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JOHN WAIHEE
GOVERNOR OF HAWAII

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

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

DEPUTIES

KEITH W. AHUE
MANABU TAGOMORI
RUSSELL N. FUKUMOTO

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

FILE NO.: MA-4/3/90-2348
DOC. NO.: 8032E

MEMORANDUM

TO: The Honorable Marvin T. Miura, Director
Office of Environmental Quality Control

FROM: William W. Paty, Chairperson
Board of Land and Natural Resources

SUBJECT: Document for Publication in the OEQC Bulletin - Environmental Assessment for Conservation District Use Application, for Beach Access and Landscape Improvements; TMK 4-2-01: 34

The above mentioned Chapter 343 Document was reviewed and a negative declaration was declared based upon the Environmental Assessment provided with the CDUA.

Please feel free to call me or Jay Lembeck of my staff, at 584-7837, if you have any questions.

William W. Paty

Attachment

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1990-05-23-MA-FEA

FILE COPY

CONSERVATION DISTRICT USE APPLICATION

PROPOSED BEACH ACCESS AND LANDSCAPING IMPROVEMENTS

Kapalua, Maui, Hawaii
December 20, 1989

February 1983

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

FOR DLNR USE ONLY
Reviewed by
Date
Accepted by
Date
Docket/File No.
180-Day Exp.
EIS Required
PH Required
Board Approved
Disapproved
Well No.

DEPARTMENT MASTER APPLICATION FORM

(Print or Type)

I. LANDOWNER/WATER SOURCE OWNER (If State land, to be filled in by Government Agency in control of property)

Name Maui Land & Pineapple Co.Inc.
Address P.O. Box 187
Kahului, Maui, HI 96732-0187

Telephone No. 531-4550/877-3882
SIGNATURE Richard H. Cameron
Date 11/13/89

II. APPLICANT (Water Use, omit if applicant is landowner)

Name Maui Land & Pineapple Co. Inc.
Address P.O. Box 187
Kahului, Maui, HI 96732-0187

Telephone No. 531-4550/877-3882
Interest in Property Landowner
(Indicate interest in property; submit written evidence of this interest)
*SIGNATURE Richard H. Cameron
Date 11/13/89

*If for a Corporation, Partnership, Agency or Organization, must be signed by an authorized officer.

III. TYPE OF PERMIT(S) APPLYING FOR

( ) A. State Lands
(X) B. Conservation District Use
( ) C. Withdraw Water From A Ground Water Control Area
( ) D. Supply Water From A Ground Water Control Area
( ) E. Well Drilling/Modification

IV. WELL OR LAND PARCEL LOCATION REQUESTED

District Lahaina
Island Maui
County Maui
Tax Map Key 2nd Div. 4-2-01:34
Area of Parcel 2.2 Acs.
(Indicate in acres or sq. ft.)
Term (if lease)

CONSERVATION DISTRICT USE APPLICATION
SUPPLEMENTARY INFORMATION
Proposed Beach Access and Landscaping Improvements
Kapalua, Maui, Hawaii

I. DESCRIPTION OF PARCEL

A. Existing Structure/Use

The project site is located at Honokahua Bay in Kapalua, Maui (See Figures 1 & 2). A portion of the site is located in Parcel 34 of Tax Map Key 2nd Div. 4-2-01 and the remainder is in the Honokahua Bay beach area which is owned by the State of Hawaii. The total project area encompasses approximately 22,000 sq. ft.

The proposed project is part of a larger planned development which the applicant is proposing to initiate within the next year. This larger area is within the Urban District and is for a new 550-room resort hotel that will include a luau/beach facility and tennis club. The planned hotel is presently in the SMA Permit Application review process with the County of Maui. An environmental assessment for the new hotel, which also cover the proposed project, is attached in the Appendix.

Other uses surrounding the project site are a planned archaeological preserve on the western boundary of the property and the County's D. T. Fleming Park on the property's eastern boundary. The planned archaeological preserve, which was the original hotel site for the Ritz Carlton, will be restored and landscaped to preserve the natural open environment of the coastal land. This effort by the resort is being done in cooperation with the County of Maui, the Office of Hawaiian Affairs, the State Department of Land and Natural Resources and the Hui Alanui O Makena, a local Hawaiian group. The County's public beach park, which occupies land owned by ML&P but is leased to the County, includes a comfort station, showers, picnic area and parking.

To the south of the project site is the Lower Honoapiilani Road. The section of the road which is located within Kapalua is owned by Maui Land and Pineapple Co. Inc. and the owner has requested and obtained approval from the County to close the right-of-way so pedestrian use may be allowed in the area. Traffic will be rerouted onto Office Road and the Honoapiilani Highway.

Honolua Plantation, which once operated a pineapple plantation in the area, never cultivated crops on the proposed site. However, ML&P's predecessor, Honolua Ranch, once raised and sold cattle in the general area.

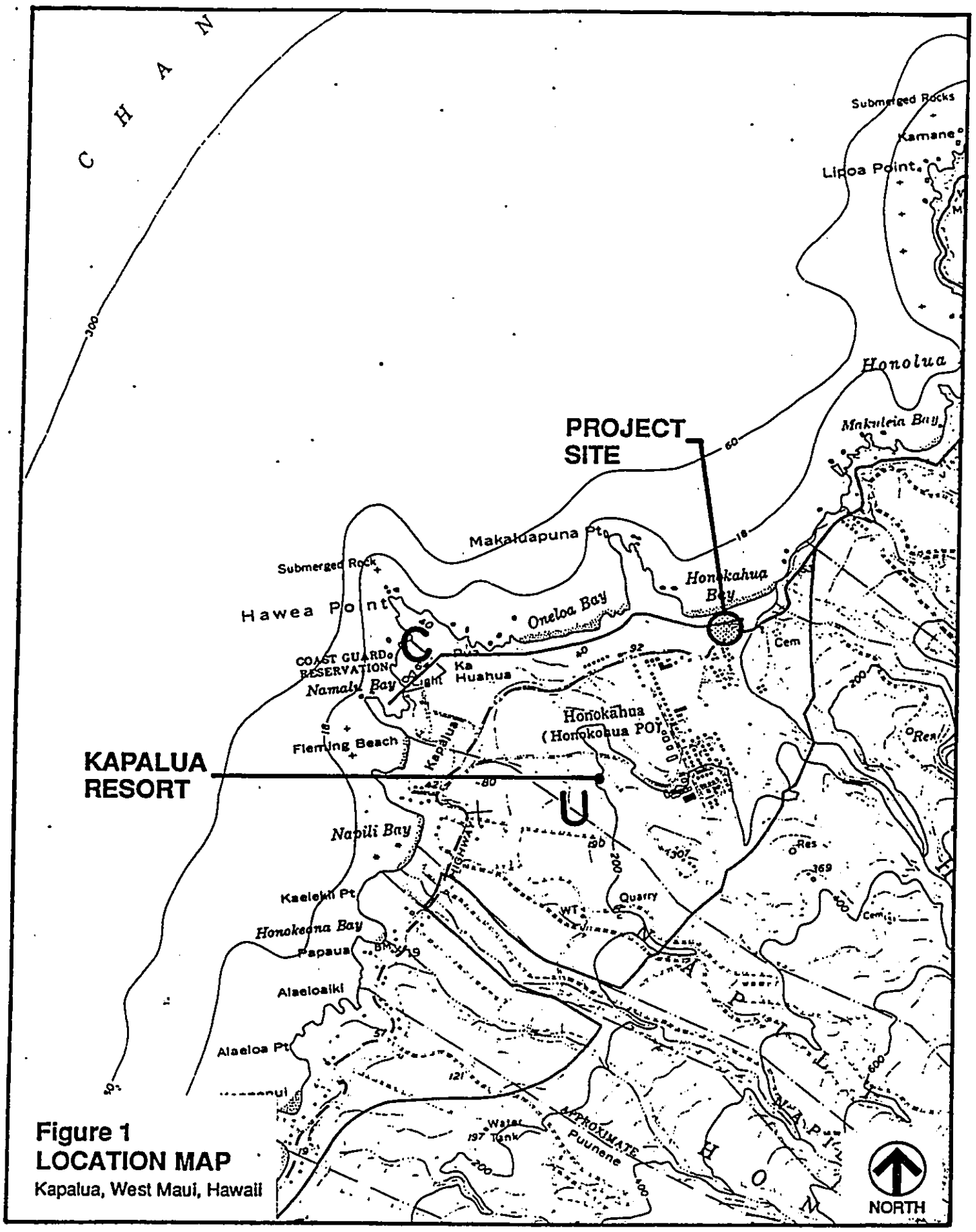

Figure 1
LOCATION MAP
Kapalua, West Maui, Hawaii

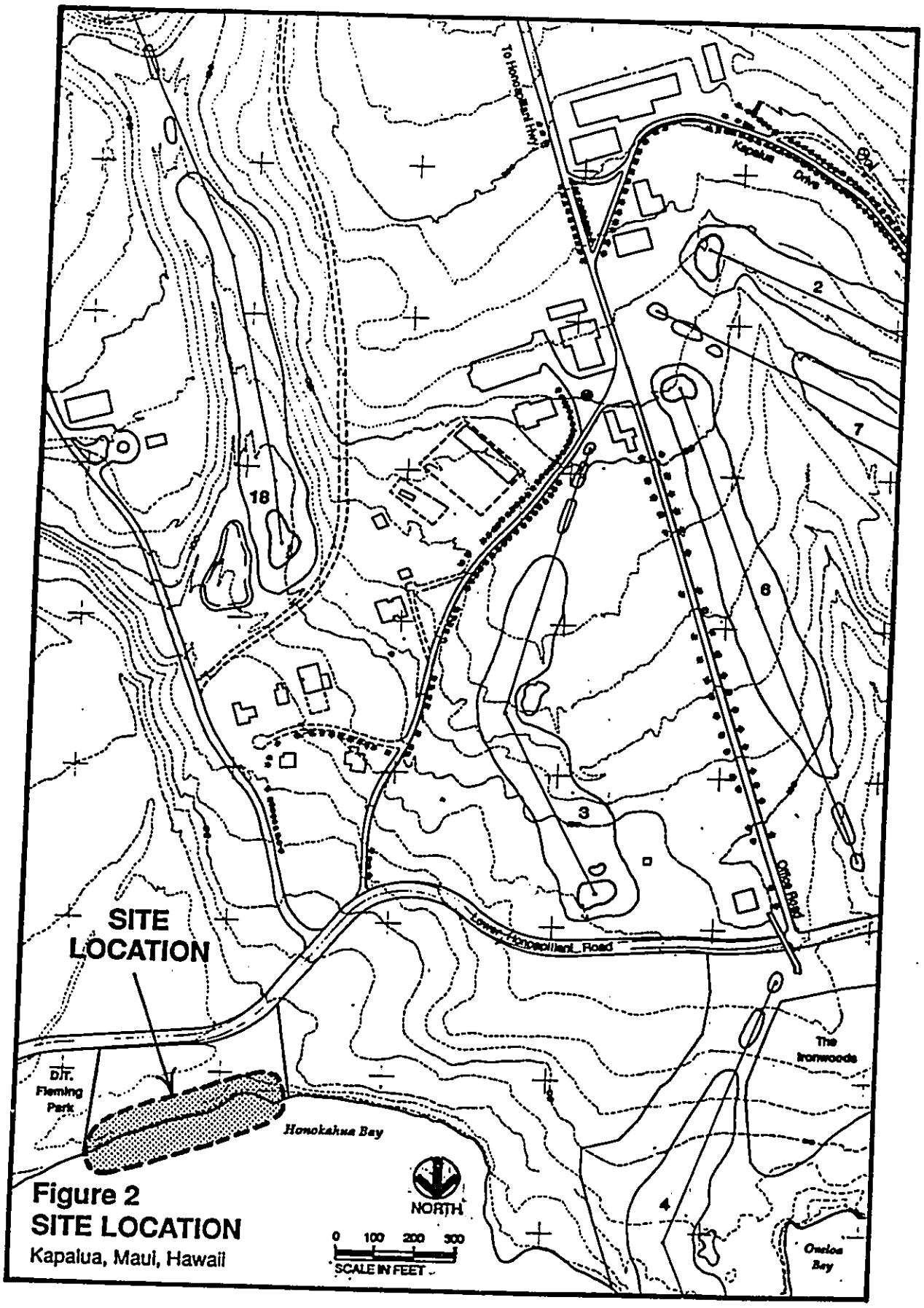

Figure 2
SITE LOCATION
Kapalua, Maui, Hawaii

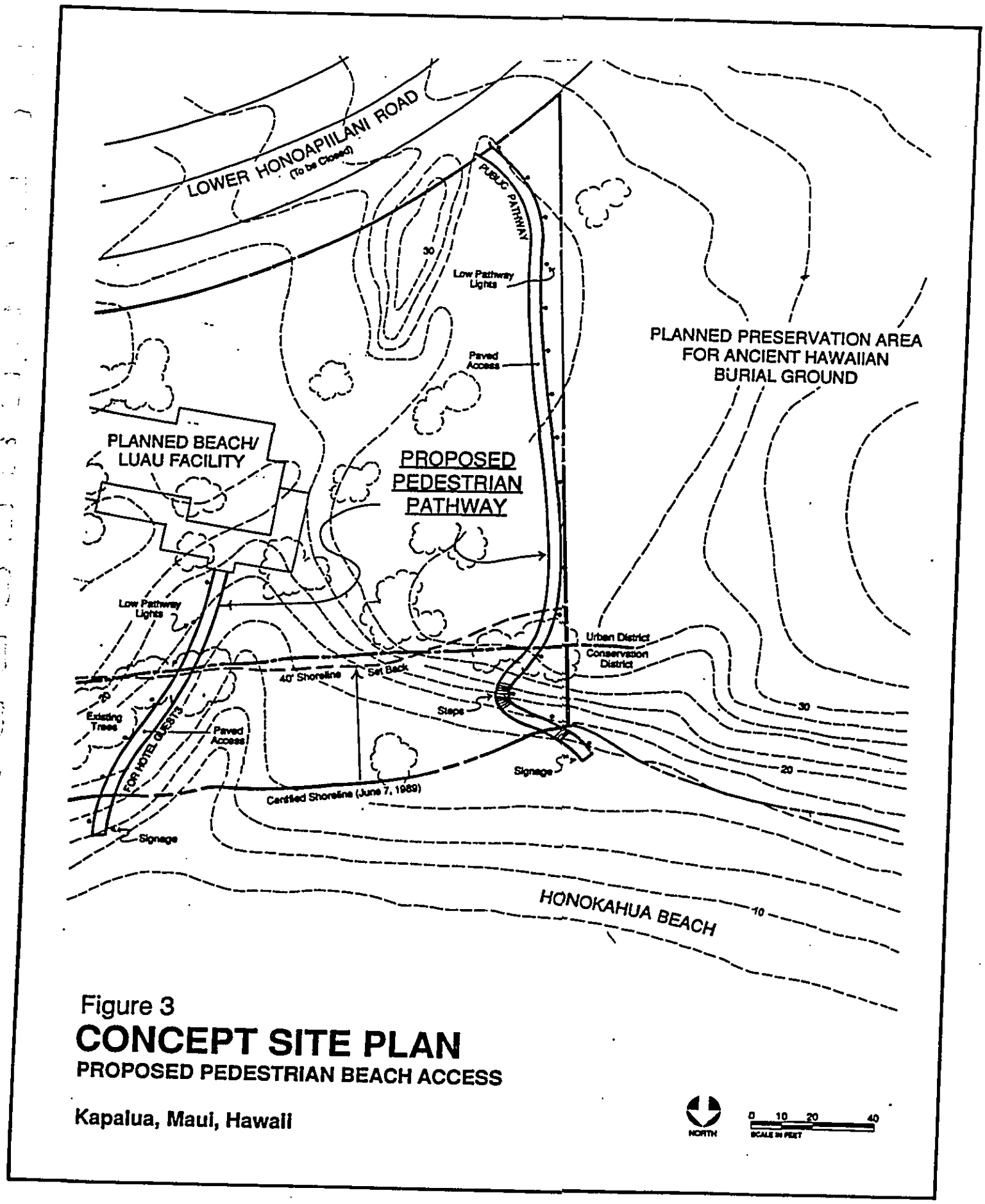

Figure 3

CONCEPT SITE PLAN

PROPOSED PEDESTRIAN BEACH ACCESS

Kapalua, Maui, Hawaii

The land above the bay from the Lower Honoapiilani Road to approximately the resort maintenance facilities which is located east of Office Road was the housing village for the old plantation. It was phased out a number of years ago and most of the homes were removed by the early 1980's. What now remains are a few buildings which were preserved or converted to accommodate some of the present resort operations.

In the middle section of the old settlement near a shallow ravine are a few residences which were part of the former plantation village. These residences will be removed and the tenents, who occupy three of the four residences and are employees of either ML&P or Kapalua resort, will be relocated.

At the intersection of Office Road and Lower Honoapiilani Road is an old church building which is presently being used as an office space by the Kumulani Chapel. The land is owned by the resort and is leased to the church. The old church building may be removed as part of the resort development plans for the mauka land. Above the old church is the 3rd hole of the Kapalua Golf Course.

B. Existing Utilities

Water: Kapalua is served by a private water system owned and operated by Kapalua Water Company. Although privately operated, this company is regulated by the Public Utilities Commission. The main source of the system is the Honokohau Stream which is a part of a basin that extends from the upper elevations of the West Maui Mountains to the shoreline. The water is treated and disinfected through filters and a chlorinator before it enters into the resort's distribution system.

The proposed use will require an irrigation system to water the proposed landscaping in the Conservation District. The system will be underground and will operate on an automatic timing system. Approximately 4,000 gallons of water per day will be used for irrigation. According to present projections, the resort has more than adequate water to meet that demand.

In bringing water specifically to the project site, the project owner plans to connect a service line to the nearest water main located along Office Road.

Sewer: Sewage in Kapalua flows into a private sewage collection system owned and operated by the Kapalua Waste Treatment Company, Ltd. (KWTC), which is also regulated by the Public Utilties Commission. Components of the system originally included a wastewater treatment plant (WWTP), gravity lines, force mains and pump stations. Notably, the WWTP component of the system was recently closed, and now all sewage is conveyed via County transmission lines to the County's

Lahaina Waste Water Treatment Plant (LWWTP) near Lahaina. The Lahaina facility has a design average daily flow capacity of 6.7 MGD and is available for service to the Lahaina District.

Existing resort facilities at Kapalua presently generate an average of nearly 0.3 million gallons of sewage per day. The proposed project within the Conservation District will not generate any sewage, therefore the Conservation District along Honokahua Bay will not be impacted by any sewage disposal requirement.

Electricity: Electrical lines presently run along Office Road adjacent to the project site. Power in these lines is provided by the Maui Electric Company from its substation in Napili. To service the project site, a connection can readily be made to one of these existing lines.

Telephone: Existing telephone lines accompany the electrical lines that run along Office Road. The proposed project will not require any telephone services.

C. Existing Access

The principal roadway in West Maui is the Honoapiilani Highway. It extends around the West Maui Mountains from Wailuku to Honokohau via Lahaina and Kaanapali. This high-speed, two-lane State right-of-way was recently realigned and upgraded between Kaanapali and Kapalua and expanded to four lanes between Kaanapali and Lahaina.

The Lower Honoapiilani Road, meanwhile, continues to serve the coastal developments between Kaanapali and Kapalua, but as a secondary access for the area's local traffic. This two-lane substandard State roadway was recently turned over to the County and the portion that crosses Kapalua was subsequently conveyed to ML&P.

In addition to the Lower Honoapiilani Road, Kapalua is served by several private interior roadways including Office Road, Kapalua Drive, Bay Drive, Simpson Way and Pineapple Hill Road. Office Road is the main access into the resort from the realigned Honoapiilani Highway. The other interior roadways provide secondary accesses into the remainder of the resort.

The project site is served directly by the Lower Honoapiilani Road. Future plans call for closing a portion of this road fronting the project site to provide resort amenities and open space. Access to the project site would then be obtained from Honoapiilani Highway and along the unclosed portion of the Lower Honoapiilani Road.

Beach access to Honokahua Bay is currently being provided by the Lower Honoapiilani Road and the pedestrian access through Fleming Park which abuts the project site. Parking and a comfort station are available at the County facility.

D. Vegetation

In April of 1989, Char & Associates conducted a floral survey of the project site as part of a larger survey (Appendix B of the Environmental Assessment). The study indicated the survey area consists of a mixture of developed areas and undeveloped vegetated waysides. Developed areas were excluded from the survey.

Char & Associates recorded a total of 157 species of vascular plants of which 144 were exotics, 6 were Polynesian-introduced species and 7 were native or presumed-native species. Within the coastal land, the predominant species included ironwood trees and sour grass. Koa haole was common throughout the study area. A complete list of the recorded species is located in Appendix B of the EA. The applicant proposes to remove the existing koa haole and ironwood trees and replace them with appropriate landscaping such as groundcover or grass that would more effectively hold the soil in place. The relandscaping should help to stabilize the steep area of the property as well as improve views through the shoreline area.

According to the survey, there were no species in the study area that are officially listed by the Federal or State governments as endangered, or candidate for such listing; none are considered rare or vulnerable. All of the species in the project area were common elements of lowland vegetation and their loss would not be expected to have a significant impact on the statewide population of those species.

E. Topography

The project site is located adjacent to Honokahua Bay. It consists of a high ground above the beach, an embankment that drops to the beach and a low ground that comprises the back portion of the beach. The high ground has an elevation of 24 to 26 feet and a gradual overall slope of 5 percent. The embankment has a steep slope of up to 45 percent over a 30-foot distance. The low ground comprises the back of the beach and measures about 10 to 30 feet in depth. It has a gradual slope of 18 percent.

Surface runoff appears to occur by sheetflow or by rapid ground percolation. Runoff from the properties above the project site is intercepted by the Honoapiilani Highway and carried into the adjacent Honokahua Stream gulch. The lands immediately above the the project site are presently vacant and will be developed in the future for resort use.

Ground maintenance will be conducted in some areas of the Conservation land to improve the appearance of the shoreline. Since no major drainage course is evident on the property, the proposed shoreline improvement would not obstruct or hinder any major natural drainage in the vicinity. A preliminary drainage report was prepared by Warren S. Unemori Engineering, Inc. for the project area (Appendix A of the EA).

F. Shoreline Area

Groundwater: Drilled wells near the shoreline, in Alaeloa and in upper Napili provide information on groundwater conditions in the Kapalua area. Ground water exists in a basal lens configuration, meaning that it is in hydraulic contact with seawater at the shoreline and saline water at depth. The lens is progressively thicker and fresher as the distance from the shoreline is increased.

Surfacewater: There are no standing surface water features on the property. The site's topography and soil characteristics provide an extremely well drained condition suitable for development. Honokahua Gulch encompasses a portion of the project and, as described above, is the drainageway for the lands above the resort development.

Marine Waters: The project site is located on the shoreline and its boundary has been delineated and certified by the Board of Land and Natural Resources. Seaward of the shoreline is a large sand area comprising Honokahua Bay beach. Its depth is about 60 to 80 feet to the water's edge at mean sea level.

The bathymetry of Honokahua Bay consists of a gradual slope out to sea. The sand area at Honokahua Beach extends offshore more than 2,500 feet and is about 1,000 feet in breadth. On the flanks are rock bottoms that represent extensions of the solid formations found onshore. The natural feature forming the west boundary of Honokahua Bay is Makaluapuna Point while the east boundary is comprised of an unassuming rocky shoreline.

Coral, both live and dead, algae, and fish, particularly Hawaiian reef fish, are found on and around these hard bottoms. Fish are more abundant around the rock areas than in the bay. According to a series of marine studies conducted in 1970 and 1971 by Environmental Consultants, Inc., the benthic biota offshore from the Kapalua resort is typical of Hawaiian coastal waters. The studies further noted that there are no rare or endangered species present.

Tidal waters as well as prevailing winds affect the direction of ocean current entering the bay. The currents are generally favorable for flushing the area of suspended matter or dissolved material.

The waters of Kapalua are classified by the State Department of Health (DOH) as Class A Waters. "It is the objective of this class of waters that their use for recreational purposes and aesthetic enjoyment be protected." Discharge into these waters is permitted only upon having the best degree of treatment or control compatible with the criteria established by the DOH for this class.

G. Existing Covenants, Easements, Restrictions

There are no easements, covenants or landowner's restrictions on the use of the project site.

H. Historic Sites

Between December 1988 and May 1989, Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted subsurface archaeological testings in several increments in and around the project site (See Figure 4 and Appendix D of the EA). The basic purpose of the study was to determine the presence or absence of significant archaeological remains which might affect the proposed improvement. Moreover, the study intended to demonstrate and document the probable absence of any substantial number of prehistoric Hawaiian human burials such as those present in the adjacent large burial ground occupying the central portion of that property.

Upon completing its field work, PHRI found that most of the study area, especially above the project site, had been substantially modified in recent historic times, initially for plantation operation and occupation and subsequently for golf course development. PHRI found no evidence of prehistoric or early historic period utilization (including burials) in the area.

In the immediate vicinity of the project site, it was initially thought by some that this area might possibly contain an eastward extension of the large burial site existing to the west. Extensive testing, however, revealed only a single probably intact burial. The burial is located midway along the property's shoreline boundary and most likely within the shoreline setback area. Subsurface rocks were also encountered at three other locations which are anomalous within the sand soil matrix and might possibly represent capstones placed atop burials. No buried cultural deposits were found except for a single volcanic glass flake and single flake of flint-like stone which indicate the possible presence of remnant or mixed/disturbed prehistoric and /or early historic period components.

Upon completion of additional testing in the project site area (addendum report, prepared in August 1989 [Appendix D of the EA), PHRI concluded that there are no in situ burials associated with the subsurface rocks. Moreover, the additional

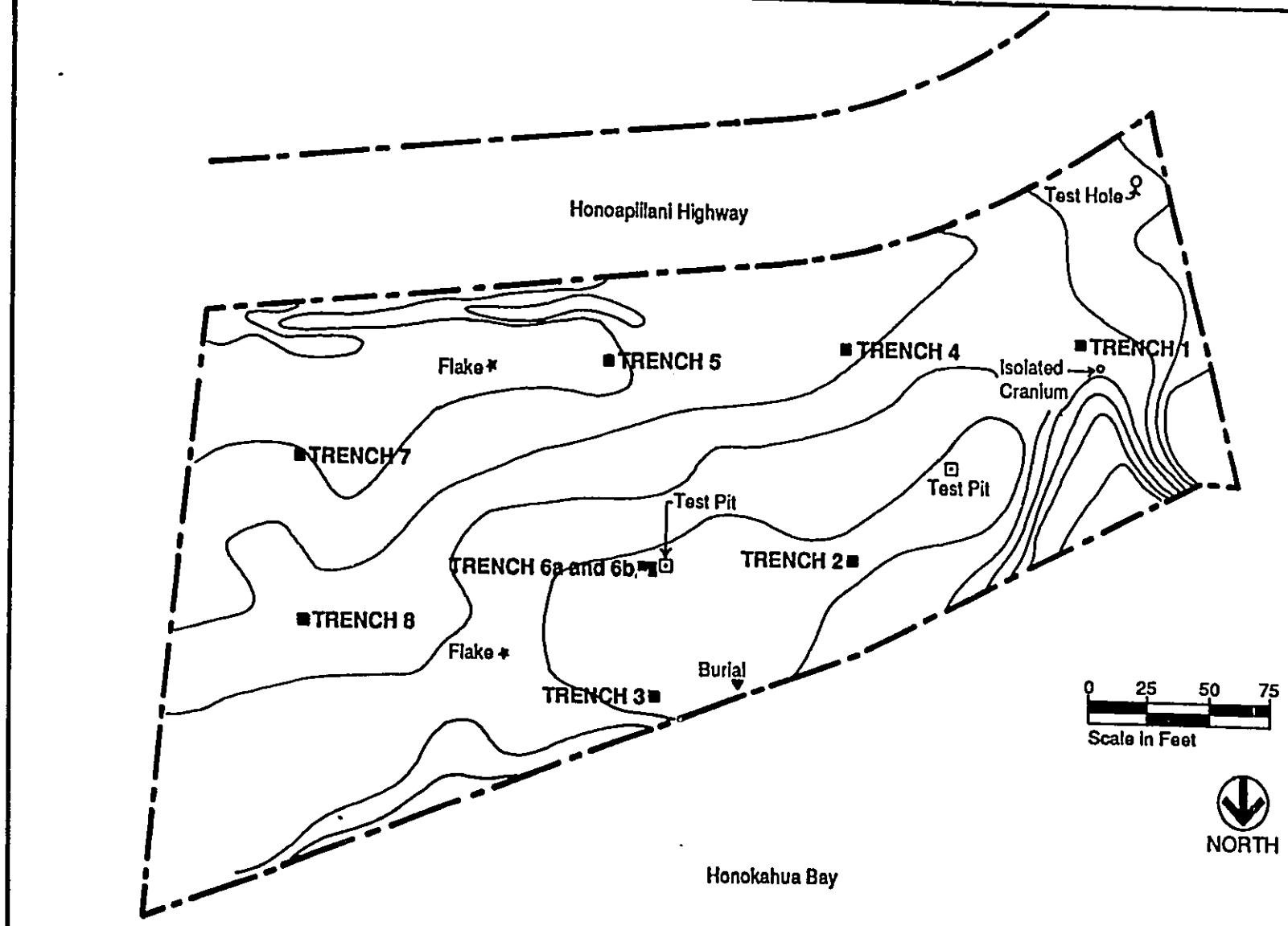

Figure 4
ARCHAEOLOGICAL SITES
Kapalua, Maui, Hawaii

testing of remnant cultural deposits along the makai edge of the Lower Honoapiilani Road reveals generally negative results and that no further archaeological testing is required.

In conclusion, PHRI indicated that there are no significant archaeological remains present anywhere within the project site that would constrain or prevent the proposed improvement. The lone burial found by PHRI near or possibly within the shoreline setback area will not be impacted by the proposed pedestrian pathways. PHRI states that no further archaeological work is required in the proposed beach facility and pedestrian access area.

PHRI has discussed its findings, conclusions and recommendations with the appropriate staff archaeologists in the State Department of Land and Natural Resources - Historic Sites Section/State Historic Preservation Office and, according to PHRI, the State is in agreement. Further, it is PHRI's understanding based on discussions with the State agency that even if a few isolated burials were to be identified within the beachfront area, disinterment would be permitted and the proposed development in that area could proceed. This would be so because the isolated burials would not be considered an extension of the large burial site in the adjacent parcel. Given the possibility, however remote, that potentially significant unidentified subsurface cultural deposits or remains might still be revealed by further test excavations in the beachfront area, PHRI's final recommendation thus calls for a qualified archaeologist to monitor the area during the project's initial grading work.

II. DESCRIPTION OF PROPOSED ACTIVITY

The applicant, Maui Land & Pineapple Company, Inc., is proposing to install two improved mauka-makai pedestrian accesses from the proposed Ritz Carlton project to Honokahua beach (See Figure 3). The accesses will be approximately 4' to 5' wide, constructed of portland cement or asphaltic concrete pavement and lit with low pathway lights (less than 2' high and spaced about 15 feet apart). The lights will be directional pointing toward the pathway.

Each access will have a sign to identify its purpose. The pathway along the Ritz Carlton western boundary will be for public use and the access from the beach/luau facility will be provided for the Ritz Carlton guests. The signs will be small (signage face area of less than 5 sq. ft.), non-illuminated and less than 3' high. The signage material would be of wood construction.

A portion of the two pathways will traverse the Conservation District and 40' shoreline setback area of Honokahua beach. These pathways over the shoreline area

are necessary because of the area's steep terrain (up to approximately 45 percent slope). The pathways, which will include a few steps, will make it safer for pedestrians to reach the beach from the Ritz Carlton project site The pathways will also allow pedestrian traffic to traverse over a stablized area and avoid the unstablized section of Honokahua beach where wear from foot traffic and erosion could be accelerated. The pathways will terminate at the backside of the beach, away from the main portion of the beach's sand area and water, so they would not interfere with the natural shoreline processes.

The proposed project is part of a larger pedestrian access system planned for the Ritz Carlton hotel and public pedestrian access system which originates from the Lower Honoapiilani Road.

The Lower Honoapiilani Road, immediately above the project site, is presently substandard and not heavily used. The applicant is proposing to close approximately 1,750 feet of this privately-owned road and improve the area for pedestrian use. The County Council has already approved the closing of this road segment.

In anticipation of an increased use of Fleming Park, the applicant is proposing 70 vehicular parking stalls above the County park facility at the eastern end of the planned pedestrian area. This is being done in compliance with the County Council's desire for a needed overflow parking in the area.

The additional parking will also be available to users of a future bike/pedestrian pathway that will be within the planned pedestrian area. The pathway will allow bicyclists to walk their bikes across as well as pedestrians to traverse the hotel property so access between the adjoining lands can continue. For safety purposes, the public bikeway/pedestrian access will be opened to the public only during daylight hours. From this lateral pedestrian access, the proposed mauka-makai public pedestrian access, as described above, will be provided.

In addition to the proposed pedestrian pathways, the applicant proposes to remove the existing koa haole and ironwood trees and replace them with appropriate landscaping such as groundcover or grass that would more effectively hold the property's soil in place. The relandscaping should help to stabilize the steep area of the property as well as improve views through the shoreline area.

The new pathways and landscape treatment, which are proposed in the Conservation District, are not expected to have any significant adverse effect on the environment. They would not impact any important archaeological site, rare or endangered plantlife species, or sensitive/unique wildlife habitat (See attached Environmental Assessment). The two accesses will not decrease the size of the

beach, nor interfere with the natural shoreline processes. They will not adversely impact the quality of the offshore waters.

The proposed project would improve the safety of access to the shoreline and prevent the acceleration of wear and tear to the beach. Finally, the proposed project would continue to allow the public to use and enjoy Honokahua Bay to the fullest extent possible.

III. COMMENCEMENT AND COMPLETION DATE

The proposed shoreline improvement is scheduled to begin construction in early 1990 and be completed in the fall of 1991.

IV. TYPE OF USE REQUESTED

Permitted Use: DLNR Title 13, Chapter 2, Section 12, Subzone: Limited

Area of Proposed Use: 22,000 sq. ft.

Name & Distance of Nearest Landmark: The project site is located adjacent to Honokahua Bay in Kapalua.

Boundary Interpretation: Attached is a portion of the County Zoning map which indicates the boundary and date of interpretation of the Conservation District by the State Land Use Commission.

Conservation District Subzone: Limited

County General Plan Designation: The project site is designated by the Lahaina Community Plan as Open Space and Business/Commercial.

ADDITIONAL INFORMATION

I. <u>Plans</u>

A. Area Plan: See Figure 1 & 2

B. Site Plan: See Figure 3

C. Construction Plans: See Figure 3 and Appendix of Environmental Assessment

D. Maintenance Plans: The proposed pedestrian pathways and pathway lightings will be maintained by the applicant.

E. Management Plans: Not applicable.

F. Historic or Archaeological Site Plan: No State or Federal Registered archaeological site exists on the project site. A survey of archaeological sites on the property was conducted by Paul H. Rosendahl, Ph.D., Inc. in 1989, and the findings of the surevey are discussed in the attached Environmental Assessment.

II. Subzone Objective

The objective of the Limited Subzone is to limit uses where natural conditions suggest constraints on human activities. The boundaries for this subzone encompass lands susceptible to floods and soil erosion, lands undergoing major erosion damage and requiring corrective attention by the county, state, or federal governments, and lands necessary for the protection of the health and welfare of the public by reason of the land's susceptibility to inundation by tsunami and flooding or to volcanic activity and landslides which incorporate a general slope of 40% or more.

Permitted uses, among others, include flood, erosion, or siltation control projects, recreational uses (which require no physical facilities) and maintenance and protection of desired vegetation including removal of dead and deteriorated plants.

Honokahua Bay is a popular beach recreational area which draws a large number of people to the site everyday. The bay is noted for having on occasions rough surf which cause severe erosion on the beach especially along the back of the sand area. This has resulted in a steep embankment which has made access to the sand difficult from the adjacent property. The applicant is proposing to make the popular recreational shoreline more accessible and safe to reach by providing a stabilized concrete pathway with steps and lighting.

Additionally, further natural erosion of this area will be mitigated by the applicant's proposal to enhance the area's landscaping. As part of the project's general cleanup and maintenance of the shoreline area, which would remove dead

and deteriorated plants, the applicant is proposing to provide additional groundcover up to the certified shoreline. This is expected to slow any erosion process along the shoreline. An irrigation system would be required to sustain the growth of new vegetation in the area.

APPENDIX
Conservation District Use Application

ENVIRONMENTAL ASSESSMENT

The Ritz Carlton, Kapalua
Kapalua, Maui, Hawaii

September 29, 1989

Prepared for:
The Ritz-Carlton Hotel Company
and
Maui Land & Pineapple Company, Inc.

Prepared by:
Belt Collins and Assoc.
Honolulu, Hawaii

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LIST OF FIGURES

I. INTRODUCTION

Purpose

The applicants, The Ritz-Carlton Hotel Company (RCHC) and Maui Land & Pineapple Company, Inc. (ML&P), are proposing a 550-room luxury-class resort hotel at Kapalua, Maui, Hawaii. In 1986, a 450-room hotel was proposed at Honokahua Bay and was approved by the County of Maui. However, recent on-site archaeological findings and community concerns resulted in the relocation of the proposed hotel. The new site is situated immediately mauka of the original site on 36.4 acres of land owned by ML&P, the co-applicant (See Figures 1 & 2). The Tax Map Key identification of the site is 4-2-01: 4, 5, 13, 34 and por. 12 & 18.

Since the hotel is being relocated to a new site, an application for a new permit will be required to replace the project's existing Special Management Area Use Permit which was granted in December 1986 to the original hotel site. The new site involves proposed improvements near the shoreline, therefore necessary approvals will also be required for a County shoreline setback variance and State Conservation District Use Application. Additionally, approval of Lahaina Project District No. 1 zoning is needed for the proposed project to conform with the County's specific land use policies on the mauka portion of Kapalua's resort land. A request for this approval has already been submitted to the Maui County Council and is presently under review. This environmental assessment supplements the owners' applications for a new SMA Use Permit, Shoreline Setback Variance and Conservation District Use Approval.

Applicant

The Ritz-Carlton Hotel Company is an Altanta-based company which has a branch office in Honolulu, Hawaii. Maui Land & Pineapple Company, Inc. (ML&P), the master developer and major landowner of Kapalua, is a Hawaii corporation whose business address is in Kahalui, Maui.

II. DESCRIPTION OF PROPOSED ACTION

Statement of Objective

In the last 15 to 20 years, tourism on the Island of Maui has grown at a rapid and continuous rate and consequently has resulted in the substantial development of visitor destination areas, especially in West Maui and Kihei. This growth has, in turn, generated the construction of a number of new hotels, resort residences and commercial facilities. Meanwhile, development plans are continuing to be prepared

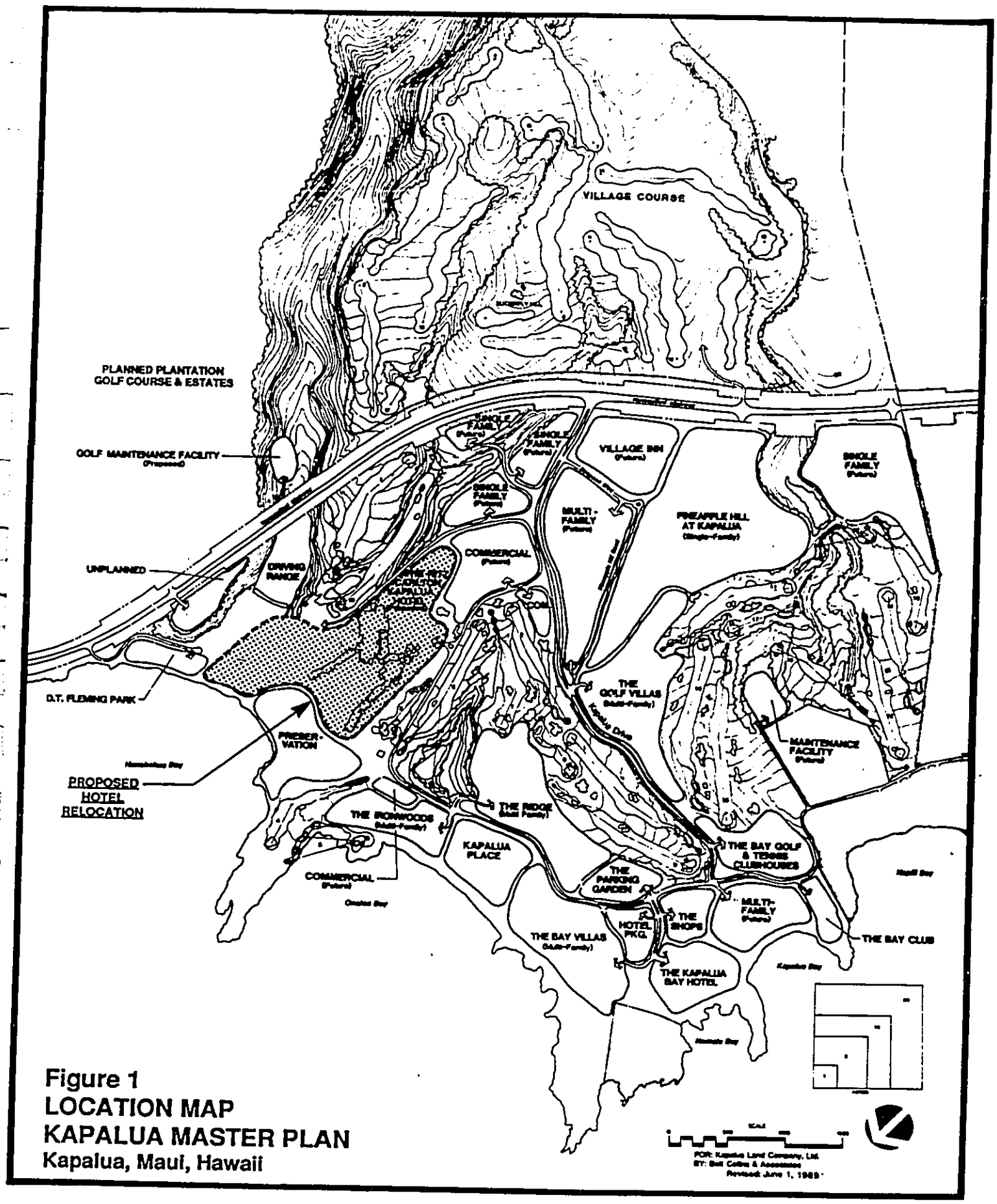


Figure 1
LOCATION MAP
KAPALUA MASTER PLAN
Kapalua, Maui, Hawaii

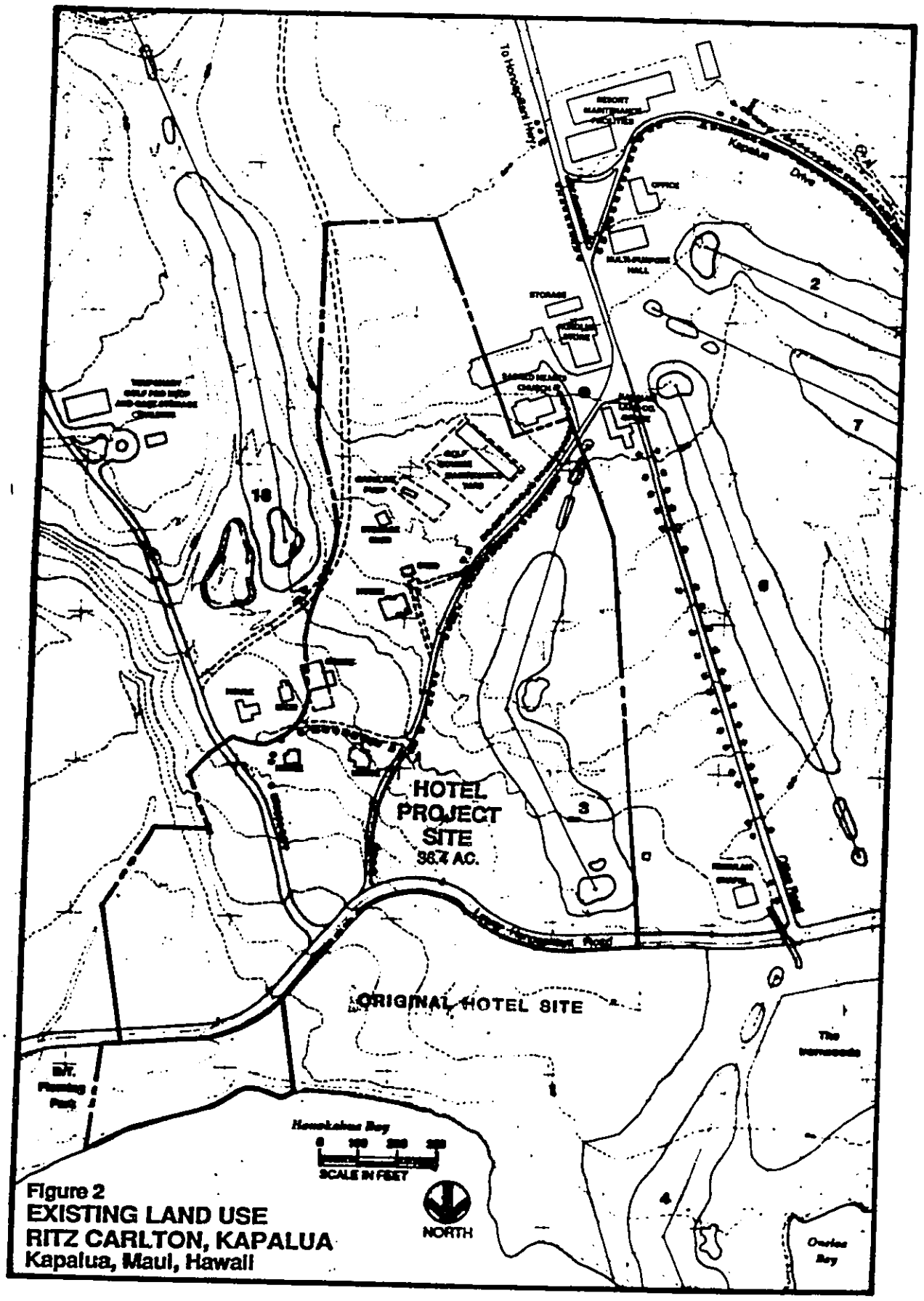


Figure 2
EXISTING LAND USE
RITZ CARLTON, KAPALUA
Kapalua, Maui, Hawaii

for new resort facilities between the existing Kaanapali area and Napili-Kahana area, among other places.

To supplement this growth, a new inter-island airport was constructed above Kahana, a realignment of the Honoapiilani Highway between Kaanapali and Kapalua was completed and a highway expansion project between Lahaina and Kaanapali is currently in progress. The old Kaanapali airstrip near the Kaanapali Resort has already been abandoned and in its place a new resort is being planned.

With the prospect of further growth in West Maui, the owner of Kapalua is encouraged and motivated to continue its high quality development program at the resort. Situated at the northern end of West Maui's visitor destination area, Kapalua is one of the most secluded and most scenic resorts on the island. Combining these site attributes with their philosophy for quality development, the applicants are prepared to develop a second luxury-class hotel at the West End. In support of that effort, the County's Community Plan shows Project District No. 1 designation for the property. Accordingly, hotel use is allowed on the site.

The new hotel is expected to complement the Kapalua Bay Hotel and match its level of excellence, and together would strengthen the stature and long-term success of the overall resort. Furthermore, the new hotel is expected to respond to projected needs in the market place for a second luxury-class accommodation as well as serve the overall anticipated growth in the region.

Background

Initial development at Kapalua began in 1974 with the construction of an 18-hole golf course and clubhouse. Following completion of the golf course, in 1975, Kapalua constructed a beach club and a 141-unit resort residential project behind Oneloa Bay. Then in 1978, the world renowned Kapalua Bay Hotel was constructed and opened. The 194-room luxury accommodation brought stature and a level of quality that was to set the standard for subsequent development at the resort. Since the opening of the hotel, a total of four residential projects, containing 528 units, have been completed. New recreational amenities, including a second 18-hole golf course and tennis club have been added, and recently, a 99-lot hillside single-family residential subdivision has been completed. Kapalua's latest endeavor is an 8-lot single-family beachfront residential subdivision at Oneloa Bay which is presently under construction. Progress within Kapalua is now at a point where the resort is ready to develop a second hotel.

In 1964, when ML&P first undertook preliminary studies to determine the feasibility of a resort development at Kapalua, a beachfront hotel was immediately envisioned at Honokahua Bay. The selected site sat on a beautiful 1,700-foot long

white sand beach tucked between two rock promontories. The site possessed excellent views, related well to other potential resort uses in the mauka land and was intrinsically suited for hotel use. Kapalua has since modified and upgraded its overall resort master plan, a number of times, but has never modified its plan for the project site.

Finally, in 1985, Kapalua proceeded with plans to develop the site for hotel use. The project went through County Special Management Area Permit review and in 1986 was approved. As a condition of approval, followup archaeological work was required before construction could begin. Results of the work while it was in progress showed the existence of substantial burials. The strong interest expressed by a number of community groups in preserving the burials on the site has resulted in the decision by ML&P to relocate the hotel to the new site. This new site is situated immediately above the original site and in an area that has been extensively improved for resort use. An archaeologist has conducted a survey of the project site and found no significant archaeological features that would be impacted by the proposed hotel. His detailed findings are presented in the Archaeological Sites section of this environmental assessment.

Market Study

In April 1985, a market feasibility study was prepared by Laventhol & Horwath for Kapalua to assess the market potential for a hotel at the original project site. The results of the study indicated that there was sufficient market support for 600 hotel rooms in the area. The conclusion was based on the following findings:

- The economic and demographic profile of Maui island was healthy and should remain strong with continuing development of tourist and meeting/convention facilities.

- The proposed site was well suited for a lodging facility because its location is on the ocean, is in the existing 750-acre Kapalua resort, and is in close proximity to the resort's existing recreational amenities and planned retail facilities.

- There were currently five competitive lodging facilities in the market area, with a total of 2,814 guest rooms. These facilities realized an estimated combined 1984 year-end average occupancy level of 86%, with an estimated average daily room rate of $109. The market demand segmentation of these facilities was estimated to be at 41% meeting and convention groups, and 59% tourists, travelers and others.

- o Research indicated that there were two proposed hotels and one proposed expansion/renovation of an existing hotel in the market area. Excluding the subject property, this represented 1,447 guest rooms that would be added to the competitive supply during the projection period.

The projected growth in lodging demand, as noted by the market study, was healthy for both market segments throughout the projection period. Specifically, annual growth rates through 1993 are projected to range from 5% to 14% in meeting and convention demand; and 5% to 10% in the tourists, travelers and others demand. The cumulative growth of lodging demand between 1985 and 1993 was projected to range from 5% to 10% annually. According to the market study, these projections were adequate to accommodate the proposed development at Kapalua.

In June 1989, Laventhol & Horwath updated their market study for the proposed hotel. The findings of the current study indicate that the luxury resort demand segment of the market will experience a stronger growth than the statewide demand for hotel room accommodations. The study estimates the luxury demand will increase from 7.6 percent to 12. 9 percent of the statewide total.

Considering existing and announced planned facilities in the luxury resort facilities market, the Laventhol study ascertains the proposed Ritz Carlton hotel will have the following competitive advantage:

- o Location in the Kapalua Resort area on Maui, an island recognized as one of the premier luxury resort destinations in the State of Hawaii;

- o Strong market penetration levels achieved by its existing hotels and resorts located on the mainland U.S.;

- o Superior quality and quantity of food and beverage, meeting and recreational facilities; and,

- o Management and marketing by the Ritz-Carlton Hotel Company, a well-recognized luxury hotel management company, which presently operates luxury hotels and resorts on the mainland U.S.

In its final conclusion, the market study indicates that the proposed 550-room hotel will capture more than its fair share of the competitive luxury resort damand, especially in the group sector of this market.

Project Description

Current plans call for a 550-room luxury-class resort hotel at Honokahua Bay, although the applicants' market study supports a 600-room hotel (See Figures 3 - 6). The proposed facility, which would accommodate predominantly long-term staying guests, will embrace an architectural style that is reminiscent of a Mediterranean venacular. Its construction will be of concrete in a formal style and its color will be off-white or other neutral hue. The roof of the building will be of clay or concrete tile construction.

Preliminary building plans call for a 2- to 3-story main structure, containing the hotel lobby and common facilities, and two building wings containing the guest rooms. The building wings will varying in height from 4 to 6 stories and branch out from the main structure toward the ocean. Between the building wings will be a pool area and landscaped garden.

The hotel will contain approximately 63 executive suites, 3 presidential suites, and 484 regular guest rooms. The common or public areas of the hotel will consist of a main lobby, restaurants, bar and lounges, retail shops, banquet/ballrooms, meeting rooms, auditorium and fitness center. The table below lists the functions and floor area of the proposed hotel.

Preliminary Hotel Function Areas	Preliminary Floor Area (in s.f.)
Guest Rooms (550)	370,880
Food and Beverage Areas	20,250
Guest Amenities/Indoor Recreation	8,600
Front Desk and Administrative Offices	5,410
Function Areas	29,100
Retail Shops	19,000
Public Areas and Circulation	51,200
Back-of-House	46,550
Total Building Area	550,990

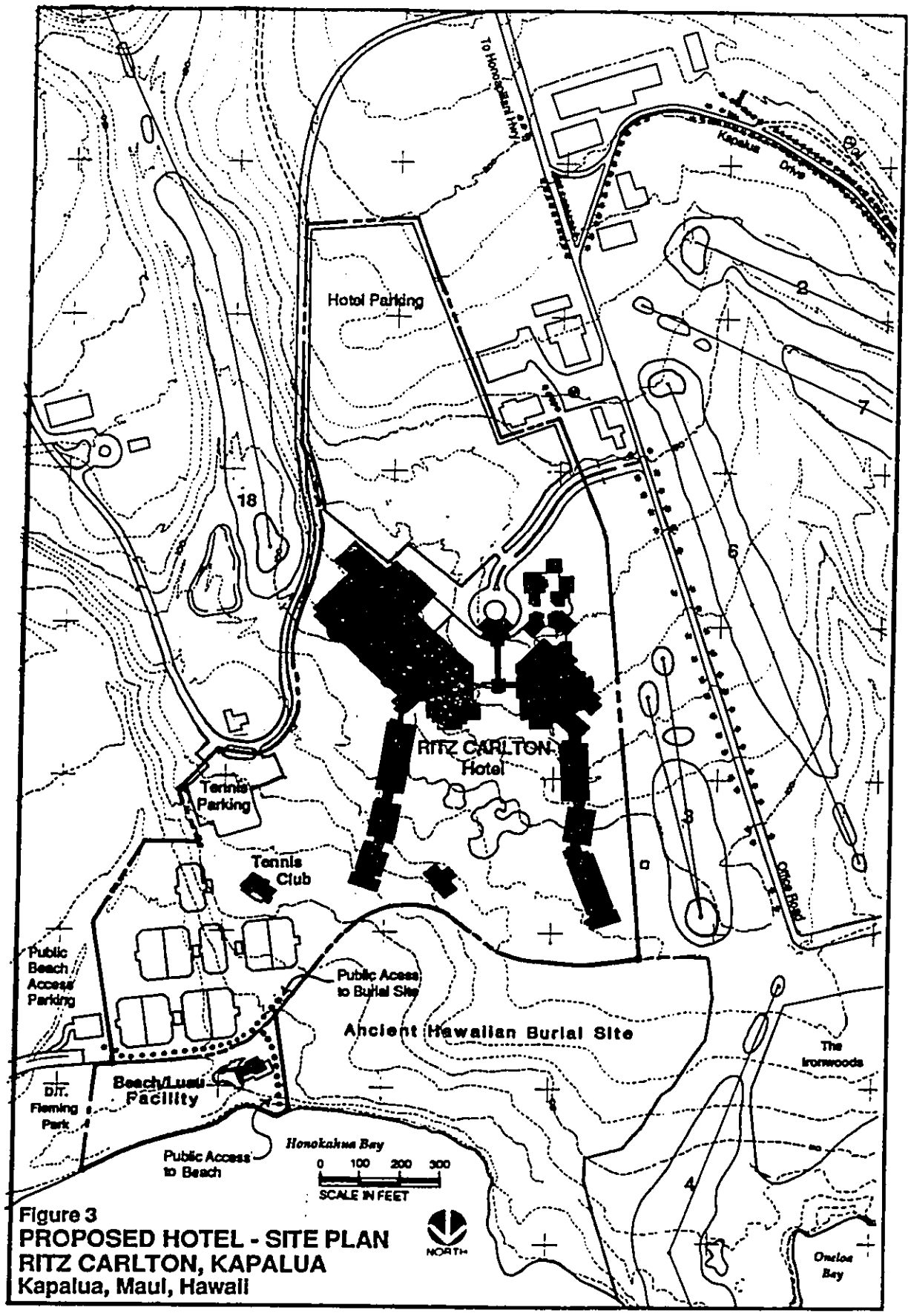
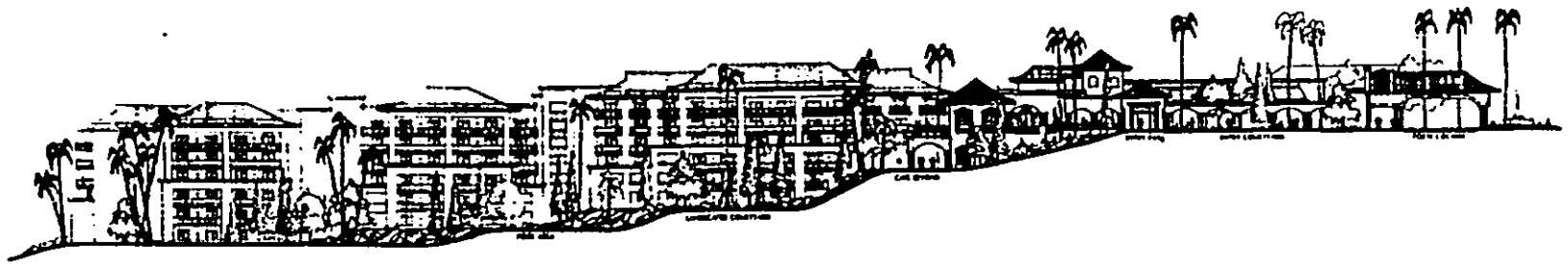


Figure 3
PROPOSED HOTEL - SITE PLAN
RITZ CARLTON, KAPALUA
Kapalua, Maui, Hawaii

SECTION THROUGH SITE



WEST ELEVATION - COURT

NORTH ELEVATION

Figure 4
PROPOSED HOTEL -
ELEVATIONS & SITE SECTION
RITZ CARLTON, KAPALUA
Kapalua, Maui, Hawaii

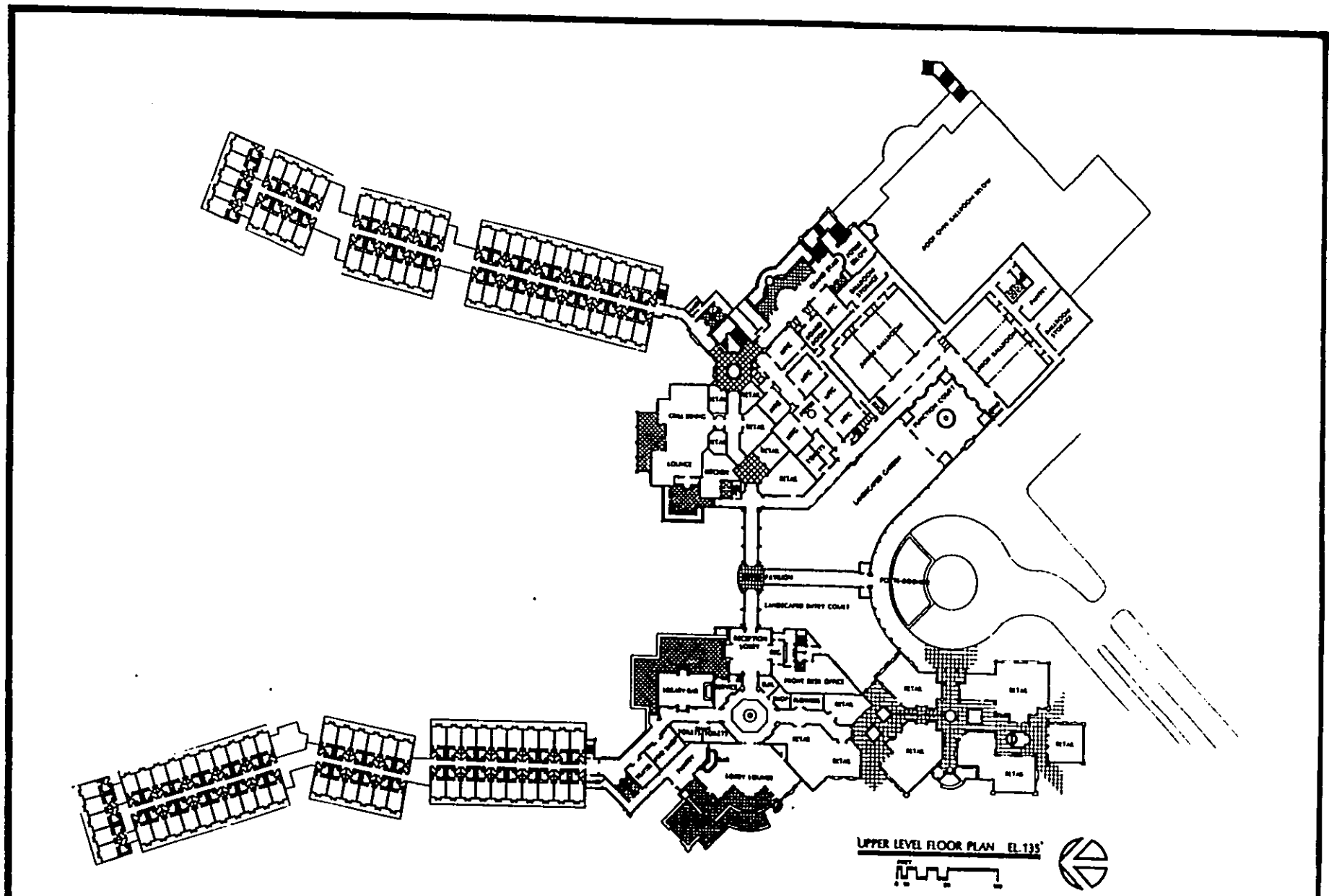


Figure 5
PROPOSED HOTEL -
FLOOR PLAN, LOBBY & COMMON AREAS
RITZ CARLTON, KAPALUA
Kapalua, Maui, Hawaii

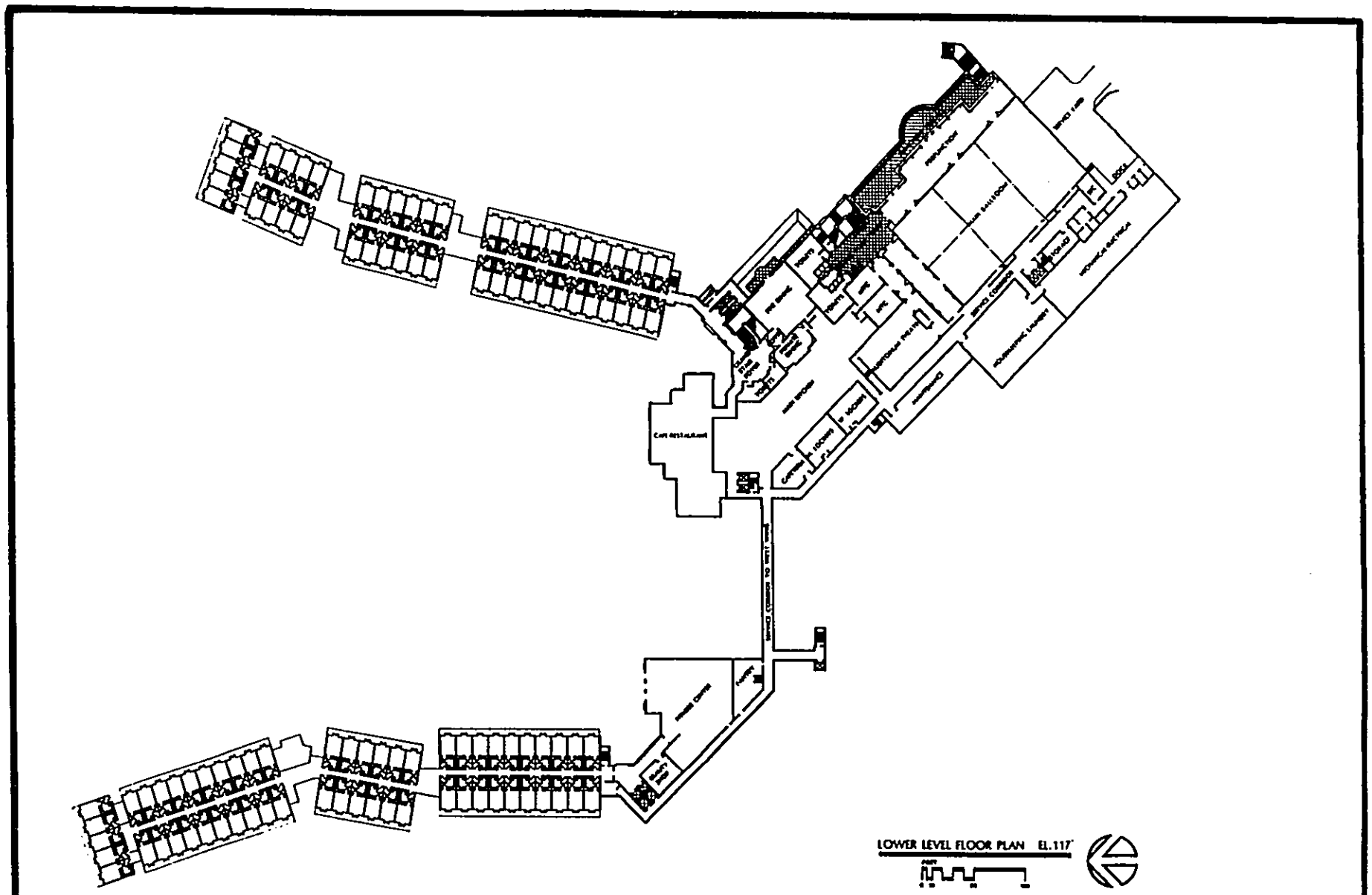


Figure 6
PROPOSED HOTEL -
FLOOR PLAN, LOWER LEVEL
RITZ CARLTON, KAPALUA
Kapalua, Maui, Hawaii

The proposed hotel will be situated on an extensively landscaped setting comprised of lush vegetation and large open spaces. Special features will include a garden and water feature. Recreational amenities will include swimming pool, spa, open landscaped areas for strolling and passive outdoor activities, and pedestrian pathways from the hotel to the beach. This type of open setting will enhance the low-profile character of the area.

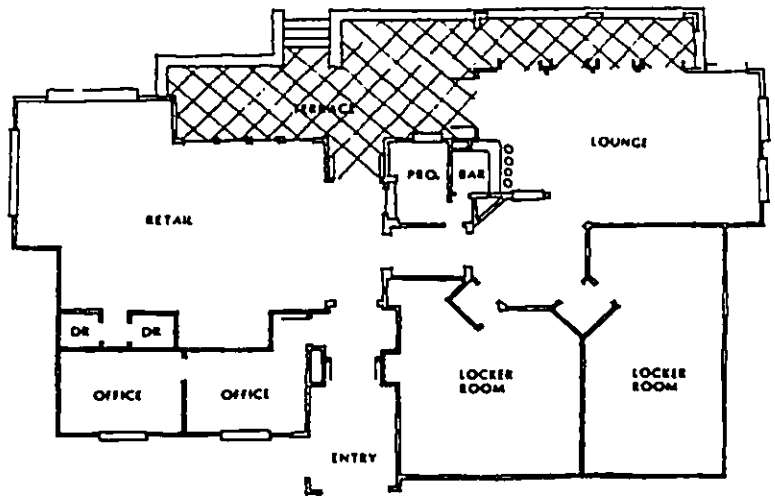
The proposed hotel will require a larger site than the original site, because it now includes an at-grade parking area which was previously contained within a parking structure and buildings which will spread out over a larger area to incorporate more extensive landscaping. These additional landscape elements will contribute to the overall low-density rural character of the project.

As an amenity for the proposed hotel, Ritz Carlton is proposing a tennis facility which will include a club house and ten tennis courts (See Figure 7). One of the courts will be for championship play and the remaining courts will be for regular play. The club house, which will contain approximately 5,000 sq. ft. of floor area, will include a pro shop, office, retail space, lounge, lockers and parking. Its architectural style will be compatible with the style of the new hotel.

In the makai section of the property, the applicants are proposing a luau and beach facility for guests of the hotel (See Figure 8). The facility will include a large lawn and grassed luau area and a building that will contain dressing rooms for the luau activities, storage room for beach activities, men's and women's rooms, and a room for food and beverage service. Similar to the hotel and tennis club house, the beach facility, which will consists of approximately 4,500 sq. ft. of floor area, will have a Mediterranean architectural style. Such a facility is essential for this hotel which will be located more than 500 feet from the beach.

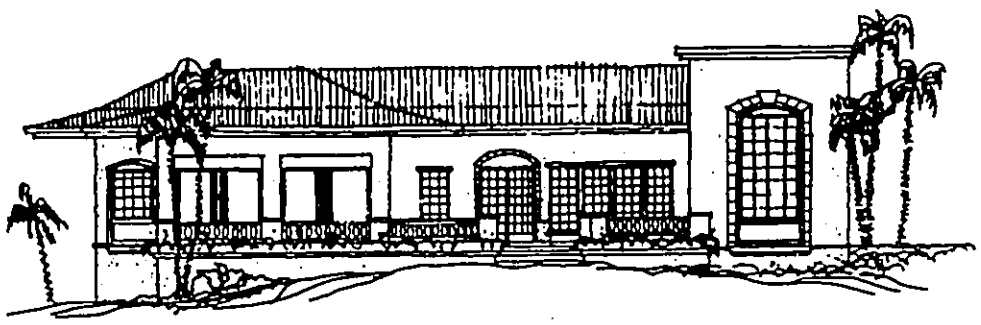
The proposed hotel parking will accommodate approximately 800 vehicular stalls or adequate parking to meet County requirements. It will be landscaped so its visual effect on the surrounding areas will be softened. In anticipation of the increased use of the adjacent D.T. Fleming Park and in compliance with the County Council's desire for adequate parking, an additional 70 stalls will be provided on ML&P land adjacent to the public park for park users.

Construction of the proposed project will require improvements to certain off-site and on-site infrastructure. Access to the hotel will be provided by a new entrance road from Office Road. The entrance road will be approximately 600 feet in length and will be owned and maintained by the hotel. Additionally, access to the hotel's tennis club and resort's planned relocated mauka golf clubhouse will be provided by a new access road that will connect with Office Road mauka of the



TENNIS HOUSE FLOOR PLAN

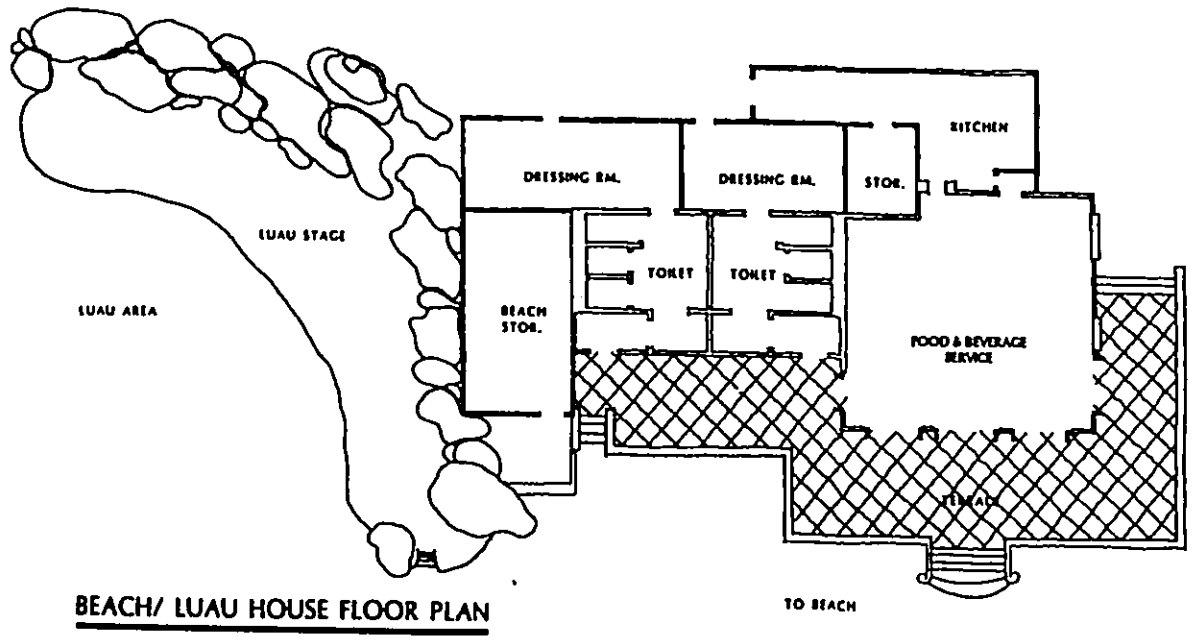
ENTRY ELEVATION



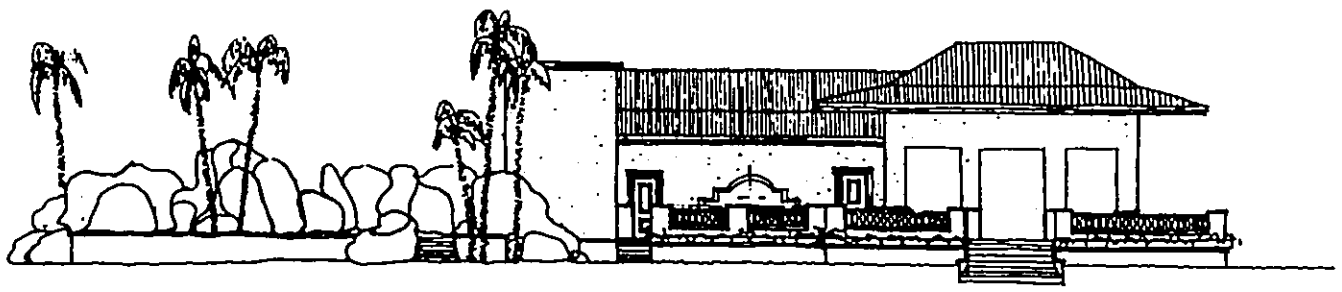
COURT SIDE ELEVATION

Figure 7
TENNIS CLUB -
FLOOR PLAN & ELEVATION PLAN
RITZ CARLTON, KAPALUA
Kapalua, Maui, Hawaii

0 5 10 20 30
SCALE IN FEET



BEACH/ LUAU HOUSE FLOOR PLAN



BEACH ELEVATION

Figure 8
BEACH / LUAU FACILITY
FLOOR PLAN & ELEVATION PLAN
KAPALUA MASTER PLAN
Kapalua, Maui, Hawaii

0 5 10 20 30
SCALE IN FEET

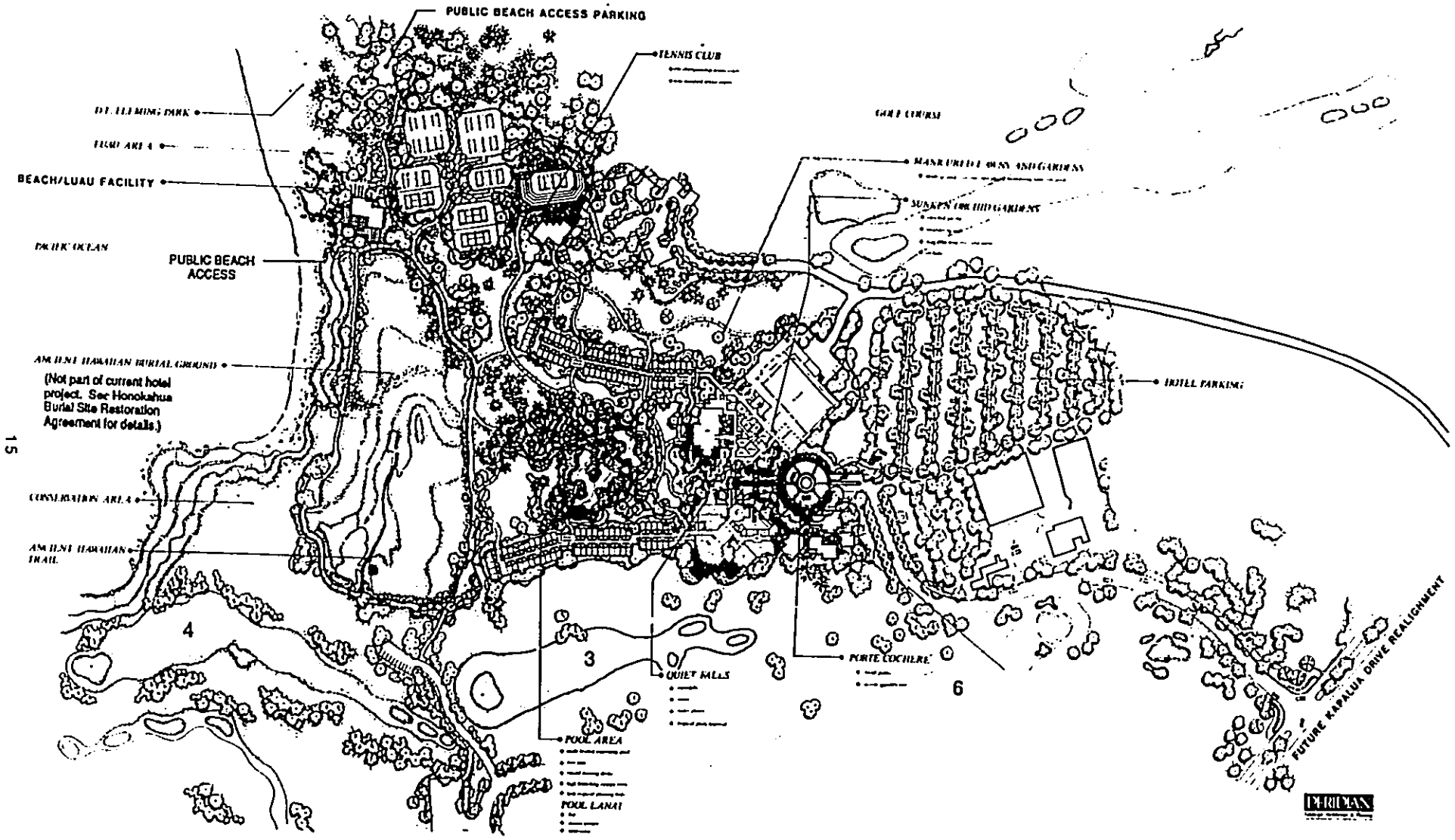


Figure 9
LANDSCAPE CONCEPT PLAN
RITZ CARLTON, KAPALUA
Kapalua, Maui, Hawaii

0 200 400
SCALE IN FEET

NORTH

hotel's proposed parking area. The planned golf clubhouse relocation is not part of the current proposed hotel project.

The Lower Honoapiilani Road, which traverses the makai section of the project site, is presently substandard and not heavily used. The applicants are proposing to close approximately 1,750 feet of this privately owned road with the approval of the County and improve the area for pedestrian use.

To accommodate bicyclists and pedestrians across the lower portion of the project site, the applicants propose to build for public use a bike/pedestrian pathway that will generally follow the closed portion of the Lower Honoapiilani Road. The pathway will allow bicyclists to walk their bikes across as well as pedestrians to traverse the lower portion of the property so access between the adjacent lands can continue. For safety purposes, the public bikeway/pedestrian access will be opened to the public only during daylight hours.

In conjunction with this lateral access, a mauka-makai beach access to Honokahua Bay will be provided for public use. It will be located near the western boundary of the beach/luau facility parcel and will consist of a paved walkway, low pathway lights and pathway sign. A second and similar pathway will also be provided from the beach/luau facility to the beach for the hotel guests.

All water and sewer lines, and underground electrical and telephone lines, required for the proposed development, will be installed underground.

The original hotel site, which is located on the makai side of the present project site, will be restored and landscaped to preserve the natural open environment of the coastal land. This improvement will be done as a separate project from the hotel and thus is not part of the hotel permit applications.

Project Schedule

The proposed hotel is scheduled to begin construction in early 1990 and be completed in the fall of 1991. Opening of the hotel is scheduled for the end of 1991.

Project Cost

The preliminary construction cost of the hotel is estimated to be $104 million. This figure is an order-of-magnitude estimate based on present day prices. A breakdown of the cost is as follows:

Hotel, Tennis & Beach Facilities	$ 85 million
Landscaping	10
On-Site Infrastructure	5
Off-Site Infrastructure	4
Total	$ 104 million

III. RELATIONSHIP TO STATE AND COUNTY LAND USE POLICIES

Hawaii State Plan

The Hawaii State Plan was adopted in 1978 to serve as a guide for the long-range future development of the state. It establishes an overall theme, goals, objectives, policies, priority directions, and a system for plan formulation and program coordination for the integration of all major State and County activities.

The goals for the State are set forth in the areas of the economy, physical environment, and physical, social and economic well-being. Moreover, the objectives and policies of the State Plan are set forth in the areas of population, the economy, the physical environment, facility systems and socio-cultural advancement.

The proposed project is consistent with a number of the broad objectives and policies embraced in the State Plan. Below is a list of those objectives and policies which are particularly applicable or related to the proposed development.

SELECTIVE LIST OF APPLICABLE STATE PLAN OBJECTIVES AND POLICIES

Population:

- o Manage population growth statewide in a manner that provides increased opportunites for Hawaii's people to pursue their physical, social, and economic aspirations while recognizing the unique needs of each county.

Economy-Visitor Industry:

- o Improve the quality of existing visitor destination areas.

- o Encourage greater cooperation between the public and private sectors in developing and maintaining well-designed and adequately serviced visitor industry and related developments.

- o Ensure that visitor facilities and destination areas are carefully planned and sensitive to existing neighboring communities and activities.

The Physical Environment - Land-based, Shoreline and Marine Resources:

- o Maintain prudent use of Hawaii's land-based, shoreline and marine resources.

- o Assure effective protection of Hawaii's unique and fragile environmental resources.

The Physical Environment - Scenic, Natural Beauty, and Historic Resources:

- o Planning for the State's physical environment shall be directed towards achievement of the objective of enchancement of Hawaii's service assets, natural beauty, and multi-cultural/historical resources.

State Functional Plans

The State Plan calls for the preparation of twelve State Functional Plans, each of which concerns itself with one specific functional area, e.g., transportation, tourism, housing, agriculture, etc. These functional plans are to:

> " . . . contain objectives to be achieved and policies to be pursued in the primary field of activity and such policies shall address major programs and the location of major [State-financed] facilities. The functional plan[s] shall also contain implementation priorities and actions which may include, but not be limited to, programs, maps, regulatory measures, standards, and interagency coordination provisions." (Section 57(b), The Hawaii State Plan)

All twelve functional plans have been adopted by the State Legislature. These plans were mandated to serve as guides in each functional area. It is the applicants' intent to consider and be as consistent as possible with these plans in the development of the proposed hotel.

State Land Use Law

All lands in the State of Hawaii are classified into four land use district categories: Urban, Rural, Agricultural and Conservation. The proposed project is located primarily in the Urban District which allows hotel and other resort uses. Responsibility for land use controls within the Urban District on the Island of Maui lies with the County of Maui.

The remaining portion (approximately 1 percent) of the property lies within the Conservation District along the shoreline. This area will not contain any hotel, tennis or beach house facilities. Paved pedestrian accesses to the beach, however, will be provided through the Conservation District to facilitate a convenient, safe and permanent walkway for the public and hotel guests. Additionally, general upkeep and ground maintenance are planned to improve the overall appearance of the shoreline area. An application to the State Department of Land and Natural Resources will be filed for all proposed improvements within the Conservation District.

Maui County General Plan

The current County of Maui General Plan sets forth the broad objectives and policies for long-term development on the Islands of Maui, Molokai, Lanai and Kahoolawe. Its objectives and policies, adopted in 1980, are intended to supplement and enhance the objectives and policies of the Hawaii State Plan. Of particular importance to the proposed project is the General Plan's requirement to provide Community Plans for the nine regions of the County. These community plans are intended to establish specific land use policies to implement the broader policies of the County-wide General Plan.

Community Plan

In December 1983, the Lahaina Community Plan was adopted by the County of Maui to provide a relatively detailed scheme for the General Plan's broad objectives and policies on development in the Lahaina region. Encompassing the area from Papawai Point to Honokohau and including the resort community of Kapalua, the Lahaina Commmunity Plan sets forth the desired sequences, patterns and characteristics of future development in West Maui to the year 2000.

In accordance with the Lahaina plan, the proposed hotel is consistent with the document's policies on economic activities, environment, support systems and recreation/culture. The land use section of the Lahaina plan shows the project area within the Lahaina Project District No. 1 and Business/Commercial designations (See Figure 10). According to the County attorney, the proposed hotel is consistent with the land use section of the Community Plan.

County Zoning

Land Zoning Map No. 944 of the County of Maui designates the project site as A-2 Apartment, BR Resort Commercial, Open Space, State Urban District and State Conservation District. The zoning map also shows parcels identified as State of Hawaii and Other Owners. However, due to subsequent land exchanges the only landowner in the area other than ML&P, is the Catholic Church which owns a parcel adjacent to the Honolua Store. Approval of the Lahaina Project District No. 1 zoning request will be required for the project site. This process is presently underway at the County Council.

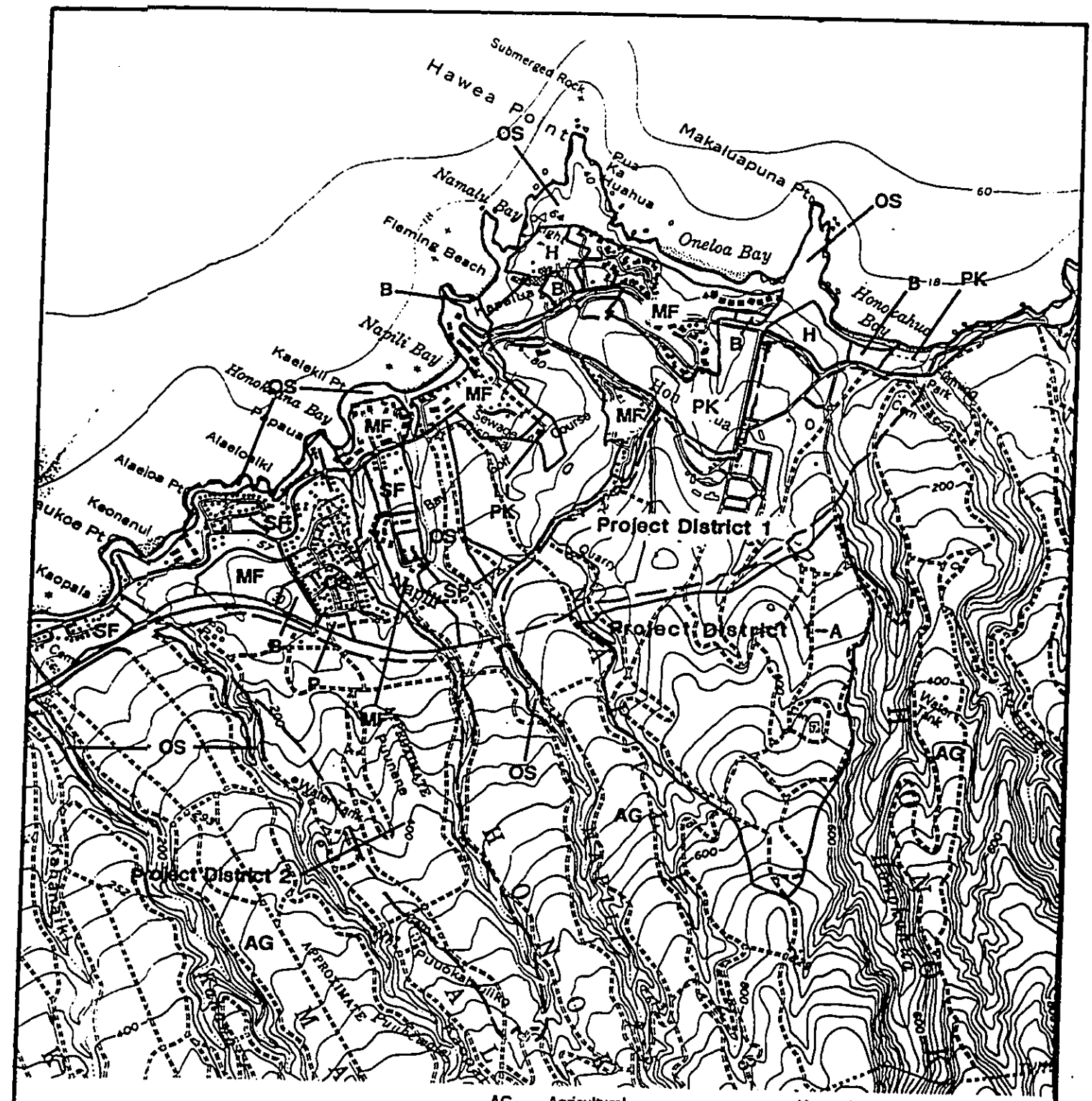
The proposed number of hotel rooms and building height are within the maximum allowed by the County zoning ordinance. The project owner will provide the required parking for the proposed hotel as called for by the existing zoning ordinance.

County Housing Requirement

ML&P has secured from the County of Maui, an employee housing credit for 432 hotel rooms as a result of its contribution of 13.5 acres of land to the County's Hale Noho housing project. Present plans for the hotel call for 550 rooms which means the project is required to provide employee housing for the remaining 118 rooms. Based on the County's employee housing formula, the 118 rooms interpret to 20 housing units, 20 lots or a cash payment of $180,000 to the County. The applicants intend to meet this requirement by participating in the provision of the required housing units.

Special Management Area

The project site is located in the Special Management Area (SMA) of the West Maui region and is thus subject to the SMA Rules and Regulations of the County of Maui. This environmental assessment has been prepared as a support document to the owner's request for an SMA Use Permit, which if approved, would allow the development of the proposed project. A discussion of the project's relationship to the SMA objectives, policies and guidelines is presented in Chapter IX of this document.



AG	Agricultural	H	Hotel
SF	Single Family Residential	P	Public/Quasi-Public
MF	Multi- Family Residential	PK	Park
B	Business/Commercial	OS	Open Space
C/R	Conservation/Residential	PD	Project District
LI	Light Industrial		

1000 0 1000 2000 3000
Feet

Figure 10
LAHAINA COMMUNITY PLAN
RITZ CARLTON, KAPALUA
Kapalua, Maui, Hawaii

Shoreline Survey

As required by the SMA Rules and Regulations of the County of Maui, a shoreline survey was conducted on April 10, 1989 by a registered land surveyor and certified on June 7, 1989 by the State Board of Land and Natural Resources. A delineation of the certified shoreline boundary is shown on Figure 11.

The proposed project will not involve any improvements within the 40' shoreline setback except for general site clean up, maintenance and two pedestrian access connections to the beach. One access, which would be in line with the County's SMA approval conditions for the original Ritz-Carlton hotel, will extend from a planned public parking on Lower Honoapiilani Road to the shoreline along the western boundary of the project's beach facility parcel. The access will be paved, approximately 3' to 5' in width, and provided to the public in perpetuity. The second access will be for hotel guests and will extend from the beach/luau facility to the beach. A shoreline setback variance application is being filed with the County for the proposed accesses.

Subdivision

The project site contains five parceis, all owned by ML&P. The Lower Honoapiilani Road, the portion which crosses the project site, represents the sixth parcel in the project area. This right-of-way parcel is owned by ML&P, but the owner has agreed to seek approval from the County Council before proceeding with any improvements within the right-of-way. Accordingly, a request to close the road across the project site is being made to the County Council to initiate the review and approval process.

Once County approval is obtained, the applicants will submit a consolidation/resubdivision application to the County Planning Department for the proposed hotel site. The application will reflect Honoapiilani road's closing and a two-parcel configuration for the property. One of the parcels, the reconfigured property, will encompass the hotel and tennis club. The second parcel, which is an existing parcel, will contain the beach/luau facility. This proposed consolidation/resubdivision action is part of the applicants' request for SMA approval.

IV. DESCRIPTION OF THE PROJECT SITE, IT'S NATURAL ENVIRONMENT, AND THE PROJECT'S PROBABLE IMPACTS

Kapalua Resort Community

Kapalua is a master planned resort community located on the northern coast of West Maui approximately four miles north of Kaanapali Resort and seven miles north of Lahaina. It is spread over 750 acres of choice coastal land in the Maui Land & Pineapple Company's 23,000-acre Honolua landholding. The selected site is situated in an area where many of the appealing natural resources for resort development are located. Three large sand beaches, spectacular viewing sites, breathtaking ravines, landmark Cook Pines and beachfront coconut tree grove comprise some of the unique features of the property. In addition, combining year-round warm and sunny climate, popular visitor attractions and quality accommodations, Kapalua is one of the most attractive and foremost visitor destination areas in the state.

Since 1964, when planning and preliminary programming for Kapalua was first initiated, a number of facilities have been developed that brought worldwide recognition for high quality accommodations and recreational amenities to the West Maui resort. Listed below are Kapalua's resort projects and their development status.

FACILITIES AT KAPALUA RESORT

Project	No. of Units	Status
Kapalua Bay Hotel	194 rooms	Completed
The Bay Villas	141 units	Completed
The Bay Course	18 holes	Completed
The Village Course	18 holes	Completed
The Bay Club	restaurant	Completed
The Tennis Garden	10 courts	Completed
The Golf Villas	186 units	Completed
The Ironwoods	40 units	Completed
The Ridge	161 units	Completed
Pineapple Hill	99 lots	Completed
The Shops	22,000 s.f.	Completed
Kapalua Place	8 lots	Under Construction
Resort Res at Kapalua Bay	100 units	Planned
Future Commercial	N.A.	Planned

Table (continued)

Project District No. 1		
The Ritz Carlton, Kapalua	550 rooms	Projected Opening in 1991
Hotel	500 rooms	Planned
Resort Residential	800 units	Planned
Commercial	10 acres	Planned
Recreational Open Space & Circulation	95 acres	Planned
Mauka Land (Above Honoapiilani Highway)		
The Plantation Course	18 holes	Planned
Residential	N.A.	Planned

In the long-term future, Kapalua is expected to have a total of approximately 1,250 hotel rooms, 1,600 to 1,800 resort residential units, three golf courses, commercial facilities and a number of other recreational amenities. The West Maui resort is envisioned to continue to serve the Free and Independent Travelers (FITs) and group tours, and to provide a full-range of quality services and facilities for its guests.

The proposed Ritz Carlton hotel will be the only other hotel to be developed near the shoreline at Kapalua (the first hotel being the existing Kapalua Bay Hotel). It is planned to anchor the resort's eastern end and complement the Kapalua Bay Hotel which is located on the western end. The new hotel is anticipated to enhance the overall stature and viability of the resort community.

Existing Land Use

The project site is located above Honokahua Bay in the northeastern section of Kapalua. Irregular in shape, it measures approximately 1,400 feet in width parallel with the shoreline, and approximately 2,400 feet in depth. It is presently occupied by a golf hole, four residences, a golf course maintenance yard, two storage sheds and approximately 8.2 acres of undeveloped land. The total area of the site is 36.4 acres.

Honolua Plantation, which once operated a pineapple plantation in the area, never cultivated crops on the proposed hotel site. The area near Makaluapuna Point was originally used as a stable.

The land above the bay from the Lower Honoapiilani Road to approximately the resort maintenance facilities east of Office Road was the housing village for the old plantation. It was phased out a number of years ago; the last homes were

removed in the early 1980's. What now remains are a few buildings which were preserved or converted to accommodate some of the present resort operations. Included are the Honolua Store and Kapalua administrative building. In the early 1980's, the Sacred Hearts Church was constructed near the Honolua Store. Although within close proximity to the new hotel site, these facilities will not be affected by the proposed development. Current plans call for preserving this area and keeping it as part of the historically quaint area of the resort.

In the mauka portion of the project site is the storage and maintenance yard for the resort's existing golf course. This facility will be relocated within Honokahua Gulch above Honoapiilani Highway where it would be removed and hidden from the guest activities of Kapalua.

In the middle section of the old settlement near a shallow ravine are the previously described existing residences, some of which were part of the former plantation village. These residences will be removed and the tenents, who occupy three of the four residences and are employees of either ML&P or Kapalua resort, will be purchasing in the 38-lot Honokeana Subdivision in nearby Napili.

At the intersection of Office Road and Lower Honoapiilani Road is an old church building which is presently being used as an office space by the Kumulani Chapel. The land is owned by the resort and is leased to the church. Once construction on the hotel begins, the old church building may be removed and the land converted to the new use. Above the old church is the 3rd hole of the Kapalua Golf Course. This hole will be relocated to a vacant area along Office Road in order to make way for the proposed hotel.

ML&P's predecessor, Honolua Ranch, originally raised and sold cattle on the property. A stable once occupied a portion of the original hotel site and remnants of two old concrete troughs resembling cattle water basins were discovered in the area.

The property is bounded on the north by the shoreline and Lower Honoapiilani Road, on the west by Office Road , on the east by the 18th golf hole and Kapalua's temporary golf clubhouse and on the south by vacant land which was once a portion of the Honolua Village. The makai portion of the project site is bounded on the west by the original hotel site and on the east by the County's D.T. Fleming Park. The public park, which occupies land owned by ML&P but is leased to the County, includes a comfort station, showers, picnic area and parking.

The proposed hotel entrance road is planned to connect with Office Road. In addition, a portion of the Lower Honoapiilani Road which crosses the lower section of the project site is being proposed for closure and to be replaced with landscaping. Although this section of the road is owned by Kapalua Land Company, the resort

owner will request approval from the County before any work is done on the right-of-way.

Physiography

The project site has an average incline of 5 to 10 percent that slopes seaward primarily from south to north toward Honokahua Bay. A small section of the property also slopes seaward from the southwest to the northeast toward the side property line. Property elevations range from the shoreline at the project site's northern boundary to the 200-foot elevation at the project site's southern boundary.

Surface runoff appears to occur by sheetflow or by rapid ground percolation, as no discernible drainage pattern is evident. Runoff from the properties above the project site is intercepted by the Honoapiilani Highway and carried into the adjacent Honokahua Stream gulch. The lands immediately above the the project site are vacant and in pineapple use. The pineapple field will be discontinued this summer when it is harvested for the last time to make way for future resort use. This area is located within Kapalua and has been master planned for resort use for many years.

Construction of the proposed hotel will result in alteration to the project site. Grading will be required to establish foundations and building pads for the hotel structure, pool decks, and parking area (See Figure 11). It is planned, however, that the site's earthwork will be minimized by the building's spread out configuration and adaptability to the terrain. Because the owner desires to minimize site work, no importation or exportation of soil is planned. Landscape maintenance work will be done in some areas in the Conservation area to improve the appearance of the shoreline. Further, since no major surface runoff pattern is evident on the property, the proposed hotel would not obstruct or hinder any major natural drainage in the vicinity. A preliminary drainage report has been prepared by Warren S. Unemori Engineering, Inc. for the proposed project (See Appendix A).

Geology

Kapalua is located on the northwestern flank of the West Maui Mountains. This large dormant volcano is one of the two major volcanoes that formed the Island of Maui; the other being Haleakala. The West Maui Mountains is the older of the two as evidenced by the mountain's advanced stage of erosion. Deep gulches and ravines dominate all flanks of the 5,788-foot high mountain.

One of the major gulches on West Maui Mountains' northwestern flank is Honokahua Stream gulch. It is almost 6 miles long and over 400 feet deep at some locations. Honokahua Bay situated at the shoreline of Honokahua Stream gulch was created by centuries of surface runoff. Coral accumulation and breakdown

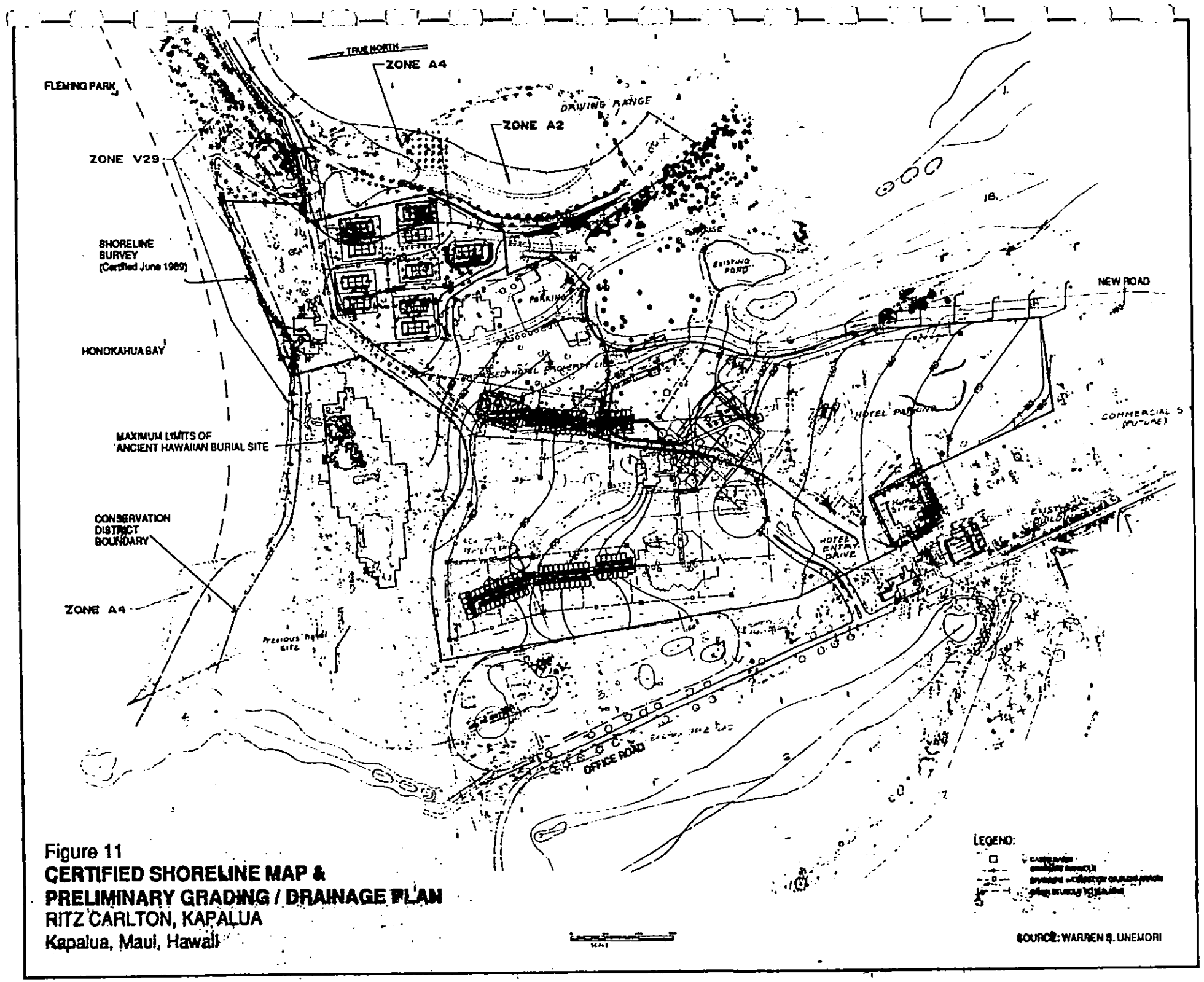


Figure 11
CERTIFIED SHORELINE MAP &
PRELIMINARY GRADING / DRAINAGE PLAN
RITZ CARLTON, KAPALUA
Kapalua, Maui, Hawaii

around Maui island and ocean current entering the bay have contributed to the subsequent formation of the bay's sand beach. Runoff from Honokahua Stream gulch is currently constricted and retarded by heavy vegetation that now covers the gulch as well as the entire West Maui Mountains and by the diversion of irrigation water for agricultural use. Runoff in Honokahua Stream gulch still continues to flow during heavy rainfall but is limited and confined to a narrow drainageway on the eastern boundary of the project site. Makai of the property, the drainageway runs through the rear and around the eastern end of Fleming Park before entering Honokahua Bay. Although a portion of the project site is located in the original gulch formation, the main facilities of the proposed development are well set back from the gulch's present drainage.

Soils

There are three soil types that comprise the soils on the property: Kahana silty clay (KbB), Pulehu clay loam (PsA) and rough broken land (rRR). Two additional soil types, dune land (DL) and beaches (BS), comprise the land types in the shoreline area (See Figure 12).

Approximately 84 percent of the project site is covered by the Kahana silty clay according to maps prepared by the U.S. Soil Conservation Service. This soil consists of well-drained materials developed in soil weathered from basic igneous rock. Runoff from this soil is slow and its erosion hazard is slight.

Pulehu clay loam comprises 8 percent of the property and compasses the eastern section of the project site in the Honokahua gulch area. This soil type consists of well-drained soils on alluvial fans, stream terraces and in basins. Permeability is moderate, runoff is slow, and the erosion hazard is no more than slight.

Rough broken land also comprises 6 percent of the project area and encompasses the gulch walls of Honokahua. It has soil depth that range from 20 to more than 60 inches over soft, weathered rock. In most places, some weathered rock fragments are mixed with the solid material. Small areas of rock outcrop, stones, and soil slips are common. Runoff is rapid, and geologic erosion is active.

Beach sand and dune land comprise the other soil types on the property. The beach sand is of the light-colored variety derived from coral and seashells. Quantities of this material have been wind-blown onto inland areas of the property and have contributed to the formation of dune land immediately behind the beach.

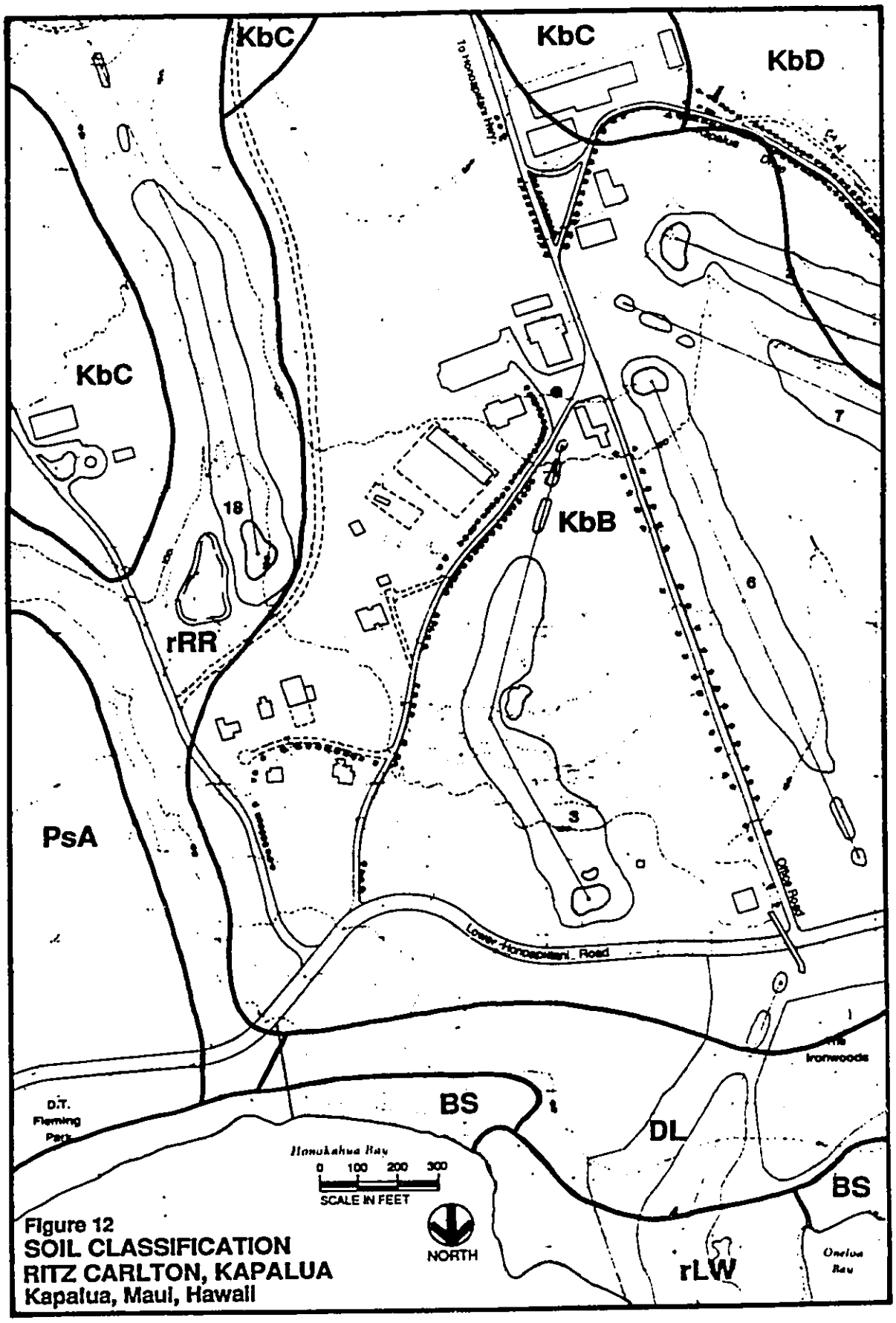


Figure 12
SOIL CLASSIFICATION
RITZ CARLTON, KAPALUA
Kapalua, Maui, Hawaii

Agricultural Potential

According to the U.S. Soil Conservation Service (SCS), the soils of the Kahana silty clay series are suitable for most kinds of crops with some limitations. The SCS Capability Classification rates these soils an IIe on a scale of I to VIII (I being soils with the least limitations and VIII being soils with the most limitations on potential agricultural use). Soils of this rating are considered to have limitations that reduce the choice of plants that can be grown. The main limitation is risk of erosion, however, close-growing plants or other protective measures may be undertaken to reduce this risk.

The Pulehu clay loam has a Capability Classification of I which indicates there are few limitations in the soil which restricts its use. Pulehu clay loam, however, is located in the reaches of Honokahua Gulch and is susceptable to flooding. It also represents only 6 percent of the project site.

Rough broken land has a Capability Classification of VIIe which indicates the soil has very severe limitations that make it unsuited to cultivation. The subscript "e" following the numerical classification indicates the limitation in the soil is due, in large part, to the erosion potential of the ground material.

The sand and dune land areas are poorly suited for agricultural use. The SCS Capability Classification of these soils is VIII which is considered to possess the most extreme limitations. Such limitations preclude the soils' use for commercial plant production and restrict the use to such purposes as recreational and aesthetics. Also, the soils have been noted to have such limitations that include severe erosion potential and susceptibility to excessive water (i.e., tidal sea water and ocean spray).

The State Department of Agriculture Agricultural Lands of Importance to the State of Hawaii (ALISH) Maps do not classify the land within the project site as prime agricultural land, unique agricultural land or other important agricultural land. A portion of the site is classified as existing urban development.

A five-class productivity rating of lands within the state was developed by the Land Study Bureau of the University of Hawaii. The rating utilizes the letters "A" through "E", with A representing the class of highest productivity and E the lowest. Within the project site, the Land Study Bureau classifies the soil as E in the beach and gulch area, C in the sand dune area and unclassified in the proposed hotel and tennis club area.

It is apparent from these soil studies that a major portion of the project site is already in urban use and that the remainder consists of marginal land that is

susceptible to considerable limitations on agricultural production. These soils are located in the beach area, stream beds and gulch walls of the project site.

The project site has long been earmarked for resort use by the owner on its long-range development plan, therefore the potential for agricultural use would be extremely limited. Some adjacent properties have already been put to urban use, while others around the project site are planned for near-term resort development. Notably, Kapalua is slowly phasing out agricultural production in the remaining portion of its resort property and concentrating on maximizing agricultural operations on ML&P's vast mauka lands south and east of the resort community.

Hydrology

Groundwater: Drilled wells near the shoreline, in Alaeloa and in upper Napili provide information on groundwater conditions in the Kapalua area. Ground water exists in a basal lens configuration, meaning that it is in hydraulic contact with seawater at the shoreline and saline water at depth. The lens is progressively thicker and fresher as the distance from the shoreline is increased.

Surfacewater: There are no standing surface water features on the property. The site's topography and soil characteristics provide an extremely well drained condition suitable for development. Honokahua Gulch encompasses a portion of the project and, as described above, is the drainageway for the lands above the resort development.

Marine Waters: The bathymetry of Honokahua Bay consists of a gradual slope out to sea. The sand area at Honokahua Beach extends offshore more than 2,500 feet and is about 1,000 feet in breadth. On the flanks are rock bottoms that represent extensions of the solid formations found onshore. The natural feature forming the west boundary of Honokahua Bay is Makaluapuna Point while the east boundary is comprised of an unassuming rocky shoreline.

Coral, both live and dead, algae, and fish, particularly Hawaiian reef fish, are found on and around these hard bottoms. Fish are more abundant around the rock areas than in the bay. According to a series of marine studies conducted in 1970 and 1971 by Environmental Consultants, Inc., the benthic biota offshore from the Kapalua resort is typical of Hawaiian coastal waters. The studies further noted that there are no rare or endangered species present.

Tidal waters as well as prevailing winds affect the direction of ocean current entering the bay. The currents are generally favorable for flushing the area of suspended matter or dissolved material.

The waters of Kapalua are classified by the State Department of Health (DOH) as Class A Waters. "It is the objective of this class of waters that their use for recreational purposes and aesthetic enjoyment be protected." Discharge into these waters is permitted only upon having the best degree of treatment or control compatible with the criteria established by the DOH for this class.

Flora

In April of 1989, Char & Associates conducted a floral survey of the project site (Appendix B). The study indicated the survey area consisted of a mixture of developed areas and undeveloped vegetated waysides. Developed areas were excluded from the survey.

Char & Associates recorded a total of 157 species of vascular plants of which 144 were exotics, 6 were Polynesian-introduced species and 7 were native or presumed-native species. The predominant species included ironwood trees and sour grass in the coastal land, a variety of fruit trees, herbs and vines in the area immediately above the coastal land, streamside vegetation along Honokahua Stream, common ruderal weeds in the middle section of the property and old fruit, nut, and ornamental trees in the upper section. Koa haole was common throughout the site. A complete list of the recorded species is located in Appendix B.

According to the study, there were no species on the site that are officially listed by the Federal or State governments as endangered, or candidate for such listing; none are considered rare or vulnerable. All of the species were common elements of lowland vegetation and their loss would not be expected to have a significant impact on the statewide population of those species.

Finally, Char recommended that a number of very large existing ornamental trees, such as a'ali'i, alahe'e, and wiliwili, be worked into the hotel's future landscaping plans. The hotel owner, upon that recommendation, will make, as much as possible, such effort. Other trees, according to Char, could be easily grown to supplement the existing plants.

Fauna

An avifaunal and feral mammal study was conducted in April 1989 by biologist Phillip L. Bruner (Appendix C) to determine the type and relative density of bird and feral mammal species on the property. In addition, the study assessed the potential impact of the proposed hotel on the identified species.

Results of the study indicated that the project site provides a fairly wide range of habitats which are utilized by the typical array of exotic birds common in such an

area. Below is a complete list of the exotic birds observed on the property. It is also expected that these birds can be observed in the surrounding land.

gray francolin	spotted dove
zebra dove	common myna
Japanese white-eye	northern cardinal
red-crested cardinal	house sparrow
house finch	nutmeg mannikin
northern mockingbird	

No indigenous or endemic birds were recorded during the survey. The common short-eared owl might occasionally be found at the project site as they forage over open lowlands as well as at higher elevations.

The Pacific golden plover was the only migratory species recorded. These birds were observed on the golf course and on other small lawns and open spaces. The only other common species which might occur either along the beach or on the lawns would be the ruddy turnstone, sanderling, and wandering tattler.

Observations of feral mammals were relatively limited. A number of mongoose and two feral cats were seen during the survey. Rats and mice were not observed but undoubtedly occur on the property. The study did not identify any rare or endangered species of either bird or animal wildlife in the area.

Construction of the proposed hotel will result in possible changes in the composition of wildlife on the property. The low number of red-crested cardinal was a little unexpected given the results of an earlier survey by Bruner on the original hotel site. The proposed development will eliminate some of the dense thickets and thus might reduce habitat for northern cardinals. House sparrows will undoubtedly increase in abundances as this site becomes more urban.

According to Bruner, migrant species particularly the Pacific golden plover are usually benefited by the kind of development that creates open spaces such as lawns. The proposed development will result in the clearing of some existing dense vegetation to make way for manicured landscaped hotel grounds and the relocation of an existing golf hole. It is not expected that there will be a net loss of open space lawns but possibly an increase in grass area with the proposed development.

As the project is developed, the feral mammals on the property are expected to relocate to the adjacent undeveloped lands. These highly mobile species would not be increasingly burdened by this anticipated impact.

Air Quality

The project site is located in a planned resort community where the air quality is conducive to a rural setting. The overall density of Kapalua is currently only 1.1 units per acre, and contains an abundance of open space amenities, including golf courses, large landscaped common areas and natural vegetation. There is an absence of intensive urban facilities such as large commercial centers and heavy industrial facilities. The pace of activities is leisurely and the overall character is recreational. Thus, this planned low-profile resort community is not a long-term generator of significant air pollutants.

The proposed Ritz Carlton hotel is expected to generate some long-term adverse effect on the ambient air quality. The primary impact would be from emissions generated by vehicular traffic associated with the proposed hotel. Present estimates show the proposed hotel would generate approximately 231 trips during PM peak hour traffic. Most of the daily trips, notably, will occur during the two peak periods (see Traffic Section of this Environmental Assessment) of the day and primarily on Office Road. When Kapalua is fully developed, by about 2005, traffic to and from the hotel would be redirected onto the upgraded Office Road and realigned Kapalua Drive. It is anticipated that air quality then would be most impacted at the intersections along the travel route to and from the proposed hotel.

In the near-term, the intersections of the hotel entrance road and Office Road and the Office Road and Honoapiilani Highway would generate the most impact. The nearest residential development to the hotel entrance road and Office Road intersection is "The Ridge" condominiums. It is situated more than 500 feet from the intersection. Immediately abutting the intersection are Kapalua Land Co.'s office and two golf course fairways.

At the resort's other major intersection, the ambient air quality is not anticipated to be significantly impacted. The intersection is efficiently designed and traffic is expected to move rapidly through the facility. The resort's Village Golf Course is located to the east and south of the intersection and no other existing use is located within 1,000 feet of the resort entrance. In the future, adjacent projects are expected to respect building setback requirements.

On-site air pollution can be expected from steam generated by the hotel boiler rooms and burnt fuel from operational and maintenance equipments. These

pollutants are minor in quantity and are expected to dissipate immediately, thus resulting in no significant effect on the surrounding environment.

Secondary impacts are expected to be generated from burnt fuel at the electrical generating plant in Maalaea. The hotel's contribution to the total discharge of pollutants at this public facility will be relatively minor in proportion and scale.

As with all new projects, short-term impacts would result from activities associated with construction of the hotel. Site preparation and landscaping will require grading which in turn would result in dust generated from the movement of ground materials and emissions from construction equipment.

These impacts are temporary and are expected to be confined to the project's approximately two-year construction period and, specifically, to the normal daylight working hours of each day. Dust control measures and other precautions will be utilized to minimize any adverse effects on the surrounding properties. Such measures may include dust screens, sprinkling of exposed areas and any other measures as prescribed by the County of Maui.

Noise Impact

Activities associated with the hotel's construction have the potential to increase noise levels at adjacent properities as well as within the project site. While the source of noise may vary in type and audio level, vehicular traffic is by far the most important in terms of its magnitude, continuance and geographic range.

The projected traffic increase around Kapalua will result in an increase in noise levels. This increase will be part of the current gradual gain now being experienced within the resort as the area continues to develop. Though the overall noise levels will rise, the impact would not exceed the level at which significant adverse effects occur. Even at peak hours and at the resort's two busiest intersections, noise levels will not be excessive and would not violate any applicable governmental regulations.

A resort hotel in South Kohala of a similar type and size as the proposed Kapalua hotel was analyzed and determined to generate only minor noise impacts. As a means of further insurance, mitigating measures such as landscape screens could be utilized to reduce traffic noise at future nearby building units.

In the short-term, noise levels can be expected to increase due to construction work associated with the hotel. It is anticipated that grading and building activities, involving the use of heavy earthmoving equipment, construction vehicles, and

power tools, will be the source of relatively high noise levels. The impact, however, will be short term.

To mitigate the effects of high noise levels, control measures will be applied during construction. Such measures would include the use of muffler devices as well as restricting heavy equipment operations to normal daylight working hours. Additionally, Kapalua's existing golf course and natural open spaces will provide a buffer zone between the project site and adjacent uses.

Archaeological Sites

The proposed hotel site is located above the original hotel grounds across the Lower Honoapiilani Road. A portion of the project site is situated between the original site and Fleming Park. Between December 1988 and May 1989, Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted subsurface archaeological testings in several increments on the project site (See Figure 13 and Appendix D). The basic purpose of the study was to determine the presence or absence of significant archaeological remains which might affect the proposed development. Moreover, the study intended to demonstrate and document the probable absence of any substantial number of prehistoric Hawaiian human burials such as those present in the large burial ground occupying the central portion of the original hotel site.

Upon completing its field work, PHRI found that most of the mauka area where the proposed hotel is to be located had been substantially modified in recent historic times, initially for plantation operation and occupation and subsequently for golf course development. PHRI found no evidence of prehistoric or early historic period utilization (including burials) in the area.

In the proposed tennis complex area, PHRI found that this area too had been substantially modified in recent historic time, apparently in connection with construction and occupation of plantation camps. Similarly with the new hotel area, the proposed tennis site does not contain any evidence of prehistoric or early historic period occupation or utilization.

In the remaining portion of the project site between the original hotel property and Fleming Park, the beachfront area was initially thought by some to possibly contain an eastward extension of the large burial site existing to the west in the original hotel property. Extensive testing, however, revealed only a single probably intact burial. The burial is located midway along the property's shoreline boundary and most likely within the shoreline setback area. Subsurface rocks were also encountered at three other locations which are anomalous within the sand soil matrix and might possibly represent capstones placed atop burials. No buried cultural deposits were found except for a single volcanic glass flake and single flake

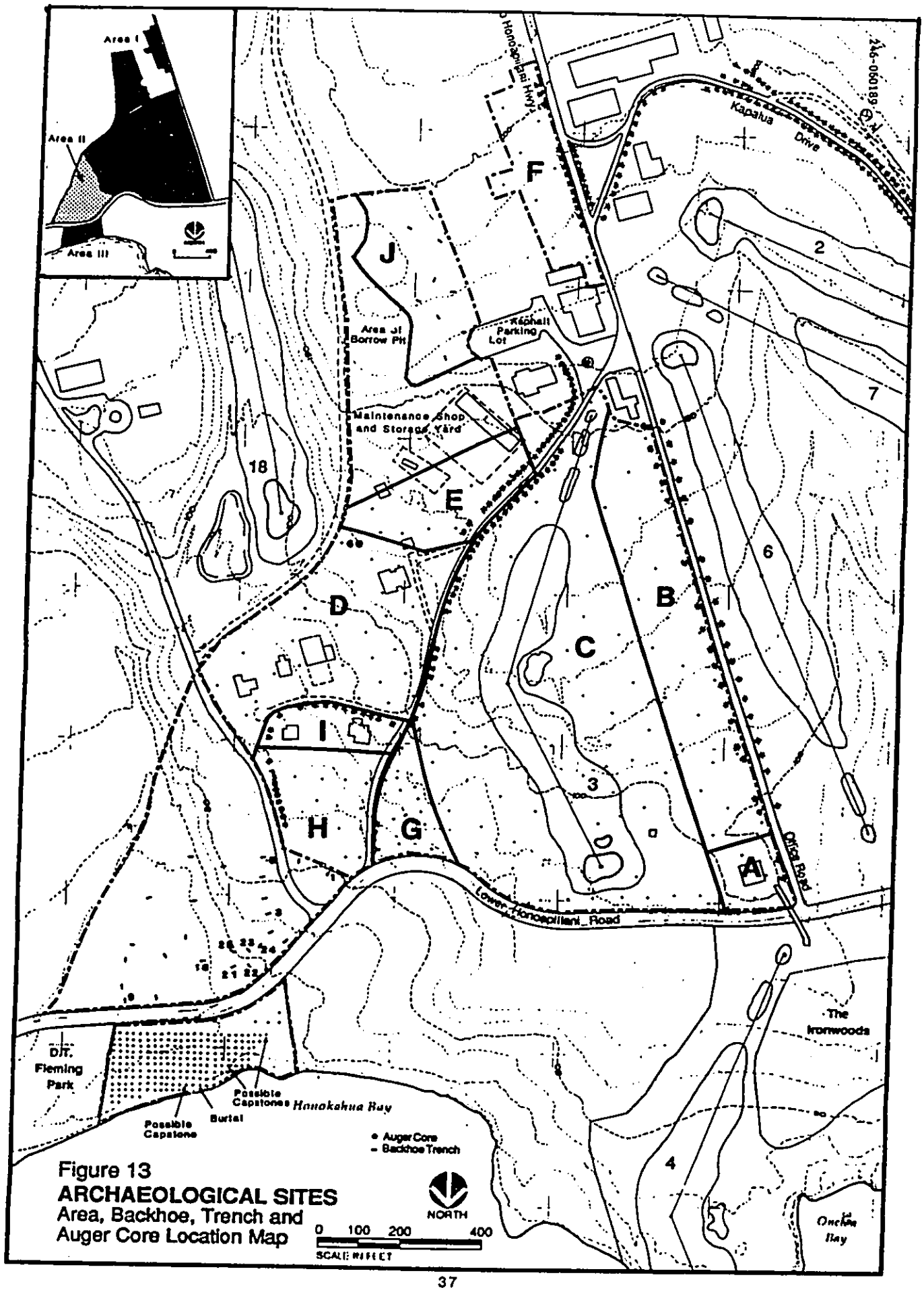


Figure 13
ARCHAEOLOGICAL SITES
Area, Backhoe, Trench and Auger Core Location Map

of flint-like stone which indicate the possible presence of remnant or mixed/disturbed prehistoric and /or early historic period components.

Upon completion of additional testing in the lower property (addendum report, prepared in August 1989 [Appendix D]), PHRI concludes that there are no in situ burials associated with the subsurface rocks. Moreover, the additional testing of remnant cultural deposits along the makai edge of the Lower Honoapiilani Road reveals generally negative results and that no further archaeological testing is required.

In conclusion, PHRI indicated that there are no significant archaeological remains present anywhere within the project site that would constrain or prevent the proposed development. No further archaeological work is required in the proposed hotel, tennis and beach facility area.

PHRI has discussed its findings, conclusions and recommendations with the appropriate staff archaeologists in the State Department of Land and Natural Resources - Historic Sites Section/State Historic Preservation Office and, according to PHRI, the State is in agreement. Further, it is PHRI's understanding based on discussions with the State agency that even if a few isolated burials were to be identified within the beachfront area, disinterment would be permitted and the proposed development in that area could proceed. This would be so because the isolated burials would not be considered an extension of the large burial site in the adjacent parcel. Given the possibility, however remote, that potentially significant unidentified subsurface cultural deposits or remains might still be revealed by further test excavations in the beachfront area, PHRI's final recommendation thus calls for a qualified archaeologist to monitor the area during the project's initial grading work.

Natural Hazards

Located above Honokahua Bay, a portion of the project site is susceptible to tsunami inundation. Notably, the proposed hotel improvements will be situated on the upper elevations of the property where they would be outside the potential inundation area. According to the Flood Insurance Rate Map (FIRM) prepared by the U.S. Army Corps of Engineers, the base flood elevation of a potential 100-year tsunami inundation over the property is 19 feet (See Figure 11). This is well below the 30-foot high sand dune that sits between the proposed hotel and the shoreline. Notably, the main facilities of the hotel will all be above the 80-foot elevation, and the proposed beach facilities will be above the 20-foot elevation.

On the same FIRM, a potential riverine flood plain is identified encompassing Honokahua Stream gulch. The boundaries of the 100-year flood plain are confined

to the narrow central portion of the gulch basin. Additionally, the flood plain incorporates a portion of the project's beachfront land where recreational improvements are proposed. The beach/luau building which is proposed with these improvements, however, is located outside of the 100-year flood plain as will the proposed hotel and tennis club building. Portions of some tennis courts will be within the potential flood plain area.

Other natural hazards are of no major consequence to the property. Once the lands surrounding the property are improved, the potential of forest or brush fires are reduced. The West Maui Mountains is extinct and the likelihood of an eruption is remote. Earthquakes are also a potential natural hazard that may occur anywhere in the state, but local building codes incorporate certain earthquake resistant standards to minimize the risk of destruction to new structures.

Views

The recently completed Honoapiilani Highway above Kapalua's resort core is intended to replace the Lower Honoapiilani Road as the primary access to all coastal development in West Maui. The section that was completed above Kapalua represented the final leg of the capital improvement project.

Views of the shoreline from the new highway will not be obstructed by the proposed hotel. Located more than 1,000 feet makai of the highway, the proposed hotel would be only a small component of the highway's panoramic view encompassing the Kapalua coastline. The hotel, in most cases, would be hidden by foreground features or objects such as high topographical reliefs and existing natural vegetation.

Views of the shoreline from areas within the resort core also would not be significantly impacted. There are no existing residential or condominium projects immediately above the project site, and future projects, especially in the upper sections of the resort, are expected to benefit from the golf course and open space frontages.

From the shoreline, the proposed hotel is expected to be setback more than 500 feet. Within this setback area is the original hotel site which is now planned for open space. Much of the existing vegetation in this area is planned to be removed as part of the archaeological site improvement program for the property. Views of the hotel from the shoreline thus will be possible but distant. Lateral views along the shoreline, however, will not be negatively impacted by the proposed development.

Climate

The climate is pleasant with generally moderate northeast trade winds throughout the year. Along the shoreline in the exposed area of Honokahua Bay, winds can be generally stronger. These winds in the past have carried sand inland and consequently accumulated and created sand dunes. The same winds have also generated wind-blown surfs that have reach the shoreline and carved high embankments on the beach head at the vegetation line .

Rainfall in Kapalua averages approximately 32 inches per year which is somewhat wetter than Waikiki and Kaanapali, but drier than Princeville and Poipu. The rainfall is heaviest in the winter months when the monthly averages are almost three inches more than the summer months.

Temperatures in the coastal area average 77 degrees (Fahrenheit) in the summer months and about 70 degrees in the winter months.

V. ECONOMIC SETTING AND PROJECT IMPACT

Maui Economy

Among Hawaii's four counties, growth has been greatest in the County of Maui during the last decade. In the ten years ending in 1987, resident population in Maui County increased 43 percent (from 63,000 to 89,900), compared with the 38 percent gain experienced by the second fastest growing county, Hawaii. Similarly, in terms of employment, growth was most rapid in Maui during the last decade.

The visitor industry has been the driving force contributing to Maui's economic growth. Most of the visitor hotel room inventory and activity is on Maui Island, in the Lahaina District, which includes the Napilihau-Kapalua area. Employment in the services and trades sectors (sectors having strong linkages with the visitor market) accounted for 57 percent of all jobs in Maui Island in 1987. In addition to service establishments such as hotels, restaurants, and the retail trade, visitor expenditures contributed significantly, directly and indirectly, to the real estate, finance, construction, and transportation industries.

Agriculture, once dominant in Maui as well as in the state as a whole, is still an important sector. However, despite growth in the diversified segments of the industry (such as flowers and nursery products and macadamia nuts), agriculture continues to decline as sugar and pineapple struggle to remain competitive in overseas markets.

Socioeconomic Trends

Socioeconomic trend data are shown in Table A below. The trends in population, employment, and real property tax base document the rapid growth that has occurred in Maui County. Employment data, however, are for Maui Island.

While current dollar personal income per capita has increased, after adjustment for inflation, personal income per capita has remained about level since 1980. Per capita personal income in 1986, was 3.9 percent higher than in 1976, when measured in constant dollar terms.

The modest growth trend in school enrollments is a result of historic changes in fertility rates which have been experienced generally in Hawaii and nationally. In Honolulu City and County, school enrollments have been declining, thus Maui's increasing enrollments reflect the much higher rate of population growth in Maui.

TABLE A. SELECTED MAUI COUNTY SOCIOECONOMIC INDICATORS

YEAR	RESIDENT POP. (July 1)	EMPLOY-MENT[1]	UNEMPLOY-MENT	PERSONAL UNEMPLOY-MENT RATE (%)	INCOME PER CAPITA ($)	SCHOOL ENROLLMENTS	REAL PROPERTY TAX BASE (million $)
1975	56,800	21,100	2,100	9.0	5,933	14,351	991
1983	79,800	38,150	2,800	6.8	11,724	16,270	5,251
1984	83,400	39,000	2,200	5.4	11,688	16,660	5,634
1985	85,500	41,300	2,250	5.2	12,440	16,842	5,566
1986	87,100	42,950	2,100	4.7	13,254	17,459	5,469
1987	89,900	46,350	1,800	3.8	NA	18,168	5,819

NA - Not available.
1 - Employment, unemployment, and unemployment rate data are for Maui Island.

Source:
Resident population, personal income per capita, and school enrollments from: State Department of Planning and Economic Development (DPED), Statistical Report 181 (11/29/85) and Statistical Report 211 (January 1989). Employment, unemployment and unemployment rate from: State Department of Labor and Industrial Relations (DLIR), Labor Force Data Book, 1987, as revised. Real property tax base from: Tax Foundation of Hawaii, Government in Hawaii, 1988 and 1984 editions.

The Maui economy has experienced relatively rapid growth in employment in recent years, with construction and visitor spending being significant contributors to the county's economic performance. With growth in employment exceeding labor force growth, unemployment has steadily declined, dropping below the 4 percent level in 1987.

Maui County's real property tax base increased almost six-fold between 1975 and 1987, increasing from $991 million to $5.8 billion. In 1985 and 1986, there were slight declines in the tax base, as assessments declined on many condominium and residential properties in some areas of Maui. The 1985 and 1986 assessments reflect the market prices which prevailed in earlier years when mortgage rates were high and the real estate market was depressed.

Structure of the Economy

Tourism and agriculture are the two primary industries comprising Maui's economic base, with the former being the dominant sector. The relative magnitude of tourism in relation to agriculture is roughly indicated by the amount of visitor expenditures compared with crop and livestock sales. In 1987 visitor expenditures were $1.27 billion, compared with total crop and livestock sales of $0.15 billion. Other primary economic activities include manufacturing (mainly food processing) and research. Food processing includes pineapple canning, dairy products, processed pork, tropical jellies and purees, wine and champagne, and specialty snack foods.

The relative size of Maui Island industries as measured by employment is indicated in Table C. Agriculture, which was once dominant in Maui, currently provides 2,450 jobs (1987), but employment has continued to decline despite growth in some of the diversified crops like flowers and nursery products, macadamia nuts, and seed corn.

Sugar and pineapple (including processing), which together accounted for 2,750 of Maui County's total agricultural workforce of 3,950 in 1975, employed only 2,250 out of a total of 3,150 in the agricultural sector in 1987. Foreign competition and other factors (such as increasing use of corn sweetners in the case of sugar), are expected to result in a continuing decline in sugar and pineapple employment in Hawaii and Maui County. While some growth in diversified agriculture is expected, the increase in jobs is not projected to offset the decline in sugar and pineapple employment in Maui County.

TABLE B. MAUI COUNTY VISITOR INDUSTRY INDICATORS

YEAR	VISITOR[1] ARRIVALS ('000)	VISITOR EXPENDITURES (million $)	HOTEL[2] EMPLOYMENT	HOTEL UNITS	HOTEL OCCUPANCY RATE (in percent)
1975	932	154	2,350	5,731	72.3
1983	1,645	793	6,100	12,110	75.2
1984	1,855	1,078	6,150	12,499	80.5
1985	1,831	1,106	6,250	13,515	78.5
1986	2,002	1,196	6,100	13,451	81.5
1987	1,909	1,268	6,950	13,264	76.2

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1 - Westbound
2 - Hotel employment, hotel units, and occupancy rate are for Maui Island.

Source:
Visitor arrivals and occupancy rate are from DPED, Statistical Reports 181 and 211. Visitor Expenditures from: DBED, Data Book 1988, Table 219. Hotel employment from DLIR, Labor Force Data Book. Hotel units from Hawaii Visitor Bureau, Hawaii Visitor Plant Inventory; and DBED, Statistical Report 121.

TABLE C. EMPLOYMENT[1] BY INDUSTRY: MAUI ISLAND

INDUSTRY	1975	1983	1984	1985	1986	1987
Agriculture	2,850	2,750	2,700	2,600	2,400	2,450
Construction	1,550	1,100	1,000	1,200	1,450	1,650
Manufacturing	2,150	2,000	2,000	2,000	1,950	2,100
Trans., Comm., & Utilities	1,200	1,650	1,800	2,050	2,050	2,250
Trade	4,500	8,050	8,950	9,800	10,600	11,100
Services	4,750	10,500	10,500	11,300	11,700	13,200
Finance, Insur. & Real Est.	1,200	2,150	2,350	2,450	2,450	2,400
Government	3,050	3,950	4,050	4,100	4,250	4,450
Self-Employed (non-ag.)	1,700	2,800	2,800	2,850	2,900	2,800
Labor Disputes	*	*	0	*	*	*
Total	22,950	34,500	36,250	38,350	39,750	42,400

1 - Job count. Job count data differ from employment data in Table A, which represent number of employees. Employment data is based on island of residence, whereas job count is number of jobs regardless of employee's residence.
* - fewer than 50.
Source: DLIR, Labor Force Data Book, 1987, as revised.

For most industries, such as construction and manufacturing, employment data provide a fairly good indication of relative importance of the industry in the economy. However, in assessing the visitor industry, this is not the case, since the industry is actually a sector of the economy comprised of many industries (as defined by the Standard Industrial Classification used to define U.S. industries), each involved in providing different goods and services to the visitor. Besides the hotel industry, eating and drinking establishments, retail stores, banks, transportation firms, providers of recreational services, and firms in other industries count visitors (in varying degree) in their business clientele.

Among the industries shown in Table C, services (which include hotels), and trade (retail and wholesale firms), depend heavily on visitor expenditures in Maui Island. Many of the transportation firms, and the non-agricultural self- employed also depend on visitors for a significant portion of their sales. As the data indicate in Table C, trade and services jobs accounted for 24,300 (57%) of Maui Island total employment in 1987. Consistent with growth in visitor expenditures, growth in the number of services and retail and wholesale trade jobs has been rapid in Maui Island. The average annual rate of growth in combined services and trade jobs has been 8.4 percent, compared with a 0.8 percent average annual decline in combined agriculture and manufacturing jobs between 1975 and 1987.

Industries with less direct reliance upon the visitor market experienced growth in employment. For example, in transportation, communications, and utilities, growth averaged 5.4 percent between 1975 and 1987. In this industry group, transportation services is most directly involved in the visitor market, with communications and utilities largely indirectly affected by visitor demand.

Construction (See Table D) and the finance, real estate, and insurance group of industries also are indirectly and directly affected by visitor demand. Hotel construction is obviously linked to the visitor market, while condominium and other residential construction is both directly and indirectly affected by visitor industry requirements.

Real estate brokerage, title and escrow company services, mortgage financing, and related services are directly and indirectly supported by visitor expenditures, and investment spending attracted by the visitor market. Long-term growth in the number of visitors and visitor spending also influences the rate of growth in resident population, although the nature of the linkage is quite complex for a given area, such as Maui. To the extent that resident population increases, there is increased demand for resident housing, and therefore additional demand for construction and financial services.

TABLE D. CONSTRUCTION AND HOUSING INDICATORS: MAUI COUNTY

YEAR	CONSTRUCTION EMPLOYMENT[1]	CONSTRUCTION COMPLETED ('000 $)	HOUSING UNITS[2]
1975	1,550	58,400	22,432
1983	1,100	67,000	38,201
1984	1,000	68,600	38,904
1985	1,200	73,500	39,510
1986	1,450	92,600	40,768
1987	1,650	103,800	42,780

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1 - Maui Island
2 - Includes units occupied by nonresidents and residents, and vacant units.
Source:
Construction completed from: Bank of Hawaii, Construction in Hawaii, 1988.
Construction employment (see Table C).
Housing units: DPED, Data Book, 1988, Table 628.

Future Economic Growth and Employment Opportunities

County of Maui and Lahaina District public policy is to promote a diversified economic base which will provide employment for residents and maintain economic growth. It is recognized that growth in the number of visitors and visitor spending will continue to be the primary contributor to overall economic activity, particularly in the Lahaina District. At the same time, economic diversification is desired, to provide alternative occupational opportunities and to give more stability to the economy.

Economic diversification may be expected through promoting aquaculture, selected light industrial activities such as food processing, diversified agricultural activities, and R&D in biotechnology, astronomy, or aquaculture-related areas.

Although sugar and pineapple employment is expected to decline, maintaining operations and acreage in crop through productivity gains is considered an important economic and environmental objective. These traditional crops also are identified with Hawaii in the eyes of visitors.

State economic projections, disaggregated to the county level, indicate that most of the growth in jobs in Maui County are expected to occur in the following industries: construction; transportation, communications, and utilities; eating and drinking places; other trade (i.e. other retail and wholesale business); banking and finance; hotels; other services; state and local government; and self-employment. Of the total projected increase in jobs (36,100) between 1985 and 2010, 52 percent are projected to occur in hotels, other services, and eating and drinking places, the three sectors most directly linked to the visitor market. The self-employment and state and local government sectors were other industries expected to experience significant employment gains. Virtually, no increases in employment were projected in the agriculture and manufacturing sectors.

Economic Impact Analysis

Construction and operation of the proposed Ritz Carlton hotel can be expected to result in increased employment, personal income, and government revenues. Direct short-term construction and long-term operational economic benefits would be realized primarily in the Lahaina District. These economic benefits also would be experienced indirectly in the rest of Maui Island and in the state.

Employment and income effects of the proposed hotel entail direct, as well as indirect and induced impacts, in both the temporary construction phase and the permanent long-term operation of the hotel and related entertainment and recreational facilities. For example, during hotel construction, direct employment would include the number of construction workers required to build the hotel structures and related on- and off-site facilities. Indirect employment would refer to employment generated in firms supplying materials and services needed to construct the hotel and related facilities. Induced employment refers to the additional jobs created throughout the economy when construction workers and employees and proprietors of supply firms spend their wages and salaries. When indirect and induced employment are added to direct employment, the result is a multiplier effect. That is, in the economy as a whole, more than one job is generated for each job created at the hotel construction site. Similiarly, multiplier effects apply to hotel operational employment, and to wage and salary income of employees, as discussed in the following sections.

Of the total number of long-term hotel operational jobs, part would be filled by employees hired or transferred from off-island, and part would be filled by residents

from residential areas outside of the Lahaina District, in such areas as Kihei, Haiku, and Wailuku.

Construction Impacts

Employment:

The project architect estimates that construction will require approximately 20 months. Therefore, with an expected early 1990 construction start, completion of the hotel is expected to be in the fall of 1991.

During the construction phase, employment at the Kapalua project site will fluctuate, depending on particular labor requirements in each stage of construction. Moreover, some construction workers would be employed on a part-time basis. Given these factors, employment estimates in this analysis will be expressed in terms of average full-time equivalent (FTE) jobs. That is, total FTE worker-months required for project construction divided by the 20- to 24-month construction period, results in an average monthly number of FTE jobs.

For a luxury hotel such as the Ritz Carlton, it is estimated that 1.3 direct construction jobs would be generated for each hotel room. Therefore, 715 worker-years (1.3 full-time annual jobs x 550 rooms) would be required to construct the hotel. The total labor requirement of 8,580 worker- months (715 x 12), results in an estimate of about 430 FTE direct jobs, on average, during construction (8,580 divided by 20).

Indirect and induced employment generated by the proposed hotel have been estimated by applying the construction industry employment multiplier from the Hawaii Input- Output Model (DBED, April 1989). The Hawaii construction industry multiplier is 2.6, meaning that for each direct construction job created, another 1.6 indirect plus induced jobs are generated throughout the state economy.

Since a large proportion of construction industry material and services inputs are provided by Oahu firms (as are the goods and services purchased with the wages and salaries of Maui construcion workers), much of the indirect and induced employment that would be generated by the proposed hotel, would occur outside of Maui -- mainly on Oahu. Of the total indirect and induced employment generated (1.6 jobs per direct job), an estimated 0.2 job would be added in the Maui economy. The latter estimate is based on the regional multiplier derived for Kauai (Anderson, 1974). Total indirect and induced construction employment of the proposed project is summarized below, together with direct employment.

EMPLOYMENT[1] GENERATED BY CONSTRUCTION

Job Category	Maui	Rest of State	Total
Direct Construction	430	NA	430
Indirect and Induced	86	602	688
Total	516	602	1,118

[1]Average monthly number of FTE jobs.
NA - Not applicable.

Typically the majority of direct construction jobs would be expected to be filled by Maui residents. (Jobs summarized above are based on location of job, not on the residence of the person hired to fill the job). Contractors normally would hire from the local labor pool, rather than incur the extra costs of bringing workers from Oahu or other islands. However, during the period in which the Ritz Carlton is scheduled to be under construction, several major projects also will be under construction, including the Grand Hyatt hotel and the upgrading of the Kahului Airport. If the Maui construction industry in general continues to be as busy as it has been in recent years, the additional construction demand represented by these major projects may require that many of the direct construction jobs be filled by workers from Oahu and other islands.

Income:

Labor income, in the form of wages and salaries received by those filling the 1,118 new jobs, represents personal income. Estimated total personal income generated by the Ritz Carlton is indicated by category of jobs below.

Category	Number	Average Monthly Wage ($)[1]	Construction Period (months)	Personal Income ($)
Construction Jobs	430	2,700	20	23,220,000
Indirect & Induced Jobs	688	1,700	20	23,392,000
Total	1,118			46,612,000

[1] Estimated 1989 monthly wage rates, based on Department of Labor and Industrial Relations (DLIR) data for 1988 (DLIR, April 1989).

Government Revenue:

Based on Tax Foundation of Hawaii data, it is estimated that about 13 percent of personal income is paid by Hawaii households to both State and County

governments for all personal taxes, including general excise taxes on retail sales, fuel taxes, property taxes and income taxes. Applying this percentage factor to personal income ($46,612,000) generated by construction, the result is about $6.1 million in tax revenues.

Hotel Operation Impacts

In contrast to the short-term construction-related economic impacts, operation of the proposed hotel would result in long-term beneficial economic effects. The luxury class hotel includes a wide range of entertainment, recreational, and shopping amenities, and these facilities as well as the hotel proper would provide a large number of jobs. In addition to the direct jobs created at the Ritz Carlton, additional indirect and induced permanent jobs would be generated in Maui and the rest of the state, as a result of firms supplying the hotel with the goods and services sold to guests, and by multiplier effects of wage and salary spending.

The increase in permanent employment resulting from operation of the new hotel, also would be associated with permanent increases in personal income and government revenue.

Hotel Employment:

Direct hotel employment, including on-site employment in facilities such as restaurants and shops, can be estimated on the basis of the average number of jobs per hotel room. The Ritz Carlton is being designed as a luxury class hotel. Hotels of this caliber are relatively labor intensive compared with a statewide average staffing ratio of about 0.7 jobs per room. In calculating direct employment at the proposed hotel, a staffing ratio of 1.2 to 1.5 is judged to be appropriate. A portion of the Ritz Carlton's employees would be part-time workers, but the staffing ratio of 1.5 that is used here to calculate employment is in terms of FTE jobs per hotel room.

The total number of direct FTE jobs at the Ritz Carlton hotel is estimated at 825. Indirect and induced jobs have been calculated on the basis of the hotel total employment multiplier from the State Input-Output Model (DPED, April 1989). The hotel employment multiplier is 1.9, meaning that for each direct hotel job there is an additional 0.9 indirect and induced job generated in the state economy.

In addition to the 825 direct jobs at the Ritz Carlton, about 149 of the 743 indirect and induced jobs could be expected to occur in the Maui Island economy, mainly in the Lahaina District. This is based on the regional multiplier effect of 0.2 jobs per direct job -- the same regional impact calculated in the case of construction.

Examples of the indirect and induced jobs that would be created include farm jobs that produce fruits, vegetables, and flowers purchased by the hotel restaurants

and shops, and truck drivers and other service employees that deliver supplies used in operating the hotel (indirect jobs). Additional jobs in grocery stores, banks, auto repair shops, and in other firms would be created to provide goods and services to the Ritz Carlton hotel employees who would live in Maui (induced jobs). The employment impacts of hotel operations are summarized below.

Category	Maui Island	Rest of State	Total
Direct Hotel Jobs	825	NA	825
Indirect and Induced Jobs	149	594	743
Total	974	594	1,568

NA - Not applicable.

Under normal Maui labor market conditions, a large majority of the 825 direct hotel jobs would be filled by Maui residents. However with recent growth in visitor plant inventory and overall strong economic growh in the Maui economy, labor market conditions have tightened as indicated by the unusually low unemployment rate which recently has approached the 3 percent level (First Hawaiian Bank, March/April 1989). Moreover, the Grand Hyatt and Four Seasons hotels are scheduled to open before the Ritz Carlton. If the visitor industry continues to record high activity levels, the opening of the two major hotels in the 1990-1991 time frame could result in a competition of available local labor supply.

Hotel Income:

The direct jobs created by the new hotel would entail a permanent payroll. Wages and salaries paid to the 825 job holders would constitute an increase in personal income. Personal income effects for direct hotel jobs, and for the indirect and induced jobs generated by the proposed hotel are summarized below.

Job Category	Number	Average Wage ($)[1]	Personal Income ($)
Direct Hotel Jobs	825	16,600	13,695,000
Indirect and Induced Jobs	743	20,600	15,306,000
Total	1,568		29,001,000

1 - Estimated 1989 annual wage rate, based on DLIR wage data for 1987-88 (DLIR, April 1989).

Of the total increase in personal income of $29.0 million, more than half (about $16.8 million) would occur in Maui Island, with the balance being associated with indirect and induced jobs generated in the rest of the state.

Government Revenue

Impact of the proposed hotel on government revenue in the long-term would be comprised of two components: (1) an increase in property tax base and consequent property taxes payable to the county; and (2) tax revenue resulting from the earning and spending of wage, salary, and proprietor's income associated with the direct, indirect, and induced jobs generated by the operation of the hotel. The latter component would accrue primarily to the state government, while the county government would receive gasoline and other minor tax revenues.

Property Tax:

The site of the proposed Ritz Carlton hotel consists of approximately 36 acres currently in mixed use -- residential, unimproved resort residential and golf course. Part of a much larger parcel, the assessed value for tax purposes is not known, but given the type of mixed uses, the current assessed value is probably well under $3.0 million. At the present County tax rate (on improved residential) of $4.75 per $1,000 of assessed value, current property taxes are estimated at $14,250 per annum, assuming an assessed value of $3.0 million.

Development of the property for use as a 550-room luxury hotel is estimated to result in an improved property valued at about $90.0 million (in 1989 dollars) for tax assessment purposes. Given this estimate of assessed value in hotel use, County property tax revenues would increase from about $14,000 to about $630,000 per annum, a 45-fold increase at the current tax rate of $7.00 per $1,000 assessed value of hotel land and improvements.

Other Tax Revenues:

As in the case of personal income generated during hotel construction, the receipt and spending of personal income associated with the 1,568 direct, indirect, and induced jobs would produce tax revenues. As previously mentioned, most of this revenue would go to the State government.

Total personal income in the form of wages and salaries generated by hotel operations has been estimated at $29.0 million at current average wage and salary rates. As discussed earlier, about 13 percent of wage and salary personal income is paid in taxes to state and local government. Using this percentage factor, annual tax revenue of about $3.77 million would be generated as a result of operating the proposed hotel. Since the $3.77 million includes all tax revenues, property taxes, estimated in the previous section (the $630,000), must be netted out, to arrive at the

estimate of non-property government revenue that would be generated by the hotel, about $3.14 million.

Housing

Demand for housing attributable to the proposed project would include construction-related demand (temporary demand), and the long-term demand that would relate to operation of the hotel.

Construction-Related Demand:

During the 20- to 24-month construction period, the number of workers is expected to fluctuate above and below the 430 average number of full-time equivalent jobs. Part of the construction workforce would consist of Maui Island residents. Given anticipated heavy demand for construction in the next two years, part of the hotel construction workforce may also have to be brought in from Oahu and other islands. Some of the Maui Island workers whose homes are in other parts of the island also are likely to need housing in the Lahaina area.

The temporary demand for housing by Maui non-resident and resident workers is expected to be met by transient accommodations. In the Lahaina District there are over 8,500 hotel units, a large proportion of which are in apartment hotels – many in the Napili area. These local accommodations should meet expected housing demand during the project construction phase.

Hotel Operation-Related Demand:

Permanent housing will be needed by hotel employees coming from off-island, and for Maui resident employees living in other parts of the island who would want to relocate to the Lahaina-Napili area. The County now requires hotel developers to provide housing in the amount of one unit for every six hotel units. In the case of the proposed Ritz Carlton, ML&P would be providing the required housing -- one-sixth of the number (550) of hotel units to be developed. To the extent that these units may be occupied by two or more hotel employees (e.g., single employees sharing apartments, or families with two or more hotel employees), more than 92 employees may be accommodated. If the anticipated tight labor market for hotel employees prevails during the period the Ritz Carlton is recruiting staff, it is possible that substantially more than 92 employees would need housing in the Lahaina District. Developers and landowners, including ML&P have a number of housing projects in the planning and development stages (some are in Kihei), and State and County initiatives with respect to affordable housing in the Honokowai-Wahikuli areas are expected to provide a large number of units although the timing is uncertain. In fulfilling its obligation with the County, ML&P has already met its requirement for 72 of the 92 units via its Hale Noho project. The provision of the remainder of the units is scheduled for a later date.

VI. PUBLIC FACILITIES AND SERVICES

Circulation and Traffic Impact

Existing Circulation:

The principal roadway in West Maui is the Honoapiilani Highway. It extends around the West Maui Mountains from Wailuku to Honokohau via Lahaina and Kaanapali. This high-speed, two-lane State right-of-way was recently realigned and upgraded between Kaanapali and Kapalua. The estimated capacity of the highway north of Kaanapali is now about 2,100 vehicles per hour (vph).

Already beginning its next capital improvement project, the State is upgrading the Honoapiilani Highway between Kaanapali and Lahaina. Scheduled to be completed by the end of 1989, this congested stretch of roadway is being expanded from three to four lanes. The capacity of this roadway, thus, will be significantly increased when the project is completed.

The Lower Honoapiilani Road, meanwhile, continues to serve the coastal developments between Kaanapali and Kapalua, but as a secondary access for the area's local traffic. This two-lane substandard State roadway was recently turned over to the County and the portion that crosses Kapalua was subsequently conveyed to ML&P.

In addition to the Lower Honoapiilani Road, Kapalua is served by several private interior roadways including Office Road, Kapalua Drive, Bay Drive, Simpson Way and Pineapple Hill Road. Office Road is the main access into the resort from the realigned Honoapiilani Highway. The other interior roadways provide secondary accesses into the remainder of the resort. The proposed hotel site will be served directly by Office Road and the new Honoapiilani Highway. Future plans call for the hotel entrance road to connect with an upgraded and realigned Kapalua Drive. This will occur when the surrounding areas within the resort are designed and developed.

Kapalua has undertaken a number of road improvements within its property, but new interior roadways are also planned. To date, Lower Honoapiilani Road between Napili and Office Road has been upgraded, and Kapalua Drive between Lower Honoapiilani Road and Pineapple Hill Road has been brought up to resort standards. With the completion of the new Pineapple Hill subdivision, Simpson Way has been improved to provide better access to the new development.

The improved Kapalua Drive is planned to be extended from Pineapple Hill Road to the new Honoapiilani Highway replacing a portion of Office Road. The extended alignment will then serve as the main entrance into the resort. Office

Road will consequently branch off from Kapalua Drive and serve as a secondary access within the resort.

Existing Traffic Conditions:

In August 1989, Wilbur Smith Associates conducted a traffic impact study for the proposed Ritz Carlton hotel. The study indicated that existing average daily traffic (ADT) volumes on Honoapiilani Highway are about 25,000 vehicles per day between Napili and Kaanapali Parkway, 35,000 between Kaanapali and Lahaina and 30,000 through Lahaina. This compares to an estimated 2,000 vehicles per day on Office Road in Kapalua.

Peak hour traffic, which is a better indicator of traffic load impact on roadways than ADT, was utilized in analyzing existing and projected traffic conditions at selected locations in the region. The traffic analysis shows that daily peak hours occur from 7:30 AM to 8:30 AM and from 4:00 PM to 5:00 PM. Additionally, intersections, which have more restrictive capacities than open segments of roadways, were the focus of this traffic study. Estimates of existing volumes at six selected intersections were made based on State Department of Transportation 1989 intersection approach counts, the 1987 turning movement counts reported in the Draft Environmental Impact Statement (DEIS) for the Planned Honoapiilani Highway Bypass, and sampled turning movement validation counts.

Capacity utilizations of the intersections were evaluated using the Planning Level Analysis methodology which is described in the 1985 *Highway Capacity Manual*. In general, the methodology compares the amount of critical conflict turning movements at an intersection to an empirically defined capacity for the facility. Results of the analysis are presented below in terms of volume-to-capacity (V/C) ratios.

Existing Peak-Hour Traffic Volume-To-Capacity Ratios at Selected Intersections on Honoapiilani Highway

	Peak Hour Traffic V/C	
Honoapiilani Hwy Intersections	AM	PM
Office Road	0.08	0.11
Kaanapali Parkway	0.85	1.02
Front Street/Fleming Street	1.06	1.08
Kapunakea Street	0.94	0.93
Papalaua Street	0.79	0.80
Lahainaluna Road	0.91	0.90

The above analysis shows that the traffic volume on the Honoapiilani Highway intersection (Office Road junction) nearest the proposed project is well below the design capacity of the facility. Three other intersections in the region are also operating below capacity. The Kaanapali Parkway intersection at Kaanapali and Front Street intersection at Lahaina, on the other hand, are two of the busiest in the region and are operating at capacity.

Future Traffic Conditions:

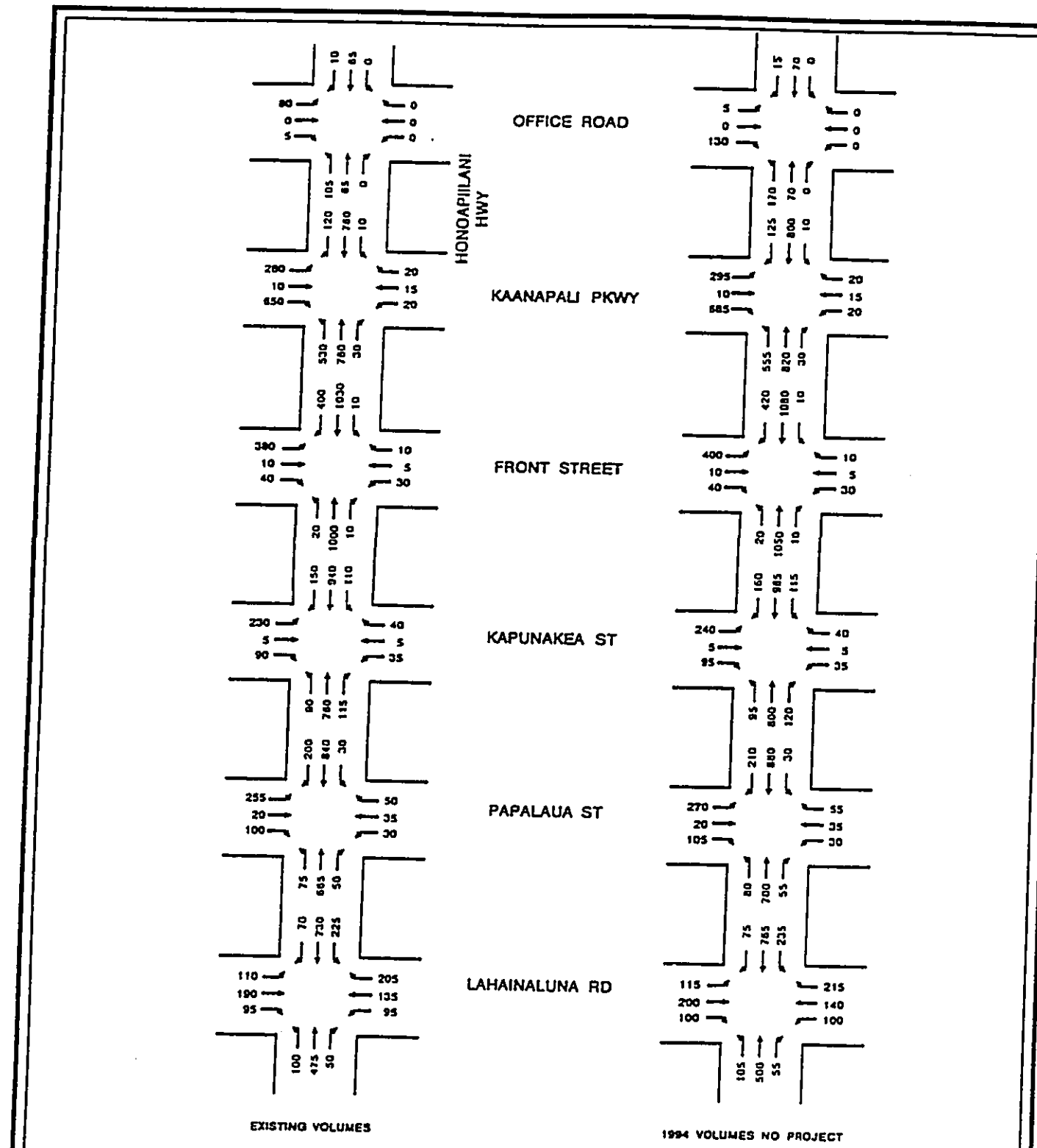
The DEIS for the Planned Honoapiilani Highway Bypass projects about a 4 percent annual increase in traffic on Honoapiilani Highway from 1987 to 1997. This forecast assumes normal development growth in the West Maui corridor. Based on this projection, peak hour traffic without the project, on Honoapiilani Highway between Kapalua and Kaanapali would thus increase from an existing 240 vehicles per hour (vph) to 440 vph by 1994, when the proposed hotel is expected to be in full operation, and from 2,830 vph to 2,970 vph for the roadway segment between Kaanapali and Lahaina (See Figure 14).

The impact of this projected traffic increase was translated to the six intersections which appear on the following exhibit and table. The projection assumes the fourth lane of the Honoapiilani Highway between Kaanapali and Lahaina will be in operation by the 1994 date.

Existing and 1994 Peak-Hour Traffic at Selected Intersections on Honoapiilani Highway

	Volume To Capacity Ratios			
	Existing Condition Peak Hour Traffic		1994 No Project Peak Hour Traffic	
Honoapiilani Hwy Intersections	AM	PM	AM	PM
Office Road	0.08	0.11	0.11	0.16
Kaanapali Parkway	0.85	1.02	0.90	1.07
Front Street/Fleming Street	1.06	1.08	0.72	0.77
Kapunakea Street	0.94	0.93	0.58	0.71
Papalaua Street	0.79	0.80	0.52	0.73
Lahainaluna Road	0.91	0.90	0.70	0.75

Note: A V/C ratio of 1.0 represents a highway facility or intersection operating at capacity.



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EXISTING AND 1994 NO PROJECT
AFTERNOON PEAK HOUR TRAFFIC VOLUMES

Ritz Carlton Hotel, Kapalua, Maui

Figure 14

As shown above, the intersections at Kaanapali and Front Street are presently at capacity. After this year when the fourth lane is completed on Honoapiilani Highway, the intersections' V/C ratio in 1994 will improve to the point that only the Kaanapali intersection will be at capacity. All of the other major intersections in West Maui will have adequate capacity to accommodate peak hour traffic.

Traffic volumes that would be generated by Kapalua in 1994, with and without the proposed hotel, were also estimated.

Kapalua Resort at Office Rd. Intersection	Enter	Exit
Current Development	115	85
1994 Development*		
Without Ritz Carlton Hotel	185	135
With Ritz Carlton Hotel	306	245

* 1994 is the year the proposed hotel is expected to be in full operation.

The 550-room hotel is expected to generate 121 vph entering and 110 vph leaving the resort. This would essentially raise the total projected traffic by the resort in 1994 to 306 entering and 245 exiting with the hotel and 185 entering and 135 exiting without the hotel.

Traffic Impact:

Trips generated by the resort will increase traffic on the roadway and highway networks both within and outside of Kapalua. This increase, however, is not expected to have a significant effect on the right-of-way system when the proposed hotel is scheduled to open. In the long-term future, additional resort roadway improvements will be implemented to alleviate internal circulation pressures.

On the regional roadways, the impact of the Ritz Carlton hotel, itself, is not anticipated to be significant in terms of percentage of total regional traffic and its effect on the capacity of the area roadway network.

By 1994, the proportion of traffic north of Kaanapali that would be generated by the Ritz Carlton is expected to be about 10 percent while the proportion of traffic that would be generated by the Ritz Carlton between Kaanapali and Lahaina, the busiest road segment in West Maui, is expected to be only about 7 percent.

At the six regional intersections, the following volume-to-capacity ratios are expected to occur, with and without the proposed project.

Projected Peak-Hour Traffic at Selected Intersections on Honoapiilani Highway

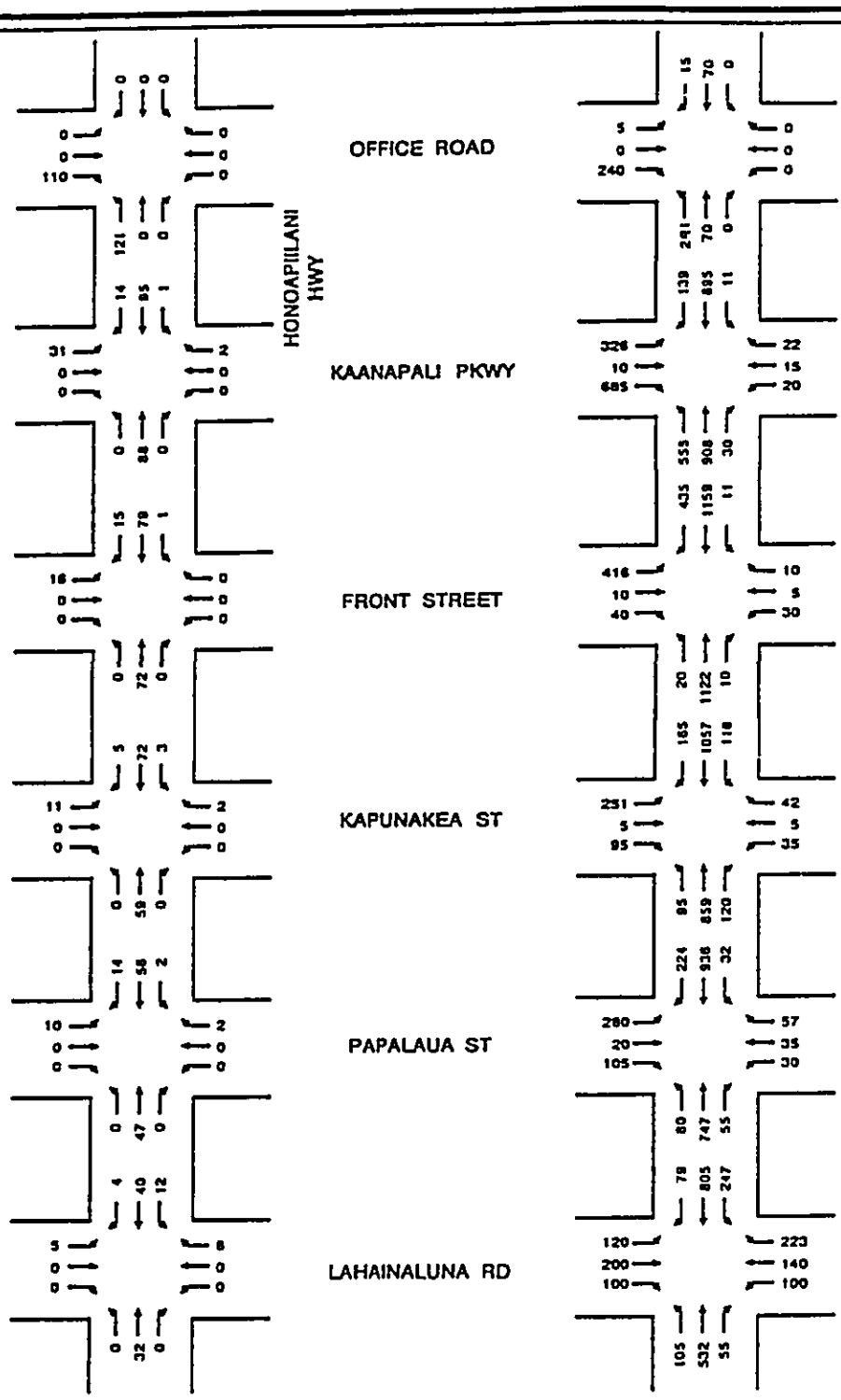
	Volume To Capacity Ratios			
	1994 No Project Peak Hour Traffic		1994 With Project Peak Hour Traffic	
Honoapiilani Hwy Intersections	AM	PM	AM	PM
Office Road	0.11	0.16	0.17	0.23
Kaanapali Parkway	0.90	1.07	0.96	1.16
Front Street/Fleming Street	0.72	0.77	0.76	0.81
Kapunakea Street	0.58	0.71	0.61	0.74
Papalaua Street	0.52	0.73	0.55	0.76
Lahainaluna Road	0.70	0.75	0.72	0.78

The projected increase in traffic, that would result from the proposed hotel, will not significantly affect the operating condition of the major intersections in the region. Those intersections which would be operating below capacity, without the hotel in 1994, will continue to operate well below capacity with the proposed project in the same year (See Figure 15). Except for the Office Road intersection, the impact would be only a 4 to 5 percent increase in the V/C ratio. The Kaanapali Parkway intersection, which would already be operating at capacity in 1994, without the proposed project, will also be operating at capacity when the proposed hotel is completed. Therefore, improvements would be needed at the intersection even without the proposed project.

Mitigation Measures:

In summary, the proposed Ritz Carlton will add traffic to Honoapiilani Highway, but its peak-hour generated traffic is expected to be proportionately small compared with the projected regional traffic.

With the new Kapalua/West Maui Airport now in operation, visitors who are arriving in West Maui by plane would not have to drive from Kahului through Kaanapali and Lahaina to reach Kapalua. Traffic through this area thus would be significantly reduced. Additionally, by the end of this year the fourth lane of the Honoapiilani Highway between Lahaina and Kaanapali is expected to be completed. This road widening project will significantly increase the capacity of the right-of-way and relieve some of the area traffic pressures. Already signs of improvement are evident in the completed sections of the roadway widening project.



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FORECAST RITZ CARLTON HOTEL
AFTERNOON PEAK HOUR TRAFFIC VOLUMES

Ritz Carlton Hotel, Kapalua, Maui

Figure 15

The State is also planning a highway by-pass that would take regional traffic around Kaanapali and Lahaina. Several routes are being considered and a construction schedule is being formulated. Completion of this much needed controlled-access, four-lane highway will greatly mitigate the area congestions that now exist.

Recognizing that traffic congestions, large and small, will continue to occur in the region, Kapalua is investigating programs that would alleviate present and future traffic congestions. It is Kapalua's intent to work with the State and County to explore feasible solutions for mitigating traffic problems in West Maui. Some of the measures being considered by Kapalua are:

1. Carpool, vanpool and buspool programs for resort employees.

2. Bicycle facilities at the resort (i.e. paths and secured racks).

3. Flex-time or staggered work hours.

4. Resort shuttle service for guests and employees.

5. Roadway improvements by the County and State. Since the traffic problem is a regional condition--not caused by a single development--CIP funds should be made available for public right-of-way improvements.

6. Coordination with other resorts and businesses in the region to explore possible participation in rideshare and transportation programs with Kapalua.

As a beginning, Kapalua has appointed a director of traffic management to administer a transportation program for the resort. Results of the director's initial efforts are encouraging. As of February, 1988, 36 percent of Kapalua's employees were participating in carpool and ride sharing.

It is recognized that the traffic condition in West Maui is a regional problem created by the overall growth of the area and not by a single development. Improvement to the traffic situation calls for a cooperative effort by government and individual parties working together to develop a feasible solution. Kapalua is willing to do its share and participate in the implementation of programs, such as in those described above, so traffic conditions can improve in West Maui.

Water

Existing System:

Kapalua is served by a private water system owned and operated by Kapalua Water Company. The source of the system is the Honokohau Stream which is a part of a basin that extends from the upper elevations of the West Maui Mountains to the shoreline.

Water from the stream is diverted into a concrete ditch and tunnel system, known as the Honokohau Ditch. Located at approximately the 800-foot elevation of the West Maui Mountains, the ditch runs for about 12 to 15 miles from Honokohau to Lahaina.

Kapalua's intake from the Honokohau Ditch, known as the Honolua ditch intake, is located at the 780-foot elevation in the West Maui Forest Reserve near Honolua Valley. Water from the intake is gravity fed via a 12-inch transmission line over a distance of one mile into a 1.0 million gallon reservoir at the 428-foot elevation. The capacity of the transmission line is about 4.5 million gallons per day.

Prior to entering the reservoir, the water is treated and disinfected through filters and a chlorinator. The potable water is then stored in the reservoir or conveyed into the distribution system that serves Kapalua resort. The distribution system is comprised of primarily 16- and 12-inch lines that enter the resort along Kapalua's Office Road and Kapalua Drive.

Irrigation water for the resort's two golf courses is provided from the same system. Immediately above the water treatment and storage facility, a 12-inch intake pipe diverts the untreated water from the 12-inch transmission line to an open reservoir on the next ridge south of the treatment-storage facility. In addition to its function as a storage reservoir, the open water feature is ideal as a landscape element in the golf course fairways. Irrigation of the two golf courses is then undertaken by gravity fed underground distribution lines which make their way through the 36 golf holes.

Current Demand:

Presently, there are 194 hotel rooms, 528 condominium units, a golf and tennis club, a temporary second golf club house, a beach club, a shopping village and a few residential homes in Kapalua. Inasmuch as the resort community includes visitor accommodations and second homes, as well as, primary residences, it is not anticipated that the resort will be occupied 100 percent year around. Existing water records show that domestic usage in Kapalua are averaging only about 0.6 million gallons per day.

Project Demand:

It is anticipated the proposed 550-room hotel will use an average of approximately 0.33 MGD of water and the tennis club and beach facilities will use about 1,000 gpd from the Kapalua water system. According to present projections, the resort has more than adequate water to meet that demand.

Excess supply in the water system is presently being used by Maui Land & Pine for pineapple operations in the lands above the resort. ML&P's withdrawal from the system, however, will be reduced as new resort projects are hooked up to the water network. As this is being done, ML&P would be reverting back to withdrawing water directly from the Honokohau Ditch for irrigation.

To further enhance its source of water supply, Kapalua has recently dug a well above the resort near its reservoir. Not yet outfitted for operation, the well will provide additional supply for the resort facilities, if needed, and will serve as a backup source to the resort's upland ditch and tunnel system.

In bringing water specifically to the new hotel site, the project owner plans to connect a 12-inch service line to the nearest water main that presently runs along Office Road and west onto the Lower Honoapiilani Road.

Sewer

Existing System:

Sewage in Kapalua flows into a private sewage collection system owned and operated by the Kapalua Waste Treatment Company, Ltd. (KWTC). Components of the system originally included a wastewater treatment plant (WWTP), gravity lines, force mains and pump stations. Notably, the WWTP component of the system was recently closed, and now all sewage is conveyed via County transmission lines to the County's Lahaina Waste Water Treatment Plant (LWWTP) near Lahaina. The Lahaina facility has a design average daily flow capacity of 6.7 MGD and is available for service to the Lahaina District.

Current and Projected Demand:

Existing resort facilities at Kapalua presently generate an average of nearly 0.3 million gallons of sewage per day. The proposed Ritz Carlton project would generate an additional 0.15 million gallons per day.

Facilities at the LWWTP will be available to accommodate this anticipated sewage from the proposed Ritz Carlton project. Kapalua has County approval through an agreement among Maui County, ML&P and KWTC to use 300,000 gpd capacity in the Lahaina plant and another 200,000 gpd capacity in a rent arrangement with Amfac Development through an agreement between Amfac and Maui County.

Should additional capacity be required or should the Amfac capacity be needed by Amfac, Kapalua would still be able to accommodate its wastewater disposal requirement via its active participation in the possible expansion of the LWWTP. If the Lahaina facility is not expanded and does not have sufficient capacity, Kapalua will provide the needed treatment capacity within the resort.

Electricity

Electrical lines presently run along Office Road adjacent to the project site. Power in these lines is provided by the Maui Electric Company from its substation in Napili. To service the project site, a connection can readily be made to one of these existing lines.

Telephone

Existing telephone lines accompany the electrical lines that run along Office Road. Connections can readily be made to these existing lines to service the proposed hotel.

Other Public Facilities

A new civic center and community park are located between Lahaina and Kaanapali to serve the Lahaina District. Occupants of the civic center include a post office, police substation, fire station, district court, auditorium and health center. Notably, a fire station is also being planned at Napilihau approximately one mile south of Kapalua to effectively serve the Kapalua-to-Mahinahina area.

In Lahaina town are other major public facilities including a small boat harbor, State library, public parks and County offices.

Maui Memorial Hospital is located in Wailuku, and the nearest physician's office is located in Kaanapali. A dentist's office is located in the Lahaina Shopping Center approximately 9 miles from the proposed hotel.

Kapalua is located in the Lahaina School District which is served by Lahainaluna High School (10-12), Lahaina Intermediate (7-9), and Kamehameha III School (K-6). Additionally, a small private school, Sacred Hearts School, is located in Lahaina. The Lahaina Community Plan recognizes the growth trend in the region and recommends that a school site in Napilihau be set aside for future needs. At this time, however, State Department of Education planners believe that the expected student enrollment growth is best met by expanding existing school facilities in the Lahaina area.

It should be recognized that Kapalua is a visitor-oriented development and its guests and residents are predominantly transient. The West Maui resort, therefore, is not expected to generate any major needs for school facilities.

VII. ALTERNATIVES TO THE PROPOSED ACTION

"No Action" Alternative

An alternative to the proposed action is to do nothing. This "no action" approach would result in no hotel, tennis complex, beach facility, infrastructure and consolidation/resubdivision of the property, and no project amenities. Portions of the property would remain in their existing use while the remainder would lay idle and unproductive.

From the community standpoint, the tremedous economic benefit of such a project would not be realized. There would be no new jobs, no additional personal income and no increased public revenues from property taxes, excise taxes, and income taxes.

Very importantly, there would be no new quality hotel that would meet the increasing needs for luxury accommodations in West Maui. The project's market study indicates a substantial demand exists and that the project site is the most suitable in the area. If this demand goes unmet, there would probably be more crowded facilities in the region, and/or prospective patrons may fulfill their needs by going elsewhere perhaps to the neighbor islands.

The proposed hotel is an integral part of the resort's master plan development of the Kapalua area. Its concept as a resort component has also been included in the County's community plan. The proposed hotel, it should be noted, will fortify the provision of needed resort facilities and services and assure of the long-term success of the resort.

Alternative Site

The applicants' desire to develop a luxury-class hotel at Kapalua would require a site that is comparable to the existing Kapalua Bay Hotel property. Such a prerequisite is necessary for the new hotel to complement the existing hotel and to maintain the resort's high standard of quality facilities for its guests. Notably, the nearby Kapalua Bay Hotel site possesses oceanfront amenities including a sandy beach and spectacular coastal views that make it very appealing and desirable to its guests.

The Ritz Carlton project was originally proposed on a 16-acre site immediately behind the Honokahua Bay shoreline. This property was the only remaining site along the Kapalua coast that was not committed for development or to another ownership interest. Beginning with the original Kapalua master plan, the original Ritz Carlton site was always planned for hotel use. Although the master plan has undergone modifications since its original conception, the hotel location was never changed. This is a testament that the original hotel site was extremely appropriate.

After obtaining the necessary governmental land use approvals for the project, intensive archaeological work was performed to clear the site for development. During progress of the archaeological work, however, a significant number of burials were uncovered which resulted in a strong community interest to preserve the area as a important burial ground.

In response to this community interest, ML&P, as landowner, worked on an agreement with Ritz Carlton, the hotel developer, to relocate the proposed facility to an area away from the burial and above the original project site. Plans are now proceeding to develop the hotel at the new location. Archaeological studies have been performed and their results indicate the new site does not contain any significant archaeological features that would affect the proposed development.

Alternative Density

The proposed hotel size is the result of a project feasibility analysis and several development schemes. The number of rooms was determined to be the most appropriate for a viable venture of this type and competitive in a visitor destination area like West Maui.

The applicants initially planned for a 600-room hotel, as allowed by zoning, on the original more restrictive hotel site. Due to concerns expressed by the County over the project's proposed density, the hotel design was scaled back to a 450-room facility. That design was subsequently approved and an SMA Use Permit was granted.

The present proposal on the new hotel site provides more flexibility in density development. With an area of 36 acres (20 acres more than the original site), the owners are now able to build closer to their desired development objective. Although the new project site will have 100 rooms more than the previously approved proposal, the overall density will be less and the buildings will be more spread out. The previously approved project would have had a density of 28 rooms/acre; the larger present site will have a density of 15 rooms/acre. The new property will have more open space, landscaping and outdoor recreational amenities.

Alternative Use

An alternative to the proposed project would be to develop a park. This, however, would result in a redundancy of resources in the immediate area. A 3.3-acre public park presently exists adjacent to the project site and contains a number of improvements including showers, picnic area, comfort station and parking.

Additionally, the original hotel site is being planned for public use. It will be preserved in its natural condition and kept in conservation use with open space amenities and controlled public access.

Residential lots and low/medium-density apartments represent other uses which may be developed on the property. This is a real possibility since the County zoning presently allows for such uses on the property. Considering there are a number of other sites in the resort that are designated for future residential use, it would not be critical that the subject site be developed for residential use.

Other uses, allowed by County zoning, such as auditoriums, museums, and libraries, are more appropriate in existing residential communities. They would require proximity, visibility and accessibility to the general public. The proposed site, thus, would not be ideal for such uses.

VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Development of the proposed hotel, tennis complex and beach facility will commit the project site to long-term resort use. Manpower resources, construction equipment, building materials, and private funds will be needed to construct the proposed facilities. Additionally, public utilities, such as sewer, electricity, and telephone (water will be provided by a private source), as well as community facilities, such as public and private roadways, police/fire protection and medical facilities, will be required to serve the proposed development on a permanent basis.

IX. PROPOSED DEVELOPMENT IN RELATION TO THE SMA OBJECTIVES, POLICIES AND GUIDELINES

An assessment of the proposed project's relationship to the objectives, policies and guidelines set forth in Article II, Section 2-8 of the Rules and Regulations of the Planning Commission of the County of Maui is presented below. Many of the SMA policies are directed at public agencies rather than at private entities such as the

applicants. To the extent that the policies are directed to the applicants, they will be addressed.

Project's Relationship to the Objectives and Policies Relating to:

Recreational Resources:

Public access to Honokahua beach is provided through the existing 3.3-acre Fleming Park. The County facility, which contains parking, showers and a comfort station, occupies approximately 40 percent of Honokahua Bay's 1,700-foot long beach frontage. The burial preserve (Ritz Carlton's original hotel site) occupies 35 percent of the beach frontage and the proposed beach facility site occupies the remainder.

In addition to the existing public park, the applicants are proposing to provide public parking and a public pedestrian walkway from the Lower Honoapiilani Road near Fleming Park through their project site to the beach.

The proposed project will not damage nor reduce the size of Honokahua Beach. All proposed improvements will be set back, at least, 40' from the shoreline. Only general clean up, maintenance and improved pedestrian accesses are planned in the shoreline area.

The hotel and beach facility is expected to increase public use of the shoreline, however, it would not overburden the sand area of Honokahua beach as hotel guests will have a number of beach-related options on the hotel grounds to choose from including swimming pools, wet bars, outdoor jacuzzies, sun decks and lounge areas.

The guests of the hotel will also have access to the resort's three golf courses and hotel's tennis club.

Historic Resources:

An archaeological inventory was recently conducted by a consultant archaeologist to determine the presence and location of archaeological sites on the property. The study findings indicate that there are no significant archaeological features in the proposed hotel and tennis area. The area adjacent to the beach was found to contain a few sites that needed further study. The archaeologist, at the request of the project owner, conducted the additional testings and, based on no significant features found, determined that no further archaeological work will be required. Additionally, the consultant recommends that the beach front area be monitored by a qualified archaeologist during the project's clearing and grading work to assure that any unanticipated significant archaeological finds be recorded and reported to the appropriate government agencies.

Scenic and Open Space Resources:

The planned burial preserve and proposed beach facility at Honokahua Bay will assure a lateral view corridor along the oceanfront. The proposed beach facility will be setback from the shoreline to provide adequate open space fronting the sand area. Main structures of the hotel facility will be located more than 500 feet from the ocean and about 500 feet from any resort residential area. There will be abundant open space, golf course fairways and existing vegetation abutting the property to create a landscaped and natural buffer around the project site.

The new state coastal highway is located more than 1,000 feet from the proposed hotel. Views from the highway are expected to be long-range and panoramic. The proposed hotel consequently is expected to be a very small component of this far-reaching view. Additionally, it is anticipated a major portion of the hotel will be hidden by surrounding vegetation and topographic relief.

The proposed hotel is coastal dependent and is planned to take advantage of the site's proximity to the sea. Considering its location above the shoreline, the proposed project is sensitive to the environmental concerns of the project area.

Coastal Ecosystems:

The proposed hotel would not significantly damage valuable coastal ecosystems of significant biological or economic importance. Preserving a 400- to 500-foot wide band of open space along the beach for an existing burial site will minimize disruption or degradation of the coastal water ecosystems.

Potential erosion damage from surface runoff will be minimized by hotel landscaping and existing rapid ground percolation.

There will be no dumping of commercial or industrial waste nor sewage effluent into the coastal waters. The proposed project will comply with all State Department of Health water quality regulations.

Economic Uses:

The proposed hotel will be developed by a private venture on a site which is considered suitable for hotel development. The proposed facility is resort-related in terms of function and is dependent upon its location near the shoreline.

Kapalua is a County-approved resort that is being developed in several phases over a period of time. Such a project is an allowable use on the property under existing State and County land use laws, ordinances and regulations. The proposed hotel, which will be a part of the Kapalua community, would not result in any

significant negative social impact on the region that is presently characterized as visitor oriented.

The proposed project will not preclude the use and enjoyment of beaches and coastal areas by the general public. To insure the long-term accessibility of the coastal area to the general public, existing public beach accesses will be maintained and open space buffers along the shoreline will be preserved. Additionally, the applicants are proposing a new parking area near Fleming Park and a pedestrian access for public use through their project site to Honokahua beach.

The proposed project will benefit from and contribute to the visitor industry which is a vital element of the state's economy. Moreover, it will create new jobs and generate substantial income in the local community.

Coastal Hazard:

The proposed development will not alter any drainage patterns that would adversely affect adjacent or downstream properties. No portion of the proposed hotel is subject to a potential 100-year riverine flood or to extensive damage from mauka runoff.

The proposed hotel is located above the tsunami inundation zone and thus would not be subject to any coastal high hazard flood.

Managing Development:

This environmental assessment is a tool for communicating the impacts of the proposed project at an early stage of its development. It is intended to "facilitate the public participation in the plan and review process".

Project's Relationship to SMA Guidelines:

SMA Guidelines A.1 - A.4:

D.T. Fleming Park, which is located adjacent to the project site and has over 600 feet of beach frontage, provides adequate public access to Honokahua Bay. Other improvements at the 3.3-acre public park include parking, toilets, showers, and picnic areas.

The proposed hotel will not reduce the size of this park nor interfere with it's provision of public access to the beach. Also, the proposed hotel will not interfere with any other existing public recreation or wildlife preserve located in the West Maui area.

The proposed hotel will employ sound site engineering practices in preparing the property for construction. As standard procedure, soil tests and preliminary

drainage studies will be conducted and site grading plans will be prepared to assure minimal adverse effects on water resources and to minimize danger of flood, land slide, erosion, siltation or failure in the event of earthquake.

Liquid waste generated by the proposed development will be adequately and safely disposed of in the region's sewage collection system. The system includes sewer gravity lines, force mains, lift stations and a County waste water treatment facility.

Solid waste generated by the proposed development will be arranged by the resort for hauling to a County solid waste disposal facility.

SMA Guidelines B.1 - B. 3 :

As elaborated above, the proposed development and its anticipated cumulative effects will not result in any substantial long-term adverse impact on the project site and surrounding environment. The proposed project is consistent with the County General Plan, Lahaina Community Plan, and County Zoning Ordinance and is presently proceeding through the County's subdivision review process. As provided herein, also, the proposed project is consistent with the objectives and policies, as enumerated in Chapter 205A of the Hawaii Revised Statutes, and as recited under Sections 20.12.640 and 20.12.650, and the Special Management Area Guidelines as set forth in Section 20.12.660.

SMA Guidelines C.1 - C. 5 :

No portion of the proposed hotel improvements will be located within the Conservation District or within 40 feet of the shoreline. The only exception would be two pedestrian walkways to the beach which would assure the safety and convenience of the public and hotel guests.

No hotel improvements will be made that would result in the reduction of public beach land at Honokahua Bay. There will be no dredging, filling, or altering of the nearshore or offshore waters, nor will there be any significant adverse effect on the quality of those waters. Nearby fishing grounds will not be adversely impacted nor will inland water areas.

The project site, as noted earlier, is not known to be unique or significant as a wildlife habitat.

Public access to Honokahua Bay via D.T. Fleming Park will continue to be maintained and free of interference from adjacent and nearby development. The proposed project will not result in significant adverse effects on panoramic views from the new Honoapiilani Highway to the shoreline and lateral views along the shoreline at Honokahua Bay.

APPENDICES

APPENDIX A

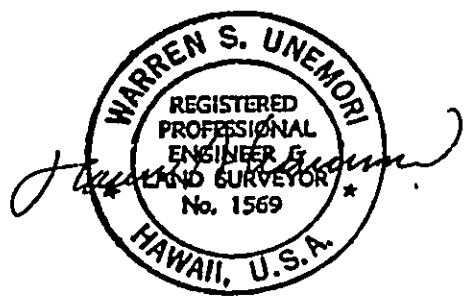
Preliminary Drainage and Soil Erosion Control Report

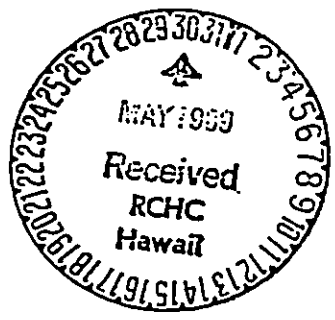
Preliminary Drainage and Soil Erosion Control Report For The Ritz-Carlton Kapalua Hotel

Honokahua, Maui, Hawaii

Prepared for:

The Ritz-Carlton Hotel Company
Honolulu, Hawaii





Prepared by:

Warren S. Unemori Engineering, Inc.
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May 1989

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Preliminary Drainage and Soil Erosion Control Report
for
The Ritz-Carlton Kapalua Hotel

I. INTRODUCTION

This report examines both the existing and proposed drainage conditions for the Ritz-Carlton Kapalua Hotel planned for Honokahua, Maui. The report also evaluates the potential for movement of soil off of the project site by storm runoff and proposes measures to control soil erosion during construction in accordance with Title 20 of the Maui County Code.

II. PROPOSED PROJECT

A. Site Location

The Ritz-Carlton Kapalua hotel will be located in Honokahua, on Maui's northern coast. The 36-acre hotel site will be situated within the Kapalua Resort on the hillside above Honokahua Bay between Honoapiilani Highway and Lower Honoapiilani Road.

B. Project Description

The Ritz-Carlton Hotel Company plans to develop the 36-acre site into a luxury resort hotel, complete with its own tennis complex and an oceanside "Beach House" for entertaining hotel guests.

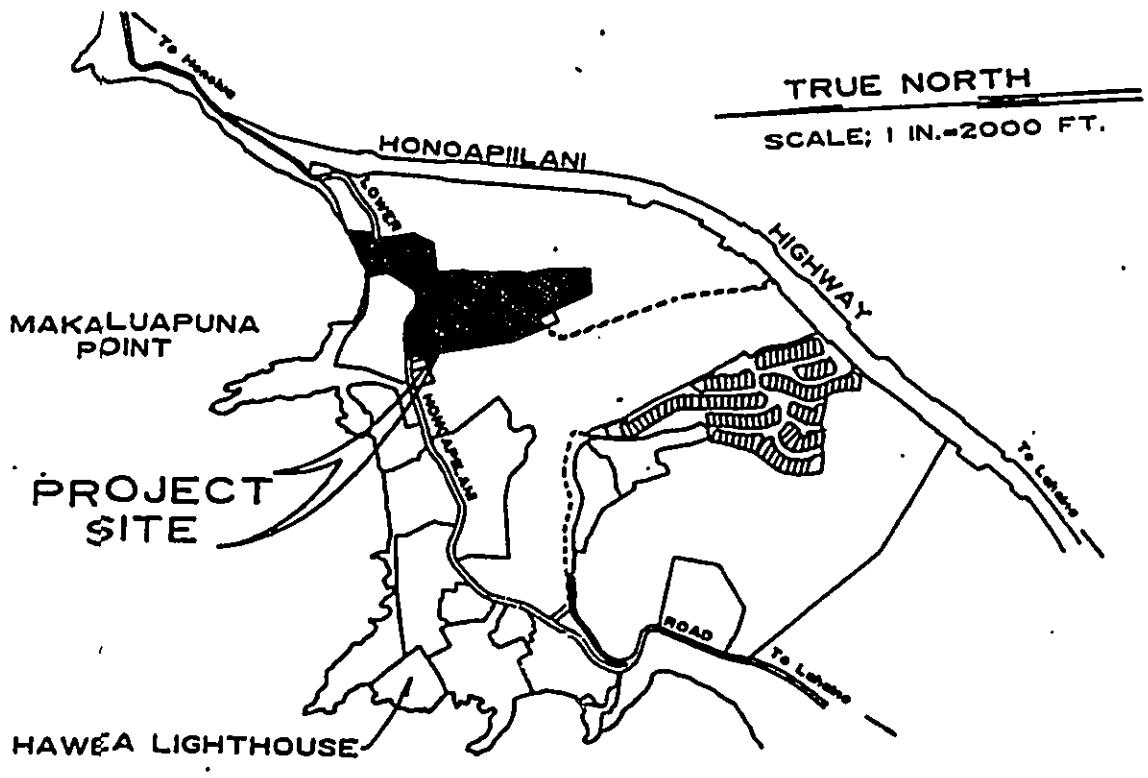

Figure 1:
LOCATION MAP
SCALE: 1 IN.=2000 FT.

III. EXISTING CONDITIONS

A. Topography and Soil Conditions

Roughly half of the 36 acres of land on which the hotel will be built is now a part of the Kapalua Golf course, including a portion of the fairway and several utility buildings. The remaining acreage consists of vacant, undeveloped land adjoining the golf course to the south and east. The site selected for the hotel slopes gently downward toward the ocean at a grade of roughly eight percent. Honokahua Stream flows nearby in a large gulch located to the east of the project site.

A survey of the area by the Soil Conservation Service found a reddish-brown Kahana series silty clay present over most of the project site. This type of soil is reportedly good for either topsoil or embankment material, is well-drained, and poses only a slight to moderate erosion hazard.[1]

The 36 acre site includes approximately 2 acres of land near the ocean, just to the west of the D. T. Fleming Beach Park. Sand dunes and ironwood trees cover most of the two acres.

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[1]United States Department of Agriculture Soil Conservation Service, Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii (Washington D.C.: U.S. Government Printing Office, August 1972), pp. 28-29, 50-51, 159, 175, Map Sheet No. 91.

B. Drainage

The existing site produces a peak discharge of 34 cfs during a 10-year design storm. Runoff presently sheet flows down the mountainside toward Lower Honoapiilani Road, where it enters a low area that diverts it eastward toward the mouth of Honokahua Stream and into the ocean.

C. Flood and Tsunami Zone

Approximately 0.80 acre of hotel property adjacent to the proposed tennis courts is located within the Honokahua Stream flood plain. This area is designated A4 on the Federal Flood Insurance Map for Maui County,[2] indicating that it is in a location vulnerable to 100-year riverine flooding. The present site plan places three of the Tennis Club's ten courts within this flood zone.[3]

A small 4000 square foot triangle of land along the shoreline falls within the tsunami high hazard area designated V29 on the Flood Insurance Map. This hazard area will not affect the proposed Beach House Snack Bar, which will be situated atop high ground safe from both tsunami wave action and flooding.

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[2]Federal Emergency Management Agency, Federal Insurance Administration, "National Flood Insurance Program; Flood insurance Rate Map; Maui County, Hawaii," Effective June 1, 1989, Community Panel Number 150003 0138 B, Panel 138 of 400.

[3]Section 19.62.070 of the 1988 Maui County Code allows the construction of "public and private outdoor recreational facilities, lawn, garden, and play areas" within a flood district.

IV. POST-DEVELOPMENT CONDITIONS

A. Drainage Plan

Development of the 36-acre site into a hotel and tennis complex is expected to increase the peak 10-year storm runoff generated by the site from 34 cfs to 91 cfs -- an increase of 57 cfs. The runoff generated by the 10 acres above the hotel (the future hotel parking area) will be intercepted by an underground storm sewer network and piped into the existing retention pond located approximately 300 feet to the east of the future hotel. The runoff collected in the pond will then be released slowly into Honokahua Stream via the existing culvert and concrete spillway. The use of the retention pond to dispose of storm runoff will have two important environmental benefits: first, the gradual release of storm water into Honokahua Stream will prevent the runoff from the parking lot from contributing to any local flooding that might occur downstream; second, sediment and debris carried by the runoff will settle out in the retention pond instead of washing into Honokahua Stream (and, consequently, Honokahua Bay).

The runoff generated by the remaining 26 acres occupied by the hotel and tennis complex will be intercepted by another underground storm sewer system.[4] The runoff captured by this second system will pass into a large-diameter storm drain located along the makai

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[4]Runoff from the roof of the hotel building will be piped directly into the storm sewer system in order to minimize the possiblity of erosion occurring.

boundary of the hotel property that will convey the storm water eastward and discharge it into Honokahua Stream on the downstream side of the existing 9 ft. x 9 ft. concrete box culvert under Lower Honoapiilani Road. The storm water from the hotel will be discharged far enough downstream and far enough away from developed areas to ensure that it does not have an adverse impact on the flood prone areas further upstream.

B. Hydrologic Calculations

The storm runoff figures presented in this report were arrived at using the methods described in the Drainage Master Plan for the County of Maui, prepared by the R. M. Towill Corporation for the County of Maui in October, 1971. Calculations are based upon the Rational Formula:

$$Q = C*I*A$$

where Q = Rate of Flow (cfs)

C = Rainfall Coefficient

I = Rainfall Intensity (inches/hour)

A = Area (Acres)

The hydrologic calculations for this project may be found in Appendix A.

Figure 2:

HYDROLOGIC SUMMARY

Drainage Area = 36 acres

Recurrence Interval = 10 years

One-hour Rainfall = 2.0 inches

Pre-Development

Total Runoff = 34 cfs

Post-Development

10 Acre Hotel Parking Area	=	36 cfs
26 Acre Hotel and Tennis Complex	=	55 cfs
Total Runoff	=	91 cfs
Net Increase	=	57 cfs

C. Conclusion

Development the project site will not have an adverse impact on the drainage situation in the area. Although the peak storm discharge from the project site will increase significantly due to the construction of the new hotel, adequate drainage facilities will be provided to ensure the safe disposal of the storm runoff.

V. SOIL EROSION CONTROL PLAN

The following measures will be taken to control erosion during the site development period (estimated at 24 months):

1. Construction time will be minimized.
2. Existing ground cover will be retained until the latest date not interfering with construction.
3. No more than 15 acres will be left exposed at any time during the construction period.
4. Drainage control features will be constructed early.
5. Temporary area sprinklers will be used in non-active construction areas where the ground cover has been removed.
6. Water trucks will be stationed on the construction site to provide immediate sprinkling when needed in active construction zones -- weekends and holidays included.
7. Temporary berms and cutoff ditches will be used where needed to control erosion.
8. Graded areas will be thoroughly watered at the end of every workday (weekends included).
9. All cut and fill slopes will be sodded or planted immediately after grading work has been completed.

Soil erosion calculations (see Appendix B) indicate that the construction of the Ritz-Carlton Hotel will not pose a sedimentation hazard to coastal waters. Both the severity rating computed for the proposed development and the estimated soil loss are within the limits set forth by the Hawaii Environmental

Simulation Laboratory[5] and adopted by the County of Maui; therefore, erosion control measures beyond those listed above will not be required.

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[5]Paul Bartram and Doak C. Cox of the Hawaii Environmental Simulation Laboratory, University of Hawaii, The Regulation of Sedimentation Associated With Urbanization in Hawaii, Working Paper WP74-004 (University of Hawaii, June 3, 1975).

Appendix A

Hydrologic Calculations

W.S. UNEMORI ENGINEERING, INC.
2145 Wells Street Suite 403
Wailuku, Maui, Hawaii 96793

BY: D. Unemori
DATE: May 25, 1989

HYDROLOGIC STUDY
FOR
THE RITZ-CARLTON KAPALUA HOTEL

Honokahua, Maui, Hawaii

Pre-Development Runoff

36 Acres of Golf Course and Undeveloped Grassland

RECURRENCE INTERVAL:	10 years	HYDRAULIC LENGTH:	2400.0 ft.
ONE-HOUR RAINFALL:	2.00 inches	ELEV'N. DIFFERENTIAL:	190.00 ft.
		HYDRAULIC SLOPE:	0.079 ft./ft.
WEIGHTED RUNOFF COEFFICIENT, C:	0.40	TIME OF CONCENTRATION:	45.0 min.
INTENSITY, I:	2.35 inches		
AREA, A:	36.00 acres	SUB BASINS CONSIDERED:	1

Q = C*I*A = 33.84 cfs

COMMENTS:

W.S. UNEMORI ENGINEERING, INC.
2145 Wells Street Suite 403
Wailuku, Maui, Hawaii 96793

BY: D. Unemori
DATE: May 25, 1989

THE RITZ-CARLTON KAPALUA HOTEL
[continued]

TABULATION OF RUNOFF COEFFICIENTS & AREAS:

SUB-BASIN 1 OF 1 : Golf Course / Undeveloped Grassland

INFILTRATION:	Medium	0.07	
RELIEF:	Rolling (5-15%)	0.03	>>> COMPOSITE C = 0.400
VEGETAL COVER:	High (50-90%)	0.00	>>> AREA = 36.000 acres
DEVELOPMENT:	Rural	0.30	

W.S. UNEMORI ENGINEERING, INC.
2145 Wells Street Suite 403
Wailuku, Maui, Hawaii 96793

BY: D. Unemori
DATE: May 25, 1989

HYDROLOGIC STUDY
FOR
THE RITZ-CARLTON KAPALUA HOTEL

Honokahua, Maui, Hawaii

Post-Development Runoff

10 Acre Hotel Parking Area

RECURRENCE INTERVAL:	10 years	HYDRAULIC LENGTH:	1000.0 ft.
ONE-HOUR RAINFALL:	2.00 inches	ELEV'N. DIFFERENTIAL:	80.00 ft.
		HYDRAULIC SLOPE:	0.080 ft./ft.
WEIGHTED RUNOFF COEFFICIENT, C:	0.81	TIME OF CONCENTRATION:	8.0 min.
INTENSITY, I:	4.50 inches		
AREA, A:	10.00 acres	SUB BASINS CONSIDERED:	2

Q = C*I*A = 36.22 cfs

COMMENTS: Assumes 90% of total area paved, 10% planted

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THE RITZ-CARLTON KAPALUA HOTEL
[continued]

TABULATION OF RUNOFF COEFFICIENTS & AREAS:

SUB-BASIN 1 OF 2 : Paved Area

INFILTRATION:	Negligible	0.20	
RELIEF:	Rolling (5-15%)	0.03	>>> COMPOSITE C = 0.850
VEGETAL COVER:	None	0.07	>>> AREA = 9.000 acres
DEVELOPMENT:	Industrial / Business	0.55	

SUB-BASIN 2 OF 2 : Planted Area

INFILTRATION:	Medium	0.07	
RELIEF:	Rolling (5-15%)	0.03	>>> COMPOSITE C = 0.400
VEGETAL COVER:	High (50-90%)	0.00	>>> AREA = 1.000 acres
DEVELOPMENT:	Rural	0.30	

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BY: D. Unemori
DATE: May 25, 1989

HYDROLOGIC STUDY
FOR
THE RITZ-CARLTON KAPALUA HOTEL

Honokahua, Maui, Hawaii

Post-Development Runoff

26 Acre Hotel and Tennis Complex

RECURRENCE INTERVAL:	10 years	HYDRAULIC LENGTH:	1800.0 ft.
ONE-HOUR RAINFALL:	2.00 inches	ELEV'N. DIFFERENTIAL:	110.00 ft.
		HYDRAULIC SLOPE:	0.061 ft./ft.
WEIGHTED RUNOFF COEFFICIENT, C:	0.63	TIME OF CONCENTRATION:	18.0 min.
INTENSITY, I:	3.40 inches		
AREA, A:	26.00 acres	SUB BASINS CONSIDERED:	2

Q = C*I*A = 55.25 cfs

COMMENTS: Assumes 50% of total area impermeable, 50% planted

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THE RITZ-CARLTON KAPALUA HOTEL
[continued]

TABULATION OF RUNOFF COEFFICIENTS & AREAS:

SUB-BASIN 1 OF 2 : Rooftops, Tennis Courts, Roads and Walkways

INFILTRATION:	Negligible	0.20	
RELIEF:	Rolling (5-15%)	0.03	>>> COMPOSITE C = 0.850
VEGETAL COVER:	None	0.07	>>> AREA = 13.000 acres
DEVELOPMENT:	Industrial / Business	0.55	

SUB-BASIN 2 OF 2 : Lawns and Landscaped Areas

INFILTRATION:	Medium	0.07	
RELIEF:	Rolling (5-15%)	0.03	>>> COMPOSITE C = 0.400
VEGETAL COVER:	High (50-90%)	0.00	>>> AREA = 13.000 acres
DEVELOPMENT:	Rural	0.30	

Appendix B

Universal Soil Loss Equation Calculations

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Wailuku, Maui, Hawaii 96793

BY: D. Unemori
DATE: May 22, 1989

H.E.S.L.
FOR
RITZ-CARLTON HOTEL SITE

Kapalua, Maui

1. HESL EQUATION: E = R*K*LS*C*P

WHERE:
- E = Soil Loss (tons/acre/year)
- R = Average Annual Rainfall Factor for Erosion
- K = Soil Erodibility Factor
- L = Horizontal Slope Length (feet)
- S = Average Slope (%)
- LS = Slope Factor (function of L and S)
- C = Cover and Management Factor
- P = Erosion Control Practice Factor

R = 200.0 tons/acre/year
(Soil Erosion & Sediment Control Guide for Hawaii; Appendix A: Average Annual Values of Rainfall Factor)

K = 0.17 Soil Series: Kahana
(Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii; Soil Type Plates & Table 4; Soil Properties Related to Erosion & Sedimentation ....)

L = 2,000.0 feet
δ = 160.0 feet
(Soil Erosion & Sediment Control Guide for Hawaii; Table 16)

S = (δ/L)
= 8.0 %

LS= 4.436

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BY: D. Unemori
DATE: May 22, 1989

RITZ-CARLTON HOTEL SITE
[Continued]

C = 1.00
(Soil Erosion & Sediment Control Guide for Hawaii Tables 17-22, Pages 59-61; C=1.00 for Bare Soil)

P = 1.00
(Soil Erosion & Sediment Control Guide for Hawaii; the Universal Soil Loss Equation in Hawaii)'

E = R*K*LS*C*P
= 150.8 tons/acre/year

2. SEVERITY RATING NUMBER EQUATION: H=[(2*F*T)+(3*D)]*A*E

WHERE:
H = Severity rating number
T = Duration of land-disturbing activity (years)
A = Area subject to disturbance (acres)
E = Rate of soil loss under disturbed conditions (tons/acre/year)
F = Downslope-downstream rating factor (rating points/ton)
D = Coastal water rating factor (rating points/ton)

T = 2.00 years

A = 15.00 acres

E = R*K*LS*C*P
= 150.8 tons/acre/year

F = 4 (Downslope-downstream detriment: Major)

D = 2 (Coastal water rating factor: Class A)

H = [(2*F*T)+(3*D)]*A*E
= 49,777.0

Standard severity rating (allowable): 50,000 ≥ 49,777.0 =>OK

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DATE: May 22, 1989

RITZ-CARLTON HOTEL SITE
[Continued]

3. MAXIMUM ALLOWABLE SOIL LOSS: E max = H max/(2FT+3D)A

E max = H max/(2FT+3D)A, Hmax = 50,000
= 151.5 tons/acre/year ≥ 150.8 tons/acre/year =>OK

Coastal Hazard: Class A waters are approximately 500 feet from the site.

CONCLUSION: Sedimentation hazard to coastal waters and downstream properties is minimal. Erosion rate computed for this project site is within the tolerable limits and additional control measures are not required.

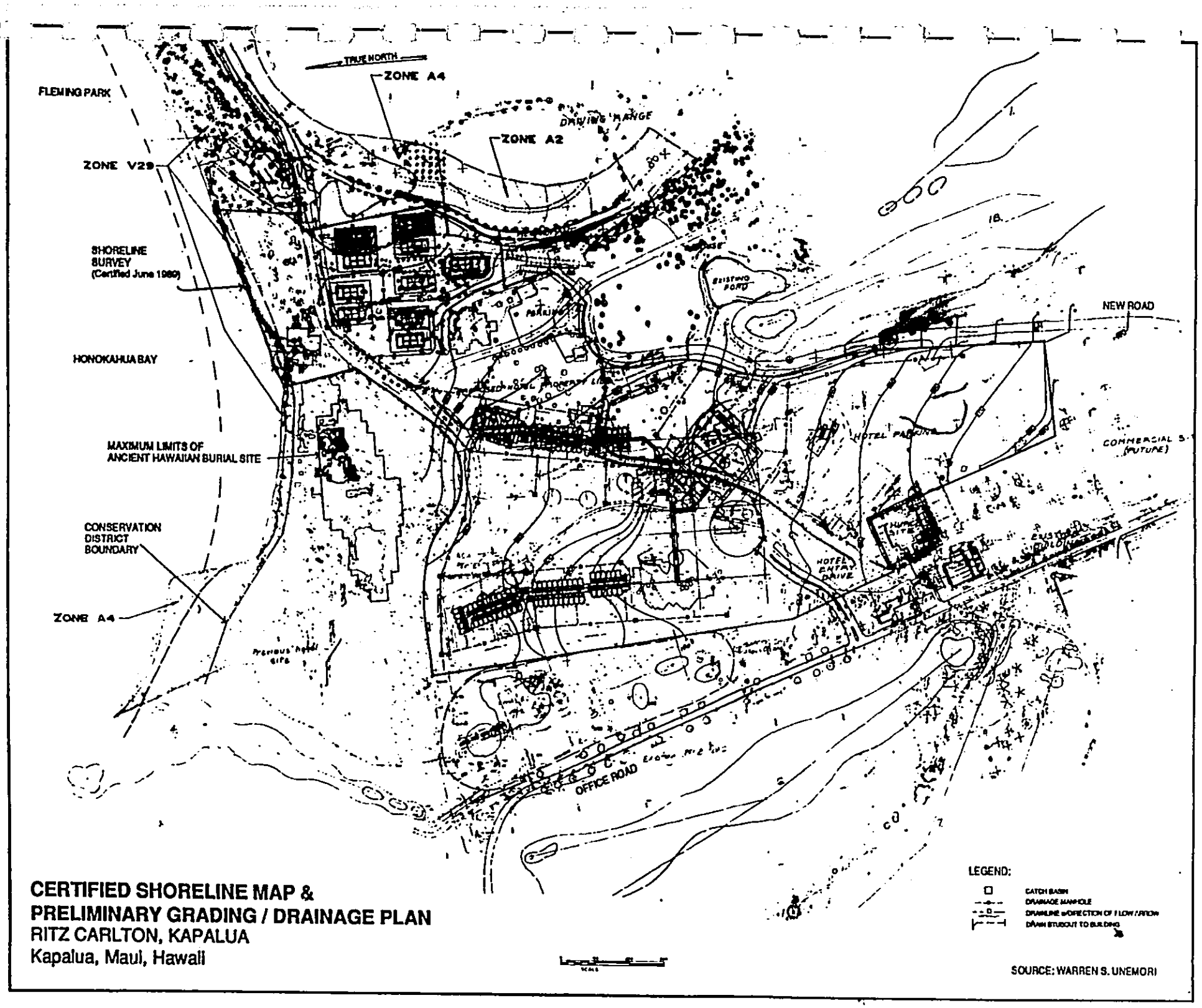
4. REFERENCES:

1. Soil Conservation Service (USDA); 'Guidelines For Use of the Universal Soil Loss Equation in Hawaii,' Technical Notes, March 1975. (Revised Draft)

2. County of Maui; (Ord No. 816), 'Chapter 24, Soil Erosion and Sedimentation Control,' June 13, 1975.

3. Soil Conservation Service (USDA); 'Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai; State of Hawaii, August 1972.

4. Hawaii Environmental Simulation Laboratory; 'Guidelines for Data Preparation, Part 1: Universal Soil Loss Equation; Undated (Draft).



CERTIFIED SHORELINE MAP &
PRELIMINARY GRADING / DRAINAGE PLAN
RITZ CARLTON, KAPALUA
Kapalua, Maui, Hawaii

SOURCE: WARREN S. UNEMORI

APPENDIX B

Botanical Survey

BOTANICAL SURVEY

RITZ-CARLTON KAPALUA, MAUI

by

George K. Linney
and
Winona P. Char

CHAR & ASSOCIATES
Botanical/Environmental Consultants
Honolulu, Hawaii

Prepared for: BELT COLLINS & ASSOCIATES

MAY 1989

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SUMMARY

On 14 April 1989 a botanical survey was made of the proposed Ritz Carlton Kapalua site, West Maui. The site consisted of a mixture of developed areas (golf course, habitations, etc.) and weedy waysides. Developed areas were excluded from the survey, so that only the weedy areas were studied. A total of 157 species of vascular plants were found, of which 144 (92%) were exotics, 6 (4%) Polynesian-introduced species, and 7 (4%) native or presumed-native species. There were no species on the site officially listed as endangered, or candidate for such listing; none are considered rare or vulnerable. None of the native species are of botanical interest or warrant mitigative action before the site is developed. A number of plants on the site have potential value as landscape plants in the development of the site.

INTRODUCTION

The Ritz-Carlton site consisted of approximately 36 acres, extending from Honokahua Bay, adjacent to Fleming Park, to about 2000 feet inland. The elevational range is from about sea level to about 210 feet above sea level. Small parcels at the upper and lower ends of the site, compprising roughly a third of the total area, were unmaintained. The middle portion of the site was largely given over to the Village golf course, various support facilities, and other businesses or concerns.

Nearest the coast, the substrate was coral sand, quickly giving way to a deep, sticky, red soil inland. Rainfall is approximately 20 inches per year, though soil moisture may be enhanced somewhat by agricultural and landscape activity in the area, causing the vegetation to be more lush than might be expected. Even in scrub areas, exotic species persist from earlier, long-abandoned plantings.

PREVIOUS SURVEYS

About 13.6 acres fronting Honokahua Bay was formerly designated for the Ritz-Carlton hotel site. An extensive Polynesian burial site was found on a portion of the site during

archeological studies. The proposed project site has since been relocated inland of the old Honoapi'ilani Road, although a small portion still abuts Honokahua Bay.

The botanical survey of the former site (Char, 1986), conducted in February 1986, recognized three vegetation types: kiawe-koa haole stands, ironwood forest, and scrub vegetation. All were dominated by introduced plants. The native plants occurred primarily on the rocky coastal area of Makaluapuna Point. None of these plants were considered rare, threatened, or endangered.

SURVEY METHODS

Only the areas not currently maintained were surveyed, as they were more likely to harbor native species or native plant communities. The golf course and grounds around habitations and other buildings in use were omitted. A walk-through method was used in the relatively small non-maintained parcels. The site was readily accessible by a series of roads around the periphery and through the center of the site. Plants were identified in the field. Those plants that were not recognized in the field were brought back for comparison with preserved specimens and the taxonomic literature. Taxonomy and nomenclature of ferns follows Wagner and Wagner (1987), while for flowering plants Wagner, et al. (in press), was followed for the most part, supplemented by Neal (1965). A list of all species found on the project site is presented at the end of this report.

DESCRIPTION OF THE VEGETATION

There were only two extensive undeveloped areas within the site: a parcel extending from the coast to about 1000 feet inland, and one extending down about 500 feet from the top of the site. The coastal parcel was divided into two vegetation sub-types. On the ocean side of old Honoapi'ilani Road, vegetation consisted almost entirely of tall-stature ironwood trees (Casuarina equisetifolia) up to 50 feet tall, and a ground cover of sour grass (Digitaria insularis). Immediately adjacent to Fleming Park, heavy beach-user traffic had thinned or eliminated

the sour grass, and the ground was covered by low-stature Bermuda grass (Cynodon dactylon), and miscellaneous weeds. The only noteworthy weedy species was a peppergrass (Lepidium cf. bonariense). If the identification is correct, this is a new island record. All other plant species were typical lowland or coastal wayside weeds. They are listed at the end of the report.

Inland of old Honoapi'ilani Road the vegetation was largely of former plantings, now largely abandoned, although coconut trees (Cocos nucifera) were evidently being dug and transplanted elsewhere. The old trees included mango (Mangifera indica), an unknown resembling a Simarouba, soursop (Annona muricata), sweetsop (Annona squamosa), physic nut (Jatropha curcas), and avocado (Persea americana). There was a minor element of 'opiuma (Pithecellobium dulce), monkeypod (Samanea saman), and kiawe (Prosopis pallida). Koa haole (Leucaena leucocephala) formed a dense scrub layer throughout. A number of noteworthy herbs were also present, including 'ape (Alocasia macrorrhiza) and tobacco (Nicotiana tabacum). Along Honokahua Stream, there was typical streamside vegetation, such as Javaplum (Syzygium cumini) and elephant grass (Pennisetum purpureum). A number of vines were climbing the trees. The most conspicuous of these were yellow morning glory (Ipomoea ochracea), moon flower (Ipomoea alba), bittermelon (Momordica charantia), and coral vine (Antigonon leptopus). In addition to these naturalized species, there was Java grape (Tetrastigma harmandii), a rampant vine usually planted as a living screen to hide unsightly objects. This species is not known to be naturalized in Hawaii, and it was not clear whether this species had naturalized or represented only a persisting former planting. If the plant has naturalized here, it will be a very serious noxious plant. Seedlings of precatory bean (Abrus precatorius) were also found. The seeds of this vine are extremely attractive scarlet and black, but deadly poison. They pose such a threat to life that their import into the United States is forbidden, even though they are already growing in several places within the country.

Near the upper end of this lower unmaintained parcel, the vegetation has elements of gulch vegetation, due to the proximity of the steep edge of Honokahua gulch. These elements include two species of Eucalyptus and Formosan koa (Acacia confusa), all probably representing escapes from gulch forestry plantings, as

well as sword fern (Nephrolepis multiflora). The remainder of the vegetation consisted of common ruderal weeds.

Smaller patches of unmaintained vegetation associated with the fringes of the golf course consisted of a very open koa haole-kiawe scrub with a dense undergrowth of sour grass and Guinea grass (Panicum maximum). The largest of these patches was adjacent to old Honoapi'ilani Road, and associated with a clump of ironwood (Casuarina glauca). This species produces root-suckers continuously. While it can be invasive, it also forms a very dense screen and is valuable as a windbreak and living screen. It does not seem to produce fruits as freely as the more common ironwood along the coast, and so is more compatible with barefoot pedestrian traffic. As with other ironwoods, little or nothing else grows under these trees.

The unmaintained parcel at the top of the site consists of old fruit, nut, and ornamental trees, now largely overgrown by Guinea grass and other weeds. The trees included mango, lime (Citrus aurantiifolia), egg fruit (Pouteria campechiana), macadamia (Macadamia integrifolia), Siamese rough bush (Streblus asper), and star fruit (Averrhoa carambola). At the uppermost boundary of the site, and apparently just outside of the site, was a single large specimen of kauri pine (Agathis sp.) There was also tomato (Lycopersicon esculentum and pimpinellifolium), banana (Musa x paradisiaca), and yard-long, or asparagus, bean (Vigna sesquipedale). Some of these species are characteristic of plantation workers' gardens, and may indicate the parcel was a former plantation camp or village.

Two ferns were found growing epiphytically on large trees. These were laua'e (Phymatosorus scolopendria) and the native pakahakaha (Pleopeltis thunbergiana). The former is much overused as a commercial landscape ornamental, considering its coarse growth, and is becoming an increasingly serious noxious weed in native forests.

A single specimen of India rubber vine (Cryptostegia grandifolia) was observed in this parcel. Occasionally grown as an ornamental, it is not particularly attractive. It has escaped in two coastal locations on O'ahu, as well as the maritime lowlands of Keauhou and Kailua-Kona on the island of Hawai'i.

THREATENED AND ENDANGERED SPECIES

No species officially listed as endangered by the Federal or State governments (U. S. Fish and Wildlife Service, 1985; Herbst, 1987), were found on the site. None of the native species found in the survey are considered rare or threatened, or candidates for official protection; nor were any of them of any other botanical interest. All were common elements of lowland vegetation, and their loss would not be expected to have a significant impact on the statewide populations of those species.

RECOMMENDATIONS

There is no botanical impediment to the development of the site. A number of very large ornamental trees occur on the site, and these could well be worked into the future landscaping plans. In the nusery area adjacent to the present golf course are a number very nice specimens of native species. It would be desirable to preserve these and work them into the future landscaping for both cultural and ornamental reasons. These plants include a'ali'i (Dodonaea viscosa), alahe'e (Canthium odoratum), and wiliwili (Erythrina sandwicensis). Others could also be grown ornamentally. Some are already adapted to the local climatic conditions, while others would require only normal landscaping conditions and maintenance. A list of suitable plants can be provided on request, and many species are already commercially available. Others grow nearby and could be brought into cultivation on demand.

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Neal, M. 1965. In Gardens of Hawaii. Bernice P. Bishop Museum, Honolulu.

U. S. Fish and Wildlife Service. 1985. Endangered and threatened wildlife and plants; Review of plant taxa for listing as Endangered and Threatened Species; Notice of review. Federal Register 50(188): 39526-39527 + 57-page table.

Wagner, W. H., Jr., and F. S. Wagner. 1987. Revised checklist of Hawaiian Pteridophytes. (Unpublished manuscript).

Wagner, W. L., D. Herbst, and S. Sohmer. In press. Manual of the Flowering Plants of the Hawaiian Islands. B. P. Bishop Museum Press.

SPECIES LIST

A list of all the vascular plants found on the site follows. Plants are organized in four groups -- ferns, conifers, monocots, and dicots. Within each group they are further arranged in alphabetical order by family, genus, and finally species. An accepted common name is given for each. A Hawaiian name is given for all native plants when known, and also for those exotic species that are generally known by a Hawaiian name. Biogeographic status is indicated by a letter code. An explanation of abbreviations used (other than author citations) is given below.

SCIENTIFIC NAME

cf. - uncertain identity, resembling the species or genus named
s.l. - in a broad sense

STATUS

E - endemic, native only to the Hawaiian Islands; none found in this survey
I - indigenous, considered native to the Hawaiian Islands, but also found elsewhere
P - Polynesian introduction, not considered native, but thought to have been introduced to Hawaii prior to 1778
X - exotic, not native to the Hawaiian Islands, introduced after 1778

SPECIES LIST

SCIENTIFIC NAME	COMMON NAME	BIOGEOGRAPHIC STATUS
FERNS		
Aspleniaceae		
Nephrolepis multiflora (Roxb.) Jarret ex Morton	sword fern	X
Polypodiaceae		
Phymatosorus scolopendria (Burm.) Pichi Sermolli	laua'e	X
Pleopeltis thunbergiana Kaulf.	pakahakaha	I
CONIFERS		
Araucariaceae		
Araucaria columnaris (Forst.) Hook.	Cook pine	X
FLOWERING PLANTS		
MONOCOTS		
Araceae		
Alocasia macrorrhiza (L.) Schott	'ape	P
Cannaceae		
Canna indica L.	canna	X
Commelinaceae		
Commelina diffusa N. L. Burm.	dayflower	X
Cyperaceae		
Cyperus alternifolius L.	umbrellagrass	X
Cyperus gracilis R. Br.	McCoygrass	X
Cyperus rotundus L.	nutgrass, nut sedge	X

SCIENTIFIC NAME	COMMON NAME	STATUS
Gramineae		
Brachiaria mutica (Forssk.) Stapf	California grass	X
Cenchrus ciliaris L.	buffel grass	X
Cenchrus echinatus L.	sandbur	X
Chloris barbata (L.) Sw.	finger grass	X
Chloris divaricata R. Br.	star grass	X
Chloris radiata (L.) Sw.	plush grass	X
Cynodon dactylon (L.) Pers.	Bermuda grass	X
Digitaria ciliaris (Retz.) Koeler	crab grass	X
Digitaria insularis (L.) Mez ex Ekman	sour grass	X
Digitaria violascens Link	crab grass	X
Echinochloa crus-galli (L.) P. Beauv.	barnyard grass	X
Eleusine indica (L.) Gaertn.	goose grass	X
Eragrostis tenella (L.) P. Beauv. ex Roem. & Schult.	Japanese love-grass	X
Eragrostis sp.	eragrostis	X
Panicum maximum Jacq.	Guinea grass	X
Panicum repens L.	panic grass	X
Paspalum dilatatum Poir.	Dallis grass	X
Pennisetum setaceum (Forssk.) Chiov.	fountain grass	X
Setaria gracilis Kunth	slender foxtail	X
Setaria verticillata (L.) P. Beauv.	bristly foxtail	X
Sorghum halapense (L.) Pers.	Johnson grass	X
Rhynchelytrum repens (Willd.) C. E. Hubb	Natal redtop	X
Liliaceae, s.l.		
Asparagus setaceus (Kunth) Jessup	asparagusfern	X
Musaceae		
Musa x *paradisiaca* L.	banana, mai'a	P

SCIENTIFIC NAME	COMMON NAME	STATUS
Palmae		
Cocos nucifera L.	coconut, niu	P
DICOTS		
Acanthaceae		
Asystasia gangetica (L.) T. Anderson	Chinese violet	X
Aizoaceae		
Tetragonia tetragonioides (Pall.) Kuntze	New Zealand spinach	X
Amaranthaceae		
Amaranthus dubius Mart. ex Thell.	amaranthus	X
Amaranthus spinosus L.	spiny pigweed	X
Anacardiaceae		
Mangifera indica L.	mango	X
Schinus terebinthifolius Raddi	Christmas berry	X
Annonaceae		
Annona muricata L.	soursop	X
Annona squamosa L.	sweetsop, sugarapple	X
Araliaceae		
Schefflera actinophylla (Endl.) Harms	octopus tree	X
Asclepiadaceae		
Cryptostegia grandiflora (Roxb.) R. Br.	India rubber vine	X
Bignoniaceae		
Spathodea campanulata P. Beauv.	African tulip tree	X

SCIENTIFIC NAME	COMMON NAME	STATUS
Boraginaceae		
Heliotropium amplexicaule Vahl	heliotrope	X
Cactaceae		
Hylocereus undatus (Haw.) Britton & Rose	night blooming cereus	X
Caricaceae		
Carica papaya L.	papaya	X
Casuarinaceae		
Casuarina equisetifolia L.	ironwood, she-oak	X
Casuarina glauca Siebold ex Spreng.	ironwood, she-oak	X
Chenopodiaceae		
Chenopodium murale L.	chenopodium	X
Combretaceae		
Terminalia catappa L.	false kamani, Indian almond	X
Compositae		
Ageratum conyzoides L.	ageratum	X
Bidens pilosa L.	Spanish needle	X
Calyptocarpus vialis Less.	hierba de caballo	X
Conyza bonariensis (L.) Cronq.	hairy horseweed	X
Conyza canadensis (L.) Cronq.	horseweed	X
Crassocephalum crepidioides (Benth.) S. Moore	crassocephalum	X
Emilia fosbergii Nicolson	emilia	X
Gnaphalium purpureum L.	cudweed	X
Pluchea symphytifolia (Mill.) Gillis	pluchea	X
Sonchus oleraceus L.	sowthistle	X
Synedrella nodiflora (L.) Gaertn.	synedrella	X

SCIENTIFIC NAME	COMMON NAME	STATUS
Taraxacum officinale W.W. Weber	dandelion	X
Tridax procumbens L.	coat buttons	X
Verbesina encelioides (Cav.) Benth. & Hook.	golden crownbeard	X
Vernonia cinerea (L.) Less.	ironweed	X
Wedelia trilobata (L.) Hitchc.	wedelia	X
Xanthium strumarium L.	cocklebur	X
Youngia japonica (L.) DC.	youngia	X
Convolvulaceae		
Ipomoea alba L.	moon flower	X
Ipomoea indica (J. Burm.) Merr.	koali-awahia	I
Ipomoea obscura (L.) Ker-Gawl.	white bindweed	X
Ipomoea ochracea (Lindl.) G. Don	yellow morning-glory	X
Ipomoea pes-caprae (L.) R. Br.	pohuehue	I
Ipomoea triloba L.	pink bindweed	X
Merremia aegyptia (L.) Urb.	koali-kua-hulu	X?
Merremia tuberosa (L.) Rendle	woodrose	X
Cruciferae		
Coronopus didymus (L.) Sm.	wart cress	X
Lepidium cf. *bonariense* L.	peppergrass	X
Nasturtium sarmentosum (G. Forst.) Schinz & Guillaumin	pa'ihi	P?
Cucurbitaceae		
Momordica charantia L.	bittermelon	X
Euphorbiaceae		
Aleurites mollucana (L.) Willd.	kukui	P
Chamaesyce hirta (L.) Millsp.	euphorbia	X
Chamaesyce hypericifolia (L.) Millsp.	euphorbia	X
Chamaesyce prostrata (Aiton) Small	euphorbia	X

SCIENTIFIC NAME	COMMON NAME	STATUS
Chamaesyce thymifolia (L.) Millsp.	euphorbia	X
Euphorbia heterophylla L.	euphorbia	X
Jatropha curcas L.	physic nut	X
Phyllanthus acidus (L.) Skeels	Otaheite gooseberry	X
Phyllanthus debilis Klein ex Willd.	phyllanthus	X
Phyllanthus tenellus Roxb.	phyllanthus	X
Ricinus communis L.	castorbean	X
Labiatae		
Leonotis nepetifolia (L.) R. Br.	lion's ear	X
Lauraceae		
Persea americana Mill.	avocado	X
Leguminosae		
Abrus precatorius L.	precatory bean	X
Acacia confusa Merr.	Formosan koa	X
Chamaecrista nictitans (L.) Moench	partridge pea, lau-ki	X
Crotalaria pallida Aiton	rattlepod	X
Crotalaria retusa L.	rattlepod	X
Desmanthus virgatus (L.) Willd.	desmanthus	X
Desmodium incanum DC.	beggar's ticks	X
Desmodium tortuosum (Sw.) DC.	beggar's ticks	X
Desmodium triflorum (L.) DC.	Spanish clover	X
Indigofera suffruticosa Mill.	indigo	X
Leucaena leucocephala (Lam.) deWit	koa-haole	X
Macroptilium cf. *atropurpureum* (DC.) Urb.	wild bean	X
Macroptilium lathyroides (L.) Urb.	wild bean	X
Macroptilium cf. *atropurpurpureum* x *lathyroides*	wild bean	X
Medicago lupulina L.	medick	X
Pithecellobium dulce (Roxb.) Benth.	'opiuma	X

SCIENTIFIC NAME	COMMON NAME	STATUS
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe	X
Samanea saman (Jacq.) Merr.	monkey pod	X
Senna alata (L.) Roxb.	candle bush	X
Senna occidentalis (L.) Link	coffee senna	X
Senna surattensis (N.L. Burm.) Irwin & Barneby	kolomona	X
Vigna sesquipedalis W.F. Wight	yard-long bean	X
Malvaceae		
Abutilon grandifolium (Willd.) Sweet	ma'o	X
Hibiscus tiliaceus L.	hau	I?
Malva parviflora L.	cheeseweed	X
Malvastrum coromandelianum (L.) Garcke	malvastrum	X
Sida rhombifolia L.	sida	X
Sida spinosa L.	sida	X
Thespesia populnea (L.) Sol. ex Correa	milo	I?
Moraceae		
Ficus microcarpa L. f.	Chinese banyan	X
Streblus asper Lour.	Siamese rough bush	X
Myrtaceae		
Eucalyptus sp. 1	eucalyptus	X
Eucalyptus sp. 2	eucalyptus	X
Syzygium cumini (L.) Skeels	Javaplum	X
Nyctaginaceae		
Mirabilis jalapa L.	four-o'clock	X

SCIENTIFIC NAME	COMMON NAME	STATUS
Oxalidaceae		
Averrhoa carambola L.	star fruit	X
Oxalis corniculata L.	yellow wood sorrel	P?
Oxalis corymbosa DC.	pink wood sorrel	X
Passifloraceae		
Passiflora edulis Sims	liliko'i, passion fruit	X
Passiflora suberosa L.	passiflora	X
Plantaginaceae		
Plantago major L.	common plantain	X
Polygonaceae		
Antigonon leptopus Hooker & Arnott	coral vine	X
Portulacaceae		
Portulaca oleracea L.	purslane	X
Portulaca pilosa L.	portulaca	X
Primulaceae		
Anagallis arvensis L.	scarlet pimpernel	X
Proteaceae		
Macadamia integrifolia Maiden & Betche	macadamia nut	X
Rutaceae		
Citrus aurantiifolia (Christmann) Swingle	lime	X
Sapotaceae		
Pouteria campechiana (H.B.K.) Baehni	egg fruit	X

SCIENTIFIC NAME	COMMON NAME	STATUS
Simaroubaceae		
cf. Simarouba sp.	simarouba	X
Solanaceae		
Datura stramonium L.	Jamestown weed, Jimsonweed	X
Lycopersicon esculentum Mill.	cherry tomato	X
Lycopersicon pimpinellifolium (Jusl.) Mill.	currant tomato	X
Nicandra physalodes (L.) Gaertn.	nicandra	X
Nicotiana tabacum L.	tobacco	X
Solanum americanum Mill.	popolo	I?
Solanum seaforthianum Andr.	potato vine	X
Sterculiaceae		
Waltheria indica L.	'uhaloa, hi'aloa	I?
Umbelliferae		
Ciclospermum leptophyllum (Pers.) Sprague	apium	X
Verbenaceae		
Stachytarpheta jamaicensis (L.) Vahl	stachytarpheta	X
Stachytarpheta urticifolia (Salisb.) Sims	stachytarpheta	X
Vitaceae		
Tetrastigma harmandii Planch.	Java grape, ayo	X

APPENDIX C

An Avifaunal and Feral Mammal Survey of Kapalua Development, Honokahua, Lahaina, Maui

FIELD SURVEY OF THE AVIFAUNA AND FERAL MAMMALS AT KAPALUA, MAUI

Prepared for

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By

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19 April 1989

FIELD SURVEY OF THE AVIFAUNA AND FERAL MAMMALS AT KAPALUA, MAUI

INTRODUCTION

The purpose of this report is to summarize the findings of a two day (15-16 April 1989) bird and mammal field survey conducted at the site of a proposed development project at Kapalua, Maui (Fig.1). Also included are references to pertinent literature and unpublished reports of faunal surveys in adjacent or similar habitat. Finally, the report discusses some possible changes that might occur in the faunal community following the proposed development.

The objectives of the field survey were to:

1- Document what bird and mammal species occur on the property or may likely occur given the type of habitats available.

2- Provide some baseline data on the relative abundance of each species.

3- Assess the possible changes in the faunal communities that might occur as a result of habitat alteration following the proposed development. In the event that special or critical habitat resources exist on the property identify these sites and make recommendations regarding their protection or what mitigating measures should be considered.

GENERAL SITE DESCRIPTION

The project site is located on the NE coast of Maui (see Fig.1). The area surveyed included a small coastal section as well as lands mauka of Highway 30. The dominant plants in the area included: Eucalyptus (spp.), Kiawe (Prosopis pallida), Iron Wood (Casuarina spp.) and Cook Pine (Araucaria columnaris) along with a host of exotic fruit trees. Parkland habitat created by the existing golf course occupies a significant portion of the site.

Weather during the field survey was variable with cool cloudy mornings and afternoons and brief mid-day clear periods. Winds were from the east at 10-30 mph.

STUDY METHODS

Field observations were made with the aid of binoculars and by listening for vocalizations. Attention was also paid to the presence of tracks and scats as indicators of bird and mammal activity. A total of nine census stations (Fig.1) were established and eight minute counts were made of all birds seen or heard at these stations. These counts provide the basis for the population estimates given in this report. Between these count stations additional observations of birds were also kept. Faunal surveys of birds in similar

habitats elsewhere on Maui were consulted in order to acquire a more complete picture of the bird activity typical in this type of habitat on Maui (Berger 1972, Bruner 1986, 1988a, 1988b, 1988c).

Observations of feral mammals were limited to visual sightings and evidence in the form of scats and tracks. No attempts were made to trap mammals in order to obtain data on their relative abundance and distribution.

Scientific names used herein follow those given in the most recent American Ornithologist's Union Checklist (A.O.U. 1983), Hawaii's Birds (Hawaii Audubon Society 1984), A Field Guide to the Birds of Hawaii and the Tropical Pacific (Pratt et al. 1987) and Mammal Species of the World (Honacki et al. 1982).

RESULTS AND DISCUSSION

Resident Endemic (Native) Birds:

No endemic birds were recorded during the actual survey. The Short-eared Owl (*Asio flammeus sandwichensis*) might occasionally be found at this site as they forage over open lowlands as well as at higher elevation. This species is common elsewhere on Maui, especially in Haleakala National Park (Hawaii Audubon Society 1984).

Migratory Indigenous (Native) Birds:

Pacific Golden Plover (Pluvialis fulva) -
Plovers prefer open areas for foraging such as mud flats and lawns. A total of 28 plover were recorded during the field survey. These birds were observed on the golf course and on other small lawns and open spaces scattered throughout the survey site. Johnson et al. (1981) and Bruner (1983) have shown plover are extremely site-faithful on their wintering grounds (returning each day to the same spot and maintaining this behavior throughout their life time). Plover also establish foraging territories which they defend vigorously. Such behavior makes it possible to acquire a fairly good estimate of the abundance of plover in any one area. These populations likewise remain relatively stable over many years (Johnson et al. 1989).

No other migratory shorebirds were observed. The only other common species which might occur either along the beach or on the lawns would be the Ruddy Turnstone (Arenaria interpres), Sanderling (Calidris alba) and Wandering Tattler (Heteroscelus incanus). The later species, however, is more often found on rocky coastlines and along streams (Pratt et al. 1987).

Resident Indigenous (Native) Birds:

No resident indigenous species were recorded. This is not surprising given the nature of this habitat. The Black-crowned Night Heron (Nycticorax nycticorax) might forage on rare occasions along the small stream which borders the eastern edge of the property.

Exotic (Introduced) Birds:

A total of 11 species of exotic birds were recorded during the field survey. Table One shows the relative abundance of these species. The most numerous during the two day survey were Common Myna (Acridotheres tristis), Japanese White-eye (Zosterops japonicus), House Finch (Carpodacus mexicanus) and Zebra Dove (Geopelia striata). Northern Mockingbird (Mimus polyglottos) was the only new species added to the list of exotic birds for the Kapalua area since the 1986 faunal survey by Bruner (Bruner 1986). Northern Mockingbird and Gray Francolin (Francolinus pondicerianus) were both rare at this site as they prefer drier habitat. Red-Crested Cardinal (Paroaria coronata) was much less common than on the 1986 survey while the Northern Cardinal (Cardinalis cardinalis) was markedly more abundant (Bruner 1986).

Four species recorded in similar habitat elsewhere on Maui (Hawaii Audubon Society 1984, Pratt et al. 1987, Bruner 1986, 1988a, 1988b, 1988c) were not seen on this

survey but potentially could occur on the property or on adjacent lands. They include: Common Barn-Owl (Tyto alba), Cattle Egret (Bubulcus ibis), Ring-necked Pheasant (Phasianus colchicus) and Melodious Laughing-Thrush (Garrulax canorus).

Feral Mammals:

Two feral cats were seen during the survey. Rats and mice were not observed but undoubtedly occur on the property. Six mongoose (Herpestes auropunctatus) were also recorded. Without a trapping program it is difficult to conclude much about the relative abundance of rats, mice, cats and mongoose on this property, however, it is likely that their numbers are not dramatically different from what one would find elsewhere on Maui in similar habitat.

Records of the endemic and endangered Hawaiian Hoary Bat (Lasiurus cinerus semotus) are sketchy but the species has been recorded on Maui (Tomich 1986). Little is known of their natural history, distribution and ecological requirements. No bats were recorded on this project site despite two nights of observation.

CONCLUSION AND RECOMMENDATIONS

A brief survey can at best provide a limited perspective of the wildlife present in any given area. Not all species will likely be observed and information on their use of the site must sketched together from brief observations and the available literature. The number of species and the relative abundance of each species may vary throughout the year due to available resources and reproductive success. Species which are migratory will quite obviously be a part of the ecological picture only at certain times during the year. Exotic species sometimes prosper for a time only to later disappear or become a less significant part of the ecosystem (Williams 1987). Thus only long term studies can provide the insights necessary to acquire both a broad view as well as a more definitive perspective of the bird and mammal population in a particular area. However, when brief studies are coupled with data gathered from other similar habitats the value of the conclusions which are drawn is significantly increased.

In terms of broad conclusions related to bird and mammal activity on the project site the following are offered:

1- The present environment at the project site provides a fairly wide range of habitats which are utilized by the typical array of exotic birds one would expect at this elevation and in this type of environment on Maui. The low number of Red-Crested Cardinal was a little unexpected given the results of an earlier survey (Bruner 1986). The proposed development will eliminate some of the dense thickets and thus might reduce habitat for Northern Cardinals. House Sparrows (Passer domesticus) will undoubtedly increase in abundance as this site becomes more urban.

2- Migrant species particularly Pacific Golden Plover are usually benefited by the kind of development that creates open spaces such as lawns. The loss of the habitat provided by the present golf course will adversely effect the plover which have winter territories on this site. Bruner (1983) has shown that plover establish their winter territories in the first year of their life and return each year to reoccupy the exact same space. Experiments have also shown that some plover whose winter territories have been eliminated are unable to adjust and acquire new territories. The proposed development should have little or no effect, however, on other migratory shorebirds.

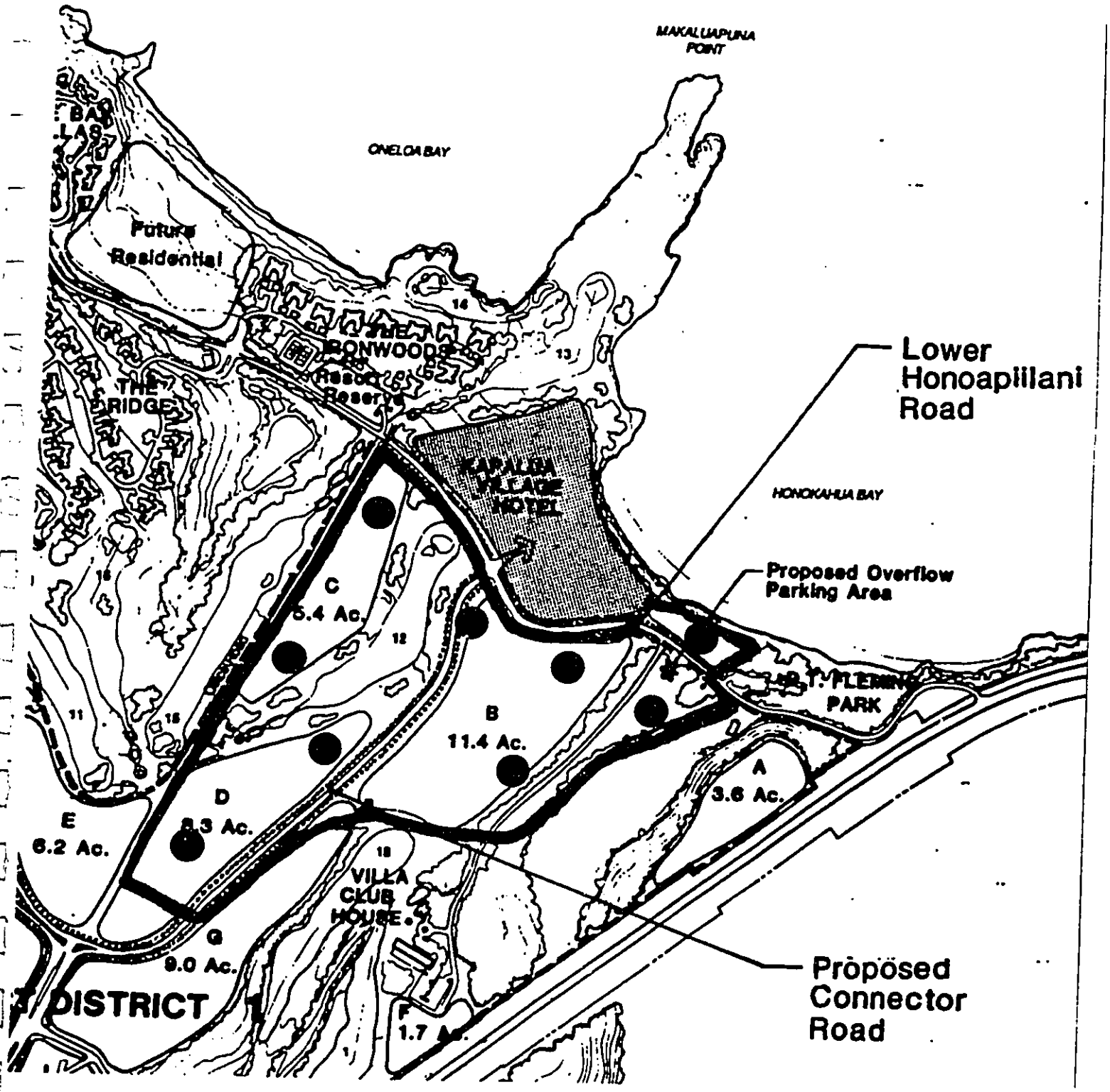

Fig. 1. Project stie with eight minute count stations marked by solid circles.

TABLE 1

Relative abundance of exotic birds recorded at Kapalua, Maui.

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE*
Gray Francolin	Francolinus pondicerianus	R = 2
Spotted Dove	Streptopelia chinensis	U = 4.7
Zebra Dove	Geopelia striata	A = 10.3
Common Myna	Acridotheres tristis	A = 11.5
Northern Mockingbird	Mimus polyglottos	R = 1
Japanese White-eye	Zosterops japonica	A = 14.9
Northern Cardinal	Cardinalis cardinalis	C = 5.6
Red-Crested Cardinal	Paroaria coronata	U = 2.2
House Sparrow	Passer domesticus	U = 3.3
House Finch	Carpodacus mexicanus	A = 12.1
Nutmeg Mannikin	Lonchura punctulata	U = 4.8

* (See page 11 for key to symbols)

KEY TO TABLE 1

Relative Abundance = Determined by frequency on eight minute counts in appropriate habitat. Number which follows is average of all counts for that species in appropriate habitat.

A = Abundant (ave. 10+)

C = Common (ave. 5-10)

U = Uncommon (ave. less than 5)

R = Rare (number which follows is total individuals seen during the field survey)

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APPENDIX D

Subsurface Archaeological Testing
Revised Ritz-Carlton Kapalua Hotel Project Site

PAUL H. ROSENDAHL, Ph.D., Inc.
Consulting Archaeologist

Report 246-060189

SUBSURFACE ARCHAEOLOGICAL TESTING
REVISED RITZ-CARLTON KAPALUA HOTEL PROJECT SITE
AREAS I, II, AND III

Land of Honokahua
Lahaina District, Island of Maui

by

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SUMMARY

At the request of Kapalua Land Company, Ltd., Paul H. Rosendahl, Ph.D., Inc. (PHRI) carried out a program of subsurface archaeological testing in connection with the proposed revision of the Ritz-Carlton Kapalua Hotel Project Site at the Kapalua Bay Resort. Field work was conducted in several increments between December 1988 and May 1989. The basic purpose of the testing was to determine the presence or absence of significant archaeological remains which might represent potentially serious constraints upon development of the revised project site. More specifically, the purpose of the testing was demonstrate and document the probable absence of any substantial number of prehistoric Hawaiian human burials such as those present in the large burial ground (Site 1342) occupying the central portion of the original hotel site (Parcel 2-H) overlooking Honokahua Bay.

Subsurface archaeological testing was carried out the in three different areas comprising the revised hotel project site: (a) Area I-Proposed Revised Hotel Area--area (estimated c. 30 ac±) inland of Lower Honoapiilani Road (across from the original hotel site) and east of Office Road; (b) Area II-Proposed Tennis Complex Area--area (c. 5.0 ac) inland of Lower Honoapiilani Road (across from D.T. Fleming Beach Park) and northeast of and adjacent to Area I; and (c) Area III-Proposed Beach Activities Area--area (c. 2.3 ac) seaward of Lower Honoapiilani Road (between the original hotel site and D.T. Fleming Beach Park) and north of Area II. Systematic subsurface testing was conducted throughout each area by means of hand-powered sand auger and/or mechanical backhoe. In Area I, 162 auger cores and 16 backhoe "scoop" trenches were dug; in Area II, 25 backhoe trenches of varying lengths wer. dug; and in Area III, 202 auger cores were dug.

Most of Area I had been substantially modified in recent historic times, initially for plantation cultivation and subsequently for golf course development. Trenches and cores dug during the present testing project yielded a scatter of historic period artifacts, most of which appeared to be fairly recent, and which most likely reflect plantation camp occupation dating back to around the beginning of the 20th century. No evidence of prehistoric or early historic period occupation or utilization (including burials) was encountered anywhere in Area I.

Much of Area II had also been substantially modified in recent historic times, apparently in connection with construction and occupation of plantation camps. Initial surface inspection identified primarily remnants of recent historic structures. The few fragments of human bone found on the surface were determined to have been brought in with discarded fill material that came from outside of the area. No evidence of prehistoric or early historic period occupation or utilization (including burials) was encountered anywhere in Area II.

Area III was initially thought by some possibly to contain an eastward extension of Site 1342, present to the west in the original hotel site. Extensive testing revealed only a single probably intact burial, situated midway along the shoreline boundary of the parcel, and most likely within the setback area. Subsurface rocks encountered at three other locations were anomalous within the sand soil matrix, and might possibly represent capstones placed atop burials--a situation found in approximately 20% of the burials excavated in the large burial site present in the original hotel site. No buried cultural deposits were encountered anywhere in Area III, but the single volcanic glass flake and single flake of flint-like stone indicate the possible presence of remnant or mixed/disturbed prehistoric and/or early historic period components. In any case, Area III does not evidence any extension of the large prehistoric burial site (cemetery) present in the original hotel site, though it is thought likely--since Area III is a beach front sand dune--that there would be a few burials randomly scattered within Area III.

Based on the findings of the extensive subsurface testing, it has been concluded likely that there are no significant archaeological remains present anywhere within the three areas comprising the revised hotel project site that would constrain or prevent the proposed development. Findings, conclusions, and recommendations have been discussed with appropriate staff archaeologists in the State Department of Land and Natural Resources-Historic Sites Section/State Historic Preservation Office (DLNR-HSS/SHPO), and they are in agreement. More specifically, the following recommendations are made with regard to the three different areas that comprise the revised hotel project site: (a) For Areas I and II, no further archaeological work of any kind is needed prior to beginning of on-site hotel development construction work; and (b) for Area III, as discussed previously, it is recommended that limited further testing in the form of a combination of hand shovel and mechanical backhoe excavations be conducted to determine (1) the nature of the rocks encountered by auger at three locations (possible burial capstones or not), and (2) the possible presence of remnant cultural deposits along the inland edge of the area (adjacent to Lower Honoapiilani Road). Based on discussions with DLNR-HSS/SHPO staff, it is believed likely that even if a few isolated burials were to be identified within Area III, disinterment would be permitted and proposed development of the area could proceed. This would be so because the isolated burials would not be considered as an extension of the large burial site present in the original hotel site.

Finally, the general qualification should be made that the general conclusion and specific recommendations stated here are based on the findings of the extensive subsurface testing. With any archaeological testing, there is always the possibility, however remote, that potentially significant unidentified subsurface cultural deposits or remains might be encountered in the course of subsequent development activities involving the modification of the ground surface. Given this possibility, and the special sensitivity appropriate to development within the project site, it is recommended that all initial construction grading and excavation work within the revised hotel project site, and especially within Area III, be monitoring by a qualified archaeologist.

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ILLUSTRATIONS

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INTRODUCTION

BACKGROUND

At the request of Kapalua Land Company, Ltd., Paul H. Rosendahl, Ph.D., Inc. (PHRI) carried out a program of subsurface archaeological testing of three areas (I, II, III) in connection with the proposed revision of the Ritz-Carlton Kapalua Hotel Project Site at the Kapalua Bay Resort, in the Land of Honokahua, Lahaina District, Island of Maui. Field work was conducted in several increments between December 1988 and May 1989. Field work in Area II was conducted December 1-12, 1988 by PHRI Supervisory Archaeologists Margaret L.K. Rosendahl and Bee Burgett and required approximately 31 man-hours of labor. Field work in Area I was conducted March 14-May 3, 1989 by four to six persons under the direction of Supervisory Archaeologist Lee Ferguson. The Area I field work required approximately 1,902 man-hours of labor. Field work in Area III was conducted December 28, 1988 through January 13, 1989, under the direction of Supervisory Archaeologists Arne Carlson and Lee Ferguson. For Area III, approximately 1,064 man-hours of labor were required. The field work at all three parcels was conducted under the overall supervision of Project Director/Supervisory Archaeologist Theresa K. Donham and Principal Investigator Dr. Paul H. Rosendahl.

SCOPE OF WORK

The basic purpose of the subsurface testing was to determine the presence or absence of significant archaeological remains which might represent potentially serious constraints upon development of the revised project site. More specifically, the purpose of the testing was demonstrate and document the probable absence of any substantial number of prehistoric Hawaiian human burials such as those present in the large burial ground (Honokahua Burial Site 1342*) occupying the central portion of the original hotel site (Parcel 2-H) overlooking Honokahua Bay.

The general objectives of the subsurface testing were four-fold:

1. To identify (find and locate) cultural deposits and/or human remains in the project area, and if present, to determine the extent and density of such remains;

2. To evaluate the potential significance of all identified archaeological remains;

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*Hawaii State Inventory of Historic Places (SIHP) site designation system: four-digit site numbers prefixed by 50-50-01- (50=State of Hawaii, 10= Island of Maui, 37=USGS 7.5' series quad map ["Napili, Hawaii"]).

3) To assess possible impacts upon identified remains by any proposed development in the project area; and

4) To make recommendations on further archaeological work that might be appropriate or necessary if proposed development were to be undertaken.

The following specific tasks were deemed sufficient to fulfill the objectives of the work:

1. Conduct a surface inspection of the entire project site to identify any exposed cultural remains and/or human burials;

2. Conduct systematic subsurface testing (by hand-powered sand auger and/or mechical backhoe) over the entire project site to determine (a) the presence or absence of buried cultural remains and/or human burials and (b) the horizontal and vertical extent of any such remains; and

3. Analyze all field data and prepare appropriate reports.

The subsurface testing project was carried out in general accordance with the minimum standards and requirements for inventory-level survey recommended by the Hawaii State Department of Land and Natural Resources-Historic Sites Section/State Historic Preservation Office (DLNR-HSS/SHPO). These standards are currently used by both DLNR-HSS/SHPO and the Maui County Planning Department as guidelines for the review and evaluation of archaeological inventory survey reports submitted in conjunction with various development permit applications.

The significance of all archaeological remains identified within the project area were assessed in terms of (a) the National Register criteria contained in the Code of Federal Regulations (36 CFR Part 60), and (b) the criteria for evaluation of traditional cultural values prepared by the national Advisory Council on Historic Preservation. DLNR-HHS/SHPO and the Maui County Planning Department use these criteria to evaluate eligibility for both the Hawaii State and National Register of Historic Places.

To further facilitate client management decisions regarding the subsequent treatment of resources, the general significance of all archaeological remains identified during the survey were also evaluated in terms of three cultural resource management value modes which are derived from the previously mentioned federal evaluation criteria. Remains were evaluated in terms of potential scientific research, interpretive, and/or cultural values. Scientific research value refers to the potential of archaeological resources for producing information useful in the understanding of culture history, past lifeways, and cultural processes at the local, regional, and interregional levels of organization. Interpretive value refers to the potential of archaeological resources for public education and recreation. Cultural value, within the present framework for significance evaluation, refers to the potential of archaeological resources for the preservation and promotion of cultural and ethnic identity and values.

PROJECT AREA DESCRIPTION

Subsurface archaeological testing was carried out in three different areas, as defined below, in connection with the proposed revision of the Ritz-Carlton Kapalua Hotel Project Site at the Kapalua Bay Resort, in the Land of Honokahua, Lahaina District, Island of Maui (Figure 1).

Area I-Proposed Revised Hotel Area--Area (estimated c. 30 ac±) inland of Lower Honoapiilani Road (across from the original hotel site) and east of Office Road; incorporating the existing 12th fairway, extending southeast to the 18th fairway, and to the east-southeast of the church lot and Honolua Store; basically Parcel 13 of Maui County Land Zoning Map No. L-967.

Area II-Proposed Tennis Complex Area--Area (c. 5.0 ac) inland of Lower Honoapiilani Road (across from D.T. Fleming Beach Park) and northeast of and adjacent to Area I; basically Parcel 3 of Maui County Land Zoning Map No. L-967; also referred to as Lot 2-A-1-B-2 of Kapalua Development Subdivision Map.

Area III-Proposed Beach Activities Area--Area (c. 2.3 ac) seaward of Lower Honoapiilani Road (between the original hotel site and D.T. Fleming Beach Park) and north of Area II; basically Parcel 16 of Maui County Land Zoning Map No. L-967; also referred to as Lot A-7-C-1 of Kapalua Development Subdivision Map.

Average annual rainfall in the vicinity of the project site is approximately 30 inches per year (Armstrong 1973). Vegetation is generally sparse and primarily includes ironwood (Casuarina equestifolia L.), kiawe (Prosopis pallida [Humb. and Bonpl. ex Willd. HBK]), koa-haole (Leucaena glauca L. Benth.), and various grasses and shrubs.

With the apparent exception of the seaward-most portion of Area III, the revised hotel site project area is situated within the Honokahua Historic District (SIHP 50-50-01-1591). The Honokahua Historic District "...includes the area of Honokahua village and cannery facilities of Baldwin Packers, as well as...Honolua Ranch stables.... Specific features recorded within the historic district include the Honolua Ditch, completed in 1913, the Maui Pineapple Company Office, built in 1911, the area store, camp housing, the cannery site, and two churches (Donham 1986:6)."

Area I - Proposed Revised Hotel Area

Area I consists of two portions of unequal size, with the larger, Portion I-A (c. 27 ac) situated seaward of the church lot and Honolua Store, and the smaller, Portion I-B (c. 3 ac) situated to east-southeast of the church and store. Portion I-A is bounded on the north by Lower Honoapiilani Road, on the west by Office Road, on the east by the Village Golf Course, and on the south by a line which extends from the Kapalua Executive Office Building to the access road near the 18th green of the

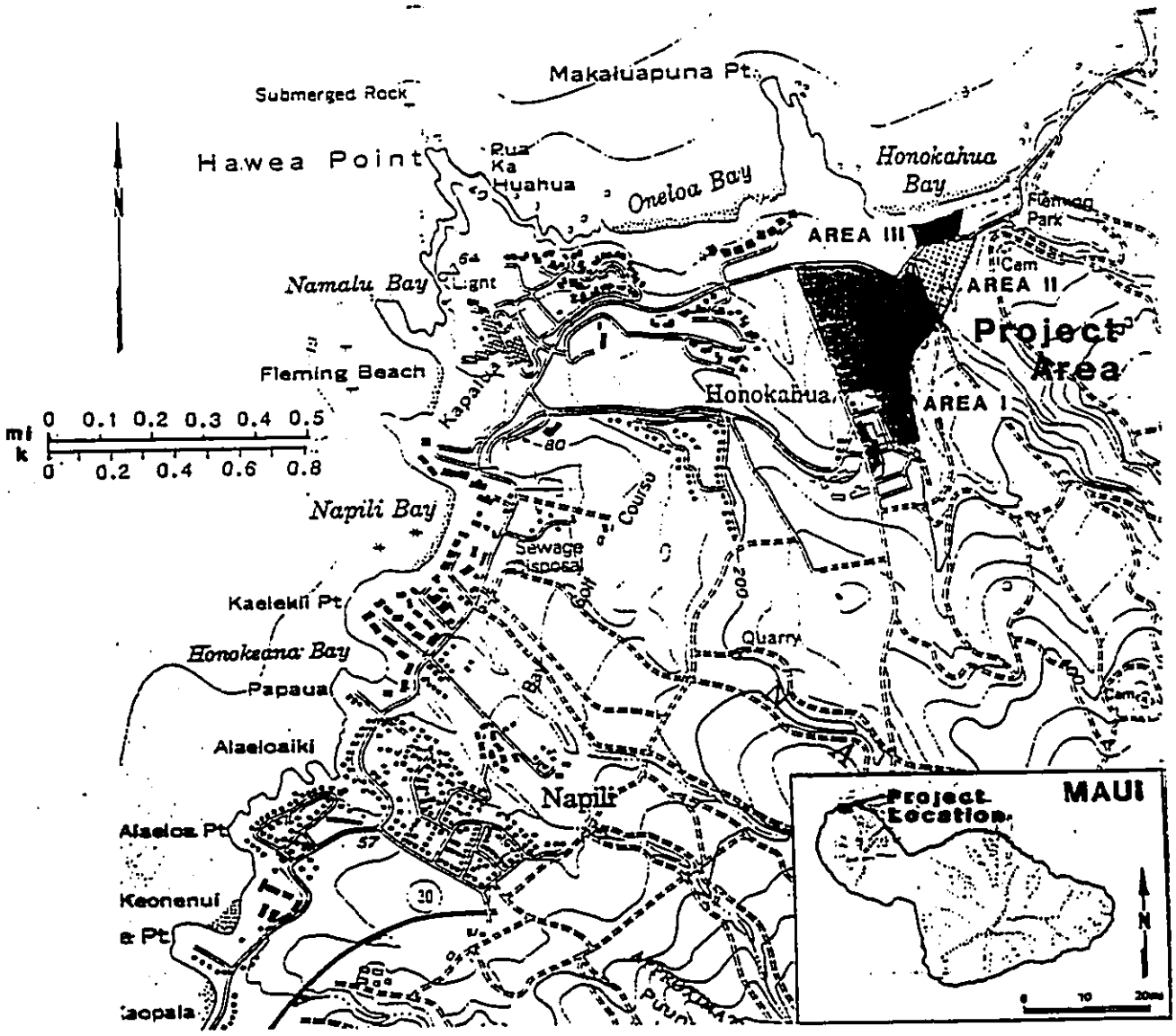

Figure 1. PROJECT AREA LOCATION MAP

Subsurface Archaeological Testing--
Revised Ritz-Carlton Kapalua Hotel Project Site
Areas I, II, and III
Land of Honokahua, Lahaina District
Island of Maui

PHRI Project 86-246 June 1989

Village Course. Most of Portion I-A surrounds the 3rd fairway of the Kapalua Bay Golf Course; the 3rd fairway occupies the top of a low ridge with a northern exposure, and land east of the fairway slopes into the gulch of Honokahua Stream. Elevation in Portion I-A ranges between 52 ft AMSL (above mean sea level) in the northeast corner, to 150 ft AMSL at the Kapalua Executive Office in the southwest corner of the parcel. Soils consist primarily of Kahana silty clay of the Waikoa-Keahua-Molokai association. The Kahana series is described as well-drained soils on uplands, developed in material weathered from basic igneous rock. A representative profile of the Kahana series has a surface layer of "...dark reddish brown silty clay about 14 inches thick. The subsoil is dark reddish brown silty clay about 50 inches thick, that has subangular blocky structure. The substratum is soft, weathered, basic igneous rock" (Foote et al. 1972:50).

Portion I-B consists of approximately three acres situated south of the golf course maintenance shop and storage yard, and south of Portion I-A. The eastern half of Portion I-B has been used as a barrow pit/quarry and has been excavated well into bedrock. The western half of I-B has been altered by structure demolition, land clearing, and excavation and filling of rubbish pits. The entire surface of Portion I-B, excepting some small islands near the bases of trees, appears to have been scraped. The surface is irregular with numerous bulldozer push piles, rubbish filled pits, and rubbish and brush piles.

Area II - Proposed Tennis Complex Area

Roughly triangular in shape, Area II consists of approximately five acres situated northeast of Area I. The area is bounded on the north by Lower Honoapiilani Road, on the southwest by Area I, and on the southeast by existing drainage for what remains of Honokahua Stream. The area is basically quite flat and open, with a ground cover of low grass. Several large kiawe trees (Prosopis pallida [Humb. and Bonpl. ex Willd. HBK]) are scattered prominently across the area, and there is a small grove of coconut palms (Cocos nucifera L.).

Area III - Proposed Beach Activities Area

Area III consists of approximately 2.3 acres and is situated between the original hotel site (Site 2-H) and D.T. Fleming Beach Park. While Area III is actually not part of the beach park, the general public apparently assumes it constitutes approximately the western one-third of the beach prk. The northern (seaward) boundary of the area is defined by the existing vegetation line and the wave-cut bank of the sand dune fronting the public beach area on Honokahua Bay. The southern (inland) boundary of Area III is defined by Lower Honoapiilani Road. The western boundary falls just west of a small erosional gully and coincides with the eastern boundary of the original hotel site.

For the most part, Area III consists primarily of a relatively flat, grass-covered sand dune ranging in elevation between 12-25 ft AMSL. The

southern portion of the parcel slopes gently down towards the adjacent road; notable lower areas include the southeast corner at the entrance to the beach park parking area (14 ft AMSL) and a small drainage gully (12 ft AMSL). Four general soil zones are present in the area: Sand Beach deposits, Dune Land, Kahana Series silty clay soils, and Pulehu Series clay loam soils (Foote et al. 1972). Of these, stabilized Sand Beach deposits comprise approximately 90 percent of the project area, with the remaining three zones comprising the remaining ten percent (south and west margins) of the area.

PREVIOUS ARCHAEOLOGICAL WORK

Prior to the recent subsurface testing, a number of archaeological projects have been conducted within and in the immediate general vicinity of the present project area. These projects were designed to identify and record archaeological resources, to assess their significance, and to preserve and/or mitigate resources. The earliest of these projects was a reconnaissance survey and testing project conducted by Bishop Museum (Kirch 1973) for Maui Land and Pineapple Company, Ltd. Kirch's study area, the Honolua Development Area, consisted of a coastal strip of land extending from Fleming Beach to Honokahua Bay, and four inland gulch areas. During his study, Kirch identified Site D13-9, the Honokahua Burial Site. Kirch noted one in situ burial eroding out of the wave-cut beach bank and other scattered bones and fragments on the dune surface. He did not attempt to determine the exact extent of the burial ground, but simply remarked that "...the sand dunes rising behind Honokahua Beach... contain an indeterminate number of human (presumably prehistoric) burials" (Kirch 1973:11). Area III of the present project area comprises approximately two percent of Kirch's original survey area, and includes a portion of Site D13-9.

Site D13-9 was subsequently revisited in the fall of 1973 by R.J. Hommon, who recorded the site for the Hawaii State Inventory of Historic Places (SIHP Site 50-50-01-1342). Site 1342 and five other prehistoric sites were then listed on the Hawaii Register of Historic Places as part of the Honokahua Archaeological District (Site 1340). In 1980, however, this district was removed from the Register of Historic Places because permission to list the sites had not been properly acquired from the landowners. In 1980, the exact extent of the burial site was still unknown. The boundaries of the site had been designated somewhat arbitrarily, having been based only on surface finds. Hommon noted that "...the burial area extends from the present dune-bank for an unknown distance" (Hommon 1973). The boundary defined at that time was a strip of land c. 20.0 m wide along the beach bank, stretching some 200.0 m westward from the east end of the present project area, to a point approximately 60.0 m west of the gully at the western end of Area III.

The most recent work in the vicinity of the present project area consists of three projects conducted by PHRI within the original hotel site (Hotel Development Site 2-H), the parcel directly west of Area III (Haun

and Rosendahl 1986; Donham 1986, 1989). These projects involved three phases of archaeological investigation; reconnaissance survey, intensive survey and testing, and data recovery/mitigation excavations. The reconnaissance survey was conducted February 3-4, 1986, and consisted of a non-systematic pedestrian survey (Haun and Rosendahl 1986). Human skeletal remains were identified in six different areas, and the survey resulted in the expansion of the Honokahua Burial Site boundaries to the south and west. On the basis of the reconnaissance survey, it was recommended that a more detailed intensive survey be conducted in the parcel.

The intensive survey was conducted April 28-March 10, 1986, and included both surface survey and systematic soil coring and test excavations (Donham 1986). During the survey, tentative boundaries for the burial site within Development Site 2-H were defined, and areas based on probability and density of burials were delineated. Based on the intensive survey and testing results, Donham formulated a research design and mitigation plan for the area of the burial site falling within Site 2-H. In relation to the present testing project, it should be noted that medium and high probability areas defined by Donham extended eastward directly up to (and therefore presumably into) the west side of the present Area III (Donham 1986:49).

On March 14, 1987 PHRI began data recovery/mitigation excavations field work within Hotel Development Site 2-H. Work continued full-time until December 23, 1988, at which point work was suspended. Interim results are summarized in an informational report prepared at the request of DLNR-HSS/SHPO (Donham 1989). Particularly relevant to the present project is the fact that Excavation Block 12 (Donham 1989:Figure 2), which immediately borders Area III, was found to have an extremely low burial density--only a single burial, or less than 0.1% of the total number of identified burials (Donham 1989:11).

FIELD METHODS AND PROCEDURES

Area I - Proposed Revised Hotel Site

For the purposes of the present testing project, Portion A of Area I was divided into nine subareas (Sections A-I) (Figure 2, at end). Within the nine subareas, series of 3-inch (diameter) hand-powered auger holes were placed. To aid in hole placement, a grid was established using the east edge of Office Road as Grid Coordinate 95 (meters) East, and a point five meters south of the paved golf cart path extending from the 3rd green to the 6th tee was established as Grid Coordinate 540 (meters) North. Auger holes were placed at 40-meter intervals along a 20-meter grid. In certain portions of the area, it was necessary to arbitrarily locate the holes. Whenever this was done, an attempt was made to place the holes within at least 30 meters of another hole.

Core samples were augered to various depths, depending on the depth of the clay overlying the bedrock. The core was usually terminated at bed-

rock, but occasionally it was necessary, due to repeated obstructions (e.g., rocks, roots) or to great depths of the overlying clays, to terminate a hole above bedrock. The soil from the cores was processed through 1/8" mesh screens, and any cultural and faunal remains were bagged by provenience and depth. The auger holes were then back-filled to the level of the original surface.

In Portion B of Area III (Section J), subsurface testing consisted of eight "scoop" backhoe trenches. In order to gain access to the locations where backhoe trenches were to be placed, it was first necessary to clear a path. A bulldozer was used to remove vegetation, to move brush and rubbish piles, and to flatten some of the push piles; bulldozing was conducted in such a way as to minimize the disturbance to the surface. The bulldozing was monitored by an archaeologist, and no archaeological remains were encountered during the bulldozing. Subsequently, eight backhoe trenches were excavated (Figure 2, at end), and the walls of each trench were examined for buried surfaces or features. Trench stratigraphies were recorded in detail. Soil layers were differentiated on the basis of color, texture, and structure. All trenches were terminated at decomposed bedrock.

Area II - Proposed Tennis Complex Area

Twenty-one backhoe trenches were initially dug to determine the presence or absence of buried cultural deposits; and four trenches were subsequently dug in areas where human bone fragments had been recovered during the initial surface inspection (Figure 2, at end). All trenches were plotted onto a field map with the aid of compass and tape, and black-and-white photographs of all trenches were taken. Soils were described using standard procedures and terminology as set forth in the Soil Survey Manual (Soil Survey Staff 1962).

Area III - Proposed Beach Activities Area

Prior to initiating the survey and testing of Area III, the area was hand-cleared of grasses and shrubs. Approximately 200 man-hours of labor were expended during clearing. In order to provide control for surface reconnaissance and subsurface coring, an east-west baseline subsequently was established along the southern edge of the area. This was accomplished by extending the previously established grid used during testing and excavation of the Honokahua Burial Site (Donham 1986:10) eastward into the area. Wooden stakes were placed at 10.0 m intervals using transit and tape. Pins were then placed at 5.0 m intervals over the entire parcel by triangulation from the baseline.

Surface survey of Area III was undertaken on a judgemental basis, with only those portions of the area that allowed visual inspection of soil deposits for archaeological remains being inspected. The erosion-cut banks along the beach and the small drainage gully on the west side of the area offered the best opportunities for such inspection.

The subsurface testing was accomplished by way of systematic soil coring. A core hole was excavated at each 5.0 m intersection on the grid, using hand-powered augers having a bucket 10 cm in diameter by 20 cm long. Pipe extensions for the augers allowed holes to be dug up to 10 m below surface. Initially, holes were to be excavated to bedrock or to some other impenetrable layer; however, it was discovered that bedrock was at some unknown depth more than 5.0 m below surface. In the southeastern portion of the area, the water table was reached at approximately 4.5 m below surface. These conditions, combined with the large number of holes to be dug, resulted in modification of original plans, and it was deemed sufficient to dig holes on the 10 m grid intersections to approximately 5.0 m below surface, and to dig all other holes to approximately 4.0 m below surface. When obstructions were encountered, or if the sidewalls of the cores slumped and holes could not be excavated below 1.0 m, a minimum of three attempts at excavation were undertaken within a 1.0 m-square area around the grid point. If the obstruction could not be avoided in this manner, the hole was abandoned.

Excavation of holes and recording of soil layers and portable remains were conducted by three teams, each consisting of two or three people. Standard stratigraphy forms were completed for each core, indicating the core grid coordinates, microenvironmental setting, adjacent vegetation, and any recent land modifications in the vicinity. Soil layers in the cores were differentiated on the basis of change in color, texture, structure, and/or consistence. Each soil layer as it was encountered in the core was recorded in terms of the beginning and ending depths, moist and/or dry color (Munsell), texture, structure, consistence, root density, and other biotic inclusions. All soil descriptions followed standard definitions and abbreviations as outlined in the Soil Survey Manual (Soil Survey Staff 1962).

All soil was then hand-processed through 1/8" mesh screen and material recovered was recorded by depth, stratigraphic layer, and core grid coordinates. The levels at which materials were recovered and collected varied, depending on the effects of the mechanics of coring on the integrity of the cores. The depths at which samples were recovered had to be critically examined in each case. In core augering, there is a certain amount of inaccuracy when determining depths for small or fragmented materials such as charcoal or shell. The action of pulling up the core and letting it back down into the hole almost always causes the auger head to bump the sidewalls. This results in a certain amount of slumpage each time. Small rocks, roots, organics, shells, or any number of other small things can be knocked from the sidewall and fall to the bottom of the hole. It was not infrequent to recover (apparently) beer bottle glass or fragments of Planaxis labiosa shells obviously from the surface layer within matrices 3-4.0 m below surface. At any rate, modern historic trash (such as beer bottle glass, metal, and styrofoam), unmodified marine faunal remains, and charcoal from the top 50 cm of each core were not collected.

FINDINGS

AREA I - PROPOSED REVISED HOTEL AREA

Area I consists of two portions (I-A, I-B). Portion I-A constitutes the original extent of Area I and consists of nine subareas designated Sections A through I. Portion I-B consists only of Section J, which was a later addition to the original Area I. (See Figure 2, at end.)

Section A

Section A surrounds Kumulani Chapel, situated in the northwest corner of Area I-A. This area has been filled to provide a flat area for the church building. Due to the proximity of this area to known sand deposits north of Lower Honoapiilani Road, and to the fact that the area has been filled, it was suspected that there might be a sand deposit buried under the fill. Four cores were augered around the building and two cores were augered north of the building, on the shoulder of Lower Honoapiilani Road. Only one of the cores (#9, east of the chapel) exhibited a sand layer. It was located 114-135 cm below the present surface and was 21 cm thick.

The only portable remains recovered from the core tests in this section was a piece of brown glass found 10-36 cm below surface in Core #6, which was placed on the shoulder of Lower Honoapiilani Road. In the area around the chapel, bedrock was encountered approximately 6.0 meters below the current filled surface. Along the shoulder of Lower Honoapiilani Road, bedrock was encountered at 150 cm and 345 cm below surface.

Section B

Section B is rectangular and measures approximately 60.0 m by a maximum of 350.0 m along the western edge of Area I-A. It extends from the southern edge of Section A to the Kapalua Executive Offices building. A c. 1970 map of this area shows a row of ten houses with outbuildings (Figure 3). Today, this section is generally open with scattered exotic trees such as mangoes (Mangifera sp.) and various palms, as well as bamboo (Bambusa sp.) and various shrubs. Parallel with Office Road is a series of slight depressions that probably represent the former house locations. The houses were demolished in the mid-1970s. Since that time, the surface has not been greatly modified; however, it is possible that intact subsurface features (e.g., privies, trash pits) associated with the houses exist in the area. Exposed surfaces, and especially the area of brush at the south end of the section, are littered with broken glass, pieces of concrete, metal cans, and other debris.

Thirty cores were augered in Section B. Soil depths above bedrock were found to be greater than 3.0 m and often exceeded 4.0 m. Portable remains recovered from the cores included glass, fragments of asphalt

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FIGURE 3. Map Showing Structures in Areas I and II (c. 1970)

shingles, charcoal, a piece of plastic, a piece of metal, two marine shells, and faunal bones. Excepting the marine shells, the remains were recovered from relatively shallow depths (less than 50 cm below surface), and probably represent debris associated with the former houses. The marine shells were recovered at Grid Coordinates 260N/140E from a depth of 2.51- 2.60 m below surface. It is possible that the shells originated at a higher level and were dislodged during augering.

Section C

Section C consists of land comprising and surrounding the 3rd fairway of Kapalua Bay Golf Course. This land is open and grassy, with a few scattered trees. Most of the area appears to have been leveled by removing soil from high spots and filling low areas, and it appears a small amount of sand was placed over the soil to aid the growth of grass.

Sixty cores were augered in this section. No cores were placed directly on the fairway or in the areas surrounding the sand traps or the two greens. Some areas around the greens were avoided due to the presence of buried live electrical wires in the areas. Soil depth was found to be variable, ranging from 0.13 m to over 4.00 m. Soil was deeper on top of the ridge along the western portion of the section, and was generally shallower on slopes on the east side of the area, probably due to the increased erosion on the slope and land modification during golf course construction. Portable remains recovered from the section included glass, charcoal, metal (nails), marine shells, a piece of ceramic ware, and a piece of plastic. These remains were found primarily in the area of a house that once stood in the northeast corner of the section. The surface around the house appears to be only slightly modified, and it is possible that subsurface features associated with the house still exist. The Honokahua Burial Site is near this section, across Lower Honoapiilani Road. Thus, the potential presence of human skeletal remains in the northern portion of this section cannot be totally dismissed.

Section D

Section D is situated in the southeast corner of Area I-A. A c. 1917 map shows a house and a building identified as the nurses' quarters located on the eastern portion of this section (Figure 4). Presently, the area contains three houses and outbuildings. The westernmost house is sided with wood shingles, and appears to have been constructed c. 1930. Associated with this house is a garage, an outbuilding, and several rock walls and terraces. Northeast of the house the ground surface drops to an artificially levelled area which is currently being used as a plant storage greenhouse. At the eastern edge of the levelled area is a rock retaining wall, and built into the wall are concrete bleachers. Behind the bleachers, at the top of the wall, are four rock columns with low connecting walls that appear to be the remains of a pavilion-like structure. Below the wall is an old tennis court, and atop the court surface are greenhouses and a Quonset hut. East of the tennis court is a

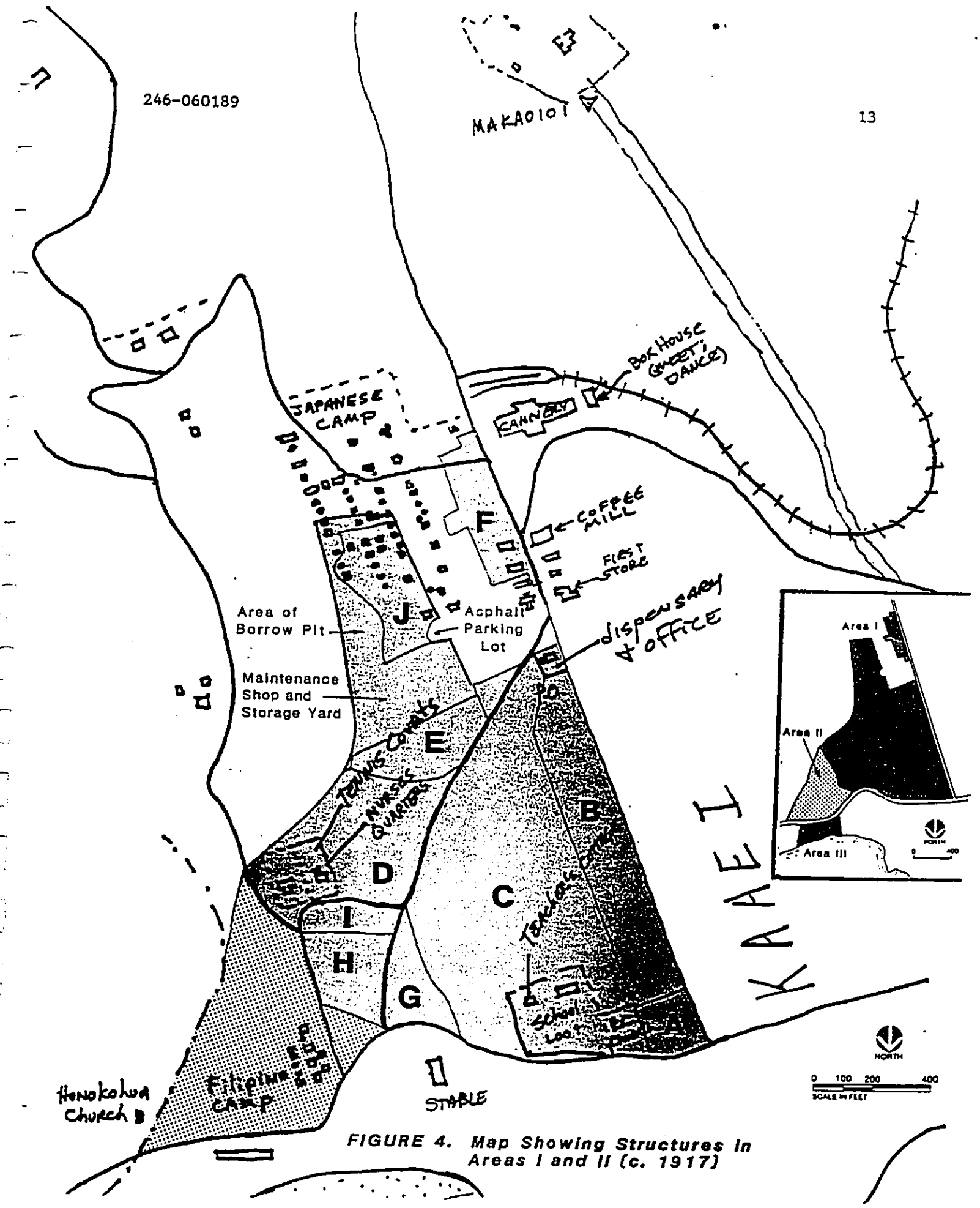

FIGURE 4. Map Showing Structures in Areas I and II (c. 1917)

garage and a house sided with wood shingles; both appear to have been constructed in the 1930s. East of the house is another house constructed of oversized concrete blocks. This house has been modified considerably since it was built, but the original house may also date to the 1930s.

Thirty core were augered in Section D. Soil depth was found to be shallow in the western and southern portions of the section and deep in the eastern portion (up to 6.0 m below surface). Portable remains recovered from Section D included glass, charcoal, asphalt shingle fragments, a metal crown cap, a marine shell, and five pieces of weathered unidentifiable bone fragments (non-human mammal). Excepting the bone fragments, the remains were found in cores placed near the present houses. The bone fragments were present in Core #60, which was placed on the side of a ditch on the southern edge of the section. The fragments were recovered from 86 to 96 cm below surface, but the proximity to the ditch and the likelihood that the configuration of the ditch has changed over time makes interpretation of their significance difficult. Section D may contain intact subsurface features associated with either the present or former structures.

Section E

Section E is situated south of Sections C and D and is currently used as a storage yard and as a parking lot by the golf course maintenance crew. This area has been greatly altered--it has been excavated to create a flat area and has been covered with up to 0.51 m of crushed gravel. The little soil that remains there in the section is quite shallow.

Eight backhoe "scoop" trenches were placed in the area. The area exhibited a single clay layer atop bedrock; this layer was 0-0.9 m thick and averaged 0.31 m thick. The only artifact noted in the trenches was a metal pipe at 25 cm below the crushed gravel layer. The potential for Section E to contain intact subsurface features is very low.

Section F

Section F is located south of Honolua Store. This area had been bulldozed recently to create a storage yard. Scattered glass and drainage tile fragments were present on the exposed surfaces of the area. Ten cores were augered in the area; soil depth ranged from 2.0 m to greater than 4.0 m. No material was recovered from the cores. Maps dated c. 1970 and c. 1917 show numerous buildings in the section (Figures 3 and 4). Subsurface features associated with these buildings may still be present in the area, despite the fact that bulldozing appears to have removed up to 30 cm of topsoil from the surface.

Section G

Section G is situated on the slope east of Section C. This section has been cleared using heavy machinery. Fifteen cores were placed in the

section. The cores were located by orienting a grid along the long axis of the lot. The soil in the section was shallow (average depth approximately 50 cm). One core (60N/10E) was augered to 3.07 m below surface (pieces of decomposed bedrock appearing at 63 cmbs); however, the core appears to have been placed within a disturbed deposit, probably a bulldozer push pile. The potential for Section G to contain intact prehistoric or historic remains is judged to be very low.

Section H

Section H is a relatively flat area situated east of Section G. Prior to testing, a 20 meter grid was oriented along the road at the west edge of the area, then 11 cores were augered in the section. The soils were comprised of clays, silty clay, and clay loams. Soil depth along the western edge of the area averaged approximately 0.8 m. In the eastern portion of the area, cores were dug to a depth in excess of 5.0 m without encountering bedrock. In the eastern portion, one bird bone was recovered from the core at 320N/240E from a depth of 295 cm. The deposits above the bone appeared to be undisturbed, and the deposition of the bone is assumed to have been natural. At least eight houses once existed in Section H (Figures 3 and 4); as such, intact subsurface features associated with these houses may exist in the section.

Section I

Section I is situated south of Section H and currently contains two houses. Although the houses appear to be constructed before 1970, they are not depicted on the c. 1970 map; thus, it is possible that older structures were moved into the area in the mid-1970s, when houses from the surrounding areas were removed. No core tests were made in this section, but based on the results from adjacent sections, the potential for this section to contain subsurface cultural remains is low.

Section J

Section J is located south of the golf course maintenance shop and storage yard and consists of approximately 3.0 acres. A backhoe was used to excavate eight "scoop" trenches, and the walls of the trenches were examined for evidence of buried surfaces or features. Detailed soil descriptions were recorded for soils in trench walls. All excavations were terminated at decomposed bedrock. The depth of the soil above the bedrock was 0.31 to 2.15 m (average depth 1.2 m). Individual trench sections are described below.

Trench #71 - The upper 17 cm contained scattered charcoal in a matrix of loamy clay (5YR3/4, dark reddish-brown). The next layer was a dark reddish-brown clay overlying decomposing bedrock.

Trench #72 - Decomposed bedrock was encountered at 215 cm below surface. The fill above bedrock consisted of rubbish (plastic sheets, firehose,

concrete, metal screening) mixed with a dusky red to dark reddish-brown loamy clay. The rubbish appears to be of recent origin and is probably related to refuse disposal by Kapalua Land Co.

Trench #73 - The upper 26 cm of this trench consists of dark reddish-brown loamy clay containing scattered charcoal; this layer is probably bulldozer push. Successive layers consist of 30 cm of reddish-brown loamy clay, and dark reddish-brown clay with increasing amounts of decomposing bedrock. Bedrock was encountered at 142 cm below surface.

Trench #74 - The upper 35 cm consists of very loose dark reddish-brown loamy clay and appears to have been disturbed. A porcelain rice bowl was recovered from the north wall of the trench at 31 cmbs. Under the upper layer was dark reddish-brown clay 19 cm thick. Bedrock was encountered 69 cm below surface.

Trench #75 - The upper 32 cm consists of dark reddish-brown clay, while the lower layer consists of 97 cm of dark reddish-brown clay. Decomposed bedrock was encountered 129 cm below surface.

Trench #76 - The upper 31 cm consists of disturbed dark reddish-brown clay containing pieces of asphalt shingles, concrete, and charcoal. Under the upper layer is a layer (2 cm thick) of asphalt shingle pieces overlying decomposed bedrock, which begins at 33 cm below surface.

Trench #77 - The upper 36 cm consists of dark reddish-brown clay, while the lower layer consists of 114 cm of dark reddish-brown clay. Bedrock was encountered at 150 cm below surface.

Trench #78 - Trench stratigraphy consists of 182 cm of dark reddish-brown clay overlying decomposed bedrock. A trash-filled pit is visible in the north wall of the trench and extends to 144 cm below surface. The trash consists of metal cans, glass, wine bottles, condiment jars, asphalt shingles, aluminum foil, rocks, concrete, and saw-cut animal bones.). Recovered from the trash was a crescent-shaped "Man in the Moon" metal ornament. The debris from this trench appears to be older than the debris from Trench #72, and is probably associated with the houses that once stood in the area.

Area I Portable Remains

A total of 168 portable items, including historic artifacts (88), charcoal fragments (46, from six cores), bone fragments (24, from six cores), and pieces of marine fauna (10) were recovered during the subsurface testing in Area I. The portable remains were recovered from 27 different auger holes, and from Backhoe Trenches #74 and #78.

Pieces of marine fauna included a gastropod opercula (1), and shell from Turbinidae (1), Cellana sp. (2), Nerita picea (1), Conidae (4), and unidentified (1). Most of the bone fragments were too small for definite identification; however, they all appeared to be non-human. Twelve recent

mammal bones (several appeared machine sawn/cut) were recovered from Trench #78. Six of them were recovered from 0-50 cm below surface, and one was recovered at 295 cm below surface. Charcoal ranged from very tiny to small fragments, and was so rare that fragments were counted rather than weighed. The charcoal did not appear to be concentrated at any specific depth or location.

Historic period portable remains included 31 bottle/jar glass fragments, 29 pieces of metal, two ceramic sherds, one piece of pink plastic (?) (comb tooth fragment?), 17± very fragmented pieces of possible asphalt roofing shingles, six pieces of concrete, and two very tiny unidentified fragments of what may be thin ceramic glazed sherds (possibly undecorated whiteware).

Glass was recovered from the uppermost portions of the testing cores (0-36 cm below surface). The recovered glass included six brown bottle fragments, 24 clear bottle/jar fragments, and one olive green bottle fragment. Only three glass fragments had diagnostic form or markings. One was a brown machine-made crown lip fragment (probably from a beer bottle), and the other two were clear machine-made base fragments which read "--H. J. HE--" and "--IN--" (probably H. J. Heinz condiment or food jar). Excepting an olive green piece and a clear piece recovered at 500N/280E from 0-18 cm below surface, all glass fragments appeared to be less than 50 years old. The two exceptions probably do not pre-date the very late 1800s or early 1900s.

Metal artifacts consisted of a .42 caliber FA centerfire shell casing, a decorative iron ornament (a half moon face with a broken place for mounting at the bottom), two tiny unidentified iron fragments, a bottle crown cap fragment, and 24 wire nails/fragments (minimum of eight different nails represented). The nails may be as old as 1890, the generally accepted beginning date for wire nail manufacturing.

The ceramic artifacts included a small undecorated whiteware plate sherd (from 500N/280E), and a blue transfer print porcelain bowl (from Backhoe Trench #74. The dates of manufacture for the ceramic artifacts could not be determined.

In summary, most of the recovered portable remains were not concentrated in any specific area, and most appeared to be recent (post-1900) materials. A possible exception would be a few pieces of materials from several cores in the northeastern portion of Section C, in the area adjacent to Section G. This area contains a relatively higher density of somewhat older historic period artifacts, including wire nails, glass, and ceramic. The artifacts may reflect limited occupation dating back to the late 1800s or, more likely, early 1900s.

AREA II - PROPOSED TENNIS COMPLEX AREA

The initial surface inspection of Area II identified remnants of a plantation camp ("Filipino Camp", see Figure 4), construction debris,

sewer pipes, outbuilding foundations, stone facing on an earthen embankment, a 1912 dime, and several human bone fragments, most likely from sand fill around the sewer pipe. No indigenous artifacts or evidence of early occupation of the project area was seen during the initial surface inspection. Most of Area II was bulldozed in the early 1970s during razing of the plantation camp, and again in 1988 prior to the making of a topographic map of the area.

Initially, 21 backhoe trenches were dug to determine the presence or absence of buried cultural deposits; four additional trenches (BT-22 thru 25) were subsequently dug in the area where human bone fragments had been recovered during the initial surface inspection. (See Figure 2, at end.) Detailed stratigraphic descriptions for six representative trenches are presented in Table 1. Summary stratigraphic descriptions for the other nineteen trenches are presented in Table 2. The upper layers of five trenches produced historic construction debris. Trench BT-18 yielded coral and waterworn stones at 4.42 m below surface, possibly indicating an earlier beach location. No archaeologically significant subsurface cultural materials of any kind (midden deposits, structures, portable artifacts, skeletal remains) were found in any of the 25 test trenches.

AREA III - PROPOSED BEACH ACTIVITIES AREA

A total of 202 core holes were excavated within Area III to an average depth of 3.5-4.5 m below surface (see Figure 2, at end). The cores evidenced little variation in soil over most of the parcel. Two basic soil profiles were observed--Types 1 and 2. These profiles roughly coincide with the beach sand/dune land soil (Type 1), and Kahana silty clay/Pulehu clay loam (Type 2) depicted by the Soil Conservation Service map as within the project area (Foote et al. 1972). However, Type 1 profiles extend somewhat farther south than the soil survey map indicates. Lower Honoapiilani Road appears to be the approximate boundary between beach sand and the silty clays and clay loams.

Type 1 profiles are present in c. 95% of the project area (everywhere except the southwest corner) and are 5.0+ m deep. Type 1 profiles consist of original beach sand reworked by natural processes such as wind and drainage. These sands have stabilized upon becoming vegetated; however, horizons are not well developed in them. A typical Type 1 profile has a dune land profile in its upper portion. Below this dune land profile are strata created by various processes. A typical Type 1 profile includes the following strata:

> Stratum I - Stratum I represents past modern activities such as leveling, grading, excavation, and land clearing during creation of Fleming Beach Co. Park. It also represents current activities surrounding use of the area as a beach park, which has disturbed the original surface. Prehistoric or historic cultural layers that may have existed near the surface would have become mixed within this stratum to an unknown degree

Table 1.

DETAILED STRATIGRAPHY OF REPRESENTATIVE AREA II BACKHOE TEST TRENCHES

Trench	Layer	Description
1	I	0-260 cmbs; dark reddish-brown (5yr 3/3 dry; 5yr 3/2 wet) sandy silt; strong, fine, subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic consistence; boundary not reached; common, very fine to fine vesicular roots
3	I	0-154 cmbs; dark brown (7.5yr 3/4 dry; 7.5yr 3/2 wet) sandy silt; strong, fine to medium, subangular blocky structure; slightly hard, friable, sticky and plastic consistence; abrupt and wavy boundary; few, fine vesicular roots
	II	154+; bedrock
8	I	0-5 cmbs; dark brown (7.5yr 3/4 dry; 7.5yr 3/2 wet) sandy silt; strong, fine to medium, subangular blocky structure; friable, sticky and plastic consistence; clear and irregulqr boundary; few, fine, fine vesicular roots
	II	5-116 cmbs; grey (10yr 5/1 dry) decomposing bedrock
	III	116+ cmbs; solid bedrock
9	I	0-25 cmbs; dark brown (7.5yr 3/4 dry; 7.5yr 3/2 wet) sandy silt; moderate, fine to medium, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic consistence; clear and wavy boundary; no roots
	II	25-51 cmbs; dark reddish-brown (2.5yr 3/4 dry; 2.5yr 3/2 wet) sandy silt; moderate, fine to medium, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic consistence; very abrupt and wavy boundary; no roots
	III	51-232+ cmbs; very pale brown (10yr 7/3 dry) sand; structureless,very fine to fine, single grain; loose, nonsticky, non plastic consistence; boundary not reached; no roots

Table 1. (Cont.)

Trench	Layer	Description
18	I	0-83 cmbs; dark brown (7.5yr 3/4 dry; 7.5yr 3/2 wet) sandy silt; strong, fine to medium, subangular blocky structure; slightly hard, friable, sticky and plastic consistence; abrupt and smooth boundary; common, very fine to fine vesicular roots
	II	83-105 cmbs; dark brown (10yr 3/3 dry; 10yr 3/2 wet) sandy silt; strong, fine to medium, subangular blocky structure; abrupt and wavy boundary; very few, very fine roots
	III	105-417 cmbs; very pale brown (10yr 5/4 dry) sand; structureless, fine, single grain; loose, nonsticky, nonplastic consistence; clear and smooth boundary
	IV	417-332+ cmbs; very pale brown (10yr 7/4 dry) sand; structureless, fine, single grain; loose, nonsticky, nonplastic consistence; boundary not reached; coral and waterworn stones at 442 cmbs
23	I	0-25 cmbs; dark brown (7.5yr 3/2 wet) silty clay; strong, fine to medium, subangular blocky structure; slightly hard, firm, sticky and plastic consistence; wavy and clear boundary; many fine, vesicular roots
	II	25-50 cmbs; dark brown (7.5yr 3/4 wet) silty clay; moderate, fine to medium, subangular blocky structure; slightly hard, firm, sticky and plastic consistence; abrupt and wavy boundary; common, fine, vesicular roots
	III	50+ cmbs; bedrock

Table 2.

SUMMARY STRATIGRAPHIC DESCRIPTIONS OF AREA II BACKHOE TEST TRENCHES

Trench	Layer	Description
2	I	0–204 cmbs; dark brown sandy silt; boundary not reached
4	I	0–24/42 cmbs; dark reddish-brown sandy silt; clear and irregular boundary
	II	24/42–89 cmbs; gray decomposing bedrock; abrupt and irregular boundary
	III	89+ cmbs; solid bedrock
5	I	0–107 cmbs; dark reddish-brown sandy silt; very abrupt and wavy boundary
	II	107+ cmbs; bedrock
6	I	0–10/68 cmbs; dark reddish-brown sandy silt; very abrupt and wavy boundary
	II	10/86+ cmbs; bedrock
7	I	0–110 cmbs; dark reddish-brown sandy silt; very abrupt and wavy boundary
	II	110+ cmbs; bedrock
10	I	0–93 cmbs; dark brown sandy silt; abrupt and smooth boundary
	II	93–123 cmbs; dark reddish-brown sandy silt; clear and smooth boundary
	III	123–223 cmbs; very pale brown sand; boundary not reached

Table 2. (Cont.)

Trench	Layer	Description
11	I	0-142 cmbs; dark reddish-brown sandy silt; abrupt and wavy boundary
	II	142-246 cmbs; dark reddish-brown silty sand; very abrupt and smooth boundary
	III	246-286 cmbs; very pale brown sand; boundary not reached
12	I	0-284 cmbs; dark brown silty sand; abrupt and smooth boundary
	II	284+ cmbs; very pale brown sand; boundary not reached
13	I	0-247+ cmbs; dark reddish-brown sandy silt; boundary not reached
14	I	0-288+ cmbs; dark reddish-brown sandy silt; boundary not reached
15	I	0-91 cmbs; dark reddish-brown silt; abrupt and wavy boundary; trench dug through the stone-faced roadway embankment; water pipe and bottles in Layer I
	II	91-342 cmbs; dark yellowish-brown silt; boundary not reached
16	I	0-99 cmbs; dark brown sandy silt; clear and smooth boundary
	II	99-309 cmbs; dark brown silty sand; abrupt and wavy boundary
	III	309+ cmbs; very pale brown sand; boundary not reached
17	I	0-211 cmbs; dark brown sandy silt; clear and smooth boundary
	II	211-292 cmbs; light yellowish-brown sand; boundary not reached

Table 2. (Cont.)

Trench	Layer	Description
19	I	0-19 cmbs; dark brown sandy silt; abrupt and wavy boundary; construction materials present
	II	19-44 cmbs; dark brown silty clay; clear and wavy boundary; construction materials present
	III	44-57 cmbs; dark brown sandy silt; clear and wavy boundary; construction materials present
	IV	57-84 cmbs; dark reddish-brown silty sand; clear and wavy boundary; construction materials present
	V	84-235 cmbs; light yellowish-brown sand; boundary not reached
20	I	0-222+ cmbs; dark brown silty clay; boundary not reached
21	I	0-32 cmbs; dark brown silty clay; clear and wavy boundary. Sewer pipe runs through Layer I.
	II	32-59 cmbs; dark brown silty clay; clear and wavy boundary
	III	59-119+ cmbs; grey decomposing bedrock
22	I	0-28 cmbs; dark brown silty clay; wavy and clear boundary; construction materials and sewer pipe present
	II	28-79 cmbs; dark brown silty clay; clear and irregular boundary
	III	79-95 cmbs; grey decomposing bedrock; abrupt and irregular boundary
24	I	0-31 cmbs; dark brown silty clay; clear and irregular boundary

Table 2. (Cont.)

Trench	Layer	Description
25	I	0-35 cmbs; dark brown silty clay; clear and wavy boundary
	II	35-72 cmbs; dark brown silty clay; abrupt and smooth boundary
	III	72+ cmbs; bedrock

and/or are not identifiable using core testing methodology. On average, the depth of this stratum is 0-60 cm below surface. In some areas, the stratum is significantly deeper, depending on the nature of modern disturbance, with a maximum recorded basal depth of 148 cm. Stratum I generally follows surface contours and has an abrupt, irregular bottom boundary. Within the stratum, any number of smaller sublayers can be observed, each representing a different episode of modern activity. Texture ranges from a humic loam at surface to a silty sand/sandy loam below. Color ranges from black to yellowish-brown. Roots are generally plentiful, as are organic inclusions, marine and land mollusc shells, and modern trash. Most of the faunal remains recovered during this project came from this stratum. Other than modern trash, one volcanic glass flake and one yellow flint flake were the only portable artifacts recovered;

Stratum II - Stratum II comprises the beginning of the undisturbed portion of the soil profile. It represents beach sand affected by natural processes (e.g., wind, rain, additions of organic material), and can be thought of as a young B-horizon. On average, its depth range is 60-130 cm, and it tends to follow surface contours and have a clear wavy bottom boundary. Texture ranges from loamy sand to fine sand, and its color ranges from brown to brownish-yellow. It has no discernible structure, and few roots, marine and faunal remains, or other organic remains;

Stratum III - Stratum III represents a transitional zone between Strata II and IV. On average, its depth range is 130-260 cm. This stratum has a diffuse, wavy bottom boundary. Texture ranges from fine to medium coarse sand, and its color ranges from brown to yellow. For the most part, it has no discernible structure; however, frequent root concretions, and sometimes the presence of a weakly cemented, discontinuous silicified sand layer within the lower part of the stratum makes it appear to have a medium granular structure. Small waterworn pebbles and shell fragments are found infrequently.

Stratum IV - Stratum IV represents the top layer of unmodified original beach sand. On average, its depth range is 260-400 cm. It has a diffuse, wavy bottom boundary. Texture is essentially medium coarse sand, and its color ranges from yellowish-brown to yellow. For the most part, it has no discernible structure; however, as in Stratum III, a weakly to strongly cemented, discontinuous silicified sand layer makes it appear to have a medium granular structure. Towards the bottom of the stratum, there is some banding of sand layers; these layers are of different coarseness and color. There are also increasing numbers of waterworn shell fragments.

Stratum V - Stratum V represents completely unmodified beach sand. On average, its depth begins at 400+ cm. Compared to the surface layer, this layer trends slightly upward generally to the southeast. Texture ranges from medium to coarse sand, and its color ranges from yellowish-brown to yellow. It has no discernible structure. A high degree of banding of layers of differing coarseness and color occurs within this stratum. Some of these bands contain large quantities of waterworn shell fragments. In the eastern portion of the area, a thin band of coarse sand with a high proportion of olivine grains is found. Along the southern edge of the area, the water table was reached at 4.5 meters below surface, at which point the soil turns gray. The depth of the water table on the north side of the area was not determined.

Because they are essentially sand, Type 1 profiles would provide an ideal matrix for the burial of human remains. With regard to the adjacent Honokahua Burial Site, Donham states that "...the presence of subsurface skeletal material is positively correlated with sand deposits and that the basal depth of potentially in situ burials is correlated with the basal depth of the sand" (1986:39). Therefore, the areas of Type 1 profile would seem to have high potential for in situ human remains. Burials could potentially be found at any depth between the surface and the water table. However, given the existence of the silicified sand layer in the lower portion of Stratum III, the probable presence of burials likely decreases below a depth of approximately 2.6 m.

Type II profile consists of red to reddish-brown clays and silty clays representing the Kahana series of upland silty clays. A variation of the Type II profile occurs adjacent to Lower Honoapiilani Road and represents the transition zone between the upland silty clays/clay loams and the shoreline beach sand/dune sand deposits. Type II profile has a low potential for the presence of in situ human remains.

Area III Burial

One apparently intact human burial was encountered in Area III, in a Type I profile at Grid Coordinates 600N/785E, midway along the shoreline boundary, at a depth of 190 cm below surface (Figure 2, at end). The

skeletal elements recovered were somewhat damaged by the auger, but their overall state of preservation was good. The identifiable pieces consisted of talus and calcaneus fragments and possibly distal tibia fragments. Given the depth at which they were found, their anatomical relationships, and their condition, it is probable that they came from an in situ burial.

Three core holes excavated in Type I soil were terminated due to rocks encountered at approximately 1.4 m below surface. These cores were situated at Grid Coordinates 600N/795E (rock hit at 134 cm), 585N/770E (rock hit at 136 cm), and 560N/740E (rock hit at 140 cm) (Figure 2, at end). Rocks at such depths are anomalous within the Type I soil profile, and might can possibly represent burial pit capstones. During excavation of burials in the nearby Honokahua Burial Site, approximately 20% of the burials excavated were found to have large rock capstones placed in or on top of the burial pit.

Area III Portable Remains

No buried cultural deposits were identified; however, two finds indicate the possible presence of cultural remains. The first is a volcanic glass flake recovered from Stratum I of a Type 1 deposit. Found at 25 cm below surface at Grid Coordinates 560N/815E, the flake suggests that there might be prehistoric cultural remains in the area; however, a single flake does not provide sufficient evidence to allow definition of a cultural component, especially when recovered from a disturbed stratum. The second find is a flake of yellow, flint-like material; the flake was found at 24 cm below surface in Stratum I of a Type 1 profile, at Grid Coordinates 595N/815E. Thought perhaps to be a gun flint or from a strike-a-light, this flake suggests the possible presence of historic cultural remains in the area. However, as in the case of the volcanic glass flake, nothing more definitive can be concluded from a single flake. Also recovered in Area III were 24 pieces of non-human bone, all of which probably represent modern debris.

CONCLUSION

DISCUSSION

At the instruction of Kapalua Land Company, PHRI carried out a program of subsurface archaeological testing in connection with the proposed revision of the Ritz-Carlton Kapalua Hotel Project Site at the Kapalua Bay Resort. The basic purpose of the testing was to determine the presence or absence of significant archaeological remains which might represent potentially serious constraints upon development of the revised project site. More specifically, the purpose of the testing was demonstrate and document the probable absence of any substantial number of prehistoric Hawaiian human burials such as those present in the large burial ground occupying the central portion of the original hotel site overlooking Honokahua Bay.

Subsurface archaeological testing was carried out in several increments between December 1988 and May 1989 in three different areas which comprise the revised hotel project site: (a) Area I--the proposed revised hotel area, situated inland of Lower Honoapiilani Road (across from the original hotel site) and east of Office Road; (b) Area II--the proposed tennis complex area, situated inland of Lower Honoapiilani Road (across from D.T. Fleming Beach Park) and northeast of and adjacent to Area I; and (c) Area III--the proposed beach activities area, situated seaward of Lower Honoapiilani Road (between the original hotel site and D.T. Fleming Beach Park) and north of Area II. Systematic subsurface testing was conducted throughout each area by means of hand-powered sand auger and/or mechanical backhoe. In Area I, 162 auger cores and 16 backhoe "scoop" trenches were dug; in Area II, 25 backhoe trenches of varying lengths were dug; and in Area III, 202 auger cores were dug.

Most of Area I was found to have been substantially modified in recent historic times, initially for plantation cultivation and subsequently for golf course development. Test trenches and cores yielded a scatter of historic period artifacts, most of which appeared to be fairly recent, and which most likely reflect plantation camp occupation dating back to around the beginning of the 20th century. No evidence of prehistoric or early historic period occupation or utilization (including burials) was identified anywhere in Area I.

Much of Area II was also found to have been substantially modified in recent historic times, apparently in connection with construction and occupation of plantation camps. Initial surface inspection identified primarily remnants of recent historic structures. The few fragments of human bone found on the surface were determined to have been brought in with discarded fill material that came from outside of the area, possibly from the sand dune area across Lower Honoapiilani Road where the Honokahua Burial Site is situated. No evidence of prehistoric or early historic period occupation or utilization (including burials) was identified anywhere in Area II.

Area III was initially thought by some possibly to contain an eastward extension of the large Honokahua Burial Site present to the west in the original hotel site. However, extensive subsurface testing revealed only a single probably intact burial, situated midway along the shoreline boundary of the parcel, and most likely within the setback area. Subsurface rocks encountered at three other locations were considered to be anomalous within the sand soil matrix, and might possibly represent capstones placed atop burials--a situation found in approximately 20% of the burials excavated in the nearby Honokahua Burial Site. No buried intact cultural deposits were encountered anywhere in Area III, but two recovered items, a volcanic glass flake and a flake of flint-like stone, suggest the possible presence of remnant or mixed/disturbed prehistoric and/or early historic period components. In any case, Area III does not evidence any extension of the large prehistoric burial site (cemetery) present in the original hotel site, though it is thought likely--since Area III is a beach front sand dune--that there would be a few burials randomly scattered within Area III.

SIGNIFICANCE ASSESSMENTS AND RECOMMENDATIONS

Significance assessments are based on the National Register criteria for evaluation, as outlined in the Code of Federal Regulations (36 CFR Part 60). The Hawaii State Department of Land and Natural Resources-Historic Sites Section/State Historic Preservation Office (DLNR-HSS/SHPO) uses these criteria for evaluating the significance of archaeological resources. Those determined to be potentially significant for information content fall under Criterion D, which defines significant resources as ones which "...have yielded, or may be likely to yield, information important in prehistory or history." Resources potentially significant as representative examples of site types are evaluated under Criterion C, which defines significant resources as those which "...embody the distinctive characteristics of a type, period, or method of construction...or that represent a significant and distinguishable entity whose components may lack individual distinction."

Resources with potential cultural significance are evaluated under guidelines prepared by the Advisory Council on Historic Preservation (ACHP) entitled "Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review" (ACHP 1985). The guidelines define cultural value as "...the contribution made by an historic property to an ongoing society or cultural system. A traditional cultural value is a cultural value that has historical depth" (1985:1). The guidelines further specify that "[a] property need not have been in consistent use since antiquity by a cultural system in order to have traditional cultural value" (1985:7).

General assessments and recommendations with regard to the three different areas that comprise the revised hotel project site are summarized below. Somewhat more detailed evaluation and recommendation comments follow. The findings and conclusions of the testing--including

evaluations and recommendations--have been discussed with the appropriate staff archaeologists in the Department of Land and Natural Resources-Historic Sites Section/State Historic Preservation Office (DLNR-HSS/SHPO), and they are in general agreement.

Summary of General Significance Assessments and Recommendations

Based on the findings of the extensive subsurface testing of the revised hotel project site, the general conclusion has been reached that there are no significant archaeological remains present anywhere within the three areas comprising the revised hotel project site that would substantially constrain or prevent proposed development. Based on discussions with DLNR-HSS/SHPO staff, it seems most likely that even if a few isolated burials were to be identified within Area III, disinterment would be permitted and proposed development of the area could proceed. This would be so because the isolated burials would not be considered as an extension of the large Honokahua Burial Site present in the original hotel site.

General recommendations with regard to the three different areas that comprise the revised hotel project site can be summarized as follows:

> Areas I and II--no further archaeological work of any kind is needed prior to beginning of on-site hotel development construction work;
>
> Area III--limited further testing by a combination of shovel and mechanical backhoe excavations be conducted to determine (a) the nature of the rocks encountered by auger at three locations (possible burial capstones or not), and (b) the possible presence of remnant cultural deposits on the inland edge of the area (adjacent to Lower Honoapiilani Road); and
>
> Areas I, II, and III--with any archaeological testing, there is always the possiblity, however remote, that potentially significant unidentified subsurface cultural deposits or remains might be encountered in the course of subsequent land modification activities. Given this, and the special sensitivity appropriate to development within the project site, all initial grading and excavation work within the revised hotel project site, and especially within Area III, should be monitored by a qualified archaeologist.

Area I - Proposed Revised Hotel Area

Area I is generally assessed as potentially significant for information content and cultural value--assuming the possible presence of any intact remnant buried cultural features or deposits. For Area I, the following specific recommendations should be considered:

1. Since houses and other buildings most likely related to plantation camps dating back to the early 1900s are known to have existed on various portions of Area I, it is possible that subsurface features associated with these structures (such as privies or trash pits) exist in the vicinity. Therefore, it is recommended that an archaeologist monitor all initial earth moving operations in the areas of the previously present houses and buildings;

2. Although no evidence of human skeletal remains was found during testing, the proximity of Area I to the Honokahua Burial Site suggests that burials might possibly be present along the northern portion of the area, especially in the area of the third green and Kumulani Chapel. For this reason, it is recommended that any earth moving operations in these areas be monitored by an archaeologist;

3. Although Section J appears to have been altered by land clearing, structure demolition, and other activities, it is the location of a Japanese worker's camp of c. 1917 and is also the location of later camp housing as well. It is likely that subsurface features related to the camp and housing still exist in the area. The trash-filled pit in the wall of Trench #78 may be one of these features. Therefore, it is recommended that an archaeologist monitor initial earth moving operations in the area; and

4. Because the area falls within the Honokahua Historic District, it is likely that documentation of the historic period resources within the district would be required prior to any development activity in the parcel. Any structures listed as part of the district, such as Kumulani Chapel, and possibly the three houses and rock constructions in Section E, would require documentation prior to development.

Area II - Proposed Tennis Complex Area

Area II is generally assessed as potentially significant in terms of information and cultural values--assuming the possible presence of human burials. Considerable past land modification has occurred throughout the parcel, thereby eliminating evidence of any archaeological sites or structures that might have been present in the area. Survey and tyesting of the area revealed no surface or subsurface archaeological sites, cultural materials, or burials. Because the Honokahua Burial Site is located near the project area, however, it is recommended that a qualified archaeologist monitor any subsurface machine activity in the eastern portion portion of the area. Trenching in that portion disclosed deep underlying sand deposits extending approximately 75 m (240 ft) south of Honoapiilani Road in a coconut grove. Aside from the monitoring, no further archaeological work is believed necessary.

Area III - Proposed Beach Activities Area

Area III is generally assessed as potentially significant in terms of information content and cultural value--assuming primarily the possible presence of a few randomly scattered human burials. Based on the results of the present survey and testing, it appears that Area III lies at the very limits, or more likely outside, of the eastern boundary of the Honokahua Burial Site. The confirmed presence in Area IIIof one *in situ* burial, the earlier surface finds along the beach cut-bank, and the possible presence of other *in situ* burials capped with large rocks suggests the likely presence of a few burials within the area. However, burial density would be very low, and the recent testing evidence suggests that within the area burials would likely be situated only within a 10 to 15 m wide strip of land paralleling the erosion-cut beach bank. The close spacing of the core holes (5 meter intervals) that were augered during the present testing project provides a high degree of confidence as to minimal burial density.

Concerning the possible remnant buried cultural components within Area III, it seems that cultural deposits associated with such components are either very limited or are completely disturbed. This, however, may have been due to the field methodology not providing good enough stratigraphic resolution upon which to base such evaluations. Therefore it is generally recommended that limited further archaeological work, if conducted, should attempt to provide better definition of the extent of potential undisturbed cultural components within the area.

Because of the proximity of Area III to the Honokahua Burial Site, and because of the past problems concerning mitigation of that site, it is also generally advisable that development activities within Area III be limited to those that would only minimally affect subsurface deposits. The following specific recommendations would be appropriate:

1. Preserve intact the 10-15 m wide strip of land along the erosion-cut beach bank which possesses the highest potential for the presence of further *in situ* burials (i.e., shoreline setback area);

2. Conduct a program of limited subsurface testing to determine (a) the nature of the rocks encountered by auger at three locations (possible burial capstones or not), and (b) the possible presence of remnant cultural deposits along the inland edge of the area (adjacent to Lower Honoapiilani Road); and

3. Monitor all subsurface construction excavations within the parcel.

Revised Hotel Project Site Overall

Finally, the general qualification should be made that the general conclusion and specific recommendations stated here are based on the

findings of the extensive subsurface testing. With any archaeological testing, there is always the possiblity, however remote, that potentially significant unidentified subsurface cultural deposits or remains might be encountered in the course of subsequent development activities involving the modification of the ground surface. Given this possibility, and the special sensitivity appropriate to development within the project site, it is recommended that all initial construction grading and excavation work within the revised hotel project site, and especially within Area III, be monitoring by a qualified archaeologist.

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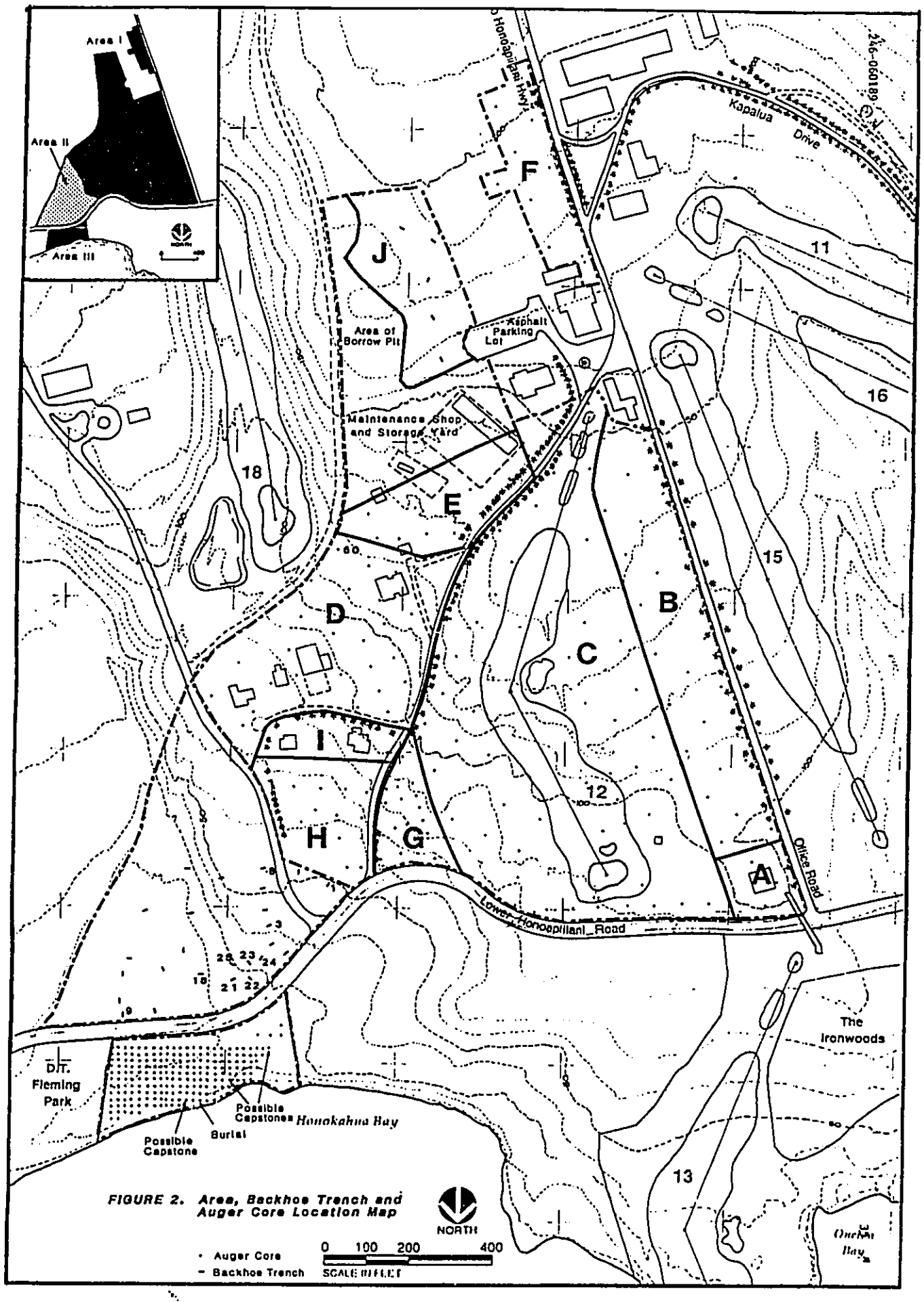

FIGURE 2. Area, Backhoe Trench and Auger Core Location Map

PAUL H. ROSENDAHL, Ph.D., Inc.
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Report 246-063089

ADDENDUM REPORT:

ADDITIONAL SUBSURFACE TESTING OF AREA III

SUBSURFACE ARCHAEOLOGICAL TESTING
REVISED RITZ-CARLTON KAPALUA HOTEL PROJECT SITE
AREAS I, II, AND III

Land of Honokahua
Lahaina District, Island of Maui

by

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ADDITIONAL SUBSURFACE TESTING OF AREA III

INTRODUCTION

At the request of Kapalua Land Company, Ltd., Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted limited additional subsurface archaeological testing at Area III (Kapalua Development Lot A-7-C-1). This area had undergone a program of systematic auger core testing in January 1989 (Ferguson et al. 1989). The testing had entailed systematic excavation of 202 cores at 5.0 m intervals across the 2.3 acre property. During the coring, a single in situ human interment, three loci of buried stones, and two isolated artifacts (a volcanic glass flake and a chert gunflint) were identified. Based on these findings, PHRI recommended the following:

> [I]t is recommended that limited further testing in the form of a combination of hand shovel and mechanical backhoe excavations be conducted to determine (a) the nature of the rocks encountered by auger at three locations (possible burial capstones or not), and (b) the possible presence of remnant cultural deposits along the inland edge of the area (adjacent to Honoapiilani Road) (PHRI Letter 246-060789 dated 7 June 1989, from PHRI to James E. Pavisha).

Subsequently, the following specific tasks for the further limited testing were formulated:

1. Relocate the grid points where subsurface stones had been encountered during prior testing, and establish additional points in the southern portion of the parcel for excavation of stratigraphy trenches;

2. Excavate at stone locations with machinery in upper levels and hand tools in lower levels, in order to determine if any of the stones are associated with human interments;

3. Examine walls and excavated matrix in all trenches, in order to determine if buried cultural deposits are present; and

4. Prepare a report of findings.

PHRI was retained by Kapalua Land Company, Inc., to conduct the above archaeological work. The field work was conducted on June 15, 16, and 19, 1989 by two crew members. The project was conducted under the supervision of PHRI Supervisory Archaeologist Theresa K. Donham and under the overall direction of PHRI Principal Investigator Dr. Paul H. Rosendahl.

FINDINGS

On June 15, 1989, the grid system used in the previous testing was reestablished and locations of subsurface stones and stratigraphy trenches were marked. Excavation of stone locations was conducted June 16, and statigraphy trench excavation was conducted June 16 and 19 (Figure 1). Excavation and trenching loci were numbered sequentially (1-8). Representative sections of all excavations were profiled, except in the case of Trench 1, which collapsed before a profile could be completed. The following are detailed descriptions of the test trenches:

TRENCH NO: 1
LOCATION: 560N/740E
STRATIGRAPHY:
Layer I 0-30 cmbs; disturbed sandy loam (10YR3/3)
Layer II 30-50 cmbs; disturbed sandy fill (10YR4/6)
Layer III 50-200 cmbs; disturbed sand (10YR4/4)

DESCRIPTION: Trench 1 was excavated in the location of a previous auger test core; this core, placed in the western portion of the project area, had encountered stone 140 cm below surface. The trench was placed approximately 4.0 m from the eroded face of a drainage gully. All soil zones in the trench were found to have been previously disturbed, possibly during tree removal activities. A well-defined layer of stones was encountered, beginning at 70 cm below surface and continuing to 180 cm below surface. The stones were concentrated in the eastern half of the trench; they were of various sizes and some were broken. The excavation was expanded to 2.0 m N-S by 4.0 m E-W in order to determine the size of the rock concentration. This expansion did not ascertain the limits of the stones; it did, however, permit thorough examination of the stone matrix. The examination indicated the matrix was disturbed and apparently consisted of material that had been dumped along the banks of the drainage gully. Modern rubbish was mixed throughout Layers I and II, and all layers were very loose. All walls collapsed before soil stratigraphy could be recorded. No human skeletal material or burial pit features were encountered.

TRENCH NO: 2
LOCATION: 585N/770E
STRATIGRAPHY:
Layer I 0-40/60 cm; root mat and modern disturbance
Layer II 40/60-70 cm; loose loamy sand (10YR6/4)
Layer III 70-80 cm; silty loam band (7.5YR4/4)
Layer IV 80-180 cm; loose sterile sand (10YR6/4)
Layer V 180-200 cm; lithified sand

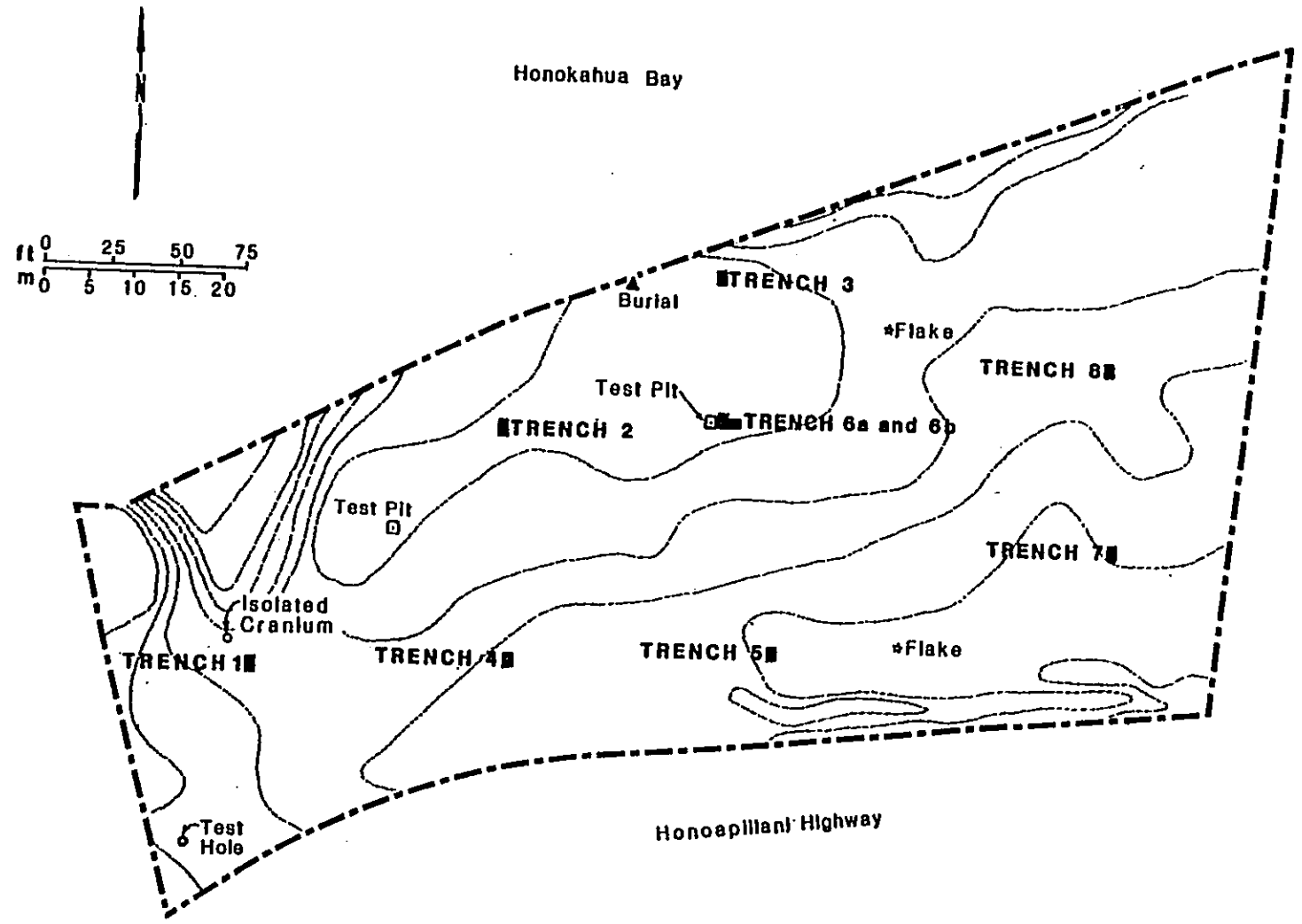

FIGURE 1. Project Area Map Showing Subsurface Testing Locations

DESCRIPTION: Trench 2 was excavated in the location of a prior auger test; this test had located stone at 140 cm below surface. The trench was placed in a relatively level area approximately 12.0 m south of the Conservation Setback. The upper 40 to 60 cm of soil was disturbed and contained modern rubbish, charcoal flecks, faunal material, one Cellana sp. shell, and loose stones. Three stones were encountered at depths of 20-30 cm, 30-55 cm, and 40-60 cm below surface. A fourth stone was encountered below the disturbed layer, at 50-90 cm below surface. No human skeletal material or other cultural features were encountered in association with the stones. The excavation was terminated at hard, lithified sand.

TRENCH NO: 3
LOCATION: 600N/795E
STRATIGRAPHY: Layer I 0-140 cm; banded loamy sand (10YR6/4, 4/4)
Layer II 140-185 cm; sandy loam (10YR3/3)
Layer III 185-250 cm; sterile sand (10YR6/4)

DESCRIPTION: Trench 3 was excavated in the location of at a prior auger test; this test had located stone 140 cm below surface. The trench was placed 5.0 m south of the Conservation Setback, in a cleared grassy area currently used by beachgoers. An in situ burial identified during the earlier project (Ferguson et al. 1989:25) had been located approximately 10.0 m west of this trench. The soil stratigraphy in the trench appeared to be undisturbed; no modern rubbish or other historic materials were encountered (Figure 2a). A single stone (50 by 35 cm surface area) was encountered in the trench at 150-158 cm below surface within sandy loam (Layer II). This stone probably was the one encountered during the auger testing. Layer II in the trench may represent a cultural deposit; it was found to contain waterworn pebbles and scattered charcoal flecks as well as concentrations of charcoal, marine shell (P. labiosa, N. picea, Isognomon sp.), and minute pieces of skeletal material (too small to determine if human). A charcoal sample was collected from the base of Layer II. No burial pits or identifiable human bone were observed in the trench.

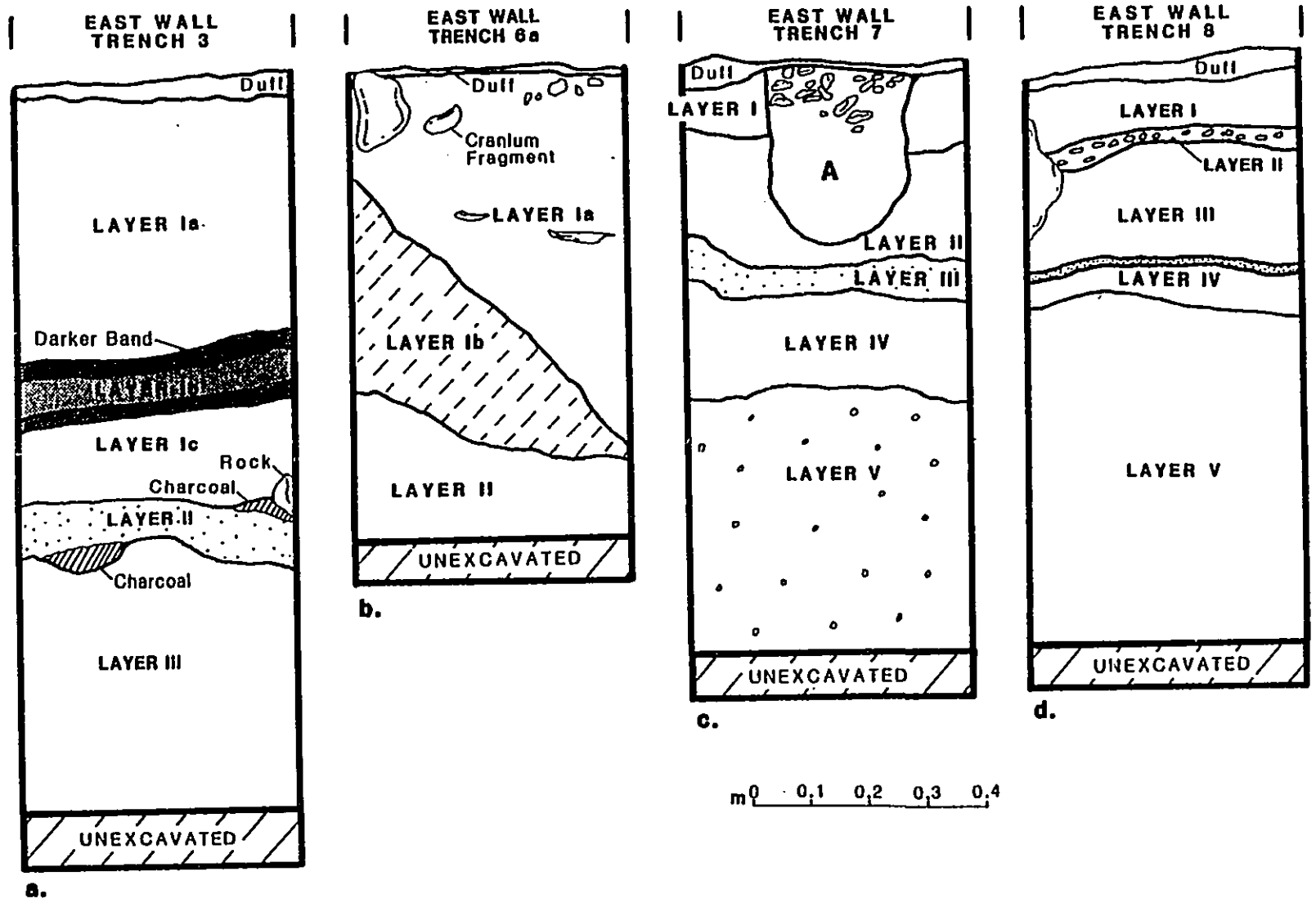

FIGURE 2. Representative Backhoe Trench Sections

TRENCH NO: 4
LOCATION: 560N/770E
STRATIGRAPHY: Layer I 0-45 cm; disturbed sandy loam (10YR4/4)
Layer II 45-140 cm; fine, loose sand (10YR6/6)
Layer III 140-180 cm; lithified sand

DESCRIPTION: Trench 4 was excavated in order to determine if a buried cultural deposit was present in the southern portion of the project area. It was placed near the center of Area III, 10.0 m north of Honoapiilani Highway. The upper 45 cm of soil in the trench was disturbed and contained glass fragments and small stones. Beneath this, the soil appeared to be undisturbed and exhibited no evidence of cultural deposits. The trench was terminated at hard, lithified sand 180 cm below surface.

TRENCH NO: 5
LOCATION: 560N/800E
STRATIGRAPHY: Layer I 0-60/110 cm; disturbed loamy sand (10YR4/4)
Layer II 60/110-200 cm; loose, fine sand (10YR6/4)

DESCRIPTION: Trench 5 was excavated in order to determine if buried cultural deposits were present in the area. It was placed 30.0 m east of Trench 4, and 5.0 m north of a drainage ditch paralleling Honoapiilani Highway. The upper, disturbed layer of the trench contained a large amount of modern debris such as aluminum cans, plastic items, and glass bottles. The layer appeared to have been pushed by a bulldozer. Below the upper layer was a layer of sterile sand.

TRENCH NO: 6A
LOCATION: 585N/765E
STRATIGRAPHY: Layer I 0-140 cm; disturbed sandy loam (10YR3/2)
Layer II 140-160 cm; loamy sand (10YR4/6)

DESCRIPTION: Trench 6A was excavated in order to determine if buried cultural deposits were present in the area. Trench 6A was oriented N-S and was placed 25.0 m north of Trench 5. The entire upper 140 cm of the trench consisted of disturbed fill; modern debris was observed to a depth of 100 cm. The area of the trench appeared to have been affected by tree removal excavation. A loose rock was observed in the trench at 0-28 cm below surface. In addition, a human cranial fragment was observed at 14 to 24 cm below surface (Figure 2b). This fragment was within a disturbed fill matrix. No cultural or skeletal material was observed in the undisturbed sterile layer.

TRENCH NO: 6B
LOCATION: 585N/765E
STRATIGRAPHY: Layer I 0-140 cm; disturbed sandy loam (10YR3/2)
Layer II 140-200 cm; semi-concreted sterile sand (19YR4/6)

DESCRIPTION: Trench 6B was excavated at the south end of Trench 6A and was oriented E-W. Trench 6B was excavated in order to determine if the source of human cranial fragments in 6A could be ascertained, and to better determine the nature of the disturbance in the area. The upper layer of the trench exhibited the same extensive disturbance and modern trash as in Trench 6A; in addition, human skeletal fragments were observed scattered within it. Layer II consisted of semi-concreted sterile sand which contained no skeletal material or other cultural remains.

TRENCH NO: 7
LOCATION: 570N/839E
STRATIGRAPHY: Layer I 0-30 cm; sandy loam (10YR4/4)
Layer II 30-70 cm; fine sand (10YR4/6)
Layer III 70-82 cm; slightly darker fine sand (10YR4/4)
Layer IV 82-114 cm; fine sand (10YR4/6)
Layer V 114-200 cm; semi-compacted sand with concretions
Fea. A 0-62 cm; mixed sand/loam fill

DESCRIPTION: Trench 7 was excavated in order to determine if buried cultural deposits were present in the area. It was placed at the eastern end of Area III, 40.0 m east of Trench 5 and 20.0 m north of Honoapiilani Highway. The stratigraphy in the trench appeared to be undisturbed, except where a recent fire pit had been excavated. The pit (Feature A) was present in the east wall of the trench and was recorded on the profiled section (Figure 2c). The pit contained charcoal, two marine shells (N. picea and Cellana sp.), two broken (unburned) bird bones, and several pieces of soft brick-like clay. A charcoal sample from the pit was collected. The pit had been excavated from the present ground surface and appeared to be of recent origin. However, no historic or modern debris was observed in the pit fill. All sand layers observed contained no cultural material.

TRENCH NO: 8
LOCATION: 589N/840E
STRATIGRAPHY:
Layer I 0-30 cm; sandy loam (10YR6/4)
Layer II 30-40 cm; sandy silt with inclusions (10YR4/4)
Layer III 40-70 cm; semi-compacted sand (10YR4/6)
Layer IV 70-95 cm; banded loamy sand (10YR4/4-4/6)
Layer V 95-200 cm; semi-compacted sand (10YR4/6)

DESCRIPTION: Trench 8 was excavated in order to determine if buried cultural deposits were present in the area. It was placed at the eastern end of the lot, 20.0 m north of Trench 7. The soil strata in the trench indicate no prior disturbance in the area (Figure 2d). Likewise, no evidence of a cultural deposit was observed. Layer II contained small scattered pieces of rock and weathered shell and pieces of coral. This layer may represent the remnants of an alluvial or storm deposit.

CONCLUSION

During the earlier auger core testing of Area III, subsurface stones were encountered in several cores, and it was thought that these stones possibly represented burial capstones under which were in situ burials (Ferguson et al. 1989:26). The present limited subsurface testing has indicated that this is not the case--no capstones or in situ burials were encountered. Human skeletal fragments, however, were observed in a secondary fill zone (0 to 140 cm below surface) within Trenches 6A and 6B. Also, small unidentifiable skeletal fragments were observed in Trench 3 at 150 cm below surface.

In addition to the bone fragments, what appears to be a cultural layer was observed in Trench 3 at 140-185 cm below surface. Material observed in this layer included charcoal concentrations, shell midden, waterworn pebbles, and bone fragments. A sample from a charcoal concentration at the base of the layer was collected in the event that dating would be necessary. There was insufficient evidence to determine whether the deposit was primary or secondary (i.e., brought in with alluvial wash).

It should be noted that during the excavation of Trench 1 a complete human cranium was observed 8.0 meters west of the trench, within tree roots, on the upper slope of the drainage gully in the area. The cranium was totally exposed and appeared to have washed out from a location upslope. The cranium was visually examined and was found to be in good condition, indicating that it had only recently been exposed. The area around the cranium was examined; no additional bones could be located. The location of the cranium was flagged, and the cranium was left in place and covered with sand.

Subsequent to the backhoe trenching, PHRI conducted monitoring of two test pits and one 4" test hole excavated within Area III (Figure 1). The pits and the hole were excavated in conjunction with soils exploration work for the proposed Ritz-Carlton Hotel. The monitoring was conducted by PHRI Osteologist Pat Kalima on July 7, 1989 (test hole) and July 12, 1989 (test pits). During excavation of the test hole, no bone fragments were encountered. A small end loader was used to dig the test pits. The pits were dug to approximately six feet; sand from the pits was checked for bone fragments, and the pit walls were checked for burial pit outlines. No bone fragments or burial pits were encountered.

The above generally negative testing results are in conformance with the findings of the earlier auger core testing program in Area III; that earlier program had concluded that the area "does not evidence any extension of the large prehistoric burial site (cemetery) present in the original hotel site, though it is thought likely--since Area III is a beach front sand dune--that there would be a few burials randomly scattered within [the area]" (Ferguson et al. 1989:28). Based on the present results, no further archaeological subsurface testing is recommended for Area III. The area should, however, continue to be monitored during initial grading and other excavation work.

The evaluations and recommendation presented within this report have been based on limited subsurface testing of the project area. There is always the possibility, however remote, that potentially significant, unidentified subsurface cultural remains will be encountered in the course of future archaeological investigations or subsequent development activities. In such situations, archaeological consultation should be sought immediately.

REFERENCE CITED

Ferguson, L., A. Carlson, B. Burgett, and P.H. Rosendahl

1989 Subsurface Archaeological Testing, Revised Ritz-Carlton Kapalua Hotel Project Site, Areas I, II, and III, Land of Honokahua, Lahaina District, Island of Maui. PHRI Report 246-060189. Prepared for Kapalua Land Company, Ltd.

APPENDIX E

Traffic Study
Ritz-Carlton Hotel
Kapalua, Maui

APPENDIX E

Traffic Study
Ritz-Carlton Hotel
Kapalua, Maui

RITZ-CARLTON HOTEL

KAPALUA, MAUI

TRAFFIC STUDY

Prepared for

Maui Land & Pineapple Company

and

Belt Collins & Associates

Prepared by

Wilbur Smith Associates

September 26, 1989

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ILLUSTRATIONS

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INTRODUCTION

The Ritz-Carlton Hotel Company proposes to develop a 550-room luxury hotel in Kapalua, Maui. The site location, shown in Figure 1, would have access solely from Office Road. The segment of Lower Honoapiilani Highway between D.T. Fleming Park and Office Road would be closed. As part of the Ritz-Carlton Hotel project, Village Road access to Lower Honoapiilani Road would also be eliminated.

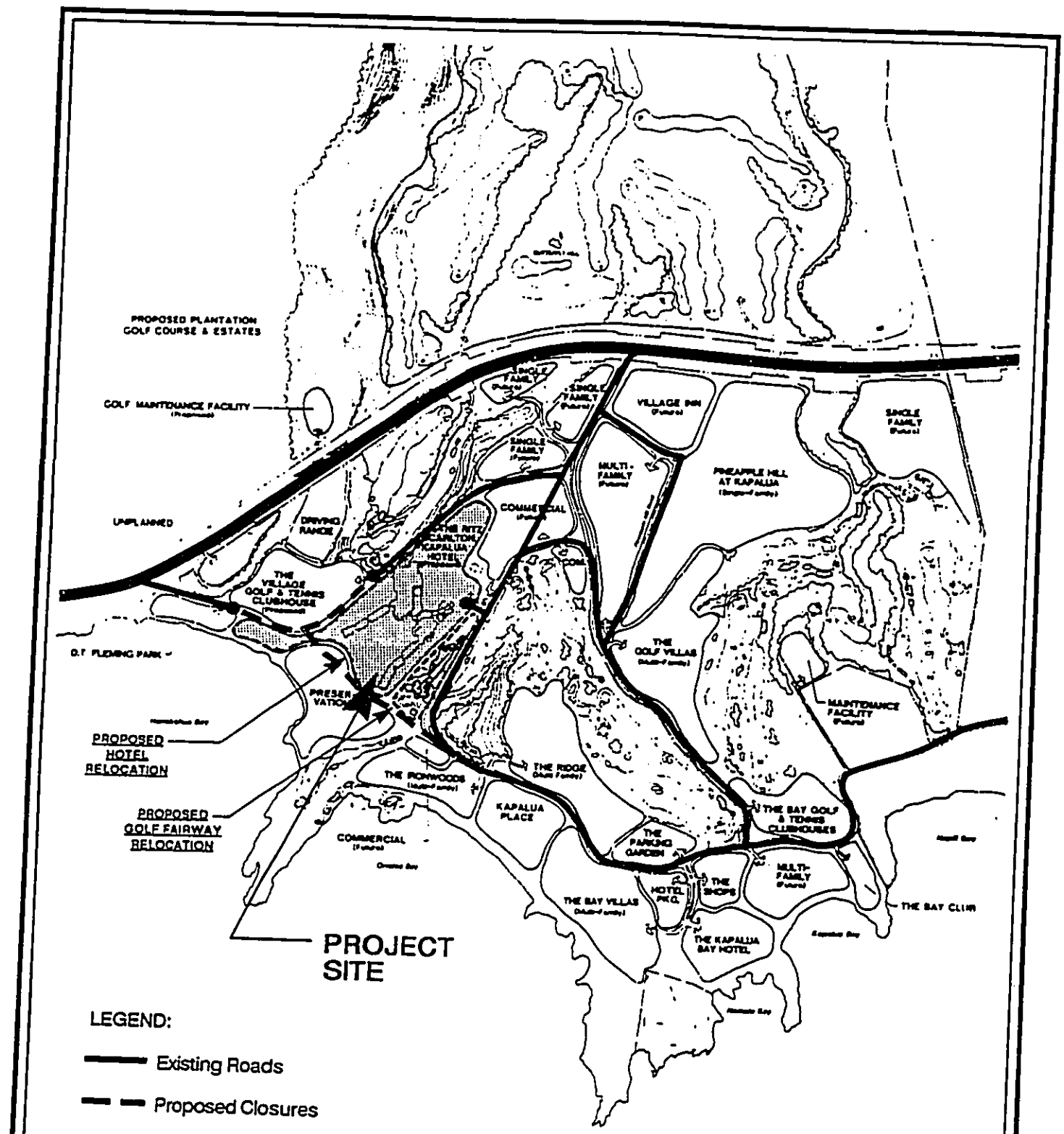
The Kapalua Master Plan Circulation Element proposes to de-emphasize Office Road and to emphasize Kapalua Drive, as shown in Figure 2. Office Road would be realigned to "T" into the Kapalua Drive extension. Therefore, access to the Ritz-Carlton Hotel from the Honoapiilani Highway initially will directly off of Office Road (Figure 1), but it is ultimately planned to be provided indirectly via Kapalua Drive and Office Road.

Study Background

When the Ritz-Carlton Hotel project was first proposed several years ago, concerns were raised about the adequacy of traffic capacity along the Honoapiilani Highway at the following key intersections:

- Kaanapali Parkway;
- Front Street/Fleming Road;
- Kapunakea Street;
- Papalaua Road; and
- Lahainaluna Road.

During the past several years the Hawaii Department of Transportation has been widening the Honoapiilani Highway between Lahainaluna Road and the Kaanapali Parkway to increase corridor capacity and address present congestion problems. The widening improvement is scheduled for completion by October 1989. The DOT has recently announced



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PROPOSED PROJECT
Ritz Carlton Hotel, Kapalua, Maui

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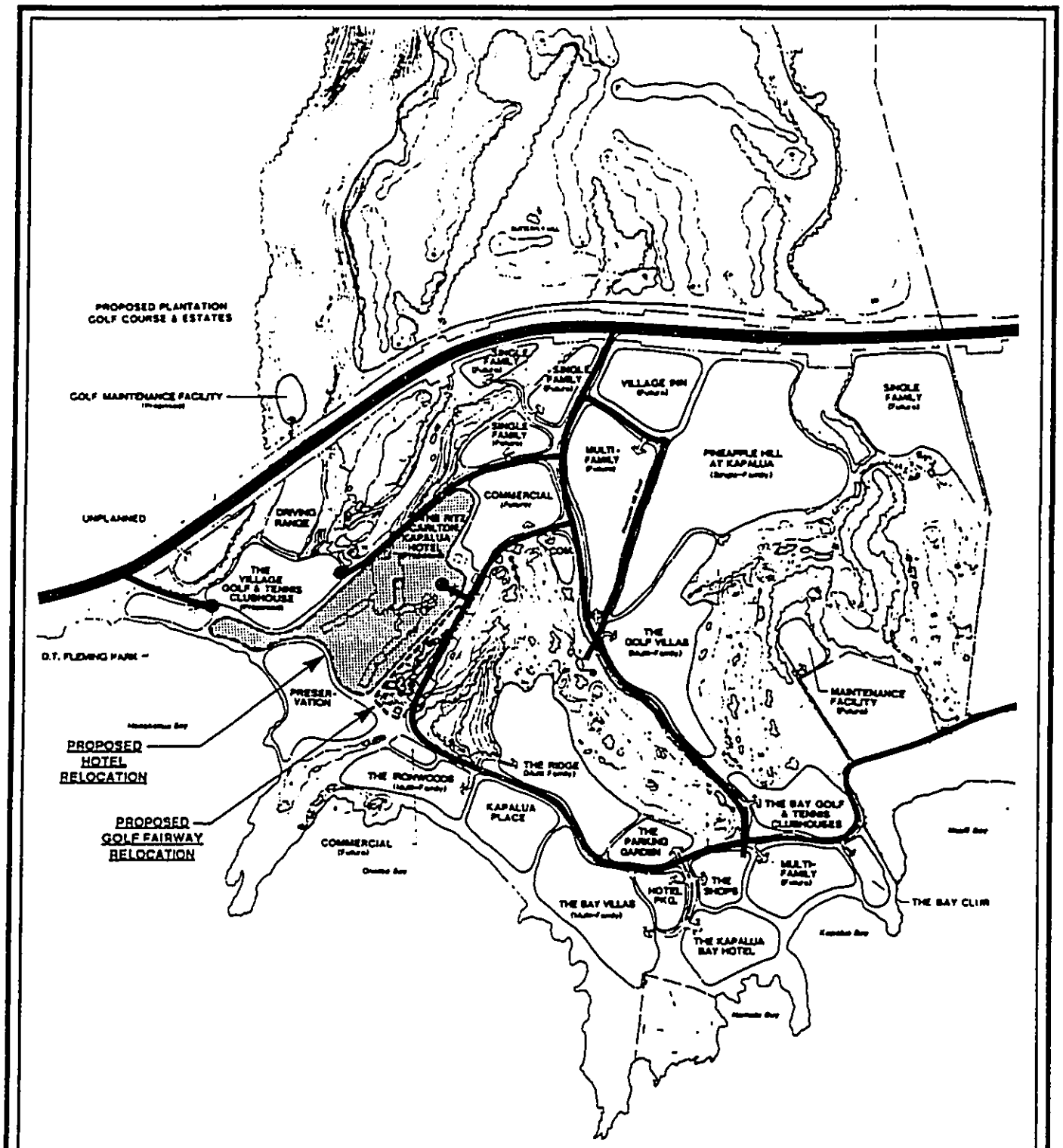


WSA	KAPALUA MASTER PLAN Ritz Carlton Hotel, Kapalua, Maui	2

the *preferred alternative* for a Lahaina Bypass, which would further increase corridor traffic capacity when the freeway is completed to the Lahaina-Kaanapali area.

Purpose and Scope

The purpose of this traffic report is to update the original project traffic study reflecting the revised description of the Ritz-Carlton Hotel project and the recent improvements to the Honoapiilani Highway. The analysis addresses traffic conditions at the five key intersections listed previously and at the Office Road-Honoapiilani Highway intersection, which provides a regional access to the project site. Traffic conditions for the morning and evening peak traffic hours were assessed.

EXISTING SETTING AND FORECAST 1994 SETTING WITHOUT THE RITZ-CARLTON HOTEL PROJECT

The Honoapiilani Highway is the principal roadway serving West Maui and, therefore, would be the principal roadway providing regional access to the Ritz-Carlton Hotel. The Honoapiilani Highway (Route 30) links Kapalua to other West Maui communities (Figure 3) and provides access to Kahului and major destinations on other portions of Maui.

Existing Setting

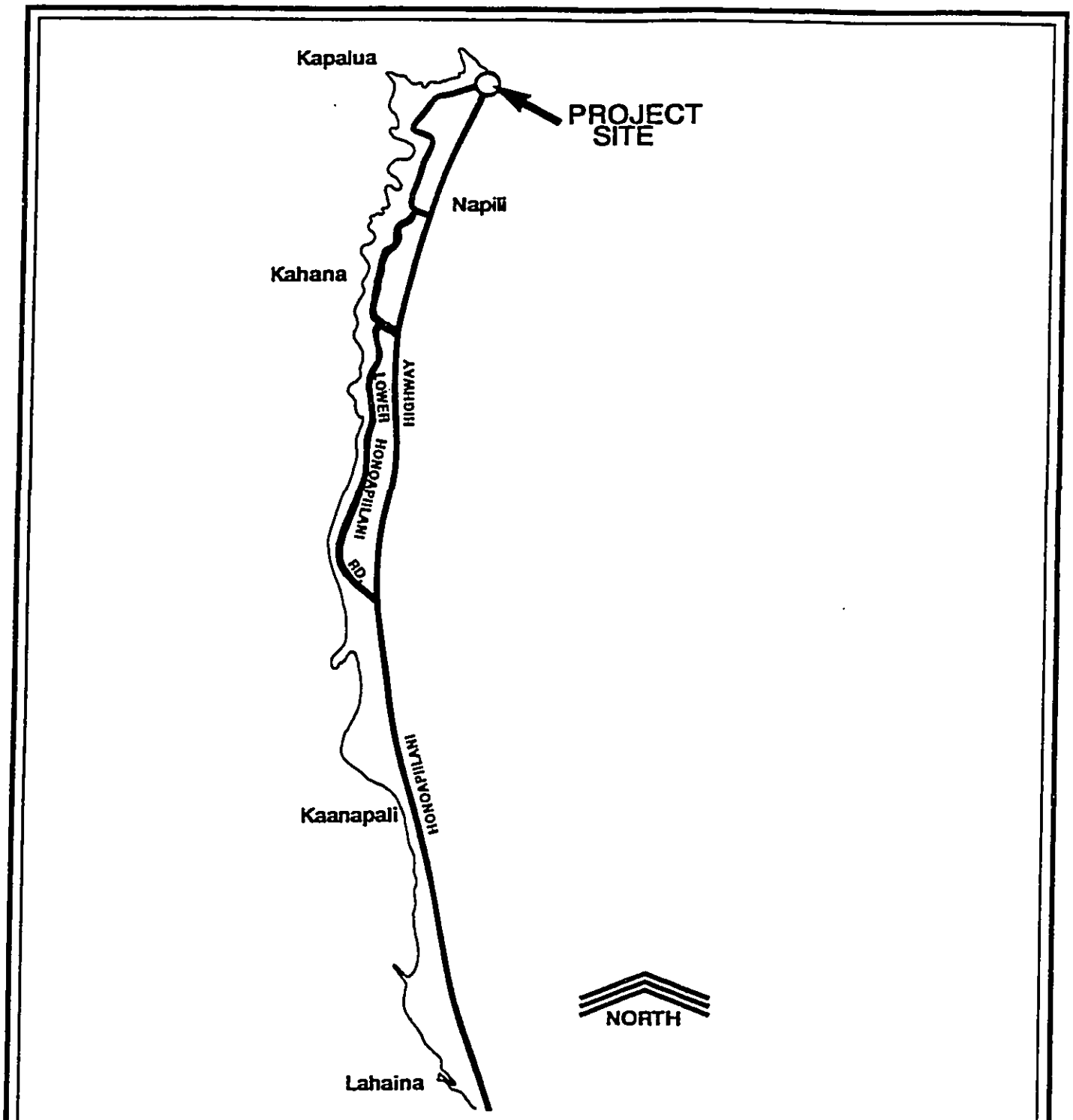
Traffic conditions along the Honoapiilani Highway are generally congested during peak traffic hours in Lahaina and are also poor northward to Kaanapali Parkway.

Roadway Resources - At present, the Honoapiilani Highway is a two-lane high speed roadway south of Lahainaluna Road. North of Lahainaluna Road to Kaanapali Parkway, the cross section widens to provide two southbound lanes, a single northbound lane and a fourth lane for intersection left-turn approach lanes. Between Kaanapali Parkway and Kapalua (Office Road), the Honoapiilani Highway is primarily a two-lane highway with left-turn lanes at major intersections.

Five of the six Honoapiilani Highway intersections analyzed in this study are signalized. The Office Road intersection has STOP sign controls on the Office Road approaches to the Highway. Figure 4 schematically describes the approach lanes for each study intersection.

Within Kapalua, principal roads include:

- Office Road;
- Lower Honoapiilani Road;
- Kapalua Drive; and
- Village Road.



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HONOAPIILANI HIGHWAY CORRIDOR
Ritz Carlton Hotel, Kapalua, Maui

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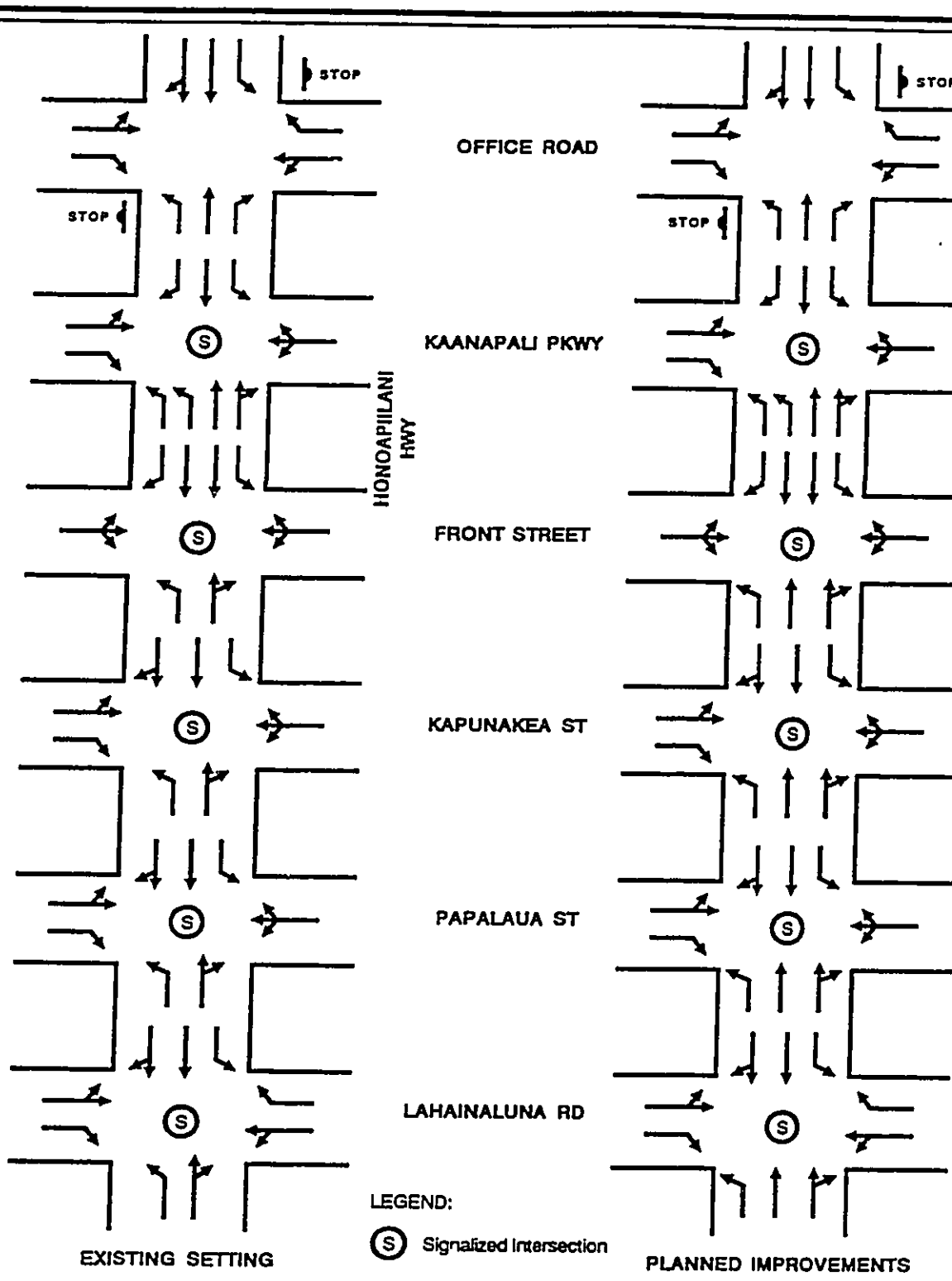

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EXISTING AND PLANNED INTERSECTION GEOMETRICS AND CONTROLS

Ritz Carlton Hotel, Kapalua, Maui

4

Lower Honoapiilani Road is a narrow two-lane road near D.T. Fleming Park and the proposed Ritz-Carlton Hotel site. South of the of the project site, Lower Honoapiilani Road has been upgraded to a modern two-lane collector road cross-section.

Office Road is an 18-foot wide roadway. No turn pockets are provided along Office Road or sidestreet approaches to Office Road except for the Honoapiilani Highway intersection.

Kapalua Drive between Pineapple Hill Road and Lower Honoapiilani Road has been upgraded to resort standards.

Existing Traffic Volumes - With the exception of the Honoapiilani Highway, traffic volumes are presently low. A review of State DOT traffic counts conducted in April 1989 indicates that average daily traffic (ADT) volumes on the Honoapiilani Highway are 25,000 vehicles per day (VPD) between Napili and Kaanapali Parkway, about 35,000 VPD between Kaanapali and Lahaina and 30,000 VPD through Lahaina. This compares to an estimated 2,000 VPD for Office Road in Kapalua.

Analysis of 15 minute interval variations in traffic volumes along Honoapiilani Highway indicates that the peak traffic hours occur from 7:30 AM to 8:30 AM and from 4:00 PM to 5:00 PM as shown in Figure 5. Estimates of 1989 turning movements at the six study intersections were developed using the State DOT's 1989 intersection approach counts, the 1987 turning movement counts reported in the Draft Environmental Impact Statement[1] for the Honoapiilani Highway, and sampled turning movement validation counts.

Intersection Capacity Analysis - The capacity utilization of the six study intersections was evaluated using the Planning Level Analysis methodology which was described in the *1985 Highway Capacity Manual.* This methodology is best suited to analysis of planning level traffic forecasts. In general, the methodology compares the amount of critical conflict turning movements at an intersection (i.e. through movement and its opposing left-turn movement) to

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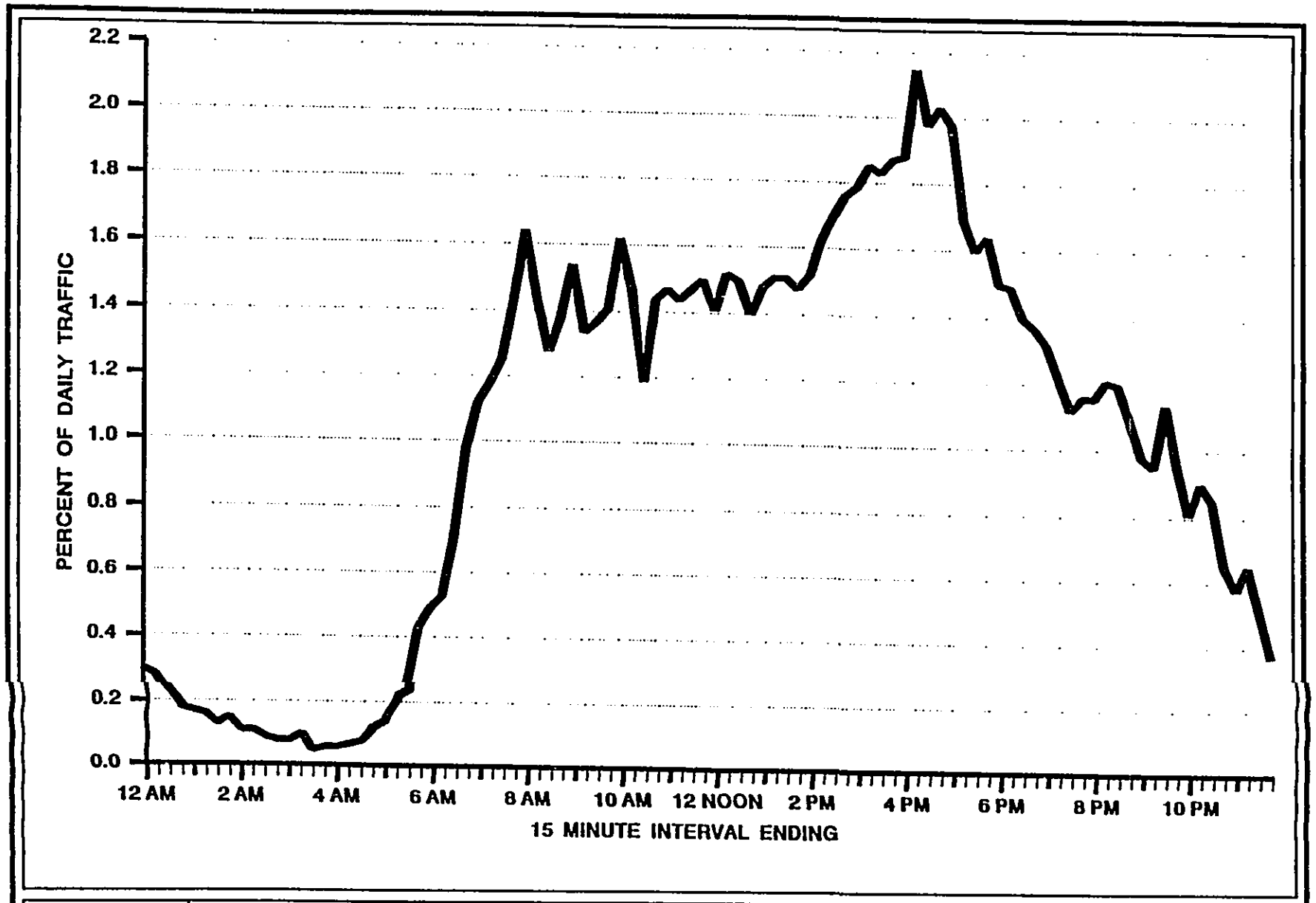
1 *Draft Environmental Impact Statement - Honoapiilani Highway (FAP Route 30) Puamana to Honokowai, Appendix J.*



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TRAFFIC VOLUME PEAKING CHARACTERISTICS
(Honoapiilani Highway at Kaanapali Parkway)
Ritz Carlton Hotel, Kapalua, Maui

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an empirically defined capacity for the intersection. Analysis results are presented in terms of volume-to-capacity (V/C) ratios. Figure 6 provides a qualitative translation of traffic conditions for ranges of volume/capacity ratios.

Analysis of existing traffic conditions indicates that the Front Street/Fleming Street intersection operates at capacity during the morning and afternoon peak hours and the Kaanapali Parkway intersection operates at capacity during the afternoon peak hour. Several other intersections operate at more than 90 percent of their estimated capacities as shown in Table 1. Congestion at one intersection often affects adjacent intersections within Lahaina.

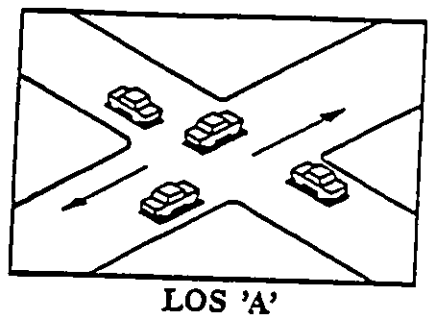
Observation of peak period traffic operations found that the Office Road intersection presently functions extremely well, almost at "free flow" conditions. High volumes of vehicles are accommodated at the Kaanapali Parkway intersection, but generally the vehicles clear the intersection within a single traffic signal cycle. The southbound lane on Honoapiilani Highway, however, does not always clear. The free right-turn from Kaanapali Parkway also appears to yield rather than merge with southbound Honcapiilani Highway traffic. Within Lahaina on the Honoapiilani Highway the principal observed problem was the inadequate capacity of the single northbound through lane.

Forecast 1994 Traffic Conditions Without the Ritz-Carlton Hotel

1994 traffic conditions are forecast to differ from existing conditions due to continued increases in traffic volumes and due to the completion of the Honoapiilani Highway widening project. For the purposes of the Ritz-Carlton Hotel Traffic Analysis, the completion of the Lahaina Bypass is not assumed by 1994. Reportedly, the Lahaina Bypass construction could begin in 1991 if it is soon approved. If constructed by 1994, the bypass would improve the forecast conditions described in this report section.

Roadway Resources - As depicted in Figure 4, the Honoapiilani Highway widening project which is scheduled for completion in the Fall of 1989 would add a second northbound lane to the segment through Lahaina. This widening project would substantially increase traffic

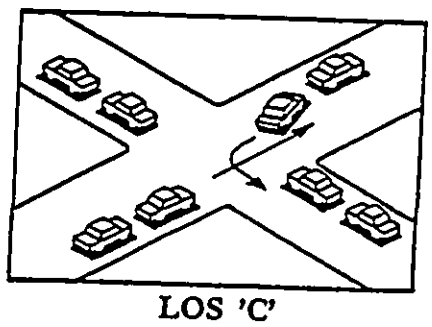
LEVEL OF SERVICE "A" - V/C = 0 TO 0.60
Describes operations with very low delay, i.e., less than 5 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all.



LOS 'A'

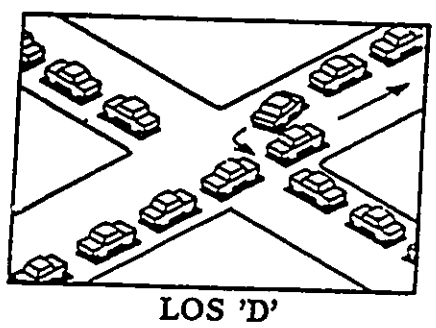
LEVEL OF SERVICE "B" - V/C = 0.61 TO 0.70
Describes operations with delays in the range of 5 to 15 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS "A", causing higher levels of average delay.

LEVEL OF SERVICE "C" - V/C = 0.71 TO 0.80
Describes operation with delay in the range of 15 to 25 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Occasionally vehicles may wait more than one red signal phase. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.



LOS 'C'

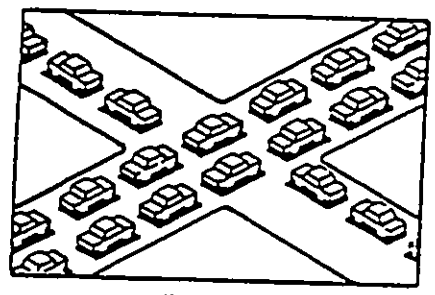
LEVEL OF SERVICE "D" - V/C = 0.81 TO 0.90
Describes operations with delay in the range of 25 to 40 seconds per vehicle. At LOS "D", the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Noticeable numbers of vehicles fail to clear signal during the first green phase.



LOS 'D'

LEVEL OF SERVICE "E" - V/C = 0.91 TO 1.00
Describes operations with delay in the range of 40 to 60 seconds per vehicle. These high delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Vehicles frequently fail to clear the signal during the first green phase.

LEVEL OF SERVICE "F" - V/C GREATER THAN 1.00
Describes operations with delay in excess of 60 seconds per vehicle. 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 motorists failing to clear the signal during the first green signal phase.



LOS 'F'

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LEVEL OF SERVICE DIAGRAM
Ritz Carlton Hotel, Kapalua, Maui

Table 1

EXISTING AND 1994 TRAFFIC CONDITIONS WITHOUT RITZ CARLTON HOTEL
Ritz-Carlton Kapalua Hotel Traffic

HONOAPIILANI HIGHWAY INTERSECTION	VOLUME TO CAPACITY RATIOS			
	EXISTING CONDITIONS[2]		1994 NO PROJECT[3]	
	AM PEAK HOUR	PM PEAK HOUR	AM PEAK HOUR	PM PEAK HOUR
Office Road[1]	0.08	0.11	0.11	0.16
Kaanapali Parkway	0.85	1.02	0.90	1.07
Front Street/ Fleming Street	1.06	1.08	0.72	0.77
Kapunakea Street	0.94	0.93	0.58	0.71
Papalaua Street	0.79	0.80	0.52	0.73
Lahainaluna Road	0.91	0.90	0.70	0.75

1 For analysis purposes Office Road intersection was treated as a signalized intersection. Volumes are very low and it would not meet special warrants.

2 Existing conditions.

3 1994 traffic conditions with completion of ongoing Honoapiilani Highway widening project.

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capacity and, therefore, improve traffic operations. Positive results already have been observed from this widening project.

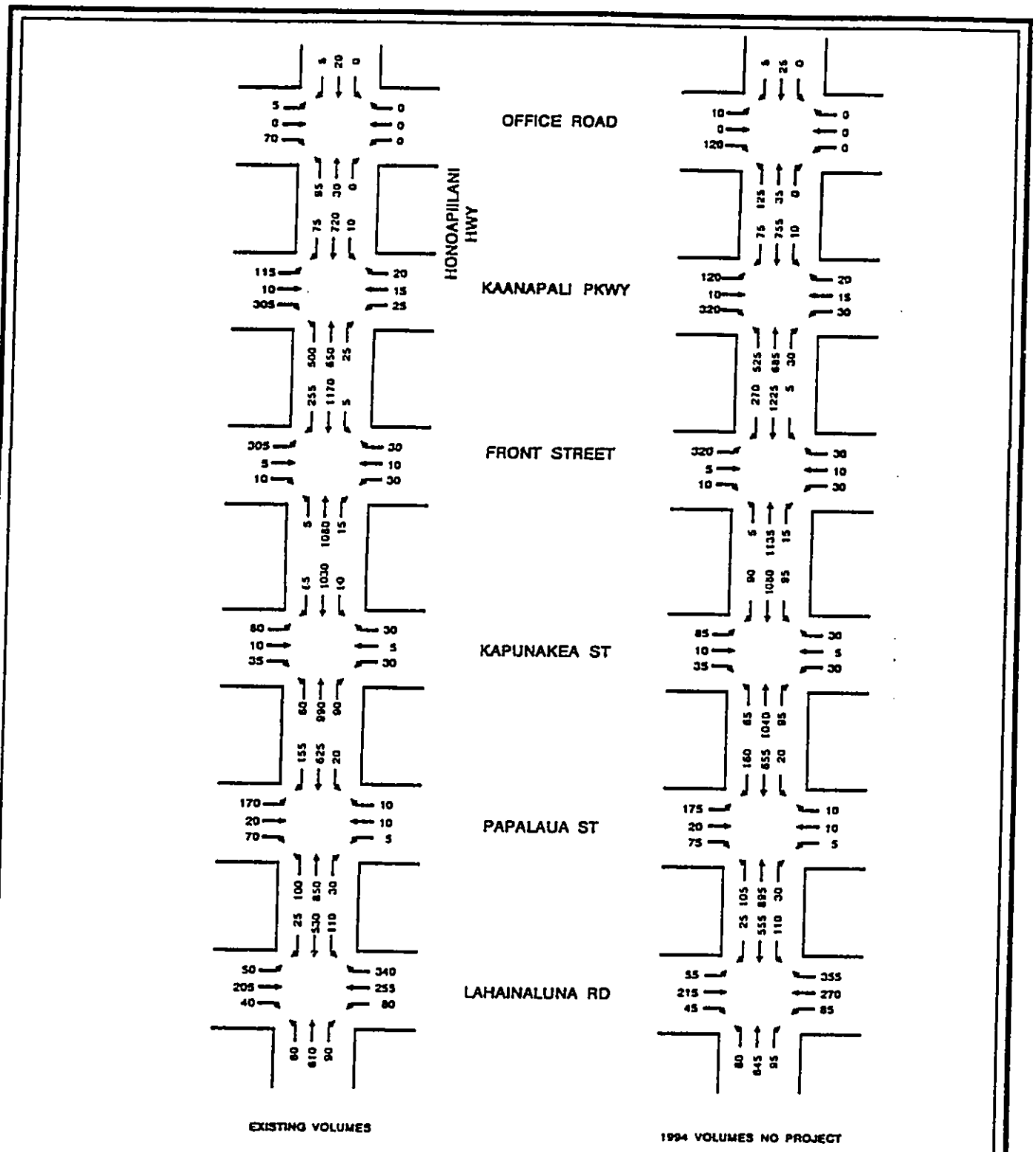
Traffic Volumes - The Draft Environmental Impact Statement for the Honoapiilani Highway Bypass project identified a 50 percent forecast traffic increase for the Honoapiilani Highway between 1987 and 1997 which is about a five percent annual increase (four percent increase if compounded). This forecast increase assumes normal development growth in the West Maui corridor.

Discussions with the County identified only one major development approved within the corridor. The Kahana Gateway project is an 85,000 gross square foot multi-use project including professional offices, retail, highway commercial and commercial recreation uses. Its location is about two miles from the Office Road intersection and about three miles from the Kaanapali Parkway intersection. A substantial portion of the highway commercial generated traffic would be "passby" traffic already traveling on the Honoapiilani Highway. Aside from the Ritz-Carlton project, two other developments in Kapalua were assumed, a 100 unit single family residential development at Pineapple Hill and a nine unit single family residential development at Kapalua Place.

The 1,994 peak hour turning movements were developed for this Ritz-Carlton Hotel Traffic Study by first factoring the 1989 volumes (Figures 7 and 8) by 1.25 to reflect the growth rate identified by the State DOT. In addition, the Kaanapali Parkway intersection traffic volumes were increased by another five percent to reflect traffic increases expected from the Kahana Gateway and Kapalua developments. Figures 7 and 8 describe the resultant 1994 traffic forecasts without Ritz-Carlton Hotel traffic.

Intersection Capacity Analysis

The ongoing widening project is forecast to more than offset forecast traffic conditions on the Honoapiilani Highway within the Lahaina area and result in improved traffic conditions. Table 1 describes these benefits, which would not extend to the Kaanapali Parkway



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EXISTING AND 1994 NO PROJECT
MORNING PEAK HOUR TRAFFIC VOLUMES

Ritz Carlton Hotel, Kapalua, Maui

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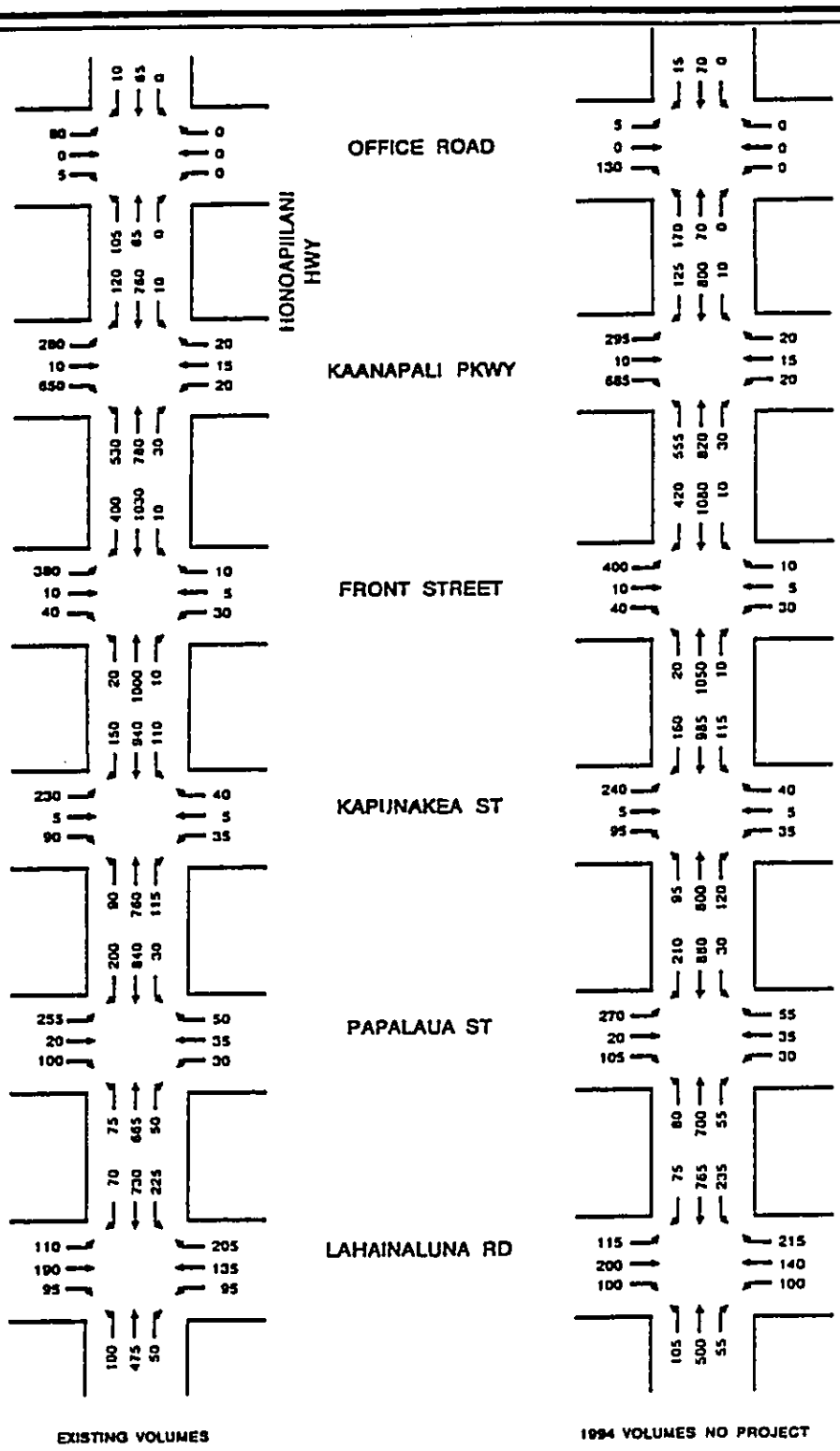

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EXISTING AND 1994 NO PROJECT
AFTERNOON PEAK HOUR TRAFFIC VOLUMES

Ritz Carlton Hotel, Kapalua, Maui

8

intersection. The Kaanapali Parkway intersection is forecast to operate at 90 percent of capacity during the morning peak traffic hour and to have insufficient capacity to serve the afternoon peak hour demand generated by the natural traffic growth of the region.

FORECAST 1994 TRAFFIC CONDITIONS
WITH RITZ-CARLTON HOTEL

The Ritz-Carlton Hotel project would affect West Maui traffic by adding traffic demand and, to a lesser extent, by modifying the circulation system in Kapalua.

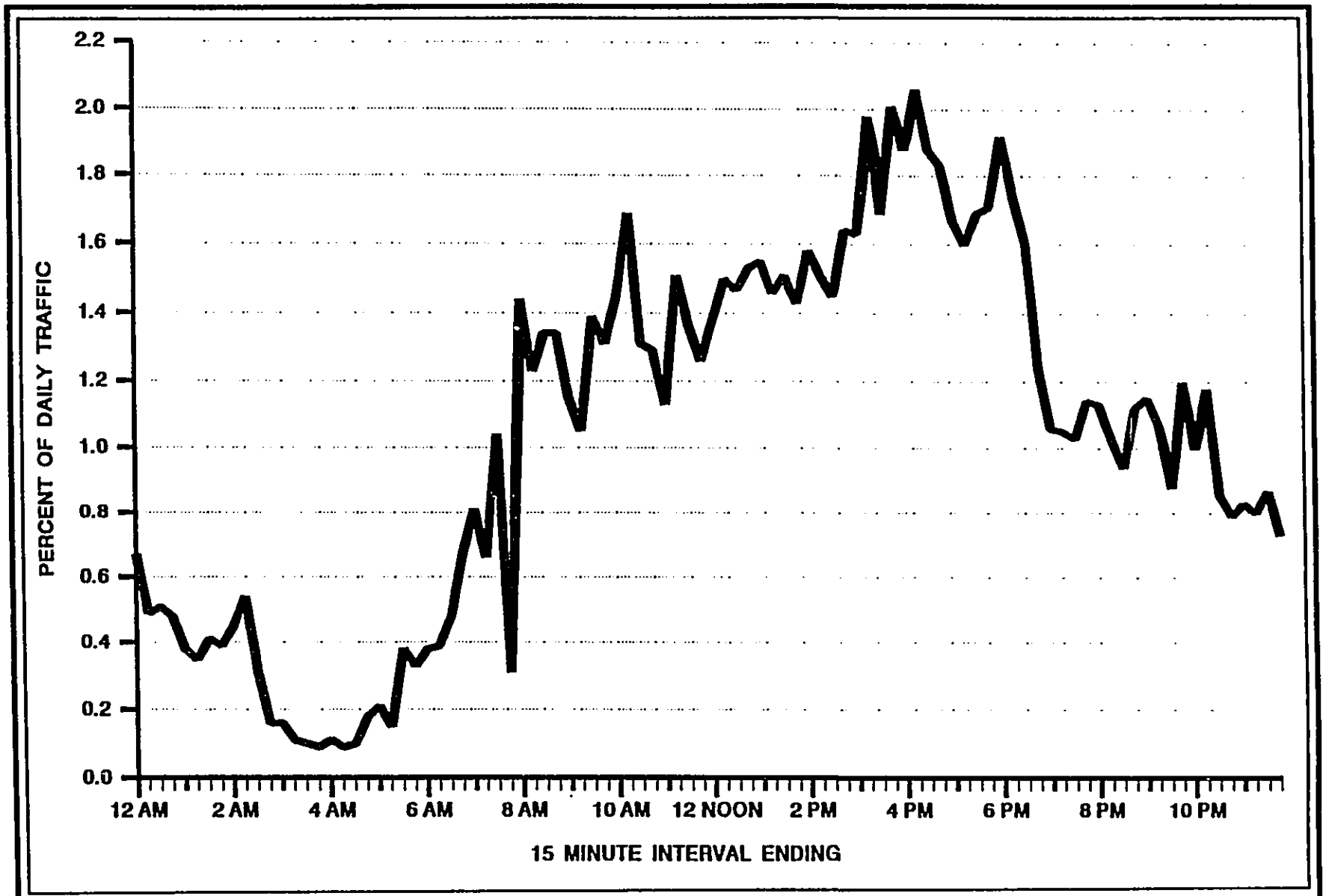
Ritz-Carlton Hotel Generated Traffic

A traffic generation survey was conducted in 1984 by Austin Tsutsumi & Associates for the Hyatt and Marriott hotels in Kaanapali. This survey indicated that these hotels generated an average of 5.7 vehicle trips daily per room. The morning peak hour was from 7:45 AM to 8:45 AM and the afternoon peak hour was from 3:30 PM to 4:30 PM as shown in Figure 9.

The amount of traffic generated by the Ritz-Carlton Hotel during its afternoon peak hour is virtually the same as the volume it is projected to generate during the Honoapiilani Highway peak traffic hour. Therefore, the 4:00 PM to 5:00 PM hotel traffic forecast was used for this impact analysis. The morning hotel peak hour generation, however, is twenty percent higher than the hotel traffic generation during the peak Honoapiilani Highway traffic hour. To be conservative, the traffic analysis assumed that the hotel peak hour traffic would occur during the peak traffic hour for the Honoapiilani Highway.

Table 2 describes the traffic generation rates and the associated Ritz-Carlton Hotel forecast traffic volumes. During the morning peak traffic hour, the 550-room Ritz-Carlton Hotel is forecast to generate 94 inbound and 72 outbound trips. Afternoon peak hour traffic generation is projected to be 121 inbound and 110 outbound vehicle trips.

These peak hour trips were distributed to the Honoapiilani Highway through a review of existing turning movements. Figures 10 and 11 describe the turning movements for the Ritz-Carlton Hotel traffic and the total 1994 traffic including the Ritz-Carlton traffic. This analysis



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TRAFFIC VOLUME PEAKING CHARACTERISTICS
(Hyatt and Mariott Hotels - Kaanapali)
Ritz Carlton Hotel, Kapalua, Maui

Table 2

RITZ-CARLTON HOTEL TRAFFIC GENERATION RATES
AND
FORECAST VOLUMES
Ritz-Carlton Kapalua Hotel Traffic

TIME PERIOD	GENERATION RATE TRIPS PER ROOM	RITZ-CARLTON VEHICLE TRIPS
DAILY	5.7	3,135
AM HIGHWAY PEAK HOUR[1]		
Inbound	0.15	83
Outbound	0.10	55
AM HOTEL PEAK HOUR[2] [3]		
Inbound	0.17	94
Outbound	0.13	72
PM HIGHWAY PEAK HOUR[3] [4]		
Inbound	0.22	121
Outbound	0.20	110
PM HOTEL PEAK HOUR[5]		
Inbound	0.23	127
Outbound	0.22	121

1 7:30 AM to 8:30 AM

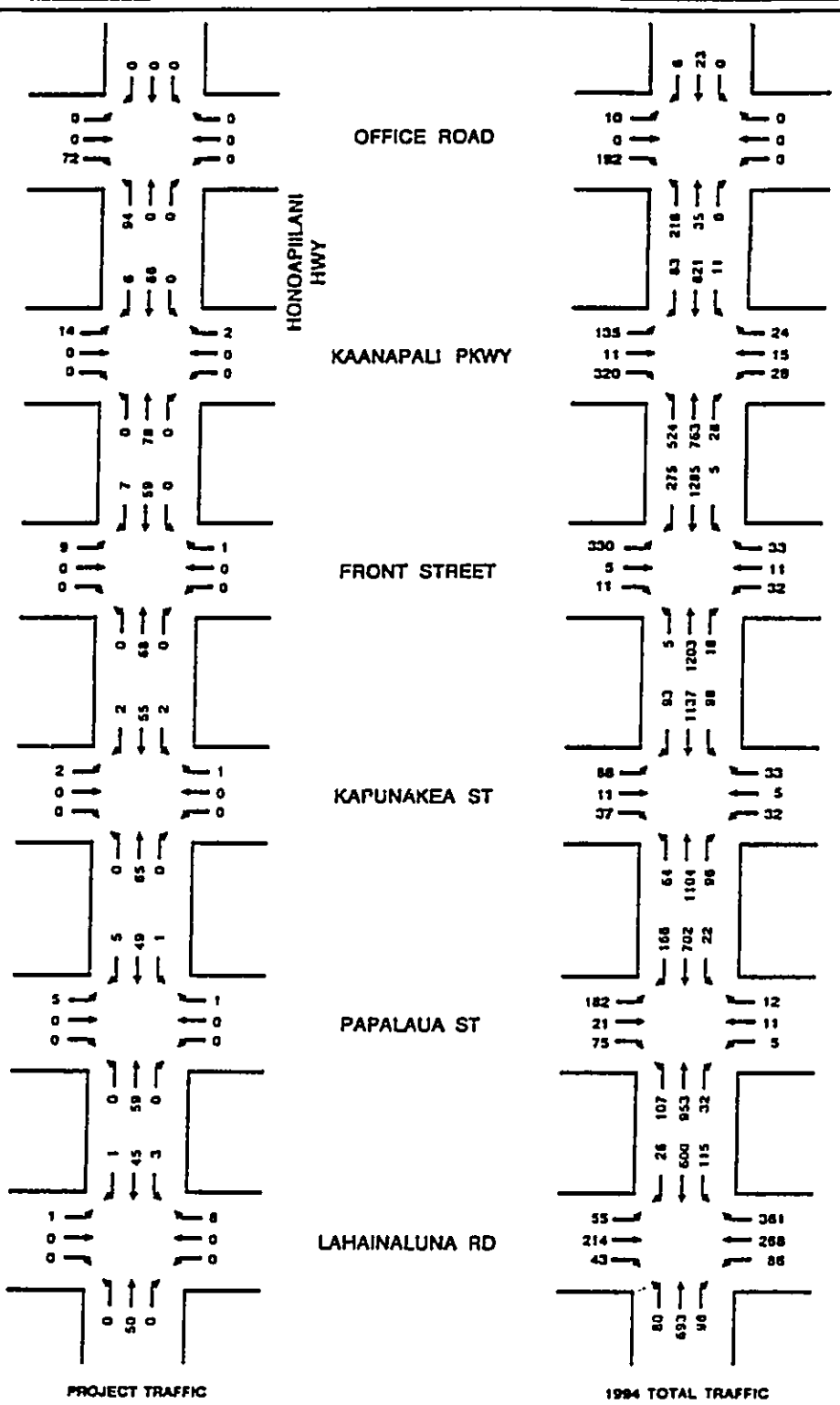
2 7:45 AM to 8:45 AM

3 The hotel peak hour traffic generation is projected to occur 15 minutes offset from the regional traffic peak hour. The hotel peak hour was selected as being the most critical traffic impact hour during the morning. In the afternoon, the hotel generated traffic during the regional highway peak hour is very nearly as high as during the peak hotel hour. For this reason the regional highway peak hour was selected as being the most critical traffic impact period.

4 4:00 PM to 5:00 PM

5 3:30 PM to 4:30 PM

T-02/217

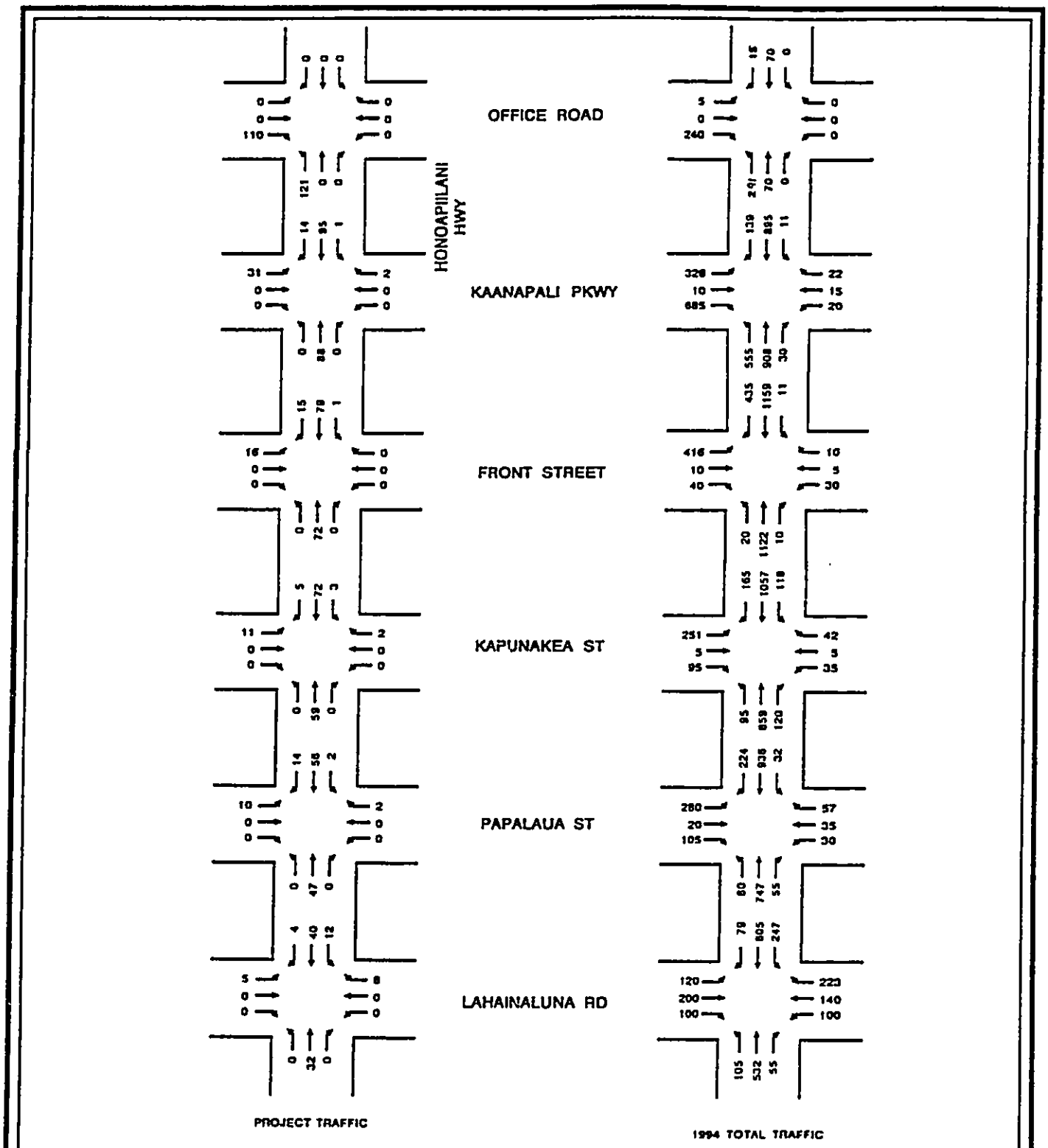


WSA

FORECAST RITZ CARLTON HOTEL
MORNING PEAK HOUR TRAFFIC VOLUMES

Ritz Carlton Hotel, Kapalua, Maui

10



WSA

FORECAST RITZ CARLTON HOTEL
AFTERNOON PEAK HOUR TRAFFIC VOLUMES

Ritz Carlton Hotel, Kapalua, Maui

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approach also assumes the worse-case conservative approach, in that it assumes that all Ritz-Carlton Hotel traffic would be to and from destinations outside Kapalua.

Kapalua Circulation Changes

As described in the introduction, Lower Honoapiilani Road would be closed between D.T. Fleming Park and Office Road and the Village Road access to Lower Honoapiilani Road would be eliminated. Present and future traffic volumes on Village Road and on the affected portion of Lower Honoapiilani Road are relatively low (less than 1,000 VPD). Regional access to D.T. Fleming Park would not be substantially affected since most Honoapiilani Highway traffic does not access the park via Office Road. Access to D.T. Fleming Park from the Kapalua Bay Hotel and other developed areas of Kapalua, however, would be made less direct by the closure.

Intersection Capacity Conditions

As shown in Table 3, five of the six study intersections would operate relatively well at 81 percent or less of their respective capacities even during peak traffic hours, based on conservative worst-case assumptions regarding traffic. The Kaanapali Parkway intersection operating conditions would exceed capacity. The Office Road-Honoapiilani Highway should continue to operate satisfactorily without signalization.

Mitigation Measures

The 18-foot width of Office Road is minimal for a two-way roadway and is adequate only for very low traffic volumes. The Ritz-Carlton Hotel would double traffic volumes on Office Road between the hotel and the Honoapiilani Highway . Road improvements would be needed as a temporary measure until Kapalua Drive is completed.

Analysis of redesignating the exclusive right-turn lane on the southbound approach to the Kaanapali Parkway to a second through traffic lane also indicates substantial benefits to

Table 3

FORECAST 1994 TRAFFIC CONDITIONS WITH AND WITHOUT RITZ-CARLTON HOTEL
Ritz-Carlton Kapalua Hotel Traffic

HONOAPIILANI HIGHWAY INTERSECTION	VOLUME TO CAPACITY RATIOS			
	1994 NO PROJECT		1994 WITH PROJECT	
	AM PEAK HOUR	PM PEAK HOUR	AM PEAK HOUR	PM PEAK HOUR
Office Road	0.11	0.16	0.17	0.23
Kaanapali Parkway	0.90	1.07	0.96	1.16
Front Street/ Fleming Street	0.72	0.77	0.76	0.81
Kapunakea Street	0.58	0.71	0.61	0.74
Papalaua Street	0.52	0.73	0.55	0.76
Lahainaluna Road	0.70	0.75	0.72	0.78

T-03/217

existing, 1994 No Project and to 1994 Ritz-Carlton Hotel traffic conditions. Two southbound departure lanes already exist to accommodate this improvement; however, the free flow right-turn from the Kaanapali Parkway would need to be changed to a yield condition. As noted earlier, a significant amount of this free flow right-turn traffic actually yields rather than merges during peak traffic hours. As such, the redesignation of traffic control would not substantially affect this right-turn traffic. Table 4 summarizes the estimated benefits of the traffic control improvements.

Lastly, a transportation coordinator would be designated to promote and facilitate ridesharing by hotel employees. The objectives of the coordinator would be to improve employee commute access and reduce commute traffic.

Table 4

ESTIMATED BENEFITS RESULTING FROM TRAFFIC CONTROL CHANGES
AT KAANAPALI PARKWAY INTERSECTION[1]
Ritz-Carlton Kapalua Hotel Traffic

	VOLUME TO CAPACITY RATIO	
	AM PEAK HOUR	PM PEAK HOUR
Existing Traffic		
Existing Control	0.85	1.02
Second Southbound Lane	0.62	0.79
1994 No Project		
Existing Control	0.90	1.07
Second Southbound Lane	0.66	0.83
1994 Ritz-Carlton Hotel		
Existing Control	0.96	1.16
Second Southbound Lane	0.69	0.89

1 Redesignate exclusive southbound right-turn lane as a second southbound through traffic lane and convert Kaanapali Parkway free right-turn to a signalized or yield right-turn.

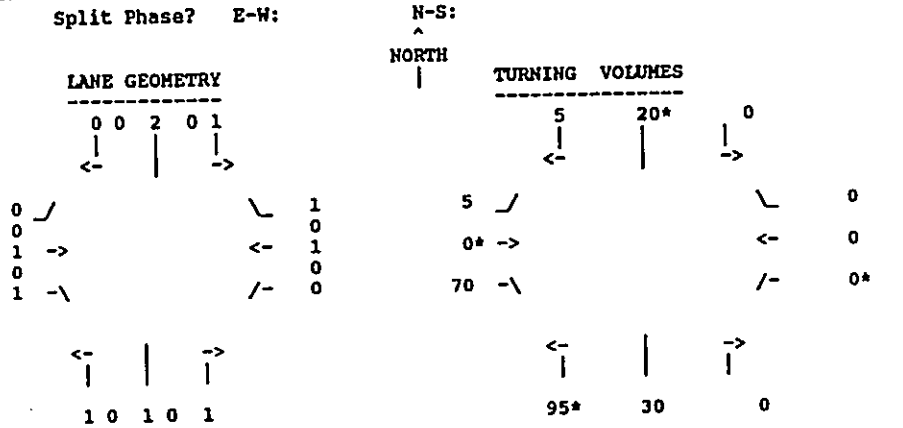
T-04/217

APPENDIX E-1

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 1
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Office Road Signal Phasing: 4
Approach 3/4: Honoapiilani Highway Conditions:
Comments: Existing Conditions

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
5	6	0	0	0	0	0	12	0	0	30	95
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
0	5	0	1	0	0	95	12

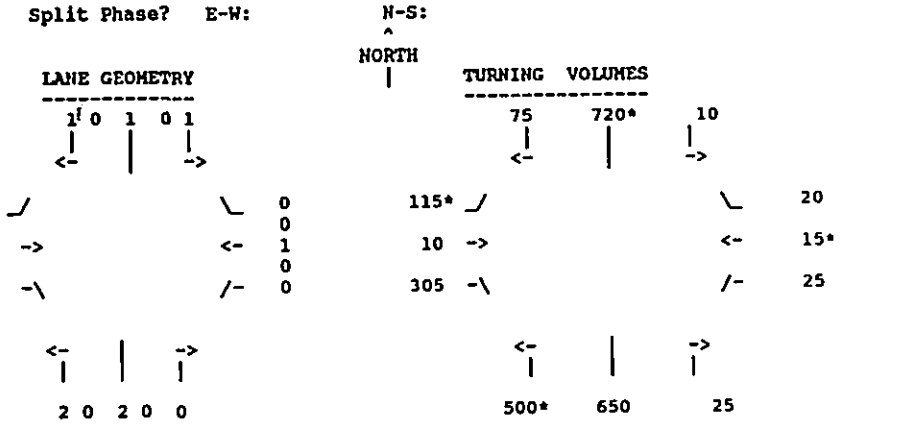
Total Critical Volume = 113 LOS = A V/C = 0.08

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:22:21 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 2
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Kaanapali Parkway Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: Existing Conditions

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
115	137	0	0	85	25	10	720	0	0	337	275
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
25	90	0	85	10	0	265	720

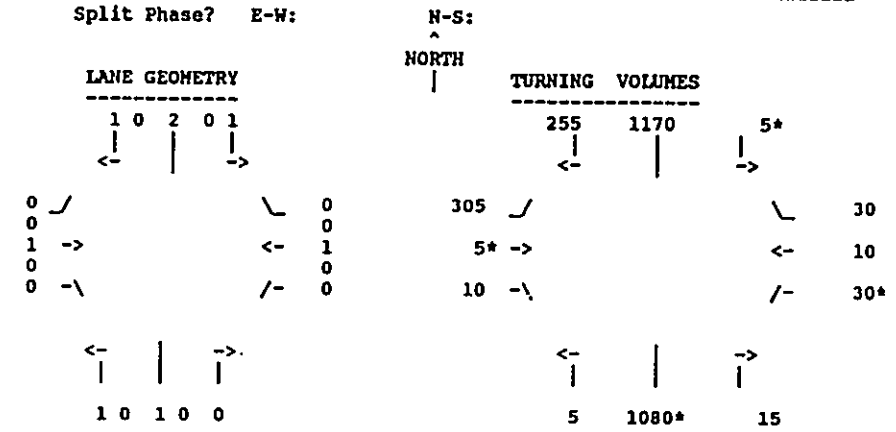
Total Critical Volume = 1195 LOS = D V/C = 0.85

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:22:25 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 3
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Front Street/ Flemmi Signal Phasing: 5
Approach 3/4: Honoapiilani Highway Conditions:
Comments: Existing Conditions

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
305	351	0	0	73	30	5	585	0	0	1095	5
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
30	275	0	76	5	0	0	1095

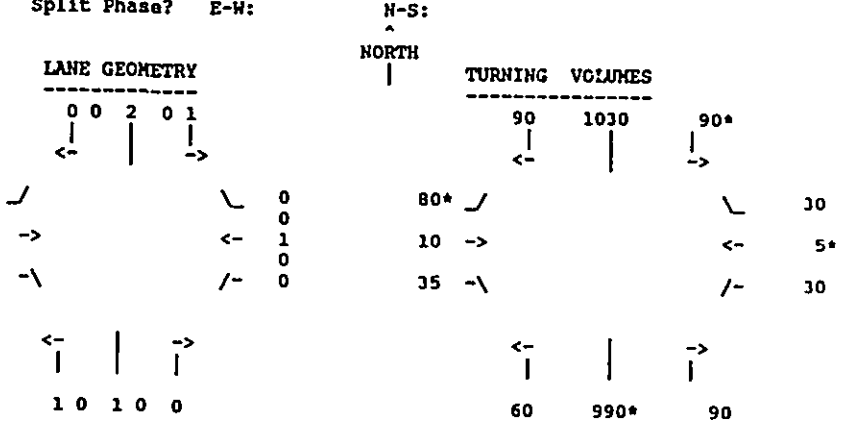
Total Critical Volume = 1481 LOS = F V/C = 1.06

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:22:29 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 4
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Kapunakea Street Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: Existing Conditions

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
80	98	0	0	68	30	90	560	0	0	1080	60
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
30	50	0	68	60	30	0	1080

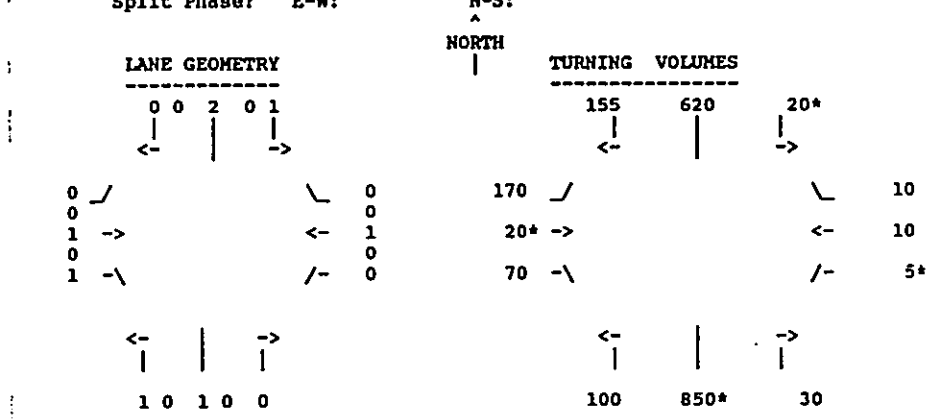
Total Critical Volume = 1318 LOS = E V/C = 0.94

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:22:34 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 5
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Papalaua Street Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: Existing Conditions

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
170	207	0	0	26	5	20	387	0	0	880	100
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
5	165	0	42	20	0	80	800

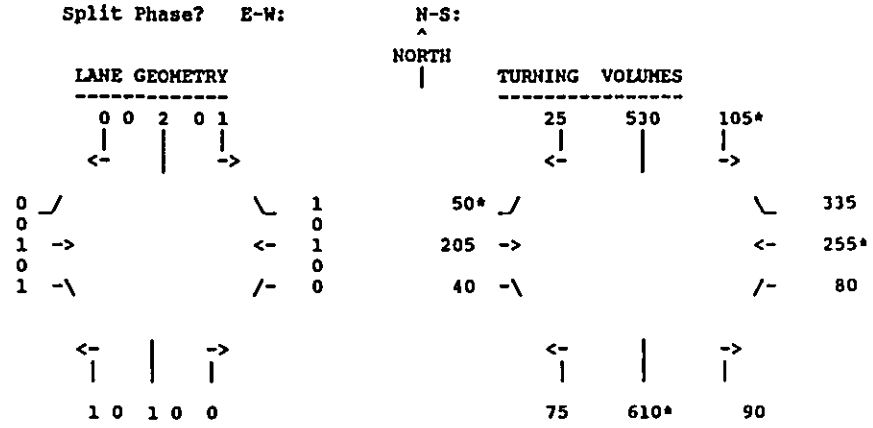
Total Critical Volume = 1112 LOS = C V/C = 0.79

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:22:38 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 6
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Lahainaluna Road Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: Existing Conditions

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
50	305	0	0	415	80	105	277	0	0	700	75
--------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
50	0	30	385	75	30	0	700

Total Critical Volume = 1270 LOS = E V/C = 0.91

Intersection capacity = 1400
Double left-turn factor = 1.1
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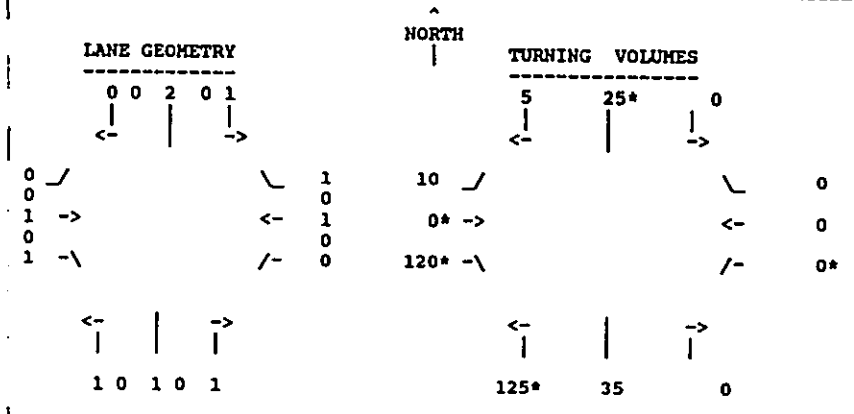
Time of run: 3:22:42 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCH/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 1
Project: Ritz Carlton Hotel Design Hour: AM PEAK HOUR
Approach 1/2: Office Road Signal Phasing: 4
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 NO PROJECT



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
10	11	2	0	0	0	0	15	0	0	35	125
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
0	10	0	3	0	0	125	15

Total Critical Volume = 153 LOS = A V/C = 0.11

Intersection capacity = 1400
Double left-turn factor = 1.1
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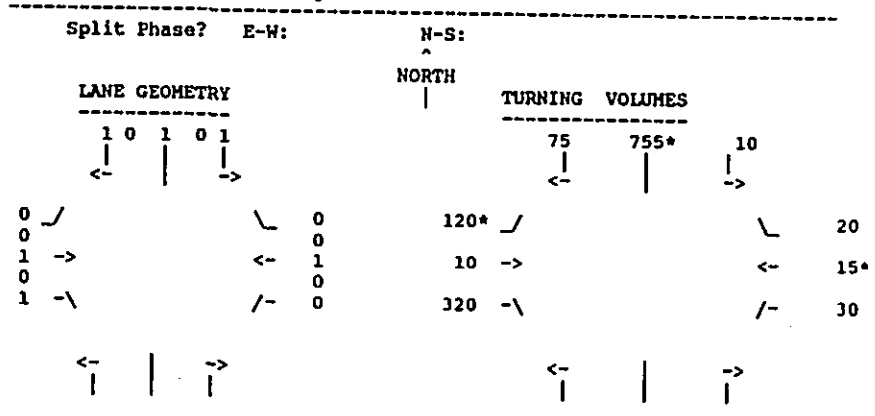
Date of run: 09/27/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.84

W I L B U R S M I T H A S S O C I A T E S
1985 HWCH/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 2
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Kaanapali Parkway Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 No Project

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
120	142	0	0	95	30	10	755	0	0	357	289
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
30	90	0	95	10	0	279	755

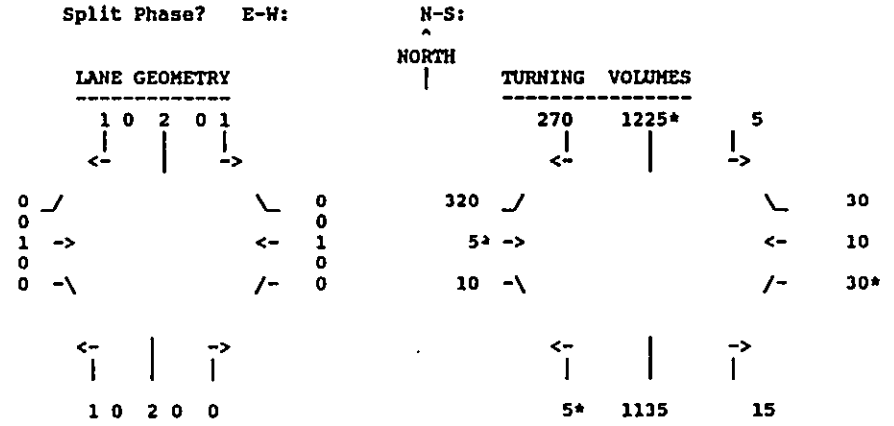
Total Critical Volume = 1259 LOS = D V/C = 0.90

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:24:17 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 3
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Front Street/ Plemmi Signal Phasing: 5
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 No Project

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
320	367	0	0	73	30	5	612	0	0	575	5
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
30	290	0	77	5	0	0	612

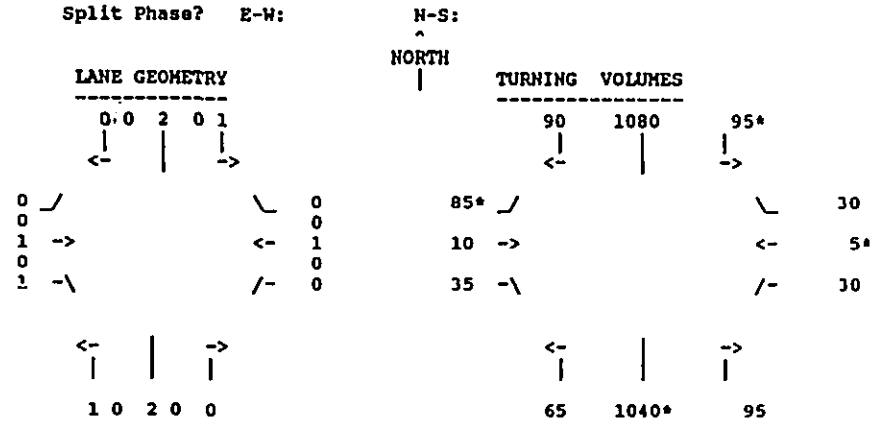
Total Critical Volume = 1014 LOS = C V/C = 0.72

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:24:21 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 4
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Kapunakea Street Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 No Project

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
85	104	0	0	68	30	95	585	0	0	567	65
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
30	55	0	68	65	30	0	567

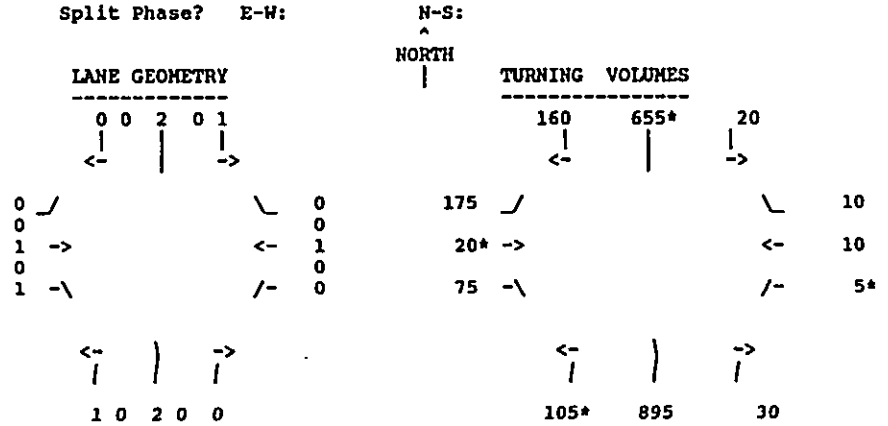
Total Critical Volume = 815 LOS = A V/C = 0.58

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:24:25 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 5
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Papalaua Street Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 No Project

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
175	213	0	0	26	5	20	407	0	0	462	105
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
5	170	0	43	20	0	85	407

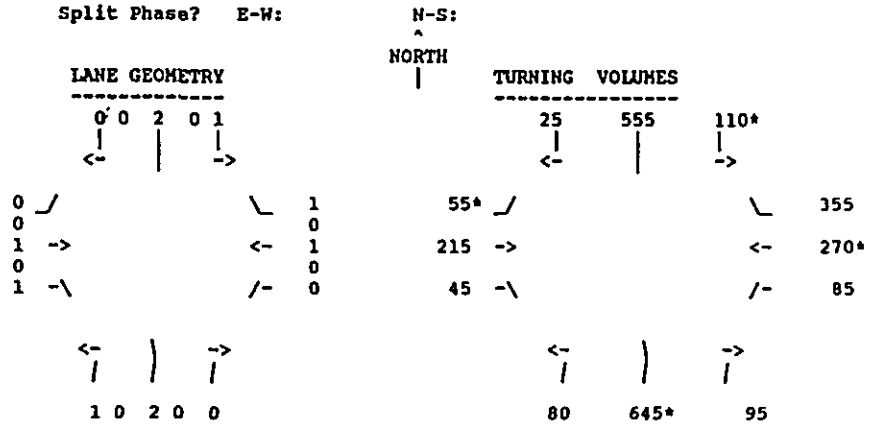
Total Critical Volume = 730 LOS = A V/C = 0.52

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:24:30 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 6
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Lahainaluna Road Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 No Project

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
55	380	0	0	440	85	110	290	0	0	370	80
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
55	0	30	410	80	30	0	370

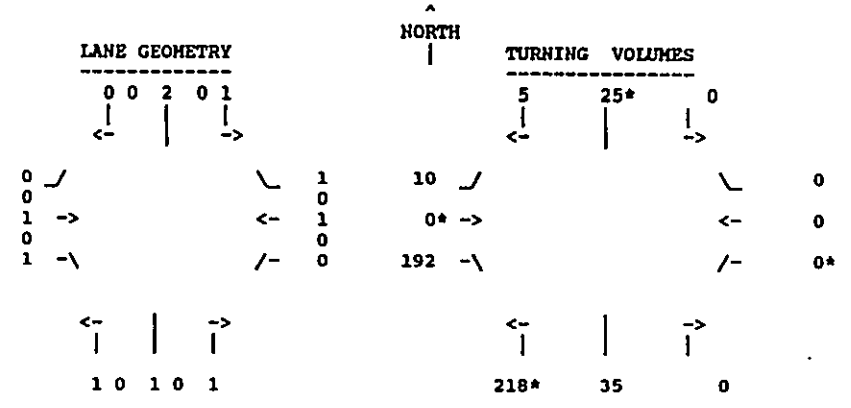
Total Critical Volume = 975 LOS = B V/C = 0.70

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:24:34 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S

1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 1
Project: Ritz Carlton Hotel Design Hour: AM PEAK HOUR
Approach 1/2: Office Road Signal Phasing: 4
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 WITH PROJECT



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
10	11	0	0	0	0	0	15	0	0	35	218
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
0	10	0	1	0	0	218	15

Total Critical Volume = 244 LOS = A V/C = 0.17

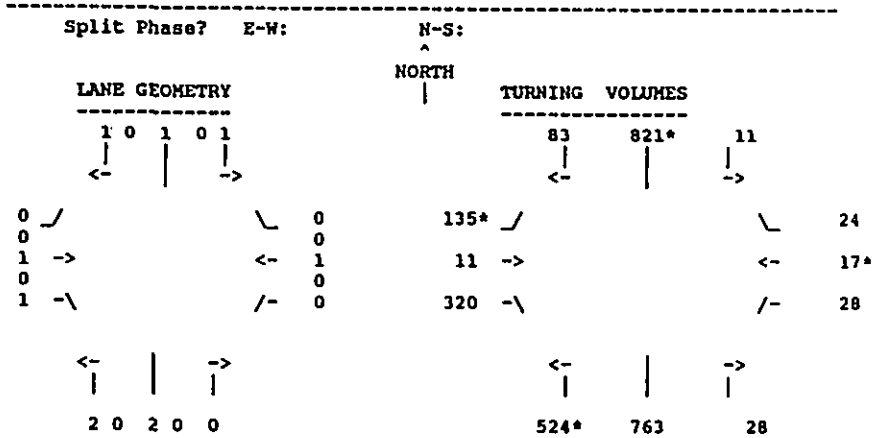
Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: *.dat
Time of run: 9:23:43 AM
Date of run: 09/27/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.84

W I L B U R S M I T H A S S O C I A T E S

1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 2
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Kaanapali Parkway Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 with Project

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
135	160	0	0	97	28	11	821	0	0	395	288
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
28	107	0	97	11	0	277	821

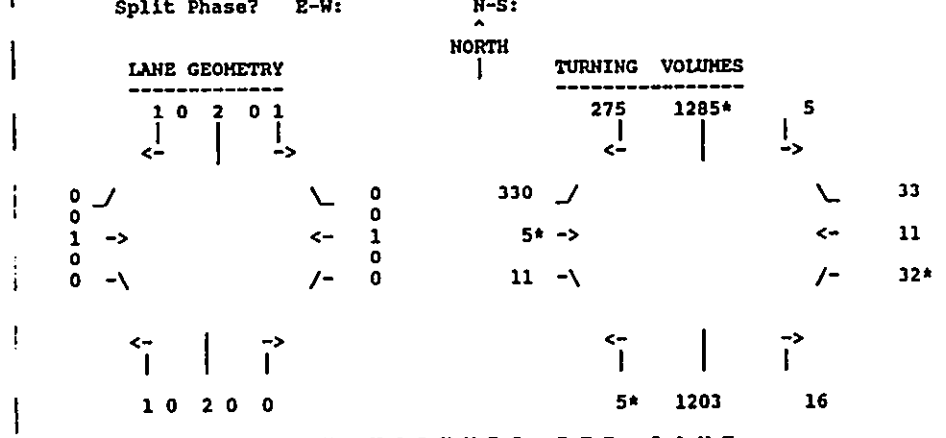
Total Critical Volume = 1341 LOS = E V/C = 0.96

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:25:04 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 3
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Front Street/ Flemmi Signal Phasing: 5
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 with Project

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
330	379	0	0	79	32	5	642	0	0	609	5
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

1	2	3	4	5	6	7	8
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
32	298	0	81	5	0	0	642

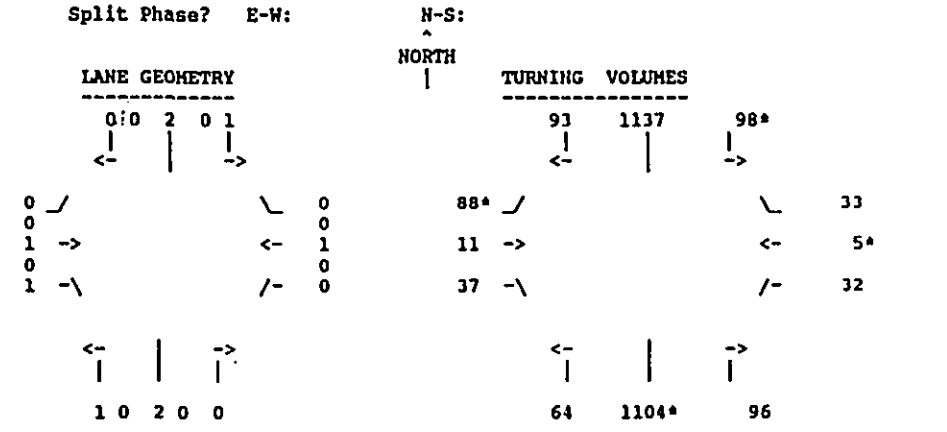
Total Critical Volume = 1058 LOS = C V/C = 0.76

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:25:08 PM
Date of run: 08/17/1989
Wilbur Smith Asscciates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 4
Project: Ritz Carlton Hotel Design Hour: AM Peak Hour
Approach 1/2: Kapunakea Street Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 with Project

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
88	108	0	0	73	32	98	615	0	0	600	64
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

1	2	3	4	5	6	7	8
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
32	56	0	73	64	34	0	600

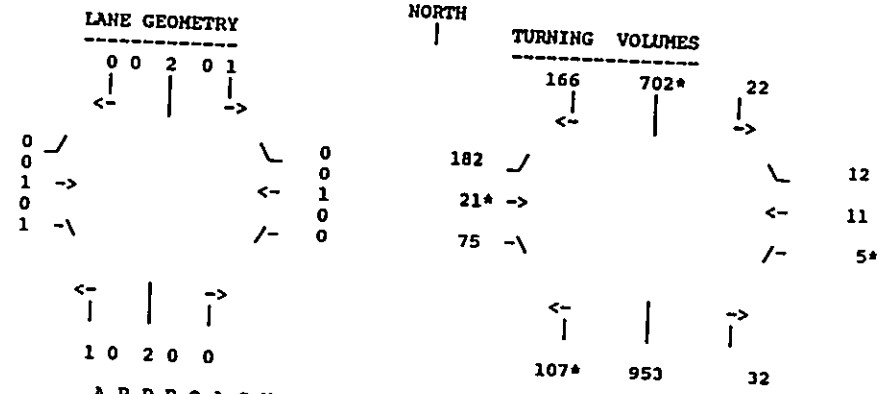
Total Critical Volume = 859 LOS = B V/C = 0.61

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:25:13 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 5
Project: Ritz Carlton Hotel
Approach 1/2: Papalaua Street
Approach 3/4: Honoapiilani Highway
Comments: 1994 with Project
Design Hour: AM Peak Hour
Signal Phasing: 6
Conditions:

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
182	221	0	0	29	5	22	434	0	0	492	107
-------R---0.80-			-0.80---R-------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
5	177	0	44	22	0	85	434

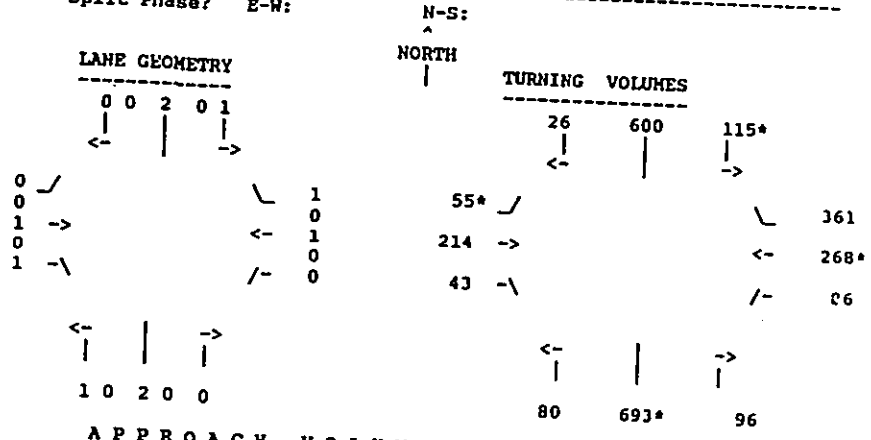
Total Critical Volume = 767 LOS = A V/C = 0.55

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:25:17 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 6
Project: Ritz Carlton Hotel
Approach 1/2: Lahainaluna Road
Approach 3/4: Honoapiilani Highway
Comments: 1994 with Project
Design Hour: AM Peak Hour
Signal Phasing: 6
Conditions:

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
55	379	0	0	440	86	115	313	0	0	394	80
-------R---0.80-			-0.80---R-------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
55	0	31	409	80	35	0	394

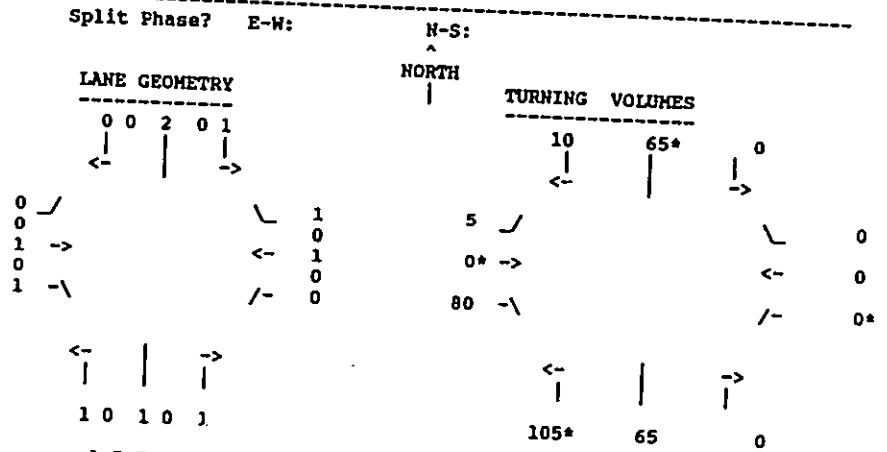
Total Critical Volume = 1004 LOS = C V/C = 0.72

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:25:21 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 1
Project: Ritz Carlton Hotel
Approach 1/2: Office Road
Approach 3/4: Honoapiilani Highway
Comments: Existing Conditions
Design Hour: PM Peak Hour
Signal Phasing: 4
Conditions:

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
5	6	0	0	0	0	0	37	0	0	65	105
-------R---0.80-			-0.80---R--------			-------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

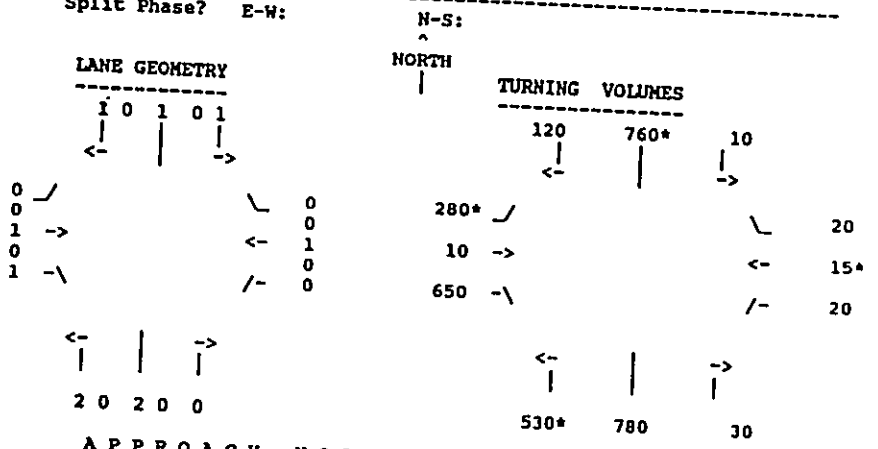
--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	--- 7 ---	--- 8 ---
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
0	5	0	1	0	0	105	37
Total Critical Volume = 148 LOS = A						V/C = 0.11	

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:25:59 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 2
Project: Ritz Carlton Hotel
Approach 1/2: Kaanapali Parkway
Approach 3/4: Honoapiilani Highway
Comments: Existing Conditions
Design Hour: PM Peak Hour
Signal Phasing: 6
Conditions:

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
280	318	32	0	95	20	10	760	0	0	405	292
-------R---0.80-			-0.80---R--------			-------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

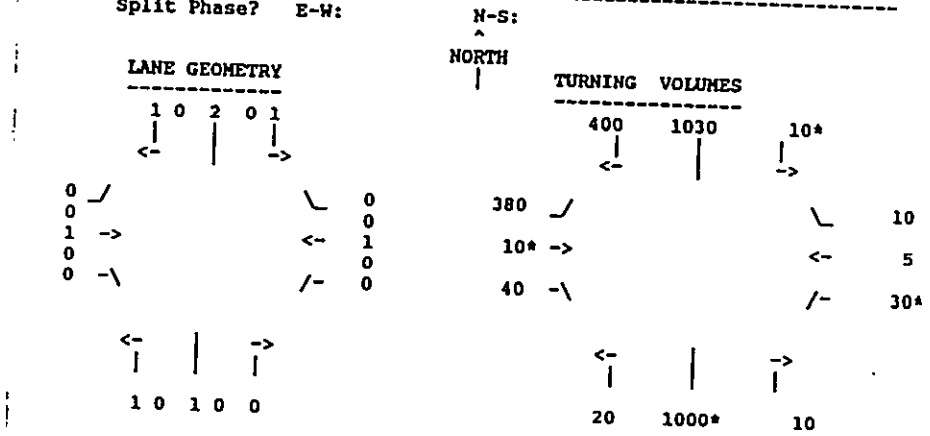
--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	--- 7 ---	--- 8 ---
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
20	260	0	95	10	0	282	760
Total Critical Volume = 1427 LOS = F						V/C = 1.02	

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:26:03 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 3
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Front Street/ Plemmi Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: Existing Conditions

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
380	468	0	0	48	30	10	515	0	01010		20
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	--- 7 ---	--- 8 ---
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
30	350	0	118	10	0	10	1000

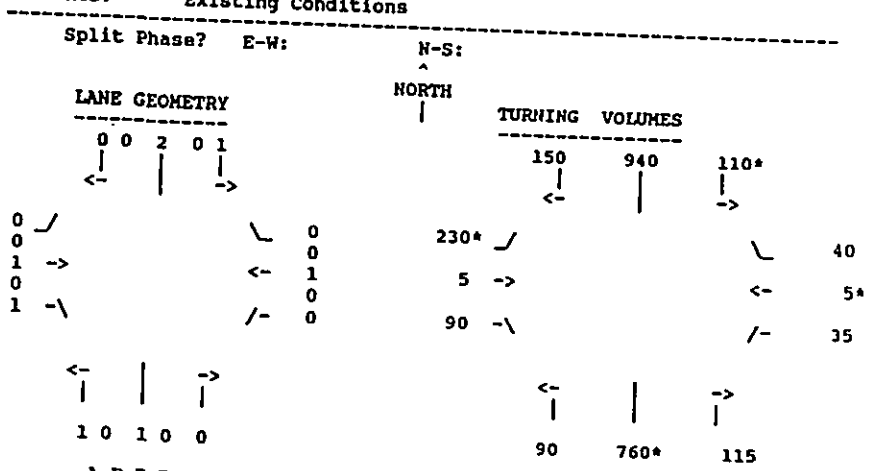
Total Critical Volume = 1518 LOS = F V/C = 1.08

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:26:07 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 4
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Kapunakea Street Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: Existing Conditions

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
230	258	0	0	84	35	110	545	0	0	875	90
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	--- 7 ---	--- 8 ---
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
35	195	0	84	90	20	0	875

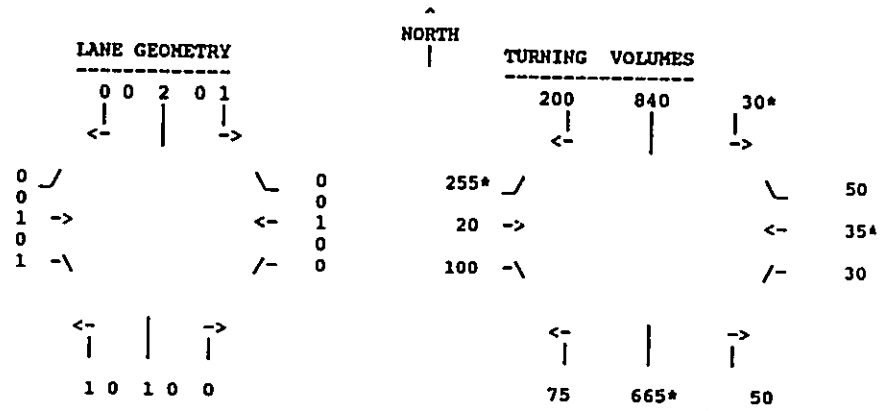
Total Critical Volume = 1299 LOS = E V/C = 0.93

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:26:12 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 5
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Papalaua Street Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: Existing Conditions

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
255	301	0	0	118	30	30	520	0	0	715	75
-------R---0.80-			-0.80---R-------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
30	225	0	118	30	0	45	670

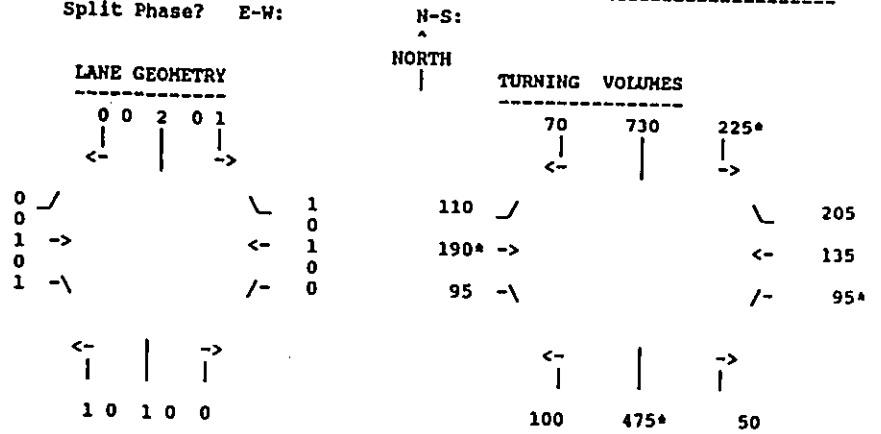
Total Critical Volume = 1118 LOS = C V/C = 0.80

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:26:16 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 6
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Lahainaluna Road Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: Existing Conditions

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
110	410	0	0	325	95	225	400	0	0	525	100
-------R---0.80-			-0.80---R-------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

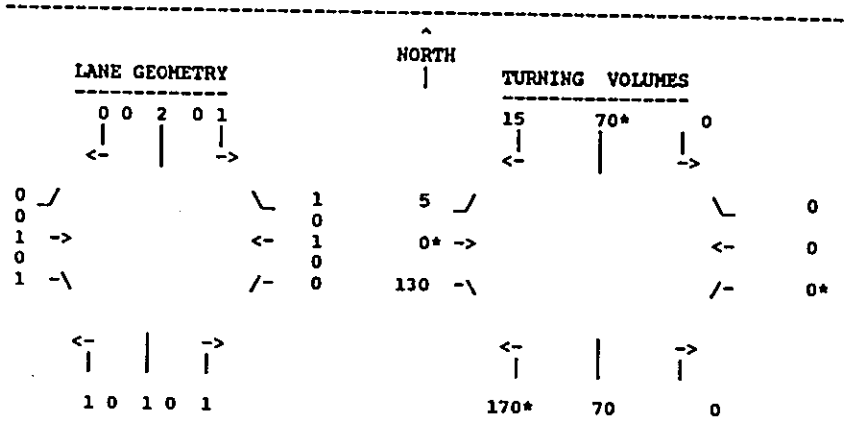
--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
95	15	0	395	100	125	0	525

Total Critical Volume = 1255 LOS = D V/C = 0.90

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:26:20 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 1
Project: Ritz Carlton Hotel Design Hour: PM PEAK HOUR
Approach 1/2: Office Road Signal Phasing: 4
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 NO PROJECT



APPROACH VOLUMES PER LANE

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
5	6	0	0	0	0	0	42	0	0	70	170
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
0	5	0	1	0	0	170	42

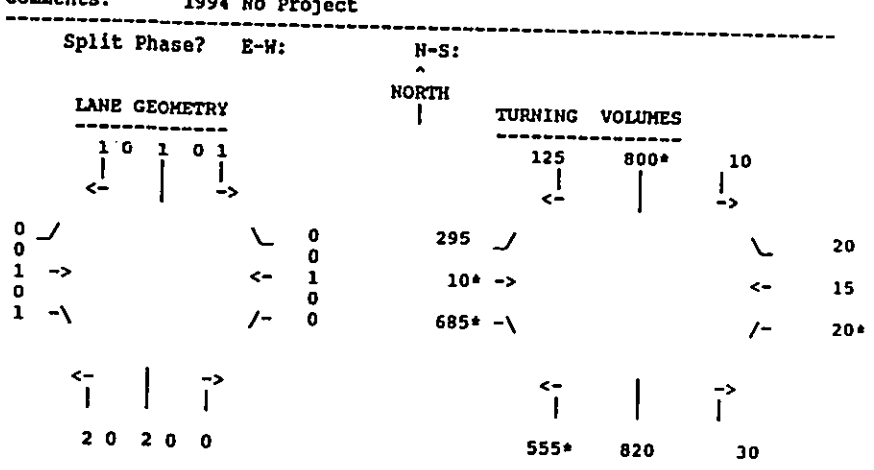
Total Critical Volume = 218 LOS = A V/C = 0.16

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: *.dat
Time of run: 9:27:02 AM
Date of run: 09/27/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.84

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 2
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Kaanapali Parkway Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 No Project

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
295	335	36	0	95	20	10	800	0	0	425	305
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
20	275	0	96	10	0	295	800

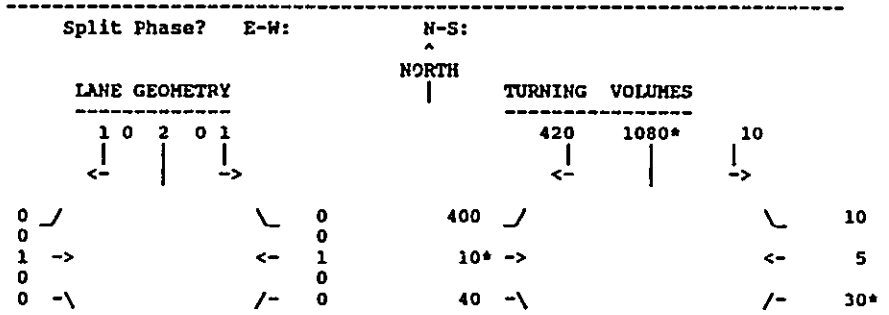
Total Critical Volume = 1496 LOS = F V/C = 1.07

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:26:50 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 3
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Front Street/ Flemmi Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 No Project

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
400	490	0	0	48	30	10	540	0	0	530	20
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
30	370	0	120	10	0	10	540

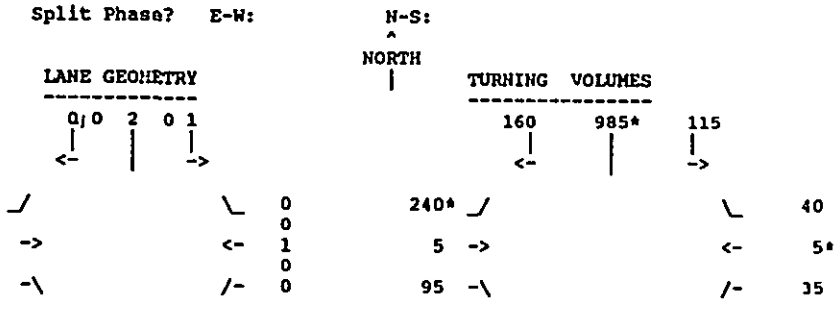
Total Critical Volume = 1080 LOS = C V/C = 0.77

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:26:55 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 4
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Kapunakea Street Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 No Project

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORTHBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
240	269	0	0	84	35	115	572	0	0	460	95
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
35	205	0	84	95	20	0	552

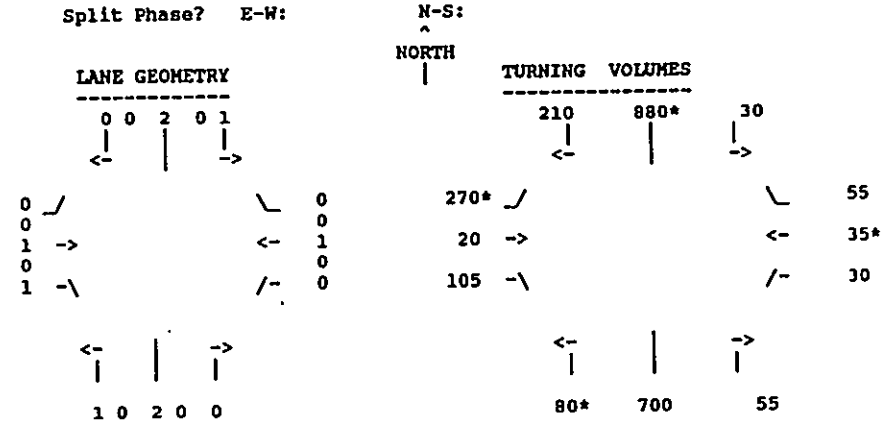
Total Critical Volume = 991 LOS = C V/C = 0.71

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:26:59 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 5
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Papalaua Street Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 No Project

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
270	317	0	0	123	30	30	545	0	0	377	80
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

--- 1 --	--- 2 --	--- 3 --	--- 4 --	--- 5 --	--- 6 --	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
30	240	0	123	30	0	50	545

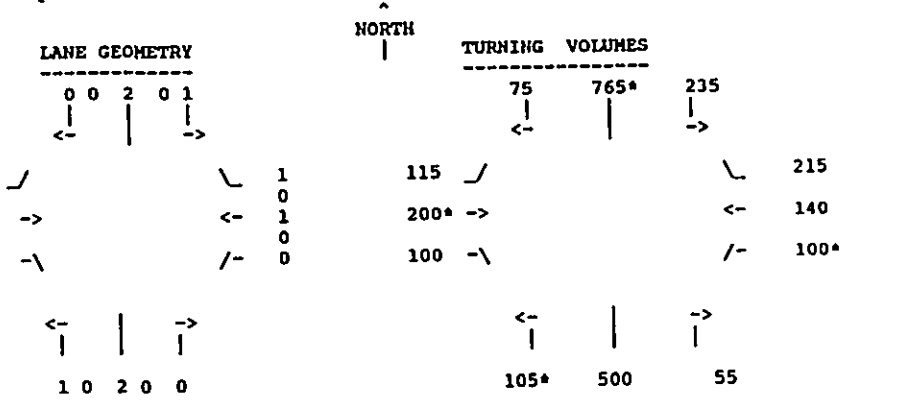
Total Critical Volume = 1018 LOS = C V/C = 0.73

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:27:03 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 6
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Lahainaluna Road Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 No Project

Split Phase? E-W: N-S:



A P P R O A C H V O L U M E S P E R L A N E

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
115	430	0	0	340	100	235	420	0	0	277	105
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

C R I T I C A L P H A S E S

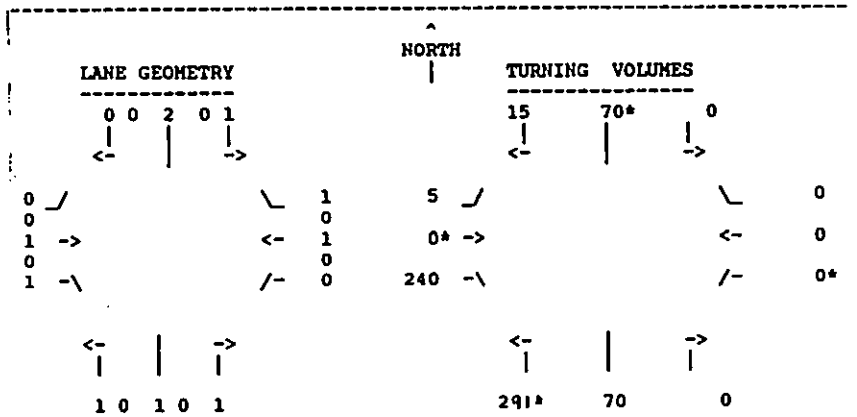
--- 1 --	--- 2 --	--- 3 --	--- 4 --	--- 5 --	--- 6 --	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
100	15	0	415	105	130	0	290

Total Critical Volume = 1055 LOS = C V/C = 0.75

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:27:08 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 1
Project: Ritz Carlton Hotel Design Hour: PM PEAK HOUR
Approach 1/2: Office Road Signal Phasing: 4
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 WITH PROJECT



APPROACH VOLUMES PER LANE

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
5	6	0	0	0	0	0	42	0	0	70	291
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
0	5	0	1	0	0	291	42

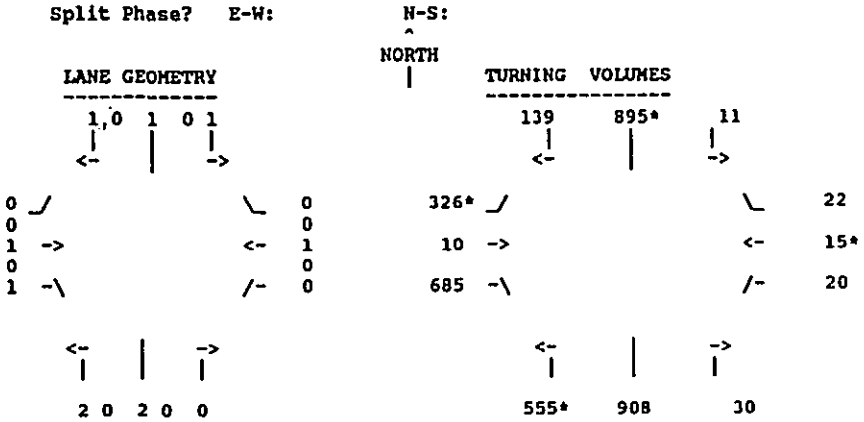
Total Critical Volume = 328 LOS = A V/C = 0.23

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: *.dat
Time of run: 9:25:34 AM
Date of run: 09/27/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.84

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 2
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Kaanapali Parkway Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 with Project

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
326	369	9	0	97	20	11	895	0	0	469	305
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
20	306	0	97	11	0	294	895

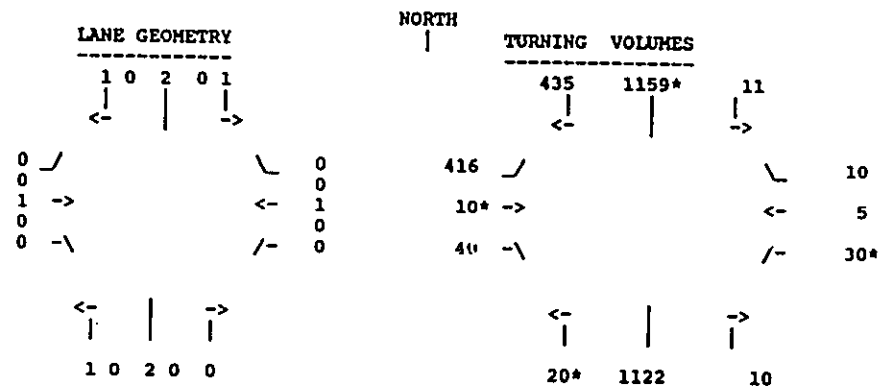
Total Critical Volume = 1623 LOS = F V/C = 1.16

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:27:40 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCH/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 3
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Front Street/ Plemmi Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 with Project

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
416	508	0	0	48	30	11	579	0	0	566	20
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
30	386	0	122	11	0	9	579

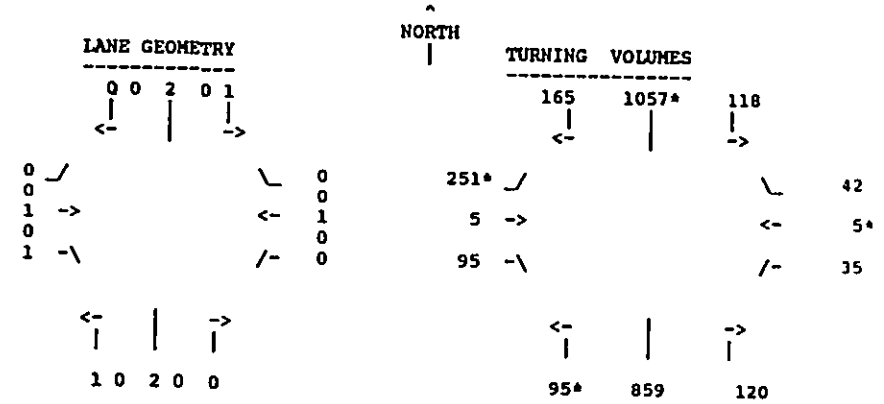
Total Critical Volume = 1137 LOS = D V/C = 0.81

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:27:45 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCH/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 4
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Kapunakea Street Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 with Project

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND LT	EASTBOUND TH	EASTBOUND RT	WESTBOUND RT	WESTBOUND TH	WESTBOUND LT	SOUTHBOUND LT	SOUTHBOUND TH	SOUTHBOUND RT	NORHTBOUND RT	NORHTBOUND TH	NORHTBOUND LT
251	281	0	0	86	35	118	611	0	0	489	95
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
35	216	0	86	95	23	0	588

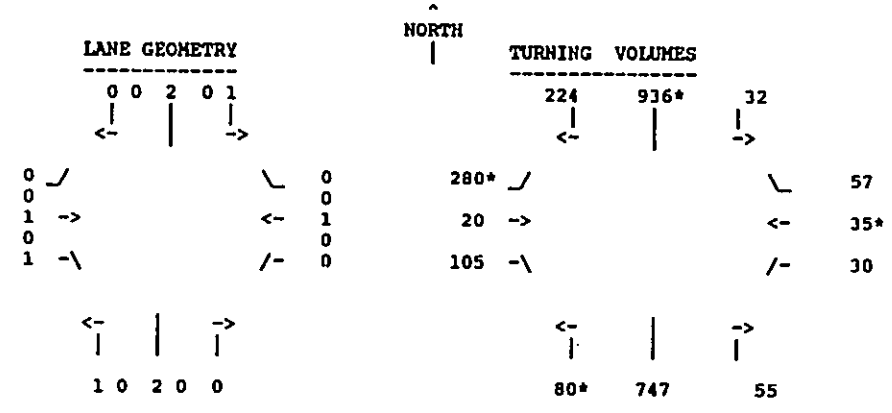
Total Critical Volume = 1043 LOS = C V/C = 0.74

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:27:49 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 5
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Papalaua Street Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 with Project

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
280	328	0	0	125	30	32	580	0	0	401	80
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
30	250	0	125	32	0	48	580

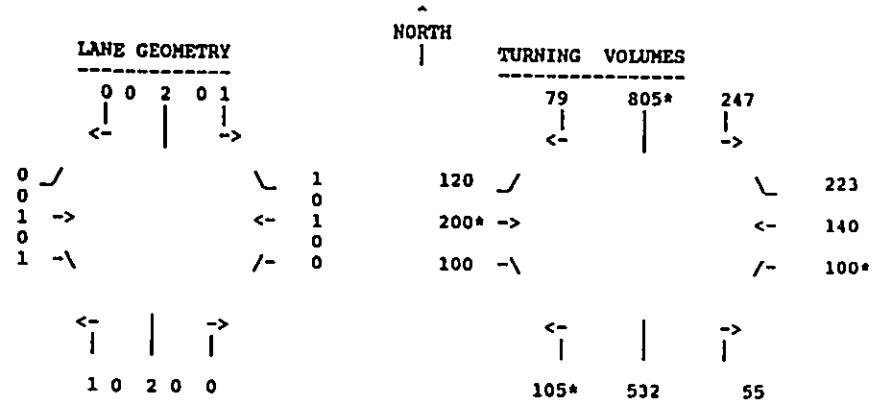
Total Critical Volume = 1065 LOS = C V/C = 0.76

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:27:53 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88

W I L B U R S M I T H A S S O C I A T E S
1985 HWCM/CIRC 212, SIGNALIZED, ISOLATED INTERSECTION CAPACITY ANALYSIS
PLANNING METHOD

Intersection no.: 6
Project: Ritz Carlton Hotel Design Hour: PM Peak Hour
Approach 1/2: Lahainaluna Road Signal Phasing: 6
Approach 3/4: Honoapiilani Highway Conditions:
Comments: 1994 with Project

Split Phase? E-W: N-S:



APPROACH VOLUMES PER LANE

EASTBOUND			WESTBOUND			SOUTHBOUND			NORHTBOUND		
LT	TH	RT	RT	TH	LT	LT	TH	RT	RT	TH	LT
120	440	0	0	340	100	247	442	0	0	293	105
-------R---0.80-			-0.80---R--------			--------R---0.80-			-0.80---R-------		

CRITICAL PHASES

--- 1 ---	--- 2 ---	--- 3 ---	--- 4 ---	--- 5 ---	--- 6 ---	-- 7 --	-- 8 --
WB LT/ EB LT	EB TH/ EB LT	WB TH/ WB LT	WB TH/ EB TH	SB LT/ NB LT	SB TH/ SB LT	NB TH/ NB LT	SB TH/ NB TH
100	20	0	420	105	142	0	300

Total Critical Volume = 1087 LOS = C V/C = 0.78

Intersection capacity = 1400
Double left-turn factor = 1.1
FILE: CAPPY.DAT
Time of run: 3:27:58 PM
Date of run: 08/17/1989
Wilbur Smith Associates, 1987,1988,1989. ver. 6.88