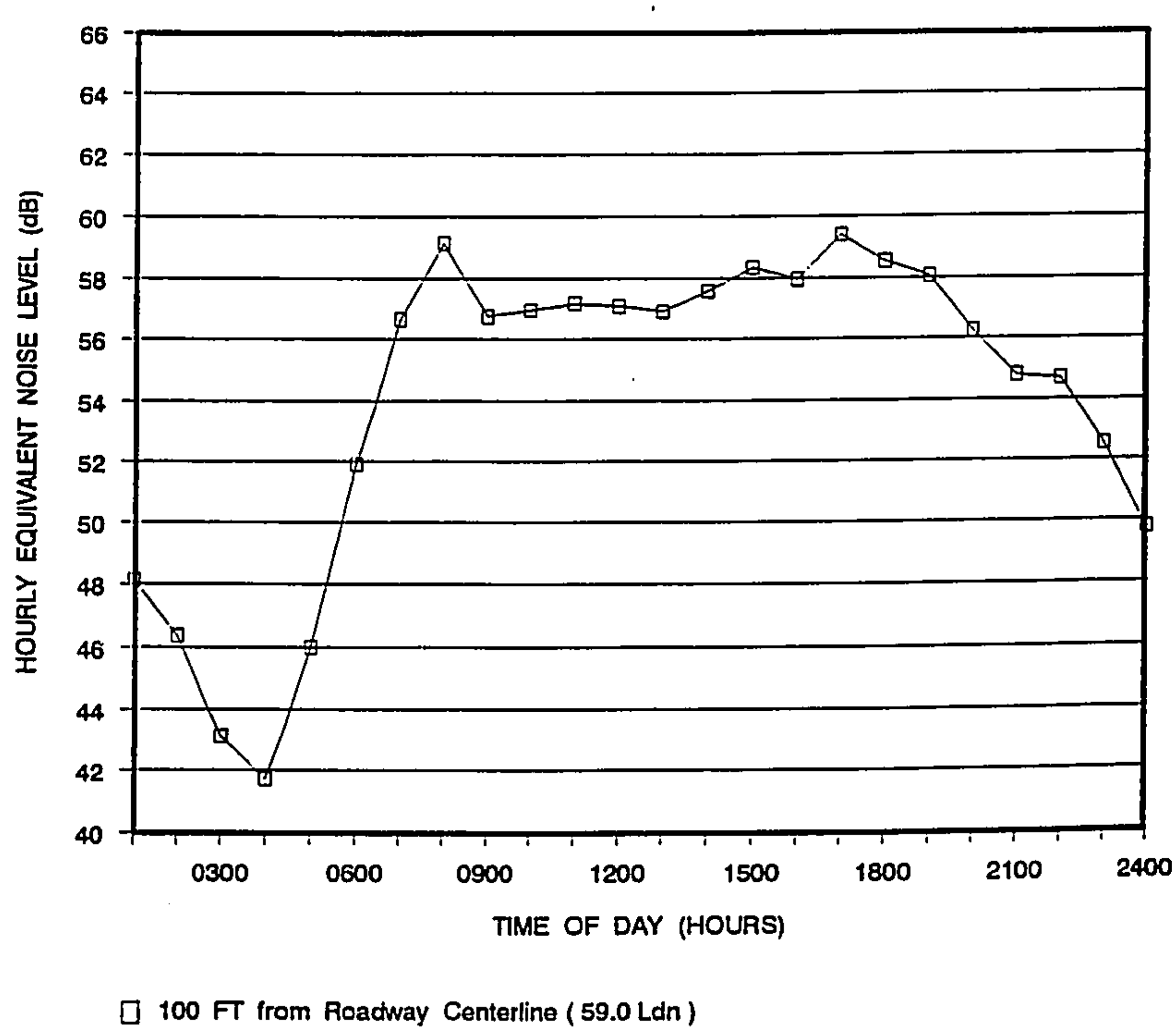
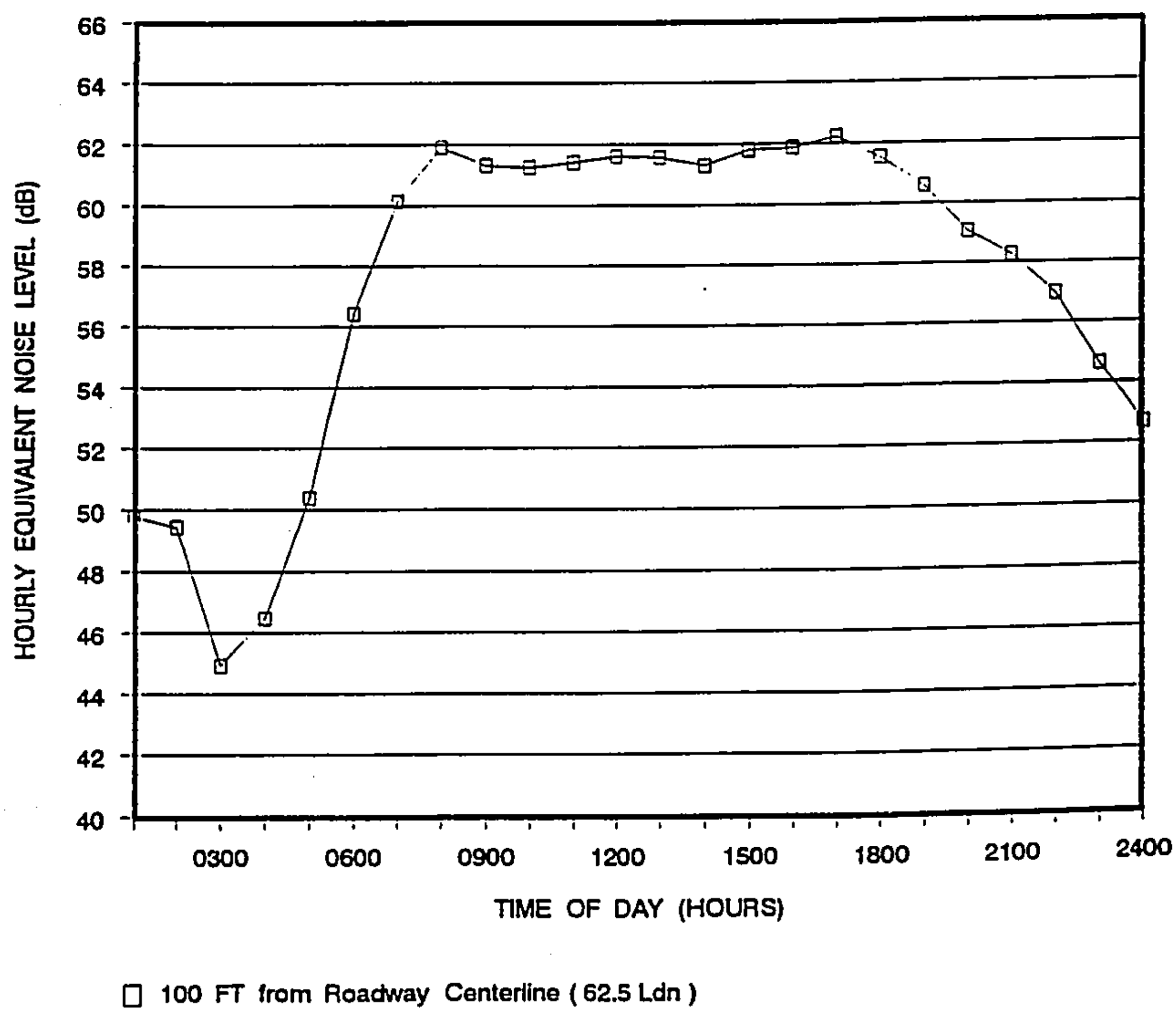


FIGURE 14

HOURLY VARIATIONS OF TRAFFIC NOISE LEVELS AT 100 FT DISTANCE FROM THE CENTERLINE OF KAHULUI BEACH RD. AT KANALOA AVE. (4/24/91)



CHAPTER IV. EXISTING AND FUTURE TRAFFIC NOISE ENVIRONMENT

Existing Traffic Noise Levels. The existing traffic noise levels in the project environs are in the "Moderate Exposure, Acceptable" and "Significant Exposure, Normally Unacceptable" categories along the Rights-of-Way of Kaahumanu Avenue, South Papa Avenue, Kanaloa Avenue, and Kahului Beach Road. Traffic noise levels along the Right-of-Way of a roadway generally represent the worst case (or highest) levels due to the proximity of the Right-of-Way to the traffic noise sources.

Calculations of existing traffic noise levels during the AM peak traffic hour are presented in **TABLE 4**. The hourly Leq (or Equivalent Sound Level) contributions from each roadway section in the project environs were calculated for comparison with forecasted traffic noise levels with and without the implementation of the Maui Central Park Master Plan by CY 1994. The existing setback distances from the roadways' centerlines to their associated 60, 65, and 70 Ldn contours were also calculated as shown in **TABLE 5**. The contour line setback distances do not take into account noise shielding effects from walls or buildings, or the additive contributions of traffic noise from intersecting street sections.

Traffic noise levels at the existing two-story, student dormitory buildings of Maui Community College (between noise measurement Locations A' and B) currently range from approximately 45 to 60 Ldn. Current traffic noise levels at the dormitory buildings are considered to be compatible for residential uses, and are below the FHA/HUD noise abatement standard of 65 Ldn. Existing traffic noise levels at these college dormitory buildings are also less than the FHWA noise abatement standard of 67 Leq.

Existing traffic noise levels at the site of the future Maui Community Arts and Cultural Center buildings (west of noise measurement Location F) currently range from approximately 49 to 51 Ldn. Current traffic noise levels at the cultural center buildings are considered to be compatible for uses such as auditoriums

TABLE 4

COMPARISONS OF EXISTING AND FUTURE
TRAFFIC NOISE LEVELS IN PROJECT ENVIRONS
(AM PEAK HOUR AND 100 FT FROM ROADWAY CENTERLINES)

LOCATION	SPEED (MPH)	VPH	* HOURLY LEQ IN dB @ 100 FT * AUTO	MT	HT	ALL VEH
EXISTING (CY 1992) AM PEAK HR. TRAFFIC:						
Kaahumanu Ave. West of S. Papa Ave.	40	3,278	61.3	52.8	58.1	63.4
Kaahumanu Ave. East of S. Papa Ave.	40	2,577	60.3	51.8	57.0	62.4
S. Papa Ave. S. of Kaahumanu Ave.	36	1,202	58.2	49.4	55.1	60.3
Kahului Beach Rd. S. of Kanaloa Ave.	40	1,885	59.9	51.4	56.7	62.0
Kahului Beach Rd. W. of Kaahumanu Ave.	40	2,222	60.6	52.1	57.4	62.7
Kanaloa Ave. N. of Kaahumanu Ave.	40	792	58.2	49.6	51.9	59.6
Kanaloa Ave. W. of Kahului Beach Rd.	40	731	57.8	49.3	51.6	59.2
FUTURE (CY 1994) AM PEAK HR. TRAFFIC:						
Kaahumanu Ave. West of Papa Ave.	40	3,237	61.3	52.7	58.0	63.4
Kaahumanu Ave. East of Papa Ave.	40	2,539	60.2	51.7	57.0	62.3
S. Papa Ave. S. of Kaahumanu Ave.	36	1,239	58.4	49.6	55.3	60.5
Kahului Beach Rd. S. of Kanaloa Ave.	40	2,010	60.2	51.7	57.0	62.3
Kahului Beach Rd. W. of Kaahumanu Ave.	40	2,217	60.6	52.1	57.4	62.7
Kanaloa Ave. N. of Kaahumanu Ave.	40	617	57.1	48.5	50.8	58.5
Kanaloa Ave. West of Beach Rd.	40	815	58.3	49.8	52.0	59.7
South Papa Avenue Extension	36	400	53.5	44.7	50.4	55.6
New Parkway W. of South Papa Ave.	40	310	54.1	45.6	47.8	55.5
New Parkway E. of South Papa Ave.	40	190	52.0	43.4	45.7	53.4

Note:

The following assumed traffic mix of autos, medium trucks, and heavy vehicles were used for existing and future conditions:

(a) Kaahumanu Avenue and Kahului Beach Road: 98.0% autos, 1.0% medium trucks, and 1.0% heavy trucks and buses.

(b) Kanaloa Avenue and Parkway: 98.5% autos, 1.0% medium trucks, and 0.5% heavy trucks and buses.

(c) South Papa Avenue and Extension: 98.2% autos, 0.9% medium trucks, and 0.9% heavy trucks and buses.

TABLE 5

EXISTING AND CY 1994 DISTANCES TO 60, 65, AND 70 Ldn CONTOURS

STREET SECTION	60 Ldn SETBACK (FT) EXISTING	60 Ldn SETBACK (FT) CY 1994	65 Ldn SETBACK (FT) EXISTING	65 Ldn SETBACK (FT) CY 1994	70 Ldn SETBACK (FT) EXISTING	70 Ldn SETBACK (FT) CY 1994
Kaahumanu Ave. West of S. Papa Ave.	169	167	78	78	36	36
Kaahumanu Ave. East of S. Papa Ave.	144	142	67	66	31	31
S. Papa Ave. S. of Kaahumanu Ave.	105	107	49	50	23	23
Kahului Beach Rd. S. of Kanaloa Ave.	136	142	63	66	29	31
Kahului Beach Rd. W. of Kaahumanu Ave.	152	151	70	70	33	33
Kanaloa Ave. N. of Kaahumanu Ave.	93	79	43	37	20	17
Kanaloa Ave. W. of Kahului Beach Rd.	89	95	41	44	19	21
South Papa Avenue Extension	N/A	51	N/A	23	N/A	11
New Parkway W. of South Papa Ave.	N/A	50	N/A	23	N/A	11
New Parkway E. of South Papa Ave.	N/A	36	N/A	17	N/A	8

Notes:

(1) All setback distances are from the roadways' centerlines.
(2) See TABLE 4 for traffic volume, speed, and mix assumptions.
(3) Setback distances are for unobstructed line-of-sight conditions.
(4) Soft ground conditions assumed along all roadways.
(5) Ldn assumed to be equal to AM Peak Hour Leq along all roadways.

and concert halls.

<u>Future Traffic Noise Levels</u>. Calculations of future (CY 1994) traffic noise levels during the AM peak traffic hour are presented in **TABLE 4** for conditions following completion of the new roadways within the Maui Central Park. The future setback distances from the roadways' centerlines to their associated 60, 65, and 70 Ldn contours were also calculated as shown in **TABLE 5**. The contour line setback distances do not take into account noise shielding effects from walls or buildings, or the additive contributions of traffic noise from intersecting street sections.

The future traffic noise levels along the existing sections of South Papa Avenue, Kaahumanu Avenue, Kanaloa Avenue, and Kahului Beach Road are expected to remain similar to existing levels following completion of the new roadways within the Maui Central Park (see **TABLES 4, 5, and 6**). As indicated in **TABLE 5**, the future setback distances to the 65 Ldn traffic noise contours are predicted to be less than 25 FT from the centerlines of the new roadways. Traffic noise levels along the Rights-of-Way of the new roadways are expected to be in the "Moderate Exposure, Acceptable" noise exposure category.

The greatest increases in traffic noise levels are expected to occur within the Maui Central Park complex, along the new extension of South Papa Avenue and along the new Parkway. This is due to the relatively low existing background ambient noise levels within the interior areas of the Maui Central Park which are removed from the existing roadways surrounding the park. Traffic noise contributions from the new Parkway are predicted to be less than 50 dB at the future Maui Community Arts and Cultural Center, and adverse traffic noise impacts are not expected at that location. Future traffic noise levels at the two student dormitory buildings closest to the South Papa Avenue extension are expected to range from 60 to 58 Ldn, and remain below FHA/HUD and FHWA noise abatement standards.

TABLE 6

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 1994)

STREET SECTION	NOISE LEVEL INCREASE (Ldn) DUE TO NON-PROJECT TRAFFIC	PROJECT TRAFFIC
Kaahumanu Ave. West of S. Papa Ave.	0.0	−0.1
Kaahumanu Ave. East of S. Papa Ave.	0.0	−0.1
S. Papa Ave. S. of Kaahumanu Ave.	0.0	0.1
Kahului Beach Rd. S. of Kanaloa Ave.	0.0	0.3
Kahului Beach Rd. W. of Kaahumanu Ave.	0.0	0.0
Kanaloa Ave. N. of Kaahumanu Ave.	0.0	−1.1
Kanaloa Ave. W. of Kahului Beach Rd.	0.0	0.5
South Papa Avenue Extension	N/A	60.1
New Parkway W. of South Papa Ave.	N/A	60.0
New Parkway E. of South Papa Ave.	N/A	57.9

CHAPTER V. FUTURE NOISE IMPACTS AND POSSIBLE NOISE MITIGATION MEASURES

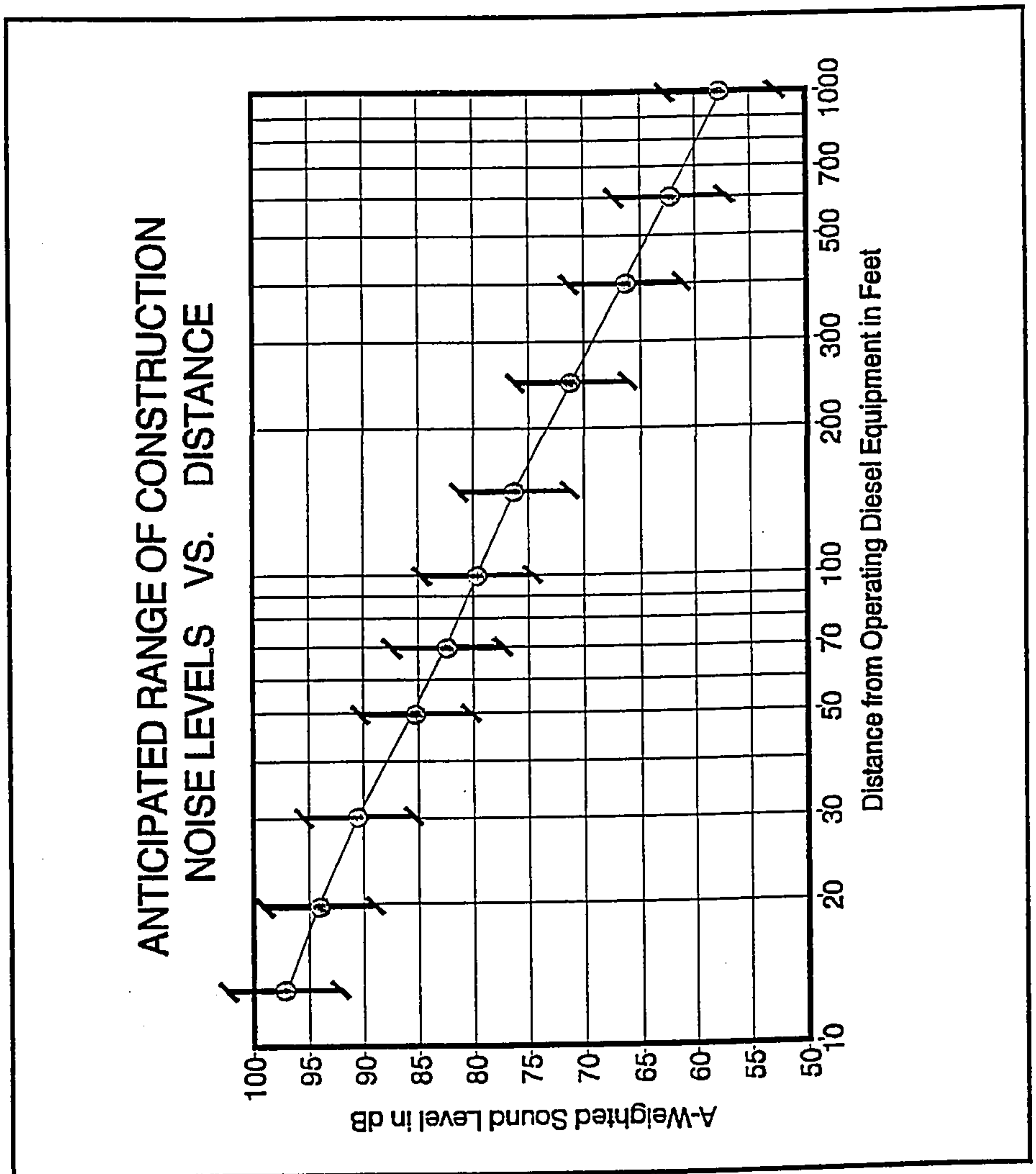
Traffic Noise. Existing noise sensitive properties along South Papa Avenue, Kaahumanu Avenue, Kanaloa Avenue, and Kahului Beach Road are not expected to be adversely impacted by the extension of South Papa Avenue and the new Parkway construction within the Maui Central Park grounds. The reason for this conclusion is that the traffic volumes and noise levels along the existing roadways are not anticipated to increase significantly as the result of the construction of new roadways within the Maui Central Park. A redistribution of traffic volumes among the existing roadways is expected to occur, but the differential volumes and resulting changes in traffic noise levels are anticipated to be 0.5 dB or less, which are considered to be insignificant (see **TABLE 6**). For this reason, traffic noise mitigation measures along the existing roadways are not considered necessary.

Traffic noise levels at the two student dormitory buildings near Location B (see **FIGURE 2**) are expected to increase by approximately 3 to 8 dB as a result of the South Papa Avenue extension. This degree of increase is considered to be large, but traffic noise mitigation measures are not required by FHA/HUD or FHWA standards for residences. Traffic noise mitigation measures would not normally be required at these dormitories due to the relatively low-to-moderate traffic noise levels predicted along the new section of South Papa Avenue.

If noise mitigation measures are desired in the future, construction of a 6 FT high sound wall between the South Papa Avenue extension and the two dormitory buildings would reduce future traffic noise levels by 5 to 10 dB within the ground floor units of the dormitories, but would not reduce future traffic noise levels within the second floor units. Realignment of the South Papa Avenue Extension by 20 to 50 FT east of its old alignment has reduced traffic noise levels by 2 to 3 dB at the dormitories. Limiting traffic speeds to 25 MPH along the South Papa Avenue extension would reduce predicted noise levels by approximately 5 dB at the student dormitory buildings. Closure and air conditioning of the dormitory units is another possible noise mitigation measure. The installation of sound attenuating windows (as was used in the Hale Noho and Skill Village Subdivisions) is another possible noise mitigation measure, but would require reconstruction of the east wall of the two dormitory buildings.

Construction Noise. Audible construction noise will probably be unavoidable during the entire project construction period. The total time period for construction is unknown, but it is anticipated that the actual work will be moving from one location on the project site to another during that period. Actual length of exposure to construction noise at any receptor location will probably be less than the total construction period for the entire project. Typical levels of noise from construction activities (excluding pile driving activity) are shown in **FIGURE 15**. The noise sensitive properties which are predicted to experience the highest noise levels during construction activities on the project site are the existing college student dormitory area adjacent to the South Papa Avenue extension, and the Maui Central Park areas along the proposed Parkway. Adverse impacts from construction noise are not expected to be in the "public health and welfare" category due to the temporary nature of the work and due to the administrative controls available for its regulation. Instead, these impacts will probably be limited to the temporary degradation of the quality of the acoustic environment in the immediate vicinity of the project site.

Mitigation of construction noise to inaudible levels will not be practical in all cases due to the intensity of construction noise sources (80 to 90+ dB at 50 FT distance), and due to the exterior nature of the work (rock breaking, grading and earth moving, trenching, concrete pouring, hammering, etc.). The use of



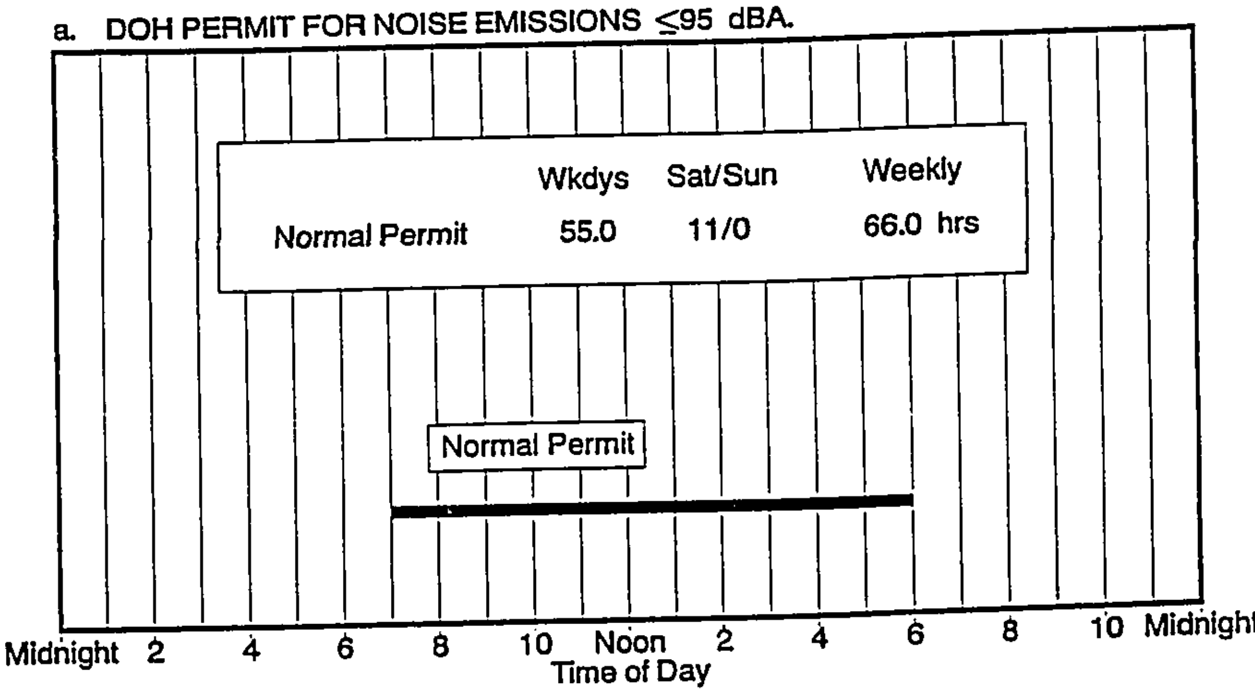
CONSTRUCTION NOISE LEVELS VS. DISTANCE	FIGURE 15

properly muffled construction equipment should be required on the job site. The incorporation of State Department of Health construction noise limits and curfew times, which are applicable on the island of Oahu (**Reference 11**), is another noise mitigation measure which can be applied to this project. **TABLE 7** depicts the allowed hours of construction for normal construction noise (levels which do not exceed 95 dB at the project's property line) and for construction noise which exceeds 95 dB at the project's property line. Noisy construction activities are not allowed on holidays under the DOH permit procedures.

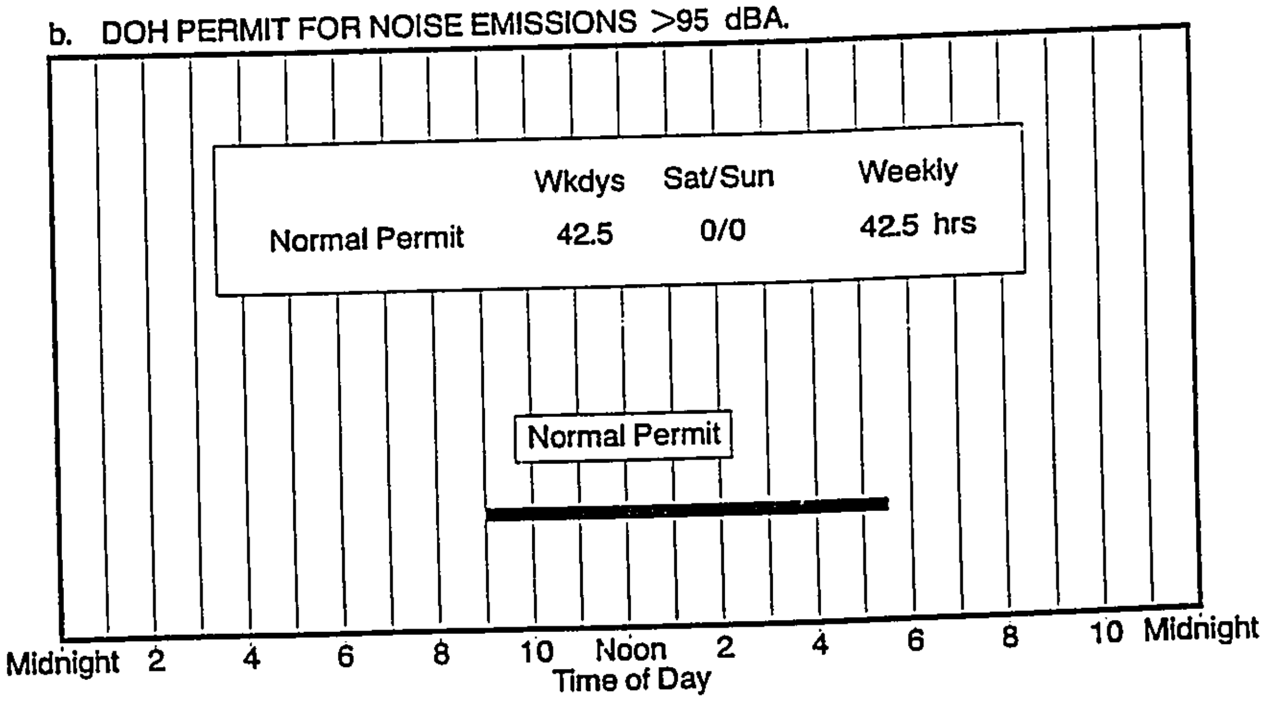
TABLE 7

AVAILABLE WORK HOURS UNDER DOH PERMIT PROCEDURES FOR CONSTRUCTION NOISE

a. DOH PERMIT FOR NOISE EMISSIONS ≤95 dBA.



b. DOH PERMIT FOR NOISE EMISSIONS >95 dBA.



APPENDIX A. REFERENCES

(1) "Guidelines for Considering Noise in Land Use Planning and Control;" Federal Interagency Committee on Urban Noise; June 1980.

(2) "Environmental Criteria and Standards, Noise Abatement and Control, 24 CFR, Part 51, Subpart B;" U.S. Department of Housing and Urban Development; July 12, 1979.

(3) "Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety;" U.S. Environmental Protection Agency; EPA 550/9-74-004; March 1974.

(4) Federal Highway Administration; "Procedures for Abatement of Highway Traffic Noise and Construction Noise;" 23 CFR Chapter I, Subchapter J, Part 772; July 8, 1982.

(5) Barry, T. and J. Reagan, "FHWA Highway Traffic Noise Prediction Model"; FHWA-RD-77-108, Federal Highway Administration; Washington, D.C.; December 1978.

(6) Existing (September 1992) Traffic Counts at Intersections in the Vicinity of Maui Community College; Transmittal from Austin, Tsutsumi & Associates, Inc.; April 22, 1993.

(7) Future (1994) Traffic Assignments for Maui Central Park Master Plan Project; Transmittals from Austin, Tsutsumi & Associates, Inc.; April 24 and 26, 1993.

(8) 24-Hour Traffic Counts, Station 1-G, South Papa Avenue at Kaahumanu Avenue; April 24, 1991; Hawaii State Department of Transportation.

(9) 24-Hour Traffic Counts, Station 1-H, Kaahumanu Avenue at Kanaloa Avenue; April 23, 1991; Hawaii State Department of Transportation.

(10) 24-Hour Traffic Counts, Station 3-G, Kanaloa Avenue at Kahului Beach Road; April 23, 1991; Hawaii State Department of Transportation.

(11) "Title 11, Administrative Rules, Chapter 43, Community Noise Control for Oahu"; Hawaii State Department of Health; November 6, 1981.

APPENDIX B

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

Descriptor Symbol Usage

The recommended symbols for the commonly used acoustic descriptors based on A-weighting are contained in Table I. As most acoustic criteria and standards used by EPA are derived from the A-weighted sound level, almost all descriptor symbol usage guidance is contained in Table I.

Since acoustic nomenclature includes weighting networks other than "A" and measurements other than pressure, an expansion of Table I was developed (Table II). The group adopted the ANSI descriptor-symbol scheme which is structured into three stages. The first stage indicates that the descriptor is a level (i.e., based upon the logarithm of a ratio), the second stage indicates the type of quantity (power, pressure, or sound exposure), and the third stage indicates the weighting network (A, B, C, D, E.....). If no weighting network is specified, "A" weighting is understood. Exceptions are the A-weighted sound level and the A-weighted peak sound level which require that the "A" be specified. For convenience in those situations in which an A-weighted descriptor is being compared to that of another weighting, the alternative column in Table II permits the inclusion of the "A". For example, a report on blast noise might wish to contrast the LCdn with the LAdn.

Although not included in the tables, it is also recommended that "Lpn" and "LepN" be used as symbols for perceived noise levels and effective perceived noise levels, respectively.

It is recommended that in their initial use within a report, such terms be written in full, rather than abbreviated. An example of preferred usage is as follows:

The A-weighted sound level (LA) was measured before and after the installation of acoustical treatment. The measured LA values were 85 and 75 dB respectively.

Descriptor Nomenclature

With regard to energy averaging over time, the term "average" should be discouraged in favor of the term "equivalent". Hence, Leq, is designated the "equivalent sound level". For Ld, Ln, and Ldn, "equivalent" need not be stated since the concept of day, night, or day-night averaging is by definition understood. Therefore, the designations are "day sound level", "night sound level", and "day-night sound level", respectively.

The peak sound level is the logarithmic ratio of peak sound pressure to a reference pressure and not the maximum root mean square pressure. While the latter is the maximum sound pressure level, it is often incorrectly labelled peak. In that sound level meters have "peak" settings, this distinction is most important.

"Background ambient" should be used in lieu of "background", "ambient", "residual", or "indigenous" to describe the level characteristics of the general background noise due to the contribution of many unidentifiable noise sources near and far.

With regard to units, it is recommended that the unit decibel (abbreviated dB) be used without modification. Hence, DBA, PNdB, and EPNdB are not to be used. Examples of this preferred usage are: the Perceived Noise Level (Lpn was found to be 75 dB. Lpn = 75 dB). This decision was based upon the recommendation of the National Bureau of Standards, and the policies of ANSI and the Acoustical Society of America, all of which disallow any modification of bel except for prefixes indicating its multiples or submultiples (e.g., deci).

Noise Impact

In discussing noise impact, it is recommended that "Level Weighted Population" (LWP) replace "Equivalent Noise Impact" (ENI). The term "Relative Change of Impact" (RCI) shall be used for comparing the relative differences in LWP between two alternatives.

Further, when appropriate, "Noise Impact Index" (NII) and "Population Weighed Loss of Hearing" (PHL) shall be used consistent with CHABA Working Group 69 Report Guidelines for Preparing Environmental Impact Statements (1977).

APPENDIX B (CONTINUED)

TABLE I

A-WEIGHTED RECOMMENDED DESCRIPTOR LIST

TERM	SYMBOL
1. A-Weighted Sound Level	L_A
2. A-Weighted Sound Power Level	L_{WA}
3. Maximum A-Weighted Sound Level	L_{max}
4. Peak A-Weighted Sound Level	L_{Apk}
5. Level Exceeded x% of the Time	L_x
6. Equivalent Sound Level	L_{eq}
7. Equivalent Sound Level over Time (T) (1)	$L_{eq(T)}$
8. Day Sound Level	L_d
9. Night Sound Level	L_n
10. Day-Night Sound Level	L_{dn}
11. Yearly Day-Night Sound Level	$L_{dn(Y)}$
12. Sound Exposure Level	L_{SE}

(1) Unless otherwise specified, time is in hours (e.g. the hourly equivalent level is $L_{eq(1)}$). Time may be specified in non-quantitative terms (e.g., could be specified a $L_{eq(WASH)}$ to mean the washing cycle noise for a washing machine).

SOURCE: EPA ACOUSTIC TERMINOLOGY GUIDE, BNA 8-14-78, NOISE REGULATION REPORTER.

APPENDIX B (CONTINUED)

TABLE II

RECOMMENDED DESCRIPTOR LIST

TERM	A-WEIGHTING	ALTERNATIVE[1] A-WEIGHTING	OTHER[2] WEIGHTING	UNWEIGHTED
1. Sound (Pressure)[3] Level	L_A	L_{pA}	L_B, L_{pB}	L_p
2. Sound Power Level	L_{WA}		L_{WB}	L_W
3. Max. Sound Level	L_{max}	L_{Amax}	L_{Bmax}	L_{pmax}
4. Peak Sound (Pressure) Level	L_{Apk}		L_{Bpk}	L_{pk}
5. Level Exceeded x% of the time	L_x	L_{Ax}	L_{Bx}	L_{px}
6. Equivalent Sound Level	L_{eq}	L_{Aeq}	L_{Beq}	L_{peq}
7. Equivalent Sound Level[4] Over Time(T)	$L_{eq(T)}$	$L_{Aeq(T)}$	$L_{Beq(T)}$	$L_{peq(T)}$
8. Day Sound Level	L_d	L_{Ad}	L_{Bd}	L_{pd}
9. Night Sound Level	L_n	L_{An}	L_{Bn}	L_{pn}
10. Day-Night Sound Level	L_{dn}	L_{Adn}	L_{Bdn}	L_{pdn}
11. Yearly Day-Night Sound Level	$L_{dn(Y)}$	$L_{Adn(Y)}$	$L_{Bdn(Y)}$	$L_{pdn(Y)}$
12. Sound Exposure Level	L_S	L_{SA}	L_{SB}	L_{Sp}
13. Energy Average value over (non-time domain) set of observations	$L_{eq(e)}$	$L_{Aeq(e)}$	$L_{Beq(e)}$	$L_{peq(e)}$
14. Level exceeded x% of the total set of (non-time domain) observations	$L_{x(e)}$	$L_{Ax(e)}$	$L_{Bx(e)}$	$L_{px(e)}$
15. Average L_x value	L_x	L_{Ax}	L_{Bx}	L_{px}

(1) "Alternative" symbols may be used to assure clarity or consistency.

(2) Only B-weighting shown. Applies also to C,D,E,.....weighting.

(3) The term "pressure" is used only for the unweighted level.

(4) Unless otherwise specified, time is in hours (e.g., the hourly equivalent level is Leq(1). Time may be specified in non-quantitative terms (e.g., could be specified as Leq(WASH) to mean the washing cycle noise for a washing machine.

Appendices D-1 and D-2

Traffic Assessment Documentation

Appendix D-1

Traffic Assessment - New Parkway and Papa Avenue Extension, Maui Central Park

TRAFFIC ASSESSMENT

NEW PARKWAY AND PAPA AVENUE EXTENSION

MAUI CENTRAL PARK

KAHULUI, MAUI

PREPARED FOR

DEPARTMENT OF

PUBLIC WORKS AND WASTE MANAGEMENT

COUNTY OF MAUI

HOWARD H. W. MAU
LICENSED
PROFESSIONAL
ENGINEER
No. 1594-C
HAWAII, U.S.A.

By

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

September 1994

CONTENTS

EXHIBITS

CONTENTS

Page

APPENDIX

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

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

TRAFFIC ASSESSMENT

NEW PARKWAY AND PAPA AVENUE EXTENSION

MAUI CENTRAL PARK

I. INTRODUCTION

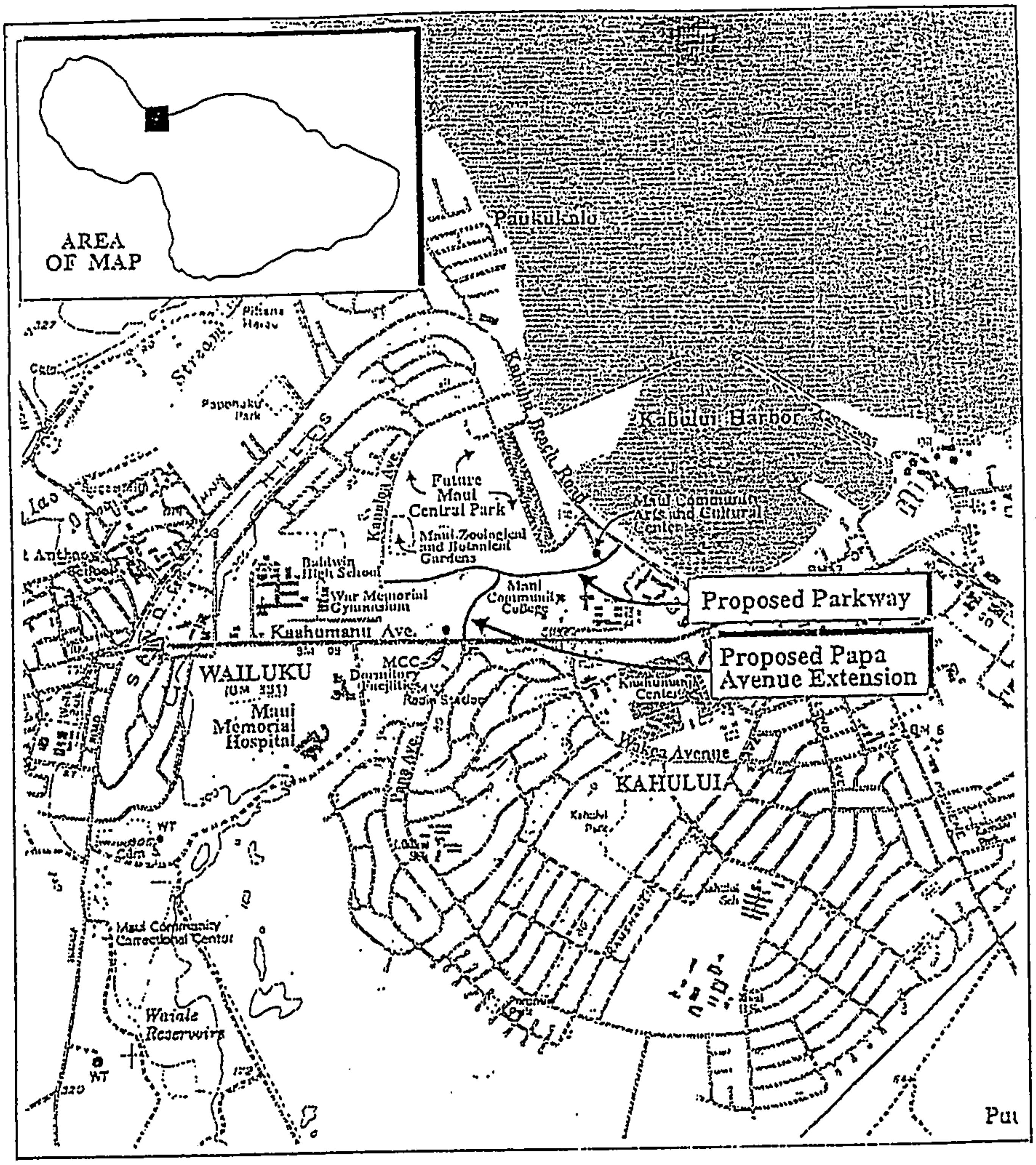
A. Project Description

The County of Maui proposes to construct the Maui Central Park Parkway and extension of Papa Avenue. Maui Central Park is located in Kahului, Maui and is generally bounded by Kanaloa Avenue on the west, Maui Community College on the south, Kahului Beach Road on the east and an existing residential development on the north. Specifically, the project site is identified as TMK: 3-8-7:Por. 1; and 3-7-1:Por. 2. Exhibit No. 1 shows the location of the project.

The proposed Parkway and the Papa Avenue extension are located along the southern boundary of Maui Central Park. The Parkway will provide a link between Kahului Beach Road and Kanaloa Avenue. It will form a T-intersection with Kahului Beach Road along the northerly edge of Maui Community College and south of the Maui Community Arts and Cultural Center; and it will form a full four-legged intersection with Kanaloa Avenue across from the access driveway to the War Memorial Center parking area.

REPLY TO:
501 SUMNER STREET, SUITE 521 • HONOLULU, HAWAII 96817-5031

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



AUSTIN, TSUTSUMI & ASSOC., INC. ENGINEERS • SURVEYORS	**TRAFFIC ASSESSMENT REPORT** MAUI CENTRAL PARK PROJECT LOCATION	**EXHIBIT** **1**

Papa Avenue will be extended from its present dead end location at the Maui Community College dormitory area to form a T-intersection with the new Parkway, thus providing a link between Kaahumanu Avenue and the Parkway.

The new Parkway will be a four-lane divided roadway with 100-foot wide right-of-way. The Papa Avenue extension will be a standard County 60-foot wide right-of-way collector road.

B. Purpose

This traffic assessment documents the methodology used in developing the traffic distribution resulting from the construction of the proposed roadways and in determining its impact on traffic operations on the existing roadways in the vicinity of the project.

The existing streets impacted by the proposed roadways are Kanaloa Avenue, Kahului Beach Road and Kaahumanu Avenue. The study area limits are defined by the following intersections:

- Kaahumanu Avenue/Kanaloa Avenue/Mahalani Street;
- Kaahumanu Avenue/Kahului Beach Road/Kane Street; and
- Kahului Beach Road/Kanaloa Avenue.

II. EXISTING CONDITIONS

A. Roadways

Kaahumanu Avenue and Kahului Beach Road provide the major roadways linking Kahului with Wailuku. These roadways are heavily utilized during the peak commuter hours of traffic. Kanaloa Avenue provides a cross link between Kaahumanu Avenue and Kahului Beach Road.

Kaahumanu Avenue is a six-lane, divided State arterial highway. All of the intersections within the study area are controlled by traffic-actuated traffic signal systems, which are supervised by a master controller for coordinated operations. Each of the intersections is channelized to provide for separate left-turn lanes and right-turn deceleration lanes on the Kaahumanu Avenue roadway approaches to the intersection. The traffic signal systems function on a protected/permissive mode for left-turning vehicles on Kaahumanu Avenue.

Kahului Beach Road is a two-lane, two-way State collector road. It begins at Kaahumanu Avenue and ends at the Lower Main Street/Waiehu Beach Road intersection, about 1200 feet north of the Kanaloa Avenue intersection.

Kanaloa Avenue is a County four-lane collector road between Kaahumanu Avenue and the makai limits of the War Memorial Center area, where it narrows to a wide, two-lane roadway to its intersection with Kahului Beach Road. The Kahului Beach Road/Kanaloa Avenue intersection is controlled by a three-phase, traffic-actuated signal system.

B. Traffic Operations

1. General

Kaahumanu Avenue is the primary arterial highway between Wailuku and Kahului. Major traffic generators that have access off Kaahumanu Avenue within the study area include Kaahumanu Center, Baldwin High School, the Maui Police Department Headquarters, Kaiser Medical Clinic, Maui Memorial Hospital and Maui Community College.

Kanaloa Avenue provides the roadway link between Kaahumanu Avenue and Kahului Beach Road. Traffic utilizing Kanaloa Avenue is generally traveling between Kaahumanu Avenue and the Lower Main Street/Waiehu Beach Road area. Traffic on Kanaloa Avenue is also generated by the residential area on the north and northwest areas off Kanaloa Avenue and Baldwin High School.

Kahului Beach Road generally carries through traffic between Kaahumanu Avenue and Lower Main Street/Waiehu Beach Road. The Harbor Lights Condominium and the students utilizing the "back" entrance to Maui Community College on Kaihee Place generate commuter traffic onto Kahului Beach Road.

The highway capacity analysis performed for this study is based upon procedures presented in the "Highway Capacity Manual", Special Report 209, Transportation Research Board, 1985, and the "Highway Capacity Software", Federal Highway Administration.

Level of Service (LOS) is a qualitative and quantitative assessment of traffic operations. Levels of Service are defined as LOS "A" through LOS "F"; LOS "A" being the best operating condition and LOS "F" the worst operating condition.

The definitions for the various Levels of Service are included in the Appendix.

2. Kaahumanu Avenue

During the AM peak period of traffic, Kaahumanu Avenue is congested in the Wailuku bound direction in the study area. The primary cause of the delay on Kaahumanu Avenue is the heavy left-turn demand at Mahalani Street, which often causes the left-turning vehicles to spill over into the Wailuku bound through lane. This causes the through traffic to queue back on Kaahumanu Avenue, which affects the left-turning vehicles from Papa Avenue. This chain reaction impacts operation on Kaahumanu Avenue, especially in the west bound direction.

During the PM peak period of traffic, motorists at the Kanaloa Avenue/Mahalani Street intersection again experience delay. Heavy left-turn demand from Kanaloa Avenue, the heavy right-turn demand from Mahalani Street, and the resulting heavy right-turn demand from Kaahumanu Avenue to south bound Papa Avenue often cause the right or south bound lane to queue almost to Mahalani Street, thus reducing the south bound capacity of Kaahumanu Avenue. South of Papa Avenue, traffic on Kaahumanu Avenue moves quite well.

3. **Kanaloa Avenue**

Traffic on Kanaloa Avenue experiences delays at the Kaahumanu Avenue intersection and at the Kahului Beach Road intersection. Kanaloa Avenue provides the link from Kahului Beach Road to Kaahumanu Avenue and, therefore, attracts the heavy left-turn demand to south bound Kaahumanu Avenue during both the AM and PM peak periods of traffic.

At the Kahului Beach Road intersection, the left-turning traffic from Kanaloa Avenue has difficulty clearing the intersection, due to the queuing on Kahului Beach Road at the Waiehu Beach Road/Lower Main Street traffic signal.

4. **Kahului Beach Road**

Traffic is congested, especially during the PM peak hour of traffic, at the Kaahumanu Avenue/Kahului Beach Road/Kane Street intersection. The left-turn traffic demand from Kahului Beach Road exceeds the capacity of the double left-turn movement to east bound Kaahumanu Avenue. Left-turning traffic experiences difficulty in exiting Kaihee Place during the peak periods of traffic due to the high volume of traffic on Kahului Beach Road.

5. Exhibit Nos. 2 and 3 show the existing LOS during the peak hour of traffic.

III. FUTURE IMPROVEMENTS

Proposed improvements to the existing roadways in the study area include the widening of Kahului Beach Road to two lanes in each direction, from Kaahumanu Avenue to Waiehu Beach Road/Lower Main Street, by the State Department of Transportation. Lower Main Street is also proposed to be widened to two lanes in each direction by the County of Maui.

Wakea Avenue, between Kaahumanu Avenue and Kea Avenue, is proposed to be widened by the County to provide two lanes in each direction, with separate turning lanes at the Kaahumanu Avenue intersection.

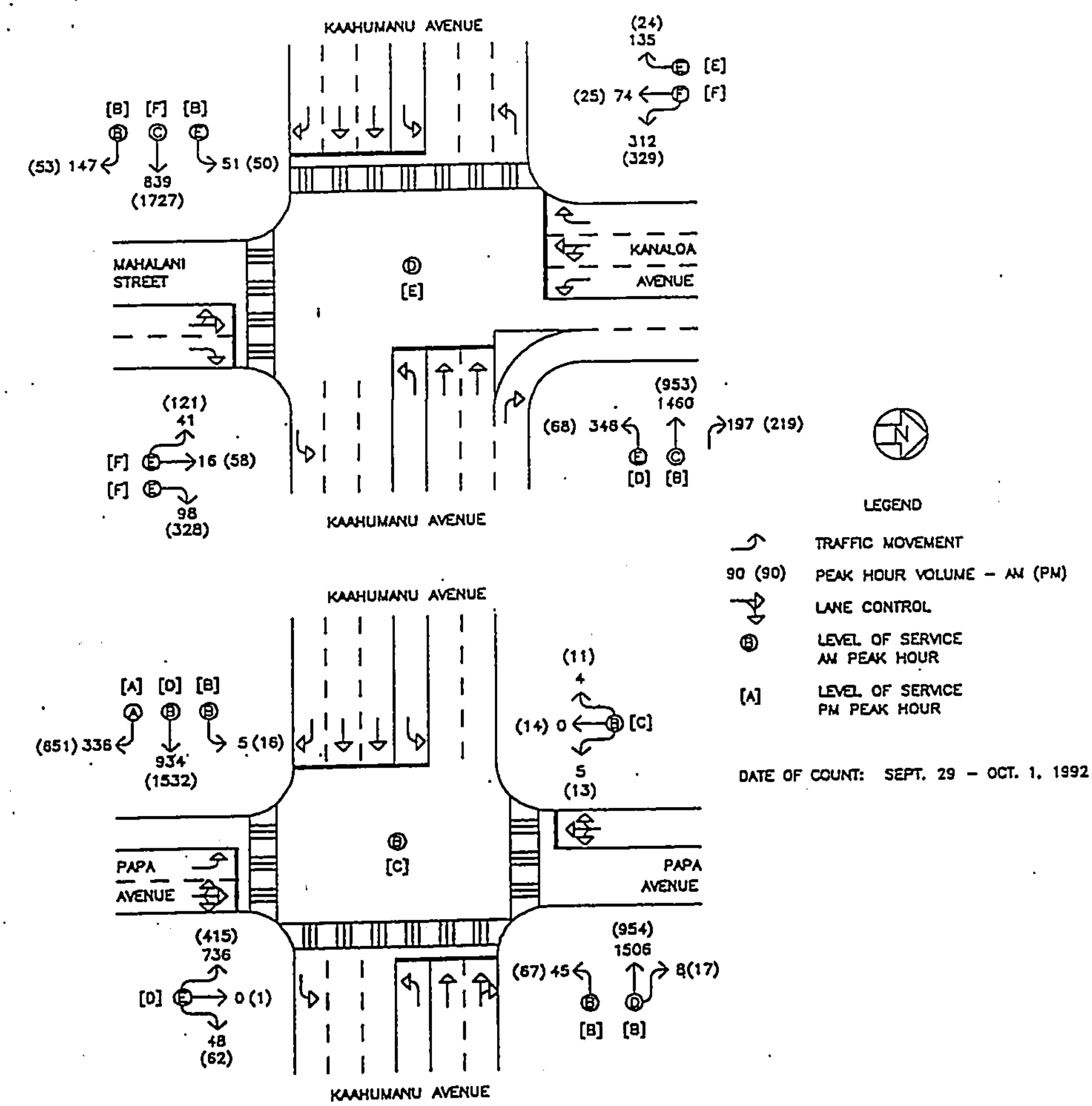
The State Department of Transportation is proposing to lengthen the left-turn storage lane on west bound Kaahumanu Avenue at the Mahalani Street/ Kanaloa Avenue intersection. This improvement will reduce the potential of left-turning vehicles spilling over into the through lane at this intersection.

IV. PROPOSED CENTRAL PARK ROADWAY

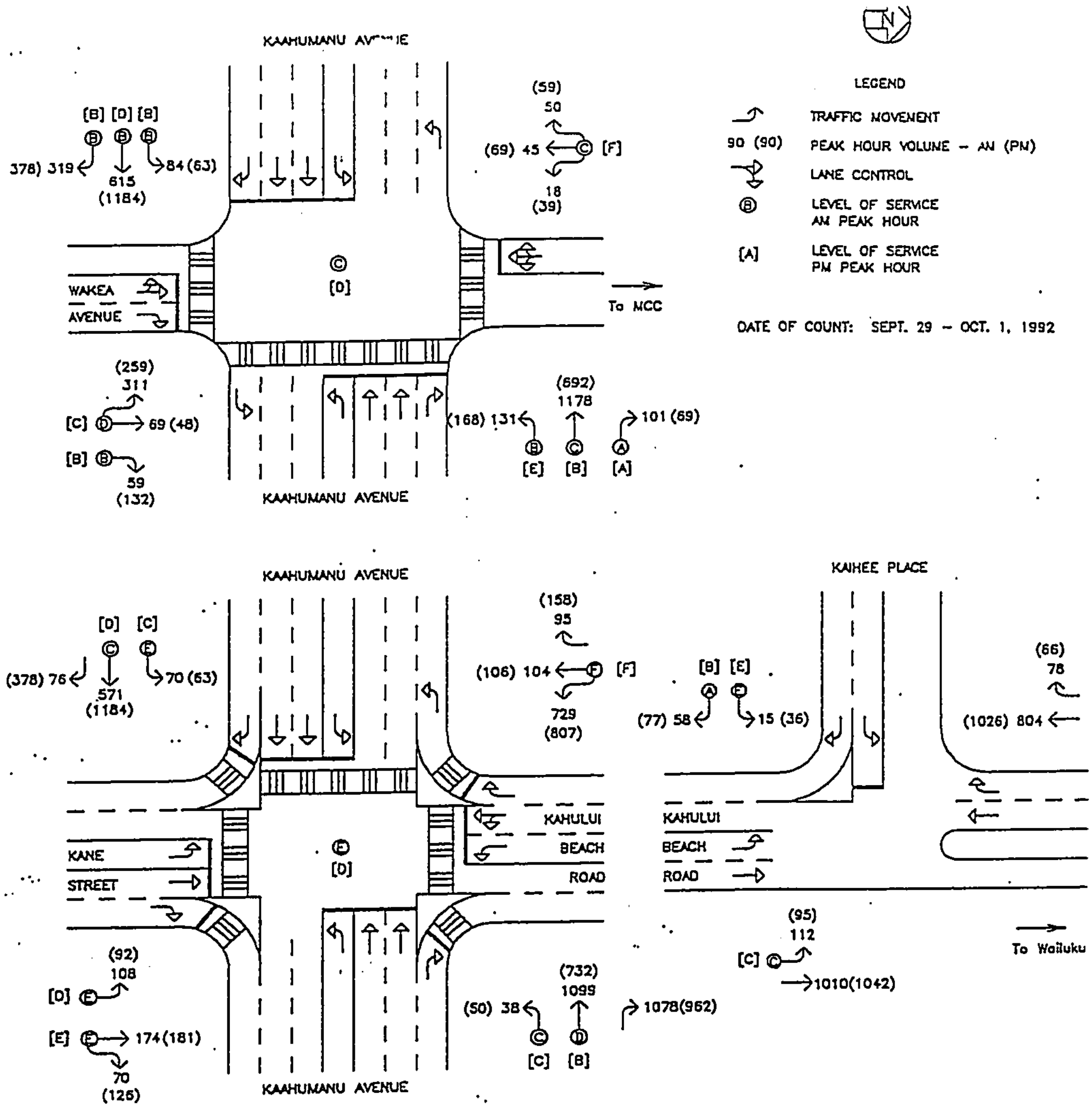
A. General

The new Parkway will be a divided four-lane roadway with two lanes in each direction and a left-turn storage lane at its intersection with the Papa Avenue extension. The Parkway will consist of a 16-foot wide median, 32 feet of paved traveled way between curbs in each direction, and 10 feet of sidewalk/ landscape area between the curb and right-of-way line.

The Papa Avenue extension will be a two-lane, two-way roadway consisting of 24 feet of pavement and 18 feet of shoulder and landscaped area.



AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS, SURVEYORS • HONOLULU, HAWAII	TRAFFIC ASSESSMENT MAUI CENTRAL PARK EXISTING AM AND PM PEAK HOUR TRAFFIC	EXHIBIT 2



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ENGINEERS, SURVEYORS • HONOLULU, HAWAII

TRAFFIC ASSESSMENT
MAUI CENTRAL PARK

EXISTING AM AND PM PEAK HOUR TRAFFIC

EXHIBIT 3

The new Parkway/Kanaloa Avenue intersection will be a four-legged intersection formed with the access driveway to the War Memorial parking area. Left-turn storage lanes will be provided on all approach roadways to the intersection. At the Kahului Beach Road intersection, the new Parkway will form a T-intersection with Kahului Beach Road. The intersection geometrics will provide a left-turn storage lane and deceleration and acceleration lanes.

The roadway project is divided into three phases as follows:

1. Phase I – Four-lane parkway from Kahului Beach Road to the Papa Avenue Extension with completion scheduled in 1994.

2. Phase II – Two lanes, one in each direction, Parkway section from Papa Avenue extension to Kanaloa Avenue and the Papa Avenue Extension with completion scheduled in 1995.

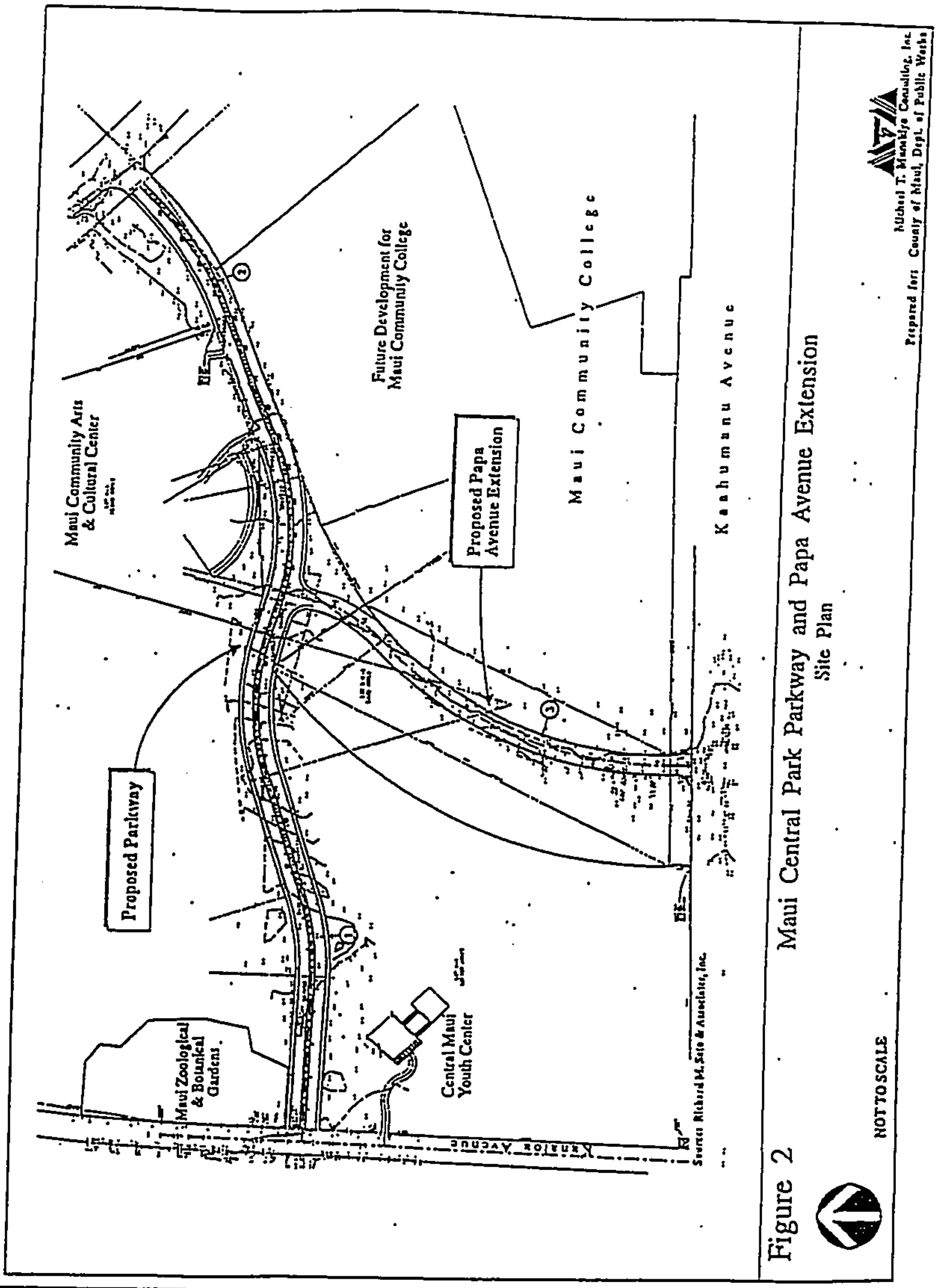
3. Phase III – Construction of the additional lanes of the Parkway to full four-lane divided roadway between Kanaloa Avenue and the Papa Avenue extension with completion scheduled in 1996.

Exhibit No. 4 shows the proposed roadway alignments.

The new roadways, in and of themselves, will not generate new traffic. However, they will cause traffic to redistribute during the peak period of traffic as motorists will utilize these roadways to reduce their delays or travel times. These roadways will also serve to help distribute traffic whenever there are special events at the War Memorial Center or at Maui Central Park and will provide another access to Maui Community College.

B. Traffic Impact

The new roadways will have a positive impact on peak period traffic operations by redistributing traffic and reducing the demands at the



ATA AUSTIN, TSUTSUMI & ASSOC., INC. ENGINEERS • SURVEYORS	TRAFFIC ASSESSMENT REPORT MAUI CENTRAL PARK PROPOSED ROADWAY ALIGNMENTS	EXHIBIT 4

congested intersections. Motorists will seek what they feel is the "best" route in reducing their delay or travel time.

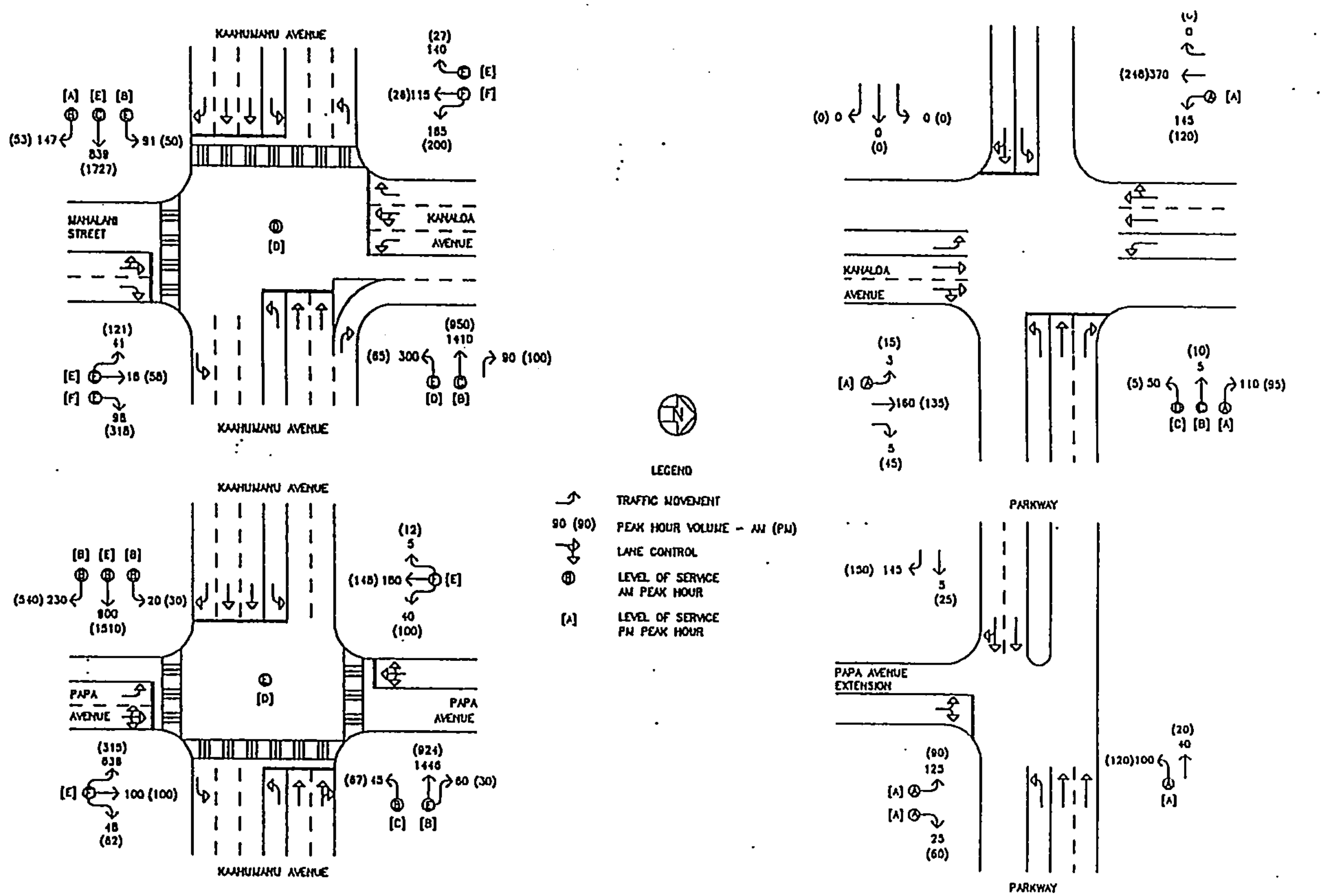
Exhibit Nos. 5 and 6 show a projected traffic redistribution and the new operating Levels of Service during the peak hours of traffic.

Although traffic will redistribute, the critical intersections between Wailuku and Kahului are still Kaahumanu Avenue/Kanaloa Avenue/Mahalani Street and Kahului Beach Road/Kanaloa Avenue.

V. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

1. The proposed Parkway and Papa Avenue extension will not adversely impact traffic operations on the existing streets in the vicinity of the project.
2. The new roadways offer motorists alternative routes of getting from point to point in the Kahului area.
3. The critical intersections for travel between Wailuku and Kahului remain the same; i.e., the Kaahumanu Avenue/Kanaloa Avenue/ Mahalani Street intersection and the Kahului Beach Road/Kanaloa Avenue intersection. Until the master planned roadways, by the State Department of Transportation/County of Maui Island-Wide Highway Master Plan are implemented, all traffic between these two population centers must funnel through the two critical intersections.



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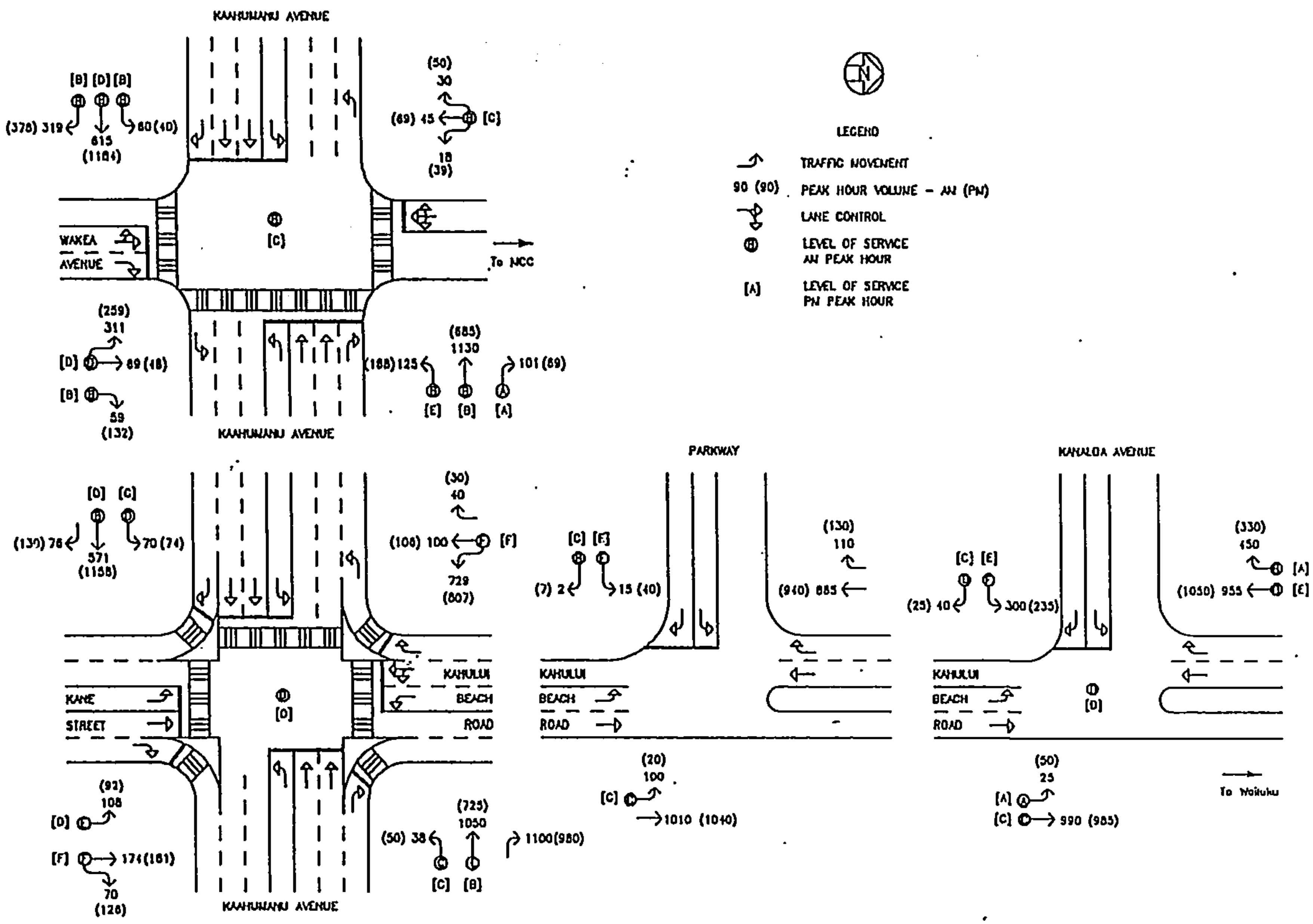
TRAFFIC ASSESSMENT
MAUI CENTRAL PARK

PROJECTED AM AND PM PEAK HOUR TRAFFIC

EXHIBIT 5



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TRAFFIC ASSESSMENT
MAUI CENTRAL PARK

PROJECTED AM AND PM PEAK HOUR TRAFFIC

EXHIBIT 6

B. Recommendations

1. The Kaahumanu Avenue/Kanaloa Avenue/Mahalani Street intersection should be improved to provide a double left-turn capability from Kaahumanu Avenue to Mahalani Street, and a longer deceleration/right-turn lane on Kaahumanu Avenue to Kanaloa Avenue. These improvements are required to accommodate existing traffic demand.

2. The Kaahumanu Avenue/Papa Avenue intersection be improved to provide the following:

   a. South bound approach – separate left-turn, through and right-turn lanes. The left-turn storage lane should be a minimum of 200 feet long.

   b. The traffic signal system be modified to provide six-phase operation.

   c. Papa Avenue south of Kaahumanu Avenue be widened to provide two south bound lanes for a distance of 1,000 feet.

   d. The deceleration/right-turn lane of east bound Kaahumanu Avenue be lengthened to 800 feet. A minimum 300-foot long deceleration/right-turn lane be provided on the west bound Kaahumanu Avenue for right turns to Papa Avenue.

   e. These improvements should be implemented with the Phase II work.

3. **New Parkway/Kanaloa Avenue Intersection**

This intersection will be a four-legged intersection by including the access driveway to the War Memorial Center parking area. Kanaloa Avenue at this location should have two through lanes in each direction, left-turn storage lanes and right-turn deceleration lanes. The side street approaches should provide for a left-turn, through and right-turn lane.

The storage lane lengths should be as follows:

a. Kanaloa Avenue: south bound 180 feet; north bound 100 feet;

b. Parkway - 180 feet;

c. Parking lot - 180 feet; and

d. Deceleration/right-turn - 200 feet.

A five-phase traffic signal system should be implemented with the Phase II work.

4. Parkway/Kahului Beach Road Intersection

This T-intersection should provide a separate left-turn lane on Kahului Beach Road with a minimum length of 120 feet. Deceleration and acceleration lanes should be provided on Kahului Beach Road. Conduits for a future traffic signal system should be placed at the time the intersection is constructed. The traffic signal system should be implemented with the Phase II construction.

5. Parkway/Papa Avenue Extension

A left-turn storage lane of 100 feet should be provided on the Parkway. A traffic signal system is not warranted at this intersection until traffic volumes increase significantly on the Parkway.

APPENDIX A

LEVEL OF SERVICE (LOS) DEFINITIONS

LEVEL OF SERVICE DEFINITIONS

1. LEVELS OF SERVICE CRITERIA FOR TWO-LANE HIGHWAYS

The highest quality of traffic service occurs when motorists are able to drive at their desired speed, representative of Level of Service A. Almost no platoons of three or more vehicles are observed. Drivers would be delayed no more than 30 percent of the time by slow-moving vehicles. A maximum flow rate of 420 pcph, total in both directions, may be achieved under ideal conditions.

Level of Service B characterizes the region of traffic flow where drivers are delayed up to 45 percent of the time on the average. Service flow rates of 750 pcph, total in both directions, can be achieved under ideal conditions. Above this flow rate, the number of platoons forming in the traffic stream begins to increase dramatically.

Further increases in flow characterize Level of Service C, resulting in noticeable increases in platoon formation, platoon size, and frequency of passing impediment. At high volume levels, chaining of platoons and significant reductions in passing capacity begin to occur. While traffic flow is stable, it is becoming susceptible to congestion due to turning traffic and slow-moving vehicles. Percent time delays are up to 60 percent. A service flow rate of up to 1,200 pcph, total in both directions, can be accommodated under ideal conditions.

Unstable traffic flow is approached as traffic flows enter Level of Service D. The two opposing traffic streams essentially begin to operate separately at higher volume levels. Mean platoon sizes of 5 to 10 vehicles are common, although speeds of 50 mph can still be maintained under ideal conditions. The fraction of no passing zones along the roadway section usually has little influence on passing. Turning vehicles and/or roadside distractions cause major shockwaves in the traffic stream. The percentage of time motorists are delayed approaches 75 percent. Maximum service flow rates of 1,800 pcph, total in both directions, can be maintained under ideal conditions. This is the highest flow rate that can be maintained for any length of time over an extended section of level terrain without a high probability of breakdown.

Level of Service E is defined as traffic flow conditions on two-lane highways having a percent time delay of greater than 75 percent. Passing is virtually impossible under Level of Service E conditions, and platooning becomes intense when slower vehicles or other interruptions are encountered.

The highest volume attainable under Level of Service E defines the capacity of the highway. Under ideal conditions, capacity is 2,800 pcph, total in both directions. Operating conditions at capacity are unstable and difficult to predict. Traffic operations are seldom observed near capacity on rural highways, primarily because of a lack of demand.

As with other highway types, Level of Service F represents heavily congested flow with traffic demand exceeding capacity. Volumes are lower than capacity. Level of Service E is seldom attained over extended sections on level terrain as more than a transient condition; most often, perturbations in traffic flow as Level E is approached cause a rapid transition to Level of Service F.

2. LEVEL OF SERVICE OF SIGNALIZED INTERSECTIONS

Level of service for signalized intersections is defined in terms of **delay**. Delay is a measure of driver discomfort, frustration, fuel consumption and lost travel time. specifically, level-of-service criteria are stated in terms of the average stopped delay per vehicle for a 15-minute analysis period. The criteria are given in Table A-1.

Table A-1. Level-of Service Criteria for Signalized Intersections

Level of Service	Stopped Delay for Vehicle (SEC)
A	$\leq$ 5.0
B	5.1 to 15.0
C	15.1 to 25.0
D	25.1 to 40.0
E	40.1 to 60.0
F	> 60.0

Delay is a complex measure, and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group or approach in question.

Level-of-service A describes operations with very low delay, i.e., less than 5.0 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.

Level-of-service B describes operations with delay in the range of 5.1 to 15.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.

Level-of-service C describes operations with delay in the range of 15.1 to 25.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear in this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.

Level-of-service D describes operations with delay in the range of 25.1 to 40.0 seconds per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

Level-of-service E describes operations with delay in the range of 40.1 to 60.0 seconds per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths and high v/c ratios. Individual cycle failures are frequent occurrences.

Level-of-service F describes operations with delay in excess of 60.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.00 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

3. LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Level of Service definitions for unsignalized intersections is determined by the reserve or unused capacity of a lane. The potential capacity is determined by the size and frequency in gaps in conflicting traffic that can accommodate the side street demand. The reserve capacity is equal to the potential capacity minus the traffic demand. A lower Level of Service translates into longer side street delay. The Levels of Service criteria are shown in the following table:

Table A-2. Level-of-Service Criteria
for Unsignalized Intersections

Reserve Capacity (PCPH)	Level of Service	Expected Delay to Minor Street Traffic
≥ 400	A	Little or no delay
300-399	B	Short traffic delays
200-299	C	Average traffic delays
100-199	D	Long traffic delays
0- 99	E	Very long traffic delays
< 0	F	Extreme traffic delays

Appendix D-2

Letter Relating to the April 4, 1995 Meeting of the Maui Central Park Advisory Committee

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

TED S. KAWAHIGASHI, P.E.
KENNETH K. KUROKAWA, P.E.
IVAN K. NAKATSUKA, P.E.
LAMBERT J. YAMASHITA, P.E.
HOWARD H.W. MAU, P.E.

#M-93-612

April 7, 1995

Ms. Charmane Tavares, Director
Department of Parks and Recreation
County of Maui
200 South High Street
Wailuku, Maui, Hawaii 96793

Dear Ms. Tavares:

Subject: Maui Central Park

This letter is the result of our meeting of April 4, 1995 regarding the new roadways proposed for Maui Central Park.

From a purely traffic engineering standpoint, it would be very difficult to justify a 100-foot right-of-way divided roadway through the park, i.e., between the extension of Papa Avenue and Kanaloa Avenue.

However, when the overall traffic circulation on the existing arterial roadways adjacent to Central Park is considered, a connecting roadway between Kanaloa Avenue and the Papa Avenue extension appears to make sense. Even a two-lane "park" type road, say 20' to 24' in pavement width, and on a curvilinear alignment, would help to reduce some of the future traffic demands, especially at the Kaahumanu Avenue/Kanaloa Avenue/Mahalani Avenue intersection. It will also provide access to park parking areas and emergency vehicle access to the park.

This roadway will most likely be used during the weekday peak periods of traffic by motorists who are familiar with the roadways in the area. Tourists and most thru traffic, say between Kahului and Wailuku and beyond, would most likely remain on Kaahumanu Avenue.

This roadway will also serve Maui Community College (MCC) traffic, Baldwin High School traffic and special events traffic at the stadium.

The proposed Papa Avenue extension to Kahului Beach Road is necessary to serve Central Park as well as MCC. This roadway should be a standard two-lane collector road with left-turn storage lanes at driveway connections.

REPLY TO:
501 SUMNER STREET, SUITE 521 • HONOLULU, HAWAII 96817-5031

OFFICES IN:
HONOLULU, HAWAII

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

County of Maui Dept. of Parks & Recreation
Ms. Charmane Tavares, Director

April 7, 1995

Based upon the above discussion, we recommend the following for Central Park relative to roadways:

1. Papa Avenue be extended to intersect with Kahului Beach Road. This road should be a two-lane roadway with left-turn storage lanes at all significant driveway locations.

2. A two-lane park road be constructed to connect to Papa Avenue extension and to Kanaloa Avenue. This roadway can be curving in alignment, with low design speeds, say 20 mph posted. Parking should be restricted along the roadway. If feasible, the first choice as to its intersection with Kanaloa Avenue should be across the Memorial Stadium driveway.

3. A left-turn storage lane on Kanaloa Avenue be constructed at any intersection or significant driveway connection to Kanaloa Avenue.

We trust that the above material will be helpful in the preparation of the Central park master plan. Should you have any questions on the above material, please feel free to call me.

Very truly yours,

AUSTIN, TSUTSUMI & ASSOCIATES, INC.

By Ted S. Kawahigashi

TED S. KAWAHIGASHI
President

TSK:MAF

cc: Mr. Charlie Jencks - County of Maui
Dept. of Public Works and Waste Management

Appendix E

Drainage and Erosion Control Report

DRAINAGE AND EROSION CONTROL REPORT
FOR
MAUI CENTRAL PARK
Roadway Improvements Phase II
TMK: 3-7-1:por 2 and 3-8-7:por 1, por 40 and por 125

BERT R. TOBA
LICENSED PROFESSIONAL ENGINEER
No. 4556-C
HAWAII, U.S.A.

PREPARED FOR:

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS

PREPARED BY:

SATO & ASSOCIATES, INC.
2115 WELLS STREET
WAILUKU, MAUI, HAWAII 96793

NOVEMBER 1994
REVISED: APRIL 1995
REVISED: JULY 1995

TABLE OF CONTENTS

I. PROJECT LOCATION

The proposed Maui Central Park Parkway is located in Kahului, Maui, Hawaii described by TMK: 3-7-1:por 2 and 3-8-7:por 1, por 40, and por 125. Phase II of the proposed parkway will extend from Kahului Beach Road west to Kanaloa Avenue. Papa Avenue Extension will extend existing Papa Avenue at the intersection of Kaahumanu north to connect to the four lane parkway.

II. PROJECT DESCRIPTION

The proposed parkway will be a 4 lane divided parkway having 90' and 100' right-of-ways and a 16' grassed median. It will extend from Kahului Beach Road to the proposed Papa Avenue extension. From here a 60' right-of-way, 2 lane roadway will connect to Kanaloa Avenue.

Phase II consists of constructing two new lanes of the parkway from Kahului Beach Road to the entrance of the Maui Community Arts and Cultural Center. A length of approximately 1,000 feet. From here 500 feet of 4 lane roadway and median will be constructed to connect to the proposed Papa Avenue intersection. From the intersection to Kanaloa Avenue, 1,700 feet of 2 lane roadway will be constructed.

The proposed parkway and 2 lane roadway will have curb and gutter on both sides and a 16' median with standard curbs from Papa Avenue extension to Kahului Beach Road. Each 2 lane paved section from curb to curb is 32 feet wide. The 2 lane roadway from Papa Avenue extension to Kanaloa, will have a 44' wide pavement width. Concrete sidewalks/bikeways will be on both sides of the entire roadway.

The proposed Papa Avenue extension will be a 2 lane roadway approximately 1,050' with a 32' wide paved section, and a 12' wide grassed drainage swale on both sides, within a 60' Right-of-Way.

The existing 350' of paved roadway will be widened and resurfaced to match the proposed extension. Existing Papa Avenue south of Kaahumanu Avenue will be widened to provide two south bound lanes for approximately 800'.

III. DRAINAGE

A. EXISTING CONDITIONS

There is approximately 1,000' of two lane Parkway that is existing. The two lane portion was part of Phase I construction and provides access to the Maui Community Arts and Cultural Center. Drainage catch basins are installed for all four lanes of this 1,000' ending at the Arts and Cultural Center. The remaining proposed parkway and Papa Avenue extension are currently unimproved. The area is vegetated with haole koa, kiawe, and various grasses and low lying shrubs. A portion of the area has been cleared and grubbed due to roadway construction leading to the Maui Community Arts and Cultural Center.

The project slopes down in a north-east direction towards Kahului Beach Road. The topography for Phase II has Sand hills to the west of the proposed Papa Avenue extension and Parkway intersection. Topography at the proposed Papa Avenue extension generally slopes to the North. Elevations range from 50' to 38'. The slope is approximately 2% for Papa Avenue extension.

A portion of the roadway lies in Flood Hazard Boundary Zones V23, A4. Zones V23 and A4 are areas where velocity wave action and 100 year floods may occur with a base flood elevation of 17'. The remaining roadways are in Zone C, area of minimal flooding.

B. DEVELOPED CONDITIONS

Road drainage for Phase II will be collected in Catch Basins located along the parkway and allowed to outlet through 24" and 30" diameter underground culverts designed for a 50-year 1 hour storm. The culverts will outlet beyond the 100' right-of-way, with the runoff allowed to pond in natural low lying areas sized to accommodate a 50 year, 1 hour storm. Developed peak runoff for roadways is calculated at 26.7 cfs.

Additional drainage improvements will include a 72" diameter underground drainline beginning at the Southeast corner of Papa Avenue and Kaahumanu Avenue. The line will cross under Kaahumanu Avenue and run North parallel to the proposed Papa Avenue extension and end at the Parkway to connect to a proposed concrete channel. At this intersection of Papa Avenue extension and the Parkway 3-60" and 1-72" diameter pipe will cross under Papa Avenue extension connecting to the concrete channel.

From there the proposed concrete channel will run parallel along the south side of the parkway to end at a 7 acre retention pond, South of the parkway and west of Kahului Beach Road. The capacity of the 7 acre retention pond will be 35.2 acre-feet. Storm drainage runoff entering the retention pond from the concrete channel will be 22.0 cfs and from the existing headwall located south of Parkway Avenue is 6.2 cfs. The estimated volume required from these two runoffs is 39,600 cf and 11,160 cf respectively. The total runoff flow entering the existing retention pond from Austin, Tsutsumi and Associates, Inc. Building "J" and Site Improvements Grading and Drainage Report is 540,000 cf. The present total volume required for the new retention pond will be 13.6 acre-feet. This results in an additional storage of 21.6 acre-feet and the entire runoff entering the new retention pond will be stored on site. Therefore, no storm drainage runoff will be discharged from the new retention pond. The freeboard from the retention pond to Kahului Beach Road will be approximately 6 feet.

These additional drainage improvements are being incorporated as part of the Kahului Drainage Master plan by Ronald M. Fukumoto Engineering Inc.

C. HYDROLOGIC AND HYDRAULIC CALCULATIONS

Storm runoff calculations for roadways were prepared for a one hour storm with a recurrence interval of 50 years using the Rational Method for determining storm runoff flow rates (see Appendix A). Tables and charts from the Drainage Master Plan for the County of Maui were referenced.

D. CONCLUSION

Due to the minimal increases in drainage runoff anticipated and disposal of drainage waters by ponding in existing low lying areas, it is our opinion there will be no significant adverse drainage impacts to the project and surrounding areas.

IV. EROSION CONTROL

The estimated soil loss has been calculated using the Universal Soil loss equation in accordance with the County of Maui Grading Ordinance concerning erosion control (see Appendix B).

Calculations show that a maximum of 9 tons/acre/year of soil may be lost during grading operations while 610 tons/acre/year is the maximum allowable annual soil loss rate.

Normal soil erosion control measures during construction (see Appendix B) should be sufficient for this project with no excessive soil loss occurring.

V. ADDITIONAL DRAINAGE IMPROVEMENTS

1. Preliminary designed based on "Kahului Drainage Master Plan" by R.M. Fukumoto Engineering, Inc., May 1992.

   Refer to schematic for locations.

PAPA AVENUE EXTENSION

A 72" diameter C.A.P. pipe will be installed along Papa Avenue extension to convey future flows. The line will begin on the southside of the proposed Papa Avenue extension to end at the proposed concrete channel.

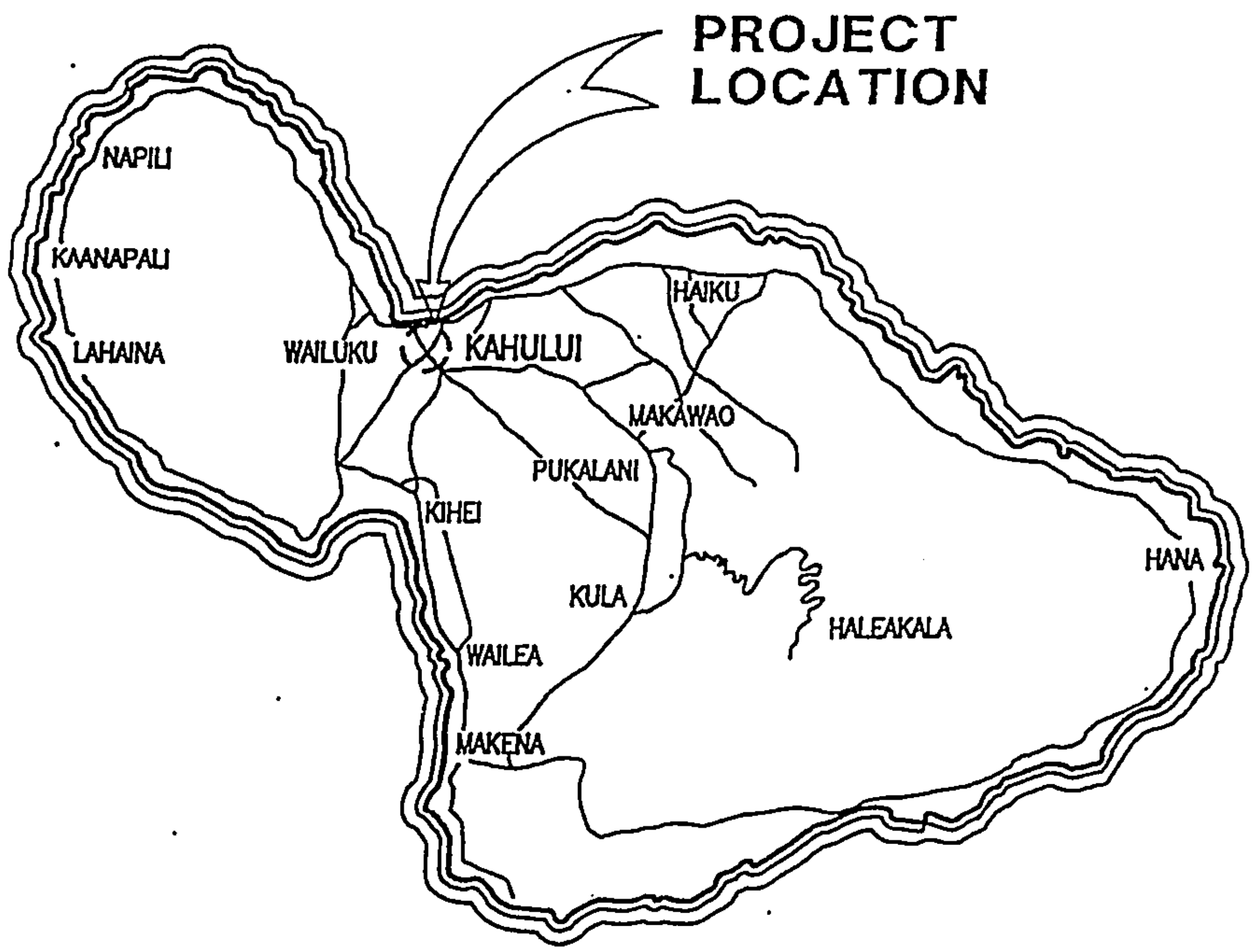
PAPA AVENUE EXTENSION AND MAUI CENTRAL PARKWAY INTERSECTION

At the intersection of the proposed Papa Avenue extension and Maui Central Parkway, 3 - 60" diameter C.A.P.'s and 1 - 72" diameter C.A.P. will be installed under Papa Avenue extension parallel to the parkway.

MAUI CENTRAL PARKWAY

Proposed a 20' wide rectangular concrete channel will convey future flows along south side of Maui Central Parkway from the proposed Papa Avenue extension to an approximately 10 acre sump at the south west corner of Maui Central Parkway and Kahului Beach Road.

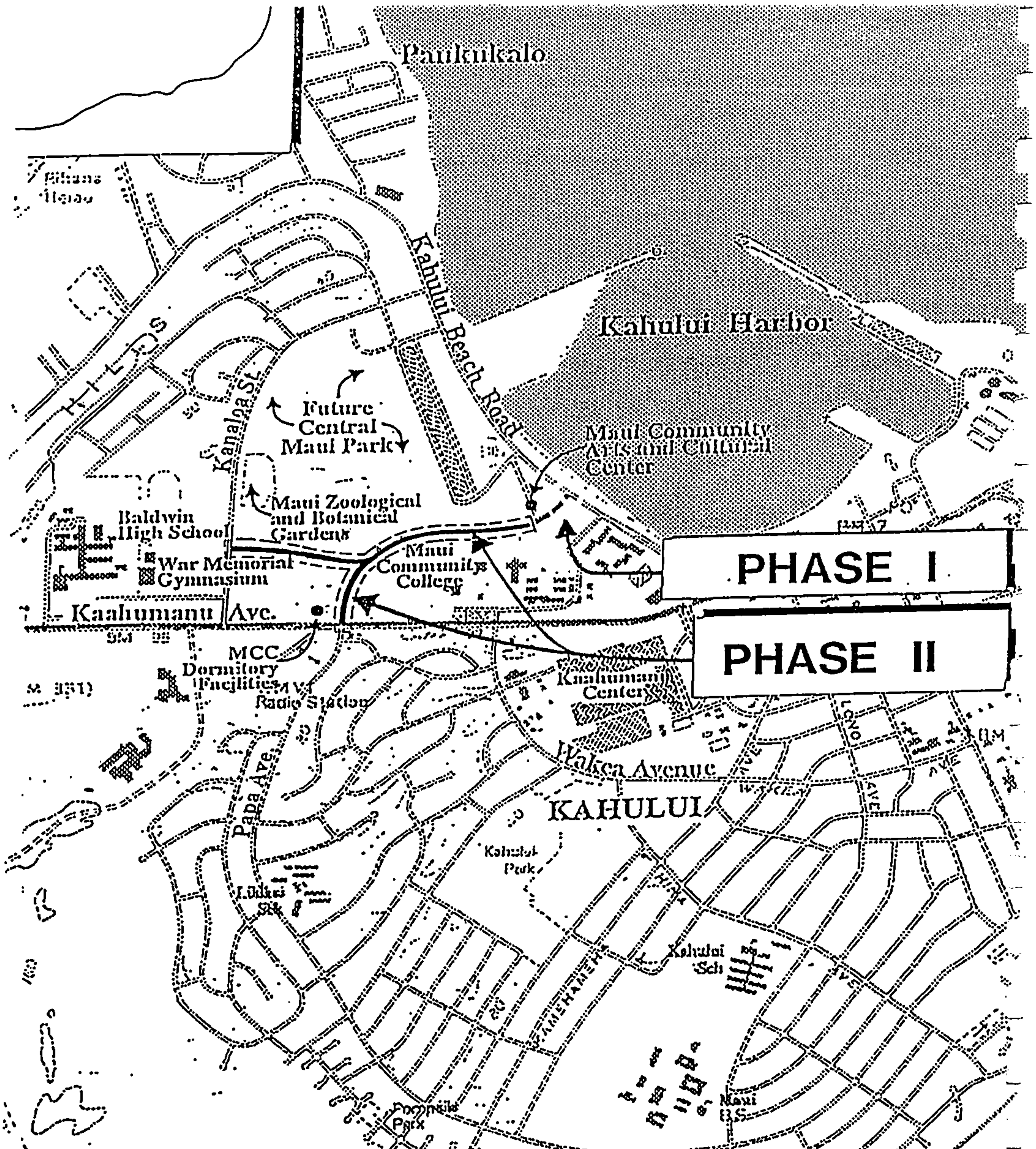
Small flows from Maui Central Parkway will enter the concrete channel and be stored in the sump area.



NORTH

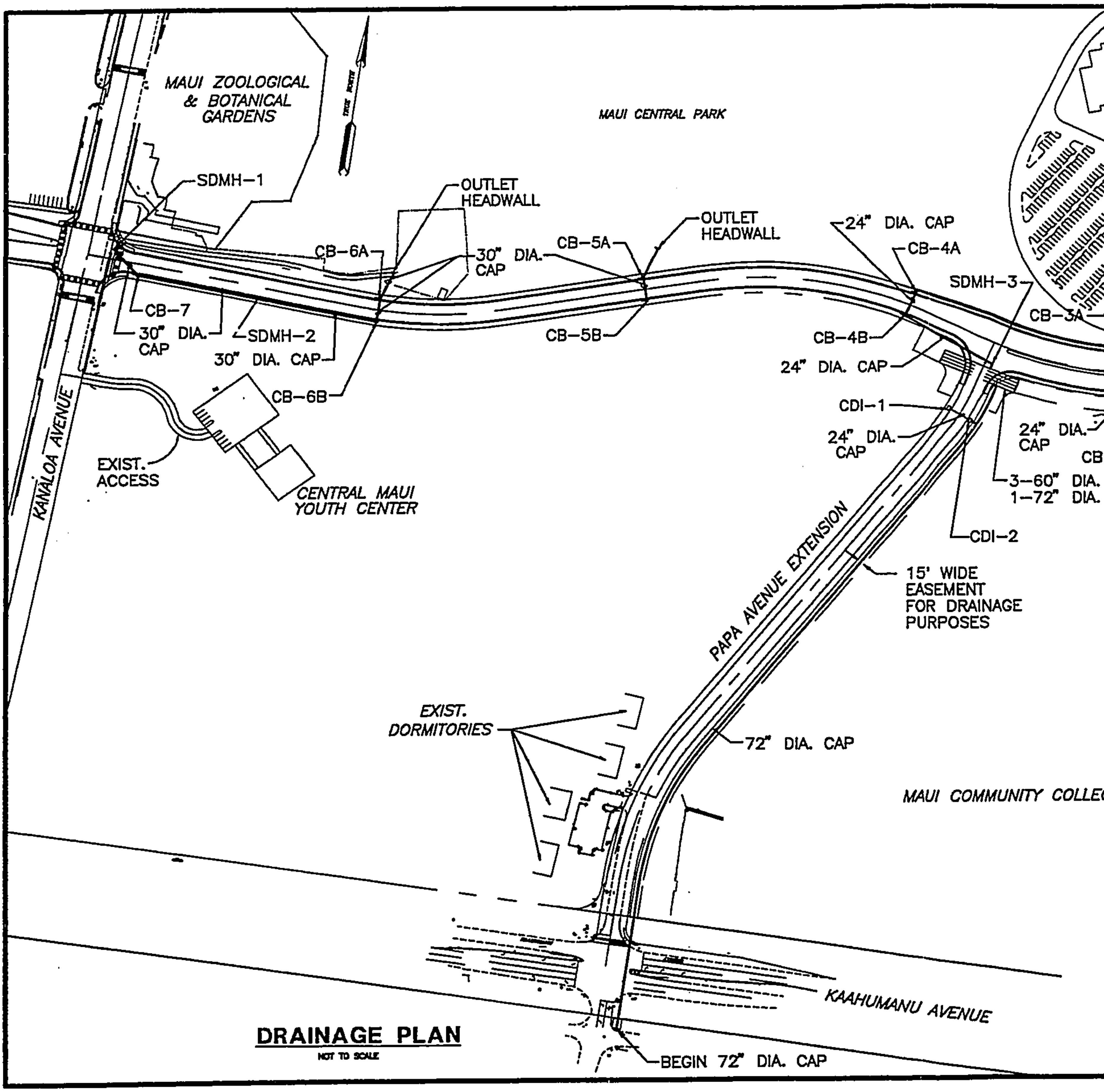
ISLAND OF MAUI

N.T.S.



LOCATION MAP

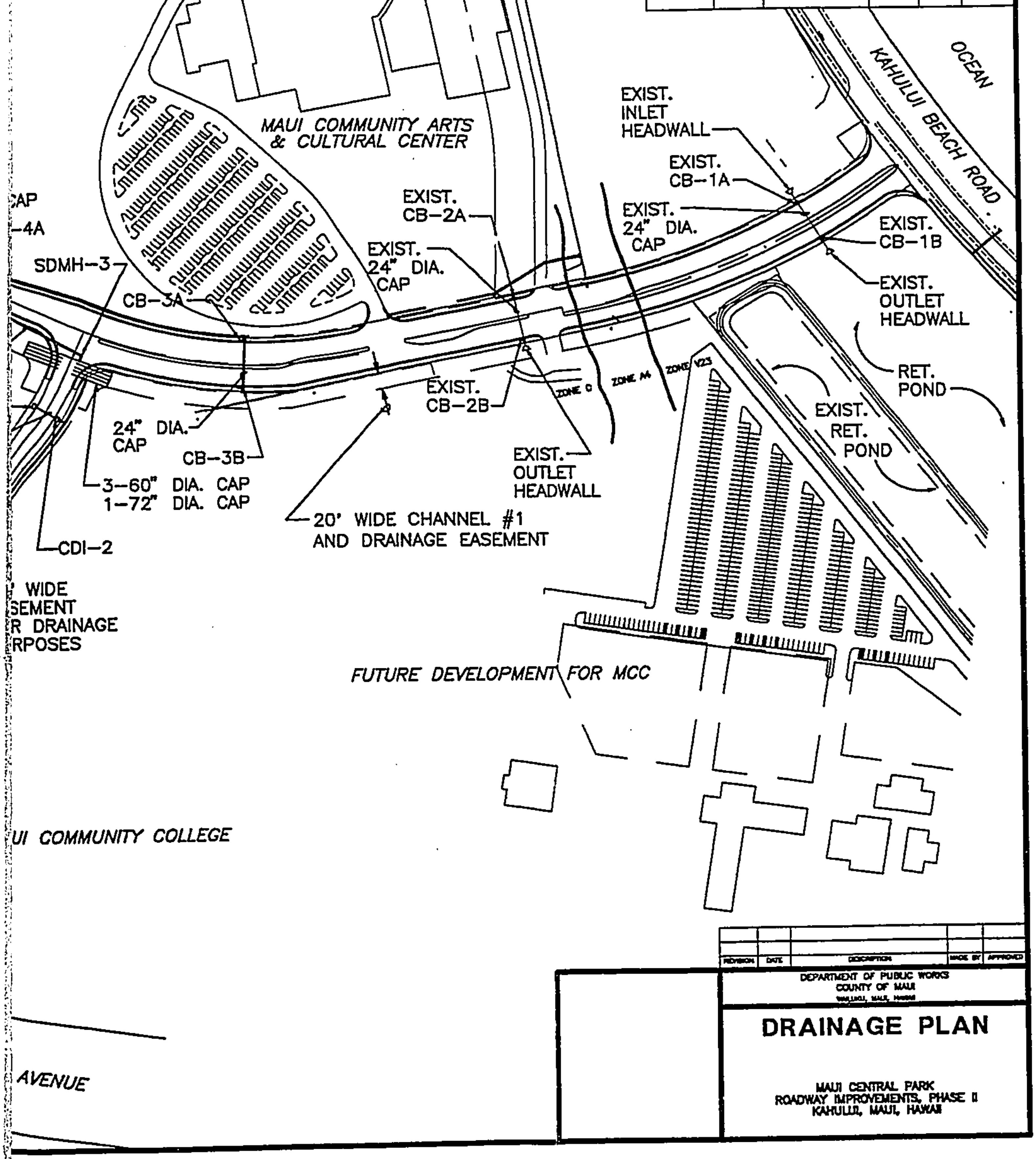
N.T.S.



DRAINAGE PLAN

NOT TO SCALE

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HI.	STP-0900(37)	1994	6	



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED

DEPARTMENT OF PUBLIC WORKS
COUNTY OF MAUI
WAILUKU, MAUI, HAWAII

DRAINAGE PLAN

MAUI CENTRAL PARK
ROADWAY IMPROVEMENTS, PHASE II
KAHULUI, MAUI, HAWAII

VI. APPENDICES

APPENDIX A - HYDROLOGIC AND HYDRAULIC CALCULATIONS

APPENDIX B - SOIL EROSION CALCULATIONS

Weighted c

.53 x .82	=	.43
.47 x .65	=	.31
weighted c	=	.74

b. Developed Runoff from Project Site

Area (A)	=	1.3 acres
L	=	900 feet
S	=	1.7 %
T_c	=	18 min.
i_{50}	=	2.5 in.
I_{50}	=	4.3 in.
Q_{50}	=	CIA = .74 x 4.3 x 1.3 = 4.1 cfs

B. Maui Central Parkway

1. Existing conditions (50 year, 1 hour storm)

a. Runoff Coefficient (c)

Infiltration (High)	.00
Relief (Flat)	.08
Vegetal Cover (Good)	.03
Development Type (Open)	.15
	.26

b. Existing runoff from project site

Area	=	6.0 acres
L	=	300 feet
S	=	11 %
T_c	=	13 min.
i_{50}	=	2.5 in/hr
I_{50}	=	3.9 in/hr
Q_{50}	=	CIA = .26 x 3.9 x 6.0 = 6.1 cfs

2. Developed Condition (50 year, 1 hour storm)

a. Runoff Coefficient

c = 0.82

b. Developed Runoff From Project Site

Area	=	6.0 acres
L	=	2000 feet
S	=	2.5 %
T_c	=	12 min.
i_{50}	=	2.5 in/hr
I_{50}	=	4.6 in/hr
Q_{50}	=	CIA = .82 x 4.6 x 6.0 = 22.6 cfs

II Hydraulic Calculations

All catch basins are Type "A" unless otherwise noted.

PARKWAY ROADWAY

Runoff to CB. 7 Station 1+00

$C = 0.82$

$A = .18$ ac

$L = 100$ ft

$T_c = 5$ min

$S = 2.0\%$

$i_{50} = 2.5$ in/hr

$I_{50} = 6.4$ in/hr

$Q_{50} = .82 \times 6.4 \times .18$

$Q_{50} = .94$ cfs

Runoff to CB6-A. Sta 5+50

PAVED

$C = 0.82$

$A = 0.31$ ac

$L = 450$ ft

$S = 2.8\%$

$T_c = 6.5$ min

$i_{50} = 2.5$ in/hr

$I_{50} = 6.0$ in/hr

$Q_{50} = .82 \times 6.0 \times .31$

$Q_{50} = 1.5$ cfs

Runoff to CB6-B. Sta 5+50

Paved, $Q_{50} = 1.5$ cfs

UNPAVED

$C = 0.26$

$A = 0.71$

$S = 6.0\%$

$L = 170$ ft

$T_c = 12$ min

$I_{50} = 4.8$ in/hr

$Q_{50} = .26 \times 4.8 \times .71$

$Q_{50} = 0.9$ cfs

Total $Q_{50} = 1.5 + 0.9 = 2.4$ cfs

PARKWAY CONT.

Runoff to CB5-A Sta 10+50

PAVED	UNPAVED
C = .82	C = .26
A = .34 ac	A = .22 ac
L = 500 ft	L = 120 ft
S = 2%	S = 23%
T_c = 7 min	T_c = 8.5 min
I_{50} = 5.9 in/hr	I_{50} = 5.5 in/hr
Q_{50} = 1.6 cfs	Q_{50} = 0.3 cfs

Total Q_{50} = 1.7 cfs

Runoff to CB5-B Sta 10+50

PAVED	UNPAVED
Q_{50} = 1.6 cfs (see CB5-A)	C = .26
	A = .14 ac
	L = 50 ft
	S = 22%
	T_c = 6 min
	I_{50} = 6.1 in/hr
	Q_{50} = .2 cfs

Total Q_{50} = 1.8 cfs

Runoff to CB 4-A Sta 15+50

PAVED	UNPAVED
C = .82	C = .26
A = .34 ac	A = .23 ac
L = 500 ft	L = 170 ft
S = 0.5%	S = 12%
T_c = 10 min	T_c = 11 min
I_{50} = 5.1 in/hr	I_{50} = 5 in/hr
Q_{50} = 1.4 cfs	Q_{50} = 0.3 cfs

Total Q_{50} = 1.7 cfs

Runoff to CB 4-B Sta 15+50

PAVED	UNPAVED
Q_{50} = 1.4 cfs (see CB 4-A)	C = .26
	A = .37 ac
	L = 190 ft
	S = 13%
	T_c = 11 min
	I_{50} = 5 in/hr
	Q_{50} = .5 cfs

Total Q_{50} = 1.9 cfs

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Sheet: — Of: 8
By: JP Date: 11/7/94
Chkd. by: Date:

PROJECT: Maui Central Park Phase II

PARKWAY cont.

Runoff to CB3-A Sta 20+00

PAVED
C = .82
A = .52 ac
L = 450 ft
S = 3.5%
T_c = 6.5 min
I_{50} = 6.2 in/hr
Q_{50} = 2.6 cfs

Runoff to CB3-B Sta 20+00

PAVED
C = .82
A = .41 ac
L = 300 Ft
S = 3.5%
T_c = 5 min
I_{50} = 6.4 in/hr
Q_{50} = 2.2 cfs

Runoff to CB2-A Sta 24+60

PAVED
C = .82
A = .53 ac
L = 460 ft
S = 2.4%
T_c = 7 min
I_{50} = 5.8 in/hr
Q_{50} = 2.5 cfs

Runoff to CB2-B Sta 24+60

PAVED
Q_{50} = 2.5 cfs
(SEE CB2-A)

Runoff to CB1-A (Existing) Sta 29+85

Q_{50} = 3.1 cfs
(Refer to Phase I Drainage Report)

Runoff to CB1-B Sta 29+85

PAVED (west)	PAVED (east)
C = .82	C = .82
A = .50 ac	A = .17 ac
L = 515 Ft	L = 175 Ft
T_c = 8 min	T_c = 5 min
S = 1.5%	S = 2.0%
I_{50} = 5.3 in/hr	I_{50} = 6.4 in/hr
Q_{50} = 2.2 cfs	Q_{50} = 0.9 cfs

Total Q_{50} = 3.1 cfs

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PROJECT: MAIN CENTRAL PARK PHASE II

PAPA AVENUE INLETS

Runoff to CDI #1 Sta. 12+50

FROM SOUTH ROADWAY
C = .72
A = .63 ac
L = 910 ft
S = 1.6%
T_c = 18 min
i_{50} = 2.5 in/hr
I_{50} = 4.3 in/hr
Q_{50} = .72 × 4.3 × .63
Q_{50} = 2.0 cfs

FROM NORTH ROADWAY
C = .82
A = .29 ac
L = 280 ft
S = 2.3%
T_c = 6 min
I_{50} = 6.2
Q_{50} = 1.5 cfs

OFF SITE
C = .18
A = 2.6 ac
L = 190 ft
S = 19%
T_c = 10 min
I_{50} = 5.1
Q_{50} = 2.4 cfs

OFF SITE
C = .18
A = .43 ac
L = 250 ft
S = 11.2%
T_c = 13 min
I_{50} = 4.8
Q_{50} = .4 cfs

Total Q_{50} 4.4 cfs (From south)

Total Q_{50} = 1.9 cfs (From North)

Total Q_{50} to inlet

4.4 + 1.9 = 6.3 cfs

Runoff to CDI #2 Sta. 12+50

FROM SOUTH ROADWAY
Q_{50} = 2.0 cfs
(See CDI #1)

FROM NORTH ROADWAY
C = .72
A = .07 ac
L = 100 ft
S = 1.5%
T_c = 6 min
I_{50} = 6.2
Q_{50} = .3 cfs

Total Q_{50} to inlet

2.0 + 0.3 = 2.3 cfs

III GRATE INLET CAPACITIES

REF: DRAINAGE OF HIGHWAY PAVEMENTS
Circular #12 U.S. D.O.T. - FHA 3/84

PAPA AVENUE

Inlet Capacity

$Q_i = C_w P d^{1.5}$

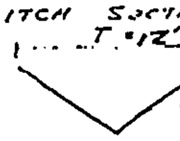
where $C_w = 3.0$
P = Perimeter of grate
d = depth of flow

Inlet grate size

6' × 3'

$P = 6+6+3+3 = 18'$

DITCH SECTION



3/4"/ft $= S_{x_1} = S_{x_2} = .0625 \frac{ft}{ft}$

$S_x = \frac{S_{x_1} S_{x_2}}{S_{x_1} + S_{x_2}}$

$S_x = \frac{(.0625)^2}{2(.0625)} = .0313$

$d = S_x T$

$d = .0313(12)$

$d = .38$ ft

$Q_i = 3.0 \times 18 \times (.38)^{1.5}$

$Q_i = 12.6$ cfs capacity

12.6 cfs > 6.3 cfs OK for CDI #1
12.6 cfs > 2.3 cfs OK For CDI #2

PARKWAY
STANDARD DEPRESSED GUTTER INLET
GREATEST AVERAGE SLOPE BETWEEN INLETS IS 3.5%
Maximum design Q for catch basins is 3.5 cfs.
Based on "Storm Drainage Standards" 4 cfs max. Q allowed
for max. slope of 4%. OK

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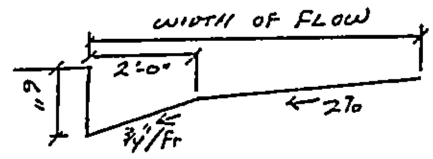
PROJECT: MAUI CENTRAL PARK PHASE II

IV WIDTH OF FLOW IN GUTTER



CHECK WORST CASES

__Flat Slope__
AT CB5-A & CB5-B $S = 0.5\%$
Design $Q_{50} = 1.9$ cfs (CB5-A)

8' WIDTH OF FLOW use Mannings Equation

$A = 1.08\ ft^2$
$wP = 8.28\ ft$
$n = .013$
$S = .005\ ft/ft$

$$Q = \frac{1.486\, A\, R^{\frac{2}{3}}\, S^{\frac{1}{2}}}{n}$$

$$Q = \frac{1.486\,(1.08)\left(\frac{1.08}{8.28}\right)^{\frac{2}{3}}(.005)^{\frac{1}{2}}}{.013}$$

$Q = 2.2$ cfs > 1.9 cfs

∴ Flow width is less than 8'

__HIGH FLOWS__
__AT CB 3-B__
Max Design $Q_{50} = 2.6$ cfs
$S = .035\ ft/ft$

8' WIDTH OF FLOW
$A = 1.08\ ft^2$
$wP = 8.28\ ft$

$$Q = \frac{1.486\,(1.08)\left(\frac{1.08}{8.28}\right)^{\frac{2}{3}}(.035)^{\frac{1}{2}}}{.013}$$

$Q = 5.9$ cfs > 2.6 cfs

∴ Flow width is less than 8' OK

IV STORAGE VOLUMES

1) Outlet at CB 6-A

Calculate volume required

a) Q from existing 30"
Assume Q_{max} for 30" and existing slope of 1.0% ±

From mannings Q_{max} = 27 cfs

Q_{peak} from catch basins
CB 7 = 0.9 cfs
CB 6-A = 1.5 cfs
CB 6-B = 2.4 cfs
Q_{peak} = 4.8 cfs
27.0 + 4.8 = 31.8 cfs total

b) Estimate volume required

$31.8 \frac{ft^3}{sec} \times 60 \frac{sec}{min} \times 60 \frac{min}{hr} \times \frac{1}{2} = 57{,}240\ ft^3$ for 1 hour 50 year storm

c) Design volume = 70,000 ft³ > 57,240 ft³ OK

2) Outlet at CB 5A & 5B
a) Q_{peak} = 3.7 cfs
b) Volume required = 6,600 ft³
c) Design volume = 37,000 ft³ w/ 4' freeboard > 6,600 ft³ OK

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	Chkd. by:	Date:

PROJECT: MAUI CENTRAL PARK PHASE II

V. STORAGE VOLUMES (CONT.)

3) Outlet from Concrete Channel

a) Total Runoff from Catch Basins

CB-4A = 1.7 cfs
CB-4B = 1.9 cfs
CB-3A = 2.6 cfs
CB-3B = 2.2 cfs
CB-2A = 2.5 cfs
CB-2B = 2.5 cfs
CDI-1 = 6.3 cfs
CDI-2 = 2.3 cfs

Q_{peak} = 22.0 cfs

b) Estimate Volume Required

$22.0\ ft^3/s \times 60\ sec/min \times 60\ min/hr \times \frac{1}{2} = 39{,}600\ ft^3$ for 1 hour 50 year storm

4) Outlet at Exist Headwall Sta 29+95 South of Parkway Ave.

a) Total Runoff from Catch Basin

CB-1A = 3.1 cfs
CB-1B = 3.1 cfs

Q_{peak} = 6.2 cfs

b) Estimate Volume Required

6.2 cfs = 11,160 cf

5) Total Runoff Flow entering the exist. retention pond from Austin, Tsutsumi and Associates, Inc. Grading and Drainage Report - Building "J" and Site Improvements is 540,000 cf.

6) Total Volume Needed = 39,600 ft^3 + 11,160 ft^3 + 540,000 cf = 590,760 cf
= 13.56 acre-ft

APPENDIX B
SOIL EROSION CALCULATIONS

I. SITE CONDITIONS DURING CONSTRUCTION

An area of approximately 11.7 acres will be graded at once.

Soil within the project site is classified as Puuone Series, Puuone Sand (PZUE). Characteristics of this soil is high permeability, slow runoff and an erosion hazard which is moderate to severe.

II. HESL SOIL LOSS FOR THE PROJECT DURING CONSTRUCTION

Erosion Rate, as set forth by the County of Maui Ordinance:

E = R K L S C P

Where:

E	= Soil Loss in tons/acre/year
R	= Rainfall Factor = 180 tons/acre/year
K	= Soil Erodibility Factor = 0.10
L	= Slope Length = 1000 feet
S	= Slope Gradient = 2.5%
LS	= Slope-Length Factor = .488
C	= Cover Factor = 1.0 (Bare Soil)
P	= Control Factor = 1.0 (Construction Site)

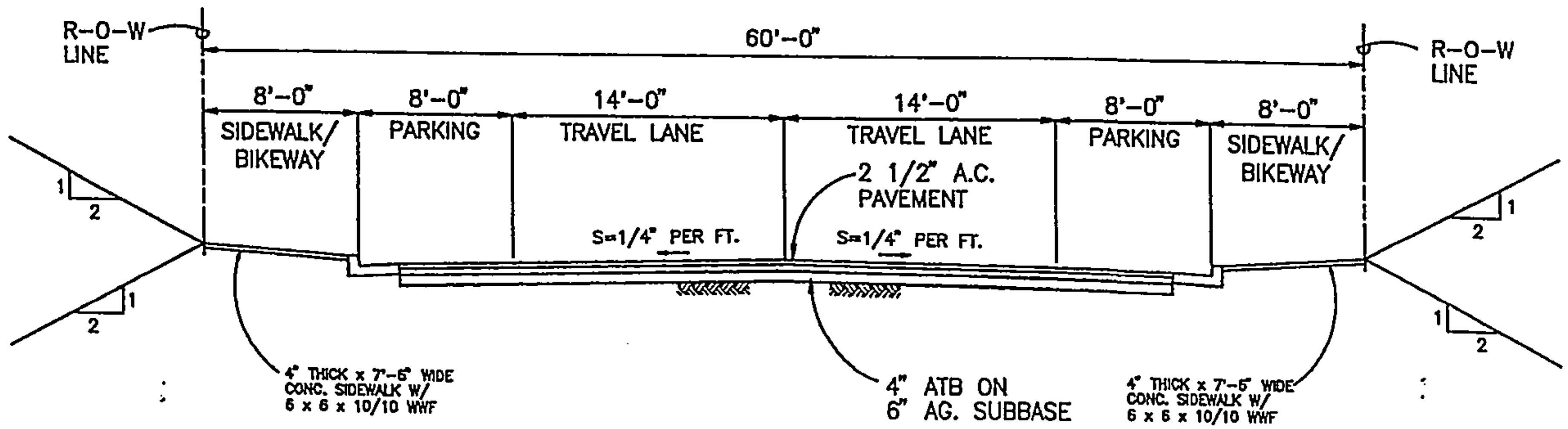
E = (180 tons/acre/year) (0.10) (0.488) (1.0) (1.0)
= 9 tons/acre/year

III. ALLOWABLE SOIL LOSS FOR SITE

Coastal Water Hazard (D) = 1 (Class B Water)
Downstream Hazard (F) = 4
Duration of Site Work = 1/2 year
Maximum Allowable Construction Area x Erosion Rate = 7143 tons/year
Project Construction Area = 11.7 acre
Maximum Allowable Rate = 7143/11.7 = 610 tons/acre/year

IV. CONCLUSION

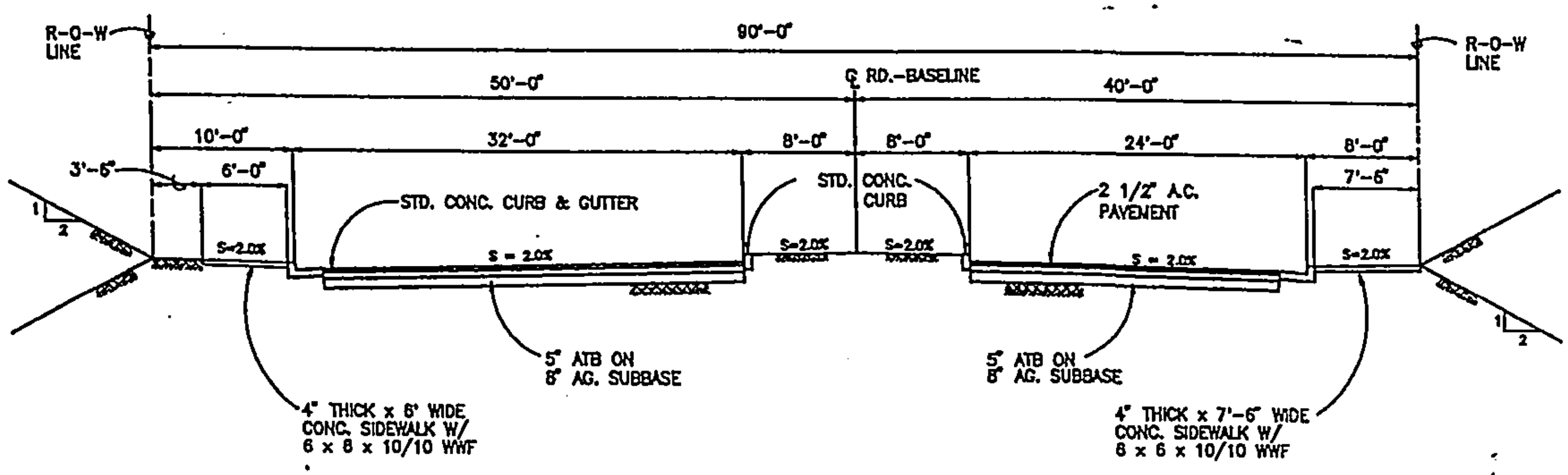
Maximum Allowable Erosion Rate of 610 tons/acre/year is greater than the Estimated Construction Erosion Rate of 9 tons/acre/year. Normal soil erosion control measures during construction should be sufficient to prevent excessive soil loss from occurring.



TYPICAL 60' ROADWAY SECTION

CENTRAL PARKWAY

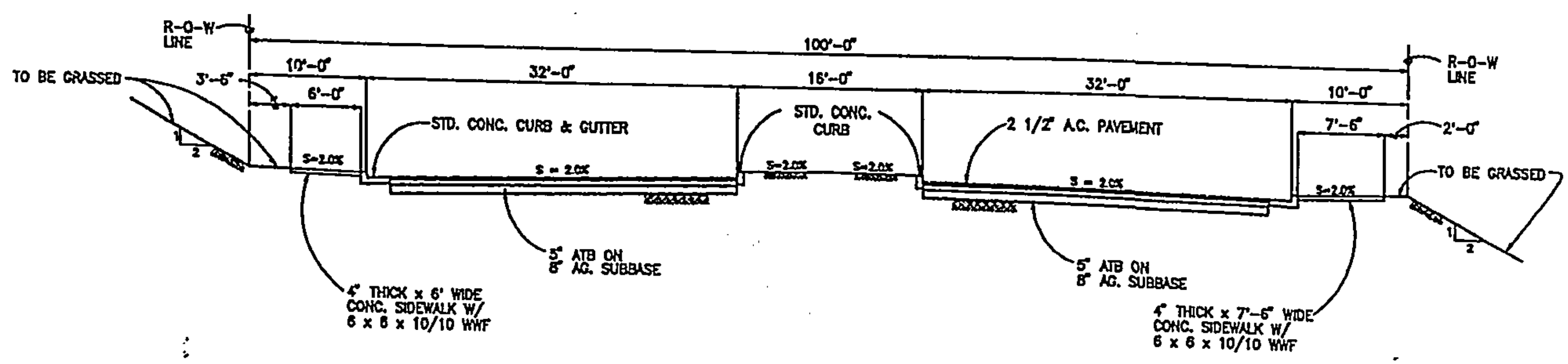
NOT TO SCALE



TYPICAL 90' ROADWAY SECTION

CENTRAL PARKWAY

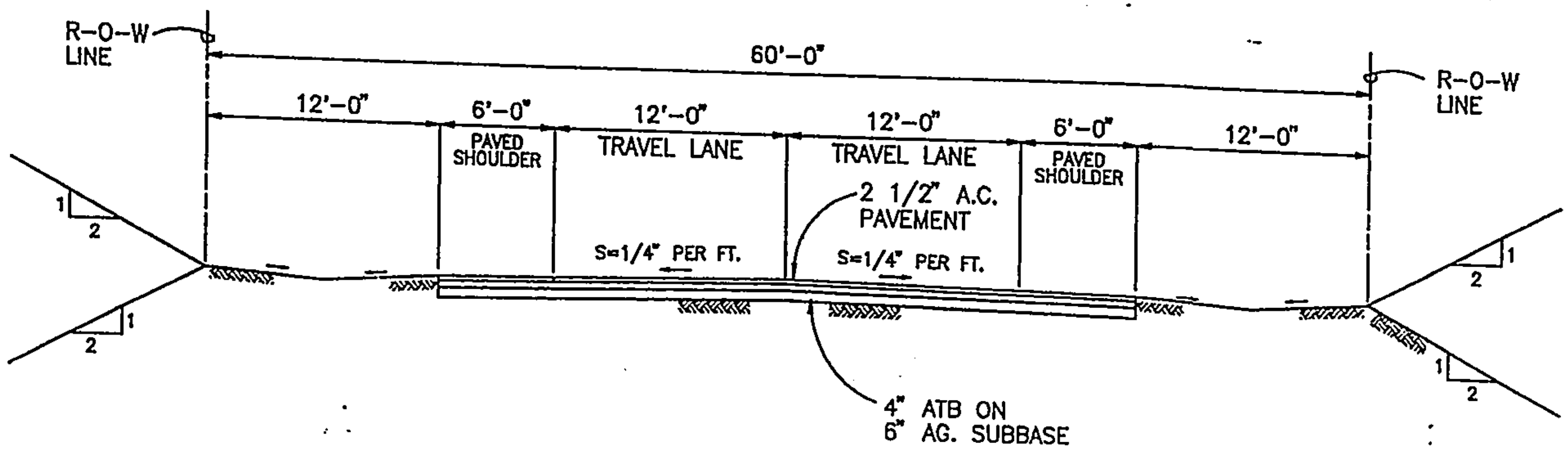
NOT TO SCALE



TYPICAL 100' ROADWAY SECTION

CENTRAL PARKWAY

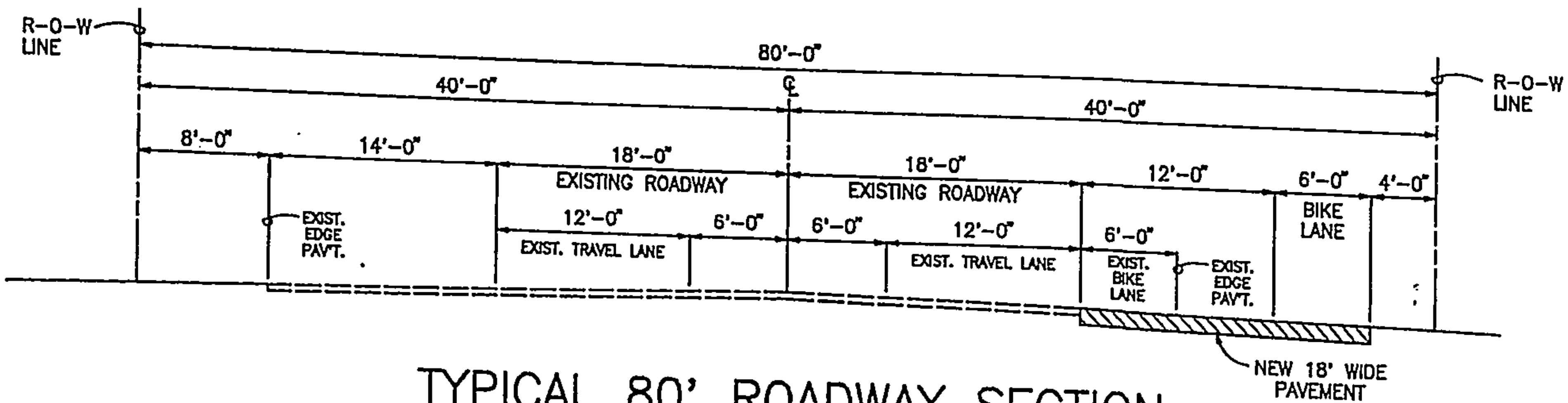
NOT TO SCALE



TYPICAL 60' ROADWAY SECTION

PAPA AVENUE

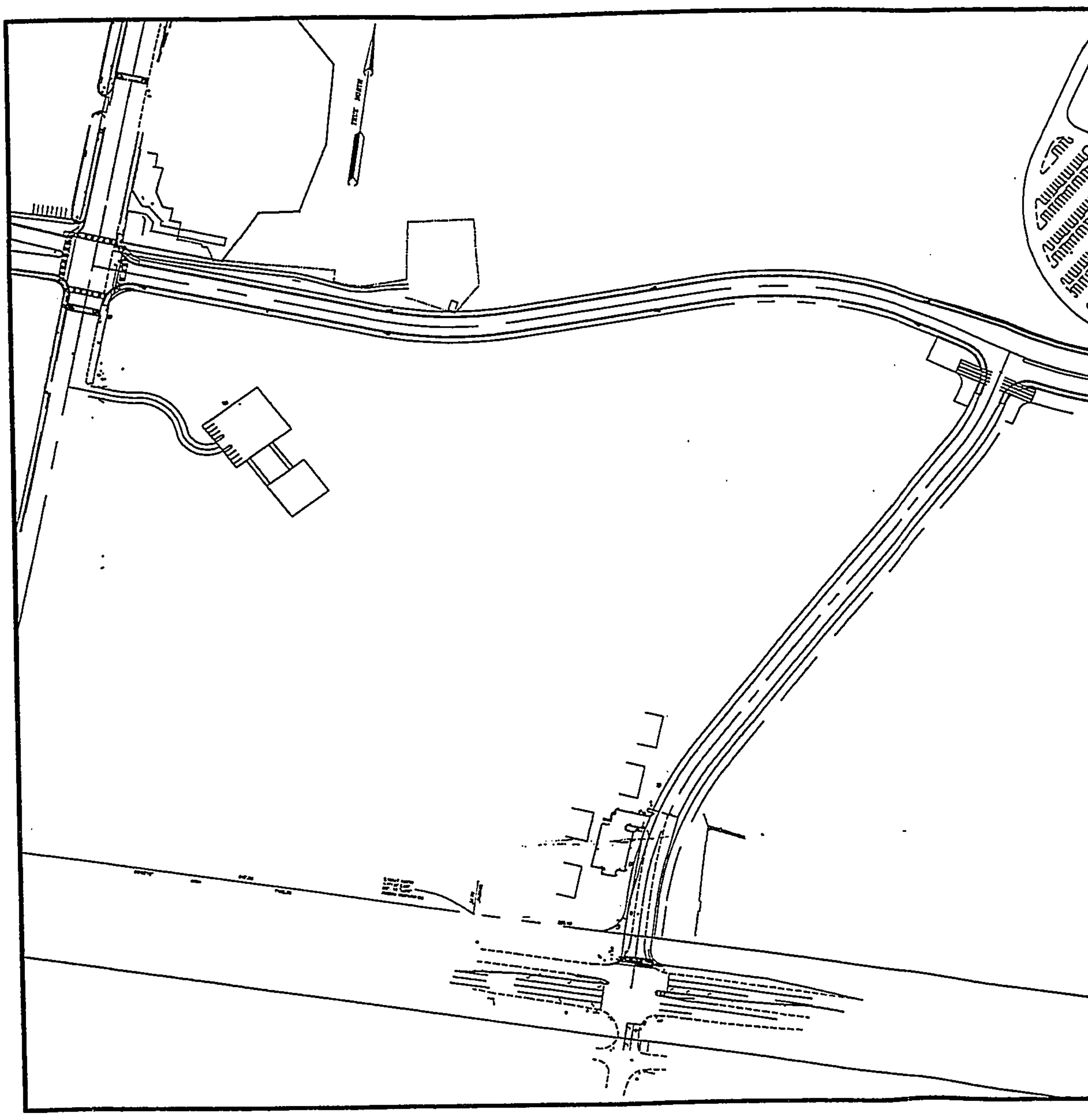
NOT TO SCALE



TYPICAL 80' ROADWAY SECTION

PAPA AVENUE ROAD WIDENING

NOT TO SCALE


TRUE NORTH